Cisco ASA 5500 Series Configuration Guide using the CLI

Software Version 8.2

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GLOSSARY

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About This Guide

This preface introduce the *Cisco ASA 5500 Series Configuration Guide using the CLI*, and includes the following sections:

- Document Objectives, page lix
- Audience, page lix
- Related Documentation, page lx
- Document Conventions, page lx
- Obtaining Documentation, Obtaining Support, and Security Guidelines, page lx

Document Objectives

The purpose of this guide is to help you configure the ASA using the command-line interface. This guide does not cover every feature, but describes only the most common configuration scenarios.

You can also configure and monitor the ASA by using ASDM, a web-based GUI application. ASDM includes configuration wizards to guide you through some common configuration scenarios, and online Help for less common scenarios. For more information, see:
http://www.cisco.com/en/US/products/ps6121/tsd_products_support_series_home.html

This guide applies to the Cisco ASA 5500 series ASAs. Throughout this guide, the term "ASA" applies generically to all supported models, unless specified otherwise. The PIX 500 security appliances are not supported.

Audience

This guide is for network managers who perform any of the following tasks:

- Manage network security
- Install and configure firewalls/ASAs
- Configure VPNs
- Configure intrusion detection software

Related Documentation

For more information, refer to *Navigating the Cisco ASA 5500 Series Documentation* at http://www.cisco.com/en/US/docs/security/asa/roadmap/asaroadmap.html.

Document Conventions

Command descriptions use these conventions:

- Braces ({ }) indicate a required choice.
- Square brackets ([ ]) indicate optional elements.
- Vertical bars (|) separate alternative, mutually exclusive elements.
- **Boldface** indicates commands and keywords that are entered literally as shown.
- *Italics* indicate arguments for which you supply values.

Examples use these conventions:

- Examples depict screen displays and the command line in `screen` font.
- Information you need to enter in examples is shown in **`boldface screen`** font.
- Variables for which you must supply a value are shown in *`italic screen`* font.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

PART 1

Getting Started and General Information

CHAPTER 1

Introduction to the ASA

The ASA combines advanced stateful firewall and VPN concentrator functionality in one device, and for some models, an integrated intrusion prevention module called the AIP SSM/SSC or an integrated content security and control module called the CSC SSM. The ASA includes many advanced features, such as multiple security contexts (similar to virtualized firewalls), transparent (Layer 2) firewall or routed (Layer6 3) firewall operation, advanced inspection engines, IPSec VPN, SSL VPN, and clientless SSL VPN support, and many more features.

This chapter includes the following sections:

- Supported Software, Models, and Modules, page 1-1
- VPN Specifications, page 1-1
- New Features, page 1-1
- Firewall Functional Overview, page 1-10
- VPN Functional Overview, page 1-14
- Security Context Overview, page 1-15

Supported Software, Models, and Modules

For a complete list of supported ASA software, models, and modules, see *Cisco ASA 5500 Series Hardware and Software Compatibility*:

http://www.cisco.com/en/US/docs/security/asa/compatibility/asamatrx.html

VPN Specifications

See the *Supported VPN Platforms, Cisco ASA 5500 Series* at http://www.cisco.com/en/US/docs/security/asa/compatibility/asa-vpn-compatibility.html

New Features

This section includes the following topics:

- New Features in Version 8.2(5), page 1-2
- New Features in Version 8.2(4.4), page 1-2

- New Features in Version 8.2(4.1), page 1-2
- New Features in Version 8.2(4), page 1-2
- New Features in Version 8.2(3.9), page 1-2
- New Features in Version 8.2(3), page 1-2
- New Features in Version 8.2(2), page 1-2
- New Features in Version 8.2(1), page 1-5

Note New, changed, and deprecated syslog messages are listed in *Cisco ASA 5500 Series System Log Messages*.

New Features in Version 8.2(5)

New Features in Version 8.2(4.4)

New Features in Version 8.2(4.1)

New Features in Version 8.2(4)

New Features in Version 8.2(3.9)

New Features in Version 8.2(3)

New Features in Version 8.2(2)

Released: January 11, 2010

Table 1-1 lists the new features forASA Version 8.2(2).

Table 1-1 New Features for ASA Version 8.2(2)

Feature	Description
Remote Access Features	
Scalable Solutions for Waiting-to-Resume VPN Sessions	An administrator can now keep track of the number of users in the active state and can look at the statistics. The sessions that have been inactive for the longest time are marked as idle (and are automatically logged off) so that license capacity is not reached and new users can log in. *Also available in Version 8.0(5).*
Application Inspection Features	
Inspection for IP Options	You can now control which IP packets with specific IP options should be allowed through the ASA. You can also clear IP options from an IP packet, and then allow it through the ASA. Previously, all IP options were denied by default, except for some special cases. **Note** This inspection is enabled by default. The following command is added to the default global service policy: **inspect ip-options**. Therefore, the ASA allows RSVP traffic that contains packets with the Router Alert option (option 20) when the ASA is in routed mode. The following commands were introduced: **policy-map type inspect ip-options**, **inspect ip-options**, **eool**, **nop**.
Enabling Call Set up Between H.323 Endpoints	You can enable call setup between H.323 endpoints when the Gatekeeper is inside the network. The ASA includes options to open pinholes for calls based on the RegistrationRequest/RegistrationConfirm (RRQ/RCF) messages. Because these RRQ/RCF messages are sent to and from the Gatekeeper, the calling endpoint IP address is unknown and the ASA opens a pinhole through source IP address/port 0/0. By default, this option is disabled. The following command was introduced: **ras-rcf-pinholes enable** (under the **policy-map type inspect h323 > parameters** commands). *Also available in Version 8.0(5).*
Unified Communication Features	
Mobility Proxy application no longer requires Unified Communications Proxy license	The Mobility Proxy no longer requires the UC Proxy license.
Interface Features	
In multiple context mode, auto-generated MAC addresses now use a user-configurable prefix, and other enhancements	The MAC address format was changed to allow use of a prefix, to use a fixed starting value (A2), and to use a different scheme for the primary and secondary unit MAC addresses in a failover pair. The MAC addresess are also now persistent accross reloads. The command parser now checks if auto-generation is enabled; if you want to also manually assign a MAC address, you cannot start the manual MAC address with A2. The following command was modified: **mac-address auto prefix** *prefix*. *Also available in Version 8.0(5).*

Table 1-1 New Features for ASA Version 8.2(2) (continued)

Feature	Description
Support for Pause Frames for Flow Control on the ASA 5580 10 Gigabit Ethernet Interfaces	You can now enable pause (XOFF) frames for flow control. The following command was introduced: **flowcontrol**.
Firewall Features	
Botnet Traffic Filter Enhancements	The Botnet Traffic Filter now supports automatic blocking of blacklisted traffic based on the threat level. You can also view the category and threat level of malware sites in statistics and reports. Reporting was enhanced to show infected hosts. The 1 hour timeout for reports for top hosts was removed; there is now no timeout. The following commands were introduced or modified: **dynamic-filter ambiguous-is-black**, **dynamic-filter drop blacklist**, **show dynamic-filter statistics**, **show dynamic-filter reports infected-hosts**, and **show dynamic-filter reports top**.
Connection timeouts for all protocols	The idle timeout was changed to apply to all protocols, not just TCP. The following command was modified: **set connection timeout**.
Routing Features	
DHCP RFC compatibility (rfc3011, rfc3527) to resolve routing issues	This enhancement introduces ASA support for DHCP RFCs 3011 (The IPv4 Subnet Selection Option) and 3527 (Link Selection Sub-option for the Relay Agent Information Option). For each DHCP server configured for VPN clients, you can now configure the ASA to send the Subnet Selection option or the Link Selection option. The following command was modified: **dhcp-server** [**subnet-selection** | **link-selection**]. *Also available in Version 8.0(5).*
High Availablility Features	
IPv6 Support in Failover Configurations	IPv6 is now supported in failover configurations. You can assign active and standby IPv6 addresses to interfaces and use IPv6 addresses for the failover and Stateful Failover interfaces. The following commands were modified: **failover interface ip**, **ipv6 address**.
No notifications when interfaces are brought up or brought down during a switchover event	To distinguish between link up/down transitions during normal operation from link up/down transitions during failover, no link up/link down traps are sent during a failover. Also, no syslog messages about link up/down transitions during failover are sent. *Also available in Version 8.0(5).*
AAA Features	
100 AAA Server Groups	You can now configure up to 100 AAA server groups; the previous limit was 15 server groups. The following command was modified: **aaa-server**.

Table 1-1 New Features for ASA Version 8.2(2) (continued)

Feature	Description
Monitoring Features	
Smart Call Home	Smart Call Home offers proactive diagnostics and real-time alerts on the ASA and provides higher network availability and increased operational efficiency. Customers and TAC engineers get what they need to resolve problems quickly when an issue is detected. **Note** Smart Call Home server Version 3.0(1) has limited support for the ASA. See the “Important Notes” for more information. The following commands were introduced: **call-home**, **call-home send alert-group**, **call-home test**, **call-home send**, **service call-home**, **show call-home**, **show call-home registered-module status**.

New Features in Version 8.2(1)

Released: May 6, 2009

Table 1-2 lists the new features for ASA Version 8.2(1).

Table 1-2 New Features for ASA Version 8.2(1)

Feature	Description
Remote Access Features	
One Time Password Support for ASDM Authentication	ASDM now supports administrator authentication using one time passwords (OTPs) supported by RSA SecurID (SDI). This feature addresses security concerns about administrators authenticating with static passwords. New session controls for ASDM users include the ability to limit the session time and the idle time. When the password used by the ASDM administrator times out, ASDM prompts the administrator to re-authenticate. The following commands were introduced: **http server idle-timeout** and **http server session-timeout**. The **http server idle-timeout** default is 20 minutes, and can be increased up to a maximum of 1440 minutes.

Table 1-2 New Features for ASA Version 8.2(1) (continued)

Feature	Description
Pre-fill Username from Certificate	The pre-fill username feature enables the use of a username extracted from a certificate for username/password authentication. With this feature enabled, the username is "pre-filled" on the login screen, with the user being prompted only for the password. To use this feature, you must configure both the **pre-fill username** and the **username-from-certificate** commands in tunnel-group configuration mode. The double-authentication feature is compatible with the pre-fill username feature, as the pre-fill username feature can support extracting a primary username and a secondary username from the certificate to serve as the usernames for double authentication when two usernames are required. When configuring the pre-fill username feature for double authentication, the administrator uses the following new tunnel-group general-attributes configuration mode commands: • **secondary-pre-fill-username**—Enables username extraction for Clientless or AnyConnect client connection. • **secondary-username-from-certificate**—Allows for extraction of a few standard DN fields from a certificate for use as a username.
Double Authentication	The double authentication feature implements two-factor authentication for remote access to the network, in accordance with the Payment Card Industry Standards Council Data Security Standard. This feature requires that the user enter two separate sets of login credentials at the login page. For example, the primary authentication might be a one-time password, and the secondary authentication might be a domain (Active Directory) credential. If either authentication fails, the connection is denied. Both the AnyConnect VPN client and Clientless SSL VPN support double authentication. The AnyConnect client supports double authentication on Windows computers (including supported Windows Mobile devices and Start Before Logon), Mac computers, and Linux computers. The IPsec VPN client, SVC client, cut-through-proxy authentication, hardware client authentication, and management authentication do not support double authentication. Double authentication requires the following new tunnel-group general-attributes configuration mode commands: • **secondary-authentication-server-group**—Specifies the secondary AAA server group, which cannot be an SDI server group. • **secondary-username-from-certificate**—Allows for extraction of a few standard DN fields from a certificate for use as a username. • **secondary-pre-fill-username**—Enables username extraction for Clientless or AnyConnect client connection. • **authentication-attr-from-server**—Specifies which authentication server authorization attributes are applied to the connection. • **authenticated-session-username**—Specifies which authentication username is associated with the session. **Note** The RSA/SDI authentication server type cannot be used as the secondary username/password credential. It can only be used for primary authentication.

Table 1-2 New Features for ASA Version 8.2(1) (continued)

Feature	Description
AnyConnect Essentials	AnyConnect Essentials is a separately licensed SSL VPN client, entirely configured on the ASA, that provides the full AnyConnect capability, with the following exceptions: • No CSD (including HostScan/Vault/Cache Cleaner) • No clientless SSL VPN • Optional Windows Mobile Support The AnyConnect Essentials client provides remote end users running Microsoft Windows Vista, Windows Mobile, Windows XP or Windows 2000, Linux, or Macintosh OS X, with the benefits of a Cisco SSL VPN client. To configure AnyConnect Essentials, the administrator uses the following command: **anyconnect-essentials**—Enables the AnyConnect Essentials feature. If this feature is disabled (using the **no** form of this command), the SSL Premium license is used. This feature is enabled by default. **Note** This license cannot be used at the same time as the shared SSL VPN premium license.
Disabling Cisco Secure Desktop per Connection Profile	When enabled, Cisco Secure Desktop automatically runs on all computers that make SSL VPN connections to the ASA. This new feature lets you exempt certain users from running Cisco Secure Desktop on a per connection profile basis. It prevents the detection of endpoint attributes for these sessions, so you might need to adjust the Dynamic Access Policy (DAP) configuration. CLI: **[no] without-csd command** **Note** "Connect Profile" in ASDM is also known as "Tunnel Group" in the CLI. Additionally, the **group-url** command is required for this feature. If the SSL VPN session uses connection-alias, this feature will not take effect.
Certificate Authentication Per Connection Profile	Previous versions supported certificate authentication for each ASA interface, so users received certificate prompts even if they did not need a certificate. With this new feature, users receive a certificate prompt only if the connection profile configuration requires a certificate. This feature is automatic; the **ssl certificate authentication** command is no longer needed, but the ASA retains it for backward compatibility.
EKU Extensions for Certificate Mapping	This feature adds the ability to create certificate maps that look at the Extended Key Usage extension of a client certificate and use these values in determining what connection profile the client should use. If the client does not match that profile, it uses the default group. The outcome of the connection then depends on whether or not the certificate is valid and the authentication settings of the connection profile. The following command was introduced: **extended-key-usage**.
SSL VPN SharePoint Support for Win 2007 Server	Clientless SSL VPN sessions now support Microsoft Office SharePoint Server 2007.

Table 1-2 New Features for ASA Version 8.2(1) (continued)

Feature	**Description**
Shared license for SSL VPN sessions	You can purchase a shared license with a large number of SSL VPN sessions and share the sessions as needed among a group of ASAs by configuring one of the ASAs as a shared license server, and the rest as clients. The following commands were introduced: **license-server** commands (various), **show shared license**. **Note** This license cannot be used at the same time as the AnyConnect Essentials license.
Firewall Features	
TCP state bypass	If you have asymmetric routing configured on upstream routers, and traffic alternates between two ASAs, then you can configure TCP state bypass for specific traffic. The following command was introduced: **set connection advanced tcp-state-bypass**.
Per-Interface IP Addresses for the Media-Termination Instance Used by the Phone Proxy	In Version 8.0(4), you configured a global media-termination address (MTA) on the ASA. In Version 8.2, you can now configure MTAs for individual interfaces (with a minimum of two MTAs). As a result of this enhancement, the old CLI has been deprecated. You can continue to use the old configuration if desired. However, if you need to change the configuration at all, only the new configuration method is accepted; you cannot later restore the old configuration.
Displaying the CTL File for the Phone Proxy	The Cisco Phone Proxy feature includes the **show ctl-file** command, which shows the contents of the CTL file used by the phone proxy. Using the **show ctl-file** command is useful for debugging when configuring the phone proxy instance. This command is not supported in ASDM.
Clearing Secure-phone Entries from the Phone Proxy Database	The Cisco Phone Proxy feature includes the **clear phone-proxy secure-phones** command, which clears the secure-phone entries in the phone proxy database. Because secure IP phones always request a CTL file upon bootup, the phone proxy creates a database that marks the IP phones as secure. The entries in the secure phone database are removed after a specified configured timeout (via the **timeout secure-phones** command). Alternatively, you can use the **clear phone-proxy secure-phones** command to clear the phone proxy database without waiting for the configured timeout. This command is not supported in ASDM.
H.239 Message Support in H.323 Application Inspection	In this release, the ASA supports the H.239 standard as part of H.323 application inspection. H.239 is a standard that provides the ability for H.300 series endpoints to open an additional video channel in a single call. In a call, an endpoint (such as a video phone), sends a channel for video and a channel for data presentation. The H.239 negotiation occurs on the H.245 channel. The ASA opens a pinhole for the additional media channel. The endpoints use open logical channel message (OLC) to signal a new channel creation. The message extension is part of H.245 version 13. The decoding and encoding of the telepresentation session is enabled by default. H.239 encoding and decoding is preformed by ASN.1 coder.

Table 1-2 New Features for ASA Version 8.2(1) (continued)

Feature	Description
Processing H.323 Endpoints When the Endpoints Do Not Send OLCAck	H.323 application inspection has been enhanced to process common H.323 endpoints. The enhancement affects endpoints using the extendedVideoCapability OLC with the H.239 protocol identifier. Even when an H.323 endpoint does not send OLCAck after receiving an OLC message from a peer, the ASA propagates OLC media proposal information into the media array and opens a pinhole for the media channel (extendedVideoCapability).
IPv6 in transparent firewall mode	Transparent firewall mode now participates in IPv6 routing. Prior to this release, the ASA could not pass IPv6 traffic in transparent mode. You can now configure an IPv6 management address in transparent mode, create IPv6 access lists, and configure other IPv6 features; the ASA recognizes and passes IPv6 packets. All IPv6 functionality is supported unless specifically noted.
Botnet Traffic Filter	Malware is malicious software that is installed on an unknowing host. Malware that attempts network activity such as sending private data (passwords, credit card numbers, key strokes, or proprietary data) can be detected by the Botnet Traffic Filter when the malware starts a connection to a known bad IP address. The Botnet Traffic Filter checks incoming and outgoing connections against a dynamic database of known bad domain names and IP addresses, and then logs any suspicious activity. You can also supplement the dynamic database with a static database by entering IP addresses or domain names in a local “blacklist” or “whitelist.” **Note** This feature requires the Botnet Traffic Filter license. See the following licensing document for more information: http://www.cisco.com/en/US/docs/security/asa/asa82/license/license82.html The following commands were introduced: **dynamic-filter** commands (various), and the **inspect dns dynamic-filter-snoop** keyword.
AIP SSC card for the ASA 5505	The AIP SSC offers IPS for the ASA 5505 ASA. Note that the AIP SSM does not support virtual sensors. The following commands were introduced: **allow-ssc-mgmt**, **hw-module module ip**, and **hw-module module allow-ip**.
IPv6 support for IPS	You can now send IPv6 traffic to the AIP SSM or SSC when your traffic class uses the **match any** command, and the policy map specifies the **ips** command.
Management Features	

Table 1-2 New Features for ASA Version 8.2(1) (continued)

Feature	Description
SNMP version 3 and encryption	This release provides DES, 3DES, or AES encryption and support for SNMP Version 3, the most secure form of the supported security models. This version allows you to configure authentication characteristics by using the User-based Security Model (USM). The following commands were introduced: • **show snmp engineid** • **show snmp group** • **show snmp-server group** • **show snmp-server user** • **snmp-server group** • **snmp-server user** The following command was modified: • **snmp-server host**
NetFlow	This feature was introduced in Version 8.1(1) for the ASA 5580; this version introduces the feature to the other platforms. The new NetFlow feature enhances the ASA logging capabilities by logging flow-based events through the NetFlow protocol.
Routing Features	
Multicast NAT	The ASA now offers Multicast NAT support for group addresses.
Troubleshooting Features	
Coredump functionality	A coredump is a snapshot of the running program when the program has terminated abnormally. Coredumps are used to diagnose or debug errors and save a crash for later or off-site analysis. Cisco TAC may request that users enable the coredump feature to troubleshoot application or system crashes on the ASA. To enable coredump, use the **coredump enable** command.

Firewall Functional Overview

Firewalls protect inside networks from unauthorized access by users on an outside network. A firewall can also protect inside networks from each other, for example, by keeping a human resources network separate from a user network. If you have network resources that need to be available to an outside user, such as a web or FTP server, you can place these resources on a separate network behind the firewall, called a *demilitarized zone* (DMZ). The firewall allows limited access to the DMZ, but because the DMZ only includes the public servers, an attack there only affects the servers and does not affect the other inside networks. You can also control when inside users access outside networks (for example, access to the Internet), by allowing only certain addresses out, by requiring authentication or authorization, or by coordinating with an external URL filtering server.

When discussing networks connected to a firewall, the *outside* network is in front of the firewall, the *inside* network is protected and behind the firewall, and a *DMZ*, while behind the firewall, allows limited access to outside users. Because the ASA lets you configure many interfaces with varied security policies, including many inside interfaces, many DMZs, and even many outside interfaces if desired, these terms are used in a general sense only.

This section includes the following topics:

- Security Policy Overview, page 1-11
- Firewall Mode Overview, page 1-13
- Stateful Inspection Overview, page 1-13

Security Policy Overview

A security policy determines which traffic is allowed to pass through the firewall to access another network. By default, the ASA allows traffic to flow freely from an inside network (higher security level) to an outside network (lower security level). You can apply actions to traffic to customize the security policy. This section includes the following topics:

- Permitting or Denying Traffic with Access Lists, page 1-11
- Applying NAT, page 1-11
- Protecting from IP Fragments, page 1-12
- Using AAA for Through Traffic, page 1-12
- Applying HTTP, HTTPS, or FTP Filtering, page 1-12
- Applying Application Inspection, page 1-12
- Sending Traffic to the Advanced Inspection and Prevention Security Services Module, page 1-12
- Sending Traffic to the Content Security and Control Security Services Module, page 1-12
- Applying QoS Policies, page 1-12
- Applying Connection Limits and TCP Normalization, page 1-13

Permitting or Denying Traffic with Access Lists

You can apply an access list to limit traffic from inside to outside, or allow traffic from outside to inside. For transparent firewall mode, you can also apply an EtherType access list to allow non-IP traffic.

Applying NAT

Some of the benefits of NAT include the following:

- You can use private addresses on your inside networks. Private addresses are not routable on the Internet.
- NAT hides the local addresses from other networks, so attackers cannot learn the real address of a host.
- NAT can resolve IP routing problems by supporting overlapping IP addresses.

Protecting from IP Fragments

The ASA provides IP fragment protection. This feature performs full reassembly of all ICMP error messages and virtual reassembly of the remaining IP fragments that are routed through the ASA. Fragments that fail the security check are dropped and logged. Virtual reassembly cannot be disabled.

Using AAA for Through Traffic

You can require authentication and/or authorization for certain types of traffic, for example, for HTTP. The ASA also sends accounting information to a RADIUS or TACACS+ server.

Applying HTTP, HTTPS, or FTP Filtering

Although you can use access lists to prevent outbound access to specific websites or FTP servers, configuring and managing web usage this way is not practical because of the size and dynamic nature of the Internet. We recommend that you use the ASA in conjunction with a separate server running one of the following Internet filtering products:

- Websense Enterprise
- Secure Computing SmartFilter

Applying Application Inspection

Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection.

Sending Traffic to the Advanced Inspection and Prevention Security Services Module

If your model supports the AIP SSM for intrusion prevention, then you can send traffic to the AIP SSM for inspection. The AIP SSM is an intrusion prevention services module that monitors and performs real-time analysis of network traffic by looking for anomalies and misuse based on an extensive, embedded signature library. When the system detects unauthorized activity, it can terminate the specific connection, permanently block the attacking host, log the incident, and send an alert to the device manager. Other legitimate connections continue to operate independently without interruption. For more information, see *Configuring the Cisco Intrusion Prevention System Sensor Using the Command Line Interface*.

Sending Traffic to the Content Security and Control Security Services Module

If your model supports it, the CSC SSM provides protection against viruses, spyware, spam, and other unwanted traffic. It accomplishes this by scanning the FTP, HTTP, POP3, and SMTP traffic that you configure the adaptive ASA to send to it.

Applying QoS Policies

Some network traffic, such as voice and streaming video, cannot tolerate long latency times. QoS is a network feature that lets you give priority to these types of traffic. QoS refers to the capability of a network to provide better service to selected network traffic.

Applying Connection Limits and TCP Normalization

You can limit TCP and UDP connections and embryonic connections. Limiting the number of connections and embryonic connections protects you from a DoS attack. The ASA uses the embryonic limit to trigger TCP Intercept, which protects inside systems from a DoS attack perpetrated by flooding an interface with TCP SYN packets. An embryonic connection is a connection request that has not finished the necessary handshake between source and destination.

TCP normalization is a feature consisting of advanced TCP connection settings designed to drop packets that do not appear normal.

Enabling Threat Detection

You can configure scanning threat detection and basic threat detection, and also how to use statistics to analyze threats.

Basic threat detection detects activity that might be related to an attack, such as a DoS attack, and automatically sends a system log message.

A typical scanning attack consists of a host that tests the accessibility of every IP address in a subnet (by scanning through many hosts in the subnet or sweeping through many ports in a host or subnet). The scanning threat detection feature determines when a host is performing a scan. Unlike IPS scan detection that is based on traffic signatures, the ASA scanning threat detection feature maintains an extensive database that contains host statistics that can be analyzed for scanning activity.

The host database tracks suspicious activity such as connections with no return activity, access of closed service ports, vulnerable TCP behaviors such as non-random IPID, and many more behaviors.

You can configure the ASA to send system log messages about an attacker or you can automatically shun the host.

Firewall Mode Overview

The ASA runs in two different firewall modes:

- Routed
- Transparent

In routed mode, the ASA is considered to be a router hop in the network.

In transparent mode, the ASA acts like a “bump in the wire,” or a “stealth firewall,” and is not considered a router hop. The ASA connects to the same network on its inside and outside interfaces.

You might use a transparent firewall to simplify your network configuration. Transparent mode is also useful if you want the firewall to be invisible to attackers. You can also use a transparent firewall for traffic that would otherwise be blocked in routed mode. For example, a transparent firewall can allow multicast streams using an EtherType access list.

Stateful Inspection Overview

All traffic that goes through the ASA is inspected using the Adaptive Security Algorithm and either allowed through or dropped. A simple packet filter can check for the correct source address, destination address, and ports, but it does not check that the packet sequence or flags are correct. A filter also checks every packet against the filter, which can be a slow process.

A stateful firewall like the ASA, however, takes into consideration the state of a packet:

- Is this a new connection?

  If it is a new connection, the ASA has to check the packet against access lists and perform other tasks to determine if the packet is allowed or denied. To perform this check, the first packet of the session goes through the "session management path," and depending on the type of traffic, it might also pass through the "control plane path."

  The session management path is responsible for the following tasks:

  - Performing the access list checks
  - Performing route lookups
  - Allocating NAT translations (xlates)
  - Establishing sessions in the "fast path"

  Some packets that require Layer 7 inspection (the packet payload must be inspected or altered) are passed on to the control plane path. Layer 7 inspection engines are required for protocols that have two or more channels: a data channel, which uses well-known port numbers, and a control channel, which uses different port numbers for each session. These protocols include FTP, H.323, and SNMP.

- Is this an established connection?

  If the connection is already established, the ASA does not need to re-check packets; most matching packets can go through the "fast" path in both directions. The fast path is responsible for the following tasks:

  - IP checksum verification
  - Session lookup
  - TCP sequence number check
  - NAT translations based on existing sessions
  - Layer 3 and Layer 4 header adjustments

  For UDP or other connectionless protocols, the ASA creates connection state information so that it can also use the fast path.

  Data packets for protocols that require Layer 7 inspection can also go through the fast path.

  Some established session packets must continue to go through the session management path or the control plane path. Packets that go through the session management path include HTTP packets that require inspection or content filtering. Packets that go through the control plane path include the control packets for protocols that require Layer 7 inspection.

VPN Functional Overview

A VPN is a secure connection across a TCP/IP network (such as the Internet) that appears as a private connection. This secure connection is called a tunnel. The ASA uses tunneling protocols to negotiate security parameters, create and manage tunnels, encapsulate packets, transmit or receive them through the tunnel, and unencapsulate them. The ASA functions as a bidirectional tunnel endpoint: it can receive plain packets, encapsulate them, and send them to the other end of the tunnel where they are unencapsulated and sent to their final destination. It can also receive encapsulated packets, unencapsulate them, and send them to their final destination. The ASA invokes various standard protocols to accomplish these functions.

The ASA performs the following functions:

- Establishes tunnels
- Negotiates tunnel parameters
- Authenticates users
- Assigns user addresses
- Encrypts and decrypts data
- Manages security keys
- Manages data transfer across the tunnel
- Manages data transfer inbound and outbound as a tunnel endpoint or router

The ASA invokes various standard protocols to accomplish these functions.

Security Context Overview

You can partition a single ASA into multiple virtual devices, known as security contexts. Each context is an independent device, with its own security policy, interfaces, and administrators. Multiple contexts are similar to having multiple standalone devices. Many features are supported in multiple context mode, including routing tables, firewall features, IPS, and management. Some features are not supported, including VPN and dynamic routing protocols.

In multiple context mode, the ASA includes a configuration for each context that identifies the security policy, interfaces, and almost all the options you can configure on a standalone device. The system administrator adds and manages contexts by configuring them in the system configuration, which, like a single mode configuration, is the startup configuration. The system configuration identifies basic settings for the ASA. The system configuration does not include any network interfaces or network settings for itself; rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses one of the contexts that is designated as the admin context.

The admin context is just like any other context, except that when a user logs into the admin context, then that user has system administrator rights and can access the system and all other contexts.

Note You can run all your contexts in routed mode or transparent mode; you cannot run some contexts in one mode and others in another.

Multiple context mode supports static routing only.

CHAPTER 2

Getting Started

This chapter describes how to get started with your ASA. This chapter includes the following sections:

- Factory Default Configurations, page 2-1
- Accessing the Command-Line Interface, page 2-4
- Working with the Configuration, page 2-5
- Applying Configuration Changes to Connections, page 2-9

Factory Default Configurations

The factory default configuration is the configuration applied by Cisco to new ASAs.

For the ASA 5510 and higher ASAs, the factory default configuration configures an interface for management so you can connect to it using ASDM, with which you can then complete your configuration.

For the ASA 5505 adaptive security appliance, the factory default configuration configures interfaces and NAT so that the ASA is ready to use in your network immediately.

The factory default configuration is available only for routed firewall mode and single context mode. See Chapter 5, "Managing Multiple Context Mode," for more information about multiple context mode. See Chapter 4, "Configuring the Transparent or Routed Firewall," for more information about routed and transparent firewall mode.

Note In addition to the image files and the (hidden) default configuration, the following folders and files are standard in flash memory: log/, crypto_archive/, and coredumpinfo/coredump.cfg. The date on these files may not match the date of the image files in flash memory. These files aid in potential troubleshooting; they do not indicate that a failure has occurred.

This section includes the following topics:

- Restoring the Factory Default Configuration, page 2-2
- ASA 5505 Default Configuration, page 2-2
- ASA 5510 and Higher Default Configuration, page 2-3

Restoring the Factory Default Configuration

This section describes how to restore the factory default configuration.

Detailed Steps

	Command	Purpose

Step 1	**`configure factory-default`** `[`*`ip_address`*` [`*`mask`*`]]`
	`Example:`
	`hostname(config)#` **`configure factory-default 10.1.1.1 255.255.255.0`**
		Restores the factory default configuration.
		If you specify the *ip_address*, then you set the inside or management interface IP address, depending on your model, instead of using the default IP address of 192.168.1.1. The **http** command uses the subnet you specify. Similarly, the **dhcpd address** command range consists of addresses within the subnet that you specify.
		Note This command also clears the **boot system** command, if present, along with the rest of the configuration. The **boot system** command lets you boot from a specific image, including an image on the external Flash memory card. The next time you reload the ASA after restoring the factory configuration, it boots from the first image in internal Flash memory; if you do not have an image in internal Flash memory, the ASA does not boot.

Step 2	**`write memory`**
	`Example:`
	`active(config)# write memory`
		Saves the default configuration to Flash memory. This command saves the running configuration to the default location for the startup configuration, even if you previously configured the **boot config** command to set a different location; when the configuration was cleared, this path was also cleared.

What to Do Next

To configure additional settings that are useful for a full configuration, see the **setup** command.

ASA 5505 Default Configuration

The default factory configuration for the ASA 5505 adaptive security appliance configures the following:

- An inside VLAN 1 interface that includes the Ethernet 0/1 through 0/7 switch ports. If you did not set the IP address in the **configure factory-default** command, then the VLAN 1 IP address and mask are 192.168.1.1 and 255.255.255.0.
- An outside VLAN 2 interface that includes the Ethernet 0/0 switch port. VLAN 2 derives its IP address using DHCP.
- The default route is also derived from DHCP.
- All inside IP addresses are translated when accessing the outside using interface PAT.
- By default, inside users can access the outside, and outside users are prevented from accessing the inside.

- The DHCP server is enabled on the ASA, so a PC connecting to the VLAN 1 interface receives an address between 192.168.1.2 and 192.168.1.254.
- The HTTP server is enabled for ASDM and is accessible to users on the 192.168.1.0 network.

The configuration consists of the following commands:

```
interface Ethernet 0/0
   switchport access vlan 2
interface Ethernet 0/1
   switchport access vlan 1
interface Ethernet 0/2
   switchport access vlan 1
interface Ethernet 0/3
   switchport access vlan 1
interface Ethernet 0/4
   switchport access vlan 1
interface Ethernet 0/5
   switchport access vlan 1
interface Ethernet 0/6
   switchport access vlan 1
interface Ethernet 0/7
   switchport access vlan 1
interface vlan2
   nameif outside
   ip address dhcp setroute
interface vlan1
   nameif inside
   ip address 192.168.1.1 255.255.255.0
   security-level 100
global (outside) 1 interface
nat (inside) 1 0 0
http server enable
http 192.168.1.0 255.255.255.0 inside
dhcpd address 192.168.1.2-192.168.1.254 inside
dhcpd auto_config outside
dhcpd enable inside
logging asdm informational
```

ASA 5510 and Higher Default Configuration

The default factory configuration for the ASA 5510 and higher adaptive security appliance configures the following:

- The management interface, Management 0/0. If you did not set the IP address in the **configure factory-default** command, then the IP address and mask are 192.168.1.1 and 255.255.255.0.
- The DHCP server is enabled on the ASA, so a PC connecting to the interface receives an address between 192.168.1.2 and 192.168.1.254.
- The HTTP server is enabled for ASDM and is accessible to users on the 192.168.1.0 network.

The configuration consists of the following commands:

```
interface management 0/0
   ip address 192.168.1.1 255.255.255.0
   nameif management
   security-level 100
asdm logging informational 100
asdm history enable
http server enable
http 192.168.1.0 255.255.255.0 management
```

```
dhcpd address 192.168.1.2-192.168.1.254 management
dhcpd lease 3600
dhcpd ping_timeout 750
dhcpd enable management
```

Accessing the Command-Line Interface

For initial configuration, access the command-line interface directly from the console port. Later, you can configure remote access using Telnet or SSH according to Chapter 37, "Configuring Management Access." If your system is already in multiple context mode, then accessing the console port places you in the system execution space. See Chapter 5, "Managing Multiple Context Mode," for more information about multiple context mode.

Note If you want to use ASDM to configure the ASA instead of the command-line interface, you can connect to the default management address of 192.168.1.1 (if your ASA includes a factory default configuration. See the "Factory Default Configurations" section on page 2-1.). On the ASA 5510 and higher adaptive security appliances, the interface to which you connect with ASDM is Management 0/0. For the ASA 5505 adaptive security appliance, the switch port to which you connect with ASDM is any port, except for Ethernet 0/0. If you do not have a factory default configuration, follow the steps in this section to access the command-line interface. You can then configure the minimum parameters to access ASDM by entering the **setup** command.

To access the command-line interface, perform the following steps:

Step 1 Connect a PC to the console port using the provided console cable, and connect to the console using a terminal emulator set for 9600 baud, 8 data bits, no parity, 1 stop bit, no flow control.

See the hardware guide that came with your ASA for more information about the console cable.

Step 2 Press the **Enter** key to see the following prompt:

hostname>

This prompt indicates that you are in user EXEC mode.

Step 3 To access privileged EXEC mode, enter the following command:

```
hostname> enable
```

The following prompt appears:

```
Password:
```

Step 4 Enter the enable password at the prompt.

By default, the password is blank, and you can press the **Enter** key to continue. See the "Changing the Enable Password" section on page 8-2 to change the enable password.

The prompt changes to:

```
hostname#
```

To exit privileged mode, enter the **disable**, **exit**, or **quit** command.

Step 5 To access global configuration mode, enter the following command:

```
hostname# configure terminal
```

The prompt changes to the following:

```
hostname(config)#
```

To exit global configuration mode, enter the **exit**, **quit**, or **end** command.

Working with the Configuration

This section describes how to work with the configuration. The ASA loads the configuration from a text file, called the startup configuration. This file resides by default as a hidden file in internal Flash memory. You can, however, specify a different path for the startup configuration. (For more information, see Chapter 78, "Managing Software and Configurations.")

When you enter a command, the change is made only to the running configuration in memory. You must manually save the running configuration to the startup configuration for your changes to remain after a reboot.

The information in this section applies to both single and multiple security contexts, except where noted. Additional information about contexts is in Chapter 5, "Managing Multiple Context Mode."

This section includes the following topics:

- Saving Configuration Changes, page 2-5
- Copying the Startup Configuration to the Running Configuration, page 2-7
- Viewing the Configuration, page 2-7
- Clearing and Removing Configuration Settings, page 2-8
- Creating Text Configuration Files Offline, page 2-8

Saving Configuration Changes

This section describes how to save your configuration, and includes the following topics:

- Saving Configuration Changes in Single Context Mode, page 2-5
- Saving Configuration Changes in Multiple Context Mode, page 2-6

Saving Configuration Changes in Single Context Mode

To save the running configuration to the startup configuration, enter the following command:

Command	Purpose

`write memory`
Example:
`hostname# write memory`
	Saves the running configuration to the startup configuration.
	Note The **copy running-config startup-config** command is equivalent to the **write memory** command.

Saving Configuration Changes in Multiple Context Mode

You can save each context (and system) configuration separately, or you can save all context configurations at the same time. This section includes the following topics:

- Saving Each Context and System Separately, page 2-6
- Saving All Context Configurations at the Same Time, page 2-6

Saving Each Context and System Separately

To save the system or context configuration, enter the following command within the system or context:

Command	Purpose

`write memory`
`Example:`
`hostname# write memory`
	Saves the running configuration to the startup configuration.
	For multiple context mode, context startup configurations can reside on external servers. In this case, the ASA saves the configuration back to the server you identified in the context URL, except for an HTTP or HTTPS URL, which do not let you save the configuration to the server.
	Note The **copy running-config startup-config** command is equivalent to the **write memory** command.

Saving All Context Configurations at the Same Time

To save all context configurations at the same time, as well as the system configuration, enter the following command in the system execution space:

Command	Purpose

`write memory all` `[`**`/noconfirm`**`]`
`Example:`
`hostname# write memory all /noconfirm`
	Saves the running configuration to the startup configuration for all contexts and the system configuration.
	If you do not enter the **/noconfirm** keyword, you see the following prompt:
	`Are you sure [Y/N]:`
	After you enter **Y**, the ASA saves the system configuration and each context. Context startup configurations can reside on external servers. In this case, the ASA saves the configuration back to the server you identified in the context URL, except for an HTTP or HTTPS URL, which do not let you save the configuration to the server.

After the ASA saves each context, the following message appears:

```
'Saving context 'b' ... ( 1/3 contexts saved ) '
```

Sometimes, a context is not saved because of an error. See the following information for errors:

- For contexts that are not saved because of low memory, the following message appears:

  ```
  The context 'context a' could not be saved due to Unavailability of resources
  ```

- For contexts that are not saved because the remote destination is unreachable, the following message appears:

  ```
  The context 'context a' could not be saved due to non-reachability of destination
  ```

- For contexts that are not saved because the context is locked, the following message appears:

```
Unable to save the configuration for the following contexts as these contexts are
locked.
context ‘a’ , context ‘x’ , context ‘z’ .
```

  A context is only locked if another user is already saving the configuration or in the process of deleting the context.

- For contexts that are not saved because the startup configuration is read-only (for example, on an HTTP server), the following message report is printed at the end of all other messages:

```
Unable to save the configuration for the following contexts as these contexts have
read-only config-urls:
context ‘a’ , context ‘b’ , context ‘c’ .
```

- For contexts that are not saved because of bad sectors in the Flash memory, the following message appears:

```
The context 'context a' could not be saved due to Unknown errors
```

Copying the Startup Configuration to the Running Configuration

Copy a new startup configuration to the running configuration using one of the following options.

Command	Purpose
copy startup-config running-config	Merges the startup configuration with the running configuration. A merge adds any new commands from the new configuration to the running configuration. If the configurations are the same, no changes occur. If commands conflict or if commands affect the running of the context, then the effect of the merge depends on the command. You might get errors, or you might have unexpected results.
reload	Reloads the ASA, which loads the startup configuration and discards the running configuration.
clear configure all **copy startup-config running-config**	Loads the startup configuration and discards the running configuration without requiring a reload.

Viewing the Configuration

The following commands let you view the running and startup configurations.

Command	Purpose
show running-config	Views the running configuration.
show running-config *command*	Views the running configuration of a specific command.
show startup-config	Views the startup configuration.

Clearing and Removing Configuration Settings

To erase settings, enter one of the following commands.

Command	Purpose

`clear configure` *`configurationcommand`* [*`level2configurationcommand`*]	Clears all the configuration for a specified command. If you only want to clear the configuration for a specific version of the command, you can enter a value for *level2configurationcommand*.
	For example, to clear the configuration for all **aaa** commands, enter the following command:
	`hostname(config)# clear configure aaa`
	To clear the configuration for only **aaa authentication** commands, enter the following command:
	`hostname(config)# clear configure aaa authentication`

`no` *`configurationcommand`* [*`level2configurationcommand`*] *`qualifier`*	Disables the specific parameters or options of a command. In this case, you use the **no** command to remove the specific configuration identified by *qualifier*. For example, to remove a specific **nat** command, enter enough of the command to identify it uniquely as follows: `hostname(config)# no nat (inside) 1`
`write erase`	Erases the startup configuration.
`clear configure all`	Erases the running configuration. **Note** In multiple context mode, if you enter **clear configure all** from the system configuration, you also remove all contexts and stop them from running. The context configuration files are not erased, and remain in their original location.

Creating Text Configuration Files Offline

This guide describes how to use the CLI to configure the ASA; when you save commands, the changes are written to a text file. Instead of using the CLI, however, you can edit a text file directly on your PC and paste a configuration at the configuration mode command-line prompt in its entirety, or line by line. Alternatively, you can download a text file to the ASA internal Flash memory. See Chapter 78, "Managing Software and Configurations," for information on downloading the configuration file to the ASA.

In most cases, commands described in this guide are preceded by a CLI prompt. The prompt in the following example is "hostname(config)#":

```
hostname(config)# context a
```

In the text configuration file you are not prompted to enter commands, so the prompt is omitted as follows:

```
context a
```

For additional information about formatting the file, see Appendix B, "Using the Command-Line Interface."

Applying Configuration Changes to Connections

When you make security policy changes to the configuration, all *new* connections use the new security policy. Existing connections continue to use the policy that was configured at the time of the connection establishment. To ensure that all connections use the new policy, you need to disconnect the current connections so they can reconnect using the new policy. To disconnect connections, enter one of the following commands:

Command	**Purpose**
`clear local-host` `[`*`ip_address`*`]` `[`**`all`**`]`	This command reinitalizes per-client run-time states such as connection limits and embryonic limits. As a result, this command removes any connection that uses those limits. See the **show local-host all** command to view all current connections per host. With no arguments, this command clears all affected through-the-box connections. To also clear to-the-box connections (including your current management session), use the **all** keyword. To clear connections to and from a particular IP address, use the *ip_address* argument.
`clear conn` `[`**`all`**`] [`**`protocol`** `{`**`tcp`** `|` **`udp`**`}] [`**`address`** *`src_ip`*`[-`*`src_ip`*`] [`**`netmask`** *`mask`*`]] [`**`port`** *`src_port`*`[-`*`src_port`*`]] [`**`address`** *`dest_ip`*`[-`*`dest_ip`*`] [`**`netmask`** *`mask`*`]] [`**`port`** *`dest_port`*`[-`*`dest_port`*`]]`	This command terminates connections in any state. See the **show conn** command to view all current connections. With no arguments, this command clears all through-the-box connections. To also clear to-the-box connections (including your current management session), use the **all** keyword. To clear specific connections based on the source IP address, destination IP address, port, and/or protocol, you can specify the desired options.
`clear xlate` `[`*`arguments`*`]`	This command clears dynamic NAT sessions; static sessions are not affected. As a result, it removes any connections using those NAT sessions. With no arguments, this command clears all NAT sessions. See the *Cisco ASA 5500 Series Command Reference* for more information about the arguments available.

CHAPTER 3

Managing Feature Licenses

A license specifies the options that are enabled on a given ASA. It is represented by an activation key which is a 160-bit (5 32-bit words or 20 bytes) value. This value encodes the serial number (an 11 character string) and the enabled features.

This chapter describes how to obtain an activation key and activate it. It also describes the available licenses for each model. This chapter includes the following sections:

- Supported Feature Licenses Per Model, page 3-1
- Information About Feature Licenses, page 3-10
- Guidelines and Limitations, page 3-18
- Viewing Your Current License, page 3-19
- Obtaining an Activation Key, page 3-21
- Entering a New Activation Key, page 3-21
- Upgrading the License for a Failover Pair, page 3-23
- Configuring a Shared License, page 3-25
- Feature History for Licensing, page 3-30

Supported Feature Licenses Per Model

This section describes the licenses available for each model as well as important notes about licenses. This section includes the following topics:

- Licenses Per Model, page 3-1
- License Notes, page 3-9
- VPN License and Feature Compatibility, page 3-10

Licenses Per Model

This section lists the feature licenses available for each model:

- ASA 5505, Table 3-1 on page 3-2
- ASA 5510, Table 3-2 on page 3-3
- ASA 5520, Table 3-3 on page 3-4

- ASA 5540, Table 3-4 on page 3-5
- ASA 5550, Table 3-5 on page 3-6
- ASA 5580, Table 3-6 on page 3-7
- ASA 5585-X, Table 3-7 on page 3-8

Items that are in italics are separate, optional licenses with which that you can replace the Base or Security Plus license. You can mix and match licenses, for example, the 10 security context license plus the Strong Encryption license; or the 500 Clientless SSL VPN license plus the GTP/GPRS license; or all four licenses together.

Table 3-1 ASA 5505 Adaptive Security Appliance License Features

ASA 5505	Base License		Security Plus	
Firewall Licenses				
Botnet Traffic Filter[1]	Disabled	*Optional temporary license: Available*	Disabled	*Optional temporary license: Available*
Firewall Conns, Concurrent	10 K		25 K	
GTP/GPRS	No support		No support	
Unified Comm. Sessions[1]	2	*Optional license: 24*	2	*Optional license: 24*
VPN Licenses[2]				
Adv. Endpoint Assessment	Disabled	*Optional license: Available*	Disabled	*Optional license: Available*
AnyConnect Essentials[1]	Disabled	*Optional license: Available*	Disabled	*Optional license: Available*
AnyConnect Mobile[1]	Disabled	*Optional license: Available*	Disabled	*Optional license: Available*
AnyConnect Premium SSL VPN (sessions)[1]	2	*Optional Permanent licenses:* *10* *25*	2	*Optional Permanent licenses:* *10* *25*
IPSec VPN (sessions)[1]	10 (max. 25 combined IPSec and SSL VPN)		25 (max. 25 combined IPSec and SSL VPN)	
VPN Load Balancing	No support		No support	
General Licenses				
Encryption	Base (DES)	*Opt. lic.: Strong (3DES/AES)*	Base (DES)	*Opt. lic.: Strong (3DES/AES)*
Failover	No support		Active/Standby (no stateful failover)	
Security Contexts	No support		No support	
Users, concurrent[3]	10[4]	*Optional licenses:* *50* *Unlimited*	10[4]	*Optional licenses:* *50* *Unlimited*
VLANs/Zones, Maximum	3 (2 regular zones and 1 restricted zone)		20	
VLAN Trunk, Maximum	No support		8 trunks	

1. See the “License Notes” section.
2. See the “VPN License and Feature Compatibility” section.
3. In routed mode, hosts on the inside (Business and Home VLANs) count towards the limit when they communicate with the outside (Internet VLAN), including when the inside initiates a connection to the outside as well as when the outside initiates a connection to the inside. Note that even when the outside initiates a connection to the inside, outside hosts are *not* counted towards the limit; only the inside hosts count. Hosts that initiate traffic between Business and Home are also not counted towards the limit. The interface associated with the default route is considered to be the outside Internet interface. If there is no default route, hosts on all interfaces are counted toward the limit. In transparent mode, the interface with the lowest number of hosts is counted towards the host limit. See the **show local-host** command to view host limits.
4. For a 10-user license, the max. DHCP clients is 32. For 50 users, the max. is 128. For unlimited users, the max. is 250, which is the max. for other models.

Table 3-2 ASA 5510 Adaptive Security Appliance License Features

<table>
<tr><th>ASA 5510</th><th colspan="6">Base License</th><th colspan="6">Security Plus</th></tr>
<tr><td colspan="13"><b>Firewall Licenses</b></td></tr>
<tr><td>Botnet Traffic Filter[1]</td><td colspan="2">Disabled</td><td colspan="4"><em>Optional temporary license: Available</em></td><td colspan="2">Disabled</td><td colspan="4"><em>Optional temporary license: Available</em></td></tr>
<tr><td>Firewall Conns, Concurrent</td><td colspan="6">50 K</td><td colspan="6">130 K</td></tr>
<tr><td>GTP/GPRS</td><td colspan="6">No support</td><td colspan="6">No support</td></tr>
<tr><td rowspan="2">Unified Comm. Sessions[1]</td><td rowspan="2">2</td><td colspan="5"><em>Optional licenses:</em></td><td rowspan="2">2</td><td colspan="5"><em>Optional licenses:</em></td></tr>
<tr><td><em>24</em></td><td><em>50</em></td><td colspan="3"><em>100</em></td><td><em>24</em></td><td><em>50</em></td><td colspan="3"><em>100</em></td></tr>
<tr><td colspan="13"><b>VPN Licenses[2]</b></td></tr>
<tr><td>Adv. Endpoint Assessment</td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td></tr>
<tr><td>AnyConnect Essentials[1]</td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td></tr>
<tr><td>AnyConnect Mobile[1]</td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td><td colspan="2">Disabled</td><td colspan="4"><em>Optional license: Available</em></td></tr>
<tr><td rowspan="5">AnyConnect Premium SSL VPN (sessions)</td><td rowspan="2">2</td><td colspan="5"><em>Optional Permanent licenses:</em></td><td rowspan="2">2</td><td colspan="5"><em>Optional Permanent licenses:</em></td></tr>
<tr><td><em>10</em></td><td><em>25</em></td><td><em>50</em></td><td><em>100</em></td><td><em>250</em></td><td><em>10</em></td><td><em>25</em></td><td><em>50</em></td><td><em>100</em></td><td><em>250</em></td></tr>
<tr><td colspan="6"><em>Optional Shared licenses: Participant or Server. For the Server, these licenses are available:</em>[1]</td><td colspan="6"><em>Optional Shared licenses: Participant or Server. For the Server, these licenses are available:</em>[1]</td></tr>
<tr><td colspan="3"><em>500-50,000 in increments of 500</em></td><td colspan="3"><em>50,000-545,000 in increments of 1000</em></td><td colspan="3"><em>500-50,000 in increments of 500</em></td><td colspan="3"><em>50,000-545,000 in increments of 1000</em></td></tr>
<tr><td colspan="6"><em>Optional FLEX license: 250</em></td><td colspan="6"><em>Optional FLEX license: 250</em></td></tr>
<tr><td>IPSec VPN (sessions)[1]</td><td colspan="6">250 (max. 250 combined IPSec and SSL VPN)</td><td colspan="6">250 (max. 250 combined IPSec and SSL VPN)</td></tr>
<tr><td>VPN Load Balancing[1]</td><td colspan="6">No support</td><td colspan="6">Supported</td></tr>
<tr><td colspan="13"><b>General Licenses</b></td></tr>
<tr><td>Encryption</td><td colspan="2">Base (DES)</td><td colspan="4"><em>Opt. lic.: Strong (3DES/AES)</em></td><td colspan="2">Base (DES)</td><td colspan="4"><em>Opt. lic.: Strong (3DES/AES)</em></td></tr>
<tr><td>Failover</td><td colspan="6">No support</td><td colspan="6">Active/Standby or Active/Active[1]</td></tr>
<tr><td>Interface Speed</td><td colspan="6">All: Fast Ethernet</td><td colspan="6">Ethernet 0/0 and 0/1: Gigabit Ethernet[3]
Ethernet 0/2, 0/3, and 0/4: Fast Ethernet</td></tr>
<tr><td rowspan="2">Security Contexts</td><td colspan="6" rowspan="2">No support</td><td rowspan="2">2</td><td colspan="5"><em>Optional licenses:</em></td></tr>
<tr><td colspan="5"><em>5</em></td></tr>
<tr><td>VLANs, Maximum</td><td colspan="6">50</td><td colspan="6">100</td></tr>
</table>

1. See the "License Notes" section.
2. See the "VPN License and Feature Compatibility" section.
3. Although the Ethernet 0/0 and 0/1 ports are Gigabit Ethernet, they are still identified as "Ethernet" in the software.

Table 3-3 ***ASA 5520 Adaptive Security Appliance License Features***

ASA 5520	Base License							
Firewall Licenses								
Botnet Traffic Filter[1]	Disabled	*Optional temporary license: Available*						
Firewall Conns, Concurrent	280 K							
GTP/GPRS	Disabled	*Optional license: Available*						
Unified Communications Proxy Sessions[1]	2	*Optional licenses:*						
		24	*50*	*100*	*250*	*500*	*750*	*1000*
VPN Licenses[2]								
Adv. Endpoint Assessment	Disabled	*Optional license: Available*						
AnyConnect Essentials[1]	Disabled	*Optional license: Available*						
AnyConnect Mobile[1]	Disabled	*Optional license: Available*						
AnyConnect Premium SSL VPN (sessions)	2	*Optional Permanent licenses:*						
		10	*25*	*50*	*100*	*250*	*500*	*750*
	Optional Shared licenses: Participant or Server. For the Server, these licenses are available:[1]							
	500-50,000 in increments of 500					*50,000-545,000 in increments of 1000*		
	Optional FLEX licenses:							
	250	*750*						
IPSec VPN (sessions)[1]	750 (max. 750 combined IPSec and SSL VPN)							
VPN Load Balancing[1]	Supported							
General Licenses								
Encryption	Base (DES)	*Optional license: Strong (3DES/AES)*						
Failover	Active/Standby or Active/Active[1]							
Security Contexts	2	*Optional licenses:*						
		5	*10*	*20*				
VLANs, Maximum	150							

1. See the "License Notes" section.
2. See the "VPN License and Feature Compatibility" section.

Table 3-4 ASA 5540 Adaptive Security Appliance License Features

ASA 5540	Base License									
Firewall Licenses										
Botnet Traffic Filter[1]	Disabled		*Optional temporary license: Available*							
Firewall Conns, Concurrent	400 K									
GTP/GPRS	Disabled		*Optional license: Available*							
Unified Communications Proxy Sessions[1]	2	*Optional licenses:*								
		24	*50*	*100*	*250*	*500*	*750*	*1000*	*2000*	
VPN Licenses[2]										
Adv. Endpoint Assessment	Disabled		*Optional license: Available*							
AnyConnect Essentials[1]	Disabled		*Optional license: Available*							
AnyConnect Mobile[1]	Disabled		*Optional license: Available*							
AnyConnect Premium SSL VPN (sessions)	2	*Optional Permanent licenses:*								
		10	*25*	*50*	*100*	*250*	*500*	*750*	*1000*	*2500*
	Optional Shared licenses: Participant or Server. For the Server, these licenses are available:[1]									
	500-50,000 in increments of 500						*50,000-545,000 in increments of 1000*			
	Optional FLEX licenses:									
	250	*750*	*1000*	*2500*						
IPSec VPN (sessions)[1]	5000 (max. 5000 combined IPSec and SSL VPN)									
VPN Load Balancing[1]	Supported									
General Licenses										
Encryption	Base (DES)		*Optional license: Strong (3DES/AES)*							
Failover	Active/Standby or Active/Active[1]									
Security Contexts	2	*Optional licenses:*								
		5	*10*	*20*	*50*					
VLANs, Maximum	200									

[1] See the "License Notes" section.

[2] See the "VPN License and Feature Compatibility" section.

Table 3-5 ASA 5550 Adaptive Security Appliance License Features

ASA 5550	Base License										
Firewall Licenses											
Botnet Traffic Filter[1]	Disabled		*Optional temporary license: Available*								
Firewall Conns, Concurrent	650 K										
GTP/GPRS	Disabled		*Optional license: Available*								
Unified Communications Proxy Sessions[1]	2	*Optional licenses:*									
		24	*50*	*100*	*250*	*500*	*750*	*1000*	*2000*	*3000*	
VPN Licenses[2]											
Adv. Endpoint Assessment	Disabled		*Optional license: Available*								
AnyConnect Essentials[1]	Disabled		*Optional license: Available*								
AnyConnect Mobile[1]	Disabled		*Optional license: Available*								
AnyConnect Premium SSL VPN (sessions)	2	*Optional Permanent licenses:*									
		10	*25*	*50*	*100*	*250*	*500*	*750*	*1000*	*2500*	*5000*
	Optional Shared licenses: Participant or Server. For the Server, these licenses are available:[1]										
	500-50,000 in increments of 500						*50,000-545,000 in increments of 1000*				
	Optional FLEX licenses:										
	250	*750*	*1000*	*2500*	*5000*						
IPSec VPN (sessions)[1]	5000 (max. 5000 combined IPSec and SSL VPN)										
VPN Load Balancing[1]	Supported										
General Licenses											
Encryption	Base (DES)		*Optional license: Strong (3DES/AES)*								
Failover	Active/Standby or Active/Active[1]										
Security Contexts	2	*Optional licenses:*									
		5	*10*	*20*	*50*						
VLANs, Maximum	250										

1. See the "License Notes" section.
2. See the "VPN License and Feature Compatibility" section.

Table 3-6 ASA 5580 Adaptive Security Appliance License Features

ASA 5580	**Base License**											
Firewall Licenses												
Botnet Traffic Filter[1]	Disabled		*Optional temporary license: Available*									
Firewall Conns, Concurrent	5580-20: 1,000 K 5580-40: 2,000 K											
GTP/GPRS	Disabled		*Optional license: Available*									
Unified Communications Proxy Sessions[1]	2	*Optional licenses:*										
		24	*50*	*100*	*250*	*500*	*750*	*1000*	*2000*	*3000*	*5000*	*10000*[2]
VPN Licenses[3]												
Adv. Endpoint Assessment	Disabled		*Optional license: Available*									
AnyConnect Essentials[1]	Disabled		*Optional license: Available*									
AnyConnect Mobile[1]	Disabled		*Optional license: Available*									
AnyConnect Premium SSL VPN (sessions)	2	*Optional Permanent licenses:*										
		10	*25*	*50*	*100*	*250*	*500*	*750*	*1000*	*2500*	*5000*	
	Optional Shared licenses: Participant or Server. For the Server, these licenses are available:[1]											
	500-50,000 in increments of 500						*50,000-545,000 in increments of 1000*					
	Optional FLEX licenses:											
	250	*750*	*1000*	*2500*	*5000*							
IPSec VPN (sessions)[1]	5000 (max. 5000 combined IPSec and SSL VPN)											
VPN Load Balancing[1]	Supported											
General Licenses												
Encryption	Base (DES)		*Optional license: Strong (3DES/AES)*									
Failover	Active/Standby or Active/Active[1]											
Security Contexts	2	*Optional licenses:*										
		5	*10*	*20*	*50*							
VLANs, Maximum	250											

1. See the "License Notes" section.
2. With the 10,000-session license, the total combined sessions can be 10,000, but the maximum number of Phone Proxy sessions is 5000.
3. See the "VPN License and Feature Compatibility" section.

Table 3-7 ASA 5585-X Adaptive Security Appliance License Features

<table>
<tr><th>ASA 5585-X</th><th colspan="12">Base License</th></tr>
<tr><td colspan="13"><b>Firewall Licenses</b></td></tr>
<tr><td>Botnet Traffic Filter[1]</td><td colspan="2">Disabled</td><td colspan="10">Optional temporary license: Available</td></tr>
<tr><td>Firewall Conns, Concurrent</td><td colspan="12">5585-X with SSP-10: 750 K
5585-X with SSP-20: 1,000 K
5585-X with SSP-40: 2,000 K
5585-X with SSP-60: 2,000 K</td></tr>
<tr><td>GTP/GPRS</td><td colspan="2">Disabled</td><td colspan="10">Optional license: Available</td></tr>
<tr><td rowspan="2">Unified Communications Proxy Sessions[1]</td><td rowspan="2">2</td><td colspan="11">Optional licenses:</td></tr>
<tr><td>24</td><td>50</td><td>100</td><td>250</td><td>500</td><td>750</td><td>1000</td><td>2000</td><td>3000</td><td>5000</td><td>10000[2]</td></tr>
<tr><td colspan="13"><b>VPN Licenses[3]</b></td></tr>
<tr><td>Adv. Endpoint Assessment</td><td colspan="2">Disabled</td><td colspan="10">Optional license: Available</td></tr>
<tr><td>AnyConnect Essentials[1]</td><td colspan="2">Disabled</td><td colspan="10">Optional license: Available</td></tr>
<tr><td>AnyConnect Mobile[1]</td><td colspan="2">Disabled</td><td colspan="10">Optional license: Available</td></tr>
<tr><td rowspan="6">AnyConnect Premium SSL VPN (sessions)</td><td rowspan="2">2</td><td colspan="11">Optional Permanent licenses:</td></tr>
<tr><td>10</td><td>25</td><td>50</td><td>100</td><td>250</td><td>500</td><td>750</td><td>1000</td><td>2500</td><td>5000</td><td>10000</td></tr>
<tr><td colspan="12">Optional Shared licenses: Participant or Server. For the Server, these licenses are available:[1]</td></tr>
<tr><td colspan="6">500-50,000 in increments of 500</td><td colspan="6">50,000-545,000 in increments of 1000</td></tr>
<tr><td colspan="12">Optional FLEX licenses:</td></tr>
<tr><td>250</td><td>750</td><td>1000</td><td>2500</td><td colspan="8">5000</td></tr>
<tr><td>IPSec VPN (sessions)[1]</td><td colspan="12">5000 (max. 5000 combined IPSec and SSL VPN)</td></tr>
<tr><td>VPN Load Balancing[1]</td><td colspan="12">Supported</td></tr>
<tr><td colspan="13"><b>General Licenses</b></td></tr>
<tr><td>Encryption</td><td colspan="2">Base (DES)</td><td colspan="10">Optional license: Strong (3DES/AES)</td></tr>
<tr><td>Failover</td><td colspan="12">Active/Standby or Active/Active[1]</td></tr>
<tr><td>10 GE I/O for SSP-10 and SSP-20[4]</td><td colspan="5">Disabled; fiber ifcs run at 1 GE</td><td colspan="7">Optional license: Available; fiber ifcs run at 10 GE</td></tr>
<tr><td rowspan="2">Security Contexts</td><td rowspan="2">2</td><td colspan="11">Optional licenses:</td></tr>
<tr><td>5</td><td>10</td><td>20</td><td colspan="8">50</td></tr>
<tr><td>VLANs, Maximum</td><td colspan="12">250</td></tr>
</table>

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[1] See the “License Notes” section.

[2] With the 10,000-session license, the total combined sessions can be 10,000, but the maximum number of Phone Proxy sessions is 5000.

[3] See the “VPN License and Feature Compatibility” section.

[4] The ASA 5585-X with SSP-40 and -60 support 10-Gigabit Ethernet speeds by default.

License Notes

Table 3-8 lists footnotes for the tables in the "Licenses Per Model" section on page 3-1.

Table 3-8 License Notes

License	Notes
Active/Active failover	You cannot use Active/Active failover and VPN; if you want to use VPN, use Active/Standby failover.
AnyConnect Essentials	This license enables AnyConnect VPN client access to the adaptive security appliance. This license does not support deploy browser-based SSL VPN access or Cisco Secure Desktop. For these features, activate an AnyConnect Premium SSL VPN license instead of the AnyConnect Essentials license. **Note** With the AnyConnect Essentials license, VPN users can use a Web browser to log in, and download and start (WebLaunch) the AnyConnect client. The AnyConnect client software offers the same set of client features, whether it is enabled by this license or an AnyConnect Premium SSL VPN license. The AnyConnect Essentials license cannot be active at the same time as the following licenses on a given adaptive security appliance: AnyConnect Premium SSL VPN license (all types) or the Advanced Endpoint Assessment license. You can, however, run AnyConnect Essentials and AnyConnect Premium SSL VPN licenses on different adaptive security appliances in the same network. By default, the ASA uses the AnyConnect Essentials license, but you can disable it to use other licenses by using the **no anyconnect-essentials** command.
AnyConnect Mobile	This license provides access to the AnyConnect Client for touch-screen mobile devices running Windows Mobile 5.0, 6.0, and 6.1. We recommend using this license if you want to support mobile access to AnyConnect 2.3 and later versions. This license requires activation of one of the following licenses to specify the total number SSL VPN sessions permitted: AnyConnect Essentials or AnyConnect Premium SSL VPN.
AnyConnect Premium SSL VPN Shared	A shared license lets the ASA act as a shared license server for multiple client ASAs. The shared license pool is large, but the maximum number of sessions used by each individual ASA cannot exceed the maximum number listed for permanent licenses.
Botnet Traffic Filter	Requires a Strong Encryption (3DES/AES) License to download the dynamic database.
Combined IPSec and SSL VPN sessions	• Although the maximum IPSec and SSL VPN sessions add up to more than the maximum VPN sessions, the combined sessions should not exceed the VPN session limit. If you exceed the maximum VPN sessions, you can overload the ASA, so be sure to size your network appropriately. • If you start a clientless SSL VPN session and then start an AnyConnect client session from the portal, 1 session is used in total. However, if you start the AnyConnect client first (from a standalone client, for example) and then log into the clientless SSL VPN portal, then 2 sessions are used.

Table 3-8 License Notes

License	Notes
Unified Communications Proxy sessions	Phone Proxy, Mobility Advantage Proxy, Presence Federation Proxy, and TLS Proxy are all licensed under the UC Proxy umbrella, and can be mixed and matched. For example, if you configure a phone with a primary and backup Cisco Unified Communications Manager, there are 2 TLS/SRTP connections, so 2 UC Proxy sessions are used. **Note** In Version 8.2(2) and later, Mobility Advantage Proxy no longer requires the UC Proxy license.
VPN load balancing	Requires a Strong Encryption (3DES/AES) License.

VPN License and Feature Compatibility

Table 3-9 shows how the VPN licenses and features can combine.

Table 3-9 VPN License and Feature Compatibility

Supported with:	Enable one of the following licenses:[1]	
	AnyConnect Essentials	AnyConnect Premium SSL VPN
AnyConnect Mobile	Yes	Yes
Advanced Endpoint Assessment	No	Yes
AnyConnect Premium SSL VPN Shared	No	Yes
Client-based SSL VPN	Yes	Yes
Browser-based (clientless) SSL VPN	No	Yes
IPsec VPN	Yes	Yes
VPN Load Balancing	Yes	Yes
Cisco Secure Desktop	No	Yes

[1] You can only have one license type active, either the AnyConnect Essentials license or the AnyConnect Premium license. By default, the ASA includes an AnyConnect Premium license for 2 sessions. If you install the AnyConnect Essentials license, then it is used by default. See the **no anyconnect-essentials** command to enable the Premium license instead.

Information About Feature Licenses

A license specifies the options that are enabled on a given ASA. It is represented by an activation key that is a 160-bit (5 32-bit words or 20 bytes) value. This value encodes the serial number (an 11 character string) and the enabled features.

This section includes the following topics:

- Preinstalled License, page 3-11
- Temporary, VPN Flex, and Evaluation Licenses, page 3-11

- Shared Licenses, page 3-13
- Licenses FAQ, page 3-17

Preinstalled License

By default, your ASA ships with a license already installed. This license might be the Base License, to which you want to add more licenses, or it might already have all of your licenses installed, depending on what you ordered and what your vendor installed for you. See the "Viewing Your Current License" section on page 3-19 section to determine which licenses you have installed.

Temporary, VPN Flex, and Evaluation Licenses

In addition to permanent licenses, you can purchase a temporary license or receive an evaluation license that has a time-limit. For example, you might buy a VPN Flex license to handle short-term surges in the number of concurrent SSL VPN users, or you might order a Botnet Traffic Filter temporary license that is valid for 1 year.

This section includes the following topics:

- How the Temporary License Timer Works, page 3-11
- How Multiple Licenses Interact, page 3-11
- Failover and Temporary Licenses, page 3-13

How the Temporary License Timer Works

- The timer for the temporary license starts counting down when you activate it on the ASA.
- If you stop using the temporary license before it times out, for example you activate a permanent license or a different temporary license, then the timer halts. The timer only starts again when you reactivate the temporary license.
- If the temporary license is active, and you shut down the ASA, then the timer continues to count down. If you intend to leave the ASA in a shut down state for an extended period of time, then you should activate the permanent license before you shut down to preserve the temporary license.
- When a temporary license expires, the next time you reload the ASA, the permanent license is used; you are not forced to perform a reload immediately when the license expires.

Note We suggest you do not change the system clock after you install the temporary license. If you set the clock to be a later date, then if you reload, the ASA checks the system clock against the original installation time, and assumes that more time has passed than has actually been used. If you set the clock back, and the actual running time is greater than the time between the original installation time and the system clock, then the license immediately expires after a reload.

How Multiple Licenses Interact

- When you activate a temporary license, then features from both permanent and temporary licenses are merged to form the running license. Note that the ASA only uses the *highest* value from each license for each feature; the values are not added together. The ASA displays any resolved conflicts between the licenses when you enter a temporary activation key. In the rare circumstance that a temporary license has lower capability than the permanent license, the permanent license values are used.

- When you activate a permanent license, it overwrites the currently-running permanent and temporary licenses and becomes the running license.

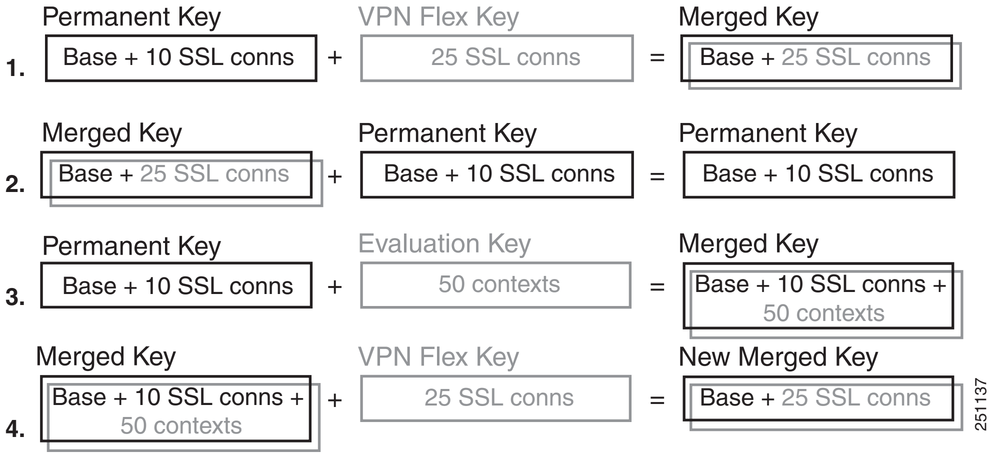
Note If you install a new permanent license, and it is a downgrade from the temporary license, then you need to reload the ASA to disable the temporary license and restore the permanent license. Until you reload, the temporary license continues to count down.

If you reactivate the *already installed* permanent license, you do not need to reload the ASA; the temporary license does not continue to count down, and there is no disruption of traffic.

- To reenable the features of the temporary license if you later activate a permanent license, simply reenter the temporary activation key. For a license upgrade, you do not need to reload.
- To switch to a different temporary license, enter the new activation key; the new license is used instead of the old temporary license and combines with the permanent license to create a new running license. The ASA can have multiple temporary licenses installed; but only one is active at any given time.

See the following figure for examples of permanent and VPN Flex activation keys, and how they interact.

Figure 3-1 Permanent and VPN Flex Activation Keys



1. In example 1 in the above figure, you apply a temporary key with 25 SSL sessions; because the VPN Flex value is greater than the permanent key value of 10 sessions, the resulting running key is a merged key that uses the VPN Flex value of 25 sessions, and not a combined total of 35 sessions.
2. In example 2 above, the merged key from example 1 is replaced by the permanent key, and the VPN Flex license is disabled. The running key defaults to the permanent key value of 10 sessions.
3. In example 3 above, an evaluation license including 50 contexts is applied to the permanent key, so the resulting running key is a merged key that includes all the features of the permanent key plus the 50 context license.
4. In example 4 above, the merged key from example 3 has the VPN Flex key applied. Because the ASA can only use one temporary key at a time, the VPN flex key replaces the evaluation key, so the end result is the same as the merged key from example 1.

Failover and Temporary Licenses

With failover, identical licenses are required. For failover purposes, temporary and permanent licenses appear to be identical, so you can have a permanent license on one unit and a temporary license on the other unit. This functionality is useful in an emergency situation; for example, if one of your units fails, and you have an extra unit, you can install the extra unit while the other one is repaired. If you do not normally use the extra unit for SSL VPN, then a VPN Flex license is a perfect solution while the other unit is being repaired.

Because the temporary license continues to count down for as long as it is activated on a failover unit, we do not recommend using a temporary license in a permanent failover installation; when the temporary license expires, failover will no longer work.

Shared Licenses

A shared license lets you purchase a large number of SSL VPN sessions and share the sessions as needed amongst a group of ASAs by configuring one of the ASAs as a shared licensing server, and the rest as shared licensing participants. This section describes how a shared license works, and includes the following topics:

- Information About the Shared Licensing Server and Participants, page 3-13
- Communication Issues Between Participant and Server, page 3-14
- Information About the Shared Licensing Backup Server, page 3-14
- Failover and Shared Licenses, page 3-15
- Maximum Number of Participants, page 3-16

Information About the Shared Licensing Server and Participants

The following steps describe how shared licenses operate:

1. Decide which ASA should be the shared licensing server, and purchase the shared licensing server license using that device serial number.
2. Decide which ASAs should be shared licensing participants, including the shared licensing backup server, and obtain a shared licensing participant license for each device, using each device serial number.
3. (Optional) Designate a second ASA as a shared licensing backup server. You can only specify one backup server.

Note The shared licensing backup server only needs a participant license.

4. Configure a shared secret on the shared licensing server; any participants with the shared secret can use the shared license.
5. When you configure the ASA as a participant, it registers with the shared licensing server by sending information about itself, including the local license and model information.

Note The participant needs to be able to communicate with the server over the IP network; it does not have to be on the same subnet.

6. The shared licensing server responds with information about how often the participant should poll the server.
7. When a participant uses up the sessions of the local license, it sends a request to the shared licensing server for additional sessions in 50-session increments.
8. The shared licensing server responds with a shared license. The total sessions used by a participant cannot exceed the maximum sessions for the platform model.

   Note The shared licensing server can also participate in the shared license pool. It does not need a participant license as well as the server license to participate.

   a. If there are not enough sessions left in the shared license pool for the participant, then the server responds with as many sessions as available.
   b. The participant continues to send refresh messages requesting more sessions until the server can adequately fulfill the request.
9. When the load is reduced on a participant, it sends a message to the server to release the shared sessions.

Note The ASA uses SSL between the server and participant to encrypt all communications.

Communication Issues Between Participant and Server

See the following guidelines for communication issues between the participant and server:

- If a participant fails to send a refresh after 3 times the refresh interval, then the server releases the sessions back into the shared license pool.
- If the participant cannot reach the license server to send the refresh, then the participant can continue to use the shared license it received from the server for up to 24 hours.
- If the participant is still not able to communicate with a license server after 24 hours, then the participant releases the shared license, even if it still needs the sessions. The participant leaves existing connections established, but cannot accept new connections beyond the license limit.
- If a participant reconnects with the server before 24 hours expires, but after the server expired the participant sessions, then the participant needs to send a new request for the sessions; the server responds with as many sessions as can be reassigned to that participant.

Information About the Shared Licensing Backup Server

The shared licensing backup server must register successfully with the main shared licensing server before it can take on the backup role. When it registers, the main shared licensing server syncs server settings as well as the shared license information with the backup, including a list of registered participants and the current license usage. The main server and backup server sync the data at 10 second intervals. After the initial sync, the backup server can successfully perform backup duties, even after a reload.

When the main server goes down, the backup server takes over server operation. The backup server can operate for up to 30 continuous days, after which the backup server stops issuing sessions to participants, and existing sessions time out. Be sure to reinstate the main server within that 30-day period. Critical-level syslog messages are sent at 15 days, and again at 30 days.

When the main server comes back up, it syncs with the backup server, and then takes over server operation.

When the backup server is not active, it acts as a regular participant of the main shared licensing server.

Note When you first launch the main shared licensing server, the backup server can only operate independently for 5 days. The operational limit increases day-by-day, until 30 days is reached. Also, if the main server later goes down for any length of time, the backup server operational limit decrements day-by-day. When the main server comes back up, the backup server starts to increment again day-by-day. For example, if the main server is down for 20 days, with the backup server active during that time, then the backup server will only have a 10-day limit left over. The backup server "recharges" up to the maximum 30 days after 20 more days as an inactive backup. This recharging function is implemented to discourage misuse of the shared license.

Failover and Shared Licenses

This section describes how shared licenses interact with failover, and includes the following topics:

- "Failover and Shared License Servers" section on page 3-15
- "Failover and Shared License Participants" section on page 3-16

Failover and Shared License Servers

This section describes how the main server and backup server interact with failover. Because the shared licensing server is also performing normal duties as the ASA, including performing functions such as being a VPN gateway and firewall, then you might need to configure failover for the main and backup shared licensing servers for increased reliability.

Note The backup server mechanism is separate from, but compatible with, failover.

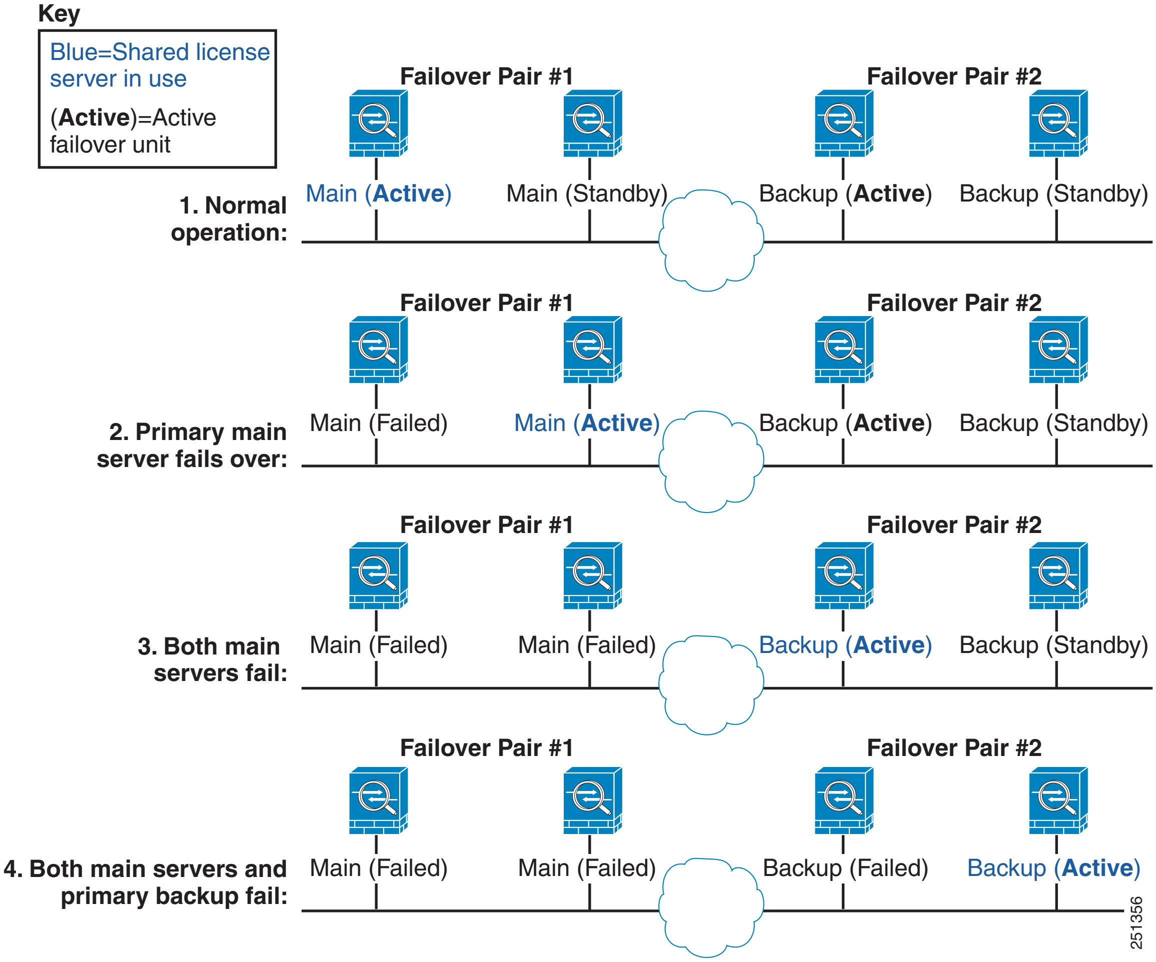
Shared licenses are supported only in single context mode, so Active/Active failover is not supported.

Both main shared licensing server units in the failover pair need to have the same license. So if you purchase a 10,000 session shared license for the primary main server unit, you must also purchase a 10,000 session shared license for the standby main server unit. Because the standby unit does not pass traffic when it is in a standby state, the total number of sessions remains at 10,000 in this example, *not* a combined 20,000 sessions.

For Active/Standby failover, the primary unit acts as the main shared licensing server, and the standby unit acts as the main shared licensing server after failover; because both units need to have the same license, both units can act as the main licensing server. The standby unit does *not* act as the backup shared licensing server. Instead, you can have a second pair of units acting as the backup server, if desired.

For example, you have a network with 2 failover pairs. Pair #1 includes the main licensing server. Pair #2 includes the backup server. When the primary unit from Pair #1 goes down, the standby unit immediately becomes the new main licensing server. The backup server from Pair #2 never gets used. Only if both units in Pair #1 go down does the backup server in Pair #2 come into use as the shared licensing server. If Pair #1 remains down, and the primary unit in Pair #2 goes down, then the standby unit in Pair #2 comes into use as the shared licensing server (see Figure 3-2).

Figure 3-2 Failover and Shared License Servers



The standby backup server shares the same operating limits as the primary backup server; if the standby unit becomes active, it continues counting down where the primary unit left off. See the "Information About the Shared Licensing Backup Server" section on page 3-14 for more information.

Failover and Shared License Participants

For participant pairs, both units register with the shared licensing server using separate participant IDs. The active unit syncs its participant ID with the standby unit. The standby unit uses this ID to generate a transfer request when it switches to the active role. This transfer request is used to move the shared sessions from the previously active unit to the new active unit.

Maximum Number of Participants

The ASA does not limit the number of participants for the shared license; however, a very large shared network could potentially affect the performance on the licensing server. In this case, you can increase the delay between participant refreshes, or you can create two shared networks.

Licenses FAQ

Q. Can I activate multiple temporary licenses, for example, VPN Flex and Botnet Traffic Filter?

A. No. You can only use one temporary license at a time. The last license you activate is the one in use. In the case of evaluation licenses that group multiple features into one activation key, then multiple features are supported at the same time. But temporary licenses for sale by Cisco are limited to one feature per activation key.

Q. Can I "stack" temporary licenses so that when the time limit runs out, it will automatically use the next license?

A. No. You can install multiple temporary licenses, but only the last activated license is active. When the active license expires, you need to manually activate the new one. Be sure to activate it shortly *before* the old one expires so you do not lose functionality. (Any remaining time on the old license remains unused; for example, if you use 10 months of a 12-month license, and activate a new 12-month license, then the remaining 2 months of the first license goes unused unless you later reactivate it. We recommend that you activate the new license as close as possible to the end of the old license to maximize the license usage.)

Q. Can I install a new permanent license while maintaining an active temporary license?

A. No. The temporary license will be deactivated when you apply a permanent license. You have to activate the permanent license, and then reactivate the temporary license to be able to use the new permanent license along with the temporary license. This will cause temporary loss of functionality for the features reliant on the temporary license.

Q. For failover, can I use a shared licensing server as the primary unit, and the shared licensing backup server as the secondary unit?

A. No. The secondary unit must also have a shared licensing server license. The backup server, which has a participant license, can be in a separate failover pair of two backup servers.

Q. Do I need to buy the same licenses for the secondary unit in a failover pair? Even for a shared licensing server?

A. Yes. Both units need the same licenses. For a shared licensing server, you need to buy the same shared licensing server license for both units. **Note:** In Active/Standby failover, for licenses that specify the number of sessions, the sessions for both units are not added to each other; only the active unit sessions can be used. For example, for a shared SSL VPN license, you need to purchase a 10,000 user session for both the active and the standby unit; the total number of sessions is 10,000, *not* 20,000 combined.

Q. Can I use a VPN Flex or permanent SSL VPN license in addition to a shared SSL VPN license?

A. Yes. The shared license is used only after the sessions from the locally installed license (VPN Flex or permanent) are used up. **Note**: On the shared licensing server, the permanent SSL VPN license is not used; you can however use a VPN Flex license at the same time as the shared licensing server license. In this case, the VPN Flex license sessions are available for local SSL VPN sessions only; they cannot be added to the shared licensing pool for use by participants.

Guidelines and Limitations

See the following guidelines for activation keys.

Context Mode Guidelines

- In multiple context mode, apply the activation key in the system execution space.
- Shared licenses are not supported in multiple context mode.

Firewall Mode Guidelines

All license types are available in both routed and transparent mode.

Failover Guidelines

- You must have the same licenses activated on the primary and secondary units.

Note For failover purposes, there is no distinction between permanent and temporary licenses as long as the feature set is the same between the two units. See the "Failover and Temporary Licenses" section on page 3-13 for more information.

- Shared licenses are not supported in Active/Active mode. See the "Failover and Shared Licenses" section on page 3-15 for more information.

Upgrade Guidelines

Your activation key remains compatible if you upgrade to Version 8.2 or later, and also if you later downgrade. After you upgrade, if you activate additional feature licenses that were introduced *before 8.2*, then the activation key continues to be compatible with earlier versions if you downgrade. However if you activate feature licenses that were introduced in *8.2 or later*, then the activation key is not backwards compatible. If you have an incompatible license key, then see the following guidelines:

- If you previously entered an activation key in an earlier version, then the ASA uses that key (without any of the new licenses you activated in Version 8.2 or later).
- If you have a new system and do not have an earlier activation key, then you need to request a new activation key compatible with the earlier version.

Additional Guidelines and Limitations

- The activation key is not stored in your configuration file; it is stored as a hidden file in Flash memory.
- The activation key is tied to the serial number of the device. Feature licenses cannot be transferred between devices (except in the case of a hardware failure). If you have to replace your device due to a hardware failure, contact the Cisco Licensing Team to have your existing license transferred to the new serial number. The Cisco Licensing Team will ask for the Product Authorization Key reference number and existing serial number.
- Once purchased, you cannot return a license for a refund or for an upgraded license.
- You cannot add two separate licenses for the same feature together; for example, if you purchase a 25-session SSL VPN license, and later purchase a 50-session license, you cannot use 75 sessions; you can use a maximum of 50 sessions. (You may be able to purchase a larger license at an upgrade price, for example from 25 sessions to 75 sessions; this kind of upgrade should be distinguished from adding two separate licenses together).

- Although you can activate all license types, some features are incompatible with each other; for example, multiple context mode and VPN. In the case of the AnyConnect Essentials license, the license is incompatible with the following licenses: full SSL VPN license, shared SSL VPN license, and Advanced Endpoint Assessment license. By default, the AnyConnect Essentials license is used instead of the above licenses, but you can disable the AnyConnect Essentials license in the configuration to restore use of the other licenses using the **no anyconnect-essentials** command.

Viewing Your Current License

This section describes how to view your current license, and for temporary activation keys, how much time the license has left.

Detailed Steps

Command	Purpose

`show activation-key detail`
`Example:`
`hostname# show activation-key detail`
	Shows the installed licenses, including information about temporary licenses.

Examples

The following is sample output from the **show activation-key detail** command that shows a permanent activation license with 2 SSL VPN peers (in bold), an active temporary license with 5000 SSL VPN peers (in bold), the merged running license with the SSL VPN peers taken from the temporary license (in bold), and also the activation keys for inactive temporary licenses:

```
hostname# show activation-key detail

Serial Number:  JMX0916L0Z4

Permanent Flash Activation Key: 0xf412675d 0x48a446bc 0x8c532580 0xb000b8c4 0xcc21f48e

Licensed features for this platform:
Maximum Physical Interfaces  : Unlimited
Maximum VLANs                : 200
Inside Hosts                 : Unlimited
Failover                     : Active/Active
VPN-DES                      : Enabled
VPN-3DES-AES                 : Enabled
Security Contexts            : 2
GTP/GPRS                     : Disabled
VPN Peers                    : 2
SSL VPN Peers                : 2
Total VPN Peers              : 250
Shared License               : Enabled
  Shared SSL VPN Peers       : 5000
AnyConnect for Mobile        : Disabled
AnyConnect for Linksys phone : Disabled
AnyConnect Essentials        : Disabled
Advanced Endpoint Assessment : Disabled
UC Phone Proxy Sessions      : 24
Total UC Proxy Sessions      : 24
Botnet Traffic Filter        : Enabled
```

```
Temporary Flash Activation Key: 0xcb0367ce 0x700dd51d 0xd57b98e3 0x6ebcf553 0x0b058aac

Licensed features for this platform:
Maximum Physical Interfaces  : Unlimited
Maximum VLANs                : 200
Inside Hosts                 : Unlimited
Failover                     : Active/Active
VPN-DES                      : Enabled
VPN-3DES-AES                 : Enabled
Security Contexts            : 2
GTP/GPRS                     : Disabled
SSL VPN Peers                : 5000
Total VPN Peers              : 250
Shared License               : Enabled
  Shared SSL VPN Peers       : 10000
AnyConnect for Mobile        : Disabled
AnyConnect for Linksys phone : Disabled
AnyConnect Essentials        : Disabled
Advanced Endpoint Assessment : Disabled
UC Phone Proxy Sessions      : 24
Total UC Proxy Sessions      : 24
Botnet Traffic Filter        : Enabled

This is a time-based license that will expire in 27 day(s).

Running Activation Key: 0xcb0367ce 0x700dd51d 0xd57b98e3 0x6ebcf553 0x0b058aac

Licensed features for this platform:
Maximum Physical Interfaces  : Unlimited
Maximum VLANs                : 200
Inside Hosts                 : Unlimited
Failover                     : Active/Active
VPN-DES                      : Enabled
VPN-3DES-AES                 : Enabled
Security Contexts            : 2
GTP/GPRS                     : Disabled
SSL VPN Peers                : 5000
Total VPN Peers              : 250
Shared License               : Enabled
  Shared SSL VPN Peers       : 10000
AnyConnect for Mobile        : Disabled
AnyConnect for Linksys phone : Disabled
AnyConnect Essentials        : Disabled
Advanced Endpoint Assessment : Disabled
UC Phone Proxy Sessions      : 24
Total UC Proxy Sessions      : 24
Botnet Traffic Filter        : Enabled


This platform has an ASA 5540 VPN Premium license.
This is a Shared SSL VPN License server.

This is a time-based license that will expire in 27 day(s).

The flash activation key is the SAME as the running key.

Non-active temporary keys:                              Time left
------------------------------------------------------------------
0x2a53d6   0xfc087bfe 0x691b94fb 0x73dc8bf3 0xcc028ca2  28 day(s)
0xa13a46c2 0x7c10ec8d 0xad8a2257 0x5ec0ab7f 0x86221397  27 day(s)
```

Obtaining an Activation Key

To obtain an activation key, you need a Product Authorization Key, which you can purchase from your Cisco account representative. You need to purchase a separate Product Activation Key for each feature license. For example, if you have the Base License, you can purchase separate keys for Advanced Endpoint Assessment and for additional SSL VPN sessions.

Note For a failover pair, you need separate activation keys for each unit. Make sure the licenses included in the keys are the same for both units.

After obtaining the Product Authorization Keys, register them on Cisco.com by performing the following steps:

Step 1 Obtain the serial number for your ASA by entering the following command.

```
hostname# show activation-key
```

Step 2 If you are not already registered with Cisco.com, create an account.

Step 3 Go to the following licensing website:

http://www.cisco.com/go/license

Step 4 Enter the following information, when prompted:

- Product Authorization Key (if you have multiple keys, enter one of the keys first. You have to enter each key as a separate process.)
- The serial number of your ASA
- Your email address

An activation key is automatically generated and sent to the email address that you provide. This key includes all features you have registered so far for permanent licenses. For VPN Flex licenses, each license has a separate activation key.

Step 5 If you have additional Product Authorization Keys, repeat Step 4 for each Product Authorization Key. After you enter all of the Product Authorization Keys, the final activation key provided includes all of the permanent features you registered.

Entering a New Activation Key

This section describes how to enter a new activation key.

Prerequisites

- Before entering the activation key, ensure that the image in Flash memory and the running image are the same by entering the show activation-key command. You can do this by reloading the ASA before entering the new activation key.
- If you are already in multiple context mode, enter the activation key in the system execution space.
- Some licenses require you to reload the ASA after you activate them. Table 3-10 lists the licenses that require reloading.

Table 3-10 License Reloading Requirements

Model	License Action Requiring Reload
ASA 5505 and ASA 5510	Changing between the Base and Security Plus license.
All models	Changing the Encryption license.
All models	Downgrading any license (for example, going from 10 contexts to 2 contexts). **Note** If a temporary license expires, and the permanent license is a downgrade, then you do not need to immediately reload the ASA; the next time you reload, the permanent license is restored.

Limitations and Restrictions

Your activation key remains compatible if you upgrade to Version 8.2 or later, and also if you later downgrade. After you upgrade, if you activate additional feature licenses that were introduced *before 8.2*, then the activation key continues to be compatible with earlier versions if you downgrade. However if you activate feature licenses that were introduced in *8.2 or later*, then the activation key is not backwards compatible. If you have an incompatible license key, then see the following guidelines:

- If you previously entered an activation key in an earlier version, then the ASA uses that key (without any of the new licenses you activated in Version 8.2 or later).
- If you have a new system and do not have an earlier activation key, then you need to request a new activation key compatible with the earlier version.

Detailed Steps

	Command	Purpose

Step 1	**`activation-key`** *`key`*
	Example:
	`hostname# activation-key 0xd11b3d48 0xa80a4c0a 0x48e0fd1c 0xb0443480 0x843fc490`
		Applies an activation key to the ASA. The key is a five-element hexadecimal string with one space between each element. The leading 0x specifier is optional; all values are assumed to be hexadecimal.
		You can enter one permanent key, and multiple temporary keys. The last temporary key entered is the active one. See the "Temporary, VPN Flex, and Evaluation Licenses" section on page 3-11 for more information. To change the running activation key, enter the **activation-key** command with a new key value.

Step 2	**`reload`**
	Example:
	`hostname# reload`
		(Might be required.) Reloads the ASA. Some licenses require you to reload the ASA after entering the new activation key. See Table 3-10 on page 3-22 for a list of licenses that need reloading. If you need to reload, you will see the following message:
		`WARNING: The running activation key was not updated with the requested key. The flash activation key was updated with the requested key, and will become active after the next reload.`

Upgrading the License for a Failover Pair

If you need to upgrade the license on a failover pair, you might have some amount of downtime depending on whether the license requires a reload. See Table 3-10 on page 3-22 for more information about licenses requiring a reload. This section includes the following topics:

- Upgrading the License for a Failover (No Reload Required), page 3-23
- Upgrading the License for a Failover (Reload Required), page 3-24

Upgrading the License for a Failover (No Reload Required)

Use the following procedure if your new license does not require you to reload. See Table 3-10 on page 3-22 for more information about licenses requiring a reload. This procedure ensures that there is no downtime.

Prerequisites

Before you upgrade the license, be sure that both units are operating correctly, the Failover LAN interface is up, and there is not an imminent failover event; for example, monitored interfaces are operating normally.

On each unit, enter the **show failover** command to view the failover status and the monitored interface status.

Detailed Steps

	Command	Purpose
	On the active unit:	

Step 1	**`no failover`**
	`Example:`
	`active(config)# no failover`
		Disables failover on the active unit. The standby unit remains in a pseudo-standby state. Deactivating failover on the active unit prevents the standby unit from attempting to become active during the period when the licenses do not match.

Step 2	**`activation-key`** *`key`*
	`Example:`
	`active(config)# activation-key 0xd11b3d48 0xa80a4c0a 0x48e0fd1c 0xb0443480 0x843fc490`
		Installs the new license on the active unit. Make sure this license is for the active unit serial number.

	On the standby unit:	

Step 3	**`activation-key`** *`key`*
	`Example:`
	`standby# activation-key 0xc125727f 0x903de1ee 0x8c838928 0x92dc84d4 0x003a2ba0`
		Installs the new license on the standby unit. Make sure this license is for the standby unit serial number.

	On the active unit:	

Step 4	**`failover`**
	`Example:`
	`active(config)# failover`
		Reenables failover.

Upgrading the License for a Failover (Reload Required)

Use the following procedure if your new license requires you to reload. See Table 3-10 on page 3-22 for more information about licenses requiring a reload. Reloading the failover pair causes a loss of connectivity during the reload.

Prerequisites

Before you upgrade the license, be sure that both units are operating correctly, the Failover LAN interface is up, and there is not an imminent failover event; for example, monitored interfaces are operating normally.

On each unit, enter the **show failover** command to view the failover status and the monitored interface status.

Detailed Steps

	Command	Purpose
	On the active unit:	

Step 1	**`no failover`**
	Example:
	`active(config)# no failover`
		Disables failover on the active unit. The standby unit remains in a pseudo-standby state. Deactivating failover on the active unit prevents the standby unit from attempting to become active during the period when the licenses do not match.

Step 2	**`activation-key`** *`key`*
	Example:
	`active(config)# activation-key 0xd11b3d48 0xa80a4c0a 0x48e0fd1c 0xb0443480 0x843fc490`
		Installs the new license on the active unit.
		If you need to reload, you will see the following message:
		`WARNING: The running activation key was not updated with the requested key. The flash activation key was updated with the requested key, and will become active after the next reload.`
		If you do not need to reload, then follow the "Upgrading the License for a Failover (No Reload Required)" section on page 3-23 instead of this procedure.

	On the standby unit:	

Step 3	**`activation-key`** *`key`*
	Example:
	`standby# activation-key 0xc125727f 0x903de1ee 0x8c838928 0x92dc84d4 0x003a2ba0`
		Installs the new license on the standby unit.

Step 4	**`reload`**
	Example:
	`standby# reload`
		Reloads the standby unit.

	On the active unit:	

Step 5	**`reload`**
	Example:
	`active(config)# reload`
		Reloads the active unit. When you are prompted to save the configuration before reloading, answer **No**. This means that when the active unit comes back up, failover will still be enabled.

Configuring a Shared License

This section describes how to configure the shared licensing server and participants. For more information about shared licenses, see the "Shared Licenses" section on page 3-13.

This section includes the following topics:

- Configuring the Shared Licensing Server, page 3-25
- Configuring the Shared Licensing Backup Server (Optional), page 3-26
- Configuring the Shared Licensing Participant, page 3-27
- Monitoring the Shared License, page 3-28

Configuring the Shared Licensing Server

This section describes how to configure the ASA to be a shared licensing server.

Prerequisites

The server must have a shared licensing server key.

Detailed Steps

	Command	Purpose

Step 1	**`license-server secret`** *`secret`*
	Example:
	`hostname(config)# license-server secret farscape`
		Sets the shared secret, a string between 4 and 128 ASCII characters. Any participant with this secret can use the licensing server.

Step 2	(Optional)
	`license-server refresh-interval` *`seconds`*
	Example:
	`hostname(config)# license-server refresh-interval 100`
		Sets the refresh interval between 10 and 300 seconds; this value is provided to participants to set how often they should communicate with the server. The default is 30 seconds.

Step 3	(Optional)
	`license-server port` *`port`*
	Example:
	`hostname(config)# license-server port 40000`
		Sets the port on which the server listens for SSL connections from participants, between 1 and 65535. The default is TCP port 50554.

	Command	Purpose
Step 4	(Optional) **license-server backup** *address* **backup-id** *serial_number* [**ha-backup-id** *ha_serial_number*] **Example:** `hostname(config)# license-server backup 10.1.1.2 backup-id JMX0916L0Z4 ha-backup-id JMX1378N0W3`	Identifies the backup server IP address and serial number. If the backup server is part of a failover pair, identify the standby unit serial number as well. You can only identify 1 backup server and its optional standby unit.
Step 5	**license-server enable** *interface_name* **Example:** `hostname(config)# license-server enable inside`	Enables this unit to be the shared licensing server. Specify the interface on which participants contact the server. You can repeat this command for as many interfaces as desired.

Examples

The following example sets the shared secret, changes the refresh interval and port, configures a backup server, and enables this unit as the shared licensing server on the inside interface and dmz interface.

```
hostname(config)# license-server secret farscape
hostname(config)# license-server refresh-interval 100
hostname(config)# license-server port 40000
hostname(config)# license-server backup 10.1.1.2 backup-id JMX0916L0Z4 ha-backup-id
JMX1378N0W3
hostname(config)# license-server enable inside
hostname(config)# license-server enable dmz
```

What to Do Next

See the "Configuring the Shared Licensing Backup Server (Optional)" section on page 3-26 , or the "Configuring the Shared Licensing Participant" section on page 3-27.

Configuring the Shared Licensing Backup Server (Optional)

This section enables a shared license participant to act as the backup server if the main server goes down.

Prerequisites

The backup server must have a shared licensing participant key.

Detailed Steps

	Command	Purpose

Step 1	**`license-server address`** *`address`* **`secret`** *`secret`* `[`**`port`** *`port`*`]`
	Example:
	`hostname(config)# license-server address 10.1.1.1 secret farscape`
		Identifies the shared licensing server IP address and shared secret. If you changed the default port in the server configuration, set the port for the backup server to match.

Step 2	**`license-server backup enable`** *`interface_name`*
	Example:
	`hostname(config)# license-server backup enable inside`
		Enables this unit to be the shared licensing backup server. Specify the interface on which participants contact the server. You can repeat this command for as many interfaces as desired.

Examples

The following example identifies the license server and shared secret, and enables this unit as the backup shared license server on the inside interface and dmz interface.

```
hostname(config)# license-server address 10.1.1.1 secret farscape
hostname(config)# license-server backup enable inside
hostname(config)# license-server backup enable dmz
```

What to Do Next

See the "Configuring the Shared Licensing Participant" section on page 3-27.

Configuring the Shared Licensing Participant

This section configures a shared licensing participant to communicate with the shared licensing server .

Prerequisites

The participant must have a shared licensing participant key.

Detailed Steps

	Command	Purpose

Step 1	**`license-server address`** *`address`* **`secret`** *`secret`* `[`**`port`** *`port`*`]`
	`Example:`
	`hostname(config)# license-server address 10.1.1.1 secret farscape`
		Identifies the shared licensing server IP address and shared secret. If you changed the default port in the server configuration, set the port for the participant to match.

Step 2	(Optional)
	`license-server backup address` *`address`*
	`Example:`
	`hostname(config)# license-server backup address 10.1.1.2`
		If you configured a backup server, enter the backup server address.

Examples

The following example sets the license server IP address and shared secret, as well as the backup license server IP address:

```
hostname(config)# license-server address 10.1.1.1 secret farscape
hostname(config)# license-server backup address 10.1.1.2
```

Monitoring the Shared License

To monitor the shared license, enter one of the following commands.

Command	Purpose
`show shared license` `[`**`detail`** `|` **`client`** `[`*`hostname`*`]` `|` **`backup`**`]`	Shows shared license statistics. Optional keywords ar available only for the licensing server: the **detail** keyword shows statistics per participant. To limit the display to one participant, use the **client** keyword. The **backup** keyword shows information about the backup server. To clear the shared license statistics, enter the **clear shared license** command.
`show activation-key`	Shows the licenses installed on the ASA. The **show version** command also shows license information.
`show vpn-sessiondb`	Shows license information about VPN sessions.

Examples

The following is sample output from the **show shared license** command on the license participant:

```
hostname>  show shared license
Primary License Server : 10.3.32.20
  Version              : 1
  Status               : Inactive

Shared license utilization:
  SSLVPN:
    Total for network :     5000
    Available         :     5000
    Utilized          :        0
  This device:
    Platform limit    :      250
    Current usage     :        0
    High usage        :        0
  Messages Tx/Rx/Error:
    Registration    : 0 / 0 / 0
    Get             : 0 / 0 / 0
    Release         : 0 / 0 / 0
    Transfer        : 0 / 0 / 0
```

The following is sample output from the **show shared license detail** command on the license server:

```
hostname>  show shared license detail
Backup License Server Info:

Device ID           : ABCD
Address             : 10.1.1.2
Registered          : NO
HA peer ID          : EFGH
Registered          : NO
  Messages Tx/Rx/Error:
    Hello           : 0 / 0 / 0
    Sync            : 0 / 0 / 0
    Update          : 0 / 0 / 0

Shared license utilization:
  SSLVPN:
    Total for network :      500
    Available         :      500
    Utilized          :        0
  This device:
    Platform limit    :      250
    Current usage     :        0
    High usage        :        0
  Messages Tx/Rx/Error:
    Registration    : 0 / 0 / 0
    Get             : 0 / 0 / 0
    Release         : 0 / 0 / 0
    Transfer        : 0 / 0 / 0


Client Info:

  Hostname          : 5540-A
  Device ID         : XXXXXXXXXXX
  SSLVPN:
    Current usage   : 0
    High            : 0
  Messages Tx/Rx/Error:
    Registration    : 1 / 1 / 0
    Get             : 0 / 0 / 0
    Release         : 0 / 0 / 0
    Transfer        : 0 / 0 / 0
...
```

Feature History for Licensing

Table 3-11 lists the release history for this feature.

Table 3-11 Feature History for Licensing

Feature Name	Releases	Feature Information
Increased Connections and VLANs	7.0(5)	Increased the following limits: • ASA5510 Base license connections from 32000 to 5000; VLANs from 0 to 10. • ASA5510 Security Plus license connections from 64000 to 130000; VLANs from 10 to 25. • ASA5520 connections from 130000 to 280000; VLANs from 25 to 100. • ASA5540 connections from 280000 to 400000; VLANs from 100 to 200.
SSL VPN Licenses	7.1(1)	SSL VPN licenses were introduced.
Increased SSL VPN Licenses	7.2(1)	A 5000-user SSL VPN license was introduced for the ASA 5550 and above.
Increased interfaces for the Base license on the ASA 5510	7.2(2)	For the Base license on the ASA 5510, the maximum number of interfaces was increased from 3 plus a management interface to unlimited interfaces.
Increased VLANs	7.2(2)	The maximum number of VLANs for the Security Plus license on the ASA 5505 ASA was increased from 5 (3 fully functional; 1 failover; one restricted to a backup interface) to 20 fully functional interfaces. In addition, the number of trunk ports was increased from 1 to 8. Now there are 20 fully functional interfaces, you do not need to use the backup interface command to cripple a backup ISP interface; you can use a fully-functional interface for it. The backup interface command is still useful for an Easy VPN configuration. VLAN limits were also increased for the ASA 5510 ASA (from 10 to 50 for the Base license, and from 25 to 100 for the Security Plus license), the ASA 5520 adaptive security appliance (from 100 to 150), the ASA 5550 adaptive security appliance (from 200 to 250).
Gigabit Ethernet Support for the ASA 5510 Security Plus License	7.2(3)	The ASA 5510 ASA now supports Gigabit Ethernet (1000 Mbps) for the Ethernet 0/0 and 0/1 ports with the Security Plus license. In the Base license, they continue to be used as Fast Ethernet (100 Mbps) ports. Ethernet 0/2, 0/3, and 0/4 remain as Fast Ethernet ports for both licenses. **Note** The interface names remain Ethernet 0/0 and Ethernet 0/1. Use the **speed** command to change the speed on the interface and use the **show interface** command to see what speed is currently configured for each interface.

Table 3-11 Feature History for Licensing (continued)

Feature Name	Releases	Feature Information
Advanced Endpoint Assessment License	8.0(2)	The Advanced Endpoint Assessment license was introduced. As a condition for the completion of a Cisco AnyConnect or clientless SSL VPN connections, the remote computer scans for a greatly expanded collection of antivirus and antispyware applications, firewalls, operating systems, and associated updates. It also scans for any registry entries, filenames, and process names that you specify. It sends the scan results to the adaptive security appliance. The ASA uses both the user login credentials and the computer scan results to assign a Dynamic Access Policy (DAP). With an Advanced Endpoint Assessment License, you can enhance Host Scan by configuring an attempt to update noncompliant computers to meet version requirements. Cisco can provide timely updates to the list of applications and versions that Host Scan supports in a package that is separate from Cisco Secure Desktop.
VPN Load Balancing for the ASA 5510	8.0(2)	VPN load balancing is now supported on the ASA 5510 Security Plus license.
AnyConnect for Mobile License	8.0(3)	The AnyConnect for Mobile license lets Windows mobile devices connect to the ASA using the AnyConnect client.
VPN Flex and Evaluation Licenses	8.0(4)/8.1(2)	Support for temporary licenses was introduced. VPN Flex licenses provide temporary support for extra SSL VPN sessions.
Increased VLANs for the ASA 5580	8.1(2)	The number of VLANs supported on the ASA 5580 are increased from 100 to 250.
Unified Communications Proxy Sessions license	8.0(4)	The UC Proxy sessions license was introduced. This feature is not available in Version 8.1.
Botnet Traffic Filter License	8.2(1)	The Botnet Traffic Filter license was introduced. The Botnet Traffic Filter protects against malware network activity by tracking connections to known bad domains and IP addresses.

Table 3-11 Feature History for Licensing (continued)

Feature Name	Releases	Feature Information
AnyConnect Essentials License	8.2(1)	This license enables AnyConnect VPN client access to the adaptive security appliance. This license does not support browser-based SSL VPN access or Cisco Secure Desktop. For these features, activate an AnyConnect Premium SSL VPN license instead of the AnyConnect Essentials license. **Note** With the AnyConnect Essentials license, VPN users can use a Web browser to log in, and download and start (WebLaunch) the AnyConnect client. The AnyConnect client software offers the same set of client features, whether it is enabled by this license or an AnyConnect Premium SSL VPN license. The AnyConnect Essentials license cannot be active at the same time as the following licenses on a given adaptive security appliance: AnyConnect Premium SSL VPN license (all types) or the Advanced Endpoint Assessment license. You can, however, run AnyConnect Essentials and AnyConnect Premium SSL VPN licenses on different adaptive security appliances in the same network. By default, the ASA uses the AnyConnect Essentials license, but you can disable it to use other licenses by using the **no anyconnect-essentials** command.
Shared Licenses for SSL VPN	8.2(1)	Shared licenses for SSL VPN were introduced. Multiple ASAs can share a pool of SSL VPN sessions on an as-needed basis.
Mobility Proxy application no longer requires Unified Communications Proxy license	8.2(2)	The Mobility Proxy no longer requires the UC Proxy license.
10 GE I/O license for the ASA 5585-X with SSP-20	8.2(3)	We introduced the 10 GE I/O license for the ASA 5585-X with SSP-20 to enable 10-Gigabit Ethernet speeds for the fiber ports. The SSP-60 supports 10-Gigabit Ethernet speeds by default.
10 GE I/O license for the ASA 5585-X with SSP-10	8.2(4)	We introduced the 10 GE I/O license for the ASA 5585-X with SSP-10 to enable 10-Gigabit Ethernet speeds for the fiber ports. The SSP-40 supports 10-Gigabit Ethernet speeds by default.

CHAPTER 4

Configuring the Transparent or Routed Firewall

This chapter describes how to configure the firewall mode, routed or transparent, and how to customize transparent firewall operation.

Note In multiple context mode, you cannot set the firewall mode separately for each context; you can only set the firewall mode for the entire ASA.

This chapter includes the following sections:

- Configuring the Firewall Mode, page 4-1
- Configuring ARP Inspection for the Transparent Firewall, page 4-8
- Customizing the MAC Address Table for the Transparent Firewall, page 4-11
- Firewall Mode Examples, page 4-15

Configuring the Firewall Mode

This section describes routed and transparent firewall mode, and how to set the mode. This section includes the following topics:

- Information About the Firewall Mode, page 4-1
- Licensing Requirements for the Firewall Mode, page 4-4
- Default Settings, page 4-4
- Guidelines and Limitations, page 4-5
- Setting the Firewall Mode, page 4-7
- Feature History for Firewall Mode, page 4-8

Information About the Firewall Mode

This section describes routed and transparent firewall mode, and includes the following topics:

- Information About Routed Firewall Mode, page 4-2
- Information About Transparent Firewall Mode, page 4-2

Information About Routed Firewall Mode

In routed mode, the ASA is considered to be a router hop in the network. It can use OSPF or RIP (in single context mode). Routed mode supports many interfaces. Each interface is on a different subnet. You can share interfaces between contexts.

The ASA acts as a router between connected networks, and each interface requires an IP address on a different subnet. In single context mode, the routed firewall supports OSPF, EIGRP, and RIP. Multiple context mode supports static routes only. We recommend using the advanced routing capabilities of the upstream and downstream routers instead of relying on the ASA for extensive routing needs.

Information About Transparent Firewall Mode

Traditionally, a firewall is a routed hop and acts as a default gateway for hosts that connect to one of its screened subnets. A transparent firewall, on the other hand, is a Layer 2 firewall that acts like a "bump in the wire," or a "stealth firewall," and is not seen as a router hop to connected devices.

This section describes transparent firewall mode, and includes the following topics:

- Transparent Firewall Network, page 4-2
- Allowing Layer 3 Traffic, page 4-2
- Allowed MAC Addresses, page 4-2
- Passing Traffic Not Allowed in Routed Mode, page 4-3
- BPDU Handling, page 4-3
- MAC Address vs. Route Lookups, page 4-3
- Using the Transparent Firewall in Your Network, page 4-4

Transparent Firewall Network

The ASA connects the same network on its inside and outside interfaces. Because the firewall is not a routed hop, you can easily introduce a transparent firewall into an existing network.

Allowing Layer 3 Traffic

IPv4 and IPv6 traffic is allowed through the transparent firewall automatically from a higher security interface to a lower security interface, without an access list. ARPs are allowed through the transparent firewall in both directions without an access list. ARP traffic can be controlled by ARP inspection. For Layer 3 traffic travelling from a low to a high security interface, an extended access list is required on the low security interface. See Chapter 11, "Adding an Extended Access List," or Chapter 15, "Adding an IPv6 Access List," for more information.

Allowed MAC Addresses

The following destination MAC addresses are allowed through the transparent firewall. Any MAC address not on this list is dropped.

- TRUE broadcast destination MAC address equal to FFFF.FFFF.FFFF
- IPv4 multicast MAC addresses from 0100.5E00.0000 to 0100.5EFE.FFFF
- IPv6 multicast MAC addresses from 3333.0000.0000 to 3333.FFFF.FFFF
- BPDU multicast address equal to 0100.0CCC.CCCD

- Appletalk multicast MAC addresses from 0900.0700.0000 to 0900.07FF.FFFF

Passing Traffic Not Allowed in Routed Mode

In routed mode, some types of traffic cannot pass through the ASA even if you allow it in an access list. The transparent firewall, however, can allow almost any traffic through using either an extended access list (for IP traffic) or an EtherType access list (for non-IP traffic).

Note The transparent mode ASA does not pass CDP packets packets, or any packets that do not have a valid EtherType greater than or equal to 0x600. For example, you cannot pass IS-IS packets. An exception is made for BPDUs, which are supported.

For example, you can establish routing protocol adjacencies through a transparent firewall; you can allow OSPF, RIP, EIGRP, or BGP traffic through based on an extended access list. Likewise, protocols like HSRP or VRRP can pass through the ASA.

Non-IP traffic (for example AppleTalk, IPX, BPDUs, and MPLS) can be configured to go through using an EtherType access list.

For features that are not directly supported on the transparent firewall, you can allow traffic to pass through so that upstream and downstream routers can support the functionality. For example, by using an extended access list, you can allow DHCP traffic (instead of the unsupported DHCP relay feature) or multicast traffic such as that created by IP/TV.

BPDU Handling

To prevent loops using the spanning tree protocol, BPDUs are passed by default. To block BPDUs, you need to configure an EtherType access list to deny them. If you are using failover, you might want to block BPDUs to prevent the switch port from going into a blocking state when the topology changes. See the "Transparent Firewall Mode Requirements" section on page 32-11 for more information.

MAC Address vs. Route Lookups

When the ASA runs in transparent mode, the outgoing interface of a packet is determined by performing a MAC address lookup instead of a route lookup.

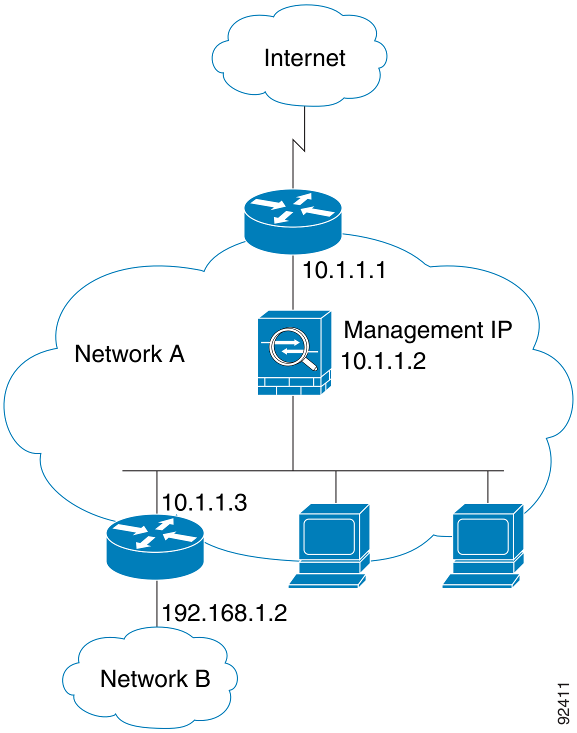
Route lookups, however, are necessary for the following traffic types:

- Traffic originating on the ASA—For example, if your syslog server is located on a remote network, you must use a static route so the ASA can reach that subnet.
- Voice over IP (VoIP) traffic with inspection enabled, and the endpoint is at least one hop away from the ASA—For example, if you use the transparent firewall between a CCM and an H.323 gateway, and there is a router between the transparent firewall and the H.323 gateway, then you need to add a static route on the ASA for the H.323 gateway for successful call completion.
- VoIP or DNS traffic with NAT and inspection enabled—To successfully translate the IP address inside VoIP and DNS packets, the ASA needs to perform a route lookup. Unless the host is on a directly-connected network, then you need to add a static route on the ASA for the real host address that is embedded in the packet.

Using the Transparent Firewall in Your Network

Figure 4-1 shows a typical transparent firewall network where the outside devices are on the same subnet as the inside devices. The inside router and hosts appear to be directly connected to the outside router.

Figure 4-1 Transparent Firewall Network



Licensing Requirements for the Firewall Mode

The following table shows the licensing requirements for this feature.

Model	License Requirement
All models	Base License.

Default Settings

The default mode is routed mode.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

- The firewall mode is set for the entire system and all contexts; you cannot set the mode individually for each context.
- For multiple context mode, set the mode in the system execution space.
- When you change modes, the ASA clears the running configuration because many commands are not supported for both modes. This action removes any contexts from running. If you then re-add a context that has an existing configuration that was created for the wrong mode, the context configuration might not work correctly. Be sure to recreate your context configurations for the correct mode before you re-add them, or add new contexts with new paths for the new configurations.

Transparent Firewall Guidelines

Follow these guidelines when planning your transparent firewall network:

- For IPv4, a management IP address is required for both management traffic and for traffic to pass through the ASA. For multiple context mode, an IP address is required for each context.

  Unlike routed mode, which requires an IP address for each interface, a transparent firewall has an IP address assigned to the entire device. The ASA uses this IP address as the source address for packets originating on the ASA, such as system messages or AAA communications.

  The management IP address must be on the same subnet as the connected network. You cannot set the subnet to a host subnet (255.255.255.255).

  For IPv6, at a minimum you need to configure link-local addresses for each interface for through traffic. For full functionality, including the ability to manage the ASA, you need to configure a global IP address for the device.

  You can configure an IP address (both IPv4 and IPv6) for the Management 0/0 or Management 0/1 management-only interface. This IP address can be on a separate subnet from the main management IP address.

- The transparent ASA uses an inside interface and an outside interface only. If your platform includes a dedicated management interface, you can also configure the management interface or subinterface for management traffic only.

  In single mode, you can only use two data interfaces (and the dedicated management interface, if available) even if your security appliance includes more than two interfaces.

  Note In transparent firewall mode, the management interface updates the MAC address table in the same manner as a data interface; therefore you should not connect both a management and a data interface to the same switch unless you configure one of the switch ports as a routed port (by default Cisco Catalyst switches share a MAC address for all VLAN switch ports). Otherwise, if traffic arrives on the management interface from the physically-connected switch, then the ASA updates the MAC address table to use the *management* interface to access the switch, instead of the data interface. This action causes a temporary traffic interruption; the ASA will not re-update the MAC address table for packets from the switch to the data interface for at least 30 seconds for security reasons.

- Each directly connected network must be on the same subnet.

- Do not specify the ASA management IP address as the default gateway for connected devices; devices need to specify the router on the other side of the ASA as the default gateway.
- For multiple context mode, each context must use different interfaces; you cannot share an interface across contexts.
- For multiple context mode, each context typically uses a different subnet. You can use overlapping subnets, but your network topology requires router and NAT configuration to make it possible from a routing standpoint.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

- When you change modes, the ASA clears the running configuration because many commands are not supported for both modes. The startup configuration remains unchanged. If you reload without saving, then the startup configuration is loaded, and the mode reverts back to the original setting. See the "Setting the Firewall Mode" section on page 4-7 for information about backing up your configuration file.
- If you download a text configuration to the ASA that changes the mode with the **firewall transparent** command, be sure to put the command at the top of the configuration; the ASA changes the mode as soon as it reads the command and then continues reading the configuration you downloaded. If the command appears later in the configuration, the ASA clears all the preceding lines in the configuration. See the "Downloading Software or Configuration Files to Flash Memory" section on page 78-2 for information about downloading text files.

Unsupported Features in Transparent Mode

Table 4-1 lists the features are not supported in transparent mode.

Table 4-1 Unsupported Features in Transparent Mode

Feature	Description
Dynamic DNS	—
DHCP relay	The transparent firewall can act as a DHCP server, but it does not support the DHCP relay commands. DHCP relay is not required because you can allow DHCP traffic to pass through using two extended access lists: one that allows DCHP requests from the inside interface to the outside, and one that allows the replies from the server in the other direction.
Dynamic routing protocols	You can, however, add static routes for traffic originating on the ASA. You can also allow dynamic routing protocols through the ASA using an extended access list.
Multicast IP routing	You can allow multicast traffic through the ASA by allowing it in an extended access list.

Table 4-1 Unsupported Features in Transparent Mode

Feature	Description
QoS	—
VPN termination for through traffic	The transparent firewall supports site-to-site VPN tunnels for management connections only. It does not terminate VPN connections for traffic through the ASA. You can pass VPN traffic through the security appliance using an extended access list, but it does not terminate non-management connections. SSL VPN is also not supported.

Setting the Firewall Mode

This section describes how to change the firewall mode.

Note We recommend that you set the firewall mode before you perform any other configuration because changing the firewall mode clears the running configuration.

Prerequisites

When you change modes, the ASA clears the running configuration (see the "Guidelines and Limitations" section on page 4-5 for more information).

- If you already have a populated configuration, be sure to back up your configuration before changing the mode; you can use this backup for reference when creating your new configuration. See the "Backing Up Configuration Files" section on page 78-7.
- Use the CLI at the console port to change the mode. If you use any other type of session, including the ASDM Command Line Interface tool or SSH, you will be disconnected when the configuration is cleared, and you will have to reconnect to the ASA using the console port in any case.

Detailed Steps

Command	Purpose

`firewall transparent`
`Example:`
`hostname(config)# firewall transparent`
	Sets the firewall mode to transparent. Enter this command in the system execution space for multiple context mode. To change the mode to routed, enter the **no firewall transparent** command.
	This command also appears in each context configuration for informational purposes only; you cannot enter this command in a context.
	Note You are not prompted to confirm the firewall mode change; the change occurs immediately.

Feature History for Firewall Mode

Table 4-2 lists the release history for this feature.

Table 4-2 Feature History for Firewall Mode

Feature Name	Releases	Feature Information
Transparent firewall mode	7.0(1)	A transparent firewall is a Layer 2 firewall that acts like a "bump in the wire," or a "stealth firewall," and is not seen as a router hop to connected devices. The following commands were introduced: **firewall transparent**, **show firewall**.

Configuring ARP Inspection for the Transparent Firewall

This section describes ARP inspection and how to enable it, and includes the following topics:

- Information About ARP Inspection, page 4-8
- Licensing Requirements for ARP Inspection, page 4-9
- Default Settings, page 4-9
- Guidelines and Limitations, page 4-9
- Configuring ARP Inspection, page 4-9
- Monitoring ARP Inspection, page 4-11
- Feature History for ARP Inspection, page 4-11

Information About ARP Inspection

By default, all ARP packets are allowed through the ASA. You can control the flow of ARP packets by enabling ARP inspection.

When you enable ARP inspection, the ASA compares the MAC address, IP address, and source interface in all ARP packets to static entries in the ARP table, and takes the following actions:

- If the IP address, MAC address, and source interface match an ARP entry, the packet is passed through.
- If there is a mismatch between the MAC address, the IP address, or the interface, then the ASA drops the packet.
- If the ARP packet does not match any entries in the static ARP table, then you can set the ASA to either forward the packet out all interfaces (flood), or to drop the packet.

Note The dedicated management interface, if present, never floods packets even if this parameter is set to flood.

ARP inspection prevents malicious users from impersonating other hosts or routers (known as ARP spoofing). ARP spoofing can enable a "man-in-the-middle" attack. For example, a host sends an ARP request to the gateway router; the gateway router responds with the gateway router MAC address.

The attacker, however, sends another ARP response to the host with the attacker MAC address instead of the router MAC address. The attacker can now intercept all the host traffic before forwarding it on to the router.

ARP inspection ensures that an attacker cannot send an ARP response with the attacker MAC address, so long as the correct MAC address and the associated IP address are in the static ARP table.

Licensing Requirements for ARP Inspection

The following table shows the licensing requirements for this feature.

Model	License Requirement
All models	Base License.

Default Settings

By default, all ARP packets are allowed through the ASA.

If you enable ARP inspection, the default setting is to flood non-matching packets.

Guidelines and Limitations

Context Mode Guidelines

- Supported in single and multiple context mode.
- In multiple context mode, configure ARP inspection within each context.

Firewall Mode Guidelines

Supported only in transparent firewall mode. Routed mode is not supported.

Configuring ARP Inspection

This section describes how to configure ARP inspection, and includes the following topics:

- Task Flow for Configuring ARP Inspection, page 4-9
- Adding a Static ARP Entry, page 4-10
- Enabling ARP Inspection, page 4-10

Task Flow for Configuring ARP Inspection

Follow these steps to configure ARP Inspection:

Step 1 Add static ARP entries according to the "Adding a Static ARP Entry" section on page 4-10. ARP inspection compares ARP packets with static ARP entries in the ARP table, so static ARP entries are required for this feature.

Step 2 Enable ARP inspection according to the "Enabling ARP Inspection" section on page 4-10.

Adding a Static ARP Entry

ARP inspection compares ARP packets with static ARP entries in the ARP table. Although hosts identify a packet destination by an IP address, the actual delivery of the packet on Ethernet relies on the Ethernet MAC address. When a router or host wants to deliver a packet on a directly connected network, it sends an ARP request asking for the MAC address associated with the IP address, and then delivers the packet to the MAC address according to the ARP response. The host or router keeps an ARP table so it does not have to send ARP requests for every packet it needs to deliver. The ARP table is dynamically updated whenever ARP responses are sent on the network, and if an entry is not used for a period of time, it times out. If an entry is incorrect (for example, the MAC address changes for a given IP address), the entry times out before it can be updated.

Note The transparent firewall uses dynamic ARP entries in the ARP table for traffic to and from the ASA, such as management traffic.

Detailed Steps

Command	Purpose
arp *interface_name ip_address mac_address* **Example:** `hostname(config)# arp outside 10.1.1.1 0009.7cbe.2100`	Adds a static ARP entry.

Examples

For example, to allow ARP responses from the router at 10.1.1.1 with the MAC address 0009.7cbe.2100 on the outside interface, enter the following command:

```
hostname(config)# arp outside 10.1.1.1 0009.7cbe.2100
```

What to Do Next

Enable ARP inspection according to the "Enabling ARP Inspection" section on page 4-10.

Enabling ARP Inspection

This section describes how to enable ARP inspection.

Detailed Steps

Command	Purpose
arp-inspection *interface_name* **enable** [**flood** | **no-flood**] **Example:** `hostname(config)# arp-inspection outside enable no-flood`	Enables ARP inspection. The **flood** keyword forwards non-matching ARP packets out all interfaces, and **no-flood** drops non-matching packets. **Note** The default setting is to flood non-matching packets. To restrict ARP through the ASA to only static entries, then set this command to **no-flood**.

Examples

For example, to enable ARP inspection on the outside interface, and to drop all non-matching ARP packets, enter the following command:

```
hostname(config)# arp-inspection outside enable no-flood
```

Monitoring ARP Inspection

To monitor ARP inspection, perform the following task:

Command	Purpose
show arp-inspection	Shows the current settings for ARP inspection on all interfaces.

Feature History for ARP Inspection

Table 4-2 lists the release history for this feature.

Table 4-3 Feature History for ARP Inspection

Feature Name	Releases	Feature Information
ARP inspection	7.0(1)	ARP inspection compares the MAC address, IP address, and source interface in all ARP packets to static entries in the ARP table. The following commands were introduced: **arp**, **arp-inspection**, and **show arp-inspection**.

Customizing the MAC Address Table for the Transparent Firewall

This section describes the MAC address table, and includes the following topics:

- Information About the MAC Address Table, page 4-12

- Licensing Requirements for the MAC Address Table, page 4-12
- Default Settings, page 4-12
- Guidelines and Limitations, page 4-13
- Configuring the MAC Address Table, page 4-13
- Monitoring the MAC Address Table, page 4-14
- Feature History for the MAC Address Table, page 4-15

Information About the MAC Address Table

The ASA learns and builds a MAC address table in a similar way as a normal bridge or switch: when a device sends a packet through the ASA, the ASA adds the MAC address to its table. The table associates the MAC address with the source interface so that the ASA knows to send any packets addressed to the device out the correct interface.

The ASA 5505 adaptive security appliance includes a built-in switch; the switch MAC address table maintains the MAC address-to-switch port mapping for traffic within each VLAN. This section discusses the bridge MAC address table, which maintains the MAC address-to-VLAN interface mapping for traffic that passes between VLANs.

Because the ASA is a firewall, if the destination MAC address of a packet is not in the table, the ASA does not flood the original packet on all interfaces as a normal bridge does. Instead, it generates the following packets for directly connected devices or for remote devices:

- Packets for directly connected devices—The ASA generates an ARP request for the destination IP address, so that the ASA can learn which interface receives the ARP response.
- Packets for remote devices—The ASA generates a ping to the destination IP address so that the ASA can learn which interface receives the ping reply.

The original packet is dropped.

Licensing Requirements for the MAC Address Table

The following table shows the licensing requirements for this feature.

Model	License Requirement
All models	Base License.

Default Settings

The default timeout value for dynamic MAC address table entries is 5 minutes.

By default, each interface automatically learns the MAC addresses of entering traffic, and the ASA adds corresponding entries to the MAC address table.

Guidelines and Limitations

Context Mode Guidelines

- Supported in single and multiple context mode.
- In multiple context mode, configure the MAC address table within each context.

Firewall Mode Guidelines

Supported only in transparent firewall mode. Routed mode is not supported.

Additional Guidelines

In transparent firewall mode, the management interface updates the MAC address table in the same manner as a data interface; therefore you should not connect both a management and a data interface to the same switch unless you configure one of the switch ports as a routed port (by default Cisco Catalyst switches share a MAC address for all VLAN switch ports). Otherwise, if traffic arrives on the management interface from the physically-connected switch, then the ASA updates the MAC address table to use the *management* interface to access the switch, instead of the data interface. This action causes a temporary traffic interruption; the ASA will not re-update the MAC address table for packets from the switch to the data interface for at least 30 seconds for security reasons.

Configuring the MAC Address Table

This section describes how you can customize the MAC address table, and includes the following sections:

- Adding a Static MAC Address, page 4-13
- Setting the MAC Address Timeout, page 4-14
- Disabling MAC Address Learning, page 4-14

Adding a Static MAC Address

Normally, MAC addresses are added to the MAC address table dynamically as traffic from a particular MAC address enters an interface. You can add static MAC addresses to the MAC address table if desired. One benefit to adding static entries is to guard against MAC spoofing. If a client with the same MAC address as a static entry attempts to send traffic to an interface that does not match the static entry, then the ASA drops the traffic and generates a system message. When you add a static ARP entry (see the "Adding a Static ARP Entry" section on page 4-10), a static MAC address entry is automatically added to the MAC address table.

To add a static MAC address to the MAC address table, enter the following command:

Command	Purpose

`mac-address-table static` *`interface_name mac_address`*
Example:
`hostname(config)# mac-address-table static inside 0009.7cbe.2100`
	Adds a static MAC address entry.
	The *interface_name* is the source interface.

Setting the MAC Address Timeout

The default timeout value for dynamic MAC address table entries is 5 minutes, but you can change the timeout. To change the timeout, enter the following command:

Command	Purpose

`mac-address-table aging-time timeout_value`
Example:
`hostname(config)# mac-address-table aging-time 10`
	Sets the MAC address entry timeout.
	The *timeout_value* (in minutes) is between 5 and 720 (12 hours). 5 minutes is the default.

Disabling MAC Address Learning

By default, each interface automatically learns the MAC addresses of entering traffic, and the ASA adds corresponding entries to the MAC address table. You can disable MAC address learning if desired, however, unless you statically add MAC addresses to the table, no traffic can pass through the ASA.

To disable MAC address learning, enter the following command:

Command	Purpose

`mac-learn interface_name disable`
Example:
`hostname(config)# mac-learn inside disable`
	Disables MAC address learning.
	The **no** form of this command reenables MAC address learning. The **clear configure mac-learn** command reenables MAC address learning on all interfaces.

Monitoring the MAC Address Table

You can view the entire MAC address table (including static and dynamic entries for both interfaces), or you can view the MAC address table for an interface. To view the MAC address table, enter the following command:

Command	Purpose
`show mac-address-table [interface_name]`	Shows the MAC address table.

Examples

The following is sample output from the **show mac-address-table** command that shows the entire table:

```
hostname# show mac-address-table
interface          mac address       type      Time Left
-----------------------------------------------------------------------
outside            0009.7cbe.2100    static      -
inside             0010.7cbe.6101    static      -
inside             0009.7cbe.5101    dynamic     10
```

The following is sample output from the **show mac-address-table** command that shows the table for the inside interface:

```
hostname# show mac-address-table inside
interface          mac address       type      Time Left
```

```
-----------------------------------------------------------------------
inside              0010.7cbe.6101     static      -
inside              0009.7cbe.5101     dynamic     10
```

Feature History for the MAC Address Table

Table 4-2 lists the release history for this feature.

Table 4-4 Feature History for the MAC Address Table

Feature Name	Releases	Feature Information
MAC address table	7.0(1)	Transparent firewall mode uses a MAC address table. The following commands were introduced: **mac-address-table static**, **mac-address-table aging-time**, **mac-learn disable**, and **show mac-address-table**.

Firewall Mode Examples

This section includes examples of how traffic moves through the ASA, and includes the following topics:

- How Data Moves Through the Security Appliance in Routed Firewall Mode, page 4-15
- How Data Moves Through the Transparent Firewall, page 4-21

How Data Moves Through the Security Appliance in Routed Firewall Mode

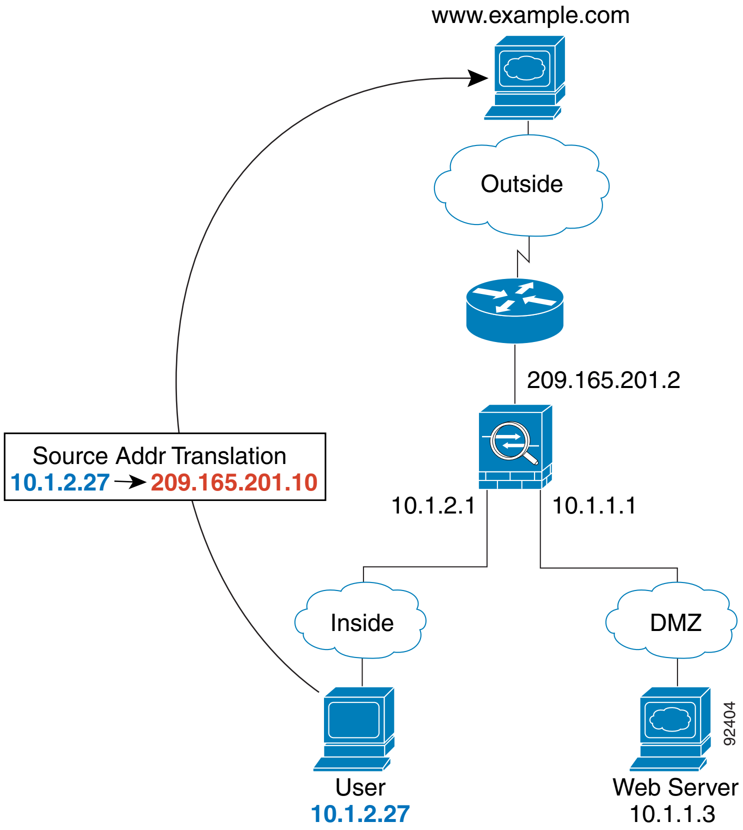
This section describes how data moves through the ASA in routed firewall mode, and includes the following topics:

- An Inside User Visits a Web Server, page 4-16
- An Outside User Visits a Web Server on the DMZ, page 4-17
- An Inside User Visits a Web Server on the DMZ, page 4-18
- An Outside User Attempts to Access an Inside Host, page 4-19
- A DMZ User Attempts to Access an Inside Host, page 4-20

An Inside User Visits a Web Server

Figure 4-2 shows an inside user accessing an outside web server.

Figure 4-2 Inside to Outside



The following steps describe how data moves through the ASA (see Figure 4-2):

1. The user on the inside network requests a web page from www.example.com.
2. The ASA receives the packet and because it is a new session, the ASA verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

   For multiple context mode, the ASA first classifies the packet according to either a unique interface or a unique destination address associated with a context; the destination address is associated by matching an address translation in a context. In this case, the interface would be unique; the www.example.com IP address does not have a current address translation in a context.
3. The ASA translates the local source address (10.1.2.27) to the global address 209.165.201.10, which is on the outside interface subnet.

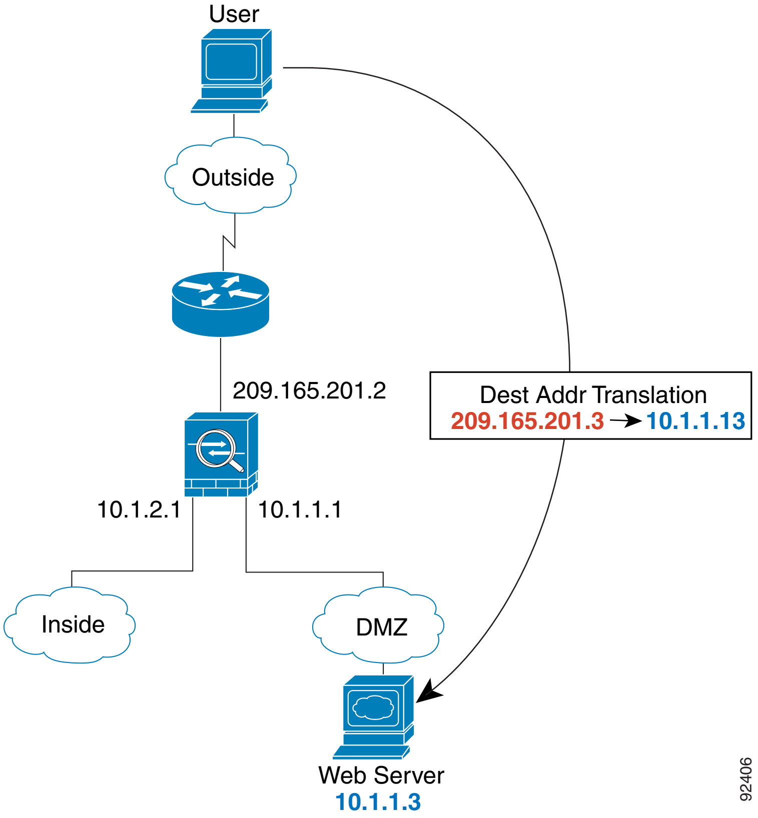
   The global address could be on any subnet, but routing is simplified when it is on the outside interface subnet.
4. The ASA then records that a session is established and forwards the packet from the outside interface.

5. When www.example.com responds to the request, the packet goes through the ASA, and because the session is already established, the packet bypasses the many lookups associated with a new connection. The ASA performs NAT by translating the global destination address to the local user address, 10.1.2.27.
6. The ASA forwards the packet to the inside user.

An Outside User Visits a Web Server on the DMZ

Figure 4-3 shows an outside user accessing the DMZ web server.

Figure 4-3 Outside to DMZ



The following steps describe how data moves through the ASA (see Figure 4-3):

1. A user on the outside network requests a web page from the DMZ web server using the global destination address of 209.165.201.3, which is on the outside interface subnet.
2. The ASA receives the packet and because it is a new session, the ASA verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

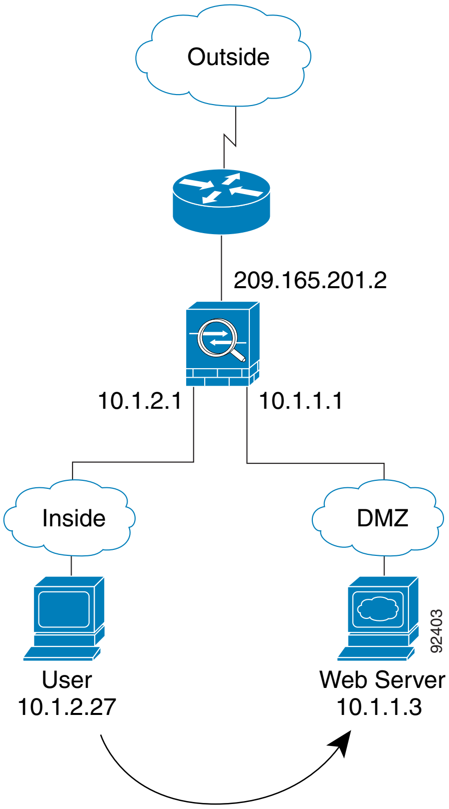
   For multiple context mode, the ASA first classifies the packet according to either a unique interface or a unique destination address associated with a context; the destination address is associated by matching an address translation in a context. In this case, the classifier "knows" that the DMZ web server address belongs to a certain context because of the server address translation.
3. The ASA translates the destination address to the local address 10.1.1.3.
4. The ASA then adds a session entry to the fast path and forwards the packet from the DMZ interface.

5. When the DMZ web server responds to the request, the packet goes through the ASA and because the session is already established, the packet bypasses the many lookups associated with a new connection. The ASA performs NAT by translating the local source address to 209.165.201.3.
6. The ASA forwards the packet to the outside user.

An Inside User Visits a Web Server on the DMZ

Figure 4-4 shows an inside user accessing the DMZ web server.

Figure 4-4 Inside to DMZ



The following steps describe how data moves through the ASA (see Figure 4-4):

1. A user on the inside network requests a web page from the DMZ web server using the destination address of 10.1.1.3.
2. The ASA receives the packet and because it is a new session, the ASA verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

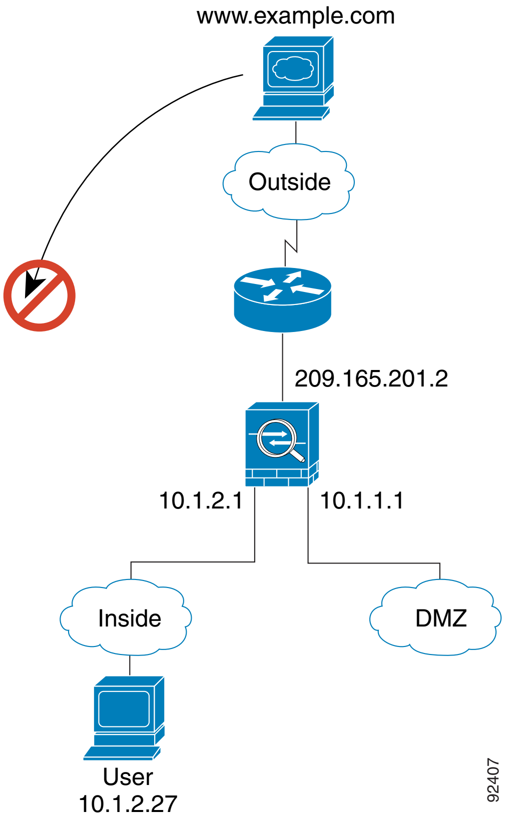
   For multiple context mode, the ASA first classifies the packet according to either a unique interface or a unique destination address associated with a context; the destination address is associated by matching an address translation in a context. In this case, the interface is unique; the web server IP address does not have a current address translation.
3. The ASA then records that a session is established and forwards the packet out of the DMZ interface.
4. When the DMZ web server responds to the request, the packet goes through the fast path, which lets the packet bypass the many lookups associated with a new connection.

5. The ASA forwards the packet to the inside user.

An Outside User Attempts to Access an Inside Host

Figure 4-5 shows an outside user attempting to access the inside network.

Figure 4-5 Outside to Inside



The following steps describe how data moves through the ASA (see Figure 4-5):

1. A user on the outside network attempts to reach an inside host (assuming the host has a routable IP address).

   If the inside network uses private addresses, no outside user can reach the inside network without NAT. The outside user might attempt to reach an inside user by using an existing NAT session.

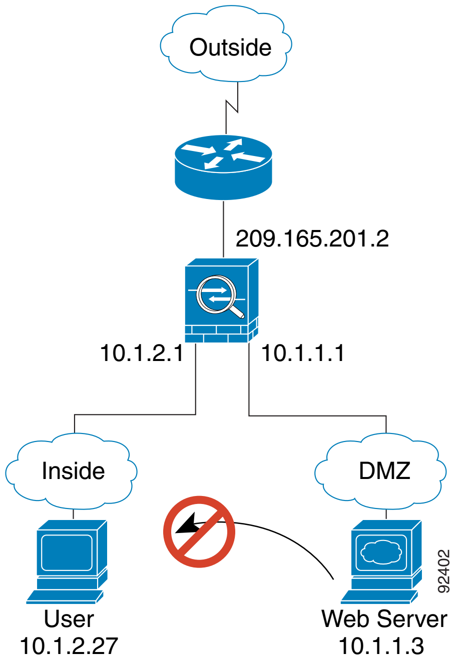
2. The ASA receives the packet and because it is a new session, the ASA verifies if the packet is allowed according to the security policy (access lists, filters, AAA).
3. The packet is denied, and the ASA drops the packet and logs the connection attempt.

   If the outside user is attempting to attack the inside network, the ASA employs many technologies to determine if a packet is valid for an already established session.

A DMZ User Attempts to Access an Inside Host

Figure 4-6 shows a user in the DMZ attempting to access the inside network.

Figure 4-6 DMZ to Inside



The following steps describe how data moves through the ASA (see Figure 4-6):

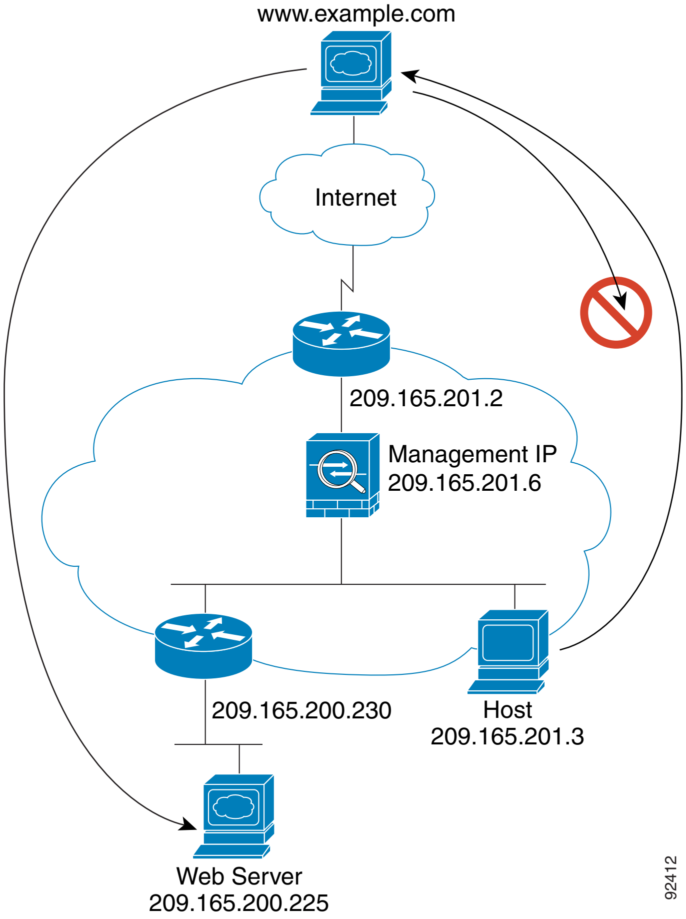
1. A user on the DMZ network attempts to reach an inside host. Because the DMZ does not have to route the traffic on the Internet, the private addressing scheme does not prevent routing.
2. The ASA receives the packet and because it is a new session, the ASA verifies if the packet is allowed according to the security policy (access lists, filters, AAA).

   The packet is denied, and the ASA drops the packet and logs the connection attempt.

How Data Moves Through the Transparent Firewall

Figure 4-7 shows a typical transparent firewall implementation with an inside network that contains a public web server. The ASA has an access list so that the inside users can access Internet resources. Another access list lets the outside users access only the web server on the inside network.

Figure 4-7 Typical Transparent Firewall Data Path



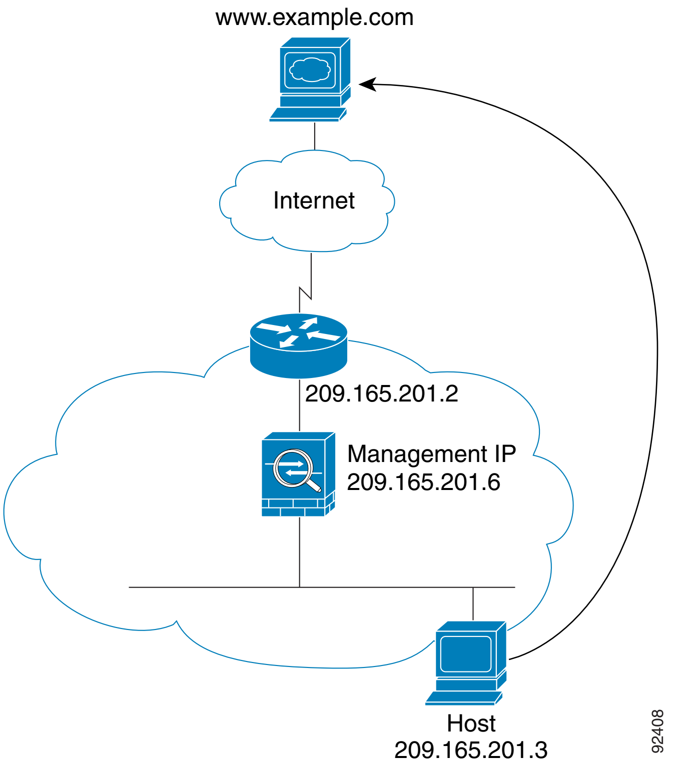
This section describes how data moves through the ASA, and includes the following topics:

- An Inside User Visits a Web Server, page 4-22
- An Inside User Visits a Web Server Using NAT, page 4-23
- An Outside User Visits a Web Server on the Inside Network, page 4-24
- An Outside User Attempts to Access an Inside Host, page 4-25

An Inside User Visits a Web Server

Figure 4-8 shows an inside user accessing an outside web server.

Figure 4-8 Inside to Outside



The following steps describe how data moves through the ASA (see Figure 4-8):

1. The user on the inside network requests a web page from www.example.com.
2. The ASA receives the packet and adds the source MAC address to the MAC address table, if required. Because it is a new session, it verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

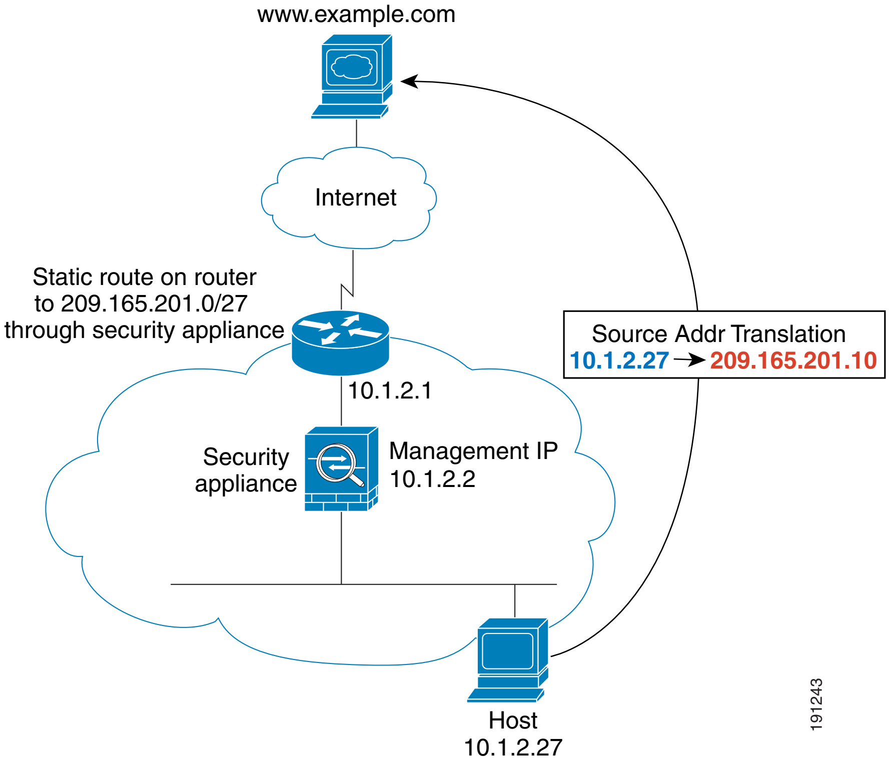
   For multiple context mode, the ASA first classifies the packet according to a unique interface.
3. The ASA records that a session is established.
4. If the destination MAC address is in its table, the ASA forwards the packet out of the outside interface. The destination MAC address is that of the upstream router, 209.186.201.2.

   If the destination MAC address is not in the ASA table, the ASA attempts to discover the MAC address by sending an ARP request or a ping. The first packet is dropped.
5. The web server responds to the request; because the session is already established, the packet bypasses the many lookups associated with a new connection.
6. The ASA forwards the packet to the inside user.

An Inside User Visits a Web Server Using NAT

Figure 4-8 shows an inside user accessing an outside web server.

Figure 4-9 Inside to Outside with NAT



The following steps describe how data moves through the ASA (see Figure 4-8):

1. The user on the inside network requests a web page from www.example.com.
2. The ASA receives the packet and adds the source MAC address to the MAC address table, if required. Because it is a new session, it verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

   For multiple context mode, the ASA first classifies the packet according to a unique interface.
3. The ASA translates the real address (10.1.2.27) to the mapped address 209.165.201.10.

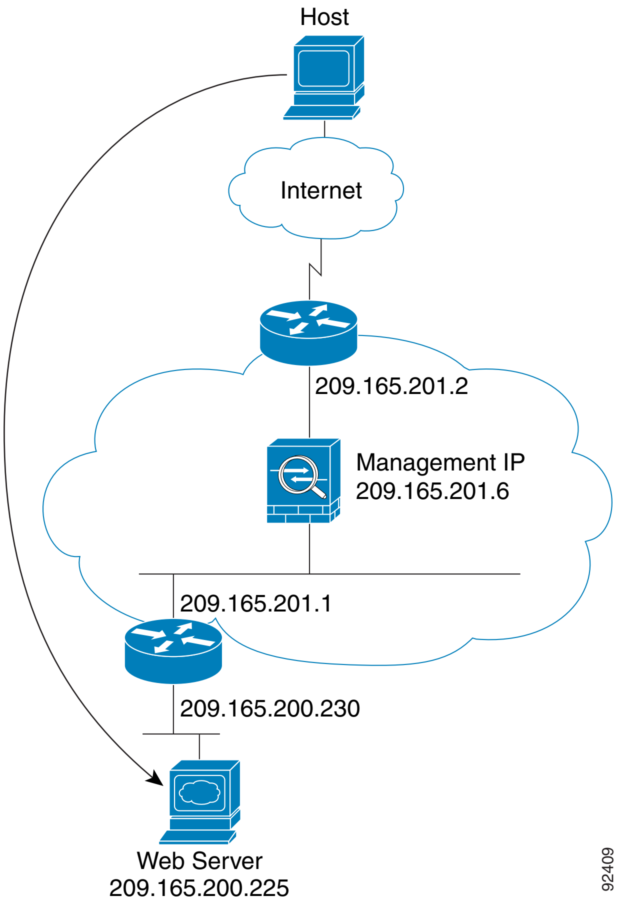
   Because the mapped address is not on the same network as the outside interface, then be sure the upstream router has a static route to the mapped network that points to the ASA.
4. The ASA then records that a session is established and forwards the packet from the outside interface.
5. If the destination MAC address is in its table, the ASA forwards the packet out of the outside interface. The destination MAC address is that of the upstream router, 10.1.2.1.

   If the destination MAC address is not in the ASA table, the ASA attempts to discover the MAC address by sending an ARP request and a ping. The first packet is dropped.
6. The web server responds to the request; because the session is already established, the packet bypasses the many lookups associated with a new connection.
7. The ASA performs NAT by translating the mapped address to the real address, 10.1.2.27.

An Outside User Visits a Web Server on the Inside Network

Figure 4-10 shows an outside user accessing the inside web server.

Figure 4-10 Outside to Inside



The following steps describe how data moves through the ASA (see Figure 4-10):

1. A user on the outside network requests a web page from the inside web server.
2. The ASA receives the packet and adds the source MAC address to the MAC address table, if required. Because it is a new session, it verifies that the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

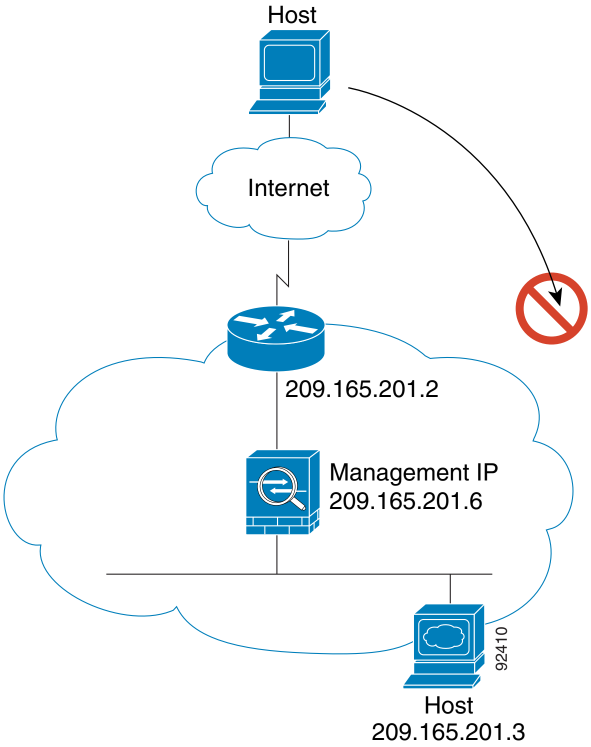
   For multiple context mode, the ASA first classifies the packet according to a unique interface.
3. The ASA records that a session is established.
4. If the destination MAC address is in its table, the ASA forwards the packet out of the inside interface. The destination MAC address is that of the downstream router, 209.165.201.1.

   If the destination MAC address is not in the ASA table, the ASA attempts to discover the MAC address by sending an ARP request and a ping. The first packet is dropped.
5. The web server responds to the request; because the session is already established, the packet bypasses the many lookups associated with a new connection.
6. The ASA forwards the packet to the outside user.

An Outside User Attempts to Access an Inside Host

Figure 4-11 shows an outside user attempting to access a host on the inside network.

Figure 4-11 Outside to Inside



The following steps describe how data moves through the ASA (see Figure 4-11):

1. A user on the outside network attempts to reach an inside host.
2. The ASA receives the packet and adds the source MAC address to the MAC address table, if required. Because it is a new session, it verifies if the packet is allowed according to the terms of the security policy (access lists, filters, AAA).

   For multiple context mode, the ASA first classifies the packet according to a unique interface.
3. The packet is denied because there is no access list permitting the outside host, and the ASA drops the packet.
4. If the outside user is attempting to attack the inside network, the ASA employs many technologies to determine if a packet is valid for an already established session.

CHAPTER 5

Managing Multiple Context Mode

This chapter describes how to configure multiple security contexts on the ASA, and includes the following sections:

- Information About Security Contexts, page 5-1
- Enabling or Disabling Multiple Context Mode, page 5-10
- Configuring Resource Management, page 5-11
- Configuring a Security Context, page 5-16
- Automatically Assigning MAC Addresses to Context Interfaces, page 5-20
- Changing Between Contexts and the System Execution Space, page 5-25
- Managing Security Contexts, page 5-25
- Monitoring Security Contexts, page 5-28

Information About Security Contexts

You can partition a single ASA into multiple virtual devices, known as security contexts. Each context is an independent device, with its own security policy, interfaces, and administrators. Multiple contexts are similar to having multiple standalone devices. Many features are supported in multiple context mode, including routing tables, firewall features, IPS, and management. Some features are not supported, including VPN and dynamic routing protocols.

Note When the ASA is configured for security contexts (also called firewall multmode) or Active/Active stateful failover, IPSec or SSL VPN cannot be enabled. Therefore, these features are unavailable.

This section provides an overview of security contexts, and includes the following topics:

- Common Uses for Security Contexts, page 5-2
- Unsupported Features, page 5-2
- Context Configuration Files, page 5-2
- How the Security Appliance Classifies Packets, page 5-3
- Cascading Security Contexts, page 5-8
- Management Access to Security Contexts, page 5-9

Common Uses for Security Contexts

You might want to use multiple security contexts in the following situations:

- You are a service provider and want to sell security services to many customers. By enabling multiple security contexts on the ASA, you can implement a cost-effective, space-saving solution that keeps all customer traffic separate and secure, and also eases configuration.
- You are a large enterprise or a college campus and want to keep departments completely separate.
- You are an enterprise that wants to provide distinct security policies to different departments.
- You have any network that requires more than one ASA.

Unsupported Features

Multiple context mode does not support the following features:

- Dynamic routing protocols

  Security contexts support only static routes. You cannot enable OSPF, RIP, or EIGRP in multiple context mode.
- VPN
- Multicast routing. Multicast bridging is supported.
- Threat Detection
- Phone Proxy
- QoS

Context Configuration Files

This section describes how the ASA implements multiple context mode configurations and includes the following sections:

- Context Configurations, page 5-2
- System Configuration, page 5-2
- Admin Context Configuration, page 5-3

Context Configurations

The ASA includes a configuration for each context that identifies the security policy, interfaces, and almost all the options you can configure on a standalone device. You can store context configurations on the internal Flash memory or the external Flash memory card, or you can download them from a TFTP, FTP, or HTTP(S) server.

System Configuration

The system administrator adds and manages contexts by configuring each context configuration location, allocated interfaces, and other context operating parameters in the system configuration, which, like a single mode configuration, is the startup configuration. The system configuration identifies basic settings for the ASA. The system configuration does not include any network interfaces or network settings for itself; rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses one of the contexts that is designated as the *admin context*. The system configuration does include a specialized failover interface for failover traffic only.

Admin Context Configuration

The admin context is just like any other context, except that when a user logs in to the admin context, then that user has system administrator rights and can access the system and all other contexts. The admin context is not restricted in any way, and can be used as a regular context. However, because logging into the admin context grants you administrator privileges over all contexts, you might need to restrict access to the admin context to appropriate users. The admin context must reside on Flash memory, and not remotely.

If your system is already in multiple context mode, or if you convert from single mode, the admin context is created automatically as a file on the internal Flash memory called admin.cfg. This context is named "admin." If you do not want to use admin.cfg as the admin context, you can change the admin context.

How the Security Appliance Classifies Packets

Each packet that enters the ASA must be classified, so that the ASA can determine to which context to send a packet. This section includes the following topics:

- Valid Classifier Criteria, page 5-3
- Invalid Classifier Criteria, page 5-4
- Classification Examples, page 5-5

Note If the destination MAC address is a multicast or broadcast MAC address, the packet is duplicated and delivered to each context.

Valid Classifier Criteria

This section describes the criteria used by the classifier, and includes the following topics:

- Unique Interfaces, page 5-3
- Unique MAC Addresses, page 5-3
- NAT Configuration, page 5-4

Unique Interfaces

If only one context is associated with the ingress interface, the ASA classifies the packet into that context. In transparent firewall mode, unique interfaces for contexts are required, so this method is used to classify packets at all times.

Unique MAC Addresses

If multiple contexts share an interface, then the classifier uses the interface MAC address. The ASA lets you assign a different MAC address in each context to the same shared interface, whether it is a shared physical interface or a shared subinterface. By default, shared interfaces do not have unique MAC addresses; the interface uses the physical interface burned-in MAC address in every context. An upstream router cannot route directly to a context without unique MAC addresses. You can set the MAC addresses manually when you configure each interface (see the "Configuring the MAC Address" section on page 6-26), or you can automatically generate MAC addresses (see the "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20).

NAT Configuration

If you do not have unique MAC addresses, then the classifier intercepts the packet and performs a destination IP address lookup. All other fields are ignored; only the destination IP address is used. To use the destination address for classification, the classifier must have knowledge about the subnets located behind each security context. The classifier relies on the NAT configuration to determine the subnets in each context. The classifier matches the destination IP address to either a **static** command or a **global** command. In the case of the **global** command, the classifier does not need a matching **nat** command or an active NAT session to classify the packet. Whether the packet can communicate with the destination IP address after classification depends on how you configure NAT and NAT control.

For example, the classifier gains knowledge about subnets 10.10.10.0, 10.20.10.0 and 10.30.10.0 when the context administrators configure **static** commands in each context:

- Context A:

  ```
  static (inside,shared) 10.10.10.0 10.10.10.0 netmask 255.255.255.0
  ```

- Context B:

  ```
  static (inside,shared) 10.20.10.0 10.20.10.0 netmask 255.255.255.0
  ```

- Context C:

  ```
  static (inside,shared) 10.30.10.0 10.30.10.0 netmask 255.255.255.0
  ```

Note For management traffic destined for an interface, the interface IP address is used for classification.

Invalid Classifier Criteria

The following configurations are not used for packet classification:

- NAT exemption—The classifier does not use a NAT exemption configuration for classification purposes because NAT exemption does not identify a mapped interface.
- Routing table—If a context includes a static route that points to an external router as the next-hop to a subnet, and a different context includes a **static** command for the same subnet, then the classifier uses the **static** command to classify packets destined for that subnet and ignores the static route.

Classification Examples

Figure 5-1 shows multiple contexts sharing an outside interface. The classifier assigns the packet to Context B because Context B includes the MAC address to which the router sends the packet.

Figure 5-1 Packet Classification with a Shared Interface using MAC Addresses

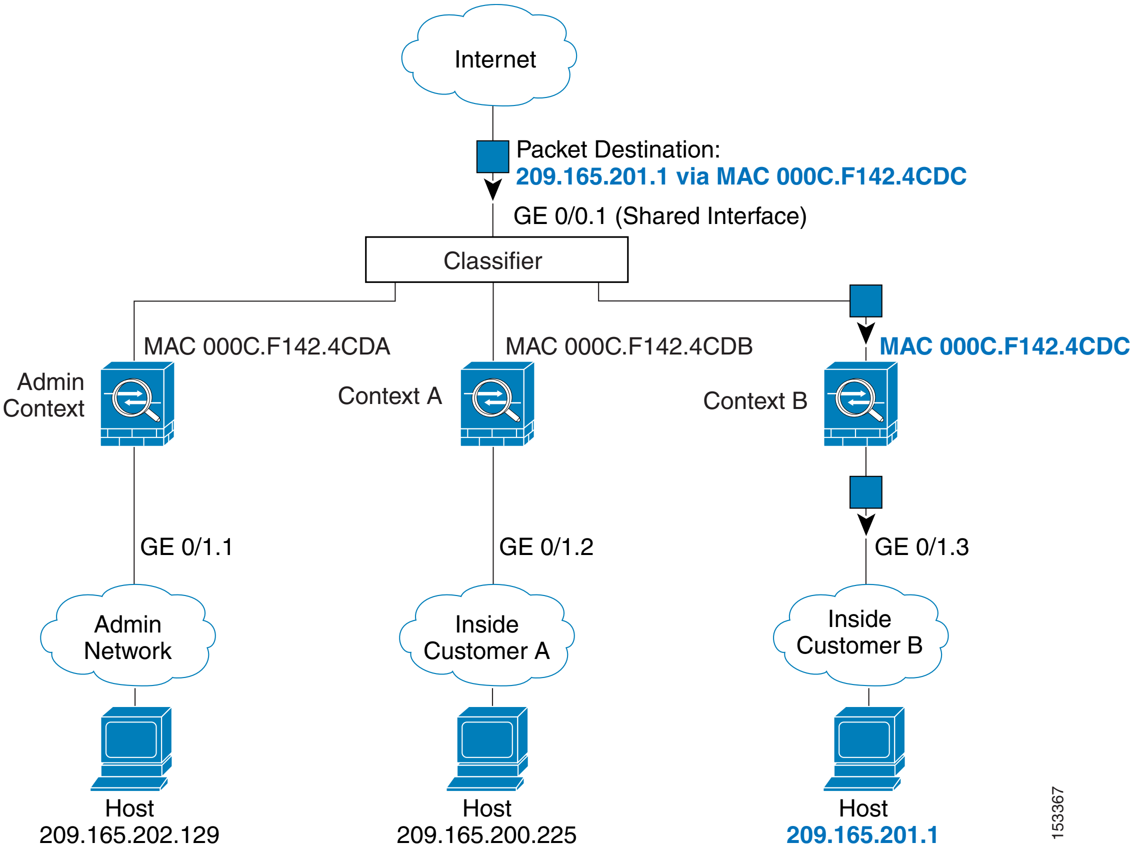
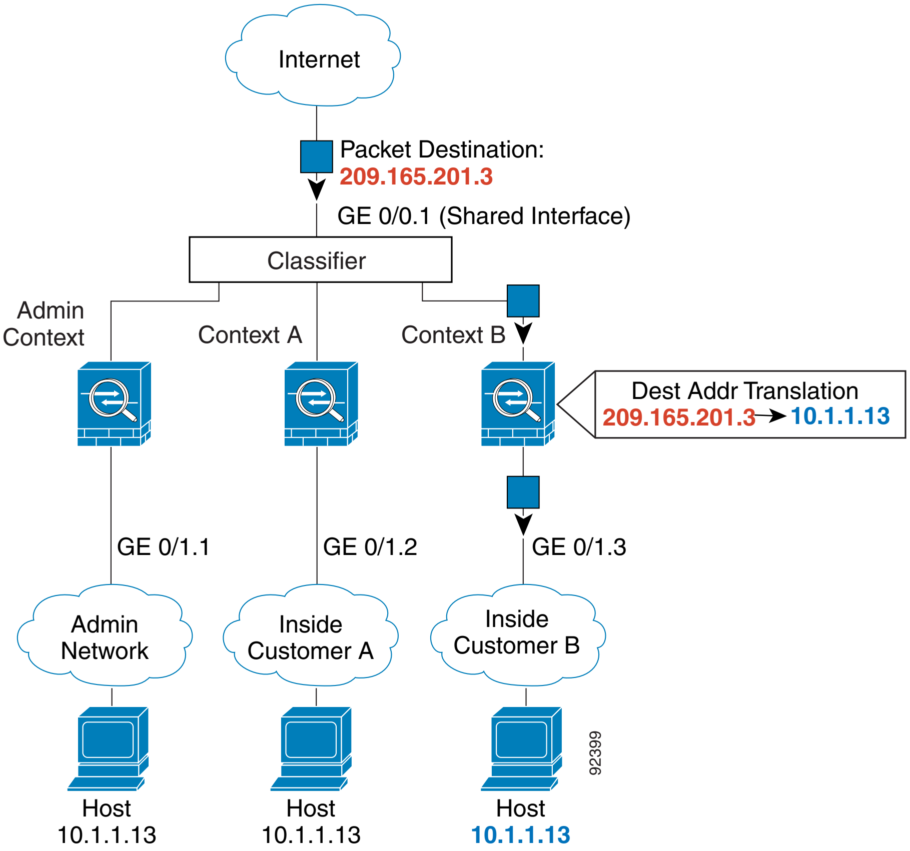


Figure 5-2 shows multiple contexts sharing an outside interface without MAC addresses assigned. The classifier assigns the packet to Context B because Context B includes the address translation that matches the destination address.

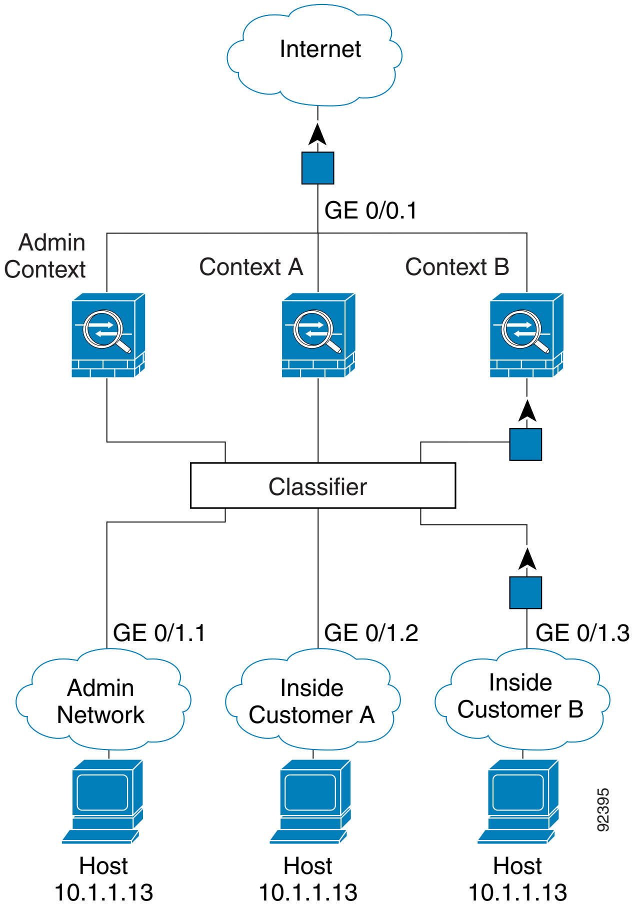
Figure 5-2 Packet Classification with a Shared Interface using NAT



Note that all new incoming traffic must be classified, even from inside networks. Figure 5-3 shows a host on the Context B inside network accessing the Internet. The classifier assigns the packet to Context B because the ingress interface is Gigabit Ethernet 0/1.3, which is assigned to Context B.

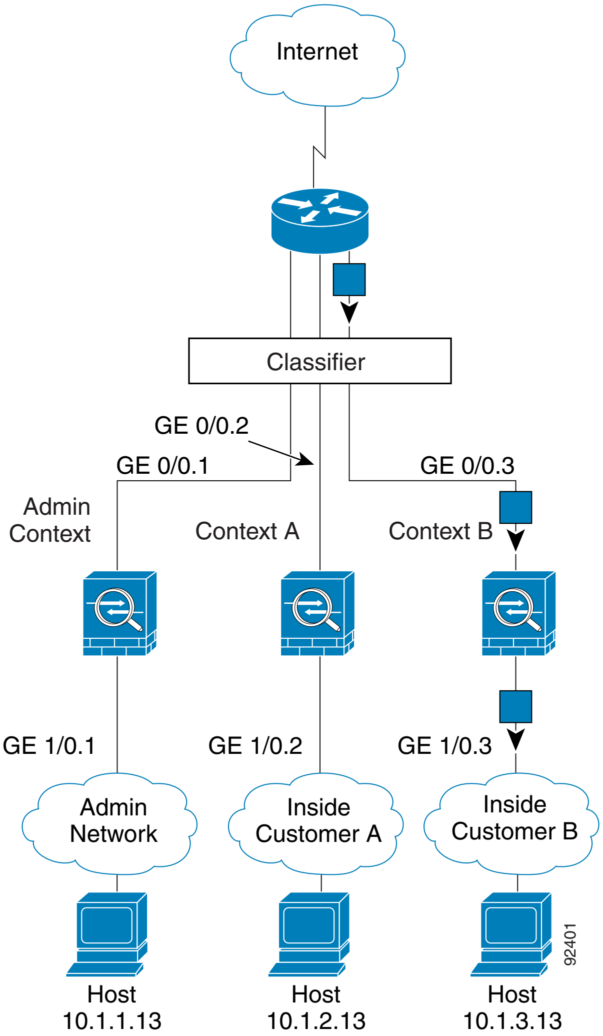
Note If you share an *inside* interface and do not use unique MAC addresses, the classifier imposes some major restrictions. The classifier relies on the address translation configuration to classify the packet within a context, and you must translate the *destination* addresses of the traffic. Because you do not usually perform NAT on outside addresses, sending packets from inside to outside on a shared interface is not always possible; the outside network is large, (the Web, for example), and addresses are not predictable for an outside NAT configuration. If you share an inside interface, we suggest you use unique MAC addresses.

Figure 5-3 Incoming Traffic from Inside Networks



For transparent firewalls, you must use unique interfaces. Figure 5-4 shows a host on the Context B inside network accessing the Internet. The classifier assigns the packet to Context B because the ingress interface is Gigabit Ethernet 1/0.3, which is assigned to Context B.

Figure 5-4 Transparent Firewall Contexts



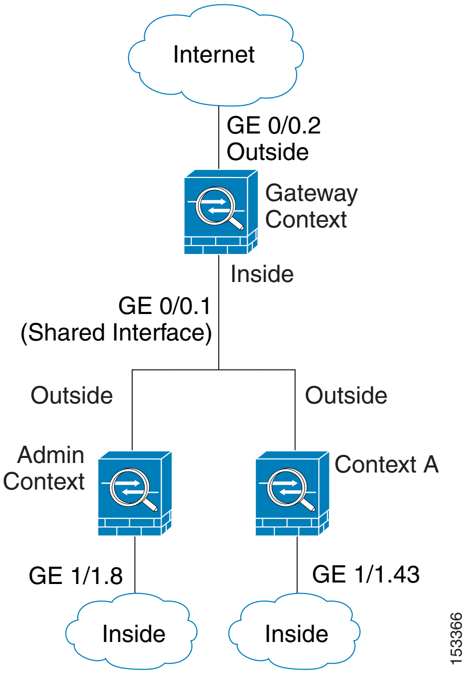
Cascading Security Contexts

Placing a context directly in front of another context is called cascading contexts; the outside interface of one context is the same interface as the inside interface of another context. You might want to cascade contexts if you want to simplify the configuration of some contexts by configuring shared parameters in the top context.

Note Cascading contexts requires that you configure unique MAC addresses for each context interface. Because of the limitations of classifying packets on shared interfaces without MAC addresses, we do not recommend using cascading contexts without unique MAC addresses.

Figure 5-5 shows a gateway context with two contexts behind the gateway.

Figure 5-5 Cascading Contexts



Management Access to Security Contexts

The ASA provides system administrator access in multiple context mode as well as access for individual context administrators. The following sections describe logging in as a system administrator or as a context administrator:

- System Administrator Access, page 5-9
- Context Administrator Access, page 5-10

System Administrator Access

You can access the ASA as a system administrator in two ways:

- Access the ASA console.

  From the console, you access the *system execution space*, which means that any commands you enter affect only the system configuration or the running of the system (for run-time commands).

- Access the admin context using Telnet, SSH, or ASDM.

  See Chapter 37, "Configuring Management Access," to enable Telnet, SSH, and SDM access.

As the system administrator, you can access all contexts.

When you change to a context from admin or the system, your username changes to the default "enable_15" username. If you configured command authorization in that context, you need to either configure authorization privileges for the "enable_15" user, or you can log in as a different name for which you provide sufficient privileges in the command authorization configuration for the context. To log in with a username, enter the **login** command. For example, you log in to the admin context with the username "admin." The admin context does not have any command authorization configuration, but all other contexts include command authorization. For convenience, each context configuration includes a user "admin" with maximum privileges. When you change from the admin context to context A, your username is altered, so you must log in again as "admin" by entering the **login** command. When you change to context B, you must again enter the **login** command to log in as "admin."

The system execution space does not support any AAA commands, but you can configure its own enable password, as well as usernames in the local database to provide individual logins.

Context Administrator Access

You can access a context using Telnet, SSH, or ASDM. If you log in to a non-admin context, you can only access the configuration for that context. You can provide individual logins to the context. See See Chapter 37, "Configuring Management Access," to enable Telnet, SSH, and SDM access and to configure management authentication.

Enabling or Disabling Multiple Context Mode

Your ASA might already be configured for multiple security contexts depending on how you ordered it from Cisco. If you are upgrading, however, you might need to convert from single mode to multiple mode by following the procedures in this section.

This section includes the following topics:

- Backing Up the Single Mode Configuration, page 5-10
- Enabling Multiple Context Mode, page 5-10
- Restoring Single Context Mode, page 5-11

Backing Up the Single Mode Configuration

When you convert from single mode to multiple mode, the ASA converts the running configuration into two files. The original startup configuration is not saved, so if it differs from the running configuration, you should back it up before proceeding.

Enabling Multiple Context Mode

The context mode (single or multiple) is not stored in the configuration file, even though it does endure reboots. If you need to copy your configuration to another device, set the mode on the new device to match using the **mode** command.

When you convert from single mode to multiple mode, the ASA converts the running configuration into two files: a new startup configuration that comprises the system configuration, and admin.cfg that comprises the admin context (in the root directory of the internal Flash memory). The original running configuration is saved as old_running.cfg (in the root directory of the internal Flash memory). The original startup configuration is not saved. The ASA automatically adds an entry for the admin context to the system configuration with the name "admin."

To enable multiple mode, enter the following command:

```
hostname(config)# mode multiple
```

You are prompted to reboot the ASA.

Restoring Single Context Mode

If you convert from multiple mode to single mode, you might want to first copy a full startup configuration (if available) to the ASA; the system configuration inherited from multiple mode is not a complete functioning configuration for a single mode device. Because the system configuration does not have any network interfaces as part of its configuration, you must access the ASA from the console to perform the copy.

To copy the old running configuration to the startup configuration and to change the mode to single mode, perform the following steps in the system execution space:

Step 1 To copy the backup version of your original running configuration to the current startup configuration, enter the following command in the system execution space:

```
hostname(config)# copy flash:old_running.cfg startup-config
```

Step 2 To set the mode to single mode, enter the following command in the system execution space:

```
hostname(config)# mode single
```

The ASA reboots.

Configuring Resource Management

By default, all security contexts have unlimited access to the resources of the ASA, except where maximum limits per context are enforced. However, if you find that one or more contexts use too many resources, and they cause other contexts to be denied connections, for example, then you can configure resource management to limit the use of resources per context.

This section includes the following topics:

- Classes and Class Members Overview, page 5-11
- Configuring a Class, page 5-14

Classes and Class Members Overview

The ASA manages resources by assigning contexts to resource classes. Each context uses the resource limits set by the class. This section includes the following topics:

- Resource Limits, page 5-12
- Default Class, page 5-13
- Class Members, page 5-14

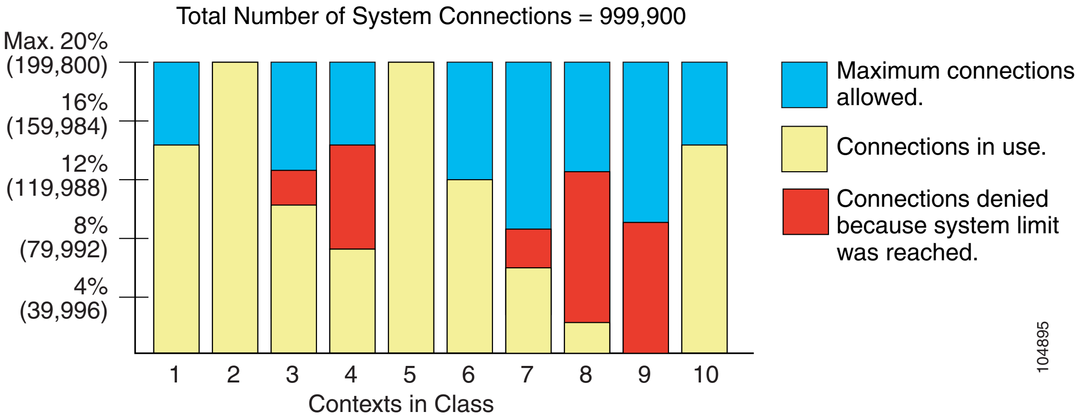
Resource Limits

When you create a class, the ASA does not set aside a portion of the resources for each context assigned to the class; rather, the ASA sets the maximum limit for a context. If you oversubscribe resources, or allow some resources to be unlimited, a few contexts can "use up" those resources, potentially affecting service to other contexts.

You can set the limit for individual resources, as a percentage (if there is a hard system limit) or as an absolute value.

You can oversubscribe the ASA by assigning more than 100 percent of a resource across all contexts. For example, you can set the Bronze class to limit connections to 20 percent per context, and then assign 10 contexts to the class for a total of 200 percent. If contexts concurrently use more than the system limit, then each context gets less than the 20 percent you intended. (See Figure 5-6.)

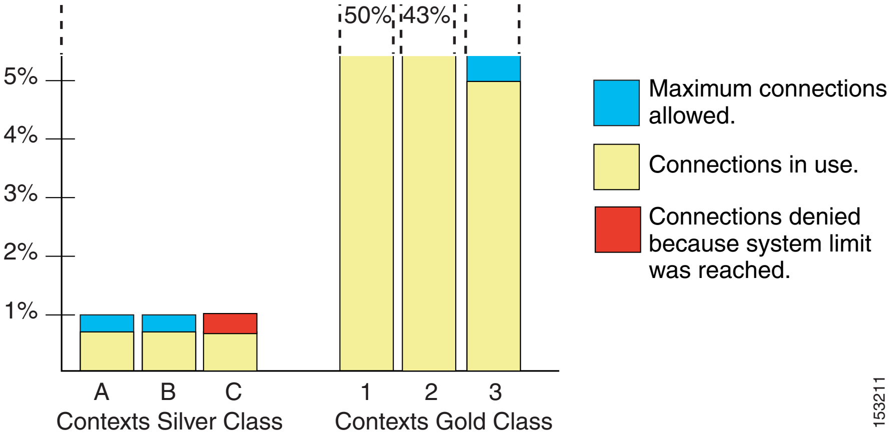
Figure 5-6 Resource Oversubscription



If you assign an absolute value to a resource across all contexts that exceeds the practical limit of the ASA, then the performance of the ASA might be impaired.

The ASA lets you assign unlimited access to one or more resources in a class, instead of a percentage or absolute number. When a resource is unlimited, contexts can use as much of the resource as the system has available or that is practically available. For example, Context A, B, and C are in the Silver Class, which limits each class member to 1 percent of the connections, for a total of 3 percent; but the three contexts are currently only using 2 percent combined. Gold Class has unlimited access to connections. The contexts in the Gold Class can use more than the 97 percent of "unassigned" connections; they can also use the 1 percent of connections not currently in use by Context A, B, and C, even if that means that Context A, B, and C are unable to reach their 3 percent combined limit. (See Figure 5-7.) Setting unlimited access is similar to oversubscribing the ASA, except that you have less control over how much you oversubscribe the system.

Figure 5-7 Unlimited Resources



Default Class

All contexts belong to the default class if they are not assigned to another class; you do not have to actively assign a context to the default class.

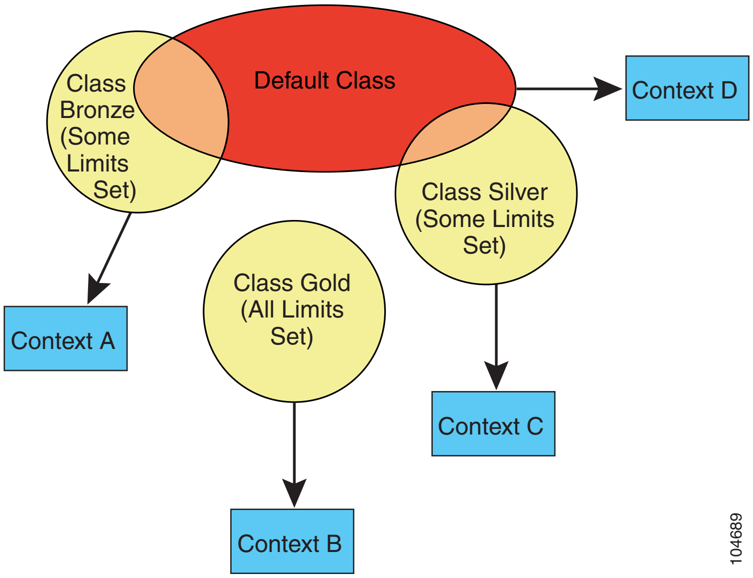
If a context belongs to a class other than the default class, those class settings always override the default class settings. However, if the other class has any settings that are not defined, then the member context uses the default class for those limits. For example, if you create a class with a 2 percent limit for all concurrent connections, but no other limits, then all other limits are inherited from the default class. Conversely, if you create a class with a limit for all resources, the class uses no settings from the default class.

By default, the default class provides unlimited access to resources for all contexts, except for the following limits, which are by default set to the maximum allowed per context:

- Telnet sessions—5 sessions.
- SSH sessions—5 sessions.
- IPSec sessions—5 sessions.
- MAC addresses—65,535 entries.

Figure 5-8 shows the relationship between the default class and other classes. Contexts A and C belong to classes with some limits set; other limits are inherited from the default class. Context B inherits no limits from default because all limits are set in its class, the Gold class. Context D was not assigned to a class, and is by default a member of the default class.

Figure 5-8 Resource Classes


Class Bronze (Some Limits Set)
Default Class
Context D
Class Silver (Some Limits Set)
Class Gold (All Limits Set)
Context A
Context C
Context B
104689

Class Members

To use the settings of a class, assign the context to the class when you define the context. All contexts belong to the default class if they are not assigned to another class; you do not have to actively assign a context to default. You can only assign a context to one resource class. The exception to this rule is that limits that are undefined in the member class are inherited from the default class; so in effect, a context could be a member of default plus another class.

Configuring a Class

To configure a class in the system configuration, perform the following steps. You can change the value of a particular resource limit by reentering the command with a new value.

Guidelines

Table 5-1 lists the resource types and the limits. See also the **show resource types** command.

Table 5-1 Resource Names and Limits

Resource Name	Rate or Concurrent	Minimum and Maximum Number per Context	System Limit[1]	Description
mac-addresses	Concurrent	N/A	65,535	For transparent firewall mode, the number of MAC addresses allowed in the MAC address table.
conns	Concurrent or Rate	N/A	Concurrent connections: See the "Supported Feature Licenses Per Model" section on page 3-1 for the connection limit for your platform. Rate: N/A	TCP or UDP connections between any two hosts, including connections between one host and multiple other hosts.
inspects	Rate	N/A	N/A	Application inspections.
hosts	Concurrent	N/A	N/A	Hosts that can connect through the ASA.
asdm	Concurrent	1 minimum 5 maximum	32	ASDM management sessions. **Note** ASDM sessions use two HTTPS connections: one for monitoring that is always present, and one for making configuration changes that is present only when you make changes. For example, the system limit of 32 ASDM sessions represents a limit of 64 HTTPS sessions.
ssh	Concurrent	1 minimum 5 maximum	100	SSH sessions.
syslogs	Rate	N/A	N/A	System log messages.
telnet	Concurrent	1 minimum 5 maximum	100	Telnet sessions.
xlates	Concurrent	N/A	N/A	Address translations.

[1] If this column value is N/A, then you cannot set a percentage of the resource because there is no hard system limit for the resource.

Detailed Steps

Step 1 To specify the class name and enter the class configuration mode, enter the following command in the system execution space:

```
hostname(config)# class name
```

The *name* is a string up to 20 characters long. To set the limits for the default class, enter **default** for the name.

Step 2 To set the resource limits, see the following options:

- To set all resource limits (shown in Table 5-1) to be unlimited, enter the following command:

```
hostname(config-resmgmt)# limit-resource all 0
```

For example, you might want to create a class that includes the admin context that has no limitations. The default class has all resources set to unlimited by default.

- To set a particular resource limit, enter the following command:

```
hostname(config-resmgmt)# limit-resource [rate] resource_name number[%]
```

For this particular resource, the limit overrides the limit set for **all**. Enter the **rate** argument to set the rate per second for certain resources. For resources that do not have a system limit, you cannot set the percentage (%) between 1 and 100; you can only set an absolute value. See Table 5-1 for resources for which you can set the rate per second and which to not have a system limit.

Examples

For example, to set the default class limit for conns to 10 percent instead of unlimited, enter the following commands:

```
hostname(config)# class default
hostname(config-class)# limit-resource conns 10%
```

All other resources remain at unlimited.

To add a class called gold, enter the following commands:

```
hostname(config)# class gold
hostname(config-class)# limit-resource mac-addresses 10000
hostname(config-class)# limit-resource conns 15%
hostname(config-class)# limit-resource rate conns 1000
hostname(config-class)# limit-resource rate inspects 500
hostname(config-class)# limit-resource hosts 9000
hostname(config-class)# limit-resource asdm 5
hostname(config-class)# limit-resource ssh 5
hostname(config-class)# limit-resource rate syslogs 5000
hostname(config-class)# limit-resource telnet 5
hostname(config-class)# limit-resource xlates 36000
```

Configuring a Security Context

The security context definition in the system configuration identifies the context name, configuration file URL, and interfaces that a context can use.

Prerequisites

- Configure physical interface parameters, VLAN subinterfaces, and redundant interfaces according to the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8.
- If you do not have an admin context (for example, if you clear the configuration) then you must first specify the admin context name by entering the following command:

```
hostname(config)# admin-context name
```

Although this context name does not exist yet in your configuration, you can subsequently enter the **context** *name* command to match the specified name to continue the admin context configuration.

Detailed Steps

Step 1 To add or modify a context, enter the following command in the system execution space:

```
hostname(config)# context name
```

The *name* is a string up to 32 characters long. This name is case sensitive, so you can have two contexts named "customerA" and "CustomerA," for example. You can use letters, digits, or hyphens, but you cannot start or end the name with a hyphen.

"System" or "Null" (in upper or lower case letters) are reserved names, and cannot be used.

Step 2 (Optional) To add a description for this context, enter the following command:

```
hostname(config-ctx)# description text
```

Step 3 To specify the interfaces you can use in the context, enter the command appropriate for a physical interface or for one or more subinterfaces.

- To allocate a physical interface, enter the following command:

```
hostname(config-ctx)# allocate-interface physical_interface [mapped_name]
[visible | invisible]
```

- To allocate one or more subinterfaces, enter the following command:

```
hostname(config-ctx)# allocate-interface
physical_interface.subinterface[-physical_interface.subinterface]
[mapped_name[-mapped_name]] [visible | invisible]
```

Note Do not include a space between the interface type and the port number.

You can enter these commands multiple times to specify different ranges. If you remove an allocation with the **no** form of this command, then any context commands that include this interface are removed from the running configuration.

Transparent firewall mode allows only two interfaces to pass through traffic; however, on the ASA adaptive security appliance, you can use the dedicated management interface, Management 0/0, (either the physical interface or a subinterface) as a third interface for management traffic.

Note The management interface for transparent mode does not flood a packet out the interface when that packet is not in the MAC address table.

You can assign the same interfaces to multiple contexts in routed mode, if desired. Transparent mode does not allow shared interfaces.

The *mapped_name* is an alphanumeric alias for the interface that can be used within the context instead of the interface ID. If you do not specify a mapped name, the interface ID is used within the context. For security purposes, you might not want the context administrator to know which interfaces are being used by the context.

A mapped name must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, or an underscore. For example, you can use the following names:

```
int0

inta

int_0
```

For subinterfaces, you can specify a range of mapped names.

If you specify a range of subinterfaces, you can specify a matching range of mapped names. Follow these guidelines for ranges:

- The mapped name must consist of an alphabetic portion followed by a numeric portion. The alphabetic portion of the mapped name must match for both ends of the range. For example, enter the following range:

  ```
  int0-int10
  ```

  If you enter **gigabitethernet0/1.1-gigabitethernet0/1.5 happy1-sad5**, for example, the command fails.

- The numeric portion of the mapped name must include the same quantity of numbers as the subinterface range. For example, both ranges include 100 interfaces:

  ```
  gigabitethernet0/0.100-gigabitethernet0/0.199 int1-int100
  ```

  If you enter **gigabitethernet0/0.100-gigabitethernet0/0.199 int1-int15**, for example, the command fails.

Specify **visible** to see physical interface properties in the **show interface** command even if you set a mapped name. The default **invisible** keyword specifies to only show the mapped name.

The following example shows gigabitethernet0/1.100, gigabitethernet0/1.200, and gigabitethernet0/2.300 through gigabitethernet0/1.305 assigned to the context. The mapped names are int1 through int8.

```
hostname(config-ctx)# allocate-interface gigabitethernet0/1.100 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.200 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/2.300-gigabitethernet0/2.305
int3-int8
```

Step 4 To identify the URL from which the system downloads the context configuration, enter the following command:

```
hostname(config-ctx)# config-url url
```

When you add a context URL, the system immediately loads the context so that it is running, if the configuration is available.

Note Enter the **allocate-interface** command(s) before you enter the **config-url** command. The ASA must assign interfaces to the context before it loads the context configuration; the context configuration might include commands that refer to interfaces (**interface**, **nat**, **global**...). If you enter the **config-url** command first, the ASA loads the context configuration immediately. If the context contains any commands that refer to interfaces, those commands fail.

See the following URL syntax:

- **disk:/**[*path*/]*filename*

  This URL indicates the internal Flash memory. The filename does not require a file extension, although we recommend using ".cfg". If the configuration file is not available, you see the following message:

  ```
  WARNING: Could not fetch the URL disk:/url
  INFO: Creating context with default config
  ```

You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to Flash memory.

Note The admin context file must be stored on the internal Flash memory.

- **ftp://**[*user*[**:***password*]**@**]*server*[:*port*]**/**[*path***/**]*filename*[**;type=***xx*]

  The **type** can be one of the following keywords:

  - **ap**—ASCII passive mode
  - **an**—ASCII normal mode
  - **ip**—(Default) Binary passive mode
  - **in**—Binary normal mode

  The server must be accessible from the admin context. The filename does not require a file extension, although we recommend using ".cfg". If the configuration file is not available, you see the following message:

```
WARNING: Could not fetch the URL ftp://url
INFO: Creating context with default config
```

  You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to the FTP server.

- **http**[**s**]**://**[*user*[**:***password*]**@**]*server*[:*port*]**/**[*path***/**]*filename*

  The server must be accessible from the admin context. The filename does not require a file extension, although we recommend using ".cfg". If the configuration file is not available, you see the following message:

```
WARNING: Could not fetch the URL http://url
INFO: Creating context with default config
```

  If you change to the context and configure the context at the CLI, you cannot save changes back to HTTP or HTTPS servers using the **write memory** command. You can, however, use the **copy tftp** command to copy the running configuration to a TFTP server.

- **tftp://**[*user*[**:***password*]**@**]*server*[:*port*]**/**[*path***/**]*filename*[**;int=***interface_name*]

  The server must be accessible from the admin context. Specify the interface name if you want to override the route to the server address. The filename does not require a file extension, although we recommend using ".cfg". If the configuration file is not available, you see the following message:

```
WARNING: Could not fetch the URL tftp://url
INFO: Creating context with default config
```

  You can then change to the context, configure it at the CLI, and enter the **write memory** command to write the file to the TFTP server.

To change the URL, reenter the **config-url** command with a new URL.

See the "Changing the Security Context URL" section on page 5-26 for more information about changing the URL.

For example, enter the following command:

```
hostname(config-ctx)# config-url ftp://joe:passw0rd1@10.1.1.1/configlets/test.cfg
```

Step 5 (Optional) To assign the context to a resource class, enter the following command:

```
hostname(config-ctx)# member class_name
```

If you do not specify a class, the context belongs to the default class. You can only assign a context to one resource class.

For example, to assign the context to the gold class, enter the following command:

```
hostname(config-ctx)# member gold
```

Step 6 (Optional) To assign an IPS virtual sensor to this context if you have the AIP SSM installed, use the **allocate-ips** command. See the "Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)" section on page 59-6 for detailed information about virtual sensors

Examples

The following example sets the admin context to be "administrator," creates a context called "administrator" on the internal Flash memory, and then adds two contexts from an FTP server:

```
hostname(config)# admin-context administrator
hostname(config)# context administrator
hostname(config-ctx)# allocate-interface gigabitethernet0/0.1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.1
hostname(config-ctx)# config-url flash:/admin.cfg

hostname(config-ctx)# context test
hostname(config-ctx)# allocate-interface gigabitethernet0/0.100 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/0.102 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/0.110-gigabitethernet0/0.115
int3-int8
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/test.cfg
hostname(config-ctx)# member gold


hostname(config-ctx)# context sample
hostname(config-ctx)# allocate-interface gigabitethernet0/1.200 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.212 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/1.230-gigabitethernet0/1.235
int3-int8
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/sample.cfg
hostname(config-ctx)# member silver
```

Automatically Assigning MAC Addresses to Context Interfaces

This section tells how to configure auto-generation of MAC addresses, and includes the following sections:

- Information About MAC Addresses, page 5-21
- Default MAC Address, page 5-21
- Failover MAC Addresses, page 5-21
- MAC Address Format, page 5-21
- Enabling Auto-Generation of MAC Addresses, page 5-22
- Viewing Assigned MAC Addresses, page 5-22

Information About MAC Addresses

To allow contexts to share interfaces, we suggest that you assign unique MAC addresses to each shared context interface. The MAC address is used to classify packets within a context. If you share an interface, but do not have unique MAC addresses for the interface in each context, then the destination IP address is used to classify packets. The destination address is matched with the context NAT configuration, and this method has some limitations compared to the MAC address method. See the "How the Security Appliance Classifies Packets" section on page 5-3 for information about classifying packets.

In the rare circumstance that the generated MAC address conflicts with another private MAC address in your network, you can manually set the MAC address for the interface within the context. See the "Configuring the MAC Address" section on page 6-26 to manually set the MAC address.

Default MAC Address

By default, the physical interface uses the burned-in MAC address, and all subinterfaces of a physical interface use the same burned-in MAC address.

All auto-generated MAC addresses start with A2. The auto-generated MAC addresses are persistent across reloads.

Interaction with Manual MAC Addresses

If you manually assign a MAC address and also enable auto-generation, then the manually assigned MAC address is used. If you later remove the manual MAC address, the auto-generated address is used.

Because auto-generated addresses start with A2, you cannot start manual MAC addresses with A2 if you also want to use auto-generation.

Failover MAC Addresses

For use with failover, the ASA generates both an active and standby MAC address for each interface. If the active unit fails over and the standby unit becomes active, the new active unit starts using the active MAC addresses to minimize network disruption. See the "MAC Address Format" section for more information.

For upgrading failover units with the legacy version of the **mac-address auto** command before the **prefix** keyword was introduced, see the **mac-address auto** command in the *Cisco ASA 5500 Series Command Reference*.

MAC Address Format

The ASA generates the MAC address using the following format:

A2xx.yyzz.zzzz

Where xx.yy is a user-defined prefix, and zz.zzzz is an internal counter generated by the ASA. For the standby MAC address, the address is identical except that the internal counter is increased by 1.

For an example of how the prefix is used, if you set a prefix of 77, then the ASA converts 77 into the hexadecimal value 004D (yyxx). When used in the MAC address, the prefix is reversed (xxyy) to match the ASA native form:

A2**4D.00**zz.zzzz

For a prefix of 1009 (03F1), the MAC address is:

A2**F1.03**zz.zzzz

Enabling Auto-Generation of MAC Addresses

You can automatically assign private MAC addresses to each context interface.

Guidelines

When you configure a **nameif** command for the interface in a context, the new MAC address is generated immediately. If you enable this command after you configure context interfaces, then MAC addresses are generated for all interfaces immediately after you enter the command. If you use the **no mac-address auto** command, the MAC address for each interface reverts to the default MAC address. For example, subinterfaces of GigabitEthernet 0/1 revert to using the MAC address of GigabitEthernet 0/1.

Note For the MAC address generation method when not using a prefix (not recommended), see the **mac-address auto** command in the *Cisco ASA 5500 Series Command Reference*.

Detailed Steps

Command	Purpose
`mac-address auto prefix` *prefix* **Example:** `hostname(config)# mac-address auto prefix 19`	Automatically assign private MAC addresses to each context interface. The *prefix* is a decimal value between 0 and 65535. This prefix is converted to a 4-digit hexadecimal number, and used as part of the MAC address. The prefix ensures that each ASA uses unique MAC addresses, so you can have multiple ASAs on a network segment, for example. See the "MAC Address Format" section for more information about how the prefix is used.

Viewing Assigned MAC Addresses

You can view auto-generated MAC addresses within the system configuration or within the context. This section includes the following topics:

- Viewing MAC Addresses in the System Configuration, page 5-22
- Viewing MAC Addresses Within a Context, page 5-24

Viewing MAC Addresses in the System Configuration

This section describes how to view MAC addresses in the system configuration.

Guidelines

If you manually assign a MAC address to an interface, but also have auto-generation enabled, the auto-generated address continues to show in the configuration even though the manual MAC address is the one that is in use. If you later remove the manual MAC address, the auto-generated one shown will be used.

Detailed Steps

Command	Purpose
`show running-config all context [name]`	Shows the assigned MAC addresses from the system execution space. The **all** option is required to view the assigned MAC addresses. Although this command is user-configurable in global configuration mode only, the **mac-address auto** command appears as a read-only entry in the configuration for each context along with the assigned MAC address. Only allocated interfaces that are configured with a **nameif** command within the context have a MAC address assigned.

Examples

The following output from the **show running-config all context admin** command shows the primary and standby MAC address assigned to the Management0/0 interface:

```
hostname# show running-config all context admin

context admin
  allocate-interface Management0/0
  mac-address auto Management0/0 a24d.0000.1440 a24d.0000.1441
  config-url disk0:/admin.cfg
```

The following output from the **show running-config all context** command shows all the MAC addresses (primary and standby) for all context interfaces. Note that because the GigabitEthernet0/0 and GigabitEthernet0/1 main interfaces are not configured with a **nameif** command inside the contexts, no MAC addresses have been generated for them.

```
hostname# show running-config all context

admin-context admin
context admin
  allocate-interface Management0/0
  mac-address auto Management0/0 a2d2.0400.125a a2d2.0400.125b
  config-url disk0:/admin.cfg
!

context CTX1
  allocate-interface GigabitEthernet0/0
  allocate-interface GigabitEthernet0/0.1-GigabitEthernet0/0.5
  mac-address auto GigabitEthernet0/0.1 a2d2.0400.11bc a2d2.0400.11bd
  mac-address auto GigabitEthernet0/0.2 a2d2.0400.11c0 a2d2.0400.11c1
  mac-address auto GigabitEthernet0/0.3 a2d2.0400.11c4 a2d2.0400.11c5
  mac-address auto GigabitEthernet0/0.4 a2d2.0400.11c8 a2d2.0400.11c9
  mac-address auto GigabitEthernet0/0.5 a2d2.0400.11cc a2d2.0400.11cd
  allocate-interface GigabitEthernet0/1
  allocate-interface GigabitEthernet0/1.1-GigabitEthernet0/1.3
  mac-address auto GigabitEthernet0/1.1 a2d2.0400.120c a2d2.0400.120d
  mac-address auto GigabitEthernet0/1.2 a2d2.0400.1210 a2d2.0400.1211
  mac-address auto GigabitEthernet0/1.3 a2d2.0400.1214 a2d2.0400.1215
  config-url disk0:/CTX1.cfg
!

context CTX2
  allocate-interface GigabitEthernet0/0
  allocate-interface GigabitEthernet0/0.1-GigabitEthernet0/0.5
  mac-address auto GigabitEthernet0/0.1 a2d2.0400.11ba a2d2.0400.11bb
  mac-address auto GigabitEthernet0/0.2 a2d2.0400.11be a2d2.0400.11bf
  mac-address auto GigabitEthernet0/0.3 a2d2.0400.11c2 a2d2.0400.11c3
  mac-address auto GigabitEthernet0/0.4 a2d2.0400.11c6 a2d2.0400.11c7
  mac-address auto GigabitEthernet0/0.5 a2d2.0400.11ca a2d2.0400.11cb
  allocate-interface GigabitEthernet0/1
  allocate-interface GigabitEthernet0/1.1-GigabitEthernet0/1.3
  mac-address auto GigabitEthernet0/1.1 a2d2.0400.120a a2d2.0400.120b
  mac-address auto GigabitEthernet0/1.2 a2d2.0400.120e a2d2.0400.120f
  mac-address auto GigabitEthernet0/1.3 a2d2.0400.1212 a2d2.0400.1213
  config-url disk0:/CTX2.cfg
!
```

Viewing MAC Addresses Within a Context

This section describes how to view MAC addresses within a context.

Detailed Steps

Command	Purpose
**`show interface	include (Interface)|(MAC)`**	Shows the MAC address in use by each interface within the context.

Examples

For example:

```
hostname/context# show interface | include (Interface)|(MAC)

Interface GigabitEthernet1/1.1 "g1/1.1", is down, line protocol is down
        MAC address a201.0101.0600, MTU 1500
Interface GigabitEthernet1/1.2 "g1/1.2", is down, line protocol is down
        MAC address a201.0102.0600, MTU 1500
Interface GigabitEthernet1/1.3 "g1/1.3", is down, line protocol is down
        MAC address a201.0103.0600, MTU 1500
...
```

Note The **show interface** command shows the MAC address in use; if you manually assign a MAC address and also have auto-generation enabled, then you can only view the unused auto-generated address from within the system configuration.

Changing Between Contexts and the System Execution Space

If you log in to the system execution space (or the admin context using Telnet or SSH), you can change between contexts and perform configuration and monitoring tasks within each context. The running configuration that you edit in a configuration mode, or that is used in the **copy** or **write** commands, depends on your location. When you are in the system execution space, the running configuration consists only of the system configuration; when you are in a context, the running configuration consists only of that context. For example, you cannot view all running configurations (system plus all contexts) by entering the **show running-config** command. Only the current configuration displays.

To change between the system execution space and a context, or between contexts, see the following commands:

- To change to a context, enter the following command:

  ```
  hostname# changeto context name
  ```

  The prompt changes to the following:

  ```
  hostname/name#
  ```

- To change to the system execution space, enter the following command:

  ```
  hostname/admin# changeto system
  ```

  The prompt changes to the following:

  ```
  hostname#
  ```

Managing Security Contexts

This section describes how to manage security contexts, and includes the following topics:

- Removing a Security Context, page 5-25
- Changing the Admin Context, page 5-26
- Changing the Security Context URL, page 5-26
- Reloading a Security Context, page 5-27

Removing a Security Context

You can only remove a context by editing the system configuration. You cannot remove the current admin context, unless you remove all contexts using the **clear context** command.

Note If you use failover, there is a delay between when you remove the context on the active unit and when the context is removed on the standby unit. You might see an error message indicating that the number of interfaces on the active and standby units are not consistent; this error is temporary and can be ignored.

Use the following commands for removing contexts:

- To remove a single context, enter the following command in the system execution space:

  ```
  hostname(config)# no context name
  ```

All context commands are also removed.

- To remove all contexts (including the admin context), enter the following command in the system execution space:

```
hostname(config)# clear context
```

Changing the Admin Context

The system configuration does not include any network interfaces or network settings for itself; rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses one of the contexts that is designated as the admin context.

The admin context is just like any other context, except that when a user logs in to the admin context, then that user has system administrator rights and can access the system and all other contexts. The admin context is not restricted in any way, and can be used as a regular context. However, because logging into the admin context grants you administrator privileges over all contexts, you might need to restrict access to the admin context to appropriate users.

You can set any context to be the admin context, as long as the configuration file is stored in the internal Flash memory. To set the admin context, enter the following command in the system execution space:

```
hostname(config)# admin-context context_name
```

Any remote management sessions, such as Telnet, SSH, or HTTPS, that are connected to the admin context are terminated. You must reconnect to the new admin context.

Note A few system commands, including **ntp server**, identify an interface name that belongs to the admin context. If you change the admin context, and that interface name does not exist in the new admin context, be sure to update any system commands that refer to the interface.

Changing the Security Context URL

You cannot change the security context URL without reloading the configuration from the new URL.

The ASA merges the new configuration with the current running configuration. Reentering the same URL also merges the saved configuration with the running configuration. A merge adds any new commands from the new configuration to the running configuration. If the configurations are the same, no changes occur. If commands conflict or if commands affect the running of the context, then the effect of the merge depends on the command. You might get errors, or you might have unexpected results. If the running configuration is blank (for example, if the server was unavailable and the configuration was never downloaded), then the new configuration is used. If you do not want to merge the configurations, you can clear the running configuration, which disrupts any communications through the context, and then reload the configuration from the new URL.

To change the URL for a context, perform the following steps:

Step 1 If you do not want to merge the configuration, change to the context and clear its configuration by entering the following commands. If you want to perform a merge, skip to Step 2.

```
hostname# changeto context name
hostname/name# configure terminal
hostname/name(config)# clear configure all
```

Step 2 If required, change to the system execution space by entering the following command:

```
hostname/name(config)# changeto system
```

Step 3 To enter the context configuration mode for the context you want to change, enter the following command:

```
hostname(config)# context name
```

Step 4 To enter the new URL, enter the following command:

```
hostname(config)# config-url new_url
```

The system immediately loads the context so that it is running.

Reloading a Security Context

You can reload the context in two ways:

- Clear the running configuration and then import the startup configuration.

  This action clears most attributes associated with the context, such as connections and NAT tables.

- Remove the context from the system configuration.

  This action clears additional attributes, such as memory allocation, which might be useful for troubleshooting. However, to add the context back to the system requires you to respecify the URL and interfaces.

This section includes the following topics:

- Reloading by Clearing the Configuration, page 5-27
- Reloading by Removing and Re-adding the Context, page 5-28

Reloading by Clearing the Configuration

To reload the context by clearing the context configuration, and reloading the configuration from the URL, perform the following steps:

Step 1 To change to the context that you want to reload, enter the following command:

```
hostname# changeto context name
```

Step 2 To access configuration mode, enter the following command:

```
hostname/name# configure terminal
```

Step 3 To clear the running configuration, enter the following command:

```
hostname/name(config)# clear configure all
```

This command clears all connections.

Step 4 To reload the configuration, enter the following command:

```
hostname/name(config)# copy startup-config running-config
```

The ASA copies the configuration from the URL specified in the system configuration. You cannot change the URL from within a context.

Reloading by Removing and Re-adding the Context

To reload the context by removing and then re-adding it, perform the steps in the following sections:

1. "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20
2. "Configuring a Security Context" section on page 5-16

Monitoring Security Contexts

This section describes how to view and monitor context information, and includes the following topics:

- Viewing Context Information, page 5-28
- Viewing Context Information, page 5-28
- Viewing Resource Allocation, page 5-29
- Viewing Resource Usage, page 5-32
- Monitoring SYN Attacks in Contexts, page 5-33

Viewing Context Information

From the system execution space, you can view a list of contexts including the name, allocated interfaces, and configuration file URL.

From the system execution space, view all contexts by entering the following command:

```
hostname# show context [name | detail| count]
```

The **detail** option shows additional information. See the following sample displays below for more information.

If you want to show information for a particular context, specify the *name*.

The **count** option shows the total number of contexts.

The following is sample output from the **show context** command. The following sample display shows three contexts:

```
hostname# show context

Context Name      Interfaces                    URL
*admin            GigabitEthernet0/1.100        disk0:/admin.cfg
                  GigabitEthernet0/1.101
contexta          GigabitEthernet0/1.200        disk0:/contexta.cfg
                  GigabitEthernet0/1.201
contextb          GigabitEthernet0/1.300        disk0:/contextb.cfg
                  GigabitEthernet0/1.301
Total active Security Contexts: 3
```

Table 5-2 shows each field description.

Table 5-2 show context Fields

Field	**Description**
Context Name	Lists all context names. The context name with the asterisk (*) is the admin context.
Interfaces	The interfaces assigned to the context.
URL	The URL from which the ASA loads the context configuration.

The following is sample output from the **show context detail** command:

```
hostname# show context detail

Context "admin", has been created, but initial ACL rules not complete
  Config URL: disk0:/admin.cfg
  Real Interfaces: Management0/0
  Mapped Interfaces: Management0/0
  Flags: 0x00000013, ID: 1

Context "ctx", has been created, but initial ACL rules not complete
  Config URL: ctx.cfg
  Real Interfaces: GigabitEthernet0/0.10, GigabitEthernet0/1.20,
     GigabitEthernet0/2.30
  Mapped Interfaces: int1, int2, int3
  Flags: 0x00000011, ID: 2

Context "system", is a system resource
  Config URL: startup-config
  Real Interfaces:
  Mapped Interfaces: Control0/0, GigabitEthernet0/0,
     GigabitEthernet0/0.10, GigabitEthernet0/1, GigabitEthernet0/1.10,
     GigabitEthernet0/1.20, GigabitEthernet0/2, GigabitEthernet0/2.30,
     GigabitEthernet0/3, Management0/0, Management0/0.1
  Flags: 0x00000019, ID: 257

Context "null", is a system resource
  Config URL: ... null ...
  Real Interfaces:
  Mapped Interfaces:
  Flags: 0x00000009, ID: 258
```

See the *Cisco ASA 5500 Series Command Reference* for more information about the **detail** output.

The following is sample output from the **show context count** command:

```
hostname# show context count
Total active contexts: 2
```

Viewing Resource Allocation

From the system execution space, you can view the allocation for each resource across all classes and class members.

To view the resource allocation, enter the following command:

```
hostname# show resource allocation [detail]
```

This command shows the resource allocation, but does not show the actual resources being used. See the "Viewing Resource Usage" section on page 5-32 for more information about actual resource usage.

The **detail** argument shows additional information. See the following sample displays for more information.

The following sample display shows the total allocation of each resource as an absolute value and as a percentage of the available system resources:

```
hostname# show resource allocation
Resource                    Total      % of Avail
 Conns [rate]               35000          N/A
 Inspects [rate]              35000          N/A
 Syslogs [rate]             10500          N/A
 Conns                     305000          30.50%
 Hosts                      78842          N/A
 SSH                           35          35.00%
 Telnet                        35          35.00%
 Xlates                     91749          N/A
 All                    unlimited
```

Table 5-3 shows each field description.

Table 5-3 show resource allocation Fields

Field	Description
Resource	The name of the resource that you can limit.
Total	The total amount of the resource that is allocated across all contexts. The amount is an absolute number of concurrent instances or instances per second. If you specified a percentage in the class definition, the ASA converts the percentage to an absolute number for this display.
% of Avail	The percentage of the total system resources that is allocated across all contexts, if the resource has a hard system limit. If a resource does not have a system limit, this column shows N/A.

The following is sample output from the **show resource allocation detail** command:

```
hostname# show resource allocation detail
Resource Origin:
    A    Value was derived from the resource 'all'
    C    Value set in the definition of this class
    D    Value set in default class
Resource         Class          Mmbrs  Origin      Limit      Total    Total %
Conns [rate]     default          all      CA  unlimited
                 gold               1       C      34000      34000     N/A
                 silver             1      CA      17000      17000     N/A
                 bronze             0      CA       8500
                 All Contexts:      3                         51000     N/A

Inspects [rate]  default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      10000      10000     N/A
                 bronze             0      CA       5000
                 All Contexts:      3                         10000     N/A

Syslogs [rate]   default          all      CA  unlimited
                 gold               1       C       6000       6000     N/A
                 silver             1      CA       3000       3000     N/A
                 bronze             0      CA       1500
                 All Contexts:      3                          9000     N/A

Conns            default          all      CA  unlimited
```

```
                 gold               1       C     200000     200000     20.00%
                 silver             1      CA     100000     100000     10.00%
                 bronze             0      CA      50000
                 All Contexts:      3                        300000     30.00%

Hosts            default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      26214      26214      N/A
                 bronze             0      CA      13107
                 All Contexts:      3                         26214      N/A

SSH              default          all       C          5
                 gold               1       D          5          5      5.00%
                 silver             1      CA         10         10     10.00%
                 bronze             0      CA          5
                 All Contexts:      3                            20     20.00%

Telnet           default          all       C          5
                 gold               1       D          5          5      5.00%
                 silver             1      CA         10         10     10.00%
                 bronze             0      CA          5
                 All Contexts:      3                            20     20.00%

Xlates           default          all      CA  unlimited
                 gold               1      DA  unlimited
                 silver             1      CA      23040      23040     N/A
                 bronze             0      CA      11520
                 All Contexts:      3                         23040     N/A

mac-addresses    default          all       C      65535
                 gold               1       D      65535      65535    100.00%
                 silver             1      CA       6553       6553      9.99%
                 bronze             0      CA       3276
                 All Contexts:      3                        137623    209.99%
```

Table 5-4 shows each field description.

Table 5-4 show resource allocation detail Fields

Field	Description
Resource	The name of the resource that you can limit.
Class	The name of each class, including the default class. The All contexts field shows the total values across all classes.
Mmbrs	The number of contexts assigned to each class.
Origin	The origin of the resource limit, as follows: • A—You set this limit with the **all** option, instead of as an individual resource. • C—This limit is derived from the member class. • D—This limit was not defined in the member class, but was derived from the default class. For a context assigned to the default class, the value will be "C" instead of "D." The ASA can combine "A" with "C" or "D."
Limit	The limit of the resource per context, as an absolute number. If you specified a percentage in the class definition, the ASA converts the percentage to an absolute number for this display.

Table 5-4 show resource allocation detail Fields

Field	Description
Total	The total amount of the resource that is allocated across all contexts in the class. The amount is an absolute number of concurrent instances or instances per second. If the resource is unlimited, this display is blank.
% of Avail	The percentage of the total system resources that is allocated across all contexts in the class. If the resource is unlimited, this display is blank. If the resource does not have a system limit, then this column shows N/A.

Viewing Resource Usage

From the system execution space, you can view the resource usage for each context and display the system resource usage.

From the system execution space, view the resource usage for each context by entering the following command:

```
hostname# show resource usage [context context_name | top n | all | summary | system]
[resource {resource_name | all} | detail] [counter counter_name [count_threshold]]
```

By default, **all** context usage is displayed; each context is listed separately.

Enter the **top** *n* keyword to show the contexts that are the top *n* users of the specified resource. You must specify a single resource type, and not **resource all**, with this option.

The **summary** option shows all context usage combined.

The **system** option shows all context usage combined, but shows the system limits for resources instead of the combined context limits.

For the **resource** *resource_name*, see Table 5-1 for available resource names. See also the **show resource type** command. Specify **all** (the default) for all types.

The **detail** option shows the resource usage of all resources, including those you cannot manage. For example, you can view the number of TCP intercepts.

The **counter** *counter_name* is one of the following keywords:

- **current**—Shows the active concurrent instances or the current rate of the resource.
- **denied**—Shows the number of instances that were denied because they exceeded the resource limit shown in the Limit column.
- **peak**—Shows the peak concurrent instances, or the peak rate of the resource since the statistics were last cleared, either using the **clear resource usage** command or because the device rebooted.
- **all**—(Default) Shows all statistics.

The *count_threshold* sets the number above which resources are shown. The default is 1. If the usage of the resource is below the number you set, then the resource is not shown. If you specify **all** for the counter name, then the *count_threshold* applies to the current usage.

Note To show all resources, set the *count_threshold* to **0**.

The following is sample output from the **show resource usage context** command, which shows the resource usage for the admin context:

```
hostname# show resource usage context admin
```

```
Resource              Current         Peak      Limit    Denied  Context
Telnet                      1            1          5         0  admin
Conns                      44           55        N/A         0  admin
Hosts                      45           56        N/A         0  admin
```

The following is sample output from the **show resource usage summary** command, which shows the resource usage for all contexts and all resources. This sample shows the limits for 6 contexts.

```
hostname# show resource usage summary

Resource              Current         Peak      Limit      Denied Context
Syslogs [rate]           1743         2132      N/A             0 Summary
Conns                     584          763      280000(S)       0 Summary
Xlates                   8526         8966      N/A             0 Summary
Hosts                     254          254      N/A             0 Summary
Conns [rate]              270          535      N/A          1704 Summary
Inspects [rate]           270          535      N/A             0 Summary
S = System: Combined context limits exceed the system limit; the system limit is shown.
```

The following is sample output from the **show resource usage summary** command, which shows the limits for 25 contexts. Because the context limit for Telnet and SSH connections is 5 per context, then the combined limit is 125. The system limit is only 100, so the system limit is shown.

```
hostname# show resource usage summary

Resource              Current         Peak      Limit    Denied   Context
Telnet                      1            1        100[S]      0   Summary
SSH                         2            2        100[S]      0   Summary
Conns                      56           90        N/A         0   Summary
Hosts                      89          102        N/A         0   Summary
S = System: Combined context limits exceed the system limit; the system limit is shown.
```

The following is sample output from the **show resource usage system** command, which shows the resource usage for all contexts, but it shows the system limit instead of the combined context limits. The **counter all 0** option is used to show resources that are not currently in use. The Denied statistics indicate how many times the resource was denied due to the system limit, if available.

```
hostname# show resource usage system counter all 0

Resource              Current         Peak      Limit        Denied    Context
Telnet                      0            0        100             0    System
SSH                         0            0        100             0    System
ASDM                        0            0         32             0    System
Syslogs [rate]              1           18        N/A             0    System
Conns                       0            1     280000             0    System
Xlates                      0            0        N/A             0    System
Hosts                       0            2        N/A             0    System
Conns [rate]                1            1        N/A             0    System
Inspects [rate]             0            0        N/A             0    System
```

Monitoring SYN Attacks in Contexts

The ASA prevents SYN attacks using TCP Intercept. TCP Intercept uses the SYN cookies algorithm to prevent TCP SYN-flooding attacks. A SYN-flooding attack consists of a series of SYN packets usually originating from spoofed IP addresses. The constant flood of SYN packets keeps the server SYN queue full, which prevents it from servicing connection requests. When the embryonic connection threshold of a connection is crossed, the ASA acts as a proxy for the server and generates a SYN-ACK response to the client SYN request. When the ASA receives an ACK back from the client, it can then authenticate the client and allow the connection to the server.

You can monitor the rate of attacks for individual contexts using the **show perfmon** command; you can monitor the amount of resources being used by TCP intercept for individual contexts using the **show resource usage detail** command; you can monitor the resources being used by TCP intercept for the entire system using the **show resource usage summary detail** command.

The following is sample output from the **show perfmon** command that shows the rate of TCP intercepts for a context called admin.

```
hostname/admin# show perfmon

Context:admin
PERFMON STATS:   Current      Average
Xlates               0/s          0/s
Connections          0/s          0/s
TCP Conns            0/s          0/s
UDP Conns            0/s          0/s
URL Access           0/s          0/s
URL Server Req       0/s          0/s
WebSns Req           0/s          0/s
TCP Fixup            0/s          0/s
HTTP Fixup           0/s          0/s
FTP Fixup            0/s          0/s
AAA Authen           0/s          0/s
AAA Author           0/s          0/s
AAA Account          0/s          0/s
TCP Intercept    322779/s      322779/s
```

The following is sample output from the **show resource usage detail** command that shows the amount of resources being used by TCP Intercept for individual contexts. (Sample text in italics shows the TCP intercept information.)

```
hostname(config)# show resource usage detail
Resource              Current         Peak      Limit        Denied Context
memory                 843732       847288  unlimited             0 admin
chunk:channels             14           15  unlimited             0 admin
chunk:fixup                15           15  unlimited             0 admin
chunk:hole                  1            1  unlimited             0 admin
chunk:ip-users             10           10  unlimited             0 admin
chunk:list-elem            21           21  unlimited             0 admin
chunk:list-hdr              3            4  unlimited             0 admin
chunk:route                 2            2  unlimited             0 admin
chunk:static                1            1  unlimited             0 admin
tcp-intercepts         328787       803610  unlimited             0 admin
np-statics                  3            3  unlimited             0 admin
statics                     1            1  unlimited             0 admin
ace-rules                   1            1  unlimited             0 admin
console-access-rul          2            2  unlimited             0 admin
fixup-rules                14           15  unlimited             0 admin
memory                 959872       960000  unlimited             0 c1
chunk:channels             15           16  unlimited             0 c1
chunk:dbgtrace              1            1  unlimited             0 c1
chunk:fixup                15           15  unlimited             0 c1
chunk:global                1            1  unlimited             0 c1
chunk:hole                  2            2  unlimited             0 c1
chunk:ip-users             10           10  unlimited             0 c1
chunk:udp-ctrl-blk          1            1  unlimited             0 c1
chunk:list-elem            24           24  unlimited             0 c1
chunk:list-hdr              5            6  unlimited             0 c1
chunk:nat                   1            1  unlimited             0 c1
```

```
chunk:route                 2            2  unlimited            0 c1
chunk:static                1            1  unlimited            0 c1
tcp-intercept-rate      16056        16254  unlimited            0 c1
globals                     1            1  unlimited            0 c1
np-statics                  3            3  unlimited            0 c1
statics                     1            1  unlimited            0 c1
nats                        1            1  unlimited            0 c1
ace-rules                   2            2  unlimited            0 c1
console-access-rul          2            2  unlimited            0 c1
fixup-rules                14           15  unlimited            0 c1
memory              232695716    232020648  unlimited            0 system
chunk:channels             17           20  unlimited            0 system
chunk:dbgtrace              3            3  unlimited            0 system
chunk:fixup                15           15  unlimited            0 system
chunk:ip-users              4            4  unlimited            0 system
chunk:list-elem          1014         1014  unlimited            0 system
chunk:list-hdr              1            1  unlimited            0 system
chunk:route                 1            1  unlimited            0 system
block:16384               510          885  unlimited            0 system
block:2048                 32           34  unlimited            0 system
```

The following sample output shows the resources being used by TCP intercept for the entire system. (Sample text in italics shows the TCP intercept information.)

```
hostname(config)# show resource usage summary detail
Resource              Current         Peak      Limit        Denied Context
memory              238421312    238434336  unlimited            0 Summary
chunk:channels             46           48  unlimited            0 Summary
chunk:dbgtrace              4            4  unlimited            0 Summary
chunk:fixup                45           45  unlimited            0 Summary
chunk:global                1            1  unlimited            0 Summary
chunk:hole                  3            3  unlimited            0 Summary
chunk:ip-users             24           24  unlimited            0 Summary
chunk:udp-ctrl-blk          1            1  unlimited            0 Summary
chunk:list-elem          1059         1059  unlimited            0 Summary
chunk:list-hdr             10           11  unlimited            0 Summary
chunk:nat                   1            1  unlimited            0 Summary
chunk:route                 5            5  unlimited            0 Summary
chunk:static                2            2  unlimited            0 Summary
block:16384               510          885  unlimited            0 Summary
block:2048                 32           35  unlimited            0 Summary
tcp-intercept-rate     341306       811579  unlimited            0 Summary
globals                     1            1  unlimited            0 Summary
np-statics                  6            6  unlimited            0 Summary
statics                     2            2        N/A            0 Summary
nats                        1            1        N/A            0 Summary
ace-rules                   3            3        N/A            0 Summary
console-access-rul          4            4        N/A            0 Summary
fixup-rules                43           44        N/A            0 Summary
```

CHAPTER 6

Configuring Interfaces

This chapter describes how to configure interfaces, including Ethernet parameters, switch ports (for the ASA 5505), VLAN subinterfaces, and IP addressing.

The procedure to configure interfaces varies depending on several factors: the ASA 5505 vs. other models; routed vs. transparent mode; and single vs. multiple mode. This chapter describes how to configure interfaces for each of these variables.

Note If your ASA has the default factory configuration, many interface parameters are already configured. This chapter assumes you do *not* have a factory default configuration, or that if you have a default configuration, that you need to change the configuration. For information about the factory default configurations, see the "Factory Default Configurations" section on page 2-1.

This chapter includes the following sections:

- Information About Interfaces, page 6-1
- Licensing Requirements for Interfaces, page 6-6
- Guidelines and Limitations, page 6-6
- Default Settings, page 6-7
- Starting Interface Configuration (ASA 5510 and Higher), page 6-8
- Starting Interface Configuration (ASA 5505), page 6-16
- Completing Interface Configuration (All Models), page 6-22
- Allowing Same Security Level Communication, page 6-30
- Enabling Jumbo Frame Support (ASA 5580 and 5585-X), page 6-31
- Monitoring Interfaces, page 6-32
- Configuration Examples for Interfaces, page 6-32
- Feature History for Interfaces, page 6-33

Information About Interfaces

This section describes ASA interfaces, and includes the following topics:

- ASA 5505 Interfaces, page 6-2
- Auto-MDI/MDIX Feature, page 6-4

- Security Levels, page 6-5
- Dual IP Stack, page 6-5
- Management Interface (ASA 5510 and Higher), page 6-5

ASA 5505 Interfaces

This section describes the ports and interfaces of the ASA 5505 ASA, and includes the following topics:

- Understanding ASA 5505 Ports and Interfaces, page 6-2
- Maximum Active VLAN Interfaces for Your License, page 6-2
- VLAN MAC Addresses, page 6-4
- Power Over Ethernet, page 6-4

Understanding ASA 5505 Ports and Interfaces

The ASA 5505 ASA supports a built-in switch. There are two kinds of ports and interfaces that you need to configure:

- Physical switch ports—The ASA has 8 Fast Ethernet switch ports that forward traffic at Layer 2, using the switching function in hardware. Two of these ports are PoE ports. See the "Power Over Ethernet" section on page 6-4 for more information. You can connect these interfaces directly to user equipment such as PCs, IP phones, or a DSL modem. Or you can connect to another switch.
- Logical VLAN interfaces—In routed mode, these interfaces forward traffic between VLAN networks at Layer 3, using the configured security policy to apply firewall and VPN services. In transparent mode, these interfaces forward traffic between the VLANs on the same network at Layer 2, using the configured security policy to apply firewall services. See the "Maximum Active VLAN Interfaces for Your License" section for more information about the maximum VLAN interfaces. VLAN interfaces let you divide your equipment into separate VLANs, for example, home, business, and Internet VLANs.

To segregate the switch ports into separate VLANs, you assign each switch port to a VLAN interface. Switch ports on the same VLAN can communicate with each other using hardware switching. But when a switch port on VLAN 1 wants to communicate with a switch port on VLAN 2, then the ASA applies the security policy to the traffic and routes or bridges between the two VLANs.

Maximum Active VLAN Interfaces for Your License

In transparent firewall mode, you can configure the following VLANs depending on your license:

- Base license—2 active VLANs.
- Security Plus license—3 active VLANs, one of which must be for failover.

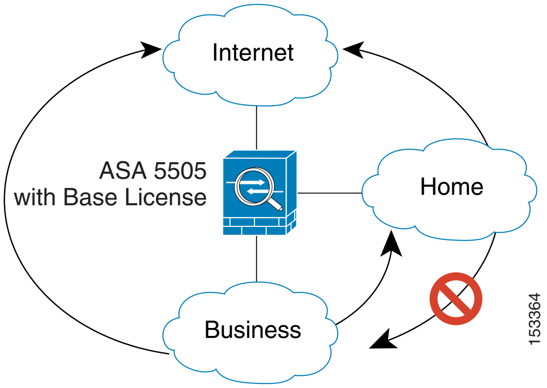
In routed mode, you can configure the following VLANs depending on your license: Base license

- Base license—3 active VLANs. The third VLAN can only be configured to initiate traffic to one other VLAN. See Figure 6-1 for more information.
- Security Plus license—20 active VLANs.

Note An *active VLAN* is a VLAN with a **nameif** command configured.

With the Base license, the third VLAN can only be configured to initiate traffic to one other VLAN. See Figure 6-1 for an example network where the Home VLAN can communicate with the Internet, but cannot initiate contact with Business.

Figure 6-1 ASA 5505 Adaptive Security Appliance with Base License

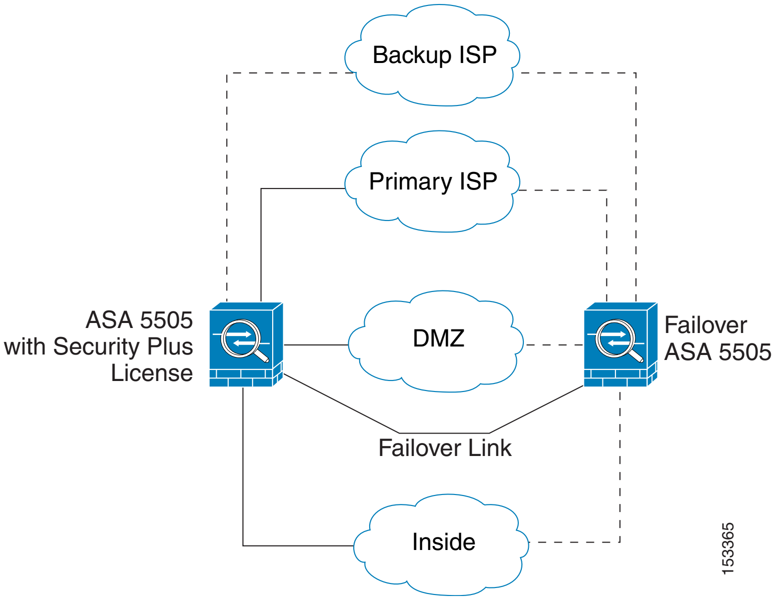


With the Security Plus license, you can configure 20 VLAN interfaces, including a VLAN interface for failover and a VLAN interface as a backup link to your ISP. You can configure the backup interface to not pass through traffic unless the route through the primary interface fails. You can configure trunk ports to accommodate multiple VLANs per port.

Note The ASA 5505 ASA supports Active/Standby failover, but not Stateful failover.

See Figure 6-2 for an example network.

Figure 6-2 ASA 5505 Adaptive Security Appliance with Security Plus License



VLAN MAC Addresses

- Routed firewall mode—All VLAN interfaces share a MAC address. Ensure that any connected switches can support this scenario. If the connected switches require unique MAC addresses, you can manually assign MAC addresses. See the "Configuring the MAC Address" section on page 6-26.
- Transparent firewall mode—Each VLAN has a unique MAC address. You can override the generated MAC addresses if desired by manually assigning MAC addresses. See the "Configuring the MAC Address" section on page 6-26.

Power Over Ethernet

Ethernet 0/6 and Ethernet 0/7 support PoE for devices such as IP phones or wireless access points. If you install a non-PoE device or do not connect to these switch ports, the ASA does not supply power to the switch ports.

If you shut down the switch port using the **shutdown** command, you disable power to the device. Power is restored when you enable the port using the **no shutdown** command. See the "Configuring and Enabling Switch Ports as Access Ports" section on page 6-17 for more information about shutting down a switch port.

To view the status of PoE switch ports, including the type of device connected (Cisco or IEEE 802.3af), use the **show power inline** command.

Monitoring Traffic Using SPAN

If you want to monitor traffic that enters or exits one or more switch ports, you can enable SPAN, also known as switch port monitoring. The port for which you enable SPAN (called the destination port) receives a copy of every packet transmitted or received on a specified source port. The SPAN feature lets you attach a sniffer to the destination port so you can monitor all traffic; without SPAN, you would have to attach a sniffer to every port you want to monitor. You can only enable SPAN for one destination port.

See the **switchport monitor** command in the *Cisco ASA 5500 Series Command Reference* for more information.

Auto-MDI/MDIX Feature

For RJ-45 interfaces, the default auto-negotiation setting also includes the Auto-MDI/MDIX feature. Auto-MDI/MDIX eliminates the need for crossover cabling by performing an internal crossover when a straight cable is detected during the auto-negotiation phase.

For the ASA 5510 and higher, either the speed or duplex must be set to auto-negotiate to enable Auto-MDI/MDIX for the interface. If you explicitly set both the speed and duplex to a fixed value, thus disabling auto-negotiation for both settings, then Auto-MDI/MDIX is also disabled.

For Gigabit Ethernet, when the speed and duplex are set to 1000 and full, then the interface always auto-negotiates; therefore Auto-MDI/MDIX is always enabled and you cannot disable it.

For the ASA 5505, you cannot disable Auto-MDI/MDIX.

Security Levels

Each interface must have a security level from 0 (lowest) to 100 (highest). For example, you should assign your most secure network, such as the inside host network, to level 100. While the outside network connected to the Internet can be level 0. Other networks, such as DMZs can be in between. You can assign interfaces to the same security level. See the "Allowing Same Security Level Communication" section on page 6-30 for more information.

The level controls the following behavior:

- Network access—By default, there is an implicit permit from a higher security interface to a lower security interface (outbound). Hosts on the higher security interface can access any host on a lower security interface. You can limit access by applying an access list to the interface.

  If you enable communication for same security interfaces (see the "Allowing Same Security Level Communication" section on page 6-30), there is an implicit permit for interfaces to access other interfaces on the same security level or lower.
- Inspection engines—Some application inspection engines are dependent on the security level. For same security interfaces, inspection engines apply to traffic in either direction.
  - NetBIOS inspection engine—Applied only for outbound connections.
  - SQL*Net inspection engine—If a control connection for the SQL*Net (formerly OraServ) port exists between a pair of hosts, then only an inbound data connection is permitted through the ASA.
- Filtering—HTTP(S) and FTP filtering applies only for outbound connections (from a higher level to a lower level).

  If you enable communication for same security interfaces, you can filter traffic in either direction.
- NAT control—When you enable NAT control, you must configure NAT for hosts on a higher security interface (inside) when they access hosts on a lower security interface (outside).

  Without NAT control, or for same security interfaces, you can choose to use NAT between any interface, or you can choose not to use NAT. Keep in mind that configuring NAT for an outside interface might require a special keyword.
- **established** command—This command allows return connections from a lower security host to a higher security host if there is already an established connection from the higher level host to the lower level host.

  If you enable communication for same security interfaces, you can configure **established** commands for both directions.

Dual IP Stack

The ASA supports the configuration of both IPv6 and IPv4 on an interface. You do not need to enter any special commands to do so; simply enter the IPv4 configuration commands and IPv6 configuration commands as you normally would. Make sure you configure a default route for both IPv4 and IPv6.

Management Interface (ASA 5510 and Higher)

The management interface is a Fast Ethernet interface designed for management traffic only, and is specified as **management** *slot*/*port* in commands. You can, however, use it for through traffic if desired (see the **management-only** command). In transparent firewall mode, you can use the management interface (for management purposes) in addition to the two interfaces allowed for through traffic. You can also add subinterfaces to the management interface to provide management in each security context for multiple context mode.

Note In transparent firewall mode, the management interface updates the MAC address table in the same manner as a data interface; therefore you should not connect both a management and a data interface to the same switch unless you configure one of the switch ports as a routed port (by default Cisco Catalyst switches share a MAC address for all VLAN switch ports). Otherwise, if traffic arrives on the management interface from the physically-connected switch, then the ASA updates the MAC address table to use the *management* interface to access the switch, instead of the data interface. This action causes a temporary traffic interruption; the ASA will not re-update the MAC address table for packets from the switch to the data interface for at least 30 seconds for security reasons.

Licensing Requirements for Interfaces

The following table shows the licensing requirements for VLANs:

Model	License Requirement
ASA 5505	Base License: 3 (2 regular zones and 1 restricted zone that can only communicate with 1 other zone) Security Plus License: 20
ASA 5510	Base License: 50 Security Plus License: 100
ASA 5520	Base License: 150
ASA 5540	Base License: 200
ASA 5550	Base License: 250
ASA 5580	Base License: 250
ASA 5585-X	Base License: 250

The following table shows the licensing requirements for VLAN trunks:

Model	License Requirement
ASA 5505	Base License: None. Security Plus License: 8.
All other models	N/A

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

In multiple context mode, configure the physical interfaces in the system execution space according to the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8.

Then, configure the logical interface parameters in the context execution space according to the "Completing Interface Configuration (All Models)" section on page 6-22.

Firewall Mode Guidelines

- Transparent firewall mode allows only two interfaces to pass through traffic; however, on the ASA 5510 and higher ASA, you can use the Management 0/0 or 0/1 interface (either the physical interface or a subinterface) as a third interface for management traffic. The mode is not configurable in this case and must always be management-only.
- Intra-interface communication is only available in routed firewall mode. Inter-interface communication is available for both routed and transparent mode.

Failover Guidelines

Do not finish configuring failover interfaces with the procedures in "Completing Interface Configuration (All Models)" section on page 6-22. See the "Configuring Active/Standby Failover" section on page 33-7 or the "Configuring Active/Active Failover" section on page 34-8 to configure the failover and state links. In multiple context mode, failover interfaces are configured in the system configuration.

IPv6 Guidelines

Supports IPv6.

In transparent mode on a per interface basis, you can only configure the link-local address; you configure the global address as the management address for the entire unit, but not per interface. Because configuring the management global IP address automatically configures the link-local addresses per interface, the only IPv6 configuration you need to perform is to set the management IP address according to the "Configuring the IPv6 Address" section on page 8-9.

Model Guidelines

Subinterfaces are not available for the ASA 5505 ASA.

Default Settings

This section lists default settings for interfaces if you do not have a factory default configuration. For information about the factory default configurations, see the "Factory Default Configurations" section on page 2-1.

Default Security Level

The default security level is 0. If you name an interface "inside" and you do not set the security level explicitly, then the ASA sets the security level to 100.

Note If you change the security level of an interface, and you do not want to wait for existing connections to time out before the new security information is used, you can clear the connections using the **clear local-host** command.

Default State of Interfaces

The default state of an interface depends on the type and the context mode.

In multiple context mode, all allocated interfaces are enabled by default, no matter what the state of the interface is in the system execution space. However, for traffic to pass through the interface, the interface also has to be enabled in the system execution space. If you shut down an interface in the system execution space, then that interface is down in all contexts that share it.

In single mode or in the system execution space, interfaces have the following default states:

- Physical interfaces and switch ports—Disabled.
- Redundant Interfaces—Enabled. However, for traffic to pass through the redundant interface, the member physical interfaces must also be enabled.
- Subinterfaces or VLANs—Enabled. However, for traffic to pass through the subinterface, the physical interface must also be enabled.

Default Speed and Duplex

- By default, the speed and duplex for copper (RJ-45) interfaces are set to auto-negotiate.
- The fiber interface for the ASA 5550 and the 4GE SSM has a fixed speed and does not support duplex, but you can set the interface to negotiate link parameters (the default) or not to negotiate.
- For fiber interfaces for the ASA 5580 and ASA 5585-X, the speed is set for automatic link negotiation.

Default Connector Type

The ASA 5550 ASA and the 4GE SSM for the ASA 5510 and higher ASA include two connector types: copper RJ-45 and fiber SFP. RJ-45 is the default. You can configure the ASA to use the fiber SFP connectors.

Default MAC Addresses

By default, the physical interface uses the burned-in MAC address, and all subinterfaces of a physical interface use the same burned-in MAC address.

Starting Interface Configuration (ASA 5510 and Higher)

This section includes tasks for starting your interface configuration for the ASA 5510 and higher.

Note For multiple context mode, complete all tasks in this section in the system execution space. To change from the context to the system execution space, enter the **changeto system** command.

For ASA 5505 configuration, see the "Starting Interface Configuration (ASA 5505)" section on page 6-16.

This section includes the following topics:

- Task Flow for Starting Interface Configuration, page 6-9
- Configuring a Redundant Interface, page 6-11
- Enabling the Physical Interface and Configuring Ethernet Parameters, page 6-9
- Configuring VLAN Subinterfaces and 802.1Q Trunking, page 6-14

- Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode), page 6-15

Task Flow for Starting Interface Configuration

To start configuring interfaces, perform the following steps:

Step 1 (Multiple context mode) Complete all tasks in this section in the system execution space. To change from the context to the system execution space, enter the **changeto system** command.

Step 2 Enable the physical interface, and optionally change Ethernet parameters. See the "Enabling the Physical Interface and Configuring Ethernet Parameters" section on page 6-9.

Physical interfaces are disabled by default.

Step 3 (Optional) Configure redundant interface pairs. See the "Configuring a Redundant Interface" section on page 6-11.

A logical redundant interface pairs an active and a standby physical interface. When the active interface fails, the standby interface becomes active and starts passing traffic.

Step 4 (Optional) Configure VLAN subinterfaces. See the "Configuring VLAN Subinterfaces and 802.1Q Trunking" section on page 6-14.

Step 5 (Multiple context mode only) Assign interfaces to contexts and automatically assign unique MAC addresses to context interfaces. See the "Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)" section on page 6-15.

Step 6 Complete the interface configuration according to the "Completing Interface Configuration (All Models)" section on page 6-22.

Enabling the Physical Interface and Configuring Ethernet Parameters

This section describes how to:

- Enable the physical interface
- Set a specific speed and duplex (if available)
- Enable pause frames for flow control.

Prerequisites

For multiple context mode, complete this procedure in the system execution space. To change from the context to the system execution space, enter the **changeto system** command.

Detailed Steps

Step 1 To specify the interface you want to configure, enter the following command:

```
hostname(config)# interface physical_interface
hostname(config-if)#
```

where the *physical_interface* ID includes the type, slot, and port number as *type*[*slot*/]*port*.

The physical interface types include the following:

- **ethernet**
- **gigabitethernet**
- **tengigabitethernet**
- **management**

Enter the type followed by *slot/port*, for example, **gigabitethernet0/1** or **ethernet 0/1**.

To view the interfaces available on your ASA, enter the **show interface** command.

Step 2 (Optional) To set the media type to SFP, if available for your model, enter the following command:

```
hostname(config-if)# media-type sfp
```

To restore the default RJ-45, enter the **media-type rj45** command.

Step 3 (Optional) To set the speed, enter the following command:

```
hostname(config-if)# speed {auto | 10 | 100 | 1000 | nonegotiate}
```

For copper interfaces, the default setting is **auto**.

For SFP interfaces, the default setting is **no speed nonegotiate**, which sets the speed to the maximum speed and enables link negotiation for flow-control parameters and remote fault information. The **nonegotiate** keyword is the only keyword available for SFP interfaces. The **speed nonegotiate** command disables link negotiation.

Step 4 (Optional) To set the duplex for copper interfaces, enter the following command:

```
hostname(config-if)# duplex {auto | full | half}
```

The **auto** setting is the default.

Step 5 (Optional) To enable pause (XOFF) frames for flow control, enter the following command:

```
hostname(config-if)# flowcontrol send on [low_water high_water pause_time] [noconfirm]
```

If you have a traffic burst, dropped packets can occur if the burst exceeds the buffering capacity of the FIFO buffer on the NIC and the receive ring buffers. Enabling pause frames for flow control can alleviate this issue. Pause (XOFF) and XON frames are generated automatically by the NIC hardware based on the FIFO buffer usage. A pause frame is sent when the buffer usage exceeds the high-water mark.

For 10 GigabitEthernet interfaces, the default *high_water* value is 128 KB; you can set it between 0 and 511. After a pause is sent, an XON frame can be sent when the buffer usage is reduced below the low-water mark. By default, the *low_water* value is 64 KB; you can set it between 0 and 511. The link partner can resume traffic after receiving an XON, or after the XOFF expires, as controlled by the timer value in the pause frame.

(8.2(5) and later) For 1 GigabitEthernet interfaces, the default *high_water* value is 16 KB; you can set it between 0 and 47. By default, the *low_water* value is 24 KB; you can set it between 0 and 47.

The default *pause_time* value is 26624; you can set it between 0 and 65535. Each pause time unit is the amount of time to transmit 64 bytes, so the time per unit depends on your link speed. If the buffer usage is consistently above the high-water mark, pause frames are sent repeatedly, controlled by the pause refresh threshold value.

When you use this command, you see the following warning:

```
Changing flow-control parameters will reset the interface. Packets may be lost during the
reset.
Proceed with flow-control changes?
```

To change the parameters without being prompted, use the **noconfirm** keyword.

Note Only flow control frames defined in 802.3x are supported. Priority-based flow control is not supported.

Step 6 To enable the interface, enter the following command:

```
hostname(config-if)# no shutdown
```

To disable the interface, enter the **shutdown** command. If you enter the **shutdown** command, you also shut down all subinterfaces. If you shut down an interface in the system execution space, then that interface is shut down in all contexts that share it.

What to Do Next

Optional Tasks:

- Configure redundant interface pairs. See the "Configuring a Redundant Interface" section on page 6-11.
- Configure VLAN subinterfaces. See the "Configuring VLAN Subinterfaces and 802.1Q Trunking" section on page 6-14.

Required Tasks:

- For multiple context mode, assign interfaces to contexts and automatically assign unique MAC addresses to context interfaces. See the "Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)" section on page 6-15.
- For single context mode, complete the interface configuration. See the "Completing Interface Configuration (All Models)" section on page 6-22.

Configuring a Redundant Interface

A logical redundant interface consists of a pair of physical interfaces: an active and a standby interface. When the active interface fails, the standby interface becomes active and starts passing traffic. You can configure a redundant interface to increase the ASA reliability. This feature is separate from device-level failover, but you can configure redundant interfaces as well as failover if desired.

This section describes how to configure redundant interfaces, and includes the following topics:

- Configuring a Redundant Interface, page 6-11
- Changing the Active Interface, page 6-14

Configuring a Redundant Interface

This section describes how to create a redundant interface. By default, redundant interfaces are enabled.

Guidelines and Limitations

- You can configure up to 8 redundant interface pairs.
- All ASA configuration refers to the logical redundant interface instead of the member physical interfaces.

- Redundant interface delay values are configurable, but by default the ASA will inherit the default delay values based on the physical type of its member interfaces.
- The only configuration available to physical interfaces that are part of a redundant interface pair are physical parameters (set in the "Enabling the Physical Interface and Configuring Ethernet Parameters" section on page 6-9), the **description** command, and the **shutdown** command. You can also enter run-time commands like **default** and **help**.
- If you shut down the active interface, then the standby interface becomes active.

For failover, follow these guidelines when adding member interfaces:

- If you want to use a redundant interface for the failover or state link, then you must configure the redundant interface as part of the basic configuration on the secondary unit in addition to the primary unit.
- If you use a redundant interface for the failover or state link, you must put a switch or hub between the two units; you cannot connect them directly. Without the switch or hub, you could have the active port on the primary unit connected directly to the standby port on the secondary unit.
- You can monitor redundant interfaces for failover using the **monitor-interface** command; be sure to reference the logical redundant interface name.
- When the active interface fails over to the standby interface, this activity does not cause the redundant interface to appear to be failed when being monitored for device-level failover. Only when both physical interfaces fail does the redundant interface appear to be failed.

Redundant Interface MAC Address

The redundant interface uses the MAC address of the first physical interface that you add. If you change the order of the member interfaces in the configuration, then the MAC address changes to match the MAC address of the interface that is now listed first. Alternatively, you can assign a MAC address to the redundant interface, which is used regardless of the member interface MAC addresses (see the "Configuring the MAC Address" section on page 6-26 or the "Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)" section on page 6-15). When the active interface fails over to the standby, the same MAC address is maintained so that traffic is not disrupted.

Prerequisites

- Both member interfaces must be of the same physical type. For example, both must be Ethernet.
- You cannot add a physical interface to the redundant interface if you configured a name for it. You must first remove the name using the **no nameif** command.
- For multiple context mode, complete this procedure in the system execution space. To change from the context to the system execution space, enter the **changeto system** command.

Caution If you are using a physical interface already in your configuration, removing the name will clear any configuration that refers to the interface.

Detailed Steps

You can configure up to 8 redundant interface pairs. To configure a redundant interface, perform the following steps:

Step 1 To add the logical redundant interface, enter the following command:

```
hostname(config)# interface redundant number
hostname(config-if)#
```

where the *number* argument is an integer between 1 and 8.

Step 2 To add the first member interface to the redundant interface, enter the following command:

```
hostname(config-if)# member-interface physical_interface
```

See the "Enabling the Physical Interface and Configuring Ethernet Parameters" section for a description of the physical interface ID.

After you add the interface, any configuration for it (such as an IP address) is removed.

Step 3 To add the second member interface to the redundant interface, enter the following command:

```
hostname(config-if)# member-interface physical_interface
```

Make sure the second interface is the same physical type as the first interface.

To remove a member interface, enter the **no member-interface** *physical_interface* command. You cannot remove both member interfaces from the redundant interface; the redundant interface requires at least one member interface.

The Add Redundant Interface dialog box appears.

You return to the Interfaces pane.

Examples

The following example creates two redundant interfaces:

```
hostname(config)# interface redundant 1
hostname(config-if)# member-interface gigabitethernet 0/0
hostname(config-if)# member-interface gigabitethernet 0/1
hostname(config-if)# interface redundant 2
hostname(config-if)# member-interface gigabitethernet 0/2
hostname(config-if)# member-interface gigabitethernet 0/3
```

What to Do Next

Optional Task:

- Configure VLAN subinterfaces. See the "Configuring VLAN Subinterfaces and 802.1Q Trunking" section on page 6-14.

Required Tasks:

- For multiple context mode, assign interfaces to contexts and automatically assign unique MAC addresses to context interfaces. See the "Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)" section on page 6-15.
- For single context mode, complete the interface configuration. See the "Completing Interface Configuration (All Models)" section on page 6-22.

Changing the Active Interface

By default, the active interface is the first interface listed in the configuration, if it is available. To view which interface is active, enter the following command:

```
hostname# show interface redundantnumber detail | grep Member
```

For example:

```
hostname# show interface redundant1 detail | grep Member
      Members GigabitEthernet0/3(Active), GigabitEthernet0/2
```

To change the active interface, enter the following command:

```
hostname# redundant-interface redundantnumber active-member physical_interface
```

where the **redundant***number* argument is the redundant interface ID, such as **redundant1**.

The *physical_interface* is the member interface ID that you want to be active.

Configuring VLAN Subinterfaces and 802.1Q Trunking

Subinterfaces let you divide a physical or redundant interface into multiple logical interfaces that are tagged with different VLAN IDs. An interface with one or more VLAN subinterfaces is automatically configured as an 802.1Q trunk. Because VLANs allow you to keep traffic separate on a given physical interface, you can increase the number of interfaces available to your network without adding additional physical interfaces or ASAs. This feature is particularly useful in multiple context mode so that you can assign unique interfaces to each context.

Guidelines and Limitations

- Maximum subinterfaces—To determine how many VLAN subinterfaces are allowed for your platform, see the "Licensing Requirements for Interfaces" section on page 6-6.
- Preventing untagged packets on the physical interface—If you use subinterfaces, you typically do not also want the physical interface to pass traffic, because the physical interface passes untagged packets. This property is also true for the active physical interface in a redundant interface pair. Because the physical or redundant interface must be enabled for the subinterface to pass traffic, ensure that the physical or redundant interface does not pass traffic by leaving out the **nameif** command. If you want to let the physical or redundant interface pass untagged packets, you can configure the **nameif** command as usual. See the "Completing Interface Configuration (All Models)" section on page 6-22 for more information about completing the interface configuration.

Prerequisites

For multiple context mode, complete this procedure in the system execution space. To change from the context to the system execution space, enter the **changeto system** command.

Detailed Steps

To add a subinterface and assign a VLAN to it, perform the following steps:

Step 1 To specify the new subinterface, enter the following command:

```
hostname(config)# interface {physical_interface | redundant number}.subinterface
hostname(config-subif)#
```

See the "Enabling Jumbo Frame Support (ASA 5580 and 5585-X)" section for a description of the physical interface ID.

The **redundant** *number* argument is the redundant interface ID, such as **redundant 1**.

The *subinterface* ID is an integer between 1 and 4294967293.

The following command adds a subinterface to a Gigabit Ethernet interface:

```
hostname(config)# interface gigabitethernet 0/1.100
```

The following command adds a subinterface to a redundant interface:

```
hostname(config)# interface redundant 1.100
```

Step 2 To specify the VLAN for the subinterface, enter the following command:

```
hostname(config-subif)# vlan vlan_id
```

The *vlan_id* is an integer between 1 and 4094. Some VLAN IDs might be reserved on connected switches, so check the switch documentation for more information.

You can only assign a single VLAN to a subinterface, and you cannot assign the same VLAN to multiple subinterfaces. You cannot assign a VLAN to the physical interface. Each subinterface must have a VLAN ID before it can pass traffic. To change a VLAN ID, you do not need to remove the old VLAN ID with the **no** option; you can enter the **vlan** command with a different VLAN ID, and the ASA changes the old ID.

What to Do Next

- For multiple context mode, assign interfaces to contexts and automatically assign unique MAC addresses to context interfaces. See the "Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)" section on page 6-15.
- For single context mode, complete the interface configuration. See the "Completing Interface Configuration (All Models)" section on page 6-22.

Assigning Interfaces to Contexts and Automatically Assigning MAC Addresses (Multiple Context Mode)

To complete the configuration of interfaces in the system execution space, perform the following tasks that are documented in Chapter 5, "Managing Multiple Context Mode":

- To assign interfaces to contexts, see the "Configuring a Security Context" section on page 5-16 .
- (Optional) To automatically assign unique MAC addresses to context interfaces, see the "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20.

  The MAC address is used to classify packets within a context. If you share an interface, but do not have unique MAC addresses for the interface in each context, then the destination IP address is used to classify packets. Alternatively, you can manually assign MAC addresses within the context according to the "Configuring the MAC Address" section on page 6-26.

What to Do Next

Complete the interface configuration. See the "Completing Interface Configuration (All Models)" section on page 6-22.

Starting Interface Configuration (ASA 5505)

This section includes tasks for starting your interface configuration for the ASA 5505 ASA, including creating VLAN interfaces and assigning them to switch ports. See the "Understanding ASA 5505 Ports and Interfaces" section on page 6-2 for more information.

For ASA 5510 and higher configuration, see the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8.

This section includes the following topics:

- Task Flow for Starting Interface Configuration, page 6-16
- Configuring VLAN Interfaces, page 6-16
- Configuring and Enabling Switch Ports as Access Ports, page 6-17
- Configuring and Enabling Switch Ports as Trunk Ports, page 6-19

Task Flow for Starting Interface Configuration

To configure interfaces in single mode, perform the following steps:

Step 1 Configure VLAN interfaces. See the "Configuring VLAN Interfaces" section on page 6-16.

Step 2 Configure and enable switch ports as access ports. See the "Configuring and Enabling Switch Ports as Access Ports" section on page 6-17.

Step 3 (Optional for Security Plus licenses) Configure and enable switch ports as trunk ports. See the "Configuring and Enabling Switch Ports as Trunk Ports" section on page 6-19.

Step 4 Complete the interface configuration according to the "Completing Interface Configuration (All Models)" section on page 6-22.

Configuring VLAN Interfaces

This section describes how to configure VLAN interfaces. For more information about ASA 5505 interfaces, see the "ASA 5505 Interfaces" section on page 6-2.

Detailed Steps

Step 1 To add a VLAN interface, enter the following command:

```
hostname(config)# interface vlan number
```

Where the *number* is between 1 and 4090.

For example, enter the following command:

```
hostname(config)# interface vlan 100
```

To remove this VLAN interface and all associated configuration, enter the **no interface vlan** command. Because this interface also includes the interface name configuration, and the name is used in other commands, those commands are also removed.

Step 2 (Optional for the Base license) To allow this interface to be the third VLAN by limiting it from initiating contact to one other VLAN, enter the following command:

```
hostname(config-if)# no forward interface vlan number
```

Where *number* specifies the VLAN ID to which this VLAN interface cannot initiate traffic.

With the Base license, you can only configure a third VLAN if you use this command to limit it.

For example, you have one VLAN assigned to the outside for Internet access, one VLAN assigned to an inside business network, and a third VLAN assigned to your home network. The home network does not need to access the business network, so you can use the **no forward interface** command on the home VLAN; the business network can access the home network, but the home network cannot access the business network.

If you already have two VLAN interfaces configured with a **nameif** command, be sure to enter the **no forward interface** command before the **nameif** command on the third interface; the ASA does not allow three fully functioning VLAN interfaces with the Base license on the ASA 5505 ASA.

Note If you upgrade to the Security Plus license, you can remove this command and achieve full functionality for this interface. If you leave this command in place, this interface continues to be limited even after upgrading.

What to Do Next

Configure the switch ports. See the "Configuring and Enabling Switch Ports as Access Ports" section on page 6-17 and the "Configuring and Enabling Switch Ports as Trunk Ports" section on page 6-19.

Configuring and Enabling Switch Ports as Access Ports

By default (with no configuration), all switch ports are shut down, and assigned to VLAN 1. To assign a switch port to a single VLAN, configure it as an access port. To create a trunk port to carry multiple VLANs, see the "Configuring and Enabling Switch Ports as Trunk Ports" section on page 6-19. If you have a factory default configuration, see the "ASA 5505 Default Configuration" section on page 2-2to check if you want to change the default interface settings according to this procedure.

For more information about ASA 5505 interfaces, see the "ASA 5505 Interfaces" section on page 6-2.

Caution The ASA 5505 ASA does not support Spanning Tree Protocol for loop detection in the network. Therefore you must ensure that any connection with the ASA does not end up in a network loop.

Detailed Steps

Step 1 To specify the switch port you want to configure, enter the following command:

```
hostname(config)# interface ethernet0/port
```

Where *port* is 0 through 7. For example, enter the following command:

```
hostname(config)# interface ethernet0/1
```

Step 2 To assign this switch port to a VLAN, enter the following command:

```
hostname(config-if)# switchport access vlan number
```

Where *number* is the VLAN ID, between 1 and 4090. See the "Configuring VLAN Interfaces" section on page 6-16 to configure the VLAN interface that you want to assign to this switch port. To view configured VLANs,

Note You might assign multiple switch ports to the primary or backup VLANs if the Internet access device includes Layer 2 redundancy.

Step 3 (Optional) To prevent the switch port from communicating with other protected switch ports on the same VLAN, enter the following command:

```
hostname(config-if)# switchport protected
```

You might want to prevent switch ports from communicating with each other if the devices on those switch ports are primarily accessed from other VLANs, you do not need to allow intra-VLAN access, and you want to isolate the devices from each other in case of infection or other security breach. For example, if you have a DMZ that hosts three web servers, you can isolate the web servers from each other if you apply the **switchport protected** command to each switch port. The inside and outside networks can both communicate with all three web servers, and vice versa, but the web servers cannot communicate with each other.

Step 4 (Optional) To set the speed, enter the following command:

```
hostname(config-if)# speed {auto | 10 | 100}
```

The **auto** setting is the default. If you set the speed to anything other than **auto** on PoE ports Ethernet 0/6 or 0/7, then Cisco IP phones and Cisco wireless access points that do not support IEEE 802.3af will not be detected and supplied with power.

Step 5 (Optional) To set the duplex, enter the following command:

```
hostname(config-if)# duplex {auto | full | half}
```

The **auto** setting is the default. If you set the duplex to anything other than **auto** on PoE ports Ethernet 0/6 or 0/7, then Cisco IP phones and Cisco wireless access points that do not support IEEE 802.3af will not be detected and supplied with power.

Step 6 To enable the switch port, enter the following command:

```
hostname(config-if)# no shutdown
```

To disable the switch port, enter the **shutdown** command.

Examples

The following example configures five VLAN interfaces, including the failover interface which is configured using the **failover lan** command:

```
hostname(config)# interface vlan 100
hostname(config-if)# nameif outside
hostname(config-if)# security-level 0
hostname(config-if)# ip address 10.1.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 200
hostname(config-if)# nameif inside
hostname(config-if)# security-level 100
hostname(config-if)# ip address 10.2.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 300
hostname(config-if)# nameif dmz
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.3.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 400
hostname(config-if)# nameif backup-isp
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.1.2.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# failover lan faillink vlan500
hostname(config)# failover interface ip faillink 10.4.1.1 255.255.255.0 standby 10.4.1.2
255.255.255.0

hostname(config)# interface ethernet 0/0
hostname(config-if)# switchport access vlan 100
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/1
hostname(config-if)# switchport access vlan 200
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/2
hostname(config-if)# switchport access vlan 300
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/3
hostname(config-if)# switchport access vlan 400
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/4
hostname(config-if)# switchport access vlan 500
hostname(config-if)# no shutdown
```

What to Do Next

If you want to configure a switch port as a trunk port, see the "Configuring and Enabling Switch Ports as Trunk Ports" section on page 6-19.

To complete the interface configuration, see the "Completing Interface Configuration (All Models)" section on page 6-22.

Configuring and Enabling Switch Ports as Trunk Ports

This procedure tells how to create a trunk port that can carry multiple VLANs using 802.1Q tagging. Trunk mode is available only with the Security Plus license.

To create an access port, where an interface is assigned to only one VLAN, see the "Configuring and Enabling Switch Ports as Access Ports" section on page 6-17.

For more information about ASA 5505 interfaces, see the "ASA 5505 Interfaces" section on page 6-2.

Detailed Steps

Step 1 To specify the switch port you want to configure, enter the following command:

```
hostname(config)# interface ethernet0/port
```

Where *port* is 0 through 7. For example, enter the following command:

```
hostname(config)# interface ethernet0/1
```

Step 2 To assign VLANs to this trunk, enter one or more of the following commands.

- To assign native VLANs, enter the following command:

  ```
  hostname(config-if)# switchport trunk native vlan vlan_id
  ```

  where the *vlan_id* is a single VLAN ID between 1 and 4090.

  Packets on the native VLAN are not modified when sent over the trunk. For example, if a port has VLANs 2, 3 and 4 assigned to it, and VLAN 2 is the native VLAN, then packets on VLAN 2 that egress the port are not modified with an 802.1Q header. Frames which ingress (enter) this port and have no 802.1Q header are put into VLAN 2.

  Each port can only have one native VLAN, but every port can have either the same or a different native VLAN.

- To assign VLANs, enter the following command:

  ```
  hostname(config-if)# switchport trunk allowed vlan vlan_range
  ```

  where the *vlan_range* (with VLANs between 1 and 4090) can be identified in one of the following ways:

  A single number (n)

  A range (n-x)

  Separate numbers and ranges by commas, for example:

  5,7-10,13,45-100

  You can enter spaces instead of commas, but the command is saved to the configuration with commas.

  You can include the native VLAN in this command, but it is not required; the native VLAN is passed whether it is included in this command or not.

This switch port cannot pass traffic until you assign at least one VLAN to it, native or non-native.

Step 3 To make this switch port a trunk port, enter the following command:

```
hostname(config-if)# switchport mode trunk
```

To restore this port to access mode, enter the **switchport mode access** command.

Step 4 (Optional) To prevent the switch port from communicating with other protected switch ports on the same VLAN, enter the following command:

```
hostname(config-if)# switchport protected
```

You might want to prevent switch ports from communicating with each other if the devices on those switch ports are primarily accessed from other VLANs, you do not need to allow intra-VLAN access, and you want to isolate the devices from each other in case of infection or other security breach. For example, if you have a DMZ that hosts three web servers, you can isolate the web servers from each other if you apply the **switchport protected** command to each switch port. The inside and outside networks can both communicate with all three web servers, and vice versa, but the web servers cannot communicate with each other.

Step 5 (Optional) To set the speed, enter the following command:

```
hostname(config-if)# speed {auto | 10 | 100}
```

The **auto** setting is the default.

Step 6 (Optional) To set the duplex, enter the following command:

```
hostname(config-if)# duplex {auto | full | half}
```

The **auto** setting is the default.

Step 7 To enable the switch port, enter the following command:

```
hostname(config-if)# no shutdown
```

To disable the switch port, enter the **shutdown** command.

Examples

The following example configures seven VLAN interfaces, including the failover interface which is configured using the **failover lan** command. VLANs 200, 201, and 202 are trunked on Ethernet 0/1.

```
hostname(config)# interface vlan 100
hostname(config-if)# nameif outside
hostname(config-if)# security-level 0
hostname(config-if)# ip address 10.1.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 200
hostname(config-if)# nameif inside
hostname(config-if)# security-level 100
hostname(config-if)# ip address 10.2.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 201
hostname(config-if)# nameif dept1
hostname(config-if)# security-level 90
hostname(config-if)# ip address 10.2.2.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 202
hostname(config-if)# nameif dept2
hostname(config-if)# security-level 90
hostname(config-if)# ip address 10.2.3.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 300
hostname(config-if)# nameif dmz
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.3.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 400
hostname(config-if)# nameif backup-isp
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.1.2.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# failover lan faillink vlan500
hostname(config)# failover interface ip faillink 10.4.1.1 255.255.255.0 standby 10.4.1.2
255.255.255.0

hostname(config)# interface ethernet 0/0
hostname(config-if)# switchport access vlan 100
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/1
hostname(config-if)# switchport mode trunk
hostname(config-if)# switchport trunk allowed vlan 200-202
hostname(config-if)# switchport trunk native vlan 5
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/2
hostname(config-if)# switchport access vlan 300
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/3
hostname(config-if)# switchport access vlan 400
hostname(config-if)# no shutdown

hostname(config-if)# interface ethernet 0/4
hostname(config-if)# switchport access vlan 500
hostname(config-if)# no shutdown
```

What to Do Next

To complete the interface configuration, see the "Completing Interface Configuration (All Models)" section on page 6-22.

Completing Interface Configuration (All Models)

This section includes tasks to complete the interface configuration for all models.

Note For multiple context mode, complete the tasks in this section in the context execution space. Enter the **changeto context** *name* command to change to the context you want to configure.

This section includes the following topics:

- Entering Interface Configuration Mode, page 6-23
- Configuring General Interface Parameters, page 6-24
- Configuring the MAC Address, page 6-26
- Configuring IPv6 Addressing, page 6-27

Task Flow for Completing Interface Configuration

Step 1 Complete the procedures in the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8 or the "Starting Interface Configuration (ASA 5505)" section on page 6-16.

Step 2 (Multiple context mode) Enter the **changeto context** *name* command to change to the context you want to configure.

Step 3 Enter interface configuration mode. See the "Entering Interface Configuration Mode" section on page 6-23.

Step 4 Configure general interface parameters, including the interface name, security level, and IPv4 address. See the "Configuring General Interface Parameters" section on page 6-24.

For transparent mode, you do not configure IP addressing per interface, except for the management-only interface (see the "Information About the Management Interface" section on page 6-24). You do need to configure the other parameters in this section, however. To set the global management address for transparent mode, see the "Configuring the IPv4 Address" section on page 8-9.

Step 5 (Optional) Configure the MAC address. See the "Configuring the MAC Address" section on page 6-26.

Step 6 (Optional) Configure IPv6 addressing. See the "Configuring IPv6 Addressing" section on page 6-27

For transparent mode, you do not configure IP addressing per interface, except for the management-only interface (see the "Information About the Management Interface" section on page 6-24). To set the global management address for transparent mode, see the "Configuring the IPv6 Address" section on page 8-9 .

Entering Interface Configuration Mode

The procedures in this section are performed in interface configuration mode.

Prerequisites

For multiple context mode, complete this procedure in the context execution space. Enter the **changeto context** *name* command to change to the context you want to configure.

Detailed Steps

If you are not already in interface configuration mode, enter the mode by using the **interface** command.

- For the ASA 5510 and higher:

```
hostname(config)# interface {{redundant number| physical_interface}[.subinterface] |
mapped_name}
hostname(config-if)#
```

The **redundant** *number* argument is the redundant interface ID, such as **redundant 1**.

See the "Enabling Jumbo Frame Support (ASA 5580 and 5585-X)" section for a description of the physical interface ID.

Append the *subinterface* ID to the physical or redundant interface ID separated by a period (.).

In multiple context mode, enter the *mapped_name* if one was assigned using the **allocate-interface** command.

- For the ASA 5505:

```
hostname(config)# interface vlan number
hostname(config-if)#
```

Configuring General Interface Parameters

This procedure describes how to set the name, security level, IPv4 address and other options.

For the ASA 5510 and higher, you must configure interface parameters for the following interface types:

- Physical interfaces
- VLAN subinterfaces
- Redundant interfaces

For the ASA 5505, you must configure interface parameters for the following interface types:

- VLAN interfaces

Guidelines and Limitations

- For the ASA 5550 ASA, for maximum throughput, be sure to balance your traffic over the two interface slots; for example, assign the inside interface to slot 1 and the outside interface to slot 0.
- For information about security levels, see the "Security Levels" section on page 6-5.
- If you are using failover, do not use this procedure to name interfaces that you are reserving for failover and Stateful Failover communications. See the "Configuring Active/Standby Failover" section on page 33-7 or the "Configuring Active/Active Failover" section on page 34-8 to configure the failover and state links.
- In routed firewall mode, set the IP address for all interfaces.
- In transparent firewall mode, do not set the IP address for each interface, but rather set it for the whole ASA or context. The exception is for the Management 0/0 or 0/1 management-only interface, which does not pass through traffic. To set the transparent firewall mode whole ASA or context management IP address, see the "Setting the Management IP Address for a Transparent Firewall" section on page 8-7. To set the IP address of the Management 0/0 or 0/1 interface or subinterface, use this procedure.

Restrictions

PPPoE is not supported in multiple context mode or transparent firewall mode.

Information About the Management Interface

The ASA 5510 and higher ASA includes a dedicated management interface called Management 0/0 or Management 0/1, depending on your model, which is meant to support traffic to the ASA. However, you can configure any interface to be a management-only interface. Also, for Management 0/0 or 0/1, you can disable management-only mode so the interface can pass through traffic just like any other interface.

Transparent firewall mode allows only two interfaces to pass through traffic; however, on the ASA 5510 and higher ASA, you can use the Management 0/0 or 0/1 interface (either the physical interface or a subinterface) as a third interface for management traffic. The mode is not configurable in this case and must always be management-only.

Prerequisites

- Complete the procedures in the "Starting Interface Configuration (ASA 5510 and Higher)" section on page 6-8 or the "Starting Interface Configuration (ASA 5505)" section on page 6-16.
- In multiple context mode, complete this procedure in the context execution space. To change from the system to a context configuration, enter the **changeto context** *name* command.
- Enter interface configuration mode according to the "Entering Interface Configuration Mode" section on page 6-23.

Detailed Steps

Step 1 To name the interface, enter the following command:

```
hostname(config-if)# nameif name
```

The *name* is a text string up to 48 characters, and is not case-sensitive. You can change the name by reentering this command with a new value. Do not enter the **no** form, because that command causes all commands that refer to that name to be deleted.

Step 2 To set the security level, enter the following command:

```
hostname(config-if)# security-level number
```

Where *number* is an integer between 0 (lowest) and 100 (highest).

Step 3 To set the IP address, enter one of the following commands.

Note For use with failover, you must set the IP address and standby address manually; DHCP and PPPoE are not supported.

In transparent firewall mode, do not set the IP address for each interface, but rather set it for the whole ASA or context. The exception is for the Management 0/0 or 0/1 management-only interface, which does not pass through traffic.

- To set the IP address manually, enter the following command:

  ```
  hostname(config-if)# ip address ip_address [mask] [standby ip_address]
  ```

  where the *ip_address* and *mask* arguments set the interface IP address and subnet mask.

  The **standby** *ip_address* argument is used for failover. See the "Configuring Active/Standby Failover" section on page 33-7 or the "Configuring Active/Active Failover" section on page 34-8 for more information.

- To obtain an IP address from a DHCP server, enter the following command:

  ```
  hostname(config-if)# ip address dhcp [setroute]
  ```

  where the **setroute** keyword lets the ASA use the default route supplied by the DHCP server.

  Reenter this command to reset the DHCP lease and request a new lease.

  If you do not enable the interface using the **no shutdown** command before you enter the **ip address dhcp** command, some DHCP requests might not be sent.

- To obtain an IP address from a PPPoE server, see Chapter 69, "Configuring the PPPoE Client."

  PPPoE is not supported in multiple context mode.

Step 4 (Optional) To set an interface to management-only mode so that it does not pass through traffic, enter the following command:

```
hostname(config-if)# management-only
```

See the "Information About the Management Interface" section on page 6-24 for more information.

What to Do Next

- (Optional) Configure the MAC address. See the "Configuring the MAC Address" section on page 6-26.
- (Optional) Configure IPv6 addressing. See the "Configuring IPv6 Addressing" section on page 6-27

Configuring the MAC Address

This section describes how to configure MAC addresses for interfaces.

Information About MAC Addresses

By default, the physical interface uses the burned-in MAC address, and all subinterfaces of a physical interface use the same burned-in MAC address. A redundant interface uses the MAC address of the first physical interface that you add. If you change the order of the member interfaces in the configuration, then the MAC address changes to match the MAC address of the interface that is now listed first. If you assign a MAC address to the redundant interface using this command, then it is used regardless of the member interface MAC addresses.

In multiple context mode, if you share an interface between contexts, you can assign a unique MAC address to the interface in each context. This feature lets the ASA easily classify packets into the appropriate context. Using a shared interface without unique MAC addresses is possible, but has some limitations. See the "How the Security Appliance Classifies Packets" section on page 5-3 for more information. You can assign each MAC address manually, or you can automatically generate MAC addresses for shared interfaces in contexts. See the "Automatically Assigning MAC Addresses to Context Interfaces" section on page 5-20 to automatically generate MAC addresses. If you automatically generate MAC addresses, you can use this procedure to override the generated address.

For single context mode, or for interfaces that are not shared in multiple context mode, you might want to assign unique MAC addresses to subinterfaces. For example, your service provider might perform access control based on the MAC address.

Prerequisites

Enter interface configuration mode according to the "Entering Interface Configuration Mode" section on page 6-23.

Detailed Steps

Command	Purpose

`mac-address mac_address [standby mac_address]`
Example:
`hostname(config-if)# mac-address 000C.F142.4CDE standby 000C.F142.4CDF`
	Assigns a private MAC address to this interface. The *mac_address* is in H.H.H format, where H is a 16-bit hexadecimal digit. For example, the MAC address 00-0C-F1-42-4C-DE is entered as 000C.F142.4CDE.
	The first two bytes of a manual MAC address cannot be A2 if you also want to use auto-generated MAC addresses.
	For use with failover, set the **standby** MAC address. If the active unit fails over and the standby unit becomes active, the new active unit starts using the active MAC addresses to minimize network disruption, while the old active unit uses the standby address.

What to Do Next

(Optional) Configure IPv6 addressing. See the "Configuring IPv6 Addressing" section on page 6-27

Configuring IPv6 Addressing

This section describes how to configure IPv6 addressing. For more information about IPv6, see the "Information About IPv6 Support" section on page 18-8 and the "IPv6 Addresses" section on page C-5 .

For transparent mode, use this section for the Management 0/0 or 0/1 interface. To configure the global IPv6 management address for transparent mode, see the "Configuring the IPv6 Address" section on page 8-9 .

Information About IPv6 Addressing

When you configure an IPv6 address on an interface, you can assign one or several IPv6 addresses to the interface at one time, such as an IPv6 link-local address and a global address. However, at a minimum, you must configure a link-local address.

Every IPv6-enabled interface must include at least one link-local address. When you configure a global address, a link-local addresses is automatically configured on the interface, so you do not also need to specifically configure a link-local address. These link-local addresses can only be used to communicate with other hosts on the same physical link.

Note If you want to only configure the link-local addresses, see the **ipv6 enable** (to auto-configure) or **ipv6 address link-local** (to manually configure) command in the *Cisco ASA 5500 Series Command Reference*.

When IPv6 is used over Ethernet networks, the Ethernet MAC address can be used to generate the 64-bit interface ID for the host. This is called the EUI-64 address. Because MAC addresses use 48 bits, additional bits must be inserted to fill the 64 bits required. The last 64 bits are used for the interface ID. For example, FE80::/10 is a link-local unicast IPv6 address type in hexadecimal format.

Information About Duplicate Address Detection

During the stateless autoconfiguration process, duplicate address detection (DAD) verifies the uniqueness of new unicast IPv6 addresses before the addresses are assigned to interfaces (the new addresses remain in a tentative state while duplicate address detection is performed). Duplicate address detection is performed first on the new link-local address. When the link local address is verified as unique, then duplicate address detection is performed all the other IPv6 unicast addresses on the interface.

Duplicate address detection is suspended on interfaces that are administratively down. While an interface is administratively down, the unicast IPv6 addresses assigned to the interface are set to a pending state. An interface returning to an administratively up state restarts duplicate address detection for all of the unicast IPv6 addresses on the interface.

When a duplicate address is identified, the state of the address is set to DUPLICATE, the address is not used, and the following error message is generated:

```
%PIX|ASA-4-325002: Duplicate address ipv6_address/MAC_address on interface
```

If the duplicate address is the link-local address of the interface, the processing of IPv6 packets is disabled on the interface. If the duplicate address is a global address, the address is not used. However, all configuration commands associated with the duplicate address remain as configured while the state of the address is set to DUPLICATE.

If the link-local address for an interface changes, duplicate address detection is performed on the new link-local address and all of the other IPv6 address associated with the interface are regenerated (duplicate address detection is performed only on the new link-local address).

The ASA uses neighbor solicitation messages to perform duplicate address detection. By default, the number of times an interface performs duplicate address detection is 1.

Information About Modified EUI-64 Interface IDs

RFC 3513: Internet Protocol Version 6 (IPv6) Addressing Architecture requires that the interface identifier portion of all unicast IPv6 addresses, except those that start with binary value 000, be 64 bits long and be constructed in Modified EUI-64 format. The ASA can enforce this requirement for hosts attached to the local link.

When this command is enabled on an interface, the source addresses of IPv6 packets received on that interface are verified against the source MAC addresses to ensure that the interface identifiers use the Modified EUI-64 format. If the IPv6 packets do not use the Modified EUI-64 format for the interface identifier, the packets are dropped and the following system log message is generated:

```
%PIX|ASA-3-325003: EUI-64 source address check failed.
```

The address format verification is only performed when a flow is created. Packets from an existing flow are not checked. Additionally, the address verification can only be performed for hosts on the local link. Packets received from hosts behind a router will fail the address format verification, and be dropped, because their source MAC address will be the router MAC address and not the host MAC address.

Prerequisites

Enter interface configuration mode according to the "Entering Interface Configuration Mode" section on page 6-23.

Restrictions

The ASA does not support IPv6 anycast addresses.

Detailed Steps

	Command	Purpose
Step 1	Do one of the following:	
	ipv6 address autoconfig **Example:** `hostname(config-if)# ipv6 address autoconfig`	Enables stateless autoconfiguration on the interface. Enabling stateless autoconfiguration on the interface configures IPv6 addresses based on prefixes received in Router Advertisement messages. A link-local address, based on the Modified EUI-64 interface ID, is automatically generated for the interface when stateless autoconfiguration is enabled.
	ipv6 address *ipv6-prefix/prefix-length* [**eui-64**] **Example:** `hostname(config-if)# ipv6 address 2001:0DB8::BA98:0:3210/48`	Assigns a global address to the interface. When you assign a global address, the link-local address is automatically created for the interface. Use the optional **eui-64** keyword to use the Modified EUI-64 interface ID in the low order 64 bits of the address. See the "IPv6 Addresses" section on page C-5 for more information about IPv6 addressing.
Step 2	(Optional) **ipv6 nd suppress-ra** **Example:** `hostname(config-if)# ipv6 nd suppress-ra`	Suppresses Router Advertisement messages on an interface. By default, Router Advertisement messages are automatically sent in response to router solicitation messages. You may want to disable these messages on any interface for which you do not want the ASA to supply the IPv6 prefix (for example, the outside interface).
Step 3	(Optional) **ipv6 nd dad attempts** *value* **Example:** `hostname(config-if)# ipv6 nd dad attempts 3`	Changes the number of duplicate address detection attempts. The *value* argument can be any value from 0 to 600. Setting the *value* argument to 0 disables duplicate address detection on the interface. By default, the number of times an interface performs duplicate address detection is 1. See the "Information About Duplicate Address Detection" section on page 6-28 for more information.
Step 4	(Optional) **ipv6 nd ns-interval** *value* **Example:** `hostname(config-if)# ipv6 nd ns-interval 2000`	Changes the neighbor solicitation message interval. When you configure an interface to send out more than one duplicate address detection attempt with the **ipv6 nd dad attempts** command, this command configures the interval at which the neighbor solicitation messages are sent out. By default, they are sent out once every 1000 milliseconds. The *value* argument can be from 1000 to 3600000 milliseconds. **Note** Changing this value changes it for all neighbor solicitation messages sent out on the interface, not just those used for duplicate address detection.
Step 5	(Optional) **ipv6 enforce-eui64** *if_name* **Example:** `hostname(config)# ipv6 enforce-eui64 inside`	Enforces the use of Modified EUI-64 format interface identifiers in IPv6 addresses on a local link. The *if_name* argument is the name of the interface, as specified by the **nameif** command, on which you are enabling the address format enforcement. See the "Information About Modified EUI-64 Interface IDs" section on page 6-28 for more information.

Allowing Same Security Level Communication

By default, interfaces on the same security level cannot communicate with each other, and packets cannot enter and exit the same interface. This section describes how to enable inter-interface communication when interfaces are on the same security level, and how to enable intra-interface communication.

Information About Inter-Interface Communication

Allowing interfaces on the same security level to communicate with each other provides the following benefits:

- You can configure more than 101 communicating interfaces.

  If you use different levels for each interface and do not assign any interfaces to the same security level, you can configure only one interface per level (0 to 100).
- You want traffic to flow freely between all same security interfaces without access lists.

If you enable same security interface communication, you can still configure interfaces at different security levels as usual.

Note If you enable NAT control, you do not need to configure NAT between same security level interfaces. See the "NAT and Same Security Level Interfaces" section on page 26-8 for more information on NAT and same security level interfaces.

Information About Intra-Interface Communication

Intra-interface communication might be useful for VPN traffic that enters an interface, but is then routed out the same interface. The VPN traffic might be unencrypted in this case, or it might be reencrypted for another VPN connection. For example, if you have a hub and spoke VPN network, where the security appliance is the hub, and remote VPN networks are spokes, for one spoke to communicate with another spoke, traffic must go into the security appliance and then out again to the other spoke.

Note All traffic allowed by this feature is still subject to firewall rules. Be careful not to create an asymmetric routing situation that can cause return traffic not to traverse the ASA.

Restrictions

Intra-interface communication is only available in routed firewall mode. Inter-interface communication is available for both routed and transparent mode.

Detailed Steps

To enable interfaces on the same security level so that they can communicate with each other, enter the following command:

```
hostname(config)# same-security-traffic permit inter-interface
```

(Routed mode only) To enable communication between hosts connected to the same interface, enter the following command:

```
hostname(config)# same-security-traffic permit intra-interface
```

To disable these settings, use the **no** form of the command.

Enabling Jumbo Frame Support (ASA 5580 and 5585-X)

A jumbo frame is an Ethernet packet larger than the standard maximum of 1518 bytes (including Layer 2 header and FCS), up to 9216 bytes. You can enable support for jumbo frames for all interfaces by increasing the amount of memory to process Ethernet frames. Assigning more memory for jumbo frames might limit the maximum use of other features, such as access lists.

Note Other platform models do not support jumbo frames.

Prerequisites

In multiple context mode, set this option in the system execution space.

Detailed Steps

To enable jumbo frame support for the ASA 5580 and 5585-X ASA, enter the following command:

```
hostname(config)# jumbo-frame reservation
```

To disable jumbo frames, use the **no** form of this command.

Note Changes in this setting require you to reboot the security appliance.

Be sure to set the MTU for each interface that needs to transmit jumbo frames to a higher value than the default 1500; for example, set the value to 9000 using the **mtu** command. In multiple context mode, set the MTU within each context.

Examples

The following example enables jumbo frame reservation, saves the configuration, and reloads the ASA:

```
hostname(config)# jumbo-frame reservation
WARNING: this command will take effect after the running-config is saved
and the system has been rebooted. Command accepted.

hostname(config)# write memory
Building configuration...
Cryptochecksum: 718e3706 4edb11ea 69af58d0 0a6b7cb5

70291 bytes copied in 3.710 secs (23430 bytes/sec)
[OK]
hostname(config)# reload
Proceed with reload? [confirm] Y
```

Monitoring Interfaces

To monitor interfaces, enter one of the following commands:

Command	Purpose
show interface	Displays interface statistics.
show interface ip brief	Displays interface IP addresses and status.

Configuration Examples for Interfaces

The following example configures parameters for the physical interface in single mode:

```
hostname(config)# interface gigabitethernet 0/1
hostname(config-if)# speed 1000
hostname(config-if)# duplex full
hostname(config-if)# nameif inside
hostname(config-if)# security-level 100
hostname(config-if)# ip address 10.1.1.1 255.255.255.0
hostname(config-if)# no shutdown
```

The following example configures parameters for a subinterface in single mode:

```
hostname(config)# interface gigabitethernet 0/1.1
hostname(config-subif)# vlan 101
hostname(config-subif)# nameif dmz1
hostname(config-subif)# security-level 50
hostname(config-subif)# ip address 10.1.2.1 255.255.255.0
hostname(config-subif)# mac-address 000C.F142.4CDE standby 020C.F142.4CDE
hostname(config-subif)# no shutdown
```

The following example configures interface parameters in multiple context mode for the system configuration, and allocates the gigabitethernet 0/1.1 subinterface to contextA:

```
hostname(config)# interface gigabitethernet 0/1
hostname(config-if)# speed 1000
hostname(config-if)# duplex full
hostname(config-if)# no shutdown
hostname(config-if)# interface gigabitethernet 0/1.1
hostname(config-subif)# vlan 101
hostname(config-subif)# no shutdown
hostname(config-subif)# context contextA
hostname(config-ctx)# ...
hostname(config-ctx)# allocate-interface gigabitethernet 0/1.1
```

The following example configures parameters in multiple context mode for the context configuration:

```
hostname/contextA(config)# interface gigabitethernet 0/1.1
hostname/contextA(config-if)# nameif inside
hostname/contextA(config-if)# security-level 100
hostname/contextA(config-if)# ip address 10.1.2.1 255.255.255.0
hostname/contextA(config-if)# mac-address 030C.F142.4CDE standby 040C.F142.4CDE
hostname/contextA(config-if)# no shutdown
```

The following example configures three VLAN interfaces for the Base license. The third home interface cannot forward traffic to the business interface.

```
hostname(config)# interface vlan 100
hostname(config-if)# nameif outside
hostname(config-if)# security-level 0
hostname(config-if)# ip address dhcp
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 200
hostname(config-if)# nameif business
hostname(config-if)# security-level 100
hostname(config-if)# ip address 10.1.1.1 255.255.255.0
hostname(config-if)# no shutdown

hostname(config-if)# interface vlan 300
hostname(config-if)# no forward interface vlan 200
hostname(config-if)# nameif home
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.2.1.1 255.255.255.0
hostname(config-if)# no shutdown
```

Feature History for Interfaces

Table 6-1 lists the release history for this feature.

Table 6-1 Feature History for Interfaces

Feature Name	Releases	Feature Information
Increased VLANs	7.0(5)	Increased the following limits: • ASA5510 Base license VLANs from 0 to 10. • ASA5510 Security Plus license VLANs from 10 to 25. • ASA5520 VLANs from 25 to 100. • ASA5540 VLANs from 100 to 200.
Increased interfaces for the Base license on the ASA 5510	7.2(2)	For the Base license on the ASA 5510, the maximum number of interfaces was increased from 3 plus a management interface to unlimited interfaces.
Increased VLANs	7.2(2)	The maximum number of VLANs for the Security Plus license on the ASA 5505 ASA was increased from 5 (3 fully functional; 1 failover; one restricted to a backup interface) to 20 fully functional interfaces. In addition, the number of trunk ports was increased from 1 to 8. Now there are 20 fully functional interfaces, you do not need to use the backup interface command to cripple a backup ISP interface; you can use a fully-functional interface for it. The backup interface command is still useful for an Easy VPN configuration. VLAN limits were also increased for the ASA 5510 ASA (from 10 to 50 for the Base license, and from 25 to 100 for the Security Plus license), the ASA 5520 ASA (from 100 to 150), the ASA 5550 ASA (from 200 to 250).

Table 6-1 Feature History for Interfaces (continued)

Feature Name	Releases	Feature Information
Gigabit Ethernet Support for the ASA 5510 Security Plus License	7.2(3)	The ASA 5510 ASA now supports GE (Gigabit Ethernet) for port 0 and 1 with the Security Plus license. If you upgrade the license from Base to Security Plus, the capacity of the external Ethernet0/0 and Ethernet0/1 ports increases from the original FE (Fast Ethernet) (100 Mbps) to GE (1000 Mbps). The interface names will remain Ethernet 0/0 and Ethernet 0/1. Use the **speed** command to change the speed on the interface and use the **show interface** command to see what speed is currently configured for each interface.
Native VLAN support for the ASA 5505	7.2(4)/8.0(4)	You can now include the native VLAN in an ASA 5505 trunk port using the **switchport trunk native vlan** command.
Gigabit Ethernet Support for the ASA 5510 Base License	7.2(4)/8.0(4)	The ASA 5510 ASA now supports GE (Gigabit Ethernet) for port 0 and 1 in the Base license (support was previously added for the Security Plus license). The capacity of the external Ethernet0/0 and Ethernet0/1 ports increases from the original FE (Fast Ethernet) (100 Mbps) to GE (1000 Mbps). The interface names will remain Ethernet 0/0 and Ethernet 0/1. Use the **speed** command to change the speed on the interface and use the **show interface** command to see what speed is currently configured for each interface.
Jumbo packet support for the ASA 5580	8.1(1)	The Cisco ASA 5580 supports jumbo frames when you enter the **jumbo-frame reservation** command. A jumbo frame is an Ethernet packet larger than the standard maximum of 1518 bytes (including Layer 2 header and FCS), up to 9216 bytes. You can enable support for jumbo frames for all interfaces by increasing the amount of memory to process Ethernet frames. Assigning more memory for jumbo frames might limit the maximum use of other features, such as access lists. In ASDM, see Configuration > Device Setup > Interfaces > Add/Edit Interface > Advanced.
Increased VLANs for the ASA 5580	8.1(2)	The number of VLANs supported on the ASA 5580 are increased from 100 to 250.
Support for Pause Frames for Flow Control on the ASA 5580 10 Gigabit Ethernet Interfaces	8.2(2)	You can now enable pause (XOFF) frames for flow control. This feature is also supported for the ASA 5585-X. The following command was introduced: flowcontrol.

CHAPTER 7

Configuring DHCP and Dynamic DNS Services

This chapter describes how to configure the DHCP server and dynamic DNS (DDNS) update methods.

This chapter includes the following topics:

- Configuring DHCP Services, page 7-1
- Configuring DDNS Services, page 7-7

Configuring DHCP Services

This section includes the following topics:

- Information about DHCP, page 7-1
- Licensing Requirements for DHCP, page 7-1
- Guidelines and Limitations, page 7-2
- Configuring a DHCP Server, page 7-2
- Configuring DHCP Relay Services, page 7-6

Information about DHCP

DHCP provides network configuration parameters, such as IP addresses, to DHCP clients. The ASA can provide a DHCP server or DHCP relay services to DHCP clients attached to ASA interfaces. The DHCP server provides network configuration parameters directly to DHCP clients. DHCP relay passes DHCP requests received on one interface to an external DHCP server located behind a different interface.

Licensing Requirements for DHCP

Table 7-1 lists the license requirements for DHCP.

Table 7-1 License Requirements

Model	**License Requirement**
All models	Base License.

For the Cisco ASA 5505 Adaptive Security Appliance, the maximum number of DHCP client addresses varies depending on the license:

- If the Host limit is 10 hosts, we limit the DHCP pool to 32 addresses.
- If the Host limit is 50 hosts, we limit the DHCP pool to 128 addresses.
- If the Host limit is unlimited, we limit the DHCP pool to 256 addresses.

Note By default the Cisco ASA 5505 Adaptive Security Appliance comes with a 10-user license.

Guidelines and Limitations

Use the following guidelines to configure the DHCP server:

- You can configure a DHCP server on each interface of the ASA. Each interface can have its own pool of addresses to draw from. However the other DHCP settings, such as DNS servers, domain name, options, ping timeout, and WINS servers, are configured globally and used by the DHCP server on all interfaces.
- You cannot configure a DHCP client or DHCP Relay services on an interface on which the server is enabled. Additionally, DHCP clients must be directly connected to the interface on which the server is enabled.
- The ASA does not support QIP DHCP servers for use with DHCP Proxy.
- When it receives a DHCP request, the security appliance sends a *discovery* message to the DHCP server. This message includes the IP address (within a subnetwork) configured with the **dhcp-network-scope** command in the group policy. If the server has an address pool that falls within that subnetwork, it sends the *offer* message with the pool information to the IP address—not to the source IP address of the discovery message.
- For example, if the server has a pool of the range 209.165.200.225 to 209.165.200.254, mask 255.255.255.0, and the IP address specified by the **dhcp-network-scope** command is 209.165.200.1, the server sends that pool in the offer message to the security appliance.
- You can add up to four DHCP relay servers per interface; however, there is a limit of ten DHCP relay servers total that can be configured on the ASA. You must add at least one **dhcprelay server** command to the ASA configuration before you can enter the **dhcprelay enable** command. You cannot configure a DHCP client on an interface that has a DHCP relay server configured

Configuring a DHCP Server

This section describes how to configure DHCP server provided by the ASA. This section includes the following topics:

- Enabling the DHCP Server, page 7-2
- Configuring DHCP Options, page 7-3
- Using Cisco IP Phones with a DHCP Server, page 7-5

Enabling the DHCP Server

The ASA can act as a DHCP server. DHCP is a protocol that supplies network settings to hosts including the host IP address, the default gateway, and a DNS server.

Note The ASA DHCP server does not support BOOTP requests. In multiple context mode, you cannot enable the DHCP server or DHCP relay on an interface that is used by more than one context.

To enable the DHCP server on a given ASA interface, perform the following steps:

Enter the following command to define the address pool:

	Command	Purpose
Step 1	`dhcpd address` *ip_address-ip_address interface_name* **Example:** `hostname(config)# dhcpd address 10.0.1.101-10.0.1.110 inside`	Create a DHCP address pool. The ASA assigns a client one of the addresses from this pool to use for a given length of time. These addresses are the local, untranslated addresses for the directly connected network. The address pool must be on the same subnet as the ASA interface.
Step 2	`dhcpd dns` *dns1* [*dns2*] **Example:** `hostname(config)# dhcpd dns 209.165.201.2 209.165.202.129`	(Optional) Specifies the IP address(es) of the DNS server(s).
Step 3	`dhcpd wins` *wins1* [*wins2*] **Example:** `hostname(config)# dhcpd wins 209.165.201.5`	(Optional) Specifies the IP address(es) of the WINS server(s). You can specify up to two WINS servers.
Step 4	`dhcpd lease` *lease_length* **Example:** `hostname(config)# dhcpd lease 3000`	(Optional) Change the lease length to be granted to the client. This lease equals the amount of time (in seconds) the client can use its allocated IP address before the lease expires. Enter a value between 0 to 1,048,575. The default value is 3600 seconds.
Step 5	`dhcpd domain` *domain_name* **Example:** `hostname(config)# dhcpd domain example.com`	(Optional) Configures the domain name.
Step 6	`dhcpd ping_timeout` *milliseconds*	(Optional) Configures the DHCP ping timeout value. To avoid address conflicts, the ASA sends two ICMP ping packets to an address before assigning that address to a DHCP client. This command specifies the timeout value for those packets.
Step 7	`dhcpd option 3 ip` *gateway_ip*	(Transparent Firewall Mode) Defines a default gateway that is sent to DHCP clients. If you do not use the DHCP option 3 to define the default gateway, DHCP clients use the IP address of the management interface. The management interface does not route traffic.
Step 8	`dhcpd enable` *interface_name*	Enables the DHCP daemon within the ASA to listen for DHCP client requests on the enabled interface

Configuring DHCP Options

You can configure the ASA to send information for the DHCP options listed in RFC 2132. The DHCP options fall into one of three categories:

The ASA supports all three categories of DHCP options. To configure a DHCP option, do one of the following:

Options that return an IP address

Command	Purpose
`dhcpd option code ip addr_1 [addr_2]`	Configures a DHCP option that returns one or two IP addresses.

Options that return a text string

Command	Purpose
`dhcpd option code ascii text`	Configures a DHCP option that returns one or two IP addresses.

Options that return a hexadecimal value

.

Command	Purpose
`dhcpd option code hex value`	Configures a DHCP option that returns a hexadecimal value.

Note The ASA does not verify that the option type and value that you provide match the expected type and value for the option code as defined in RFC 2132. For example, you can enter the **dhcpd option 46 ascii hello** command and the ASA accepts the configuration although option 46 is defined in RFC 2132 as expecting a single-digit, hexadecimal value. For more information about the option codes and their associated types and expected values, refer to RFC 2132.

Table 7-2 shows the DHCP options that are not supported by the **dhcpd option** command.

Table 7-2 Unsupported DHCP Options

Option Code	Description
0	DHCPOPT_PAD
1	HCPOPT_SUBNET_MASK
12	DHCPOPT_HOST_NAME
50	DHCPOPT_REQUESTED_ADDRESS
51	DHCPOPT_LEASE_TIME
52	DHCPOPT_OPTION_OVERLOAD
53	DHCPOPT_MESSAGE_TYPE
54	DHCPOPT_SERVER_IDENTIFIER
58	DHCPOPT_RENEWAL_TIME
59	DHCPOPT_REBINDING_TIME

Table 7-2 Unsupported DHCP Options

Option Code	**Description**
61	DHCPOPT_CLIENT_IDENTIFIER
67	DHCPOPT_BOOT_FILE_NAME
82	DHCPOPT_RELAY_INFORMATION
255	DHCPOPT_END

Specific options, DHCP option 3, 66, and 150, are used to configure Cisco IP Phones. See the "Using Cisco IP Phones with a DHCP Server" section on page 7-5 topic for more information about configuring those options.

Using Cisco IP Phones with a DHCP Server

Enterprises with small branch offices that implement a Cisco IP Telephony Voice over IP solution typically implement Cisco CallManager at a central office to control Cisco IP Phones at small branch offices. This implementation allows centralized call processing, reduces the equipment required, and eliminates the administration of additional Cisco CallManager and other servers at branch offices.

Cisco IP Phones download their configuration from a TFTP server. When a Cisco IP Phone starts, if it does not have both the IP address and TFTP server IP address preconfigured, it sends a request with option 150 or 66 to the DHCP server to obtain this information.

- DHCP option 150 provides the IP addresses of a list of TFTP servers.
- DHCP option 66 gives the IP address or the hostname of a single TFTP server.

Cisco IP Phones might also include DHCP option 3 in their requests, which sets the default route.

Cisco IP Phones might include both option 150 and 66 in a single request. In this case, the ASA DHCP server provides values for both options in the response if they are configured on the ASA.

You can configure the ASA to send information for most options listed in RFC 2132. The following example shows the syntax for any option number, as well as the syntax for commonly-used options 66, 150, and 3:

Command	**Purpose**
`dhcpd option` *number value*	Provides information for DHCP requests that include an option number as specified in RFC-2132

Command	**Purpose**
`dhcpd option 66 ascii` *server_name*	Provides the IP address or name of a TFTP server for option 66

Command	**Purpose**
`dhcpd option 150 ip` *server_ip1* [*server_ip2*]	Provides the IP address or names of one or two TFTP servers for option 150

The *server_ip1* is the IP address or name of the primary TFTP server while *server_ip2* is the IP address or name of the secondary TFTP server. A maximum of two TFTP servers can be identified using option 150.

Command	Purpose
dhcpd option 3 ip *router_ip1*	Sets the default route

Configuring DHCP Relay Services

A DHCP relay agent allows the ASA to forward DHCP requests from clients to a router connected to a different interface.

The following restrictions apply to the use of the DHCP relay agent:

- The relay agent cannot be enabled if the DHCP server feature is also enabled.
- DHCP clients must be directly connected to the ASA and cannot send requests through another relay agent or a router.
- For multiple context mode, you cannot enable DHCP relay on an interface that is used by more than one context.
- DHCP Relay services are not available in transparent firewall mode. A ASA in transparent firewall mode only allows ARP traffic through; all other traffic requires an access list. To allow DHCP requests and replies through the ASA in transparent mode, you need to configure two access lists, one that allows DCHP requests from the inside interface to the outside, and one that allows the replies from the server in the other direction.
- When DHCP relay is enabled and more than one DHCP relay server is defined, the security appliance forwards client requests to each defined DHCP relay server. Replies from the servers are also forwarded to the client until the client DHCP relay binding is removed. The binding is removed when the security appliance receives any of the following DHCP messages: ACK, NACK, or decline.

Note You cannot enable DHCP Relay on an interface running DHCP Proxy. You must Remove VPN DHCP configuration first or you will see an error message. This error happens if both DHCP relay and DHCP proxy are enabled. Ensure that either DHCP relay or DHCP proxy are enabled, but not both.

To enable DHCP relay, perform the following steps:

	Command	Purpose
Step 1	**dhcprelay server** *ip_address if_name* **Example:** `hostname(config)# dhcprelay server 201.168.200.4`	Set the IP address of a DHCP server on a different interface from the DHCP client. You can use this command up to 4 times to identify up to 4 servers.
Step 2	**dhcprelay enable** *interface* **Example:** `hostname(config)# dhcprelay enable inside`	Enables DHCP relay on the interface connected to the clients.

	Command	Purpose
Step 3	**`dhcprelay timeout`** *`seconds`*	(Optional) Set the number of seconds allowed for relay address negotiation.

Step 4	**`dhcprelay setroute`** *`interface_name`*
	Example:
	`hostname(config)# dhcprelay setroute inside`
		(Optional) Change the first default router address in the packet sent from the DHCP server to the address of the ASA interface.
		This action allows the client to set its default route to point to the ASA even if the DHCP server specifies a different router.
		If there is no default router option in the packet, the ASA adds one containing the interface address.

Feature History for DHCP

Table 7-3 lists the release history for this feature.

Table 7-3 Feature History for DHCP

Feature Name	Releases	Feature Information
DHCP	7.0(1)	This feature was introduced.

Configuring DDNS Services

This section includes the following topics:

- Information about DDNS, page 7-7
- Licensing Requirements For DDNS, page 7-7
- Configuring DDNS, page 7-8
- Configuration Examples for DDNS, page 7-8
- Feature History for DDNS, page 7-11

Information about DDNS

DDNS update integrates DNS with DHCP. The two protocols are complementary: DHCP centralizes and automates IP address allocation; DDNS update automatically records the association between assigned addresses and hostnames at pre-defined intervals. DDNS allows frequently changing address-hostname associations to be updated frequently. Mobile hosts, for example, can then move freely on a network without user or administrator intervention. DDNS provides the necessary dynamic updating and synchronizing of the name to address and address to name mappings on the DNS server.

Licensing Requirements For DDNS

Table 7-4 lists the license requirements for DDNS.

Table 7-4 License Requirements

Model	License Requirement
All models	Base License.

Configuring DDNS

This section describes examples for configuring the ASA to support Dynamic DNS. DDNS update integrates DNS with DHCP. The two protocols are complementary—DHCP centralizes and automates IP address allocation, while dynamic DNS update automatically records the association between assigned addresses and hostnames. When you use DHCP and dynamic DNS update, this configures a host automatically for network access whenever it attaches to the IP network. You can locate and reach the host using its permanent, unique DNS hostname. Mobile hosts, for example, can move freely without user or administrator intervention.

DDNS provides address and domain name mappings so hosts can find each other even though their DHCP-assigned IP addresses change frequently. The DDNS name and address mappings are held on the DHCP server in two resource records: the A RR contains the name to IP address mapping while the PTR RR maps addresses to names. Of the two methods for performing DDNS updates—the IETF standard defined by RFC 2136 and a generic HTTP method—the ASA supports the IETF method in this release.

The two most common DDNS update configurations are:

- The DHCP client updates the A RR while the DHCP server updates PTR RR.
- The DHCP server updates both the A and PTR RRs.

In general, the DHCP server maintains DNS PTR RRs on behalf of clients. Clients may be configured to perform all desired DNS updates. The server may be configured to honor these updates or not. To update the PTR RR, the DHCP server must know the Fully Qualified Domain Name of the client. The client provides an FQDN to the server using a DHCP option called Client FQDN.

Configuration Examples for DDNS

The following examples present these common scenarios:

- Example 1: Client Updates Both A and PTR RRs for Static IP Addresses, page 7-8
- Example 2: Client Updates Both A and PTR RRs; DHCP Server Honors Client Update Request; FQDN Provided Through Configuration, page 7-9
- Example 3: Client Includes FQDN Option Instructing Server Not to Update Either RR; Server Overrides Client and Updates Both RRs., page 7-9
- Example 4: Client Asks Server To Perform Both Updates; Server Configured to Update PTR RR Only; Honors Client Request and Updates Both A and PTR RR, page 7-10
- Example 5: Client Updates A RR; Server Updates PTR RR, page 7-10

Example 1: Client Updates Both A and PTR RRs for Static IP Addresses

The following example configures the client to request that it update both A and PTR resource records for static IP addresses. To configure this example, perform the following steps:

Step 1 To define a DDNS update method called ddns-2 that requests that the client update both the A and PTR RRs, enter the following commands:

```
hostname(config)# ddns update method ddns-2
hostname(DDNS-update-method)# ddns both
```

Step 2 To associate the method ddns-2 with the eth1 interface, enter the following commands:

```
hostname(DDNS-update-method)# interface eth1
hostname(config-if)# ddns update ddns-2
hostname(config-if)# ddns update hostname asa.example.com
```

Step 3 To configure a static IP address for eth1, enter the following commands:

```
hostname(config-if)# ip address 10.0.0.40 255.255.255.0
```

Example 2: Client Updates Both A and PTR RRs; DHCP Server Honors Client Update Request; FQDN Provided Through Configuration

The following example configures 1) the DHCP client to request that it update both the A and PTR RRs, and 2) the DHCP server to honor the requests. To configure this example, perform the following steps:

Step 1 To configure the DHCP client to request that the DHCP server perform no updates, enter the following command:

```
hostname(config)# dhcp-client update dns server none
```

Step 2 To create a DDNS update method named ddns-2 on the DHCP client that requests that the client perform both A and PTR updates, enter the following commands:

```
hostname(config)# ddns update method ddns-2
hostname(DDNS-update-method)# ddns both
```

Step 3 To associate the method named ddns-2 with the ASA interface named Ethernet0, and enable DHCP on the interface, enter the following commands:

```
hostname(DDNS-update-method)# interface Ethernet0
hostname(if-config)# ddns update ddns-2
hostname(if-config)# ddns update hostname asa.example.com
hostname(if-config)# ip address dhcp
```

Step 4 To configure the DHCP server, enter the following command:

```
hostname(if-config)# dhcpd update dns
```

Example 3: Client Includes FQDN Option Instructing Server Not to Update Either RR; Server Overrides Client and Updates Both RRs.

The following example configures the DHCP client to include the FQDN option instructing the DHCP server not to update either the A or PTR updates. The example also configures the server to override the client request. As a result, the client backs off without performing any updates.

To configure this scenario, perform the following steps:

Step 1 To configure the update method named ddns-2 to request that it make both A and PTR RR updates, enter the following commands:

```
hostname(config)# ddns update method ddns-2
hostname(DDNS-update-method)# ddns both
```

Step 2 To assign the DDNS update method named ddns-2 on interface Ethernet0 and provide the client hostname (asa), enter the following commands:

```
hostname(DDNS-update-method)# interface Ethernet0
hostname(if-config)# ddns update ddns-2
hostname(if-config)# ddns update hostname asa.example.com
```

Step 3 To enable the DHCP client feature on the interface, enter the following commands:

```
hostname(if-config)# dhcp client update dns server none
hostname(if-config)# ip address dhcp
```

Step 4 To configure the DHCP server to override the client update requests, enter the following command:

```
hostname(if-config)# dhcpd update dns both override
```

Example 4: Client Asks Server To Perform Both Updates; Server Configured to Update PTR RR Only; Honors Client Request and Updates Both A and PTR RR

The following example configures the server to perform only PTR RR updates by default. However, the server honors the client request that it perform both A and PTR updates. The server also forms the FQDN by appending the domain name (example.com) to the hostname provided by the client (asa).

To configure this scenario, perform the following steps:

Step 1 To configure the DHCP client on interface Ethernet0, enter the following commands:

```
hostname(config)# interface Ethernet0
hostname(config-if)# dhcp client update dns both
hostname(config-if)# ddns update hostname asa
```

Step 2 To configure the DHCP server, enter the following commands:

```
hostname(config-if)# dhcpd update dns
hostname(config-if)# dhcpd domain example.com
```

Example 5: Client Updates A RR; Server Updates PTR RR

The following example configures the client to update the A resource record and the server to update the PTR records. Also, the client uses the domain name from the DHCP server to form the FQDN.

To configure this scenario, perform the following steps:

Step 1 To define the DDNS update method named ddns-2, enter the following commands:

```
hostname(config)# ddns update method ddns-2
hostname(DDNS-update-method)# ddns
```

Step 2 To configure the DHCP client for interface Ethernet0 and assign the update method to the interface, enter the following commands:

```
hostname(DDNS-update-method)# interface Ethernet0
hostname(config-if)# dhcp client update dns
hostname(config-if)# ddns update ddns-2
hostname(config-if)# ddns update hostname asa
```

Step 3 To configure the DHCP server, enter the following commands:

```
hostname(config-if)# dhcpd update dns
hostname(config-if)# dhcpd domain example.com
```

Feature History for DDNS

Table 7-5 lists the release history for this feature.

Table 7-5 Feature History for DDNS

Feature Name	Releases	Feature Information
DHCP	7.0(1)	This feature was introduced.
DDNS	7.0(1)	This feature was introduced.

CHAPTER 8

Configuring Basic Settings

This chapter describes how to configure basic settings on your ASA that are typically required for a functioning configuration. This chapter includes the following sections:

- Changing the Login Password, page 8-1
- Changing the Enable Password, page 8-2
- Setting the Hostname, page 8-2
- Setting the Domain Name, page 8-3
- Setting the Date and Time, page 8-3
- Configuring the DNS Server, page 8-6
- Setting the Management IP Address for a Transparent Firewall, page 8-7

Changing the Login Password

The login password is used for Telnet and SSH connections. By default, the login password is "cisco." To change the password, enter the following command:

Command	Purpose
`{passwd	password} password`	Changes the password. You can enter **passwd** or **password**. The password is a case-sensitive password of up to 16 alphanumeric and special characters. You can use any character in the password except a question mark or a space. The password is saved in the configuration in encrypted form, so you cannot view the original password after you enter it. Use the **no password** command to restore the password to the default setting.

Changing the Enable Password

The enable password lets you enter privileged EXEC mode. By default, the enable password is blank. To change the enable password, enter the following command:

Command	Purpose
`enable password` *password*	Changes the enable password. The *password* is a case-sensitive password of up to 16 alphanumeric and special characters. You can use any character in the password except a question mark or a space. This command changes the password for the highest privilege level. If you configure local command authorization, you can set enable passwords for each privilege level from 0 to 15. The password is saved in the configuration in encrypted form, so you cannot view the original password after you enter it. Enter the **enable password** command without a password to set the password to the default, which is blank.

Setting the Hostname

When you set a hostname for the ASA, that name appears in the command line prompt. If you establish sessions to multiple devices, the hostname helps you keep track of where you enter commands. The default hostname depends on your platform.

For multiple context mode, the hostname that you set in the system execution space appears in the command line prompt for all contexts. The hostname that you optionally set within a context does not appear in the command line, but can be used by the **banner** command **$(hostname)** token.

Command	Purpose

`hostname` *name*
Example:
`hostname(config)# hostname farscape`
`farscape(config)#`
	Specifies the hostname for the ASA or for a context.
	This name can be up to 63 characters. A hostname must start and end with a letter or digit, and have as interior characters only letters, digits, or a hyphen.

Setting the Domain Name

The ASA appends the domain name as a suffix to unqualified names. For example, if you set the domain name to "example.com," and specify a syslog server by the unqualified name of "jupiter," then the security appliance qualifies the name to "jupiter.example.com."

The default domain name is default.domain.invalid.

For multiple context mode, you can set the domain name for each context, as well as within the system execution space.

Command	Purpose
`domain-name` *name* **Example:** `hostname(config)# domain-name example.com`	Specifies the domain name for the ASA. For example, to set the domain as example.com.

Setting the Date and Time

This section describes how to set the date and time, either manually or dynamically using an NTP server. Time derived from an NTP server overrides any time set manually. This section also describes how to set the time zone and daylight saving time date range.

Note In multiple context mode, set the time in the system configuration only.

This section includes the following topics:

- Setting the Time Zone and Daylight Saving Time Date Range, page 8-4
- Setting the Date and Time Using an NTP Server, page 8-5
- Setting the Date and Time Manually, page 8-6

Setting the Time Zone and Daylight Saving Time Date Range

By default, the time zone is UTC and the daylight saving time date range is from 2:00 a.m. on the first Sunday in April to 2:00 a.m. on the last Sunday in October. To change the time zone and daylight saving time date range, perform the following steps:

	Command	Purpose
Step 1	**clock timezone** *zone* [-]*hours* [*minutes*]	Sets the time zone. Where *zone* specifies the time zone as a string, for example, **PST** for Pacific Standard Time. The [**-**]*hours* value sets the number of hours of offset from UTC. For example, PST is **-8** hours. The *minutes* value sets the number of minutes of offset from UTC.
Step 2	Do one of the following to change the date range for daylight saving time from the default, enter one of the following commands. The default recurring date range is from 2:00 a.m. on the second Sunday in March to 2:00 a.m. on the first Sunday in November:	
	clock summer-time *zone* **date** {*day month* | *month day*} *year hh***:***mm* {*day month* | *month day*} *year hh***:***mm* [*offset*]	Sets the start and end dates for daylight saving time as a specific date in a specific year. If you use this command, you need to reset the dates every year. The *zone* value specifies the time zone as a string, for example, **PDT** for Pacific Daylight Time. The *day* value sets the day of the month, from 1 to 31. You can enter the day and month as **April 1** or as **1 April**, for example, depending on your standard date format. The *month* value sets the month as a string. You can enter the day and month as **April 1** or as **1 April**, for example, depending on your standard date format. The *year* value sets the year using four digits, for example, **2004**. The year range is 1993 to 2035. The *hh:mm* value sets the hour and minutes in 24-hour time. The *offset* value sets the number of minutes to change the time for daylight saving time. By default, the value is 60 minutes.
	clock summer-time *zone* **recurring** [*week weekday month hh***:***mm week weekday month hh***:***mm*] [*offset*]	Specifies the start and end dates for daylight saving time, in the form of a day and time of the month, and not a specific date in a year. This command lets you set a recurring date range that you do not need to alter yearly. The *zone* value specifies the time zone as a string, for example, **PDT** for Pacific Daylight Time. The *week* value specifies the week of the month as an integer between 1 and 4 or as the words **first** or **last**. For example, if the day might fall in the partial fifth week, then specify **last**. The *weekday* value specifies the day of the week: **Monday**, **Tuesday**, **Wednesday**, and so on. The *month* value sets the month as a string. The *hh:mm* value sets the hour and minutes in 24-hour time. The *offset* value sets the number of minutes to change the time for daylight saving time. By default, the value is 60 minutes.

Setting the Date and Time Using an NTP Server

To obtain the date and time from an NTP server, perform the following steps:S

	Command	Purpose
Step 1	`ntp authenticate`	Enables authentication with an NTP server.
Step 2	**`ntp trusted-key`** *`key_id`*	Specifies an authentication key ID to be a trusted key, which is required for authentication with an NTP server. Where the *key_id* is between 1 and 4294967295. You can enter multiple trusted keys for use with multiple servers.
Step 3	**`ntp authentication-key`** *`key_id`* **`md5`** *`key`*	Sets a key to authenticate with an NTP server. Where *key_id* is the ID you set in Step 2 using the **ntp trusted-key** command, and key is a string up to 32 characters in length.
Step 4	**`ntp server`** *`ip_address`* `[`**`key`** *`key_id`*`] [source interface_name] [`**`prefer`**`]`	Identifies an NTP server. Where the *key_id* is the ID you set in Step 2 using the **ntp trusted-key** command. The **source** *interface_name* identifies the outgoing interface for NTP packets if you do not want to use the default interface in the routing table. Because the system does not include any interfaces in multiple context mode, specify an interface name defined in the admin context. The **prefer** keyword sets this NTP server as the preferred server if multiple servers have similar accuracy. NTP uses an algorithm to determine which server is the most accurate and synchronizes to that one. If servers are of similar accuracy, then the **prefer** keyword specifies which of those servers to use. However, if a server is significantly more accurate than the preferred one, the ASA uses the more accurate one. For example, the ASA uses a server of stratum 2 over a server of stratum 3 that is preferred. You can identify multiple servers; the ASA uses the most accurate server.

Setting the Date and Time Manually

Command	Purpose
clock set *hh***:***mm***:***ss* {*month day* | *day month*} *year*	Sets the date time manually. Where *hh***:***mm***:***ss* sets the hour, minutes, and seconds in 24-hour time. For example, set **20:54:00** for 8:54 pm. The *day* value sets the day of the month, from 1 to 31. You can enter the day and month as **april 1** or as **1 april**, for example, depending on your standard date format. The *month* value sets the month. Depending on your standard date format, you can enter the day and month as **april 1** or as **1 april**. The *year* value sets the year using four digits, for example, **2004**. The year range is 1993 to 2035. The default time zone is UTC. If you change the time zone after you enter the **clock set** command using the **clock timezone** command, the time automatically adjusts to the new time zone. This command sets the time in the hardware chip, and does not save the time in the configuration file. This time endures reboots. Unlike the other **clock** commands, this command is a privileged EXEC command. To reset the clock, you need to set a new time for the **clock set** command.

Configuring the DNS Server

Some ASA features require use of a DNS server to access external servers by domain name; for example, the Botnet Traffic Filter feature requires a DNS server to access the dynamic database server and to resolve entries in the static database. Other features, such as the **ping** or **traceroute** command, let you enter a name that you want to PING for traceroute, and the ASA can resolve the name by communicating with a DNS server. Many SSL VPN and certificate commands also support names.

Note The ASA has limited support for using the DNS server, depending on the feature. For example, most commands require you to enter an IP address and can only use a name when you manually configure the **name** command to associate a name with an IP address and enable use of the names using the **names** command.

For information about dynamic DNS, see the "Configuring DDNS" section on page 7-8.

Prerequisites

Make sure you configure the appropriate routing for any interface on which you enable DNS domain lookup so you can reach the DNS server. See the "Information About Routing" section on page 18-1 for more information about routing.

Detailed Steps

	Command	Purpose
Step 1	**dns domain-lookup** *interface_name* **Example:** `hostname(config)# dns domain-lookup inside`	Enables the ASA to send DNS requests to a DNS server to perform a name lookup for supported commands.
Step 2	**dns server-group DefaultDNS** **Example:** `hostname(config)# dns server-group DefaultDNS`	Specifies the DNS server group that the ASA uses for from-the-box requests. Other DNS server groups can be configured for VPN tunnel groups. See the **tunnel-group** command in the *Cisco ASA 5500 Series Command Reference* for more information.
Step 3	**name-server** *ip_address* [*ip_address2*] [...] [*ip_address6*] **Example:** `hostname(config-dns-server-group)# name-server 10.1.1.5 192.168.1.67 209.165.201.6`	Specifies one or more DNS servers. You can enter all 6 IP addresses in the same command, separated by spaces, or you can enter each command separately. The security appliance tries each DNS server in order until it receives a response.

Setting the Management IP Address for a Transparent Firewall

This section describes how to configure the management IP address for transparent firewall mode, and includes the following topics:

- Information About the Management IP Address, page 8-7
- Licensing Requirements for the Management IP Address for a Transparent Firewall, page 8-8
- Guidelines and Limitations, page 8-8
- Configuring the IPv4 Address, page 8-9
- Configuring the IPv6 Address, page 8-9
- Configuration Examples for the Management IP Address for a Transparent Firewall, page 8-10
- Feature History for the Management IP Address for a Transparent Firewall, page 8-10

Information About the Management IP Address

A transparent firewall does not participate in IP routing. The only IP configuration required for the ASA is to set the management IP address. This address is required because the ASA uses this address as the source address for traffic originating on the ASA, such as system messages or communications with AAA servers. You can also use this address for remote management access.

For IPv4 traffic, the management IP address is required to pass any traffic. For IPv6 traffic, you must, at a minimum, configure the link-local addresses to pass traffic, but a global management address is recommended for full functionality, including remote management and other management operations.

Note In addition to the management IP address for the device, you can configure an IP address for the Management 0/0 or 0/1 management-only interface. This IP address can be on a separate subnet from the main management IP address. See the "Configuring General Interface Parameters" section on page 6-24.

Although you do not configure IPv4 or global IPv6 addresses for other interfaces, you still need to configure the security level and interface name according to the "Configuring General Interface Parameters" section on page 6-24.

Licensing Requirements for the Management IP Address for a Transparent Firewall

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode. For multiple context mode, set the management IP address within each context.

Firewall Mode Guidelines

Supported in transparent firewall mode. For routed mode, set the IP address for each interface according to the "Configuring General Interface Parameters" section on page 6-24.

IPv6 Guidelines

- Supports IPv6.
- The following IPv6 address-related commands are not supported in transparent mode, because they require router capabilities:
  - **ipv6 address autoconfig**
  - **ipv6 nd suppress-ra**

  For a complete list of IPv6 commands that are not supported in transparent mode, see the "IPv6-Enabled Commands" section on page 18-9.
- No support for IPv6 anycast addresses.
- You can configure both IPv6 and IPv4 addresses.

Additional Guidelines and Limitations

- In addition to the management IP address for the device, you can configure an IP address for the Management 0/0 or 0/1 management-only interface. This IP address can be on a separate subnet from the main management IP address. See the "Configuring General Interface Parameters" section on page 6-24.
- Although you do not configure IP addresses for other interfaces, you still need to configure the security level and interface name according to the "Configuring General Interface Parameters" section on page 6-24.

Configuring the IPv4 Address

To set the management IPv4 address, enter the following command in global configuration mode:

Command	Purpose

`ip address ip_address [mask] [standby ip_address]`
Example:
`hostname(config)# ip address 10.1.1.1 255.255.255.0 standby 10.1.1.2`
	This address must be on the same subnet as the upstream and downstream routers. You cannot set the subnet to a host subnet (255.255.255.255). The **standby** keyword and address is used for failover. See the "Configuring Active/Standby Failover" section on page 33-7 or the "Configuring Active/Active Failover" section on page 34-8 for more information.

Configuring the IPv6 Address

When you configure a global address, a link-local addresses is automatically configured on each interface, so you do not also need to specifically configure a link-local address.

Note If you want to only configure the link-local addresses, see the **ipv6 enable** or **ipv6 address link-local** command in the *Cisco ASA 5500 Series Command Reference*.

To set the global management IPv6 address, enter the following command in global configuration mode:

Command	Purpose

`ipv6 address ipv6-prefix/prefix-length`
Example:
`hostname(config)# ipv6 address 2001:0DB8::BA98:0:3210/48`
	Assigns a global address. When you assign a global address, link-local addresses are automatically created for each interface.
	Note The **eui** keyword, which is available in routed mode, is not available in transparent mode. The EUI address ties the unicast address to the ASA interface MAC address; but because the transparent mode IP address is not tied to an interface, an interface MAC address cannot be used.
	See the "IPv6 Addresses" section on page C-5 for more information about IPv6 addressing.

Configuration Examples for the Management IP Address for a Transparent Firewall

The following example sets the IPv4 and IPv6 global management IP addresses, and configures the inside, outside, and management interfaces:

```
hostname(config)# ip address 10.1.1.1 255.255.255.0 standby 10.1.1.2
hostname(config)# ipv6 address 2001:0DB8::BA98:0:3210/48

hostname(config)# interface gigabitethernet 0/0
hostname(config-if)# nameif inside
hostname(config-if)# security-level 100
hostname(config-if)# no shutdown

hostname(config-if)# interface gigabitethernet 0/1
hostname(config-if)# nameif outside
hostname(config-if)# security-level 0
hostname(config-if)# no shutdown

hostname(config-if)# interface management 0/0
hostname(config-if)# nameif management
hostname(config-if)# security-level 50
hostname(config-if)# ip address 10.1.2.1 255.255.255.0
hostname(config-if)# ipv6 address 2001:0DB8::BA98:0:3211/48
hostname(config-if)# no shutdown
```

Feature History for the Management IP Address for a Transparent Firewall

Table 8-1 lists the release history for this feature.

Table 8-1 Feature History for Transparent Mode Management Address

Feature Name	Releases	Feature Information
IPv6 support	8.2(1)	IPv6 support was introduced for transparent firewall mode.

CHAPTER 9

Using Modular Policy Framework

This chapter describes how to use Modular Policy Framework to create security policies for multiple features, including TCP and general connection settings, inspections, IPS, CSC, and QoS. This chapter includes the following sections:

- Information About Modular Policy Framework, page 9-1
- Licensing Requirements for Modular Policy Framework, page 9-9
- Guidelines and Limitations, page 9-9
- Default Settings, page 9-10
- Configuring Modular Policy Framework, page 9-12
- Monitoring Modular Policy Framework, page 9-26
- Configuration Examples for Modular Policy Framework, page 9-26
- Feature History for Modular Policy Framework, page 9-30

Information About Modular Policy Framework

Modular Policy Framework provides a consistent and flexible way to configure ASA features. For example, you can use Modular Policy Framework to create a timeout configuration that is specific to a particular TCP application, as opposed to one that applies to all TCP applications. This section includes the following topics:

- Modular Policy Framework Supported Features, page 9-1
- Information About Configuring Modular Policy Framework, page 9-2
- Information About Inspection Policy Maps, page 9-4
- Information About Layer 3/4 Policy Maps, page 9-5

Modular Policy Framework Supported Features

Features can be applied to through traffic or to management traffic. This section includes the following topics:

- "Supported Features for Through Traffic" section on page 9-2
- "Supported Features for Management Traffic" section on page 9-2

Supported Features for Through Traffic

Table 9-1 lists the features supported by Modular Policy Framework.

Table 9-1 Modular Policy Framework Features

Feature	See:
Application inspection (multiple types)	• Chapter 40, "Getting Started With Application Layer Protocol Inspection." • Chapter 41, "Configuring Inspection of Basic Internet Protocols." • Chapter 43, "Configuring Inspection of Database and Directory Protocols." • Chapter 44, "Configuring Inspection for Management Application Protocols." • Chapter 42, "Configuring Inspection for Voice and Video Protocols."
CSC	Chapter 60, "Configuring the Content Security and Control Application on the CSC SSM."
IPS	Chapter 59, "Configuring the IPS Module."
NetFlow Secure Event Logging filtering	Chapter 75, "Configuring NetFlow Secure Event Logging (NSEL)."
QoS input and output policing	Chapter 55, "Configuring QoS."
QoS standard priority queue	Chapter 55, "Configuring QoS."
QoS traffic shaping, hierarchical priority queue	Chapter 55, "Configuring QoS."
TCP and UDP connection limits and timeouts, and TCP sequence number randomization	Chapter 53, "Configuring Connection Limits and Timeouts."
TCP normalization	Chapter 52, "Configuring TCP Normalization."
TCP state bypass	Chapter 51, "Configuring TCP State Bypass."

Supported Features for Management Traffic

Modular Policy Framework supports the following features for management traffic:

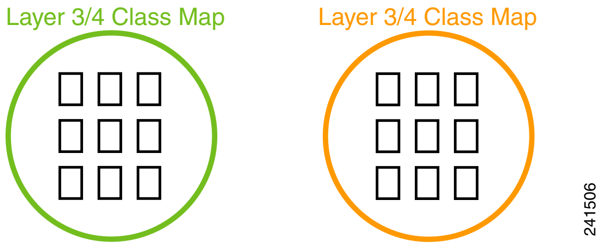
- Application inspection for RADIUS accounting traffic—See Chapter 44, "Configuring Inspection for Management Application Protocols."
- Connection limits—See Chapter 53, "Configuring Connection Limits and Timeouts."

Information About Configuring Modular Policy Framework

Configuring Modular Policy Framework consists of the following tasks:

1. **Identify the traffic** on which you want to perform Modular Policy Framework actions by creating Layer 3/4 class maps.

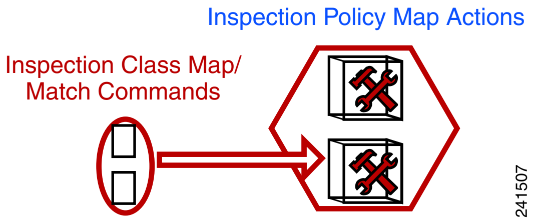
For example, you might want to perform actions on all traffic that passes through the ASA; or you might only want to perform certain actions on traffic from 10.1.1.0/24 to any destination address.



See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13.

2. If one of the actions you want to perform is application inspection, and you want to **perform additional actions on some inspection traffic**, then create an inspection policy map. The inspection policy map identifies the traffic and specifies what to do with it.

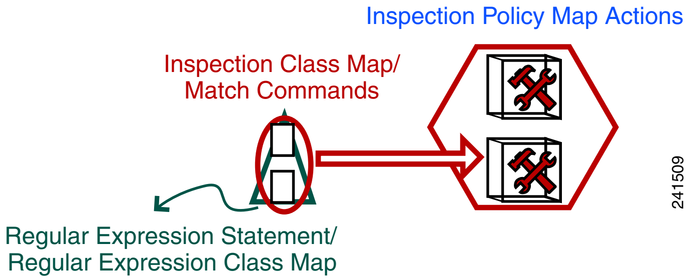
   For example, you might want to drop all HTTP requests with a body length greater than 1000 bytes.



   You can create a self-contained inspection policy map that identifies the traffic directly with **match** commands, or you can create an inspection class map for reuse or for more complicated matching. See the "Defining Actions in an Inspection Policy Map" section on page 9-17 and the "Identifying Traffic in an Inspection Class Map" section on page 9-19.

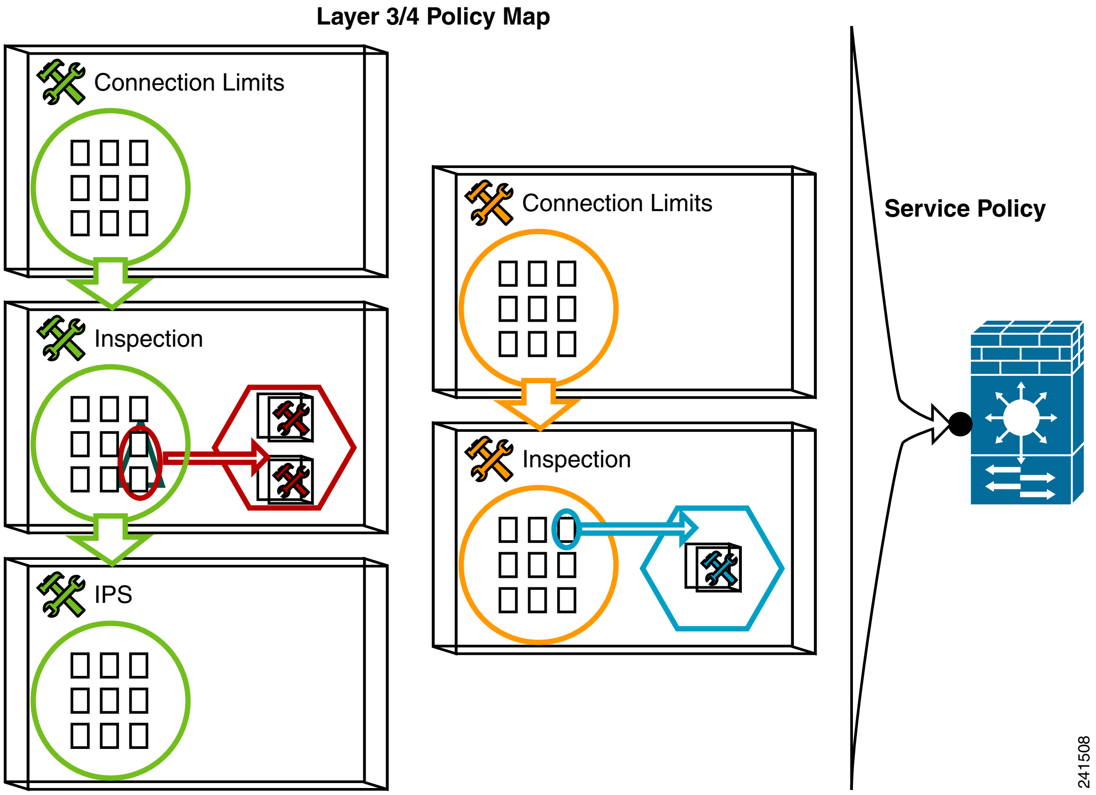
3. If you want to match text with a regular expression within inspected packets, you can **create a regular expression** or a group of regular expressions (a regular expression class map). Then, when you define the traffic to match for the inspection policy map, you can call on an existing regular expression.

   For example, you might want to drop all HTTP requests with a URL including the text "example.com."


Inspection Policy Map Actions
Inspection Class Map/
Match Commands
Regular Expression Statement/
Regular Expression Class Map
241509

   See the "Creating a Regular Expression" section on page 9-21 and the "Creating a Regular Expression Class Map" section on page 9-23.

4. **Define the actions you want to perform** on each Layer 3/4 class map by creating a Layer 3/4 policy map. Then, **determine on which interfaces you want to apply the policy map** using a service policy.



See the "Defining Actions (Layer 3/4 Policy Map)" section on page 9-24 and the "Applying Actions to an Interface (Service Policy)" section on page 9-25.

Information About Inspection Policy Maps

See the "Configuring Application Layer Protocol Inspection" section on page 40-6 for a list of applications that support inspection policy maps.

An inspection policy map consists of one or more of the following elements. The exact options available for an inspection policy map depends on the application.

- Traffic matching command—You can define a traffic matching command directly in the inspection policy map to match application traffic to criteria specific to the application, such as a URL string, for which you then enable actions.
  - Some traffic matching commands can specify regular expressions to match text inside a packet. Be sure to create and test the regular expressions before you configure the policy map, either singly or grouped together in a regular expression class map.
- Inspection class map—(Not available for all applications. See the CLI help for a list of supported applications.) An inspection class map includes traffic matching commands that match application traffic with criteria specific to the application, such as a URL string. You then identify the class map in the policy map and enable actions. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that you can create more complex match criteria and you can reuse class maps.

  - Some traffic matching commands can specify regular expressions to match text inside a packet. Be sure to create and test the regular expressions before you configure the policy map, either singly or grouped together in a regular expression class map.
- Parameters—Parameters affect the behavior of the inspection engine.

Information About Layer 3/4 Policy Maps

This section describes how Layer 3/4 policy maps work, and includes the following topics:

- Feature Directionality, page 9-5
- Feature Matching Within a Policy Map, page 9-6
- Order in Which Multiple Feature Actions are Applied, page 9-6
- Incompatibility of Certain Feature Actions, page 9-8
- Feature Matching for Multiple Policy Maps, page 9-8

Feature Directionality

Actions are applied to traffic bidirectionally or unidirectionally depending on the feature. For features that are applied bidirectionally, all traffic that enters or exits the interface to which you apply the policy map is affected if the traffic matches the class map for both directions.

Note When you use a global policy, all features are unidirectional; features that are normally bidirectional when applied to a single interface only apply to the ingress of each interface when applied globally. Because the policy is applied to all interfaces, the policy will be applied in both directions so bidirectionality in this case is redundant.

For features that are applied unidirectionally, for example QoS priority queue, only traffic that enters (or exits, depending on the feature) the interface to which you apply the policy map is affected. See Table 9-2 for the directionality of each feature.

Table 9-2 Feature Directionality

Feature	Single Interface Direction	Global Direction
Application inspection (multiple types)	Bidirectional	Ingress
CSC	Bidirectional	Ingress
IPS	Bidirectional	Ingress
NetFlow Secure Event Logging filtering	N/A	Ingress
QoS input policing	Ingress	Ingress
QoS output policing	Egress	Egress
QoS standard priority queue	Egress	Egress
QoS traffic shaping, hierarchical priority queue	Egress	Egress
TCP and UDP connection limits and timeouts, and TCP sequence number randomization	Bidirectional	Ingress

Table 9-2 Feature Directionality

Feature	Single Interface Direction	Global Direction
TCP normalization	Bidirectional	Ingress
TCP state bypass	Bidirectional	Ingress

Feature Matching Within a Policy Map

See the following information for how a packet matches class maps in a policy map:

1. A packet can match only one class map in the policy map for each feature type.
2. When the packet matches a class map for a feature type, the ASA does not attempt to match it to any subsequent class maps for that feature type.
3. If the packet matches a subsequent class map for a different feature type, however, then the ASA also applies the actions for the subsequent class map, if supported. See the "Incompatibility of Certain Feature Actions" section on page 9-8 for more information about unsupported combinations.

For example, if a packet matches a class map for connection limits, and also matches a class map for application inspection, then both class map actions are applied.

If a packet matches a class map for HTTP inspection, but also matches another class map that includes HTTP inspection, then the second class map actions are not applied.

Note Application inspection includes multiple inspection types, and each inspection type is a separate feature when you consider the matching guidelines above.

Order in Which Multiple Feature Actions are Applied

The order in which different types of actions in a policy map are performed is independent of the order in which the actions appear in the policy map.

Note NetFlow Secure Event Logging filtering is order-independent.

Actions are performed in the following order:

1. QoS input policing
2. TCP normalization, TCP and UDP connection limits and timeouts, TCP sequence number randomization, and TCP state bypass.

   Note When a the ASA performs a proxy service (such as AAA or CSC) or it modifies the TCP payload (such as FTP inspection), the TCP normalizer acts in dual mode, where it is applied before and after the proxy or payload modifying service.

3. CSC
4. Application inspection (multiple types)

The order of application inspections applied when a class of traffic is classified for multiple inspections is as follows. Only one inspection type can be applied to the same traffic. WAAS inspection is an exception, because it can be applied along with other inspections for the same traffic. See the "Incompatibility of Certain Feature Actions" section on page 9-8 for more information.

- **a.** CTIQBE
- **b.** DNS
- **c.** FTP
- **d.** GTP
- **e.** H323
- **f.** HTTP
- **g.** ICMP
- **h.** ICMP error
- **i.** ILS
- **j.** MGCP
- **k.** NetBIOS
- **l.** PPTP
- **m.** Sun RPC
- **n.** RSH
- **o.** RTSP
- **p.** SIP
- **q.** Skinny
- **r.** SMTP
- **s.** SNMP
- **t.** SQL*Net
- **u.** TFTP
- **v.** XDMCP
- **w.** DCERPC
- **x.** Instant Messaging

Note RADIUS accounting is not listed because it is the only inspection allowed on management traffic. WAAS is not listed because it can be configured along with other inspections for the same traffic.

5. IPS
6. QoS output policing
7. QoS standard priority queue
8. QoS traffic shaping, hierarchical priority queue

Incompatibility of Certain Feature Actions

Some features are not compatible with each other for the same traffic. For example, you cannot configure QoS priority queueing and QoS policing for the same set of traffic. Also, most inspections should not be combined with another inspection, so the ASA only applies one inspection if you configure multiple inspections for the same traffic. In this case, the feature that is applied is the higher priority feature in the list in the "Order in Which Multiple Feature Actions are Applied" section on page 9-6.

For information about compatibility of each feature, see the chapter or section for your feature.

Note The **match default-inspection-traffic** command, which is used in the default global policy, is a special CLI shortcut to match the default ports for all inspections. When used in a policy map, this class map ensures that the correct inspection is applied to each packet, based on the destination port of the traffic. For example, when UDP traffic for port 69 reaches the ASA, then the ASA applies the TFTP inspection; when TCP traffic for port 21 arrives, then the ASA applies the FTP inspection. So in this case only, you can configure multiple inspections for the same class map. Normally, the ASA does not use the port number to determine which inspection to apply, thus giving you the flexibility to apply inspections to non-standard ports, for example.

An example of a misconfiguration is if you configure multiple inspections in the same policy map and do not use the default-inspection-traffic shortcut. In Example 9-1, traffic destined to port 21 is mistakenly configured for both FTP and HTTP inspection. In Example 9-2, traffic destined to port 80 is mistakenly configured for both FTP and HTTP inspection. In both cases of misconfiguration examples, only the FTP inspection is applied, because FTP comes before HTTP in the order of inspections applied.

Example 9-1 Misconfiguration for FTP packets: HTTP Inspection Also Configured

```
class-map ftp
   match port tcp eq 21
class-map http
   match port tcp eq 21 [it should be 80]
policy-map test
   class ftp
     inspect ftp
   class http
     inspect http
```

Example 9-2 Misconfiguration for HTTP packets: FTP Inspection Also Configured

```
class-map ftp
   match port tcp eq 80 [it should be 21]
class-map http
   match port tcp eq 80
policy-map test
   class http
     inspect http
   class ftp
     inspect ftp
```

Feature Matching for Multiple Policy Maps

For TCP and UDP traffic (and ICMP when you enable stateful ICMP inspection), Modular Policy Framework operates on traffic flows, and not just individual packets. If traffic is part of an existing connection that matches a feature in a policy on one interface, that traffic flow cannot also match the same feature in a policy on another interface; only the first policy is used.

For example, if HTTP traffic matches a policy on the inside interface to inspect HTTP traffic, and you have a separate policy on the outside interface for HTTP inspection, then that traffic is not also inspected on the egress of the outside interface. Similarly, the return traffic for that connection will not be inspected by the ingress policy of the outside interface, nor by the egress policy of the inside interface.

For traffic that is not treated as a flow, for example ICMP when you do not enable stateful ICMP inspection, returning traffic can match a different policy map on the returning interface. For example, if you configure IPS on the inside and outside interfaces, but the inside policy uses virtual sensor 1 while the outside policy uses virtual sensor 2, then a non-stateful Ping will match virtual sensor 1 outbound, but will match virtual sensor 2 inbound.

Licensing Requirements for Modular Policy Framework

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

IPv6 Guidelines

Supports IPv6 for the following features:

- Application inspection for FTP, HTTP, ICMP, SIP, SMTP and IPSec-pass-thru
- IPS
- NetFlow Secure Event Logging filtering
- TCP and UDP connection limits and timeouts, TCP sequence number randomization
- TCP normalization
- TCP state bypass

Class Map Guidelines

The maximum number of class maps of all types is 255 in single mode or per context in multiple mode. Class maps include the following types:

- Layer 3/4 class maps (for through traffic and management traffic)
- Inspection class maps
- Regular expression class maps
- **match** commands used directly underneath an inspection policy map

This limit also includes default class maps of all types, limiting user-configured class maps to approximately 235. . See the "Default Class Maps" section on page 9-11.

Policy Map Guidelines

See the following guidelines for using policy maps:

- You can only assign one policy map per interface. (However you can create up to 64 policy maps in the configuration.)
- You can apply the same policy map to multiple interfaces.
- You can identify up to 63 Layer 3/4 class maps in a Layer 3/4 policy map.
- For each class map, you can assign multiple actions from one or more feature types, if supported. See the "Incompatibility of Certain Feature Actions" section on page 9-8.

Service Policy Guidelines

- Interface service policies take precedence over the global service policy for a given feature. For example, if you have a global policy with FTP inspection, and an interface policy with TCP normalization, then both FTP inspection and TCP normalization are applied to the interface. However, if you have a global policy with FTP inspection, and an interface policy with FTP inspection, then only the interface policy FTP inspection is applied to that interface.
- You can only apply one global policy. For example, you cannot create a global policy that includes feature set 1, and a separate global policy that includes feature set 2. All features must be included in a single policy.

Default Settings

The following topics describe the default settings for Modular Policy Framework:

- Default Configuration, page 9-10
- Default Class Maps, page 9-11
- Default Inspection Policy Maps, page 9-11

Default Configuration

By default, the configuration includes a policy that matches all default application inspection traffic and applies certain inspections to the traffic on all interfaces (a global policy). Not all inspections are enabled by default. You can only apply one global policy, so if you want to alter the global policy, you need to either edit the default policy or disable it and apply a new one. (An interface policy overrides the global policy for a particular feature.)

The default policy configuration includes the following commands:

```
class-map inspection_default
 match default-inspection-traffic
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect rsh
  inspect rtsp
  inspect esmtp
  inspect sqlnet
  inspect skinny
  inspect sunrpc
  inspect xdmcp
  inspect sip
  inspect netbios
  inspect tftp
service-policy global_policy global
```

Note See the "Incompatibility of Certain Feature Actions" section on page 9-8 for more information about the special **match default-inspection-traffic** command used in the default class map.

Default Class Maps

The configuration includes a default Layer 3/4 class map that the ASA uses in the default global policy. It is called **inspection_default** and matches the default inspection traffic:

```
class-map inspection_default
 match default-inspection-traffic
```

The **match default-inspection-traffic** command, which is used in the default global policy, is a special CLI shortcut to match the default ports for all inspections. When used in a policy map, this class map ensures that the correct inspection is applied to each packet, based on the destination port of the traffic. For example, when UDP traffic for port 69 reaches the ASA, then the ASA applies the TFTP inspection; when TCP traffic for port 21 arrives, then the ASA applies the FTP inspection. So in this case only, you can configure multiple inspections for the same class map. Normally, the ASA does not use the port number to determine which inspection to apply, thus giving you the flexibility to apply inspections to non-standard ports, for example.

Another class map that exists in the default configuration is called class-default, and it matches all traffic:

```
class-map class-default
 match any
```

This class map appears at the end of all Layer 3/4 policy maps and essentially tells the ASA to not perform any actions on all other traffic. You can use the class-default class map if desired, rather than making your own **match any** class map. In fact, some features are only available for class-default, such as QoS traffic shaping.

Default Inspection Policy Maps

The default inspection policy map configuration includes the following commands, which sets the maximum message length for DNS packets to be 512 bytes:

```
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum 512
```

Note There are other default inspection policy maps such as **policy-map type inspect esmtp _default_esmtp_map**. These default policy maps are created implicitly by the command **inspect** *protocol*. For example, **inspect esmtp** implicitly uses the policy map "_default_esmtp_map." All the default policy maps can be shown by using the **show running-config all policy-map** command.

Configuring Modular Policy Framework

This section describes how to configure your security polcy using Modular Policy Framework, and includes the following topics:

- Task Flow for Configuring Hierarchical Policy Maps, page 9-12
- Identifying Traffic (Layer 3/4 Class Map), page 9-13
- Configuring Special Actions for Application Inspections (Inspection Policy Map), page 9-16
- Defining Actions (Layer 3/4 Policy Map), page 9-24
- Applying Actions to an Interface (Service Policy), page 9-25

Task Flow for Configuring Hierarchical Policy Maps

If you enable QoS traffic shaping for a class map, then you can optionally enable priority queueing for a subset of shaped traffic. To do so, you need to create a policy map for the priority queueing, and then within the traffic shaping policy map, you can call the priority class map. Only the traffic shaping class map is applied to an interface.

See Chapter 55, "Information About QoS," for more information about this feature.

Hierarchical policy maps are only supported for traffic shaping and priority queueing.

To implement a hierarchical policy map, perform the following steps:

Step 1 Identify the prioritized traffic according to the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13.

You can create multiple class maps to be used in the hierarchical policy map.

Step 2 Create a policy map according to the "Defining Actions (Layer 3/4 Policy Map)" section on page 9-24, and identify the sole action for each class map as **priority**.

Step 3 Create a separate policy map according to the "Defining Actions (Layer 3/4 Policy Map)" section on page 9-24, and identify the **shape** action for the **class-default** class map.

Traffic shaping can only be applied the to **class-default** class map.

Step 4 For the same class map, identify the priority policy map that you created in Step 2 using the **service-policy** *priority_policy_map* command.

Step 5 Apply the shaping policy map to the interface accrding to "Applying Actions to an Interface (Service Policy)" section on page 9-25.

Identifying Traffic (Layer 3/4 Class Map)

A Layer 3/4 class map identifies Layer 3 and 4 traffic to which you want to apply actions. You can create multiple Layer 3/4 class maps for each Layer 3/4 policy map.

This section includes the following topics:

- Creating a Layer 3/4 Class Map for Through Traffic, page 9-13
- Creating a Layer 3/4 Class Map for Management Traffic, page 9-15

Creating a Layer 3/4 Class Map for Through Traffic

A Layer 3/4 class map matches traffic based on protocols, ports, IP addresses and other Layer 3 or 4 attributes.

Detailed Steps

Step 1 Create a Layer 3/4 class map by entering the following command:

```
hostname(config)# class-map class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is a string up to 40 characters in length. The name "class-default" is reserved. All types of class maps use the same name space, so you cannot reuse a name already used by another type of class map. The CLI enters class-map configuration mode.

Step 2 (Optional) Add a description to the class map by entering the following command:

```
hostname(config-cmap)# description string
```

Step 3 Define the traffic to include in the class by matching one of the following characteristics. Unless otherwise specified, you can include only one **match** command in the class map.

- Any traffic—The class map matches all traffic.

```
hostname(config-cmap)# match any
```

Note For features that support IPv6 (see the "Guidelines and Limitations" section on page 9-9), then the **match any** and **match default-inspection-traffic** commands are the only commands that match IPv6 traffic. For example, you cannot match an IPv6 access list.

- Access list—The class map matches traffic specified by an extended access list. If the ASA is operating in transparent firewall mode, you can use an EtherType access list.

```
hostname(config-cmap)# match access-list access_list_name
```

For more information about creating access lists, see Chapter 11, "Adding an Extended Access List," or Chapter 12, "Adding an EtherType Access List.".

For information about creating access lists with NAT, see the "IP Addresses Used for Access Lists When You Use NAT" section on page 10-3.

- TCP or UDP destination ports—The class map matches a single port or a contiguous range of ports.

```
hostname(config-cmap)# match port {tcp | udp} {eq port_num | range port_num port_num}
```

Tip For applications that use multiple, non-contiguous ports, use the **match access-list** command and define an ACE to match each port.

For a list of ports you can specify, see the "TCP and UDP Ports" section on page C-11.

For example, enter the following command to match TCP packets on port 80 (HTTP):

```
hostname(config-cmap)# match tcp eq 80
```

- Default traffic for inspection—The class map matches the default TCP and UDP ports used by all applications that the ASA can inspect.

```
hostname(config-cmap)# match default-inspection-traffic
```

This command, which is used in the default global policy, is a special CLI shortcut that when used in a policy map, ensures that the correct inspection is applied to each packet, based on the destination port of the traffic. For example, when UDP traffic for port 69 reaches the ASA, then the ASA applies the TFTP inspection; when TCP traffic for port 21 arrives, then the ASA applies the FTP inspection. So in this case only, you can configure multiple inspections for the same class map (with the exception of WAAS inspection, which can be configured with other inspections. See the "Incompatibility of Certain Feature Actions" section on page 9-8 for more information about combining actions). Normally, the ASA does not use the port number to determine the inspection applied, thus giving you the flexibility to apply inspections to non-standard ports, for example.

See the "Default Settings" section on page 40-4 for a list of default ports. Not all applications whose ports are included in the **match default-inspection-traffic** command are enabled by default in the policy map.

You can specify a **match access-list** command along with the **match default-inspection-traffic** command to narrow the matched traffic. Because the **match default-inspection-traffic** command specifies the ports and protocols to match, any ports and protocols in the access list are ignored.

Tip We suggest that you only inspect traffic on ports on which you expect application traffic; if you inspect all traffic, for example using **match any**, the ASA performance can be impacted.

Note For features that support IPv6 (see the "Guidelines and Limitations" section on page 9-9), then the **match any** and **match default-inspection-traffic** commands are the only commands that match IPv6 traffic. For example, you cannot match an IPv6 access list.

- DSCP value in an IP header—The class map matches up to eight DSCP values.

```
hostname(config-cmap)# match dscp value1 [value2] [...] [value8]
```

For example, enter the following:

```
hostname(config-cmap)# match dscp af43 cs1 ef
```

- Precedence—The class map matches up to four precedence values, represented by the TOS byte in the IP header.

```
hostname(config-cmap)# match precedence value1 [value2] [value3] [value4]
```

where *value1* through *value4* can be 0 to 7, corresponding to the possible precedences.

- RTP traffic—The class map matches RTP traffic.

```
hostname(config-cmap)# match rtp starting_port range
```

The *starting_port* specifies an even-numbered UDP destination port between 2000 and 65534. The *range* specifies the number of additional UDP ports to match above the *starting_port*, between 0 and 16383.

- Tunnel group traffic—The class map matches traffic for a tunnel group to which you want to apply QoS.

```
hostname(config-cmap)# match tunnel-group name
```

You can also specify one other **match** command to refine the traffic match. You can specify any of the preceding commands, except for the **match any**, **match access-list**, or **match default-inspection-traffic** commands. Or you can enter the following command to police each flow:

```
hostname(config-cmap)# match flow ip destination address
```

All traffic going to a unique IP destination address is considered a flow.

Examples

The following is an example for the **class-map** command:

```
hostname(config)# access-list udp permit udp any any
hostname(config)# access-list tcp permit tcp any any
hostname(config)# access-list host_foo permit ip any 10.1.1.1 255.255.255.255

hostname(config)# class-map all_udp
hostname(config-cmap)# description "This class-map matches all UDP traffic"
hostname(config-cmap)# match access-list udp

hostname(config-cmap)# class-map all_tcp
hostname(config-cmap)# description "This class-map matches all TCP traffic"
hostname(config-cmap)# match access-list tcp

hostname(config-cmap)# class-map all_http
hostname(config-cmap)# description "This class-map matches all HTTP traffic"
hostname(config-cmap)# match port tcp eq http

hostname(config-cmap)# class-map to_server
hostname(config-cmap)# description "This class-map matches all traffic to server 10.1.1.1"
hostname(config-cmap)# match access-list host_foo
```

Creating a Layer 3/4 Class Map for Management Traffic

For management traffic to the ASA, you might want to perform actions specific to this kind of traffic. You can specify a management class map that can match an access list or TCP or UDP ports. The types of actions available for a management class map in the policy map are specialized for management traffic. See the "Supported Features for Management Traffic" section on page 9-2.

Detailed Steps

Step 1 Create a class map by entering the following command:

```
hostname(config)# class-map type management class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is a string up to 40 characters in length. The name “class-default” is reserved. All types of class maps use the same name space, so you cannot reuse a name already used by another type of class map. The CLI enters class-map configuration mode.

Step 2 (Optional) Add a description to the class map by entering the following command:

```
hostname(config-cmap)# description string
```

Step 3 Define the traffic to include in the class by matching one of the following characteristics. You can include only one **match** command in the class map.

- Access list—The class map matches traffic specified by an extended access list. If the ASA is operating in transparent firewall mode, you can use an EtherType access list.

  ```
  hostname(config-cmap)# match access-list access_list_name
  ```

  For more information about creating access lists, see Chapter 11, “Adding an Extended Access List,” or Chapter 12, “Adding an EtherType Access List.”

  For information about creating access lists with NAT, see the “IP Addresses Used for Access Lists When You Use NAT” section on page 10-3.

- TCP or UDP destination ports—The class map matches a single port or a contiguous range of ports.

  ```
  hostname(config-cmap)# match port {tcp | udp} {eq port_num | range port_num port_num}
  ```

Tip For applications that use multiple, non-contiguous ports, use the **match access-list** command and define an ACE to match each port.

For a list of ports you can specify, see the “TCP and UDP Ports” section on page C-11.

For example, enter the following command to match TCP packets on port 80 (HTTP):

```
hostname(config-cmap)# match tcp eq 80
```

Configuring Special Actions for Application Inspections (Inspection Policy Map)

Modular Policy Framework lets you configure special actions for many application inspections. When you enable an inspection engine in the Layer 3/4 policy map, you can also optionally enable actions as defined in an *inspection policy map*. When the inspection policy map matches traffic within the Layer 3/4 class map for which you have defined an inspection action, then that subset of traffic will be acted upon as specified (for example, dropped or rate-limited).

This section includes the following topics:

- Defining Actions in an Inspection Policy Map, page 9-17
- Identifying Traffic in an Inspection Class Map, page 9-19
- Creating a Regular Expression, page 9-21
- Creating a Regular Expression Class Map, page 9-23

Defining Actions in an Inspection Policy Map

When you enable an inspection engine in the Layer 3/4 policy map, you can also optionally enable actions as defined in an inspection policy map.

Restrictions

You can specify multiple **class** or **match** commands in the policy map.

If a packet matches multiple different **match** or **class** commands, then the order in which the ASA applies the actions is determined by internal ASA rules, and not by the order they are added to the policy map. The internal rules are determined by the application type and the logical progression of parsing a packet, and are not user-configurable. For example for HTTP traffic, parsing a Request Method field precedes parsing the Header Host Length field; an action for the Request Method field occurs before the action for the Header Host Length field. For example, the following match commands can be entered in any order, but the **match request method get** command is matched first.

```
match request header host length gt 100
  reset
match request method get
  log
```

If an action drops a packet, then no further actions are performed in the inspection policy map. For example, if the first action is to reset the connection, then it will never match any further **match** or **class** commands. If the first action is to log the packet, then a second action, such as resetting the connection, can occur. (You can configure both the **reset** (or **drop-connection**, and so on.) and the **log** action for the same **match** or **class** command, in which case the packet is logged before it is reset for a given match.)

If a packet matches multiple **match** or **class** commands that are the same, then they are matched in the order they appear in the policy map. For example, for a packet with the header length of 1001, it will match the first command below, and be logged, and then will match the second command and be reset. If you reverse the order of the two **match** commands, then the packet will be dropped and the connection reset before it can match the second **match** command; it will never be logged.

```
match request header length gt 100
  log
match request header length gt 1000
  reset
```

A class map is determined to be the same type as another class map or **match** command based on the lowest priority **match** command in the class map (the priority is based on the internal rules). If a class map has the same type of lowest priority **match** command as another class map, then the class maps are matched according to the order they are added to the policy map. If the lowest priority command for each class map is different, then the class map with the higher priority **match** command is matched first. For example, the following three class maps contain two types of **match** commands: **match request-cmd** (higher priority) and **match filename** (lower priority). The ftp3 class map includes both commands, but it is ranked according to the lowest priority command, **match filename**. The ftp1 class map includes the highest priority command, so it is matched first, regardless of the order in the policy map. The ftp3 class map is ranked as being of the same priority as the ftp2 class map, which also contains the **match filename** command. They are matched according to the order in the policy map: ftp3 and then ftp2.

```
class-map type inspect ftp match-all ftp1
  match request-cmd get
class-map type inspect ftp match-all ftp2
  match filename regex abc
class-map type inspect ftp match-all ftp3
  match request-cmd get
  match filename regex abc
```

```
policy-map type inspect ftp ftp
  class ftp3
    log
  class ftp2
    log
  class ftp1
    log
```

Detailed Steps

Step 1 (Optional) Create an inspection class map according to the "Identifying Traffic in an Inspection Class Map" section on page 9-19. Alternatively, you can identify the traffic directly within the policy map.

Step 2 To create the inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect application policy_map_name
hostname(config-pmap)#
```

See the "Configuring Application Layer Protocol Inspection" section on page 40-6 for a list of applications that support inspection policy maps.

The *policy_map_name* argument is the name of the policy map up to 40 characters in length. All types of policy maps use the same name space, so you cannot reuse a name already used by another type of policy map. The CLI enters policy-map configuration mode.

Step 3 To apply actions to matching traffic, perform the following steps.

Note For information about including multiple **class** or **match** commands, see the "Restrictions" section on page 9-17.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the inspection class map that you created in the "Identifying Traffic in an Inspection Class Map" section on page 9-19 by entering the following command:

  ```
  hostname(config-pmap)# class class_map_name
  hostname(config-pmap-c)#
  ```

  Not all applications support inspection class maps.

- Specify traffic directly in the policy map using one of the **match** commands described for each application in the applicable inspection chapter. If you use a **match not** command, then any traffic that matches the criterion in the **match not** command does not have the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each application. Other actions specific to the application might also be available. See the appropriate inspection chapter for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

Step 4 To configure parameters that affect the inspection engine, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

The CLI enters parameters configuration mode. For the parameters available for each application, see the appropriate inspection chapter.

Examples

The following is an example of an HTTP inspection policy map and the related class maps. This policy map is activated by the Layer 3/4 policy map, which is enabled by the service policy.

```
hostname(config)# regex url_example example\.com
hostname(config)# regex url_example2 example2\.com
hostname(config)# class-map type regex match-any URLs
hostname(config-cmap)# match regex url_example
hostname(config-cmap)# match regex url_example2

hostname(config-cmap)# class-map type inspect http match-all http-traffic
hostname(config-cmap)# match req-resp content-type mismatch
hostname(config-cmap)# match request body length gt 1000
hostname(config-cmap)# match not request uri regex class URLs

hostname(config-cmap)# policy-map type inspect http http-map1
hostname(config-pmap)# class http-traffic
hostname(config-pmap-c)# drop-connection log
hostname(config-pmap-c)# match req-resp content-type mismatch
hostname(config-pmap-c)# reset log
hostname(config-pmap-c)# parameters
hostname(config-pmap-p)# protocol-violation action log

hostname(config-pmap-p)# policy-map test
hostname(config-pmap)# class test (a Layer 3/4 class map not shown)
hostname(config-pmap-c)# inspect http http-map1

hostname(config-pmap-c)# service-policy test interface outside
```

Identifying Traffic in an Inspection Class Map

This type of class map allows you to match criteria that is specific to an application. For example, for DNS traffic, you can match the domain name in a DNS query.

A class map groups multiple traffic matches (in a match-all class map), or lets you match any of a list of matches (in a match-any class map). The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you group multiple match commands, and you can reuse class maps. For the traffic that you identify in this class map, you can specify actions such as dropping, resetting, and/or logging the connection in the inspection policy map. If you want to perform different actions on different types of traffic, you should identify the traffic directly in the policy map.

Restrictions

Not all applications support inspection class maps. See the CLI help for **class-map type inspect** for a list of supported applications.

Detailed Steps

Step 1 (Optional) If you want to match based on a regular expression, see the "Creating a Regular Expression" section on page 9-21 and the "Creating a Regular Expression Class Map" section on page 9-23.

Step 2 Create a class map by entering the following command:

```
hostname(config)# class-map type inspect application [match-all | match-any]
class_map_name
hostname(config-cmap)#
```

Where the *application* is the application you want to inspect. For supported applications, see the CLI help for a list of supported applications or see Chapter 40, "Getting Started With Application Layer Protocol Inspection."

The *class_map_name* argument is the name of the class map up to 40 characters in length.

The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map.

The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria.

The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

Step 3 (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

Step 4 Define the traffic to include in the class by entering one or more **match** commands available for your application.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

To see the **match** commands available for each application, see the appropriate inspection chapter.

Examples

The following example creates an HTTP class map that must match all criteria:

```
hostname(config-cmap)# class-map type inspect http match-all http-traffic
hostname(config-cmap)# match req-resp content-type mismatch
hostname(config-cmap)# match request body length gt 1000
hostname(config-cmap)# match not request uri regex class URLs
```

The following example creates an HTTP class map that can match any of the criteria:

```
hostname(config-cmap)# class-map type inspect http match-any monitor-http
hostname(config-cmap)# match request method get
hostname(config-cmap)# match request method put
hostname(config-cmap)# match request method post
```

Creating a Regular Expression

A regular expression matches text strings either literally as an exact string, or by using *metacharacters* so you can match multiple variants of a text string. You can use a regular expression to match the content of certain application traffic; for example, you can match a URL string inside an HTTP packet.

Guidelines

Use **Ctrl+V** to escape all of the special characters in the CLI, such as question mark (?) or a tab. For example, type **d[Ctrl+V]?g** to enter **d?g** in the configuration.

See the **regex** command in the *Cisco ASA 5500 Series Command Reference* for performance impact information when matching a regular expression to packets.

Note As an optimization, the ASA searches on the deobfuscated URL. Deobfuscation compresses multiple forward slashes (/) into a single slash. For strings that commonly use double slashes, like “http://”, be sure to search for “http:/” instead.

Table 9-3 lists the metacharacters that have special meanings.

Table 9-3 regex Metacharacters

Character	Description	Notes
.	Dot	Matches any single character. For example, **d.g** matches dog, dag, dtg, and any word that contains those characters, such as doggonnit.
(*exp*)	Subexpression	A subexpression segregates characters from surrounding characters, so that you can use other metacharacters on the subexpression. For example, **d(o|a)g** matches dog and dag, but **do|ag** matches do and ag. A subexpression can also be used with repeat quantifiers to differentiate the characters meant for repetition. For example, **ab(xy){3}z** matches abxyxyxyz.
|	Alternation	Matches either expression it separates. For example, **dog|cat** matches dog or cat.
?	Question mark	A quantifier that indicates that there are 0 or 1 of the previous expression. For example, **lo?se** matches lse or lose. **Note** You must enter **Ctrl+V** and then the question mark or else the help function is invoked.
*	Asterisk	A quantifier that indicates that there are 0, 1 or any number of the previous expression. For example, **lo*se** matches lse, lose, loose, and so on.
+	Plus	A quantifier that indicates that there is at least 1 of the previous expression. For example, **lo+se** matches lose and loose, but not lse.
{*x*} or {*x*,}	Minimum repeat quantifier	Repeat at least *x* times. For example, **ab(xy){2,}z** matches abxyxyz, abxyxyxyz, and so on.

Table 9-3 regex Metacharacters (continued)

Character	Description	Notes
[*abc*]	Character class	Matches any character in the brackets. For example, **[abc]** matches a, b, or c.
[^*abc*]	Negated character class	Matches a single character that is not contained within the brackets. For example, **[^abc]** matches any character other than a, b, or c. **[^A-Z]** matches any single character that is not an uppercase letter.
[*a*-*c*]	Character range class	Matches any character in the range. **[a-z]** matches any lowercase letter. You can mix characters and ranges: **[abcq-z]** matches a, b, c, q, r, s, t, u, v, w, x, y, z, and so does [**a-cq-z**]. The dash (-) character is literal only if it is the last or the first character within the brackets: **[abc-]** or **[-abc]**.
""	Quotation marks	Preserves trailing or leading spaces in the string. For example, **" test"** preserves the leading space when it looks for a match.
^	Caret	Specifies the beginning of a line.
\	Escape character	When used with a metacharacter, matches a literal character. For example, **\[** matches the left square bracket.
char	Character	When character is not a metacharacter, matches the literal character.
\r	Carriage return	Matches a carriage return 0x0d.
\n	Newline	Matches a new line 0x0a.
\t	Tab	Matches a tab 0x09.
\f	Formfeed	Matches a form feed 0x0c.
\x*NN*	Escaped hexadecimal number	Matches an ASCII character using hexadecimal (exactly two digits).
\NNN	Escaped octal number	Matches an ASCII character as octal (exactly three digits). For example, the character 040 represents a space.

Detailed Steps

Step 1 To test a regular expression to make sure it matches what you think it will match, enter the following command:

```
hostname(config)# test regex input_text regular_expression
```

Where the *input_text* argument is a string you want to match using the regular expression, up to 201 characters in length.

The *regular_expression* argument can be up to 100 characters in length.

Use **Ctrl+V** to escape all of the special characters in the CLI. For example, to enter a tab in the input text in the **test regex** command, you must enter **test regex "test[Ctrl+V Tab]" "test\t"**.

If the regular expression matches the input text, you see the following message:

```
INFO: Regular expression match succeeded.
```

If the regular expression does not match the input text, you see the following message:

```
INFO: Regular expression match failed.
```

Step 2 To add a regular expression after you tested it, enter the following command:

```
hostname(config)# regex name regular_expression
```

Where the *name* argument can be up to 40 characters in length.

The *regular_expression* argument can be up to 100 characters in length.

Examples

The following example creates two regular expressions for use in an inspection policy map:

```
hostname(config)# regex url_example example\.com
hostname(config)# regex url_example2 example2\.com
```

Creating a Regular Expression Class Map

A regular expression class map identifies one or more regular expressions. You can use a regular expression class map to match the content of certain traffic; for example, you can match URL strings inside HTTP packets.

Detailed Steps

Step 1 Create one or more regular expressions according to the "Creating a Regular Expression" section.

Step 2 Create a class map by entering the following command:

```
hostname(config)# class-map type regex match-any class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is a string up to 40 characters in length. The name "class-default" is reserved. All types of class maps use the same name space, so you cannot reuse a name already used by another type of class map.

The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the regular expressions.

The CLI enters class-map configuration mode.

Step 3 (Optional) Add a description to the class map by entering the following command:

```
hostname(config-cmap)# description string
```

Step 4 Identify the regular expressions you want to include by entering the following command for each regular expression:

```
hostname(config-cmap)# match regex regex_name
```

Examples

The following example creates two regular expressions, and adds them to a regular expression class map. Traffic matches the class map if it includes the string "example.com" or "example2.com."

```
hostname(config)# regex url_example example\.com
hostname(config)# regex url_example2 example2\.com
hostname(config)# class-map type regex match-any URLs
hostname(config-cmap)# match regex url_example
hostname(config-cmap)# match regex url_example2
```

Defining Actions (Layer 3/4 Policy Map)

This section describes how to associate actions with Layer 3/4 class maps by creating a Layer 3/4 policy map.

Restrictions

The maximum number of policy maps is 64, but you can only apply one policy map per interface.

Detailed Steps

Step 1 Add the policy map by entering the following command:

```
hostname(config)# policy-map policy_map_name
```

The *policy_map_name* argument is the name of the policy map up to 40 characters in length. All types of policy maps use the same name space, so you cannot reuse a name already used by another type of policy map. The CLI enters policy-map configuration mode.

Step 2 (Optional) Specify a description for the policy map:

```
hostname(config-pmap)# description text
```

Step 3 Specify a previously configured Layer 3/4 class map using the following command:

```
hostname(config-pmap)# class class_map_name
```

where the *class_map_name* is the name of the class map you created earlier. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 to add a class map.

Step 4 Specify one or more actions for this class map. See the "Supported Features for Through Traffic" section on page 9-2.

Note If there is no **match default_inspection_traffic** command in a class map, then at most one **inspect** command is allowed to be configured under the class.

For QoS, you can configure a hierarchical policy map for the traffic shaping and priority queue features. See the "Task Flow for Configuring Hierarchical Policy Maps" section on page 9-12 for more information.

Step 5 Repeat Step 3 and Step 4 for each class map you want to include in this policy map.

Examples

The following is an example of a **policy-map** command for connection policy. It limits the number of connections allowed to the web server 10.1.1.1:

```
hostname(config)# access-list http-server permit tcp any host 10.1.1.1
hostname(config)# class-map http-server
hostname(config-cmap)# match access-list http-server

hostname(config)# policy-map global-policy
hostname(config-pmap)# description This policy map defines a policy concerning connection
to http server.
hostname(config-pmap)# class http-server
hostname(config-pmap-c)# set connection conn-max 256
```

The following example shows how multi-match works in a policy map:

```
hostname(config)# class-map inspection_default
hostname(config-cmap)# match default-inspection-traffic
hostname(config)# class-map http_traffic
hostname(config-cmap)# match port tcp eq 80

hostname(config)# policy-map outside_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect http http_map
hostname(config-pmap-c)# inspect sip
hostname(config-pmap)# class http_traffic
hostname(config-pmap-c)# set connection timeout tcp 0:10:0
```

The following example shows how traffic matches the first available class map, and will not match any subsequent class maps that specify actions in the same feature domain:

```
hostname(config)# class-map telnet_traffic
hostname(config-cmap)# match port tcp eq 23
hostname(config)# class-map ftp_traffic
hostname(config-cmap)# match port tcp eq 21
hostname(config)# class-map tcp_traffic
hostname(config-cmap)# match port tcp range 1 65535
hostname(config)# class-map udp_traffic
hostname(config-cmap)# match port udp range 0 65535
hostname(config)# policy-map global_policy
hostname(config-pmap)# class telnet_traffic
hostname(config-pmap-c)# set connection timeout tcp 0:0:0
hostname(config-pmap-c)# set connection conn-max 100
hostname(config-pmap)# class ftp_traffic
hostname(config-pmap-c)# set connection timeout tcp 0:5:0
hostname(config-pmap-c)# set connection conn-max 50
hostname(config-pmap)# class tcp_traffic
hostname(config-pmap-c)# set connection timeout tcp 2:0:0
hostname(config-pmap-c)# set connection conn-max 2000
```

When a Telnet connection is initiated, it matches **class telnet_traffic**. Similarly, if an FTP connection is initiated, it matches **class ftp_traffic**. For any TCP connection other than Telnet and FTP, it will match **class tcp_traffic**. Even though a Telnet or FTP connection can match **class tcp_traffic**, the ASA does not make this match because they previously matched other classes.

Applying Actions to an Interface (Service Policy)

To activate the Layer 3/4 policy map, create a service policy that applies it to one or more interfaces or that applies it globally to all interfaces.

Restrictions

You can only apply one global policy.

Detailed Steps

- To create a service policy by associating a policy map with an interface, enter the following command:

  ```
  hostname(config)# service-policy policy_map_name interface interface_name
  ```

- To create a service policy that applies to all interfaces that do not have a specific policy, enter the following command:

  ```
  hostname(config)# service-policy policy_map_name global
  ```

  By default, the configuration includes a global policy that matches all default application inspection traffic and applies inspection to the traffic globally. You can only apply one global policy, so if you want to alter the global policy, you need to either edit the default policy or disable it and apply a new one.

  The default service policy includes the following command:

  ```
  service-policy global_policy global
  ```

Examples

For example, the following command enables the inbound_policy policy map on the outside interface:

```
hostname(config)# service-policy inbound_policy interface outside
```

The following commands disable the default global policy, and enables a new one called new_global_policy on all other ASA interfaces:

```
hostname(config)# no service-policy global_policy global
hostname(config)# service-policy new_global_policy global
```

Monitoring Modular Policy Framework

To monitor Modular Policy Framework, enter the following command:

Command	Purpose
show service-policy	Displays the service policy statistics.

Configuration Examples for Modular Policy Framework

This section includes several Modular Policy Framework examples, and includes the following topics:

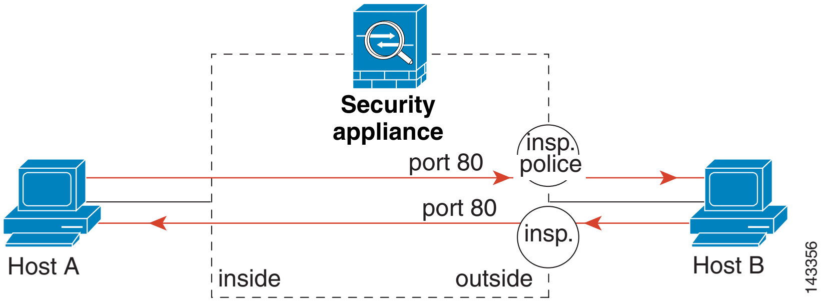
- Applying Inspection and QoS Policing to HTTP Traffic, page 9-27
- Applying Inspection to HTTP Traffic Globally, page 9-27
- Applying Inspection and Connection Limits to HTTP Traffic to Specific Servers, page 9-28

- Applying Inspection to HTTP Traffic with NAT, page 9-29

Applying Inspection and QoS Policing to HTTP Traffic

In this example (see Figure 9-1), any HTTP connection (TCP traffic on port 80) that enters or exits the ASA through the outside interface is classified for HTTP inspection. Any HTTP traffic that exits the outside interface is classified for policing.

Figure 9-1 HTTP Inspection and QoS Policing



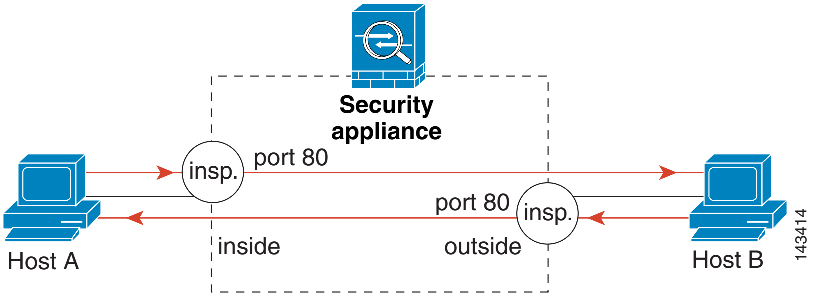
See the following commands for this example:

```
hostname(config)# class-map http_traffic
hostname(config-cmap)# match port tcp eq 80

hostname(config)# policy-map http_traffic_policy
hostname(config-pmap)# class http_traffic
hostname(config-pmap-c)# inspect http
hostname(config-pmap-c)# police output 250000
hostname(config)# service-policy http_traffic_policy interface outside
```

Applying Inspection to HTTP Traffic Globally

In this example (see Figure 9-2), any HTTP connection (TCP traffic on port 80) that enters the ASA through any interface is classified for HTTP inspection. Because the policy is a global policy, inspection occurs only as the traffic enters each interface.

Figure 9-2 Global HTTP Inspection



See the following commands for this example:

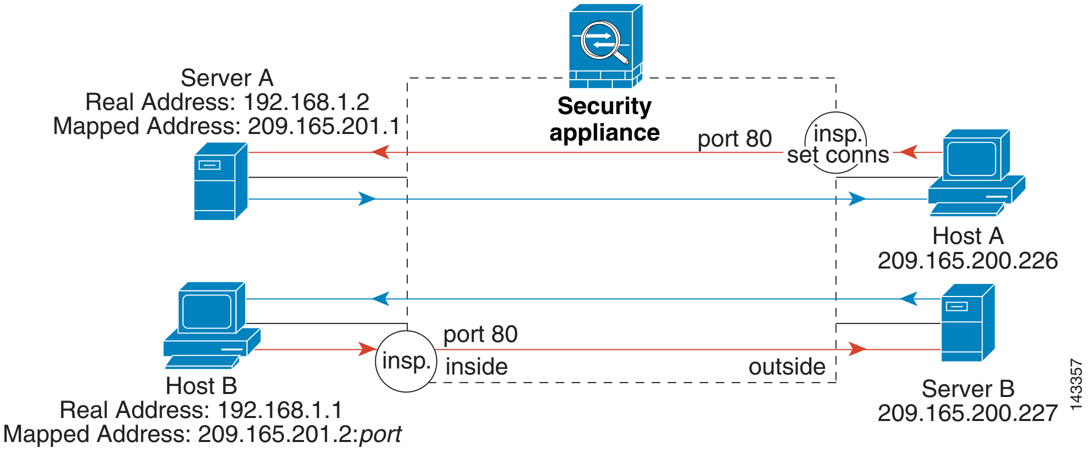
```
hostname(config)# class-map http_traffic
hostname(config-cmap)# match port tcp eq 80

hostname(config)# policy-map http_traffic_policy
hostname(config-pmap)# class http_traffic
hostname(config-pmap-c)# inspect http
hostname(config)# service-policy http_traffic_policy global
```

Applying Inspection and Connection Limits to HTTP Traffic to Specific Servers

In this example (see Figure 9-3), any HTTP connection destined for Server A (TCP traffic on port 80) that enters the ASA through the outside interface is classified for HTTP inspection and maximum connection limits. Connections initiated from server A to Host A does not match the access list in the class map, so it is not affected.

Any HTTP connection destined for Server B that enters the ASA through the inside interface is classified for HTTP inspection. Connections initiated from server B to Host B does not match the access list in the class map, so it is not affected.

Figure 9-3 HTTP Inspection and Connection Limits to Specific Servers



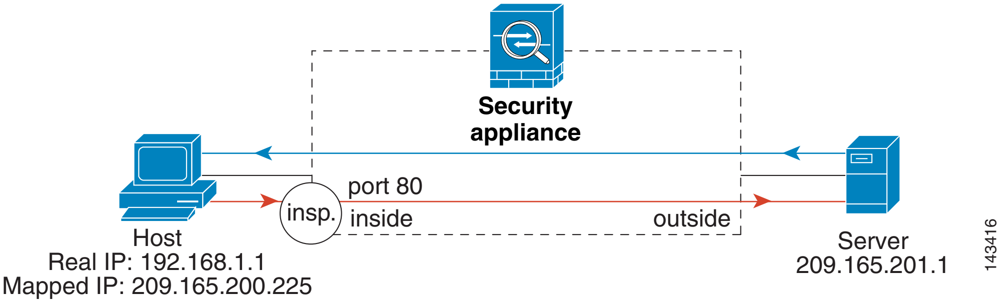
See the following commands for this example:

```
hostname(config)# static (inside,outside) 209.165.201.1 192.168.1.2
hostname(config)# nat (inside) 1 192.168.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.2
hostname(config)# access-list serverA extended permit tcp any host 209.165.201.1 eq 80
hostname(config)# access-list ServerB extended permit tcp any host 209.165.200.227 eq 80

hostname(config)# class-map http_serverA
hostname(config-cmap)# match access-list serverA
hostname(config)# class-map http_serverB
hostname(config-cmap)# match access-list serverB

hostname(config)# policy-map policy_serverA
hostname(config-pmap)# class http_serverA
hostname(config-pmap-c)# inspect http
hostname(config-pmap-c)# set connection conn-max 100
hostname(config)# policy-map policy_serverB
hostname(config-pmap)# class http_serverB
hostname(config-pmap-c)# inspect http

hostname(config)# service-policy policy_serverB interface inside
hostname(config)# service-policy policy_serverA interface outside
```

Applying Inspection to HTTP Traffic with NAT

In this example, the Host on the inside network has two addresses: one is the real IP address 192.168.1.1, and the other is a mapped IP address used on the outside network, 209.165.200.225. Because the policy is applied to the inside interface, where the real address is used, then you must use the real IP address in the access list in the class map. If you applied it to the outside interface, you would use the mapped address.

Figure 9-4 HTTP Inspection with NAT



See the following commands for this example:

```
hostname(config)# static (inside,outside) 209.165.200.225 192.168.1.1
hostname(config)# access-list http_client extended permit tcp host 192.168.1.1 any eq 80

hostname(config)# class-map http_client
hostname(config-cmap)# match access-list http_client

hostname(config)# policy-map http_client
hostname(config-pmap)# class http_client
hostname(config-pmap-c)# inspect http

hostname(config)# service-policy http_client interface inside
```

Feature History for Modular Policy Framework

Table 9-4 lists the release history for this feature.

Table 9-4 Feature History for Feature-1

Feature Name	Releases	Feature Information
Modular Policy Framework	7.0(1)	Modular Policy Framework was introduced.
Management class map for use with RADIUS accounting traffic	7.2(1)	The management class map was introduced for use with RADIUS accounting traffic. The following commands were introduced: **class-map type management**, and **inspect radius-accounting**.
Inspection policy maps	7.2(1)	The inspection policy map was introduced. The following command was introduced: **class-map type inspect**.
Regular expressions and policy maps	7.2(1)	Regular expressions and policy maps were introduced to be used under inspection policy maps. The following commands were introduced: **class-map type regex**, **regex**, **match regex**.
Match any for inspection policy maps	8.0(2)	The **match any** keyword was introduced for use with inspection policy maps: traffic can match one or more criteria to match the class map. Formerly, only **match all** was available.
Maximum connections and embryonic connections for management traffic	8.0(2)	The **set connection** command is now available for a Layer 3/4 management class map, for to-the-security appliance management traffic. Only the **conn-max** and **embryonic-conn-max** keywords are available.

PART 2

Configuring Access Lists

CHAPTER 10

Information About Access Lists

Cisco ASA 5500 Series Adaptive Security Appliances provide basic traffic filtering capabilities with access lists, which control access in your network by preventing certain traffic from entering or exiting. This chapter describes access lists and shows how to add them to your network configuration.

Access lists are made up of one or more access control entries (ACEs). An ACE is a single entry in an access list that specifies a permit or deny rule (to forward or drop the packet) and is applied to a protocol, to a source and destination IP address or network, and, optionally, to the source and destination ports.

Access lists can be configured for all routed and network protocols (IP, AppleTalk, and so on) to filter the packets of those protocols as the packets pass through a router.

Access lists are used in a variety of features. If your feature uses Modular Policy Framework, you can use an access list to identify traffic within a traffic class map. For more information on Modular Policy Framework, see Chapter 9, "Using Modular Policy Framework."

This chapter includes the following sections:

- Access List Types, page 10-1
- Access Control Entry Order, page 10-2
- Access Control Implicit Deny, page 10-3
- IP Addresses Used for Access Lists When You Use NAT, page 10-3

Access List Types

The adaptive security appliance uses five types of access control lists:

- Standard access lists—Identify the destination IP addresses of OSPF routes and can be used in a route map for OSPF redistribution. Standard access lists cannot be applied to interfaces to control traffic. For more information, see Chapter 13, "Adding a Standard Access List."
- Extended access lists—Use one or more access control entries (ACE) in which you can specify the line number to insert the ACE, the source and destination addresses, and, depending upon the ACE type, the protocol, the ports (for TCP or UDP), or the IPCMP type (for ICMP). For more information, see Chapter 11, "Adding an Extended Access List."
- EtherType access lists—Use one or more ACEs that specify an EtherType. For more information, see Chapter 12, "Adding an EtherType Access List."
- Webtype access lists—Used in a configuration that supports filtering for clientless SSL VPN. For more information, see Chapter 14, "Adding a Webtype Access List."

- IPv6 access lists—Determine which IPv6 traffic to block and which traffic to forward at router interfaces. For more information, see Chapter 15, "Adding an IPv6 Access List."

Table 10-1 lists the types of access lists and some common uses for them.

Table 10-1 Access List Types and Common Uses

Access List Use	Access List Type	Description
Control network access for IP traffic (routed and transparent mode)	Extended	The ASA does not allow any traffic from a lower security interface to a higher security interface unless it is explicitly permitted by an extended access list. **Note** To access the ASA interface for management access, you do not also need an access list allowing the host IP address. You only need to configure management access according to Chapter 37, "Configuring Management Access."
Identify traffic for AAA rules	Extended	AAA rules use access lists to identify traffic.
Control network access for IP traffic for a given user	Extended, downloaded from a AAA server per user	You can configure the RADIUS server to download a dynamic access list to be applied to the user, or the server can send the name of an access list that you already configured on the ASA.
Identify addresses for NAT (policy NAT and NAT exemption)	Extended	Policy NAT lets you identify local traffic for address translation by specifying the source and destination addresses in an extended access list.
Establish VPN access	Extended	You can use an extended access list in VPN commands.
Identify traffic in a traffic class map for Modular Policy Framework	Extended EtherType	Access lists can be used to identify traffic in a class map, which is used for features that support Modular Policy Framework. Features that support Modular Policy Framework include TCP and general connection settings, and inspection.
For transparent firewall mode, control network access for non-IP traffic	EtherType	You can configure an access list that controls traffic based on its EtherType.
Identify OSPF route redistribution	Standard	Standard access lists include only the destination address. You can use a standard access list to control the redistribution of OSPF routes.
Filtering for WebVPN	Webtype	You can configure a Webtype access list to filter URLs.
Control network access for IPV6 networks	IPv6	You can add and apply access lists to control traffic in IPv6 networks.

Access Control Entry Order

An access list is made up of one or more Access Control Entry (ACE). Each ACE that you enter for a given access list name is appended to the end of the access list. Depending on the access list type, you can specify the source and destination addresses, the protocol, the ports (for TCP or UDP), the ICMP type (for ICMP), or the EtherType.

The order of ACEs is important. When the ASA decides whether to forward or to drop a packet, the ASA tests the packet against each ACE in the order in which the entries are listed. After a match is found, no more ACEs are checked. For example, if you create an ACE at the beginning of an access list that explicitly permits all traffic, no further statements are checked, and the packet is forwarded.

Access Control Implicit Deny

Each access list has an implicit deny statement at the end, so unless you explicitly permit traffic to pass, it will be denied. For example, if you want to allow all users to access a network through the ASA except for one or more particular addresses, then you need to deny those particular addresses and then permit all others.

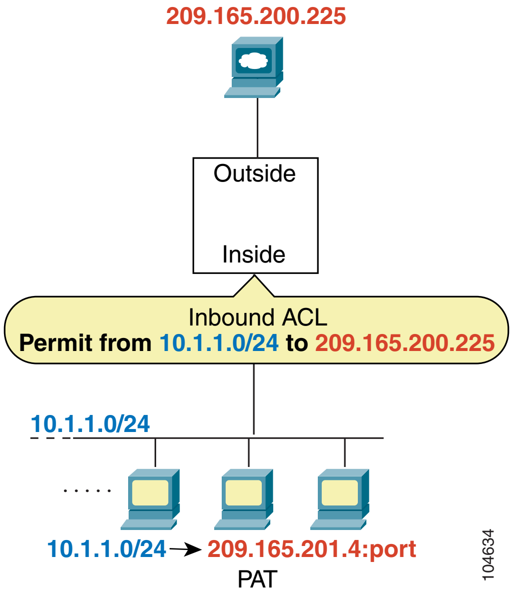
For EtherType access lists, the implicit deny at the end of the access list does not affect IP traffic or ARPs; for example, if you allow EtherType 8037, the implicit deny at the end of the access list does not now block any IP traffic that you previously allowed with an extended access list (or implicitly allowed from a high security interface to a low security interface). However, if you *explicitly* deny all traffic with an EtherType ACE, then IP and ARP traffic is denied.

IP Addresses Used for Access Lists When You Use NAT

When you use NAT, the IP addresses that you specify for an access list depend on the interface to which the access list is attached; you need to use addresses that are valid on the network connected to the interface. This guideline applies for both inbound and outbound access lists: the direction does not determine the address used, only the interface does.

For example, if you want to apply an access list to the inbound direction of the inside interface, you configure the ASA to perform NAT on the inside source addresses when they access outside addresses. Because the access list is applied to the inside interface, the source addresses are the original untranslated addresses. Because the outside addresses are not translated, the destination address used in the access list is the real address. (See Figure 10-1.)

Figure 10-1 IP Addresses in Access Lists: NAT Used for Source Addresses

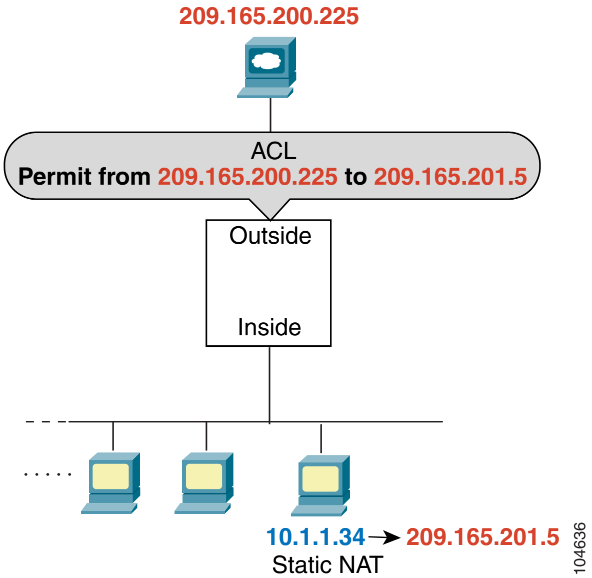

209.165.200.225
Outside
Inside
Inbound ACL
Permit from 10.1.1.0/24 to 209.165.200.225
10.1.1.0/24
.....
10.1.1.0/24→ 209.165.201.4:port
PAT
104634

See the following commands for this example:

```
hostname(config)# access-list INSIDE extended permit ip 10.1.1.0 255.255.255.0 host
209.165.200.225
hostname(config)# access-group INSIDE in interface inside
```

If you want to allow an outside host to access an inside host, you can apply an inbound access list on the outside interface. You need to specify the translated address of the inside host in the access list because that address is the address that can be used on the outside network. (See Figure 10-2.)

Figure 10-2 IP Addresses in Access Lists: NAT Used for Destination Addresses

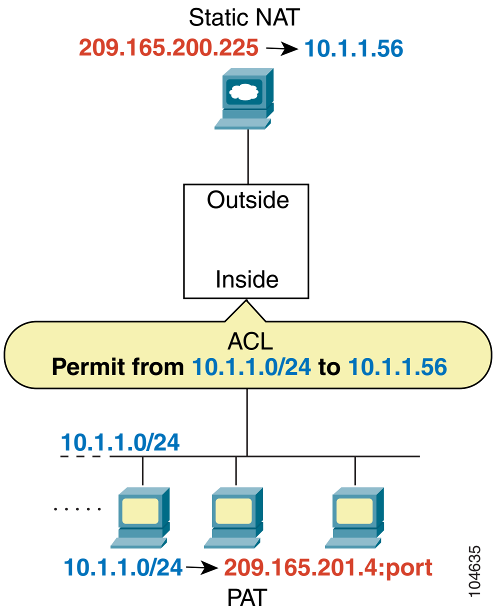


See the following commands for this example:

```
hostname(config)# access-list OUTSIDE extended permit ip host 209.165.200.225 host
209.165.201.5
hostname(config)# access-group OUTSIDE in interface outside
```

If you perform NAT on both interfaces, keep in mind the addresses that are visible to a given interface. Figure 10-3 shows an outside server that uses static NAT so that a translated address appears on the inside network.

Figure 10-3 IP Addresses in Access Lists: NAT used for Source and Destination Addresses



See the following commands for this example:

```
hostname(config)# access-list INSIDE extended permit ip 10.1.1.0 255.255.255.0 host
10.1.1.56
hostname(config)# access-group INSIDE in interface inside
```

Where to Go Next

For information about implementing access lists, see the following chapters in this guide:

- Chapter 11, “Adding an Extended Access List”
- Chapter 12, “Adding an EtherType Access List”
- Chapter 13, “Adding a Standard Access List”
- Chapter 14, “Adding a Webtype Access List”
- Chapter 15, “Adding an IPv6 Access List”

CHAPTER 11

Adding an Extended Access List

This chapter describes how to configure extended access lists (also known as access control lists), and it includes the following topics:

- Information About Extended Access Lists, page 11-1
- Licensing Requirements for Extended Access Lists, page 11-2
- Guidelines and Limitations, page 11-2
- Default Settings, page 11-4
- Configuring Extended Access Lists, page 11-4
- What to Do Next, page 11-7
- Monitoring Extended Access Lists, page 11-7
- Configuration Examples for Extended Access Lists, page 11-7
- Feature History for Extended Access Lists, page 11-8

Information About Extended Access Lists

Access lists are used to control network access or to specify traffic for many features to act upon. An extended access list is made up of one or more access control entries (ACE) in which you can specify the line number to insert the ACE, the source and destination addresses, and, depending upon the ACE type, the protocol, the ports (for TCP or UDP), or the IPCMP type (for ICMP). You can identify all of these parameters within the access-list command, or you can use object groups for each parameter. This section describes how to identify the parameters within the command. To simplify access lists with object groups, see Chapter 16, "Configuring Object Groups."

For TCP and UDP connections for both routed and transparent mode, you do not need an access list to allow returning traffic because the security appliance allows all returning traffic for established bidirectional connections. For connectionless protocols such as ICMP, however, the security appliance establishes unidirectional sessions, so you either need access lists to allow ICMP in both directions (by applying access lists to the source and destination interfaces), or you need to enable the ICMP inspection engine. The ICMP inspection engine treats ICMP sessions as bidirectional connections.

You can apply only one access list of each type (extended and EtherType) to each direction of an interface. You can apply the same access lists on multiple interfaces.

Allowing Broadcast and Multicast Traffic through the Transparent Firewall

In routed firewall mode, broadcast and multicast traffic is blocked even if you allow it in an access list, including unsupported dynamic routing protocols and DHCP (unless you configure DHCP relay). Transparent firewall mode can allow any IP traffic through. This feature is especially useful in multiple context mode, which does not allow dynamic routing, for example.

Note Because these special types of traffic are connectionless, you need to apply an extended access list to both interfaces so that returning traffic is allowed through.

Table 11-1 lists common traffic types that you can allow through the transparent firewall.

Table 11-1 Transparent Firewall Special Traffic

Traffic Type	Protocol or Port	Notes
DHCP	UDP ports 67 and 68	If you enable the DHCP server, then the ASA does not pass DHCP packets.
EIGRP	Protocol 88	—
OSPF	Protocol 89	—
Multicast streams	The UDP ports vary depending on the application.	Multicast streams are always destined to a Class D address (224.0.0.0 to 239.x.x.x).
RIP (v1 or v2)	UDP port 520	—

Licensing Requirements for Extended Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 11-2
- Firewall Mode Guidelines, page 11-2
- Additional Guidelines and Limitations, page 11-3

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported only in routed and transparent firewall modes.

IPv6 Guidelines

IPv6 is supported.

Additional Guidelines and Limitations

The following guidelines and limitations apply to creating an extended access list:

- When you enter the **access-list** command for a given access list name, the ACE is added to the end of the access list unless you specify the line number.
- Enter the access list name in uppercase letters so that the name is easy to see in the configuration. You might want to name the access list for the interface (for example, INSIDE), or you can name it for the purpose for which it is created (for example, NO_NAT or VPN).
- Typically, you identify the **ip** keyword for the protocol, but other protocols are accepted. For a list of protocol names, see the "Protocols and Applications" section on page C-11.
- Enter the **host** keyword before the IP address to specify a single address. In this case, do not enter a mask. Enter the **any** keyword instead of the address and mask to specify any address.
- You can specify the source and destination ports only for the **tcp** or **udp** protocols. For a list of permitted keywords and well-known port assignments, see the "TCP and UDP Ports" section on page C-11. DNS, Discard, Echo, Ident, NTP, RPC, SUNRPC, and Talk each require one definition for TCP and one for UDP. TACACS+ requires one definition for port 49 on TCP.
- You can specify the ICMP type only for the **icmp** protocol. Because ICMP is a connectionless protocol, you either need access lists to allow ICMP in both directions (by applying access lists to the source and destination interfaces), or you need to enable the ICMP inspection engine. (See the "Adding an ICMP Type Object Group" section on page 16-7.) The ICMP inspection engine treats ICMP sessions as stateful connections. To control ping, specify **echo-reply** (**0**) (ASA to host) or **echo** (**8**) (host to ASA). See the "Adding an ICMP Type Object Group" section on page 16-7 for a list of ICMP types.
- When you specify a network mask, the method is different from the Cisco IOS software **access-list** command. The ASA uses a network mask (for example, 255.255.255.0 for a Class C mask). The Cisco IOS mask uses wildcard bits (for example, 0.0.0.255).
- To make an ACE inactive, use the **inactive** keyword. To reenable it, enter the entire ACE without the **inactive** keyword. This feature enables you to keep a record of an inactive ACE in your configuration to make reenabling easier.
- Use the disable option to disable logging for a specified ACE.

Default Settings

Table 11-2 lists the default settings for extended access list parameters.

Table 11-2 Default Extended Access List Parameters

Parameters	Default
ACE logging	ACE logging generates system log message 106023 for denied packets. A deny ACE must be present to log denied packets.
log	When the **log** keyword is specified, the default level for system log message 106100 is 6 (informational), and the default interval is 300 seconds.

Configuring Extended Access Lists

This section shows how to add and delete an access control entry and access list, and it includes the following topics:

- Task Flow for Configuring Extended Access Lists, page 11-4
- Adding an Extended Access List, page 11-5
- Adding Remarks to Access Lists, page 11-6
- Deleting an Extended Access List Entry, page 11-6

Task Flow for Configuring Extended Access Lists

Use the following guidelines to create and implement an access list:

- Create an access list by adding an ACE and applying an access list name. (See the "Adding an Extended Access List" section on page 11-5.)
- Apply the access list to an interface. (See the "Applying an Access List to an Interface" section on page 35-4 for more information.)

Adding an Extended Access List

An access list is made up of one or more access control entries (ACEs) with the same access list ID. To create an access list you start by creating an ACE and applying a list name. An access list with one entry is still considered a list, although you can add multiple entries to the list.

To add an extended access list or an ACE, enter the following command:

Command	Purpose
`access-list` *access_list_name* [**line** *line_number*] [**extended**] {***deny*** | ***permit***} *protocol source_address mask* [*operator port*] *dest_address mask* [*operator port* | *icmp_type*] [**inactive**] **Example:** `hostname(config)# access-list ACL_IN extended permit ip any any`	Adds an extended access control entry. The **line** *line_number* options specify the line number at which insert the ACE. If you do not specify a line number, the ACE is added to the end of the access list. The line number is not saved in the configuration; it only specifies where to insert the ACE. The **extended** option adds an ACE. The **deny** keyword denies a packet if the conditions are matched. Some features do not allow deny ACEs, such as NAT. See the command documentation for each feature that uses an access list for more information. The **permit** keyword permits a packet if the conditions are matched. The protocol argument specifies the IP protocol name or number. For example UDP is 17, TCP is 6, and EGP is 47. The *source_address* specifies the IP address of the network or host from which the packet is being sent. Enter the **host** keyword before the IP address to specify a single address. In this case, do not enter a mask. Enter the **any** keyword instead of the address and mask to specify any address. The *operator port* option matches the port numbers used by the source or destination. The permitted operators are as follows: • **lt**—less than. • **gt**—greater than. • **dq**—equal to. • **neq**—not equal to. • **range**—an inclusive range of values. When you use this operator, specify two port numbers, for example: **range 100 200.** The *dest_address* argument specifies the IP address of the network or host to which the packet is being sent. Enter the **host** keyword before the IP address to specify a single address. In this case, do not enter a mask. Enter the **any** keyword instead of the address and mask to specify any address. The *icmp_type* argument specifies the ICMP type if the protocol is ICMP. The **inactive** keyword disables an ACE. To reenable it, enter the entire ACE without the **inactive** keyword. This feature enables you to keep a record of an inactive ACE in your configuration to make reenabling easier. (See the **access-list extended** command in the *Cisco Security Appliance Command Reference* for more information about command options.)

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make the access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose
access-list *access_list_name* **remark** *text* **Example:** `hostname(config)# access-list OUT remark - this is the inside admin address`	Adds a remark after the last access-list command you entered. The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored. If you enter the remark before any **access-list** command, then the remark is the first line in the access list. If you delete an access list using the **no access-list** *access_list_name* command, then all the remarks are also removed.

Example

You can add remarks before each ACE, and the remark appears in the access list in this location. Entering a dash (-) at the beginning of the remark helps set it apart from the ACEs.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

Deleting an Extended Access List Entry

This section shows how to remove an ACE. If the deleted entry is the only entry in the list, then the list and listname are deleted.

To delete an extended ACE, enter the following command:

Command	Purpose
hostname(config)# **no access-list** *access_list_name* [**line** *line_number*] [**extended**] {**deny** | **permit**} *protocol* *source_address mask* [*operator port*] *dest_address mask* [*operator port* | *icmp_type*] [**inactive**] **Example:** `hostname(config)# access-list ACL_IN extended permit ip any any`	Deletes and extended access list entry. Enter the **no access-list** command with the entire command syntax string as it appears in the configuration. **Note** To remove the entire access list, use the **clear configure access-list** command. (See the "Adding an Extended Access List" section on page 11-5 or the *Cisco Security Appliance Command Reference* for more information about command options.)

What to Do Next

Apply the access list to an interface. See the "Applying an Access List to an Interface" section on page 35-4 for more information.

Monitoring Extended Access Lists

To monitor extended access lists, enter one of the following commands:

Command	Purpose
`show access list`	Displays the access list entries by number.
`show running-config access-list`	Displays the current running access-list configuration.

Configuration Examples for Extended Access Lists

The following access list allows all hosts (on the interface to which you apply the access list) to go through the adaptive security appliance:

```
hostname(config)# access-list ACL_IN extended permit ip any any
```

The following sample access list prevents hosts on 192.168.1.0/24 from accessing the 209.165.201.0/27 network. All other addresses are permitted.

```
hostname(config)# access-list ACL_IN extended deny tcp 192.168.1.0 255.255.255.0
209.165.201.0 255.255.255.224
hostname(config)# access-list ACL_IN extended permit ip any any
```

If you want to restrict access to selected hosts only, then enter a limited permit ACE. By default, all other traffic is denied unless explicitly permitted.

```
hostname(config)# access-list ACL_IN extended permit ip 192.168.1.0 255.255.255.0
209.165.201.0 255.255.255.224
```

The following access list restricts all hosts (on the interface to which you apply the access list) from accessing a website at address 209.165.201.29. All other traffic is allowed.

```
hostname(config)# access-list ACL_IN extended deny tcp any host 209.165.201.29 eq www
hostname(config)# access-list ACL_IN extended permit ip any any
```

The following access list that uses object groups restricts several hosts on the inside network from accessing several web servers. All other traffic is allowed.

```
hostname(config-network)# access-list ACL_IN extended deny tcp object-group denied
object-group web eq www
hostname(config)# access-list ACL_IN extended permit ip any any
hostname(config)# access-group ACL_IN in interface inside
```

The following example temporarily disables an access list that permits traffic from one group of network objects (A) to another group of network objects (B):

```
hostname(config)# access-list 104 permit ip host object-group A object-group B inactive
```

To implement a time-based access list, use the **time-range** command to define specific times of the day and week. Then use the **access-list extended** command to bind the time range to an access list. The following example binds an access list named "Sales" to a time range named "New_York_Minute":

```
hostname(config)# access-list Sales line 1 extended deny tcp host 209.165.200.225 host
209.165.201.1 time-range New_York_Minute
```

Feature History for Extended Access Lists

Table 11-3 lists the release history for this feature.

Table 11-3 Feature History for Extended Access Lists

Feature Name	Releases	Feature Information
Extended access control lists	7.0	Access lists are used to control network access or to specify traffic for many features to act upon. An extended access control list is made up of one or more access control entries (ACE) in which you can specify the line number to insert the ACE, the source and destination addresses, and, depending upon the ACE type, the protocol, the ports (for TCP or UDP), or the IPCMP type (for ICMP). The following command was introduced: **access-list extended**.

CHAPTER 12

Adding an EtherType Access List

This chapter describes how to configure EtherType access lists and includes the following topics:

- Information About EtherType Access Lists, page 12-1
- Licensing Requirements for EtherType Access Lists, page 12-2
- Guidelines and Limitations, page 12-2
- Default Settings, page 12-3
- Configuring EtherType Access Lists, page 12-4
- Monitoring EtherType Access Lists, page 12-6
- What to Do Next, page 12-6
- Configuration Examples for EtherType Access Lists, page 12-7
- Feature History for EtherType Access Lists, page 12-7

Information About EtherType Access Lists

An EtherType access list is made up of one or more Access List Entries (ACEs) that specify an EtherType. This section includes the following topics:

- Supported EtherTypes, page 12-1
- Implicit Permit of IP and ARPs Only, page 12-2
- Implicit and Explicit Deny ACE at the End of an Access List, page 12-2
- Allowing MPLS, page 12-2

Supported EtherTypes

An EtherType ACE controls any EtherType identified by a 16-bit hexadecimal number. You can apply only one access list of each type (extended and EtherType) to each direction of an interface. You can also apply the same access lists on multiple interfaces.

Implicit Permit of IP and ARPs Only

IPv4 traffic is allowed through the transparent firewall automatically from a higher security interface to a lower security interface, without an access list. ARPs are allowed through the transparent firewall in both directions without an access list. ARP traffic can be controlled by ARP inspection.

However, to allow any traffic with EtherTypes other than IPv4 and ARP, you need to apply an EtherType access list, even from a high security to a low security interface.

Because EtherTypes are connectionless, you need to apply the access list to both interfaces if you want traffic to pass in both directions.

Implicit and Explicit Deny ACE at the End of an Access List

For EtherType access lists, the implicit deny at the end of the access list does not affect IP traffic or ARPs; for example, if you allow EtherType 8037, the implicit deny at the end of the access list does not now block any IP traffic that you previously allowed with an extended access list (or implicitly allowed from a high security interface to a low security interface). However, if you *explicitly* deny all traffic with an EtherType ACE, then IP and ARP traffic is denied.

Allowing MPLS

If you allow MPLS, ensure that Label Distribution Protocol and Tag Distribution Protocol TCP connections are established through the ASA by configuring both MPLS routers connected to the ASA to use the IP address on the ASA interface as the router-id for LDP or TDP sessions. (LDP and TDP allow MPLS routers to negotiate the labels [addresses] used to forward packets.)

On Cisco IOS routers, enter the appropriate command for your protocol, either LDP or TDP. The *interface* is the interface connected to the ASA.

```
hostname(config)# mpls ldp router-id interface force
```

Or

```
hostname(config)# tag-switching tdp router-id interface force
```

Licensing Requirements for EtherType Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 12-3
- Firewall Mode Guidelines, page 12-3
- Additional Guidelines and Limitations, page 12-3

Context Mode Guidelines

Available in single and multiple context modes.

Firewall Mode Guidelines

Supported in transparent firewall mode only.

Additional Guidelines and Limitations

The following guidelines and limitations apply to EtherType access lists:

- When you enter the **access-list** command for a given access list name, the ACE is added to the end of the access list.
- EtherType access lists support Ethernet V2 frames.
- 802.3-formatted frames are not handled by the access list because they use a length field as opposed to a type field. Bridge protocol data units, which are allowed by default, are the only exception; they are SNAP-encapsulated, and the adaptive security appliance is designed to specifically handle BPDUs.
- Because EtherTypes are connectionless, you need to apply the ACL to both interfaces if you want traffic to pass in both directions.
- If you allow MPLS, ensure that LDP and TDP TCP connections are established through the adaptive security appliance by configuring both MPLD routers connected to the adaptive security appliance to use the IP address on the adaptive security appliance interface as the router-ID for LDP or TDP sessions. (LDP and TDP allow MPLS routers to negotiate the labels, or addresses, used to forward packets.)
- For EtherType access lists, the implicit deny at the end of the access list does not affect IP traffic or ARPs; for example, if you allow EtherType 8037, the implicit deny at the end of the access list does not now block any IP traffic that you previously allowed with an extended access list (or implicitly allowed from a high security interface to a low security interface). However, if you explicitly deny all traffic with an EtherType ACE, then IP and ARP traffic is denied.
- You can apply only one access list of each type (extended and Ethertype) to each direction of an interface. You can also apply the same access lists on multiple interfaces.

Default Settings

Table 12-1 lists the default settings for EtherType access lists parameters.

Table 12-1 Default EtherType Access Lists Parameters

Parameters	Default
bpdu	By default, BPDUs are permitted.
deny | permit	The adaptive security appliance denies all packets on the originating interface unless you specifically permit access.

Table 12-1 Default EtherType Access Lists Parameters (continued)

Parameters	Default
deny	Access list logging generates system log message 106023 for denied packets. Deny packets must be present to loge denied packets.
log	When the **log** optional keyword is specified, the default severity level for system log message 106100 is 6 (informational).

Configuring EtherType Access Lists

This section includes the following topics:

- Task Flow for Configuring EtherType Access Lists, page 12-4
- Adding EtherType Access Lists, page 12-5
- Adding Remarks to Access Lists, page 12-6

Task Flow for Configuring EtherType Access Lists

Use the following guidelines to create and implement an access list:

- Create an access list by adding an ACE and applying an access list name, as shown in the "Adding EtherType Access Lists" section on page 12-5.
- Apply the access list to an interface. (See the "Applying an Access List to an Interface" section on page 35-4 for more information.)

Adding EtherType Access Lists

To configure an access list that controls traffic based upon its EtherType, enter the following command:

Command	Purpose
access-list *access_list_name* **ethertype** {**deny** | **permit**} {**ipx** | **bpdu** | **mpls-unicast** | **mpls-multicast** | **any** | *hex_number*} **Example:** hostname(config)# hostname(config)# **access-list ETHER ethertype permit ipx**	Adds an EtherType ACE. The *access_list_name* argument lists the name or number of an access list. When you specify an access list name, the ACE is added to the end of the access list. Enter the *access_list_name* in upper case letters so that the name is easy to see in the configuration. You might want to name the access list for the interface (for example, INSIDE) or for the purpose (for example, MPLS or PIX). The **any** keyword specifies access to anyone. The **bpdu** keyword specifies access to bridge protocol data units, which are permitted by default. The **deny** keyword denies access if the conditions are matched. If an EtherType access list is configured to deny all, all ethernet frames are discarded. Only physical protocol traffic, such as auto-negotiation, is still allowed. The *hex_number* argument indicates any Ethertype that can be identified by a 16-bit hexadecimal number greater than or equal to 0x600. (See RFC 1700, "Assigned Numbers," at http://www.ietf.org/rfc/rfc1700.txt for a list of EtherTypes.) The **ipx** keyword specifies access to IPX. The **mpls-multicast** keyword specifies access to MPLS multicast. The **mpls-unicast** keyword specifies access to MPLS unicast. The **permit** keyword permits access if the conditions are matched. **Note** To remove an EtherType ACE, enter the **no access-list** command with the entire command syntax string as it appears in the configuration.

Example

The following sample access list allows common EtherTypes originating on the inside interface:

```
hostname(config)# access-list ETHER ethertype permit ipx
hostname(config)# access-list ETHER ethertype permit mpls-unicast
hostname(config)# access-group ETHER in interface inside
```

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make an access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose

`access-list` *`access_list_name`* **`remark`** *`text`*
Example:
`hostname(config)# access-list OUT remark - this is the inside admin address`
	Adds a remark after the last access-list command you entered.
	The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored.
	If you enter the remark before any **access-list** command, then the remark is the first line in the access list.
	If you delete an access list using the **no access-list** *access_list_name* command, then all remarks are also removed.

Example

You can add remarks before each ACE, and the remarks appear in the access list in these locations. Entering a dash (-) at the beginning of a remark helps to set it apart from the ACE.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

What to Do Next

Apply the access list to an interface. (See the "Applying an Access List to an Interface" section on page 35-4 for more information.)

Monitoring EtherType Access Lists

To monitor EtherType access lists, enter one of the following commands:

Command	Purpose
`show access-list`	Displays the access list entries by number.
`show running-config access-list`	Displays the current running access-list configuration.

Configuration Examples for EtherType Access Lists

The following example shows how to configure EtherType access lists:

The following access list allows some EtherTypes through the ASA, but it denies IPX:

```
hostname(config)# access-list ETHER ethertype deny ipx
hostname(config)# access-list ETHER ethertype permit 0x1234
hostname(config)# access-list ETHER ethertype permit mpls-unicast
hostname(config)# access-group ETHER in interface inside
hostname(config)# access-group ETHER in interface outside
```

The following access list denies traffic with EtherType 0x1256, but it allows all others on both interfaces:

```
hostname(config)# access-list nonIP ethertype deny 1256
hostname(config)# access-list nonIP ethertype permit any
hostname(config)# access-group ETHER in interface inside
hostname(config)# access-group ETHER in interface outside
```

Feature History for EtherType Access Lists

Table 12-2 lists the release history for this feature.

Table 12-2 Feature History for EtherType Access Lists

Feature Name	Releases	Feature Information
EtherType access lists	7.0	EtherType access lists control traffic based upon its EtherType. The feature and the following command were introduced: **access-list ethertype**.

CHAPTER 13

Adding a Standard Access List

This chapter describes how to configure a standard access list and includes the following topics:

- Information About Standard Access Lists, page 13-1
- Licensing Requirements for Standard Access Lists, page 13-1
- Guidelines and Limitations, page 13-1
- Default Settings, page 13-2
- Adding a Standard Access List, page 13-3
- What to Do Next, page 13-4
- Monitoring Access Lists, page 13-4
- Configuration Examples for Standard Access Lists, page 13-5
- Feature History for Standard Access Lists, page 13-5

Information About Standard Access Lists

Standard access lists identify the destination IP addresses of OSPF routes and can be used in a route map for OSPF redistribution. Standard access lists cannot be applied to interfaces to control traffic.

Licensing Requirements for Standard Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 13-2
- Firewall Mode Guidelines, page 13-2

- IPv6 Guidelines, page 13-2
- Additional Guidelines and Limitations, page 13-2

Context Mode Guidelines

Supported in single context mode only.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply for standard access lists:

- To add additional ACEs at the end of the access list, enter another **access-list** command, specifying the same access list name.
- When used with the access-group command, the deny keyword does not allow a packet to traverse the adaptive security appliance. By default, the adaptive security appliance denies all packets on the originating interface unless you specifically permit access.
- When specifying a source, local, or destination address, use the following guidelines:
  - Use a 32-bit quantity in four-part, dotted-decimal format.
  - Use the keyword **any** as an abbreviation for an address and mask of 0.0.0.0.0.0.0.0.
  - Use the **host** *ip_address* option as an abbreviation for a mask of 255.255.255.255.
- You can disable an ACE by specifying the keyword **inactive** in the **access-list** command.

Default Settings

Table 13-1 lists the default settings for standard access list parameters.

Table 13-1 Default Standard Access List Parameters

Parameters	Default
deny	The adaptive security appliance denies all packets on the originating interface unless you specifically permit access. Access list logging generates system log message 106023 for denied packets. Deny packets must be present to log denied packets.

Adding a Standard Access List

This section includes the following topics:

- Task Flow for Configuring Extended Access Lists, page 13-3
- Adding a Standard Access List, page 13-3
- Adding Remarks to Access Lists, page 13-4

Task Flow for Configuring Extended Access Lists

Use the following guidelines to create and implement an access list:

- Create an access list by adding an ACE and applying an access list name. See in the "Adding a Standard Access List" section on page 13-3.
- Apply the access list to an interface. See the "Applying an Access List to an Interface" section on page 35-4 for more information.

Adding a Standard Access List

To add an access list to identify the destination IP addresses of OSPF routes, which can be used in a route map for OSPF redistribution, enter the following command:

Command	Purpose

`hostname(config)#` **access-list** *access_list_name* **standard** {**deny** | **permit**} {**any** | *ip_address mask*}
 	
Example:
`hostname(config)# access-list OSPF standard permit 192.168.1.0 255.255.255.0`
	Adds a standard access list entry. To add another ACE to the end of the access list, enter another **access-list** command, specifying the same access list name.
	The *access_list_name* argument specifies the name of number of an access list.
	The **any** keyword specifies access to anyone.
	The **deny** keyword denies access if the conditions are matched.
	The **host** *ip_address* syntax specifies access to a host IP address
	The *ip_address ip_mask* argument specifies access to a specific IP address and subnet mask.
	The **line** *line-num* option specifies the line number at which to insert an ACE.
	The **permit** keyword permits access if the conditions are matched.
	Note To remove an ACE, enter the **no access-list** command with the entire command syntax string as it appears in the configuration.

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make the access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose

`access-list` *`access_list_name`* `remark` *`text`*
Example:
`hostname(config)# access-list OUT remark - this is the inside admin address`
	Adds a remark after the last access-list command you entered.
	The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored.
	If you enter the remark before any **access-list** command, then the remark is the first line in the access list.
	If you delete an access list using the **no access-list** *access_list_name* command, then all the remarks are also removed.

Example

You can add a remark before each ACE, and the remarks appear in the access lists in these location. Entering a dash (-) at the beginning of a remark helps to set it apart from an ACE.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

What to Do Next

Apply the access list to an interface. See the "Applying an Access List to an Interface" section on page 35-4 for more information.

Monitoring Access Lists

To monitor access lists, perform one of the following tasks:

Command	Purpose
`show access-list`	Displays the access list entries by number.
`show running-config access-list`	Displays the current running access-list configuration.

Configuration Examples for Standard Access Lists

The following example shows how to deny IP traffic through the adaptive security appliance:

```
hostname(config)# access-list 77 standard deny
```

The following example shows how to permit IP traffic through the adaptive security appliance if conditions are matched:

```
hostname(config)# access-list 77 standard permit
```

The following example shows how to specify a destination address:

```
hostname(config)# access-list 77 standard permit host 10.1.10.123
```

Feature History for Standard Access Lists

Table 13-2 lists the release history for this feature.

Table 13-2 Feature History for Standard Access Lists

Feature Name	Releases	Feature Information
Standard access lists	7.0	Standard access lists identify the destination IP addresses of OSPF routes, which can be used in a route map for OSPF redistribution. The feature and the following command were introduced: **access-list standard**.

CHAPTER 14T

Adding a Webtype Access List

Webtype access lists are added to a configuration that supports filtering for clientless SSL VPN. This chapter describes how to add an access list to the configuration that supports filtering for WebVPN.

This chapter includes the following topics:

- Licensing Requirements for Webtype Access Lists, page 14-1
- Guidelines and Limitations, page 14-1
- Default Settings, page 14-2
- Adding Webtype Access Lists, page 14-2
- What to Do Next, page 14-5
- Monitoring Webtype Access Lists, page 14-5
- Configuration Examples for Webtype Access Lists, page 14-5
- Feature History for Webtype Access Lists, page 14-7

Licensing Requirements for Webtype Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 14-1
- Firewall Mode Guidelines, page 14-2
- Additional Guidelines and Limitations, page 14-2

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply to Webtype access lists:

- The access-list Webtype command is used to configure clientless SSL VPN filtering. The URL specified may be full or partial (no file specified), may include wildcards for the server, or may specify a port. See the "Adding Webtype Access Lists with a URL String" section on page 14-3 for information about using wildcard characters in the URL string.
- Valid protocol identifiers are http, https, cifs, imap4, pop3, and smtp. The RL may also contain the keyword any to refer to any URL. An asterisk may be used to refer to a subcomponent of a DNS name.

Default Settings

Table 14-1 lists the default settings for Webtype access lists parameters.

Table 14-1 Default Webtype Access List Parameters

Parameters	Default
deny	The adaptive security appliance denies all packets on the originating interface unless you specifically permit access.
log	Access list logging generates system log message 106023 for denied packets. Deny packets must be present to log denied packets.

Adding Webtype Access Lists

This section includes the following topics:

- Task Flow for Configuring Webtype Access Lists, page 14-2
- Adding Webtype Access Lists with a URL String, page 14-3
- Adding Webtype Access Lists with an IP Address, page 14-4
- Adding Remarks to Access Lists, page 14-5

Task Flow for Configuring Webtype Access Lists

Use the following guidelines to create and implement an access list:

- Create an access list by adding an ACE and applying an access list name. See the "Adding Webtype Access Lists" section on page 14-2.

- Apply the access list to an interface. See the "Applying an Access List to an Interface" section on page 35-4 for more information.

Adding Webtype Access Lists with a URL String

To add an access list to the configuration that supports filtering for clientless SSL VPN, enter the following command:

Command	Purpose
access-list *access_list_name* **webtype** {**deny** | **permit**} **url** [*url_string* | **any**] [**log**[[**disable** | **default**] | *level*] **interval** *secs*] [**time_range** *name*]] **Example:** `hostname(config)# access-list acl_company webtype deny url http://*.company.com`	Adds an access list to the configuration that supports filtering for WebVPN. The *access_list_name* argument specifies the name or number of an access list. The **any** keyword specifies all URLs. The **deny** keyword denies access if the conditions are matched. The **interval** option specifies the time interval at which to generate system log message 106100; valid values are from 1 to 600 seconds. The **log** [[**disable** | **default**] | *level*] option specifies that system log message 106100 is generated for the ACE. When the log optional keyword is specified, the default level for system log message 106100 is 6 (informational). See the **log** command for more information. The **permit** keyword permits access if the conditions are matched. The **time_range** *name* option specifies a keyword for attaching the time-range option to this access list element. The **url** keyword specifies that a URL be used for filtering. The *url_string* option specifies the URL to be filtered. You can use the following wildcard characters to define more than one wildcard in the Webtype access list entry: • Enter an asterisk "*" to match no characters or any number of characters. • Enter a question mark "?" to match any one character exactly. • Enter square brackets "[]" to create a range operator that matches any one character in a range. **Note** To match any http URL, you must enter **http://*/*** instead of the former method of entering http://*. To remove an access list, use the **no** form of this command with the complete syntax string as it appears in the configuration.

Adding Webtype Access Lists with an IP Address

To add an access list to the configuration that supports filtering for clientless SSL VPN, enter the following command:

Command	Purpose
access-list *access_list_name* **webtype** {**deny** | **permit**} **tcp** [**host** *ip_address* | *ip_address subnet_mask* | **any**] [*oper port*[*port*]] [**log**[[**disable** | **default**] | *level*] **interval** *secs*][**time_range** *name*]] **Example:** `hostname(config)# access-list acl_company webtype permit tcp any`	Adds an access list to the configuration that supports filtering for WebVPN. The *access_list_name* argument specifies the name or number of an access list. The **any** keyword specifies all IP addresses. The **deny** keyword denies access if the conditions are matched. The **host** *ip_address* option specifies a host IP address. The **interval** option specifies the time interval at which to generate system log message 106100; valid values are from 1 to 600 seconds. The *ip_address ip_mask* option specifies a specific IP address and subnet mask. The **log** [[**disable** | **default**]| *level*] option specifies that system log message 106100 is generated for the ACE. When the log optional keyword is specified, the default level for system log message 106100 is 6 (informational). See the **log** command for more information. The **permit** keyword permits access if the conditions are matched. The **port** option specifies the decimal number or name of a TCP or UDP port. The **time_range** *name* option specifies a keyword for attaching the time-range option to this access list element. To remove an access list, use the **no** form of this command with the complete syntax string as it appears in the configuration.

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make the access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose
`access-list` *access_list_name* `remark` *text* **Example:** `hostname(config)# access-list OUT remark - this is the inside admin address`	Adds a remark after the last access-list command you entered. The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored. If you enter the remark before any **access-list** command, then the remark is the first line in the access list. If you delete an access list using the **no access-list** *access_list_name* command, then all the remarks are also removed.

Example

You can add a remark before each ACE, and the remarks appear in the access list in these locations. Entering a dash (-) at the beginning of a remark helps set it apart from an ACE.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

What to Do Next

Apply the access list to an interface. See the "Applying an Access List to an Interface" section on page 35-4 for more information.

Monitoring Webtype Access Lists

To monitor webtype access lists, enter the following command:

Command	Purpose
`show running-config access list`	Displays the access-list configuration running on the adaptive security appliance.

Configuration Examples for Webtype Access Lists

The following example shows how to deny access to a specific company URL:

```
hostname(config)# access-list acl_company webtype deny url http://*.company.com
```

The following example shows how to deny access to a specific file:

```
hostname(config)# access-list acl_file webtype deny url
https://www.company.com/dir/file.html
```

The following example shows how to deny HTTP access to any URL through port 8080:

```
hostname(config)# access-list acl_company webtype deny url http://my-server:8080/*
```

The following examples show how to use wildcards in Webtype access lists.

- The following example matches URLs such as http://www.cisco.com/ and http://wwz.caco.com/:

  ```
  access-list test webtype permit url http://ww?.c*co*/
  ```

- The following example matches URLs such as http://www.cisco.com and ftp://wwz.carrier.com:

  ```
  access-list test webtype permit url *://ww?.c*co*/
  ```

- The following example matches URLs such as http://www.cisco.com:80 and https://www.cisco.com:81:

  ```
  access-list test webtype permit url *://ww?.c*co*:8[01]/
  ```

  The range operator "[]" in the preceding example specifies that either character **0** or **1** can occur.

- The following example matches URLs such as http://www.google.com and http://www.boogie.com:

  ```
  access-list test webtype permit url http://www.[a-z]oo?*/
  ```

  The range operator "[]" in the preceding example specifies that any character in the range from **a** to **z** can occur.

- The following example matches URLs such as http://www.cisco.com/anything/crazy/url/ddtscgiz:

  ```
  access-list test webtype permit url htt*://*/*cgi?*
  ```

Note To match any http URL, you must enter **http://*/*** instead of the former method of entering http://*.

The following example shows how to enforce a webtype access list to disable access to specific CIFS shares.

In this scenario we have a root folder named "shares" that contains two sub-folders named "Marketing_Reports" and "Sales_Reports." We want to specifically deny access to the "shares/Marketing_Reports" folder.

```
access-list CIFS_Avoid webtype deny url cifs://172.16.10.40/shares/Marketing_Reports.
```

However, due to the implicit "deny all," the above access list makes all of the sub-folders inaccessible ("shares/Sales_Reports" and "shares/Marketing_Reports"), including the root folder ("shares").

To fix the problem, add a new access list to allow access to the root folder and the remaining sub-folders.

```
access-list CIFS_Allow webtype permit url cifs://172.16.10.40/shares*
```

Feature History for Webtype Access Lists

Table 14-2 lists the release history for this feature.

Table 14-2 Feature History for Webtype Access Lists

Feature Name	Releases	Feature Information
Webtype access lists	7.0	Webtype access lists are access lists that are added to a configuration that supports filtering for clientless SSL VPN. The feature and the following command were introduced: **access-list webtype**.

CHAPTER 15

Adding an IPv6 Access List

This chapter describes how to configure IPv6 access lists to control and filter traffic through the security appliance.

This chapter includes the following sections:

- Information About IPv6 Access Lists, page 15-1
- Licensing Requirements for IPv6 Access Lists, page 15-1
- Prerequisites for Adding IPv6 Access Lists, page 15-2
- Guidelines and Limitations, page 15-2
- Default Settings, page 15-3
- Configuring IPv6 Access Lists, page 15-4
- Monitoring IPv6 Access Lists, page 15-7
- Configuration Examples for IPv6 Access Lists, page 15-7
- Where to Go Next, page 15-7
- Feature History for IPv6 Access Lists, page 15-7

Information About IPv6 Access Lists

The typical access list functionality in IPv6 is similar to access lists in IPv4. Access lists determine which traffic to block and which traffic to forward at router interfaces. Access lists allow filtering based upon source and destination addresses, inbound and outbound to specific interfaces. Each access list has an implicit deny statement at the end. You define IPv6 access lists and set their deny and permit conditions using the **ipv6 access-list** command with the **deny** and **permit** keywords in global configuration mode.

Licensing Requirements for IPv6 Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Prerequisites for Adding IPv6 Access Lists

You should be familiar with IPv6 addressing and basic configuration. See the **ipv6** commands in the *Cisco Security Appliance Command Reference* for more information about configuring IPv6.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context modes.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply to IPv6 access lists:

- The **ipv6 access-list** command allows you to specify whether an IPv6 address is permitted or denied access to a port or protocol. Each command is called an ACE. One or more ACEs with the same access list name are referred to as an access list. Apply an access list to an interface using the **access-group** command.
- The ASA denies all packets from an outside interface to an inside interface unless you specifically permit access using an access list. All packets are allowed by default from an inside interface to an outside interface unless you specifically deny access.
- The **ipv6 access-list** command is similar to the **access-list** command, except that it is IPv6-specific. For additional information about access lists, refer to the **access-list extended** command.
- The **ipv6 access-list icmp** command is used to filter ICMPv6 messages that pass through the ASA.To configure the ICMPv6 traffic that is allowed to originate and terminate at a specific interface, use the **ipv6 icmp** command.
- See the **object-group** command for information on how to configure object groups.
- Possible operands for the operator option of the **ipv6 access-list** command include **lt** for less than, **gt** for greater than, **eq** for equal to, **neq** for not equal to, and **range** for an inclusive range. Use the **ipv6 access-list** command without an operator and port to indicate all ports by default.
- ICMP message types are filtered by the access rule. Omitting the *icmp_type* argument indicates all ICMP types. If you specify ICMP types, the value can be a valid ICMP type number (from 0 to 255) or one of the following ICMP type literals:
  - destination-unreachable
  - packet-too-big
  - time-exceeded
  - parameter-problem
  - echo-request

  - echo-reply
  - membership-query
  - membership-report
  - membership-reduction
  - router-renumbering
  - router-solicitation
  - router-advertisement
  - neighbor-solicitation
  - neighbor-advertisement
  - neighbor-redirect
- If the protocol argument is specified, valid values are **icmp**, **ip**, **tcp**, **udp**, or an integer in the range of 1 to 254, representing an IP protocol number.

Default Settings

Table 15-1 lists the default settings for IPv6 access list parameters.

Table 15-1 Default IPv6 Access List Parameters

Parameters	Default
default	The **default** option specifies that a syslog message 106100 is generated for the ACE.
interval *secs*	Specifies the time interval at which to generate a 106100 syslog message; valid values are from 1 to 600 seconds. The default interval is 300 seconds. This value is also used as the timeout value for deleting an inactive flow.
level	The *level* option specifies the syslog level for message 106100; valid values are from 0 to 7. The default level is 6 (informational).
log	The **log** option specifies logging action for the ACE. If you do not specify the **log** keyword or you specify the **log default** keyword, then message 106023 is generated when a packet is denied by the ACE. If you specify the **log** keyword alone or with a level or interval, then message 106100 is generated when a packet is denied by the ACE. Packets that are denied by the implicit deny at the end of an access list are not logged. You must implicitly deny packets with an ACE to enable logging.

Configuring IPv6 Access Lists

This section includes the following topics:

- Task Flow for Configuring IPv6 Access Lists, page 15-4
- Adding IPv6 Access Lists, page 15-5
- Adding Remarks to Access Lists, page 15-6

Task Flow for Configuring IPv6 Access Lists

Use the following guidelines to create and implement an access list:

- Create an access list by adding an ACE and applying an access list name, as shown in the "Adding IPv6 Access Lists" section on page 15-5.
- Apply the access list to an interface. (See the "Applying an Access List to an Interface" section on page 35-4 for more information.)

Adding IPv6 Access Lists

You can add a regular IPv6 access list or add an IPv6 access list with TCP.

To add a regular IPv6 access list, enter the following command:

Command	Purpose

ipv6 access-list *id* [**line** *line-num*] {**deny** | **permit**} {*protocol* | **object-group** *protocol_obj_grp_id*} {*source-ipv6-prefix/prefix-length* | **any** | **host** *source-ipv6-address* | **object-group** *network_obj_grp_id*} [*operator* {*port* [*port*] | **object-group** *service_obj_grp_id*}] {*destination-ipv6-prefix/prefix-length* | **any** | **host** *destination-ipv6-address* | **object-group** *network_obj_grp_id*} [{*operator port* [*port*] | **object-group** *service_obj_grp_id*}] [**log** [[*level*] [**interval** *secs*] | **disable** | **default**]]
`Example:`
`hostname(config)# ipv6 access-list acl_grp permit tcp any host 3001:1::203:A0FF:FED6:162D`
	Configures an IPv6 access list.
	The **any** keyword is an abbreviation for the IPv6 prefix ::/0, indicating any IPv6 address.
	The **deny** keyword denies access if the conditions are matched.
	The *destination-ipv6-address* argument identifies the IPv6 address of the host receiving the traffic.
	The *destination-ipv6-prefix* argument identifies the IPv6 network address where the traffic is destined.
	The **disable** option disables syslog messaging.
	The **host** keyword indicates that the address refers to a specific host.
	The ***id*** *keyword* specifies the number of an access list.
	The **line** *line-num* option specifies the line number for inserting the access rule into the list. By default, the ACE is added to the end of the access list.
	The *network_obj_grp_id* argument specifies existing network object group identification.
	The **object-group** option specifies an object group.
	The *operator* option compares the source IP address or destination IP address ports. For a list of permitted operands, see the "Guidelines and Limitations" section on page 15-2.
	The **permit** keyword permits access if the conditions are matched.
	The *port* option specifies the port that you permit or deny access. You can specify the port either by a number in the range of 0 to 65535 or by a literal name if the protocol is **tcp** or **udp**. For a list of permitted TCP or UDP literal names, see the "Guidelines and Limitations" section on page 15-2.
	The *prefix-length* argument indicates how many of the high-order, contiguous bits of the address comprise the IPv6 prefix.
	The *protocol* argument specifies the name or number of an IP protocol.
	The *protocol_obj_grp_id* indicates the existing protocol object group ID.
	The *service_obj_grp_id* option specifies the object group.
	The *source-ipv6-address* specifies the address of the host sending traffic.
	The *source-ipv6-prefix* specifies the IPv6 address of traffic origin.

To configure an IPv6 access list with ICMP, enter the following command:

Command	Purpose
ipv6 access-list *id* [**line** *line-num*] {**deny** | **permit**} **icmp6** {*source-ipv6-prefix/prefix-length* | **any** | **host** *source-ipv6-address* | **object-group** *network_obj_grp_id*} {*destination-ipv6-prefix/prefix-length* | **any** | **host** *destination-ipv6-address* | **object-group** *network_obj_grp_id*} [*icmp_type* | **object-group** *icmp_type_obj_grp_id*] [**log** [[*level*] [**interval** *secs*] | **disable** | **default**]] **Example**: `hostname(config)# ipv6 access list acl_grp permit tcp any host 3001:1::203:AOFF:FED6:162D`	Configures an IPv6 access list with ICMP. The **icmp6** keyword specifies that the access rule applies to ICMPv6 traffic passing through the ASA. The *icmp_type* argument specifies the ICMP message type being filtered by the access rule. The value can be a valid ICMP type number from 0 to 255. (For a list of the permitted ICMP type literals, see the "Guidelines and Limitations" section on page 15-2.) The *icmp_type_obj_grp_id* option specifies the object group ICMP type ID. For details about additional **ipv6 access-list** command parameters, see the preceding procedure for adding a regular IPv6 access list, or see the **ipv6 access-list** command in the *Cisco Security Appliance Command Reference*.

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make the access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose

`access-list` *`access_list_name`* `remark` *`text`*
 	
Example:
`hostname(config)# access-list OUT remark - this is the inside admin address`
	Adds a remark after the last access-list command you entered.
	The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored.
	If you enter the remark before any **access-list** command, then the remark is the first line in the access list.
	If you delete an access list using the **no access-list** *access_list_name* command, then all the remarks are also removed.

Example

You can add remarks before each ACE, and the remarks appear in the access list in these locations. Entering a dash (-) at the beginning of a remark helps set it apart from an ACE.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

Monitoring IPv6 Access Lists

To monitor IPv6 access lists, perform one of the following tasks:

Command	Purpose
`show ipv6 access-list`	Displays all IPv6 access list information.

Configuration Examples for IPv6 Access Lists

The following example shows how to configure IPv6 access lists:

The following example allows any host using TCP to access the 3001:1::203:A0FF:FED6:162D server:

```
hostname(config)# ipv6 access-list acl_grp permit tcp any host 3001:1::203:A0FF:FED6:162D
```

The following example uses **eq** and a port to deny access to just FTP:

```
hostname(config)# ipv6 access-list acl_out deny tcp any host 3001:1::203:A0FF:FED6:162D eq
ftp
hostname(config)# access-group acl_out in interface inside
```

The following example uses **lt** to permit access to all ports less than port 2025, which permits access to the well-known ports (1 to 1024):

```
hostname(config)# ipv6 access-list acl_dmz1 permit tcp any host 3001:1::203:A0FF:FED6:162D
lt 1025
hostname(config)# access-group acl_dmz1 in interface dmz1
```

Where to Go Next

Apply the access list to an interface. (See the "Applying an Access List to an Interface" section on page 35-4 for more information.)

Feature History for IPv6 Access Lists

Table 15-2 lists the release history for this feature.

Table 15-2 Feature History for IPv6 Access Lists

Feature Name	Releases	Feature Information
IPv6 access lists	7.0(1)	The following command was introduced: **ipv6 access-list**.

CHAPTER 16

Configuring Object Groups

You can configure access lists in modules, or object groups, to simplify access list creation and maintenance. This chapter describes how to configure, organize, and display object groups, and it includes the following sections:

- Configuring Object Groups, page 16-1
- Using Object Groups with Access Lists, page 16-10
- Adding Remarks to Access Lists, page 16-13
- Scheduling Extended Access List Activation, page 16-14

Configuring Object Groups

This section includes the following topics:

- Information About Object Groups, page 16-2
- Licensing Requirements for Object Groups, page 16-2
- Guidelines and Limitations for Object Groups, page 16-3
- Adding Object Groups, page 16-4
- Removing Object Groups, page 16-8
- Monitoring Object Groups, page 16-8
- Nesting Object Groups, page 16-9
- Feature History for Object Groups, page 16-10

Information About Object Groups

By grouping like objects together, you can use the object group in an ACE instead of having to enter an ACE for each object separately. You can create the following types of object groups:

- Protocol
- Network
- Service
- ICMP type

For example, consider the following three object groups:

- MyServices—Includes the TCP and UDP port numbers of the service requests that are allowed access to the internal network.
- TrustedHosts—Includes the host and network addresses allowed access to the greatest range of services and servers.
- PublicServers—Includes the host addresses of servers to which the greatest access is provided.

After creating these groups, you could use a single ACE to allow trusted hosts to make specific service requests to a group of public servers.

You can also nest object groups in other object groups.

Note The ACE system limit applies to expanded access lists. If you use object groups in ACEs, the number of actual ACEs that you enter is fewer, but the number of expanded ACEs is the same as without object groups. In many cases, object groups create more ACEs than if you added them manually because creating ACEs manually leads you to summarize addresses more than an object group does. For example, consider a network object group with 100 sources, a network object group with 100 destinations, and a port object group with 5 ports. Permitting the ports from sources to destinations could result in 50,000 ACEs (5 x 100 x 100) in the expanded access list.

Licensing Requirements for Object Groups

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Object Groups

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 16-3
- Firewall Mode Guidelines, page 16-3
- IPv6 Guidelines, page 16-3
- Additional Guidelines and Limitations, page 16-3

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply to object groups:

- Object groups must have unique names. While you might want to create a network object group named “Engineering” and a service object group named “Engineering,” you need to add an identifier (or “tag”) to the end of at least one object group name to make it unique. For example, you can use the names “Engineering_admins” and “Engnineering_hosts” to make the object group names unique and to aid in identification.
- After you add an object group you can add more objects as required by following the same procedure again for the same group name and specifying additional objects. You do not need to reenter existing objects: the command you already set remains in place unless you remove the object group with the **no** form of the command.
- Objects such as hosts, protocols, or services can be grouped, and then you can enter a single command using the group name to apply every item in the group.
- When you define a group with the object group command and then use any security appliance command, the command applies to every item in that group. This feature can significantly reduce your configuration size.

Note You cannot remove an object group or make an object group empty if it is used in an access list. For information about removing object groups, see the “Removing Object Groups” section on page 16-8.

- The security appliance does not support IPv6 nested object groups, so you cannot group an object with IPv6 entities under another IPv6 object-group.

Adding Object Groups

This section includes the following topics:

- Adding a Protocol Object Group, page 16-4
- Adding a Network Object Group, page 16-5
- Adding a Service Object Group, page 16-6
- Adding an ICMP Type Object Group, page 16-7

Adding a Protocol Object Group

To add or change a protocol object group, perform the steps in this section. After you add the group, you can add more objects as required by following this procedure again for the same group name and specifying additional objects. You do not need to reenter existing objects; the commands you already set remain in place unless you remove them with the **no** form of the command.

Detailed Steps

	Command	Purpose

Step 1	**`object-group protocol`** *`obj_grp_id`*
	Example:
	`hostname(config)# object-group protocol tcp_udp_icmp`
		Adds a protocol group. The *obj_grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters:
		• underscore "_"
		• dash "-"
		• period "."
		The prompt changes to protocol configuration mode.

Step 2	**`description`** *`text`*
	Example:
	`hostname(config-protocol)# description New` *`Group`*
		(Optional) Adds a description. The description can be up to 200 characters.

Step 3	**`protocol-object`** *`protocol`*
	Example:
	`hostname(config-protocol)# protocol-object tcp`
		Defines the protocols in the group. Enter the command for each protocol. The protocol is the numeric identifier of the specified IP protocol (1 to 254) or a keyword identifier (for example, **icmp**, **tcp**, or **udp**). To include all IP protocols, use the keyword **ip**. For a list of protocols that you can specify, see the "Protocols and Applications" section on page C-11.

Example

To create a protocol group for TCP, UDP, and ICMP, enter the following commands:

```
hostname (config)# object-group protocol tcp_udp_icmp
hostname (config-protocol)# protocol-object tcp
hostname (config-protocol)# protocol-object udp
hostname (config-protocol)# protocol-object icmp
```

Adding a Network Object Group

A network object group supports IPv4 and IPv6 addresses, depending upon the type of access list. For more information about IPv6 access lists, see Chapter 15, "Adding an IPv6 Access List."

To add or change a network object group, perform the steps in this section. After you add the group, you can add more objects as required by following this procedure again for the same group name and specifying additional objects. You do not need to reenter existing objects; the commands you already set remain in place unless you remove them with the no form of the command.

Detailed Steps

	Command	Purpose

Step 1	**`object-group network`** *`grp_id`*
	
	Example:
	`hostname(config)# object-group network admins`
		Adds a network group.
		The *grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters:
		• underscore "_"
		• dash "-"
		• period "."
		The prompt changes to protocol configuration mode.

Step 2	**`description`** *`text`*
	
	Example:
	`hostname(config-network)# Administrator Addresses`
		(Optional) Adds a description. The description can be up to 200 characters.

Step 3	**`network-object`** *`network`* `{host ip_address | ip_address mask}`
	
	Example:
	`hostname(config-network)# network-object host 10.1.1.4`
		Defines the networks in the group. Enter the command for each network or address.

Example

To create a network group that includes the IP addresses of three administrators, enter the following commands:

```
hostname (config)# object-group network admins
hostname (config-protocol)# description Administrator Addresses
hostname (config-protocol)# network-object host 10.1.1.4
hostname (config-protocol)# network-object host 10.1.1.78
hostname (config-protocol)# network-object host 10.1.1.34
```

Adding a Service Object Group

To add or change a service object group, perform the steps in this section. After you add the group, you can add more objects as required by following this procedure again for the same group name and specifying additional objects. You do not need to reenter existing objects; the commands you already set remain in place unless you remove them with the **no** form of the command.

Detailed Steps

	Command	Purpose

Step 1	**object-group service** *grp_id* {**tcp** | **udp** | **tcp-udp**}
	Example:
	`hostname(config)# object-group service services1 tcp-udp`
		Adds a service group. The *grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters:
		• underscore "_"
		• dash "-"
		• period "."
		Specify the protocol for the services (ports) you want to add with either the **tcp**, **udp**, or **tcp-udp** keywords. Enter the **tcp-udp** keyword if your service uses both TCP and UDP with the same port number, for example, DNS (port53).
		The prompt changes to service configuration mode.

Step 2	**description** *text* **Example:** `hostname(config-service)# description DNS Group`	(Optional) Adds a description. The description can be up to 200 characters.

Step 3	**port-object** {**eq** *port* | **range** *begin_port end_port*}
	Example:
	`hostname(config-service)# port-object eq domain`
		Defines the ports in the group. Enter the command for each port or range of ports. For a list of permitted keywords and well-known port assignments, see the "Protocols and Applications" section on page C-11.

Example

To create service groups that include DNS (TCP/UDP), LDAP (TCP), and RADIUS (UDP), enter the following commands:

```
hostname (config)# object-group service services1 tcp-udp
hostname (config-service)# description DNS Group
hostname (config-service)# port-object eq domain

hostname (config)# object-group service services2 udp
hostname (config-service)# description RADIUS Group
hostname (config-service)# port-object eq radius
hostname (config-service)# port-object eq radius-acct

hostname (config)# object-group service services3 tcp
hostname (config-service)# description LDAP Group
hostname (config-service)# port-object eq ldap
```

Adding an ICMP Type Object Group

To add or change an ICMP type object group, perform the steps in this section. After you add the group, you can add more objects as required by following this procedure again for the same group name and specifying additional objects. You do not need to reenter existing objects; the commands you already set remain in place unless you remove them with the **no** form of the command.

Detailed Steps

	Command	Purpose

Step 1	**`object-group icmp-type`** *`grp_id`*
	`Example:`
	`hostname(config)# object-group icmp-type ping`
		Adds an ICMP type object group. The *grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters:
		• underscore "_"
		• dash "-"
		• period "."
		The prompt changes to ICMP type configuration mode.

Step 2	**`description`** *`text`*
	`Example:`
	`hostname(config-icmp-type)# description Ping Group`
		(Optional) Adds a description. The description can be up to 200 characters.

Step 3	**`icmp-object`** *`icmp-type`*
	`Example:`
	`hostname(config-icmp-type)# icmp-object echo-reply`
		Defines the ICMP types in the group. Enter the command for each type. For a list of ICMP types, see the"ICMP Types" section on page C-15.

Example

Create an ICMP type group that includes echo-reply and echo (for controlling ping) by entering the following commands.

```
hostname (config)# object-group icmp-type ping
hostname (config-service)# description Ping Group
hostname (config-service)# icmp-object echo
hostname (config-service)# icmp-object echo-reply
```

Removing Object Groups

You can remove a specific object group or remove all object groups of a specified type; however, you cannot remove an object group or make an object group empty if it is used in an access list.

Detailed Step

Step 1 Do one of the following:

`no object-group` *`grp_id`*
Example:
`hostname(config)# no object-group Engineering_host`
	Removes the specified object group. The *grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters:
	• underscore "_"
	• dash "-"
	• period "."

`clear object-group` `[`**`protocol`** `|` **`network`** `|` **`services`** `|` **`icmp-type`**`]`
Example:
`hostname(config)# clear-object group network`
	Removes all object groups of the specified type.
	Note If you do not enter a type, all object groups are removed.

Monitoring Object Groups

To monitor object groups, enter the following commands:

Command	Purpose
`show access-list`	Displays the access list entries that are expanded out into individual entries without their object groupings.
`show running-config object-group`	Displays all current object groups.
`show running-config object-group` *`grp_id`*	Displays the current object groups by their group ID.
`show running-config object-group` *`grp_type`*	Displays the current object groups by their group type.

Nesting Object Groups

You can nest object groups heirarchically so that one object group can contain other object groups of the same type. However, the security appliance does not support IPv6 nested object groups, so you cannot group an object with IPv6 entities under another IPv6 object-group.

To nest an object group within another object group of the same type, first create the group that you want to nest (see the "Adding Object Groups" section on page 16-4) and then perform the steps in this section.

Detailed Steps

	Command	Purpose
Step 1	**object-group group** {{**protocol** | **network** | **icmp-type**} *grp_id* |**service** grp_id {**tcp** | **udp** | **tcp-udp**}} **Example:** hostname(config)# object-group network Engineering_group	Adds or edits the specified object group type under which you want to nest another object group. The **service**_*grp_id* is a text string up to 64 characters in length and can be any combination of letters, digits, and the following characters: • underscore "_" • dash "-" • period "."
Step 2	**group-object** *group_id* **Example:** hostname(config-network)# network-object host 10.1.1.5 hostname(config-network)# network-object host 10.1.1.7 hostname(config-network)# network-object host 10.1.1.9	Adds the specified group under the object group you specified in Step 1. The nested group must be of the same type. You can mix and match nexted group objects and regular objects within an object group.

Examples

Create network object groups for privileged users from various departments by entering the following commands:

```
hostname (config)# object-group network eng
hostname (config-network)# network-object host 10.1.1.5
hostname (config-network)# network-object host 10.1.1.9
hostname (config-network)# network-object host 10.1.1.89

hostname (config)# object-group network hr
hostname (config-network)# network-object host 10.1.2.8
hostname (config-network)# network-object host 10.1.2.12

hostname (config)# object-group network finance
hostname (config-network)# network-object host 10.1.4.89
hostname (config-network)# network-object host 10.1.4.100
```

You then nest all three groups together as follows:

```
hostname (config)# object-group network admin
hostname (config-network)# group-object eng
hostname (config-network)# group-object hr
hostname (config-network)# group-object finance
```

You only need to specify the admin object group in your ACE as follows:

```
hostname (config)# access-list ACL_IN extended permit ip object-group admin host
209.165.201.29
```

Feature History for Object Groups

Table 16-1 lists the release history for this feature.

Table 16-1 Feature History for Object Groups

Feature Name	Releases	Feature Information
Object groups	7.0	Object groups simplify access list creation and maintenance. The following commands were introduced or modified: **object-group** *protocol*, **object-group** *network*, **object-group** *service*, **object-group** *icmp_type*.

Using Object Groups with Access Lists

This section contains the following topics:

- Information About Using Object Groups with Access Lists, page 16-10
- Licensing Requirements for Using Object Groups with Access Lists, page 16-10
- Guidelines and Limitations for Using Object Groups with Access Lists, page 16-11
- Configuring Object Groups with Access Lists, page 16-11
- Monitoring the Use of Object Groups with Access Lists, page 16-12
- Configuration Examples for Using Object Groups with Access Lists, page 16-12
- Feature History for Using Object Groups with Access Lists, page 16-13

Information About Using Object Groups with Access Lists

You can use object groups in an access list, replace the normal protocol (*protocol*), network (*source_address mask*, and so on) service (*operator port*), or ICMP type (*icmp_type*) parameter with the **object-group** *grp_id* parameter.

Licensing Requirements for Using Object Groups with Access Lists

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Using Object Groups with Access Lists

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 16-11
- Firewall Mode Guidelines, page 16-11
- IPv6 Guidelines, page 16-3
- Additional Guidelines and Limitations, page 16-11

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply to using object groups with access lists:

You do not have to use object groups for all parameters; for example, you can use an object group for the source address but identify the destination address with an address and mask.

Configuring Object Groups with Access Lists

To use object groups for all available parameters in the **access-list** {**tcp** | **udp**} command, enter the following command:

Command	Purpose
access-list *access_list_name* [**line** *line_number*] [**extended**] {***deny*** | ***permit***} {**tcp** | **udp**} **object-group** *nw_grp_id* [**object-group** *svc_grp_id*] **object-group** *nw_grp_id* [**object-group** *svc_grp_id*] [**log** [[*level*] [**interval** *secs*] | **disable** | **default**]] [**inactive** | **time-range** *time_range_name*] `hostname(config)# access-list 104 permit tcp object-group A object-group B inactive`	Configures object groups with access lists. For a detailed list of command options, see the **access list estended** command in the *Cisco Adaptive Security Appliance Command Reference*. For a complete configuration example about using object groups with access lists, see the "Configuration Examples for Scheduling Access List Activation" section on page 16-16.

Monitoring the Use of Object Groups with Access Lists

To monitor the use of object groups with accesslists, enter the following commands:

Command	Purpose
show access-list	Displays the access list entries that are expanded out into individual entries without their object groupings.
show object-group [**protocol** | **network** | **service** | **icmp-type** | **id** *grp_id*]	Displays a list of the currently configured object groups. If you enter the command without any parameters, the system displays all configured object groups.
show running-config object-group	Displays all current object groups.
show running-config object-group *grp_id*	Displays the current object groups by their group ID.
show running-config object-group *grp_type*	Displays the current object groups by their group type.

Example

The following is sample output from the **show object-group** command:

```
hostname# show object-group
object-group network ftp_servers
  description: This is a group of FTP servers
  network-object host 209.165.201.3
  network-object host 209.165.201.4
object-group network TrustedHosts
  network-object host 209.165.201.1
  network-object 192.168.1.0 255.255.255.0
  group-object ftp_servers
```

Configuration Examples for Using Object Groups with Access Lists

The following normal access list that does not use object groups restricts several hosts on the inside network from accessing several web servers. All other traffic is allowed.

```
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.4 host 209.165.201.29
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.78 host 209.165.201.29
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.89 host 209.165.201.29
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.4 host 209.165.201.16
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.78 host 209.165.201.16
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.89 host 209.165.201.16
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.4 host 209.165.201.78
eq www
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.78 host 209.165.201.78
eq www
```

```
hostname(config)# access-list ACL_IN extended deny tcp host 10.1.1.89 host 209.165.201.78
eq www
hostname(config)# access-list ACL_IN extended permit ip any any
hostname(config)# access-group ACL_IN in interface inside
```

If you make two network object groups, one for the inside hosts, and one for the web servers, then the configuration can be simplified and can be easily modified to add more hosts:

```
hostname(config)# object-group network denied
hostname(config-network)# network-object host 10.1.1.4
hostname(config-network)# network-object host 10.1.1.78
hostname(config-network)# network-object host 10.1.1.89

hostname(config-network)# object-group network web
hostname(config-network)# network-object host 209.165.201.29
hostname(config-network)# network-object host 209.165.201.16
hostname(config-network)# network-object host 209.165.201.78

hostname(config-network)# access-list ACL_IN extended deny tcp object-group denied
object-group web eq www
hostname(config)# access-list ACL_IN extended permit ip any any
hostname(config)# access-group ACL_IN in interface inside
```

Feature History for Using Object Groups with Access Lists

Table 16-2 lists the release history for this feature.

Table 16-2 Feature History for Using Object Groups with Access Lists

Feature Name	Releases	Feature Information
Object groups	7.0	Object groups simplify access list creation and maintenance. The following commands were introduced or modified: **object-group** *protocol*, **object-group** *network*, **object-group** *service*, **object-group** *icmp_type*.

Adding Remarks to Access Lists

You can include remarks about entries in any access list, including extended, EtherType, IPv6, standard, and Webtype access lists. The remarks make the access list easier to understand.

To add a remark after the last **access-list** command you entered, enter the following command:

Command	Purpose
access-list *access_list_name* **remark** *text* **Example:** `hostname(config)# access-list OUT remark - this is the inside admin address`	Adds a remark after the last access-list command you entered. The text can be up to 100 characters in length. You can enter leading spaces at the beginning of the text. Trailing spaces are ignored. If you enter the remark before any **access-list** command, then the remark is the first line in the access list. If you delete an access list using the **no access-list** *access_list_name* command, then all the remarks are also removed.

Example

You can add a remark before each ACE, and the remarks appear in the access list in these location. Entering a dash (-) at the beginning of a remark helps to set it apart from the ACE.

```
hostname(config)# access-list OUT remark - this is the inside admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT remark - this is the hr admin address
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any
```

Scheduling Extended Access List Activation

This section includes the following topics:

- Information About Scheduling Access List Activation, page 16-14
- Licensing Requirements for Scheduling Access List Activation, page 16-14
- Guidelines and Limitations for Scheduling Access List Activation, page 16-15
- Configuring and Applying Time Ranges, page 16-15
- Configuration Examples for Scheduling Access List Activation, page 16-16
- Feature History for Scheduling Access Lis t Activation, page 16-17

Information About Scheduling Access List Activation

You can schedule each ACE in an access list to be activated at specific times of the day and week by applying a time range to the ACE.

Licensing Requirements for Scheduling Access List Activation

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Scheduling Access List Activation

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 16-15
- Firewall Mode Guidelines, page 16-15
- IPv6 Guidelines, page 16-11
- Additional Guidelines and Limitations, page 16-15

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The following guidelines and limitations apply to using object groups with access lists:

- Users could experience a delay of approximately 80 to 100 seconds after the specified end time for the ACL to become inactive. For example, if the specified end time is 3:50, because the end time is inclusive, the command is picked up anywhere between 3:51:00 and 3:51:59. After the command is picked up, the security appliance finishes any currently running task and then services the command to deactivate the ACL.
- Multiple periodic entries are allowed per **time-range** command. If a **time-range** command has both **absolute** and **periodic** values specified, then the **periodic** commands are evaluated only after the **absolute** start time is reached, and they are not further evaluated after the **absolute** end time is reached.

Configuring and Applying Time Ranges

You can add a time range to implement a time-based access list. To identify the time range, perform the steps in this section.

Detailed Steps

	Command	Purpose

Step 1	**`time-range`** *`name`*
	Example:
	`hostname(config)# time range Sales`
		Identifies the time-range name.

Step 2	Do one of the following:	

	Command	Purpose
	periodic *days-of-the-week time* **to** [*days-of-the-week*] *time* **Example:** `hostname(config-time-range)# periodic monday 7:59 to friday 17:01`	Specifies a recurring time range. You can specify the following values for *days-of-the-week*: • **monday**, **tuesday**, **wednesday**, **thursday**, **friday**, **saturday**, or **sunday**. • **daily** • **weekdays** • **weekend** The *time* is in the format *hh*:*mm*. For example, 8:00 is 8:00 a.m. and 20:00 is 8:00 p.m.
	absolute **start** *time date* [**end** *time date*] **Example:** `hostname(config-time-range)# absolute start 7:59 2 january 2009`	Specifies an absolute time range. The *time* is in the format *hh*:*mm*. For example, 8:00 is 8:00 a.m. and 20:00 is 8:00 p.m. The *date* is in the format *day month year*; for example, **1 january 2006**.
Step 3	**access-list** *access_list_name* [**extended**] {**deny** | **permit**}...[**time-range** *name*] **Example:** `hostname(config)# access list Marketing extended deny tcp host 209.165.200.225 host 209.165 201.1 time-range Pacific_Coast`	Applies the time range to an ACE. **Note** If you also enable logging for the ACE, use the **log** keyword before the **time-range** keyword. If you disable the ACE using the **inactive** keyword, use the **inactive** keyword as the last keyword. See Chapter 11, "Adding an Extended Access List," for complete **access-list** command syntax.

Example

The following example binds an access list named "Sales" to a time range named "New_York_Minute."

```
hostname(config)# access-list Sales line 1 extended deny tcp host 209.165.200.225 host 
209.165.201.1 time-range New_York_Minute
```

Configuration Examples for Scheduling Access List Activation

The following is an example of an absolute time range beginning at 8:00 a.m. on January 1, 2006. Because no end time and date are specified, the time range is in effect indefinitely.

```
hostname(config)# time-range for2006
hostname(config-time-range)# absolute start 8:00 1 january 2006
```

The following is an example of a weekly periodic time range from 8:00 a.m. to 6:00 p.m on weekdays:

```
hostname(config)# time-range workinghours
hostname(config-time-range)# periodic weekdays 8:00 to 18:00
```

Feature History for Scheduling Access Lis t Activation

Table 16-3 lists the release history for this feature.

Table 16-3 Feature History for Scheduling Access List Activation

Feature Name	Releases	Feature Information
Scheduling access list activation	7.0	You can schedule each ACE in an access list to be activated at specific times of the day and week. The following commands were introduced or modified: **object-group** *protocol*, **object-group** *network*, **object-group** *service*, **object-group** *icmp_type*.

CHAPTER 17

Configuring Logging for Access Lists

This chapter describes how to configure access list logging for extended access lists and Webytpe access lists, and it describes how to manage deny flows.

This section includes the following topics:

- Configuring Logging for Access Lists, page 17-1
- Managing Deny Flows, page 17-5

Configuring Logging for Access Lists

This section includes the following topics

- Information About Logging Access List Activity, page 17-1
- Licensing Requirements for Access List Logging, page 17-2
- Guidelines and Limitations, page 17-3
- Default Settings, page 17-3
- Configuring Access List Logging, page 17-3
- Monitoring Access Lists, page 17-4
- Configuration Examples for Access List Logging, page 17-4
- Feature History for Access List Logging, page 17-5

Information About Logging Access List Activity

By default, when traffic is denied by an extended ACE or a Webtype ACE, the ASA generates system message 106023 for each denied packet in the following form:

```
%ASA|PIX-4-106023: Deny protocol src [interface_name:source_address/source_port] dst
interface_name:dest_address/dest_port [type {string}, code {code}] by access_group acl_id
```

If the ASA is attacked, the number of system messages for denied packets can be very large. We recommend that you instead enable logging using system message 106100, which provides statistics for each ACE and enables you to limit the number of system messages produced. Alternatively, you can disable all logging.

Note Only ACEs in the access list generate logging messages; the implicit deny at the end of the access list does not generate a message. If you want all denied traffic to generate messages, add the implicit ACE manually to the end of the access list, as shown in the following example:

```
hostname(config)# access-list TEST deny ip any any log
```

The **log** options at the end of the extended **access-list** command enable you to set the following behavior:

- Enable message 106100 instead of message 106023
- Disable all logging
- Return to the default logging using message 106023

System message 106100 uses the following form:

```
%ASA|PIX-n-106100: access-list acl_id {permitted | denied} protocol
interface_name/source_address(source_port) -> interface_name/dest_address(dest_port)
hit-cnt number ({first hit | number-second interval})
```

When you enable logging for message 106100, if a packet matches an ACE, the ASA creates a flow entry to track the number of packets received within a specific interval. The ASA generates a system message at the first hit and at the end of each interval, identifying the total number of hits during the interval. At the end of each interval, the ASA resets the hit count to 0. If no packets match the ACE during an interval, the ASA deletes the flow entry.

A flow is defined by the source and destination IP addresses, protocols, and ports. Because the source port might differ for a new connection between the same two hosts, you might not see the same flow increment because a new flow was created for the connection. See the "Managing Deny Flows" section on page 17-5 to limit the number of logging flows.

Permitted packets that belong to established connections do not need to be checked against access lists; only the initial packet is logged and included in the hit count. For connectionless protocols, such as ICMP, all packets are logged, even if they are permitted, and all denied packets are logged.

See the *Cisco ASA 5500 Series System Log Messages* for detailed information about this system message.

Licensing Requirements for Access List Logging

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 17-3
- Firewall Mode Guidelines, page 17-3
- IPv6 Guidelines, page 17-3
- Additional Guidelines and Limitations, page 17-3

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported only in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

ACE logging generates system log message 106023 for denied packets. A deny ACE must be present to log denied packets.

Default Settings

Table 17-1 lists the default settings for extended access list parameters.

Table 17-1 Default Extended Access List Parameters

Parameters	Default
log	When the **log** keyword is specified, the default level for system log message 106100 is 6 (informational), and the default interval is 300 seconds.

Configuring Access List Logging

This sections describes how to configure access list logging.

Note For complete access list command syntax, see the "Configuring Extended Access Lists" section on page 11-4 and the "Adding Webtype Access Lists" section on page 14-2.

To configure logging for an ACE, enter the following command:

Command	Purpose

`access-list` *`access_list_name`* `[`**`extended`**`]`
`{`***`deny`*** `|` ***`permit`***`}...[`**`log`** `[[`*`level`*`] [`**`interval`**
`secs``] |` **`disable`** `|` **`default`**`]]`
 	
`Example``:`
`hostname(config)# access-list outside-acl permit ip host 1.1.1.1 any log 7 interval 600`
	Configures logging for an ACE.
	The **access-list** *access_list_name* syntax specifies the access list for which you want to configure logging.
	The **extended** option adds an ACE.
	The **deny** keyword denies a packet if the conditions are matched. Some features do not allow deny ACEs, such as NAT. (See the command documentation for each feature that uses an access list for more information.)
	The **permit** keyword permits a packet if the conditions are matched.
	If you enter the **log** option without any arguments, you enable system log message 106100 at the default level (6) and for the default interval (300 seconds). See the following options:
	• *level*—A severity level between 0 and 7. The default is 6.
	• **interval** *secs*—The time interval in seconds between system messages, from 1 to 600. The default is 300. This value is also used as the timeout value for deleting an inactive flow.
	• **disable**—Disables all access list logging.
	• **default**—Enables logging to message 106023. This setting is the same as having no **log** option.
	(See the **access-list** command in the *Cisco Security Appliance Command Reference* for more information about command options.)

Monitoring Access Lists

To monitor access lists, enter one of the following commands:

Command	Purpose
`show access list`	Displays the access list entries by number.
`show running-config access-list`	Displays the current running access-list configuration.

Configuration Examples for Access List Logging

This section includes sample configurations for logging access lists.

You might configure the following access list:

```
hostname(config)# access-list outside-acl permit ip host 1.1.1.1 any log 7 interval 600
hostname(config)# access-list outside-acl permit ip host 2.2.2.2 any
hostname(config)# access-list outside-acl deny ip any any log 2
hostname(config)# access-group outside-acl in interface outside
```

When the first ACE of outside-acl permits a packet, the ASA generates the following system message:

```
%ASA|PIX-7-106100: access-list outside-acl permitted tcp outside/1.1.1.1(12345) ->
inside/192.168.1.1(1357) hit-cnt 1 (first hit)
```

Although 20 additional packets for this connection arrive on the outside interface, the traffic does not have to be checked against the access list, and the hit count does not increase.

If one or more connections by the same host are initiated within the specified 10 minute interval (and the source and destination ports remain the same), then the hit count is incremented by 1, and the following message displays at the end of the 10 minute interval:

```
%ASA|PIX-7-106100: access-list outside-acl permitted tcp outside/1.1.1.1(12345)->
inside/192.168.1.1(1357) hit-cnt 2 (600-second interval)
```

When the third ACE denies a packet, the ASA generates the following system message:

```
%ASA|PIX-2-106100: access-list outside-acl denied ip outside/3.3.3.3(12345) ->
inside/192.168.1.1(1357) hit-cnt 1 (first hit)
```

If 20 additional attempts occur within a 5 minute interval (the default), the following message appears at the end of 5 minutes:

```
%ASA|PIX-2-106100: access-list outside-acl denied ip outside/3.3.3.3(12345) ->
inside/192.168.1.1(1357) hit-cnt 21 (300-second interval)
```

Feature History for Access List Logging

Table 17-2 lists the release history for this feature.

Table 17-2 Feature History for Access List Logging

Feature Name	Releases	Feature Information
Access list logging	7.0	You can enable logging using system message 106100, which provides statistics for each ACE and lets you limit the number of system messages produced. The following command was introduced: **access-list**.

Managing Deny Flows

This section includes the following topics:

- Information About Managing Deny Flows, page 17-6
- Licensing Requirements for Managing Deny Flows, page 17-6
- Guidelines and Limitations, page 17-6
- Managing Deny Flows, page 17-7
- Monitoring Deny Flows, page 17-8
- Feature History for Managing Deny Flows, page 17-8

Information About Managing Deny Flows

When you enable logging for message 106100, if a packet matches an ACE, the ASA creates a flow entry to track the number of packets received within a specific interval. The ASA has a maximum of 32 K logging flows for ACEs. A large number of flows can exist concurrently at any point of time. To prevent unlimited consumption of memory and CPU resources, the ASA places a limit on the number of concurrent *deny* flows; the limit is placed on deny flows only (not on permit flows) because they can indicate an attack. When the limit is reached, the ASA does not create a new deny flow for logging until the existing flows expire.

For example, if someone initiates a DoS attack, the ASA can create a large number of deny flows in a short period of time. Restricting the number of deny flows prevents unlimited consumption of memory and CPU resources.

When you reach the maximum number of deny flows, the ASA issues system message 106100:

```
%ASA|PIX-1-106101: The number of ACL log deny-flows has reached limit (number).
```

The **access-list alert-interval** command sets the time interval for generating the system log message 106001. The system log message 106001 alerts you that the adaptive security appliance has reached a deny flow maximum. When the deny flow maximum is reached, another system log message 106001 is generated if at least six seconds have passed since the last 106001 message was generated.

Licensing Requirements for Managing Deny Flows

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 17-3
- Firewall Mode Guidelines, page 17-3
- IPv6 Guidelines, page 17-3
- Additional Guidelines and Limitations, page 17-3

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported only in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines and Limitations

The ASA places a limit on the number of concurrent *deny* flows only—not permit flows.

Default Settings

Table 17-1 lists the default settings for managing deny flows.

Table 17-3 Default Parameters for Managing Deny Flows

Parameters	Default
numbers	The *numbers* argument specifies the maximum number of deny flows. The default is 4096.
secs	The *secs* argument specifies the time, in seconds, between system messages. The default is 300.

Managing Deny Flows

To configure the maximum number of deny flows and to set the interval between deny flow alert messages (106100), enter the following command:

Command	Purpose

`access-list deny-flow-max` *`number`*
`Example:`
`hostname(config)# access-list deny-flow-max 3000`
	Sets the maximum number of deny flows.
	The *numbers* argument specifies the maximum number, which can be between 1 and 4096. The default is 4096.

To set the amount of time between system messages (number 106101), which identifies that the maximum number of deny flows was reached, enter the following command:

Command	Purpose

`access-list alert-interval` *`secs`*
`Example:`
`hostname(config)# access-list alert-interval 200`
	Sets the time, in seconds, between system messages.
	The *secs* argument specifies the time interval between each deny flow maximum message. Valid values are from 1 to 3600 seconds. The default is 300 seconds.

Monitoring Deny Flows

To monitor access lists, enter one of the following commands:

Command	Purpose
`show access-list`	Displays access list entries by number.
`show running-config access-list`	Displays the current running access-list configuration.

Feature History for Managing Deny Flows

Table 17-2 lists the release history for this feature.

Table 17-4 Feature History for Managing Deny Flows

Feature Name	Releases	Feature Information
Managing Deny Flows	7.0	You can configure the maximum number of deny flows and set the interval between deny flow alert messages. The following commands were introduced: **access-list deny-flow** and **access-list alert-interval**.

PART 3

Configuring IP Routing

CHAPTER 18

Information About Routing

This chapter describes underlying concepts of how routing behaves on the ASA, and the routing protocols that are supported. Subsequent chapters address each specific routing protocol in more detail.

This chapter includes the following sections:

- Information About Routing, page 18-1
- How Routing Behaves Within the Adaptive Security Appliance, page 18-3
- Supported Internet Protocols for Routing, page 18-4
- Information About the Routing Table, page 18-5
- Information About IPv6 Support, page 18-8

Information About Routing

Routing is the act of moving information across an internetwork from a source to a destination. Along the way, at least one intermediate node typically is encountered. Routing involves two basic activities: determining optimal routing paths and transporting information groups (typically called packets) through an internetwork. In the context of the routing process, the latter of these is referred to as packet switching. Although packet switching is relatively straightforward, path determination can be very complex.

Switching

Switching algorithms is relatively simple; it is the same for most routing protocols. In most cases, a host determines that it must send a packet to another host. Having acquired a router's address by some means, the source host sends a packet addressed specifically to a router’s physical (Media Access Control [MAC]-layer) address, this time with the protocol (network layer) address of the destination host.

As it examines the packet's destination protocol address, the router determines that it either knows or does not know how to forward the packet to the next hop. If the router does not know how to forward the packet, it typically drops the packet. If the router knows how to forward the packet, however, it changes the destination physical address to that of the next hop and transmits the packet.

The next hop may be the ultimate destination host. If not, the next hop is usually another router, which executes the same switching decision process. As the packet moves through the internetwork, its physical address changes, but its protocol address remains constant.

Path Determination

Routing protocols use metrics to evaluate what path will be the best for a packet to travel. A metric is a standard of measurement, such as path bandwidth, that is used by routing algorithms to determine the optimal path to a destination. To aid the process of path determination, routing algorithms initialize and maintain routing tables, which contain route information. Route information varies depending on the routing algorithm used.

Routing algorithms fill routing tables with a variety of information. Destination/next hop associations tell a router that a particular destination can be reached optimally by sending the packet to a particular router representing the "next hop" on the way to the final destination. When a router receives an incoming packet, it checks the destination address and attempts to associate this address with a next hop.

Routing tables also can contain other information, such as data about the desirability of a path. Routers compare metrics to determine optimal routes, and these metrics differ depending on the design of the routing algorithm used.

Routers communicate with one another and maintain their routing tables through the transmission of a variety of messages. The routing update message is one such message that generally consists of all or a portion of a routing table. By analyzing routing updates from all other routers, a router can build a detailed picture of network topology. A link-state advertisement, another example of a message sent between routers, informs other routers of the state of the sender's links. Link information also can be used to build a complete picture of network topology to enable routers to determine optimal routes to network destinations.

Note Asymetric routing is not supported on the ASA.

Supported RouteTypes

There are several types of route types that a router can use, Listed below are the route types that the ASA uses.

- Static Versus Dynamic, page 18-2
- Single-Path Versus Multipath, page 18-3
- Flat Versus Hierarchical, page 18-3
- Link-State Versus Distance Vector, page 18-3

Static Versus Dynamic

Static routing algorithms are hardly algorithms at all, but are table mappings established by the network administrator before the beginning of routing. These mappings do not change unless the network administrator alters them. Algorithms that use static routes are simple to design and work well in environments where network traffic is relatively predictable and where network design is relatively simple.

Because static routing systems cannot react to network changes, they generally are considered unsuitable for today's large, constantly changing networks. Most of the dominant routing algorithms today are dynamic routing algorithms, which adjust to changing network circumstances by analyzing incoming routing update messages. If the message indicates that a network change has occurred, the routing software recalculates routes and sends out new routing update messages. These messages permeate the network, stimulating routers to rerun their algorithms and change their routing tables accordingly.

Dynamic routing algorithms can be supplemented with static routes where appropriate. A router of last resort (a router to which all unroutable packets are sent), for example, can be designated to act as a repository for all unroutable packets, ensuring that all messages are at least handled in some way.

Single-Path Versus Multipath

Some sophisticated routing protocols support multiple paths to the same destination. Unlike single-path algorithms, these multipath algorithms permit traffic multiplexing over multiple lines. The advantages of multipath algorithms are obvious: They can provide substantially better throughput and reliability. This is generally called load sharing.

Flat Versus Hierarchical

Some routing algorithms operate in a flat space, while others use routing hierarchies. In a flat routing system, the routers are peers of all others. In a hierarchical routing system, some routers form what amounts to a routing backbone. Packets from nonbackbone routers travel to the backbone routers, where they are sent through the backbone until they reach the general area of the destination. At this point, they travel from the last backbone router through one or more nonbackbone routers to the final destination.

Routing systems often designate logical groups of nodes, called domains, autonomous systems, or areas. In hierarchical systems, some routers in a domain can communicate with routers in other domains, while others can communicate only with routers within their domain. In very large networks, additional hierarchical levels may exist, with routers at the highest hierarchical level forming the routing backbone.

The primary advantage of hierarchical routing is that it mimics the organization of most companies and therefore supports their traffic patterns well. Most network communication occurs within small company groups (domains). Because intradomain routers need to know only about other routers within their domain, their routing algorithms can be simplified, and, depending on the routing algorithm being used, routing update traffic can be reduced accordingly.

Link-State Versus Distance Vector

Link-state algorithms (also known as shortest path first algorithms) flood routing information to all nodes in the internetwork. Each router, however, sends only the portion of the routing table that describes the state of its own links. In link-state algorithms, each router builds a picture of the entire network in its routing tables. Distance vector algorithms (also known as Bellman-Ford algorithms) call for each router to send all or some portion of its routing table, but only to its neighbors. In essence, link-state algorithms send small updates everywhere, while distance vector algorithms send larger updates only to neighboring routers. Distance vector algorithms know only about their neighbors. Typically, this type of algorithmn is used in conjunction with OSPF routing protocols.

How Routing Behaves Within the Adaptive Security Appliance

The ASA uses both routing table and XLATE tables for routing decisions. To handle destination IP translated traffic, that is, untranslated traffic, the ASA searches for existing XLATE, or static translation to select the egress interface. The selection process is as follows:

Egress Interface Selection Process

1. If destination IP translating XLATE already exists, the egress interface for the packet is determined from the XLATE table, but not from the routing table.

2. If destination IP translating XLATE does not exist, but a matching static translation exists, then the egress interface is determined from the static route and an XLATE is created, and the routing table is not used.
3. If destination IP translating XLATE does not exist and no matching static translation exists, the packet is not destination IP translated. The ASA processes this packet by looking up the route to select egress interface, then source IP translation is performed (if necessary).

   For regular dynamic outbound NAT, initial outgoing packets are routed using the route table and then creating the XLATE. Incoming return packets are forwarded using existing XLATE only. For static NAT, destination translated incoming packets are always forwarded using existing XLATE or static translation rules.

Next Hop Selection Process

After selecting egress interface using any method described above, an additional route lookup is performed to find out suitable next hop(s) that belong to previously selected egress interface. If there are no routes in routing table that explicitly belong to selected interface, the packet is dropped with level 6 error message 110001 "`no route to host`", even if there is another route for a given destination network that belongs to different egress interface. If the route that belongs to selected egress interface is found, the packet is forwarded to corresponding next hop.

Load sharing on the ASA is possible only for multiple next-hops available using single egress interface. Load sharing cannot share multiple egress interfaces.

If dynamic routing is in use on ASA and route table changes after XLATE creation, for example route flap, then destination translated traffic is still forwarded using old XLATE, not via route table, until XLATE times out. It may be either forwarded to wrong interface or dropped with message 110001 "`no route to host`" if old route was removed from the old interface and attached to another one by routing process.

The same problem may happen when there is no route flaps on the ASA itself, but some routing process is flapping around it, sending source translated packets that belong to the same flow through the ASA using different interfaces. Destination translated return packets may be forwarded back using the wrong egress interface.

This issue has a high probability in same security traffic configuration, where virtually any traffic may be either source-translated or destination-translated, depending on direction of initial packet in the flow. When this issue occurs after a route flap, it can be resolved manually by using the **`clear xlate`** command, or automatically resolved by an XLATE timeout. XLATE timeout may be decreased if necessary. To ensure that this rarely happens, make sure that there is no route flaps on ASA and around it. That is, ensure that destination translated packets that belong to the same flow are always forwarded the same way through the ASA.

Supported Internet Protocols for Routing

The ASA supports several internet protocols for routing. Each protocol is briefly desribed in this section.

- Enhanced Interior Gateway Routing Protocol (EIGRP)

  Enhanced IGRP provides compatibility and seamless interoperation with IGRP routers. An automatic-redistribution mechanism allows IGRP routes to be imported into Enhanced IGRP, and vice versa, so it is possible to add Enhanced IGRP gradually into an existing IGRP network.

  For more infomation on configuring EIGRP, see the chapter ‘Configuring EIGRP’.
- Open Shortest Path First (OSPF)

Open Shortest Path First (OSPF) is a routing protocol developed for Internet Protocol (IP) networks by the interior gateway protocol (IGP) working group of the Internet Engineering Task Force (IETF). OSPF uses a link-state algorithm in order to build and calculate the shortest path to all known destinations. Each router in an OSPF area contains an identical link-state database, which is a list of each of the router usable interfaces and reachable neighbors

For more infomation on configuring OSPF, see the chapter 'Configuring OSPF'.

- Routing Information Protocol

  The Routing Information Protocol (RIP) is a distance-vector protocol that uses hop count as its metric. RIP is widely used for routing traffic in the global Internet and is an interior gateway protocol (IGP), which means that it performs routing within a single autonomous system.

  For more infomation on configuring RIP, see the chapter 'Configuring RIP'.

Information About the Routing Table

This section contains the following topics:

- Displaying the Routing Table, page 18-5
- How the Routing Table is Populated, page 18-5
- How Forwarding Decisions are Made, page 18-7

Displaying the Routing Table

To view the entries in the routing table, enter the following command:

```
hostname# show route

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 10.86.194.1 to network 0.0.0.0

S    10.1.1.0 255.255.255.0 [3/0] via 10.86.194.1, outside
C    10.86.194.0 255.255.254.0 is directly connected, outside
S*   0.0.0.0 0.0.0.0 [1/0] via 10.86.194.1, outside
```

On the ASA 5505 ASA, the following route is also shown. It is the internal loopback interface, which is used by the VPN hardware client feature for individual user authentication.

```
C 127.1.0.0 255.255.0.0 is directly connected, _internal_loopback
```

How the Routing Table is Populated

The ASA routing table can be populated by statically defined routes, directly connected routes, and routes discovered by the RIP, EIGRP, and OSPF routing protocols. Because the ASA can run multiple routing protocols in addition to having static and connected routed in the routing table, it is possible that the same route is discovered or entered in more than one manner. When two routes to the same destination are put into the routing table, the one that remains in the routing table is determined as follows:

- If the two routes have different network prefix lengths (network masks), then both routes are considered unique and are entered in to the routing table. The packet forwarding logic then determines which of the two to use.

  For example, if the RIP and OSPF processes discovered the following routes:

  - RIP: 192.168.32.0/24
  - OSPF: 192.168.32.0/19

  Even though OSPF routes have the better administrative distance, both routes are installed in the routing table because each of these routes has a different prefix length (subnet mask). They are considered different destinations and the packet forwarding logic determine which route to use.

- If the ASA learns about multiple paths to the same destination from a single routing protocol, such as RIP, the route with the better metric (as determined by the routing protocol) is entered into the routing table.

  Metrics are values associated with specific routes, ranking them from most preferred to least preferred. The parameters used to determine the metrics differ for different routing protocols. The path with the lowest metric is selected as the optimal path and installed in the routing table. If there are multiple paths to the same destination with equal metrics, load balancing is done on these equal cost paths.

- If the ASA learns about a destination from more than one routing protocol, the administrative distances of the routes are compared and the routes with lower administrative distance is entered into the routing table.

  You can change the administrative distances for routes discovered by or redistributed into a routing protocol. If two routes from two different routing protocols have the same administrative distance, then the route with the lower *default* administrative distance is entered into the routing table. In the case of EIGRP and OSPF routes, if the EIGRP route and the OSPF route have the same administrative distance, then the EIGRP route is chosen by default.

Administrative distance is a route parameter that the ASA uses to select the best path when there are two or more different routes to the same destination from two different routing protocols. Because the routing protocols have metrics based on algorithms that are different from the other protocols, it is not always possible to determine the “best path” for two routes to the same destination that were generated by different routing protocols.

Each routing protocol is prioritized using an administrative distance value. Table 18-1 shows the default administrative distance values for the routing protocols supported by the ASA.

Table 18-1 Default Administrative Distance for Supported Routing Protocols

Route Source	Default Administrative Distance
Connected interface	0
Static route	1
EIGRP Summary Route	5
Internal EIGRP	90
OSPF	110
RIP	120

Table 18-1 Default Administrative Distance for Supported Routing Protocols

EIGRP external route	170
Unknown	255

The smaller the administrative distance value, the more preference is given to the protocol. For example, if the ASA receives a route to a certain network from both an OSPF routing process (default administrative distance - 110) and a RIP routing process (default administrative distance - 120), the ASA chooses the OSPF route because OSPF has a higher preference. This means the router adds the OSPF version of the route to the routing table.

In the above example, if the source of the OSPF-derived route was lost (for example, due to a power shutdown), the ASA would then use the RIP-derived route until the OSPF-derived route reappears.

The administrative distance is a local setting. For example, if you use the **distance-ospf** command to change the administrative distance of routes obtained through OSPF, that change would only affect the routing table for the ASA the command was entered on. The administrative distance is not advertised in routing updates.

Administrative distance does not affect the routing process. The OSPF and RIP routing processes only advertise the routes that have been discovered by the routing process or redistributed into the routing process. For example, the RIP routing process advertises RIP routes, even if routes discovered by the OSPF routing process are used in the ASA routing table.

Backup Routes

A backup route is registered when the initial attempt to install the route in the routing table fails because another route was installed instead. If the route that was installed in the routing table fails, the routing table maintenance process calls each routing protocol process that has registered a backup route and requests them to reinstall the route in the routing table. If there are multiple protocols with registered backup routes for the failed route, the preferred route is chosen based on administrative distance.

Because of this process, you can create “floating” static routes that are installed in the routing table when the route discovered by a dynamic routing protocol fails. A floating static route is simply a static route configured with a greater administrative distance than the dynamic routing protocols running on the ASA. When the corresponding route discover by a dynamic routing process fails, the static route is installed in the routing table.

How Forwarding Decisions are Made

Forwarding decisions are made as follows:

- If the destination does not match an entry in the routing table, the packet is forwarded through the interface specified for the default route. If a default route has not been configured, the packet is discarded.
- If the destination matches a single entry in the routing table, the packet is forwarded through the interface associated with that route.
- If the destination matches more than one entry in the routing table, and the entries all have the same network prefix length, the packets for that destination are distributed among the interfaces associated with that route.

- If the destination matches more than one entry in the routing table, and the entries have different network prefix lengths, then the packet is forwarded out of the interface associated with the route that has the longer network prefix length.

For example, a packet destined for 192.168.32.1 arrives on an interface of a ASA with the following routes in the routing table:

```
hostname# show route
         ....
         R   192.168.32.0/24 [120/4] via 10.1.1.2
         O   192.168.32.0/19 [110/229840] via 10.1.1.3
         ....
```

In this case, a packet destined to 192.168.32.1 is directed toward 10.1.1.2, because 192.168.32.1 falls within the 192.168.32.0/24 network. It also falls within the other route in the routing table, but the 192.168.32.0/24 has the longest prefix within the routing table (24 bits verses 19 bits). Longer prefixes are always preferred over shorter ones when forwarding a packet.

Dynamic Routing and Failover

Because static routing systems cannot react to network changes, they generally are considered unsuitable for today's large, constantly changing networks. Most of the dominant routing algorithms today are dynamic routing algorithms, which adjust to changing network circumstances by analyzing incoming routing update messages. If the message indicates that a network change has occurred, the routing software recalculates routes and sends out new routing update messages. These messages permeate the network, stimulating routers to rerun their algorithms and change their routing tables accordingly.

Dynamic routing algorithms can be supplemented with static routes where appropriate. A router of last resort (a router to which all unroutable packets are sent), for example, can be designated to act as a repository for all unroutable packets, ensuring that all messages are at least handled in some way.

Dynamic routes are not replicated to the standby unit or failover group in a failover configuration. Therefore, immediately after a failover occurs, some packets received by the ASA may be dropped because of a lack of routing information or routed to a default static route while the routing table is repopulated by the configured dynamic routing protocols.

For more information on static routs and how to configure them , see “Configuring Static and Default Routes”.

Information About IPv6 Support

Many, but not all, features on the ASA supports IPv6 traffic. This section describes the commands and features that support IPv6, and includes the following topics:

- Features that Support IPv6, page 18-8
- IPv6-Enabled Commands, page 18-9
- Entering IPv6 Addresses in Commands, page 18-10

Features that Support IPv6

The following features support IPv6.

Note For features that use the Modular Policy Framework, be sure to use the **match any** command to match IPv6 traffic; other **match** commands do not support IPv6.

- The following application inspections support IPv6 traffic:
  - FTP
  - HTTP
  - ICMP
  - SIP
  - SMTP
  - IPSec-pass-thru
- IPS
- NetFlow Secure Event Logging filtering
- Connection limits, timeouts, and TCP randomization
- TCP Normalization
- TCP state bypass
- Access group, using an IPv6 access list
- Static Routes
- VPN (all types)

IPv6-Enabled Commands

The following ASA commands can accept and display IPv6 addresses:

- **capture**
- **configure**
- **copy**
- **http**
- **name**
- **object-group**
- **ping**
- **show conn**
- **show local-host**
- **show tcpstat**
- **ssh**
- **telnet**
- **tftp-server**
- **who**
- **write**

The following commands were modified to work for IPv6:

- **debug**
- **fragment**
- **ip verify**
- **mtu**
- **icmp** (entered as **ipv6 icmp**)

IPv6 Command Guidelines in Transparent Firewall Mode

The **ipv6 address** and **ipv6 enable** commands are available in global configuration mode instead of interface configuration mode. The **ipv6 address** command does not support the **eui** keyword. (The **ipv6 address link-local** command is still available in interface configuration mode.

The following IPv6 commands are not supported in transparent firewall mode, because they require router capabilities:

- **ipv6 address autoconfig**
- **ipv6 nd prefix**
- **ipv6 nd ra-interval**
- **ipv6 nd ra-lifetime**
- **ipv6 nd suppress-ra**

The following VPN command is not supported, because transparent mode does not support VPN:

- **ipv6 local pool**

Entering IPv6 Addresses in Commands

When entering IPv6 addresses in commands that support them, simply enter the IPv6 address using standard IPv6 notation, for example: `ping fe80::2e0:b6ff:fe01:3b7a`. The ASA correctly recognizes and processes the IPv6 address. However, you must enclose the IPv6 address in square brackets ([ ]) in the following situations:

- You need to specify a port number with the address, for example: `[fe80::2e0:b6ff:fe01:3b7a]:8080`.
- The command uses a colon as a separator, such as the **write net** and **config net** commands, for example: `configure net [fe80::2e0:b6ff:fe01:3b7a]:/tftp/config/pixconfig`.

CHAPTER 19

Configuring Static and Default Routes

This chapter describes how to configure static and default routes on the ASA, and includes the following sections:

- Information About Static and Default Routes, page 19-1
- Licensing Requirements for Static and Default Routes, page 19-2
- Guidelines and Limitations, page 19-2
- Configuring Static and Default Routes, page 19-2
- Monitoring a Static or Default Route, page 19-5
- Configuration Examples for Static or Default Routes, page 19-7
- Feature History for Static and Default Routes, page 19-7

Information About Static and Default Routes

To route traffic to a non-connected host or network, you must define a static route to the host or network or, at a minimum, a default route for any networks to which the ASA is not directly connected; for example, when there is a router between a network and the ASA.

Without a static or default route defined, traffic to non-connected hosts or networks generates the following error message:

```
%ASA-6-110001: No route to dest_address from source_address
```

Multiple context mode does not support dynamic routing,

You might want to use static routes in single context mode in the following cases:

- Your networks use a different router discovery protocol from EIGRP, RIP, or OSPF.
- Your network is small and you can easily manage static routes.
- You do not want the traffic or CPU overhead associated with routing protocols.

The simplest option is to configure a default route to send all traffic to an upstream router, relying on the router to route the traffic for you. However, in some cases the default gateway might not be able to reach the destination network, so you must also configure more specific static routes. For example, if the default gateway is outside, then the default route cannot direct traffic to any inside networks that are not directly connected to the ASA.

In transparent firewall mode, for traffic that originates on the ASA and is destined for a non-directly connected network, you need to configure either a default route or static routes so the ASA knows out of which interface to send traffic. Traffic that originates on the ASA might include communications to a syslog server, Websense or N2H2 server, or AAA server. If you have servers that cannot all be reached through a single default route, then you must configure static routes. Additionally, the ASA supports up to three equal cost routes on the same interface for load balancing.

Licensing Requirements for Static and Default Routes

Model	**License Requirement**
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

IPv6 Guidelines

Supports IPv6.

Configuring Static and Default Routes

This section explains how to configure a static, and a static default route and includes the following topics:

- Configuring a Static Route, page 19-2
- Configuring a Default Static Route, page 19-3
- Configuring IPv6 Default and Static Routes, page 19-4

Configuring a Static Route

Static routing algorithms are basically table mappings established by the network administrator before the beginning of routing. These mappings do not change unless the network administrator alters them. Algorithms that use static routes are simple to design and work well in environments where network traffic is relatively predictable and where network design is relatively simple. Because of this fact, static routing systems cannot react to network changes.

Static routes remain in the routing table even if the specified gateway becomes unavailable. If the specified gateway becomes unavailable, you need to remove the static route from the routing table manually. However, static routes are removed from the routing table if the specified interface goes down, and are reinstated when the interface comes back up.

Note If you create a static route with an administrative distance greater than the administrative distance of the routing protocol running on the ASA, then a route to the specified destination discovered by the routing protocol takes precedence over the static route. The static route is used only if the dynamically discovered route is removed from the routing table.

To configure a static route, enter the following command:

Detailed Steps

Command	Purpose

`route` *`if_name dest_ip mask gateway_ip`* [*`distance`*]
`Example:`
`hostname(config)# route outside 10.10.10.0 255.255.255.0 192.168.1.1 [1]`
	This enables you to add a static route.
	The *dest_ip* and *mask* is the IP address for the destination network and the *gateway_ip* is the address of the next-hop router.The addresses you specify for the static route are the addresses that are in the packet before entering the ASA and performing NAT.
	The *distance* is the administrative distance for the route. The default is 1 if you do not specify a value. Administrative distance is a parameter used to compare routes among different routing protocols. The default administrative distance for static routes is 1, giving it precedence over routes discovered by dynamic routing protocols but not directly connect routes.
	The default administrative distance for routes discovered by OSPF is 110. If a static route has the same administrative distance as a dynamic route, the static routes take precedence. Connected routes always take precedence over static or dynamically discovered routes.

Configuring a Default Static Route

A default route identifies the gateway IP address to which the ASA sends all IP packets for which it does not have a learned or static route. A default static route is simply a static route with 0.0.0.0/0 as the destination IP address. Routes that identify a specific destination take precedence over the default route.

Note In ASA software Versions 7.0 and later, if you have two default routes configured on different interfaces that have different metrics, the connection to the ASA firewall that is made from the higher metric interface fails, but connections to the ASA firewall from the lower metric interface succeed as expected.

You can define up to three equal cost default route entries per device. Defining more than one equal cost default route entry causes the traffic sent to the default route to be distributed among the specified gateways. When defining more than one default route, you must specify the same interface for each entry.

If you attempt to define more than three equal cost default routes, or if you attempt to define a default route with a different interface than a previously defined default route, you receive the following message:

```
“ERROR: Cannot add route entry, possible conflict with existing routes.”
```

You can define a separate default route for tunneled traffic along with the standard default route. When you create a default route with the **tunneled** option, all traffic from a tunnel terminating on the ASA that cannot be routed using learned or static routes, is sent to this route. For traffic emerging from a tunnel, this route overrides over any other configured or learned default routes.

Limitations on Configuring a Default Static Route

The following restrictions apply to default routes with the **tunneled** option:

- Do not enable unicast RPF (**ip verify reverse-path**) on the egress interface of tunneled route. Enabling Unicast RPF on the egress interface of a tunneled route causes the session to fail.
- Do not enable TCP intercept on the egress interface of the tunneled route. Doing so causes the session to fail.
- Do not use the VoIP inspection engines (CTIQBE, H.323, GTP, MGCP, RTSP, SIP, SKINNY), the DNS inspect engine, or the DCE RPC inspection engine with tunneled routes. These inspection engines ignore the tunneled route.

You cannot define more than one default route with the **tunneled** option; ECMP for tunneled traffic is not supported.

To define a tunneled default route, enter the following command:

Detailed Steps

Command	Purpose

`route if_name 0.0.0.0 0.0.0.0 gateway_ip [distance | tunneled]`
Example:
`hostname(config)# route outside 0 0 192.168.2.4 tunneled`
	This enables you to add a static route.
	The *dest_ip* and *mask* is the IP address for the destination network and the *gateway_ip* is the address of the next-hop router. The addresses you specify for the static route are the addresses that are in the packet before entering the ASA and performing NAT.
	The *distance* is the administrative distance for the route. The default is 1 if you do not specify a value. Administrative distance is a parameter used to compare routes among different routing protocols. The default administrative distance for static routes is 1, giving it precedence over routes discovered by dynamic routing protocols but not directly connect routes. The default administrative distance for routes discovered by OSPF is 110. If a static route has the same administrative distance as a dynamic route, the static routes take precedence. Connected routes always take precedence over static or dynamically discovered routes.

Tip You can enter 0 0 instead of 0.0.0.0 0.0.0.0 for the destination network address and mask, for example:

```
hostname(config)# route outside 0 0 192.168.1 1
```

Configuring IPv6 Default and Static Routes

The ASA automatically routes IPv6 traffic between directly connected hosts if the interfaces to which the hosts are attached are enabled for IPv6 and the IPv6 ACLs allow the traffic.

To configure an IPv6 default route and static routes, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**ipv6 route** *if_name* **::/0** *next_hop_ipv6_addr* **Example:** hostname(config)#ipv6 route *inside* 7fff::0/32 *3FFE:1100:0:CC00::1*	This step adds a default IPv6 route. This example routes packets for network 7fff::0/32 to a networking device on the inside interface at 3FFE:1100:0:CC00::1 The address ::/0 is the IPv6 equivalent of "any."
Step 2	**ipv6 route** *if_name destination next_hop_ipv6_addr* [*admin_distance*] **Example:** hostname(config)# ipv6 route i*nside* 7fff::0/32 *3FFE:1100:0:CC00::1* [*110*]	This step adds an IPv6 static route to the IPv6 routing table. This example routes packets for network 7fff::0/32 to a networking device on the inside interface at 3FFE:1100:0:CC00::1 , and with an administrative distance of 110.

Note The **ipv6 route** command works like the **route** command used to define IPv4 static routes.

Monitoring a Static or Default Route

One of the problems with static routes is that there is no inherent mechanism for determining if the route is up or down. They remain in the routing table even if the next hop gateway becomes unavailable. Static routes are only removed from the routing table if the associated interface on the ASA goes down.

The static route tracking feature provides a method for tracking the availability of a static route and installing a backup route if the primary route should fail. This allows you to, for example, define a default route to an ISP gateway and a backup default route to a secondary ISP in case the primary ISP becomes unavailable.

The ASA does this by associating a static route with a monitoring target that you define. It monitors the target using ICMP echo requests. If an echo reply is not received within a specified time period, the object is considered down and the associated route is removed from the routing table. A previously configured backup route is used in place of the removed route.

When selecting a monitoring target, you need to make sure it can respond to ICMP echo requests. The target can be any network object that you choose, but you should consider using:

- the ISP gateway (for dual ISP support) address
- the next hop gateway address (if you are concerned about the availability of the gateway)
- a server on the target network, such as a AAA server, that the ASA needs to communicate with
- a persistent network object on the destination network (a desktop or notebook computer that may be shut down at night is not a good choice)

You can configure static route tracking for statically defined routes or default routes obtained through DHCP or PPPoE. You can only enable PPPoE clients on multiple interface with route tracking.

To configure static route tracking, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**sla monitor** *sla_id* **Example:** hostname(config)# sla monitor *sla_id*	Configure the tracked object monitoring parameters by defining the monitoring process. If you are configuring a new monitoring process, you enter SLA monitor configuration mode. If you are changing the monitoring parameters for an unscheduled monitoring process that already has a type defined, you automatically enter SLA protocol configuration mode.
Step 2	**type echo protocol ipIcmpEcho** *target_ip* **interface** *if_name* **Example:** hostname(config-sla-monitor)# type echo protocol ipIcmpEcho *target_ip* interface *if_name*	Specify the monitoring protocol. If you are changing the monitoring parameters for an unscheduled monitoring process that already has a type defined, you automatically enter SLA protocol configuration mode and cannot change this setting. The *target_ip* is the IP address of the network object whose availability the tracking process monitors. While this object is available, the tracking process route is installed in the routing table. When this object becomes unavailable, the tracking process removed the route and the backup route is used in its place.
Step 3	**sla monitor schedule** *sla_id* [**life** {**forever** | *seconds*}] [**start-time** {*hh*:*mm*[:*ss*] [*month day* | *day month*] | *pending* | *now* | **after** *hh*:*mm*:*ss*}] [**ageout** *seconds*] [**recurring**] **Example:** hostname(config)# sla monitor schedule *sla_id* [life {forever | *seconds*}] [start-time {*hh*:*mm*[:*ss*] [*month day* | *day month*] | *pending* | *now* | after *hh*:*mm*:*ss*}] [ageout *seconds*] [recurring]	Schedule the monitoring process. Typically, you will use **sla monitor schedule** *sla_id* **life forever start-time now** for the monitoring schedule, and allow the monitoring configuration determine how often the testing occurs. However, you can schedule this monitoring process to begin in the future and to only occur at specified times.
Step 4	**track** *track_id* **rtr** *sla_id* **reachability** **Example:** hostname(config)# track *track_id* rtr *sla_id* reachability	Associate a tracked static route with the SLA monitoring process. The *track_id* is a tracking number you assign with this command. The *sla_id* is the ID number of the SLA process.
Step 5	Do one of the following to define the static route to be installed in the routing table while the tracked object is reachable. These options allow you to track a static route, or default route obtained through DHCP or PPPOE.	
	route *if_name dest_ip mask gateway_ip* [*admin_distance*] **track** *track_id* **Example:** hostname(config)# route *if_name dest_ip mask gateway_ip* [*admin_distance*] track *track_id*	This option tracks a static route. You cannot use the **tunneled** option with the **route** command with static route tracking.

Command	Purpose

`hostname(config)# interface phy_if`
`hostname(config-if)# dhcp client route track track_id`
`hostname(config-if)# ip addresss dhcp setroute`
`hostname(config-if)# exit`
	This option tracks a default route obtained through DHCP,
	Remember that you must use the **setroute** argument with the **ip address dhcp** command to obtain the default route using DHCP.

`hostname(config)# interface phy_if`
`hostname(config-if)# pppoe client route track track_id`
`hostname(config-if)# ip addresss pppoe setroute`
`hostname(config-if)# exit`
	This option tracks a default route obtained through PPPoE.
	You must use the **setroute** argument with the **ip address pppoe** command to obtain the default route using PPPoE.

Configuration Examples for Static or Default Routes

Step 1 Create a static route:

```
hostname(config)# route inside 10.1.1.0 255.255.255.0 10.1.2.45 1
```

In this step, a static route is created that sends all traffic destined for 10.1.1.0/24 to the router (10.1.2.45) connected to the inside interface.

Step 2 Define three equal cost static routes that directs traffic to three different gateways on the outside interface, and adds a default route for tunneled traffic. The ASA distributes the traffic among the specified gateways.

```
hostname(config)# route outside 10.10.10.0 255.255.255.0 192.168.2.1
hostname(config)# route outside 10.10.10.0 255.255.255.0 192.168.2.2
hostname(config)# route outside 10.10.10.0 255.255.255.0 192.168.2.3
hostname(config)# route outside 0 0 192.168.2.4 tunneled
```

Unencrypted traffic received by the ASA for which there is no static or learned route is distributed among the gateways with the IP addresses 192.168.2.1, 192.168.2.2, 192.168.2.3. Encrypted traffic receive by the ASA for which there is no static or learned route is passed to the gateway with the IP address 192.168.2.4.

Feature History for Static and Default Routes

Table 19-1 lists the release history for this feature.

Table 19-1 Feature History for Static and Default Routes

Feature Name	Releases	Feature Information
route command	7.0	The **route** command is used to enter a static or default route for the specified interface.

CHAPTER 20

Defining Route Maps

This chapter includes the following sections:

- Overview, page 20-1
- Licensing Requirements for Route Maps, page 20-3
- Guidelines and Limitations, page 20-3
- Defining a Route Map, page 20-4
- Customizing a Route Map, page 20-4
- Configuration Example for Route Maps, page 20-6
- Related Documents, page 20-6
- Feature History for Route Maps, page 20-6

Overview

Route maps are used when redistributing routes into an OSPF, RIP, or EIGRP routing process. They are also used when generating a default route into an OSPF routing process. A route map defines which of the routes from the specified routing protocol are allowed to be redistributed into the target routing process.

Route maps have many features in common with widely known access control lists (ACLs). These are some of the traits common to both mechanisms:

- They are an ordered sequence of individual statements, each has a permit or deny result. Evaluation of ACL or route-maps consists of a list scan, in a predetermined order, and an evaluation of the criteria of each statement that matches. A list scan is aborted once the first statement match is found and an action associated with the statement match is performed.
- They are generic mechanisms—criteria matches and match interpretation are dictated by the way they are applied. The same route map applied to different tasks might be interpreted differently.

These are some of the differences between route-maps and ACLs:

- Rout -maps frequently use ACLs as matching criteria.
- The main result from the evaluation of an access list is a yes or no answer—an ACL either permits or denies input data. Applied to redistribution, an ACL determines if a particular route can (route matches ACLs permit statement) or can not (matches deny statement) be redistributed. Typical route-maps not only permit (some) redistributed routes but also modify information associated with the route, when it is redistributed into another protocol.

- Route-maps are more flexible than ACLs and can verify routes based on criteria which ACLs can not verify. For example, a route map can verify if the type of route is internal.
- Each ACL ends with an implicit deny statement, by design convention; there is no similar convention for route-maps. If the end of a route map is reached during matching attempts, the result depends on the specific application of the route map. Fortunately, route-maps that are applied to redistribution behave the same way as ACLs: if the route does not match any clause in a route map then the route redistribution is denied, as if the route map contained deny statement at the end.

The dynamic protocol **redistribute** command allows you to apply a route map. Route-maps are preferred if you intend to either modify route information during redistribution or if you need more powerful matching capability than an ACL can provide. If you simply need to selectively permit some routes based on their prefix or mask, Cisco recommends that you use route map to map to an ACL (or equivalent prefix list) directly in the **redistribute** command. If you use a route map to selectively permit some routes based on their prefix or mask, you typically use more configuration commands to achieve the same goal.

Permit and Deny Clauses

Route-maps can have **permit** and **deny** clauses. In **route map ospf-to-eigrp**, there is one deny clause (with sequence number 10) and two permit clauses. The deny clause rejects route matches from redistribution. Therefore, these rules apply:

- If you use an ACL in a route map permit clause, routes that are permitted by the ACL are redistributed.
- If you use an ACL in a route map deny clause, routes that are permitted by the ACL are not redistributed.
- If you use an ACL in a route map permit or deny clause, and the ACL denies a route, then the route map clause match is not found and the next route map clause is evaluated.

Match and Set Commands

Each route map clause has two types of commands:

- **match—**Selects routes to which this clause should be applied.
- **set—**Modifies information which will be redistributed into the target protocol.

For each route that is being redistributed, the router first evaluates the match command of a clause in the route map. If the match criteria succeeds, then the route is redistributed or rejected as dictated by the permit or deny clause, and some of its attributes might be modified by **set** commands. If the match criteria fails, then this clause is not applicable to the route, and the software proceeds to evaluate the route against the next clause in the route map. Scan of the route map continues until a clause is found whose **match** command(s) match the route or until the end of the route map is reached.

A **match** or **set** command in each clause can be missed or repeated several times, if one of these conditions exist:

- If several **match** commands are present in a clause, all must succeed for a given route in order for that route to match the clause (in other words, the logical AND algorithm is applied for multiple match commands).
- If a **match** command refers to several objects in one command, either of them should match (the logical OR algorithm is applied). For example, in the **match ip address 101 121** command, a route is permitted if it is permitted by access list 101 or access list 121.

- If a **match** command is not present, all routes match the clause. In the previous example, all routes that reach clause 30 match; therefore, the end of the route map is never reached.
- If a **set** command is not present in a route map permit clause then the route is redistributed without modification of its current attributes.

Note Do not configure a **set** command in a deny route map clause because the deny clause prohibits route redistribution—there is no information to modify.

A route map clause without a **match** or **set** command performs an action. An empty permit clause allows a redistribution of the remaining routes without modification. An empty deny clause does not allows a redistribution of other routes (this is the default action if a route map is completely scanned but no explicit match is found).

Licensing Requirements for Route Maps

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single context mode.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

IPv6 Guidelines

Does not support IPv6.

Defining a Route Map

To define a route map, enter the following command:

Detailed Steps

Command	Purpose
route-map *name* {**permit** | **deny**} [*sequence_number*] **Example:** hostname(config)# **route-map** *name* {**permit**} [*12*]	Create the route map entry. Route map entries are read in order. You can identify the order using the *sequence_number* option, or the ASA uses the order in which you add the entries.

Customizing a Route Map

This section describes how to customize the route map, and includes the following topics:

- Defining a Route to Match a Specific Destination Address, page 20-4
- Configuring the Metric Values for a Route Action, page 20-5

Defining a Route to Match a Specific Destination Address

To define a route to match a specified desitnation address, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**route-map** *name* {**permit** | **deny**} [*sequence_number*] **Example:** hostname(config)# **route-map** *name* {**permit**} [*12*]	Create the route map entry. Route map entries are read in order. You can identify the order using the *sequence_number* option, or the ASA uses the order in which you add the entries.
Step 2	Enter one of the following **match** commands to match routes to a specified destination address:	
	match ip address *acl_id* [*acl_id*] [...] **Example:** hostname(config-route-map)# **match ip address** *acl_id* [*acl_id*] [...]	This allows you to match any routes that have a destination network that matches a standard ACL. If you specify more than one ACL, then the route can match any of the ACLs.
	match metric *metric_value* **Example:** hostname(config-route-map)# **match metric** *200*	This allows you to match any routes that have a specified metric. The *metric_value* can be from 0 to 4294967295.

Command	Purpose
match ip next-hop *acl_id* [*acl_id*] [...] **Example:** `hostname(config-route-map)# match ip next-hop acl_id [acl_id] [...]`	This allows you to match any routes that have a next hop router address that matches a standard ACL. If you specify more than one ACL, then the route can match any of the ACLs.
match interface *if_name* **Example:** `hostname(config-route-map)# match interface if_name`	This allows you to match any routes with the specified next hop interface. If you specify more than one interface, then the route can match either interface.
match ip route-source *acl_id* [*acl_id*] [...] **Example:** `hostname(config-route-map)# match ip route-source acl_id [acl_id] [...]`	This allows you to match any routes that have been advertised by routers that match a standard ACL. If you specify more than one ACL, then the route can match any of the ACLs.

match route-type {**internal** | **external** [**type-1** | **type-2**]}
Example:
`hostname(config-route-map)# match route-type internal type-1`
	This allows you to match the route type.

Configuring the Metric Values for a Route Action

If a route matches the **match** commands, then the following **set** commands determine the action to perform on the route before redistributing it.

To configure a route action, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**route-map** *name* {**permit** | **deny**} [*sequence_number*] **Example:** `hostname(config)# route-map name {permit} [12]`	Create the route map entry. Route map entries are read in order. You can identify the order using the *sequence_number* option, or the ASA uses the order in which you add the entries.
Step 2	Enter one or more of the following **set** commands to set a metric for the route map:	
	set metric *metric_value* **Example:** `hostname(config-route-map)# set metric 200`	This allows you to set the metric. The *metric_value* can be a value between 0 and 294967295.

	set metric-type {**type-1** | **type-2**}
	Example:
	`hostname(config-route-map)# set metric-type type-2`
		This allows you to set the metric type.
		The *metric-type* can be type-1 or type-2.

Configuration Example for Route Maps

The following example shows how to redistribute routes with a hop count equal to 1 into OSPF. The ASA redistributes these routes as external LSAs with a metric of 5 and a metric type of Type 1.

```
hostname(config)# route-map 1-to-2 permit
hostname(config-route-map)# match metric 1
hostname(config-route-map)# set metric 5
hostname(config-route-map)# set metric-type type-1
```

The following example shows how to redistribute the 10.1.1.0 static route into eigrp process 1 with the configured metric value:

```
hostname(config)# route outside 10.1.1.0 255.255.255.0 192.168.1.1
hostname(config-route-map)# access-list mymap2 line 1 permit 10.1.1.0 255.255.255.0
hostname(config-route-map)# route-map mymap2 permit 10
hostname(config-route-map)# match ip address mymap2
hostname(config-route-map)# router eigrp 1
hostname(config)# redistribute static metric 250 250 1 1 1 route-map mymap2
```

Related Documents

For additional information related to routing, see the following:

Related Topic	Document Title
Routing Overview	Information About Routing
How to configure OSPF	Configuring OSPF
How to configure EIGRP	Configuring EIGRP
How to configure RIP	Configuring RIP
How to configure a static or default route	Configuring Static and Default Routes
How to configure multicast routing	Configuring Multicast Routing

Feature History for Route Maps

Table 20-1 lists the release history for this feature.

Table 20-1 Feature History for Route Maps

Feature Name	Releases	Feature Information
Route mapping	7.0(1)	The **route-map** command allows you to define a route map entry.

CHAPTER 21

Configuring OSPF

This chapter describes how to configure the ASA to route data, perform authentication, and redistribute routing information, using the Open Shortest Path First (OSPF) routing protocol.

This chapter includes the following sections:

- Overview, page 21-1
- Licensing Requirements for OSPF, page 21-2
- Guidelines and Limitations, page 21-3
- Enabling OSPF, page 21-3
- Customizing OSPF, page 21-4
- Monitoring OSPF, page 21-15
- Configuration Example for OSPF, page 21-16
- Feature History for OSPF, page 21-17
- Additional References, page 21-17

Overview

OSPF is an interior gateway routing protocol that uses link states rather than distance vectors for path selection. OSPF propagates link-state advertisements rather than routing table updates. Because only LSAs are exchanged instead of the entire routing tables, OSPF networks converge more quickly than RIP networks.

OSPF uses a link-state algorithm to build and calculate the shortest path to all known destinations. Each router in an OSPF area contains an identical link-state database, which is a list of each of the router usable interfaces and reachable neighbors.

The advantages of OSPF over RIP include the following:

- OSPF link-state database updates are sent less frequently than RIP updates, and the link-state database is updated instantly rather than gradually as stale information is timed out.
- Routing decisions are based on cost, which is an indication of the overhead required to send packets across a certain interface. The ASA calculates the cost of an interface based on link bandwidth rather than the number of hops to the destination. The cost can be configured to specify preferred paths.

The disadvantage of shortest path first algorithms is that they require a lot of CPU cycles and memory.

The ASA can run two processes of OSPF protocol simultaneously, on different sets of interfaces. You might want to run two processes if you have interfaces that use the same IP addresses (NAT allows these interfaces to coexist, but OSPF does not allow overlapping addresses). Or you might want to run one process on the inside, and another on the outside, and redistribute a subset of routes between the two processes. Similarly, you might need to segregate private addresses from public addresses.

You can redistribute routes into an OSPF routing process from another OSPF routing process, a RIP routing process, or from static and connected routes configured on OSPF-enabled interfaces.

The ASA supports the following OSPF features:

- Support of intra-area, interarea, and external (Type I and Type II) routes.
- Support of a virtual link.
- OSPF LSA flooding.
- Authentication to OSPF packets (both password and MD5 authentication).
- Support for configuring the ASA as a designated router or a designated backup router. The ASA also can be set up as an ABR.
- Support for stub areas and not-so-stubby-areas.

Area boundary router type-3 LSA filtering.

OSPF supports MD5 and clear text neighbor authentication. Authentication should be used with all routing protocols when possible because route redistribution between OSPF and other protocols (like RIP) can potentially be used by attackers to subvert routing information.

If NAT is used, if OSPF is operating on public and private areas, and if address filtering is required, then you need to run two OSPF processes—one process for the public areas and one for the private areas.

A router that has interfaces in multiple areas is called an Area Border Router (ABR). A router that acts as a gateway to redistribute traffic between routers using OSPF and routers using other routing protocols is called an Autonomous System Boundary Router (ASBR).

An ABR uses LSAs to send information about available routes to other OSPF routers. Using ABR type 3 LSA filtering, you can have separate private and public areas with the ASA acting as an ABR. Type 3 LSAs (inter-area routes) can be filtered from one area to other. This lets you use NAT and OSPF together without advertising private networks.

Note Only type 3 LSAs can be filtered. If you configure the ASA as an ASBR in a private network, it will send type 5 LSAs describing private networks, which will get flooded to the entire AS including public areas.

If NAT is employed but OSPF is only running in public areas, then routes to public networks can be redistributed inside the private network, either as default or type 5 AS External LSAs. However, you need to configure static routes for the private networks protected by the ASA. Also, you should not mix public and private networks on the same ASA interface.

You can have two OSPF routing processes, one RIP routing process, and one EIGRP routing process running on the ASA at the same time.

Licensing Requirements for OSPF

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

IPv6 Guidelines

Does not support IPv6.

Configuring OSPF

This section explains how to enable and restart the OSPF process on your system. After enabling see the section, to learn how to customize the OSPF process on your system.

- Enabling OSPF, page 21-3
- Restarting the OSPF Process, page 21-4

Enabling OSPF

To enable OSPF, you need to create an OSPF routing process, specify the range of IP addresses associated with the routing process, then assign area IDs associated with that range of IP addresses.

To enable OSPF, perform the following detailed steps:

Detailed Steps

	Command	Purpose
Step 1	**router ospf** *process_id* **Example:** hostname(config)# router ospf *2*	This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process. The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.
Step 2	**network** *ip_address mask* **area** *area_id* **Example:** hostname(config)# router ospf 2 hostname(config-router)# network 10.0.0.0 255.0.0.0 area 0	This step defines the IP addresses on which OSPF runs and to define the area ID for that interface.

Restarting the OSPF Process

This step allows you to remove the entire OSPF configuration you have enabled. Once this is cleared, you must reconfigure OSPF again using the **router ospf** command, perform the following step:

Command	Purpose
clear ospf *pid* {**process** | **redistribution** | **counters** [**neighbor** [*neighbor-interface*] [*neighbor-id*]]} **Example:** hostname(config)# clear ospf	This remove entire OSPF configuration you have enabled. Once this is cleared, you must reconfigure OSPF again using the **router ospf** command.

Customizing OSPF

This section explains how to customize the OSPF process and includes the following topics:

- Redistributing Routes Into OSPF, page 21-5
- Generating a Default Route, page 21-6
- Configuring OSPF Interface Parameters, page 21-8
- Configuring Route Summarization Between OSPF Areas, page 21-8
- Configuring OSPF Interface Parameters, page 21-8
- Configuring OSPF Area Parameters, page 21-11
- Configuring OSPF NSSA, page 21-12
- Configuring Route Calculation Timers, page 21-13
- Defining Static OSPF Neighbors, page 21-13
- Logging Neighbors Going Up or Down, page 21-14

Redistributing Routes Into OSPF

The ASA can control the redistribution of routes between OSPF routing processes. The ASA matches and changes routes according to settings in the **redistribute** command or by using a route map.

If you want to redistribute a route by defining which of the routes from the specified routing protocol are allowed to be redistributed into the target routing process, you must firstgenerate a default map and then define a route map.

Note (Optional) Create a route-map to further define which routes from the specified routing protocol are redistributed in to the OSPF routing process. See Chapter 20, "Defining Route Maps." Also, see the "Generating a Default Route" section on page 21-6 for another use for route maps.

To redistribute static, connected, RIP, or OSPF routes into an OSPF process, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	`router ospf process_id`
	
	Example:
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for tfor the OSPF process you want to redistribute.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	Do one of the following to redistribute the selected route type into the OSPF routing process:	

	`redistribute connected`
	`[[metric metric-value]`
	`[metric-type {type-1 | type-2}]`
	`[tag tag_value] [subnets] [route-map`
	`map_name]`
	
	Example:
	`hostname(config)# redistribute connected`
		This step redistributes connected routes into the OSPF routing process

	`redistribute static [metric metric-value]`
	`[metric-type {type-1 | type-2}]`
	`[tag tag_value] [subnets] [route-map`
	`map_name`
	
	Example:
	`hostname(config)# redistribute static`
		This step redistribute static routes into the OSPF routing process.

Command	Purpose

redistribute ospf ***pid*** **[match {internal | external [1 | 2] | nssa-external [1 | 2]}]** [**metric** *metric-value*] [**metric-type** {**type-1** | **type-2**}] [**tag** *tag_value*] [**subnets**] [**route-map** *map_name*]
Example:
`hostname(config)# route-map 1-to-2 permit`
`hostname(config-route-map)# match metric 1`
`hostname(config-route-map)# set metric 5`
`hostname(config-route-map)# set metric-type type-1`
`hostname(config-route-map)# router ospf 2`
`hostname(config-router)# redistribute ospf 1 route-map 1-to-2`
	This step allows you to redistribute routes from an OSPF routing process into another OSPF routing process.
	You can either use the **match** options in this command to match and set route properties, or you can use a route map. The **subnet** option does not have equivalents in the **route-map** command. If you use both a route map and **match** options in the **redistribute** command, then they must match.
	This example shows route redistribution from OSPF process 1 into OSPF process 2 by matching routes with a metric equal to 1. The ASA redistributes these routes as external LSAs with a metric of 5, metric type of Type 1.

redistribute rip [**metric** *metric-value*] [**metric-type** {**type-1** | **type-2**}] [**tag** *tag_value*] [**subnets**] [**route-map** *map_name*] **Example:** `hostname(config)# redistribute rip 25`	This step allows you to redistribute routes from a RIP routing process into the OSPF routing process.
redistribute eigrp ***as-num*** [**metric** *metric-value*] [**metric-type** {**type-1** | **type-2**}] [**tag** *tag_value*] [**subnets**] [**route-map** *map_name*] **Example:** `hostname(config)# redistribute eigrp 2`	This step allows you to redistribute routes from an EIGRP routing process into the OSPF routing process.

Generating a Default Route

You can force an autonomous system boundary router to generate a default route into an OSPF routing domain. Whenever you specifically configure redistribution of routes into an OSPF routing domain, the router automatically becomes an autonomous system boundary router. However, an autonomous system boundary router does not by default generate a default route into the OSPF routing domain.

To generate a default route, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	`Example:`
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**`default-information originate`** `[`**`always`**`] [`**`metric`** *`metric-value`*`] [`**`metric-type`** `{`**`1`** `|` **`2`**`}] [`**`route-map`** *`map-name`*`]`
	`Example:`
	`hostname(config-router)# default-information originate always`
		This step forces the autonomous system boundary router to generate a default route.

Configuring Route Summarization When Redistributing Routes into OSPF

When routes from other protocols are redistributed into OSPF, each route is advertised individually in an external LSA. However, you can configure the ASA to advertise a single route for all the redistributed routes that are covered by a specified network address and mask. This configuration decreases the size of the OSPF link-state database.

To configure the software advertisement on one summary route for all redistributed routes covered by a network address and mask, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	`Example:`
	`hostname(config)# router ospf 1`
		This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**`summary-address`** *`ip_address mask`* `[`**`not-advertise`**`] [`**`tag`** *`tag`*`]`
	`Example:`
	`hostname(config)# router ospf 1`
	`hostname(config-router)# summary-address 10.1.0.0 255.255.0.0`
		This step sets the summary address.
		In this example, the summary address 10.1.0.0 includes address 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. Only the address 10.1.0.0 is advertised in an external link-state advertisement

Note OSPF does not support **summary-address 0.0.0.0 0.0.0.0**.

Configuring Route Summarization Between OSPF Areas

Route summarization is the consolidation of advertised addresses. This feature causes a single summary route to be advertised to other areas by an area boundary router. In OSPF, an area boundary router advertises networks in one area into another area. If the network numbers in an area are assigned in a way such that they are contiguous, you can configure the area boundary router to advertise a summary route that covers all the individual networks within the area that fall into the specified range.

To define an address range for route summarization, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**router ospf** *process_id* **Example:** `hostname(config)# router ospf 1`	This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process. The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**area** *area-id* **range** *ip-address mask* [**advertise** | **not-advertise**]
	Example:
	`hostname(config)# router ospf 1`
	`hostname(config-router)# area 17 range 12.1.0.0 255.255.0.0`
		This step sets the address range.
		In this example, the address range is set between OSPF areas.

Configuring OSPF Interface Parameters

You can alter some interface-specific OSPF parameters as necessary. You are not required to alter any of these parameters, but the following interface parameters must be consistent across all routers in an attached network: **ospf hello-interval**, **ospf dead-interval**, and **ospf authentication-key**. Be sure that if you configure any of these parameters, the configurations for all routers on your network have compatible values.

To configure OSPF interface parameters, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**router ospf** *process_id* **Example:** hostname(config)# router ospf 2	This creates an OSPF routing process, and the user enters router configuration mode for tfor the OSPF process you want to redistribute. The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.
Step 2	**network** *ip_address mask* **area** *area_id* **Example:** hostname(config)# router ospf 2 hostname(config-router)# network 10.0.0.0 255.0.0.0 area 0	This step defines the IP addresses on which OSPF runs and to define the area ID for that interface.
Step 3	hostname(config)# **interface** *interface_name* **Example:** hostname(config)# interface *my_interface*	This allows you to enter interface configuration mode.
Step 4	Do one of the following to configure optional OSPF interface parameters:	
	ospf authentication [**message-digest** | **null**] **Example:** hostname(config-interface)# ospf authentication message-digest	This specifies the authentication type for an interface.
	ospf authentication-key *key* **Example:** hostname(config-interface)# ospf authentication-key cisco	This allows you to assign a password to be used by neighboring OSPF routers on a network segment that is using the OSPF simple password authentication. The *key* can be any continuous string of characters up to 8 bytes in length. The password created by this command is used as a key that is inserted directly into the OSPF header when the ASA software originates routing protocol packets. A separate password can be assigned to each network on a per-interface basis. All neighboring routers on the same network must have the same password to be able to exchange OSPF information.
	ospf cost *cost* **Example:** hostname(config-interface)# ospf cost *20*	This allows you to explicitly specify the cost of sending a packet on an OSPF interface. The *cost* is an integer from 1 to 65535. In this example, the cost is set to 20.
	ospf dead-interval *seconds* **Example:** hostname(config-interface)# ospf dead-interval *40*	This allows you to set the number of seconds that a device must wait before it declares a neighbor OSPF router down because it has not received a hello packet. The value must be the same for all nodes on the network. In this example, the dead-interval is set to 40.

Command	Purpose
ospf hello-interval *seconds* **Example:** hostname(config-interface)# **ospf hello-interval** *10*	This allows you to specify the length of time between the hello packets that the ASA sends on an OSPF interface. The value must be the same for all nodes on the network. In this example, the hello-interval is set to 10.
ospf message-digest-key *key_id* **md5** *key* **Example:** hostname(config-interface)# ospf message-digest-key 1 md5 cisco	This enables OSPF MD5 authentication. The following values can be set: • *key_id*—An identifier in the range from 1 to 255. • *key*—Alphanumeric password of up to 16 bytes. Usually, one key per interface is used to generate authentication information when sending packets and to authenticate incoming packets. The same key identifier on the neighbor router must have the same key value. We recommend that you not keep more than one key per interface. Every time you add a new key, you should remove the old key to prevent the local system from continuing to communicate with a hostile system that knows the old key. Removing the old key also reduces overhead during rollover.
ospf priority *number_value* **Example:** hostname(config-interface)# ospf priority 20	This allows you to set the priority to help determine the OSPF designated router for a network. The *number_value* is between 0 to 255. In this example, the priority number value is set to 20.
ospf retransmit-interval *seconds* **Example:** hostname(config-interface)# ospf retransmit-interval seconds	This allows you to specify the number of seconds between LSA retransmissions for adjacencies belonging to an OSPF interface. The value for *seconds* must be greater than the expected round-trip delay between any two routers on the attached network. The range is from 1 to 65535 seconds. The default value is 5 seconds. In this example, the retransmit-interval value is set to 15.
ospf transmit-delay *seconds* **Example:** hostname(config-interface)# ospf transmit-delay *5*	Sets the estimated number of seconds required to send a link-state update packet on an OSPF interface. The *seconds* value is from 1 to 65535 seconds. The default value is 1 second. In this example, the transmit-delay is 5 seconds.
ospf network point-to-point non-broadcast **Example:** hostname(config-interface)# ospf network point-to-point non-broadcast	Specifies the interface as a point-to-point, non-broadcast network. When you designate an interface as point-to-point, non-broadcast, you must manually define the OSPF neighbor; dynamic neighbor discover is not possible. See Defining Static OSPF Neighbors, page 21-13, for more information. Additionally, you can only define one OSPF neighbor on that interface.

Configuring OSPF Area Parameters

You can configure several area parameters. These area parameters (shown in the following task table) include setting authentication, defining stub areas, and assigning specific costs to the default summary route. Authentication provides password-based protection against unauthorized access to an area.

Stub areas are areas into which information on external routes is not sent. Instead, there is a default external route generated by the ABR, into the stub area for destinations outside the autonomous system. To take advantage of the OSPF stub area support, default routing must be used in the stub area. To further reduce the number of LSAs sent into a stub area, you can configure the **no-summary** keyword of the **area stub** command on the ABR to prevent it from sending summary link advertisement (LSA Type 3) into the stub area.

To specify area parameters for your network, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**router ospf** *process_id* **Example:** `hostname(config)# router ospf 2`	This creates an OSPF routing process, and the user enters router configuration mode for tfor the OSPF process you want to redistribute. The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.
Step 2	Do one of the following to configure optional OSPF area parameters:	
	area *area-id* **authentication** **Example:** `hostname(config-router)# area 0 authentication`	This step enables authentication for an OSPF area.
	area *area-id* **authentication message-digest** **Example:** `hostname(config-router)# area 0 authentication message-digest`	This step enables MD5 authentication for an OSPF area.
	area *area-id* **stub** [**no-summary**] **Example:** `hostname(config-router)# area 17 stub`	This defines an area to be a stub area.
	area *area-id* **default-cost** *cost* **Example:** `hostname(config-router)# area 17 default-cost 20`	This step assigns a specific cost to the default summary route used for the stub area. The *cost* is an integer from 1 to 65535. The default value is 1.

Configuring OSPF NSSA

The OSPF implementation of an NSSA is similar to an OSPF stub area. NSSA does not flood type 5 external LSAs from the core into the area, but it can import autonomous system external routes in a limited way within the area.

NSSA importsType 7 autonomous system external routes within an NSSA area by redistribution. These Type 7 LSAs are translated into Type 5 LSAs by NSSA ABRs, which are flooded throughout the whole routing domain. Summarization and filtering are supported during the translation.

You can simplify administration if you are an ISP or a network administrator that must connect a central site using OSPF to a remote site that is using a different routing protocol using NSSA.

Before the implementation of NSSA, the connection between the corporate site border router and the remote router could not be run as an OSPF stub area because routes for the remote site could not be redistributed into the stub area, and two routing protocols needed to be maintained. A simple protocol such as RIP was usually run and handled the redistribution. With NSSA, you can extend OSPF to cover the remote connection by defining the area between the corporate router and the remote router as an NSSA.

Before you use this feature, consider these guidelines:

- You can set a Type 7 default route that can be used to reach external destinations. When configured, the router generates a Type 7 default into the NSSA or the NSSA area boundary router.
- Every router within the same area must agree that the area is NSSA; otherwise, the routers will not be able to communicate.

To specify area parameters for your network as needed to configure OSPF NSSA, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	Example:
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for tfor the OSPF process you want to redistribute.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	Do one of the following to configure optional OSPF NSSA parameters:	

Command	Purpose

`area` *`area-id`* **`nssa`** `[`**`no-redistribution`**`]`
`[`**`default-information-originate`**`]`
 	
`Example:`
`hostname(config-router)# area 0 nssa`
	This step defines an NSSA area.

`summary-address` *`ip_address mask`*
`[`**`not-advertise`**`] [`**`tag`** *`tag`*`]`
 	
`Example:`
`hostname(config)# router ospf 1`
`hostname(config-router)# summary-address`
`10.1.0.0 255.255.0.0`
	This step sets the summary address and helps reduce the size of the routing table. Using this command for OSPF causes an OSPF ASBR to advertise one external route as an aggregate for all redistributed routes that are covered by the address.
	In this example, the summary address 10.1.0.0 includes address 10.1.1.0, 10.1.2.0, 10.1.3.0, and so on. Only the address 10.1.0.0 is advertised in an external link-state advertisement

Note OSPF does not support **summary-address 0.0.0.0 0.0.0.0**.

Defining Static OSPF Neighbors

You need to define static OSPF neighbors to advertise OSPF routes over a point-to-point, non-broadcast network. This lets you broadcast OSPF advertisements across an existing VPN connection without having to encapsulate the advertisements in a GRE tunnel.

Before you begin, you must create a static route to the OSPF neighbor. See the chapter, 'Configuring Static and Default Routes' for more information about creating static routes.

To define a static OSPF neighbor, perform the following tasks:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	
	`Example:`
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**`neighbor`** *`addr`* `[`**`interface`** *`if_name`*`]`
	
	`Example:`
	`hostname(config-router)# neighbor`
	`255.255.0.0 [interface` *`my_interface`*`]`
		This step defines the OSPF neighborhood.
		The *addr* argument is the IP address of the OSPF neighbor. The *if_name* is the interface used to communicate with the neighbor. If the OSPF neighbor is not on the same network as any of the directly-connected interfaces, you must specify the **interface**.

Configuring Route Calculation Timers

You can configure the delay time between when OSPF receives a topology change and when it starts an SPF calculation. You also can configure the hold time between two consecutive SPF calculations.

To configure route calculation timers, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	`Example:`
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**`timers spf`** *`spf-delay spf-holdtime`*
	`Example:`
	`hostname(config-router)# timers spf 10 120`
		This step configure the route calculation times.
		The *spf-delay* is the delay time (in seconds) between when OSPF receives a topology change and when it starts an SPF calculation. It can be an integer from 0 to 65535. The default time is 5 seconds. A value of 0 means that there is no delay; that is, the SPF calculation is started immediately.
		The *spf-holdtime* is the minimum time (in seconds) between two consecutive SPF calculations. It can be an integer from 0 to 65535. The default time is 10 seconds. A value of 0 means that there is no delay; that is, two SPF calculations can be done, one immediately after the other.

Logging Neighbors Going Up or Down

By default, the system sends a system message when an OSPF neighbor goes up or down.

Configure this command if you want to know about OSPF neighbors going up or down without turning on the **debug ospf adjacency** command. The **log-adj-changes** router configuration command provides a higher level view of the peer relationship with less output. Configure **log-adj-changes detail** if you want to see messages for each state change.

To log neighbors going up or down, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router ospf`** *`process_id`*
	`Example:`
	`hostname(config)# router ospf 2`
		This creates an OSPF routing process, and the user enters router configuration mode for this OSPF process.
		The *process_id* is an internally used identifier for this routing process. It can be any positive integer. This ID does not have to match the ID on any other device; it is for internal use only. You can use a maximum of two processes.

Step 2	**`log-adj-changes`** `[`**`detail`**`]`
	`Example:`
	`hostname(config-router)# log-adj-changes [detail]`
		This step configures logging for neighbors going up or down.

Note Logging must be enabled for the the neighbor up/down messages to be sent.

Monitoring OSPF

You can display specific statistics such as the contents of IP routing tables, caches, and databases. You can also use the information provided to determine resource utilization and solve network problems. You can also display information about node reachability and discover the routing path that your device packets are taking through the network.

To monitor or display various OSPF routing statistics, perform one of the following tasks:

Command	Purpose
show ospf [*process-id [area-id]*]	Displays general information about OSPF routing processes.
show ospf border-routers	Displays the internal OSPF routing table entries to the ABR and ASBR.
show ospf [*process-id* [*area-id*]] **database**	Displays lists of information related to the OSPF database for a specific router.
show ospf flood-list *if-name*	Displays a list of LSAs waiting to be flooded over an interface (to observe OSPF packet pacing). OSPF update packets are automatically paced so they are not sent less than 33 milliseconds apart. Without pacing, some update packets could get lost in situations where the link is slow, a neighbor could not receive the updates quickly enough, or the router could run out of buffer space. For example, without pacing packets might be dropped if either of the following topologies exist: • A fast router is connected to a slower router over a point-to-point link. • During flooding, several neighbors send updates to a single router at the same time. Pacing is also used between resends to increase efficiency and minimize lost retransmissions. You also can display the LSAs waiting to be sent out an interface. The benefit of the pacing is that OSPF update and retransmission packets are sent more efficiently. There are no configuration tasks for this feature; it occurs automatically
show ospf interface [*if_name*]	Displays OSPF-related interface information.
show ospf neighbor [*interface-name*] [*neighbor-id*] [**detail**]	Displays OSPF neighbor information on a per-interface basis.
show ospf request-list *neighbor if_name*	Displays a list of all LSAs requested by a router.

Command	Purpose
show ospf retransmission-list *neighbor if_name*	Displays a list of all LSAs waiting to be resent.
show ospf [*process-id*] **summary-address**	Displays a list of all summary address redistribution information configured under an OSPF process.
show ospf [*process-id*] **virtual-links**	Displays OSPF-related virtual links information.

Configuration Example for OSPF

The following example shows how to enable and configure OSPF with various optional processes:

Step 1 Enable OSPF.

```
hostname(config)# router ospf 2
hostname(config-router)# network 10.0.0.0 255.0.0.0 area 0
```

Step 2 Redistribute routes from one OSPF process to another OSPF process (optional):

```
hostname(config)# route-map 1-to-2 permit
hostname(config-route-map)# match metric 1
hostname(config-route-map)# set metric 5
hostname(config-route-map)# set metric-type type-1
hostname(config-route-map)# router ospf 2
hostname(config-router)# redistribute ospf 1 route-map 1-to-2
```

Step 3 Configure OSPF interface parameters (optional):

```
hostname(config)# router ospf 2
hostname(config-router)# network 2.0.0.0 255.0.0.0 area 0
hostname(config-router)# interface inside
hostname(config-interface)# ospf cost 20
hostname(config-interface)# ospf retransmit-interval 15
hostname(config-interface)# ospf transmit-delay 10
hostname(config-interface)# ospf priority 20
hostname(config-interface)# ospf hello-interval 10
hostname(config-interface)# ospf dead-interval 40
hostname(config-interface)# ospf authentication-key cisco
hostname(config-interface)# ospf message-digest-key 1 md5 cisco
hostname(config-interface)# ospf authentication message-digest
```

Step 4 Configure OSPF area parameters (optional):

```
hostname(config)# router ospf 2
hostname(config-router)# area 0 authentication
hostname(config-router)# area 0 authentication message-digest
hostname(config-router)# area 17 stub
hostname(config-router)# area 17 default-cost 20
```

Step 5 Configure the route calculation timers and show the log neighbor up/down messages (optional):

```
hostname(config-router)# timers spf 10 120
hostname(config-router)# log-adj-changes [detail]
```

Step 6 Restart the OSPF process .

```
hostname(config)# clear ospf pid {process | redistribution | counters
[neighbor [neighbor-interface] [neighbor-id]]}
```

Step 7 Show the results of your OSPF configuration (optional):

The following is sample output from the **show ospf** command:

```
hostname(config)# show ospf

Routing Process "ospf 2" with ID 20.1.89.2 and Domain ID 0.0.0.2
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 5. Checksum Sum 0x 26da6
Number of opaque AS LSA 0. Checksum Sum 0x     0
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 1
        Area has no authentication
        SPF algorithm executed 2 times
        Area ranges are
        Number of LSA 5. Checksum Sum 0x 209a3
        Number of opaque link LSA 0. Checksum Sum 0x     0
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
```

Feature History for OSPF

Table 21-1 lists the release history for this feature.

Table 21-1 Feature History for OSPF

Feature Name	Releases	Feature Information
router ospf	7.0	route data, perform authentication, redistribute and monitor routing information, using the Open Shortest Path First (OSPF) routing protocol.

Additional References

For additional information related to routing, see the following:

- Related Documents, page 21-18

Related Documents

Related Topic	Document Title
Routing Overview	Information About Routing
How to configure EIGRP	Configuring EIGRP
How to configure RIP	Configuring RIP
How to configure a static or default route	Configuring Static and Default Routes
How to configure a route map	Defining Route Maps
How to configure multicast routing	Configuring Multicast Routing

CHAPTER 22

Configuring RIP

This chapter describes how to configure the ASA to route data, perform authentication, and redistribute routing information, using the Routing Information Protocol (RIP) routing protocol.

This chapter includes the following sections:

- Overview, page 22-1
- Licensing Requirements for RIP, page 22-2
- Guidelines and Limitations, page 22-2
- Configuring RIP, page 22-3
- Customizing RIP, page 22-3
- Monitoring RIP, page 22-8
- Configuration Example for RIP, page 22-9
- Feature History for RIP, page 22-10
- Additional References, page 22-10

Overview

The Routing Information Protocol, or RIP, as it is more commonly called, is one of the most enduring of all routing protocols. RIP has four basic components: routing update process, RIP routing metrics, routing stability, and routing timers. Devices that support RIP send routing-update messages at regular intervals and when the network topology changes. These RIP packets contain information about the networks that the devices can reach, as well as the number of routers or gateways that a packet must travel through to reach the destination address. RIP generates more traffic than OSPF, but is easier to configure.

RIP has advantages over static routes because the initial configuration is simple, and you do not need to update the configuration when the topology changes. The disadvantage to RIP is that there is more network and processing overhead than static routing.

The ASA supports RIP Version 1 and RIP Version 2.

Routing Update Process

RIP sends routing-update messages at regular intervals and when the network topology changes. When a router receives a routing update that includes changes to an entry, it updates its routing table to reflect the new route. The metric value for the path is increased by 1, and the sender is indicated as the next hop.

RIP routers maintain only the best route (the route with the lowest metric value) to a destination. After updating its routing table, the router immediately begins transmitting routing updates to inform other network routers of the change. These updates are sent independently of the regularly scheduled updates that RIP routers send.

RIP Routing Metric

RIP uses a single routing metric (hop count) to measure the distance between the source and a destination network. Each hop in a path from source to destination is assigned a hop count value, which is typically 1. When a router receives a routing update that contains a new or changed destination network entry, the router adds 1 to the metric value indicated in the update and enters the network in the routing table. The IP address of the sender is used as the next hop.

RIP Stability Features

RIP prevents routing loops from continuing indefinitely by implementing a limit on the number of hops allowed in a path from the source to a destination. The maximum number of hops in a path is 15. If a router receives a routing update that contains a new or changed entry, and if increasing the metric value by 1 causes the metric to be infinity (that is, 16), the network destination is considered unreachable. The downside of this stability feature is that it limits the maximum diameter of a RIP network to less than 16 hops.

RIP includes a number of other stability features that are common to many routing protocols. These features are designed to provide stability despite potentially rapid changes in network topology. For example, RIP implements the split horizon and holddown mechanisms to prevent incorrect routing information from being propagated.

RIP Timers

RIP uses numerous timers to regulate its performance. These include a routing-update timer, a route-timeout timer, and a route-flush timer. The routing-update timer clocks the interval between periodic routing updates. Generally, it is set to 30 seconds, with a small random amount of time added whenever the timer is reset. This is done to help prevent congestion, which could result from all routers simultaneously attempting to update their neighbors. Each routing table entry has a route-timeout timer associated with it. When the route-timeout timer expires, the route is marked invalid but is retained in the table until the route-flush timer expires.

Licensing Requirements for RIP

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

IPv6 Guidelines

Does not support IPv6.

Configuring RIP

This section explains how to enable and restart the RIP process on your system.

- Enabling RIP, page 22-3

After enabling see the section Customizing RIP, page 22-3, to learn how to customize the RIP process on your system.

Enabling RIP

You can only enable one RIP routing process on the ASA. After you enable the RIP routing process, you must define the interfaces that will participate in that routing process using the **network** command. By default, the ASA sends RIP Version 1 updates and accepts RIP Version 1 and Version 2 updates.

To enable the RIP routing process, perform the following step:

Detailed Steps

Command	Purpose

`router rip`
 	
Example:
`hostname(config)# router rip`
	This starts the RIP routing process and places you in router configuration mode.

Use the **no router rip** command to remove entire RIP configuration you have enabled. Once this is cleared, you must reconfigure RIP again using the **router rip** command.

Customizing RIP

This section describes how to configure RIP, and includes the following topics:

- Generating a Default Route, page 22-4
- Configuring Interfaces for RIP, page 22-4
- Disabling Route Summarization, page 22-5
- Filtering Networks in RIP, page 22-5
- Redistributing Routes into the RIP Routing Process, page 22-6

- Configuring RIP Send/Receive Version on an Interface, page 22-7
- Enabling RIP Authentication, page 22-8

Generating a Default Route

To generate a default route in RIP, use the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router rip`**
	`Example:`
	`hostname(config)# router rip`
		This starts the RIP routing process and places you in router configuration mode.

Step 2	**`default-information originate`**
	`Example:`
	`hostname(config-router):#`
	default-information originate
		This step generates a default route into RIP.

Configuring Interfaces for RIP

If you have an interface that you do not want to participate in RIP routing, but that is attached to a network that you want advertised, you can configure a **network** command that covers the network to which the interface is attached, and use the **passive-interface** command to prevent that interface from sending RIP advertisements. Additionally, you can specify the version of RIP that is used by the ASA for updates.

Detailed Steps

	Command	Purpose

Step 1	**`router rip`**
	`Example:`
	`hostname(config)# router rip`
		This starts the RIP routing process and places you in router configuration mode.

Step 2	**`network`** *`network_address`*
	`Example:`
	`hostname(config)# router rip`
	`hostname(config-router)# network 10.0.0.0`
		This step specifies the interfaces that will participate in the RIP routing process.
		If an interface belongs to a network defined by this command, the interface will participate in the RIP routing process. If an interface does not belong to a network defined by this command, it will not send or receive RIP updates.

Step 3	Do one of the following to customize an interface to participate in RIP routing:	

Command	Purpose

`version [1 | 2]`
Example:
`hostname(config-router):# version [1]`
	Specifies the version of RIP used by the ASA.
	You can override this setting on a per-interface basis

`passive-interface [default | *if_name*]`
Example:
`hostname(config-router):# passive-interface [default]`
	This step specifies an interface to operate in passive mode.
	Using the **default** keyword causes all interfaces to operate in passive mode. Specifying an interface name sets only that interface to passive RIP mode. In passive mode, RIP routing updates are accepted by, but not sent out of, the specified interface. You can enter this command for each interface that you want to set to passive mode.

Disabling Route Summarization

RIP Version 1 always uses automatic route summarization. You cannot disable this feature for RIP Version 1. RIP Version 2 uses automatic route summarization by default. The RIP routing process summarizes on network number boundaries. This can cause routing problems if you have non-contiguous networks.

For example, if you have a router with the networks 192.168.1.0, 192.168.2.0, and 192.168.3.0 connected to it, and those networks all participate in RIP, the RIP routing process creates the summary address 192.168.0.0 for those routes. If an additional router is added to the network with the networks 192.168.10.0 and 192.168.11.0, and those networks participate in RIP, they will also be summarized as 192.168.0.0. To prevent the possibility of traffic being routed to the wrong location, you should disable automatic route summarization on the routers creating the conflicting summary addresses.

To disable automatic router summarization, enter the following command in router configuration mode for the RIP routing process:

Detailed Steps

	Command	Purpose

Step 1	**`router rip`**
	Example:
	`hostname(config)# router rip`
		This starts the RIP routing process and places you in router configuration mode.

Step 2	**`no auto-summarize`**
	Example:
	`hostname(config-router):# no auto-summarize`
		This step disables automatic route summarization.

Filtering Networks in RIP

To filter the networks received in updates, perform the following steps:

Note Before you begin, you must create a standard access list permitting the networks you want the RIP process to allow in the routing table and denying the networks you want the RIP process to discard. For more information on creating standard access lists, see the chapter, "Identifying Traffic with Access Lists".

Detailed Steps

	Command	Purpose

Step 1	**`router rip`**
	
	Example:
	`hostname(config)# router rip`
		This starts the RIP routing process and places you in router configuration mode.

Step 2	**`distribute-list`** ***`acl`*** **`in [interface`** ***`if_name`*** **`]`**
	`distribute-list` ***`acl`*** **`out [connected | eigrp | interface`** ***`if_name`*** **`| ospf | rip | static]`**
	
	Example:
	`hostname(config-router)# distribute-list` *`acl2`* `in [interface` *`interface1`*`]`
	`hostname(config-router): distribute-list` *`acl3`* `out [connected]`
		This step filters the networks sent in updates.
		You can specify an interface to apply the filter to only those updates received or sent by that interface. You can enter this command for each interface you want to apply a filter to. If you do not specify an interface name, the filter is applied to all RIP updates.

Redistributing Routes into the RIP Routing Process

You can redistribute routes from the OSPF, EIGRP, static, and connected routing processes into the RIP routing process.

To redistribute a routes into the RIP routing process, perform the following steps:

Note Before you begin this procedure, you must create a route-map to further define which routes from the specified routing protocol are redistributed in to the RIP routing process. See Chapter 20, "Defining Route Maps," for more information about creating a route map.

Detailed Steps

	Command	Purpose
Step 1	Do one of the following to redistribute the selected route type into the RIP routing process. You must specify the RIP metric values in the **redistribute** command if you do not have a **default-metric** command in the RIP router configuration.	

	`redistribute connected [ metric` `<`*`metric-value`*`>` **`| transparent ] [route-map`** `<`*`route-map-name`*`>`**`]`**
	
	Example:
	`hostname(config-router): # redistribute connected [ metric <`*`metric-value`*`> | transparent ] [route-map <`*`route-map-name`*`>]`
		Use this step to redistribute connected routes into the RIP routing process.

Command	Purpose
redistribute static [metric {*metric_value* | transparent}] [route-map *map_name*] **Example:** hostname(config-router):# redistribute static [metric {*metric_value* | transparent}] [route-map *map_name*]	Use this step to redistribute static routes into the EIGRP routing process.
redistribute ospf *pid* [match {internal | external [1 | 2] | nssa-external [1 | 2]}] [metric {*metric_value* | transparent}] [route-map *map_name*] **Example:** hostname(config-router):# redistribute ospf pid [match {internal | external [1 | 2] | nssa-external [1 | 2]}] [metric {*metric_value* | transparent}] [route-map *map_name*]	Use this step to redistribute routes from an OSPF routing process into the RIP routing process.
redistribute eigrp *as-num* [metric {*metric_value* | transparent}] [route-map *map_name*] **Example:** hostname(config-router):# redistribute eigrp *as-num* [metric {metric_value | transparent}] [route-map *map_name*]	Use this step to redistribute routes from an EIGRP routing process into the RIP routing process.

Configuring RIP Send/Receive Version on an Interface

You can override the globally-set version of RIP the ASA uses to send and receive RIP updates on a per-interface basis.

To configure the RIP send and receive version, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**interface** *phy_if* **Example:** hostname(config)# interface *phy_if*	This step enters interface configuration mode for the interface you are configuring.
Step 2	Do one of the following to to send or receive RIP updates on a per-interface basis.	
	rip send version {[1] [2]} **Example:** hostname(config-if)# rip send version 1	This step specifies the version of RIP to use when sending RIP updates out of the interface. In this example, version 1 is selected.
	rip receive version {[1] [2]} **Example:** hostname(config-if)# rip receive version 2	This step specifies the version of RIP advertisements permitted to be received by an interface. In this example, version 2 is selected. RIP updates received on the interface that do not match the allowed version are dropped.

Enabling RIP Authentication

Note The ASA supports RIP message authentication for RIP Version 2 messages.

RIP route authentication provides MD5 authentication of routing updates from the RIP routing protocol. The MD5 keyed digest in each RIP packet prevents the introduction of unauthorized or false routing messages from unapproved sources.

RIP route authentication is configured on a per-interface basis. All RIP neighbors on interfaces configured for RIP message authentication must be configured with the same authentication mode and key for adjacencies to be established.

Note Before you can enable RIP route authentication, you must enable RIP.

To enable RIP authentication on an interface, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`router rip`**
	Example:
	`hostname(config)# router rip`
		This creates an RIP routing process, and the user enters router configuration mode for this RIP process.
		The *as-num* argument is the autonomous system number of the RIP routing process.

Step 2	**`interface`** *`phy_if`*
	Example:
	`hostname(config)# interface` *`phy_if`*
		Enter interface configuration mode for the interface on which you are configuring RIP message authentication.

Step 3	**`rip authentication mode`** `{`**`text`** `|` **`md5`**`}`
	Example:
	`hostname(config-if)# rip authentication mode md5`
		This step sets the authentication mode. By default, text authentication is used. We recommend MD5 authentication.

Step 4	**`rip authentication key`** *`key`* **`key-id`** *`key-id`*
	Example:
	`hostname(config-if)# rip authentication key` *`cisco`* `key-id` *`200`*
		Configure the authentication key used by the MD5 algorithm.
		The *key* argument can contain up to 16 characters.
		The *key-id* argument is a number from 0 to 255.

Monitoring RIP

You can use the following commands to monitor or debug the RIP routing process.

We recommend that you only use the **debug** commands to troubleshoot specific problems or during troubleshooting sessions with Cisco TAC.

Debugging output is assigned high priority in the CPU process and can render the system unusable. It is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system performance. For examples and descriptions of the command output, see the *Cisco Security Appliance Command Reference*.

To monitor or debug various RIP routing statistics, perform one of the following tasks:

Command	Purpose
Monitoring RIP Routing	
`show rip database`	Display the contents of the RIP routing database.
`show running-config router rip`	Displays the RIP commands.
Debug RIP	
`debug rip events`	Displays RIP processing events.
`debug rip database`	Displays RIP database events.

Configuration Example for RIP

The following example shows how to enable and configure RIP with various optional processes:

Step 1 Enable RIP:

```
hostname(config)# router rip 2
```

Step 2 Configure a default route into RIP:

```
hostname(config-router): default-information originate
```

Step 3 Specify the version of RIP to use:

```
hostname(config-router): version [1]
```

Step 4 Specify the interfaces that will participate in the RIP routing process:

```
hostname(config-router)# network 225.25.25.225
```

Step 5 Specify an interface to operate in passive mode:

```
hostname(config-router)# passive-interface [default]
```

Step 6 Redistribute a connected route into the RIP routing process

```
hostname(config-router): redistribute connected [metric bandwidth delay reliability
loading mtu] [route-map map_name]
```

Feature History for RIP

Table 22-1 lists the release history for this feature.

Table 22-1 Feature History for RIP

Feature Name	Releases	Feature Information
router rip	7.0	This feature allows you to route data, perform authentication, redistribute and monitor routing information, using the Routing Information Protocol (RIP) routing protocol.

Additional References

For additional information related to routing, see the following:

- Related Documents, page 22-10

Related Documents

Related Topic	Document Title
Routing Overview	Information About Routing
How to configure EIGRP	Configuring EIGRP
How to configure RIP	Configuring RIP
How to configure a static or default route	Configuring Static and Default Routes
How to configure a route map	Defining Route Maps
How to configure multicast routing	Configuring Multicast Routing

CHAPTER 23

Configuring EIGRP

This chapter describes how to configure the ASA to route data, perform authentication, and redistribute routing information, using the Enhanced Interior Gateway Routing Protocol (EIGRP) routing protocol.

This chapter includes the following sections:

- Overview, page 23-1
- Licensing Requirements for EIGRP, page 23-2
- Guidelines and Limitations, page 23-2
- Enabling EIGRP, page 23-3
- Customizing EIGRP, page 23-4
- Monitoring EIGRP, page 23-13
- Configuration Example for EIGRP, page 23-14
- Feature History for EIGRP, page 23-15
- Additional References, page 23-15

Overview

EIGRP is an enhanced version of IGRP developed by Cisco. Unlike IGRP and RIP, EIGRP does not send out periodic route updates. EIGRP updates are sent out only when the network topology changes. Key capabilities that distinguish EIGRP from other routing protocols include fast convergence, support for variable-length subnet mask, support for partial updates, and support for multiple network layer protocols.

A router running EIGRP stores all the neighbor routing tables so that it can quickly adapt to alternate routes. If no appropriate route exists, EIGRP queries its neighbors to discover an alternate route. These queries propagate until an alternate route is found. Its support for variable-length subnet masks permits routes to be automatically summarized on a network number boundary. In addition, EIGRP can be configured to summarize on any bit boundary at any interface. EIGRP does not make periodic updates. Instead, it sends partial updates only when the metric for a route changes. Propagation of partial updates is automatically bounded so that only those routers that need the information are updated. As a result of these two capabilities, EIGRP consumes significantly less bandwidth than IGRP.

Neighbor discovery is the process that the ASA uses to dynamically learn of other routers on directly attached networks. EIGRP routers send out multicast hello packets to announce their presence on the network. When the ASA receives a hello packet from a new neighbor, it sends its topology table to the neighbor with an initialization bit set. When the neighbor receives the topology update with the initialization bit set, the neighbor sends its topology table back to the ASA.

The hello packets are sent out as multicast messages. No response is expected to a hello message. The exception to this is for statically defined neighbors. If you use the **neighbor** command to configure a neighbor, the hello messages sent to that neighbor are sent as unicast messages. Routing updates and acknowledgements are sent out as unicast messages.

Once this neighbor relationship is established, routing updates are not exchanged unless there is a change in the network topology. The neighbor relationship is maintained through the hello packets. Each hello packet received from a neighbor contains a hold time. This is the time in which the ASA can expect to receive a hello packet from that neighbor. If the ASA does not receive a hello packet from that neighbor within the hold time advertised by that neighbor, the ASA considers that neighbor to be unavailable.

The EIGRP protocol uses four key algorithm technologies, four key technologies, including neighbor discover/recovery, Reliable Transport Protocol (RTP), and the fourth one, DUAL being important for route computations. DUAL saves all routes to a destination in the topology table, not just the least-cost route. The least-cost route is inserted into the routing table. The other routes remain in the topology table. If the main route fails, another route is chosen from the feasible successors. A successor is a neighboring router used for packet forwarding that has a least-cost path to a destination. The feasibility calculation guarantees that the path is not part of a routing loop.

If a feasible successor is not found in the topology table, a route recomputation must occur. During route recomputation, DUAL queries the EIGRP neighbors for a route, who in turn query their neighbors. Routers that do no have a feasible successor for the route return an unreachable message.

During route recomputation, DUAL marks the route as active. By default, the ASA waits for three minutes to receive a response from its neighbors. If the ASA does not receive a response from a neighbor, the route is marked as stuck-in-active. All routes in the topology table that point to the unresponsive neighbor as a feasibility successor are removed.

Note EIGRP neighbor relationships are not supported through the IPSec tunnel without a GRE tunnel.

Licensing Requirements for EIGRP

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single context mode.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

IPv6 Guidelines

Does not support IPv6.

Configuring EIGRP

This section explains how to enable and restart the EIGRP process on your system. After enabling see the section, to learn how to customize the EIGRP process on your system.

- Enabling EIGRP, page 23-3
- Enabling EIGRP Stub Routing, page 23-3
- Restarting the EIGRP Process, page 23-4

Enabling EIGRP

You can only enable one EIGRP routing process on the ASA. To enable EIGRP, perform the following detailed steps.

Detailed Steps

	Command	Purpose

Step 1	**`router eigrp`** *`as-num`*
	
	Example:
	`hostname(config)# router eigrp 2`
		This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process.
		The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	**`network`** *`ip-addr`* `[`*`mask`*`]`
	
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0 255.0.0.0`
		This step configure the interfaces and networks that participate in EIGRP routing. You can configure one or more **network** statements with this command.
		Directly-connected and static networks that fall within the defined network are advertised by the ASA. Additionally, only interfaces with an IP address that fall within the defined network participate in the EIGRP routing process.
		If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, see the section Configuring Interfaces in EIGRP.

Enabling EIGRP Stub Routing

You can enable, and configure the ASA as an EIGRP stub router. Stub routing decreases memory and processing requirements on the ASA. As a stub router, the ASA does not need to maintain a complete EIGRP routing table because it forwards all nonlocal traffic to a distribution router. Generally, the distribution router need not send anything more than a default route to the stub router.

Only specified routes are propagated from the stub router to the distribution router. As a stub router, the ASA responds to all queries for summaries, connected routes, redistributed static routes, external routes, and internal routes with the message “inaccessible.” When the ASA is configured as a stub, it sends a special peer information packet to all neighboring routers to report its status as a stub router. Any neighbor that receives a packet informing it of the stub status will not query the stub router for any routes, and a router that has a stub peer will not query that peer. The stub router depends on the distribution router to send the proper updates to all peers.

To enable the ASA as an EIGRP stub routing process, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**router eigrp** *as-num* **Example:** `hostname(config)# router eigrp 2`	This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process. The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	**network** *ip-addr* [*mask*]
	
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0`
	`255.0.0.0`
		This step configure the interfaces and networks that participate in EIGRP routing. You can configure one or more **network** statements with this command.
		Directly-connected and static networks that fall within the defined network are advertised by the ASA. Additionally, only interfaces with an IP address that fall within the defined network participate in the EIGRP routing process.
		If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, see the section Configuring Interfaces for EIGRP.

Step 3	**eigrp stub** {**receive-only** | [**connected**] [**redistributed**] [**static**] [**summary**]}
	
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0`
	`255.0.0.0`
	`hostname(config-router)# eigrp stub`
	`{receive-only | [connected]`
	`[redistributed] [static] [summary]}`
		This step configure the stub routing process. You must specify which networks are advertised by the stub routing process to the distribution router. Static and connected networks are not automatically redistributed into the stub routing process.

Restarting the EIGRP Process

To restart an EIGRP process, clear redistribution, or counters, enter the following command:

```
hostname(config)# clear eigrp pid {<1-65535> | neighbors | topology | events)}
```

Customizing EIGRP

This section describes how to customize the EIGRP routing, and includes the following topics:

- Configuring Interfaces for EIGRP, page 23-5
- Configuring the Summary Aggregate Addresses on Interfaces, page 23-6
- Changing the Interface Delay Value, page 23-6
- Enabling EIGRP Authentication on an Interface, page 23-7

- Defining an EIGRP Neighbor, page 23-8
- Redistributing Routes Into EIGRP, page 23-9
- Filtering Networks in EIGRP, page 23-10
- Customizing the EIGRP Hello Interval and Hold Time, page 23-11
- Disabling Automatic Route Summarization, page 23-12
- Disabling EIGRP Split Horizon, page 23-13

Configuring Interfaces for EIGRP

If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, you can configure a **network** command that covers the network the interface is attached to, and use the **passive-interface** command to prevent that interface from sending or receiving EIGRP updates.

Detailed Steps

	Command	Purpose
Step 1	**router eigrp** *as-num* **Example:** `hostname(config)# router eigrp 2`	This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process. The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	`hostname(config-router)#` **network** *ip-addr* [*mask*]
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0 255.0.0.0`
		This step configure the interfaces and networks that participate in EIGRP routing. You can configure one or more **network** statements with this command.
		Directly-connected and static networks that fall within the defined network are advertised by the ASA. Additionally, only interfaces with an IP address that fall within the defined network participate in the EIGRP routing process.
		If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, see the section Configuring Interfaces for EIGRP.

Step 3	Do one of the following to customize an interface to participate in EIGRP routing:	

Command	Purpose
passive-interface {**default** | *if-name*} **Example:** hostname(config)# router eigrp 2 hostname(config-router)# network 10.0.0.0 255.0.0.0 hostname(config-router)# passive-interface {default}	This step prevents an interface from sending or receiving EIGRP routing message. Using the **default** keyword disables EIGRP routing updates on all interfaces. Specifying an interface name, as defined by the **nameif** command, disables EIGRP routing updates on the specified interface. You can have multiple **passive-interface** commands in your EIGRP router configuration.
no default-information {**in** | **out** | **WORD**} **Example:** hostname(config)# router eigrp 2 hostname(config-router)# network 10.0.0.0 255.0.0.0 hostname(config-router)# no default-information {in | out | WORD}	This allows you to control the sending or receiving of candidate default route information. Configuring **no default-information in** causes the candidate default route bit to be blocked on received routes. Configuring **no default-information out** disables the setting of th edefault route bit in advertised routes.

Configuring the Summary Aggregate Addresses on Interfaces

You can configure a summary addresses on a per-interface basis. You need to manually define summary addresses if you want to create summary addresses that do not occur at a network number boundary or if you want to use summary addresses on a ASA with automatic route summarization disabled. If any more specific routes are in the routing table, EIGRP will advertise the summary address out the interface with a metric equal to the minimum of all more specific routes.

To create a summary address, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**interface** *phy_if* **Example:** hostname(config)# **interface** *phy_if*	Enter interface configuration mode for the interface on which you are changing the delay value used by EIGRP.
Step 2	**summary-address eigrp** *as-num address mask* [*distance*] **Example:** hostname(config-if)# **summary-address eigrp** *2 address mask* [*20*]	This step creates the summary address. By default, EIGRP summary addresses that you define have an administrative distance of 5. You can change this value by specifying the optional *distance* argument in the **summary-address** command.

Changing the Interface Delay Value

The interface delay value is used in EIGRP distance calculations. You can modify this value on a per-interface basis. To change the delay value, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`interface`** *`phy_if`*
	`Example:`
	`hostname(config)#` **`interface`** *`phy_if`*
		Enter interface configuration mode for the interface on which you are changing the delay value used by EIGRP.

Step 2	**`delay`** *`value`*
	`Example:`
	`hostname(config-if)#` **`delay`** *`200`*
		The *value* entered is in tens of microseconds. So, to set the delay for 2000 microseconds, you would enter a *value* of 200.
		To view the delay value assigned to an interface, use the **show interface** command.

Enabling EIGRP Authentication on an Interface

EIGRP route authentication provides MD5 authentication of routing updates from the EIGRP routing protocol. The MD5 keyed digest in each EIGRP packet prevents the introduction of unauthorized or false routing messages from unapproved sources.

EIGRP route authentication is configured on a per-interface basis. All EIGRP neighbors on interfaces configured for EIGRP message authentication must be configured with the same authentication mode and key for adjacencies to be established.

Note Before you can enable EIGRP route authentication, you must enable EIGRP.

To enable EIGRP authentication on an interface, perform the following steps:

Detailed Steps

Step 1	**router eigrp** *as-num* **Example:** hostname(config)# **router eigrp** *2*	This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process. The *as-num* argument is the autonomous system number of the EIGRP routing process.
Step 2	**network** *ip-addr* [*mask*] **Example:** hostname(config)# **router eigrp 2** hostname(config-router)# **network 10.0.0.0 255.0.0.0**	This step configure the interfaces and networks that participate in EIGRP routing. You can configure one or more **network** statements with this command. Directly-connected and static networks that fall within the defined network are advertised by the ASA. Additionally, only interfaces with an IP address that fall within the defined network participate in the EIGRP routing process. If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, see the section Configuring Interfaces in EIGRP.
Step 3	**interface** *phy_if* **Example:** hostname(config)# **interface** *phy_if*	Enter interface configuration mode for the interface on which you are configuring EIGRP message authentication.
Step 4	**authentication mode eigrp** *as-num* **md5** **Example:** hostname(config)# **authentication mode eigrp** *2* **md5**	Enable MD5 authentication of EIGRP packets. The *as-num* argument is the autonomous system number of the EIGRP routing process configured on the ASA. If EIGRP is not enabled or if you enter the wrong number, the ASA returns the following error message: `% Asystem(100) specified does not exist`
Step 5	**authentication key eigrp** *as-num key* **key-id** *key-id* **Example:** hostname(config)# **authentication key eigrp** *2 cisco* **key-id** *200*	Configure the key used by the MD5 algorithm. The *as-num* argument is the autonomous system number of the EIGRP routing process configured on the ASA. If EIGRP is not enabled or if you enter the wrong number, the ASA returns the following error message: `% Asystem(100) specified does not exist` The *key* argument can contain up to 16 characters. The *key-id* argument is a number from 0 to 255

Defining an EIGRP Neighbor

EIGRP hello packets are sent as multicast packets. If an EIGRP neighbor is located across a nonbroadcast network, such as a tunnel, you must manually define that neighbor. When you manually define an EIGRP neighbor, hello packets are sent to that neighbor as unicast messages.

To manually define an EIGRP neighbor, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	`router eigrp` *`as-num`*
	
	`Example:`
	`hostname(config)#` **`router eigrp`** *`2`*
		This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process.
		The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	`neighbor` *`ip-addr`* `interface` *`if_name`*
	
	`Example:`
	`hostname(config)#` **`router eigrp 2`**
	`hostname(config-router)#` **`neighbor 10.0.0.0 interface`** *`interface1`*
		This step defines the static neighbor.
		The *ip-addr* argument is the IP address of the neighbor.
		The *if-name* argument is the name of the interface, as specified by the **nameif** command, through which that neighbor is available. You can define multiple neighbors for an EIGRP routing process.

Redistributing Routes Into EIGRP

You can redistribute routes discovered by RIP and OSPF into the EIGRP routing process. You can also redistribute static and connected routes into the EIGRP routing process. You do not need to redistribute connected routes if they fall within the range of a **network** statement in the EIGRP configuration.

Note **For RIP only**: Before you begin this procedure, you must create a route-map to further define which routes from the specified routing protocol are redistributed in to the RIP routing process. See Chapter 20, "Defining Route Maps," for more information about creating a route map.

To redistribute routes into the EIGRP routing process, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	`router eigrp` *`as-num`*
	
	`Example:`
	`hostname(config)#` **`router eigrp`** *`2`*
		This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process.
		The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	**`default-metric`** *`bandwidth delay reliability loading mtu`*
	
	`Example:`
	`hostname(config)#` **`router eigrp`** *`2`*
	`hostname(config-router)#` **`default-metric`** *`bandwidth delay reliability loading mtu`*
		(Optional) Specify the default metrics that should be applied to routes redistributed into the EIGRP routing process.
		If you do not specify a **default-metric** in the EIGRP router configuration, you must specify the metric values in each **redistribute** command. If you specify the EIGRP metrics in the **redistribute** command and have the **default-metric** command in the EIGRP router configuration, the metrics in the **redistribute** command are used.

Step 3	Do one of the following to redistribute the selected route type into the EIGRP routing process. You must specify the EIGRP metric values in the **redistribute** command if you do not have a **default-metric** command in the EIGRP router configuration.	

Command	Purpose
redistribute connected [metric *bandwidth delay reliability loading mtu*] **[route-map** *map_name*] **Example:** hostname(config-router): **redistribute connected [metric** *bandwidth delay reliability loading mtu*] **[route-map** *map_name*]	To redistribute connected routes into the EIGRP routing process.
redistribute static [metric *bandwidth delay reliability loading mtu*] **[route-map** *map_name*] **Example:** hostname(config-router): **redistribute static [metric** *bandwidth delay reliability loading mtu*] **[route-map** *map_name*]	To redistribute static routes into the EIGRP routing process.
redistribute ospf *pid* **[match {internal | external [1 | 2] | nssa-external [1 | 2]}] [metric** *bandwidth delay reliability loading mtu*] **[route-map** *map_name*] **Example:** hostname(config-router): **redistribute ospf** *pid* **[match {internal | external [1 | 2] | nssa-external [1 | 2]}] [metric** *bandwidth delay reliability loading mtu*] **[route-map** *map_name*]	To redistribute routes from an OSPF routing process into the EIGRP routing process.
redistribute rip [**metric** bandwidth delay reliability load mtu] [**route-map map_name**] **Example:** (config-router): **redistribute rip** [**metric** bandwidth delay reliability load mtu] [**route-map map_name**]	To redistribute routes from a RIP routing process into the EIGRP routing process.

Filtering Networks in EIGRP

Note Before you begin this process, you must create a standard access list that defines the routes you want to advertise. That is, create a standard access list that defines the routes you want to filter from sending or receiving updates. For more information on creating standard access lists, see the chapter, "Identifying Traffic with Access Lists".

Detailed Steps

	Command	Purpose

Step 1	**`router eigrp`** *`as-num`*
	Example:
	`hostname(config)# router eigrp 2`
		This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process.
		The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	`hostname(config-router)#` **`network`** *`ip-addr`* `[`*`mask`*`]`
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0 255.0.0.0`
		This step configure the interfaces and networks that participate in EIGRP routing. You can configure one or more **network** statements with this command.
		Directly-connected and static networks that fall within the defined network are advertised by the ASA. Additionally, only interfaces with an IP address that fall within the defined network participate in the EIGRP routing process.
		If you have an interface that you do not want to participate in EIGRP routing, but that is attached to a network that you want advertised, see the section Configuring Interfaces for EIGRP.

Step 3	Do one of the following to filter networks sent or received in EIGRP routing updates. You can enter multiple **distribute-list** commands in your EIGRP router configuration.	

	`distribute-list` *`acl`* **`out`** `[`**`connected`** `|` **`ospf`** `|` **`rip`** `|` **`static`** `|` **`interface`** *`if_name`*`]`
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0 255.0.0.0`
	`hostname(config-router): distribute-list acl out [connected]`
		This allows you to filter networks sent in EIGRP routing updates.
		You can specify an interface to apply the filter to only those updates sent by that specific interface.

	`distribute-list` *`acl`* **`in`** `[`**`interface`** *`if_name`*`]`
	Example:
	`hostname(config)# router eigrp 2`
	`hostname(config-router)# network 10.0.0.0 255.0.0.0`
	`hostname(config-router): distribute-list acl in [interface interface1]`
		This allows you to filter networks received in EIGRP routing updates.
		You can specify an interface to apply the filter to only those updates received by that interface.

Customizing the EIGRP Hello Interval and Hold Time

The ASA periodically sends hello packets to discover neighbors and to learn when neighbors become unreachable or inoperative. By default, hello packets are sent every 5 seconds.

The hello packet advertises the ASA hold time. The hold time indicates to EIGRP neighbors the length of time the neighbor should consider the ASA reachable. If the neighbor does not receive a hello packet within the advertised hold time, then the ASA is considered unreachable. By default, the advertised hold time is 15 seconds (three times the hello interval).

Both the hello interval and the advertised hold time are configured on a per-interface basis. We recommend setting the hold time to be at minimum three times the hello interval.

To configure the hello interval and advertised hold time, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`interface`** *`phy_if`*
	Example:
	`hostname(config)# interface phy_if`
		Enter interface configuration mode for the interface on which you are configuring hello interval or advertised hold time.

Step 2	**`hello-interval eigrp`** *`as-num seconds`*
	Example:
	`hostname(config)# hello-interval eigrp 2 60`
		This step allows you to change the hello interval.

Step 3	**`hold-time eigrp`** *`as-num seconds`*
	Example:
	`hostname(config)# hold-time eigrp 2 60`
		This step allows you to change the hold time.

Disabling Automatic Route Summarization

Automatic route summarization is enabled by default. The EIGRP routing process summarizes on network number boundaries. This can cause routing problems if you have non-contiguous networks.

For example, if you have a router with the networks 192.168.1.0, 192.168.2.0, and 192.168.3.0 connected to it, and those networks all participate in EIGRP, the EIGRP routing process creates the summary address 192.168.0.0 for those routes. If an additional router is added to the network with the networks 192.168.10.0 and 192.168.11.0, and those networks participate in EIGRP, they will also be summarized as 192.168.0.0. To prevent the possibility of traffic being routed to the wrong location, you should disable automatic route summarization on the routers creating the conflicting summary addresses.

To disable automatic router summarization, enter the following command in router configuration mode for the EIGRP routing process:

Detailed Steps

	Command	Purpose

Step 1	**`router eigrp`** *`as-num`*
	Example:
	`hostname(config)# router eigrp 2`
		This creates an EIGRP routing process, and the user enters router configuration mode for this EIGRP process.
		The *as-num* argument is the autonomous system number of the EIGRP routing process.

Step 2	**`no auto-summary`**
	Example:
	`hostname(config-router)# no auto-summary`
		Automatic summary addresses have an adminstrative distance of 5. You cannot configure this value.

Disabling EIGRP Split Horizon

Split horizon controls the sending of EIGRP update and query packets. When split horizon is enabled on an interface, update and query packets are not sent for destinations for which this interface is the next hop. Controlling update and query packets in this manner reduces the possibility of routing loops.

By default, split horizon is enabled on all interfaces.

Split horizon blocks route information from being advertised by a router out of any interface from which that information originated. This behavior usually optimizes communications among multiple routing devices, particularly when links are broken. However, with nonbroadcast networks, there may be situations where this behavior is not desired. For these situations, including networks in which you have EIGRP configured, you may want to disable split horizon.

If you disable split horizon on an interface, you must disable it for all routers and access servers on that interface.

To disable EIGRP split-horizon, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`interface`** *`phy_if`*
	Example:
	`hostname(config)#` **`interface`** *`phy_if`*
		Enter interface configuration mode for the interface on which you are changing the delay value used by EIGRP.

Step 2	**`no split-horizon eigrp`** *`as-number`*
	Example:
	`hostname(config-if)#` **`no split-horizon eigrp`** *`2`*
		This step disables the split horizon.

Monitoring EIGRP

You can use the following commands to monitor the EIGRP routing process. For examples and descriptions of the command output, see the *Cisco Security Appliance Command Reference*. Additionally, you can disable the logging of neighbor change message and neighbor warning messages

To monitor or disable various EIGRP routing statistics, perform one of the following tasks:

Command	Purpose
Monitoring EIGRP Routing	
show eigrp [*as-number*] **events** [{*start end*} | **type**]	Displays the EIGRP event log.
show eigrp [*as-number*] **neighbors** [**detail** | **static**] [*if-name*]	Displays the EIGRP neighbor table.
show eigrp [*as-number*] **interfaces** [*if-name*] [**detail**]	Displays the interfaces participating in EIGRP routing.
show eigrp [*as-number*] **topology** [*ip-addr* [*mask*] | **active** | **all-links** | **pending** | **summary** | **zero-successors**]	Displays the EIGRP topology table.

Command	Purpose
show eigrp [*as-number*] **traffic**	Displays EIGRP traffic statistics.
router-id	Displays the router-id for this EIGRP process.
Disabling EIGRP Logging Messages	
no eigrp log-neighbor-changes	Disables the logging of neighbor change messages. Enter this command in router configuration mode for the EIGRP routing process.
no eigrp log-neighbor-warnings	Disables the logging of neighbor warning messages.

Note By default neighbor change, and neighbor warning messages are logged.

Configuration Example for EIGRP

The following example shows how to enable and configure EIGRP with various optional processes:

Step 1 Enable EIGRP:

```
hostname(config)# router eigrp 2
hostname(config-router)# network 10.0.0.0 255.0.0.0
```

Step 2 Configure an interface from sending or receiving EIGRP routing message:

```
hostname(config-router)# passive-interface {default}
```

Step 3 Define an EIGRP neighbor:

```
hostname(config-router)# neighbor 10.0.0.0 interface interface1
```

Step 4 Configure the interfaces and networks that participate in EIGRP routing:

```
hostname(config-router)# network 10.0.0.0 255.0.0.0
```

Step 5 Change the interface delay value is used in EIGRP distance calculations:

```
hostname(config-router)# exit
hostname(config)# interface phy_if
hostname(config-if)# delay 200
```

Feature History for EIGRP

Table 23-1 lists the release history for this feature.

Table 23-1 Feature History for EIGRP

Feature Name	Releases	Feature Information
router eigrp	7.0	This feature allows you to route data, perform authentication, redistribute and monitor routing information, using the Enhanced Interior Gateway Routing Protocol (EIGRP) routing protocol.

Additional References

For additional information related to routing, see the following:

- Related Documents, page 23-15

Related Documents

Related Topic	Document Title
Routing Overview	Information About Routing
How to configure OSPF	Configuring OSPF
How to configure RIP	Configuring RIP
How to configure a static or default route	Configuring Static and Default Routes
How to configure a route map	Defining Route Maps
How to configure multicast routing	Configuring Multicast Routing

CHAPTER 24

Configuring Multicast Routing

This chapter describes how to configure the ASA to use the multicast routing protocol and includes the following sections:

- Information About Multicast Routing, page 24-17
- Licensing Requirements for Multicast Routing, page 24-18
- Guidelines and Limitations, page 24-18
- Enabling Multicast Routing, page 24-19
- Customizing Multicast Routing, page 24-20
- Configuration Example for Multicast Routing, page 24-30
- Configuration Example for Multicast Routing, page 24-30
- Additional References, page 24-31

Information About Multicast Routing

Multicast routing is a bandwidth-conserving technology that reduces traffic by simultaneously delivering a single stream of information to thousands of corporate recipients and homes. Applications that take advantage of multicast routing include videoconferencing, corporate communications, distance learning, and distribution of software, stock quotes, and news.

Multicast routing protocols delivers source traffic to multiple receivers without adding any additional burden on the source or the receivers while using the least network bandwidth of any competing technology. Multicast packets are replicated in the network by Cisco routers enabled with Protocol Independent Multicast (PIM) and other supporting multicast protocols resulting in the most efficient delivery of data to multiple receivers possible.

The ASA supports both stub multicast routing and PIM multicast routing. However, you cannot configure both concurrently on a single ASA.

Note The UDP and non-UDP transports are both supported for multicast routing. However, the non-UDP transport has no FastPath optimization.

Stub Multicast Routing

Stub multicast routing provides dynamic host registration and facilitates multicast routing. When configured for stub multicast routing, the ASA acts as an IGMP proxy agent. Instead of fully participating in multicast routing, the ASA forwards IGMP messages to an upstream multicast router, which sets up delivery of the multicast data. When configured for stub multicast routing, the ASA cannot be configured for PIM.

The ASA supports both PIM-SM and bi-directional PIM. PIM-SM is a multicast routing protocol that uses the underlying unicast routing information base or a separate multicast-capable routing information base. It builds unidirectional shared trees rooted at a single Rendezvous Point per multicast group and optionally creates shortest-path trees per multicast source.

PIM Multicast Routing

Bi-directional PIM is a variant of PIM-SM that builds bi-directional shared trees connecting multicast sources and receivers. Bi-directional trees are built using a DF election process operating on each link of the multicast topology. With the assistance of the DF, multicast data is forwarded from sources to the Rendezvous Point, and therefore along the shared tree to receivers, without requiring source-specific state. The DF election takes place during Rendezvous Point discovery and provides a default route to the Rendezvous Point.

Note If the ASA is the PIM RP, use the untranslated outside address of the ASA as the RP address.

Multicast Group Concept

Multicast is based on the concept of a group. An arbitrary group of receivers expresses an interest in receiving a particular data stream. This group does not have any physical or geographical boundaries—the hosts can be located anywhere on the Internet. Hosts that are interested in receiving data flowing to a particular group must join the group using IGMP. Hosts must be a member of the group to receive the data stream.

Multicast Addresses

Multicast addresses specify an arbitrary group of IP hosts that have joined the group and want to receive traffic sent to this group.

Licensing Requirements for Multicast Routing

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single context mode. In multiple context mode, shared interfaces are not supported.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

IPv6 Guidelines

Does not support IPv6.

Enabling Multicast Routing

Enabling multicast routing lets the ASA forward multicast packets. Enabling multicast routing automatically enables PIM and IGMP on all interfaces.

To enable multicast routing, perform the following step:

Detailed Steps

Command	Purpose

`multicast-routing`
Example:
`hostname(config)# multicast-routing`
	This step enables multicast routing.
	The number of entries in the multicast routing tables are limited by the amount of RAM on the system.

Table 24-1 lists the maximum number of entries for specific multicast tables based on the amount of RAM on the ASA. Once these limits are reached, any new entries are discarded.

Table 24-1 Entry Limits for Multicast Tables

Table	16 MB	128 MB	128+ MB
MFIB	1000	3000	5000
IGMP Groups	1000	3000	5000
PIM Routes	3000	7000	12000

Customizing Multicast Routing

This section describes how to customize multicast routing and includes the following topics:

- Configuring Stub Multicast Routing, page 24-20
- Configuring a Static Multicast Route, page 24-20
- Configuring IGMP Features, page 24-21
- Configuring PIM Features, page 24-25

Configuring Stub Multicast Routing

Note Stub Multicast Routing and PIM are not supported concurrently.

A ASA acting as the gateway to the stub area does not need to participate in PIM. Instead, you can configure it to act as an IGMP proxy agent and forward IGMP messages from hosts connected on one interface to an upstream multicast router on another. To configure the ASA as an IGMP proxy agent, forward the host join and leave messages from the stub area interface to an upstream interface.

To forward the host join and leave messages, perform the following step from the interface attached to the stub area:

Detailed Steps

Command	Purpose

`igmp forward interface` *`if_name`*
 	
`Example:`
`hostname(config-if)# igmp forward interface` *`interface1`*
	This step configures stub multicast routing.

Configuring a Static Multicast Route

When using PIM, the ASA expects to receive packets on the same interface where it sends unicast packets back to the source. In some cases, such as bypassing a route that does not support multicast routing, you may want unicast packets to take one path and multicast packets to take another.

Static multicast routes are not advertised or redistributed.

To configure a static multicast route or a static multicast route for a stub area, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	Do one of the following to configure a static multicast route or a static multicast route for a stub area.	
	mroute *src_ip src_mask* {*input_if_name* | *rpf_neighbor*} [*distance*] **Example:** hostname(config)# mroute *src_ip src_mask* {*input_if_name* | *rpf_neighbor*} [*distance*]	This step configures a static multicast route.
	mroute *src_ip src_mask input_if_name* [**dense** *output_if_name*] [*distance*] **Example:** hostname(config)# mroute *src_ip src_mask input_if_name* [dense *output_if_name*] [*distance*]	This step configures a static multicast route for a stub area. The **dense** *output_if_name* keyword and argument pair is only supported for stub multicast routing.

Configuring IGMP Features

IP hosts use Internet Group Management Protocol, or IGMP, to report their group memberships to directly connected multicast routers.

IGMP is used to dynamically register individual hosts in a multicast group on a particular LAN. Hosts identify group memberships by sending IGMP messages to their local multicast router. Under IGMP, routers listen to IGMP messages and periodically send out queries to discover which groups are active or inactive on a particular subnet.

IGMP uses group addresses (Class D IP address) as group identifiers. Host group address can be in the range 224.0.0.0 to 239.255.255.255. The address 224.0.0.0 is never assigned to any group. The address 224.0.0.1 is assigned to all systems on a subnet. The address 224.0.0.2 is assigned to all routers on a subnet.

When you enable multicast routing on the ASA, IGMP Version 2 is automatically enabled on all interfaces.

Note Only the **no igmp** command appears in the interface configuration when you use the **show run** command. If the **multicast-routing** command appears in the device configuration, then IGMP is automatically enabled on all interfaces.

This section describes how to configure optional IGMP setting on a per-interface basis. This section includes the following topics:

- Disabling IGMP on an Interface, page 24-22
- Configuring IGMP Group Membership, page 24-22
- Configuring a Statically Joined IGMP Group, page 24-22
- Controlling Access to Multicast Groups, page 24-23
- Limiting the Number of IGMP States on an Interface, page 24-23

- Modifying the Query Messages to Multicast Groups, page 24-24
- Changing the IGMP Version, page 24-25

Disabling IGMP on an Interface

You can disable IGMP on specific interfaces. This is useful if you know that you do not have any multicast hosts on a specific interface and you want to prevent the ASA from sending host query messages on that interface.

To disable IGMP on an interface, perform the following steps:

Detailed Steps

Command	Purpose

`no igmp`
Example:
`hostname(config-if)# no igmp`
	This step disables IGMP on an interface.
	To reenable IGMP on an interface, do the following:
	`hostname(config-if)# igmp`

Note Only the **no igmp** command appears in the interface configuration.

Configuring IGMP Group Membership

You can configure the ASA to be a member of a multicast group. Configuring the ASA to join a multicast group causes upstream routers to maintain multicast routing table information for that group and keep the paths for that group active.

To have the ASA join a multicast group, perform the following steps:

Detailed Steps

Command	Purpose

`igmp join-group` *`group-address`*
Example:
`hostname(config-if)# igmp join-group` *`mcast-group`*
	This step configures the ASA to be a member of a multicast group.
	The *`group-address`* is the IP address of the group.

Configuring a Statically Joined IGMP Group

Sometimes a group member cannot report its membership in the group, or there may be no members of a group on the network segment, but you still want multicast traffic for that group to be sent to that network segment. You can have multicast traffic for that group sent to the segment in one of two ways:

- Using the **igmp join-group** command (see Configuring IGMP Group Membership, page 24-22). This causes the ASA to accept and to forward the multicast packets.

- Using the **igmp static-group** command. The ASA does not accept the multicast packets but rather forwards them to the specified interface.

To configure a statically joined multicast group on an interface,perform the following steps:

Detailed Steps

Command	Purpose
igmp static-group **Example:** hostname(config-if)# **igmp static-group** *group-address*	This step configures the ASA statistically join a multicast group on an interface. The *group-address* is the IP address of the group.

Controlling Access to Multicast Groups

To control the multicast groups that hosts on the ASA interface can join, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	Do one of the following to to create a standard or extended access list.	
	access-list *name* **standard** [**permit** | **deny**] *ip_addr mask* **Example:** hostname(config)# access-list *acl1* standard permit *192.52.662.25*	This step creates a standard access list for the multicast traffic. You can create more than one entry for a single access list. You can use extended or standard access lists. The *ip_addr mask* argument is the IP address of the multicast group being permitted or denied.
	access-list *name* **extended** [**permit** | **deny**] *protocol* src_*ip_addr src_mask dst_ip_addr dst_mask* **Example:** hostname(config)# access-list *acl2* extended permit *protocol* src_*ip_addr src_mask dst_ip_addr dst_mask*	This step creates an extended access list. The *dst_ip_addr* argument is the IP address of the multicast group being permitted or denied.
Step 2	**igmp access-group** *acl* **Example:** hostname(config-if)# igmp access-group *acl*	Apply the access list to an interface. The *acl* argument is the name of a standard or extended IP access list.

Limiting the Number of IGMP States on an Interface

You can limit the number of IGMP states resulting from IGMP membership reports on a per-interface basis. Membership reports exceeding the configured limits are not entered in the IGMP cache and traffic for the excess membership reports is not forwarded.

To limit the number of IGMP states on an interface, perform the following steps:

Detailed Steps

Command	Purpose

`igmp limit` *`number`*
`Example:`
`hostname(config-if)# igmp limit 50`
	This limit the number of IGMP states on an interface.
	Valid values range from 0 to 500, with 500 being the default value. Setting this value to 0 prevents learned groups from being added, but manually defined memberships (using the **igmp join-group** and **igmp static-group** commands) are still permitted. The **no** form of this command restores the default value.

Modifying the Query Messages to Multicast Groups

Note The **igmp query-timeout** and **igmp query-interval** commands require IGMP Version 2.

The ASA sends query messages to discover which multicast groups have members on the networks attached to the interfaces. Members respond with IGMP report messages indicating that they want to receive multicast packets for specific groups. Query messages are addressed to the all-systems multicast group, which has an address of 224.0.0.1, with a time-to-live value of 1.

These messages are sent periodically to refresh the membership information stored on the ASA. If the ASA discovers that there are no local members of a multicast group still attached to an interface, it stops forwarding multicast packet for that group to the attached network and it sends a prune message back to the source of the packets.

By default, the PIM designated router on the subnet is responsible for sending the query messages. By default, they are sent once every 125 seconds.

When changing the query response time, by default, the maximum query response time advertised in IGMP queries is 10 seconds. If the ASA does not receive a response to a host query within this amount of time, it deletes the group.

To change the query interval, query response time, and query timeout value, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`igmp query-interval`** *`seconds`*
	`Example:`
	`hostname(config-if)# igmp query-interval 30`
		To set the query interval time in seconds.
		Valid values range from 0 to 500, with 125 being the default value.
		If the ASA does not hear a query message on an interface for the specified timeout value (by default, 255 seconds), then the ASA becomes the designated router and starts sending the query messages.

	Command	Purpose

Step 2	`igmp query-timeout seconds`
	Example:
	`hostname(config-if)# igmp query-timeout 30`
		To change this timeout value of the query.
		Valid values range from 0 to 500, with 225 being the default value.

Step 3	`igmp query-max-response-time seconds`
	Example:
	`hostname(config-if)# igmp query-max-response-time 30`
		To change the maximum query response time.

Changing the IGMP Version

By default, the ASA runs IGMP Version 2, which enables several additional features such as the **igmp query-timeout** and **igmp query-interval** commands.

All multicast routers on a subnet must support the same version of IGMP. The ASA does not automatically detect version 1 routers and switch to version 1. However, a mix of IGMP Version 1 and 2 hosts on the subnet works; the ASA running IGMP Version 2 works correctly when IGMP Version 1 hosts are present.

To control which version of IGMP is running on an interface, perform the following steps:

Detailed Steps

Command	Purpose

`igmp version {1 | 2}`
Example:
`hostname(config-if)# igmp version 2`
	This step controls which version of IGMP you want to run on the interface.

Configuring PIM Features

Routers use PIM to maintain forwarding tables for forwarding multicast diagrams. When you enable multicast routing on the ASA, PIM and IGMP are automatically enabled on all interfaces.

Note PIM is not supported with PAT. The PIM protocol does not use ports and PAT only works with protocols that use ports.

This section describes how to configure optional PIM settings. This section includes the following topics:

- Enabling and Disabling PIM on an Interface, page 24-26
- Configuring a Static Rendezvous Point Address, page 24-26
- Configuring the Designated Router Priority, page 24-27
- Filtering PIM Register Messages, page 24-28
- Configuring PIM Message Intervals, page 24-28
- Configuring a Multicast Boundary, page 24-28

- Filtering PIM Neighbors, page 24-29
- Supporting Mixed Bidirectional/Sparse-Mode PIM Networks, page 24-29

Enabling and Disabling PIM on an Interface

You can disable PIM on specific interfaces. To disable PIM on an interface, use the following steps

Detailed Steps

	Command	Purpose

Step 1	**`pim`**
	Example:
	`hostname(config-if)# pim`
		This step enables or reenables PIM on a specific interface.

Step 2	**`no pim`**
	Example:
	`hostname(config-if)# no pim`
		This step disables PIM on a specific interface.

Note Only the **no pim** command appears in the interface configuration.

Configuring a Static Rendezvous Point Address

All routers within a common PIM sparse mode or bidir domain require knowledge of the PIM RP address. The address is statically configured using the **pim rp-address** command.

Note The ASA does not support Auto-RP or PIM BSR; you must use the **pim rp-address** command to specify the RP address.

You can configure the ASA to serve as RP to more than one group. The group range specified in the access list determines the PIM RP group mapping. If an access list is not specified, then the RP for the group is applied to the entire multicast group range (224.0.0.0/4).

To configure the address of the PIM PR, use the following step:

Detailed Steps

Command	Purpose

`pim rp-address` *`ip_address`* `[`*`acl`*`] [`**`bidir`**`]`
`Example:`
`hostname(config)# pim rp-address`
`ip_address` `[`*`acl`*`] [bidir]`
	This step enables or reenables PIM on a specific interface.
	The *ip_address* argument is the unicast IP address of the router to be a PIM RP.
	The *acl* argument is the name or number of a standard access list that defines which multicast groups the RP should be used with. Do not use a host ACL with this command.
	Excluding the **bidir** keyword causes the groups to operate in PIM sparse mode.

Note The ASA always advertises the bidir capability in the PIM hello messages regardless of the actual bidir configuration.

Configuring the Designated Router Priority

The DR is responsible for sending PIM register, join, and prune messaged to the RP. When there is more than one multicast router on a network segment, there is an election process to select the DR based on DR priority. If multiple devices have the same DR priority, then the device with the highest IP address becomes the DR.

By default, the ASA has a DR priority of 1. You can change this value by performing this step:

Detailed Steps

Command	Purpose

`pim dr-priority` *`num`*
`Example:`
`hostname(config-if)# pim dr-priority` *`500`*
	This step changes the designated router priority.
	The *num* argument can be any number from 1 to 4294967294.

Filtering PIM Register Messages

You can configure the ASA to filter PIM register messages. To filter PIM register messages, perform the following step:

Detailed Steps

Command	Purpose

pim accept-register {**list** *acl* | **route-map** *map-name*}
 	
Example:
`hostname(config)# pim accept-register {list acl | route-map map-name}`
	This step configure the ASA to filter PIM register messages.

Configuring PIM Message Intervals

Router query messages are used to select the PIM DR. The PIM DR is responsible for sending router query messages. By default, router query messages are sent every 30 seconds. Additionally, every 60 seconds, the ASA sends PIM join/prune messages. To change these intervals, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**pim hello-interval** *seconds* **Example:** `hostname(config-if)# pim hello-interval 60`	This step sends router query messages. Valid values for the *seconds* argument range from 1 to 3600 seconds.
Step 2	**pim join-prune-interval** *seconds* **Example:** `hostname(config-if)# pim join-prune-interval 60`	This step changes the amount of time (in seconds) that the ASA sends PIM join/prune messages. Valid values for the *seconds* argument range from 10 to 600 seconds

Configuring a Multicast Boundary

Address scoping defines domain boundaries so that domains with RPs that have the same IP address do not leak into each other. Scoping is performed on the subnet boundaries within large domains and on the boundaries between the domain and the Internet.

You can set up an administratively scoped boundary on an interface for multicast group addresses using the **multicast boundary** command. IANA has designated the multicast address range 239.0.0.0 to 239.255.255.255 as the administratively scoped addresses. This range of addresses can be reused in domains administered by different organizations. They would be considered local, not globally unique.

A standard ACL defines the range of addresses affected. When a boundary is set up, no multicast data packets are allowed to flow across the boundary from either direction. The boundary allows the same multicast group address to be reused in different administrative domains.

You can configure the **filter-autorp** keyword to examine and filter Auto-RP discovery and announcement messages at the administratively scoped boundary. Any Auto-RP group range announcements from the Auto-RP packets that are denied by the boundary access control list (ACL) are removed. An Auto-RP group range announcement is permitted and passed by the boundary only if all addresses in the Auto-RP group range are permitted by the boundary ACL. If any address is not permitted, the entire group range is filtered and removed from the Auto-RP message before the Auto-RP message is forwarded.

To configure a multicast boundary, perform the following step:

Detailed Steps

Command	Purpose
multicast boundary *acl* [**filter-autorp**] **Example:** `hostname(config-if)# multicast boundary acl [filter-autorp]`	This step configures a multicast boundary.

Filtering PIM Neighbors

You can define the routers that can become PIM neighbors . By filtering the routers that can become PIM neighbors, you can:

- Prevent unauthorized routers from becoming PIM neighbors.
- Prevent attached stub routers from participating in PIM.

To define the neighbors that can become a PIM neighbor, perform the following steps:

Detailed Steps

	Command	Purpose
Step 1	**access-list pim_nbr deny** *router-IP_addr PIM neighbor* **Example:** `hostname(config)# access-list pim_nbr deny 10.1.1.1 255.255.255.255`	This step uses the **access-list** command to define a standard access list defines the routers you want to participate in PIM. In this example the following access list, when used with the **pim neighbor-filter** command, prevents the 10.1.1.1 router from becoming a PIM neighbor:

Step 2	**pim neighbor-filter pim_nbr**
	Example:
	`hostname(config)# interface GigabitEthernet0/3`
	`hostname(config-if)# pim neighbor-filter pim_nbr`
		Use the **pim neighbor-filter** command on an interface to filter the neighbor routers.
		In this example, the 10.1.1.1 router is prevented from becoming a PIM neighbor on interface GigabitEthernet0/3.

Supporting Mixed Bidirectional/Sparse-Mode PIM Networks

Bidirectional PIM allows multicast routers to keep reduced state information. All of the multicast routers in a segment must be bidirectionally enabled in order for bidir to elect a DF.

Bidirectional PIM enables the transition from a sparse-mode-only network to a bidir network by letting you specify the routers that should participate in DF election while still allowing all routers to participate in the sparse-mode domain. The bidir-enabled routers can elect a DF from among themselves, even when there are non-bidir routers on the segment. Multicast boundaries on the non-bidir routers prevent PIM messages and data from the bidir groups from leaking in or out of the bidir subset cloud.

When bidirectional PIM is enabled, the routers that are permitted by the ACL are considered to be bidir-capable. Therefore:

- If a permitted neighbor does not support bidir, the DF election does not occur.
- If a denied neighbor supports bidir, then DF election does not occur.
- If a denied neighbor des not support bidir, the DF election occurs.

To control which neighbors can participate in the DF election, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`access-list pim_bidir deny any`**
	Example:
	`hostname(config)# access-list pim_bidir permit 10.1.1.1 255.255.255.255`
	`hostname(config)# access-list pim_bidir permit 10.1.1.2 255.255.255.255`
	`hostname(config)# access-list pim_bidir deny any`
		This step uses the **access-list** command to define a standard access list defines the routers you want to participate in in the DF election and denies all others.
		In this example, the following access list permits the routers at 10.1.1.1 and 10.2.2.2 to participate in the DF election and denies all others.

Step 2	**`pim bidir-neighbor-filter pim_bidir`**
	Example:
	`hostname(config)# interface GigabitEthernet0/3`
	`hostname(config-if)# pim bidir-neighbor-filter pim_bidir`
		Enable bidirectional PIM on an interface.
		This example applies the access list created previous step to the interface GigabitEthernet0/3.

Configuration Example for Multicast Routing

The following example shows how to enable and configure muticastrouting with various optional processes:

Step 1 Enable multicast routing.

```
hostname(config)# multicast-routing
```

Step 2 Configure a static multicast route.

```
hostname(config)# mroute src_ip src_mask {input_if_name | rpf_neighbor} [distance]
hostname(config)# exit
```

Step 3 Configure the configure the ASA to be a member of a multicast group:

```
hostname(config) # interface
hostname(config-if)# igmp join-group group-address
```

Additional References

For additional information related to routing, see the following:

- Related Documents, page 24-31
- RFCs, page 24-31

Related Documents

Related Topic	**Document Title**
Routing Overview	Information About Routing
How to configure OSPF	Configuring OSPF
How to configure EIGRP	Configuring EIGRP
How to configure RIP	Configuring RIP
How to configure a static or default route	Configuring Static and Default Routes
How to configure a route map	Defining Route Maps

RFCs

The following is list of RFCs from the IETF provide technical details about the IGMP and multicast routing standards used for implementing the SMR feature:

- RFC 2236 IGMPv2
- RFC 2362 PIM-SM
- RFC 2588 IP Multicast and Firewalls
- RFC 2113 IP Router Alert Option
- IETF draft-ietf-idmr-igmp-proxy-01.txt

CHAPTER 25

Configuring IPv6 Neighbor Discovery

The IPv6 neighbor discovery process uses ICMPv6 messages and solicited-node multicast addresses to determine the link-layer address of a neighbor on the same network (local link), verify the readability of a neighbor, and keep track of neighboring routers.

This chapter describes how to enable and configure IPv6 neighbor discovery on the security appliance, and it includes the following topics:

- Configuring Neighbor Solicitation Messages, page 25-1
- Configuring Router Advertisement Messages, page 25-7
- Configuring a Static IPv6 Neighbor, page 25-22

Configuring Neighbor Solicitation Messages

This section includes the following configuration task topics:

- Configuring Neighbor Solicitation Message Interval, page 25-1
- Configuring the Neighbor Reachable Time, page 25-5

Configuring Neighbor Solicitation Message Interval

- Information About Neighbor Solicitation Messages, page 25-2
- Licensing Requirements for Neighbor Solicitation Messages, page 25-3
- Guidelines and Limitations for the Neighbor Solicitation Message Interval, page 25-3
- Default Settings for the Neighbor Solicitation Message Interval, page 25-3
- Configuring the Neighbor Solicitation Message Interval, page 25-3
- Monitoring Neighbor Solicitation Message Intervals, page 25-4
- Feature History for Neighbor Solicitation Message Interval, page 25-4

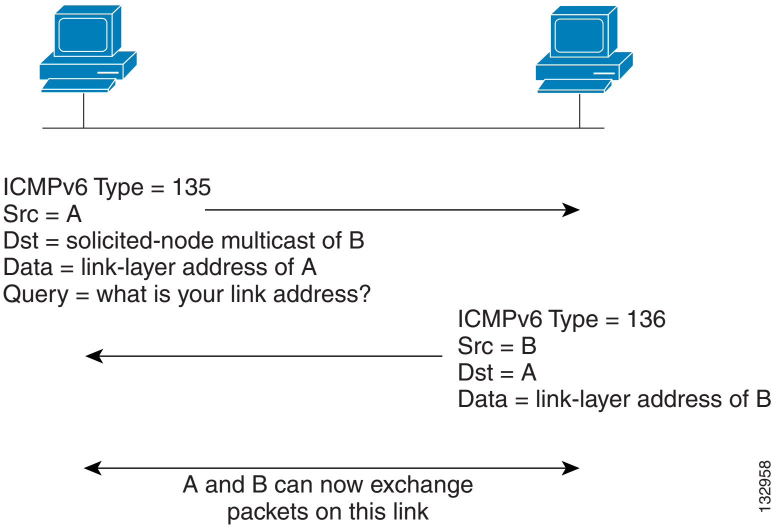
Information About Neighbor Solicitation Messages

Neighbor solicitation messages (ICMPv6 Type 135) are sent on the local link by nodes attempting to discover the link-layer addresses of other nodes on the local link. The neighbor solicitation message is sent to the solicited-node multicast address.The source address in the neighbor solicitation message is the IPv6 address of the node sending the neighbor solicitation message. The neighbor solicitation message also includes the link-layer address of the source node.

After receiving a neighbor solicitation message, the destination node replies by sending a neighbor advertisement message (ICPMv6 Type 136) on the local link. The source address in the neighbor advertisement message is the IPv6 address of the node sending the neighbor advertisement message; the destination address is the IPv6 address of the node that sent the neighbor solicitation message. The data portion of the neighbor advertisement message includes the link-layer address of the node sending the neighbor advertisement message.

After the source node receives the neighbor advertisement, the source node and destination node can communicate. Figure 25-1 shows the neighbor solicitation and response process.

Figure 25-1 IPv6 Neighbor Discovery—Neighbor Solicitation Message


ICMPv6 Type = 135
Src = A
Dst = solicited-node multicast of B
Data = link-layer address of A
Query = what is your link address?
ICMPv6 Type = 136
Src = B
Dst = A
Data = link-layer address of B
A and B can now exchange packets on this link
132958

Neighbor solicitation messages are also used to verify the reachability of a neighbor after the link-layer address of a neighbor is identified. When a node wants to verifying the reachability of a neighbor, the destination address in a neighbor solicitation message is the unicast address of the neighbor.

Neighbor advertisement messages are also sent when there is a change in the link-layer address of a node on a local link. When there is such a change, the destination address for the neighbor advertisement is the all-nodes multicast address.

This section shows how you can configure the neighbor solicitation message interval and neighbor reachable time on a per-interface basis.

Licensing Requirements for Neighbor Solicitation Messages

The following table shows the licensing requirements for this feature:

Model	**License Requirement**
All models	Base License.

Guidelines and Limitations for the Neighbor Solicitation Message Interval

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-23
- Firewall Mode Guidelines, page 25-23
- Additional Guidelines and Limitations, page 25-23

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The interval value is included in all IPv6 router advertisements sent out this interface.

Default Settings for the Neighbor Solicitation Message Interval

Table 25-13 lists the default settings for neighbor solicitation message parameters.

Table 25-1 Default Neighbor Solicitation Messages Parameters

Parameters	**Default**
value (transmission interval)	1000 seconds between neighbor solicitation transmissions

Configuring the Neighbor Solicitation Message Interval

To configure the interval between IPv6 neighbor solicitation retransmissions on an interface, enter the following command:

Command	**Purpose**

`ipv6 nd ns-interval value`
Example:
`hostname (config-if)# ipv6 nd ns-interval 9000`
	Sets the interval between IPv6 neighbor solicitation retransmissions on an interface.
	Valid values for the value argument range from 1000 to 3600000 milliseconds.
	This information is also sent in router advertisement messages.

Example

The following example configures an IPv6 neighbor solicitation transmission interval of 9000 milliseconds for Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd ns-interval 9000
```

Monitoring Neighbor Solicitation Message Intervals

To monitor IPv6 neighbor solicitation message intervals, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as "outside," displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Feature History for Neighbor Solicitation Message Interval

Table 25-14 lists the release history for this feature.

Table 25-2 Feature History for Neighbor Solicitation Message Interval

Feature Name	Releases	Feature Information
Neighbor solicitation message interval	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 nd ns-interval**.

Configuring the Neighbor Reachable Time

This section includes the following topics:

- Information About Neighbor Reachable Time, page 25-5
- Licensing Requirements for Neighbor Reachable Time, page 25-5
- Guidelines and Limitations for Neighbor Reachable Time, page 25-5
- Default Settings for Neighbor Reachable Time, page 25-6
- Configuring Neighbor Reachable Time, page 25-6
- Monitoring Neighbor Reachable Time, page 25-7
- Feature History for Neighbor Reachable Time, page 25-7

Information About Neighbor Reachable Time

The neighbor reachable time enables detecting unavailable neighbors. Shorter configured times enable detecting unavailable neighbors more quickly, however, shorter times consume more IPv6 network bandwidth and processing resources in all IPv6 network devices. Very short configured times are not recommended in normal IPv6 operation.

Licensing Requirements for Neighbor Reachable Time

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Neighbor Reachable Time

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-5
- Firewall Mode Guidelines, page 25-5
- Additional Guidelines and Limitations, page 25-6

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

- The interval value is included in all IPv6 router advertisements sent out this interface.
- The configured time enables detecting unavailable neighbors. Shorter configured times enable detecting unavailable neighbors more quickly; however, shorter times consume more IPv6 network bandwidth and processing resources in all IPv6 network devices. Very short configured times are not recommended in normal IPv6 operation.

Default Settings for Neighbor Reachable Time

Table 25-3 lists the default settings for neighbor reachable time parameters.

Table 25-3 Default Neighbor Reachable Time Parameters

Parameters	Default
value (time mode is reachable)	The default is 0.

Configuring Neighbor Reachable Time

To configure the amount of time that a remote IPv6 node is considered reachable after a reachability confirmation event has occurred, enter the following command:

Command	Purpose
ipv6 nd reachable-time *value* **Example**: hostname (config-if)# **ipv6 nd reachable-time 1700000**	Sets the amount of time that a remote IPv6 node is reachable. Valid values for the *value* argument range from 0 to 3600000 milliseconds. When 0 is used for the value, the reachable time is sent as undetermined. It is up to the receiving devices to set and track the reachable time value.

Example

The following example configures an IPv6 reachable time of 1700000 milliseconds for the selected interface, Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd reachable-time 1700000
```

Monitoring Neighbor Reachable Time

To monitor IPv6 neighbor reachable time, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as "outside," displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Feature History for Neighbor Reachable Time

Table 25-4 lists the release history for this feature.

Table 25-4 Feature History for Neighbor Reachable Time

Feature Name	Releases	Feature Information
Neighbor solicitation message interval	7.0	The feature was introduced. The following command was introduced: **ipv6 nd ns-interval**.

Configuring Router Advertisement Messages

A security appliance can participate in router advertisements so that neighboring devices can dynamically learn a default router address.

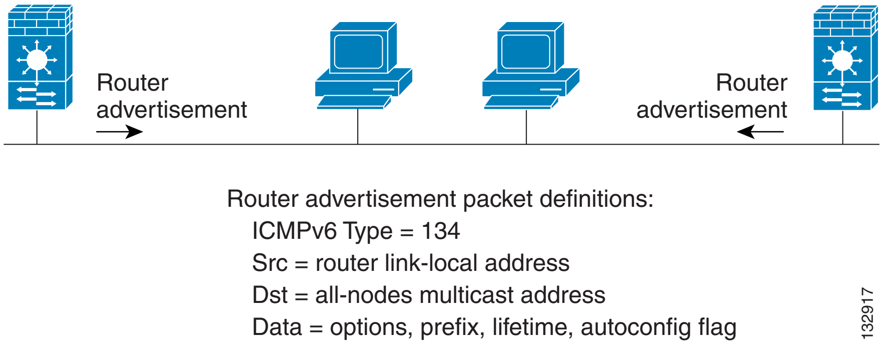
This section includes the following topics:

- Information About Router Advertisement Messages, page 25-8
- Configuring the Router Advertisement Transmission Interval, page 25-9
- Configuring the Router Lifetime Value, page 25-12
- Configuring the IPv6 Prefix, page 25-15
- Suppressing Router Advertisement Messages, page 25-21

Information About Router Advertisement Messages

A security appliance can participate in router advertisements so that neighboring devices can dynamically learn a default router address. Router advertisement messages (ICMPv6 Type 134) are periodically sent out each IPv6 configured interface of the ASA. The router advertisement messages are sent to the all-nodes multicast address.

Figure 25-2 IPv6 Neighbor Discovery—Router Advertisement Message


Router advertisement
Router advertisement
Router advertisement packet definitions:
ICMPv6 Type = 134
Src = router link-local address
Dst = all-nodes multicast address
Data = options, prefix, lifetime, autoconfig flag
132917

Router advertisement messages typically include the following information:

- One or more IPv6 prefix that nodes on the local link can use to automatically configure their IPv6 addresses.
- Lifetime information for each prefix included in the advertisement.
- Sets of flags that indicate the type of autoconfiguration (stateless or stateful) that can be completed.
- Default router information (whether the router sending the advertisement should be used as a default router and, if so, the amount of time (in seconds) the router should be used as a default router).
- Additional information for hosts, such as the hop limit and MTU a host should use in packets that it originates.
- The amount of time between neighbor solicitation message retransmissions on a given link.
- The amount of time a node considers a neighbor reachable.

Router advertisements are also sent in response to router solicitation messages (ICMPv6 Type 133). Router solicitation messages are sent by hosts at system startup so that the host can immediately autoconfigure without needing to wait for the next scheduled router advertisement message. Because router solicitation messages are usually sent by hosts at system startup, and the host does not have a configured unicast address, the source address in router solicitation messages is usually the unspecified IPv6 address (0:0:0:0:0:0:0:0). If the host has a configured unicast address, the unicast address of the interface sending the router solicitation message is used as the source address in the message. The destination address in router solicitation messages is the all-routers multicast address with a scope of the link. When a router advertisement is sent in response to a router solicitation, the destination address in the router advertisement message is the unicast address of the source of the router solicitation message.

You can configure the following settings for router advertisement messages:

- The time interval between periodic router advertisement messages.
- The router lifetime value, which indicates the amount of time IPv6 nodes should consider the ASA to be the default router.
- The IPv6 network prefixes in use on the link.

- Whether or not an interface transmits router advertisement messages.

Unless otherwise noted, the router advertisement message settings are specific to an interface and are entered in interface configuration mode. See the following topics for information about changing these settings:

- Configuring the Router Advertisement Transmission Interval, page 25-9
- Configuring the Router Lifetime Value, page 25-12
- Configuring the IPv6 Prefix, page 25-15
- Suppressing Router Advertisement Messages, page 25-19

Configuring the Router Advertisement Transmission Interval

This section shows how to configure the interval between IPv6 router advertisement transmissions on an interface.

This section includes the following topics:

- Licensing Requirements for Router Advertisement Transmission Interval, page 25-9
- Guidelines and Limitations for Router Advertisement Transmission Interval, page 25-9
- Default Settings for Router Advertisement Transmission Interval, page 25-10
- Configuring Router Advertisement Transmission Interval, page 25-10
- Monitoring Router Advertisement Transmission Interval, page 25-11
- Feature History for Router Advertisement Transmission Interval, page 25-11

Licensing Requirements for Router Advertisement Transmission Interval

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Router Advertisement Transmission Interval

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-9
- Firewall Mode Guidelines, page 25-9
- Additional Guidelines and Limitations, page 25-10

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The interval between transmissions should be less than or equal to the IPv6 router advertisement lifetime if the security appliance is configured as a default router by using the **ipv6 nd ra-lifetime** command. To prevent synchronization with other IPv6 nodes, randomly adjust the actual value used to within 20 percent of the specified value.

Default Settings for Router Advertisement Transmission Interval

Table 25-5 lists the default settings for neighbor reachable time parameters.

Table 25-5 Default Router Advertisement Transmission Interval Parameters

Parameters	Default
value (interval between transmissions)	The default is 200 seconds.

Configuring Router Advertisement Transmission Interval

To configure the interval between IPv6 router advertisement transmissions on an interface, enter the following command:

Command	Purpose

`ipv6 nd ra-interval [msec] value`
Example:
`hostname (config-if)# ipv6 nd ra-interval 201`
	Sets the interval between IPv6 router advertisement transmissions.
	The optional **msec** keyword indicates that the value provided is in milliseconds. If this keyword is not present, the value provided is in seconds.
	Valid values for the *value* argument range from 3 to 1800 seconds or from 500 to 1800000 milliseconds if the msec keyword is provided.

Example

The following example configures an IPv6 router advertisement interval of 201 seconds for the selected interface, Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd ra-interval 201
```

Monitoring Router Advertisement Transmission Interval

To monitor IPv6 neighbor reachable time, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as "outside," displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Feature History for Router Advertisement Transmission Interval

Table 25-6 lists the release history for this feature.

Table 25-6 Feature History for Router Advertisement Transmission Interval

Feature Name	Releases	Feature Information
Router advertisement transmission interval	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 nd ra-interval**.

Configuring the Router Lifetime Value

This section shows how to configure the interval between IPv6 router advertisement transmissions on an interface.

This section includes the following topics:

- Licensing Requirements for Router Advertisement Transmission Interval, page 25-9
- Guidelines and Limitations for Router Advertisement Transmission Interval, page 25-9
- Default Settings for Router Advertisement Transmission Interval, page 25-10
- Configuring Router Advertisement Transmission Interval, page 25-10
- Monitoring Router Advertisement Transmission Interval, page 25-11
- Feature History for Router Advertisement Transmission Interval, page 25-11

Licensing Requirements for Router Advertisement Transmission Interval

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Router Advertisement Transmission Interval

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-12
- Firewall Mode Guidelines, page 25-12
- Additional Guidelines and Limitations, page 25-13

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The interval between transmissions should be less than or equal to the IPv6 router advertisement lifetime if the security appliance is configured as a default router by using the ipv6 nd ra-lifetime command. To prevent synchronization with other IPv6 nodes, randomly adjust the actual value used to within 20 percent of the specified value.

Default Settings for Router Advertisement Transmission Interval

Table 25-7 lists the default settings for neighbor reachable time parameters.

Table 25-7 Default Router Advertisement Transmission Interval Parameters

Parameters	Default
value (interval between transmissions)	The default is 200 seconds.

Configuring Router Advertisement Transmission Interval

To configure the interval between IPv6 router advertisement transmissions on an interface, enter the following command:

Command	Purpose
ipv6 nd ra-interval [**msec**] *value* **Example:** hostname (config-if)# **ipv6 nd ra-interval 201**	Sets the interval between IPv6 router advertisement transmissions. The optional **msec** keyword indicates that the value provided is in milliseconds. If this keyword is not present, the value provided is in seconds. Valid values for the *value* argument range from 3 to 1800 seconds or from 500 to 1800000 milliseconds if the msec keyword is provided.

Example

The following example configures an IPv6 router advertisement interval of 201 seconds for the selected interface, Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd ra-interval 201
```

Monitoring Router Advertisement Transmission Interval

To monitor IPv6 neighbor reachable time, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as "outside," displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Where to Go Next

Configure the "router lifetime" value in IPv6 router advertisements on an interface with the **ipv6 nd ra-lifetime** command.

Feature History for Router Advertisement Transmission Interval

Table 25-8 lists the release history for this feature.

Table 25-8 Feature History for Router Advertisement Transmission Interval

Feature Name	Releases	Feature Information
Router advertisement transmission interval	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 nd ra-interval**.

Configuring the IPv6 Prefix

Stateless autoconfiguration uses IPv6 prefixes provided in router advertisement messages to create the global unicast address from the link-local address. The prefix advertisement can be used by neighboring devices to autoconfigure their interface addresses. You can configure which IPv6 prefixes ar e included in IPv6 router advertisements.

This section shows how to configure IPv6 prefixes and includes the following topics:

- Licensing Requirements for IPv6 Prefixes, page 25-15
- Guidelines and Limitations for IPv6 Prefixes, page 25-15
- Default Settings for IPv6 Prefixes, page 25-16
- Configuring IPv6 Prefixes, page 25-17
- Monitoring IPv6 Prefixes, page 25-18
- Feature History for IPv6 Prefixes, page 25-19

Licensing Requirements for IPv6 Prefixes

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for IPv6 Prefixes

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-15
- Firewall Mode Guidelines, page 25-15
- Additional Guidelines and Limitations, page 25-16

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The **ipv6 nd prefix** command allows control over the individual parameters per prefix, including whether or not the prefix should be advertised.

By default, prefixes configured as addresses on an interface using the **ipv6 address** command are advertised in router advertisements. If you configure prefixes for advertisement using the **ipv6 nd prefix** command, then only these prefixes are advertised.

The **default** keyword can be used to set default parameters for all prefixes.

A date can be set to specify the expiration of a prefix. The valid and preferred lifetimes are counted down in real time. When the expiration date is reached, the prefix will no longer be advertised.

When onlink is “on” (by default), the specified prefix is assigned to the link. Nodes sending traffic to such addresses that contain the specified prefix consider the destination to be locally reachable on the link.

When autoconfig is “on” (by default), it indicates to hosts on the local link that the specified prefix can be used for IPv6 autoconfiguration.

For stateless autoconfiguration to work properly, the advertised prefix length in router advertisement messages must always be 64 bits.

Default Settings for IPv6 Prefixes

Table 25-9 lists the default settings for neighbor reachable time parameters.

Table 25-9 Default for IPv6 Prefixes Parameters

Parameters	Default
prefix lifetime	The default lifetime is 2592000 seconds (30 days) and a preferred lifetime of 604800 seconds (7 days).
on-link flag	The flag is on by default, which means that the prefix is used on the advertising interface.
autoconfig flag	The flag is on by default, which means that the prefix is used for autoconfiguration.

Configuring IPv6 Prefixes

To configure the which IPv6 prefixes are included in IPv6 router advertisements, enter the following command:

Command	Purpose
`ipv6 nd prefix` *`ipv6-prefix/prefix-length`* | **`default`** [[*`valid-lifetime preferred-lifetime`*] | [**`at`** *`valid-date preferred-date`*] | **`infinite`** | **`no-advertise`** | **`off-link`** | **`no-autoconfig`**] **`Example`**: `hostname (config-if)#` **`ipv6 nd prefix 2001:200:200::/35 1000 900`**	Configures which IPv6 prefixes are included in IPv6 router advertisements. The **at** *valid-date preferred-date* syntax indicates the date and time at which the lifetime and preference expire. The prefix is valid until this specified date and time are reached. Dates are expressed in the form *date-valid-expire month-valid-expire hh:mm-valid-expire date-prefer-expire month-prefer-expire hh:mm-prefer-expire*. The **default** keyword indicates that default values are used. The optional **infinite** keyword specifies that the valid lifetime does not expire. The *ipv6-prefix* argument specifies the IPv6 network number to include in router advertisements. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons. The optional **no-advertise** keyword indicates to hosts on the local link that the specified prefix is not to be used for IPv6 autoconfiguration. The optional **no-autoconfig** keyword indicates to hosts on the local link that the specified prefix cannot be used for IPv6 autoconfiguration. The optional **off-link** keyword indicates that the specified prefix is not used for on-link determination. The *preferred-lifetime* argument specifies the amount of time (in seconds) that the specified IPv6 prefix is advertised as being preferred. Valid values range from 0 to 4294967295 seconds. The maximum value represents infinity, which can also be specified with infinite. The default is 604800 (7 days). The *prefix-length* argument specifies the length of the IPv6 prefix. This value indicates how many of the high-order, contiguous bits of the address comprise the network portion of the prefix. The slash (/) must precede the prefix length. The *valid-lifetime* argument specifies the amount of time that the specified IPv6 prefix is advertised as being valid. Valid values range from 0 to 4294967295 seconds. The maximum value represents infinity, which can also be specified with infinite. The default is 2592000 (30 days).

Example

The following example includes the IPv6 prefix 2001:200::/35, with a valid lifetime of 1000 seconds and a preferred lifetime of 900 seconds, in router advertisements sent out on the specified interface, which is Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd prefix 2001:200:200::/35 1000 900
```

Monitoring IPv6 Prefixes

To monitor IPv6 neighbor reachable time, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as "outside," displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Additional References

For additional information related to implementing IPv6 router advertisement messages, see the following sections:

- Related Documents for IPv6 Prefixes, page 25-19
- RFCs for IPv6 Prefixes, page 25-19

Related Documents for IPv6 Prefixes

Related Topic	Document Title
ipv6 commands	*Cisco Security Appliance Command Reference*

RFCs for IPv6 Prefixes

RFC	Title
RFC 2373 includes complete documentation to show how IPv6 network address numbers must be shown in router advertisements. The command argument *ipv6-prefix* indicates this network number, where the address must be specified in hexadecimal using 16-bit values between colons.	*RFC 2373—IP Version 6 Addressing Architecture*

Feature History for IPv6 Prefixes

Table 25-10 lists the release history for this feature.

Table 25-10 Feature History for Router Advertisement Transmission Interval

Feature Name	Releases	Feature Information
Router advertisement transmission interval	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 nd prefix**.

Suppressing Router Advertisement Messages

Router advertisement messages are automatically sent in response to router solicitation messages. You may want to disable these messages on any interface for which you do not want the security appliance to supply the IPv6 prefix (for example, the outside interface).

This section shows how to suppress IPv6 router advertisement transmissions on an interface, and it includes the following topics:

- Licensing Requirements for Suppressing Router Advertisement Messages, page 25-20
- Guidelines and Limitations for Suppressing Router Advertisement Messages, page 25-20
- Default Settings for Suppressing Router Advertisement Messages, page 25-20
- Suppressing Router Advertisement Messages, page 25-21
- Monitoring Router Advertisement Messages, page 25-21
- Feature History for Suppressing Router Advertisement Messages, page 25-22

Licensing Requirements for Suppressing Router Advertisement Messages

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Suppressing Router Advertisement Messages

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-20
- Firewall Mode Guidelines, page 25-20
- Additional Guidelines and Limitations, page 25-20

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The “router lifetime” value is included in all IPv6 router advertisements sent out the interface. The value indicates the usefulness of the security appliance as a default router on this interface.

Setting the value to a non-zero value indicates that the security appliance should be considered a default router on this interface. The no-zero value for the “router lifetime” value should not be less than the router advertisement interval.

Default Settings for Suppressing Router Advertisement Messages

Table 25-11 lists the default settings for neighbor reachable time parameters.

Table 25-11 Default for Suppressing Router Advertisement Parameters

Parameters	Default
router lifetime	The default lifetime is 1800 seconds. Setting the value to 0 indicates that the security appliance should not be considered a default router on this interface.

Suppressing Router Advertisement Messages

To configure the “router lifetime” value in IPv6 router advertisements on an interface, enter the following command. Entering this command causes the security appliance to appear as a regular IPv6 neighbor on the link and not as an IPv6 router.

Command	Purpose

`ipv6 nd ra-lifetime` *`seconds`*
`Example``:`
`hostname (config-if)#` **`ipv6 nd prefix 2001:200:200::/35 1000 900`**
	Configures the “router lifetime” value.
	The *seconds* argument specifies the validity of the security appliance as a default router on this interface. Valid values range from 0 to 9000 seconds. The default is 1800 seconds. 0 indicates that the security appliance should not be considered a default router on the specified interface.

Example

The following example configures an IPv6 router advertisement lifetime of 1801 seconds for the specified interface, which is Gigabitethernet 0/0:

```
hostname (config)# interface gigabitethernet 0/0
hostname (config-if)# ipv6 nd ra-lifetime 1801
```

Monitoring Router Advertisement Messages

To monitor IPv6 neighbor reachable time, perform one of the following tasks:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as “outside,” displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings. • The actual time when the command is set to 0. • The neighbor discovery reachable time that is being used.

Feature History for Suppressing Router Advertisement Messages

Table 25-12 lists the release history for this feature.

Table 25-12 Feature History for Suppressing Router Advertisement Messages

Feature Name	Releases	Feature Information
Suppressing router advertisement messages	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 nd ra-lifetime**.

Configuring a Static IPv6 Neighbor

This section includes the following topics:

- Information About a Static IPv6 Neighbor, page 25-22
- Licensing Requirements for Static IPv6 Neighbor, page 25-22
- Guidelines and Limitations, page 25-22
- Default Settings, page 25-23
- Configuring a Static IPv6 Neighbor, page 25-24
- Monitoring Neighbor Solicitation Messages, page 25-24
- Feature History for Configuring a Static IPv6 Neighbor, page 25-25

Information About a Static IPv6 Neighbor

You can manually define a neighbor in the IPv6 neighbor cache. If an entry for the specified IPv6 address already exists in the neighbor discovery cache—learned through the IPv6 neighbor discovery process—the entry is automatically converted to a static entry. Static entries in the IPv6 neighbor discovery cache are not modified by the neighbor discovery process

Licensing Requirements for Static IPv6 Neighbor

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 25-23
- Firewall Mode Guidelines, page 25-23

- Additional Guidelines and Limitations, page 25-23

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Transparent mode is not supported.

Additional Guidelines and Limitations

The following guidelines and limitations apply for configuring a static IPv6 neighbor:

- The **ipv6 neighbor** command is similar to the **arp** command. If an entry for the specified IPv6 address already exists in the neighbor discovery cache—learned through the IPv6 neighbor discovery process—the entry is automatically converted to a static entry. These entries are stored in the configuration when the copy command is used to store the configuration.
- Use the **show ipv6 neighbor** command to view static entries in the IPv6 neighbor discovery cache.
- The **clear ipv6 neighbor** command deletes all entries in the IPv6 neighbor discovery cache except static entries. The **no ipv6 neighbor** command deletes a specified static entry from the neighbor discovery cache; the command does not remove dynamic entries—entries learned from the IPv6 neighbor discovery process—from the cache. Disabling IPv6 on an interface by using the **no ipv6 enable** command deletes all IPv6 neighbor discovery cache entries configured for that interface except static entries (the state of the entry changes to INCMP [Incomplete]).
- Static entries in the IPv6 neighbor discovery cache are not modified by the neighbor discovery process.
- The clear ipv6 neighbor command does not remove static entries from the IPv6 neighbor discovery cache; it only clears the dynamic entries.

Default Settings

Table 25-13 lists the default settings for static IPv6 neighbor parameters.

Table 25-13 Default Static IPv6 Neighbor Parameters

Parameters	Default
Static IPv6 neighbor	Static entries are not configured in the IPv6 neighbor discovery cache.

Configuring a Static IPv6 Neighbor

To configure a static entry in the IPv6 neighbor discovery cache, enter the following command:

Command	Purpose

`ipv6 neighbor` *`ipv6_address if_name mac_address`*
Example:
`hostname)config-if)#` **`ipv6 neighbor 3001:1::45A inside 002.7D1A.9472`**
	Configures a static entry in the IPv6 neighbor discovery cache.
	The *ipv6_address* argument is the link-local IPv6 address of the neighbor, the *if_name* argument is the interface through which the neighbor is available, and the *mac_address* argument is the MAC address of the neighbor interface.

Example

The following example adds a static entry for an inside host with an IPv6 address of 3001:1::45A and a MAC address of 002.7D1a.9472 to the neighbor discovery cache:

```
hostname)config-if)# ipv6 neighbor 3001:1::45A inside 002.7D1A.9472
```

Monitoring Neighbor Solicitation Messages

To monitor IPv6 neighbor discovery, perform the following task:

Command	Purpose
`show ipv6 interface`	Displays the usability status of interfaces configured for IPv6. Including the interface name, such as “outside,” displays the settings for the specified interface. Excluding the name from the command displays the settings for all interfaces that have IPv6 enabled on them. Output for the command shows the following: • The name and status of the interface. • The link-local and global unicast addresses. • The multicast groups to which the interface belongs. • ICMP redirect and error message settings. • Neighbor discovery settings.

Feature History for Configuring a Static IPv6 Neighbor

Table 25-14 lists the release history for this feature.

Table 25-14 Feature History for Configuring a Static IPv6 Neighbor

Feature Name	Releases	Feature Information
Static IPv6 Neighbor	7.0(1)	The feature was introduced. The following command was introduced: **ipv6 neighbor**.

PART 4

Configuring Network Address Translation

CHAPTER 26

Information About NAT

This chapter provides an overview of how Network Address Translation (NAT) works on the ASA and includes the following sections:

- Introduction to NAT, page 26-1
- NAT Types, page 26-2
- NAT in Routed Mode, page 26-2
- NAT in Transparent Mode, page 26-3
- Policy NAT, page 26-5
- NAT and Same Security Level Interfaces, page 26-8
- Order of NAT Commands Used to Match Real Addresses, page 26-8
- Mapped Address Guidelines, page 26-8
- DNS and NAT, page 26-9
- Where to Go Next, page 26-11

Introduction to NAT

Address translation substitutes the real address in a packet with a mapped address that is routable on the destination network. NAT is composed of two steps: the process by which a real address is translated into a mapped address and the process to undo translation for returning traffic.

The ASA translates an address when a NAT rule matches the traffic. If no NAT rule matches, processing for the packet continues. The exception is when you enable NAT control. NAT control requires that packets traversing from a higher security interface (inside) to a lower security interface (outside) match a NAT rule, or processing for the packet stops. See the "Security Levels" section on page 6-5 for more information about security levels. See Chapter 27, "Configuring NAT Control," for more information about NAT control.

Note In this document, all types of translation are referred to as NAT. When describing NAT, the terms *inside* and *outside* represent the security relationship between any two interfaces. The higher security level is inside and the lower security level is outside. For example, interface 1 is at 60 and interface 2 is at 50; therefore, interface 1 is "inside" and interface 2 is "outside."

Some of the benefits of NAT are as follows:

- You can use private addresses on your inside networks. Private addresses are not routable on the Internet. See the "Private Networks" section on page C-2 for more information.
- NAT hides the real addresses from other networks, so attackers cannot learn the real address of a host.
- You can resolve IP routing problems, such as overlapping addresses.

See Table 40-1 on page 40-4 for information about protocols that do not support NAT.

NAT Types

You can implement address translation as dynamic NAT, Port Address Translation (PAT), static NAT, static PAT, or as a mix of these types. You can also configure rules to bypass NAT; for example, to enable NAT control when you do not want to perform NAT. The following translation types are available:

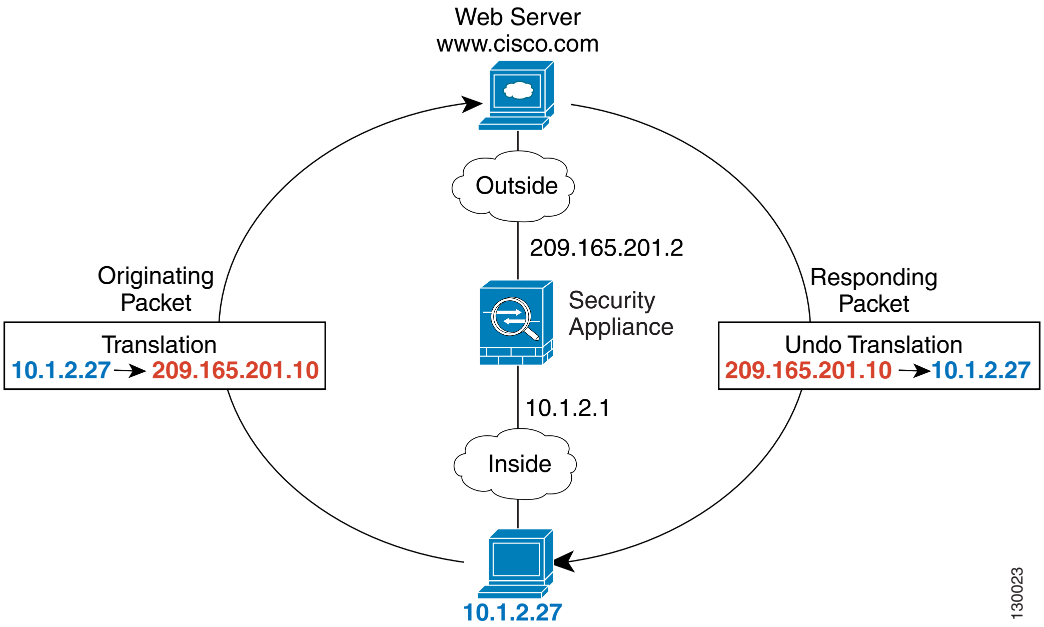
- Dynamic NAT—Dynamic NAT translates a group of real addresses to a pool of mapped addresses that are routable on the destination network. For details about dynamic NAT, see the Chapter 29, "Configuring Dynamic NAT and PAT."
- PAT—PAT translates multiple real address to a single mapped IP address. For details about PAT, see the Chapter 29, "Configuring Dynamic NAT and PAT."
- Static NAT—Static NAT creates a fixed translation of real addresses to mapped addresses. With dynamic NAT and PAT, each host uses a different address or port for each subsequent translation. For details about static NAT, see the Chapter 28, "Configuring Static NAT."
- Static PAT—Static PAT is the same as static NAT, except that it enables you to specify the protocol and port for the real and mapped addresses. For details about static PAT, see the Chapter 30, "Configuring Static PAT."

If you enable NAT control, then inside hosts must match a NAT rule when accessing outside hosts. If you do not want to perform NAT for some hosts, then you can bypass NAT for those hosts, or you can disable NAT control. For details about bypassing NAT, see Chapter 31, "Bypassing NAT."

NAT in Routed Mode

Figure 26-1 shows a typical NAT example in routed mode, with a private network on the inside. When the inside host at 10.1.2.27 sends a packet to a web server, the real source address, 10.1.2.27, of the packet is changed to a mapped address, 209.165.201.10. When the server responds, it sends the response to the mapped address, 209.165.201.10, and the security appliance receives the packet. The security appliance then changes the translation of the mapped address, 209.165.201.10, back to the real address, 10.1.2.27, before sending it to the host.

Figure 26-1 NAT Example: Routed Mode



See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.1-209.165.201.15
```

NAT in Transparent Mode

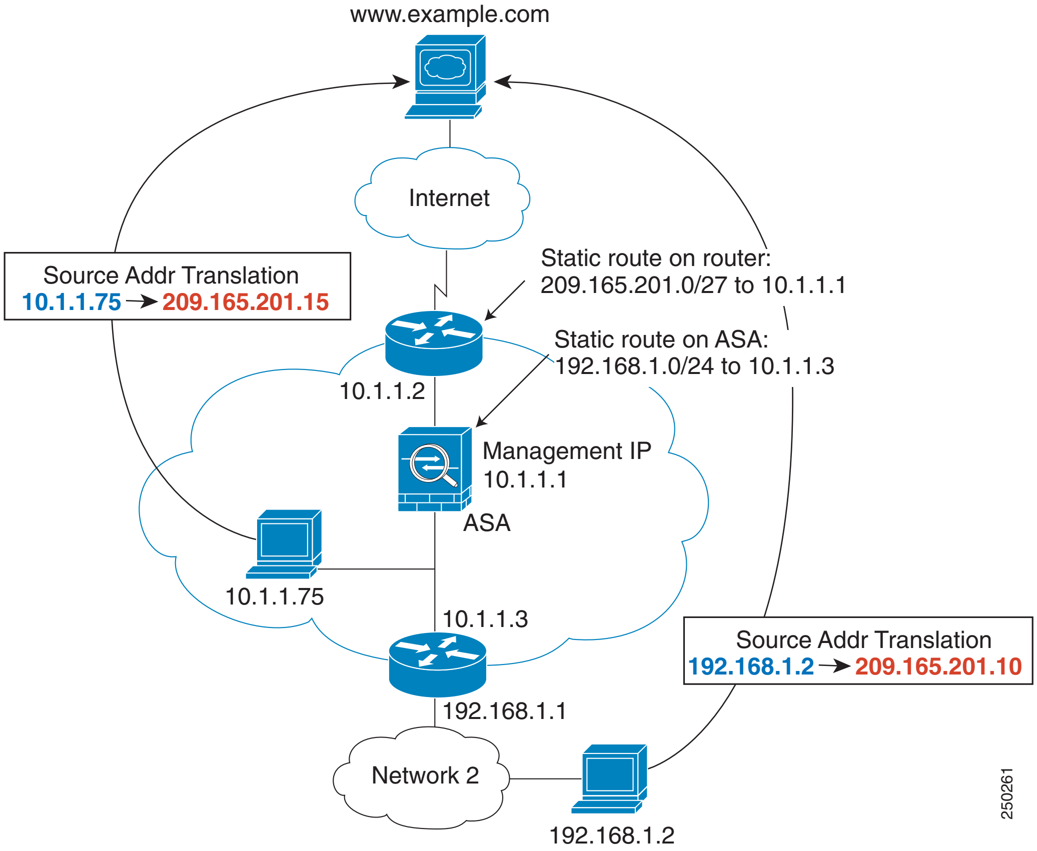
Using NAT in transparent mode eliminates the need for the upstream or downstream routers to perform NAT for their networks. For example, a transparent firewall ASA is useful between two VRFs so tha you can establish BGP neighbor relations between the VRFs and the global table. However, NAT per VRF might not be supported. In this case, using NAT in transparent mode is essential.

NAT in transparent mode has the following requirements and limitations:

- When the mapped addresses are not on the same network as the transparent firewall, then on the upstream router you need to add a static route for the mapped addresses that points to the downstream router (through the ASA).
- When you have VoIP or DNS traffic with NAT and inspection enabled, to successfully translate the IP address inside VoIP and DNS packets, the ASA needs to perform a route lookup. Unless the host is on a directly-connected network, then you need to add a static route on the ASA for the real host address that is embedded in the packet.
- The **alias** command is not supported.
- Because the transparent firewall does not have any interface IP addresses, you cannot use interface PAT.
- ARP inspection is not supported. Moreover, if for some reason a host on one side of the firewall sends an ARP request to a host on the other side of the firewall, and the initiating host real address is mapped to a different address on the same subnet, then the real address remains visible in the ARP request.

Figure 26-2 shows a typical NAT scenario in transparent mode, with the same network on the inside and outside interfaces. The transparent firewall in this scenario is performing the NAT service so that the upstream router does not have to perform NAT.

Figure 26-2 NAT Example: Transparent Mode



1. When the inside host at 10.1.1.75 sends a packet to a web server, the real source address of the packet, 10.1.1.75, is changed to a mapped address, 209.165.201.15.
2. When the server responds, it sends the response to the mapped address, 209.165.201.15, and the ASA receives the packet because the upstream router includes this mapped network in a static route directed through the ASA.
3. The ASA then undoes the translation of the mapped address, 209.165.201.15, back to the real address, 10.1.1.1.75. Because the real address is directly-connected, the ASA sends it directly to the host.
4. For host 192.168.1.2, the same process occurs, except that the ASA looks up the route in its route table and sends the packet to the downstream router at 10.1.1.3 based on the static route.

See the following commands for this example:

```
hostname(config)# route inside 192.168.1.0 255.255.255.0 10.1.1.3 1
hostname(config)# nat (inside) 1 10.1.1.0 255.255.255.0
hostname(config)# nat (inside) 1 192.168.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.1-209.165.201.15
```

Policy NAT

Policy NAT lets you identify real addresses for address translation by specifying the source and destination addresses in an extended access list. You can also optionally specify the source and destination ports. Regular NAT can only consider the source addresses, not the destination address . For example, with policy NAT you can translate the real address to mapped address A when it accesses server A, but also translate the real address to mapped address B when it accesses server B.

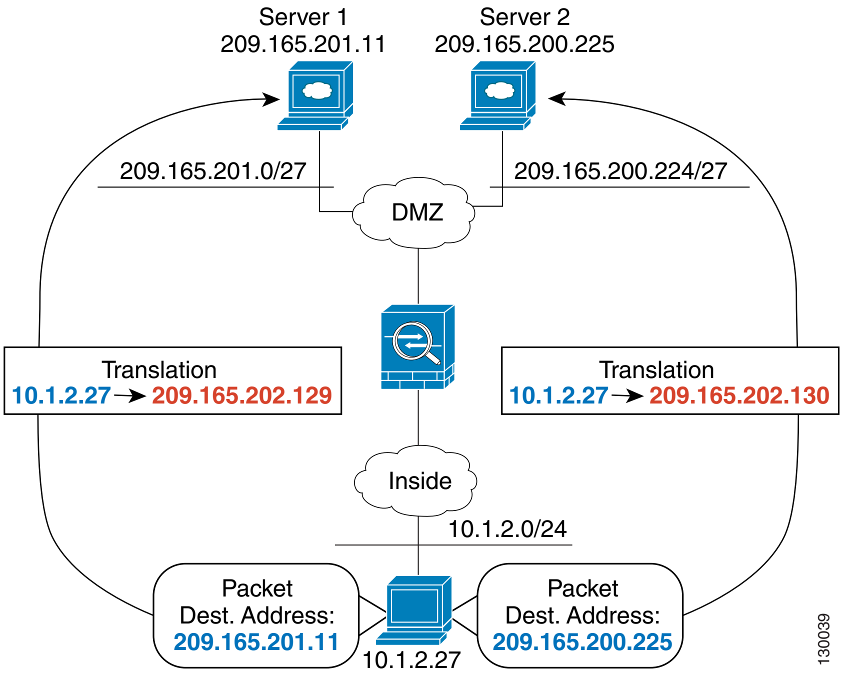
Note Policy NAT does not support time-based access lists.

For applications that require application inspection for secondary channels (for example, FTP and VoIP), the policy specified in the policy NAT statement should include the secondary ports. When the ports cannot be predicted, the policy should specify only the IP addresses for the secondary channel. With this configuration, the security appliance translates the secondary ports.

Note All types of NAT support policy NAT, except for NAT exemption. NAT exemption uses an access list to identify the real addresses, but it differs from policy NAT in that the ports are not considered. See the "Bypassing NAT When NAT Control is Enabled" section on page 27-3 for other differences. You can accomplish the same result as NAT exemption using static identity NAT, which does support policy NAT.

Figure 26-3 shows a host on the 10.1.2.0/24 network accessing two different servers. When the host accesses the server at 209.165.201.11, the real address is translated to 209.165.202.129. When the host accesses the server at 209.165.200.225, the real address is translated to 209.165.202.130.

Figure 26-3 Policy NAT with Different Destination Addresses

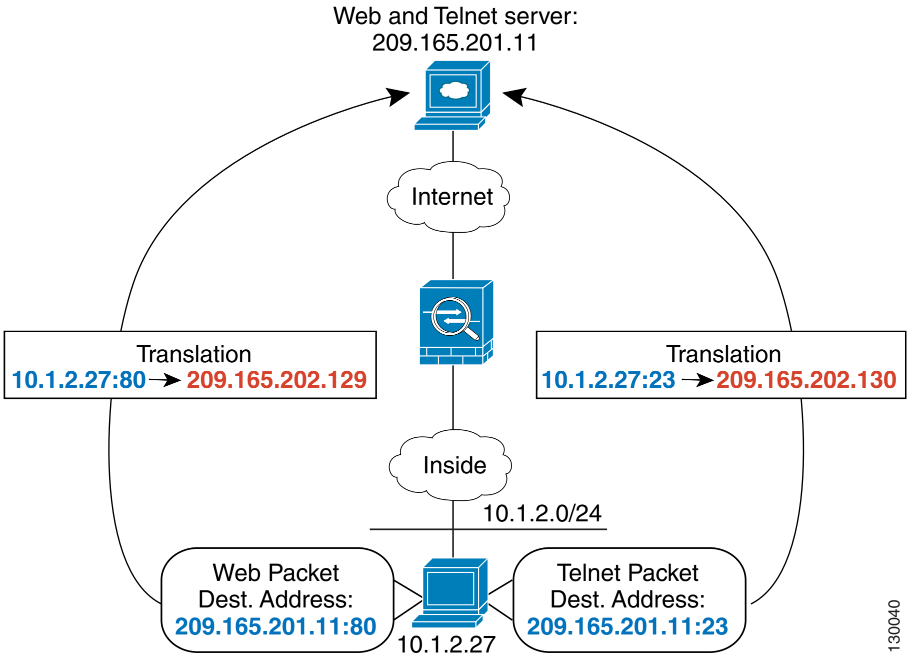


See the following commands for this example:

```
hostname(config)# access-list NET1 permit ip 10.1.2.0 255.255.255.0 209.165.201.0 
255.255.255.224
hostname(config)# access-list NET2 permit ip 10.1.2.0 255.255.255.0 209.165.200.224 
255.255.255.224
hostname(config)# nat (inside) 1 access-list NET1
hostname(config)# global (outside) 1 209.165.202.129
hostname(config)# nat (inside) 2 access-list NET2
hostname(config)# global (outside) 2 209.165.202.130
```

Figure 26-4 shows the use of source and destination ports. The host on the 10.1.2.0/24 network accesses a single host for both web services and Telnet services. When the host accesses the server for web services, the real address is translated to 209.165.202.129. When the host accesses the same server for Telnet services, the real address is translated to 209.165.202.130.

Figure 26-4 Policy NAT with Different Destination Ports



See the following commands for this example:

```
hostname(config)# access-list WEB permit tcp 10.1.2.0 255.255.255.0 209.165.201.11 
255.255.255.255 eq 80
hostname(config)# access-list TELNET permit tcp 10.1.2.0 255.255.255.0 209.165.201.11 
255.255.255.255 eq 23
hostname(config)# nat (inside) 1 access-list WEB
hostname(config)# global (outside) 1 209.165.202.129
hostname(config)# nat (inside) 2 access-list TELNET
hostname(config)# global (outside) 2 209.165.202.130
```

For policy static NAT (and for NAT exemption, which also uses an access list to identify traffic), you can initiate traffic to and from the real host. However, the destination address in the access list is only used for traffic initiated by the real host. For traffic *to* the real host from the destination network, the source address is not checked, and the first matching NAT rule for the real host address is used. So if you configure static policy NAT such as the following:

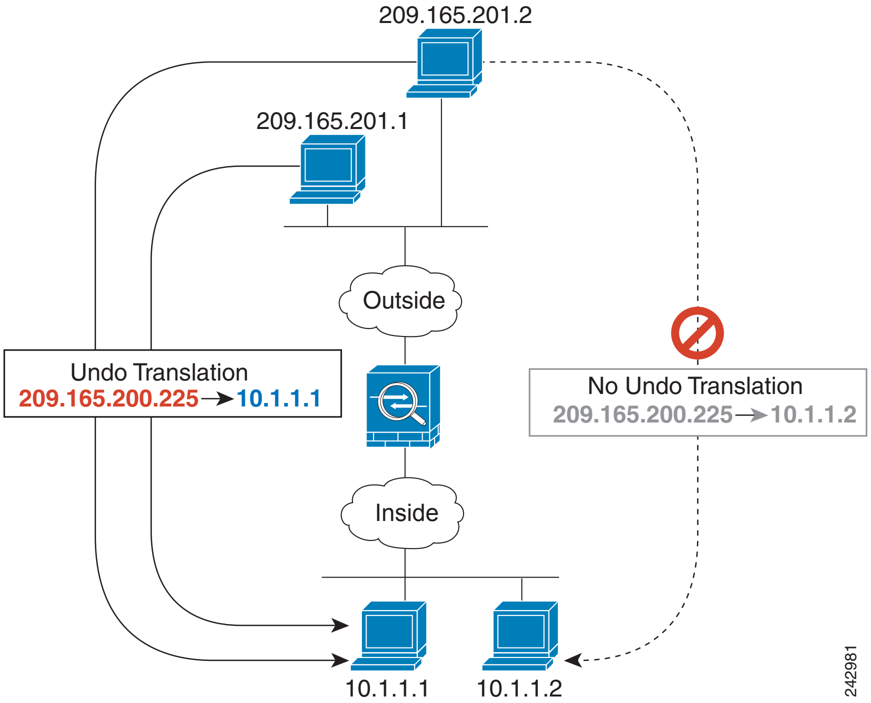
```
hostname(config)# access-list NET1 permit ip 10.1.2.0 255.255.255.224 209.165.201.0
```

```
255.255.255.224
hostname(config)# static (inside,outside) 209.165.202.128 access-list NET1
```

Then when hosts on the 10.1.2.0/27 network access 209.165.201.0/24, they are translated to corresponding addresses on the 209.165.202.128/27 network. But *any* host on the outside can access the mapped addresses 209.165.202.128/27, and not just hosts on the 209.165.201.0/24 network.

For the same reason (the source address is not checked for traffic *to* the real host), you cannot use policy static NAT to translate different real addresses to the same mapped address. For example, Figure 26-5 shows two inside hosts, 10.1.1.1 and 10.1.1.2, that you want to be translated to 209.165.200.225. When outside host 209.165.201.1 connects to 209.165.200.225, then the connection goes to 10.1.1.1. When outside host 209.165.201.2 connects to the same mapped address, 209.165.200.225, you want the connection to go to 10.1.1.2. However, because the destination address in the access list is not checked for traffic to the real host, then the first ACE that matches the real host is used. Since the first ACE is for 10.1.1.1, then all inbound connections sourced from 209.165.201.1 and 209.165.201.2 and destined to 209.165.200.255 will have their destination address translated to 10.1.1.1.

Figure 26-5 Real Addresses Cannot Share the Same Mapped Address



See the following commands for this example. (Although the second ACE in the example does allow 209.165.201.2 to connect to 209.165.200.225, it only allows 209.165.200.225 to be translated to 10.1.1.1.)

```
hostname(config)# static (in,out) 209.165.200.225 access-list policy-nat
hostname(config)# access-list policy-nat permit ip host 10.1.1.1 host 209.165.201.1
hostname(config)# access-list policy-nat permit ip host 10.1.1.2 host 209.165.201.2
```

Note Policy NAT does not support SQL*Net, but it is supported by regular NAT. See the "When to Use Application Protocol Inspection" section on page 40-2 for information about NAT support for other protocols.

NAT and Same Security Level Interfaces

NAT is not required between same security level interfaces even if you enable NAT control. You can optionally configure NAT if desired. However, if you configure dynamic NAT when NAT control is enabled, then NAT is required. See Chapter 27, "Configuring NAT Control," for more information. Also, when you specify a group of IP addresses for dynamic NAT or PAT on a same security interface, then you must perform NAT on that group of addresses when they access any lower or same security level interface (even when NAT control is not enabled). Traffic identified for static NAT is not affected.

See the "Allowing Same Security Level Communication" section on page 6-30 to enable same security communication.

Note The ASA does not support VoIP inspection engines when you configure NAT on same security interfaces. These inspection engines include Skinny, SIP, and H.323. See the "When to Use Application Protocol Inspection" section on page 40-2 for supported inspection engines.

Order of NAT Commands Used to Match Real Addresses

The ASA matches real addresses to NAT commands in the following order:

1. NAT exemption (**nat 0 access-list**)—In order, until the first match. Identity NAT is not included in this category; it is included in the regular static NAT or regular NAT category. We do not recommend overlapping addresses in NAT exemption statements because unexpected results can occur.
2. Static NAT and Static PAT (regular and policy) (**static**)—In order, until the first match. Static identity NAT is included in this category.
3. Policy dynamic NAT (**nat access-list**)—In order, until the first match. Overlapping addresses are allowed.
4. Regular dynamic NAT (**nat**)—Best match. Regular identity NAT is included in this category. The order of the NAT commands does not matter; the NAT statement that best matches the real address is used. For example, you can create a general statement to translate all addresses (0.0.0.0) on an interface. If you want to translate a subset of your network (10.1.1.1) to a different address, then you can create a statement to translate only 10.1.1.1. When 10.1.1.1 makes a connection, the specific statement for 10.1.1.1 is used because it matches the real address best. We do not recommend using overlapping statements; they use more memory and can slow the performance of the ASA.

Mapped Address Guidelines

When you translate the real address to a mapped address, you can use the following mapped addresses:

- Addresses on the same network as the mapped interface.

  If you use addresses on the same network as the mapped interface (through which traffic exits the ASA), the ASA uses proxy ARP to answer any requests for mapped addresses, and thus it intercepts traffic destined for a real address. This solution simplifies routing because the ASA does not have to be the gateway for any additional networks. However, this approach does put a limit on the number of available addresses used for translations.

  For PAT, you can even use the IP address of the mapped interface.
- Addresses on a unique network.

If you need more addresses than are available on the mapped interface network, you can identify addresses on a different subnet. The ASA uses proxy ARP to answer any requests for mapped addresses, and thus it intercepts traffic destined for a real address. If you use OSPF to advertise mapped IP addresses that belong to a different subnet from the mapped interface, you need to create a static route to the mapped addresses that are destined to the mapped interface IP, and then redistribute this static route in OSPF. If the mapped interface is passive (not advertising routes) or you are using static routing, then you need to add a static route on the upstream router that sends traffic destined for the mapped addresses to the ASA.

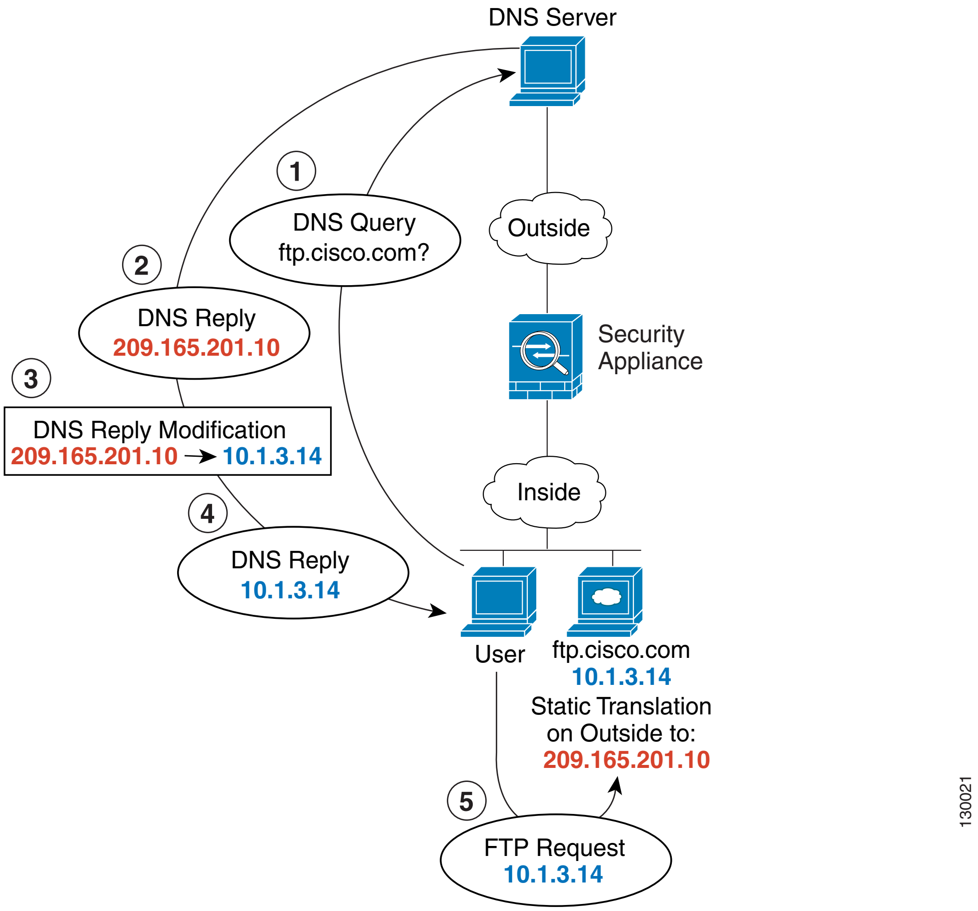
DNS and NAT

You might need to configure the ASA to modify DNS replies by replacing the address in the reply with an address that matches the NAT configuration. You can configure DNS modification when you configure each translation.

For example, a DNS server is accessible from the outside interface. A server, ftp.cisco.com, is on the inside interface. You configure the ASA to statically translate the ftp.cisco.com real address (10.1.3.14) to a mapped address (209.165.201.10) that is visible on the outside network. (See Figure 26-6.) In this case, you want to enable DNS reply modification on this static statement so that inside users who have access to ftp.cisco.com using the real address receive the real address from the DNS server, and not the mapped address.

When an inside host sends a DNS request for the address of ftp.cisco.com, the DNS server replies with the mapped address (209.165.201.10). The ASA refers to the static statement for the inside server and translates the address inside the DNS reply to 10.1.3.14. If you do not enable DNS reply modification, then the inside host attempts to send traffic to 209.165.201.10 instead of accessing ftp.cisco.com directly.

Figure 26-6 DNS Reply Modification



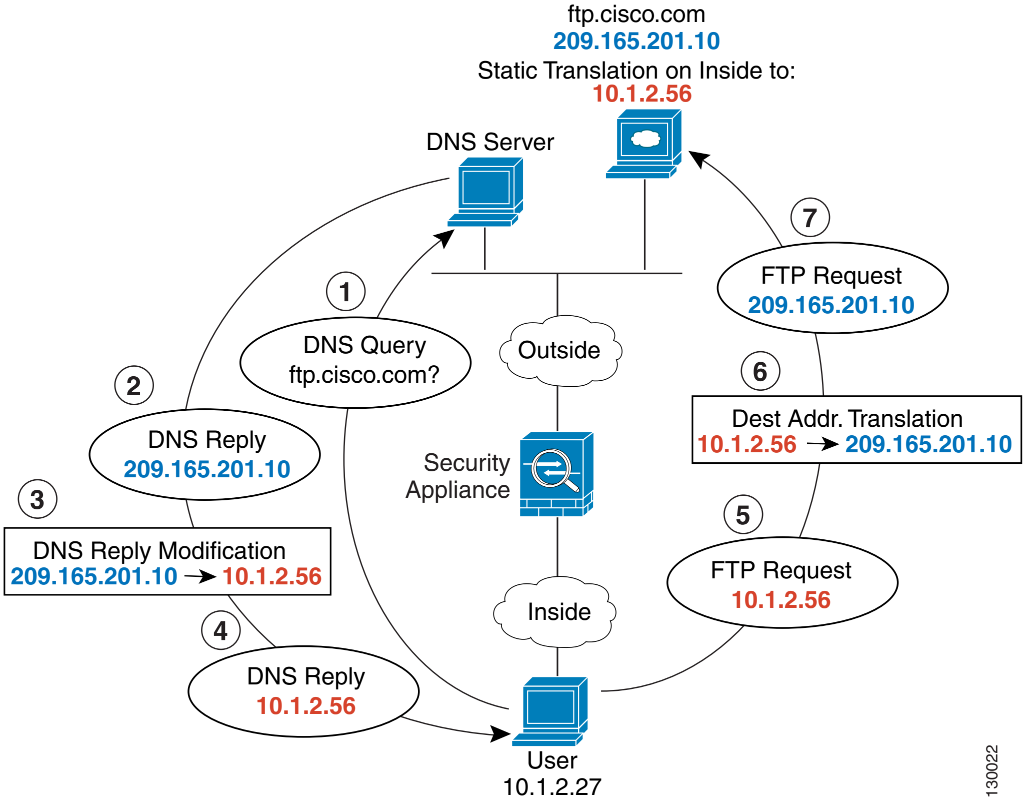
See the following command for this example:

```
hostname(config)# static (inside,outside) 209.165.201.10 10.1.3.14 netmask 255.255.255.255
dns
```

Note If a user on a different network (for example, DMZ) also requests the IP address for ftp.cisco.com from the outside DNS server, then the IP address in the DNS reply is also modified for this user, even though the user is not on the Inside interface referenced by the **static** command.

Figure 26-7 shows a web server and DNS server on the outside. The ASA has a static translation for the outside server. In this case, when an inside user requests the address for ftp.cisco.com from the DNS server, the DNS server responds with the real address, 209.165.20.10. Because you want inside users to use the mapped address for ftp.cisco.com (10.1.2.56) you need to configure DNS reply modification for the static translation.

Figure 26-7 DNS Reply Modification Using Outside NAT



See the following command for this example:

```
hostname(config)# static (outside,inside) 10.1.2.56 209.165.201.10 netmask 255.255.255.255
dns
```

Where to Go Next

- Chapter 27, "Configuring NAT Control"
- Chapter 29, "Configuring Dynamic NAT and PAT"
- Chapter 28, "Configuring Static NAT"
- Chapter 30, "Configuring Static PAT"
- Chapter 31, "Bypassing NAT"

CHAPTER 27

Configuring NAT Control

This chapter describes NAT control, and it includes the following sections:

- Information About NAT Control, page 27-1
- Licensing Requirements, page 27-3
- Prerequisites for NAT Control, page 27-4
- Guidelines and Limitations, page 27-4
- Default Settings, page 27-4
- Configuring NAT Control, page 27-5
- Monitoring NAT Control, page 27-5
- Configuration Examples for NAT Control, page 27-5
- Feature History for NAT Control, page 27-6

Information About NAT Control

This section describes NAT control, and it includes the following topics:

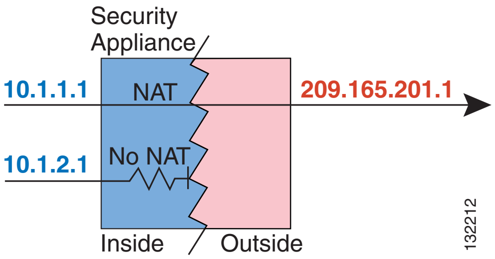
- NAT Control and Inside Interfaces, page 27-1
- NAT Control and Same Security Interfaces, page 27-2
- NAT Control and Outside Dynamic NAT, page 27-2
- NAT Control and Static NAT, page 27-3
- Bypassing NAT When NAT Control is Enabled, page 27-3

NAT Control and Inside Interfaces

NAT control requires that packets traversing from an inside interface to an outside interface match a NAT rule; for any host on the inside network to access a host on the outside network, you must configure NAT to translate the inside host address, as shown in Figure 27-1.

Note NAT control is used for NAT configurations defined with earlier versions of the ASA. The best practice is to use access rules for access control instead of relying on the absence of a NAT rule to prevent traffic through the ASA.

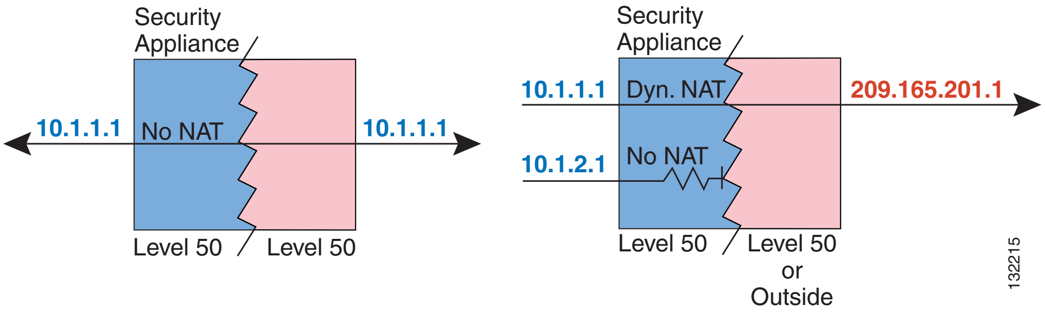
Figure 27-1 NAT Control and Outbound Traffic



NAT Control and Same Security Interfaces

Interfaces at the same security level are not required to use NAT to communicate. However, if you configure dynamic NAT or PAT on a same security interface, then all traffic from the interface to a same security interface or an outside interface must match a NAT rule, as shown in Figure 27-2.

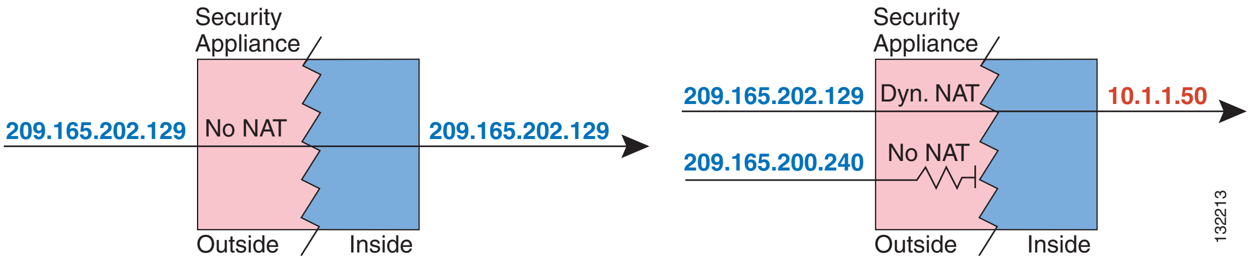
Figure 27-2 NAT Control and Same Security Traffic



NAT Control and Outside Dynamic NAT

Similarly, if you enable outside dynamic NAT or PAT, then all outside traffic must match a NAT rule when it accesses an inside interface. (See Figure 27-3.)

Figure 27-3 NAT Control and Inbound Traffic



NAT Control and Static NAT

NAT control does not affect static NAT and does not cause the restrictions seen with dynamic NAT.

Bypassing NAT When NAT Control is Enabled

If you want the added security of NAT control but do not want to translate inside addresses in some cases, you can apply a NAT exemption or identity NAT rule on those addresses.

If you enable NAT control, then inside hosts must match a NAT rule when accessing outside hosts. If you do not want to perform NAT for some hosts, then you can bypass NAT for those hosts or you can disable NAT control. You might want to bypass NAT, for example, if you are using an application that does not support NAT. See the "When to Use Application Protocol Inspection" section on page 40-2 for information about inspection engines that do not support NAT.

You can configure traffic to bypass NAT using one of the following three methods. All methods achieve compatibility with inspection engines. However, each method offers slightly different capabilities.

- Identity NAT (**nat 0** command)—When you configure identity NAT (which is similar to dynamic NAT), you do not limit translation for a host on specific interfaces; you must use identity NAT for connections through all interfaces. Therefore, you cannot choose to perform normal translation on real addresses when you access interface A, but you use identity NAT when accessing interface B. Regular dynamic NAT, on the other hand, enables you to specify a particular interface on which to translate the addresses. Make sure that the real addresses for which you use identity NAT are routable on all networks that are available according to your access lists.

  For identity NAT, even though the mapped address is the same as the real address, you cannot initiate a connection from the outside to the inside (even if the interface access list allows it). Use static identity NAT or NAT exemption for this functionality.
- Static identity NAT (**static** command)—Static identity NAT enables you to specify the interface on which you want to allow the real addresses to appear, so you can use identity NAT when you access interface A, and use regular translation when you access interface B. Static identity NAT also enables you to use policy NAT, which identifies the real and destination addresses when determining the real addresses to translate. (See the "Policy NAT" section on page 26-5 for more information about policy NAT.) For example, you can use static identity NAT for an inside address when it accesses the outside interface and the destination is server A, but use a normal translation when accessing the outside server B.
- NAT exemption (**nat 0 access-list** command)—NAT exemption allows both translated and remote hosts to initiate connections. Like identity NAT, you do not limit translation for a host on specific interfaces; you must use NAT exemption for connections through all interfaces. However, NAT exemption does enable you to specify the real and destination addresses when determining the real addresses to translate (similar to policy NAT), so you have greater control using NAT exemption. However unlike policy NAT, NAT exemption does not consider the ports in the access list. NAT exemption also does not support connection settings, such as maximum TCP connections.

Licensing Requirements

Model	License Requirement
All models	Base License.

Prerequisites for NAT Control

NAT control has the following prerequisites:

- NAT control requires that packets traversing from an inside interface to an outside interface match a NAT rule; for any host on the inside network to access a host on the outside network, you must configure NAT to translate the inside host address.
- Interfaces at the same security level are not required to use NAT to communicate. However, if you configure dynamic NAT or PAT on a same security interface with NAT control enabled, then all traffic from the interface to a same security interface or an outside interface must match a NAT rule.
- Similarly, if you enable outside dynamic NAT or PAT with NAT control, then all outside traffic must match a NAT rule when it accesses an inside interface.
- Static NAT with NAT control does not cause these restrictions.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

- Supported in single and multiple context modes.
- In multiple context mode, the packet classifier might rely on the NAT configuration to assign packets to contexts if you do not enable unique MAC addresses for shared interfaces. See the "How the Security Appliance Classifies Packets" section on page 5-3 for more information about the relationship between the classifier and NAT.

Firewall Mode Guidelines

Supported in routed and transparent modes.

Additional Guidelines and Limitations

If you want the added security of NAT control but do not want to translate inside addresses in some cases, you can apply a NAT exemption (**nat 0 access-lis**t) or identity NAT (**nat 0** or **static**) rule on those addresses.

Default Settings

By default, NAT control is disabled; therefore, you do not need to perform NAT on any networks unless you want to do so. If you upgraded from an earlier version of software, however, NAT control might be enabled on your system. Even with NAT control disabled, you need to perform NAT on any addresses for which you configure dynamic NAT. See the Chapter 29, "Configuring Dynamic NAT and PAT," for more information about how dynamic NAT is applied.

Configuring NAT Control

To enable NAT control, enter the following command:

Command	Purpose

`nat-control`
Example:
`hostname(config)# nat-control`
	Enables NAT control.
	To disable NAT control, enter the **no** form of the command.

Monitoring NAT Control

To monitor NAT control, perform one of the following tasks:

Command	Purpose
`show running-config nat-control`	Shows the NAT configuration requirement.

Configuration Examples for NAT Control

When NAT control is disabled with the **no-nat control** command, and a NAT and a global command pair are configured for an interface, the real IP addresses cannot go out on other interfaces unless you define those destinations with the **nat 0 access-list** command.

For example, the following NAT is the that one you want performed when going to the outside network:

```
nat (inside) 1 0.0.0.0 0.0.0.0
global (outside) 1 209.165.201.2
```

The above configuration catches everything on the inside network, so if you do not want to translate inside addresses when they go to the DMZ, then you need to match that traffic for NAT exemption, as shown in the following example:

```
access-list EXEMPT extended permit ip any 192.168.1.0 255.255.255.0
access-list EXEMPT remark This matches any traffic going to DMZ1
access-list EXEMPT extended permit ip any 10.1.1.0 255.255.255.0
access-list EXEMPT remark This matches any traffic going to DMZ1
nat (inside) 0 access-list EXEMPT
```

Alternately, you can perform NAT translation on all interfaces:

```
nat (inside) 1 0.0.0.0 0.0.0.0
global (outside) 1 209.165.201.2
global (dmz1) 1 192.168.1.230
global (dmz2) 1 10.1.1.230
```

Feature History for NAT Control

Table 27-1 lists the release history for this feature.

Table 27-1 Feature History for NAT Control

Feature Name	Releases	Feature Information
Ability to enable and disable NAT control	7.0(1)	The ability to enable and disable NAT control was introduced. The following command was introduced: **nat-control**.

CHAPTER 28

Configuring Static NAT

This chapter describes how to configure a static network translation and includes the following topics:

- Information About Static NAT, page 28-1
- Licensing Requirements for Static NAT, page 28-2
- Guidelines and Limitations, page 28-2
- Default Settings, page 28-3
- Configuring Static NAT, page 28-4
- Monitoring Static NAT, page 28-9
- Configuration Examples for Static NAT, page 28-9
- Additional References, page 28-11
- Feature History for Static NAT, page 28-11

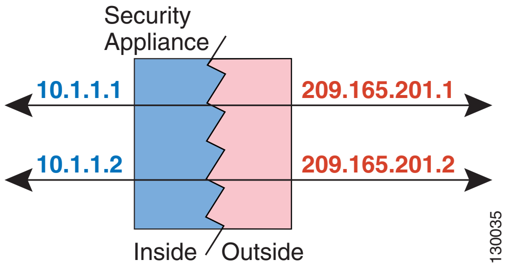
Information About Static NAT

Static NAT creates a fixed translation of real address(es) to mapped address(es).With dynamic NAT and PAT, each host uses a different address or port for each subsequent translation. Because the mapped address is the same for each consecutive connection with static NAT, and a persistent translation rule exists, static NAT allows hosts on the destination network to initiate traffic to a translated host (if an access list exists that allows it).

The main difference between dynamic NAT and a range of addresses for static NAT is that static NAT allows a remote host to initiate a connection to a translated host (if an access list exists that allows it), while dynamic NAT does not. You also need an equal number of mapped addresses as real addresses with static NAT.

Figure 28-1 shows a typical static NAT scenario. The translation is always active so both translated and remote hosts can originate connections, and the mapped address is statically assigned by the **static** command.

Figure 28-1 Static NAT



Licensing Requirements for Static NAT

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 28-2
- Firewall Mode Guidelines, page 28-2
- Additional Guidelines and Limitations, page 28-2

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall mode.

Additional Guidelines and Limitations

The following features are not supported for static NAT:

- You cannot use the same real or mapped address in multiple **static** commands between the same two interfaces unless you use static PAT. (For more information, see Chapter 30, “Configuring Static PAT.”)
- Do not use a mapped address in the **static** command that is also defined in a **global** command for the same mapped interface.

If your **nat** command includes the address of a host that has an entry in a DNS server, and the DNS server is on a different interface from a client, then the client and the DNS server need different addresses for the host; one needs the mapped address and one needs the real address. This option rewrites the address in the DNS reply to the client. The translated host needs to be on the same interface as either the client or the DNS server. Typically, hosts that need to allow access from other interfaces use a static translation, so this option is more likely to be used with the **static** command. (See the "DNS and NAT" section on page 26-9 for more information.)

-
- If you remove a **static** command, existing connections that use the translation are not affected. To remove these connections, enter the **clear local-host** command.
- You cannot clear static translations from the translation table with the **clear xlate** command; you must remove the **static** command instead. Only dynamic translations created by the **nat** and **global** commands can be removed with the **clear xlate** command.

Default Settings

Table 28-1 lists the command options and defaults for static NAT.

Table 28-1 Command Options and Defaults for Policy NAT

Command	Purpose
norandomseq, **tcp** *tcp_max_conns*, **udp** *udp_max_conns*, and *emb_limit*	These keywords set connection limits. However, we recommend using a more versatile method for setting connection limits; for more information, see Chapter 53, "Configuring Connection Limits and Timeouts." For *tcp_max_conns*, *emb_limit*, and *udp_max_conns*, the default value is 0 (unlimited), which is the maximum available.

Table 28-2 Command Options and Defaults for Regular NAT

nat_id	An integer between 1 and 2147483647. The NAT ID must match a **global** command NAT ID. See the "Information About Implementing Dynamic NAT and PAT" section on page 29-5 for more information about how NAT IDs are used. **0** is reserved for identity NAT. See the "Configuring Identity NAT" section on page 31-1 for more information about identity NAT. See Table 28-1, "Command Options and Defaults for Policy NAT," for information about other command options.

Configuring Static NAT

This section describes how to configure a static translation and includes the following topics:

- Configuring Policy Static NAT, page 28-5
- Configuring Regular Static NAT, page 28-8

Configuring Policy Static NAT

When you configure “policy NAT,” you identify the real addresses and destination/source addresses using an extended access list. To configure policy static NAT, enter the following command:

Command	Purpose
static (*real_interface,mapped_interface*) {*mapped_ip* | **interface**} **access-list** *acl_name* [**dns**] [**norandomseq**] [[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*] **Example:** `hostname(config)# static (inside,outside) 209.165.202.129 access-list NET1`	Configures a persistent one-to-one address translation rule by mapping a real IP address to a mapped IP address. Identify the real addresses and destination/source addresses using an extended access list. Create the extended access list using the **access-list extended** command. The first address in the access list is the real address; the second address is either the source or destination address, depending on where the traffic originates. (For more information, see Chapter 11, "Adding an Extended Access List."). This access list should include only **permit** ACEs. You can optionally specify the real and destination ports in the access list using the **eq** operator. Policy NAT considers the **inactive** and **time-range** keywords, but it does not support ACL with all **inactive** and **time-range** ACEs. The *real_ifc* argument specifies the name of the interface connected to the real IP address network. The *mapped_ifc* argument specifies the name of the interface connected to the mapped IP address network. The *mapped_ip* argument specifies the address to which the real address is translated. The **interface** keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP. The **dns** option rewrites the A record, or address record, in DNS replies that match this static. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. The **norandomseq** disables TCP ISN randomization protection. The **tcp** *tcp_max_cons* option specifies the maximum number of simultaneous TCP connections allowed to the local-host. (See the **local-host** command). (Idle connections are closed after the idle timeout specified by the **timeout conn** command.) The *emb_limit* is the maximum number of embryonic connections per host. **Note** An embryonic limit applied using static NAT is applied to all connections to or from the real IP address, and not just connections between the specified interfaces. To apply limits to specific flows, see the "Configuring Connection Limits and Timeouts" section on page 53-3. The **udp** *tcp_max_cons* option specifies the maximum number of simultaneous UDP connections allowed to the local-host. (See the **local-host** command.) (Idle connections are closed after the idle timeout specified by the **timeout conn** command.) If this interface is on a lower security level than the interface you identify by the matching **global** statement, then you must enter **outside** to identify the NAT instance as outside NAT.

Example

To translate the real address 10.1.1.1 to the mapped address 192.168.1.1 when 10.1.1.1 sends traffic to the 209.165.200.224 network, the **access-list** and **static** commands are as follows:

```
hostname(config)# access-list TEST extended ip host 10.1.1.1 209.165.200.224
255.255.255.224
hostname(config)# static (inside,outside) 192.168.1.1 access-list TEST
```

In this case, the second address is the destination address. However, the same configuration is used for hosts to originate a connection to the mapped address. For example, when a host on the 209.165.200.224/27 network initiates a connection to 192.168.1.1, then the second address in the access list is the source address.

This access list should include only **permit** ACEs. You can optionally specify the real and destination ports in the access list using the **eq** operator. Policy NAT does not consider the **inactive** or **time-range** keywords; all ACEs are considered to be active for policy NAT configuration. See the "Policy NAT" section on page 26-5 for more information.

If you specify a network for translation (for example, 10.1.1.0 255.255.255.0), then the ASA translates the .0 and .255 addresses. If you want to prevent access to these addresses, be sure to configure an access list to deny access.

See Chapter 29, "Configuring Dynamic NAT and PAT," for information about the other options.

Configuring Regular Static NAT

To configure regular static NAT, enter the following command:

Command	Purpose
static (*real_interface,mapped_interface*) {*mapped_ip* | **interface**} *real_ip* [**netmask** *mask*][**dns**] [**norandomseq**] [[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*] **Example:** `hostname(config)# static (inside,outside) 209.165.201.12 10.1.1.3 netmask 255.255.255.255`	Configures a persistent one-to-one address translation rule by mapping a real IP address to a mapped IP address. The *real_ifc* argument specifies the name of the interface connected to the real IP address network. The *mapped_ifc* argument specifies the name of the interface connected to the mapped IP address network. The *mapped_ip* argument specifies the address to which the real address is translated. The **interface** keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP. The *real_ip* specifies the real address that you want to translate. The **netmask** *mask* specifies the subnet mask for the real and mapped addresses. For single hosts, use 255.255.255.255. If you do not enter a mask, then the default mask for the IP address class is used, with one exception. If a host-bit is non-zero after masking, a host mask of 255.255.255.255 is used. If you use the **access-list** keyword instead of the real_ip, then the subnet mask used in the access list is also used for the mapped_ip. The **dns** option rewrites the A record, or address record, in DNS replies that match this static. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. The **norandomseq** disables TCP ISN randomization protection. The **tcp** *tcp_max_cons* option specifies the maximum number of simultaneous TCP connections allowed to the local-host. (See the **local-host** command). (Idle connections are closed after the idle timeout specified by the **timeout conn** command.) The *emb_limit* is the maximum number of embryonic connections per host. **Note** An embryonic limit applied using static NAT is applied to all connections to or from the real IP address, and not just connections between the specified interfaces. To apply limits to specific flows, see the "Configuring Connection Limits and Timeouts" section on page 53-3. The **udp** *tcp_max_cons* option specifies the maximum number of simultaneous UDP connections allowed to the local-host. (See the **local-host** command.) (Idle connections are closed after the idle timeout specified by the **timeout conn** command.)

Monitoring Static NAT

To monitor static NAT, perform one of the following tasks:

Command	Purpose
show running-config static	Displays all static commands in the configuration

Configuration Examples for Static NAT

This section contains configuration examples for static NAT and contains these sections:

- Typical Static NAT Examples, page 28-9
- Example of Overlapping Networks, page 28-10

Typical Static NAT Examples

For example, the following policy static NAT example shows a single real address that is translated to two mapped addresses depending on the destination address (see Figure 26-3 on page 26-5, "Policy NAT with Different Destination Addresses," for a related figure):

```
hostname(config)# access-list NET1 permit ip host 10.1.2.27 209.165.201.0 255.255.255.224
hostname(config)# access-list NET2 permit ip host 10.1.2.27 209.165.200.224
255.255.255.224
hostname(config)# static (inside,outside) 209.165.202.129 access-list NET1
hostname(config)# static (inside,outside) 209.165.202.130 access-list NET2
```

The following command maps an inside IP address (10.1.1.3) to an outside IP address (209.165.201.12):

```
hostname(config)# static (inside,outside) 209.165.201.12 10.1.1.3 netmask 255.255.255.255
```

The following command maps the outside address (209.165.201.15) to an inside address (10.1.1.6):

```
hostname(config)# static (outside,inside) 10.1.1.6 209.165.201.15 netmask 255.255.255.255
```

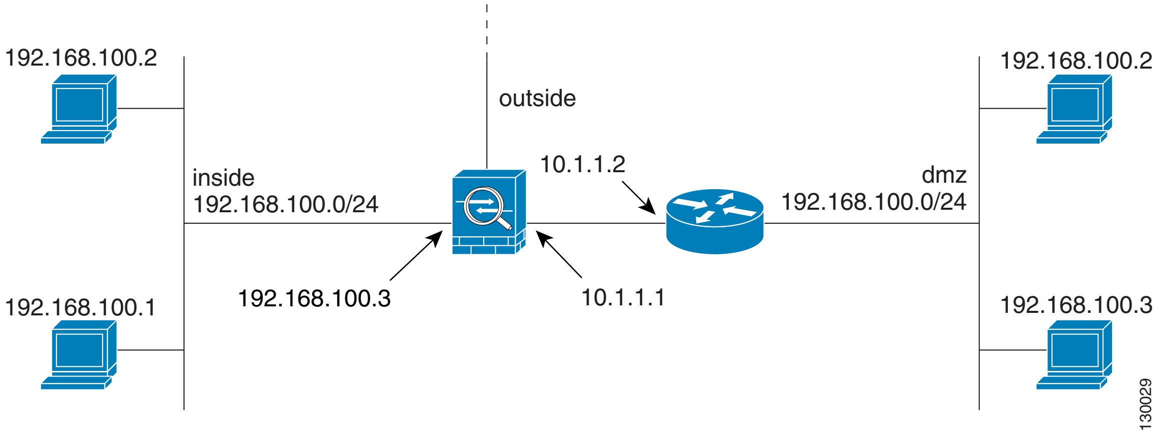
The following command statically maps an entire subnet:

```
hostname(config)# static (inside,dmz) 10.1.1.0 10.1.2.0 netmask 255.255.255.0
```

Example of Overlapping Networks

In Figure 28-2, the ASA connects two private networks with overlapping address ranges.

Figure 28-2 Using Outside NAT with Overlapping Networks



Two networks use an overlapping address space (192.168.100.0/24), but hosts on each network must communicate (as allowed by access lists). Without NAT, when a host on the inside network tries to access a host on the overlapping DMZ network, the packet never makes it past the ASA, which sees the packet as having a destination address on the inside network. Moreover, if the destination address is being used by another host on the inside network, that host receives the packet.

To solve this problem, use NAT to provide non-overlapping addresses. If you want to allow access in both directions, use static NAT for both networks. If you only want to allow the inside interface to access hosts on the DMZ, then you can use dynamic NAT for the inside addresses, and static NAT for the DMZ addresses you want to access. This example shows static NAT.

To configure static NAT for these two interfaces, perform the following steps. The 10.1.1.0/24 network on the DMZ is not translated.

Step 1 Translate 192.168.100.0/24 on the inside to 10.1.2.0/24 when it accesses the DMZ by entering the following command:

```
hostname(config)# static (inside,dmz) 10.1.2.0 192.168.100.0 netmask 255.255.255.0
```

Step 2 Translate the 192.168.100.0/24 network on the DMZ to 10.1.3.0/24 when it accesses the inside by entering the following command:

```
hostname(config)# static (dmz,inside) 10.1.3.0 192.168.100.0 netmask 255.255.255.0
```

Step 3 Configure the following static routes so that traffic to the dmz network can be routed correctly by the ASA:

```
hostname(config)# route dmz 192.168.100.128 255.255.255.128 10.1.1.2 1
hostname(config)# route dmz 192.168.100.0 255.255.255.128 10.1.1.2 1
```

The ASA already has a connected route for the inside network. These static routes allow the ASA to send traffic for the 192.168.100.0/24 network out the DMZ interface to the gateway router at 10.1.1.2. (You need to split the network into two because you cannot create a static route with the exact same network as a connected route.) Alternatively, you could use a more broad route for the DMZ traffic, such as a default route.

If host 192.168.100.2 on the DMZ network wants to initiate a connection to host 192.168.100.2 on the inside network, the following events occur:

1. The DMZ host 192.168.100.2 sends the packet to IP address 10.1.2.2.
2. When the ASA receives this packet, the ASA translates the source address from 192.168.100.2 to 10.1.3.2.
3. Then the ASA translates the destination address from 10.1.2.2 to 192.168.100.2, and the packet is forwarded.

Additional References

For additional information related to implementing Static NAT, see the following sections:

- Related Documents, page 28-11

Related Documents

Related Topic	Document Title
static command	*Cisco Security Appliance Command Reference*

Feature History for Static NAT

Table 28-3 lists the release history for this feature.

Table 28-3 Feature History for Static NAT

Feature Name	Releases	Feature Information
Regular static NAT and policy static NAT	7.0	Static NAT creates a fixed translation of real addresses to mapped addresses. The **static** command was introduced.
Regular static NAT and policy static NAT	7.3.1	NAT began support in transparent firewall mode.

CHAPTER 29

Configuring Dynamic NAT and PAT

This section describes dynamic network address translation. The configuration for dynamic NAT and PAT are almost identical; for NAT you specify a range of mapped addresses, and for PAT you specify a single address.

This chapter includes the following topics:

- Information About Dynamic NAT and PAT, page 29-1
- Licensing Requirements for Dynamic NAT and PAT, page 29-10
- Guidelines and Limitations, page 29-11
- Default Settings, page 29-11
- Configuring Dynamic NAT or Dynamic PAT, page 29-13
- Monitoring Dynamic NAT and PAT, page 29-18
- Configuration Examples for Dynamic NAT and PAT, page 29-18
- Feature History for Dynamic NAT and PAT, page 29-19

Information About Dynamic NAT and PAT

This section includes the following topics:

- Information About Dynamic NAT, page 29-1
- Information About PAT, page 29-4
- Information About Implementing Dynamic NAT and PAT, page 29-5

Information About Dynamic NAT

Dynamic NAT translates a group of real addresses to a pool of mapped addresses that are routable on the destination network. The mapped pool may include fewer addresses than the real group. When a host you want to translate accesses the destination network, the ASA assigns the host an IP address from the mapped pool. The translation is added only when the real host initiates the connection. The translation is in place only for the duration of the connection, and a given user does not keep the same IP address after the translation times out. For an example, see the **timeout xlate** command in the *Cisco ASA 5500 Series Command Reference*. Users on the destination network, therefore, cannot initiate a reliable connection to a host that uses dynamic NAT, although the connection is allowed by an access list, and the ASA rejects any attempt to connect to a real host address directly. See Chapter 28, "Configuring Static NAT," or Chapter 30, "Configuring Static PAT," for information about how to obtain reliable access to hosts.

Note In some cases, a translation is added for a connection, although the session is denied by the ASA. This condition occurs with an outbound access list, a management-only interface, or a backup interface in which the translation times out normally. For an example, see the **show xlate** command in the *Cisco ASA 5500 Series Command Reference*.

Figure 29-1 shows a remote host attempting to connect to the real address. The connection is denied because the ASA only allows returning connections to the mapped address.

Figure 29-1 Remote Host Attempts to Connect to the Real Address

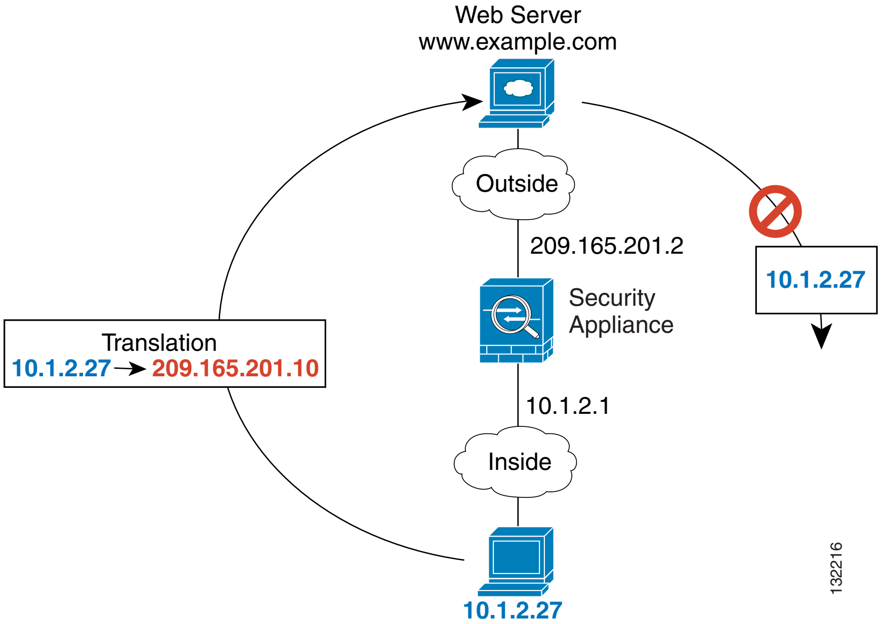
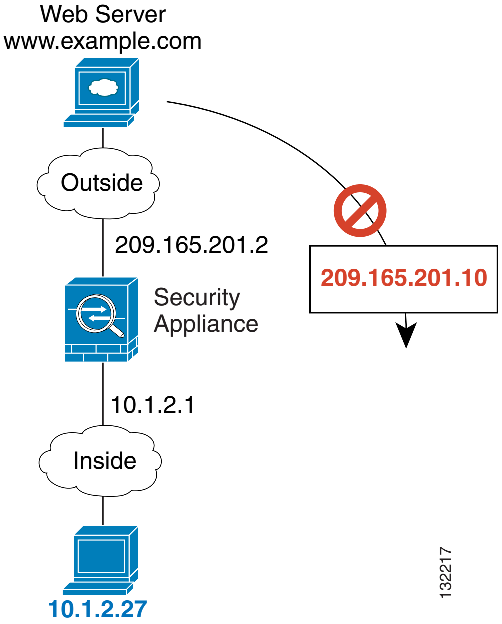


Figure 29-2 shows a remote host attempting to initiate a connection to a mapped address. This address is not currently in the translation table; therefore, the ASA drops the packet.

Figure 29-2 Remote Host Attempts to Initiate a Connection to a Mapped Address



Note For the duration of the translation, a remote host can initiate a connection to the translated host if an access list allows it. Because the address is unpredictable, a connection to the host is unlikely. Nevertheless, in this case you can rely on the security of the access list.

Dynamic NAT has these disadvantages:

- If the mapped pool has fewer addresses than the real group, you could run out of addresses if the amount of traffic is more than expected.

  Use PAT if this event occurs often because PAT provides over 64,000 translations using ports of a single address.
- You have to use a large number of routable addresses in the mapped pool; if the destination network requires registered addresses, such as the Internet, you might encounter a shortage of usable addresses.

The advantage of dynamic NAT is that some protocols cannot use PAT. PAT does not work with the following:

- IP protocols that do not have a port to overload, such as GRE version 0.
- Some multimedia applications that have a data stream on one port, the control path on another port, and are not open standard.

See the "When to Use Application Protocol Inspection" section on page 40-2 for more information about NAT and PAT support.

Information About PAT

PAT translates multiple real addresses to a single mapped IP address. Specifically, the security appliance translates the real address and source port (real socket) to the mapped address and a unique port above 1024 (mapped socket). Each connection requires a separate translation because the source port differs for each connection. For example, 10.1.1.1:1025 requires a separate translation from 10.1.1.1:1026.

After the connection expires, the port translation also expires after 30 seconds of inactivity. The timeout is not configurable. Users on the destination network cannot reliably initiate a connection to a host that uses PAT (even if the connection is allowed by an access list). Not only can you not predict the real or mapped port number of the host, but the ASA does not create a translation at all unless the translated host is the initiator. See Chapter 28, “Configuring Static NAT,” or Chapter 30, “Configuring Static PAT,” for information about reliable access to hosts.

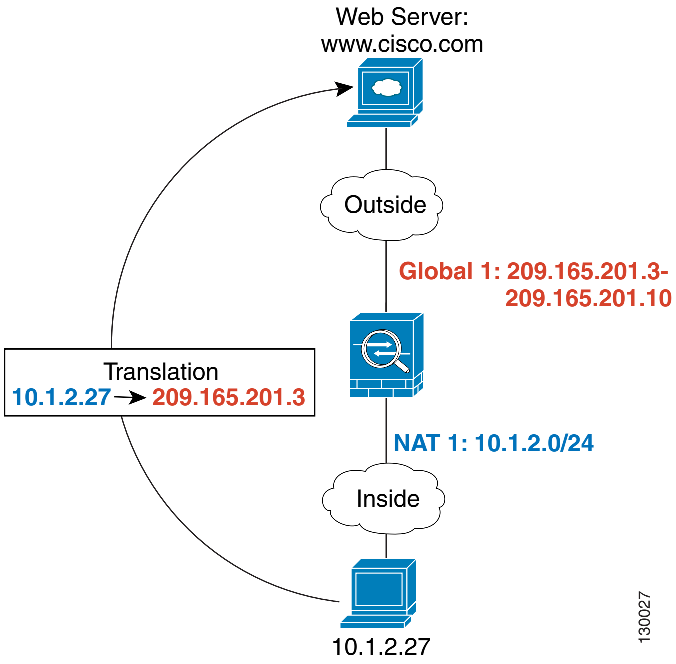
PAT lets you use a single mapped address, thus conserving routable addresses. You can even use the ASA interface IP address as the PAT address. PAT does not work with some multimedia applications that have a data stream that is different from the control path. See the “When to Use Application Protocol Inspection” section on page 40-2 for more information about NAT and PAT support.

Note For the duration of the translation, a remote host can initiate a connection to the translated host if an access list allows it. Because the port address (both real and mapped) is unpredictable, a connection to the host is unlikely. Nevertheless, in this case you can rely on the security of the access list. However, policy PAT does not support time-based ACLs.

Information About Implementing Dynamic NAT and PAT

For dynamic NAT and PAT, you first configure a **nat** command identifying the real addresses on a given interface that you want to translate. Then you configure a separate **global** command to specify the mapped addresses when exiting another interface (in the case of PAT, this is one address). Each **nat** command matches a **global** command by comparing the NAT ID, a number that you assign to each command. (See Figure 29-3.)

Figure 29-3 nat and global ID Matching

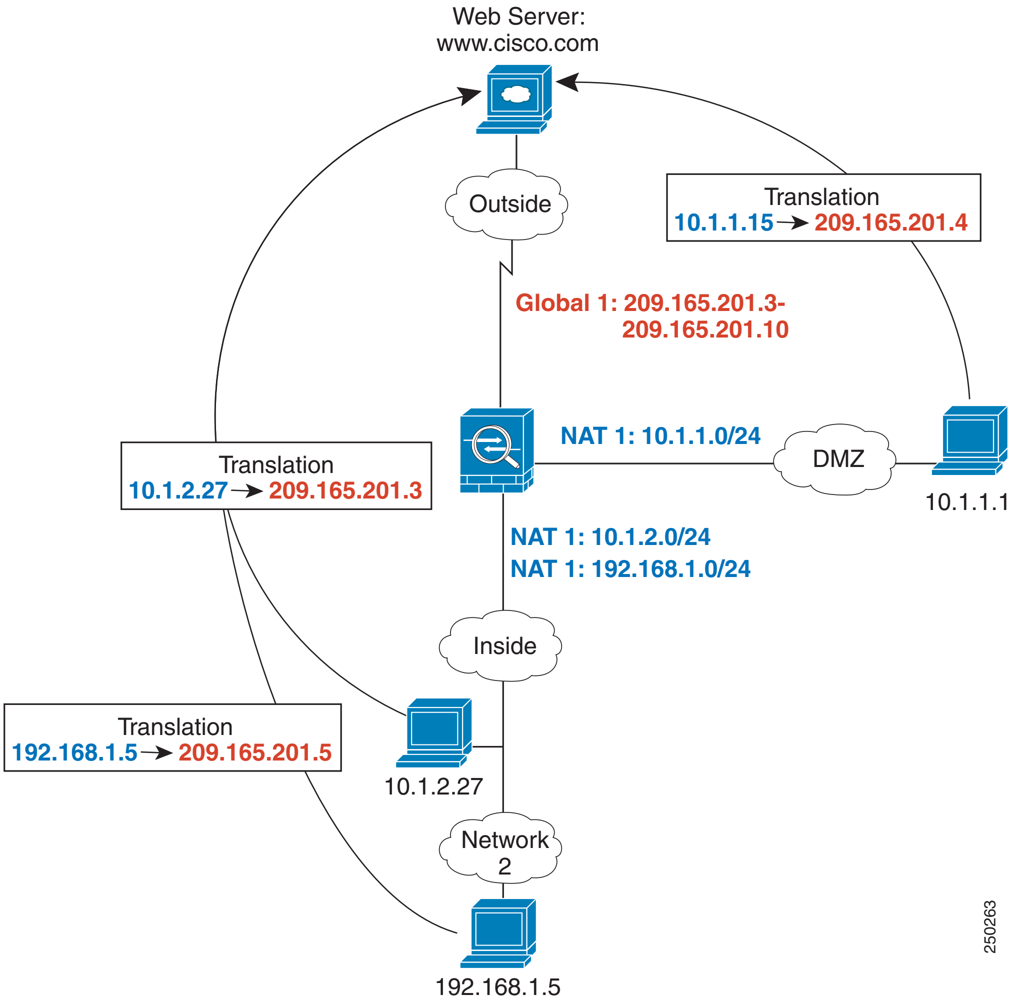


See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.10
```

You can enter multiple **nat** commands using the same NAT ID on one or more interfaces; they all use the same **global** command when traffic exits a given interface. For example, you can configure **nat** commands for Inside and DMZ interfaces, both on NAT ID 1. Then you configure a **global** command on the Outside interface that is also on ID 1. Traffic from the Inside interface and the DMZ interface share a mapped pool or a PAT address when exiting the Outside interface. (See Figure 29-4.)

Figure 29-4 nat Commands on Multiple Interfaces

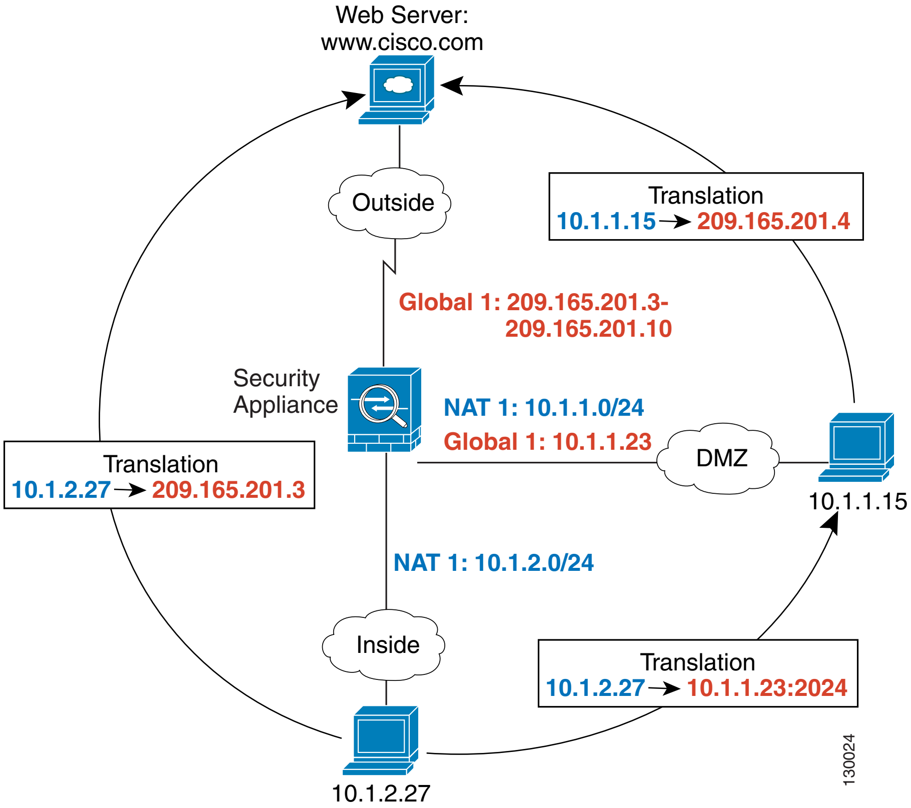


See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# nat (inside) 1 192.168.1.0 255.255.255.0
hostname(config)# nat (dmz) 1 10.1.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.10
```

You can also enter a **global** command for each interface using the same NAT ID. If you enter a **global** command for the Outside and DMZ interfaces on ID 1, then the Inside **nat** command identifies traffic to be translated when going to both the Outside and the DMZ interfaces. Similarly, if you also enter a **nat** command for the DMZ interface on ID 1, then the **global** command on the Outside interface is also used for DMZ traffic. (See Figure 29-5.)

Figure 29-5 global and nat Commands on Multiple Interfaces

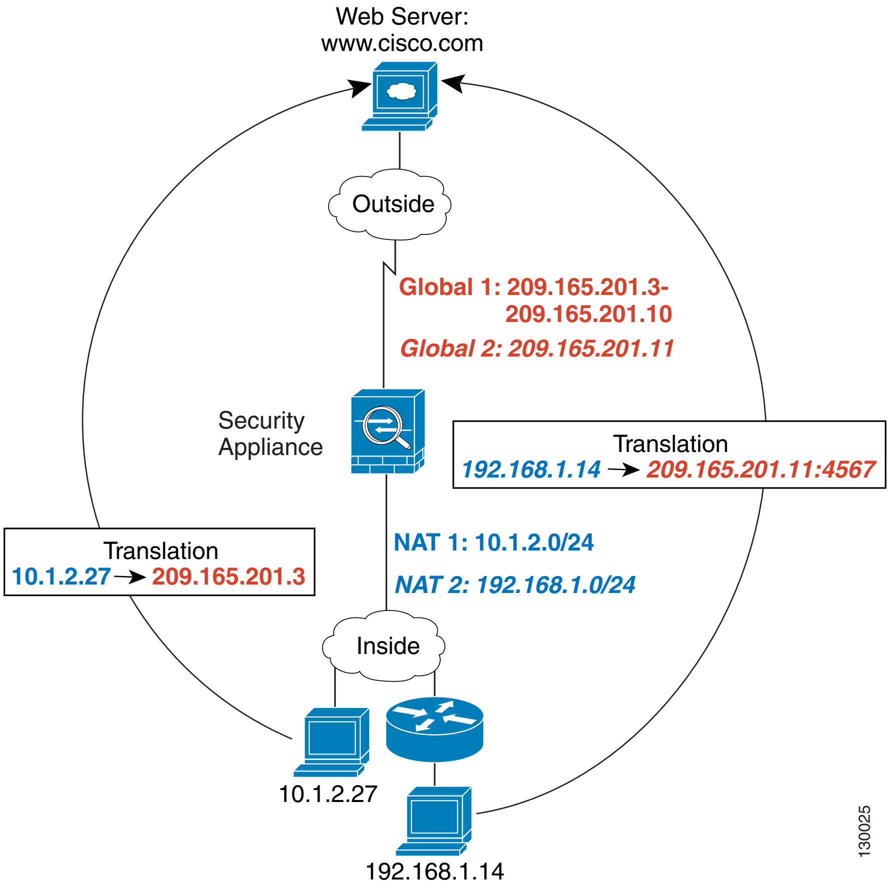


See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# nat (dmz) 1 10.1.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.10
hostname(config)# global (dmz) 1 10.1.1.23
```

If you use different NAT IDs, you can identify different sets of real addresses to have different mapped addresses. For example, on the Inside interface, you can have two **nat** commands on two different NAT IDs. On the Outside interface, you configure two **global** commands for these two IDs. Then, when traffic from Inside network A exits the Outside interface, the IP addresses are translated to pool A addresses; while traffic from Inside network B are translated to pool B addresses. (See Figure 29-6.) If you use policy NAT, you can specify the same real addresses for multiple **nat** commands, as long as the destination addresses and ports are unique in each access list.

Figure 29-6 Different NAT IDs

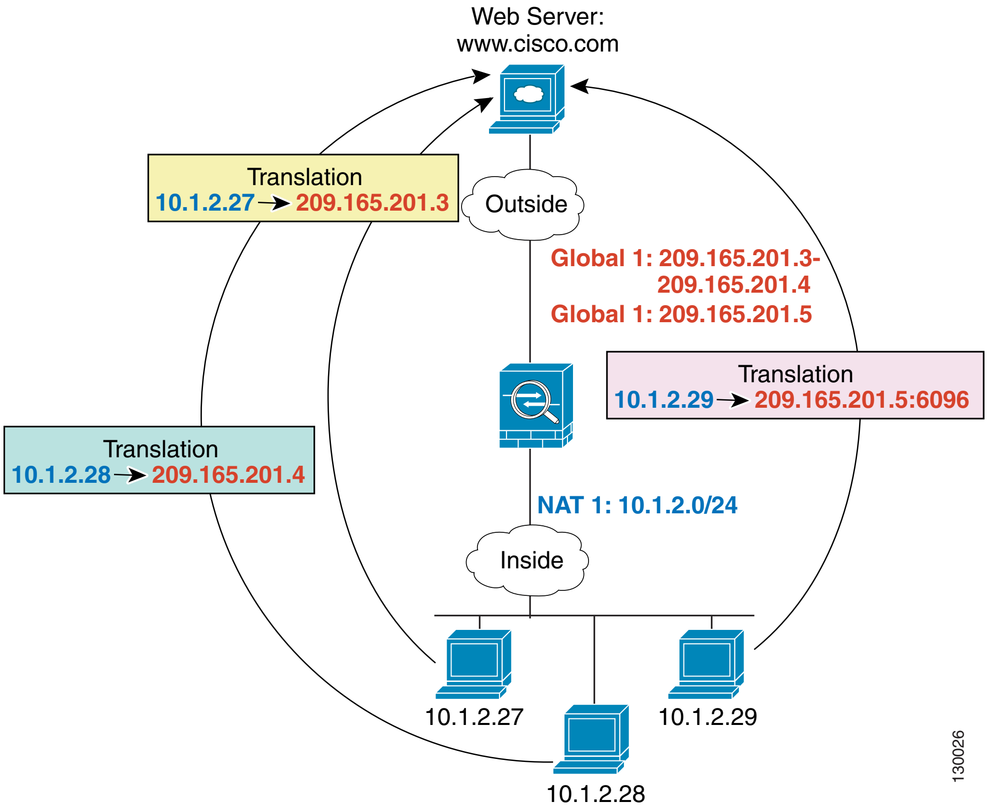


See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# nat (inside) 2 192.168.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.10
hostname(config)# global (outside) 2 209.165.201.11
```

You can enter multiple **global** commands for one interface using the same NAT ID; the ASA uses the dynamic NAT **global** commands first, in the order they are in the configuration, and then it uses the PAT **global** commands in order. You might want to enter both a dynamic NAT **global** command and a PAT **global** command if you need to use dynamic NAT for a particular application, but you should have a backup PAT statement in case all the dynamic NAT addresses are depleted. Similarly, you might enter two PAT statements if you need more than the approximately 64,000 PAT sessions that a single PAT mapped statement supports. (See Figure 29-7.)

Figure 29-7 NAT and PAT Together

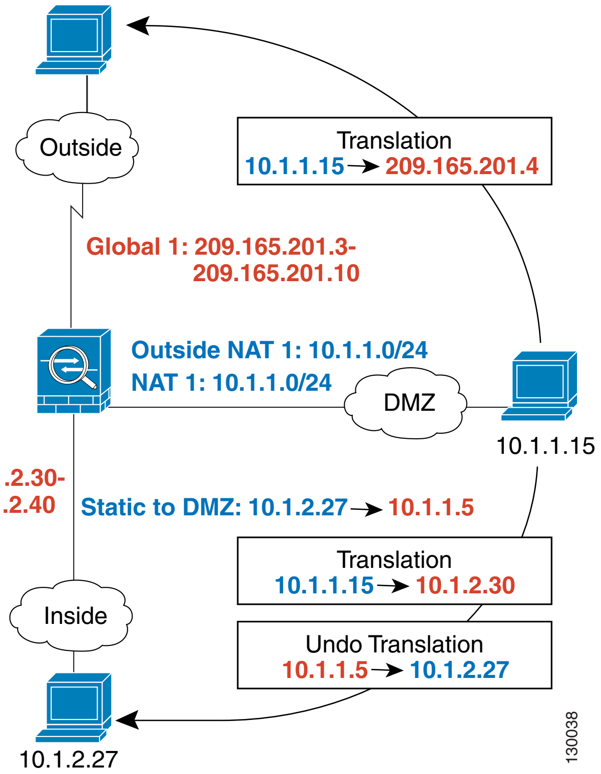


See the following commands for this example:

```
hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.4
hostname(config)# global (outside) 1 209.165.201.5
```

For outside NAT (from outside to inside), you need to use the **outside** keyword in the **nat** command. If you also want to translate the same traffic when it accesses an outside interface (for example, traffic on a DMZ is translated when accessing the Inside and the Outside interfaces), then you must configure a separate **nat** command without the **outside** option. In this case, you can identify the same addresses in both statements and use the same NAT ID. (See Figure 29-8.) Note that for outside NAT (DMZ interface to Inside interface), the inside host uses a **static** command to allow outside access, so both the source and destination addresses are translated.

Figure 29-8 Outside NAT and Inside NAT Combined



See the following commands for this example:

```
hostname(config)# nat (dmz) 1 10.1.1.0 255.255.255.0 outside
hostname(config)# nat (dmz) 1 10.1.1.0 255.255.255.0
hostname(config)# static (inside,dmz) 10.1.1.5 10.1.2.27 netmask 255.255.255.255
hostname(config)# global (outside) 1 209.165.201.3-209.165.201.4
hostname(config)# global (inside) 1 10.1.2.30-1-10.1.2.40
```

When you specify a group of IP address(es) in a **nat** command, then you must perform NAT on that group of addresses when they access any lower or same security level interface; you must apply a **global** command with the same NAT ID on each interface, or use a **static** command. NAT is not required for that group when it accesses a higher security interface because to perform NAT from outside to inside you must create a separate **nat** command using the **outside** keyword. If you do apply outside NAT, then the NAT requirements preceding come into effect for that group of addresses when they access all higher security interfaces. Traffic identified by a **static** command is not affected.

Licensing Requirements for Dynamic NAT and PAT

The following table shows the licensing requirements for these features:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported only in routed and transparent firewall mode.

Additional Guidelines and Limitations

The following features are not supported for dynamic NAT and PAT:

- If you change the NAT configuration, and you do not want to wait for existing translations to time out before the new NAT information is used, you can clear the translation table using the **clear xlate** command. However, clearing the translation table disconnects all current connections that use translations.

  Note If you remove a dynamic NAT or PAT rule, and then add a new rule with mapped addresses that overlap the addresses in the removed rule, then the new rule will not be used until all connections associated with the removed rule time out or are cleared using the **clear xlate** command. This safeguard ensures that the same address is not assigned to multiple hosts.

- You can identify overlapping addresses in other **nat** commands. For example, you can identify 10.1.1.0 in one command but 10.1.1.1 in another. The traffic is matched to a policy NAT command in order, until the first match, or for regular NAT, using the best match.
- All types of NAT support policy NAT except for NAT exemption. NAT exemption uses an access list to identify the real addresses, but it differs from policy NAT in that the ports are not considered. You can accomplish the same result as NAT exemption using static identity NAT, which does support policy NAT.
- When using dynamic PAT, for the duration of the translation a remote host can initiate a connection to the translated host if an access list allows it. Because the address (both real and mapped) is unpredictable, a connection to the host is unlikely. However, in this case you can rely on the security of the access list.
- If the mapped pool has fewer addresses than the real group, you might run out of addresses if the amount of traffic is more than expected. Use PAT if this event occurs often because PAT provides over 64,000 translations using ports of a single address.
- You have to use a large number of routable addresses in the mapped pool; if the destination network requires registered addresses, such as the Internet, you might encounter a shortage of usable addresses.

Default Settings

Table 29-1 lists the command options and default settings for policy NAT and regular NAT. Table 29-2 lists an additional command option for regular NAT.

See the **nat** command in the *Cisco Security Appliance Command Reference* for a complete description of command options.

Table 29-1 Configuring Command Options and Defaults for Policy NAT and Regular NAT

Command	Purpose
access-list *acl_name*	Identifies the real addresses and destination addresses using an extended access list. Create the extended access list using the **access-list extended** command. (See Chapter 11, "Adding an Extended Access List.") This access list should include only **permit** ACEs. You can optionally specify the real and destination ports in the access list using the **eq** operator. Policy NAT considers the **inactive** and **time-range** keywords, but it does not support ACL with all **inactive** and **time-range** ACEs.
nat_id	An integer between 1 and 65535. The NAT ID should match a **global** command NAT ID. See the "Information About Implementing Dynamic NAT and PAT" section on page 29-5 for more information about how NAT IDs are used. **0** is reserved for NAT exemption. (See the "Configuring Static Identity NAT" section on page 31-5 for more information about NAT exemption.)
dns	If your **nat** command includes the address of a host that has an entry in a DNS server, and the DNS server is on a different interface from a client, then the client and the DNS server need different addresses for the host; one needs the mapped address and one needs the real address. This option rewrites the address in the DNS reply to the client. The translated host needs to be on the same interface as either the client or the DNS server. Typically, hosts that need to allow access from other interfaces use a static translation, so this option is more likely to be used with the **static** command. (See the "DNS and NAT" section on page 26-9 for more information.)
outside	If this interface is on a lower security level than the interface you identify by the matching **global** statement, then you must enter **outside** to identify the NAT instance as outside NAT
norandomseq, **tcp** *tcp_max_conns*, **udp** *udp_max_conns*, and *emb_limit*	These keywords set connection limits. However, we recommend using a more versatile method for setting connection limits; for more information, see Chapter 53, "Configuring Connection Limits and Timeouts." The default value for *tcp_max_conns*, *emb_limit*, and *udp_max_conns* is 0 (unlimited), which is the maximum available.

Table 29-2 Command Options and Defaults for Regular NAT

nat_id	An integer between 1 and 2147483647. The NAT ID must match a **global** command NAT ID. See the "Information About Implementing Dynamic NAT and PAT" section on page 29-5 for more information about how NAT IDs are used. **0** is reserved for identity NAT. See the "Configuring Identity NAT" section on page 31-1 for more information about identity NAT.

Configuring Dynamic NAT or Dynamic PAT

This section describes how to configure dynamic NAT or dynamic PAT, and it includes the following topics:

- Task Flow for Configuring Dynamic NAT and PAT, page 29-13
- Configuring Policy Dynamic NAT, page 29-15
- Configuring Regular Dynamic NAT, page 29-17

Task Flow for Configuring Dynamic NAT and PAT

Use the following guidelines to configure either Dynamic NAT or PAT:

- First configure a **nat** command, identifying the real addresses on a given interface that you want to translate.
- Then configure a separate **global** command to specify the mapped addresses when exiting another interface. (In the case of PAT, this is one address.) Each nat command matches a global command by comparing the NAT ID, a number that you assign to each command.

Note The configuration for dynamic NAT and PAT are almost identical; for NAT you specify a range of mapped addresses, and for PAT you specify a single address.

Figure 29-9 shows a typical dynamic NAT scenario. Only translated hosts can create a NAT session, and responding traffic is allowed back. The mapped address is dynamically assigned from a pool defined by the **global** command.

Figure 29-9 Dynamic NAT

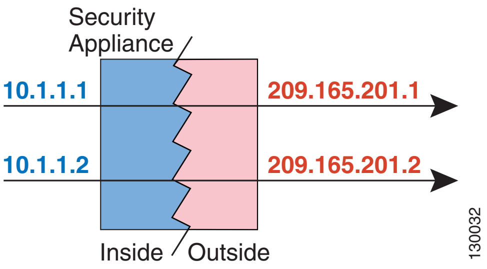
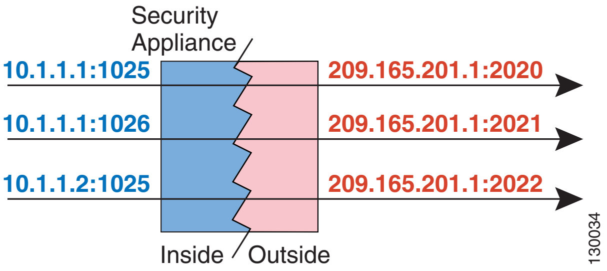


Figure 29-10 shows a typical dynamic PAT scenario. Only translated hosts can create a NAT session, and responding traffic is allowed back. The mapped address defined by the **global** command is the same for each translation, but the port is dynamically assigned.

Figure 29-10 Dynamic PAT



For more information about dynamic NAT, see the "Information About Dynamic NAT" section on page 29-1. For more information about PAT, see the "Information About PAT" section on page 29-4.

Configuring Policy Dynamic NAT

To configure dynamic NAT and PAT and identify the real addresses on one interface that are translated to mapped addressed on another interface, perform the following steps:

	Command	Purpose
Step 1	**nat** (*real_interface*) *nat_id* **access-list** *acl_name* [**dns**] [**outside**][[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*][**norandomseq**] **Example**: `hostname(config)# nat (inside) 1 access-list NET1 tcp 0 2000 udp 10000`	Configures dynamic policy NAT or PAT, identifying the real addresses on a given interface that you want to translate to one of a pool of mapped addresses. The *real_interface* specifies the name of the interface connected to the real IP address network. The *nat_id* should match a **nat** command NAT ID. The matching **nat** command identifies the addresses that you want to translate when they exit this interface. You can specify a single address (for PAT) or a range of addresses (for NAT). The range can go across subnet boundaries if desired. For example, you can specify the following "supernet": **`192.168.1.1-192.168.2.254`** For policy NAT, the *nat_id* argument is an integer between 1 and 65535. The **access-list** keyword identifies the real addresses and destination/source addresses using an extended access list. The *acl_name* argument identifies the name of the access list. The **dns** option rewrites the A record, or address record, in DNS replies that match this static. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. Enter the **outside** optional keyword if this interface is on a lower security level than the interface you identify by the matching global statement. This feature is called outside NAT or bidirectional NAT. The **tcp** option specifies the protocol at TCP. The *tcp_max_cons* argument specifies the maximum number of simultaneous TCP connections allowed to the local-host (see the local-host command). The default is 0, which means unlimited connections. (Idle connections are closed after the idle timeout specified by the timeout conn command.) The *emb_limit* option specifies the maximum number of embryonic connections per host. The default is **0,** which means unlimited embryonic connections. The **udp** *udp_max_conns* options specify the maximum number of simultaneous UDP connections allowed to the local host. The default is **0**, which means unlimited connections. The **norandomseq** option disables TCP ISN randomization protection.

	Command	Purpose

Step 2	`global (mapped_interface) nat_id {mapped_ip[-mapped_ip] | interface}`
	Example:
	`hostname(config)# global (outside) 1 209.165.202.129`
		Identifies the mapped address(es) to which you want to translate the real addresses when they exit a particular interface. (In the case of PAT, this is one address.)
		The *mapped_interface* option specifies the name of the interface connected to the mapped IP address network.
		The *nat_id* argument must match a **global** command NAT ID. See the "Information About Implementing Dynamic NAT and PAT" section on page 29-5 for more information about using NAT IDs.
		The *mapped_ip mapped_ip* specify the mapped address(es) to which you want to translate the real addresses when they exit the mapped interface. If you specify a single address, then you configure PAT. If you specify a range of addresses, then you configure dynamic NAT. If the external network is connected to the Internet, each global IP address must be registered with the Network Information Center (NIC).
		The **interface** keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP.
		See Table 29-1, "Command Options and Defaults for Policy NAT and Regular NAT," for information about other command options.

Configuring Regular Dynamic NAT

To configure regular dynamic NAT and identify the real addresses on one interface that are translated to mapped addressed on another interface, perform the following steps:

	Command	Purpose
Step 1	**nat** (*real_interface*) *nat_id real_ip* [*mask* [**dns**] [**outside**]] [[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*]] [**norandomseq**] **Example**: `hostname(config)# nat (inside) 1 10.1.2.0 255.255.255.0`	Configures dynamic NAT or PAT, identifying the real addresses on a given interface that you want to translate to one of a pool of mapped addresses. The *nat_id* should match a **nat** command NAT ID. The matching **nat** command identifies the addresses that you want to translate when they exit this interface. You can specify a single address (for PAT) or a range of addresses (for NAT). The range can go across subnet boundaries if desired. For example, you can specify the following "supernet": **`192.168.1.1-192.168.2.254`**. For regular NAT, the *nat_id* argument is an integer between 1 and 2147483647. The *real_ip* argument specifies the real address that you want to translate. You can use 0.0.0.0 (or the abbreviation 0) to specify all addresses. The *mask* argument specifies the subnet mask for the real addresses. If you do not enter a mask, then the default mask for the IP address class is used. The **dns** keyword rewrites the A record, or address record, in DNS replies that match this command. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. Enter the **outside** option if this interface is on a lower security level than the interface you identify by the matching global statement. This feature is called outside NAT or bidirectional NAT. The **tcp** *tcp_max_cons* argument specifies the maximum number of simultaneous TCP connections allowed to the local-host. (See the **local-host** command.) The default is 0, which means unlimited connections. (Idle connections are closed after the idle timeout specified by the **timeout conn** command.) The **udp** *udp_max_conns* specify the maximum number of simultaneous UDP connections allowed to the local-host. (See the **local-host** command.) The default is 0, which means unlimited connections. (Idle connections are closed after the idle timeout specified by the **timeout conn** command.) The **norandomseq** keyword disables TCP ISN randomization protection. Not supported for NAT exemption (nat 0 access-list). Although you can enter this argument at the CLI, it is not saved to the configuration. (For additional information about command options, see the *Cisco Security Appliance Command Reference*.)

	Command	Purpose

Step 2	**global** (*mapped_interface*) *nat_id* {*mapped_ip*[**-***mapped_ip*] | **interface**}
	Example:
	`hostname(config)# global (outside) 1 209.165.201.3-209.165.201.10`
		Identifies the mapped address(es) to which you want to translate the real addresses when they exit a particular interface.
		The *mapped_interface* option specifies the name of the interface connected to the mapped IP address network.
		The *nat_id* must match a **global** command NAT ID. For more information about how NAT IDs are used, see the "Information About Implementing Dynamic NAT and PAT" section on page 29-5.
		The *mapped_ip mapped_ip* specify the mapped address(es) to which you want to translate the real addresses when they exit the mapped interface. If you specify a single address, then you configure PAT. If you specify a range of addresses, then you configure dynamic NAT. If the external network is connected to the Internet, each global IP address must be registered with the Network Information Center (NIC).
		The **interface** keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP.
		See Table 29-1, "Command Options and Defaults for Policy NAT and Regular NAT," for information about other command options, and see and Table 29-2 for additional information specific to regular NAT only.

Monitoring Dynamic NAT and PAT

To monitor dynamic NAT and PAT, perform the following task:

Command	Purpose
show running-config nat	Displays a pool of global IP addresses that are associated with the network.

Configuration Examples for Dynamic NAT and PAT

For example, to translate the 10.1.1.0/24 network on the inside interface, enter the following command:

```
hostname(config)# nat (inside) 1 10.1.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.1-209.165.201.30
```

To identify a pool of addresses for dynamic NAT as well as a PAT address for when the NAT pool is exhausted, enter the following commands:

```
hostname(config)# nat (inside) 1 10.1.1.0 255.255.255.0
hostname(config)# global (outside) 1 209.165.201.5
hostname(config)# global (outside) 1 209.165.201.10-209.165.201.20
```

To translate the lower security dmz network addresses so they appear to be on the same network as the inside network (10.1.1.0), for example, to simplify routing, enter the following commands:

```
hostname(config)# nat (dmz) 1 10.1.2.0 255.255.255.0 outside dns
hostname(config)# global (inside) 1 10.1.1.45
```

To identify a single real address with two different destination addresses using policy NAT, enter the following commands (see Figure 26-3 on page 26-5 for a related figure):

```
hostname(config)# access-list NET1 permit ip 10.1.2.0 255.255.255.0 209.165.201.0
255.255.255.224
hostname(config)# access-list NET2 permit ip 10.1.2.0 255.255.255.0 209.165.200.224
255.255.255.224
hostname(config)# nat (inside) 1 access-list NET1 tcp 0 2000 udp 10000
hostname(config)# global (outside) 1 209.165.202.129
hostname(config)# nat (inside) 2 access-list NET2 tcp 1000 500 udp 2000
hostname(config)# global (outside) 2 209.165.202.130
```

To identify a single real address/destination address pair that use different ports using policy NAT, enter the following commands (see Figure 26-4 on page 26-6 for a related figure):

```
hostname(config)# access-list WEB permit tcp 10.1.2.0 255.255.255.0 209.165.201.11
255.255.255.255 eq 80
hostname(config)# access-list TELNET permit tcp 10.1.2.0 255.255.255.0 209.165.201.11
255.255.255.255 eq 23
hostname(config)# nat (inside) 1 access-list WEB
hostname(config)# global (outside) 1 209.165.202.129
hostname(config)# nat (inside) 2 access-list TELNET
hostname(config)# global (outside) 2 209.165.202.130
```

Feature History for Dynamic NAT and PAT

Table 29-3 lists the release history for this feature.

Table 29-3 Feature History for Dynamic NAT and PAT

Feature Name	Releases	Feature Information
NAT in transparent firewall mode	8.0(2)	NAT is now supported in transparent firewall mode.

CHAPTER 30

Configuring Static PAT

Static PAT translations allow a specific UDP or TCP port on a global address to be translated to a specific port on a local address. That is, both the address and the port numbers are translated. This chapter describes how to configure static PAT and includes the following topics:

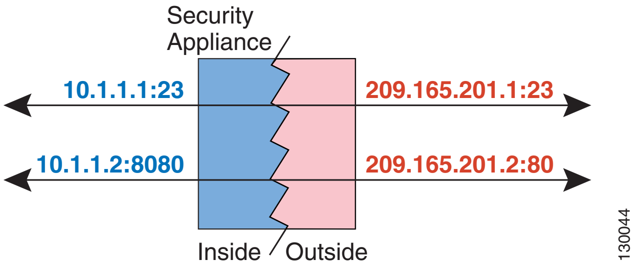
- Information About Static PAT, page 30-1
- Licensing Requirements for Static PAT, page 30-3
- Prerequisites for Static PAT, page 30-3
- Guidelines and Limitations, page 30-4
- Default Settings, page 30-4
- Configuring Static PAT, page 30-5
- Monitoring Static PAT, page 30-9
- Configuration Examples for Static PAT, page 30-9
- Feature History for Static PAT, page 30-11

Information About Static PAT

Static PAT is the same as static NAT, except that it enables you to specify the protocol (TCP or UDP) and port for the real and mapped addresses. Static PAT enables you to identify the same mapped address across many different static statements, provided that the port is different for each statement. You cannot use the same mapped address for multiple static NAT statements.

Figure 30-1 shows a typical static PAT scenario. The translation is always active so both translated and remote hosts can originate connections, and the mapped address and port are statically assigned by the **static** command.

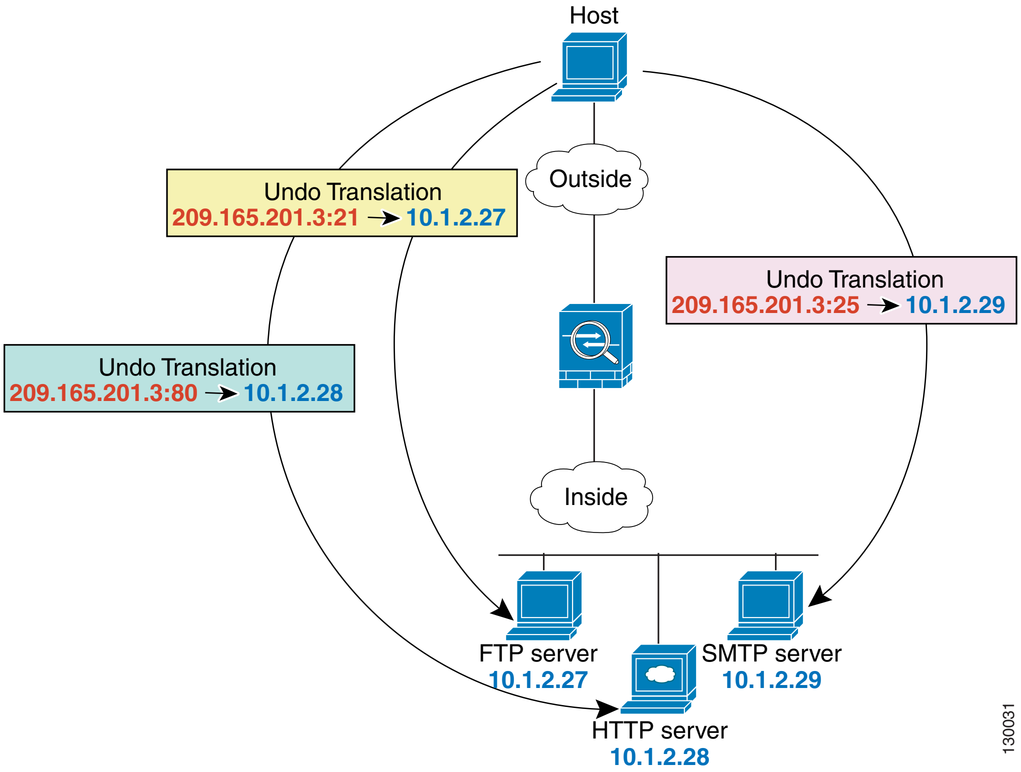
Figure 30-1 Typical Static PAT Scenario



For applications that require application inspection for secondary channels (for example, FTP and VoIP), the ASA automatically translates the secondary ports.

For example, if you want to provide a single address for remote users to access FTP, HTTP, and SMTP, but these are all actually different servers on the real network, you can specify static PAT statements for each server that uses the same mapped IP address, but different ports. (See Figure 30-2.)

Figure 30-2 Static PAT



See the following commands for this example:

```
hostname(config)# static (inside,outside) tcp 209.165.201.3 ftp 10.1.2.27 ftp netmask
255.255.255.255
```

```
hostname(config)# static (inside,outside) tcp 209.165.201.3 http 10.1.2.28 http netmask
255.255.255.255
hostname(config)# static (inside,outside) tcp 209.165.201.3 smtp 10.1.2.29 smtp netmask
255.255.255.255
```

You can also use static PAT to translate a well-known port to a non-standard port or vice versa. For example, if inside web servers use port 8080, you can allow outside users to connect to port 80, and then undo translation to the original port 8080. Similarly, to provide extra security, you can tell web users to connect to non-standard port 6785, and then undo translation to port 80.

This section describes how to configure a static port translation. Static PAT lets you translate the real IP address to a mapped IP address, as well as the real port to a mapped port. You can choose to translate the real port to the same port, which lets you translate only specific types of traffic, or you can take it further by translating to a different port.

Licensing Requirements for Static PAT

Model	License Requirement
All models	Base License.

Prerequisites for Static PAT

Static PAT has the following prerequisites:

An extended access list must be configured. Create the extended access list using the access-list extended command. (See the Chapter 11, “Adding an Extended Access List,” for more information.)

Identify the real addresses and destination/source addresses using an extended access list. Create the extended access list using the **access-list extended** command. (See Chapter 11, “Adding an Extended Access List.”). The first address in the access list is the real address; the second address is either the source or destination address, depending on where the traffic originates. For example, to translate the real address 10.1.1.1 to the mapped address 192.168.1.1 when 10.1.1.1 sends traffic to the 209.165.200.224 network, the **access-list** and **static** commands are:

```
hostname(config)# access-list TEST extended ip host 10.1.1.1 209.165.200.224
255.255.255.224
hostname(config)# static (inside,outside) 192.168.1.1 access-list TEST
```

In this case, the second address is the destination address. However, the same configuration is used for hosts to originate a connection to the mapped address. For example, when a host on the 209.165.200.224/27 network initiates a connection to 192.168.1.1, then the second address in the access list is the source address.

This access list should include only **permit** ACEs. You can optionally specify the real and destination ports in the access list using the **eq** operator. Policy NAT does not consider the **inactive** or **time-range** keywords; all ACEs are considered to be active for policy NAT configuration. See the “Policy NAT” section on page 26-5 for more information.

If you specify a network for translation (for example, 10.1.1.0 255.255.255.0), then the ASA translates the .0 and .255 addresses. If you want to prevent access to these addresses, be sure to configure an access list to deny access. See the Chapter 29, “Configuring Dynamic NAT and PAT,” for information about the other options.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

- Context Mode Guidelines, page 30-4
- Firewall Mode Guidelines, page 30-4
- Additional Guidelines and Limitations, page 30-4

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported only in routed and transparent firewall mode.

Additional Guidelines and Limitations

The following guidelines and limitations apply to the static PAT feature:

- Static translations can be defined for a single host or for all addresses contained in an IP subnet.
- Do not use a mapped address in the **static** command that is also defined in a **global** command for the same mapped interface.
- If you remove a **static** command, existing connections that use the translation are not affected. To removed these connections, enter the **clear local-host** command.
- You cannot clear static translations from the translation table with the **clear xlate** command; you must remove the **static** command instead. Only dynamic translations created by the **nat** and **global** commands can be removed with the **clear xlate** command.
- When configuring static PAT with FTP, you need to add entries for both TCP ports 20 and 21. You must specify port 20 so that the source port for the active transfer is not modified to another port, which may interfere with other devices that perform NAT on FTP traffic.

Default Settings

Table 30-1 lists the default settings for static PAT parameters.

Table 30-1 Default static PAT Parameters

Parameters	Default
emb_limit	The default value is **0** (unlimited), which is the maximum available.
tcp_max_cons	The default value is **0** (unlimited), which is the maximum available.
udp_max_cons	The default value is **0** (unlimited), which is the maximum available.

Configuring Static PAT

This section describes how to configure a static port translation and includes the following topics:

- Configuring Policy Static PAT, page 30-5
- Configuring Regular Static PAT, page 30-7

Configuring Policy Static PAT

Policy static PAT enables you to reference a route map to identify specific conditions or policies that trigger a static translation.

To configure policy static PAT, enter the following command:

<table>
<tr><th>Command</th><th>Purpose</th></tr>
<tr><td><b>static</b> (<i>real_interface</i>,<i>mapped_interface</i>) {<b>tcp</b> | <b>udp</b>} {<i>mapped_ip</i> | <b>interface</b>} <i>mapped_port</i> <b>access-list</b> <i>acl_name</i> [<b>dns</b>] [<b>norandomseq</b>] [[<b>tcp</b>] <i>tcp_max_conns</i> [<i>emb_limit</i>]] [<b>udp</b> <i>udp_max_conns</i>]

<b>Example</b>:
hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet access-list TELNET</td><td>Configures a route map to identify policies that trigger a static translation.

The real <i>real_interface</i>argument specifies the name of the interface connected to the real IP address network, and the <i>mapped_interface</i> argument specifies the name of the interface connected to the mapped IP address network.

Either <b>tcp</b> or <b>udp</b> specifies the protocol.

The <i>mapped_ip</i> argument specifies the address to which the real address is translated (the interface connected to the mapped IP address network).

The <b>interface</b> keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP. You must use the interface keyword instead of specifying the actual IP address when you want to include the IP address of an interface in a static PAT entry.

The <i>mapped_port</i> argument specifies the mapped TCP or UDP port. You can specify the ports by either a literal name or a number in the range of 0 to 65535. You can view valid port numbers online at the following website: http://www.iana.org/assignments/port-numbers

The <b>access-list</b> keyword and <i>acl_id</i> argument identify the real addresses and destination/source addresses using an extended access list. Create the extended access list using the <b>access-list extended</b> command. (See Chapter 11, “Adding an Extended Access List,” for more information.) This access list should include only <b>permit</b> ACEs. Make sure that the source address in the access list matches the <i>real_ip</i> in this command.

The optional <b>dns</b> keyword rewrites the A record, or address record, in DNS replies that match this <b>static</b> command. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. DNS inspection must be enabled to support this functionality.

The optional <b>norandomseq</b> keyword disables TCP ISN randomization protection

The optional <b>tcp</b> <i>tcp_max_conns</i> keyword specifies the maximum number of simultaneous TCP connections allowed to the local host. The optional <i>emb_limit</i> argument specifies the maximum number of embryonic connections per host.

<b>Note</b> An embryonic limit applied using static NAT is applied to all connections to or from the real IP address, and not just connections between the specified interfaces. To apply limits to specific flows, see the “Configuring Connection Limits and Timeouts” section on page 53-3.

The optional <b>udp</b> <i>udp_max_conns</i> keyword and argument specify the maximum number of simultaneous UDP connections allowed to the local host. (For additional information about command options, see the <i>Cisco Security Appliance Command Reference</i>.)</td></tr>
</table>

Configuring Regular Static PAT

Static PAT translations allow a specific UDP or TCP port on a global address to be translated to a specific port on a local address.

To configure regular static PAT, enter the following command:

Command	Purpose
static (*real_interface*,*mapped_interface*) {**tcp** | **udp**} {*mapped_ip* | **interface**} *mapped_port real_ip real_port* [**netmask** *mask*] [**dns**] [**norandomseq**] [[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*] **Example:** `hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet 10.1.1.15 telnet netmask 255.255.255.255`	Configures static PAT. The real *real_interface*argument specifies the name of the interface connected to the real IP address network, and the *mapped_interface* argument specifies the name of the interface connected to the mapped IP address network. Either **tcp** or **udp** specifies the protocol. The *mapped_ip* argument specifies the address to which the real address is translated (the interface connected to the mapped IP address network). The **interface** keyword uses the interface IP address as the mapped address. Use this keyword if you want to use the interface address, but the address is dynamically assigned using DHCP. You must use the interface keyword instead of specifying the actual IP address when you want to include the IP address of an interface in a static PAT entry. The *mapped_port* and *real_port* arguments specify the mapped and real TCP or UDP ports. You can specify the ports by either a literal name or a number in the range of 0 to 65535. You can view valid port numbers online at the following website: http://www.iana.org/assignments/port-numbers The **netmask** *mask* option specifies the subnet mask for the real and mapped addresses. For single hosts, use 255.255.255.255. If you do not enter a mask, then the default mask for the IP address class is used, with one exception. If a host-bit is non-zero after masking, a host mask of 255.255.255.255 is used. If you use the access-list keyword instead of the real_ip, then the subnet mask used in the access list is also used for the mapped_ip. The **dns** option rewrites the A record, or address record, in DNS replies that match this **static** command. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. DNS inspection must be enabled to support this functionality. The **norandomseq** option disables TCP ISN randomization protection The **tcp** *tcp_max_conns* options specify the maximum number of simultaneous TCP connections allowed to the local host. The *emb_limit* option specifies the maximum number of embryonic connections per host. **Note** An embryonic limit applied using static NAT is applied to all connections to or from the real IP address, and not just connections between the specified interfaces. To apply limits to specific flows, see the "Configuring Connection Limits and Timeouts" section on page 53-3. The **udp** *udp_max_conns* options specify the maximum number of simultaneous UDP connections allowed to the local host. (For additional information about command options, see the *Cisco Security Appliance Command Reference*.)

Monitoring Static PAT

To monitor static PAT, enter the following command:

Command	Purpose
`show running-config static`	Displays all static commands in the configuration.

Configuration Examples for Static PAT

This section includes configuration examples for policy static PAT and regular static PAT, and it contains these topics:

- Examples of Policy Static PAT, page 30-9
- Examples of Regular Static PAT, page 30-9
- Example of Redirecting Ports, page 30-10

Examples of Policy Static PAT

For Telnet traffic initiated from hosts on the 10.1.3.0 network to the ASA outside interface (10.1.2.14), you can redirect the traffic to the inside host at 10.1.1.15 by entering the following commands:

```
hostname(config)# access-list TELNET permit tcp host 10.1.1.15 eq telnet 10.1.3.0
255.255.255.0
hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet access-list TELNET
```

For HTTP traffic initiated from hosts on the 10.1.3.0 network to the ASA outside interface (10.1.2.14), you can redirect the traffic to the inside host at 10.1.1.15 by entering:

```
hostname(config)# access-list HTTP permit tcp host 10.1.1.15 eq http 10.1.3.0
255.255.255.0
hostname(config)# static (inside,outside) tcp 10.1.2.14 http access-list HTTP
```

Examples of Regular Static PAT

To redirect Telnet traffic from the ASA outside interface (10.1.2.14) to the inside host at 10.1.1.15, enter the following command:

```
hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet 10.1.1.15 telnet netmask
255.255.255.255
```

If you want to allow the preceding real Telnet server to initiate connections, though, then you need to provide additional translation. For example, to translate all other types of traffic, enter the following commands. The original **static** command provides translation for Telnet to the server, while the **nat** and **global** commands provide PAT for outbound connections from the server.

```
hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet 10.1.1.15 telnet netmask
255.255.255.255
hostname(config)# nat (inside) 1 10.1.1.15 255.255.255.255
hostname(config)# global (outside) 1 10.1.2.14
```

If you also have a separate translation for all inside traffic, and the inside hosts use a different mapped address from the Telnet server, you can still configure traffic initiated from the Telnet server to use the same mapped address as the **static** statement that allows Telnet traffic to the server. You need to create a more exclusive **nat** statement just for the Telnet server. Because **nat** statements are read for the best match, more exclusive **nat** statements are matched before general statements. The following example shows the Telnet **static** statement, the more exclusive **nat** statement for initiated traffic from the Telnet server, and the statement for other inside hosts, which uses a different mapped address.

```
hostname(config)# static (inside,outside) tcp 10.1.2.14 telnet 10.1.1.15 telnet netmask
255.255.255.255
hostname(config)# nat (inside) 1 10.1.1.15 255.255.255.255
hostname(config)# global (outside) 1 10.1.2.14
hostname(config)# nat (inside) 2 10.1.1.0 255.255.255.0
hostname(config)# global (outside) 2 10.1.2.78
```

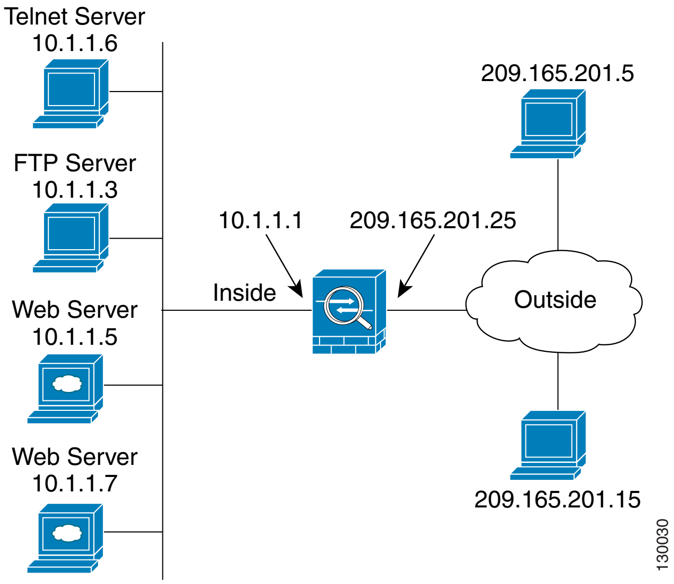
To translate a well-known port (80) to another port (8080), enter the following command:

```
hostname(config)# static (inside,outside) tcp 10.1.2.45 80 10.1.1.16 8080 netmask
255.255.255.255
```

Example of Redirecting Ports

Figure 30-3 shows an example of a network configuration in which the port redirection feature might be useful.

Figure 30-3 Port Redirection Using Static PAT



In the configuration described in this section, port redirection occurs for hosts on external networks as follows:

- Telnet requests to IP address 209.165.201.5 are redirected to 10.1.1.6.
- FTP requests to IP address 209.165.201.5 are redirected to 10.1.1.3.
- HTTP request to an ASA outside IP address 209.165.201.25 are redirected to 10.1.1.5.
- HTTP port 8080 requests to PAT address 209.165.201.15 are redirected to 10.1.1.7 port 80.

To implement this configuration, perform the following steps:

Step 1 Configure PAT for the inside network by entering the following commands:

```
hostname(config)# nat (inside) 1 0.0.0.0 0.0.0.0 0 0
hostname(config)# global (outside) 1 209.165.201.15
```

Step 2 Redirect Telnet requests for 209.165.201.5 to 10.1.1.6 by entering the following command:

```
hostname(config)# static (inside,outside) tcp 209.165.201.5 telnet 10.1.1.6 telnet netmask
255.255.255.255
```

Step 3 Redirect FTP requests for IP address 209.165.201.5 to 10.1.1.3 by entering the following command:

```
hostname(config)# static (inside,outside) tcp 209.165.201.5 ftp 10.1.1.3 ftp netmask
255.255.255.255
```

Step 4 Redirect HTTP requests for the ASA outside interface address to 10.1.1.5 by entering the following command:

```
hostname(config)# static (inside,outside) tcp interface www 10.1.1.5 www netmask
255.255.255.255
```

Step 5 Redirect HTTP requests on port 8080 for PAT address 209.165.201.15 to 10.1.1.7 port 80 by entering the following command:

```
hostname(config)# static (inside,outside) tcp 209.165.201.15 8080 10.1.1.7 www netmask
255.255.255.255
```

Feature History for Static PAT

Table 30-2 lists the release history for this feature.

Table 30-2 Feature History for Static PAT

Feature Name	Releases	Feature Information
Static PAT	7.0	Static PAT translations allow a specific UDP or TCP port on a global address to be translated to a specific port on a local address. This feature was introduced.
NAT and static PAT	7.3.(1)	NAT are supported in transparent firewall mode.

CHAPTER 31

Bypassing NAT

If you enable NAT control, then inside hosts must match a NAT rule when accessing outside hosts. You might want to bypass NAT when you enable NAT control so that local IP addresses appear untranslated. You also might want to bypass NAT if you are using an application that does not support NAT. See the "When to Use Application Protocol Inspection" section on page 40-2 for information about inspection engines that do not support NAT.

You can bypass NAT using identity NAT, static identity NAT, or NAT exemption.

This chapter describes how to bypass NAT, and it includes the following topics:

- Configuring Identity NAT, page 31-1
- Configuring Static Identity NAT, page 31-5
- Configuring NAT Exemption, page 31-11

Configuring Identity NAT

This section includes the following topics:

- Information About Identity NAT, page 31-2
- Licensing Requirements for Identity NAT, page 31-2
- Guidelines and Limitations for Identity NAT, page 31-2
- Default Settings for Identity NAT, page 31-3
- Configuring Identity NAT, page 31-4
- Monitoring Identity NAT, page 31-5
- Feature History for Identity NAT, page 31-5

Information About Identity NAT

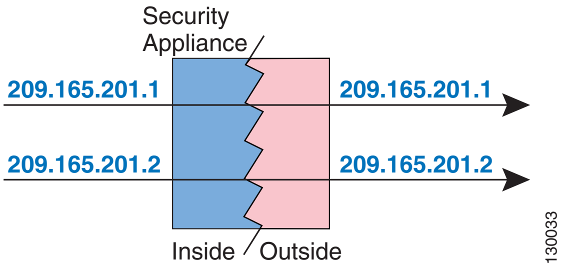
Identity NAT translates the real IP address to the same IP address. Only "translated" hosts can create NAT translations, and responding traffic is allowed back.

When you configure identity NAT (which is similar to dynamic NAT), you do not limit translation for a host on specific interfaces; you must use identity NAT for connections through all interfaces. For example, you cannot choose to perform normal translation on real addresses when you access interface A and then use identity NAT when accessing interface B. Because you use identity NAT for all connections through all interfaces, make sure that the real addresses for which you use identity NAT are routable on all networks that are available according to your access list.

Note If you need to specify a particular interface on which to translate the addresses, use regular dynamic NAT.

Figure 31-1 shows a typical identity NAT scenario.

Figure 31-1 Identity NAT



Licensing Requirements for Identity NAT

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Identity NAT

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall modes.

Additional Guidelines and Limitations

The following guidelines and limitations apply to identity NAT:

- If you change the NAT configuration, and you do not want to wait for existing translations to time out before the new NAT information is used, you can clear the translation table using the **clear xlate** command. However, clearing the translation table disconnects all current connections that use translations.
- The real addresses for which you use identity NAT must be routable on all networks that are available according to your access lists.
- For identity NAT, even though the mapped address is the same as the real address, you cannot initiate a connection from the outside to the inside (even if the interface access list allows it). Use static identity NAT or NAT exemption for this functionality.

Default Settings for Identity NAT

Table 31-1 lists the default settings for identity NAT parameters.

Table 31-1 Default Identity NAT Parameters

Parameters	Default
emb_limit	The default is **0**, which means unlimited embryonic connections
tcp *tcp_max_conns*	The default is **0**, which means unlimited connections.
udp *udp_max_conns*	The default is **0**, which means unlimited connections.

Configuring Identity NAT

To configure identity NAT, enter the following command:

Command	Purpose
nat (*real_interface*) *nat_id real_ip* [*mask* [**dns**] [**outside**] [**norandomseq**] [[**tcp**] *tcp_max_conns* [*emb_limit*]] [**udp** *udp_max_conns*] **Example:** `hostname(config)# nat (inside) 0 10.1.1.0 255.255.255.0`	Configures identity NAT for the inside 10.1.1.0/24 network. The *real_interface* argument specifies the name of the interface connected to the real IP address network. The *nat_id* argument specifies an integer for the NAT ID. For identity NAT, use the NAT ID of **0**. This ID is referenced by the global command to associate a global pool with the *real_ip*. The *real_ip* argument specifies the real address that you want to translate. You can use **0.0.0.0** (or the abbreviation **0**) to specify all addresses. The optional *mask* argument specifies the subnet mask for the real addresses. If you do not enter a mask, then the default mask for the IP address class is used. The optional **dns** keyword rewrites the A record, or address record, in DNS replies that match this command. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. You must enter **outside** if this interface is on a lower security level than the interface you identify by the matching global statement. The optional **norandomseq** keyword disables TCP ISN randomization protection. The optional **tcp** *tcp_max_conns* keyword and argument specify the maximum number of simultaneous TCP connections allowed to the local host. The default is **0**, which means unlimited connections. The optional *emb_limit* argument specifies the maximum number of embryonic connections per host. The default is **0,** which means unlimited embryonic connections. The optional **udp** *udp_max_conns* keyword and argument specify the maximum number of simultaneous UDP connections allowed to the local host. The default is **0**, which means unlimited connections. (For additional information about command options, see the **nat** command in the *Cisco Security Appliance Command Reference*.)

Monitoring Identity NAT

To monitor NAT bypass, enter the following command:

Command	Purpose
`show running-config nat`	Displays a pool of global IP addresses that are associated with the network.

Feature History for Identity NAT

Table 31-2 lists the release history for this feature.

Table 31-2 Feature History for Identity NAT

Feature Name	Releases	Feature Information
Identity NAT	7.0	Identity NAT translates the real IP address to the same IP address. You use identity NAT for connections through all interfaces. The following command was introduced: **nat**.
NAT	8.0(2)	NAT began support in transparent firewall mode.

Configuring Static Identity NAT

This section includes the following topics:

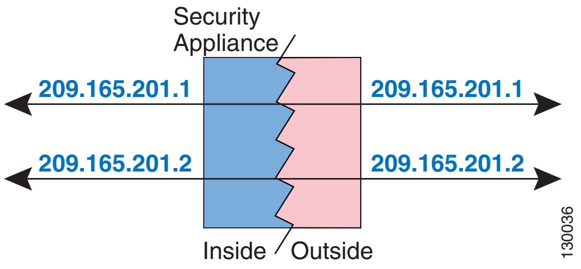
- Information About Static Identity NAT, page 31-5
- Licensing Requirements for Static Identity NAT, page 31-6
- Guidelines and Limitations for Static Identity NAT, page 31-6
- Default Settings for Static Identity NAT, page 31-7
- Configuring Static Identity NAT, page 31-7
- Monitoring Static Identity NAT, page 31-10
- Feature History for Static Identity NAT, page 31-10

Information About Static Identity NAT

Static identity NAT translates the real IP address to the same IP address. Static identity NAT enables you to specify the interface on which you want to allow the real addresses to appear, so you can use identity NAT when you access interface A, and use regular translation when you access interface B. Static identity NAT also enables you to use policy NAT, which identifies the real and destination addresses when determining the real addresses to translate. (See the "Policy NAT" section on page 26-5 for more information about policy NAT.) For example, you can use static identity NAT for an inside address when it accesses the outside interface and the destination is server A, but you can use a normal translation when accessing the outside server B. The translation is always active, and both "translated" and remote hosts can originate connections.

Figure 31-2 shows a typical static identity NAT scenario.

Figure 31-2 Static Identity NAT



Licensing Requirements for Static Identity NAT

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations for Static Identity NAT

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall modes.

Additional Guidelines and Limitations

The following guidelines and limitations apply to static identity NAT:

- You cannot clear static translations from the translation table with the **clear xlate** command; you must remove the **static** command instead. Only dynamic translations created by the **nat** and **global** commands can be removed with the **clear xlate** command.
- If you remove a **static** command, existing connections that use the translation are not affected. To remove these connections, enter the **clear local-host** command.
- Policy static identity NAT does not consider the inactive or time-range keywords; all ACEs are considered to be active for policy NAT configurations. (See the“Policy NAT” section on page 26-5 for more information.)
- For static policy NAT, in undoing the translation, the ACL in the **static** command is not used. If the destination address in the packet matches the mapped address in the static rule, the static rule is used to untranslate the address.

Default Settings for Static Identity NAT

Table 31-3 lists the default settings for static identity NAT parameters.

Table 31-3 Default Static Identity NAT Parameters

Parameters	Default
emb_limit	The default is **0**, which means unlimited embryonic connections.
tcp *tcp_max_conns*	The default is **0**, which means unlimited embryonic connections.
udp *udp_max_conns*	The default is **0**, which means unlimited embryonic connections.

Configuring Static Identity NAT

This section describes how to configure policy static identity NAT and regular static identity NAT, and it includes the following topics:

- Configuring Policy Static Identity NAT, page 31-8
- Configuring Regular Static Identity NAT, page 31-9

Configuring Policy Static Identity NAT

To configure policy static identity NAT, enter the following command:

Command	Purpose

`static (real_interface,mapped_interface) real_ip access-list acl_id [dns] [norandomseq] [[tcp] tcp_max_conns [emb_limit]] [udp udp_max_conns]`
Example:
`hostname(config)# static (inside,outside) 209.165.202.129 access-list NET1`
	Configures policy static NAT.
	The *real_interface,mapped_interface* arguments specify the name of the interface connected to the real IP address network and the name of the interface connected to the mapped IP address network.
	The *real_ip* argument specifies the real address that you want to translate.
	The **access-list** keyword and *acl_id* argument identify the real addresses and destination/source addresses using an extended access list. Create the extended access list using the **access-list extended** command. (See Chapter 11, "Adding an Extended Access List.") This access list should include only **permit** ACEs. Make sure that the source address in the access list matches the *real_ip* in this command.
	The optional **dns** keyword rewrites the A record, or address record, in DNS replies that match this **static** command. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value. DNS inspection must be enabled to support this functionality.
	The optional **norandomseq** keyword disables TCP ISN randomization protection.
	The optional **tcp** *tcp_max_conns* keyword and argument specify the maximum number of simultaneous TCP connections allowed to the local host. The default is **0**, which means unlimited connections.
	The optional *emb_limit* argument specifies the maximum number of embryonic connections per host. The default is **0,** which means unlimited embryonic connections.
	The optional **udp** *udp_max_conns* keyword and argument specify the maximum number of simultaneous UDP connections allowed to the local host. The default is **0**, which means unlimited connections.
	(For additional information about command options, see the **static** command in the *Cisco Security Appliance Command Reference*.)

Example of Policy Static Identity NAT

The following policy static identity NAT example shows a single real address that uses identity NAT when accessing one destination address and a translation when accessing another:

```
hostname(config)# access-list NET1 permit ip host 10.1.2.27 209.165.201.0 255.255.255.224
hostname(config)# access-list NET2 permit ip host 10.1.2.27 209.165.200.224
255.255.255.224
hostname(config)# static (inside,outside) 209.165.202.129 access-list NET1
hostname(config)# static (inside,outside) 209.165.202.130 access-list NET2
```

Configuring Regular Static Identity NAT

To configure regular static identity NAT, enter the following command:

Command	Purpose

`static` `(`*`real_interface,mapped_interface`*`)` *`real_ip real_ip`* `[`**`netmask`** *`mask`*`] [`**`dns`**`] [`**`norandomseq`**`] [[`**`tcp`**`]` *`tcp_max_conns`* `[`*`emb_limit`*`]] [`**`udp`** *`udp_max_conns`*`]`
`Example``:`
`hostname(config)# static (inside,outside) 10.1.1.3 10.1.1.3 netmask 255.255.255.255`
	Configures static identity NAT.
	The *real_interface,mapped_interface* arguments specify the name of the interface connected to the real IP address network and the name of the interface connected to the mapped IP address network.
	The *real_ip* argument specifies the real address that you want to translate. Specify the same IP address for both *real_ip* arguments.
	The **netmask** *mask* options specify the subnet mask for the real and mapped addresses.
	The **dns** option rewrites the A record, or address record, in DNS replies that match this static. For DNS replies traversing from a mapped interface to any other interface, the A record is rewritten from the mapped value to the real value. Inversely, for DNS replies traversing from any interface to a mapped interface, the A record is rewritten from the real value to the mapped value.
	Note Note DNS inspection must be enabled to support this functionality.
	The **norandomseq** option disables TCP ISN randomization protection. Each TCP connection has two ISNs: one generated by the client and one generated by the server. The security appliance randomizes the ISN of the TCP SYN passing in both the inbound and outbound directions.
	For static PAT, the **tcp** option specifies the protocol as TCP.
	The *tcp_max_cons* argument specifies the maximum number of simultaneous TCP connections allowed to the local-host. (See the local-host command.) The default is 0, which means unlimited connections.
	The optional *emb_limit* argument specifies the maximum number of embryonic connections per host. The default is 0, which means unlimited embryonic connections.
	The **udp** *udp_max_conns* option specifies the maximum number of simultaneous UDP connections allowed to the local-host. (See the local-host command.) The default is 0, which means unlimited connections.
	The example shown uses static identity NAT for an inside IP address (10.1.1.3) when accessed by the outside.

Examples of Regular Static Identity NAT

The following command uses static identity NAT for an inside IP address (10.1.1.3) when accessed by the outside:

```
hostname(config)# static (inside,outside) 10.1.1.3 10.1.1.3 netmask 255.255.255.255
```

The following command uses static identity NAT for an outside address (209.165.201.15) when accessed by the inside:

```
hostname(config)# static (outside,inside) 209.165.201.15 209.165.201.15 netmask
255.255.255.255
```

The following command statically maps an entire subnet:

```
hostname(config)# static (inside,dmz) 10.1.2.0 10.1.2.0 netmask 255.255.255.0
```

Monitoring Static Identity NAT

To monitor static identity NAT, enter the following command:

Command	Purpose
`show running-config static`	Displays all static commands in the configuration.

Feature History for Static Identity NAT

Table 31-4 lists the release history for this feature.

Table 31-4 Feature History for Static Identity NAT

Feature Name	Releases	Feature Information
Static identity NAT	7.0	Static identity NAT translates the real IP address to the same IP address. The following command was introduced: **static**.
NAT	8.0(2)	NAT began support in transparent firewall mode.

Configuring NAT Exemption

This section includes the following topics:

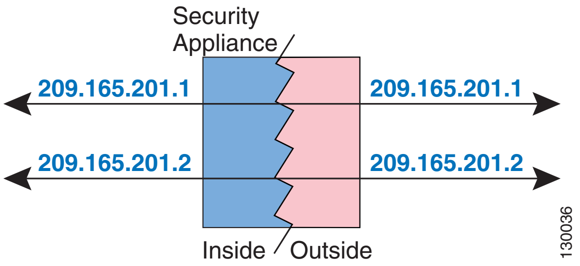
- Information About NAT Exemption, page 31-11
- Licensing Requirements for NAT Exemption, page 31-11
- Guidelines and Limitations for NAT Exemption, page 31-12
- Default Settings for NAT Exemption, page 31-12
- Configuring NAT Exemption, page 31-13
- Monitoring NAT Exemption, page 31-13
- Configuration Examples for NAT Exemption, page 31-13
- Feature History for NAT Exemption, page 31-14

Information About NAT Exemption

NAT exemption exempts addresses from translation and allows both translated and remote hosts to initiate connections. Like identity NAT, you do not limit translation for a host on specific interfaces; you must use NAT exemption for connections through all interfaces. However, NAT exemption does enable you to specify the real and destination addresses when determining the real addresses to translate (similar to policy NAT), so you have greater control using NAT exemption than identity NAT. However, unlike policy NAT, NAT exemption does not consider the ports in the access list. Use static identity NAT to consider ports in the access list.

Figure 31-3 shows a typical NAT exemption scenario.

Figure 31-3 NAT Exemption



Licensing Requirements for NAT Exemption

The following table shows the licensing requirements for this feature:

Model	**License Requirement**
All models	Base License.

Guidelines and Limitations for NAT Exemption

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall modes.

Additional Guidelines and Limitations

The following guidelines and limitations apply to NAT exemption:

- If you remove a NAT exemption configuration, existing connections that use NAT exemption are not affected. To remove these connections, enter the **clear local-host** command.
- NAT exemption does not support connection settings, such as maximum TCP connections.
- By default, the **nat** command exempts traffic from inside to outside. If you want traffic from outside to inside to bypass NAT, then add an additional **nat** command and enter **outside** to identify the NAT instance as outside NAT. You might want to use outside NAT exemption if you configure dynamic NAT for the outside interface and want to exempt other traffic.
- Access list hit counts, as shown by the **show access-list** command, do not increment for NAT exemption access lists.

Default Settings for NAT Exemption

Table 31-5 lists the default settings for NAT exemption parameters.

Table 31-5 Default NAT Exemption Parameters

Parameters	Default
nat_id	Specifies an integer for the NAT ID. For NAT exemption, use the NAT ID of **0**.

Configuring NAT Exemption

To configure NAT exemption, enter the following command:

Command	Purpose
nat (*real_interface*) *nat_id* **access-list** *acl_name* [**outside**] **Example:** `hostname(config)# nat (inside) 0 access-list EXEMPT`	Configures NAT exemption. The *real_interface* argument specifies the name of the interface connected to the real Ip address network. The *nat_id* argument specifies an integer for the NAT ID. For NAT exemption, use the NAT ID of **0**. The **access-list** key word identifies local addresses and destination addresses using an extended access list. Create the extended access list using the **access-list extended** command. (See the Chapter 11, "Adding an Extended Access List.") This access list can include both **permit** ACEs and **deny** ACEs. Do not specify the real and destination ports in the access list; NAT exemption does not consider the ports. NAT exemption considers the **inactive** and **time-range** keywords, but it does not support ACL with all **inactive** and **time-range** ACEs. By default, this command exempts traffic from inside to outside. If you want traffic from outside to inside to bypass NAT, then add an additional **nat** command and enter **outside** to identify the NAT instance as outside NAT. You might want to use outside NAT exemption if you configure dynamic NAT for the outside interface and want to exempt other traffic. Enter **outside** if this interface is on a lower security level than the interface you identify by the matching global statement. (For additional information about command options, see the **nat** command in the *Cisco Security Appliance Command Reference*.)

Monitoring NAT Exemption

To monitor NAT bypass, enter the following command:

Command	Purpose
show running-config nat	Displays a pool of global IP addresses that are associated with the network.

Configuration Examples for NAT Exemption

The following examples show how to configure NAT exemption.

To exempt an inside network when accessing any destination address, enter the following command:

```
hostname(config)# access-list EXEMPT permit ip 10.1.2.0 255.255.255.0 any
hostname(config)# nat (inside) 0 access-list EXEMPT
```

To use dynamic outside NAT for a DMZ network, and exempt another DMZ network, enter the following command:

```
hostname(config)# nat (dmz) 1 10.1.2.0 255.255.255.0 outside dns
hostname(config)# global (inside) 1 10.1.1.45
hostname(config)# access-list EXEMPT permit ip 10.1.3.0 255.255.255.0 any
hostname(config)# nat (dmz) 0 access-list EXEMPT
```

To exempt an inside address when accessing two different destination addresses, enter the following commands:

```
hostname(config)# access-list NET1 permit ip 10.1.2.0 255.255.255.0 209.165.201.0
255.255.255.224
hostname(config)# access-list NET1 permit ip 10.1.2.0 255.255.255.0 209.165.200.224
255.255.255.224
hostname(config)# nat (inside) 0 access-list NET1
```

Feature History for NAT Exemption

Table 31-6 lists the release history for this feature.

Table 31-6 Feature History for NAT Exemption

Feature Name	Releases	Feature Information
NAT exemption	7.0	NAT exemption exempts addresses from translation and allows both translated and remote hosts to initiate connections. The following command was introduced: **nat**.
NAT	8.0(2)	NAT began support in transparent firewall mode.

PART 5

Configuring High Availability

CHAPTER 32

Information About High Availability

This chapter provides an overview of the failover features that enable you to achieve high availability on the Cisco 5500 series adaptive security appliances. For information about configuring high availability, see Chapter 34, "Configuring Active/Active Failover" or Chapter 33, "Configuring Active/Standby Failover."

This chapter includes the following sections:

- Information About Failover and High Availability, page 32-1
- Failover System Requirements, page 32-2
- Failover and Stateful Failover Links, page 32-3
- Active/Active and Active/Standby Failover, page 32-9
- Stateless (Regular) and Stateful Failover, page 32-10
- Transparent Firewall Mode Requirements, page 32-11
- Auto Update Server Support in Failover Configurations, page 32-12
- Failover Health Monitoring, page 32-14
- Failover Feature/Platform Matrix, page 32-16
- Failover Times by Platform, page 32-16
- Failover Messages, page 32-17

Information About Failover and High Availability

Configuring high availability requires two identical ASAs connected to each other through a dedicated failover link and, optionally, a Stateful Failover link. The health of the active interfaces and units is monitored to determine if specific failover conditions are met. If those conditions are met, failover occurs.

The ASA supports two failover configurations, Active/Active failover and Active/Standby failover. Each failover configuration has its own method for determining and performing failover.

With Active/Active failover, both units can pass network traffic. This also lets you configure traffic sharing on your network. Active/Active failover is available only on units running in multiple context mode.

With Active/Standby failover, only one unit passes traffic while the other unit waits in a standby state. Active/Standby failover is available on units running in either single or multiple context mode.

Both failover configurations support stateful or stateless (regular) failover.

Note When the security appliance is configured for Active/Active stateful failover, you cannot enable IPsec or SSL VPN. Therefore, these features are unavailable. VPN failover is available for Active/Standby failover configurations only.

Failover System Requirements

This section describes the hardware, software, and license requirements for ASAs in a failover configuration.

This section contains the following topics:

- Hardware Requirements, page 32-2
- Software Requirements, page 32-2
- Licensing Requirements, page 32-3

Hardware Requirements

The two units in a failover configuration must be the same model, have the same number and types of interfaces, and the same SSMs installed (if any).

If you are using units with different Flash memory sizes in your failover configuration, make sure the unit with the smaller Flash memory has enough space to accommodate the software image files and the configuration files. If it does not, configuration synchronization from the unit with the larger Flash memory to the unit with the smaller Flash memory will fail.

Although it is not required, it is recommended that both units have the same amount of RAM memory installed.

Software Requirements

The two units in a failover configuration must be in the same operating modes (routed or transparent, single or multiple context). They must have the same major (first number) and minor (second number) software version. However, you can use different versions of the software during an upgrade process; for example, you can upgrade one unit from Version 7.0(1) to Version 7.0(2) and have failover remain active. We recommend upgrading both units to the same version to ensure long-term compatibility.

See "Performing Zero Downtime Upgrades for Failover Pairs" section on page 78-5 for more information about upgrading the software on a failover pair.

Licensing Requirements

The licensed features (such as SSL VPN peers or security contexts, for example) on both units participating in failover must be identical.

Failover and Stateful Failover Links

This section describes the failover and the Stateful Failover links, which are dedicated connections between the two units in a failover configuration. This section includes the following topics:

- Failover Link, page 32-3
- Stateful Failover Link, page 32-4
- Avoiding Interrupted Failover Links, page 32-5

Failover Link

The two units in a failover pair constantly communicate over a failover link to determine the operating status of each unit. The following information is communicated over the failover link:

- The unit state (active or standby)
- Hello messages (keep-alives)
- Network link status
- MAC address exchange
- Configuration replication and synchronization

Caution All information sent over the failover and Stateful Failover links is sent in clear text unless you secure the communication with a failover key. If the ASA is used to terminate VPN tunnels, this information includes any usernames, passwords and preshared keys used for establishing the tunnels. Transmitting this sensitive data in clear text could pose a significant security risk. We recommend securing the failover communication with a failover key if you are using the ASA to terminate VPN tunnels.

You can use any unused Ethernet interface on the device as the failover link; however, you cannot specify an interface that is currently configured with a name. The LAN failover link interface is not configured as a normal networking interface; it exists for failover communication only. This interface should only be used for the LAN failover link (and optionally for the Stateful Failover link).

Connect the LAN failover link in one of the following two ways:

- Using a switch, with no other device on the same network segment (broadcast domain or VLAN) as the LAN failover interfaces of the ASA.
- Using a crossover Ethernet cable to connect the appliances directly, without the need for an external switch.

Note When you use a crossover cable for the LAN failover link, if the LAN interface fails, the link is brought down on both peers. This condition may hamper troubleshooting efforts because you cannot easily determine which interface failed and caused the link to come down.

Note The ASA supports Auto-MDI/MDIX on its copper Ethernet ports, so you can either use a crossover cable or a straight-through cable. If you use a straight-through cable, the interface automatically detects the cable and swaps one of the transmit/receive pairs to MDIX.

Stateful Failover Link

To use Stateful Failover, you must configure a Stateful Failover link to pass all state information. You have three options for configuring a Stateful Failover link:

- You can use a dedicated Ethernet interface for the Stateful Failover link.
- If you are using LAN-based failover, you can share the failover link.
- You can share a regular data interface, such as the inside interface. However, this option is not recommended.

If you are using a dedicated Ethernet interface for the Stateful Failover link, you can use either a switch or a crossover cable to directly connect the units. If you use a switch, no other hosts or routers should be on this link.

Note Enable the PortFast option on Cisco switch ports that connect directly to the ASA.

If you use a data interface as the Stateful Failover link, you receive the following warning when you specify that interface as the Stateful Failover link:

```
******* WARNING ***** WARNING ******* WARNING ****** WARNING  *********
  Sharing Stateful failover interface with regular data interface is not
  a recommended configuration due to performance and security concerns.
******* WARNING ***** WARNING ******* WARNING ****** WARNING  *********
```

Sharing a data interface with the Stateful Failover interface can leave you vulnerable to replay attacks. Additionally, large amounts of Stateful Failover traffic may be sent on the interface, causing performance problems on that network segment.

Note Using a data interface as the Stateful Failover interface is supported in single context, routed mode only.

In multiple context mode, the Stateful Failover link resides in the system context. This interface and the failover interface are the only interfaces in the system context. All other interfaces are allocated to and configured from within security contexts.

Note The IP address and MAC address for the Stateful Failover link does not change at failover unless the Stateful Failover link is configured on a regular data interface.

Caution All information sent over the failover and Stateful Failover links is sent in clear text unless you secure the communication with a failover key. If the ASA is used to terminate VPN tunnels, this information includes any usernames, passwords, and preshared keys used for establishing the tunnels. Transmitting this sensitive data in clear text could pose a significant security risk. We recommend securing the failover communication with a failover key if you are using the ASA to terminate VPN tunnels.

Failover Interface Speed for Stateful Links

If you use the failover link as the Stateful Failover link, you should use the fastest Ethernet interface available. If you experience performance problems on that interface, consider dedicating a separate interface for the Stateful Failover interface.

Use the following failover interface speed guidelines for the adaptive security appliances:

- Cisco ASA 5510
  - Stateful link speed can be 100 Mbps, even though the data interface can operate at 1 Gigabit due to the CPU speed limitation.
- Cisco ASA 5520/5540/5550
  - Stateful link speed should match the fastest data link.
- Cisco ASA 5580/5585
  - Use only non-management 1 Gigabit ports for the stateful link because management ports have lower performance and cannot meet the performance requirement for stateful failover.

For optimum performance when using long distance LAN failover, the latency for the failover link should be less than 10 milliseconds and no more than 250 milliseconds. If latency is more than10 milliseconds, some performance degradation occurs due to retransmission of failover messages.

All platforms support sharing of failover heartbeat and stateful link, but we recommend using a separate heartbeat link on systems with high Stateful Failover traffic.

Avoiding Interrupted Failover Links

Because adaptive security appliances uses failover LAN interfaces to transport messages between primary and secondary units, if a failover LAN interface is down (that is, the physical link is down or the switch used to connect the LAN interface is down), then the adaptive security appliance failover operation is affected until the health of the failover LAN interface is restored.

In the event that all communication is cut off between the units in a failover pair, both units go into the active state, which is expected behavior. When communication is restored and the two active units resume communication through the failover link or through any monitored interface, the primary unit remains active, and the secondary unit immediately returns to the standby state. This relationship is established regardless of the health of the primary unit.

Because of this behavior, stateful flows that were passed properly by the secondary active unit during the network split are now interrupted. To avoid this interruption, failover links and data interfaces should travel through different paths to decrease the chance that all links fail at the same time. In the event that only one failover link is down, the adaptive security appliance takes a sample of the interface health, exchanges this information with its peer through the data interface, and performs a switchover if the active unit has a greater number of down interfaces. Subsequently, the failover operation is suspended until the health of the failover link is restored.

Depending upon their network topologies, several primary/secondary failure scenarios exist in adaptive security appliance failover pairs, as shown in the following scenarios.

Scenario 1—Not Recommended

If a single switch or a set of switches are used to connect both failover and data interfaces between two adaptive security appliances, then when a switch or inter-switch-link is down, both adaptive security appliances become active. Therefore, the following two connection methods shown in Figure 32-1 and Figure 32-2 are NOT recommended.

Figure 32-1 Connecting with a Single Switch—Not Recommended

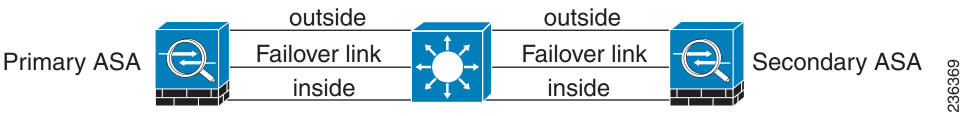
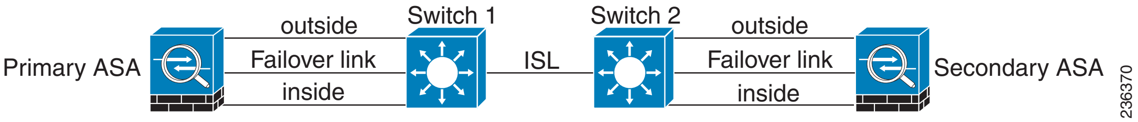


Figure 32-2 Connecting with a Double Switch—Not Recommended



Scenario 2—Recommended

To make the ASA failover pair resistant to failover LAN interface failure, we recommend that failover LAN interfaces NOT use the same switch as the data interfaces, as shown in the prededing connections. Instead, use a different switch or use a direct cable to connect two adaptive security appliance failover interfaces, as shown in Figure 32-3 and Figure 32-4.

Figure 32-3 Connecting with a Different Switch

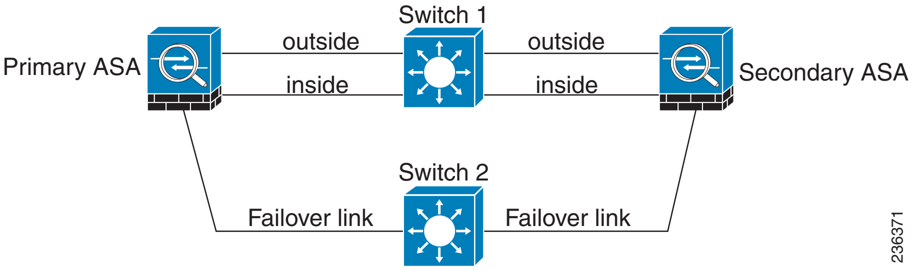
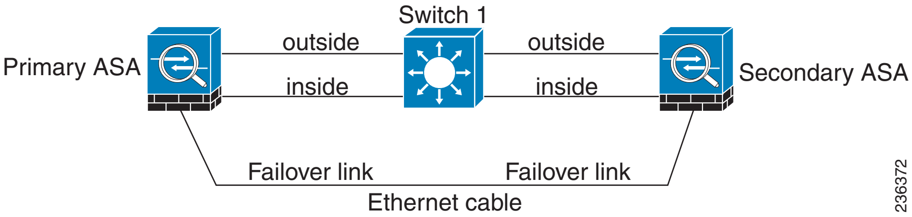


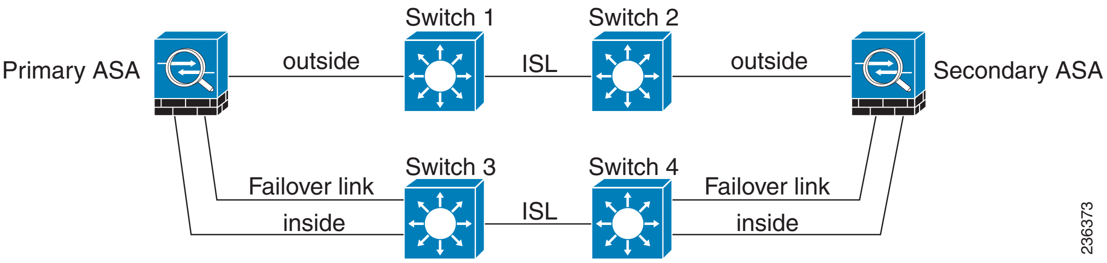
Figure 32-4 Connecting with a Cable



Scenario 3—Recommended

If the adaptive security appliance data interfaces are connected to more than one set of switches, then a failover LAN interface can be connected to one of the switches, preferably the switch on the secure side of network, as shown in Figure 32-5.

Figure 32-5 Connecting with a Secure Switch



Scenario 4—Recommended

The most reliable failover configurations use a redundant interface on the failover LAN interface, as shown in Figure 32-6, Figure 32-7, and Figure 32-8.

Figure 32-6 Connecting with Ethernet Cables

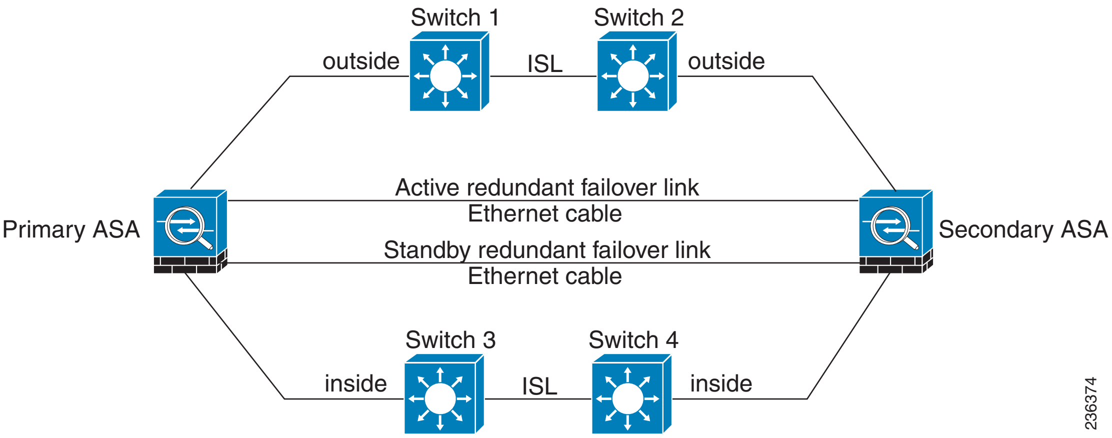


Figure 32-7 Connecting with Redundant Interfaces

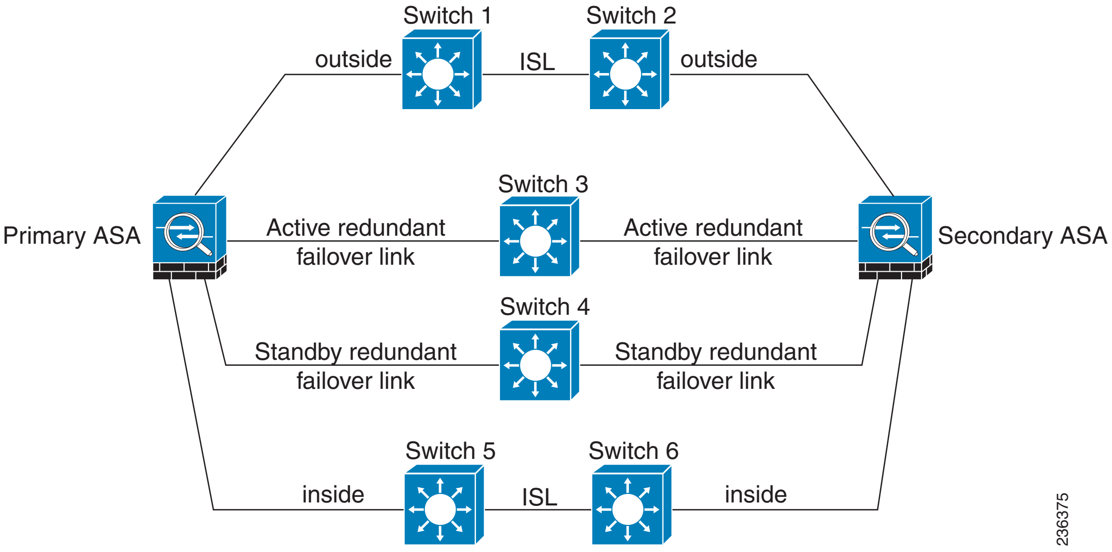
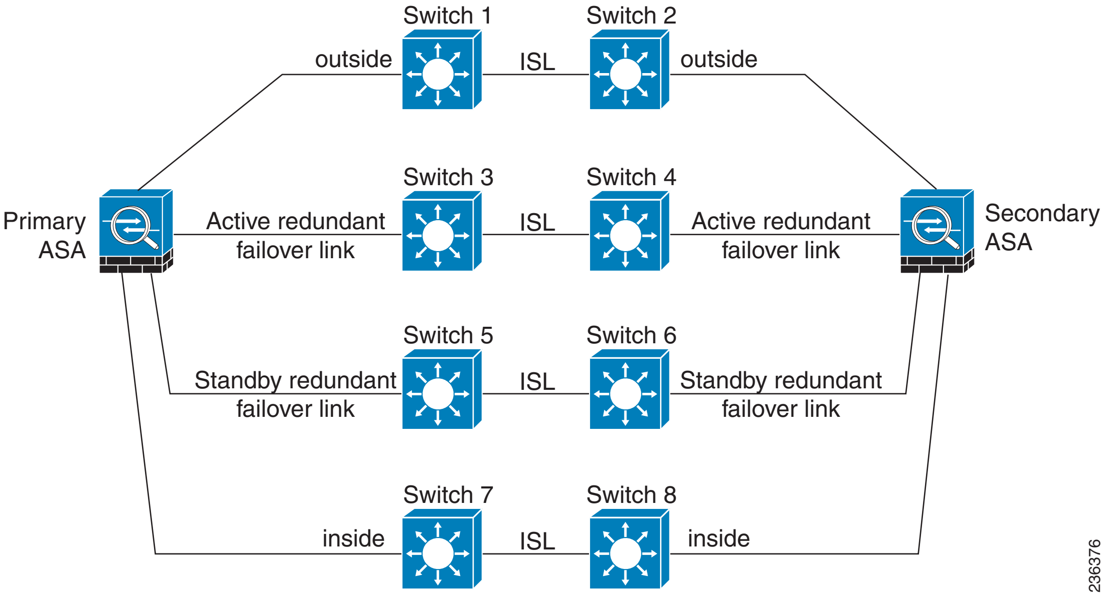

Switch 1
Switch 2
outside
ISL
outside
Switch 3
Primary ASA
Active redundant failover link
Active redundant failover link
Secondary ASA
Switch 4
Standby redundant failover link
Standby redundant failover link
Switch 5
Switch 6
inside
ISL
inside
236375

Figure 32-8 Connecting with Inter-switch Links



Active/Active and Active/Standby Failover

Two types of failover configurations are supported by the ASA: Active/Standby and Active/Active.

In Active/Standby failover, one unit is the active unit. It passes traffic. The standby unit does not actively pass traffic. When a failover occurs, the active unit fails over to the standby unit, which then becomes active. You can use Active/Standby failover for ASAs in single or multiple context mode, although it is most commonly used for ASAs in single context mode.

Active/Active failover is only available to ASAs in multiple context mode. In an Active/Active failover configuration, both ASAs can pass network traffic. In Active/Active failover, you divide the security contexts on the ASA into *failover groups*. A failover group is simply a logical group of one or more security contexts. Each group is assigned to be active on a specific ASA in the failover pair. When a failover occurs, it occurs at the failover group level.

For more detailed information about each type of failover, refer the following information:

- Chapter 33, "Configuring Active/Standby Failover"
- Chapter 34, "Configuring Active/Active Failover"

Determining Which Type of Failover to Use

The type of failover you choose depends upon your ASA configuration and how you plan to use the ASAs.

If you are running the ASA in single mode, then you can use only Active/Standby failover. Active/Active failover is only available to ASAs running in multiple context mode.

If you are running the ASA in multiple context mode, then you can configure either Active/Active failover or Active/Standby failover.

- To allow both members of the failover pair to share the traffic, use Active/Active failover. Do not exceed 50% load on each device.
- If you do not want to share the traffic in this way, use Active/Standby or Active/Active failover.

Table 32-1 provides a comparison of some of the features supported by each type of failover configuration:

Table 32-1 Failover Configuration Feature Support

Feature	Active/Active	Active/Standby
Single Context Mode	No	Yes
Multiple Context Mode	Yes	Yes
Traffic Sharing Network Configurations	Yes	No
Unit Failover	Yes	Yes
Failover of Groups of Contexts	Yes	No
Failover of Individual Contexts	No	No

Stateless (Regular) and Stateful Failover

The ASA supports two types of failover, regular and stateful. This section includes the following topics:

- Stateless (Regular) Failover, page 32-10
- Stateful Failover, page 32-10

Stateless (Regular) Failover

When a failover occurs, all active connections are dropped. Clients need to reestablish connections when the new active unit takes over.

Note In Release 8.0 and later, some configuration elements for WebVPN (such as bookmarks and customization) use the VPN failover subsystem, which is part of Stateful Failover. You must use Stateful Failover to synchronize these elements between the members of the failover pair. Stateless (regular) failover is not recommended for WebVPN.

Stateful Failover

When Stateful Failover is enabled, the active unit continually passes per-connection state information to the standby unit. After a failover occurs, the same connection information is available at the new active unit. Supported end-user applications are not required to reconnect to keep the same communication session.

Table 32-2 list the state information that is and is not passed to the standby unit when Stateful Failover is enabled.

Table 32-2 State Information

State Information Passed to Standby Unit	State Information Not Passed to Standby Unit
NAT translation table	The HTTP connection table (unless HTTP replication is enabled).
TCP connection states	The user authentication (uauth) table. Inspected protocols are subject to advanced TCP-state tracking, and the TCP state of these connections is not automatically replicated. While these connections are replicated to the standby unit, there is a best-effort attempt to re-establish a TCP state.
UDP connection states	The routing tables. After a failover occurs, some packets may be lost or routed out of the wrong interface (the default route) while the dynamic routing protocols rediscover routes.
The ARP table	State information for Security Service Modules.
The Layer 2 bridge table (when running in transparent firewall mode)	DHCP server address leases.

Table 32-2 State Information

State Information Passed to Standby Unit	State Information Not Passed to Standby Unit
The HTTP connection states (if HTTP replication is enabled)	Stateful failover for phone proxy. When the active unit goes down, the call fails, media stops flowing, and the phone should unregister from the failed unit and reregister with the active unit. The call must be re-established.
The ISAKMP and IPSec SA table	—
GTP PDP connection database	—
SIP signalling sessions	—

The following WebVPN features are not supported with Stateful Failover:

- Smart Tunnels
- Port Forwarding
- Plugins
- Java Applets
- IPv6 clientless or Anyconnect sessions
- Citrix authentication (Citrix users must reauthenticate after failover)

Note If failover occurs during an active Cisco IP SoftPhone session, the call remains active because the call session state information is replicated to the standby unit. When the call is terminated, the IP SoftPhone client loses connection with the Cisco CallManager. This occurs because there is no session information for the CTIQBE hangup message on the standby unit. When the IP SoftPhone client does not receive a response back from the Call Manager within a certain time period, it considers the CallManager unreachable and unregisters itself.

For VPN failover, VPN end-users should not have to reauthenticate or reconnect the VPN session in the event of a failover. However, applications operating over the VPN connection could lose packets during the failover process and not recover from the packet loss.

Transparent Firewall Mode Requirements

When the active unit fails over to the standby unit, the connected switch port running Spanning Tree Protocol (STP) can go into a blocking state for 30 to 50 seconds when it senses the topology change. To avoid traffic loss while the port is in a blocking state, you can configure one of the following workarounds depending on the switch port mode:

- Access mode—Enable the STP PortFast feature on the switch:

  ```
  interface interface_id
  spanning-tree portfast
  ```

  The PortFast feature immediately transitions the port into STP forwarding mode upon linkup. The port still participates in STP. So if the port is to be a part of the loop, the port eventually transitions into STP blocking mode.

- Trunk mode—Block BPDUs on the ASA on both the inside and outside interfaces:

```
access-list id ethertype deny bpdu
access-group id in interface inside_name
access-group id in interface outside_name
```

Blocking BPDUs disables STP on the switch. Be sure not to have any loops involving the ASA in your network layout.

If neither of the above options are possible, then you can use one of the following less desirable workarounds that impacts failover functionality or STP stability:

- Disable failover interface monitoring.
- Increase failover interface holdtime to a high value that will allow STP to converge before the ASAs fail over.
- Decrease STP timers to allow STP to converge faster than the failover interface holdtime.

Auto Update Server Support in Failover Configurations

You can use Auto Update Server to deploy software images and configuration files to ASAs in an Active/Standby failover configuration. To enable Auto Update on an Active/Standby failover configuration, enter the Auto Update Server configuration on the primary unit in the failover pair. See the "Configuring Auto Update Support" section on page 78-19, for more information.

The following restrictions and behaviors apply to Auto Update Server support in failover configurations:

- Only single mode, Active/Standby configurations are supported.
- When loading a new platform software image, the failover pair stops passing traffic.
- When using LAN-based failover, new configurations must not change the failover link configuration. If they do, communication between the units will fail.
- Only the primary unit will perform the call home to the Auto Update Server. The primary unit must be in the active state to call home. If it is not, the ASA automatically fails over to the primary unit.
- Only the primary unit downloads the software image or configuration file. The software image or configuration is then copied to the secondary unit.
- The interface MAC address and hardware-serial ID is from the primary unit.
- The configuration file stored on the Auto Update Server or HTTP server is for the primary unit only.

Auto Update Process Overview

The following is an overview of the Auto Update process in failover configurations. This process assumes that failover is enabled and operational. The Auto Update process cannot occur if the units are synchronizing configurations, if the standby unit is in the failed state for any reason other than SSM card failure, or if the failover link is down.

1. Both units exchange the platform and ASDM software checksum and version information.
2. The primary unit contacts the Auto Update Server. If the primary unit is not in the active state, the ASA first fails over to the primary unit and then contacts the Auto Update Server.
3. The Auto Update Server replies with software checksum and URL information.
4. If the primary unit determines that the platform image file needs to be updated for either the active or standby unit, the following occurs:

   - **a.** The primary unit retrieves the appropriate files from the HTTP server using the URL from the Auto Update Server.
   - **b.** The primary unit copies the image to the standby unit and then updates the image on itself.
   - **c.** If both units have new image, the secondary (standby) unit is reloaded first.
     - If hitless upgrade can be performed when secondary unit boots, then the secondary unit becomes the active unit and the primary unit reloads. The primary unit becomes the active unit when it has finished loading.
     - If hitless upgrade cannot be performed when the standby unit boots, then both units reload at the same time.
   - **d.** If only the secondary (standby) unit has new image, then only the secondary unit reloads. The primary unit waits until the secondary unit finishes reloading.
   - **e.** If only the primary (active) unit has new image, the secondary unit becomes the active unit, and the primary unit reloads.
   - **f.** The update process starts again at step 1.

5. If the ASA determines that the ASDM file needs to be updated for either the primary or secondary unit, the following occurs:
   - **a.** The primary unit retrieves the ASDM image file from the HTTP server using the URL provided by the Auto Update Server.
   - **b.** The primary unit copies the ASDM image to the standby unit, if needed.
   - **c.** The primary unit updates the ASDM image on itself.
   - **d.** The update process starts again at step 1.
6. If the primary unit determines that the configuration needs to be updated, the following occurs:
   - **a.** The primary unit retrieves the configuration file from the using the specified URL.
   - **b.** The new configuration replaces the old configuration on both units simultaneously.
   - **c.** The update process begins again at step 1.
7. If the checksums match for all image and configuration files, no updates are required. The process ends until the next poll time.

Monitoring the Auto Update Process

You can use the **debug auto-update client** or **debug fover cmd-exe** commands to display the actions performed during the Auto Update process. The following is sample output from the **debug auto-update client** command.

```
Auto-update client: Sent DeviceDetails to /cgi-bin/dda.pl of server 192.168.0.21
Auto-update client: Processing UpdateInfo from server 192.168.0.21
   Component: asdm, URL: http://192.168.0.21/asdm.bint, checksum: 
0x94bced0261cc992ae710faf8d244cf32
   Component: config, URL: http://192.168.0.21/config-rms.xml, checksum: 
0x67358553572688a805a155af312f6898
   Component: image, URL: http://192.168.0.21/cdisk73.bin, checksum: 
0x6d091b43ce96243e29a62f2330139419
Auto-update client: need to update img, act: yes, stby yes
name
ciscoasa(config)# Auto-update client: update img on stby unit...
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 1, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 1001, len = 1024
```

```
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 1501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 2001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 2501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 3001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 3501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 4001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 4501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 5001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 5501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 6001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 6501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 7001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 7501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 8001, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 8501, len = 1024
auto-update: Fover copyfile, seq = 4 type = 1, pseq = 9001, len = 1024
auto-update: Fover file copy waiting at clock tick 6129280
fover_parse: Rcvd file copy ack, ret = 0, seq = 4
auto-update: Fover filecopy returns value: 0 at clock tick 6150260, upd time 145980 msecs
Auto-update client: update img on active unit...
fover_parse: Rcvd image info from mate
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
auto-update: HA safe reload: reload active waiting with mate state: 20
Beginning configuration replication: Sending to mate.
auto-update: HA safe reload: reload active waiting with mate state: 50
auto-update: HA safe reload: reload active waiting with mate state: 50

auto-update: HA safe reload: reload active waiting with mate state: 80
        Sauto-update: HA safe reload: reload active unit at clock tick: 6266860
Auto-update client: Succeeded: Image, version: 0x6d091b43ce96243e29a62f2330139419
```

The following system log message is generated if the Auto Update process fails:

`%ASA4-612002: Auto Update failed:` *`file`* `version:` *`version`* `reason:` *`reason`*

The *file* is “image”, “asdm”, or “configuration”, depending on which update failed. The *version* is the version number of the update. And the *reason* is the reason the update failed.

Failover Health Monitoring

The ASA monitors each unit for overall health and for interface health. See the following sections for more information about how the ASA performs tests to determine the state of each unit:

- Unit Health Monitoring, page 32-15
- Interface Monitoring, page 32-15

Unit Health Monitoring

The ASA determines the health of the other unit by monitoring the failover link. When a unit does not receive three consecutive hello messages on the failover link, the unit sends interface hello messages on each interface, including the failover interface, to validate whether or not the peer interface is responsive. The action that the ASA takes depends upon the response from the other unit. See the following possible actions:

- If the ASA receives a response on the failover interface, then it does not fail over.
- If the ASA does not receive a response on the failover link, but it does receive a response on another interface, then the unit does not failover. The failover link is marked as failed. You should restore the failover link as soon as possible because the unit cannot fail over to the standby while the failover link is down.
- If the ASA does not receive a response on any interface, then the standby unit switches to active mode and classifies the other unit as failed.

Note If a failed unit does not recover, and you believe it should not be failed, you can reset the state by entering the **failover reset** command. If the failover condition persists, however, the unit will fail again.

You can configure the frequency of the hello messages and the hold time before failover occurs. A faster poll time and shorter hold time speed the detection of unit failures and make failover occur more quickly, but it can also cause “false” failures due to network congestion delaying the keepalive packets.

Interface Monitoring

You can monitor up to 250 interfaces divided between all contexts. You should monitor important interfaces. For example, you might configure one context to monitor a shared interface. (Because the interface is shared, all contexts benefit from the monitoring.)

When a unit does not receive hello messages on a monitored interface for half of the configured hold time, it runs the following tests:

1. Link Up/Down test—A test of the interface status. If the Link Up/Down test indicates that the interface is operational, then the ASA performs network tests. The purpose of these tests is to generate network traffic to determine which (if either) unit has failed. At the start of each test, each unit clears its received packet count for its interfaces. At the conclusion of each test, each unit looks to see if it has received any traffic. If it has, the interface is considered operational. If one unit receives traffic for a test and the other unit does not, the unit that received no traffic is considered failed. If neither unit has received traffic, then the next test is used.
2. Network Activity test—A received network activity test. The unit counts all received packets for up to 5 seconds. If any packets are received at any time during this interval, the interface is considered operational and testing stops. If no traffic is received, the ARP test begins.
3. ARP test—A reading of the unit ARP cache for the 2 most recently acquired entries. One at a time, the unit sends ARP requests to these machines, attempting to stimulate network traffic. After each request, the unit counts all received traffic for up to 5 seconds. If traffic is received, the interface is considered operational. If no traffic is received, an ARP request is sent to the next machine. If at the end of the list no traffic has been received, the ping test begins.
4. Broadcast Ping test—A ping test that consists of sending out a broadcast ping request. The unit then counts all received packets for up to 5 seconds. If any packets are received at any time during this interval, the interface is considered operational and testing stops.

If an interface has IPv4 and IPv6 addresses configured on it, the ASA uses the IPv4 addresses to perform the health monitoring.

If an interface has only IPv6 addresses configured on it, then the ASA uses IPv6 neighbor discovery instead of ARP to perform the health monitoring tests. For the broadcast ping test, the ASA uses the IPv6 all nodes address (FE02::1).

If all network tests fail for an interface, but this interface on the other unit continues to successfully pass traffic, then the interface is considered to be failed. If the threshold for failed interfaces is met, then a failover occurs. If the other unit interface also fails all the network tests, then both interfaces go into the "Unknown" state and do not count towards the failover limit.

An interface becomes operational again if it receives any traffic. A failed ASA returns to standby mode if the interface failure threshold is no longer met.

Note If a failed unit does not recover and you believe it should not be failed, you can reset the state by entering the **failover reset** command. If the failover condition persists, however, the unit will fail again.

Failover Feature/Platform Matrix

Table 32-3 shows the failover features supported by each hardware platform.

Table 32-3 Failover Feature Support by Platform

Platform	LAN-Based Failover	Stateful Failover	Active/Standby Failover	Active/Active Failover
Cisco ASA 5505 ASA	Yes	No	Yes	No
Cisco ASA 5500 series ASA (other than the ASA 5505)	Yes	Yes	Yes	Yes

Failover Times by Platform

Table 32-4 shows the minimum, default, and maximum failover times for the Cisco ASA 5500 series ASA.

Table 32-4 Cisco ASA 5500 Series Adaptive Security Appliance Failover Times

Failover Condition	Minimum	Default	Maximum
Active unit loses power or stops normal operation.	800 milliseconds	15 seconds	45 seconds
Active unit main board interface link down.	500 milliseconds	5 seconds	15 seconds
Active unit 4GE card interface link down.	2 seconds	5 seconds	15 seconds
Active unit IPS or CSC card fails.	2 seconds	2 seconds	2 seconds
Active unit interface up, but connection problem causes interface testing.	5 seconds	25 seconds	75 seconds

Failover Messages

When a failover occurs, both ASAs send out system messages. This section includes the following topics:

- Failover System Messages, page 32-17
- Debug Messages, page 32-17
- SNMP, page 32-17

Failover System Messages

The ASA issues a number of system messages related to failover at priority level 2, which indicates a critical condition. To view these messages, see the *Cisco ASA 5500 Series System Log Messages* to enable logging and to see descriptions of the system messages.

Note During switchover, failover logically shuts down and then bring up interfaces, generating syslog 411001 and 411002 messages. This is normal activity.

Debug Messages

To see debug messages, enter the **debug fover** command. See the *Cisco ASA 5500 Series Command Reference* for more information.

Note Because debugging output is assigned high priority in the CPU process, it can drastically affect system performance. For this reason, use the **debug fover** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco TAC.

SNMP

To receive SNMP syslog traps for failover, configure the SNMP agent to send SNMP traps to SNMP management stations, define a syslog host, and compile the Cisco syslog MIB into your SNMP management station. See the **snmp-server** and **logging** commands in the *Cisco Security Appliance Command Reference* for more information.

CHAPTER 33

Configuring Active/Standby Failover

This chapter describes how to configure active/standby failover, and it includes the following sections:

- Information About Active/Standby Failover, page 33-1
- Licensing Requirements for Active/Standby Failover, page 33-5
- Prerequisites for Active/Standby Failover, page 33-6
- Guidelines and Limitations, page 33-6
- Configuring Active/Standby Failover, page 33-7
- Controlling Failover, page 33-15
- Monitoring Active/Standby Failover, page 33-16

Information About Active/Standby Failover

This section describes Active/Standby failover, and it includes the following topics:

- Active/Standby Failover Overview, page 33-1
- Primary/Secondary Status and Active/Standby Status, page 33-2
- Device Initialization and Configuration Synchronization, page 33-2
- Command Replication, page 33-3
- Failover Triggers, page 33-4
- Failover Actions, page 33-4

Active/Standby Failover Overview

Active/Standby failover enables you to use a standby ASA to take over the functionality of a failed unit. When the active unit fails, it changes to the standby state while the standby unit changes to the active state. The unit that becomes active assumes the IP addresses (or, for transparent firewall, the management IP address) and MAC addresses of the failed unit and begins passing traffic. The unit that is now in standby state takes over the standby IP addresses and MAC addresses. Because network devices see no change in the MAC to IP address pairing, no ARP entries change or time out anywhere on the network.

Note For multiple context mode, the ASA can fail over the entire unit (including all contexts) but cannot fail over individual contexts separately.

Primary/Secondary Status and Active/Standby Status

The main differences between the two units in a failover pair are related to which unit is active and which unit is standby, namely which IP addresses to use and which unit actively passes traffic.

However, a few differences exist between the units based on which unit is primary (as specified in the configuration) and which unit is secondary:

- The primary unit always becomes the active unit if both units start up at the same time (and are of equal operational health).
- The primary unit MAC addresses are always coupled with the active IP addresses. The exception to this rule occurs when the secondary unit is active and cannot obtain the primary unit MAC addresses over the failover link. In this case, the secondary unit MAC addresses are used.

Device Initialization and Configuration Synchronization

Configuration synchronization occurs when one or both devices in the failover pair boot. Configurations are always synchronized from the active unit to the standby unit. When the standby unit completes its initial startup, it clears its running configuration (except for the failover commands needed to communicate with the active unit), and the active unit sends its entire configuration to the standby unit.

The active unit is determined by the following:

- If a unit boots and detects a peer already running as active, it becomes the standby unit.
- If a unit boots and does not detect a peer, it becomes the active unit.
- If both units boot simultaneously, then the primary unit becomes the active unit, and the secondary unit becomes the standby unit.

Note If the secondary unit boots without detecting the primary unit, it becomes the active unit. It uses its own MAC addresses for the active IP addresses. However, when the primary unit becomes available, the secondary unit changes the MAC addresses to those of the primary unit, which can cause an interruption in your network traffic. To avoid this, configure the failover pair with virtual MAC addresses. See the "Configuring Virtual MAC Addresses" section on page 33-13 for more information.

When the replication starts, the ASA console on the active unit displays the message "Beginning configuration replication: Sending to mate," and when it is complete, the ASA displays the message "End Configuration Replication to mate." During replication, commands entered on the active unit may not replicate properly to the standby unit, and commands entered on the standby unit may be overwritten by the configuration being replicated from the active unit. Avoid entering commands on either unit in the failover pair during the configuration replication process. Depending upon the size of the configuration, replication can take from a few seconds to several minutes.

Note The **crypto ca server** command and related sub-commands are not synchronized to the failover peer.

On the standby unit, the configuration exists only in running memory. To save the configuration to Flash memory after synchronization, do the following:

- For single context mode, enter the **write memory** command on the active unit. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory.
- For multiple context mode, enter the **write memory all** command on the active unit from the system execution space. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory. Using the **all** keyword with this command causes the system and all context configurations to be saved.

Note Startup configurations saved on external servers are accessible from either unit over the network and do not need to be saved separately for each unit. Alternatively, you can copy the contexts on disk from the active unit to an external server, and then copy them to disk on the standby unit, where they become available when the unit reloads.

Command Replication

Command replication always flows from the active unit to the standby unit. As commands are entered on the active unit, they are sent across the failover link to the standby unit. You do not have to save the active configuration to Flash memory to replicate the commands.

Table 33-1 lists the commands that are and are not replicated to the standby unit:

Table 33-1 Command Replication

Command Replicated to the Standby Unit	Commands Not Replicated to the Standby Unit
all configuration commands except for the **mode**, **firewall**, and **failover lan unit** commands	all forms of the **copy** command except for **copy running-config startup-config**
copy running-config startup-config	all forms of the **write** command except for **write memory**
delete	**crypto ca server** and associated sub-commands
mkdir	**debug**
rename	**failover lan unit**
rmdir	**firewall**
write memory	**mode**
—	**show**
—	**terminal pager** and **pager**

Note Changes made on the standby unit are not replicated to the active unit. If you enter a command on the standby unit, the ASA displays the message `**** WARNING **** Configuration Replication is NOT performed from Standby unit to Active unit. Configurations are no longer synchronized.` This message displays even when you enter many commands that do not affect the configuration.

If you enter the **write standby** command on the active unit, the standby unit clears its running configuration (except for the failover commands used to communicate with the active unit), and the active unit sends its entire configuration to the standby unit.

For multiple context mode, when you enter the **write standby** command in the system execution space, all contexts are replicated. If you enter the **write standby** command within a context, the command replicates only the context configuration.

Replicated commands are stored in the running configuration. To save the replicated commands to the Flash memory on the standby unit, do the following:

- For single context mode, enter the **copy running-config startup-config** command on the active unit. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory.
- For multiple context mode, enter the **copy running-config startup-config** command on the active unit from the system execution space and within each context on disk. The command is replicated to the standby unit, which proceeds to write its configuration to Flash memory. Contexts with startup configurations on external servers are accessible from either unit over the network and do not need to be saved separately for each unit. Alternatively, you can copy the contexts on disk from the active unit to an external server, and then copy them to disk on the standby unit.

Failover Triggers

The unit can fail if one of the following events occurs:

- The unit has a hardware failure or a power failure.
- The unit has a software failure.
- Too many monitored interfaces fail.
- The **no failover active** command is entered on the active unit or the **failover active** command is entered on the standby unit.

Failover Actions

In Active/Standby failover, failover occurs on a unit basis. Even on systems running in multiple context mode, you cannot fail over individual or groups of contexts.

Table 33-2 shows the failover action for each failure event. For each failure event, the table shows the failover policy (failover or no failover), the action taken by the active unit, the action taken by the standby unit, and any special notes about the failover condition and actions.

Table 33-2 Failover Behavior

Failure Event	Policy	Active Action	Standby Action	Notes
Active unit failed (power or hardware)	Failover	n/a	Become active Mark active as failed	No hello messages are received on any monitored interface or the failover link.
Formerly active unit recovers	No failover	Become standby	No action	None.
Standby unit failed (power or hardware)	No failover	Mark standby as failed	n/a	When the standby unit is marked as failed, then the active unit does not attempt to fail over, even if the interface failure threshold is surpassed.

Table 33-2 Failover Behavior (continued)

Failure Event	Policy	Active Action	Standby Action	Notes
Failover link failed during operation	No failover	Mark failover interface as failed	Mark failover interface as failed	You should restore the failover link as soon as possible because the unit cannot fail over to the standby unit while the failover link is down.
Failover link failed at startup	No failover	Mark failover interface as failed	Become active	If the failover link is down at startup, both units become active.
Stateful Failover link failed	No failover	No action	No action	State information becomes out of date, and sessions are terminated if a failover occurs.
Interface failure on active unit above threshold	Failover	Mark active as failed	Become active	None.
Interface failure on standby unit above threshold	No failover	No action	Mark standby as failed	When the standby unit is marked as failed, then the active unit does not attempt to fail over even if the interface failure threshold is surpassed.

Optional Active/Standby Failover Settings

You can configure the following Active/Standby failover options when you initially configuring failover or after failover has been configured:

- HTTP replication with Stateful Failover—Allows connections to be included in the state information replication.
- Interface monitoring—Allows you to monitor up to 250 interfaces on a unit and control which interfaces affect your failover.
- Interface health monitoring—Enables the security appliance to detect and respond to interface failures more quickly.
- Failover criteria setup—Allows you to specify a specific number of interfaces or a percentage of monitored interfaces that must fail before failover occurs.
- Virtual MAC address configuration—Ensures that the secondary unit uses the correct MAC addresses when it is the active unit, even if it comes online before the primary unit.

Licensing Requirements for Active/Standby Failover

The following table shows the licensing requirements for this feature:

Model	License Requirement
ASA 5505	Security Plus License. (Stateful failover is not supported).
ASA 5510	Security Plus License.
All other models	Base License.

Prerequisites for Active/Standby Failover

Active/Standby failover has the following prerequisites:

- Both units must be identical security appliances that are connected to each other through a dedicated failover link and, optionally, a Stateful Failover link.
- Both units must have the same software configuration and the proper license.
- Both units must be in the same mode (single or multiple, transparent or routed).

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

- Supported in single and multiple context mode.
- For multiple context mode, perform all steps in the system execution space unless otherwise noted.

Firewall Mode Guidelines

- Supported in transparent and routed firewall mode.

IPv6 Guidelines

- IPv6 failover is supported.

Model Guidelines

- Stateful failover is not supported on the Cisco ASA 5505 adaptive security appliance.

Additional Guidelines and Limitations

The following guidelines and limitations apply for Active/Standby failover:

- To receive packets from both units in a failover pair, standby IP addresses need to be configured on all interfaces.
- The standby IP addresses are used on the security appliance that is currently the standby unit, and they must be in the same subnet as the active IP address on the corresponding interface on the active unit.
- If you enter the **terminal pager** or **pager** commands on the active unit in a failover pair, the active console terminal pager settings change, but the standby unit settings do not. A default configuration issued on the active unit does affect behavior on the standby unit.
- When you enable interface monitoring, you can monitor up to 250 interfaces on a unit.
- By default, the security appliance does not replicate HTTP session information when Stateful Failover is enabled. Because HTTP sessions are typically short-lived, and because HTTP clients typically retry failed connection attempts, not replicating HTTP sessions increases system

performance without causing serious data or connection loss. The failover replication http command enables the stateful replication of HTTP sessions in a Stateful Failover environment, but it could have a negative impact upon system performance.

Configuring Active/Standby Failover

This section describes how to configure Active/Standby failover.

This section includes the following topics:

- Task Flow for Configuring Active/Standby Failover, page 33-7
- Configuring the Primary Unit, page 33-7
- Configuring the Secondary Unit, page 33-10
- Configuring Optional Active/Standby Failover Settings, page 33-11

Task Flow for Configuring Active/Standby Failover

Follow these steps to configure Active/Standby Failover:

Step 1 Configure the primary unit, as shown in the "Configuring the Primary Unit" section on page 33-7.

Step 2 Configure the secondary unit, as shown in the "Configuring the Secondary Unit" section on page 33-10.

Step 3 (Optional) Configure optional Active/Standby failover settings, as shown in the "Configuring Optional Active/Standby Failover Settings" section on page 33-11.

Configuring the Primary Unit

Follow the steps in this section to configure the primary unit in a LAN-based, Active/Standby failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit.

Restrictions

Do not configure an IP address in interface configuration mode for the Stateful Failover link if you are going to use a dedicated Stateful Failover interface. You use the **failover interface ip** command to configure a dedicated Stateful Failover interface in a later step.

Detailed Steps

	Command	Purpose

Step 1	**ip address** *active_addr netmask* **standby** *standby_addr*
	ipv6 address {**autoconfig** | *ipv6-prefix/prefix-length* [**eui-64**] [**standby** *ipv6-prefix*] | *ipv6-address* **link-local** [**standby** *ipv6-address*]}
	Example:
	`hostname(config-if)# ip address 10.1.1.1 255.255.255.0 standby 10.1.1.2`
	`hostname(config-if)# ipv6 address 3ffe:c00:0:1::576/64 standby 3ffe:c00:0:1::575`
		Configures the active and standby IP addresses for each data interface (routed mode), for the management IP address (transparent mode), or for the management-only interface.
		In routed firewall mode and for the management-only interface, enter this command in interface configuration mode for each interface.
		In transparent firewall mode, enter the command in global configuration mode.
		In multiple context mode, configure the interface addresses from within each context. Use the **change to context** command to switch between contexts. The command prompt changes to `hostname/`*`context`*`(config-if)#`, where *context* is the name of the current context. You must enter a management IP address for each context in transparent firewall multiple context mode.
		Each data interface can have an IPv4 address and one or more IPv6 addresses. For IPv6 addresses that use the **eui-64** option, you do not need to specify a standby address—one will be created automatically.

Step 2	**failover lan unit primary**	Designates the unit as the primary unit.
Step 3	**failover lan interface** *if_name phy_if* **Example:** `hostname(config)# failover lan interface folink GigabitEthernet0/3`	Specifies the interface to be used as the failover interface. The *if_name* argument assigns a name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. On the ASA 5505 adaptive ASA, the *phy_if* specifies a VLAN. This interface should not be used for any other purpose (except, optionally, the Stateful Failover link).

Step 4	**failover interface ip** *if_name* [*ip_address mask* **standby** *ip_address* | *ipv6_address***/***prefix* **standby***ipv6_address*]
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	`hostname(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71`
		Assigns the active and standby IP addresses to the failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the failover link.
		The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.
		The failover link IP address and MAC address do not change at failover. The active IP address for the failover link always stays with the primary unit, while the standby IP address stays with the secondary unit.

Step 5	**interface** *phy_if*
	Example:
	`hostname(config)# interface vlan100`
	`hostname(config-if)# no shutdown`
		Enables the interface.

	Command	Purpose
Step 6	**failover link** *if_name phy_if* **Example:** `hostname(config)# failover link statelink GigabitEthernet0/2`	(Optional) Specifies the interface to be used as the Stateful Failover link. **Note** If the Stateful Failover link uses the failover link or a data interface, then you only need to supply the *if_name* argument. The *if_name* argument assigns a logical name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. This interface should not be used for any other purpose (except, optionally, the failover link).

Step 7	**failover interface ip** *if_name* [*ip_address mask* **standby** *ip_address* | *ipv6_address***/***prefix* **standby***ipv6_address*]
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	`hostname(config)# failover interface ip statelink 2001:a1a:b00::a0a:a70/64 standby 2001:a1a:b00::a0a:a71`
		(Optional) Assigns an active and standby IP address to the Stateful Failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the Stateful Failover link.
		Note If the stateful Failover link uses the failover link or data interface, skip this step. You have already defined the active and standby IP addresses for the interface.
		The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.
		The Stateful Failover link IP address and MAC address do not change at failover unless it uses a data interface. The active IP address always stays with the primary unit, while the standby IP address stays with the secondary unit.

Step 8	**interface** *phy_if*
	no shutdown
	Example:
	`hostname(config)# interface vlan100`
	`hostname(config-if)# no shutdown`
		(Optional) Enables the interface.
		If the Stateful Failover link uses the failover link or a data interface, skip this step. You have already enabled the interface.

Step 9	**failover** **Example:** `hostname(config)# failover`	Enables failover.
Step 10	**copy running-config startup-config** **Example:** `hostname(config)# copy running-config startup-config`	Saves the system configuration to Flash memory.

Configuring the Secondary Unit

The only configuration required on the secondary unit is for the failover interface. The secondary unit requires these commands to communicate initially with the primary unit. After the primary unit sends its configuration to the secondary unit, the only permanent difference between the two configurations is the **failover lan unit** command, which identifies each unit as primary or secondary.

Prerequisites

When configuring LAN-based failover, you must bootstrap the secondary device to recognize the failover link before the secondary device can obtain the running configuration from the primary device

Detailed Steps

	Command	Purpose

Step 1	**`failover lan interface`** *`if_name phy_if`*
	Example:
	`hostname(config)# failover lan interface folink vlan100`
		Specifies the interface to be used as the failover interface. (Use the same settings that you used for the primary unit.)
		The *if_name* argument assigns a name to the interface specified by the *phy_if* argument.

Step 2	**`failover interface ip`** *`if_name`* `[`*`ip_address mask`* **`standby`** *`ip_address`* `|` *`ipv6_address`***`/`***`prefix`* **`standby`***`ipv6_address`*`]`
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	`hostname(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71`
		Assigns the active and standby IP addresses to the failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the failover link.
		To receive packets from both units in a failover pair, standby IP addresses need to be configured on all interfaces.
		Note Enter this command exactly as you entered it on the primary unit when you configured the failover interface on the primary unit (including the same IP address).

Step 3	**`interface`** *`phy_if`*
	`no shutdown`
	Example:
	`hostname(config)# interface vlan100`
	`hostname(config-if)# no shutdown`
		Enables the interface.

Step 4	**`failover lan unit secondary`**
	Example:
	`hostname(config)# failover lan unit secondary`
		(Optional) Designates this unit as the secondary unit:
		Note This step is optional because, by default, units are designated as secondary unless previously configured.

	Command	Purpose

Step 5	**`failover`**
	Example:
	`hostname(config)# failover`
		Enables failover.
		After you enable failover, the active unit sends the configuration in running memory to the standby unit. As the configuration synchronizes, the messages "Beginning configuration replication: Sending to mate" and "End Configuration Replication to mate" appear on the active unit console.

Step 6	**`copy running-config startup-config`**
	Example:
	`hostname(config)# copy running-config startup-config`
		Saves the configuration to Flash memory.
		Enter the command after the running configuration has completed replication.

Configuring Optional Active/Standby Failover Settings

This section includes the following topics:

- Enabling HTTP Replication with Stateful Failover, page 33-11
- Disabling and Enabling Interface Monitoring, page 33-12
- Configuring the Interface Health Poll Time, page 33-12
- Configuring Failover Criteria, page 33-13
- Configuring Virtual MAC Addresses, page 33-13

You can configure the optional Active/Standby failover settings when initially configuring the primary unit in a failover pair (see Configuring the Primary Unit, page 33-7) or on the active unit in the failover pair after the initial configuration.

Enabling HTTP Replication with Stateful Failover

To allow HTTP connections to be included in the state information replication, you need to enable HTTP replication. Because HTTP connections are typically short-lived, and because THTTP clients typically retry failed connection attempts, HTTP connections are not automatically included in the replicated state information.

Enter the following command in global configuration mode to enable HTTP state replication when Stateful Failover is enabled.

Command	Purpose

`failover replication http`
Example:
`hostname (config)# failover replication http`
	Enables HTTP state replication.

Disabling and Enabling Interface Monitoring

You can control which interfaces affect your failover policy by disabling the monitoring of specific interfaces and enabling the monitoring of others. This feature enables you to exclude interfaces attached to less critical networks from affecting your failover policy.

You can monitor up to 250 interfaces on a unit. By default, monitoring physical interfaces is enabled and monitoring subinterfaces is disabled.

Hello messages are exchanged during every interface poll frequency time period between the security appliance failover pair. The failover interface poll time is 3 to 15 seconds. For example, if the poll time is set to 5 seconds, testing begins on an interface if 5 consecutive hellos are not heard on that interface (25 seconds).

Monitored failover interfaces can have the following status:

- Unknown—Initial status. This status can also mean the status cannot be determined.
- Normal—The interface is receiving traffic.
- Testing—Hello messages are not heard on the interface for five poll times.
- Link Down—The interface or VLAN is administratively down.
- No Link—The physical link for the interface is down.
- Failed—No traffic is received on the interface, yet traffic is heard on the peer interface.

For units in single configuration mode, enter the following commands to enable or disable health monitoring for specific interfaces. For units in multiple configuration mode, you must enter the commands within each security context.

Do one of the following:	

`no monitor-interface` *`if_name`*
Example:
`hostname(config)# no monitor-interface lanlink`
	Disables health monitoring for an interface.

`monitor-interface` *`if_name`*
Example:
`hostname(config)# monitor-interface lanlink`
	Enables health monitoring for an interface.

Configuring the Interface Health Poll Time

The ASA sends hello packets out of each data interface to monitor interface health. If the ASA does not receive a hello packet from the corresponding interface on the peer unit for over half of the hold time, then the additional interface testing begins. If a hello packet or a successful test result is not received within the specified hold time, the interface is marked as failed. Failover occurs if the number of failed interfaces meets the failover criteria.

Decreasing the poll and hold times enables the ASA to detect and respond to interface failures more quickly, but may consume more system resources.

Command	Purpose
failover polltime interface [**msec**] *time* [**holdtime** *time*] **Example:** `hostname (config): failover polltime interface msec 500 holdtime 5`	Changes the interface poll time. Valid values for poll time are from 1 to 15 seconds or, if the optional **msec** keyword is used, from 500 to 999 milliseconds. The hold time determines how long it takes from the time a hello packet is missed to when the interface is marked as failed. Valid values for the hold time are from 5 to 75 seconds. You cannot enter a hold time that is less than 5 times the poll time. If the interface link is down, interface testing is not conducted and the standby unit could become active in just one interface polling period if the number of failed interfaces meets or exceeds the configured failover criteria.

Configuring Failover Criteria

You can specify a specific number of interface or a percentage of monitored interfaces that must fail be fore failover occurs. By default, a single interface failure causes failover.

To the change the default failover criteria, enter the following command in global configuration mode:

Command	Purpose
failover interface-policy *num*[%] **Example:** `hostname (config)# failover interface-policy 20%`	Changes the default failover criteria. When specifying a specific number of interfaces, the *num* argument can be from 1 to 250. When specifying a percentage of interfaces, the *num* argument can be from 1 to 100.

Configuring Virtual MAC Addresses

In Active/Standby failover, the MAC addresses for the primary unit are always associated with the active IP addresses. If the secondary unit boots first and becomes active, it uses the burned-in MAC address for its interfaces. When the primary unit comes online, the secondary unit obtains the MAC addresses from the primary unit. The change can disrupt network traffic.

You can configure virtual MAC addresses for each interface to ensure that the secondary unit uses the correct MAC addresses when it is the active unit, even if it comes online before the primary unit. If you do not specify virtual MAC addresses the failover pair uses the burned-in NIC addresses as the MAC addresses.

Note You cannot configure a virtual MAC address for the failover or Stateful Failover links. The MAC and IP addresses for those links do not change during failover.

Enter the following command on the active unit to configure the virtual MAC addresses for an interface:

Command	Purpose

`failover mac address` *`phy_if active_mac standby_mac`*
Example:
`hostname (config): failover mac address Ethernet0/2 00a0.c969.87c8 00a0.c918.95d8`
	Configures the virtual MAC address for an interface.
	The *phy_if* argument is the physical name of the interface, such as Ethernet1. The *active_mac* and *standby_mac* arguments are MAC addresses in H.H.H format, where H is a 16-bit hexadecimal digit. For example, the MAC address 00-0C-F1-42-4C-DE would be entered as 000C.F142.4CDE.
	The *active_mac* address is associated with the active IP address for the interface, and the *standby_mac* is associated with the standby IP address for the interface.
	There are multiple ways to configure virtual MAC addresses on the ASA. When more than one method has been used to configure virtual MAC addresses, the ASA uses the following order of preference to determine which virtual MAC address is assigned to an interface:
	1. The **mac-address** command (in interface configuration mode) address.
	2. The **mac-address auto** command generated address.
	3. The **failover mac address** command address.
	4. The burned-in MAC address.
	Use the **show interface** command to display the MAC address used by an interface.

Controlling Failover

This sections describes how to control and monitor failover. This section includes the following topics:

- Forcing Failover, page 33-15
- Disabling Failover, page 33-15
- Restoring a Failed Unit, page 33-15

Forcing Failover

To force the standby unit to become active, enter one of the following commands:

Command	Purpose

`failover active`
Example:
`hostname# failover active`
	Forces a failover when entered on the standby unit in a failover pair. The standby unit becomes the active unit.

`no failover active`
Example:
`hostname# no failover active`
	Forces a failover when entered on the active unit in a failover pair. The active unit becomes the standby unit.

Disabling Failover

To disable failover, enter the following command:

Command	Purpose

`no failover`
Example:
`hostname(config)# no failover`
	Disables failover. Disabling failover on an Active/Standby pair causes the active and standby state of each unit to be maintained until you restart. For example, the standby unit remains in standby mode so that both units do not start passing traffic. To make the standby unit active (even with failover disabled), see the "Forcing Failover" section on page 33-15.

Restoring a Failed Unit

To restore a failed unit to an unfailed state, enter the following command:

Command	Purpose

`failover reset`
Example:
`hostname(config)# failover reset`
	Restored a failed unit to an unfailed state. Restoring a failed unit to an unfailed state does not automatically make it active; restored units remain in the standby state until made active by failover (forced or natural).

Testing the Failover Functionality

To test failover functionality, perform the following steps:

Step 1 Test that your active unit is passing traffic as expected by using FTP (for example) to send a file between hosts on different interfaces.

Step 2 Force a failover by entering the following command on the active unit:

```
hostname(config)# no failover active
```

Step 3 Use FTP to send another file between the same two hosts.

Step 4 If the test was not successful, enter the **show failover** command to check the failover status.

Step 5 When you are finished, you can restore the unit to active status by enter the following command on the newly active unit:

```
hostname(config)# no failover active
```

Monitoring Active/Standby Failover

To monitor Active/Standby failover, enter one of the following commands:

Command	Purpose
`show failover`	Displays information about the failover state of the unit.
`show monitor-interface`	Displays information about the monitored interface.
`show running-config failover`	Displays the failover commands in the running configuration.

For more information about the output of the monitoring commands, refer to the *Cisco ASA 5500 Series Command Reference*.

Feature History for Active/Standby Failover

Table 33-3 lists the release history for this feature.

Table 33-3 Feature History for Optional Active/Standby Failover Settings

Feature Name	Releases	Feature Information
This feature was introduced.	7.0	This feature was introduced.
IPv6 support for failover added.	8.2(2)	The following commands were modified: **failover interface ip**, **show failover**, **ipv6 address**, **show monitor-interface**.

CHAPTER 34

Configuring Active/Active Failover

This chapter describes how to configure Active/Active failover, and it includes the following sections:

- Information About Active/Active Failover, page 34-1
- Licensing Requirements for Active/Active Failover, page 34-6
- Prerequisites for Active/Active Failover, page 34-7
- Guidelines and Limitations, page 34-7
- Configuring Active/Active Failover, page 34-8
- Remote Command Execution, page 34-22
- Monitoring Active/Active Failover, page 34-26
- Feature History for Active/Active Failover, page 34-26

Information About Active/Active Failover

This section describes Active/Active failover. This section includes the following topics:

- Active/Active Failover Overview, page 34-1
- Primary/Secondary Status and Active/Standby Status, page 34-2
- Device Initialization and Configuration Synchronization, page 34-3
- Command Replication, page 34-3
- Failover Triggers, page 34-4
- Failover Actions, page 34-5

Active/Active Failover Overview

Active/Active failover is only available to ASAs in multiple context mode. In an Active/Active failover configuration, both ASAs can pass network traffic.

In Active/Active failover, you divide the security contexts on the ASA into *failover groups*. A failover group is simply a logical group of one or more security contexts. You can create a maximum of two failover groups. The admin context is always a member of failover group 1. Any unassigned security contexts are also members of failover group 1 by default.

The failover group forms the base unit for failover in Active/Active failover. Interface failure monitoring, failover, and active/standby status are all attributes of a failover group rather than the unit. When an active failover group fails, it changes to the standby state while the standby failover group becomes active. The interfaces in the failover group that becomes active assume the MAC and IP addresses of the interfaces in the failover group that failed. The interfaces in the failover group that is now in the standby state take over the standby MAC and IP addresses.

Note A failover group failing on a unit does not mean that the unit has failed. The unit may still have another failover group passing traffic on it.

When creating the failover groups, you should create them on the unit that will have failover group 1 in the active state.

Note Active/Active failover generates virtual MAC addresses for the interfaces in each failover group. If you have more than one Active/Active failover pair on the same network, it is possible to have the same default virtual MAC addresses assigned to the interfaces on one pair as are assigned to the interfaces of the other pairs because of the way the default virtual MAC addresses are determined. To avoid having duplicate MAC addresses on your network, make sure you assign each physical interface a virtual active and standby MAC address.

Primary/Secondary Status and Active/Standby Status

As in Active/Standby failover, one unit in an Active/Active failover pair is designated the primary unit, and the other unit the secondary unit. Unlike Active/Standby failover, this designation does not indicate which unit becomes active when both units start simultaneously. Instead, the primary/secondary designation does two things:

- Determines which unit provides the running configuration to the pair when they boot simultaneously.
- Determines on which unit each failover group appears in the active state when the units boot simultaneously. Each failover group in the configuration is configured with a primary or secondary unit preference. You can configure both failover groups be in the active state on a single unit in the pair, with the other unit containing the failover groups in the standby state. However, a more typical configuration is to assign each failover group a different role preference to make each one active on a different unit, distributing the traffic across the devices.

  Note The ASA also provides load balancing, which is different from failover. Both failover and load balancing can exist on the same configuration. For information about load balancing, see the "Understanding Load Balancing" section on page 63-6.

Which unit each failover group becomes active on is determined as follows:

- When a unit boots while the peer unit is not available, both failover groups become active on the unit.
- When a unit boots while the peer unit is active (with both failover groups in the active state), the failover groups remain in the active state on the active unit regardless of the primary or secondary preference of the failover group until one of the following:
  - A failover occurs.

  - You manually force a failover.
  - You configured preemption for the failover group, which causes the failover group to automatically become active on the preferred unit when the unit becomes available.
- When both units boot at the same time, each failover group becomes active on its preferred unit after the configurations have been synchronized.

Device Initialization and Configuration Synchronization

Configuration synchronization occurs when one or both units in a failover pair boot. The configurations are synchronized as follows:

- When a unit boots while the peer unit is active (with both failover groups active on it), the booting unit contacts the active unit to obtain the running configuration regardless of the primary or secondary designation of the booting unit.
- When both units boot simultaneously, the secondary unit obtains the running configuration from the primary unit.

When the replication starts, the ASA console on the unit sending the configuration displays the message "Beginning configuration replication: Sending to mate," and when it is complete, the ASA displays the message "End Configuration Replication to mate." During replication, commands entered on the unit sending the configuration may not replicate properly to the peer unit, and commands entered on the unit receiving the configuration may be overwritten by the configuration being received. Avoid entering commands on either unit in the failover pair during the configuration replication process. Depending upon the size of the configuration, replication can take from a few seconds to several minutes.

On the unit receiving the configuration, the configuration exists only in running memory. To save the configuration to Flash memory after synchronization enter the **write memory all** command in the system execution space on the unit that has failover group 1 in the active state. The command is replicated to the peer unit, which proceeds to write its configuration to Flash memory. Using the **all** keyword with this command causes the system and all context configurations to be saved.

Note Startup configurations saved on external servers are accessible from either unit over the network and do not need to be saved separately for each unit. Alternatively, you can copy the contexts configuration files from the disk on the primary unit to an external server, and then copy them to disk on the secondary unit, where they become available when the unit reloads.

Command Replication

After both units are running, commands are replicated from one unit to the other as follows:

- Commands entered within a security context are replicated from the unit on which the security context appears in the active state to the peer unit.

  Note A context is considered in the active state on a unit if the failover group to which it belongs is in the active state on that unit.

- Commands entered in the system execution space are replicated from the unit on which failover group 1 is in the active state to the unit on which failover group 1 is in the standby state.

- Commands entered in the admin context are replicated from the unit on which failover group 1 is in the active state to the unit on which failover group 1 is in the standby state.

Failure to enter the commands on the appropriate unit for command replication to occur causes the configurations to be out of synchronization. Those changes may be lost the next time the initial configuration synchronization occurs.

Table 34-1 lists the commands that are and are not replicated to the standby unit.

Table 34-1 Command Replication

Commands Replicated to the Standby Unit	Commands Not Replicated to the Standby Unit
all configuration commands except for the **mode**, **firewall**, and **failover lan unit** commands	all forms of the **copy** command except for **copy running-config startup-config**
copy running-config startup-config	all forms of the **write** command except for **write memory**
delete	**debug**
mkdir	**failover lan unit**
rename	**firewall**
rmdir	**mode**
write memory	**show**

You can use the **write standby** command to resynchronize configurations that have become out of sync. For Active/Active failover, the **write standby** command behaves as follows:

- If you enter the **write standby** command in the system execution space, the system configuration and the configurations for all of the security contexts on the ASA is written to the peer unit. This includes configuration information for security contexts that are in the standby state. You must enter the command in the system execution space on the unit that has failover group 1 in the active state.

Note If there are security contexts in the active state on the peer unit, the **write standby** command causes active connections through those contexts to be terminated. Use the **failover active** command on the unit providing the configuration to make sure all contexts are active on that unit before entering the **write standby** command.

- If you enter the **write standby** command in a security context, only the configuration for the security context is written to the peer unit. You must enter the command in the security context on the unit where the security context appears in the active state.

Replicated commands are not saved to the Flash memory when replicated to the peer unit. They are added to the running configuration. To save replicated commands to Flash memory on both units, use the **write memory** or **copy running-config startup-config** command on the unit that you made the changes on. The command is replicated to the peer unit and cause the configuration to be saved to Flash memory on the peer unit.

Failover Triggers

In Active/Active failover, failover can be triggered at the unit level if one of the following events occurs:

- The unit has a hardware failure.

- The unit has a power failure.
- The unit has a software failure.
- The **no failover active** or the **failover active** command is entered in the system execution space.

Failover is triggered at the failover group level when one of the following events occurs:

- Too many monitored interfaces in the group fail.
- The **no failover active group** *group_id* or **failover active group** *group_id* command is entered.

You configure the failover threshold for each failover group by specifying the number or percentage of interfaces within the failover group that must fail before the group fails. Because a failover group can contain multiple contexts, and each context can contain multiple interfaces, it is possible for all interfaces in a single context to fail without causing the associated failover group to fail.

See the "Failover Health Monitoring" section on page 32-14 for more information about interface and unit monitoring.

Failover Actions

In an Active/Active failover configuration, failover occurs on a failover group basis, not a system basis. For example, if you designate both failover groups as active on the primary unit, and failover group 1 fails, then failover group 2 remains active on the primary unit while failover group 1 becomes active on the secondary unit.

Note When configuring Active/Active failover, make sure that the combined traffic for both units is within the capacity of each unit.

Table 34-2 shows the failover action for each failure event. For each failure event, the policy (whether or not failover occurs), actions for the active failover group, and actions for the standby failover group are given.

Table 34-2 Failover Behavior for Active/Active Failover

Failure Event	Policy	Active Group Action	Standby Group Action	Notes
A unit experiences a power or software failure	Failover	Become standby Mark as failed	Become active Mark active as failed	When a unit in a failover pair fails, any active failover groups on that unit are marked as failed and become active on the peer unit.
Interface failure on active failover group above threshold	Failover	Mark active group as failed	Become active	None.
Interface failure on standby failover group above threshold	No failover	No action	Mark standby group as failed	When the standby failover group is marked as failed, the active failover group does not attempt to fail over, even if the interface failure threshold is surpassed.
Formerly active failover group recovers	No failover	No action	No action	Unless failover group preemption is configured, the failover groups remain active on their current unit.

Table 34-2 Failover Behavior for Active/Active Failover (continued)

Failure Event	Policy	Active Group Action	Standby Group Action	Notes
Failover link failed at startup	No failover	Become active	Become active	If the failover link is down at startup, both failover groups on both units become active.
Stateful Failover link failed	No failover	No action	No action	State information becomes out of date, and sessions are terminated if a failover occurs.
Failover link failed during operation	No failover	n/a	n/a	Each unit marks the failover interface as failed. You should restore the failover link as soon as possible because the unit cannot fail over to the standby unit while the failover link is down.

Optional Active/Active Failover Settings

You can configure the following Active/Standby failover options when you initially configuring failover or after failover has been configured:

- Failover Group Preemption—Assigns a primary or secondary priority to a failover group to specify on which unit in the failover group becomes active when both units boot simultaneously.
- HTTP replication with Stateful Failover—Allows connections to be included in the state information replication.
- Interface monitoring—Allows you to monitor up to 250 interfaces on a unit and control which interfaces affect your failover.
- Interface health monitoring—Enables the security appliance to detect and respond to interface failures more quickly.
- Failover criteria setup—Allows you to specify a specific number of interfaces or a percentage of monitored interfaces that must fail before failover occurs.
- Virtual MAC address configuration—Ensures that the secondary unit uses the correct MAC addresses when it is the active unit, even if it comes online before the primary unit.

Licensing Requirements for Active/Active Failover

The following table shows the licensing requirements for this feature:

Model	License Requirement
ASA 5505	No support.
ASA 5510	Security Plus License.
All other models	Base License.

Prerequisites for Active/Active Failover

In Active/Active failover, both units must have the following:

- The same hardware model
- The same number of interfaces
- The same types of interfaces
- The same software version, with the same major (first number) and minor (second number) version numbers. However you can use different versions of the software during an upgrade process; for example you can upgrade one unit from Version 7.0(1) to Version 7.9(2) and have failover remain active. We recommend upgrading both units to the same version to ensure long-term compatibility. (See the "Performing Zero Downtime Upgrades for Failover Pairs" section on page __ for more information about upgrading the software on a failover pair.)
- The same software configuration
- The same mode (multiple context mode)
- The proper license

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in multiple context mode only.

Firewall Mode Guidelines

Supported only in routed and transparent firewall mode.

IPv6 Guidelines

IPv6 failover is supported.

Model Guidelines

Active/Active failover is not available on the Cisco ASA 5505 adaptive security appliance.

Additional Guidelines and Limitations

The following features are not supported for Active/Active failover:

- To receive packets from both units in a failover pair, standby IP addresses need to be configured on all interfaces.
- The standby IP address is used on the security appliance that is currently the standby unit, and it must be in the same subnet as the active IP address.
- You can define a maximum number of two failover groups.
- The **failover group** command can only be added to the system context of devices that are configured for multiple context mode.
- You can create and remove failover groups only when failover is disabled.

- Entering the failover group command puts you in the failover group command mode. The primary, secondary, preempt, replication http, interface-policy, mac address, and polltime interface commands are available in the failover group configuration mode. Use the exit command to return to global configuration mode.
- The failover polltime interface, failover interface-policy, failover replication http, and failover MAC address commands have no effect on Active/Active failover configurations. They are overridden by the following failover group configuration mode commands: polltime interface, interface-policy, replication http, and mac address.
- When removing failover groups, you must remove failover group 1 last. Failover group1 always contains the admin context. Any context not assigned to a failover group defaults to failover group 1. You cannot remove a failover group that has contexts explicitly assigned to it.
- VPN failover is unavailable. (It is available in Active/Standby failover configurations only.)

Configuring Active/Active Failover

This section describes how to configure Active/Active failover using an Ethernet failover link. When configuring LAN-based failover, you must bootstrap the secondary device to recognize the failover link before the secondary device can obtain the running configuration from the primary device.

This section includes the following topics:

- Task Flow for Configuring Active/Active Failover, page 34-8
- Configuring the Primary Failover Unit, page 34-8
- Configuring the Secondary Failover Unit, page 34-11

Task Flow for Configuring Active/Active Failover

Follow these steps to configure Active/Active Failover:

Step 1 Configure the primary unit, as shown in the "Configuring the Primary Failover Unit" section on page 34-8.

Step 2 Configure the secondary unit, as shown in the "Configuring the Secondary Failover Unit" section on page 34-11.

Step 3 (Optional) Configure optional Active/Active failover settings, as shown in the "Optional Active/Active Failover Settings" section on page 34-6.

Configuring the Primary Failover Unit

Follow the steps in this section to configure the primary unit in a LAN-based, Active/Active failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit.

Restrictions

Do not configure an IP address for the Stateful Failover link if you are going to use a dedicated Stateful Failover interface. You use the **failover interface ip** command to configure a dedicated Stateful Failover interface in a later step.

Detailed Steps

	Command	Purpose

Step 1	**`changeto`** *`context`*
	`int` *`phy_if`*
	`ip address` *`active_addr netmask`* **`standby`** *`standby_addr`*
	
	`ipv6 address` `{`**`autoconfig`** `|` *`ipv6-prefix/prefix-length`* `[`**`eui-64`**`] [`**`standby`** *`ipv6-prefix`*`] |` *`ipv6-address`* **`link-local`** `[`**`standby`** *`ipv6-address`*`]}`
	`exit`
	
	Example:
	`hostname(config)# changeto context`
	`hostname/context(config)# inte`
	`hostname/context(config-if)# ip address 10.1.1.1 255.255.255.0 standby 10.1.1.2`
	
	`hostname/context(config-if)# ipv6 address 3ffe:c00:0:1::576/64 standby 3ffe:c00:0:1::575`
		For data interface (routed mode), for the management IP address (transparent mode), or for the management-only interface, configure the active and standby IP addresses.
		
		Configure the interface addresses from within each context. Use the **change to context** command to switch between contexts. The command prompt changes to `hostname/`*`context`*`(config-if)#`, where *context* is the name of the current context.
		
		In transparent firewall mode, enter the command in global configuration mode. You must enter a management IP address for each context in transparent firewall mode.

Step 2	**`changeto system`**
	
	Example:
	`hostname/context(config)#changeto system`
		Changes back to the system execution space.

Step 3	**`failover lan unit primary`**	Designates the unit as the primary unit.

Step 4	**`failover lan interface`** *`if_name phy_if`*
	
	Example:
	`hostname(config)# failover lan interface folink GigabitEthernet0/3`
		Specifies the interface to be used as the failover interface.
		
		The *if_name* argument assigns a name to the interface specified by the *phy_if* argument.
		
		The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. On the ASA 5505 adaptive ASA, the *phy_if* specifies a VLAN. This interface should not be used for any other purpose (except, optionally, the Stateful Failover link).

	Command	Purpose

Step 5	**`failover interface ip`** *`if_name`* `[`*`ip_address mask`* **`standby`** *`ip_address`* `|` *`ipv6_address`***`/`***`prefix`* **`standby`***`ipv6_address`*`]`
	
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	
	`hostname(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71`
		Assigns the active and standby IP addresses to the failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the failover link.
		The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.
		The failover link IP address and MAC address do not change at failover. The active IP address for the failover link always stays with the primary unit, while the standby IP address stays with the secondary unit.

Step 6	**`failover link`** *`if_name phy_if`*
	
	Example:
	`hostname(config)# failover link folink GigabitEthernet0/2`
		(Optional) Specifies the interface to be used as the Stateful Failover link.
		Note If the Stateful Failover link uses the failover link or a data interface, then you only need to supply the *if_name* argument.
		The *if_name* argument assigns a logical name to the interface specified by the *phy_if* argument. The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. This interface should not be used for any other purpose (except, optionally, the failover link).

Step 7	**`failover interface ip`** *`if_name`* `[`*`ip_address mask`* **`standby`** *`ip_address`* `|` *`ipv6_address`***`/`***`prefix`* **`standby`***`ipv6_address`*`]`
	
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	
	`hostname(config)# failover interface ip statelink 2001:a1a:b00::a0a:a70/64 standby 2001:a1a:b00::a0a:a71`
		(Optional) Assigns an active and standby IP address to the Stateful Failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the Stateful Failover link.
		Note If the stateful Failover link uses the failover link or data interface, skip this step. You have already defined the active and standby IP addresses for the interface.
		The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.
		The Stateful Failover link IP address and MAC address do not change at failover unless it uses a data interface. The active IP address always stays with the primary unit, while the standby IP address stays with the secondary unit.

Step 8	**`interface`** *`phy_if`*
	`no shutdown`
	
	Example:
	`hostname(config)# interface GigabitEthernet 0/3`
	`hostname(config-if)# no shutdown`
		Enables the interface.
		Note If the Stateful failover link uses the failover link or regular data interface, skip this step. You have already enabled the interface.

	Command	Purpose

Step 9	`failover group {1 | 2}`
	`primary | secondary`
	
	Example:
	`hostname(config)# failover group 1`
	`hostname(config-fover-group)# primary`
	`hostname(config-fover-group)# exit`
	`hostname(config)# failover group 2`
	`hostname(config-fover-group)# secondary`
	`hostname(config-fover-group)# exit`
		Configures the failover groups.
		You can have only two failover groups. The **failover group** command creates the specified failover group if it does not exist and enters the failover group configuration mode.
		For each failover group, specify whether the failover group has primary or secondary preference using the **primary** or **secondary** commands. You can assign the same preference to both failover groups. For traffic sharing configurations, you should assign each failover group a different unit preference.
		The **exit** command restores global configuration mode.
		The example assigns failover group 1 as the primary preference and failover group 2 as the secondary preference.

Step 10	**`context`** *`name`*
	`join-failover-group {1 | 2}`
	
	Example:
	`hostname(config)# context Eng`
	`hostname(config-context)#`
	`join-failover-group 1`
	`hostname(config-context) exit`
		Assigns each user context to a failover group (in context configuration mode).
		Any unassigned contexts are automatically assigned to failover group 1. The admin context is always a member of failover group 1.

Step 11	`failover`
	
	Example:
	`hostname(config)# failover`
		Enables failover.

Step 12	`copy running-config startup-config`
	
	Example:
	`hostname(config)# copy running-config`
	`startup-config`
		Saves the system configuration to Flash memory.

Configuring the Secondary Failover Unit

Follow the steps in this section to configure the secondary unit in a LAN-based, Active/Active failover configuration. These steps provide the minimum configuration needed to enable failover on the primary unit.

Prerequisites

When configuring LAN-based failover, you must bootstrap the secondary device to recognize the failover link before the secondary device can obtain the running configuration from the primary device.

Detailed Steps

	Command	Purpose

Step 1	`failover lan interface` *`if_name phy_if`*
	Example:
	`hostname(config)# failover lan interface folink GigabitEthernet0/3`
		Specifies the interface to be used as the failover interface.
		The *if_name* argument assigns a name to the interface specified by the *phy_if* argument.
		The *phy_if* argument can be the physical port name, such as Ethernet1, or a previously created subinterface, such as Ethernet0/2.3. On the ASA 5505 adaptive ASA, the *phy_if* specifies a VLAN. This interface should not be used for any other purpose (except, optionally, the Stateful Failover link).

Step 2	`failover interface ip` *`if_name`* `[`*`ip_address mask`* `standby` *`ip_address`* `|` *`ipv6_address`*`/`*`prefix`* `standby`*`ipv6_address`*`]`
	Example:
	`hostname(config)# failover interface ip folink 172.27.48.1 255.255.255.0 standby 172.27.48.2`
	`hostname(config)# failover interface ip folink 2001:a0a:b00::a0a:b70/64 standby 2001:a0a:b00::a0a:b71`
		Assigns the active and standby IP addresses to the failover link. You can assign either an IPv4 or an IPv6 address to the interface. You cannot assign both types of addresses to the failover link.
		The standby IP address must be in the same subnet as the active IP address. You do not need to identify the standby address subnet mask.
		The failover link IP address and MAC address do not change at failover. The active IP address for the failover link always stays with the primary unit, while the standby IP address stays with the secondary unit.

Step 3	`interface` *`phy_if`*
	`no shutdown`
	Example:
	`hostname(config-if)# interface GigabitEthernet0/3`
		Enables the interface.

Step 4	`failover lan unit secondary`
	Example:
	`hostname(config)# failover lan unit secondary`
		(Optional) Designates this unit as the secondary unit:
		Note This step is optional because, by default, units are designated as secondary unless previously configured.

Step 5	`failover`
	Example:
	`hostname(config)# failover`
		Enables failover.
		After you enable failover, the active unit sends the configuration in running memory to the standby unit. As the configuration synchronizes, the messages "Beginning configuration replication: Sending to mate" and "End Configuration Replication to mate" appear on the active unit console.

	Command	Purpose

Step 6	**`copy running-config startup-config`**
	Example:
	`hostname(config)# copy running-config startup-config`
		Saves the configuration to Flash memory.
		Enter the command after the running configuration has completed replication.

Step 7	**`no failover active group`** `group_id`
	Example:
	`hostname(config)# no failover active group 1`
		If necessary, force any failover group that is active on the primary to the active state on the secondary unit. To force a failover group to become active on the secondary unit, enter this command in the system execution space on the primary unit.
		The *group_id* argument specifies the group you want to become active on the secondary unit.

Configuring Optional Active/Active Failover Settings

The following optional Active/Active failover settings can be configured when you are initially configuring failover or after you have already established failover. Unless otherwise noted, the commands should be entered on the unit that has failover group 1 in the active state.

This section includes the following topics:

- Configuring Failover Group Preemption, page 34-13
- Enabling HTTP Replication with Stateful Failover, page 34-15
- Disabling and Enabling Interface Monitoring, page 34-15
- Configuring Interface Health Monitoring, page 34-16
- Configuring Failover Criteria, page 34-17
- Configuring Virtual MAC Addresses, page 34-17
- Configuring Support for Asymmetrically Routed Packets, page 34-19

Configuring Failover Group Preemption

Assigning a primary or secondary priority to a failover group specifies which unit the failover group becomes active on when both units boot simultaneously. However, if one unit boots before the other, then both failover groups become active on that unit. When the other unit comes online, any failover groups that have the unit as a priority do not become active on that unit unless manually forced over, unless a failover occurs, or unless the failover group is configured with the **preempt** command. The **preempt** command causes a failover group to become active on the designated unit automatically when that unit becomes available.

Enter the following commands to configure preemption for the specified failover group:

	Command	Purpose

Step 1	**`failover group`** `{`**`1`** `|` **`2`**`}`
	Example:
	`hostname(config)# failover group 1`
		Specifies the failover group.

Step 2	**`preempt`** `[delay]`
	Example:
	`hostname(config-fover-group)# preempt 1200`
		Causes the failover group to become active on the designated unit.
		You can enter an optional *delay* value, which specifies the number of seconds the failover group remains active on the current unit before automatically becoming active on the designated unit. Valid values are from 1 to 1200.
		Note If Stateful Failover is enabled, the preemption is delayed until the connections are replicated from the unit on which the failover group is currently active.

Example

The following example configures failover group 1 with the primary unit as the higher priority and failover group 2 with the secondary unit as the higher priority. Both failover groups are configured with the preempt command with a wait time of 100 seconds, so the groups will automatically become active on their preferred unit 100 seconds after the units become available.

```
hostname(config)# failover group 1
hostname(config-fover-group)# primary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# exit
hostname(config)# failover group 2
hostname(config-fover-group)# secondary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# mac-address e1 0000.a000.a011 0000.a000.a012
hostname(config-fover-group)# exit
hostname(config)#
```

Enabling HTTP Replication with Stateful Failover

To allow HTTP connections to be included in the state information, you need to enable HTTP replication. Because HTTP connections are typically short-lived, and because HTTP clients typically retry failed connection attempts, HTTP connections are not automatically included in the replicated state information.

You can use the **replication http** command to cause a failover group to replicate HTTP state information when Stateful Failover is enabled.

	Command	Purpose

Step 1	**`failover group`** `{`**`1`** `|` **`2`**`}`
	Example:
	`hostname(config)# failover group 1`
		Specifies the failover group.

Step 2	**`replication http`**
	Example:
	`hostname(config-fover-group)# replication http`
		Enables HTTP state replication for the specified failover group.
		This command affects only the failover group in which it was configured. To enable HTTP state replication for both failover groups you must enter this command in each group. This command should be entered in the system execution space.

Example

The following example shows a possible configuration for a failover group:

```
hostname(config)# failover group 1
hostname(config-fover-group)# primary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# replication http
hostname(config-fover-group)# exit
```

Disabling and Enabling Interface Monitoring

You can control which interfaces affect your failover policy by disabling the monitoring of specific interfaces and enabling the monitoring of others. This feature enables you to exclude interfaces attached to less critical networks from affecting your failover policy.

You can monitor up to 250 interfaces on a unit. By default, monitoring physical interfaces is enabled and monitoring subinterfaces is disabled.

Hello messages are exchanged during every interface poll frequency time period between the security appliance failover pair. The failover interface poll time is 3 to 15 seconds. For example, if the poll time is set to 5 seconds, testing begins on an interface if 5 consecutive hellos are not heard on that interface (25 seconds).

Monitored failover interfaces can have the following status:

- Unknown—Initial status. This status can also mean the status cannot be determined.
- Normal—The interface is receiving traffic.
- Testing—Hello messages are not heard on the interface for five poll times.
- Link Down—The interface or VLAN is administratively down.
- No Link—The physical link for the interface is down.

- Failed—No traffic is received on the interface, yet traffic is heard on the peer interface.

In Active/Active failover, this command is only valid within a context.

To enable or disable interface monitoring for specific interfaces, enter one of the following commands.

Do one of the following:	

no monitor-interface *if_name*
Example:
`hostname/context (config)#`
`no monitor-interface 1`
	Disables health monitoring for an interface.

monitor-interface *if_name*
Example:
`hostname/context (config)#`
`monitor-interface 1`
	Enables health monitoring for an interface.

Example

The following example enables monitoring on an interface named “inside”:

```
hostname(config)# monitor-interface inside
hostname(config)#
```

Configuring Interface Health Monitoring

The ASA sends hello packets out of each data interface to monitor interface health. If the ASA does not receive a hello packet from the corresponding interface on the peer unit for over half of the hold time, then the additional interface testing begins. If a hello packet or a successful test result is not received within the specified hold time, the interface is marked as failed. Failover occurs if the number of failed interfaces meets the failover criteria.

Decreasing the poll and hold times enables the ASA to detect and respond to interface failures more quickly, but may consume more system resources.

To change the default interface poll time, enter the following commands:

	Command	Purpose

Step 1	**failover group** {**1** | **2**}
	Example:
	`hostname(config)# failover group 1`
		Specifies the failover group.

Step 2	**polltime interface** *seconds* **Example:** `hostname(config-fover-group)# polltime interface seconds`	Specifies the data interface poll and hold times in the Active/Active failover configuration Valid values for the poll time are from 1 to 15 seconds or, if the optional msec keyword is used, from 500 to 999 milliseconds. The hold time determines how long it takes from the time a hello packet is missed to when the interface is marked as failed. Valid values for the hold time are from 5 to 75 seconds. You cannot enter a hold time that is less than 5 times the poll time.

Example

The following partial example shows a possible configuration for a failover group. The interface poll time is set to 500 milliseconds and the hold time to 5 seconds for data interfaces in failover group 1.

```
hostname(config)# failover group 1
hostname(config-fover-group)# primary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# polltime interface msec 500 holdtime 5
hostname(config-fover-group)# exit
hostname(config)#
```

Configuring Failover Criteria

By default, if a single interface fails failover occurs. You can specify a specific number of interfaces or a percentage of monitored interfaces that must fail before a failover occurs. The failover criteria is specified on a failover group basis.

To change the default failover criteria for the specified failover group, enter the following commands:

	Command	Purpose

Step 1	**`failover group`** `{`**`1`** `|` **`2`**`}`
	Example:
	`hostname(config)# failover group 1`
		Specifies the failover group.

Step 2	**`interface-policy`** *`num`*`[%]`
	Example:
	`hostname(config-fover-group)# interface-policy 225`
		Specifies the policy for failover when monitoring detects an interface failure.
		When specifying a specific number of interfaces, the *num* argument can be from 1 to 250. When specifying a percentage of interfaces, the *num* argument can be from 1 to 100.

The following partial example shows a possible configuration for a failover group:

```
hostname(config)# failover group 1
hostname(config-fover-group)# primary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# interface-policy 25%
hostname(config-fover-group)# exit
hostname(config)#
```

Configuring Virtual MAC Addresses

Active/Active failover uses virtual MAC addresses on all interfaces. If you do not specify the virtual MAC addresses, then they are computed as follows:

- Active unit default MAC address: 00a0.c9*physical_port_number.failover_group_id*01.
- Standby unit default MAC address: 00a0.c9*physical_port_number.failover_group_id*02.

Note If you have more than one Active/Active failover pair on the same network, it is possible to have the same default virtual MAC addresses assigned to the interfaces on one pair as are assigned to the interfaces of the other pairs because of the way the default virtual MAC addresses are determined. To avoid having duplicate MAC addresses on your network, make sure you assign each physical interface a virtual active and standby MAC address for all failover groups.

To configure specific active and standby MAC addresses for an interface, enter the following commands:

	Command	Purpose

Step 1	**`failover group`** `{`**`1`** `|` **`2`**`}`
	Example:
	`hostname(config)# failover group 1`
		Specifies the failover group.

Step 2	**`mac address`** *`phy_if active_mac standby_mac`*
	Example:
	`hostname(config-fover-group)# mac address e1 0000.a000.a011 0000.a000.a012`
		Specifies the virtual MAC addresses for the active and standby units.
		The *phy_if* argument is the physical name of the interface, such as Ethernet1. The *active_mac* and *standby_mac* arguments are MAC addresses in H.H.H format, where H is a 16-bit hexadecimal digit. For example, the MAC address 00-0C-F1-42-4C-DE would be entered as 000C.F142.4CDE.
		The *active_mac* address is associated with the active IP address for the interface, and the *standby_mac* is associated with the standby IP address for the interface.
		There are multiple ways to configure virtual MAC addresses on the ASA. When more than one method has been used to configure virtual MAC addresses, the ASA uses the following order of preference to determine which virtual MAC address is assigned to an interface:
		1. The **mac-address** command (in interface configuration mode) address.
		2. The **failover mac address** command address.
		3. The **mac-address auto** command generate address.
		4. The automatically generated failover MAC address.
		Use the **show interface** command to display the MAC address used by an interface.

Example

The following partial example shows a possible configuration for a failover group:

```
hostname(config)# failover group 1
hostname(config-fover-group)# primary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# exit
hostname(config)# failover group 2
hostname(config-fover-group)# secondary
hostname(config-fover-group)# preempt 100
hostname(config-fover-group)# mac address e1 0000.a000.a011 0000.a000.a012
hostname(config-fover-group)# exit
hostname(config)#
```

Configuring Support for Asymmetrically Routed Packets

When running in Active/Active failover, a unit may receive a return packet for a connection that originated through its peer unit. Because the ASA that receives the packet does not have any connection information for the packet, the packet is dropped. This most commonly occurs when the two ASAs in an Active/Active failover pair are connected to different service providers and the outbound connection does not use a NAT address.

You can prevent the return packets from being dropped using the **asr-group** command on interfaces where this is likely to occur. When an interface configured with the **asr-group** command receives a packet for which it has no session information, it checks the session information for the other interfaces that are in the same group. If it does not find a match, the packet is dropped. If it finds a match, then one of the following actions occurs:

- If the incoming traffic originated on a peer unit, some or all of the layer 2 header is rewritten and the packet is redirected to the other unit. This redirection continues as long as the session is active.
- If the incoming traffic originated on a different interface on the same unit, some or all of the layer 2 header is rewritten and the packet is reinjected into the stream.

Note Using the **asr-group** command to configure asymmetric routing support is more secure than using the **static** command with the **nailed** option.

The **asr-group** command does not provide asymmetric routing; it restores asymmetrically routed packets to the correct interface.

Prerequisites

You must have to following configured for asymmetric routing support to function properly:

- Active/Active Failover
- Stateful Failover—Passes state information for sessions on interfaces in the active failover group to the standby failover group.
- **replication http**—HTTP session state information is not passed to the standby failover group, and therefore is not present on the standby interface. For the ASA to be able re-route asymmetrically routed HTTP packets, you need to replicate the HTTP state information.

You can configure the **asr-group** command on an interface without having failover configured, but it does not have any effect until Stateful Failover is enabled.

Detailed Steps

To configure support for asymmetrically routed packets, perform the following steps:

Step 1 Configure Active/Active Stateful Failover for the failover pair. See the "Configuring Active/Active Failover" section on page 34-8.

Step 2 For each interface that you want to participate in asymmetric routing support enter the following command. You must enter the command on the unit where the context is in the active state so that the command is replicated to the standby failover group. For more information about command replication, see Command Replication, page 34-3.

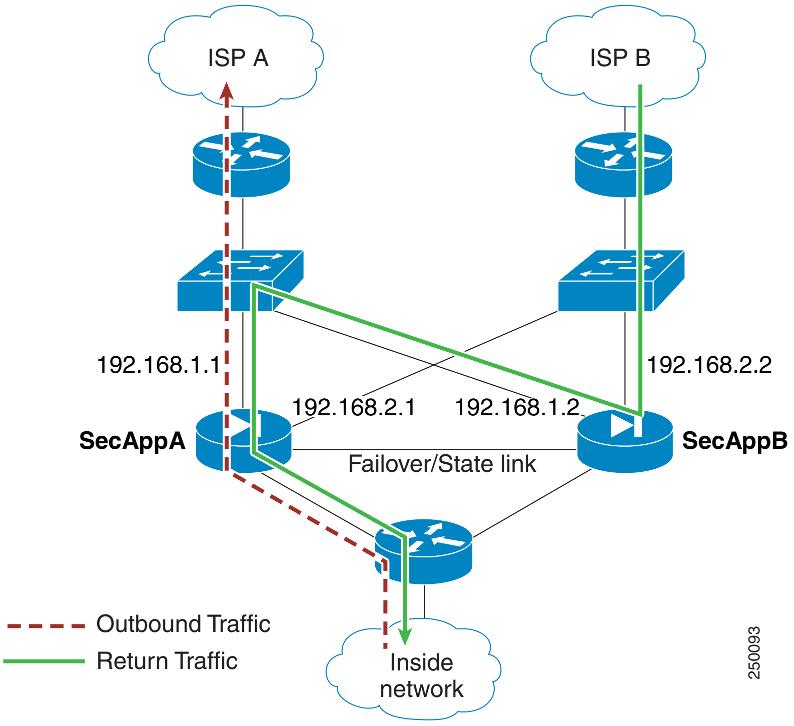
```
hostname/ctx(config)# interface phy_if
hostname/ctx(config-if)# asr-group num
```

Valid values for *num* range from 1 to 32. You need to enter the command for each interface that participates in the asymmetric routing group. You can view the number of ASR packets transmitted, received, or dropped by an interface using the **show interface detail** command. You can have more than one ASR group configured on the ASA, but only one per interface. Only members of the same ASR group are checked for session information.

Example

Figure 34-1 shows an example of using the **asr-group** command for asymmetric routing support.

Figure 34-1 ASR Example



The two units have the following configuration (configurations show only the relevant commands). The device labeled SecAppA in the diagram is the primary unit in the failover pair.

Example 34-1 Primary Unit System Configuration

```
hostname primary
interface GigabitEthernet0/1
description LAN/STATE Failover Interface
interface GigabitEthernet0/2
```

```
no shutdown
interface GigabitEthernet0/3
no shutdown
interface GigabitEthernet0/4
no shutdown
interface GigabitEthernet0/5
no shutdown
failover
failover lan unit primary
failover lan interface folink GigabitEthernet0/1
failover link folink
failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
failover group 1
primary
failover group 2
secondary
admin-context admin
context admin
description admin
allocate-interface GigabitEthernet0/2
allocate-interface GigabitEthernet0/3
config-url flash:/admin.cfg
join-failover-group 1
context ctx1
description context 1
allocate-interface GigabitEthernet0/4
allocate-interface GigabitEthernet0/5
config-url flash:/ctx1.cfg
join-failover-group 2
```

Example 34-2 admin Context Configuration

```
hostname SecAppA
interface GigabitEthernet0/2
nameif outsideISP-A
security-level 0
ip address 192.168.1.1 255.255.255.0 standby 192.168.1.2
asr-group 1
interface GigabitEthernet0/3
nameif inside
security-level 100
ip address 10.1.0.1 255.255.255.0 standby 10.1.0.11
monitor-interface outside
```

Example 34-3 ctx1 Context Configuration

```
hostname SecAppB
interface GigabitEthernet0/4
nameif outsideISP-B
security-level 0
ip address 192.168.2.2 255.255.255.0 standby 192.168.2.1
asr-group 1
interface GigabitEthernet0/5
nameif inside
security-level 100
ip address 10.2.20.1 255.255.255.0 standby 10.2.20.11
```

Figure 34-1 on page 34-20 shows the ASR support working as follows:

1. An outbound session passes through ASA SecAppA. It exits interface outsideISP-A (192.168.1.1).

2. Because of asymmetric routing configured somewhere upstream, the return traffic comes back through the interface outsideISP-B (192.168.2.2) on ASA SecAppB.
3. Normally the return traffic would be dropped because there is no session information for the traffic on interface 192.168.2.2. However, the interface is configure with the command **asr-group 1**. The unit looks for the session on any other interface configured with the same ASR group ID.
4. The session information is found on interface outsideISP-A (192.168.1.2), which is in the standby state on the unit SecAppB. Stateful Failover replicated the session information from SecAppA to SecAppB.
5. Instead of being dropped, the layer 2 header is re-written with information for interface 192.168.1.1 and the traffic is redirected out of the interface 192.168.1.2, where it can then return through the interface on the unit from which it originated (192.168.1.1 on SecAppA). This forwarding continues as needed until the session ends.

Remote Command Execution

Remote command execution lets you send commands entered at the command line to a specific failover peer.

Because configuration commands are replicated from the active unit or context to the standby unit or context, you can use the **failover exec** command to enter configuration commands on the correct unit, no matter which unit you are logged-in to. For example, if you are logged-in to the standby unit, you can use the **failover exec active** command to send configuration changes to the active unit. Those changes are then replicated to the standby unit. Do not use the **failover exec** command to send configuration commands to the standby unit or context; those configuration changes are not replicated to the active unit and the two configurations will no longer be synchronized.

Output from configuration, exec, and **show** commands is displayed in the current terminal session, so you can use the **failover exec** command to issue **show** commands on a peer unit and view the results in the current terminal.

You must have sufficient privileges to execute a command on the local unit to execute the command on the peer unit.

To send a command to a failover peer, perform the following steps:

Step 1 If you are in multiple context mode, use the **changeto** command to change to the context you want to configure. You cannot change contexts on the failover peer with the **failover exec** command.

If you are in single context mode, skip to the next step.

Step 2 Use the following command to send commands to he specified failover unit:

```
hostname(config)# failover exec {active | mate | standby}
```

Use the **active** or **standby** keyword to cause the command to be executed on the specified unit, even if that unit is the current unit. Use the **mate** keyword to cause the command to be executed on the failover peer.

Commands that cause a command mode change do not change the prompt for the current session. You must use the **show failover exec** command to display the command mode the command is executed in. See Changing Command Modes, page 34-23, for more information.

Changing Command Modes

The **failover exec** command maintains a command mode state that is separate from the command mode of your terminal session. By default, the **failover exec** command mode starts in global configuration mode for the specified device. You can change that command mode by sending the appropriate command (such as the **interface** command) using the **failover exec** command. The session prompt does not change when you change mode using **failover exec**.

For example, if you are logged-in to global configuration mode of the active unit of a failover pair, and you use the **failover exec active** command to change to interface configuration mode, the terminal prompt remains in global configuration mode, but commands entered using **failover exec** are entered in interface configuration mode.

The following examples shows the difference between the terminal session mode and the **failover exec** command mode. In the example, the administrator changes the **failover exec** mode on the active unit to interface configuration mode for the interface GigabitEthernet0/1. After that, all commands entered using **failover exec active** are sent to interface configuration mode for interface GigabitEthernet0/1. The administrator then uses failover exec active to assign an IP address to that interface. Although the prompt indicates global configuration mode, the **failover exec active** mode is in interface configuration mode.

```
hostname(config)# failover exec active interface GigabitEthernet0/1
hostname(config)# failover exec active ip address 192.168.1.1 255.255.255.0 standby
192.168.1.2
hostname(config)# router rip
hostname(config-router)#
```

Changing commands modes for your current session to the device does not affect the command mode used by the **failover exec** command. For example, if you are in interface configuration mode on the active unit, and you have not changed the **failover exec** command mode, the following command would be executed in global configuration mode. The result would be that your session to the device remains in interface configuration mode, while commands entered using **failover exec active** are sent to router configuration mode for the specified routing process.

```
hostname(config-if)# failover exec active router ospf 100
hostname(config-if)#
```

Use the **show failover exec** command to display the command mode on the specified device in which commands sent with the **failover exec** command are executed. The **show failover exec** command takes the same keywords as the failover exec command: **active**, **mate**, or **standby**. The **failover exec** mode for each device is tracked separately.

For example, the following is sample output from the **show failover exec** command entered on the standby unit:

```
hostname(config)# failover exec active interface GigabitEthernet0/1
hostname(config)# sh failover exec active
Active unit Failover EXEC is at interface sub-command mode

hostname(config)# sh failover exec standby
Standby unit Failover EXEC is at config mode

hostname(config)# sh failover exec mate
Active unit Failover EXEC is at interface sub-command mode
```

Security Considerations

The **failover exec** command uses the failover link to send commands to and receive the output of the command execution from the peer unit. You should use the **failover key** command to encrypt the failover link to prevent eavesdropping or man-in-the-middle attacks.

Limitations of Remote Command Execution

- If you upgrade one unit using the zero-downtime upgrade procedure and not the other, both units must be running software that supports the **failover exec** command for the command to work.
- Command completion and context help is not available for the commands in the *cmd_string* argument.
- In multiple context mode, you can only send commands to the peer context on the peer unit. To send commands to a different context, you must first change to that context on the unit you are logged-in to.
- You cannot use the following commands with the **failover exec** command:
  - **changeto**
  - **debug** (**undebug**)
- If the standby unit is in the failed state, it can still receive commands from the **failover exe**c command if the failure is due to a service card failure; otherwise, the remote command execution will fail.
- You cannot use the **failover exec** command to switch from privileged EXEC mode to global configuration mode on the failover peer. For example, if the current unit is in privileged EXEC mode, and you enter **failover exec mate configure terminal**, the **show failover exec mate** output will show that the failover exec session is in global configuration mode. However, entering configuration commands for the peer unit using **failover exec** will fail until you enter global configuration mode on the current unit.
- You cannot enter recursive failover exec commands, such as **failover exec mate failover exec mate** *command.*
- Commands that require user input or confirmation must use the **/nonconfirm** option.

Controlling Failover

This sections describes how to control and monitor failover. This section includes the following topics:

- Forcing Failover, page 34-24
- Disabling Failover, page 34-25
- Restoring a Failed Unit or Failover Group, page 34-25

Forcing Failover

To force the standby failover group to become active, enter one of the following commands:

Enter the following command in the system execution space of the unit where the failover group is in the standby state:

```
hostname# failover active group group_id
```

Or, enter the following command in the system execution space of the unit where the failover group is in the active state:

```
hostname# no failover active group group_id
```

Entering the following command in the system execution space causes all failover groups to become active:

```
hostname# failover active
```

Disabling Failover

To disable failover, enter the following command:

```
hostname(config)# no failover
```

Disabling failover on an Active/Active failover pair causes the failover groups to remain in the active state on whichever unit they are currently active on, no matter which unit they are configured to prefer. Enter the **no failover** command in the system execution space.

Restoring a Failed Unit or Failover Group

To restore a failed unit to an unfailed state, enter the following command:

```
hostname(config)# failover reset
```

To restore a failed Active/Active failover group to an unfailed state, enter the following command:

```
hostname(config)# failover reset group group_id
```

Restoring a failed unit or group to an unfailed state does not automatically make it active; restored units or groups remain in the standby state until made active by failover (forced or natural). An exception is a failover group configured with the **preempt** command. If previously active, a failover group becomes active if it is configured with the **preempt** command and if the unit on which it failed is the preferred unit.

Testing the Failover Functionality

To test failover functionality, perform the following steps:

Step 1 Test that your active unit or failover group is passing traffic as expected by using FTP (for example) to send a file between hosts on different interfaces.

Step 2 Force a failover to the standby unit by entering the following command on the unit where the failover group containing the interface connecting your hosts is active:

```
hostname(config)# no failover active group group_id
```

Step 3 Use FTP to send another file between the same two hosts.

Step 4 If the test was not successful, enter the **show failover** command to check the failover status.

Step 5 When you are finished, you can restore the unit or failover group to active status by enter the following command on the unit where the failover group containing the interface connecting your hosts is active:

```
hostname(config)# failover active group group_id
```

Monitoring Active/Active Failover

To monitor Active/Active Failover, perform one of the following tasks. Commands are entered in the system execution space unless otherwise noted.

Command	Purpose
`show failover`	Displays information about the failover state of the unit.
`show failover group`	Displays information abouthe failover state of the failover group. The information displayed is similar to that of the **show failover** command, but limited to the specified group.
`show monitor-interface`	Displays information about the monitored interface. Enter this command within a security context.
`show running-config failover`	Displays the failover commands in the running configuration.

For more information about the output of the monitoring commands, refer to the *Cisco ASA 5500 Series Command Reference*.

Feature History for Active/Active Failover

Table 34-3 lists the release history for this feature.

Table 34-3 Feature History for Active/Active Failover

Feature Name	Releases	Feature Information
Active/Active failover	7.0	In an Active/Active failover configuration, both ASAs can pass network traffic. This feature and the relevant commands were introduced.
IPv6 Support in failover	8.2(2)	The following commands were modified: **failover interface ip**, **show failover**, **ipv6 address**, **show monitor-interface**.

PART 6

Configuring Access Control

CHAPTER 35

Permitting or Denying Network Access

This chapter describes how to control network access through the security appliance by applying an access list to an interface, and it includes the following sections:

- Information About Inbound and Outbound Access Rules, page 35-1
- Licensing Requirements for Access Rules, page 35-2
- Prerequisites, page 35-3
- Guidelines and Limitations, page 35-3
- Default Settings, page 35-4
- Applying an Access List to an Interface, page 35-4
- Monitoring Permitting or Denying Network Access, page 35-5
- Configuration Examples for Permitting or Denying Network Access, page 35-6
- Feature History for Permitting or Denying Network Access, page 35-7

Information About Inbound and Outbound Access Rules

Because all traffic from a higher-security interface to a lower-security interface is allowed, access lists enable you to either allow traffic from lower-security interfaces or restrict traffic from higher-security interfaces.

The ASA supports two types of access lists:

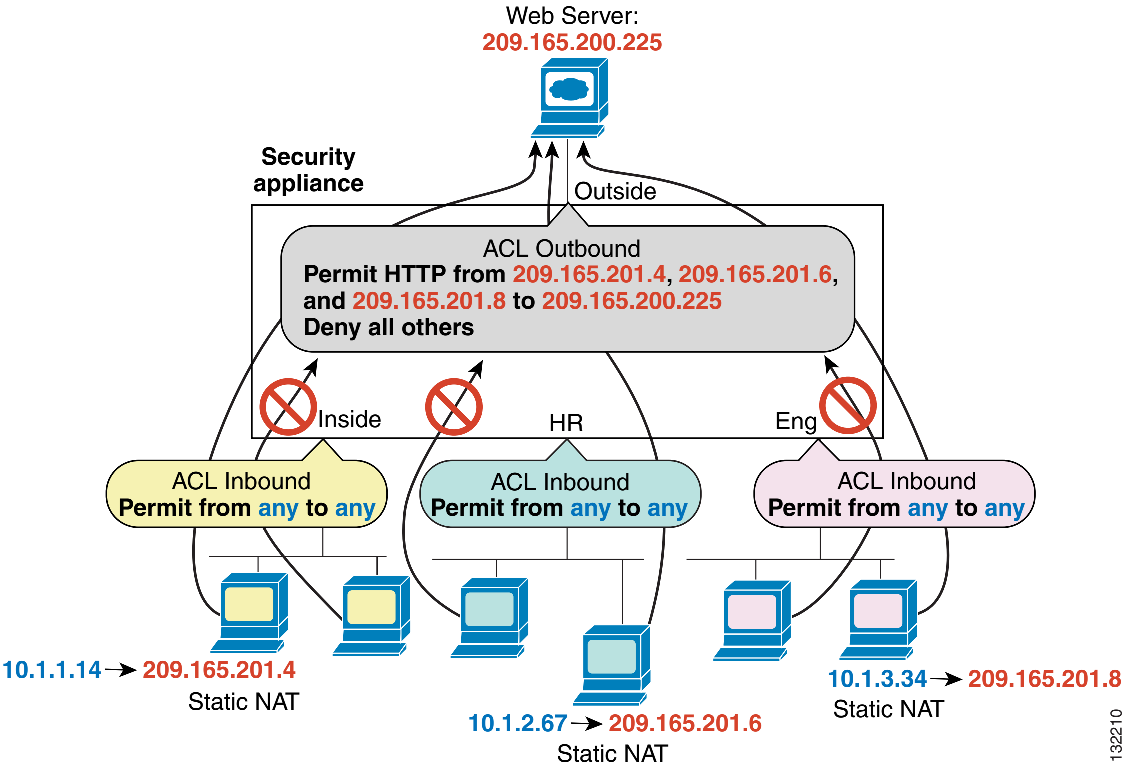
- Inbound—Inbound access lists apply to traffic as it enters an interface.
- Outbound—Outbound access lists apply to traffic as it exits an interface.

Note The terms “inbound” and “outbound” refer to the application of an access list on an interface, either to traffic entering the ASA on an interface or traffic exiting the ASA on an interface. These terms do not refer to the movement of traffic from a lower security interface to a higher security interface, commonly known as inbound, or from a higher to lower interface, commonly known as outbound.

An outbound access list is useful, for example, if you want to allow only certain hosts on the inside networks to access a web server on the outside network. Rather than creating multiple inbound access lists to restrict access, you can create a single outbound access list that allows only the specified hosts.

(See Figure 35-1.) See the "IP Addresses Used for Access Lists When You Use NAT" section on page 10-3 for information about NAT and IP addresses. The outbound access list prevents any other hosts from reaching the outside network.

Figure 35-1 Outbound Access List



See the following commands for this example:

```
hostname(config)# access-list OUTSIDE extended permit tcp host 209.165.201.4
host 209.165.200.225 eq www
hostname(config)# access-list OUTSIDE extended permit tcp host 209.165.201.6
host 209.165.200.225 eq www
hostname(config)# access-list OUTSIDE extended permit tcp host 209.165.201.8
host 209.165.200.225 eq www
hostname(config)# access-group OUTSIDE out interface outside
```

Licensing Requirements for Access Rules

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Prerequisites

Permitting and denying network access has the following prerequisites:

Before you can apply an access list to an you need to have created the access list with access list entries. See Chapter 11, "Adding an Extended Access List," for more information.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

- Supported in single and multiple context mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall modes.

IPv6 Guidelines

- Supports IPv6

Additional Guidelines and Limitations

The following guidelines and limitations apply to permitting or denying network access:

- By default, all IP traffic from a higher-security interface to a lower-security interface is allowed. Access lists enable you to either allow traffic from lower-security interfaces or restrict traffic from higher-security interfaces.
- You use access lists to control network access in both routed and transparent firewall modes. In transparent mode, you can use both extended access lists (for Layer 3 traffic) and EtherType access lists (for Layer 2 traffic). For information about creating extended access lists, see Chapter 11, "Adding an Extended Access List," For information about creating EtherType access lists, see Chapter 12, "Adding an EtherType Access List."
- To access the ASA interface for management access, you do not need an access list allowing the host IP address. You only need to configure management access by following the instructions in Chapter 37, "Configuring Management Access."
- For connectionless protocols, you need to apply the access list to the source and destination interfaces if you want traffic to pass in both directions. For example, you can allow BGP in an EtherType access list in transparent mode, and you need to apply the access list to both interfaces.
- At the time a packet arrives, if there is no per-user access list associated with the packet, the interface access list will be applied.
- The per-user access list is governed by the timeout value specified by the **uauth** option of the **timeout** command, but it can be overridden by the AAA per-user session timeout value.
- If user traffic is denied because of a per-user access list, syslog message 109025 will be logged. If user traffic is permitted, no syslog message is generated. The log option in the per-user access-list will have no effect.
- Always use the **access-list** command with the **access-group** command.

- If all of the functional entries (the permit and deny statements) are removed from an access list that is referenced by one or more **access-group** commands, the **access-group** commands are automatically removed from the configuration. The **access-group** command cannot reference empty access lists or access lists that contain only a remark.
- The **no access-group** command unbinds the access list from the interface *interface_name*.
- The show running config access-group command displays the current access list bound to the interfaces.
- The **clear configure access-group** command removes all the access lists from the interfaces.
- Access control rules for to-the-box management traffic (defined by such commands as **http**, **ssh**, or **telnet**) have higher precedence than an access list applied with the **control-plane** option. Therefore, such permitted management traffic will be allowed to come in even if explicitly denied by the to-the-box access list.

Default Settings

Table 35-1 lists the default settings for Permitting or Denying Network Access parameters.

Table 35-1 Default Parameters for Permitting or Denying Network Access

Parameters	Default
—	No default behavior or values.

Applying an Access List to an Interface

You can apply an extended access list to the inbound or outbound direction of an interface. You can apply one access list of each type (extended and EtherType) to both directions of the interface. You can also apply an IPv4 and an IPv6 access list to an interface at the same time and in the same direction. See the "Information About Inbound and Outbound Access Rules" section on page 35-1 for more information about access list directions.

To apply an access list to the inbound or outbound direction of an interface, enter the following command.

Command	**Purpose**

`access-group` *`access_list`* `{`**`in`** `|` **`out`**`}`
`interface` *`interface_name`*
`[`**`per-user-override`**`]`
 	
`Example:`
`hostname(config)# access-group acl_out in interface outside`
	Binds an access list to an interface. The access list is applied to traffic inbound to an interface. If you enter the **permit** option in the **access-list** command statement, the security appliance continues to process the packet. If you enter the deny option in the **access-list** command statement, the security appliance discards the packet and generates a syslog message.
	The **in** keyword applies the access list to the traffic on the specified interface. The **out** keyword applies the access list to the outbound traffic.
	The **per-user-override** keyword allows dynamic user access lists that are downloaded for user authorization to override the access list assigned to the interface. For example, if the interface access list denies all traffic from 10.0.0.0, but the dynamic access list permits all traffic from 10.0.0.0, then the dynamic access list overrides the interface access list for that user. See the "Configuring RADIUS Authorization" section on page 38-9 for more information about per-user access lists.
	Note The optional **per-user-override** keyword is only available for inbound access lists.
	If the **per-user-override** optional argument is not present, the security appliance preserves the existing filtering behavior.
	(For additional information about command options, see the **access-group** command in the *Cisco Security Appliance Command Reference*.)

The following example shows how to use the **access-group** command:

```
hostname(config)# static (inside,outside) 209.165.201.3 10.1.1.3
hostname(config)# access-list acl_out permit tcp any host 209.165.201.3 eq 80
hostname(config)# access-group acl_out in interface outside
```

The **static** command provides a global address of 209.165.201.3 for the web server at 10.1.1.3. The **access-list** command lets any host access the global address using port 80. The **access-group** command specifies that the **access-list** command applies to traffic entering the outside interface.

Monitoring Permitting or Denying Network Access

To monitor network access, perform one of the following tasks:

Command	**Purpose**
`show running-config access-group`	Displays the current access list bound to the interfaces.

Configuration Examples for Permitting or Denying Network Access

This section includes typical configuration examples for permitting or denying network access.

The following example illustrates the commands required to enable access to an inside web server with the IP address 209.165.201.12. (This IP address is the address visible on the outside interface after NAT.)

```
hostname(config)# access-list ACL_OUT extended permit tcp any host 209.165.201.12 eq www
hostname(config)# access-group ACL_OUT in interface outside
```

You also need to configure NAT for the web server.

The following example allows all hosts to communicate between the **inside** and **hr** networks but only specific hosts to access the outside network:

```
hostname(config)# access-list ANY extended permit ip any any
hostname(config)# access-list OUT extended permit ip host 209.168.200.3 any
hostname(config)# access-list OUT extended permit ip host 209.168.200.4 any

hostname(config)# access-group ANY in interface inside
hostname(config)# access-group ANY in interface hr
hostname(config)# access-group OUT out interface outside
```

For example, the following sample access list allows common EtherTypes originating on the inside interface:

```
hostname(config)# access-list ETHER ethertype permit ipx
hostname(config)# access-list ETHER ethertype permit mpls-unicast
hostname(config)# access-group ETHER in interface inside
```

The following example allows some EtherTypes through the ASA, but it denies all others:

```
hostname(config)# access-list ETHER ethertype permit 0x1234
hostname(config)# access-list ETHER ethertype permit mpls-unicast
hostname(config)# access-group ETHER in interface inside
hostname(config)# access-group ETHER in interface outside
```

The following example denies traffic with EtherType 0x1256 but allows all others on both interfaces:

```
hostname(config)# access-list nonIP ethertype deny 1256
hostname(config)# access-list nonIP ethertype permit any
hostname(config)# access-group ETHER in interface inside
hostname(config)# access-group ETHER in interface outside
```

The following example uses object groups to permit specific traffic on the inside interface:

```
!
hostname (config)# object-group service myaclog
hostname (config-service)# service-object tcp source range 2000 3000
hostname (config-service)# service-object tcp source range 3000 3010 destinatio$
hostname (config-service)# service-object ipsec
hostname (config-service)# service-object udp destination range 1002 1006
hostname (config-service)# service-object icmp echo

hostname(config)# access-list outsideacl extended permit object-group myaclog interface
inside any
```

Feature History for Permitting or Denying Network Access

Table 35-2 lists the release history for this feature.

Table 35-2 Feature History for Permitting or Denying Network Access

Feature Name	Releases	Feature Information
Permitting or denying network access	7.0	Controlling network access through the security appliance using access lists. The following command was introduced or modified: **access-group**.

CHAPTER 36

Configuring AAA Servers and the Local Database

This chapter describes support for AAA (pronounced "triple A") and how to configure AAA servers and the local database.

This chapter contains the following sections:

- AAA Overview, page 36-1
- AAA Server and Local Database Support, page 36-3
- Configuring the Local Database, page 36-8
- Identifying AAA Server Groups and Servers, page 36-9
- Configuring an LDAP Server, page 36-13
- Using Certificates and User Login Credentials, page 36-17
- Differentiating User Roles Using AAA, page 36-19

AAA Overview

AAA enables the ASA to determine who the user is (authentication), what the user can do (authorization), and what the user did (accounting).

AAA provides an extra level of protection and control for user access than using access lists alone. For example, you can create an access list allowing all outside users to access Telnet on a server on the DMZ network. If you want only some users to access the server and you might not always know IP addresses of these users, you can enable AAA to allow only authenticated and/or authorized users to make it through the ASA. (The Telnet server enforces authentication, too; the ASA prevents unauthorized users from attempting to access the server.)

You can use authentication alone or with authorization and accounting. Authorization always requires a user to be authenticated first. You can use accounting alone, or with authentication and authorization.

This section includes the following topics:

- About Authentication, page 36-2
- About Authorization, page 36-2
- About Accounting, page 36-2

About Authentication

Authentication controls access by requiring valid user credentials, which are typically a username and password. You can configure the ASA to authenticate the following items:

- All administrative connections to the ASA including the following sessions:
  - Telnet
  - SSH
  - Serial console
  - ASDM (using HTTPS)
  - VPN management access
- The **enable** command
- Network access
- VPN access

About Authorization

Authorization controls access *per user* after users authenticate. You can configure the ASA to authorize the following items:

- Management commands
- Network access
- VPN access

Authorization controls the services and commands available to each authenticated user. Were you not to enable authorization, authentication alone would provide the same access to services for all authenticated users.

If you need the control that authorization provides, you can configure a broad authentication rule, and then have a detailed authorization configuration. For example, you authenticate inside users who attempt to access any server on the outside network and then limit the outside servers that a particular user can access using authorization.

The ASA caches the first 16 authorization requests per user, so if the user accesses the same services during the current authentication session, the ASA does not resend the request to the authorization server.

About Accounting

Accounting tracks traffic that passes through the ASA, enabling you to have a record of user activity. If you enable authentication for that traffic, you can account for traffic per user. If you do not authenticate the traffic, you can account for traffic per IP address. Accounting information includes when sessions start and stop, username, the number of bytes that pass through the ASA for the session, the service used, and the duration of each session.

AAA Server and Local Database Support

The ASA supports a variety of AAA server types and a local database that is stored on the ASA. This section describes support for each AAA server type and the local database.

This section contains the following topics:

- Summary of Support, page 36-3
- RADIUS Server Support, page 36-4
- TACACS+ Server Support, page 36-5
- RSA/SDI Server Support, page 36-5
- NT Server Support, page 36-6
- Kerberos Server Support, page 36-6
- LDAP Server Support, page 36-6
- SSO Support for Clientless SSL VPN with HTTP Forms, page 36-6
- Local Database Support, page 36-7

Summary of Support

Table 36-1 summarizes the support for each AAA service by each AAA server type, including the local database. For more information about support for a specific AAA server type, refer to the topics following the table.

Table 36-1 Summary of AAA Support

	Database Type							
AAA Service	**Local**	**RADIUS**	**TACACS+**	**SDI (RSA)**	**NT**	**Kerberos**	**LDAP**	**HTTP Form**
Authentication of...								
VPN users[1]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes[2]
Firewall sessions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Administrators	Yes	Yes	Yes	Yes[3]	Yes	Yes	Yes	No
Authorization of...								
VPN users	Yes	Yes	No	No	No	No	Yes	No
Firewall sessions	No	Yes[4]	Yes	No	No	No	No	No
Administrators	Yes[5]	No	Yes	No	No	No	No	No
Accounting of...								
VPN connections	No	Yes	Yes	No	No	No	No	No
Firewall sessions	No	Yes	Yes	No	No	No	No	No
Administrators	No	Yes[6]	Yes	No	No	No	No	No

1. For SSL VPN connections, either PAP or MS-CHAPv2 can be used.
2. HTTP Form protocol supports both authentication and single sign-on operations for clientless SSL VPN users sessions only.
3. RSA/SDI is supported for ASDM HTTP administrative access with ASA5500 software version 8.2 or later.

4. For firewall sessions, RADIUS authorization is supported with user-specific access lists only, which are received or specified in a RADIUS authentication response.
5. Local command authorization is supported by privilege level only.
6. Command accounting is available for TACACS+ only.

Note In addition to the native protocol authentication listed in table Table 1-1, the adaptive security appliance supports proxying authentication. For example, the adaptive security appliance can proxy to an RSA/SDI and/or LDAP server via a RADIUS server. Authentication via digital certificates and/or digital certificates with the AAA combinations listed in the table are also supported

RADIUS Server Support

The ASA supports the following RADIUS servers for AAA, in addition to the one available on the ASA itself:

- Cisco Secure ACS 3.2, 4.0, 4.1
- RSA Radius in RSA Authentication Manager 5.2 & 6.1

Authentication Methods

The ASA supports the following authentication methods with RADIUS:

- PAP—For all connection types.
- CHAP—For L2TP-over-IPsec.
- MS-CHAPv1—For L2TP-over-IPsec.
- MS-CHAPv2—For L2TP-over-IPsec, and for regular IPsec remote access connections when the password-management feature is enabled. You can also use MS-CHAPv2 with clientless connections.
- Authentication Proxy modes—Including RADIUS to Active Directory, RADIUS to RSA/SDI, RADIUS to Token-server, and RSA/SI to RADIUS,

Note To enable MS-CHAPv2 as the protocol used between the ASA and the RADIUS server for a VPN connection, password management must be enabled in the tunnel-group general-attributes. Enabling password management generates an MS-CHAPv2 authentication request from the ASA to the RADIUS server. See the description of the **password-management** command for details.

If you use double authentication and enable password management in the tunnel group, then the primary and secondary authentication requests include MS-CHAPv2 request attributes. If a RADIUS server does not support MS-CHAPv2, then you can configure that server to send a non-MS-CHAPv2 authentication request by using the **no mschapv2-capable** command.

Attribute Support

The ASA supports the following sets of RADIUS attributes:

- Authentication attributes defined in RFC 2138.

- Accounting attributes defined in RFC 2139.
- RADIUS attributes for tunneled protocol support, defined in RFC 2868.
- Cisco IOS VSAs, identified by RADIUS vendor ID 9.
- Cisco VPN-related VSAs, identified by RADIUS vendor ID 3076.
- Microsoft VSAs, defined in RFC 2548.
- Cisco VSA (Cisco-Priv-Level), which provides a standard 0-15 numeric ranking of privileges, with 1 being the lowest level and 15 being the highest level. A zero level indicates no privileges. The first level (login) allows privileged EXEC access for the commands available at this level. The second level (enable) allows CLI configuration privileges.

RADIUS Authorization Functions

The ASA can use RADIUS servers for user authorization for network access using dynamic access lists or access list names per user. To implement dynamic access lists, you must configure the RADIUS server to support it. When the user authenticates, the RADIUS server sends a downloadable access list or access list name to the ASA. Access to a given service is either permitted or denied by the access list. The ASA deletes the access list when the authentication session expires.

TACACS+ Server Support

The ASA supports TACACS+ authentication with ASCII, PAP, CHAP, and MS-CHAPv1.

RSA/SDI Server Support

The RSA SecureID servers are also known as SDI servers.

This section contains the following topics:

- RSA/SDI Version Support, page 36-5
- Two-step Authentication Process, page 36-5
- SDI Primary and Replica Servers, page 36-6

RSA/SDI Version Support

The ASA supports SDI Version 5.0, 6.0, and 7.0. SDI uses the concepts of an SDI primary and SDI replica servers. Each primary and its replicas share a single node secret file. The node secret file has its name based on the hexadecimal value of the ACE/Server IP address with .sdi appended.

A version 5.0, 6.0, or 7.0 SDI server that you configure on the ASA can be either the primary or any one of the replicas. See the "SDI Primary and Replica Servers" section on page 36-6 for information about how the SDI agent selects servers to authenticate users.

Two-step Authentication Process

SDI version 5.0, 6.0, or 7.0 uses a two-step process to prevent an intruder from capturing information from an RSA SecurID authentication request and using it to authenticate to another server. The Agent first sends a lock request to the SecurID server before sending the user authentication request. The server locks the username, preventing another (replica) server from accepting it. This means that the same user cannot authenticate to two ASAs using the same authentication servers simultaneously. After a successful username lock, the ASA sends the passcode.

SDI Primary and Replica Servers

The ASA obtains the server list when the first user authenticates to the configured server, which can be either a primary or a replica. The ASA then assigns priorities to each of the servers on the list, and subsequent server selection derives at random from those assigned priorities. The highest priority servers have a higher likelihood of being selected.

NT Server Support

The ASA supports Microsoft Windows server operating systems that support NTLM version 1, collectively referred to as NT servers.

Note NT servers have a maximum length of 14 characters for user passwords. Longer passwords are truncated. This is a limitation of NTLM version 1.

Kerberos Server Support

The ASA supports 3DES, DES, and RC4 encryption types.

Note The ASA does not support changing user passwords during tunnel negotiation. To avoid this situation happening inadvertently, disable password expiration on the Kerberos/Active Directory server for users connecting to the ASA.

For a simple Kerberos server configuration example, see Example 36-2 on page 36-13.

LDAP Server Support

The ASA supports LDAP. For detailed information, see the “Configuring an LDAP Server” section on page 36-13.

SSO Support for Clientless SSL VPN with HTTP Forms

The ASA can use the HTTP Form protocol for single sign-on (SSO) authentication of Clientless SSL VPN users only. Single sign-on support lets Clientless SSL VPN users enter a username and password only once to access multiple protected services and Web servers. The Clientless SSL VPN server running on the ASA acts as a proxy for the user to the authenticating server. When a user logs in, the Clientless SSL VPN server sends an SSO authentication request, including username and password, to the authenticating server using HTTPS. If the server approves the authentication request, it returns an SSO authentication cookie to the Clientless SSL VPN server. The ASA keeps this cookie on behalf of the user and uses it to authenticate the user to secure websites within the domain protected by the SSO server.

In addition to the HTTP Form protocol, Clientless SSL VPN administrators can choose to configure SSO with the HTTP Basic and NTLM authentication protocols (the **auto-signon** command), or with Computer Associates eTrust SiteMinder SSO server (formerly Netegrity SiteMinder) as well. For an in-depth discussion of configuring SSO with either HTTP Forms, **auto-signon** or SiteMinder, see the Configuring Clientless SSL VPN chapter.

Local Database Support

The ASA maintains a local database that you can populate with user profiles.

This section contains the following topics:

- User Profiles, page 36-7
- Fallback Support, page 36-7

User Profiles

User profiles contain, at a minimum, a username. Typically, a password is assigned to each username, although passwords are optional.

The **username attributes** command lets you enter the username mode. In this mode, you can add other information to a specific user profile. The information you can add includes VPN-related attributes, such as a VPN session timeout value.

Fallback Support

The local database can act as a fallback method for several functions. This behavior is designed to help you prevent accidental lockout from the ASA.

For users who need fallback support, we recommend that their usernames and passwords in the local database match their usernames and passwords in the AAA servers. This provides transparent fallback support. Because the user cannot determine whether a AAA server or the local database is providing the service, using usernames and passwords on AAA servers that are different than the usernames and passwords in the local database means that the user cannot be certain which username and password should be given.

The local database supports the following fallback functions:

- **Console and enable password authentication**—When you use the **aaa authentication console** command, you can add the **LOCAL** keyword after the AAA server group tag. If the servers in the group all are unavailable, the ASA uses the local database to authenticate administrative access. This can include enable password authentication, too.
- **Command authorization**—When you use the **aaa authorization command** command, you can add the **LOCAL** keyword after the AAA server group tag. If the TACACS+ servers in the group all are unavailable, the local database is used to authorize commands based on privilege levels.
- **VPN authentication and authorization**—VPN authentication and authorization are supported to enable remote access to the ASA if AAA servers that normally support these VPN services are unavailable. The **authentication-server-group** command, available in tunnel-group general attributes mode, lets you specify the **LOCAL** keyword when you are configuring attributes of a tunnel group. When VPN client of an administrator specifies a tunnel group configured to fallback to the local database, the VPN tunnel can be established even if the AAA server group is unavailable, provided that the local database is configured with the necessary attributes.

Configuring the Local Database

This section describes how to manage users in the local database. You can use the local database for CLI access authentication, privileged mode authentication, command authorization, network access authentication, and VPN authentication and authorization. You cannot use the local database for network access authorization. The local database does not support accounting.

For multiple context mode, you can configure usernames in the system execution space to provide individual logins using the **login** command; however, you cannot configure any **aaa** commands in the system execution space.

To define a user account in the local database, perform the following steps:

Step 1 To create the user account, enter the following command:

```
hostname(config)# username name {nopassword | password password [mschap]} [privilege
priv_level]
```

where the *username* keyword is a string from 4 to 64 characters long.

The **password** *password* argument is a string from 3 to 16 characters long.

The **mschap** keyword specifies that the password is e converted to unicode and hashed using MD4 after you enter it. Use this keyword if users are authenticated using MSCHAPv1 or MSCHAPv2.

The **privilege** *level* argument sets the privilege level from 0 to 15. The default is 2. This privilege level is used with command authorization.

Caution If you do not use command authorization (the **aaa authorization command LOCAL** command), then the default level 2 allows management access to privileged EXEC mode. If you want to limit access to privileged EXEC mode, either set the privilege level to 0 or 1, or use the **service-type** command (see Step 4).

The **nopassword** keyword creates a user account with no password.

Note The **encrypted** and **nt-encrypted** keywords are typically for display only. When you define a password in the **username** command, the ASA encrypts it when it saves it to the configuration for security purposes. When you enter the **show running-config** command, the **username** command does not show the actual password; it shows the encrypted password followed by the **encrypted** or **nt-encrypted** keyword (when you specify **mschap**). For example, if you enter the password "test," the **show running-config** display would appear to be something like the following:

```
username pat password DLaUiAX3l78qgoB5c7iVNw== nt-encrypted
```

The only time you would actually enter the **encrypted** or **nt-encrypted** keyword at the CLI is if you are cutting and pasting a configuration to another ASA and you are using the same password.

Step 2 (Optional) To enforce user-specific access levels for users who authenticate for management access (see the **aaa authentication console LOCAL** command), enter the following command:

```
hostname(config)# aaa authorization exec authentication-server
```

This command enables management authorization for local users and for any users authenticated by RADIUS, LDAP, and TACACS+. See the "Limiting User CLI and ASDM Access with Management Authorization" section on page 37-7 for information about configuring a user on a AAA server to accommodate management authorization.

For a local user, configure the level of access using the **service-type** command as described in Step 4.

Step 3 (Optional) To configure username attributes, enter the following command:

```
hostname(config)# username username attributes
```

where the *username* argument is the username you created in Step 1.

Step 4 (Optional) If you configured management authorization in Step 2, enter the following command to configure the user level:

```
hostname(config-username)# service-type {admin | nas-prompt | remote-access}
```

where the **admin** keyword allows full access to any services specified by the **aaa authentication console LOCAL** commands. **admin** is the default.

The **nas-prompt** keyword allows access to the CLI when you configure the **aaa authentication** {**telnet | ssh | serial**} **console LOCAL** command, but denies ASDM configuration access if you configure the **aaa authentication http console LOCAL** command. ASDM monitoring access is allowed. If you configure enable authentication with the **aaa authentication enable console LOCAL** command, the user cannot access privileged EXEC mode using the **enable** command (or by using the **login** command).

The **remote-access** keyword denies management access. The user cannot use any services specified by the **aaa authentication console LOCAL** commands (excluding the **serial** keyword; serial access is allowed).

Step 5 (Optional) If you are using this username for VPN authentication, you can configure many VPN attributes for the user. See the "Configuring User Attributes" section on page 64-79.

For example, the following command assigns a privilege level of 15 to the admin user account:

```
hostname(config)# username admin password passw0rd privilege 15
```

The following command creates a user account with no password:

```
hostname(config)# username bcham34 nopassword
```

The following commands enable management authorization, creates a user account with a password, enters username attributes configuration mode, and specifies the service-type attribute:

```
hostname(config)# aaa authorization exec authentication-server
hostname(config)# username rwilliams password gOgeOus
hostname(config)# username rwilliams attributes
hostname(config-username)# service-type nas-prompt
```

Identifying AAA Server Groups and Servers

If you want to use an external AAA server for authentication, authorization, or accounting, you must first create at least one AAA server group per AAA protocol and add one or more servers to each group. You identify AAA server groups by name. Each server group is specific to one type of server: Kerberos, LDAP, NT, RADIUS, SDI, or TACACS+.

The ASA contacts the first server in the group. If that server is unavailable, the ASA contacts the next server in the group, if configured. If all servers in the group are unavailable, the ASA tries the local database if you configured it as a fallback method (management authentication and authorization only). If you do not have a fallback method, the ASA continues to try the AAA servers.

To illustrate further illustrate the distinction between no response and an authentication failure, consider this scenario:

> You configure an LDAP server group with two Active Directory servers, server 1 and server 2, in that order. When the remote user logs in, the adaptive security appliance attempts to authentication to server 1.
>
> If server 1 responds with an authentication failure (such as user not found), the adaptive security appliance does not attempt to authentication to server 2.
>
> If server 1 does not respond within the timeout period (or the number of authentication attempts exceeds the configured maximum), the adaptive security appliance tries server 2.
>
> If both servers in the group do not respond, and the adaptive security appliance is configured to fallback to the local database, the adaptive security appliance attempts the authenticate to the local database.

To create a server group and add AAA servers to it, follow these steps:

Step 1 For each AAA server group you need to create, follow these steps:

a. Identify the server group name and the protocol. To do so, enter the following command:

```
hostname(config)# aaa-server server_group protocol {kerberos | ldap | nt | radius |
sdi | tacacs+}
```

For example, to use RADIUS to authenticate network access and TACACS+ to authenticate CLI access, you need to create at least two server groups, one for RADIUS servers and one for TACACS+ servers.

You can have up to 100 single-mode server groups or 4 multiple-mode server groups. Each server group can have up to 16 servers in single mode or up to 4 servers in multiple mode.

When you enter a **aaa-server protocol** command, you enter group mode.

b. Merge a downloadable ACL with the ACL received in the Cisco AV pair from a RADIUS packet by entering the following command:

```
hostname(config-aaa-server-group)# merge-dacl {before-avpair | after-avpair}
```

The default setting is **no merge dacl**, which specifies that downloadable ACLs will not be merged with Cisco AV pair ACLs. If both an AV pair and a downloadable ACL are received, the AV pair has priority and is used.

The **before-avpair** option specifies that the downloadable ACL entries should be placed before the Cisco AV pair entries.

The **after-avpair** option specifies that the downloadable ACL entries should be placed after the Cisco AV pair entries. This option applies only to VPN connections. For VPN users, ACLs can be in the form of Cisco AV pair ACLs, downloadable ACLs, and an ACL that is configured on the ASA. This option determines whether or not the downloadable ACL and the AV pair ACL are merged, and does not apply to any ACLs configured on the ASA.

c. If you want to specify the maximum number of requests sent to a AAA server in the group before trying the next server, enter the following command:

```
hostname(config-aaa-server-group)# max-failed-attempts number
```

The *number* can be between 1 and 5. The default is 3.

If you configured a fallback method using the local database (for management access only; see the "Configuring AAA for System Administrators" section on page 37-5 and the "Configuring TACACS+ Command Authorization" section on page 37-14 to configure the fallback mechanism), and all the servers in the group fail to respond, then the group is considered to be unresponsive, and the fallback method is tried. The server group remains marked as unresponsive for a period of 10 minutes (by default) so that additional AAA requests within that period do not attempt to contact the server group, and the fallback method is used immediately. To change the unresponsive period from the default, see the **reactivation-mode** command in the following step.

If you do not have a fallback method, the ASA continues to retry the servers in the group.

d. If you want to specify the method (reactivation policy) by which failed servers in a group are reactivated, enter the following command:

```
hostname(config-aaa-server-group)# # reactivation-mode {depletion [deadtime minutes] |
timed}
```

Where the **depletion** keyword reactivates failed servers only after all of the servers in the group are inactive.

The **deadtime** *minutes* argument specifies the amount of time in minutes, between 0 and 1440, that elapses between the disabling of the last server in the group and the subsequent re-enabling of all servers. The default is 10 minutes.

The **timed** keyword reactivates failed servers after 30 seconds of down time.

e. If you want to send accounting messages to all servers in the group (RADIUS or TACACS+ only), enter the following command:

```
hostname(config-aaa-server-group)# accounting-mode simultaneous
```

To restore the default of sending messages only to the active server, enter the **accounting-mode single** command.

Step 2 For each AAA server on your network, follow these steps:

a. Identify the server, including the AAA server group it belongs to. To do so, enter the following command:

```
hostname(config)# aaa-server server_group (interface_name) host server_ip
```

When you enter a **aaa-server host** command, you enter host mode.

b. As needed, use host mode commands to further configure the AAA server.

The commands in host mode do not apply to all AAA server types. Table 36-2 lists the available commands, the server types they apply to, and whether a new AAA server definition has a default value for that command. Where a command is applicable to the server type you specified and no default value is provided (indicated by "—"), use the command to specify the value. For more information about these commands, see the *Cisco ASA 5500 Series Command Reference*.

Table 36-2 Host Mode Commands, Server Types, and Defaults

Command	Applicable AAA Server Types	Default Value
accounting-port	RADIUS	1646
acl-netmask-convert	RADIUS	standard
authentication-port	RADIUS	1645
kerberos-realm	Kerberos	—
key	RADIUS	—
	TACACS+	—
ldap-attribute-map	LDAP	—
ldap-base-dn	LDAP	—
ldap-login-dn	LDAP	—
ldap-login-password	LDAP	—
ldap-naming-attribute	LDAP	—
ldap-over-ssl	LDAP	—
ldap-scope	LDAP	—
maschapv2-capable	RADIUS	enabled
nt-auth-domain-controller	NT	—
radius-common-pw	RADIUS	—
retry-interval	Kerberos	10 seconds
	RADIUS	10 seconds
	SDI	10 seconds
sasl-mechanism	LDAP	—
server-port	Kerberos	88
	LDAP	389
	NT	139
	SDI	5500
	TACACS+	49
server-type	LDAP	auto-discovery
timeout	All	10 seconds

Example 36-1 shows commands that add one TACACS+ group with one primary and one backup server, one RADIUS group with a single server, and an NT domain server.

Example 36-1 Multiple AAA Server Groups and Servers

```
hostname(config)# aaa-server AuthInbound protocol tacacs+
hostname(config-aaa-server-group)# max-failed-attempts 2
hostname(config-aaa-server-group)# reactivation-mode depletion deadtime 20
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthInbound (inside) host 10.1.1.1
hostname(config-aaa-server-host)# key TACPlusUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# aaa-server AuthInbound (inside) host 10.1.1.2
hostname(config-aaa-server-host)# key TACPlusUauthKey2
hostname(config-aaa-server-host)# exit
hostname(config)# aaa-server AuthOutbound protocol radius
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthOutbound (inside) host 10.1.1.3
hostname(config-aaa-server-host)# key RadUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# aaa-server NTAuth protocol nt
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server NTAuth (inside) host 10.1.1.4
hostname(config-aaa-server-host)# nt-auth-domain-controller primary1
hostname(config-aaa-server-host)# exit
```

Example 36-2 shows commands that configure a Kerberos AAA server group named watchdogs, add a AAA server to the group, and define the Kerberos realm for the server. Because Example 36-2 does not define a retry interval or the port that the Kerberos server listens to, the ASA uses the default values for these two server-specific parameters. Table 36-2 lists the default values for all AAA server host mode commands.

Note Kerberos realm names use numbers and upper-case letters only. Although the ASA accepts lower-case letters for a realm name, it does not translate lower-case letters to upper-case letters. Be sure to use upper-case letters only.

Example 36-2 Kerberos Server Group and Server

```
hostname(config)# aaa-server watchdogs protocol kerberos
hostname(config-aaa-server-group)# aaa-server watchdogs host 192.168.3.4
hostname(config-aaa-server-host)# kerberos-realm EXAMPLE.COM
hostname(config-aaa-server-host)# exit
hostname(config)#
```

Configuring an LDAP Server

If you are introducing an ASA to an existing LDAP directory, your security policy will likely involve setting permissions/authorization entitlements for the VPN remote access policy user from that LDAP directory. You must create LDAP attribute maps that map your existing user-defined attribute names and values to Cisco attribute names and values, which are used for permission setting on the ASA. You can then bind these attribute maps to LDAP servers or remove them as needed. You can also show or clear attribute maps. This section describes using an LDAP directory with the ASA for user authentication and VPN authorization. This section includes the following topics:

- Authentication with LDAP, page 36-14
- Authorization with LDAP for VPN, page 36-15
- LDAP Attribute Mapping, page 36-16

For example configuration procedures used to set up LDAP authentication or authorization, see "Configuring an External LDAP Server" section on page D-3.

Authentication with LDAP

During authentication, the ASA acts as a client proxy to the LDAP server for the user, and authenticates to the LDAP server in either plain text or using the Simple Authentication and Security Layer (SASL) protocol. By default, the ASA passes authentication parameters, usually a username and password, to the LDAP server in plain text. Whether using SASL or plain text, you can secure the communications between the ASA and the LDAP server with SSL using the **ldap-over-ssl** command.

Note If you do not configure SASL, we strongly recommend that you secure LDAP communications with SSL. See the **ldap-over-ssl** command in the *Cisco ASA 5500 Series Command Reference*.

When user LDAP authentication has succeeded, the LDAP server returns the attributes for the authenticated user. For VPN authentication, these attributes generally include authorization data which is applied to the VPN session. Thus, using LDAP accomplishes authentication and authorization in a single step.

Securing LDAP Authentication with SASL

The ASA supports the following SASL mechanisms, listed in order of increasing strength:

- Digest-MD5 — The ASA responds to the LDAP server with an MD5 value computed from the username and password.
- Kerberos — The ASA responds to the LDAP server by sending the username and realm using the GSSAPI (Generic Security Services Application Programming Interface) Kerberos mechanism.

You can configure the ASA and LDAP server to support any combination of these SASL mechanisms. If you configure multiple mechanisms, the ASA retrieves the list of SASL mechanisms configured on the server and sets the authentication mechanism to the strongest mechanism configured on both the ASA and the server. For example, if both the LDAP server and the ASA support both mechanisms, the ASA selects Kerberos, the stronger of the mechanisms.

The following example configures the ASA for authentication to an LDAP directory server named ldap_dir_1 using the digest-MD5 SASL mechanism, and communicating over an SSL-secured connection:

```
hostname(config)# aaa-server ldap_dir_1 protocol ldap
hostname(config-aaa-server-group)# aaa-server ldap_dir_1 host 10.1.1.4
hostname(config-aaa-server-host)# sasl-mechanism digest-md5
hostname(config-aaa-server-host)# ldap-over-ssl enable
hostname(config-aaa-server-host)#
```

Setting the LDAP Server Type

The ASA supports LDAP version 3 and is compatible with the Sun Microsystems JAVA System Directory Server (formerly named the Sun ONE Directory Server), the Microsoft Active Directory, and other LDAPv3 directory servers.

By default, the ASA auto-detects whether it is connected to a Microsoft Active Directory, a Sun LDAP directory server, or a generic LDAPv3 directory server. However, if auto-detection fails to determine the LDAP server type, and you know the server is either a Microsoft, Sun or generic LDAP server, you can manually configure the server type using the keywords **sun**, **microsoft**, or **generic**. The following example sets the LDAP directory server ldap_dir_1 to the Sun Microsystems type:

```
hostname(config)# aaa-server ldap_dir_1 protocol ldap
hostname(config-aaa-server-group)# aaa-server ldap_dir_1 host 10.1.1.4
hostname(config-aaa-server-host)# server-type sun
hostname(config-aaa-server-host)#
```

Note

- Sun—The DN configured on the ASA to access a Sun directory server must be able to access the default password policy on that server. We recommend using the directory administrator, or a user with directory administrator privileges, as the DN. Alternatively, you can place an ACI on the default password policy.
- Microsoft—You must configure LDAP over SSL to enable password management with Microsoft Active Directory.
- Generic—The ASA does not support password management with a generic LDAPv3 directory server.

Authorization with LDAP for VPN

When user LDAP authentication for VPN access has succeeded, the ASA queries the LDAP server which returns LDAP attributes. These attributes generally include authorization data that applies to the VPN session. Thus, using LDAP accomplishes authentication and authorization in a single step.

There may be cases, however, where you require authorization from an LDAP directory server that is separate and distinct from the authentication mechanism. For example, if you use an SDI or certificate server for authentication, no authorization information is passed back. For user authorizations in this case, you can query an LDAP directory after successful authentication, accomplishing authentication and authorization in two steps.

To set up VPN user authorization using LDAP, you must first create a AAA server group and a tunnel group. You then associate the server and tunnel groups using the **tunnel-group general-attributes** command. While there are other authorization-related commands and options available for specific requirements, the following example shows fundamental commands for enabling user authorization with LDAP. This example then creates an IPsec remote access tunnel group named remote-1, and assigns that new tunnel group to the previously created ldap_dir_1 AAA server for authorization.

```
hostname(config)# tunnel-group remote-1 type ipsec-ra
hostname(config)# tunnel-group remote-1 general-attributes
hostname(config-general)# authorization-server-group ldap_dir_1
hostname(config-general)#
```

After you complete this fundamental configuration work, you can configure additional LDAP authorization parameters such as a directory password, a starting point for searching a directory, and the scope of a directory search:

```
hostname(config)# aaa-server ldap_dir_1 protocol ldap
hostname(config-aaa-server-group)# aaa-server ldap_dir_1 host 10.1.1.4
hostname(config-aaa-server-host)# ldap-login-dn obscurepassword
hostname(config-aaa-server-host)# ldap-base-dn starthere
hostname(config-aaa-server-host)# ldap-scope subtree
hostname(config-aaa-server-host)#
```

See LDAP commands in the *Cisco ASA 5500 Series Command Reference* for more information.

LDAP Attribute Mapping

If you are introducing a ASA to an existing LDAP directory, your existing LDAP attribute names and values are probably different from the existing ones. You must create LDAP attribute maps that map your existing user-defined attribute names and values to Cisco attribute names and values that are compatible with the ASA. You can then bind these attribute maps to LDAP servers or remove them as needed. You can also show or clear attribute maps.

Note To use the attribute mapping features correctly, you need to understand the Cisco LDAP attribute names and values as well as the user-defined attribute names and values.

The following command, entered in global configuration mode, creates an unpopulated LDAP attribute map table named att_map_1:

```
hostname(config)# ldap attribute-map att_map_1
hostname(config-ldap-attribute-map)#
```

The following commands map the user-defined attribute name department to the Cisco attribute name IETF-Radius-Class. The second command maps the user-defined attribute value Engineering to the user-defined attribute department and the Cisco-defined attribute value group1.

```
hostname(config)# ldap attribute-map att_map_1
hostname(config-ldap-attribute-map)# map-name department IETF-Radius-Class
hostname(config-ldap-attribute-map)# map-value department Engineering group1
hostname(config-ldap-attribute-map)#
```

The following commands bind the attribute map att_map_1 to the LDAP server ldap_dir_1:

```
hostname(config)# aaa-server ldap_dir_1 host 10.1.1.4
hostname(config-aaa-server-host)# ldap-attribute-map att_map_1
hostname(config-aaa-server-host)#
```

Note The command to create an attribute map (**ldap attribute-map**) and the command to bind it to an LDAP server (**ldap-attribute-map**) differ only by a hyphen and the mode.

The following commands display or clear all LDAP attribute maps in the running configuration:

```
hostname# show running-config all ldap attribute-map
hostname(config)# clear configuration ldap attribute-map
hostname(config)#
```

The names of frequently mapped Cisco LDAP attributes and the type of user-defined attributes they would commonly be mapped to include:

```
Group_Policy — Sets the group policy based on the directory’s departement or user group
(for example, Microsoft Active Directory memberOf) attribute value. The Group-Policy
attribute replaced the IETF-Radius-Class attribute with ASDM version 6.2/ASA version 8.2
or later.
IETF-Radius-Filter-Id — An access control list or ACL applied to VPN clients, IPsec, and
SSL
IETF-Radius-Framed-IP-Address — Assigns a static IP address to a VPN remote access client,
IPsec, and SSL
.Banner1 — Displays a text banner when the VPN remote access user logs in
Tunneling-Protocols — Allows or denies the VPN remote access session based on the access
type
```

Note A single ldapattribute map may contain one or many attributes. You can only assign one ldap attribute map to a specific LDAP server.

The following example shows how to limit management sessions to the ASA based on an LDAP attribute called accessType. The accessType attribute has three possible values:

- VPN
- admin
- helpdesk

Each value is mapped to one of the valid IETF RADIUS Service-Types that the ASA supports: remote-access (Service-Type 5) Outbound, admin (Service-Type 6) Administrative, and nas-prompt (Service-Type 7) NAS Prompt.

```
hostname(config)# ldap attribute-map MGMT
hostname(config-ldap-attribute-map)# map-name accessType IETF-Radius-Service-Type
hostname(config-ldap-attribute-map)# map-value accessType VPN 5
hostname(config-ldap-attribute-map)# map-value accessType admin 6
hostname(config-ldap-attribute-map)# map-value accessType helpdesk 7

hostname(config-ldap-attribute-map)# aaa-server LDAP protocol ldap
hostname(config-aaa-server-group)# aaa-server LDAP (inside) host 10.1.254.91
hostname(config-aaa-server-host)# ldap-base-dn CN=Users,DC=cisco,DC=local
hostname(config-aaa-server-host)# ldap-scope subtree
hostname(config-aaa-server-host)# ldap-login-password test
hostname(config-aaa-server-host)# ldap-login-dn
CN=Administrator,CN=Users,DC=cisco,DC=local
hostname(config-aaa-server-host)# server-type auto-detect
hostname(config-aaa-server-host)# ldap-attribute-map MGMT
```

For a list of Cisco LDAP attribute names and values, see "Configuring an External LDAP Server" section on page D-3. Alternatively, you can enter "?" within ldap-attribute-map mode to display the complete list of Cisco LDAP attribute names, as shown in the following example:

```
hostname(config)# ldap attribute-map att_map_1
hostname(config-ldap-attribute-map)# map-name att_map_1 ?

ldap mode commands/options:
cisco-attribute-names:
  Access-Hours
  Allow-Network-Extension-Mode
  Auth-Service-Type
  Authenticated-User-Idle-Timeout
  Authorization-Required
  Authorization-Type
    :
    :
  X509-Cert-Data
hostname(config-ldap-attribute-map)#
```

Using Certificates and User Login Credentials

The following section describes the different methods of using certificates and user login credentials (username and password) for authentication and authorization. This applies to both IPsec and Clientless SSL VPN.

In all cases, LDAP authorization does not use the password as a credential. RADIUS authorization uses either a common password for all users or the username as a password.

Using User Login Credentials

The default method for authentication and authorization uses the user login credentials.

- Authentication
  - Enabled by authentication server group setting
  - Uses the username and password as credentials
- Authorization
  - Enabled by authorization server group setting
  - Uses the username as a credential

Using certificates

If user digital certificates are configured, the security appliance first validates the certificate. It does not, however, use any of the DNs from the certificates as a username for the authentication.

If both authentication and authorization are enabled, the security appliance uses the user login credentials for both user authentication and authorization.

- Authentication
  - Enabled by authentication server group setting
  - Uses the username and password as credentials
- Authorization
  - Enabled by authorization server group setting
  - Uses the username as a credential

If authentication is disabled and authorization is enabled, the security appliance uses the primary DN field for authorization.

- Authentication
  - DISABLED (set to None) by authentication server group setting
  - No credentials used
- Authorization
  - Enabled by authorization server group setting
  - Uses the username value of the certificate primary DN field as a credential

Note If the primary DN field is not present in the certificate, the security appliance uses the secondary DN field value as the username for the authorization request.

For example, consider a user certificate that contains the following Subject DN fields and values:

`Cn=anyuser,OU=sales;O=XYZCorporation;L=boston;S=mass;C=us;ea=anyuser@example.com`.

If the Primary DN = EA (E-mail Address) and the Secondary DN = CN (Common Name), then the username used in the authorization request would be anyuser@example.com.

Differentiating User Roles Using AAA

This section includes the following topics:

- Using Local Authentication, page 36-19
- Using RADIUS Authentication, page 36-20
- Using LDAP Authentication, page 36-20
- Using TACACS+ Authentication, page 36-21

The ASA enables you to distinguish between administrative and remote-access users when they authenticate using RADIUS, LDAP, TACACS+, or the local user database. User role differentiation can prevent remote access VPN and network access users from establishing an administrative connection to the ASA.

To differentiate user roles, use the **service-type** attribute in username configuration mode. For RADIUS and LDAP (with the **ldap-attribute-map** command), you can use a Cisco Vendor-Specific Attribute (VSA), Cisco-Priv-Level, to assign a privilege level to an authenticated user.

Using Local Authentication

Before you configure the **service-type** attribute and privilege level when using local authentication, you must create a user, assign a password, and assign a privilege level. To do so, enter the following command:

```
hostname(config)# username admin password mysecret123 privilege 15
```

Where **mysecret123** is the stored password and 15 is the assigned privilege level, which indicates an admin user.

The available configuration options for the **service-type** attribute include the following:

- **admin**, in which users are allowed access to the configuration mode. This option also allows a user to connect via remote access.
- **nas-prompt**, in which users are allowed access to the EXEC mode.
- **remote-access**, in which users are allowed access to the network.

The following example designates a **service-type** of **admin** for a user named admin:

```
hostname(config)# username admin attributes
hostname(config-username)# service-type admin
```

The following example designates a **service-type** of **remote-access** for a user named ra-user:

```
hostname(config)# username ra-user attributes
hostname(config-username)# service-type remote-access
```

Using RADIUS Authentication

The RADIUS IETF **service-type** attribute, when sent in an access-accept message as the result of a RADIUS authentication and authorization request, is used to designate which type of service is granted to the authenticated user. The supported attribute values are the following: administrative(6), nas-prompt(7), Framed(2), and Login(1).

For more information about using RADIUS authentication, see the "Configuring an External RADIUS Server" section on page D-30. For more information about configuring RADIUS authentication for Cisco Secure ACS, see the Cisco Secure ACS documentation on Cisco.com.

The RADIUS Cisco VSA **privilege-level** attribute (Vendor ID 3076, sub-ID 220), when sent in an access-accept message, is used to designate the level of privilege for the user. For a list of supported RADIUS VSAs used for authorization, see the "Configuring an External RADIUS Server" section on page D-30.

Using LDAP Authentication

When users are authenticated through LDAP, the native LDAP attributes and their values can be mapped to Cisco ASA attributes to provide specific authorization features. For the supported list of LDAP VSAs used for authorization, see the "Configuring an External LDAP Server" section on page D-3.

You can use the LDAP attribute mapping feature for LDAP authorization. For examples of this feature, see the "Understanding Policy Enforcement of Permissions and Attributes" section on page D-2.

The following example shows how to define an LDAP attribute map. In this example, the security policy specifies that users being authenticated through LDAP map the user record fields or parameters title and company to the IETF-RADIUS service-type and privilege-level, respectively.

To define an LDAP attribute map, enter the following commands:

```
hostname(config)# ldap attribute-map admin-control
hostname(config-ldap-attribute-map)# map-name title IETF-RADIUS-Service-Type
hostname(config-ldap-attribute-map)# map-name company Privilege-Level
```

The following is sample output from the **ldap-attribute-map** command:

```
ldap attribute-map admin-control
    map-name company Privilege-Level
    map-name title IETF-Radius-Service-Type
```

To apply the LDAP attribute map to the LDAP AAA server, enter the following commands:

```
hostname(config)# aaa-server ldap-server (dmz1) host 10.20.30.1
hostname(config-aaa-server-host)# ldap-attribute-map admin-control
```

Note When an authenticated user tries administrative access to the ASA through ASDM, SSH, or Telnet, but does not have the appropriate privilege level to do so, the ASA generates syslog message 113021. This message informs the user that the attempted login failed because of inappropriate administrative privileges.

Using TACACS+ Authentication

For information about how to configure TACACS+ authentication, see the "Configuring an External TACACS+ Server" section on page D-39.

CHAPTER 37

Configuring Management Access

This chapter describes how to access the ASA for system management through Telnet, SSH, and HTTPS (using ASDM). It also describes how to authenticate and authorize users and how to create login banners.

This chapter includes the following sections:

- Allowing Telnet Access, page 37-1
- Allowing SSH Access, page 37-2
- Allowing HTTPS Access for ASDM, page 37-4
- Configuring Management Access Over a VPN Tunnel, page 37-5
- Configuring AAA for System Administrators, page 37-5
- Configuring a Login Banner, page 37-20

Note To access the ASA interface for management access, you do not also need an access list allowing the host IP address. You only need to configure management access according to the sections in this chapter.

Allowing Telnet Access

The ASA allows Telnet connections to the ASA for management purposes. You cannot use Telnet to the lowest security interface unless you use Telnet inside an IPSec tunnel.

The ASA allows a maximum of 5 concurrent Telnet connections per context, if available, with a maximum of 100 connections divided between all contexts. To gain access to the ASA console using Telnet, enter the username **asa** and the login password set by the **password** command or log in by using the **aaa authentication telnet console** command.

To configure Telnet access to the ASA, follow these steps:

Step 1 To identify the IP addresses from which the ASA accepts connections, enter the following command for each address or subnet:

```
hostname(config)# telnet source_IP_address mask source_interface
```

If there is only one interface, you can configure Telnet to access that interface as long as the interface has a security level of 100.

Step 2 (Optional) To set the duration for how long a Telnet session can be idle before the ASA disconnects the session, enter the following command:

```
hostname(config)# telnet timeout minutes
```

Set the timeout from 1 to 1440 minutes. The default is 5 minutes. The default duration is too short in most cases and should be increased until all pre-production testing and troubleshooting has been completed.

For example, to let a host on the inside interface with an address of 192.168.1.2 access the ASA, enter the following command:

```
hostname(config)# telnet 192.168.1.2 255.255.255.255 inside
hostname(config)# telnet timeout 30
```

To allow all users on the 192.168.3.0 network to access the ASA on the inside interface, enter the following command:

```
hostname(config)# telnet 192.168.3.0 255.255.255.0 inside
```

Allowing SSH Access

The ASA allows SSH connections to the ASA for management purposes. The ASA allows a maximum of 5 concurrent SSH connections per context, if available, with a maximum of 100 connections divided between all contexts.

SSH is an application running on top of a reliable transport layer, such as TCP/IP, that provides strong authentication and encryption capabilities. The ASA supports the SSH remote shell functionality provided in SSH Versions 1 and 2 and supports DES and 3DES ciphers.

To gain access to the ASA console using SSH, at the SSH client prompt, enter the username **asa** and the login password set by the **password** command or log in by using the **aaa authentication telnet console** command.

Note XML management over SSL and SSH are not supported.

This section includes the following topics:

- Configuring SSH Access, page 37-2
- Using an SSH Client, page 37-3

Configuring SSH Access

To configure SSH access to the ASA, follow these steps:

Step 1 To generate an RSA key pair, which is required for SSH, enter the following command:

```
hostname(config)# crypto key generate rsa modulus modulus_size
```

The modulus (in bits) is 512, 768, 1024, or 2048. The larger the key modulus size you specify, the longer it takes to generate an RSA. We recommend a value of 1024.

Step 2 To save the RSA keys to persistent Flash memory, enter the following command:

```
hostname(config)# write mem
```

Step 3 To identify the IP addresses from which the ASA accepts connections, enter the following command for each address or subnet:

```
hostname(config)# ssh source_IP_address mask source_interface
```

The ASA accepts SSH connections from all interfaces, including the one with the lowest security level.

Step 4 (Optional) To set the duration for how long an SSH session can be idle before the ASA disconnects the session, enter the following command:

```
hostname(config)# ssh timeout minutes
```

Set the timeout from 1 to 60 minutes. The default is 5 minutes. The default duration is too short in most cases and should be increased until all pre-production testing and troubleshooting has been completed.

For example, to generate RSA keys and let a host on the inside interface with an address of 192.168.1.2 access the ASA, enter the following command:

```
hostname(config)# crypto key generate rsa modulus 1024
hostname(config)# write mem
hostname(config)# ssh 192.168.1.2 255.255.255.255 inside
hostname(config)# ssh 192.168.1.2 255.255.255.255 inside
hostname(config)# ssh timeout 30
```

To allow all users on the 192.168.3.0 network to access the ASA on the inside interface, the following command:

```
hostname(config)# ssh 192.168.3.0 255.255.255.0 inside
```

By default SSH allows both version one and version two. To specify the version number enter the following command:

hostname(config)# **ssh version** `version_number`

The *version_number* can be *1* or *2*.

Using an SSH Client

To gain access to the ASA console using SSH, at the SSH client enter the username **asa** and enter the login password set by the **password** command (see the "Changing the Login Password" section on page 8-1).

When starting an SSH session, a dot (.) displays on the ASA console before the SSH user authentication prompt appears, as follows:

```
hostname(config)# .
```

The display of the dot does not affect the functionality of SSH. The dot appears at the console when generating a server key or decrypting a message using private keys during SSH key exchange before user authentication occurs. These tasks can take up to two minutes or longer. The dot is a progress indicator that verifies that the ASA is busy and has not hung.

Allowing HTTPS Access for ASDM

To use ASDM, you need to enable the HTTPS server, and allow HTTPS connections to the ASA. All of these tasks are completed if you use the **setup** command. This section describes how to manually configure ASDM access and how to login to ASDM.

The security appliance allows a maximum of 5 concurrent ASDM instances per context, if available, with a maximum of 32 ASDM instances between all contexts.

This section includes the following topics:

- Enabling HTTPS Access, page 37-4
- Accessing ASDM from Your PC, page 37-4

Enabling HTTPS Access

To configure ASDM access, follow these steps:

Step 1 To identify the IP addresses from which the ASA accepts HTTPS connections, enter the following command for each address or subnet:

```
hostname(config)# http source_IP_address mask source_interface
```

Step 2 To enable the HTTPS server, enter the following command:

```
hostname(config)# http server enable [port]
```

By default, the *port* is 443. If you change the port number, be sure to include the new port in the ASDM access URL. For example, if you change it to port 444, enter:

```
https://10.1.1.1:444
```

Step 3 To specify the location of the ASDM image, enter the following command:

```
hostname(config)# asdm image disk0:/asdmfile
```

For example, to enable the HTTPS server and let a host on the inside interface with an address of 192.168.1.2 access ASDM, enter the following commands:

```
hostname(config)# crypto key generate rsa modulus 1024
hostname(config)# write mem
hostname(config)# http server enable
hostname(config)# http 192.168.1.2 255.255.255.255 inside
```

To allow all users on the 192.168.3.0 network to access ASDM on the inside interface, enter the following command:

```
hostname(config)# http 192.168.3.0 255.255.255.0 inside
```

Accessing ASDM from Your PC

From a supported web browser on the ASA network, enter the following URL:

```
https://interface_ip_address[:port]
```

In transparent firewall mode, enter the management IP address.

Configuring Management Access Over a VPN Tunnel

If your VPN tunnel terminates on one interface, but you want to manage the ASA by accessing a different interface, you can identify that interface as a management-access interface. For example, if you enter the ASA from the outside interface, this feature lets you connect to the inside interface using ASDM, SSH, Telnet, or SNMP; or you can ping the inside interface when entering from the outside interface. Management access is available via the following VPN tunnel types: IPsec clients, IPsec LAN-to-LAN, and the AnyConnect SSL VPN client.

To specify an interface as a mangement-only interface, enter the following command:

```
hostname(config)# management access management_interface
```

where *management_interface* specifies the name of the management interface you want to access when entering the security appliance from another interface.

You can define only one management-access interface.

Configuring AAA for System Administrators

This section describes how to enable authentication and command authorization for system administrators. Before you configure AAA for system administrators, first configure the local database or AAA server according to Chapter 36, "AAA Server and Local Database Support."

This section includes the following topics:

- Configuring Authentication for CLI and ASDM Access, page 37-5
- Configuring Authentication To Access Privileged EXEC Mode (the enable Command), page 37-6
- Limiting User CLI and ASDM Access with Management Authorization, page 37-7
- Configuring Command Authorization, page 37-8
- Configuring Command Accounting, page 37-18
- Viewing the Current Logged-In User, page 37-18
- Recovering from a Lockout, page 37-19

Configuring Authentication for CLI and ASDM Access

If you enable CLI authentication, the ASA prompts you for your username and password to log in. After you enter your information, you have access to user EXEC mode.

To enter privileged EXEC mode, enter the **enable** command or the **login** command (if you are using the local database only).

If you configure **enable** authentication (see the "Configuring Authentication for the enable Command" section on page 37-6), the ASA prompts you for your username and password. If you do not configure **enable** authentication, enter the system enable password when you enter the **enable** command (set by the **enable password** command). However, if you do not use **enable** authentication, after you enter the **enable** command, you are no longer logged in as a particular user. To maintain your username, use **enable** authentication.

For authentication using the local database, you can use the **login** command, which maintains the username but requires no configuration to turn on authentication.

Note Before the ASA can authenticate a Telnet, SSH, or HTTP user, you must first configure access to the ASA using the **telnet**, **ssh**, and **http** commands. These commands identify the IP addresses that are allowed to communicate with the ASA.

To authenticate users who access the CLI, enter the following command:

```
hostname(config)# aaa authentication {telnet | ssh | http | serial} console {LOCAL |
server_group [LOCAL]}
```

The **http** keyword authenticates the ASDM client that accesses the ASA using HTTPS. You only need to configure HTTP authentication if you want to use a AAA server. By default, ASDM uses the local database for authentication even if you do not configure this command. HTTP management authentication does not support the SDI protocol for a AAA server group.

If you use a AAA server group for authentication, you can configure the ASA to use the local database as a fallback method if the AAA server is unavailable. Specify the server group name followed by **LOCAL** (**LOCAL** is case sensitive). We recommend that you use the same username and password in the local database as the AAA server because the ASA prompt does not give any indication which method is being used.

You can alternatively use the local database as your main method of authentication (with no fallback) by entering **LOCAL** alone.

Configuring Authentication To Access Privileged EXEC Mode (the enable Command)

You can configure the ASA to authenticate users with a AAA server or the local database when they enter the **enable** command. Alternatively, users are automatically authenticated with the local database when they enter the **login** command, which also accesses privileged EXEC mode depending on the user level in the local database.

This section includes the following topics:

- Configuring Authentication for the enable Command, page 37-6
- Authenticating Users Using the Login Command, page 37-7

Configuring Authentication for the enable Command

You can configure the ASA to authenticate users when they enter the **enable** command. If you do not authenticate the **enable** command, when you enter **enable**, the ASA prompts for the system enable password (set by the **enable password** command), and you are no longer logged in as a particular user. Applying authentication to the **enable** command maintains the username. This feature is particularly useful when you perform command authorization, where usernames are important to determine the commands a user can enter.

To authenticate users who enter the **enable** command, enter the following command:

```
hostname(config)# aaa authentication enable console {LOCAL | server_group [LOCAL]}
```

The user is prompted for the username and password.

If you use a AAA server group for authentication, you can configure the ASA to use the local database as a fallback method if the AAA server is unavailable. Specify the server group name followed by **LOCAL** (**LOCAL** is case sensitive). We recommend that you use the same username and password in the local database as the AAA server because the ASA prompt does not give any indication which method is being used.

You can alternatively use the local database as your main method of authentication (with no fallback) by entering **LOCAL** alone.

Authenticating Users Using the Login Command

From user EXEC mode, you can log in as any username in the local database using the **login** command.

This feature allows users to log in with their own username and password to access privileged EXEC mode, so you do not have to give out the system enable password to everyone. To allow users to access privileged EXEC mode (and all commands) when they log in, set the user privilege level to 2 (the default) through 15. If you configure local command authorization, then the user can only enter commands assigned to that privilege level or lower. See the "Configuring Local Command Authorization" section on page 37-11 for more information.

Caution If you add users to the local database who can gain access to the CLI and whom you do not want to enter privileged EXEC mode, you should configure command authorization. Without command authorization, users can access privileged EXEC mode (and all commands) at the CLI using their own password if their privilege level is 2 or greater (2 is the default). Alternatively, you can use a AAA server for authentication, or you can set all local users to level 1 so you can control who can use the system enable password to access privileged EXEC mode.

To log in as a user from the local database, enter the following command:

```
hostname> login
```

The ASA prompts for your username and password. After you enter your password, the ASA places you in the privilege level that the local database specifies.

Limiting User CLI and ASDM Access with Management Authorization

If you configure CLI or **enable** authentication, you can limit a local user, RADIUS, TACACS+, or LDAP user (if you map LDAP attributes to RADIUS attributes) from accessing the CLI, ASDM, or the **enable** command.

Note Serial access is not included in management authorization, so if you configure **aaa authentication serial console**, then any user who authenticates can access the console port.

To configure management authorization, perform the following steps:

Step 1 To enable management authorization, enter the following command:

```
hostname(config)# aaa authorization exec authentication-server
```

This command also enables support of administrative user privilege levels from RADIUS, which can be used in conjunction with local command privilege levels for command authorization. See the "Configuring Local Command Authorization" section on page 37-11 for more information.

Step 2 To configure the user for management authorization, see the following requirements for each AAA server type or local user:

- RADIUS or LDAP (mapped) users—Use the IETF RADIUS numeric Service-Type attribute which maps to one of the following values. (To map LDAP attributes, see the "LDAP Attribute Mapping" section on page 36-16.)
  - Service-Type 6 (Administrative)—Allows full access to any services specified by the **aaa authentication console** commands.
  - Service-Type 7 (NAS prompt)—Allows access to the CLI when you configure the **aaa authentication** {**telnet** | **ssh**} **console** command, but denies ASDM configuration access if you configure the **aaa authentication http console** command. ASDM monitoring access is allowed. If you configure **enable** authentication with the **aaa authentication enable console** command, the user cannot access privileged EXEC mode using the **enable** command.
  - Service-Type 5 (Outbound)—Denies management access. The user cannot use any services specified by the **aaa authentication console** commands (excluding the **serial** keyword; serial access is allowed). Remote access (IPSec and SSL) users can still authenticate and terminate their remote access sessions.
- TACACS+ users—Authorization is requested with the "service=shell" and the server responds with PASS or FAIL.
  - PASS, privilege level 1—Allows full access to any services specified by the **aaa authentication console** commands.
  - PASS, privilege level 2 and higher—Allows access to the CLI when you configure the **aaa authentication** {**telnet** | **ssh**} **console** command, but denies ASDM configuration access if you configure the **aaa authentication http console** command. ASDM monitoring access is allowed. If you configure **enable** authentication with the **aaa authentication enable console** command, the user cannot access privileged EXEC mode using the **enable** command.
  - FAIL—Denies management access. The user cannot use any services specified by the **aaa authentication console** commands (excluding the **serial** keyword; serial access is allowed).
- Local users—Set the **service-type** command. See the "Configuring the Local Database" section on page 36-8. By default, the **service-type** is **admin**, which allows full access to any services specified by the **aaa authentication console** commands.

Configuring Command Authorization

If you want to control the access to commands, the ASA lets you configure command authorization, where you can determine which commands that are available to a user. By default when you log in, you can access user EXEC mode, which offers only minimal commands. When you enter the **enable** command (or the **login** command when you use the local database), you can access privileged EXEC mode and advanced commands, including configuration commands.

This section includes the following topics:

- Command Authorization Overview, page 37-9
- Configuring Local Command Authorization, page 37-11

- Configuring TACACS+ Command Authorization, page 37-14

Command Authorization Overview

This section describes command authorization, and includes the following topics:

- Supported Command Authorization Methods, page 37-9
- About Preserving User Credentials, page 37-9
- Security Contexts and Command Authorization, page 37-10

Supported Command Authorization Methods

You can use one of two command authorization methods:

- Local privilege levels—Configure the command privilege levels on the ASA. When a local, RADIUS, or LDAP (if you map LDAP attributes to RADIUS attributes) user authenticates for CLI access, the ASA places that user in the privilege level that is defined by the local database, RADIUS, or LDAP server. The user can access commands at the user's privilege level and below. Note that all users access user EXEC mode when they first log in (commands at level 0 or 1). The user needs to authenticate again with the **enable** command to access privileged EXEC mode (commands at level 2 or higher), or they can log in with the **login** command (local database only).

Note You can use local command authorization without any users in the local database and without CLI or **enable** authentication. Instead, when you enter the **enable** command, you enter the system enable password, and the ASA places you in level 15. You can then create enable passwords for every level, so that when you enter **enable** *n* (2 to 15), the ASA places you in level *n*. These levels are not used unless you turn on local command authorization (see "Configuring Local Command Authorization" below). (See the *Cisco ASA 5500 Series Command Reference* for more information about **enable**.)

- TACACS+ server privilege levels—On the TACACS+ server, configure the commands that a user or group can use after they authenticate for CLI access. Every command that a user enters at the CLI is checked with the TACACS+ server.

About Preserving User Credentials

When a user logs into the ASA, they are required to provide a username and password for authentication. The ASA retains these session credentials in case further authentication is needed later in the session.

When the following configurations are in place, a user needs only to authenticate with the local server upon login. Subsequent serial authorization uses the saved credentials. The user is also prompted for the privilege level 15 password. When exiting privileged mode, the user is authenticated again. User credentials are not retained in privileged mode.

- Local server is configured to authenticate user access.
- Privilege level 15 command access is configured to require a password.
- User's account is configured for serial only authorization (no access to console or ASDM).
- User's account is configured for privilege level 15 command access.

The following table shows how credentials are used in this case by the ASA.

Credentials required	Username and Password Authentication	Serial Authorization	Privileged Mode Command Authorization	Privileged Mode Exit Authorization
Username	Yes	No	No	Yes
Password	Yes	No	No	Yes
Privileged Mode Password	No	No	Yes	No

Security Contexts and Command Authorization

The following are important points to consider when implementing command authorization with multiple security contexts:

- AAA settings are discrete per context, not shared between contexts.

  When configuring command authorization, you must configure each security context separately. This provides you the opportunity to enforce different command authorizations for different security contexts.

  When switching between security contexts, administrators should be aware that the commands permitted for the username specified when they login may be different in the new context session or that command authorization may not be configured at all in the new context. Failure to understand that command authorizations may differ between security contexts could confuse an administrator. This behavior is further complicated by the next point.

- New context sessions started with the **changeto** command always use the default "enable_15" username as the administrator identity, regardless of what username was used in the previous context session. This behavior can lead to confusion if command authorization is not configured for the enable_15 user or if authorizations are different for the enable_15 user than for the user in the previous context session.

  This behavior also affects command accounting, which is useful only if you can accurately associate each command that is issued with a particular administrator. Because all administrators with permission to use the **changeto** command can use the enable_15 username in other contexts, command accounting records may not readily identify who was logged in as the enable_15 username. If you use different accounting servers for each context, tracking who was using the enable_15 username requires correlating the data from several servers.

  When configuring command authorization, consider the following:

  - An administrator with permission to use the **changeto** command effectively has permission to use all commands permitted to the enable_15 user in each of the other contexts.
  - If you intend to authorize commands differently per context, ensure that in each context the enable_15 username is denied use of commands that are also denied to administrators who are permitted use of the **changeto** command.

  When switching between security contexts, administrators can exit privileged EXEC mode and enter the **enable** command again to use the username they need.

Note The system execution space does not support AAA commands; therefore, command authorization is not available in the system execution space.

Configuring Local Command Authorization

Local command authorization lets you assign commands to one of 16 privilege levels (0 to 15). By default, each command is assigned either to privilege level 0 or 15. You can define each user to be at a specific privilege level, and each user can enter any command at their privilege level or below. The ASA supports user privilege levels defined in the local database, a RADIUS server, or an LDAP server (if you map LDAP attributes to RADIUS attributes. See the "LDAP Attribute Mapping" section on page 36-16.)

This section includes the following topics:

- Local Command Authorization Prerequisites, page 37-11
- Default Command Privilege Levels, page 37-11
- Assigning Privilege Levels to Commands and Enabling Authorization, page 37-12
- Viewing Command Privilege Levels, page 37-13

Local Command Authorization Prerequisites

Complete the following tasks as part of your command authorization configuration:

- Configure **enable** authentication. (See the "Configuring Authentication To Access Privileged EXEC Mode (the enable Command)" section on page 37-6.)

  enable authentication is essential to maintain the username after the user accesses the **enable** command.

  Alternatively, you can use the **login** command (which is the same as the **enable** command with authentication; for the local database only), which requires no configuration. We do not recommend this option because it is not as secure as **enable** authentication.

  You can also use CLI authentication, but it is not required.

- See the following prerequisites for each user type:
  - Local database users—Configure each user in the local database at a privilege level from 0 to 15.

    To configure the local database, see the "Configuring the Local Database" section on page 36-8.
  - RADIUS users—Configure the user with Cisco VSA CVPN3000-Privilege-Level with a value between 0 and 15.
  - LDAP users—Configure the user with a privilege level between 0 and 15, and then map the LDAP attribute to Cisco VAS CVPN3000-Privilege-Level according to the "LDAP Attribute Mapping" section on page 36-16.

Default Command Privilege Levels

By default, the following commands are assigned to privilege level 0. All other commands are at level 15.

- **show checksum**
- **show curpriv**
- **enable**
- **help**
- **show history**
- **login**
- **logout**

- **pager**
- **show pager**
- **clear pager**
- **quit**
- **show version**

If you move any configure mode commands to a lower level than 15, be sure to move the **configure** command to that level as well, otherwise, the user will not be able to enter configuration mode.

To view all privilege levels, see the "Viewing Command Privilege Levels" section on page 37-13.

Assigning Privilege Levels to Commands and Enabling Authorization

To assign a command to a new privilege level, and enable authorization, follow these steps:

Step 1 To assign a command to a privilege level, enter the following command:

```
hostname(config)# privilege [show | clear | cmd] level level [mode {enable | cmd}] command
command
```

Repeat this command for each command you want to reassign.

See the following information about the options in this command:

- **show | clear | cmd**—These optional keywords let you set the privilege only for the show, clear, or configure form of the command. The configure form of the command is typically the form that causes a configuration change, either as the unmodified command (without the **show** or **clear** prefix) or as the **no** form. If you do not use one of these keywords, all forms of the command are affected.
- **level** *level*—A level between 0 and 15.
- **mode** {**enable | configure**}—If a command can be entered in user EXEC/privileged EXEC mode as well as configuration mode, and the command performs different actions in each mode, you can set the privilege level for these modes separately:
  - **enable**—Specifies both user EXEC mode and privileged EXEC mode.
  - **configure**—Specifies configuration mode, accessed using the **configure terminal** command.
- **command** *command*—The command you are configuring. You can only configure the privilege level of the *main* command. For example, you can configure the level of all **aaa** commands, but not the level of the **aaa authentication** command and the **aaa authorization** command separately.

Step 2 To support administrative user privilege levels from RADIUS, enter the following command:

```
hostname(config)# aaa authorization exec authentication-server
```

Without this command, the ASA only supports privilege levels for local database users and defaults all other types of users to level 15.

This command also enables management authorization for local, RADIUS, LDAP (mapped), and TACACS+ users. See the "Limiting User CLI and ASDM Access with Management Authorization" section on page 37-7 for more information.

Step 3 To enable the use of local command privilege levels, which can be checked against the privilege level of users in the local database, RADIUS server, or LDAP server (with mapped attributes), enter the following command:

```
hostname(config)# aaa authorization command LOCAL
```

When you set command privilege levels, command authorization does not take place unless you configure command authorization with this command.

For example, the **filter** command has the following forms:

- **filter** (represented by the **configure** option)
- **show running-config filter**
- **clear configure filter**

You can set the privilege level separately for each form, or set the same privilege level for all forms by omitting this option. For example, set each form separately as follows.

```
hostname(config)# privilege show level 5 command filter
hostname(config)# privilege clear level 10 command filter
hostname(config)# privilege cmd level 10 command filter
```

Alternatively, you can set all filter commands to the same level:

```
hostname(config)# privilege level 5 command filter
```

The **show privilege** command separates the forms in the display.

The following example shows the use of the **mode** keyword. The **enable** command must be entered from user EXEC mode, while the **enable password** command, which is accessible in configuration mode, requires the highest privilege level.

```
hostname(config)# privilege cmd level 0 mode enable command enable
hostname(config)# privilege cmd level 15 mode cmd command enable
hostname(config)# privilege show level 15 mode cmd command enable
```

This example shows an additional command, the **configure** command, that uses the **mode** keyword:

```
hostname(config)# privilege show level 5 mode cmd command configure
hostname(config)# privilege clear level 15 mode cmd command configure
hostname(config)# privilege cmd level 15 mode cmd command configure
hostname(config)# privilege cmd level 15 mode enable command configure
```

Note This last line is for the **configure terminal** command.

Viewing Command Privilege Levels

The following commands let you view privilege levels for commands.

- To show all commands, enter the following command:

  ```
  hostname(config)# show running-config all privilege all
  ```

- To show commands for a specific level, enter the following command:

  ```
  hostname(config)# show running-config privilege level level
  ```

  The *level* is an integer between 0 and 15.

- To show the level of a specific command, enter the following command:

  ```
  hostname(config)# show running-config privilege command command
  ```

For example, for the **show running-config all privilege all** command, the system displays the current assignment of each CLI command to a privilege level. The following is sample output from the command.

```
hostname(config)# show running-config all privilege all
privilege show level 15 command aaa
privilege clear level 15 command aaa
privilege configure level 15 command aaa
privilege show level 15 command aaa-server
privilege clear level 15 command aaa-server
privilege configure level 15 command aaa-server
privilege show level 15 command access-group
privilege clear level 15 command access-group
privilege configure level 15 command access-group
privilege show level 15 command access-list
privilege clear level 15 command access-list
privilege configure level 15 command access-list
privilege show level 15 command activation-key
privilege configure level 15 command activation-key
....
```

The following command displays the command assignments for privilege level 10:

```
hostname(config)# show running-config privilege level 10
privilege show level 10 command aaa
```

The following command displays the command assignment for the **access-list** command:

```
hostname(config)# show running-config privilege command access-list
privilege show level 15 command access-list
privilege clear level 15 command access-list
privilege configure level 15 command access-list
```

Configuring TACACS+ Command Authorization

If you enable TACACS+ command authorization, and a user enters a command at the CLI, the ASA sends the command and username to the TACACS+ server to determine if the command is authorized.

When configuring command authorization with a TACACS+ server, do not save your configuration until you are sure it works the way you want. If you get locked out because of a mistake, you can usually recover access by restarting the ASA. If you still get locked out, see the "Recovering from a Lockout" section on page 37-19.

Be sure that your TACACS+ system is completely stable and reliable. The necessary level of reliability typically requires that you have a fully redundant TACACS+ server system and fully redundant connectivity to the ASA. For example, in your TACACS+ server pool, include one server connected to interface 1, and another to interface 2. You can also configure local command authorization as a fallback method if the TACACS+ server is unavailable. In this case, you need to configure local users and command privilege levels according to the "Configuring Command Authorization" section on page 37-8.

This section includes the following topics:

- TACACS+ Command Authorization Prerequisites, page 37-14
- Configuring Commands on the TACACS+ Server, page 37-15
- Enabling TACACS+ Command Authorization, page 37-17

TACACS+ Command Authorization Prerequisites

Complete the following tasks as part of your command authorization configuration:

- Configure CLI authentication (see the "Configuring Local Command Authorization" section on page 37-11).

- Configure **enable** authentication (see the "Configuring Authentication To Access Privileged EXEC Mode (the enable Command)" section on page 37-6).

Configuring Commands on the TACACS+ Server

You can configure commands on a Cisco Secure Access Control Server (ACS) TACACS+ server as a shared profile component, for a group, or for individual users. For third-party TACACS+ servers, see your server documentation for more information about command authorization support.

See the following guidelines for configuring commands in Cisco Secure ACS Version 3.1; many of these guidelines also apply to third-party servers:

- The ASA sends the commands to be authorized as "shell" commands, so configure the commands on the TACACS+ server as shell commands.

Note Cisco Secure ACS might include a command type called "pix-shell." Do not use this type for ASA command authorization.

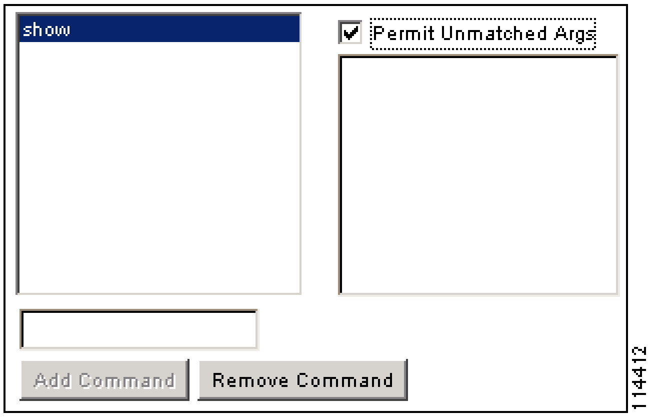
- The first word of the command is considered to be the main command. All additional words are considered to be arguments, which need to be preceded by **permit** or **deny**.

  For example, to allow the **show running-configuration aaa-server** command, add **show running-configuration** to the command box, and type **permit aaa-server** in the arguments box.

- You can permit all arguments of a command that you do not explicitly deny by selecting the **Permit Unmatched Args** check box.

  For example, you can configure just the **show** command, and then all the **show** commands are allowed. We recommend using this method so that you do not have to anticipate every variant of a command, including abbreviations and **?**, which shows CLI usage (see Figure 37-1).

Figure 37-1 Permitting All Related Commands

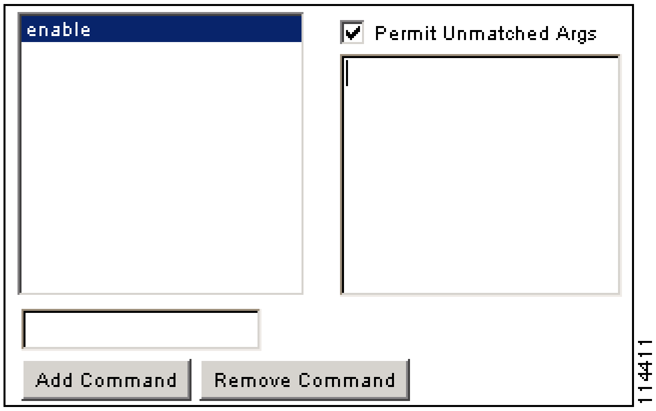


show

☑ Permit Unmatched Args

- For commands that are a single word, you *must* permit unmatched arguments, even if there are no arguments for the command, for example **enable** or **help** (see Figure 37-2).

Figure 37-2 Permitting Single Word Commands



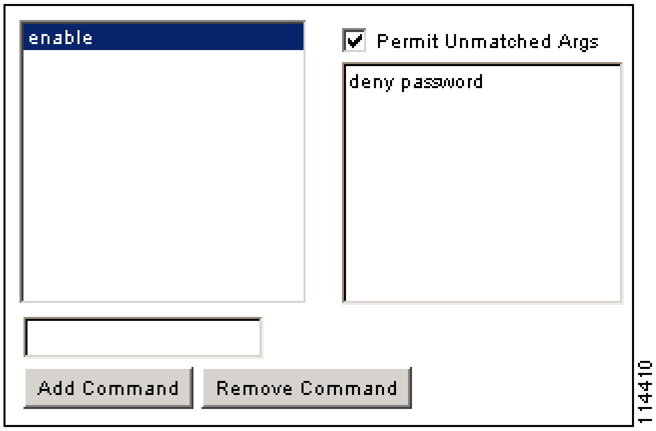
enable

☑ Permit Unmatched Args

- To disallow some arguments, enter the arguments preceded by **deny**.

  For example, to allow **enable**, but not **enable password**, enter **enable** in the commands box, and **deny password** in the arguments box. Be sure to select the Permit Unmatched Args check box so that **enable** alone is still allowed (see Figure 37-3).

Figure 37-3 Disallowing Arguments



enable

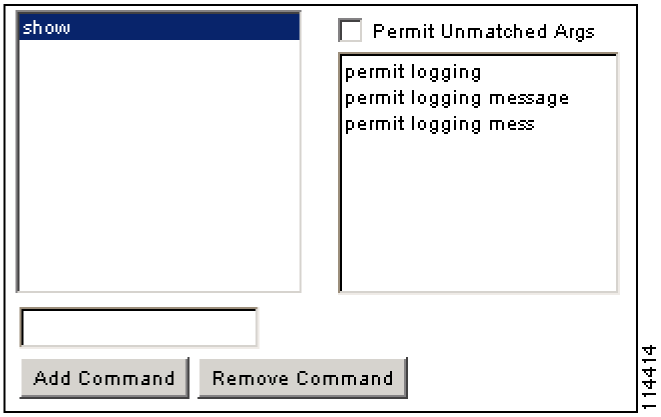
☑ Permit Unmatched Args

deny password

- When you abbreviate a command at the command line, the ASA expands the prefix and main command to the full text, but it sends additional arguments to the TACACS+ server as you enter them.

  For example, if you enter **sh log**, then the ASA sends the entire command to the TACACS+ server, **show logging**. However, if you enter **sh log mess**, then the ASA sends **show logging mess** to the TACACS+ server, and not the expanded command **show logging message**. You can configure multiple spellings of the same argument to anticipate abbreviations (see Figure 37-4).

Figure 37-4 Specifying Abbreviations



permit logging
permit logging message
permit logging mess

- We recommend that you allow the following basic commands for all users:
  - **show checksum**
  - **show curpriv**
  - **enable**
  - **help**
  - **show history**
  - **login**
  - **logout**
  - **pager**
  - **show pager**
  - **clear pager**
  - **quit**
  - **show version**

Enabling TACACS+ Command Authorization

Before you enable TACACS+ command authorization, be sure that you are logged into the ASA as a user that is defined on the TACACS+ server, and that you have the necessary command authorization to continue configuring the ASA. For example, you should log in as an admin user with all commands authorized. Otherwise, you could become unintentionally locked out.

To perform command authorization using a TACACS+ server, enter the following command:

```
hostname(config)# aaa authorization command tacacs+_server_group [LOCAL]
```

You can configure the ASA to use the local database as a fallback method if the TACACS+ server is unavailable. To enable fallback, specify the server group name followed by **LOCAL** (**LOCAL** is case sensitive). We recommend that you use the same username and password in the local database as the TACACS+ server because the ASA prompt does not give any indication which method is being used. Be sure to configure users in the local database (see the "Configuring Command Authorization" section on page 37-8) and command privilege levels (see the "Configuring Local Command Authorization" section on page 37-11).

Configuring Command Accounting

You can send accounting messages to the TACACS+ accounting server when you enter any command other than **show** commands at the CLI. If you customize the command privilege level using the **privilege** command (see the "Assigning Privilege Levels to Commands and Enabling Authorization" section on page 37-12), you can limit which commands the ASA accounts for by specifying a minimum privilege level. The ASA does not account for commands that are below the minimum privilege level.

To enable command accounting, enter the following command:

```
hostname(config)# aaa accounting command [privilege level] server-tag
```

Where *level* is the minimum privilege level and *server-tag* is the name of the TACACS+ server group that to which the ASA should send command accounting messages. The TACACS+ server group configuration must already exist. For information about configuring a AAA server group, see the "Identifying AAA Server Groups and Servers" section on page 36-9.

Viewing the Current Logged-In User

To view the current logged-in user, enter the following command:

```
hostname# show curpriv
```

See the following sample **show curpriv** command output. A description of each field follows.

```
hostname# show curpriv
Username : admin
Current privilege level : 15
Current Mode/s : P_PRIV
```

Table 37-1 describes the **show curpriv** command output.

Table 37-1 show curpriv Display Description

Field	Description
Username	Username. If you are logged in as the default user, the name is enable_1 (user EXEC) or enable_15 (privileged EXEC).
Current privilege level	Level from 0 to 15. Unless you configure local command authorization and assign commands to intermediate privilege levels, levels 0 and 15 are the only levels that are used.
Current Mode/s	Shows the access modes: • P_UNPR—User EXEC mode (levels 0 and 1) • P_PRIV—Privileged EXEC mode (levels 2 to 15) • P_CONF—Configuration mode

Recovering from a Lockout

In some circumstances, when you turn on command authorization or CLI authentication, you can be locked out of the ASA CLI. You can usually recover access by restarting the ASA. However, if you already saved your configuration, you might be locked out. Table 37-2 lists the common lockout conditions and how you might recover from them.

Table 37-2 CLI Authentication and Command Authorization Lockout Scenarios

Feature	Lockout Condition	Description	Workaround: Single Mode	Workaround: Multiple Mode
Local CLI authentication	No users in the local database	If you have no users in the local database, you cannot log in, and you cannot add any users.	Log in and reset the passwords and **aaa** commands.	Session into the ASA from the switch. From the system execution space, you can change to the context and add a user.
TACACS+ command authorization TACACS+ CLI authentication RADIUS CLI authentication	Server down or unreachable and you do not have the fallback method configured	If the server is unreachable, then you cannot log in or enter any commands.	1. Log in and reset the passwords and AAA commands. 2. Configure the local database as a fallback method so you do not get locked out when the server is down.	1. If the server is unreachable because the network configuration is incorrect on the ASA, session into the ASA from the switch. From the system execution space, you can change to the context and reconfigure your network settings. 2. Configure the local database as a fallback method so you do not get locked out when the server is down.
TACACS+ command authorization	You are logged in as a user without enough privileges or as a user that does not exist	You enable command authorization, but then find that the user cannot enter any more commands.	Fix the TACACS+ server user account. If you do not have access to the TACACS+ server and you need to configure the ASA immediately, then log into the maintenance partition and reset the passwords and **aaa** commands.	Session into the ASA from the switch. From the system execution space, you can change to the context and complete the configuration changes. You can also disable command authorization until you fix the TACACS+ configuration.
Local command authorization	You are logged in as a user without enough privileges	You enable command authorization, but then find that the user cannot enter any more commands.	Log in and reset the passwords and **aaa** commands.	Session into the ASA from the switch. From the system execution space, you can change to the context and change the user level.

Configuring a Login Banner

You can configure a message to display when a user connects to the ASA, before a user logs in, or before a user enters privileged EXEC mode.

To configure a login banner, enter the following command in the system execution space or within a context:

```
hostname(config)# banner {exec | login | motd} text
```

Adds a banner to display at one of three times: when a user first connects (message-of-the-day (**motd**)), when a user logs in (**login**), and when a user accesses privileged EXEC mode (**exec**). When a user connects to the ASA, the message-of-the-day banner appears first, followed by the login banner and prompts. After the user successfully logs in to the ASA, the exec banner displays.

For the banner text, spaces are allowed but tabs cannot be entered using the CLI. You can dynamically add the hostname or domain name of the ASA by including the strings **$(hostname)** and **$(domain)**. If you configure a banner in the system configuration, you can use that banner text within a context by using the **$(system)** string in the context configuration.

To add more than one line, precede each line by the **banner** command.

For example, to add a message-of-the-day banner, enter:

```
hostname(config)# banner motd Welcome to $(hostname).
hostname(config)# banner motd Contact me at admin@example.com for any
hostname(config)# banner motd issues.
```

CHAPTER 38

Applying AAA for Network Access

This chapter describes how to enable AAA (pronounced "triple A") for network access.

For information about AAA for management access, see the "Configuring AAA for System Administrators" section on page 37-5.

This chapter includes the following sections:

- AAA Performance, page 38-1
- Configuring Authentication for Network Access, page 38-1
- Configuring Authorization for Network Access, page 38-8
- Configuring Accounting for Network Access, page 38-14
- Using MAC Addresses to Exempt Traffic from Authentication and Authorization, page 38-15

AAA Performance

The ASA uses "cut-through proxy" to significantly improve performance compared to a traditional proxy server. The performance of a traditional proxy server suffers because it analyzes every packet at the application layer of the OSI model. The ASA cut-through proxy challenges a user initially at the application layer and then authenticates against standard AAA servers or the local database. After the ASA authenticates the user, it shifts the session flow, and all traffic flows directly and quickly between the source and destination while maintaining session state information.

Configuring Authentication for Network Access

This section includes the following topics:

- Authentication Overview, page 38-2
- Enabling Network Access Authentication, page 38-3
- Enabling Secure Authentication of Web Clients, page 38-5
- Authenticating Directly with the Security Appliance, page 38-6

Authentication Overview

The ASA lets you configure network access authentication using AAA servers. This section includes the following topics:

- One-Time Authentication, page 38-2
- Applications Required to Receive an Authentication Challenge, page 38-2
- Security Appliance Authentication Prompts, page 38-2
- Static PAT and HTTP, page 38-3
- Enabling Network Access Authentication, page 38-3

One-Time Authentication

A user at a given IP address only needs to authenticate one time for all rules and types, until the authentication session expires. (See the **timeout uauth** command in the *Cisco ASA 5500 Series Command Reference* for timeout values.) For example, if you configure the ASA to authenticate Telnet and FTP, and a user first successfully authenticates for Telnet, then as long as the authentication session exists, the user does not also have to authenticate for FTP.

Applications Required to Receive an Authentication Challenge

Although you can configure the ASA to require authentication for network access to any protocol or service, users can authenticate directly with HTTP, HTTPS, Telnet, or FTP only. A user must first authenticate with one of these services before the ASA allows other traffic requiring authentication.

The authentication ports that the ASA supports for AAA are fixed:

- Port 21 for FTP
- Port 23 for Telnet
- Port 80 for HTTP
- Port 443 for HTTPS

Security Appliance Authentication Prompts

For Telnet and FTP, the ASA generates an authentication prompt.

For HTTP, the ASA uses basic HTTP authentication by default, and provides an authentication prompt. You can optionally configure the ASA to redirect users to an internal web page where they can enter their username and password (configured with the **aaa authentication listener** command).

For HTTPS, the ASA generates a custom login screen. You can optionally configure the ASA to redirect users to an internal web page where they can enter their username and password (configured with the **aaa authentication listener** command).

Redirection is an improvement over the basic method because it provides an improved user experience when authenticating, and an identical user experience for HTTP and HTTPS in both Easy VPN and firewall modes. It also supports authenticating directly with the ASA.

You might want to continue to use basic HTTP authentication if: you do not want the ASA to open listening ports; if you use NAT on a router and you do not want to create a translation rule for the web page served by the ASA; basic HTTP authentication might work better with your network. For example non-browser applications, like when a URL is embedded in email, might be more compatible with basic authentication.

After you authenticate correctly, the ASA redirects you to your original destination. If the destination server also has its own authentication, the user enters another username and password. If you use basic HTTP authentication and need to enter another username and password for the destination server, then you need to configure the **virtual http** command.

Note If you use HTTP authentication, by default the username and password are sent from the client to the ASA in clear text; in addition, the username and password are sent on to the destination web server as well. See the "Enabling Secure Authentication of Web Clients" section on page 38-5 for information to secure your credentials.

For FTP, a user has the option of entering the ASA username followed by an at sign (@) and then the FTP username (name1@name2). For the password, the user enters the ASA password followed by an at sign (@) and then the FTP password (password1@password2). For example, enter the following text.

```
name> jamiec@patm
password> letmein@he110
```

This feature is useful when you have cascaded firewalls that require multiple logins. You can separate several names and passwords by multiple at signs (@).

Static PAT and HTTP

For HTTP authentication, the ASA checks real ports when static PAT is configured. If it detects traffic destined for real port 80, regardless of the mapped port, the ASA intercepts the HTTP connection and enforces authentication.

For example, assume that outside TCP port 889 is translated to port 80 (www) and that any relevant access lists permit the traffic:

```
static (inside,outside) tcp 10.48.66.155 889 192.168.123.10 www netmask 255.255.255.255
```

Then when users try to access 10.48.66.155 on port 889, the ASA intercepts the traffic and enforces HTTP authentication. Users see the HTTP authentication page in their web browsers before the ASA allows HTTP connection to complete.

If the local port is different than port 80, as in the following example:

```
static (inside,outside) tcp 10.48.66.155 889 192.168.123.10 111 netmask 255.255.255.255
```

Then users do not see the authentication page. Instead, the ASA sends to the web browser an error message indicating that the user must be authenticated prior using the requested service.

Enabling Network Access Authentication

To enable network access authentication, perform the following steps:

Step 1 Using the **aaa-server** command, identify your AAA servers. If you have already identified your AAA servers, continue to the next step.

For more information about identifying AAA servers, see the "Identifying AAA Server Groups and Servers" section on page 36-9.

Step 2 Using the **access-list** command, create an access list that identifies the source addresses and destination addresses of traffic you want to authenticate. For steps, see Chapter 11, "Adding an Extended Access List."

The **permit** ACEs mark matching traffic for authentication, while **deny** entries exclude matching traffic from authentication. Be sure to include the destination ports for either HTTP, HTTPS, Telnet, or FTP in the access list because the user must authenticate with one of these services before other services are allowed through the ASA.

Step 3 To configure authentication, enter the following command:

```
hostname(config)# aaa authentication match acl_name interface_name server_group
```

Where *acl_name* is the name of the access list you created in Step 2, *interface_name* is the name of the interface as specified with the **nameif** command, and *server_group* is the AAA server group you created in Step 1.

Note You can alternatively use the **aaa authentication include** command (which identifies traffic within the command). However, you cannot use both methods in the same configuration. See the *Cisco ASA 5500 Series Command Reference* for more information.

Step 4 (Optional) To enable the redirection method of authentication for HTTP or HTTPS connections, enter the following command:

```
hostname(config)# aaa authentication listener http[s] interface_name [port portnum]
redirect
```

where the *interface_name* argument is the interface on which you want to enable listening ports.

The **port** *portnum* argument specifies the port number that the ASA listens on; the defaults are 80 (HTTP) and 443 (HTTPS). You can use any port number and retain the same functionality, but be sure your direct authentication users know the port number; redirected traffic is sent to the correct port number automatically, but direct authenticators must specify the port number manually.

Enter this command separately for HTTP and for HTTPS.

Step 5 (Optional) If you are using the local database for network access authentication and you want to limit the number of consecutive failed login attempts that the ASA allows any given user account (with the exception of users with a privilege level of 15; this feature does not affect level 15 users), use the following command:

```
hostname(config)# aaa local authentication attempts max-fail number
```

Where number is between 1 and 16.

For example:

```
hostname(config)# aaa local authentication attempts max-fail 7
```

Tip To clear the lockout status of a specific user or all users, use the **clear aaa local user lockout** command.

For example, the following commands authenticate all inside HTTP traffic and SMTP traffic:

```
hostname(config)# aaa-server AuthOutbound protocol tacacs+
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthOutbound (inside) host 10.1.1.1
hostname(config-aaa-server-host)# key TACPlusUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# access-list MAIL_AUTH extended permit tcp any any eq smtp
hostname(config)# access-list MAIL_AUTH extended permit tcp any any eq www
hostname(config)# aaa authentication match MAIL_AUTH inside AuthOutbound
hostname(config)# aaa authentication listener http inside redirect
```

The following commands authenticate Telnet traffic from the outside interface to a particular server (209.165.201.5):

```
hostname(config)# aaa-server AuthInbound protocol tacacs+
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthInbound (inside) host 10.1.1.1
hostname(config-aaa-server-host)# key TACPlusUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# access-list TELNET_AUTH extended permit tcp any host 209.165.201.5 eq
telnet
hostname(config)# aaa authentication match TELNET_AUTH outside AuthInbound
```

Enabling Secure Authentication of Web Clients

If you use HTTP authentication, by default the username and password are sent from the client to the ASA in clear text; in addition, the username and password are sent on to the destination web server as well. The ASA provides several methods of securing HTTP authentication:

- Enable the redirection method of authentication for HTTP—Use the **aaa authentication listener** command with the **redirect** keyword. This method prevents the authentication credentials from continuing to the destination server. See the "Security Appliance Authentication Prompts" section on page 38-2 for more information about the redirection method versus the basic method.
- Enable virtual HTTP—Use the **virtual http** command to let you authenticate separately with the security appliance and with the HTTP server. Even if the HTTP server does not need a second authentication, this command achieves the effect of stripping the basic authentication credentials from the HTTP GET request.
- Enable the exchange of usernames and passwords between a web client and the ASA with HTTPS—Use the **aaa authentication secure-http-client** command to enable the exchange of usernames and passwords between a web client and the ASA with HTTPS. This is the only method that protects credentials between the client and the ASA, as well as between the ASA and the destination server. You can use this method alone, or in conjunction with either of the other methods so you can maximize your security.

  After enabling this feature, when a user requires authentication when using HTTP, the ASA redirects the HTTP user to an HTTPS prompt. After you authenticate correctly, the ASA redirects you to the original HTTP URL.

  Secured web-client authentication has the following limitations:

  - A maximum of 16 concurrent HTTPS authentication sessions are allowed. If all 16 HTTPS authentication processes are running, a new connection requiring authentication will not succeed.
  - When **uauth timeout 0** is configured (the **uauth timeout** is set to 0), HTTPS authentication might not work. If a browser initiates multiple TCP connections to load a web page after HTTPS authentication, the first connection is let through, but the subsequent connections trigger authentication. As a result, users are continuously presented with an authentication page, even

if the correct username and password are entered each time. To work around this, set the **uauth timeout** to 1 second with the **timeout uauth 0:0:1** command. However, this workaround opens a 1-second window of opportunity that might allow non-authenticated users to go through the firewall if they are coming from the same source IP address.

- Because HTTPS authentication occurs on the SSL port 443, users must not configure an **access-list** command statement to block traffic from the HTTP client to HTTP server on port 443. Furthermore, if static PAT is configured for web traffic on port 80, it must also be configured for the SSL port. In the following example, the first line configures static PAT for web traffic and the second line must be added to support the HTTPS authentication configuration.

```
static (inside,outside) tcp 10.132.16.200 www 10.130.16.10 www
static (inside,outside) tcp 10.132.16.200 443 10.130.16.10 443
```

Authenticating Directly with the Security Appliance

If you do not want to allow HTTP, HTTPS, Telnet, or FTP through the ASA but want to authenticate other types of traffic, you can authenticate with the ASA directly using HTTP, HTTPS, or Telnet.

This section includes the following topics:

- Enabling Direct Authentication Using HTTP and HTTPS, page 38-6
- Enabling Direct Authentication Using Telnet, page 38-7

Enabling Direct Authentication Using HTTP and HTTPS

If you enabled the redirect method of HTTP and HTTPS authentication in the “Enabling Network Access Authentication” section on page 38-3, then you also automatically enabled direct authentication.

If you want to continue to use basic HTTP authentication, but want to enable direct authentication for HTTP and HTTPS, then enter the following command:

```
hostname(config)# aaa authentication listener http[s] interface_name [port portnum]
```

where the *interface_name* argument is the interface on which you want to enable direct authentication.

The **port** *portnum* argument specifies the port number that the ASA listens on; the defaults are 80 (HTTP) and 443 (HTTPS).

Enter this command separately for HTTP and for HTTPS.

If the destination HTTP server requires authentication in addition to the ASA, then the **virtual http** command lets you authenticate separately with the ASA (via a AAA server) and with the HTTP server. Without virtual HTTP, the same username and password you used to authenticate with the ASA is sent to the HTTP server; you are not prompted separately for the HTTP server username and password. Assuming the username and password is not the same for the AAA and HTTP servers, then the HTTP authentication fails.

This command redirects all HTTP connections that require AAA authentication to the virtual HTTP server on the ASA. The ASA prompts for the AAA server username and password. After the AAA server authenticates the user, the ASA redirects the HTTP connection back to the original server, but it does not include the AAA server username and password. Because the username and password are not included in the HTTP packet, the HTTP server prompts the user separately for the HTTP server username and password.

For inbound users (from lower security to higher security), you must also include the virtual HTTP address as a destination interface in the access list applied to the source interface. Moreover, you must add a **static** command for the virtual HTTP IP address, even if NAT is not required (using the **no nat-control** command). An identity NAT command is typically used (where you translate the address to itself).

For outbound users, there is an explicit permit for traffic, but if you apply an access list to an inside interface, be sure to allow access to the virtual HTTP address. A **static** statement is not required.

Note Do not set the **timeout uauth** command duration to 0 seconds when using the **virtual http** command, because this setting prevents HTTP connections to the real web server.

You can authenticate directly with the ASA at the following URLs when you enable AAA for the interface:

```
http://interface_ip[:port]/netaccess/connstatus.html
https://interface_ip[:port]/netaccess/connstatus.html
```

Enabling Direct Authentication Using Telnet

Although you can configure network access authentication for any protocol or service (see the **aaa authentication match** or **aaa authentication include** command), you can authenticate directly with HTTP, Telnet, or FTP only. A user must first authenticate with one of these services before other traffic that requires authentication is allowed through. If you do not want to allow HTTP, Telnet, or FTP through the ASA, but want to authenticate other types of traffic, you can configure virtual Telnet; the user Telnets to a given IP address configured on the ASA, and the ASA provides a Telnet prompt.

To configure a virtual Telnet server, enter the following command:

```
hostname(config)# virtual telnet ip_address
```

where the *ip_address* argument sets the IP address for the virtual Telnet server. Make sure this address is an unused address that is routed to the ASA.

You must configure authentication for Telnet access to the virtual Telnet address as well as the other services you want to authenticate using the **authentication match** or **aaa authentication include** command.

When an unauthenticated user connects to the virtual Telnet IP address, the user is challenged for a username and password, and then authenticated by the AAA server. Once authenticated, the user sees the message “Authentication Successful.” Then, the user can successfully access other services that require authentication.

For inbound users (from lower security to higher security), you must also include the virtual Telnet address as a destination interface in the access list applied to the source interface. Moreover, you must add a **static** command for the virtual Telnet IP address, even if NAT is not required (using the **no nat-control** command). An identity NAT command is typically used (where you translate the address to itself).

For outbound users, there is an explicit permit for traffic, but if you apply an access list to an inside interface, be sure to allow access to the virtual Telnet address. A **static** statement is not required.

To logout from the ASA, reconnect to the virtual Telnet IP address; you are prompted to log out.

This example shows how to enable virtual Telnet along with AAA authentication for other services:

```
hostname(config)# virtual telnet 209.165.202.129
hostname(config)# access-list ACL-IN extended permit tcp any host 209.165.200.225 eq smtp
hostname(config)# access-list ACL-IN remark This is the SMTP server on the inside
hostname(config)# access-list ACL-IN extended permit tcp any host 209.165.202.129 eq
telnet
hostname(config)# access-list ACL-IN remark This is the virtual Telnet address
hostname(config)# access-group ACL-IN in interface outside
hostname(config)# static (inside, outside) 209.165.202.129 209.165.202.129 netmask
255.255.255.255
hostname(config)# access-list AUTH extended permit tcp any host 209.165.200.225 eq smtp
hostname(config)# access-list AUTH remark This is the SMTP server on the inside
hostname(config)# access-list AUTH extended permit tcp any host 209.165.202.129 eq telnet
hostname(config)# access-list AUTH remark This is the virtual Telnet address
hostname(config)# aaa authentication match AUTH outside tacacs+
```

Configuring Authorization for Network Access

After a user authenticates for a given connection, the ASA can use authorization to further control traffic from the user.

This section includes the following topics:

- Configuring TACACS+ Authorization, page 38-8
- Configuring RADIUS Authorization, page 38-9

Configuring TACACS+ Authorization

You can configure the ASA to perform network access authorization with TACACS+. You identify the traffic to be authorized by specifying access lists that authorization rules must match. Alternatively, you can identify the traffic directly in authorization rules themselves.

Tip Using access lists to identify traffic to be authorized can greatly reduced the number of authorization commands you must enter. This is because each authorization rule you enter can specify only one source and destination subnet and service, whereas an access list can include many entries.

Authentication and authorization statements are independent; however, any unauthenticated traffic matched by an authorization statement will be denied. For authorization to succeed, a user must first authenticate with the ASA. Because a user at a given IP address only needs to authenticate one time for all rules and types, if the authentication session hasn’t expired, authorization can occur even if the traffic is matched by an authentication statement.

After a user authenticates, the ASA checks the authorization rules for matching traffic. If the traffic matches the authorization statement, the ASA sends the username to the TACACS+ server. The TACACS+ server responds to the ASA with a permit or a deny for that traffic, based on the user profile. The ASA enforces the authorization rule in the response.

See the documentation for your TACACS+ server for information about configuring network access authorizations for a user.

To configure TACACS+ authorization, perform the following steps:

Step 1 Enable authentication. For more information, see the “Enabling Network Access Authentication” section on page 38-3. If you have already enabled authentication, continue to the next step.

Step 2 Using the **access-list** command, create an access list that identifies the source addresses and destination addresses of traffic you want to authorize. For steps, see Chapter 11, "Adding an Extended Access List."

The **permit** ACEs mark matching traffic for authorization, while **deny** entries exclude matching traffic from authorization. The access list you use for authorization matching should contain rules that are equal to or a subset of the rules in the access list used for authentication matching.

Note If you have configured authentication and want to authorize all the traffic being authenticated, you can use the same access list you created for use with the **aaa authentication match** command.

Step 3 To enable authorization, enter the following command:

```
hostname(config)# aaa authorization match acl_name interface_name server_group
```

where *acl_name* is the name of the access list you created in Step 2, *interface_name* is the name of the interface as specified with the **nameif** command or by default, and *server_group* is the AAA server group you created when you enabled authentication.

Note Alternatively, you can use the **aaa authorization include** command (which identifies traffic within the command) but you cannot use both methods in the same configuration. See the *Cisco ASA 5500 Series Command Reference* for more information.

The following commands authenticate and authorize inside Telnet traffic. Telnet traffic to servers other than 209.165.201.5 can be authenticated alone, but traffic to 209.165.201.5 requires authorization.

```
hostname(config)# access-list TELNET_AUTH extended permit tcp any any eq telnet
hostname(config)# access-list SERVER_AUTH extended permit tcp any host 209.165.201.5 eq
telnet
hostname(config)# aaa-server AuthOutbound protocol tacacs+
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthOutbound (inside) host 10.1.1.1
hostname(config-aaa-server-host)# key TACPlusUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# aaa authentication match TELNET_AUTH inside AuthOutbound
hostname(config)# aaa authorization match SERVER_AUTH inside AuthOutbound
```

Configuring RADIUS Authorization

When authentication succeeds, the RADIUS protocol returns user authorizations in the access-accept message sent by a RADIUS server. For more information about configuring authentication, see the "Configuring Authentication for Network Access" section on page 38-1.

When you configure the ASA to authenticate users for network access, you are also implicitly enabling RADIUS authorizations; therefore, this section contains no information about configuring RADIUS authorization on the ASA. It does provide information about how the ASA handles access list information received from RADIUS servers.

You can configure a RADIUS server to download an access list to the ASA or an access list name at the time of authentication. The user is authorized to do only what is permitted in the user-specific access list.

Note If you have used the **access-group** command to apply access lists to interfaces, be aware of the following effects of the **per-user-override** keyword on authorization by user-specific access lists:

- Without the **per-user-override** keyword, traffic for a user session must be permitted by both the interface access list and the user-specific access list.
- With the **per-user-override** keyword, the user-specific access list determines what is permitted.

For more information, see the **access-group** command entry in the *Cisco ASA 5500 Series Command Reference*.

This section includes the following topics:

- Configuring a RADIUS Server to Send Downloadable Access Control Lists, page 38-10
- Configuring a RADIUS Server to Download Per-User Access Control List Names, page 38-14

Configuring a RADIUS Server to Send Downloadable Access Control Lists

This section describes how to configure Cisco Secure ACS or a third-party RADIUS server, and includes the following topics:

- About the Downloadable Access List Feature and Cisco Secure ACS, page 38-10
- Configuring Cisco Secure ACS for Downloadable Access Lists, page 38-12
- Configuring Any RADIUS Server for Downloadable Access Lists, page 38-13
- Converting Wildcard Netmask Expressions in Downloadable Access Lists, page 38-13

About the Downloadable Access List Feature and Cisco Secure ACS

Downloadable access lists is the most scalable means of using Cisco Secure ACS to provide the appropriate access lists for each user. It provides the following capabilities:

- Unlimited access list size—Downloadable access lists are sent using as many RADIUS packets as required to transport the full access list from Cisco Secure ACS to the ASA.
- Simplified and centralized management of access lists—Downloadable access lists enable you to write a set of access lists once and apply it to many user or group profiles and distribute it to many ASAs.

This approach is most useful when you have very large access list sets that you want to apply to more than one Cisco Secure ACS user or group; however, its ability to simplify Cisco Secure ACS user and group management makes it useful for access lists of any size.

The ASA receives downloadable access lists from Cisco Secure ACS using the following process:

1. The ASA sends a RADIUS authentication request packet for the user session.
2. If Cisco Secure ACS successfully authenticates the user, Cisco Secure ACS returns a RADIUS access-accept message that contains the internal name of the applicable downloadable access list. The Cisco IOS cisco-av-pair RADIUS VSA (vendor 9, attribute 1) contains the following attribute-value pair to identify the downloadable access list set:

   ```
   ACS:CiscoSecure-Defined-ACL=acl-set-name
   ```

where *acl-set-name* is the internal name of the downloadable access list, which is a combination of the name assigned to the access list by the Cisco Secure ACS administrator and the date and time that the access list was last modified.

3. The ASA examines the name of the downloadable access list and determines if it has previously received the named downloadable access list.
    - If the ASA has previously received the named downloadable access list, communication with Cisco Secure ACS is complete and the ASA applies the access list to the user session. Because the name of the downloadable access list includes the date and time it was last modified, matching the name sent by Cisco Secure ACS to the name of an access list previous downloaded means that the ASA has the most recent version of the downloadable access list.
    - If the ASA has not previously received the named downloadable access list, it may have an out-of-date version of the access list or it may not have downloaded any version of the access list. In either case, the ASA issues a RADIUS authentication request using the downloadable access list name as the username in the RADIUS request and a null password attribute. In a cisco-av-pair RADIUS VSA, the request also includes the following attribute-value pairs:

      ```
      AAA:service=ip-admission
      AAA:event=acl-download
      ```

      In addition, the ASA signs the request with the Message-Authenticator attribute (IETF RADIUS attribute 80).
4. Upon receipt of a RADIUS authentication request that has a username attribute containing the name of a downloadable access list, Cisco Secure ACS authenticates the request by checking the Message-Authenticator attribute. If the Message-Authenticator attribute is missing or incorrect, Cisco Secure ACS ignores the request. The presence of the Message-Authenticator attribute prevents malicious use of a downloadable access list name to gain unauthorized network access. The Message-Authenticator attribute and its use are defined in RFC 2869, RADIUS Extensions, available at http://www.ietf.org.
5. If the access list required is less than approximately 4 KB in length, Cisco Secure ACS responds with an access-accept message containing the access list. The largest access list that can fit in a single access-accept message is slightly less than 4 KB because some of the message must be other required attributes.

   Cisco Secure ACS sends the downloadable access list in a cisco-av-pair RADIUS VSA. The access list is formatted as a series of attribute-value pairs that each contain an ACE and are numbered serially:

   ```
   ip:inacl#1=ACE-1
   ip:inacl#2=ACE-2
   .
   .
   .
   ip:inacl#n=ACE-n
   ```

   An example of an attribute-value pair follows:

   ```
   ip:inacl#1=permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
   ```
6. If the access list required is more than approximately 4 KB in length, Cisco Secure ACS responds with an access-challenge message that contains a portion of the access list, formatted as described above, and an State attribute (IETF RADIUS attribute 24), which contains control data used by Cisco Secure ACS to track the progress of the download. Cisco Secure ACS fits as many complete attribute-value pairs into the cisco-av-pair RADIUS VSA as it can without exceeding the maximum RADIUS message size.

The ASA stores the portion of the access list received and responds with another access-request message containing the same attributes as the first request for the downloadable access list plus a copy of the State attribute received in the access-challenge message.

This repeats until Cisco Secure ACS sends the last of the access list in an access-accept message.

Configuring Cisco Secure ACS for Downloadable Access Lists

You can configure downloadable access lists on Cisco Secure ACS as a shared profile component and then assign the access list to a group or to an individual user.

The access list definition consists of one or more ASA commands that are similar to the extended **access-list** command (see Chapter 11, "Adding an Extended Access List,"), except without the following prefix:

```
access-list acl_name extended
```

The following example is a downloadable access list definition on Cisco Secure ACS version 3.3:

```
+--------------------------------------------+
| Shared profile Components                  |
|                                            |
|      Downloadable IP ACLs Content          |
|                                            |
| Name:     acs_ten_acl                      |
|                                            |
|      ACL Definitions                       |
|                                            |
| permit tcp any host 10.0.0.254             |
| permit udp any host 10.0.0.254             |
| permit icmp any host 10.0.0.254            |
| permit tcp any host 10.0.0.253             |
| permit udp any host 10.0.0.253             |
| permit icmp any host 10.0.0.253            |
| permit tcp any host 10.0.0.252             |
| permit udp any host 10.0.0.252             |
| permit icmp any host 10.0.0.252            |
| permit ip any any                          |
+--------------------------------------------+
```

For more information about creating downloadable access lists and associating them with users, see the user guide for your version of Cisco Secure ACS.

On the ASA, the downloaded access list has the following name:

```
#ACSACL#-ip-acl_name-number
```

The *acl_name* argument is the name that is defined on Cisco Secure ACS (acs_ten_acl in the preceding example), and *number* is a unique version ID generated by Cisco Secure ACS.

The downloaded access list on the ASA consists of the following lines:

```
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.254
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.253
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit tcp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit udp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit icmp any host 10.0.0.252
access-list #ACSACL#-ip-asa-acs_ten_acl-3b5385f7 permit ip any any
```

Configuring Any RADIUS Server for Downloadable Access Lists

You can configure any RADIUS server that supports Cisco IOS RADIUS VSAs to send user-specific access lists to the ASA in a Cisco IOS RADIUS cisco-av-pair VSA (vendor 9, attribute 1).

In the cisco-av-pair VSA, configure one or more ACEs that are similar to the **access-list extended** command (see Chapter 11, "Adding an Extended Access List,"), except that you replace the following command prefix:

```
access-list acl_name extended
```

with the following text:

```
ip:inacl#nnn=
```

The *nnn* argument is a number in the range from 0 to 999999999 that identifies the order of the command statement to be configured on the ASA. If this parameter is omitted, the sequence value is 0, and the order of the ACEs inside the cisco-av-pair RADIUS VSA is used.

The following example is an access list definition as it should be configured for a cisco-av-pair VSA on a RADIUS server:

```
ip:inacl#1=permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
ip:inacl#99=deny tcp any any
ip:inacl#2=permit udp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
ip:inacl#100=deny udp any any
ip:inacl#3=permit icmp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
```

For information about making unique per user the access lists that are sent in the cisco-av-pair attribute, see the documentation for your RADIUS server.

On the ASA, the downloaded access list name has the following format:

```
AAA-user-username
```

The *username* argument is the name of the user that is being authenticated.

The downloaded access list on the ASA consists of the following lines. Notice the order based on the numbers identified on the RADIUS server.

```
access-list  AAA-user-bcham34-79AD4A08 permit tcp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list  AAA-user-bcham34-79AD4A08 permit udp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list  AAA-user-bcham34-79AD4A08 permit icmp 10.1.0.0 255.0.0.0 10.0.0.0 255.0.0.0
access-list  AAA-user-bcham34-79AD4A08 deny tcp any any
access-list  AAA-user-bcham34-79AD4A08 deny udp any any
```

Downloaded access lists have two spaces between the word "access-list" and the name. These spaces serve to differentiate a downloaded access list from a local access list. In this example, "79AD4A08" is a hash value generated by the ASA to help determine when access list definitions have changed on the RADIUS server.

Converting Wildcard Netmask Expressions in Downloadable Access Lists

If a RADIUS server provides downloadable access lists to Cisco VPN 3000 series concentrators as well as to the ASA, you may need the ASA to convert wildcard netmask expressions to standard netmask expressions. This is because Cisco VPN 3000 series concentrators support wildcard netmask expressions but the ASA only supports standard netmask expressions. Configuring the ASA to convert wildcard netmask expressions helps minimize the effects of these differences upon how you configure downloadable access lists on your RADIUS servers. Translation of wildcard netmask expressions means that downloadable access lists written for Cisco VPN 3000 series concentrators can be used by the ASA without altering the configuration of the downloadable access lists on the RADIUS server.

You configure access list netmask conversion on a per-server basis, using the **acl-netmask-convert** command, available in the aaa-server configuration mode. For more information about configuring a RADIUS server, see "Identifying AAA Server Groups and Servers" section on page 36-9. For more information about the **acl-netmask-convert** command, see the *Cisco ASA 5500 Series Command Reference*.

Configuring a RADIUS Server to Download Per-User Access Control List Names

To download a name for an access list that you already created on the ASA from the RADIUS server when a user authenticates, configure the IETF RADIUS filter-id attribute (attribute number 11) as follows:

```
filter-id=acl_name
```

Note In Cisco Secure ACS, the value for filter-id attributes are specified in boxes in the HTML interface, omitting **filter-id=** and entering only *acl_name*.

For information about making unique per user the filter-id attribute value, see the documentation for your RADIUS server.

See Chapter 11, "Adding an Extended Access List," to create an access list on the ASA.

Configuring Accounting for Network Access

The ASA can send accounting information to a RADIUS or TACACS+ server about any TCP or UDP traffic that passes through the ASA. If that traffic is also authenticated, then the AAA server can maintain accounting information by username. If the traffic is not authenticated, the AAA server can maintain accounting information by IP address. Accounting information includes when sessions start and stop, username, the number of bytes that pass through the ASA for the session, the service used, and the duration of each session.

To configure accounting, perform the following steps:

Step 1 If you want the ASA to provide accounting data per user, you must enable authentication. For more information, see the "Enabling Network Access Authentication" section on page 38-3. If you want the ASA to provide accounting data per IP address, enabling authentication is not necessary and you can continue to the next step.

Step 2 Using the **access-list** command, create an access list that identifies the source addresses and destination addresses of traffic you want accounted. For steps, see Chapter 11, "Adding an Extended Access List."

The **permit** ACEs mark matching traffic for authorization, while **deny** entries exclude matching traffic from authorization.

Note If you have configured authentication and want accounting data for all the traffic being authenticated, you can use the same access list you created for use with the **aaa authentication match** command.

Step 3 To enable accounting, enter the following command:

```
hostname(config)# aaa accounting match acl_name interface_name server_group
```

where the *acl_name* argument is the access list name set in the **access-list** command.

The *interface_name* argument is the interface name set in the **nameif** command.

The *server_group* argument is the server group name set in the **aaa-server** command.

Note Alternatively, you can use the **aaa accounting include** command (which identifies traffic within the command) but you cannot use both methods in the same configuration. See the *Cisco ASA 5500 Series Command Reference* for more information.

The following commands authenticate, authorize, and account for inside Telnet traffic. Telnet traffic to servers other than 209.165.201.5 can be authenticated alone, but traffic to 209.165.201.5 requires authorization and accounting.

```
hostname(config)# aaa-server AuthOutbound protocol tacacs+
hostname(config-aaa-server-group)# exit
hostname(config)# aaa-server AuthOutbound (inside) host 10.1.1.1
hostname(config-aaa-server-host)# key TACPlusUauthKey
hostname(config-aaa-server-host)# exit
hostname(config)# access-list TELNET_AUTH extended permit tcp any any eq telnet
hostname(config)# access-list SERVER_AUTH extended permit tcp any host 209.165.201.5 eq
telnet
hostname(config)# aaa authentication match TELNET_AUTH inside AuthOutbound
hostname(config)# aaa authorization match SERVER_AUTH inside AuthOutbound
hostname(config)# aaa accounting match SERVER_AUTH inside AuthOutbound
```

Using MAC Addresses to Exempt Traffic from Authentication and Authorization

The ASA can exempt from authentication and authorization any traffic from specific MAC addresses. For example, if the ASA authenticates TCP traffic originating on a particular network but you want to allow unauthenticated TCP connections from a specific server, you would use a MAC exempt rule to exempt from authentication and authorization any traffic from the server specified by the rule.

This feature is particularly useful to exempt devices such as IP phones that cannot respond to authentication prompts.

To use MAC addresses to exempt traffic from authentication and authorization, perform the following steps:

Step 1 To configure a MAC list, enter the following command:

```
hostname(config)# mac-list id {deny | permit} mac macmask
```

Where the *id* argument is the hexadecimal number that you assign to the MAC list. To group a set of MAC addresses, enter the **mac-list** command as many times as needed with the same ID value. Because you can only use one MAC list for AAA exemption, be sure that your MAC list includes all the MAC addresses you want to exempt. You can create multiple MAC lists, but you can only use one at a time.

The order of entries matters, because the packet uses the first entry it matches, as opposed to a best match scenario. If you have a permit entry, and you want to deny an address that is allowed by the permit entry, be sure to enter the deny entry before the permit entry.

The *mac* argument specifies the source MAC address in 12-digit hexadecimal form; that is, nnnn.nnnn.nnnn.

The *macmask* argument specifies the portion of the MAC address that should be used for matching. For example, ffff.ffff.ffff matches the MAC address exactly. ffff.ffff.0000 matches only the first 8 digits.

Step 2 To exempt traffic for the MAC addresses specified in a particular MAC list, enter the following command:

```
hostname(config)# aaa mac-exempt match id
```

Where *id* is the string identifying the MAC list containing the MAC addresses whose traffic is to be exempt from authentication and authorization. You can only enter one instance of the **aaa mac-exempt** command.

The following example bypasses authentication for a single MAC address:

```
hostname(config)# mac-list abc permit 00a0.c95d.0282 ffff.ffff.ffff
hostname(config)# aaa mac-exempt match abc
```

The following entry bypasses authentication for all Cisco IP Phones, which have the hardware ID 0003.E3:

```
hostname(config)# mac-list acd permit 0003.E300.0000 FFFF.FF00.0000
hostname(config)# aaa mac-exempt match acd
```

The following example bypasses authentication for a a group of MAC addresses except for 00a0.c95d.02b2. Enter the deny statement before the permit statement, because 00a0.c95d.02b2 matches the permit statement as well, and if it is first, the deny statement will never be matched.

```
hostname(config)# mac-list 1 deny 00a0.c95d.0282 ffff.ffff.ffff
hostname(config)# mac-list 1 permit 00a0.c95d.0000 ffff.ffff.0000
hostname(config)# aaa mac-exempt match 1
```

CHAPTER 39

Applying Filtering Services

This chapter describes how filtering can provide greater control over traffic passing through the ASA. Filtering can be used in two distinct ways:

- Filtering ActiveX objects or Java applets
- Filtering with an external filtering server

Instead of blocking access altogether, you can remove specific undesirable objects from HTTP traffic, such as ActiveX objects or Java applets, that may pose a security threat in certain situations.

You can also use URL filtering to direct specific traffic to an external filtering server, such an Secure Computing SmartFilter (formerly N2H2) or Websense filtering server. Long URL, HTTPS, and FTP filtering can now be enabled using both Websense and Secure Computing SmartFilter for URL filtering. Filtering servers can block traffic to specific sites or types of sites, as specified by the security policy.

Note URL caching will only work if the version of the URL server software from the URL server vender supports it.

Because URL filtering is CPU-intensive, using an external filtering server ensures that the throughput of other traffic is not affected. However, depending on the speed of your network and the capacity of your URL filtering server, the time required for the initial connection may be noticeably slower when filtering traffic with an external filtering server.

This chapter includes the following sections:

- Configuring ActiveX Filtering, page 39-1
- Configuring Java Applet Filtering, page 39-3
- Configuring URLs and FTP Requests with an External Server, page 39-5

Configuring ActiveX Filtering

This section includes the following topics:

- Information About ActiveX Filtering, page 39-2
- Licensing Requirements for ActiveX Filtering, page 39-2
- Configuring ActiveX Filtering, page 39-2
- Configuration Examples for ActiveX Filtering, page 39-3
- Feature History for ActiveX Filtering, page 39-3

Information About ActiveX Filtering

ActiveX objects may pose security risks because they can contain code intended to attack hosts and servers on a protected network. You can disable ActiveX objects with ActiveX filtering.

ActiveX controls, formerly known as OLE or OCX controls, are components you can insert in a web page or other application. These controls include custom forms, calendars, or any of the extensive third-party forms for gathering or displaying information. As a technology, ActiveX creates many potential problems for network clients including causing workstations to fail, introducing network security problems, or being used to attack servers.

The **filter activex** command blocks the HTML <object> commands by commenting them out within the HTML web page. ActiveX filtering of HTML files is performed by selectively replacing the <APPLET> and </APPLET> and <OBJECT CLASSID> and </OBJECT> tags with comments. Filtering of nested tags is supported by converting top-level tags to comments.

Caution This command also blocks any Java applets, image files, or multimedia objects that are embedded in object tags.

If the <object> or </object> HTML tags split across network packets or if the code in the tags is longer than the number of bytes in the MTU, ASA cannot block the tag.

ActiveX blocking does not occur when users access an IP address referenced by the **alias** command or for WebVPN traffic.

Licensing Requirements for ActiveX Filtering

The following table shows the licensing requirements for this feature:

Table 39-1 Licensing Requirements

Model	License Requirement
All models	Base License.

Configuring ActiveX Filtering

To remove ActiveX objects in HTTP traffic passing through the ASA, enter the following command:

Command	Purpose
`filter activex` *port*[-*port*] *local_ip* *local_mask foreign_ip foreign_mask*	Removes ActiveX objects.

To use this command, replace port with the TCP port to which filtering is applied. Typically, this is port 80, but other values are accepted. The **http** or **url** literal can be used for port 80. You can specify a range of ports by using a hyphen between the starting port number and the ending port number.

The local IP address and mask identify one or more internal hosts that are the source of the traffic to be filtered. The foreign address and mask specify the external destination of the traffic to be filtered.

Configuration Examples for ActiveX Filtering

You can set either address to **0.0.0.0** (or in shortened form, **0**) to specify all hosts. You can use **0.0.0.0** for either mask (or in shortened form, **0**) to specify all hosts. This command specifies that the ActiveX object blocking applies to web traffic on port 80 from any local host and for connections to any foreign host.

The following example shows how to configure activeX filtering to block all outbound connections. To remove the configuration, use the **no** form of the command:

```
hostname(config)# filter activex 80 0 0 0 0
hostname(config)# no filter activex 80 0 0 0 0
```

Feature History for ActiveX Filtering

Table 39-2 lists the release history for ActiveX Filtering.

Table 39-2 Feature History for ActiveX Filtering

Feature Name	Releases	Feature Information
Filter activex	7.0	This command was preexisting.

Configuring Java Applet Filtering

This section includes the following topics:

- Information About Java Applet Filtering, page 39-3
- Licensing Requirements for Java Applet Filtering, page 39-4
- Configuring Java Applet Filtering, page 39-4
- Configuration Examples for Java Applet Filtering, page 39-4
- Feature History for Java Applet Filtering, page 39-5

Information About Java Applet Filtering

The **filter java** command filters out Java applets that return to the ASA from an outbound connection. The user still receives the HTML page, but the web page source for the applet is commented out so that the applet cannot execute. The **filter java** command does not filter WebVPN traffic.

Java applets may pose security risks because they can contain code intended to attack hosts and servers on a protected network. You can remove Java applets with the **filter java** command.

Note Use the **filter activex** command to remove Java applets that are embedded in <object> tags.

Licensing Requirements for Java Applet Filtering

The following table shows the licensing requirements for java applet filtering:

Table 39-3 Licensing Requirements

Model	License Requirement
All models	Base License.

Configuring Java Applet Filtering

To apply filtering to remove Java applets from HTTP traffic passing through the ASA, enter the following command:

Command	Purpose
`filter java` *port*[-*port*] *local_ip local_mask foreign_ip foreign_mask*	Removes Java applets in HTTP traffic passing through the ASA.

To use this command, replace port with the TCP port to which filtering is applied. Typically, this is port 80, but other values are accepted. The **http** or **url** literal can be used for port 80. You can specify a range of ports by using a hyphen between the starting port number and the ending port number.

The local IP address and mask identify one or more internal hosts that are the source of the traffic to be filtered. The foreign address and mask specify the external destination of the traffic to be filtered.

You can set either address to **0.0.0.0** (or in shortened form, **0**) to specify all hosts. You can use **0.0.0.0** for either mask (or in shortened form, **0**) to specify all hosts.

You can set either address to **0.0.0.0** (or in shortened form, **0**) to specify all hosts. You can use **0.0.0.0** for either mask (or in shortened form, **0**) to specify all hosts.

Configuration Examples for Java Applet Filtering

The following example shows how to configure java applet filtering:

The following example specifies that Java applets are blocked on all outbound connections:

```
hostname(config)# filter java 80 0 0 0 0
```

This command specifies that the Java applet blocking applies to web traffic on port 80 from any local host and for connections to any foreign host.

The following example blocks downloading of Java applets to a host on a protected network:

```
hostname(config)# filter java http 192.168.3.3 255.255.255.255 0 0
```

This command prevents host 192.168.3.3 from downloading Java applets.

To remove the configuration, use the **no** form of the command, as in the following example:

```
hostname(config)# no filter java http 192.168.3.3 255.255.255.255 0 0
```

Feature History for Java Applet Filtering

Table 39-2 lists the release history for java applet filtering.

Table 39-4 Feature History for Java Applet Filtering

Feature Name	Releases	Feature Information
filter java	7.0	This command was preexisting.

Configuring URLs and FTP Requests with an External Server

This section describes how to filter URLs and FTP requests with an external server. This section includes the following topics:

- Information About URL Filtering, page 39-5
- Identifying the Filtering Server, page 39-6
- Buffering the Content Server Response, page 39-7
- Caching Server Addresses, page 39-8
- Filtering HTTP URLs, page 39-8
- Filtering HTTPS URLs, page 39-10
- Filtering FTP Requests, page 39-11

Information About URL Filtering

You can apply filtering to connection requests originating from a more secure network to a less secure network. Although you can use ACLs to prevent outbound access to specific content servers, managing usage this way is difficult because of the size and dynamic nature of the Internet. You can simplify configuration and improve security appliance performance by using a separate server running one of the following Internet filtering products:

- Websense Enterprise for filtering HTTP, HTTPS, and FTP.
- Secure Computing SmartFilter (formerly N2H2) for filtering HTTP, HTTPS, FTP, and long URL filtering.

Note URL caching will only work if the version of the URL server software from the URL server vender supports it.

Although security appliance performance is less affected when using an external server, users may notice longer access times to websites or FTP servers when the filtering server is remote from the security appliance.

When filtering is enabled and a request for content is directed through the security appliance, the request is sent to the content server and to the filtering server at the same time. If the filtering server allows the connection, the security appliance forwards the response from the content server to the originating client. If the filtering server denies the connection, the security appliance drops the response and sends a message or return code indicating that the connection was not successful.

If user authentication is enabled on the security appliance, then the security appliance also sends the user name to the filtering server. The filtering server can use user-specific filtering settings or provide enhanced reporting regarding usage.

Licensing Requirements for URL Filtering

The following table shows the licensing requirements for url filtering:

Table 39-5 Licensing Requirements

Model	License Requirement
All models	Base License.

Identifying the Filtering Server

You can identify up to four filtering servers per context. The ASA uses the servers in order until a server responds. You can only configure a single type of server (Websense or Secure Computing SmartFilter) in your configuration.

Note You must add the filtering server before you can configure filtering for HTTP or HTTPS with the **filter** command. If you remove the filtering servers from the configuration, then all **filter** commands are also removed.

Identify the address of the filtering server using the **url-server** command:

- For Websense:

```
hostname(config)# url-server (if_name) host local_ip [timeout seconds] [protocol TCP | UDP
version [1|4] [connections num_conns] ]
```

- For Secure Computing SmartFilter (formerly N2H2):

```
hostname(config)# url-server (if_name) vendor {secure-computing | n2h2} host
<local_ip> [port <number>] [timeout <seconds>] [protocol {TCP [connections <number>]} |
UDP]
```

where <*if_name*> is the name of the security appliance interface connected to the filtering server (the default is inside).

For the **vendor** {secure-computing | n2h2}, you can use ‘secure-computing as a vendor string, however, ‘n2h2’ is acceptable for backward compatibility. When the configuration entries are generated, ‘secure-computing’ is saved as the vendor string.

The **host** <*local_ip*> is the IP address of the URL filtering server.

The **port** <*number*> is the Secure Computing SmartFilter server port number of the filtering server; the ASA also listens for UDP replies on this port.

Note The default port is 4005. This is the default port used by the Secure Computing SmartFilter server to communicate to the ASA via TCP or UDP. For information on changing the default port, please refer to the *Filtering by N2H2 Administrator's Guide*.

The **timeout** <*seconds*> is the number of seconds the security appliance should keep trying to connect to the filtering server.

The **connections** <*number*> is the number of tries to attempt to make a connection between the host and server.

For example, to identify a single Websense filtering server, enter the following command:

```
hostname(config)# url-server (perimeter) host 10.0.1.1 protocol TCP version 4
```

This identifies a Websense filtering server with the IP address 10.0.1.1 on a perimeter interface of the ASA.Version 4, which is enabled in this example, is recommended by Websense because it supports caching.

To identify redundant Secure Computing SmartFilter servers, enter the following commands:

```
hostname(config)# url-server (perimeter) vendor n2h2 host 10.0.1.1
hostname(config)# url-server (perimeter) vendor n2h2 host 10.0.1.2
```

This identifies two Sentian filtering servers, both on a perimeter interface of the ASA.

Buffering the Content Server Response

When a user issues a request to connect to a content server, the ASA sends the request to the content server and to the filtering server at the same time. If the filtering server does not respond before the content server, the server response is dropped. This delays the web server response from the point of view of the web client because the client must reissue the request.

By enabling the HTTP response buffer, replies from web content servers are buffered and the responses are forwarded to the requesting client if the filtering server allows the connection. This prevents the delay that might otherwise occur.

To configure buffering for responses to HTTP or FTP requests, perform the following steps:

	Command	Purpose
Step 1	`url-block block` *`block-buffer-limit`*	Enables buffering of responses for HTTP or FTP requests that are pending a response from the filtering server. Replace *block-buffer* with the maximum number of HTTP responses that can be buffered while awaiting responses from the url-server. **Note** Buffering URLs longer than 3072 bytes are not supported.
Step 2	`url-block mempool-size memory-pool-size`	Configures the maximum memory available for buffering pending URLs (and for buffering long URLs). Replace memory-pool-size with a value from 2 to 10240 for a maximum memory allocation of 2 KB to 10 MB.

Caching Server Addresses

After a user accesses a site, the filtering server can allow the ASA to cache the server address for a certain amount of time, as long as every site hosted at the address is in a category that is permitted at all times. Then, when the user accesses the server again, or if another user accesses the server, the ASA does not need to consult the filtering server again.

Note Requests for cached IP addresses are not passed to the filtering server and are not logged. As a result, this activity does not appear in any reports. You can accumulate Websense run logs before using the **url-cache** command.

Use the **url-cache** command if needed to improve throughput, as follows:

Command	Purpose
**`url-cache dst	src_dst`** *`size`*	Replace *size* with a value for the cache size within the range 1 to 128 (KB). Use the **dst** keyword to cache entries based on the URL destination address. Select this mode if all users share the same URL filtering policy on the Websense server. Use the **src_dst** keyword to cache entries based on both the source address initiating the URL request as well as the URL destination address. Select this mode if users do not share the same URL filtering policy on the Websense server.

Filtering HTTP URLs

This section describes how to configure HTTP filtering with an external filtering server. This section includes the following topics:

- Configuring HTTP Filtering, page 39-8
- Enabling Filtering of Long HTTP URLs, page 39-9
- Truncating Long HTTP URLs, page 39-9
- Exempting Traffic from Filtering, page 39-10

Configuring HTTP Filtering

You must identify and enable the URL filtering server before enabling HTTP filtering.

When the filtering server approves an HTTP connection request, the ASA allows the reply from the web server to reach the originating client. If the filtering server denies the request, the ASA redirects the user to a block page, indicating that access was denied.

To enable HTTP filtering, enter the following command:

Command	Purpose
filter url [**http** | *port*[-*port*] *local_ip local_mask foreign_ip foreign_mask*] [**allow**] [**proxy-block**]	Replace *port* with one or more port numbers if a different port than the default port for HTTP (80) is used. Replace *local_ip* and *local_mask* with the IP address and subnet mask of a user or subnetwork making requests. Replace *foreign_ip* and *foreign_mask* with the IP address and subnet mask of a server or subnetwork responding to requests. The **allow** option causes the ASA to forward HTTP traffic without filtering when the primary filtering server is unavailable. Use the **proxy-block** command to drop all requests to proxy servers.

Enabling Filtering of Long HTTP URLs

By default, the ASA considers an HTTP URL to be a long URL if it is greater than 1159 characters. You can increase the maximum length allowed.

Configure the maximum size of a single URL with the following command:

Command	Purpose
url-block url-size long-url-size	Replace long-url-size with the maximum size in KB for each long URL being buffered. For Websense, this is a value from 2 to 4 for a maximum URL size of 2 KB to 4 KB; for Secure Computing, this is a value between 2 to 3 for a maximum URL size of 2 KB to 3 KB. The default value is 2.

Truncating Long HTTP URLs

By default, if a URL exceeds the maximum permitted size, then it is dropped. To avoid this, you can set the ASA to truncate a long URL by entering the following command:

Command	Purpose
filter url [**longurl-truncate** | **longurl-deny** | **cgi-truncate**]	The **longurl-truncate** option causes the ASA to send only the hostname or IP address portion of the URL for evaluation to the filtering server when the URL is longer than the maximum length permitted. Use the **longurl-deny** option to deny outbound URL traffic if the URL is longer than the maximum permitted. Use the **cgi-truncate** option to truncate CGI URLs to include only the CGI script location and the script name without any parameters. Many long HTTP requests are CGI requests. If the parameters list is very long, waiting and sending the complete CGI request including the parameter list can use up memory resources and affect ASA performance.

Exempting Traffic from Filtering

Command	Purpose
`filter url except` *`source_ip source_mask dest_ip dest_mask`*	Exempts specific traffic from filtering.

For example, the following commands cause all HTTP requests to be forwarded to the filtering server except for those from 10.0.2.54.

```
hostname(config)# filter url http 0 0 0 0
hostname(config)# filter url except 10.0.2.54 255.255.255.255 0 0
```

Filtering HTTPS URLs

You must identify and enable the URL filtering server before enabling HTTPS filtering.

Note Websense and Smartfilter currently support HTTPS; older versions of Secure Computing SmartFilter (formerly N2H2) did not support HTTPS filtering.

Because HTTPS content is encrypted, the ASA sends the URL lookup without directory and filename information. When the filtering server approves an HTTPS connection request, the ASA allows the completion of SSL connection negotiation and allows the reply from the web server to reach the originating client. If the filtering server denies the request, the ASA prevents the completion of SSL connection negotiation. The browser displays an error message such as “The Page or the content cannot be displayed.”

Note The ASA does not provide an authentication prompt for HTTPS, so a user must authenticate with the ASA using HTTP or FTP before accessing HTTPS servers.

Command	Purpose
`filter https` *`port`*`[-`*`port`*`]` *`localIP local_mask foreign_IP foreign_mask`* `[`**`allow`**`]`	Enables HTTPS filtering. Replace *port*[-*port*] with a range of port numbers if a different port than the default port for HTTPS (443) is used. Replace *local_ip* and *local_mask* with the IP address and subnet mask of a user or subnetwork making requests. Replace *foreign_ip* and *foreign_mask* with the IP address and subnet mask of a server or subnetwork responding to requests. The **allow** option causes the ASA to forward HTTPS traffic without filtering when the primary filtering server is unavailable.

Filtering FTP Requests

You must identify and enable the URL filtering server before enabling FTP filtering.

Note Websense and Smartfilter currently support FTP; older versions of Secure Computing SmartFilter (formerly known as N2H2) did not support FTP filtering.

When the filtering server approves an FTP connection request, the ASA allows the successful FTP return code to reach originating client. For example, a successful return code is “250: CWD command successful.” If the filtering server denies the request, alters the FTP return code to show that the connection was denied. For example, the ASA changes code 250 to “550 Requested file is prohibited by URL filtering policy.”

Command	Purpose
filter ftp *port*[-*port*] *localIP local_mask foreign_IP foreign_mask* [**allow**] [**interact-block**]	Enables FTP filtering. Replace *port*[-*port*] with a range of port numbers if a different port than the default port for FTP (21) is used. Replace *local_ip* and *local_mask* with the IP address and subnet mask of a user or subnetwork making requests. Replace *foreign_ip* and *foreign_mask* with the IP address and subnet mask of a server or subnetwork responding to requests. The **allow** option causes the ASA to forward HTTPS traffic without filtering when the primary filtering server is unavailable.

Use the **interact-block** option to prevent interactive FTP sessions that do not provide the entire directory path. An interactive FTP client allows the user to change directories without typing the entire path. For example, the user might enter **cd ./files** instead of **cd /public/files**.

Viewing Filtering Statistics and Configuration

This section describes how to monitor filtering statistics. This section includes the following topics:

- Viewing Filtering Server Statistics, page 39-11
- Viewing Buffer Configuration and Statistics, page 39-12
- Viewing Caching Statistics, page 39-13
- Viewing Filtering Performance Statistics, page 39-13
- Viewing Filtering Configuration, page 39-14

Viewing Filtering Server Statistics

To show information about the filtering server, enter the following command:

```
hostname# show url-server
```

The following is sample output from the **show url-server** command:

```
hostname# show url-server
url-server (outside) vendor n2h2 host 128.107.254.202 port 4005 timeout 5 protocol TCP
```

To show information about the filtering server or to show statistics, enter the following command:

The following is sample output from the **show url-server statistics** command, which shows filtering statistics:

```
hostname# show url-server statistics

Global Statistics:
--------------------
URLs total/allowed/denied         13/3/10
URLs allowed by cache/server      0/3
URLs denied by cache/server       0/10
HTTPSs total/allowed/denied       138/137/1
HTTPSs allowed by cache/server    0/137
HTTPSs denied by cache/server     0/1
FTPs total/allowed/denied         0/0/0
FTPs allowed by cache/server      0/0
FTPs denied by cache/server       0/0
Requests dropped                  0
Server timeouts/retries           0/0
Processed rate average 60s/300s   0/0 requests/second
Denied rate average 60s/300s      0/0 requests/second
Dropped rate average 60s/300s     0/0 requests/second

Server Statistics:
--------------------
10.125.76.20                      UP
  Vendor                          websense
  Port                            15868
  Requests total/allowed/denied   151/140/11
  Server timeouts/retries         0/0
  Responses received              151
  Response time average 60s/300s  0/0

URL Packets Sent and Received Stats:
------------------------------------
Message                 Sent    Received
STATUS_REQUEST          1609    1601
LOOKUP_REQUEST          1526    1526
LOG_REQUEST             0       NA

Errors:
-------
RFC noncompliant GET method     0
URL buffer update failure       0
```

Viewing Buffer Configuration and Statistics

The **show url-block** command displays the number of packets held in the url-block buffer and the number (if any) dropped due to exceeding the buffer limit or retransmission.

The following is sample output from the **show url-block** command:

```
hostname# show url-block
    url-block url-mempool 128
    url-block url-size 4
    url-block block 128
```

This shows the configuration of the URL block buffer.

The following is sample output from the **show url-block block statistics** command:

```
hostname# show url-block block statistics

URL Pending Packet Buffer Stats with max block  128
-----------------------------------------------------
Cumulative number of packets held:              896
Maximum number of packets held (per URL):       3
Current number of packets held (global):        38
Packets dropped due to
       exceeding url-block buffer limit:        7546
       HTTP server retransmission:              10
Number of packets released back to client:      0
```

This shows the URL block statistics.

Viewing Caching Statistics

The following is sample output from the **show url-cache stats** command:

```
hostname# show url-cache stats
URL Filter Cache Stats
----------------------
    Size :     128KB
 Entries :      1724
  In Use :       456
 Lookups :        45
    Hits :         8

This shows how the cache is used.
```

Viewing Filtering Performance Statistics

The following is sample output from the **show perfmon** command:

```
hostname# show perfmon
PERFMON STATS:    Current      Average
Xlates               0/s          0/s
Connections          0/s          2/s
TCP Conns            0/s          2/s
UDP Conns            0/s          0/s
URL Access           0/s          2/s
URL Server Req       0/s          3/s
TCP Fixup            0/s          0/s
TCPIntercept         0/s          0/s
HTTP Fixup           0/s          3/s
FTP Fixup            0/s          0/s
AAA Authen           0/s          0/s
AAA Author           0/s          0/s
AAA Account          0/s          0/s
```

This shows URL filtering performance statistics, along with other performance statistics. The filtering statistics are shown in the URL Access and URL Server Req rows.

Viewing Filtering Configuration

The following is sample output from the **show filter** command:

```
hostname# show filter
filter url http 0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0
```

Feature History for URL Filtering

Table 39-2 lists the release history for url filtering.

Table 39-6 Feature History for URL Filtering

Feature Name	Releases	Feature Information
filter url	7.0	This command was preexisting.

PART 7

Configuring Application Inspection

CHAPTER 40

Getting Started With Application Layer Protocol Inspection

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path (see the "Stateful Inspection Overview" section on page 1-13 for more information about the fast path). As a result, inspection engines can affect overall throughput. Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network.

This chapter includes the following sections:

- Information about Application Layer Protocol Inspection, page 40-1
- Guidelines and Limitations, page 40-3
- Default Settings, page 40-4
- Configuring Application Layer Protocol Inspection, page 40-6

Information about Application Layer Protocol Inspection

This section includes the following topics:

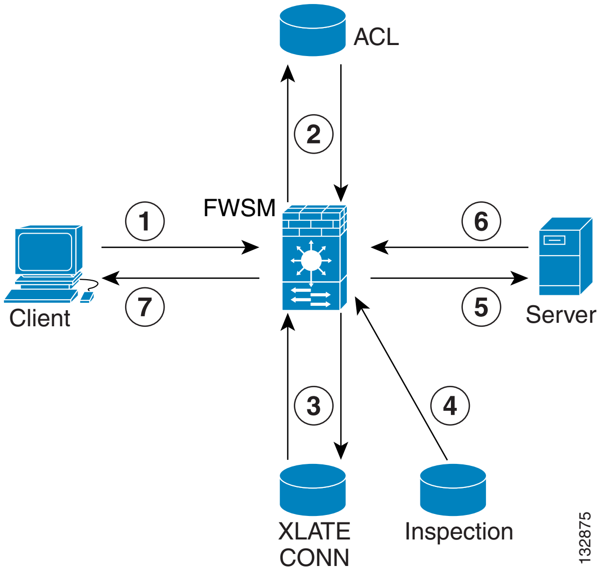
- How Inspection Engines Work, page 40-1
- When to Use Application Protocol Inspection, page 40-2

How Inspection Engines Work

As illustrated in Figure 40-1, the ASA uses three databases for its basic operation:

- Access lists—Used for authentication and authorization of connections based on specific networks, hosts, and services (TCP/UDP port numbers).
- Inspections—Contains a static, predefined set of application-level inspection functions.
- Connections (XLATE and CONN tables)—Maintains state and other information about each established connection. This information is used by the Adaptive Security Algorithm and cut-through proxy to efficiently forward traffic within established sessions.

Figure 40-1 How Inspection Engines Work



In Figure 40-1, operations are numbered in the order they occur, and are described as follows:

1. A TCP SYN packet arrives at the ASA to establish a new connection.
2. The ASA checks the access list database to determine if the connection is permitted.
3. The ASA creates a new entry in the connection database (XLATE and CONN tables).
4. The ASA checks the Inspections database to determine if the connection requires application-level inspection.
5. After the application inspection engine completes any required operations for the packet, the ASA forwards the packet to the destination system.
6. The destination system responds to the initial request.
7. The ASA receives the reply packet, looks up the connection in the connection database, and forwards the packet because it belongs to an established session.

The default configuration of the ASA includes a set of application inspection entries that associate supported protocols with specific TCP or UDP port numbers and that identify any special handling required.

When to Use Application Protocol Inspection

When a user establishes a connection, the ASA checks the packet against access lists, creates an address translation, and creates an entry for the session in the fast path, so that further packets can bypass time-consuming checks. However, the fast path relies on predictable port numbers and does not perform address translations inside a packet.

Many protocols open secondary TCP or UDP ports. The initial session on a well-known port is used to negotiate dynamically assigned port numbers.

Other applications embed an IP address in the packet that needs to match the source address that is normally translated when it goes through the ASA.

If you use applications like these, then you need to enable application inspection.

When you enable application inspection for a service that embeds IP addresses, the ASA translates embedded addresses and updates any checksum or other fields that are affected by the translation.

When you enable application inspection for a service that uses dynamically assigned ports, the ASA monitors sessions to identify the dynamic port assignments, and permits data exchange on these ports for the duration of the specific session.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

Failover Guidelines

State information for multimedia sessions that require inspection are not passed over the state link for stateful failover. The exception is GTP, which is replicated over the state link.

IPv6 Guidelines

Supports IPv6 for the following inspections:

- FTP
- HTTP
- ICMP
- SIP
- SMTP
- IPSec pass-through

Additional Guidelines and Limitations

Some inspection engines do not support PAT, NAT, outside NAT, or NAT between same security interfaces. See "Default Settings" for more information about NAT support.

For all the application inspections, the adaptive security appliance limits the number of simultaneous, active data connections to 200 connections. For example, if an FTP client opens multiple secondary connections, the FTP inspection engine allows only 200 active connections and the 201 connection is dropped and the adaptive security appliance generates a system error message.

Inspected protocols are subject to advanced TCP-state tracking, and the TCP state of these connections is not automatically replicated. While these connections are replicated to the standby unit, there is a best-effort attempt to re-establish a TCP state.

Default Settings

By default, the configuration includes a policy that matches all default application inspection traffic and applies inspection to the traffic on all interfaces (a global policy). Default application inspection traffic includes traffic to the default ports for each protocol. You can only apply one global policy, so if you want to alter the global policy, for example, to apply inspection to non-standard ports, or to add inspections that are not enabled by default, you need to either edit the default policy or disable it and apply a new one.

Table 40-1 lists all inspections supported, the default ports used in the default class map, and the inspection engines that are on by default, shown in bold. This table also notes any NAT limitations.

Table 40-1 Supported Application Inspection Engines

Application[1]	Default Port	NAT Limitations	Standards[2]	Comments
CTIQBE	TCP/2748	—	—	—
DCERPC	TCP/135	—	—	—
DNS over UDP	UDP/53	No NAT support is available for name resolution through WINS.	RFC 1123	No PTR records are changed.
FTP	TCP/21	—	RFC 959	—
GTP	UDP/3386 UDP/2123	—	—	Requires a special license.
H.323 H.225 and **RAS**	TCP/1720 UDP/1718 UDP (RAS) 1718-1719	No NAT on same security interfaces. No static PAT.	ITU-T H.323, H.245, H225.0, Q.931, Q.932	—
HTTP	TCP/80	—	RFC 2616	Beware of MTU limitations stripping ActiveX and Java. If the MTU is too small to allow the Java or ActiveX tag to be included in one packet, stripping may not occur.
ICMP	—	—	—	All ICMP traffic is matched in the default class map.
ICMP ERROR	—	—	—	All ICMP traffic is matched in the default class map.
ILS (LDAP)	TCP/389	No PAT.	—	—
Instant Messaging (IM)	Varies by client	—	RFC 3860	—
IP Options	—	—	RFC 791, RFC 2113	All IP Options traffic is matched in the default class map.
MMP	TCP 5443	—	—	—
MGCP	UDP/2427, 2727	—	RFC 2705bis-05	—
NetBIOS Name Server over IP	UDP/137, 138 (Source ports)	—	—	NetBIOS is supported by performing NAT of the packets for NBNS UDP port 137 and NBDS UDP port 138.

Table 40-1 Supported Application Inspection Engines (continued)

Application[1]	Default Port	NAT Limitations	Standards[2]	Comments
PPTP	TCP/1723	—	RFC 2637	—
RADIUS Accounting	1646	—	RFC 2865	—
RSH	TCP/514	No PAT	Berkeley UNIX	—
RTSP	TCP/554	No PAT. No outside NAT.	RFC 2326, 2327, 1889	No handling for HTTP cloaking.
SIP	TCP/5060 UDP/5060	No outside NAT. No NAT on same security interfaces.	RFC 2543	—
SKINNY (SCCP)	TCP/2000	No outside NAT. No NAT on same security interfaces.	—	Does not handle TFTP uploaded Cisco IP Phone configurations under certain circumstances.
SMTP and **ESMTP**	TCP/25	—	RFC 821, 1123	—
SNMP	UDP/161, 162	No NAT or PAT.	RFC 1155, 1157, 1212, 1213, 1215	v.2 RFC 1902-1908; v.3 RFC 2570-2580.
SQL*Net	TCP/1521	—	—	v.1 and v.2.
Sun RPC over UDP and TCP	UDP/111	No NAT or PAT.	—	The default rule includes UDP port 111; if you want to enable Sun RPC inspection for TCP port 111, you need to create a new rule that matches TCP port 111 and performs Sun RPC inspection.
TFTP	UDP/69	—	RFC 1350	Payload IP addresses are not translated.
WAAS	—	—	—	—
XDCMP	UDP/177	No NAT or PAT.	—	—

1. Inspection engines that are enabled by default for the default port are in bold.
2. The ASA is in compliance with these standards, but it does not enforce compliance on packets being inspected. For example, FTP commands are supposed to be in a particular order, but the ASA does not enforce the order.

The default policy configuration includes the following commands:

```
class-map inspection_default
 match default-inspection-traffic
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect ip-options
  inspect rsh
  inspect rtsp
  inspect esmtp
  inspect sqlnet
  inspect skinny
  inspect sunrpc
  inspect xdmcp
  inspect sip
  inspect netbios
  inspect tftp
service-policy global_policy global
```

Configuring Application Layer Protocol Inspection

This feature uses Modular Policy Framework, so that implementing application inspection consists of identifying traffic, applying inspections to the traffic, and activating inspections on an interface. For some applications, you can perform special actions when you enable inspection. See Chapter 9, "Using Modular Policy Framework," for more information.

Inspection is enabled by default for some applications. See the "Default Settings" section for more information. Use this section to modify your inspection policy.

To configure application inspection, perform the following steps:

Step 1 To identify the traffic to which you want to apply inspections, add either a Layer 3/4 class map for through traffic or a Layer 3/4 class map for management traffic. See the "Creating a Layer 3/4 Class Map for Through Traffic" section on page 9-13 and "Creating a Layer 3/4 Class Map for Management Traffic" section on page 9-15 for detailed information. The management Layer 3/4 class map can be used only with the RADIUS accounting inspection.

The default Layer 3/4 class map for through traffic is called "inspection_default." It matches traffic using a special **match** command, **match default-inspection-traffic**, to match the default ports for each application protocol. This traffic class (along with **match any**, which is not typically used for inspection) matches both IPv4 and IPv6 traffic for inspections that support IPv6. See the "Guidelines and Limitations" section on page 40-3 for a list of IPv6-enabled inspections.

You can specify a **match access-list** command along with the **match default-inspection-traffic** command to narrow the matched traffic to specific IP addresses. Because the **match default-inspection-traffic** command specifies the ports to match, any ports in the access list are ignored.

Tip We suggest that you only inspect traffic on ports on which you expect application traffic; if you inspect all traffic, for example using **match any**, the ASA performance can be impacted.

If you want to match non-standard ports, then create a new class map for the non-standard ports. See the "Default Settings" section on page 40-4 for the standard ports for each inspection engine. You can combine multiple class maps in the same policy if desired, so you can create one class map to match certain traffic, and another to match different traffic. However, if traffic matches a class map that contains an inspection command, and then matches another class map that also has an inspection command, only the first matching class is used. For example, SNMP matches the inspection_default class. To enable SNMP inspection, enable SNMP inspection for the default class in Step 5. Do not add another class that matches SNMP.

For example, to limit inspection to traffic from 10.1.1.0 to 192.168.1.0 using the default class map, enter the following commands:

```
hostname(config)# access-list inspect extended permit ip 10.1.1.0 255.255.255.0
192.168.1.0 255.255.255.0
hostname(config)# class-map inspection_default
hostname(config-cmap)# match access-list inspect
```

View the entire class map using the following command:

```
hostname(config-cmap)# show running-config class-map inspection_default
!
class-map inspection_default
 match default-inspection-traffic
 match access-list inspect
!
```

To inspect FTP traffic on port 21 as well as 1056 (a non-standard port), create an access list that specifies the ports, and assign it to a new class map:

```
hostname(config)# access-list ftp_inspect extended permit tcp any any eq 21
hostname(config)# access-list ftp_inspect extended permit tcp any any eq 1056
hostname(config)# class-map new_inspection
hostname(config-cmap)# match access-list ftp_inspect
```

Step 2 (Optional) Some inspection engines let you control additional parameters when you apply the inspection to the traffic. See the following sections to configure an inspection policy map for your application:

- DCERPC—See the "Configuring a DCERPC Inspection Policy Map for Additional Inspection Control" section on page 44-2
- DNS—See the "Configuring a DNS Inspection Policy Map for Additional Inspection Control" section on page 41-8
- ESMTP—See the "Configuring an ESMTP Inspection Policy Map for Additional Inspection Control" section on page 41-33
- FTP—See the "Configuring an FTP Inspection Policy Map for Additional Inspection Control" section on page 41-13.
- GTP—See the "Configuring a GTP Inspection Policy Map for Additional Inspection Control" section on page 44-5.
- H323—See the "Configuring an H.323 Inspection Policy Map for Additional Inspection Control" section on page 42-6
- HTTP—See the "Configuring an HTTP Inspection Policy Map for Additional Inspection Control" section on page 41-19.
- Instant Messaging—See the "Configuring an Instant Messaging Inspection Policy Map for Additional Inspection Control" section on page 41-24
- IP Options—See the "Configuring an IP Options Inspection Policy Map for Additional Inspection Control" section on page 41-28
- MGCP—See the "Configuring an MGCP Inspection Policy Map for Additional Inspection Control" section on page 42-13.
- NetBIOS—See the "Configuring a NetBIOS Inspection Policy Map for Additional Inspection Control" section on page 41-30
- RADIUS Accounting—See the "Configuring a RADIUS Inspection Policy Map for Additional Inspection Control" section on page 44-10
- RTSP—See the "Configuring an RTSP Inspection Policy Map for Additional Inspection Control" section on page 42-16

- SIP—See the "Configuring a SIP Inspection Policy Map for Additional Inspection Control" section on page 42-21
- Skinny—See the "Configuring a Skinny (SCCP) Inspection Policy Map for Additional Inspection Control" section on page 42-27
- SNMP—See the "Configuring an SNMP Inspection Policy Map for Additional Inspection Control" section on page 44-11.

Step 3 To add or edit a Layer 3/4 policy map that sets the actions to take with the class map traffic, enter the following command:

```
hostname(config)# policy-map name
hostname(config-pmap)#
```

The default policy map is called "global_policy." This policy map includes the default inspections listed in the "Default Settings" section on page 40-4. If you want to modify the default policy (for example, to add or delete an inspection, or to identify an additional class map for your actions), then enter **global_policy** as the name.

Step 4 To identify the class map from Step 1 to which you want to assign an action, enter the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

If you are editing the default policy map, it includes the inspection_default class map. You can edit the actions for this class by entering **inspection_default** as the name. To add an additional class map to this policy map, identify a different name. You can combine multiple class maps in the same policy if desired, so you can create one class map to match certain traffic, and another to match different traffic. However, if traffic matches a class map that contains an inspection command, and then matches another class map that also has an inspection command, only the first matching class is used. For example, SNMP matches the inspection_default class map.To enable SNMP inspection, enable SNMP inspection for the default class in Step 5. Do not add another class that matches SNMP.

Step 5 Enable application inspection by entering the following command:

```
hostname(config-pmap-c)# inspect protocol
```

The *protocol* is one of the following values:

Table 40-2 Protocol Keywords

Keywords	Notes
ctiqbe	—
dcerpc [*map_name*]	If you added a DCERPC inspection policy map according to "Configuring a DCERPC Inspection Policy Map for Additional Inspection Control" section on page 44-2, identify the map name in this command.

Table 40-2 Protocol Keywords

Keywords	Notes
dns [*map_name*] [**dynamic-filter-snoop**]	If you added a DNS inspection policy map according to "Configuring a DNS Inspection Policy Map for Additional Inspection Control" section on page 41-8, identify the map name in this command. The default DNS inspection policy map name is "preset_dns_map." The default inspection policy map sets the maximum DNS packet length to 512 bytes. To enable DNS snooping for the Botnet Traffic Filter, enter the **dynamic-filter-snoop** keyword. See the "Enabling DNS Snooping" section on page 54-9 for more information.
esmtp [*map_name*]	If you added an ESMTP inspection policy map according to "Configuring an ESMTP Inspection Policy Map for Additional Inspection Control" section on page 41-33, identify the map name in this command.
ftp [**strict** [*map_name*]]	Use the **strict** keyword to increase the security of protected networks by preventing web browsers from sending embedded commands in FTP requests. See the "Using the strict Option" section on page 41-12 for more information. If you added an FTP inspection policy map according to "Configuring an FTP Inspection Policy Map for Additional Inspection Control" section on page 41-13, identify the map name in this command.
gtp [*map_name*]	If you added a GTP inspection policy map according to the "Configuring a GTP Inspection Policy Map for Additional Inspection Control" section on page 44-5, identify the map name in this command.
h323 h225 [*map_name*]	If you added an H323 inspection policy map according to "Configuring an H.323 Inspection Policy Map for Additional Inspection Control" section on page 42-6, identify the map name in this command.
h323 ras [*map_name*]	If you added an H323 inspection policy map according to "Configuring an H.323 Inspection Policy Map for Additional Inspection Control" section on page 42-6, identify the map name in this command.
http [*map_name*]	If you added an HTTP inspection policy map according to the "Configuring an HTTP Inspection Policy Map for Additional Inspection Control" section on page 41-19, identify the map name in this command.
icmp	—
icmp error	—
ils	—
im [*map_name*]	If you added an Instant Messaging inspection policy map according to "Configuring an Instant Messaging Inspection Policy Map for Additional Inspection Control" section on page 41-24, identify the map name in this command.

Table 40-2 Protocol Keywords

Keywords	Notes
ip-options [*map_name*]	If you added an IP Options inspection policy map according to "Configuring an IP Options Inspection Policy Map for Additional Inspection Control" section on page 41-28, identify the map name in this command.
mgcp [*map_name*]	If you added an MGCP inspection policy map according to "Configuring an MGCP Inspection Policy Map for Additional Inspection Control" section on page 42-13, identify the map name in this command.
netbios [*map_name*]	If you added a NetBIOS inspection policy map according to "Configuring a NetBIOS Inspection Policy Map for Additional Inspection Control" section on page 41-30, identify the map name in this command.
pptp	—
radius-accounting [*map_name*]	The **radius-accounting** keyword is only available for a management class map. See the "Creating a Layer 3/4 Class Map for Management Traffic" section on page 9-15 for more information about creating a management class map. If you added a RADIUS accounting inspection policy map according to "Configuring a RADIUS Inspection Policy Map for Additional Inspection Control" section on page 44-10, identify the map name in this command.
rsh	—
rtsp [*map_name*]	If you added a NetBIOS inspection policy map according to "Configuring an RTSP Inspection Policy Map for Additional Inspection Control" section on page 42-16, identify the map name in this command.
sip [*map_name*]	If you added a SIP inspection policy map according to "Configuring a SIP Inspection Policy Map for Additional Inspection Control" section on page 42-21, identify the map name in this command.
skinny [*map_name*]	If you added a Skinny inspection policy map according to "Configuring a Skinny (SCCP) Inspection Policy Map for Additional Inspection Control" section on page 42-27, identify the map name in this command.
snmp [*map_name*]	If you added an SNMP inspection policy map according to "Configuring an SNMP Inspection Policy Map for Additional Inspection Control" section on page 44-11, identify the map name in this command.
sqlnet	—
sunrpc	The default class map includes UDP port 111; if you want to enable Sun RPC inspection for TCP port 111, you need to create a new class map that matches TCP port 111, add the class to the policy, and then apply the **inspect sunrpc** command to that class.

Table 40-2 Protocol Keywords

Keywords	Notes
tftp	—
xdmcp	—

Step 6 To activate the policy map on one or more interfaces, enter the following command:

```
hostname(config)# service-policy policymap_name {global | interface interface_name}
```

Where **global** applies the policy map to all interfaces, and **interface** applies the policy to one interface. By default, the default policy map, "global_policy," is applied globally. Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

CHAPTER 41

Configuring Inspection of Basic Internet Protocols

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path. As a result, inspection engines can affect overall throughput.

Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network. This chapter includes the following sections:

- DNS Inspection, page 41-1
- FTP Inspection, page 41-12
- HTTP Inspection, page 41-19
- ICMP Inspection, page 41-23
- ICMP Error Inspection, page 41-24
- Instant Messaging Inspection, page 41-24
- IP Options Inspection, page 41-27
- NetBIOS Inspection, page 41-29
- PPTP Inspection, page 41-31
- SMTP and Extended SMTP Inspection, page 41-32
- TFTP Inspection, page 41-36

DNS Inspection

This section describes DNS application inspection. This section includes the following topics:

- How DNS Application Inspection Works, page 41-2
- How DNS Rewrite Works, page 41-2
- Configuring DNS Rewrite, page 41-3
- Configuring a DNS Inspection Policy Map for Additional Inspection Control, page 41-8
- Verifying and Monitoring DNS Inspection, page 41-11

How DNS Application Inspection Works

The ASA tears down the DNS session associated with a DNS query as soon as the DNS reply is forwarded by the ASA. The ASA also monitors the message exchange to ensure that the ID of the DNS reply matches the ID of the DNS query.

When DNS inspection is enabled, which is the default, the ASA performs the following additional tasks:

- Translates the DNS record based on the configuration completed using the **alias**, **static** and **nat** commands (DNS Rewrite). Translation only applies to the A-record in the DNS reply; therefore, DNS Rewrite does not affect reverse lookups, which request the PTR record.

Note DNS Rewrite is not applicable for PAT because multiple PAT rules are applicable for each A-record and the PAT rule to use is ambiguous.

- Enforces the maximum DNS message length (the default is 512 bytes and the maximum length is 65535 bytes). The ASA performs reassembly as needed to verify that the packet length is less than the maximum length configured. The ASA drops the packet if it exceeds the maximum length.

Note If you enter the **inspect dns** command without the **maximum-length** option, DNS packet size is not checked

- Enforces a domain-name length of 255 bytes and a label length of 63 bytes.
- Verifies the integrity of the domain-name referred to by the pointer if compression pointers are encountered in the DNS message.
- Checks to see if a compression pointer loop exists.

A single connection is created for multiple DNS sessions, as long as they are between the same two hosts, and the sessions have the same 5-tuple (source/destination IP address, source/destination port, and protocol). DNS identification is tracked by *app_id*, and the idle timer for each app_id runs independently.

Because the app_id expires independently, a legitimate DNS response can only pass through the ASA within a limited period of time and there is no resource build-up. However, if you enter the **show conn** command, you will see the idle timer of a DNS connection being reset by a new DNS session. This is due to the nature of the shared DNS connection and is by design.

How DNS Rewrite Works

When DNS inspection is enabled, DNS rewrite provides full support for NAT of DNS messages originating from any interface.

If a client on an inside network requests DNS resolution of an inside address from a DNS server on an outside interface, the DNS A-record is translated correctly. If the DNS inspection engine is disabled, the A-record is not translated.

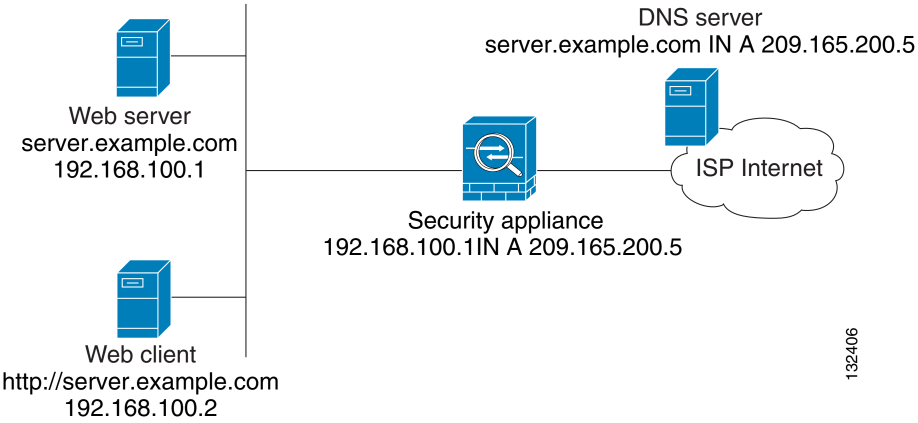
As long as DNS inspection remains enabled, you can configure DNS rewrite using the **alias**, **static**, or **nat** commands. For details about the configuration required see the "Configuring DNS Rewrite" section on page 41-3.

DNS Rewrite performs two functions:

- Translating a public address (the routable or "mapped" address) in a DNS reply to a private address (the "real" address) when the DNS client is on a private interface.
- Translating a private address to a public address when the DNS client is on the public interface.

In Figure 41-1, the DNS server resides on the external (ISP) network The real address of the server (192.168.100.1) has been mapped using the **static** command to the ISP-assigned address (209.165.200.5). When a web client on the inside interface attempts to access the web server with the URL http://server.example.com, the host running the web client sends a DNS request to the DNS server to resolve the IP address of the web server. The ASA translates the non-routable source address in the IP header and forwards the request to the ISP network on its outside interface. When the DNS reply is returned, the ASA applies address translation not only to the destination address, but also to the embedded IP address of the web server, which is contained in the A-record in the DNS reply. As a result, the web client on the inside network gets the correct address for connecting to the web server on the inside network. For configuration instructions for scenarios similar to this one, see the "Configuring DNS Rewrite with Two NAT Zones" section on page 41-4.

Figure 41-1 Translating the Address in a DNS Reply (DNS Rewrite)



DNS rewrite also works if the client making the DNS request is on a DMZ network and the DNS server is on an inside interface. For an illustration and configuration instructions for this scenario, see the "DNS Rewrite with Three NAT Zones" section on page 41-5.

Configuring DNS Rewrite

You configure DNS rewrite using the **alias**, **static**, or **nat** commands. The **alias** and **static** command can be used interchangeably; however, we recommend using the **static** command for new deployments because it is more precise and unambiguous. Also, DNS rewrite is optional when using the **static** command.

This section describes how to use the **alias** and **static** commands to configure DNS rewrite. It provides configuration procedures for using the **static** command in a simple scenario and in a more complex scenario. Using the **nat** command is similar to using the **static** command except that DNS Rewrite is based on dynamic translation instead of a static mapping.

This section includes the following topics:

- Using the Static Command for DNS Rewrite, page 41-4
- Using the Static Command for DNS Rewrite, page 41-4
- Configuring DNS Rewrite with Two NAT Zones, page 41-4

- DNS Rewrite with Three NAT Zones, page 41-5
- Configuring DNS Rewrite with Three NAT Zones, page 41-7

For detailed syntax and additional functions for the **alias**, **nat**, and **static** command, see the appropriate command page in the *Cisco ASA 5500 Series Command Reference*.

Using the Static Command for DNS Rewrite

The **static** command causes addresses on an IP network residing on a specific interface to be translated into addresses on another IP network on a different interface. The syntax for this command is as follows:

```
hostname(config)# static (real_ifc,mapped_ifc) mapped-address real-address dns
```

The following example specifies that the address 192.168.100.10 on the inside interface is translated into 209.165.200.5 on the outside interface:

```
hostname(config)# static (inside,outside) 209.165.200.225 192.168.100.10 dns
```

Note Using the **nat** command is similar to using the **static** command except that DNS Rewrite is based on dynamic translation instead of a static mapping.

Using the Alias Command for DNS Rewrite

The **alias** command causes the ASA to translate addresses on an IP network residing on any interface into addresses on another IP network connected through a different interface. The syntax for this command is as follows:

```
hostname(config)# alias (interface_name) mapped-address real-address
```

The following example specifies that the real address (192.168.100.10) on any interface except the inside interface will be translated to the mapped address (**209.165.200.225)** on the inside interface. Notice that the location of 192.168.100.10 is not precisely defined.

```
hostname(config)# alias (inside) 209.165.200.225 192.168.100.10
```

Note If you use the **alias** command to configure DNS Rewrite, proxy ARP will be performed for the mapped address. To prevent this, disable Proxy ARP by entering the **sysopt noproxyarp** command after entering the **alias** command.

Configuring DNS Rewrite with Two NAT Zones

To implement a DNS Rewrite scenario similar to the one shown in Figure 41-1, perform the following steps:

Step 1 Create a static translation for the web server, as follows:

```
hostname(config)# static (real_ifc,mapped_ifc) mapped-address real-address netmask
255.255.255.255 dns
```

where the arguments are as follows:

- *real_ifc*—The name of the interface connected to the real addresses.

- *mapped_ifc*—The name of the interface where you want the addresses to be mapped.
- *mapped-address*—The translated IP address of the web server.
- *real-address*—The real IP address of the web server.

Step 2 Create an access list that permits traffic to the port that the web server listens to for HTTP requests.

```
hostname(config)# access-list acl-name extended permit tcp any host mapped-address eq port
```

where the arguments are as follows:

acl-name—The name you give the access list.

mapped-address—The translated IP address of the web server.

port—The TCP port that the web server listens to for HTTP requests.

Step 3 Apply the access list created in Step 2 to the mapped interface. To do so, use the **access-group** command, as follows:

```
hostname(config)# access-group acl-name in interface mapped_ifc
```

Step 4 If DNS inspection is disabled or if you want to change the maximum DNS packet length, configure DNS inspection. DNS application inspection is enabled by default with a maximum DNS packet length of 512 bytes. For configuration instructions, see the "Configuring a DNS Inspection Policy Map for Additional Inspection Control" section on page 41-8.

Step 5 On the public DNS server, add an A-record for the web server, such as:

```
domain-qualified-hostname. IN A mapped-address
```

where `domain-qualified-hostname` is the hostname with a domain suffix, as in server.example.com. The period after the hostname is important. *mapped-address* is the translated IP address of the web server.

The following example configures the ASA for the scenario shown in Figure 41-1. It assumes DNS inspection is already enabled.

```
hostname(config)# static (inside,outside) 209.165.200.225 192.168.100.1 netmask
255.255.255.255 dns
hostname(config)# access-list 101 permit tcp any host 209.165.200.225 eq www
hostname(config)# access-group 101 in interface outside
```

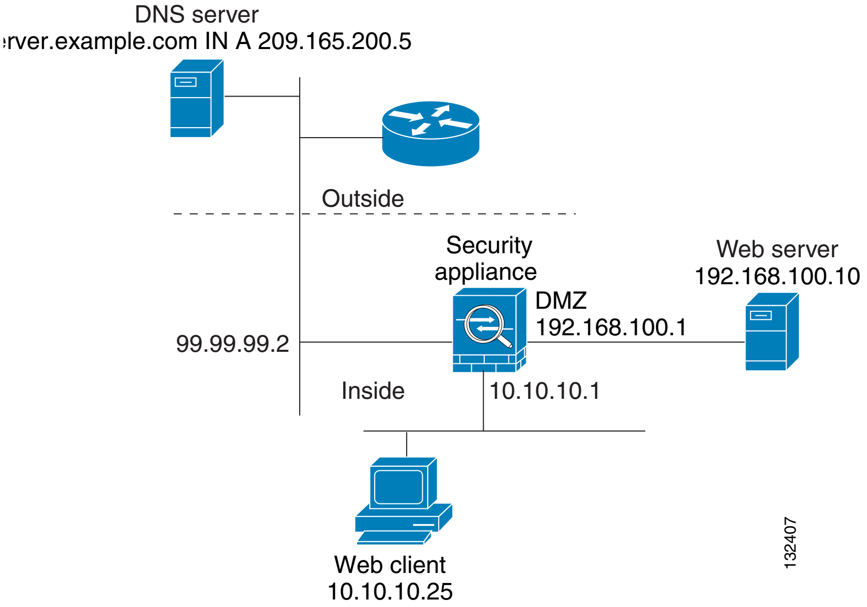
This configuration requires the following A-record on the DNS server:

```
server.example.com. IN A 209.165.200.225
```

DNS Rewrite with Three NAT Zones

Figure 41-2 provides a more complex scenario to illustrate how DNS inspection allows NAT to operate transparently with a DNS server with minimal configuration. For configuration instructions for scenarios like this one, see the "Configuring DNS Rewrite with Three NAT Zones" section on page 41-7.

Figure 41-2 DNS Rewrite with Three NAT Zones



In Figure 41-2, a web server, server.example.com, has the real address 192.168.100.10 on the DMZ interface of the ASA. A web client with the IP address 10.10.10.25 is on the inside interface and a public DNS server is on the outside interface. The site NAT policies are as follows:

- The outside DNS server holds the authoritative address record for server.example.com.
- Hosts on the outside network can contact the web server with the domain name server.example.com through the outside DNS server or with the IP address 209.165.200.5.
- Clients on the inside network can access the web server with the domain name server.example.com through the outside DNS server or with the IP address 192.168.100.10.

When a host or client on any interface accesses the DMZ web server, it queries the public DNS server for the A-record of server.example.com. The DNS server returns the A-record showing that server.example.com binds to address 209.165.200.5.

When a web client on the *outside* network attempts to access http://server.example.com, the sequence of events is as follows:

1. The host running the web client sends the DNS server a request for the IP address of server.example.com.
2. The DNS server responds with the IP address 209.165.200.225 in the reply.
3. The web client sends its HTTP request to 209.165.200.225.
4. The packet from the outside host reaches the ASA at the outside interface.
5. The static rule translates the address 209.165.200.225 to 192.168.100.10 and the ASA directs the packet to the web server on the DMZ.

When a web client on the *inside* network attempts to access http://server.example.com, the sequence of events is as follows:

1. The host running the web client sends the DNS server a request for the IP address of server.example.com.
2. The DNS server responds with the IP address 209.165.200.225 in the reply.

3. The ASA receives the DNS reply and submits it to the DNS application inspection engine.
4. The DNS application inspection engine does the following:
   a. Searches for any NAT rule to undo the translation of the embedded A-record address "[outside]:209.165.200.5". In this example, it finds the following static configuration:

      ```
      static (dmz,outside) 209.165.200.225 192.168.100.10 dns
      ```

   b. Uses the static rule to rewrite the A-record as follows because the **dns** option is included:

      ```
      [outside]:209.165.200.225 --> [dmz]:192.168.100.10
      ```

      Note If the **dns** option were not included with the **static** command, DNS Rewrite would not be performed and other processing for the packet continues.

   c. Searches for any NAT to translate the web server address, [dmz]:192.168.100.10, when communicating with the inside web client.

      No NAT rule is applicable, so application inspection completes.

      If a NAT rule (nat or static) were applicable, the **dns** option must also be specified. If the **dns** option were not specified, the A-record rewrite in step b would be reverted and other processing for the packet continues.
5. The ASA sends the HTTP request to server.example.com on the DMZ interface.

Configuring DNS Rewrite with Three NAT Zones

To enable the NAT policies for the scenario in Figure 41-2, perform the following steps:

Step 1 Create a static translation for the web server on the DMZ network, as follows:

```
hostname(config)# static (dmz,outside) mapped-address real-address dns
```

where the arguments are as follows:

- *dmz*—The name of the DMZ interface of the ASA.
- *outside*—The name of the outside interface of the ASA.
- *mapped-address*—The translated IP address of the web server.
- *real-address*—The real IP address of the web server.

Step 2 Create an access list that permits traffic to the port that the web server listens to for HTTP requests.

```
hostname(config)# access-list acl-name extended permit tcp any host mapped-address eq port
```

where the arguments are as follows:

acl-name—The name you give the access list.

mapped-address—The translated IP address of the web server.

port—The TCP port that the web server listens to for HTTP requests.

Step 3 Apply the access list created in Step 2 to the outside interface. To do so, use the **access-group** command, as follows:

```
hostname(config)# access-group acl-name in interface outside
```

Step 4 If DNS inspection is disabled or if you want to change the maximum DNS packet length, configure DNS inspection. DNS application inspection is enabled by default with a maximum DNS packet length of 512 bytes. For configuration instructions, see the "Configuring a DNS Inspection Policy Map for Additional Inspection Control" section on page 41-8.

Step 5 On the public DNS server, add an A-record for the web server, such as:

```
domain-qualified-hostname. IN A mapped-address
```

where `domain-qualified-hostname` is the hostname with a domain suffix, as in server.example.com. The period after the hostname is important. *mapped-address* is the translated IP address of the web server.

The following example configures the ASA for the scenario shown in Figure 41-2. It assumes DNS inspection is already enabled.

```
hostname(config)# static (dmz,outside) 209.165.200.225 192.168.100.10 dns
hostname(config)# access-list 101 permit tcp any host 209.165.200.225 eq www
hostname(config)# access-group 101 in interface outside
```

This configuration requires the following A-record on the DNS server:

```
server.example.com. IN A 209.165.200.225
```

Configuring a DNS Inspection Policy Map for Additional Inspection Control

DNS application inspection supports DNS message controls that provide protection against DNS spoofing and cache poisoning. User configurable rules allow filtering based on DNS header, domain name, resource record type and class. Zone transfer can be restricted between servers with this function, for example.

The Recursion Desired and Recursion Available flags in the DNS header can be masked to protect a public server from attack if that server only supports a particular internal zone. In addition, DNS randomization can be enabled avoid spoofing and cache poisoning of servers that either do not support randomization, or utilize a weak pseudo random number generator. Limiting the domain names that can be queried also restricts the domain names which can be queried, which protects the public server further.

A configurable DNS mismatch alert can be used as notification if an excessive number of mismatching DNS responses are received, which could indicate a cache poisoning attack. In addition, a configurable check to enforce a Transaction Signature be attached to all DNS messages is also supported.

To specify actions when a message violates a parameter, create a DNS inspection policy map. You can then apply the inspection policy map when you enable DNS inspection.

To create a DNS inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 (Optional) Create a DNS inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop, drop-connection, reset, mask, set the rate limit, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect dns [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

c. (Optional) To match a specific flag that is set in the DNS header, enter the following command:

```
hostname(config-cmap)# match [not] header-flag [eq] {f_well_known | f_value}
```

Where the *f_well_known* argument is the DNS flag bit. The *f_value* argument is the 16-bit value in hex. The **eq** keyword specifies an exact match.

d. (Optional) To match a DNS type, including Query type and RR type, enter the following command:

```
hostname(config-cmap)# match [not] dns-type {eq t_well_known | t_val} {range t_val1
t_val2}
```

Where the *t_well_known* argument is the DNS flag bit. The *t_val* arguments are arbitrary values in the DNS type field (0-65535). The **range** keyword specifies a range and the **eq** keyword specifies an exact match.

e. (Optional) To match a DNS class, enter the following command:

```
hostname(config-cmap)# match [not] dns-class {eq c_well_known | c_val} {range c_val1
c_val2}
```

Where the *c_well_known* argument is the DNS class. The *c_val* arguments are arbitrary values in the DNS class field. The **range** keyword specifies a range and the **eq** keyword specifies an exact match.

f. (Optional) To match a DNS question or resource record, enter the following command:

```
hostname(config-cmap)# match {question | {resource-record answer | authority | any}}
```

Where the **question** keyword specifies the question portion of a DNS message. The **resource-record** keyword specifies the resource record portion of a DNS message. The ***answer*** keyword specifies the Answer RR section. The **authority** keyword specifies the Authority RR section. The ***additional*** keyword specifies the Additional RR section.

g. (Optional) To match a DNS message domain name list, enter the following command:

```
hostname(config-cmap)# match [not] domain-name {regex regex_id | regex class class_id]
```

The **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

Step 4 Create a DNS inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect dns policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the DNS class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To randomize the DNS identifier for a DNS query, enter the following command:

```
hostname(config-pmap-p)# id-randomization
```

c. To enable logging for excessive DNS ID mismatches, enter the following command:

```
hostname(config-pmap-p)# id-mismatch [count number duration seconds] action log
```

Where the **count** *string* argument specifies the maximum number of mismatch instances before a system message log is sent. The **duration** ***seconds*** specifies the period, in seconds, to monitor.

d. To require a TSIG resource record to be present, enter the following command:

```
hostname(config-pmap-p)# tsig enforced action {drop [log] | [log}
```

Where the **count** *string* argument specifies the maximum number of mismatch instances before a system message log is sent. The **duration** ***seconds*** specifies the period, in seconds, to monitor.

The following example shows a how to define a DNS inspection policy map.

```
hostname(config)# regex domain_example "example\.com"
hostname(config)# regex domain_foo "foo\.com"

hostname(config)# ! define the domain names that the server serves
hostname(config)# class-map type inspect regex match-any my_domains
hostname(config-cmap)# match regex domain_example
hostname(config-cmap)# match regex domain_foo

hostname(config)# ! Define a DNS map for query only
hostname(config)# class-map type inspect dns match-all pub_server_map
hostname(config-cmap)# match not header-flag QR
hostname(config-cmap)# match question
hostname(config-cmap)# match not domain-name regex class my_domains

hostname(config)# policy-map type inspect dns serv_prot
hostname(config-pmap)# class pub_server_map
hostname(config-pmap-c)# drop log
hostname(config-pmap-c)# match header-flag RD
hostname(config-pmap-c)# mask log

hostname(config)# class-map dns_serv_map
hostname(config-cmap)# match default-inspection-traffic

hostname(config)# policy-map pub_policy
hostname(config-pmap)# class dns_serv_map
hostname(config-pmap-c)# inspect dns serv_prot

hostname(config)# service-policy pub_policy interface dmz
```

Verifying and Monitoring DNS Inspection

To view information about the current DNS connections, enter the following command:

```
hostname# show conn
```

For connections using a DNS server, the source port of the connection may be replaced by the IP address of DNS server in the show conn command output.

A single connection is created for multiple DNS sessions, as long as they are between the same two hosts, and the sessions have the same 5-tuple (source/destination IP address, source/destination port, and protocol). DNS identification is tracked by app_id, and the idle timer for each app_id runs independently.

Because the app_id expires independently, a legitimate DNS response can only pass through the security appliance within a limited period of time and there is no resource build-up. However, when you enter the **show conn** command, you see the idle timer of a DNS connection being reset by a new DNS session. This is due to the nature of the shared DNS connection and is by design.

To display the statistics for DNS application inspection, enter the **show service-policy** command. The following is sample output from the **show service-policy** command:

```
hostname# show service-policy
Interface outside:
  Service-policy: sample_policy
    Class-map: dns_port
      Inspect: dns maximum-length 1500, packet 0, drop 0, reset-drop 0
```

FTP Inspection

This section describes the FTP inspection engine. This section includes the following topics:

- FTP Inspection Overview, page 41-12
- Using the strict Option, page 41-12
- Configuring an FTP Inspection Policy Map for Additional Inspection Control, page 41-13
- Verifying and Monitoring FTP Inspection, page 41-17

FTP Inspection Overview

The FTP application inspection inspects the FTP sessions and performs four tasks:

- Prepares dynamic secondary data connection
- Tracks the FTP command-response sequence
- Generates an audit trail
- Translates the embedded IP address

FTP application inspection prepares secondary channels for FTP data transfer. Ports for these channels are negotiated through PORT or PASV commands. The channels are allocated in response to a file upload, a file download, or a directory listing event.

Note If you disable FTP inspection engines with the **no inspect ftp** command, outbound users can start connections only in passive mode, and all inbound FTP is disabled.

Using the strict Option

Using the **strict** option with the **inspect ftp** command increases the security of protected networks by preventing web browsers from sending embedded commands in FTP requests.

Note To specify FTP commands that are not permitted to pass through the ASA, create an FTP map according to the "Configuring an FTP Inspection Policy Map for Additional Inspection Control" section on page 41-13.

After you enable the **strict** option on an interface, FTP inspection enforces the following behavior:

- An FTP command must be acknowledged before the ASA allows a new command.
- The ASA drops connections that send embedded commands.
- The 227 and PORT commands are checked to ensure they do not appear in an error string.

Caution Using the **strict** option may cause the failure of FTP clients that are not strictly compliant with FTP RFCs.

If the **strict** option is enabled, each FTP command and response sequence is tracked for the following anomalous activity:

- Truncated command—Number of commas in the PORT and PASV reply command is checked to see if it is five. If it is not five, then the PORT command is assumed to be truncated and the TCP connection is closed.
- Incorrect command—Checks the FTP command to see if it ends with <CR><LF> characters, as required by the RFC. If it does not, the connection is closed.
- Size of RETR and STOR commands—These are checked against a fixed constant. If the size is greater, then an error message is logged and the connection is closed.
- Command spoofing—The PORT command should always be sent from the client. The TCP connection is denied if a PORT command is sent from the server.
- Reply spoofing—PASV reply command (227) should always be sent from the server. The TCP connection is denied if a PASV reply command is sent from the client. This prevents the security hole when the user executes "227 xxxxx a1, a2, a3, a4, p1, p2."
- TCP stream editing—The ASA closes the connection if it detects TCP stream editing.
- Invalid port negotiation—The negotiated dynamic port value is checked to see if it is less than 1024. As port numbers in the range from 1 to 1024 are reserved for well-known connections, if the negotiated port falls in this range, then the TCP connection is freed.
- Command pipelining—The number of characters present after the port numbers in the PORT and PASV reply command is cross checked with a constant value of 8. If it is more than 8, then the TCP connection is closed.
- The ASA replaces the FTP server response to the SYST command with a series of Xs. to prevent the server from revealing its system type to FTP clients. To override this default behavior, use the **no mask-syst-reply** command in the FTP map.

Configuring an FTP Inspection Policy Map for Additional Inspection Control

FTP command filtering and security checks are provided using strict FTP inspection for improved security and control. Protocol conformance includes packet length checks, delimiters and packet format checks, command terminator checks, and command validation.

Blocking FTP based on user values is also supported so that it is possible for FTP sites to post files for download, but restrict access to certain users. You can block FTP connections based on file type, server name, and other attributes. System message logs are generated if an FTP connection is denied after inspection.

If you want FTP inspection to allow FTP servers to reveal their system type to FTP clients, and limit the allowed FTP commands, then create and configure an FTP map. You can then apply the FTP map when you enable FTP inspection.

To create an FTP map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 (Optional) Create an FTP inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop, drop-connection, reset, mask, set the rate limit, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect ftp [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

c. (Optional) To match a filename for FTP transfer, enter the following command:

```
hostname(config-cmap)# match [not] filename regex [regex_name |
class regex_class_name]
```

Where the *regex_name* is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

d. (Optional) To match a file type for FTP transfer, enter the following command:

```
hostname(config-cmap)# match [not] filetype regex [regex_name |
class regex_class_name]
```

Where the *regex_name* is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

e. (Optional) To disallow specific FTP commands, use the following command:

```
hostname(config-cmap)# match [not] request-command ftp_command [ftp_command...]
```

Where *ftp_command* with one or more FTP commands that you want to restrict. See Table 41-1 for a list of the FTP commands that you can restrict.

Table 41-1 FTP Map request-command deny Options

request-command deny Option	Purpose
appe	Disallows the command that appends to a file.
cdup	Disallows the command that changes to the parent directory of the current working directory.
dele	Disallows the command that deletes a file on the server.
get	Disallows the client command for retrieving a file from the server.
help	Disallows the command that provides help information.
mkd	Disallows the command that makes a directory on the server.
put	Disallows the client command for sending a file to the server.
rmd	Disallows the command that deletes a directory on the server.
rnfr	Disallows the command that specifies rename-from filename.
rnto	Disallows the command that specifies rename-to filename.
site	Disallows the command that are specific to the server system. Usually used for remote administration.
stou	Disallows the command that stores a file using a unique file name.

f. (Optional) To match an FTP server, enter the following command:

```
hostname(config-cmap)# match [not] server regex [regex_name | class regex_class_name]
```

Where the *regex_name* is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

g. (Optional) To match an FTP username, enter the following command:

```
hostname(config-cmap)# match [not] username regex [regex_name |
class regex_class_name]
```

Where the *regex_name* is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

h. (Optional) To match active FTP traffic commands PORT and EPRT, enter the following command:

```
hostname(config-cmap)# match [not] active-ftp
```

i. (Optional) To match passive FTP traffic commands PASV and EPSV, enter the following command:

```
hostname(config-cmap)# match [not] passive-ftp
```

Step 4 Create an FTP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect ftp policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the FTP class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the “Defining Actions in an Inspection Policy Map” section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To mask the greeting banner from the FTP server, enter the following command:

```
hostname(config-pmap-p)# mask-banner
```

c. To mask the reply to **syst** command, enter the following command:

```
hostname(config-pmap-p)# mask-syst-reply
```

Before submitting a username and password, all FTP users are presented with a greeting banner. By default, this banner includes version information useful to hackers trying to identify weaknesses in a system. The following example shows how to mask this banner:

```
hostname(config)# policy-map type inspect ftp mymap
hostname(config-pmap)# parameters
hostname(config-pmap-p)# mask-banner

hostname(config)# class-map match-all ftp-traffic
hostname(config-cmap)# match port tcp eq ftp

hostname(config)# policy-map ftp-policy
hostname(config-pmap)# class ftp-traffic
hostname(config-pmap-c)# inspect ftp strict mymap

hostname(config)# service-policy ftp-policy interface inside
```

Verifying and Monitoring FTP Inspection

FTP application inspection generates the following log messages:

- An Audit record 303002 is generated for each file that is retrieved or uploaded.
- The FTP command is checked to see if it is RETR or STOR and the retrieve and store commands are logged.
- The username is obtained by looking up a table providing the IP address.
- The username, source IP address, destination IP address, NAT address, and the file operation are logged.
- Audit record 201005 is generated if the secondary dynamic channel preparation failed due to memory shortage.

In conjunction with NAT, the FTP application inspection translates the IP address within the application payload. This is described in detail in RFC 959.

During FTP inspection, the ASA can drop packets silently. To see whether the ASA has dropped any packets internally, enter the **show service-policy inspect ftp** command.

Note The command output does not display drop counters that are zero. The ASA infrequently drops packets silently; therefore, the output of this command rarely displays drop counters.

Table 41-2 describes the output from the **show service-policy inspect ftp** command:

Table 41-2 FTP Drop Counter Descriptions

Drop Counter	Counter increments...
Back port is zero drop	If the port value is 0 when processing APPE, STOR, STOU, LIST, NLIST, RETR commands.
Can't allocate back conn drop	When an attempt to allocate a secondary data connection fails.
Can't allocate CP conn drop	When the ASA attempts to allocate a data structure for a CP connection and the attempt fails. Check for low system memory.
Can't alloc FTP data structure drop	When the ASA attempts to allocate a data structure for FTP inspection and the attempt fails. Check for low system memory
Can't allocate TCP proxy drop	When the ASA attempts to allocate a data structure for a TCP proxy and the attempt fails. Check for low system memory
Can't append block drop	When the FTP packet is out of space and data cannot be added to the packet.
Can't PAT port drop	When the ASA fails to configure PAT for a port.

Table 41-2 FTP Drop Counter Descriptions

Drop Counter	Counter increments...
Cmd in reply mode drop	When a command is received in REPLY mode.
Cmd match failure drop	When the ASA encounters an internal error in regex matching. Contact Cisco TAC.
Cmd not a cmd drop	When the FTP command string contains invalid characters, such as numeric characters.
Cmd not port drop	When the ASA expects to receive a PORT command but receives another command.
Cmd not supported drop	When the ASA encounters an unsupported FTP command.
Cmd not supported in IPv6 drop	When an FTP command is not supported in IPv6.
Cmd not terminated drop	When the FTP command is not terminated with NL or CR.
Cmd retx unexpected drop	When a retransmitted packet is received unexpectedly.
Cmd too short drop	When the FTP command is too short.
ERPT too short drop	When the ERPT command is too short.
IDS internal error drop	When an internal error is encountered during FTP ID checks. Contact Cisco TAC.
Invalid address drop	When an invalid IP address is encountered during inspection.
Invalid EPSV format drop	When a formatting error is found in the ESPV command.
Invalid ERPT AF number drop	When the Address Family (AF) is invalid in the ERPT command.
Invalid port drop	When an invalid port is encountered during inspection.
No back port for data drop	If the packet does not contain a port when processing APPE, STOR, STOU, LIST, NLIST, RETR commands.
PORT command/reply too long drop	When the length of PORT command or passive reply is greater than 8.
Reply code invalid drop	When the reply code is invalid.
Reply length negative drop	When a reply has a negative length value.
Reply unexpected drop	If the ASA receives a reply when a reply is not expected.
Retx cmd in cmd mode drop	When a retransmitted command is received in CMD mode.
Retx port not old port drop	When a packet is retransmitted but the port in the packet is different from the originally transmitted port.
TCP option exceeds limit drop	When the length value in a TCP option causes the length of the option to exceed the TCP header limit.
TCP option length error drop	When the length value in a TCP option is not correct.

The following is sample output from the **show service-policy inspect ftp** command:

```
hostname# show show show service-policy inspect ftp

Global policy:
  Service-policy: global_policy
    Class-map: inspection_default
      Inspect: ftp, packet 0, drop 0, reset-drop 0
```

```
Can't alloc CP conn drop 1, Can't alloc proxy drop 2
TCP option exceeds limit drop 3, TCP option length error drop 4
Can't alloc FTP structure drop 1, Can't append block drop 2
PORT cmd/reply too long drop 3, ERPT too short drop 4
Invalid ERPT AF number drop 5, IDS internal error drop 6
Invalid address drop 7, Invalid port drop 8
Can't PAT port drop 9, Invalid EPSV format drop 10
Retx port not old port drop 11, No back port for data drop 12
Can't alloc back conn drop 13, Back port is zero drop 14
Cmd too short drop 15, Cmd not terminated drop 16
Cmd not a cmd drop 17, Cmd match failure drop 18
Cmd not supported drop 19, Cmd not supported in IPv6 drop 20
Cmd not port drop 21, Retx cmd in cmd mode drop 22
Cmd retx unexpected drop 23, Cmd in reply mode drop 24
Reply length negative drop 25, Reply unexpected drop 26
Reply code invalid drop 27
```

HTTP Inspection

This section describes the HTTP inspection engine. This section includes the following topics:

- HTTP Inspection Overview, page 41-19
- Configuring an HTTP Inspection Policy Map for Additional Inspection Control, page 41-19

HTTP Inspection Overview

Use the HTTP inspection engine to protect against specific attacks and other threats that may be associated with HTTP traffic. HTTP inspection performs several functions:

- Enhanced HTTP inspection
- URL screening through N2H2 or Websense
- Java and ActiveX filtering

The latter two features are configured in conjunction with the **filter** command. For more information about filtering, see Chapter 39, "Applying Filtering Services."

The enhanced HTTP inspection feature, which is also known as an application firewall and is available when you configure an HTTP map (see "Configuring an HTTP Inspection Policy Map for Additional Inspection Control"), can help prevent attackers from using HTTP messages for circumventing network security policy. It verifies the following for all HTTP messages:

- Conformance to RFC 2616
- Use of RFC-defined methods only.
- Compliance with the additional criteria.

Configuring an HTTP Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create an HTTP inspection policy map. You can then apply the inspection policy map when you enable HTTP inspection.

Note When you enable HTTP inspection with an inspection policy map, strict HTTP inspection with the action reset and log is enabled by default. You can change the actions performed in response to inspection failure, but you cannot disable strict inspection as long as the inspection policy map remains enabled.

To create an HTTP inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 (Optional) Create an HTTP inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop, drop-connection, reset, mask, set the rate limit, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

Note If you need to change a **match** command for HTTP inspection after configuring the inspection, you must remove the attached service policy by using the **no service policy** command and then reconfigure the service policy. Changing the class map by removing a **match** command causes HTTP inspection to block all HTTP traffic until you remove and reconfigure the attached service policy so that all the **match** commands are reprocessed.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect http [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

c. (Optional) To match traffic with a content-type field in the HTTP response that does not match the accept field in the corresponding HTTP request message, enter the following command:

```
hostname(config-cmap)# match [not] req-resp content-type mismatch
```

d. (Optional) To match text found in the HTTP request message arguments, enter the following command:

```
hostname(config-cmap)# match [not] request args regex [regex_name | class
regex_class_name]
```

Where the *regex_name* is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

e. (Optional) To match text found in the HTTP request message body or to match traffic that exceeds the maximum HTTP request message body length, enter the following command:

```
hostname(config-cmap)# match [not] request body {regex [regex_name | class
regex_class_name] | length gt max_bytes}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2. The **length gt** *max_bytes* is the maximum message body length in bytes.

f. (Optional) To match text found in the HTTP request message header, or to restrict the count or length of the header, enter the following command:

```
hostname(config-cmap)# match [not] request header {[field]
[regex [regex_name | class regex_class_name]] |
[length gt max_length_bytes | count gt max_count_bytes]}
```

Where the *field* is the predefined message header keyword. The **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2. The **length gt** *max_bytes* is the maximum message body length in bytes. The **count gt** *max_count* is the maximum number of header fields.

g. (Optional) To match text found in the HTTP request message method, enter the following command:

```
hostname(config-cmap)# match [not] request method {[method] |
[regex [regex_name | class regex_class_name]]
```

Where the *method* is the predefined message method keyword. The **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

h. (Optional) To match text found in the HTTP request message URI, enter the following command:

```
hostname(config-cmap)# match [not] request uri {regex [regex_name | class
regex_class_name] | length gt max_bytes}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2. The **length gt** *max_bytes* is the maximum message body length in bytes.

i. Optional) To match text found in the HTTP response message body, or to comment out Java applet and Active X object tags in order to filter them, enter the following command:

```
hostname(config-cmap)# match [not] response body {[active-x] | [java-applet] |
[regex [regex_name | class regex_class_name]] | length gt max_bytes}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2. The **length gt** *max_bytes* is the maximum message body length in bytes.

j. (Optional) To match text found in the HTTP response message header, or to restrict the count or length of the header, enter the following command:

```
hostname(config-cmap)# match [not] response header {[field]
[regex [regex_name | class regex_class_name]] |
[length gt max_length_bytes | count gt max_count]}
```

Where the *field* is the predefined message header keyword. The **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2. The **length gt** *max_bytes* is the maximum message body length in bytes. The **count gt** *max_count* is the maximum number of header fields.

k. (Optional) To match text found in the HTTP response message status line, enter the following command:

```
hostname(config-cmap)# match [not] response status-line {regex [regex_name | class
regex_class_name]}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

Step 4 Create an HTTP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect http policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the HTTP class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To check for HTTP protocol violations, enter the following command:

```
hostname(config-pmap-p)# protocol-violation [action [drop-connection | reset | log]]
```

Where the **drop-connection** action closes the connection. The **reset** action closes the connection and sends a TCP reset to the client. The **log** action sends a system log message when this policy map matches traffic.

c. To substitute a string for the server header field, enter the following command:

```
hostname(config-pmap-p)# spoof-server string
```

Where the *string* argument is the string to substitute for the server header field. Note: WebVPN streams are not subject to the **spoof-server** comand.

The following example shows how to define an HTTP inspection policy map that will allow and log any HTTP connection that attempts to access “www\.xyz.com/.*\.asp" or "www\.xyz[0-9][0-9]\.com" with methods "GET" or "PUT." All other URL/Method combinations will be silently allowed.

```
hostname(config)# regex url1 “www\.xyz.com/.*\.asp”
hostname(config)# regex url2 “www\.xyz[0-9][0-9]\.com”
hostname(config)# regex get “GET”
hostname(config)# regex put “PUT”

hostname(config)# class-map type regex match-any url_to_log
hostname(config-cmap)# match regex url1
hostname(config-cmap)# match regex url2
hostname(config-cmap)# exit

hostname(config)# class-map type regex match-any methods_to_log
hostname(config-cmap)# match regex get
hostname(config-cmap)# match regex put
hostname(config-cmap)# exit

hostname(config)# class-map type inspect http http_url_policy
hostname(config-cmap)# match request uri regex class url_to_log
hostname(config-cmap)# match request method regex class methods_to_log
hostname(config-cmap)# exit

hostname(config)# policy-map type inspect http http_policy
hostname(config-pmap)# class http_url_policy
hostname(config-pmap-c)# log
```

ICMP Inspection

The ICMP inspection engine allows ICMP traffic to have a “session” so it can be inspected like TCP and UDP traffic. Without the ICMP inspection engine, we recommend that you do not allow ICMP through the ASA in an access list. Without stateful inspection, ICMP can be used to attack your network. The ICMP inspection engine ensures that there is only one response for each request, and that the sequence number is correct.

ICMP Error Inspection

When this feature is enabled, the ASA creates translation sessions for intermediate hops that send ICMP error messages, based on the NAT configuration. The ASA overwrites the packet with the translated IP addresses.

When disabled, the ASA does not create translation sessions for intermediate nodes that generate ICMP error messages. ICMP error messages generated by the intermediate nodes between the inside host and the ASA reach the outside host without consuming any additional NAT resource. This is undesirable when an outside host uses the traceroute command to trace the hops to the destination on the inside of the ASA. When the ASA does not translate the intermediate hops, all the intermediate hops appear with the mapped destination IP address.

The ICMP payload is scanned to retrieve the five-tuple from the original packet. Using the retrieved five-tuple, a lookup is performed to determine the original address of the client. The ICMP error inspection engine makes the following changes to the ICMP packet:

- In the IP Header, the mapped IP is changed to the real IP (Destination Address) and the IP checksum is modified.
- In the ICMP Header, the ICMP checksum is modified due to the changes in the ICMP packet.
- In the Payload, the following changes are made:
  - Original packet mapped IP is changed to the real IP
  - Original packet mapped port is changed to the real Port
  - Original packet IP checksum is recalculated

Instant Messaging Inspection

This section describes the IM inspection engine. This section includes the following topics:

- IM Inspection Overview, page 41-24
- Configuring an Instant Messaging Inspection Policy Map for Additional Inspection Control, page 41-24

IM Inspection Overview

The IM inspect engine lets you apply fine grained controls on the IM application to control the network usage and stop leakage of confidential data, propagation of worms, and other threats to the corporate network.

Configuring an Instant Messaging Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create an IM inspection policy map. You can then apply the inspection policy map when you enable IM inspection.

To create an IM inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.s

Step 3 (Optional) Create an IM inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop-connection, reset, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect im [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *the class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

Where *the string* is the description of the class map (up to 200 characters).

c. (Optional) To match traffic of a specific IM protocol, such as Yahoo or MSN, enter the following command:

```
hostname(config-cmap)# match [not] protocol {im-yahoo | im-msn}
```

d. (Optional) To match a specific IM service, such as chat, file-transfer, webcam, voice-chat, conference, or games, enter the following command:

```
hostname(config-cmap)# match [not] service {chat | file-transfer | webcam | voice-chat
| conference | games}
```

e. (Optional) To match the source login name of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] login-name regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

f. (Optional) To match the destination login name of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] peer-login-name regex {class class_name |
regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

g. (Optional) To match the source IP address of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] ip-address ip_address ip_address_mask
```

Where the *ip_address* and the *ip_address_mask* is the IP address and netmask of the message source.

h. (Optional) To match the destination IP address of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] peer-ip-address ip_address ip_address_mask
```

Where the *ip_address* and the *ip_address_mask* is the IP address and netmask of the message destination.

i. (Optional) To match the version of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] version regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

j. (Optional) To match the filename of the IM message, enter the following command:

```
hostname(config-cmap)# match [not] filename regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

Note Not supported using MSN IM protocol.

Step 4 Create an IM inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect im policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the IM class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {drop-connection | reset | log}
```

Where the **drop-connection** action closes the connection. The **reset** action closes the connection and sends a TCP reset to the client. The **log** action sends a system log message when this policy map matches traffic.

The following example shows how to define an IM inspection policy map.

```
hostname(config)# regex loginname1 "ying\@yahoo.com"
hostname(config)# regex loginname2 "Kevin\@yahoo.com"
hostname(config)# regex loginname3 "rahul\@yahoo.com"
hostname(config)# regex loginname4 "darshant\@yahoo.com"
hostname(config)# regex yahoo_version_regex "1\.0"
hostname(config)# regex gif_files ".*\.gif"
hostname(config)# regex exe_files ".*\.exe"

hostname(config)# class-map type regex match-any yahoo_src_login_name_regex
hostname(config-cmap)# match regex loginname1
hostname(config-cmap)# match regex loginname2

hostname(config)# class-map type regex match-any yahoo_dst_login_name_regex
hostname(config-cmap)# match regex loginname3
hostname(config-cmap)# match regex loginname4

hostname(config)# class-map type inspect im match-any yahoo_file_block_list
hostname(config-cmap)# match filename regex gif_files
hostname(config-cmap)# match filename regex exe_files

hostname(config)# class-map type inspect im match-all yahoo_im_policy
hostname(config-cmap)# match login-name regex class yahoo_src_login_name_regex
hostname(config-cmap)# match peer-login-name regex class yahoo_dst_login_name_regex

hostname(config)# class-map type inspect im match-all yahoo_im_policy2
hostname(config-cmap)# match version regex yahoo_version_regex

hostname(config)# class-map im_inspect_class_map
hostname(config-cmap)# match default-inspection-traffic

hostname(config)# policy-map type inspect im im_policy_all
hostname(config-pmap)# class yahoo_file_block_list
hostname(config-pmap-c)# match service file-transfer
hostname(config-pmap)# class yahoo_im_policy
hostname(config-pmap-c)# drop-connection
hostname(config-pmap)# class yahoo_im_policy2
hostname(config-pmap-c)# reset
hostname(config)# policy-map global_policy_name
hostname(config-pmap)# class im_inspect_class_map
hostname(config-pmap-c)# inspect im im_policy_all
```

IP Options Inspection

This section describes the IM inspection engine. This section includes the following topics:

- IP Options Inspection Overview, page 41-28
- Configuring an IP Options Inspection Policy Map for Additional Inspection Control, page 41-28

IP Options Inspection Overview

In a packet, the IP header contains the Options field. The Options field, commonly referred to as IP Options, provide for control functions that are required in some situations but unnecessary for most common communications. In particular, IP Options include provisions for time stamps, security, and special routing. Use of IP Options is optional and the field can contain zero, one, or more options.

You can configure IP Options inspection to control which IP packets with specific IP options are allowed through the ASA. Configuring this inspection instructs the ASA to allow a packet to pass or to clear the specified IP options and then allow the packet to pass.

IP Options inspection can check for the following three IP options in a packet:

- End of Options List (EOOL) or IP Option 0—This option, which contains just a single zero byte, appears at the end of all options to mark the end of a list of options. This might not coincide with the end of the header according to the header length.
- No Operation (NOP) or IP Option 1—The Options field in the IP header can contain zero, one, or more options, which makes the total length of the field variable. However, the IP header must be a multiple of 32 bits. If the number of bits of all options is not a multiple of 32 bits, the NOP option is used as “internal padding” to align the options on a 32-bit boundary.
- Router Alert (RTRALT) or IP Option 20—This option notifies transit routers to inspect the contents of the packet even when the packet is not destined for that router. This inspection is valuable when implementing RSVP and similar protocols require relatively complex processing from the routers along the packets delivery path.

Note IP Options inspection is included by default in the global inspection policy. Therefore, the ASA allows RSVP traffic that contains packets with the Router Alert option (option 20) when the ASA is in routed mode.

Dropping RSVP packets containing the Router Alert option can cause problems in VoIP implementations.

When you configure ASA to clear the Router Alert option from IP headers, the IP header changes in the following ways:

- The Options field is padded so that the field ends on a 32 bit boundary.
- Internet header length (IHL) changes.
- The total length of the packet changes.
- The checksum is recomputed.

If an IP header contains additional options other than EOOL, NOP, or RTRALT, regardless of whether the ASA is configured to allow these options, the ASA will drop the packet.

Configuring an IP Options Inspection Policy Map for Additional Inspection Control

Step 1 To create an IP Options inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect ip-options policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 2 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 3 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To allow or clear packets with the End of Options List (EOOL) option, enter the following command:

```
hostname(config-pmap-p)# eool action {allow | clear}
```

This option, which contains just a single zero byte, appears at the end of all options to mark the end of a list of options. This might not coincide with the end of the header according to the header length.

c. To allow or clear packets with the No Operation (NOP) option, enter the following command:

```
hostname(config-pmap-p)# nop action {allow | clear}
```

The Options field in the IP header can contain zero, one, or more options, which makes the total length of the field variable. However, the IP header must be a multiple of 32 bits. If the number of bits of all options is not a multiple of 32 bits, the NOP option is used as “internal padding” to align the options on a 32-bit boundary.

d. To allowor clear packets with the Router Alert (RTRALT) option, enter the following command:

```
hostname(config-pmap-p)# router-alert action {allow | clear}
```

This option notifies transit routers to inspect the contents of the packet even when the packet is not destined for that router. This inspection is valuable when implementing RSVP and similar protocols require relatively complex processing from the routers along the packets delivery path.

Note Enter the **clear** command to clear the IP option from the packet before allowing the packet through the ASA.

NetBIOS Inspection

This section describes the IM inspection engine. This section includes the following topics:

- NetBIOS Inspection Overview, page 41-29
- Configuring a NetBIOS Inspection Policy Map for Additional Inspection Control, page 41-30

NetBIOS Inspection Overview

NetBIOS inspection is enabled by default. The NetBios inspection engine translates IP addresses in the NetBios name service (NBNS) packets according to the ASA NAT configuration.

Configuring a NetBIOS Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create a NETBIOS inspection policy map. You can then apply the inspection policy map when you enable NETBIOS inspection.

To create a NETBIOS inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 Create a NetBIOS inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect netbios policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 4 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 5 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the NetBIOS class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 6 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To check for NETBIOS protocol violations, enter the following command:

```
hostname(config-pmap-p)# protocol-violation [action [drop-connection | reset | log]]
```

Where the **drop-connection** action closes the connection. The **reset** action closes the connection and sends a TCP reset to the client. The **log** action sends a system log message when this policy map matches traffic.

The following example shows how to define a NETBIOS inspection policy map.

```
hostname(config)# policy-map type inspect netbios netbios_map
hostname(config-pmap)# protocol-violation drop log

hostname(config)# policy-map netbios_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect netbios netbios_map
```

PPTP Inspection

PPTP is a protocol for tunneling PPP traffic. A PPTP session is composed of one TCP channel and usually two PPTP GRE tunnels. The TCP channel is the control channel used for negotiating and managing the PPTP GRE tunnels. The GRE tunnels carries PPP sessions between the two hosts.

When enabled, PPTP application inspection inspects PPTP protocol packets and dynamically creates the GRE connections and xlates necessary to permit PPTP traffic. Only Version 1, as defined in RFC 2637, is supported.

PAT is only performed for the modified version of GRE [RFC 2637] when negotiated over the PPTP TCP control channel. Port Address Translation is *not* performed for the unmodified version of GRE [RFC 1701, RFC 1702].

Specifically, the ASA inspects the PPTP version announcements and the outgoing call request/response sequence. Only PPTP Version 1, as defined in RFC 2637, is inspected. Further inspection on the TCP control channel is disabled if the version announced by either side is not Version 1. In addition, the outgoing-call request and reply sequence are tracked. Connections and xlates are dynamic allocated as necessary to permit subsequent secondary GRE data traffic.

The PPTP inspection engine must be enabled for PPTP traffic to be translated by PAT. Additionally, PAT is only performed for a modified version of GRE (RFC2637) and only if it is negotiated over the PPTP TCP control channel. PAT is not performed for the unmodified version of GRE (RFC 1701 and RFC 1702).

As described in RFC 2637, the PPTP protocol is mainly used for the tunneling of PPP sessions initiated from a modem bank PAC (PPTP Access Concentrator) to the headend PNS (PPTP Network Server). When used this way, the PAC is the remote client and the PNS is the server.

However, when used for VPN by Windows, the interaction is inverted. The PNS is a remote single-user PC that initiates connection to the head-end PAC to gain access to a central network.

SMTP and Extended SMTP Inspection

This section describes the IM inspection engine. This section includes the following topics:

- SMTP and ESMTP Inspection Overview, page 41-32
- Configuring an ESMTP Inspection Policy Map for Additional Inspection Control, page 41-33

SMTP and ESMTP Inspection Overview

ESMTP application inspection provides improved protection against SMTP-based attacks by restricting the types of SMTP commands that can pass through the ASA and by adding monitoring capabilities.

ESMTP is an enhancement to the SMTP protocol and is similar is most respects to SMTP. For convenience, the term SMTP is used in this document to refer to both SMTP and ESMTP. The application inspection process for extended SMTP is similar to SMTP application inspection and includes support for SMTP sessions. Most commands used in an extended SMTP session are the same as those used in an SMTP session but an ESMTP session is considerably faster and offers more options related to reliability and security, such as delivery status notification.

Extended SMTP application inspection adds support for these extended SMTP commands, including AUTH, EHLO, ETRN, HELP, SAML, SEND, SOML, STARTTLS, and VRFY. Along with the support for seven RFC 821 commands (DATA, HELO, MAIL, NOOP, QUIT, RCPT, RSET), the ASA supports a total of fifteen SMTP commands.

Other extended SMTP commands, such as ATRN, ONEX, VERB, CHUNKING, and private extensions and are not supported. Unsupported commands are translated into Xs, which are rejected by the internal server. This results in a message such as "500 Command unknown: 'XXX'." Incomplete commands are discarded.

The ESMTP inspection engine changes the characters in the server SMTP banner to asterisks except for the "2", "0", "0" characters. Carriage return (CR) and linefeed (LF) characters are ignored.

With SMTP inspection enabled, a Telnet session used for interactive SMTP may hang if the following rules are not observed: SMTP commands must be at least four characters in length; must be terminated with carriage return and line feed; and must wait for a response before issuing the next reply.

An SMTP server responds to client requests with numeric reply codes and optional human-readable strings. SMTP application inspection controls and reduces the commands that the user can use as well as the messages that the server returns. SMTP inspection performs three primary tasks:

- Restricts SMTP requests to seven basic SMTP commands and eight extended commands.
- Monitors the SMTP command-response sequence.
- Generates an audit trail—Audit record 108002 is generated when invalid character embedded in the mail address is replaced. For more information, see RFC 821.

SMTP inspection monitors the command and response sequence for the following anomalous signatures:

- Truncated commands.
- Incorrect command termination (not terminated with <CR><LR>).

- The MAIL and RCPT commands specify who are the sender and the receiver of the mail. Mail addresses are scanned for strange characters. The pipeline character (|) is deleted (changed to a blank space) and "<" ,">" are only allowed if they are used to define a mail address (">" must be preceded by "<").
- Unexpected transition by the SMTP server.
- For unknown commands, the ASA changes all the characters in the packet to X. In this case, the server generates an error code to the client. Because of the change in the packed, the TCP checksum has to be recalculated or adjusted.
- TCP stream editing.
- Command pipelining.

Configuring an ESMTP Inspection Policy Map for Additional Inspection Control

ESMTP inspection detects attacks, including spam, phising, malformed message attacks, buffer overflow/underflow attacks. It also provides support for application security and protocol conformance, which enforce the sanity of the ESMTP messages as well as detect several attacks, block senders/receivers, and block mail relay.

To specify actions when a message violates a parameter, create an ESMTP inspection policy map. You can then apply the inspection policy map when you enable ESMTP inspection.

To create an ESMTP inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 Create an ESMTP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect esmtp policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 4 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 5 To apply actions to matching traffic, perform the following steps.

a. Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 6 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To configure a local domain name, enter the following command:

```
hostname(config-pmap-p)# mail-relay domain-name action [drop-connection / log]]
```

Where the **drop-connection** action closes the connection. The **log** action sends a system log message when this policy map matches traffic.

c. To enforce banner obfuscation, enter the following command:

```
hostname(config-pmap-p)# mask-banner
```

d. (Optional) To detect special characters in sender or receiver email addresses, enter the following command:

```
hostname(config-pmap-p)# special-character action [drop-connection | log]]
```

Using this command detects pipe (|), backquote (`) and null characters.

e. (Optional) To match the body length or body line length, enter the following command:

```
hostname(config-pmap-p)# match body [line] length gt length
```

Where *length* is the length of the message body or the length of a line in the message body.

f. (Optional) To match an ESMTP command verb, enter the following command:

```
hostname(config-pmap-p)# match cmd verb verb
```

Where *verb* is any of the following ESMTP commands:

```
AUTH|DATA|EHLO|ETRN||HELO|HELP|MAIL|NOOP|QUIT|RCPT|RSET|SAML|SOML|VRFY
```

g. (Optional) To match the number of recipient addresses, enter the following command:

```
hostname(config-pmap-p)# match cmd RCPT count gt count
```

Where *count* is the number of recipient addresses.

h. (Optional) To match the command line length, enter the following command:

```
hostname(config-pmap-p)# match cmd line length gt length
```

Where *length* is the command line length.

i. (Optional) To match the ehlo-reply-parameters, enter the following command:

```
hostname(config-pmap-p)# match ehlo-reply-parameter extensions
```

Where *extensions* are the ESMTP service extensions sent by the server in response to the EHLO message from the client. These extensions are implemented as a new command or as parameters to an existing command. *extensions* can be any of the following:

```
8bitmime|binarymime|checkpoint|dsn|ecode|etrn|others|pipelining|size|vrfy
```

j. (Optional) To match the header length or header line length, enter the following command:

```
hostname(config-pmap-p)# match header [line] length gt length
```

Where *length* is the number of characters in the header or line.

k. (Optional) To match the header to-fields count, enter the following command:

```
hostname(config-pmap-p)# match header to-fields count gt count
```

Where *count* is the number of recipients in the to-field of the header.

l. (Optional) To match the number of invalid recipients, enter the following command:

```
hostname(config-pmap-p)# match invalid-recipients count gt count
```

Where *count* is the number of invalid recipients.

m. (Optional) To match the type of MIME encoding scheme used, enter the following command:

```
hostname(config-pmap-p)# match mime encoding [7bit|8bit|base64|binary|others|
quoted-printable]
```

n. (Optional) To match the MIME filename length, enter the following command:

```
hostname(config-pmap-p)# match mime filename length gt length
```

Where *length* is the length of the *filename* in the range 1 to 1000.

o. (Optional) To match the MIME file type, enter the following command:

```
hostname(config-pmap-p)# match mime filetype regex [name | class name]
```

Where *name* or *class name* is the regular expression that matches a file type or a class map. The regular expression used to match a class map can select multiple file types.

p. (Optional) To match a sender address, enter the following command:

```
hostname(config-pmap-p)# match sender-address regex [name | class name]
```

Where *name* or *class name* is the regular expression that matches a sender address or a class map. The regular expression used to match a class map can select multiple sender addresses.

q. (Optional) To match the length of a sender's address, enter the following command:

```
hostname(config-pmap-p)# match sender-address length gt length
```

Where *length* is the number of characters in the sender's address.

The following example shows how to define an ESMTP inspection policy map.

```
hostname(config)# regex user1 "user1@cisco.com"
hostname(config)# regex user2 "user2@cisco.com"
hostname(config)# regex user3 "user3@cisco.com"
hostname(config)# class-map type regex senders_black_list
hostname(config-cmap)# description "Regular expressions to filter out undesired senders"
hostname(config-cmap)# match regex user1
hostname(config-cmap)# match regex user2
hostname(config-cmap)# match regex user3

hostname(config)# policy-map type inspect esmtp advanced_esmtp_map
hostname(config-pmap)# match sender-address regex class senders_black_list
hostname(config-pmap-c)# drop-connection log

hostname(config)# policy-map outside_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect esmtp advanced_esmtp_map

hostname(config)# service-policy outside_policy interface outside
```

TFTP Inspection

TFTP inspection is enabled by default.

TFTP, described in RFC 1350, is a simple protocol to read and write files between a TFTP server and client.

The ASA inspects TFTP traffic and dynamically creates connections and translations, if necessary, to permit file transfer between a TFTP client and server. Specifically, the inspection engine inspects TFTP read request (RRQ), write request (WRQ), and error notification (ERROR).

A dynamic secondary channel and a PAT translation, if necessary, are allocated on a reception of a valid read (RRQ) or write (WRQ) request. This secondary channel is subsequently used by TFTP for file transfer or error notification.

Only the TFTP server can initiate traffic over the secondary channel, and at most one incomplete secondary channel can exist between the TFTP client and server. An error notification from the server closes the secondary channel.

TFTP inspection must be enabled if static PAT is used to redirect TFTP traffic.

CHAPTER 42

Configuring Inspection for Voice and Video Protocols

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path. As a result, inspection engines can affect overall throughput.

Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network. This chapter includes the following sections:

- CTIQBE Inspection, page 42-1
- H.323 Inspection, page 42-3
- MGCP Inspection, page 42-11
- RTSP Inspection, page 42-15
- SIP Inspection, page 42-19
- Skinny (SCCP) Inspection, page 42-25

CTIQBE Inspection

This section describes CTIQBE application inspection. This section includes the following topics:

- CTIQBE Inspection Overview, page 42-1
- Limitations and Restrictions, page 42-2
- Verifying and Monitoring CTIQBE Inspection, page 42-2

CTIQBE Inspection Overview

CTIQBE protocol inspection supports NAT, PAT, and bidirectional NAT. This enables Cisco IP SoftPhone and other Cisco TAPI/JTAPI applications to work successfully with Cisco CallManager for call setup across the ASA.

TAPI and JTAPI are used by many Cisco VoIP applications. CTIQBE is used by Cisco TSP to communicate with Cisco CallManager.

Limitations and Restrictions

The following summarizes limitations that apply when using CTIQBE application inspection:

- CTIQBE application inspection does not support configurations with the **alias** command.
- Stateful failover of CTIQBE calls is not supported.
- Entering the **debug ctiqbe** command may delay message transmission, which may have a performance impact in a real-time environment. When you enable this debugging or logging and Cisco IP SoftPhone seems unable to complete call setup through the ASA, increase the timeout values in the Cisco TSP settings on the system running Cisco IP SoftPhone.

The following summarizes special considerations when using CTIQBE application inspection in specific scenarios:

- If two Cisco IP SoftPhones are registered with different Cisco CallManagers, which are connected to different interfaces of the ASA, calls between these two phones fails.
- When Cisco CallManager is located on the higher security interface compared to Cisco IP SoftPhones, if NAT or outside NAT is required for the Cisco CallManager IP address, the mapping must be static as Cisco IP SoftPhone requires the Cisco CallManager IP address to be specified explicitly in its Cisco TSP configuration on the PC.
- When using PAT or Outside PAT, if the Cisco CallManager IP address is to be translated, its TCP port 2748 must be statically mapped to the same port of the PAT (interface) address for Cisco IP SoftPhone registrations to succeed. The CTIQBE listening port (TCP 2748) is fixed and is not user-configurable on Cisco CallManager, Cisco IP SoftPhone, or Cisco TSP.

Verifying and Monitoring CTIQBE Inspection

The **show ctiqbe** command displays information regarding the CTIQBE sessions established across the ASA. It shows information about the media connections allocated by the CTIQBE inspection engine.

The following is sample output from the **show ctiqbe** command under the following conditions. There is only one active CTIQBE session setup across the ASA. It is established between an internal CTI device (for example, a Cisco IP SoftPhone) at local address 10.0.0.99 and an external Cisco CallManager at 172.29.1.77, where TCP port 2748 is the Cisco CallManager. The heartbeat interval for the session is 120 seconds.

```
hostname# # show ctiqbe

Total: 1
        LOCAL           FOREIGN         STATE   HEARTBEAT
---------------------------------------------------------------
1       10.0.0.99/1117  172.29.1.77/2748        1       120
        ----------------------------------------------
        RTP/RTCP: PAT xlates: mapped to 172.29.1.99(1028 - 1029)
        ----------------------------------------------
        MEDIA: Device ID 27     Call ID 0
               Foreign 172.29.1.99      (1028 - 1029)
               Local   172.29.1.88      (26822 - 26823)
        ----------------------------------------------
```

The CTI device has already registered with the CallManager. The device internal address and RTP listening port is PATed to 172.29.1.99 UDP port 1028. Its RTCP listening port is PATed to UDP 1029.

The line beginning with `RTP/RTCP: PAT xlates:` appears only if an internal CTI device has registered with an external CallManager and the CTI device address and ports are PATed to that external interface. This line does not appear if the CallManager is located on an internal interface, or if the internal CTI device address and ports are translated to the same external interface that is used by the CallManager.

The output indicates a call has been established between this CTI device and another phone at 172.29.1.88. The RTP and RTCP listening ports of the other phone are UDP 26822 and 26823. The other phone locates on the same interface as the CallManager because the ASA does not maintain a CTIQBE session record associated with the second phone and CallManager. The active call leg on the CTI device side can be identified with Device ID 27 and Call ID 0.

The following is sample output from the **show xlate debug** command for these CTIBQE connections:

```
hostname# show xlate debug
3 in use, 3 most used
Flags:  D - DNS, d - dump, I - identity, i - inside, n - no random,
        r - portmap, s - static
TCP PAT from inside:10.0.0.99/1117 to outside:172.29.1.99/1025 flags ri idle 0:00:22
timeout 0:00:30
UDP PAT from inside:10.0.0.99/16908 to outside:172.29.1.99/1028 flags ri idle 0:00:00
timeout 0:04:10
UDP PAT from inside:10.0.0.99/16909 to outside:172.29.1.99/1029 flags ri idle 0:00:23
timeout 0:04:10
```

The **show conn state ctiqbe** command displays the status of CTIQBE connections. In the output, the media connections allocated by the CTIQBE inspection engine are denoted by a ‘C’ flag. The following is sample output from the **show conn state ctiqbe** command:

```
hostname# show conn state ctiqbe
1 in use, 10 most used
hostname# show conn state ctiqbe detail
1 in use, 10 most used
Flags: A - awaiting inside ACK to SYN, a - awaiting outside ACK to SYN,
       B - initial SYN from outside, C - CTIQBE media, D - DNS, d - dump,
       E - outside back connection, F - outside FIN, f - inside FIN,
       G - group, g - MGCP, H - H.323, h - H.225.0, I - inbound data,
       i - incomplete, J - GTP, j - GTP data, k - Skinny media,
       M - SMTP data, m - SIP media, O - outbound data, P - inside back connection,
       q - SQL*Net data, R - outside acknowledged FIN,
       R - UDP RPC, r - inside acknowledged FIN, S - awaiting inside SYN,
       s - awaiting outside SYN, T - SIP, t - SIP transient, U - up
```

H.323 Inspection

This section describes the H.323 application inspection. This section includes the following topics:

- H.323 Inspection Overview, page 42-4
- How H.323 Works, page 42-4
- H.239 Support in H.245 Messages, page 42-5
- ASA-Tandberg Interoperability with H.323 Inspection, page 42-5
- Limitations and Restrictions, page 42-6
- Configuring an H.323 Inspection Policy Map for Additional Inspection Control, page 42-6
- Configuring H.323 and H.225 Timeout Values, page 42-9
- Verifying and Monitoring H.323 Inspection, page 42-9

H.323 Inspection Overview

H.323 inspection provides support for H.323 compliant applications such as Cisco CallManager and VocalTec Gatekeeper. H.323 is a suite of protocols defined by the International Telecommunication Union for multimedia conferences over LANs. The ASA supports H.323 through Version 6, including H.323 v3 feature Multiple Calls on One Call Signaling Channel.

With H.323 inspection enabled, the ASA supports multiple calls on the same call signaling channel, a feature introduced with H.323 Version 3. This feature reduces call setup time and reduces the use of ports on the ASA.

The two major functions of H.323 inspection are as follows:

- NAT the necessary embedded IPv4 addresses in the H.225 and H.245 messages. Because H.323 messages are encoded in PER encoding format, the ASA uses an ASN.1 decoder to decode the H.323 messages.
- Dynamically allocate the negotiated H.245 and RTP/RTCP connections.

How H.323 Works

The H.323 collection of protocols collectively may use up to two TCP connection and four to eight UDP connections. FastConnect uses only one TCP connection, and RAS uses a single UDP connection for registration, admissions, and status.

An H.323 client can initially establish a TCP connection to an H.323 server using TCP port 1720 to request Q.931 call setup. As part of the call setup process, the H.323 terminal supplies a port number to the client to use for an H.245 TCP connection. In environments where H.323 gatekeeper is in use, the initial packet is transmitted using UDP.

H.323 inspection monitors the Q.931 TCP connection to determine the H.245 port number. If the H.323 terminals are not using FastConnect, the ASA dynamically allocates the H.245 connection based on the inspection of the H.225 messages.

Note The H.225 connection can also be dynamically allocated when using RAS.

Within each H.245 message, the H.323 endpoints exchange port numbers that are used for subsequent UDP data streams. H.323 inspection inspects the H.245 messages to identify these ports and dynamically creates connections for the media exchange. RTP uses the negotiated port number, while RTCP uses the next higher port number.

The H.323 control channel handles H.225 and H.245 and H.323 RAS. H.323 inspection uses the following ports.

- 1718—Gate Keeper Discovery UDP port
- 1719—RAS UDP port
- 1720—TCP Control Port

You must permit traffic for the well-known H.323 port 1719 for RAS signaling. Additionally, you must permit traffic for the well-known H.323 port 1720 for the H.225 call signaling; however, the H.245 signaling ports are negotiated between the endpoints in the H.225 signaling. When an H.323 gatekeeper is used, the ASA opens an H.225 connection based on inspection of the ACF and RCF nmessages.

After inspecting the H.225 messages, the ASA opens the H.245 channel and then inspects traffic sent over the H.245 channel as well. All H.245 messages passing through the ASA undergo H.245 application inspection, which translates embedded IP addresses and opens the media channels negotiated in H.245 messages.

The H.323 ITU standard requires that a TPKT header, defining the length of the message, precede the H.225 and H.245, before being passed on to the reliable connection. Because the TPKT header does not necessarily need to be sent in the same TCP packet as H.225 and H.245 messages, the ASA must remember the TPKT length to process and decode the messages properly. For each connection, the ASA keeps a record that contains the TPKT length for the next expected message.

If the ASA needs to perform NAT on IP addresses in messages, it changes the checksum, the UUIE length, and the TPKT, if it is included in the TCP packet with the H.225 message. If the TPKT is sent in a separate TCP packet, the ASA proxy ACKs that TPKT and appends a new TPKT to the H.245 message with the new length.

Note The ASA does not support TCP options in the Proxy ACK for the TPKT.

Each UDP connection with a packet going through H.323 inspection is marked as an H.323 connection and times out with the H.323 timeout as configured with the **timeout** command.

Note You can enable call setup between H.323 endpoints when the Gatekeeper is inside the network. The ASA includes options to open pinholes for calls based on the RegistrationRequest/RegistrationConfirm (RRQ/RCF) messages. Because these RRQ/RCF messages are sent to and from the Gatekeeper, the calling endpoint's IP address is unknown and the ASA opens a pinhole through source IP address/port 0/0. By default, this option is disabled. To enable call setup between H.323 endpoint, enter the **ras-rcf-pinholes enable** command during parameter configuration mode while creating an H.323 Inspection policy map. See Configuring an H.323 Inspection Policy Map for Additional Inspection Control, page 42-6.

H.239 Support in H.245 Messages

The ASA sits between two H.323 endpoints. When the two H.323 endpoints set up a telepresentation session so that the endpoints can send and receive a data presentation, such as spreadsheet data, the ASA ensure successful H.239 negotiation between the endpoints.

H.239 is a standar that provides the ability for H.300 series endpoints to open an additional video channel in a single call. In a call, an endpoint (such as a video phone), sends a channel for video and a channel for data presentation. The H.239 negotiation occurs on the H.245 channel.

The ASA opens pinholes for the additional media channel and the media control channel. The endpoints use open logical channel message (OLC) to signal a new channel creation. The message extension is part of H.245 version 13.

The decoding and encoding of of the telepresentation session is enabled by default. H.239 encoding and decoding is preformed by ASN.1 coder.

ASA-Tandberg Interoperability with H.323 Inspection

H.323 Inspection supports uni-directional signaling for two-way video sessions. This support allows H.323 Inspection of one-way video conferences supported by Tandberg video phones.

The ASA opens a pinhole in the firewall even when only one side of the connection sends an H.245 Open Logical Channel (OLC) message or OLC ACK message.

When setting up a two-way session to send a video stream, Tandberg video phones close and re-open their half of the session to remove the Welcome screen in H.263 (with one set of OLC and OLC ACK message) and then switch video modes (close their side of an H.263 video session and reopen the session using H.264 (with another set of OLC and OLC ACK messages). H.264 provides the compression standard for high-definition video.

Supporting uni-directional signaling also allows Tandberg video phones to renegotiate port numbers and mute audio on one side of a video teleconference.

Limitations and Restrictions

The following are some of the known issues and limitations when using H.323 application inspection:

- Static PAT may not properly translate IP addresses embedded in optional fields within H.323 messages. If you experience this kind of problem, do not use static PAT with H.323.
- H.323 application inspection is not supported with NAT between same-security-level interfaces.
- When a NetMeeting client registers with an H.323 gatekeeper and tries to call an H.323 gateway that is also registered with the H.323 gatekeeper, the connection is established but no voice is heard in either direction. This problem is unrelated to the ASA.
- If you configure a network static address where the network static address is the same as a third-party netmask and address, then any outbound H.323 connection fails.

Configuring an H.323 Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create an H.323 inspection policy map. You can then apply the inspection policy map when you enable H.323 inspection.

To create an H.323 inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.s

Step 3 (Optional) Create an H.323 inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop-connection, reset, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect h323 [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *the class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

Where *string* is the description of the class map (up to 200 characters).

c. (Optional) To match a called party, enter the following command:

```
hostname(config-cmap)# match [not] called-party regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

d. (Optional) To match a media type, enter the following command:

```
hostname(config-cmap)# match [not] media-type {audio | data | video}
```

Step 4 Create an H.323 inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect h323 policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the H.323 class map that you created in Step 3 by entering the following command:

  ```
  hostname(config-pmap)# class class_map_name
  hostname(config-pmap-c)#
  ```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To enable call setup betweeen H.323 Endpoings, enter the following command:

```
hostname(config)# ras-rcf-pinholes enable
```

You can enable call setup between H.323 endpoints when the Gatekeeper is inside the network. The ASA includes options to open pinholes for calls based on the RegistrationRequest/RegistrationConfirm (RRQ/RCF) messages. Because these RRQ/RCF messages are sent to and from the Gatekeeper, the calling endpoint's IP address is unknown and the ASA opens a pinhole through source IP address/port 0/0. By default, this option is disabled.

c. To define the H.323 call duration limit, enter the following command:

```
hostname(config-pmap-p)# call-duration-limit time
```

Where *time* is the call duration limit in seconds. Range is from 0:0:0 ti 1163:0;0. A value of 0 means never timeout.

d. To enforce call party number used in call setup, enter the following command:

```
hostname(config-pmap-p)# call-party-number
```

e. To enforce H.245 tunnel blocking, enter the following command:

```
hostname(config-pmap-p)# h245-tunnel-block action {drop-connection | log}
```

f. To define an hsi group and enter hsi group configuration mode, enter the following command:

```
hostname(config-pmap-p)# hsi-group id
```

Where *id* is the hsi group ID. Range is from 0 to 2147483647.

To add an hsi to the hsi group, enter the following command in hsi group configuration mode:

```
hostname(config-h225-map-hsi-grp)# hsi ip_address
```

Where *ip_address* is the host to add. A maximum of five hosts per hsi group are allowed.

To add an endpoint to the hsi group, enter the following command in hsi group configuration mode:

```
hostname(config-h225-map-hsi-grp)# endpoint ip_address if_name
```

Where *ip_address* is the endpoint to add and *if_name* is the interface through which the endpoint is connected to the security appliance. A maximum of ten endpoints per hsi group are allowed.

g. To check RTP packets flowing on the pinholes for protocol conformance, enter the following command:

```
hostname(config-pmap-p)# rtp-conformance [enforce-payloadtype]
```

Where the **enforce-payloadtype** keyword enforces the payload type to be audio or video based on the signaling exchange.

h. To enable state checking validation, enter the following command:

```
hostname(config-pmap-p)# state-checking {h225 | ras}
```

The following example shows how to configure phone number filtering:

```
hostname(config)# regex caller 1 "5551234567"
hostname(config)# regex caller 2 "5552345678"
hostname(config)# regex caller 3 "5553456789"

hostname(config)# class-map type inspect h323 match-all h323_traffic
hostname(config-pmap-c)# match called-party regex caller1
hostname(config-pmap-c)# match calling-party regex caller2

hostname(config)# policy-map type inspect h323 h323_map
hostname(config-pmap)# parameters
hostname(config-pmap-p)# class h323_traffic
hostname(config-pmap-c)# drop
```

Configuring H.323 and H.225 Timeout Values

To configure the idle time after which an H.225 signalling connection is closed, use the **timeout h225** command. The default for H.225 timeout is one hour.

To configure the idle time after which an H.323 control connection is closed, use the **timeout h323** command. The default is five minutes.

Verifying and Monitoring H.323 Inspection

This section describes how to display information about H.323 sessions. This section includes the following topics:

- Monitoring H.225 Sessions, page 42-9
- Monitoring H.245 Sessions, page 42-10
- Monitoring H.323 RAS Sessions, page 42-11

Monitoring H.225 Sessions

The **show h225** command displays information for H.225 sessions established across the ASA. Along with the **debug h323 h225 event**, **debug h323 h245 event**, and **show local-host** commands, this command is used for troubleshooting H.323 inspection engine issues.

Before entering the **show h225**, **show h245**, or **show h323-ras** commands, we recommend that you configure the **pager** command. If there are a lot of session records and the **pager** command is not configured, it may take a while for the **show** command output to reach its end. If there is an abnormally large number of connections, check that the sessions are timing out based on the default timeout values or the values set by you. If they are not, then there is a problem that needs to be investigated.

The following is sample output from the **show h225** command:

```
hostname# show h225
Total H.323 Calls: 1
1 Concurrent Call(s) for
    Local:   10.130.56.3/1040   Foreign: 172.30.254.203/1720
    1. CRV 9861
    Local:   10.130.56.3/1040   Foreign: 172.30.254.203/1720
0 Concurrent Call(s) for
    Local:   10.130.56.4/1050   Foreign: 172.30.254.205/1720
```

This output indicates that there is currently 1 active H.323 call going through the ASA between the local endpoint 10.130.56.3 and foreign host 172.30.254.203, and for these particular endpoints, there is 1 concurrent call between them, with a CRV for that call of 9861.

For the local endpoint 10.130.56.4 and foreign host 172.30.254.205, there are 0 concurrent calls. This means that there is no active call between the endpoints even though the H.225 session still exists. This could happen if, at the time of the **show h225** command, the call has already ended but the H.225 session has not yet been deleted. Alternately, it could mean that the two endpoints still have a TCP connection opened between them because they set "maintainConnection" to TRUE, so the session is kept open until they set it to FALSE again, or until the session times out based on the H.225 timeout value in your configuration.

Monitoring H.245 Sessions

The **show h245** command displays information for H.245 sessions established across the ASA by endpoints using slow start. Slow start is when the two endpoints of a call open another TCP control channel for H.245. Fast start is where the H.245 messages are exchanged as part of the H.225 messages on the H.225 control channel.) Along with the **debug h323 h245 event**, **debug h323 h225 event**, and **show local-host** commands, this command is used for troubleshooting H.323 inspection engine issues.

The following is sample output from the **show h245** command:

```
hostname# show h245
Total: 1
        LOCAL           TPKT    FOREIGN         TPKT
1       10.130.56.3/1041        0       172.30.254.203/1245    0
        MEDIA: LCN 258 Foreign 172.30.254.203 RTP 49608 RTCP 49609
                      Local   10.130.56.3 RTP 49608 RTCP 49609
        MEDIA: LCN 259 Foreign 172.30.254.203 RTP 49606 RTCP 49607
                      Local   10.130.56.3 RTP 49606 RTCP 49607
```

There is currently one H.245 control session active across the ASA. The local endpoint is 10.130.56.3, and we are expecting the next packet from this endpoint to have a TPKT header because the TPKT value is 0. The TKTP header is a 4-byte header preceding each H.225/H.245 message. It gives the length of the message, including the 4-byte header. The foreign host endpoint is 172.30.254.203, and we are expecting the next packet from this endpoint to have a TPKT header because the TPKT value is 0.

The media negotiated between these endpoints have an LCN of 258 with the foreign RTP IP address/port pair of 172.30.254.203/49608 and an RTCP IP address/port of 172.30.254.203/49609 with a local RTP IP address/port pair of 10.130.56.3/49608 and an RTCP port of 49609.

The second LCN of 259 has a foreign RTP IP address/port pair of 172.30.254.203/49606 and an RTCP IP address/port pair of 172.30.254.203/49607 with a local RTP IP address/port pair of 10.130.56.3/49606 and RTCP port of 49607.

Monitoring H.323 RAS Sessions

The **show h323-ras** command displays information for H.323 RAS sessions established across the ASA between a gatekeeper and its H.323 endpoint. Along with the **debug h323 ras event** and **show local-host** commands, this command is used for troubleshooting H.323 RAS inspection engine issues.

The **show h323-ras** command displays connection information for troubleshooting H.323 inspection engine issues. The following is sample output from the **show h323-ras** command:

```
hostname# show h323-ras
Total: 1
        GK                      Caller
        172.30.254.214 10.130.56.14
```

This output shows that there is one active registration between the gatekeeper 172.30.254.214 and its client 10.130.56.14.

MGCP Inspection

This section describes MGCP application inspection. This section includes the following topics:

- MGCP Inspection Overview, page 42-11
- Configuring an MGCP Inspection Policy Map for Additional Inspection Control, page 42-13
- Configuring MGCP Timeout Values, page 42-14
- Verifying and Monitoring MGCP Inspection, page 42-14

MGCP Inspection Overview

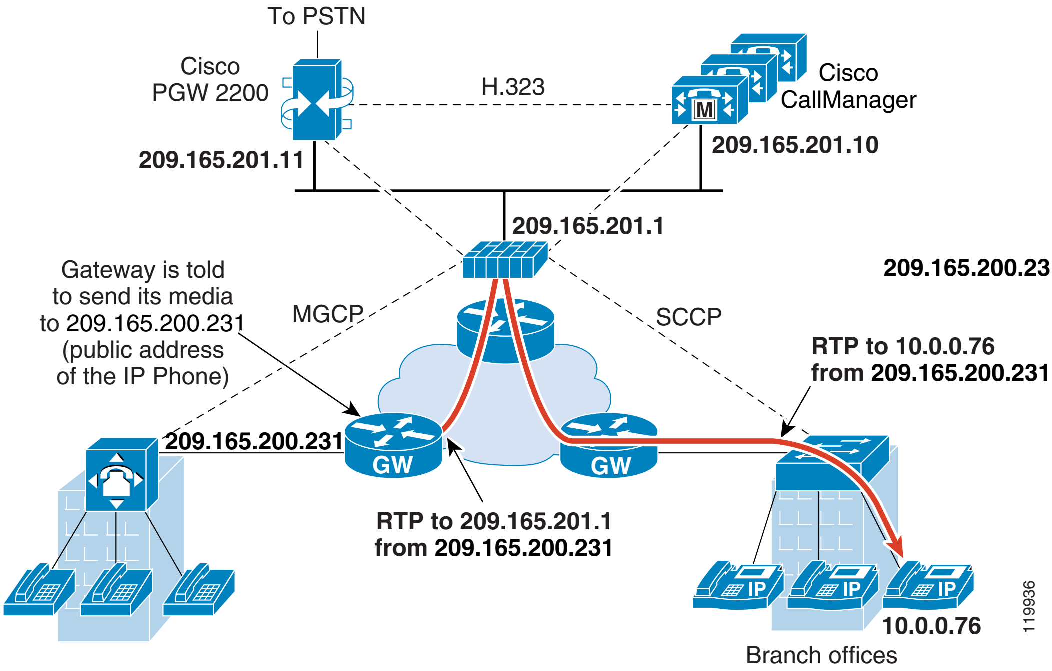
MGCP is a master/slave protocol used to control media gateways from external call control elements called media gateway controllers or call agents. A media gateway is typically a network element that provides conversion between the audio signals carried on telephone circuits and data packets carried over the Internet or over other packet networks. Using NAT and PAT with MGCP lets you support a large number of devices on an internal network with a limited set of external (global) addresses. Examples of media gateways are:

- Trunking gateways, that interface between the telephone network and a Voice over IP network. Such gateways typically manage a large number of digital circuits.
- Residential gateways, that provide a traditional analog (RJ11) interface to a Voice over IP network. Examples of residential gateways include cable modem/cable set-top boxes, xDSL devices, broad-band wireless devices.
- Business gateways, that provide a traditional digital PBX interface or an integrated soft PBX interface to a Voice over IP network.

Note To avoid policy failure when upgrading from ASA version 7.1, all layer 7 and layer 3 policies must have distinct names. For instance, a previously configured policy map with the same name as a previously configured MGCP map must be changed before the upgrade.

MGCP messages are transmitted over UDP. A response is sent back to the source address (IP address and UDP port number) of the command, but the response may not arrive from the same address as the command was sent to. This can happen when multiple call agents are being used in a failover configuration and the call agent that received the command has passed control to a backup call agent, which then sends the response. Figure 42-1 illustrates how NAT can be used with MGCP.

Figure 42-1 Using NAT with MGCP


To PSTN
Cisco PGW 2200
H.323
Cisco CallManager
209.165.201.11
209.165.201.10
209.165.201.1
Gateway is told to send its media to 209.165.200.231 (public address of the IP Phone)
MGCP
SCCP
209.165.200.231
RTP to 10.0.0.76 from 209.165.200.231
209.165.200.231
GW
GW
RTP to 209.165.201.1 from 209.165.200.231
IP
IP
IP
10.0.0.76
Branch offices
119936

MGCP endpoints are physical or virtual sources and destinations for data. Media gateways contain endpoints on which the call agent can create, modify and delete connections to establish and control media sessions with other multimedia endpoints. Also, the call agent can instruct the endpoints to detect certain events and generate signals. The endpoints automatically communicate changes in service state to the call agent.

MGCP transactions are composed of a command and a mandatory response. There are eight types of commands:

- CreateConnection
- ModifyConnection
- DeleteConnection
- NotificationRequest
- Notify
- AuditEndpoint
- AuditConnection

- RestartInProgress

The first four commands are sent by the call agent to the gateway. The Notify command is sent by the gateway to the call agent. The gateway may also send a DeleteConnection. The registration of the MGCP gateway with the call agent is achieved by the RestartInProgress command. The AuditEndpoint and the AuditConnection commands are sent by the call agent to the gateway.

All commands are composed of a Command header, optionally followed by a session description. All responses are composed of a Response header, optionally followed by a session description.

- The port on which the gateway receives commands from the call agent. Gateways usually listen to UDP port 2427.
- The port on which the call agent receives commands from the gateway. Call agents usually listen to UDP port 2727.

Note MGCP inspection does not support the use of different IP addresses for MGCP signaling and RTP data. A common and recommended practice is to send RTP data from a resilient IP address, such as a loopback or virtual IP address; however, the ASA requires the RTP data to come from the same address as MGCP signalling.

Configuring an MGCP Inspection Policy Map for Additional Inspection Control

If the network has multiple call agents and gateways for which the ASA has to open pinholes, create an MGCP map. You can then apply the MGCP map when you enable MGCP inspection.

To create an MGCP map, perform the following steps:

Step 1 To create an MGCP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect mgcp map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 2 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 3 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To configure the call agents, enter the following command for each call agent:

```
hostname(config-pmap-p)# call-agent ip_address group_id
```

Use the **call-agent** command to specify a group of call agents that can manage one or more gateways. The call agent group information is used to open connections for the call agents in the group (other than the one a gateway sends a command to) so that any of the call agents can send the response. call agents with the same *group_id* belong to the same group. A call agent may belong to more than one group. The *group_id* option is a number from 0 to 4294967295. The *ip_address* option specifies the IP address of the call agent.

Note MGCP call agents send AUEP messages to determine if MGCP end points are present. This establishes a flow through the ASA and allows MGCP end points to register with the call agent.

c. To configure the gateways, enter the following command for each gateway:

```
hostname(config-pmap-p)# gateway ip_address group_id
```

Use the **gateway** command to specify which group of call agents are managing a particular gateway. The IP address of the gateway is specified with the *ip_address* option. The *group_id* option is a number from 0 to 4294967295 that must correspond with the *group_id* of the call agents that are managing the gateway. A gateway may only belong to one group.

d. If you want to change the maximum number of commands allowed in the MGCP command queue, enter the following command:

```
hostname(config-pmap-p)# command-queue command_limit
```

The following example shows how to define an MGCP map:

```
hostname(config)# policy-map type inspect mgcp sample_map
hostname(config-pmap)# parameters
hostname(config-pmap-p)# call-agent 10.10.11.5 101
hostname(config-pmap-p)# call-agent 10.10.11.6 101
hostname(config-pmap-p)# call-agent 10.10.11.7 102
hostname(config-pmap-p)# call-agent 10.10.11.8 102
hostname(config-pmap-p)# gateway 10.10.10.115 101
hostname(config-pmap-p)# gateway 10.10.10.116 102
hostname(config-pmap-p)# gateway 10.10.10.117 102
hostname(config-pmap-p)# command-queue 150
```

Configuring MGCP Timeout Values

The **timeout mgcp command** lets you set the interval for inactivity after which an MGCP media connection is closed. The default is 5 minutes.

The **timeout mgcp-pat** command lets you set the timeout for PAT xlates. Because MGCP does not have a keepalive mechanism, if you use non-Cisco MGCP gateways (call agents), the PAT xlates are torn down after the default timeout interval, which is 30 seconds.

Verifying and Monitoring MGCP Inspection

The **show mgcp commands** command lists the number of MGCP commands in the command queue. The **show mgcp sessions** command lists the number of existing MGCP sessions. The **detail** option includes additional information about each command (or session) in the output. The following is sample output from the **show mgcp commands** command:

```
hostname# show mgcp commands
1 in use, 1 most used, 200 maximum allowed
CRCX, gateway IP: host-pc-2, transaction ID: 2052, idle: 0:00:07
```

The following is sample output from the **show mgcp detail** command.

```
hostname# show mgcp commands detail
```

```
1 in use, 1 most used, 200 maximum allowed
CRCX, idle: 0:00:10
        Gateway IP      host-pc-2
        Transaction ID  2052
        Endpoint name   aaln/1
        Call ID         9876543210abcdef
        Connection ID
        Media IP        192.168.5.7
        Media port      6058
```

The following is sample output from the **show mgcp sessions** command.

```
hostname# show mgcp sessions
1 in use, 1 most used
Gateway IP host-pc-2, connection ID 6789af54c9, active 0:00:11
```

The following is sample output from the **show mgcp sessions detail** command.

```
hostname# show mgcp sessions detail
1 in use, 1 most used
Session active 0:00:14
        Gateway IP      host-pc-2
        Call ID         9876543210abcdef
        Connection ID   6789af54c9
        Endpoint name   aaln/1
        Media lcl port  6166
        Media rmt IP    192.168.5.7
        Media rmt port  6058
```

RTSP Inspection

This section describes RTSP application inspection. This section includes the following topics:

- RTSP Inspection Overview, page 42-15
- Using RealPlayer, page 42-16
- Restrictions and Limitations, page 42-16
- Configuring an RTSP Inspection Policy Map for Additional Inspection Control, page 42-16

RTSP Inspection Overview

The RTSP inspection engine lets the ASA pass RTSP packets. RTSP is used by RealAudio, RealNetworks, Apple QuickTime 4, RealPlayer, and Cisco IP/TV connections.

Note For Cisco IP/TV, use RTSP TCP port 554 and TCP 8554.

RTSP applications use the well-known port 554 with TCP (rarely UDP) as a control channel. The ASA only supports TCP, in conformity with RFC 2326. This TCP control channel is used to negotiate the data channels that is used to transmit audio/video traffic, depending on the transport mode that is configured on the client.

The supported RDT transports are: rtp/avp, rtp/avp/udp, x-real-rdt, x-real-rdt/udp, and x-pn-tng/udp.

The ASA parses Setup response messages with a status code of 200. If the response message is travelling inbound, the server is outside relative to the ASA and dynamic channels need to be opened for connections coming inbound from the server. If the response message is outbound, then the ASA does not need to open dynamic channels.

Because RFC 2326 does not require that the client and server ports must be in the SETUP response message, the ASA keeps state and remembers the client ports in the SETUP message. QuickTime places the client ports in the SETUP message and then the server responds with only the server ports.

RTSP inspection does not support PAT or dual-NAT. Also, the ASA cannot recognize HTTP cloaking where RTSP messages are hidden in the HTTP messages.

Using RealPlayer

When using RealPlayer, it is important to properly configure transport mode. For the ASA, add an **access-list** command from the server to the client or vice versa. For RealPlayer, change transport mode by clicking **Options>Preferences>Transport>RTSP Settings**.

If using TCP mode on the RealPlayer, select the **Use TCP to Connect to Server** and **Attempt to use TCP for all content** check boxes. On the ASA, there is no need to configure the inspection engine.

If using UDP mode on the RealPlayer, select the **Use TCP to Connect to Server** and **Attempt to use UDP for static content** check boxes, and for live content not available via Multicast. On the ASA, add an **inspect rtsp** *port* command.

Restrictions and Limitations

The following restrictions apply to the **inspect rtsp** command.

- The ASA does not support multicast RTSP or RTSP messages over UDP.
- The ASA does not have the ability to recognize HTTP cloaking where RTSP messages are hidden in the HTTP messages.
- The ASA cannot perform NAT on RTSP messages because the embedded IP addresses are contained in the SDP files as part of HTTP or RTSP messages. Packets could be fragmented and ASA cannot perform NAT on fragmented packets.
- With Cisco IP/TV, the number of translates the ASA performs on the SDP part of the message is proportional to the number of program listings in the Content Manager (each program listing can have at least six embedded IP addresses).
- You can configure NAT for Apple QuickTime 4 or RealPlayer. Cisco IP/TV only works with NAT if the Viewer and Content Manager are on the outside network and the server is on the inside network.

Configuring an RTSP Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create an RTSP inspection policy map. You can then apply the inspection policy map when you enable RTSP inspection.

To create an RTSP inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 (Optional) Create an RTSP inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop-connection and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect rtsp [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *class_map_name* is the name of the class map. The **match-all** keyword is the default, and specifies that traffic must match all criteria to match the class map. The **match-any** keyword specifies that the traffic matches the class map if it matches at least one of the criteria. The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

c. (Optional) To match an RTSP request method, enter the following command:

```
hostname(config-cmap)# match [not] request-method method
```

Where *method* is the type of method to match (announce, describe, get_parameter, options, pause, play, record, redirect, setup, set_parameter, teardown).

d. (Optional) To match URL filtering, enter the following command:

```
hostname(config-cmap)# match [not] url-filter regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

Step 4 To create an RTSP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect rtsp policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the RTSP class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To restrict usage on reserve port for media negotiation, enter the following command:

```
hostname(config-pmap-p)# reserve-port-protect
```

c. To set the limit on the URL length allowed in the message, enter the following command:

```
hostname(config-pmap-p)# url-length-limit length
```

Where the *length* argument specifies the URL length in bytes (0 to 6000).

The following example shows a how to define an RTSP inspection policy map.

```
hostname(config)# regex badurl1 www.url1.com/rtsp.avi
hostname(config)# regex badurl2 www.url2.com/rtsp.rm
hostname(config)# regex badurl3 www.url3.com/rtsp.asp

hostname(config)# class-map type regex match-any badurl-list
hostname(config-cmap)# match regex badurl1
hostname(config-cmap)# match regex badurl2
hostname(config-cmap)# match regex badurl3

hostname(config)# policy-map type inspect rtsp rtsp-filter-map
hostname(config-pmap)# match url-filter regex class badurl-list
hostname(config-pmap-p)# drop-connection

hostname(config)# class-map rtsp-traffic-class
hostname(config-cmap)# match default-inspection-traffic

hostname(config)# policy-map rtsp-traffic-policy
hostname(config-pmap)# class rtsp-traffic-class
hostname(config-pmap-c)# inspect rtsp rtsp-filter-map

hostname(config)# service-policy rtsp-traffic-policy global
```

SIP Inspection

This section describes SIP application inspection. This section includes the following topics:

- SIP Inspection Overview, page 42-19
- SIP Instant Messaging, page 42-20
- Configuring a SIP Inspection Policy Map for Additional Inspection Control, page 42-21
- Configuring SIP Timeout Values, page 42-24
- Verifying and Monitoring SIP Inspection, page 42-25

SIP Inspection Overview

SIP, as defined by the IETF, enables call handling sessions, particularly two-party audio conferences, or “calls.” SIP works with SDP for call signalling. SDP specifies the ports for the media stream. Using SIP, the ASA can support any SIP VoIP gateways and VoIP proxy servers. SIP and SDP are defined in the following RFCs:

- SIP: Session Initiation Protocol, RFC 3261
- SDP: Session Description Protocol, RFC 2327

To support SIP calls through the ASA, signaling messages for the media connection addresses, media ports, and embryonic connections for the media must be inspected, because while the signaling is sent over a well-known destination port (UDP/TCP 5060), the media streams are dynamically allocated. Also, SIP embeds IP addresses in the user-data portion of the IP packet. SIP inspection applies NAT for these embedded IP addresses.

The following limitations and restrictions apply when using PAT with SIP:

- If a remote endpoint tries to register with a SIP proxy on a network protected by the ASA, the registration fails under very specific conditions, as follows:
  - PAT is configured for the remote endpoint.
  - The SIP registrar server is on the outside network.
  - The port is missing in the contact field in the REGISTER message sent by the endpoint to the proxy server.

  - Configuring static PAT is not supported with SIP inspection. If static PAT is configured for the Cisco Unified Communications Manager, SIP inspection cannot rewrite the SIP packet. Configure one-to-one static NAT for the Cisco Unified Communications Manager.
- If a SIP device transmits a packet in which the SDP portion has an IP address in the owner/creator field (o=) that is different than the IP address in the connection field (c=), the IP address in the o= field may not be properly translated. This is due to a limitation in the SIP protocol, which does not provide a port value in the o= field.

SIP Instant Messaging

Instant Messaging refers to the transfer of messages between users in near real-time. SIP supports the Chat feature on Windows XP using Windows Messenger RTC Client version 4.7.0105 only. The MESSAGE/INFO methods and 202 Accept response are used to support IM as defined in the following RFCs:

- Session Initiation Protocol (SIP)-Specific Event Notification, RFC 3265
- Session Initiation Protocol (SIP) Extension for Instant Messaging, RFC 3428

MESSAGE/INFO requests can come in at any time after registration/subscription. For example, two users can be online at any time, but not chat for hours. Therefore, the SIP inspection engine opens pinholes that time out according to the configured SIP timeout value. This value must be configured at least five minutes longer than the subscription duration. The subscription duration is defined in the Contact Expires value and is typically 30 minutes.

Because MESSAGE/INFO requests are typically sent using a dynamically allocated port other than port 5060, they are required to go through the SIP inspection engine.

Note Only the Chat feature is currently supported. Whiteboard, File Transfer, and Application Sharing are not supported. RTC Client 5.0 is not supported.

SIP inspection translates the SIP text-based messages, recalculates the content length for the SDP portion of the message, and recalculates the packet length and checksum. It dynamically opens media connections for ports specified in the SDP portion of the SIP message as address/ports on which the endpoint should listen.

SIP inspection has a database with indices CALL_ID/FROM/TO from the SIP payload. These indices identify the call, the source, and the destination. This database contains the media addresses and media ports found in the SDP media information fields and the media type. There can be multiple media addresses and ports for a session. The ASA opens RTP/RTCP connections between the two endpoints using these media addresses/ports.

The well-known port 5060 must be used on the initial call setup (INVITE) message; however, subsequent messages may not have this port number. The SIP inspection engine opens signaling connection pinholes, and marks these connections as SIP connections. This is done for the messages to reach the SIP application and be translated.

As a call is set up, the SIP session is in the “transient” state until the media address and media port is received from the called endpoint in a Response message indicating the RTP port the called endpoint listens on. If there is a failure to receive the response messages within one minute, the signaling connection is torn down.

Once the final handshake is made, the call state is moved to active and the signaling connection remains until a BYE message is received.

If an inside endpoint initiates a call to an outside endpoint, a media hole is opened to the outside interface to allow RTP/RTCP UDP packets to flow to the inside endpoint media address and media port specified in the INVITE message from the inside endpoint. Unsolicited RTP/RTCP UDP packets to an inside interface does not traverse the ASA, unless the ASA configuration specifically allows it.

Configuring a SIP Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create a SIP inspection policy map. You can then apply the inspection policy map when you enable SIP inspection.

To create a SIP inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.s

Step 3 (Optional) Create a SIP inspection class map by performing the following steps.

A class map groups multiple traffic matches. Traffic must match *all* of the **match** commands to match the class map. You can alternatively identify **match** commands directly in the policy map. The difference between creating a class map and defining the traffic match directly in the inspection policy map is that the class map lets you create more complex match criteria, and you can reuse class maps.

To specify traffic that should not match the class map, use the **match not** command. For example, if the **match not** command specifies the string "example.com," then any traffic that includes "example.com" does not match the class map.

For the traffic that you identify in this class map, you can specify actions such as drop-connection, reset, and/or log the connection in the inspection policy map.

If you want to perform different actions for each **match** command, you should identify the traffic directly in the policy map.

a. Create the class map by entering the following command:

```
hostname(config)# class-map type inspect sip [match-all | match-any] class_map_name
hostname(config-cmap)#
```

Where *the class_map_name* is the name of the class map. The match-all keyword is the default, and specifies that traffic must match all criteria to match the class map. The match-any keyword specifies that the traffic matches the class map if it matches at leX(The CLI enters class-map configuration mode, where you can enter one or more **match** commands.

b. (Optional) To add a description to the class map, enter the following command:

```
hostname(config-cmap)# description string
```

Where *string* is the description of the class map (up to 200 characters).

c. (Optional) To match a called party, as specified in the To header, enter the following command:

```
hostname(config-cmap)# match [not] called-party regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

d. (Optional) To match a calling party, as specified in the From header, enter the following command:

```
hostname(config-cmap)# match [not] calling-party regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

e. (Optional) To match a content length in the SIP header, enter the following command:

```
hostname(config-cmap)# match [not] content length gt length
```

Where *length* is the number of bytes the content length is greater than. 0 to 65536.

f. (Optional) To match an SDP content type or regular expression, enter the following command:

```
hostname(config-cmap)# match [not] content type {sdp | regex {class class_name |
regex_name}}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

g. (Optional) To match a SIP IM subscriber, enter the following command:

```
hostname(config-cmap)# match [not] im-subscriber regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

h. (Optional) To match a SIP via header, enter the following command:

```
hostname(config-cmap)# match [not] message-path regex {class class_name | regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

i. (Optional) To match a SIP request method, enter the following command:

```
hostname(config-cmap)# match [not] request-method method
```

Where *method* is the type of method to match (ack, bye, cancel, info, invite, message, notify, options, prack, refer, register, subscribe, unknown, update).

j. (Optional) To match the requester of a third-party registration, enter the following command:

```
hostname(config-cmap)# match [not] third-party-registration regex {class class_name |
regex_name}
```

Where the **regex** *regex_name* argument is the regular expression you created in Step 1. The **class** *regex_class_name* is the regular expression class map you created in Step 2.

k. (Optional) To match an URI in the SIP headers, enter the following command:

```
hostname(config-cmap)# match [not] uri {sip | tel} length gt length
```

Where *length* is the number of bytes the URI is greater than. 0 to 65536.

Step 4 Create a SIP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect sip policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 5 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 6 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the SIP class map that you created in Step 3 by entering the following command:

```
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To enable or disable instant messaging, enter the following command:

```
hostname(config-pmap-p)# im
```

c. To enable or disable IP address privacy, enter the following command:

```
hostname(config-pmap-p)# ip-address-privacy
```

d. To enable check on Max-forwards header field being 0 (which cannot be 0 before reaching the destination), enter the following command:

```
hostname(config-pmap-p)# max-forwards-validation action {drop | drop-connection |
reset | log} [log]
```

e. To enable check on RTP packets flowing on the pinholes for protocol conformance, enter the following command:

```
hostname(config-pmap-p)# rtp-conformance [enforce-payloadtype]
```

Where the **enforce-payloadtype** keyword enforces the payload type to be audio or video based on the signaling exchange.

f. To identify the Server and User-Agent header fields, which expose the software version of either a server or an endpoint, enter the following command:

```
hostname(config-pmap-p)# software-version action {mask | log} [log]
```

Where the **mask** keyword masks the software version in the SIP messages.

g. To enable state checking validation, enter the following command:

```
hostname(config-pmap-p)# state-checking action {drop | drop-connection | reset | log}
[log]
```

h. To enable strict verification of the header fields in the SIP messages according to RFC 3261, enter the following command:

```
hostname(config-pmap-p)# strict-header-validation action {drop | drop-connection |
reset | log} [log]
```

i. To allow non SIP traffic using the well-known SIP signaling port, enter the following command:

```
hostname(config-pmap-p)# traffic-non-sip
```

j. To identify the non-SIP URIs present in the Alert-Info and Call-Info header fields, enter the following command:

```
hostname(config-pmap-p)# uri-non-sip action {mask | log} [log]
```

The following example shows how to disable instant messaging over SIP:

```
hostname(config)# policy-map type inspect sip mymap
hostname(config-pmap)# parameters
hostname(config-pmap-p)# no im

hostname(config)# policy-map global_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect sip mymap

hostname(config)# service-policy global_policy global
```

Configuring SIP Timeout Values

The media connections are torn down within two minutes after the connection becomes idle. This is, however, a configurable timeout and can be set for a shorter or longer period of time. To configure the timeout for the SIP control connection, enter the following command:

```
hostname(config)# timeout sip hh:mm:ss
```

This command configures the idle timeout after which a SIP control connection is closed.

To configure the timeout for the SIP media connection, enter the following command:

```
hostname(config)# timeout sip_media hh:mm:ss
```

This command configures the idle timeout after which a SIP media connection is closed.

Verifying and Monitoring SIP Inspection

The **show sip** command assists in troubleshooting SIP inspection engine issues and is described with the **inspect protocol sip udp 5060** command. The **show timeout sip** command displays the timeout value of the designated protocol.

The **show sip** command displays information for SIP sessions established across the ASA. Along with the **debug sip** and **show local-host** commands, this command is used for troubleshooting SIP inspection engine issues.

Note We recommend that you configure the **pager** command before entering the **show sip** command. If there are a lot of SIP session records and the **pager** command is not configured, it takes a while for the **show sip** command output to reach its end.

The following is sample output from the **show sip** command:

```
hostname# show sip
Total: 2
call-id c3943000-960ca-2e43-228f@10.130.56.44
    state Call init, idle 0:00:01
call-id c3943000-860ca-7e1f-11f7@10.130.56.45
    state Active, idle 0:00:06
```

This sample shows two active SIP sessions on the ASA (as shown in the Total field). Each call-id represents a call.

The first session, with the call-id c3943000-960ca-2e43-228f@10.130.56.44, is in the state Call Init, which means the session is still in call setup. Call setup is not complete until a final response to the call has been received. For instance, the caller has already sent the INVITE, and maybe received a 100 Response, but has not yet seen the 200 OK, so the call setup is not complete yet. Any non-1xx response message is considered a final response. This session has been idle for 1 second.

The second session is in the state Active, in which call setup is complete and the endpoints are exchanging media. This session has been idle for 6 seconds.

Skinny (SCCP) Inspection

This section describes SCCP application inspection. This section includes the following topics:

- SCCP Inspection Overview, page 42-26
- Supporting Cisco IP Phones, page 42-26
- Restrictions and Limitations, page 42-26
- Configuring a Skinny (SCCP) Inspection Policy Map for Additional Inspection Control, page 42-27
- Verifying and Monitoring SCCP Inspection, page 42-29

SCCP Inspection Overview

Skinny (SCCP) is a simplified protocol used in VoIP networks. Cisco IP Phones using SCCP can coexist in an H.323 environment. When used with Cisco CallManager, the SCCP client can interoperate with H.323 compliant terminals. Application layer functions in the ASA recognize SCCP Version 3.3. There are 5 versions of the SCCP protocol: 2.4, 3.0.4, 3.1.1, 3.2, and 3.3.2. The ASA supports all versions through Version 3.3.2.

The ASA supports PAT and NAT for SCCP. PAT is necessary if you have more IP phones than global IP addresses for the IP phones to use. By supporting NAT and PAT of SCCP Signaling packets, Skinny application inspection ensures that all SCCP signalling and media packets can traverse the ASA.

Normal traffic between Cisco CallManager and Cisco IP Phones uses SCCP and is handled by SCCP inspection without any special configuration. The ASA also supports DHCP options 150 and 66, which it accomplishes by sending the location of a TFTP server to Cisco IP Phones and other DHCP clients. Cisco IP Phones might also include DHCP option 3 in their requests, which sets the default route. For more information, see the "Using Cisco IP Phones with a DHCP Server" section on page 7-5.

Supporting Cisco IP Phones

In topologies where Cisco CallManager is located on the higher security interface with respect to the Cisco IP Phones, if NAT is required for the Cisco CallManager IP address, the mapping must be **static** as a Cisco IP Phone requires the Cisco CallManager IP address to be specified explicitly in its configuration. An static identity entry allows the Cisco CallManager on the higher security interface to accept registrations from the Cisco IP Phones.

Cisco IP Phones require access to a TFTP server to download the configuration information they need to connect to the Cisco CallManager server.

When the Cisco IP Phones are on a lower security interface compared to the TFTP server, you must use an access list to connect to the protected TFTP server on UDP port 69. While you do need a static entry for the TFTP server, this does not have to be an identity static entry. When using NAT, an identity static entry maps to the same IP address. When using PAT, it maps to the same IP address and port.

When the Cisco IP Phones are on a *higher* security interface compared to the TFTP server and Cisco CallManager, no access list or static entry is required to allow the Cisco IP Phones to initiate the connection.

Restrictions and Limitations

The following are limitations that apply to the current version of PAT and NAT support for SCCP:

- PAT does not work with configurations containing the **alias** command.
- Outside NAT or PAT is *not* supported.

If the address of an internal Cisco CallManager is configured for NAT or PAT to a different IP address or port, registrations for external Cisco IP Phones fail because the ASA currently does not support NAT or PAT for the file content transferred over TFTP. Although the ASA supports NAT of TFTP messages and opens a pinhole for the TFTP file, the ASA cannot translate the Cisco CallManager IP address and port embedded in the Cisco IP Phone configuration files that are transferred by TFTP during phone registration.

Note The ASA supports stateful failover of SCCP calls except for calls that are in the middle of call setup.

Configuring a Skinny (SCCP) Inspection Policy Map for Additional Inspection Control

To specify actions when a message violates a parameter, create an SCCP inspection policy map. You can then apply the inspection policy map when you enable SCCP inspection.

To create an SCCP inspection policy map, perform the following steps:

Step 1 (Optional) Add one or more regular expressions for use in traffic matching commands according to the "Creating a Regular Expression" section on page 9-21. See the types of text you can match in the **match** commands described in Step 3.

Step 2 (Optional) Create one or more regular expression class maps to group regular expressions according to the "Creating a Regular Expression Class Map" section on page 9-23.

Step 3 Create an SCCP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect skinny policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 4 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 5 To apply actions to matching traffic, perform the following steps.

a. Specify the traffic on which you want to perform actions using one of the following methods:

- Specify the SCCP class map that you created in Step 3 by entering the following command:

  ```
  hostname(config-pmap)# class class_map_name
  hostname(config-pmap-c)#
  ```

- Specify traffic directly in the policy map using one of the **match** commands described in Step 3. If you use a **match not** command, then any traffic that does not match the criterion in the **match not** command has the action applied.

b. Specify the action you want to perform on the matching traffic by entering the following command:

```
hostname(config-pmap-c)# {[drop [send-protocol-error] |
drop-connection [send-protocol-error]| mask | reset] [log] | rate-limit message_rate}
```

Not all options are available for each **match** or **class** command. See the CLI help or the *Cisco ASA 5500 Series Command Reference* for the exact options available.

The **drop** keyword drops all packets that match.

The **send-protocol-error** keyword sends a protocol error message.

The **drop-connection** keyword drops the packet and closes the connection.

The **mask** keyword masks out the matching portion of the packet.

The **reset** keyword drops the packet, closes the connection, and sends a TCP reset to the server and/or client.

The **log** keyword, which you can use alone or with one of the other keywords, sends a system log message.

The **rate-limit** *message_rate* argument limits the rate of messages.

Step 6 You can specify multiple **class** or **match** commands in the policy map. For information about the order of **class** and **match** commands, see the "Defining Actions in an Inspection Policy Map" section on page 9-17.To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To enforce registration before calls can be placed, enter the following command:

```
hostname(config-pmap-p)# enforce-registration
```

c. To set the maximum SCCP station message ID allowed, enter the following command:

```
hostname(config-pmap-p)# message-ID max hex_value
```

Where the *hex_value* argument is the station message ID in hex.

d. To check RTP packets flowing on the pinholes for protocol conformance, enter the following command:

```
hostname(config-pmap-p)# rtp-conformance [enforce-payloadtype]
```

Where the **enforce-payloadtype** keyword enforces the payload type to be audio or video based on the signaling exchange.

e. To set the maximum and minimum SCCP prefix length value allowed, enter the following command:

```
hostname(config-pmap-p)# sccp-prefix-len {max | min} value_length
```

Where the *value_length* argument is a maximum or minimum value.

f. To configure the timeout value for signaling and media connections, enter the following command:

```
hostname(config-pmap-p)# timeout
```

The following example shows how to define an SCCP inspection policy map.

```
hostname(config)# policy-map type inspect skinny skinny-map
hostname(config-pmap)# parameters
hostname(config-pmap-p)# enforce-registration
hostname(config-pmap-p)# match message-id range 200 300
hostname(config-pmap-p)# drop log
hostname(config)# class-map inspection_default
hostname(config-cmap)# match default-inspection-traffic
hostname(config)# policy-map global_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect skinny skinny-map
hostname(config)# service-policy global_policy global
```

Verifying and Monitoring SCCP Inspection

The **show skinny** command assists in troubleshooting SCCP (Skinny) inspection engine issues. The following is sample output from the **show skinny** command under the following conditions. There are two active Skinny sessions set up across the ASA. The first one is established between an internal Cisco IP Phone at local address 10.0.0.11 and an external Cisco CallManager at 172.18.1.33. TCP port 2000 is the CallManager. The second one is established between another internal Cisco IP Phone at local address 10.0.0.22 and the same Cisco CallManager.

```
hostname# show skinny
        LOCAL                  FOREIGN                STATE
---------------------------------------------------------------
1       10.0.0.11/52238        172.18.1.33/2000              1
  MEDIA 10.0.0.11/22948        172.18.1.22/20798
2       10.0.0.22/52232        172.18.1.33/2000              1
  MEDIA 10.0.0.22/20798        172.18.1.11/22948
```

The output indicates that a call has been established between two internal Cisco IP Phones. The RTP listening ports of the first and second phones are UDP 22948 and 20798 respectively.

The following is sample output from the **show xlate debug** command for these Skinny connections:

```
hostname# show xlate debug
2 in use, 2 most used
Flags:  D - DNS, d - dump, I - identity, i - inside, n - no random,
        r - portmap, s - static
NAT from inside:10.0.0.11 to outside:172.18.1.11 flags si idle 0:00:16 timeout 0:05:00
NAT from inside:10.0.0.22 to outside:172.18.1.22 flags si idle 0:00:14 timeout 0:05:00
```

CHAPTER 43

Configuring Inspection of Database and Directory Protocols

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path. As a result, inspection engines can affect overall throughput.

Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network. This chapter includes the following sections:

- ILS Inspection, page 43-1
- SQL*Net Inspection, page 43-2
- Sun RPC Inspection, page 43-3

ILS Inspection

The ILS inspection engine provides NAT support for Microsoft NetMeeting, SiteServer, and Active Directory products that use LDAP to exchange directory information with an ILS server.

The ASA supports NAT for ILS, which is used to register and locate endpoints in the ILS or SiteServer Directory. PAT cannot be supported because only IP addresses are stored by an LDAP database.

For search responses, when the LDAP server is located outside, NAT should be considered to allow internal peers to communicate locally while registered to external LDAP servers. For such search responses, xlates are searched first, and then DNAT entries to obtain the correct address. If both of these searches fail, then the address is not changed. For sites using NAT 0 (no NAT) and not expecting DNAT interaction, we recommend that the inspection engine be turned off to provide better performance.

Additional configuration may be necessary when the ILS server is located inside the ASA border. This would require a hole for outside clients to access the LDAP server on the specified port, typically TCP 389.

Because ILS traffic only occurs on the secondary UDP channel, the TCP connection is disconnected after the TCP inactivity interval. By default, this interval is 60 minutes and can be adjusted using the **timeout** command.

ILS/LDAP follows a client/server model with sessions handled over a single TCP connection. Depending on the client's actions, several of these sessions may be created.

During connection negotiation time, a BIND PDU is sent from the client to the server. Once a successful BIND RESPONSE from the server is received, other operational messages may be exchanged (such as ADD, DEL, SEARCH, or MODIFY) to perform operations on the ILS Directory. The ADD REQUEST and SEARCH RESPONSE PDUs may contain IP addresses of NetMeeting peers, used by H.323 (SETUP and CONNECT messages) to establish the NetMeeting sessions. Microsoft NetMeeting v2.X and v3.X provides ILS support.

The ILS inspection performs the following operations:

- Decodes the LDAP REQUEST/RESPONSE PDUs using the BER decode functions
- Parses the LDAP packet
- Extracts IP addresses
- Translates IP addresses as necessary
- Encodes the PDU with translated addresses using BER encode functions
- Copies the newly encoded PDU back to the TCP packet
- Performs incremental TCP checksum and sequence number adjustment

ILS inspection has the following limitations:

- Referral requests and responses are not supported
- Users in multiple directories are not unified
- Single users having multiple identities in multiple directories cannot be recognized by NAT

Note Because H225 call signalling traffic only occurs on the secondary UDP channel, the TCP connection is disconnected after the interval specified by the TCP **timeout** command. By default, this interval is set at 60 minutes.

SQL*Net Inspection

SQL*Net inspection is enabled by default.

The SQL*Net protocol consists of different packet types that the ASA handles to make the data stream appear consistent to the Oracle applications on either side of the ASA.

The default port assignment for SQL*Net is 1521. This is the value used by Oracle for SQL*Net, but this value does not agree with IANA port assignments for Structured Query Language (SQL). Use the **class-map** command to apply SQL*Net inspection to a range of port numbers.

Note Disable SQL*Net inspection when SQL data transfer occurs on the same port as the SQL control TCP port 1521. The security appliance acts as a proxy when SQL*Net inspection is enabled and reduces the client window size from 65000 to about 16000 causing data transfer issues.

The ASA translates all addresses and looks in the packets for all embedded ports to open for SQL*Net Version 1.

For SQL*Net Version 2, all DATA or REDIRECT packets that immediately follow REDIRECT packets with a zero data length will be fixed up.

The packets that need fix-up contain embedded host/port addresses in the following format:

```
(ADDRESS=(PROTOCOL=tcp)(DEV=6)(HOST=a.b.c.d)(PORT=a))
```

SQL*Net Version 2 TNSFrame types (Connect, Accept, Refuse, Resend, and Marker) will not be scanned for addresses to NAT nor will inspection open dynamic connections for any embedded ports in the packet.

SQL*Net Version 2 TNSFrames, Redirect, and Data packets will be scanned for ports to open and addresses to NAT, if preceded by a REDIRECT TNSFrame type with a zero data length for the payload. When the Redirect message with data length zero passes through the ASA, a flag will be set in the connection data structure to expect the Data or Redirect message that follows to be translated and ports to be dynamically opened. If one of the TNS frames in the preceding paragraph arrive after the Redirect message, the flag will be reset.

The SQL*Net inspection engine will recalculate the checksum, change IP, TCP lengths, and readjust Sequence Numbers and Acknowledgment Numbers using the delta of the length of the new and old message.

SQL*Net Version 1 is assumed for all other cases. TNSFrame types (Connect, Accept, Refuse, Resend, Marker, Redirect, and Data) and all packets will be scanned for ports and addresses. Addresses will be translated and port connections will be opened.

Sun RPC Inspection

This section describes Sun RPC application inspection. This section includes the following topics:

- Sun RPC Inspection Overview, page 43-3
- Managing Sun RPC Services, page 43-4
- Verifying and Monitoring Sun RPC Inspection, page 43-4

Sun RPC Inspection Overview

The Sun RPC inspection engine enables or disables application inspection for the Sun RPC protocol. Sun RPC is used by NFS and NIS. Sun RPC services can run on any port. When a client attempts to access an Sun RPC service on a server, it must learn the port that service is running on. It does this by querying the port mapper process, usually rpcbind, on the well-known port of 111.

The client sends the Sun RPC program number of the service and the port mapper process responds with the port number of the service. The client sends its Sun RPC queries to the server, specifying the port identified by the port mapper process. When the server replies, the ASA intercepts this packet and opens both embryonic TCP and UDP connections on that port.

The following limitations apply to Sun RPC inspection:

- NAT or PAT of Sun RPC payload information is not supported.
- Sun RPC inspection supports inbound access lists only. Sun RPC inspection does not support outbound access lists because the inspection engine uses dynamic access lists instead of secondary connections. Dynamic access lists are always added on the ingress direction and not on egress; therefore, this inspection engine does not support outbound access lists. To view the dynamic access lists configured for the ASA, use the **show asp table classify domain permit** command. For information about the **show asp table classify domain permit** command, see the *Cisco ASA 5500 Series Configuration Guide using the CLI*.

Managing Sun RPC Services

Use the Sun RPC services table to control Sun RPC traffic through the ASA based on established Sun RPC sessions. To create entries in the Sun RPC services table, use the **sunrpc-server** command in global configuration mode:

```
hostname(config)# sunrpc-server interface_name ip_address mask service service_type
protocol {tcp | udp} port[-port] timeout hh:mm:ss
```

You can use this command to specify the timeout after which the pinhole that was opened by Sun RPC application inspection will be closed. For example, to create a timeout of 30 minutes to the Sun RPC server with the IP address 192.168.100.2, enter the following command:

```
hostname(config)# sunrpc-server inside 192.168.100.2 255.255.255.255 service 100003
protocol tcp 111 timeout 00:30:00
```

This command specifies that the pinhole that was opened by Sun RPC application inspection will be closed after 30 minutes. In this example, the Sun RPC server is on the inside interface using TCP port 111. You can also specify UDP, a different port number, or a range of ports. To specify a range of ports, separate the starting and ending port numbers in the range with a hyphen (for example, 111-113).

The service type identifies the mapping between a specific service type and the port number used for the service. To determine the service type, which in this example is 100003, use the **sunrpcinfo** command at the UNIX or Linux command line on the Sun RPC server machine.

To clear the Sun RPC configuration, enter the following command.

```
hostname(config)# clear configure sunrpc-server
```

This removes the configuration performed using the **sunrpc-server** command. The **sunrpc-server** command allows pinholes to be created with a specified timeout.

To clear the active Sun RPC services, enter the following command:

```
hostname(config)# clear sunrpc-server active
```

This clears the pinholes that are opened by Sun RPC application inspection for specific services, such as NFS or NIS.

Verifying and Monitoring Sun RPC Inspection

The sample output in this section is for a Sun RPC server with an IP address of 192.168.100.2 on the inside interface and a Sun RPC client with an IP address of 209.168.200.5 on the outside interface.

To view information about the current Sun RPC connections, enter the **show conn** command. The following is sample output from the **show conn** command:

```
hostname# show conn
15 in use, 21 most used
UDP out 209.165.200.5:800 in 192.168.100.2:2049 idle 0:00:04 flags -
UDP out 209.165.200.5:714 in 192.168.100.2:111 idle 0:00:04 flags -
UDP out 209.165.200.5:712 in 192.168.100.2:647 idle 0:00:05 flags -
UDP out 192.168.100.2:0 in 209.165.200.5:714 idle 0:00:05 flags i
hostname(config)#
```

To display the information about the Sun RPC service table configuration, enter the **show running-config sunrpc-server** command. The following is sample output from the **show running-config sunrpc-server** command:

```
hostname(config)# show running-config sunrpc-server
```

```
sunrpc-server inside 192.168.100.2 255.255.255.255 service 100003 protocol UDP port 111
timeout 0:30:00
sunrpc-server inside 192.168.100.2 255.255.255.255 service 100005 protocol UDP port 111
timeout 0:30:00
```

This output shows that a timeout interval of 30 minutes is configured on UDP port 111 for the Sun RPC server with the IP address 192.168.100.2 on the inside interface.

To display the pinholes open for Sun RPC services, enter the **show sunrpc-server active** command. The following is sample output from **show sunrpc-server active** command:

```
hostname# show sunrpc-server active
LOCAL FOREIGN SERVICE TIMEOUT
-----------------------------------------------
1 209.165.200.5/0 192.168.100.2/2049 100003 0:30:00
2 209.165.200.5/0 192.168.100.2/2049 100003 0:30:00
3 209.165.200.5/0 192.168.100.2/647 100005 0:30:00
4 209.165.200.5/0 192.168.100.2/650 100005 0:30:00
```

The entry in the LOCAL column shows the IP address of the client or server on the inside interface, while the value in the FOREIGN column shows the IP address of the client or server on the outside interface.

To view information about the Sun RPC services running on a Sun RPC server, enter the **rpcinfo -p** command from the Linux or UNIX server command line. The following is sample output from the **rpcinfo -p** command:

```
sunrpcserver:~ # rpcinfo -p
program vers proto port
100000 2 tcp 111 portmapper
100000 2 udp 111 portmapper
100024 1 udp 632 status
100024 1 tcp 635 status
100003 2 udp 2049 nfs
100003 3 udp 2049 nfs
100003 2 tcp 2049 nfs
100003 3 tcp 2049 nfs
100021 1 udp 32771 nlockmgr
100021 3 udp 32771 nlockmgr
100021 4 udp 32771 nlockmgr
100021 1 tcp 32852 nlockmgr
100021 3 tcp 32852 nlockmgr
100021 4 tcp 32852 nlockmgr
100005 1 udp 647 mountd
100005 1 tcp 650 mountd
100005 2 udp 647 mountd
100005 2 tcp 650 mountd
100005 3 udp 647 mountd
100005 3 tcp 650 mountd
```

In this output, port 647 corresponds to the mountd daemon running over UDP. The mountd process would more commonly be using port 32780. The mountd process running over TCP uses port 650 in this example.

CHAPTER 44

Configuring Inspection for Management Application Protocols

This chapter describes how to configure application layer protocol inspection. Inspection engines are required for services that embed IP addressing information in the user data packet or that open secondary channels on dynamically assigned ports. These protocols require the ASA to do a deep packet inspection instead of passing the packet through the fast path. As a result, inspection engines can affect overall throughput.

Several common inspection engines are enabled on the ASA by default, but you might need to enable others depending on your network. This chapter includes the following sections:

- DCERPC Inspection, page 44-1
- GTP Inspection, page 44-3
- RADIUS Accounting Inspection, page 44-9
- RSH Inspection, page 44-11
- SNMP Inspection, page 44-11
- XDMCP Inspection, page 44-12

DCERPC Inspection

This section describes the DCERPC inspection engine. This section includes the following topics:

- DCERPC Overview, page 44-1
- Configuring a DCERPC Inspection Policy Map for Additional Inspection Control, page 44-2

DCERPC Overview

DCERPC is a protocol widely used by Microsoft distributed client and server applications that allows software clients to execute programs on a server remotely.

DCERPC inspection maps inspection for native TCP communication between a server called the Endpoint Mapper (EPM) and client on the well-known TCP port 135. Map and lookup operations of the EPM are supported for clients. Client and server can be located in any security zone. The embedded server IP address and port number are received from the applicable EPM response messages. Because a client can attempt multiple connections to the server port returned by EPM, creation of multiple pinholes is allowed. User configurable timeouts are allowed for multiple pinholes.

Note DCERPC inspection only supports communication between an EPM server and clients to open pinholes through the ASA. Clients using RPC communication that does not use an EPM server is not supported with DCERPC inspection.

Typically, software clients remotely execute programs on an EPM server in the following way:

Step 1 A client queries an EPM server for the dynamically-allocated port number of a required DCERPC service. The EPM server listens on the well-known TCP port 135.

Step 2 The ASA, located between the client and EPM server, intercepts the communication.

Step 3 The EPM server indicates the port number on which the DCERPC service is available.

Step 4 The ASA opens a pinhole for that DCERPC service.

Note Because the pinhole does not have a value for the source port, the source port value is set to 0. The source IP address, destination IP address, and destination port are indicated.

Step 5 Using that pinhole, the client attempts to connect to the DCERPC service on the indicated port.

Step 6 The ASA detects that the connection is permitted and creates a secondary connection to the server instance providing the DCERPC service. When creating the secondary connection, the ASA applies NAT if necessary.

Note When the pinhole timeout is reached, the ASA destroys the pinhole and permits new connections from the client to the EPM server; existing connections remain, however, because they are independent.

Configuring a DCERPC Inspection Policy Map for Additional Inspection Control

To specify additional DCERPC inspection parameters, create a DCERPC inspection policy map. You can then apply the inspection policy map when you enable DCERPC inspection.

To create a DCERPC inspection policy map, perform the following steps:

Step 1 Create a DCERPC inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect dcerpc policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 2 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 3 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

b. To configure the timeout for DCERPC pinholes and override the global system pinhole timeout of two minutes, enter the following command:

```
hostname(config-pmap-p)# timeout pinhole hh:mm:ss
```

Where the *hh:mm:ss* argument is the timeout for pinhole connections. Value is between 0:0:1 and 1193:0:0.

c. To configure options for the endpoint mapper traffic, enter the following command:

```
hostname(config-pmap-p)# endpoint-mapper [epm-service-only] [lookup-operation
[timeout hh:mm:ss]]
```

Where the *hh:mm:ss* argument is the timeout for pinholes generated from the lookup operation. If no timeout is configured for the lookup operation, the timeout pinhole command or the default is used. The **epm-service-only** keyword enforces endpoint mapper service during binding so that only its service traffic is processed. The **lookup-operation** keyword enables the lookup operation of the endpoint mapper service.

The following example shows how to define a DCERPC inspection policy map with the timeout configured for DCERPC pinholes.

```
hostname(config)# policy-map type inspect dcerpc dcerpc_map
hostname(config-pmap)# timeout pinhole 0:10:00

hostname(config)# class-map dcerpc
hostname(config-cmap)# match port tcp eq 135

hostname(config)# policy-map global-policy
hostname(config-pmap)# class dcerpc
hostname(config-pmap-c)# inspect dcerpc dcerpc-map

hostname(config)# service-policy global-policy global
```

GTP Inspection

This section describes the GTP inspection engine. This section includes the following topics:

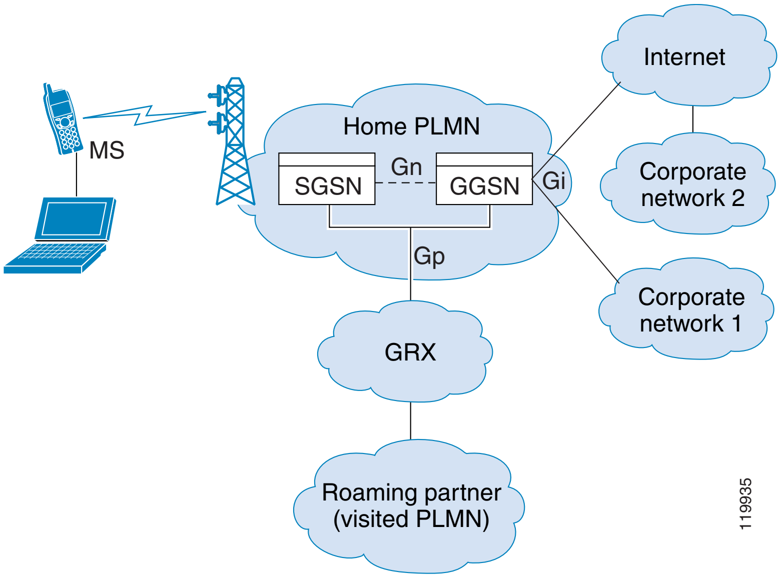
- GTP Inspection Overview, page 44-4
- Configuring a GTP Inspection Policy Map for Additional Inspection Control, page 44-5
- Verifying and Monitoring GTP Inspection, page 44-8

Note GTP inspection requires a special license. If you enter GTP-related commands on a ASA without the required license, the ASA displays an error message.

GTP Inspection Overview

GPRS provides uninterrupted connectivity for mobile subscribers between GSM networks and corporate networks or the Internet. The GGSN is the interface between the GPRS wireless data network and other networks. The SGSN performs mobility, data session management, and data compression (See Figure 44-1).

Figure 44-1 GPRS Tunneling Protocol



The UMTS is the commercial convergence of fixed-line telephony, mobile, Internet and computer technology. UTRAN is the networking protocol used for implementing wireless networks in this system. GTP allows multi-protocol packets to be tunneled through a UMTS/GPRS backbone between a GGSN, an SGSN and the UTRAN.

GTP does not include any inherent security or encryption of user data, but using GTP with the ASA helps protect your network against these risks.

The SGSN is logically connected to a GGSN using GTP. GTP allows multiprotocol packets to be tunneled through the GPRS backbone between GSNs. GTP provides a tunnel control and management protocol that allows the SGSN to provide GPRS network access for a mobile station by creating, modifying, and deleting tunnels. GTP uses a tunneling mechanism to provide a service for carrying user data packets.

Note When using GTP with failover, if a GTP connection is established and the active unit fails before data is transmitted over the tunnel, the GTP data connection (with a “j” flag set) is not replicated to the standby unit. This occurs because the active unit does not replicate embryonic connections to the standby unit.

Configuring a GTP Inspection Policy Map for Additional Inspection Control

If you want to enforce additional parameters on GTP traffic, create and configure a GTP map. If you do not specify a map with the **inspect gtp** command, the ASA uses the default GTP map, which is preconfigured with the following default values:

- **request-queue 200**
- **timeout gsn 0:30:00**
- **timeout pdp-context 0:30:00**
- **timeout request 0:01:00**
- **timeout signaling 0:30:00**
- **timeout tunnel 0:01:00**
- **tunnel-limit 500**

To create and configure a GTP map, perform the following steps. You can then apply the GTP map when you enable GTP inspection according to the "Configuring Application Layer Protocol Inspection" section on page 40-6.

Step 1 Create a GTP inspection policy map, enter the following command:

```
hostname(config)# policy-map type inspect gtp policy_map_name
hostname(config-pmap)#
```

Where the *policy_map_name* is the name of the policy map. The CLI enters policy-map configuration mode.

Step 2 (Optional) To add a description to the policy map, enter the following command:

```
hostname(config-pmap)# description string
```

Step 3 To match an Access Point name, enter the following command:

```
hostname(config-pmap)# match [not] apn regex [regex_name | class regex_class_name]
```

Step 4 To match a message ID, enter the following command:

```
hostname(config-pmap)# match [not] message id [message_id | range lower_range upper_range]
```

Where the *message_id* is an alphanumeric identifier between 1 and 255. The *lower_range* is lower range of message IDs. The *upper_range* is the upper range of message IDs.

Step 5 To match a message length, enter the following command:

```
hostname(config-pmap)# match [not] message length min min_length max max_length
```

Where the *min_length* and *max_length* are both between 1 and 65536. The length specified by this command is the sum of the GTP header and the rest of the message, which is the payload of the UDP packet.

Step 6 To match the version, enter the following command:

```
hostname(config-pmap)# match [not] version [version_id | range lower_range upper_range]
```

Where the *version_id* is between 0and 255. The *lower_range* is lower range of versions. The *upper_range* is the upper range of versions.

Step 7 To configure parameters that affect the inspection engine, perform the following steps:

a. To enter parameters configuration mode, enter the following command:

```
hostname(config-pmap)# parameters
hostname(config-pmap-p)#
```

The **mnc** *network_code* argument is a two or three-digit value identifying the network code.

By default, the security appliance does not check for valid MCC/MNC combinations. This command is used for IMSI Prefix filtering. The MCC and MNC in the IMSI of the received packet is compared with the MCC/MNC configured with this command and is dropped if it does not match.

This command must be used to enable IMSI Prefix filtering. You can configure multiple instances to specify permitted MCC and MNC combinations. By default, the ASA does not check the validity of MNC and MCC combinations, so you must verify the validity of the combinations configured. To find more information about MCC and MNC codes, see the ITU E.212 recommendation, *Identification Plan for Land Mobile Stations*.

b. To allow invalid GTP packets or packets that otherwise would fail parsing and be dropped, enter the following command:

```
hostname(config-pmap-p)# permit errors
```

By default, all invalid packets or packets that failed, during parsing, are dropped.

c. To enable support for GSN pooling, use the **permit response** command.

If the ASA performs GTP inspection, by default the ASA drops GTP responses from GSNs that were not specified in the GTP request. This situation occurs when you use load-balancing among a pool of GSNs to provide efficiency and scalability of GPRS.

You can enable support for GSN pooling by using the **permit response** command. This command configures the ASA to allow responses from any of a designated set of GSNs, regardless of the GSN to which a GTP request was sent. You identify the pool of load-balancing GSNs as a network object. Likewise, you identify the SGSN as a network object. If the GSN responding belongs to the same object group as the GSN that the GTP request was sent to and if the SGSN is in a object group that the responding GSN is permitted to send a GTP response to, the ASA permits the response.

d. To create an object to represent the pool of load-balancing GSNs, perform the following steps:

Use the **object-group** command to define a new network object group representing the pool of load-balancing GSNs.

```
hostname(config)# object-group network GSN-pool-name
hostname(config-network)#
```

For example, the following command creates an object group named gsnpool32:

```
hostname(config)# object-group network gsnpool32
hostname(config-network)#
```

e. Use the **network-object** command to specify the load-balancing GSNs. You can do so with one **network-object** command per GSN, using the **host** keyword. You can also using **network-object** command to identify whole networks containing GSNs that perform load balancing.

```
hostname(config-network)# network-object host IP-address
```

For example, the following commands create three network objects representing individual hosts:

```
hostname(config-network)# network-object host 192.168.100.1
hostname(config-network)# network-object host 192.168.100.2
hostname(config-network)# network-object host 192.168.100.3
hostname(config-network)#
```

f. To create an object to represent the SGSN that the load-balancing GSNs are permitted to respond to, perform the following steps:

a. Use the **object-group** command to define a new network object group that will represent the SGSN that sends GTP requests to the GSN pool.

```
hostname(config)# object-group network SGSN-name
hostname(config-network)#
```

For example, the following command creates an object group named sgsn32:

```
hostname(config)# object-group network sgsn32
hostname(config-network)#
```

b. Use the **network-object** command with the **host** keyword to identify the SGSN.

```
hostname(config-network)# network-object host IP-address
```

For example, the following command creates a network objects representing the SGSN:

```
hostname(config-network)# network-object host 192.168.50.100
hostname(config-network)#
```

g. To allow GTP responses from any GSN in the network object representing the GSN pool, defined in c., d, to the network object representing the SGSN, defined in c., f., enter the following commands:

```
hostname(config)# gtp-map map_name
hostname(config-gtp-map)# permit response to-object-group SGSN-name from-object-group
GSN-pool-name
```

For example, the following command permits GTP responses from any host in the object group named gsnpool32 to the host in the object group named sgsn32:

```
hostname(config-gtp-map)# permit response to-object-group sgsn32 from-object-group
gsnpool32
```

The following example shows how to support GSN pooling by defining network objects for the GSN pool and the SGSN. An entire Class C network is defined as the GSN pool but you can identify multiple individual IP addresses, one per **network-object** command, instead of identifying whole networks. The example then modifies a GTP map to permit responses from the GSN pool to the SGSN.

```
hostname(config)# object-group network gsnpool32
hostname(config-network)# network-object 192.168.100.0 255.255.255.0
hostname(config)# object-group network sgsn32
hostname(config-network)# network-object host 192.168.50.100
hostname(config)# gtp-map gtp-policy
hostname(config-gtp-map)# permit response to-object-group sgsn32 from-object-group
gsnpool32
```

h. To specify the maximum number of GTP requests that will be queued waiting for a response, enter the following command:

```
hostname(config-gtp-map)# request-queue max_requests
```

where the *max_requests* argument sets the maximum number of GTP requests that will be queued waiting for a response, from 1 to 4294967295. The default is 200.

When the limit has been reached and a new request arrives, the request that has been in the queue for the longest time is removed. The Error Indication, the Version Not Supported and the SGSN Context Acknowledge messages are not considered as requests and do not enter the request queue to wait for a response.

i. To change the inactivity timers for a GTP session, enter the following command:

```
hostname(config-gtp-map)# timeout {gsn | pdp-context | request | signaling | tunnel}
hh:mm:ss
```

Enter this command separately for each timeout.

The **gsn** keyword specifies the period of inactivity after which a GSN will be removed.

The **pdp-context** keyword specifies the maximum period of time allowed before beginning to receive the PDP context.

The **request** keyword specifies the maximum period of time allowed before beginning to receive the GTP message.

The **signaling** keyword specifies the period of inactivity after which the GTP signaling will be removed.

The **tunnel** keyword specifies the period of inactivity after which the GTP tunnel will be torn down.

The *hh***:***mm***:***ss* argument is the timeout where *hh* specifies the hour, *mm* specifies the minutes, and *ss* specifies the seconds. The value **0** means never tear down.

j. To specify the maximum number of GTP tunnels allowed to be active on the ASA, enter the following command:

```
hostname(config-gtp-map)# tunnel-limit max_tunnels
```

where the *max_tunnels* argument is the maximum number of tunnels allowed, from 1 to 4294967295. The default is 500.

New requests will be dropped once the number of tunnels specified by this command is reached.

The following example shows how to limit the number of tunnels in the network:

```
hostname(config)# policy-map type inspect gtp gmap
hostname(config-pmap)# parameters
hostname(config-pmap-p)# tunnel-limit 3000

hostname(config)# policy-map global_policy
hostname(config-pmap)# class inspection_default
hostname(config-pmap-c)# inspect gtp gmap

hostname(config)# service-policy global_policy global
```

Verifying and Monitoring GTP Inspection

To display GTP configuration, enter the **show service-policy inspect gtp** command in privileged EXEC mode. For the detailed syntax for this command, see the command page in the *Cisco ASA 5500 Series Command Reference*.

Use the **show service-policy inspect gtp statistics** command to show the statistics for GTP inspection. The following is sample output from the **show service-policy inspect gtp statistics** command:

```
hostname# show service-policy inspect gtp statistics
GPRS GTP Statistics:
  version_not_support            0     msg_too_short           0
  unknown_msg                    0     unexpected_sig_msg      0
  unexpected_data_msg            0     ie_duplicated           0
  mandatory_ie_missing           0     mandatory_ie_incorrect  0
  optional_ie_incorrect          0     ie_unknown              0
  ie_out_of_order                0     ie_unexpected           0
  total_forwarded                0     total_dropped           0
  signalling_msg_dropped         0     data_msg_dropped        0
  signalling_msg_forwarded          0     data_msg_forwarded        0
  total created_pdp                 0     total deleted_pdp         0
  total created_pdpmcb              0     total deleted_pdpmcb      0
  pdp_non_existent                  0
```

You can use the vertical bar (|) to filter the display. Type **?|** for more display filtering options.

The following is sample GSN output from the **show service-policy inspect gtp statistics gsn** command:

```
hostname# show service-policy inspect gtp statistics gsn 9.9.9.9
1 in use, 1 most used, timeout 0:00:00

GTP GSN Statistics for 9.9.9.9, Idle 0:00:00, restart counter 0
    Tunnels Active 0Tunnels Created 0
    Tunnels Destroyed 0
    Total Messages Received 2
    Signaling Messages Data Messages
    total received 2 0
    dropped 0 0
    forwarded 2 0
```

Use the **show service-policy inspect gtp pdp-context** command to display PDP context-related information. The following is sample output from the **show service-policy inspect gtp pdp-context** command:

```
hostname# show service-policy inspect gtp pdp-context detail
1 in use, 1 most used, timeout 0:00:00

Version TID                  MS Addr        SGSN Addr    Idle      APN
v1      1234567890123425         10.0.1.1        10.0.0.2 0:00:13  gprs.cisco.com

    user_name (IMSI): 214365870921435    MS address:         1.1.1.1
    primary pdp: Y                       nsapi: 2
    sgsn_addr_signal:        10.0.0.2    sgsn_addr_data:          10.0.0.2
    ggsn_addr_signal:        10.1.1.1    ggsn_addr_data:          10.1.1.1
    sgsn control teid:     0x000001d1    sgsn data teid:        0x000001d3
    ggsn control teid:     0x6306ffa0    ggsn data teid:        0x6305f9fc
    seq_tpdu_up:                    0    seq_tpdu_down:                  0
    signal_sequence:                0
    upstream_signal_flow:          0     upstream_data_flow:          0
    downstream_signal_flow:        0     downstream_data_flow:        0
    RAupdate_flow:                 0
```

The PDP context is identified by the tunnel ID, which is a combination of the values for IMSI and NSAPI. A GTP tunnel is defined by two associated PDP contexts in different GSN nodes and is identified with a Tunnel ID. A GTP tunnel is necessary to forward packets between an external packet data network and a MS user.

You can use the vertical bar (|) to filter the display, as in the following example:

```
hostname# show service-policy gtp statistics  |  grep gsn
```

RADIUS Accounting Inspection

This section describes the IM inspection engine. This section includes the following topics:

- RADIUS Accounting Inspection Overview, page 44-10
- Configuring a RADIUS Inspection Policy Map for Additional Inspection Control, page 44-10

RADIUS Accounting Inspection Overview

One of the well known problems is the over-billing attack in GPRS networks. The over-billing attack can cause consumers anger and frustration by being billed for services that they have not used. In this case, a malicious attacker sets up a connection to a server and obtains an IP address from the SGSN. When the attacker ends the call, the malicious server will still send packets to it, which gets dropped by the GGSN, but the connection from the server remains active. The IP address assigned to the malicious attacker gets released and reassigned to a legitimate user who will then get billed for services that the attacker will use.

RADIUS accounting inspection prevents this type of attack by ensuring the traffic seen by the GGSN is legitimate. With the RADIUS accounting feature properly configured, the security appliance tears down a connection based on matching the Framed IP attribute in the Radius Accounting Request Start message with the Radius Accounting Request Stop message. When the Stop message is seen with the matching IP address in the Framed IP attribute, the security appliance looks for all connections with the source matching the IP address.

You have the option to configure a secret pre-shared key with the RADIUS server so the security appliance can validate the message. If the shared secret is not configured, the security appliance does not need to validate the source of the message and will only check that the source IP address is one of the configured addresses allowed to send the RADIUS messages.

Note When using RADIUS accounting inspection with GPRS enabled, theASA checks for the 3GPP-Session-Stop-Indicator in the Accounting Request STOP messages to properly handle secondary PDP contexts. Specifically, the ASA requires that the Accounting Request STOP messages include the 3GPP-SGSN-Address attribute before it will temrinate the user sessions and all associated connections. Some third-party GGSNs might not send this attribute by default.

Configuring a RADIUS Inspection Policy Map for Additional Inspection Control

In order to use this feature, the **radius-accounting-map** will need to be specified in the **policy-map type management** and then applied to the service-policy using the new **control-plane** keyword to specify that this traffic is for to-the-box inspection.

The following example shows the complete set of commands in context to properly configure this feature:

Step 1 Configure the class map and the port:

```
class-map type management c1
  match port udp eq 1888
```

Step 2 Create the policy map, and configure the parameters for RADIUS accounting inspection using the parameter command to access the proper mode to configure the attributes, host, and key.

```
policy-map type inspect radius-accounting radius_accounting_map
  parameters
    host 10.1.1.1 inside key 123456789
    send response
    enable gprs
    validate-attribute 22
```

Step 3 Configure the service policy and control-plane keywords.

```
policy-map type management global_policy
  class c1
     inspect radius-accounting radius_accounting_map
```

```
service-policy global_policy control-plane abc global
```

RSH Inspection

RSH inspection is enabled by default. The RSH protocol uses a TCP connection from the RSH client to the RSH server on TCP port 514. The client and server negotiate the TCP port number where the client listens for the STDERR output stream. RSH inspection supports NAT of the negotiated port number if necessary.

SNMP Inspection

This section describes the IM inspection engine. This section includes the following topics:

- SNMP Inspection Overview, page 44-11
- Configuring an SNMP Inspection Policy Map for Additional Inspection Control, page 44-11

SNMP Inspection Overview

SNMP application inspection lets you restrict SNMP traffic to a specific version of SNMP. Earlier versions of SNMP are less secure; therefore, denying certain SNMP versions may be required by your security policy. The ASA can deny SNMP versions 1, 2, 2c, or 3. You control the versions permitted by creating an SNMP map. You then apply the SNMP map when you enable SNMP inspection according to the "Configuring Application Layer Protocol Inspection" section on page 40-6.

Configuring an SNMP Inspection Policy Map for Additional Inspection Control

To create an SNMP inspection policy map, perform the following steps:

Step 1 To create an SNMP map, enter the following command:

```
hostname(config)# snmp-map map_name
hostname(config-snmp-map)#
```

where *map_name* is the name of the SNMP map. The CLI enters SNMP map configuration mode.

Step 2 To specify the versions of SNMP to deny, enter the following command for each version:

```
hostname(config-snmp-map)# deny version version
hostname(config-snmp-map)#
```

where *version* is 1, 2, 2c, or 3.

The following example denies SNMP Versions 1 and 2:

```
hostname(config)# snmp-map sample_map
hostname(config-snmp-map)# deny version 1
hostname(config-snmp-map)# deny version 2
```

XDMCP Inspection

XDMCP inspection is enabled by default; however, the XDMCP inspection engine is dependent upon proper configuration of the **established** command.

XDMCP is a protocol that uses UDP port 177 to negotiate X sessions, which use TCP when established.

For successful negotiation and start of an XWindows session, the ASA must allow the TCP back connection from the Xhosted computer. To permit the back connection, use the **established** command on the ASA. Once XDMCP negotiates the port to send the display, The **established** command is consulted to verify if this back connection should be permitted.

During the XWindows session, the manager talks to the display Xserver on the well-known port 6000 | n. Each display has a separate connection to the Xserver, as a result of the following terminal setting.

```
setenv DISPLAY Xserver:n
```

where *n* is the display number.

When XDMCP is used, the display is negotiated using IP addresses, which the ASA can NAT if needed. XDCMP inspection does not support PAT.

PART 8

Configuring Unified Communications

CHAPTER 45

Information About Cisco Unified Communications Proxy Features

This chapter describes how to configure the adaptive security appliance for Cisco Unified Communications Proxy features.

This chapter includes the following sections:

- Information About the Adaptive Security Appliance in Cisco Unified Communications, page 45-1
- TLS Proxy Applications in Cisco Unified Communications, page 45-2
- Licensing for Cisco Unified Communications Proxy Features, page 45-4

Information About the Adaptive Security Appliance in Cisco Unified Communications

This section describes the Cisco UC Proxy features on the Cisco ASA 5500 series appliances. The purpose of a proxy is to terminate and reoriginate connections between a client and server. The proxy delivers a range of security functions such as traffic inspection, protocol conformance, and policy control to ensure security for the internal network. An increasingly popular function of a proxy is to terminate encrypted connections in order to apply security policies while maintaining confidentiality of connections. The Cisco ASA 5500 Series appliances are a strategic platform to provide proxy functions for unified communications deployments.

The Cisco UC Proxy includes the following solutions:

Phone Proxy: Secure remote access for Cisco encrypted endpoints, and VLAN traversal for Cisco softphones

The phone proxy feature enables termination of Cisco SRTP/TLS-encrypted endpoints for secure remote access. The phone proxy allows large scale deployments of secure phones without a large scale VPN remote access hardware deployment. End-user infrastructure is limited to just the IP endpoint, without VPN tunnels or hardware.

The Cisco adaptive security appliance phone proxy is the replacement product for the Cisco Unified Phone Proxy. Additionally, the phone proxy can be deployed for voice/data VLAN traversal for softphone applications. Cisco IP Communicator (CIPC) traffic (both media and signaling) can be proxied through the ASA, thus traversing calls securely between voice and data VLANs.

For information about the differences between the TLS proxy and phone proxy, go to the following URL for Unified Communications content, including TLS Proxy vs. Phone Proxy white paper:

http://www.cisco.com/go/secureuc

TLS Proxy: Decryption and inspection of Cisco Unified Communications encrypted signaling

End-to-end encryption often leaves network security appliances “blind” to media and signaling traffic, which can compromise access control and threat prevention security functions. This lack of visibility can result in a lack of interoperability between the firewall functions and the encrypted voice, leaving businesses unable to satisfy both of their key security requirements.

The ASA is able to intercept and decrypt encrypted signaling from Cisco encrypted endpoints to the Cisco Unified Communications Manager (Cisco UCM), and apply the required threat protection and access control. It can also ensure confidentiality by re-encrypting the traffic onto the Cisco UCM servers.

Typically, the ASA TLS Proxy functionality is deployed in campus unified communications network. This solution is ideal for deployments that utilize end to end encryption and firewalls to protect Unified Communications Manager servers.

Mobility Proxy: Secure connectivity between Cisco Unified Mobility Advantage server and Cisco Unified Mobile Communicator clients

Cisco Unified Mobility Advantage solutions include the Cisco Unified Mobile Communicator (Cisco UMC), an easy-to-use software application for mobile handsets that extends enterprise communications applications and services to mobile phones and the Cisco Unified Mobility Advantage (Cisco UMA) server. The Cisco Unified Mobility Advantage solution streamlines the communication experience, enabling single number reach and integration of mobile endpoints into the Unified Communications infrastructure.

The security appliance acts as a proxy, terminating and reoriginating the TLS signaling between the Cisco UMC and Cisco UMA. As part of the proxy security functionality, inspection is enabled for the Cisco UMA Mobile Multiplexing Protocol (MMP), the protocol between Cisco UMC and Cisco UMA.

Presence Federation Proxy: Secure connectivity between Cisco Unified Presence servers and Cisco/Microsoft Presence servers

Cisco Unified Presence solution collects information about the availability and status of users, such as whether they are using communication devices, such as IP phones at particular times. It also collects information regarding their communications capabilities, such as whether web collaboration or video conferencing is enabled. Using user information captured by Cisco Unified Presence, applications such as Cisco Unified Personal Communicator and Cisco UCM can improve productivity by helping users connect with colleagues more efficiently through determining the most effective way for collaborative communication.

Using the ASA as a secure presence federation proxy, businesses can securely connect their Cisco Unified Presence (Cisco UP) servers to other Cisco or Microsoft Presence servers, enabling intra-enterprise communications. The security appliance terminates the TLS connectivity between the servers, and can inspect and apply policies for the SIP communications between the servers.

TLS Proxy Applications in Cisco Unified Communications

Table 45-1 shows the Cisco Unified Communications applications that utilize the TLS proxy on the ASA.

Table 45-1 TLS Proxy Applications and the Security Appliance

Application	TLS Client	TLS Server	Client Authentication	Security Appliance Server Role	Security Appliance Client Role
Phone Proxy and TLS Proxy	IP phone	Cisco UCM	Yes	Proxy certificate, self-signed or by internal CA	Local dynamic certificate signed by the ASA CA (might not need certificate for phone proxy application)
Mobility Proxy	Cisco UMC	Cisco UMA	No	Using the Cisco UMA private key or certificate impersonation	Any static configured certificate
Presence Federation Proxy	Cisco UP or MS LCS/OCS	Cisco UP or MS LCS/OCS	Yes	Proxy certificate, self-signed or by internal CA	Using the Cisco UP private key or certificate impersonation

The ASA supports TLS proxy for various voice applications. For the phone proxy, the TLS proxy running on the ASA has the following key features:

- The ASA forces remote IP phones connecting to the phone proxy through the Internet to be in secured mode even when the Cisco UCM cluster is in non-secure mode.
- The TLS proxy is implemented on the ASA to intercept the TLS signaling from IP phones.
- The TLS proxy decrypts the packets, sends packets to the inspection engine for NAT rewrite and protocol conformance, optionally encrypts packets, and sends them to Cisco UCM or sends them in clear text if the IP phone is configured to be in nonsecure mode on the Cisco UCM.
- The ASA acts as a media terminator as needed and translates between SRTP and RTP media streams.
- The TLS proxy is a transparent proxy that works based on establishing trusted relationship between the TLS client, the proxy (the ASA), and the TLS server.

For the Cisco Unified Mobility Advantage solution, the TLS client is a Cisco UMA client and the TLS server is a Cisco UMA server. The ASA is between a Cisco UMA client and a Cisco UMA server. The mobility proxy (implemented as a TLS proxy) for Cisco Unified Mobility Advantage allows the use of an imported PKCS-12 certificate for server proxy during the handshake with the client. Cisco UMA clients are not required to present a certificate (no client authentication) during the handshake.

For the Cisco Unified Presence solution, the ASA acts as a TLS proxy between the Cisco UP server and the foreign server. This allows the ASA to proxy TLS messages on behalf of the server that initiates the TLS connection, and route the proxied TLS messages to the client. The ASA stores certificate trustpoints for the server and the client, and presents these certificates on establishment of the TLS session.

Licensing for Cisco Unified Communications Proxy Features

The Cisco Unified Communications proxy features supported by the ASA require a Unified Communications Proxy license:

- Phone proxy
- TLS proxy for encrypted voice inspection
- Presence federation proxy

Note In Version 8.2(2) and later, the Mobility Advantage proxy no longer requires a Unified Communications Proxy license.

The Unified Communications proxy features are licensed by TLS session. For the phone proxy or TLS proxy, each IP phone may have a single connection to the Cisco UCM server or two connections—one connection to the primary Cisco UCM and one connection to the backup Cisco UCM. In the second scenario, the phone proxy uses two Unified Communications Proxy sessions because two TLS sessions are set up. For the mobility proxy and presence federation proxy, each endpoint utilizes one Unified Communications Proxy session.

Table 45-2 shows the Unified Communications Proxy license details by platform.

Table 45-2 License Requirements for the Security Appliance

Security Appliance Platform	Max UC Proxy Licenses	Tiers for UC Proxy Licenses
ASA 5505	24	24
ASA 5510	100	24, 50, 100
ASA 5520	1,000	24, 50, 100, 250, 500, 750, 1000
ASA 5540	2,000	24, 50, 100, 250, 500, 750, 1000, 2000
ASA 5550	3,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000
ASA 5580	10,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000, 5000, 10000

Table 45-3 shows the default and maximum TLS session details by platform.

Table 45-3 Default and Maximum TLS Sessions on the Security Appliance

Security Appliance Platform	Default TLS Sessions	Maximum TLS Sessions
ASA 5505	10	80
ASA 5510	100	200
ASA 5520	300	1200
ASA 5540	1000	4500
ASA 5550	2000	4500
ASA 5580	4000	13,000

A Unified Communications Proxy license is applied the same way as other licensed features (such as, SSL VPN), via the **activation-key** command. For more information about licensing, see Chapter 3, “Managing Feature Licenses.”

CHAPTER 46

Configuring the Cisco Phone Proxy

This chapter describes how to configure the adaptive security appliance for Cisco Phone Proxy feature.

This chapter includes the following sections:

- Information About the Cisco Phone Proxy, page 46-1
- Licensing Requirements for the Phone Proxy, page 46-4
- Prerequisites for the Phone Proxy, page 46-5
- Phone Proxy Guidelines and Limitations, page 46-12
- Configuring the Phone Proxy, page 46-14
- Troubleshooting the Phone Proxy, page 46-27
- Configuration Examples for the Phone Proxy, page 46-43
- Feature History for the Phone Proxy, page 46-53

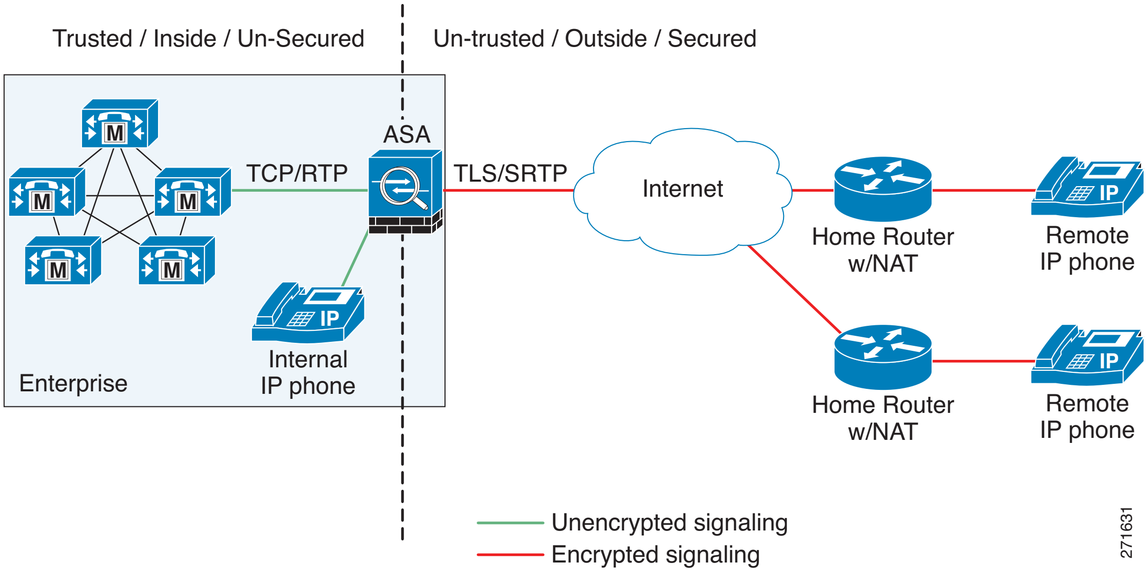
Information About the Cisco Phone Proxy

The Cisco Phone Proxy on the ASA bridges IP telephony between the corporate IP telephony network and the Internet in a secure manner by forcing data from remote phones on an untrusted network to be encrypted.

Phone Proxy Functionality

Telecommuters can connect their IP phones to the corporate IP telephony network over the Internet securely via the phone proxy without the need to connect over a VPN tunnel as illustrated by Figure 46-1.

Figure 46-1 Phone Proxy Secure Deployment



The phone proxy supports a Cisco UCM cluster in mixed mode or nonsecure mode. Regardless of the cluster mode, the remote phones that are capable of encryption are always forced to be in encrypted mode. TLS (signaling) and SRTP (media) are always terminated on the ASA. The ASA can also perform NAT, open pinholes for the media, and apply inspection policies for the SCCP and SIP protocols. In a nonsecure cluster mode or a mixed mode where the phones are configured as nonsecure, the phone proxy behaves in the following ways:

- The TLS connections from the phones are terminated on the ASA and a TCP connection is initiated to the Cisco UCM.
- SRTP sent from external IP phones to the internal network IP phone via the ASA is converted to RTP.

In a mixed mode cluster where the internal IP phones are configured as authenticated, the TLS connection is not converted to TCP to the Cisco UCM but the SRTP is converted to RTP.

In a mixed mode cluster where the internal IP phone is configured as encrypted, the TLS connection remains a TLS connection to the Cisco UCM and the SRTP from the remote phone remains SRTP to the internal IP phone.

Since the main purpose of the phone proxy is to make the phone behave securely while making calls to a nonsecure cluster, the phone proxy performs the following major functions:

- Creates the certificate trust list (CTL) file, which is used to perform certificate based authentication with remote phones.
- Modifies the IP phone configuration file when it is requested via TFTP, changes security fields from nonsecure to secure, and signs all files sent to the phone. These modifications secure remote phones by forcing the phones to perform encrypted signaling and media.
- Terminates TLS signaling from the phone and initiates TCP or TLS to Cisco UCM
- Inserts itself into the media path by modifying the Skinny and SIP signaling messages.
- Terminates SRTP and initiates RTP/SRTP to the called party.

Note As an alternative to authenticating remote IP phones through the TLS handshake, you can configure authentication via LSC provisioning. With LSC provisioning you create a password for each remote IP phone user and each user enters the password on the remote IP phones to retrieve the LSC.

Because using LSC provisioning to authenticate remote IP phones requires the IP phones first register in nonsecure mode, Cisco recommends LSC provisioning be done inside the corporate network before giving the IP phones to end-users. Otherwise, having the IP phones register in nonsecure mode requires the Administrator to open the nonsecure signaling port for SIP and SCCP on the ASA.

See "Example 5: LSC Provisioning in Mixed-mode Cisco UCM cluster; Cisco UCM and TFTP Server on Publisher, page 46-49". See also the Cisco Unified Communications Manager Security Guide for information on Using the Certificate Authority Proxy Function (CAPF) to install a locally significant certificate (LSC).

Supported Cisco UCM and IP Phones for the Phone Proxy

Cisco Unified Communications Manager

The following release of the Cisco Unified Communications Manager are supported with the phone proxy:

- Cisco Unified CallManager Version 4.*x*
- Cisco Unified CallManager Version 5.0
- Cisco Unified CallManager Version 5.1
- Cisco Unified Communications Manager 6.1
- Cisco Unified Communications Manager 7.0

Cisco Unified IP Phones

The phone proxy supports these IP phone features:

- Enterprise features like conference calls on remote phones connected through the phone proxy
- XML services

Note The phone proxy supports only the features described in the list above. All other IP phone features not described by this list are unsupported by the phone proxy.

The phone proxy does not support displaying the lock icon on IP phone screens. IP phones display the lock icon on the phone screen during encrypted calls. Even though the lock icon is not displayed on the screen, the IP phone call is still encrypted because the phone proxy encrypts calls by default.

The following IP phones in the Cisco Unified IP Phones 7900 Series are supported with the phone proxy:

- Cisco Unified IP Phone 7975
- Cisco Unified IP Phone 7971
- Cisco Unified IP Phone 7970
- Cisco Unified IP Phone 7965
- Cisco Unified IP Phone 7962

- Cisco Unified IP Phone 7961
- Cisco Unified IP Phone 7961G-GE
- Cisco Unified IP Phone 7960 (SCCP protocol support only)
- Cisco Unified IP Phone 7945
- Cisco Unified IP Phone 7942
- Cisco Unified IP Phone 7941
- Cisco Unified IP Phone 7941G-GE
- Cisco Unified IP Phone 7940 (SCCP protocol support only)
- Cisco Unified Wireless IP Phone 7921
- Cisco Unified Wireless IP Phone 7925

Note To support Cisco Unified Wireless IP Phone 7925, you must also configure MIC or LSC on the IP phone so that it properly works with the phone proxy.

- CIPC for softphones (CIPC versions with Authenticated mode only)

Note The Cisco IP Communicator is supported with the phone proxy VLAN Traversal in authenticated TLS mode. We do not recommend it for remote access because SRTP/TLS is not supported currently on the Cisco IP Communicator.

The phone proxy and CIPC are not supported when CIPC is installed on computers in remote locations, such that the calls from those computers traverse the Internet, terminating at theASA, to reach IP phones residing on the network behind the adaptive security appliance. The computers where CIPC is installed must be on the network to reach the IP phones behind the ASA.

Licensing Requirements for the Phone Proxy

The Cisco Phone Proxy feature supported by the ASA require a Unified Communications Proxy license.

The Unified Communications proxy features, which includes the Cisco Phone Proxy feature, are licensed by TLS session. For the phone proxy, each IP phone may have a single connection to the Cisco UCM server or two connections —one connection to the primary Cisco UCM and one connection to the backup Cisco UCM. In the second scenario, the phone proxy uses two Unified Communications Proxy sessions because two TLS sessions are set up.

Table 46-1 shows the Unified Communications Proxy license details by platform.

Table 46-1 License Requirements for the Security Appliance

Security Appliance Platform	Max UC Proxy Licenses	Tiers for UC Proxy Licenses
ASA 5505	24	24
ASA 5510	100	24, 50, 100
ASA 5520	1,000	24, 50, 100, 250, 500, 750, 1000
ASA 5540	2,000	24, 50, 100, 250, 500, 750, 1000, 2000

Table 46-1 License Requirements for the Security Appliance

Security Appliance Platform	Max UC Proxy Licenses	Tiers for UC Proxy Licenses
ASA 5550	3,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000
ASA 5580	10,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000, 5000, 10000

A Unified Communications Proxy license is applied the same way as other licensed features (such as, SSL VPN), via the **activation-key** command. For more information about licensing, see Chapter 3, "Managing Feature Licenses."

Prerequisites for the Phone Proxy

This section contains the following topics:

- Media Termination Instance Prerequisites, page 46-5
- Certificates from the Cisco UCM, page 46-6
- DNS Lookup Prerequisites, page 46-6
- Cisco Unified Communications Manager Prerequisites, page 46-7
- Access List Rules, page 46-7
- NAT and PAT Prerequisites, page 46-7
- Prerequisites for IP Phones on Multiple Interfaces, page 46-8
- 7960 and 7940 IP Phones Support, page 46-8
- Cisco IP Communicator Prerequisites, page 46-9
- Prerequisites for Rate Limiting TFTP Requests, page 46-10
- About ICMP Traffic Destined for the Media Termination Address, page 46-11
- End-User Phone Provisioning, page 46-11

Media Termination Instance Prerequisites

The ASA must have a media termination instance that meets the following criteria:

- You must configure one media termination for each phone proxy on the ASA. Multiple media termination instances on the ASA are not supported.
- For the media termination instance, you can configure a global media-termination address for all interfaces or configure a media-termination address for different interfaces. However, you cannot use a global media-termination address and media-termination addresses configured for each interface at the same time.
- If you configure a media termination address for multiple interfaces, you must configure an address on each interface that the ASA uses when communicating with IP phones.

For example, if you had three interfaces on the ASA (one internal interface and two external interfaces) and only one of the external interfaces were used to communicate with IP phones, you would configure two media termination addresses: one on the internal interface and one on the external interface that communicated with the IP phones.

- Only one media-termination address can be configured per interface.
- The IP addresses are publicly routable addresses that are unused IP addresses within the address range on that interface.
- The IP address on an interface cannot be the same address as that interface on the ASA.
- The IP addresses cannot overlap with existing static NAT pools or NAT rules.
- The IP addresses cannot be the same as the Cisco UCM or TFTP server IP address.
- For IP phones behind a router or gateway, you must also meet this prerequisite. On the router or gateway, add routes to the media termination address on the ASA interface that the IP phones communicate with so that the phone can reach the media termination address.

Certificates from the Cisco UCM

Import the following certificates which are stored on the Cisco UCM. These certificates are required by the ASA for the phone proxy.

- Cisco_Manufacturing_CA
- CAP-RTP-001
- CAP-RTP-002
- CAPF certificate (Optional)

If LSC provisioning is required or you have LSC enabled IP phones, you must import the CAPF certificate from the Cisco UCM. If the Cisco UCM has more than one CAPF certificate, you must import all of them to the ASA.

Note You can configure LSC provisioning for additional end-user authentication. See the Cisco Unified Communications Manager configuration guide for information.

See Importing Certificates from the Cisco UCM, page 46-15. For example, the CA Manufacturer certificate is required by the phone proxy to validate the IP phone certificate.

DNS Lookup Prerequisites

- If you have an fully qualified domain name (FQDN) configured for the Cisco UCM rather than an IP address, you must configure and enable DNS lookup on the ASA. For information about the **dns domain-lookup** command and how to use it to configure DNS lookup, see *Cisco ASA 5500 Series Command Reference*.
- After configuring the DNS lookup, make sure that the ASA can ping the Cisco UCM with the configured FQDN.
- You must configure DNS lookup when you have a CAPF service enabled and the Cisco UCM is not running on the Publisher but the Publisher is configured with a FQDN instead of an IP address.

Cisco Unified Communications Manager Prerequisites

- The TFTP server must reside on the same interface as the Cisco UCM.
- The Cisco UCM can be on a private network on the inside but you need to have a static mapping for the Cisco UCM on the ASA to a public routable address.
- If NAT is required for Cisco UCM, it must be configured on the ASA, not on the existing firewall.

Access List Rules

If the phone proxy is deployed behind an existing firewall, access-list rules to permit signaling, TFTP requests, and media traffic to the phone proxy must be configured.

If NAT is configured for the TFTP server or Cisco UCMs, the translated "global" address must be used in the access lists.

Table 46-2 lists the ports that are required to be configured on the existing firewall:

Table 46-2 Port Configuration Requirements

Address	Port	Protocol	Description
Media Termination	1024-65535	UDP	Allow incoming SRTP
TFTP Server	69	UDP	Allow incoming TFTP
Cisco UCM	2443	TCP	Allow incoming secure SCCP
Cisco UCM	5061	TCP	Allow incoming secure SIP
CAPF Service (on Cisco UCM)	3804	TCP	Allow CAPF service for LSC provisioning

Note All these ports are configurable on the Cisco UCM, except for TFTP. These are the default values and should be modified if they are modified on the Cisco UCM. For example, 3804 is the default port for the CAPF Service. This default value should be modified if it is modified on the Cisco UCM.

NAT and PAT Prerequisites

NAT Prerequisites

- If NAT is configured for the TFTP server, the NAT configuration must be configured prior to configuring the **tftp-server** command under the phone proxy.
- If NAT is configured for the TFTP server or Cisco UCMs, the translated "global" address must be used in the access lists.

PAT Prerequisites

- When the Skinny inspection global port is configured to use a non-default port, then you must configure the nonsecure port as the `global_sccp_port+443`.

Therefore, if *global_sccp_port* is 7000, then the global secure SCCP port is 7443. Reconfiguring the port might be necessary when the phone proxy deployment has more than one Cisco UCM and they must share the interface IP address or a global IP address:

```
/* use the default ports for the first CUCM */
static (inside,outside) tcp interface 2000 10.0.0.1 2000
static (inside,outside) tcp interface 2443 10.0.0.1 2443
/* use non-default ports for the 2nd CUCM */
static (inside,outside) tcp interface 7000 10.0.0.2 2000
static (inside,outside) tcp interface 7443 10.0.0.2 2443
```

Note Both PAT configurations—for the nonsecure and secure ports—must be configured.

- When the IP phones must contact the CAPF on the Cisco UCM and the Cisco UCM is configured with static PAT (LCS provisioning is required), you must configure static PAT for the default CAPF port 3804.

Prerequisites for IP Phones on Multiple Interfaces

When IP phones reside on multiple interfaces, the phone proxy configuration must have the correct IP address set for the Cisco UCM in the CTL file.

See the following example topology for information about how to correctly set the IP address:

```
phones --- (dmz)-----|
                     |----- ASA PP --- (outside Internet) --- phones
phones --- (inside)--|
```

In this example topology, the following IP address are set:

- Cisco UCM on the inside interface is set to 10.0.0.5
- The DMZ network is 192.168.1.0/24
- The inside network is 10.0.0.0/24

The Cisco UCM is mapped with different global IP addresses from DMZ > outside and inside interfaces > outside interface.

In the CTL file, the Cisco UCM must have two entries because of the two different IP addresses. For example, if the static statements for the Cisco UCM are as follows:

```
static (inside,outside) 128.106.254.2 10.0.0.5
static (inside,dmz) 192.168.1.2 10.0.0.5
```

There must be two CTL file record entries for the Cisco UCM:

```
record-entry cucm trustpoint cucm_in_to_out address 128.106.254.2
record-entry cucm trustpoint cucm_in_to_dmz address 192.168.1.2
```

7960 and 7940 IP Phones Support

- An LSC must be installed on these IP phones because they do not come pre installed with a MIC. Install the LSC on each phone before using them with the phone proxy to avoid opening the nonsecure SCCP port for the IP phones to register in nonsecure mode with the Cisco UCM.

  See the following document for the steps to install an LSC on IP phones:

http://www.cisco.com/en/US/docs/voice_ip_comm/cucm/security/7_0_1/secugd/secucapf.html#wp1093518

Note If an IP phone already has an LSC installed on it from a different Cisco UCM cluster, delete the LSC from the different cluster and install an LSC from the current Cisco UCM cluster.

Note You can configure LSC provisioning for additional end-user authentication. See the Cisco Unified Communications Manager configuration guide for information.

- The CAPF certificate must be imported onto the ASA.
- The CTL file created on the ASA must be created with a CAPF record-entry.
- The phone must be configured to use only the SCCP protocol because the SIP protocol does not support encryption on these IP phones.
- If LSC provisioning is done via the phone proxy, you must add an ACL to allow the IP phones to register with the Cisco UCM on the nonsecure port 2000.

Cisco IP Communicator Prerequisites

To configure Cisco IP Communicator (CIPC) with the phone proxy, you must meet the following prerequisites:

- Include the **cipc security-mode authenticated** command under the **phone-proxy** command when configuring the phone proxy instance.
- Create an ACL to allow CIPC to register with the Cisco UCM in nonsecure mode.
- Configure null-sha1 as one of the SSL encryption ciphers.

Current versions of Cisco IP Communicator (CIPC) support authenticated mode and perform TLS signaling but not voice encryption. Therefore, you must include the following command when configuring the phone proxy instance:

cipc security-mode authenticated

Because CIPC requires an LSC to perform the TLS handshake, CIPC needs to register with the Cisco UCM in nonsecure mode using cleartext signaling. To allow the CIPC to register, create an ACL that allows the CIPC to connect to the Cisco UCM on the nonsecure SIP/SCCP signalling ports (5060/2000).

Note You can configure LSC provisioning for additional end-user authentication. See the Cisco Unified Communications Manager configuration guide for information.

CIPC uses a different cipher when doing the TLS handshake and requires the null-sha1 cipher and SSL encryption be configured. To add the null-shal cipher, use the show run all ssl command to see the output for the ssl encryption command and add null-shal to the end of the SSL encryption list.

Note When used with CIPC, the phone proxy does not support end-users resetting their device name in CIPC (Prefences > Network tab > Use this Device Name field) or Administrators resetting the devide name in Cisco Unified CM Administration console (Device menu > Phone Configuration > Device Name field).

To function with the phone proxy, the CIPC configuration file must be in the format: SEP<mac_address>.cnf.xml. If the device name does not follow this format (SEP<mac_address>), CIPC cannot retrieve its configuration file from Cisco UMC via the phone proxy and CIPC will not function.

The phone proxy and CIPC are not supported when CIPC is installed on computers in remote locations, such that the calls from those computers traverse the Internet, terminating at the ASA, to reach IP phones residing on the network behind the adaptive security appliance. The computers where CIPC is installed must be on the network to reach the IP phones behind the ASA.

Prerequisites for Rate Limiting TFTP Requests

In a remote access scenario, we recommend that you configure rate limiting of TFTP requests because any IP phone connecting through the Internet is allowed to send TFTP requests to the TFTP server.

To configure rate limiting of TFTP requests, configure the **police** command in the Modular Policy Framework. See the *Cisco ASA 5500 Series Command Reference* for information about using the **police** command.

Policing is a way of ensuring that no traffic exceeds the maximum rate (in bits/second) that you configure, thus ensuring that no one traffic flow can take over the entire resource. When traffic exceeds the maximum rate, the ASA drops the excess traffic. Policing also sets the largest single burst of traffic allowed.

Rate Limiting Configuration Example

The following example describes how you configure rate limiting for TFTP requests by using the **police** command and the Modular Policy Framework.

Begin by determining the conformance rate that is required for the phone proxy. To determine the conformance rate, use the following formula:

```
X * Y * 8
```

Where

X = requests per second

Y = size of each packet, which includes the L2, L3, and L4 plus the payload

Therefore, if a rate of 300 TFTP requests/second is required, then the conformance rate would be calculated as follows:

```
300 requests/second * 80 bytes * 8 = 192000
```

The example configuration below shows how the calculated conformance rate is used with the **police** command:

```
access-list tftp extended permit udp any host 192.168.0.1 eq tftp

class-map tftpclass
   match access-list tftp

policy-map tftpmap
   class tftpclass
   police output 192000

service-policy tftpmap interface inside
```

About ICMP Traffic Destined for the Media Termination Address

To control which hosts can ping the media termination address, use the **icmp** command and apply the access rule to the outside interface on the ASA.

Any rules for ICMP access applied to the outside interface apply to traffic destined for the media termination address.

For example, use the following command to deny ICMP pings from any host destined for the media termination address:

icmp deny any outside

End-User Phone Provisioning

The phone proxy is a transparent proxy with respect to the TFTP and signaling transactions. If NAT is not configured for the Cisco UCM TFTP server, then the IP phones need to be configured with the Cisco UCM cluster TFTP server address.

If NAT is configured for the Cisco UCM TFTP server, then the Cisco UCM TFTP server global address is configured as the TFTP server address on the IP phones.

Ways to Deploy IP Phones to End Users

In both options, deploying a remote IP phone behind a commercial Cable/DSL router with NAT capabilities is supported.

Option 1 (Recommended)

Stage the IP phones at corporate headquarters before sending them to the end users:

- The phones register inside the network. IT ensures there are no issues with the phone configurations, image downloads, and registration.
- If Cisco UCM cluster was in mixed mode, the CTL file should be erased before sending the phone to the end user.

Advantages of this option are:

- Easier to troubleshoot and isolate problems with the network or phone proxy because you know whether the phone is registered and working with the Cisco UCM.
- Better user experience because the phone does not have to download firmware from over a broadband connection, which can be slow and require the user to wait for a longer time.

Option 2

Send the IP phone to the end user. When using option 2, the user must be provided instructions to change the settings on phones with the appropriate Cisco UCM and TFTP server IP address.

Note As an alternative to authenticating remote IP phones through the TLS handshake, you can configure authentication via LSC provisioning. With LSC provisioning you create a password for each remote IP phone user and each user enters the password on the remote IP phones to retrieve the LSC.

Because using LSC provisioning to authenticate remote IP phones requires the IP phones first register in nonsecure mode, Cisco recommends LSC provisioning be done inside the corporate network before giving the IP phones to end-users. Otherwise, having the IP phones register in nonsecure mode requires the Administrator to open the nonsecure signaling port for SIP and SCCP on the ASA.

See "Example 5: LSC Provisioning in Mixed-mode Cisco UCM cluster; Cisco UCM and TFTP Server on Publisher, page 46-49". See also the Cisco Unified Communications Manager Security Guide for information on Using the Certificate Authority Proxy Function (CAPF) to install a locally significant certificate (LSC).

Phone Proxy Guidelines and Limitations

This section includes the following topics:

- General Guidelines and Limitations, page 46-12
- Media Termination Address Guidelines and Limitations, page 46-13

General Guidelines and Limitations

The phone proxy has the following general limitations:

- Only one phone proxy instance can be configured on the ASA by using the **phone-proxy** command. See the *Cisco ASA 5500 Series Command Reference* for information about the **phone-proxy** command. See also Creating the Phone Proxy Instance, page 46-23.
- The phone proxy only supports one Cisco UCM cluster. See Creating the CTL File, page 46-18 for the steps to configure the Cisco UCM cluster for the phone proxy.
- The phone proxy is not supported when the ASA is running in transparent mode or multiple context mode.
- When a remote IP phone calls an invalid internal or external extension, the phone proxy does not support playing the annunciator message from the Cisco UCM. Instead, the remote IP phone plays a fast busy signal instead of the annunciator message "Your call cannot be completed ..." However, when an internal IP phone dials in invalid extension, the annunciator messages plays "Your call cannot be completed ..."
- The phone proxy does not support inspection of packets from phones connecting to the phone proxy over a VPN tunnel. Therefore, sending phone proxy traffic through a VPN tunnel is not supported. Configuring the phone proxy feature on the ASA allows IP phones to connect to the corporate network without requiring that the traffic go through VPN tunnels.
- The phone proxy does not support recording calls when the recording traffic must traverse the security appliance to get to the recording device. For example, the Unified Communication Manager versions 6.x and 7.x supports using a third-party recording device with the forking feature. When the recording feature is used with the phone proxy, the feature creates a second RTP media stream that is a copy of the original RTP media stream. The existence of two RTP media streams from the outside IP phone to the recording device on behind the security device disrupts the IP phone audio.
- The ASA supports stateful failover for the phone proxy in the following way. When the active unit goes down, any calls from IP phones going through the phone proxy fail, media stops flowing, and the IP phones should unregister from the failed unit and reregister with the active unit. Then, the calls must be re-established."

- The phone proxy does not support IP phones sending Real-Time Control Protocol (RTCP) packets through the ASA. Disable RTCP packets in the Cisco Unified CM Administration console from the Phone Configuration page. See your Cisco Unified Communications Manager (CallManager) documentation for information about setting this configuration option.
- When used with CIPC, the phone proxy does not support end-users resetting their device name in CIPC (Prefences > Network tab > Use this Device Name field) or Administrators resetting the devide name in Cisco Unified CM Administration console (Device menu > Phone Configuration > Device Name field). To function with the phone proxy, the CIPC configuration file must be in the format: SEP<mac_address>.cnf.xml. If the device name does not follow this format (SEP<mac_address>), CIPC cannot retrieve its configuration file from Cisco UMC via the phone proxy and CIPC will not function.
- The phone proxy and CIPC are not supported when CIPC is installed on computers in remote locations, such that the calls from those computers traverse the Internet, terminating at the ASA, to reach IP phones residing on the network behind the ASA. The computers where CIPC is installed must be on the network to reach the IP phones behind the adaptive security appliance.
- The phone proxy does not support IP phones sending SCCP video messages using Cisco VT Advantage because SCCP video messages do not support SRTP keys.
- For mixed-mode clusters, the phone proxy does not support the Cisco Unified Call Manager using TFTP to send encrypted configuration files to IP phones through the ASA.
- Multiple IP phones behind one NAT device must be configured to use the same security mode.

  When the phone proxy is configured for a mixed-mode cluster and multiple IP phones are behind one NAT device and registering through the phone proxy, all the SIP and SCCP IP phones must be configured as authenticated or encrypted, or all as non-secure on the Unified Call Manager.

  For example, if there are four IP phones behind one NAT device where two IP phones are configured using SIP and two IP phones are configured using SCCP, the following configurations on the Unified Call Manager are acceptable:

  - Two SIP IP phones: one IP phone in authenticated mode and one in encrypted mode, both in authenticated mode, or both in encrypted mode

    Two SCCP IP phones: one IP phone in authenticated mode and one in encrypted mode, both in authenticated mode, or both in encrypted mode
  - Two SIP IP phones: both in non-secure mode

    Two SCCP IP phones: one IP phone in authenticated mode and one in encrypted mode, both in authenticated mode, both in encrypted mode
  - Two SIP IP phones: one IP phone in authenticated mode and one in encrypted mode, both in authenticated mode, both in encrypted mode

    Two SCCP IP phones: both in non-secure mode

  This limitation results from the way the application-redirect rules (rules that convert TLS to TCP) are created for the IP phones.
- The phone proxy does not support displaying the lock icon on IP phone screens. IP phones display the lock icon on the phone screen during encrypted calls. Even though the lock icon is not displayed on the screen, the IP phone call is still encrypted because the phone proxy encrypts calls by default.

Media Termination Address Guidelines and Limitations

The phone proxy has the following limitations relating to configuring the media-termination address:

- When configuring the media-termination address, the phone proxy does not support having internal IP phones (IP phones on the inside network) being on a different network interface from the Cisco UCM unless the IP phones are forced to use the non-secure Security mode.

  When internal IP phones are on a different network interface than the Cisco UCM, the IP phones signalling sessions still go through ASA; however, the IP phone traffic does not go through the phone proxy. Therefore, Cisco recommends that you deploy internal IP phones on the same network interface as the Cisco UMC.

  If the Cisco UMC and the internal IP phones must be on different network interfaces, you must add routes for the internal IP phones to access the network interface of the media-termination address where Cisco UMC resides.

  When the phone proxy is configured to use a global media-termination address, all IP phones see the same global address, which is a public routable address.
- If you decide to configure a media-termination address on interfaces (rather than using a global interface), you must configure a media-termination address on at least two interfaces (the inside and an outside interface) before applying the phone-proxy service policy. Otherwise, you will receive an error message when enabling the Phone Proxy with SIP and Skinny Inspection.
- The phone proxy can use only one type of media termination instance at a time; for example, you can configure a global media-termination address for all interfaces or configure a media-termination address for different interfaces. However, you cannot use a global media-termination address and media-termination addresses configured for each interface at the same time.

Configuring the Phone Proxy

This section includes the following topics:

- Task Flow for Configuring the Phone Proxy in a Non-secure Cisco UCM Cluster, page 46-14
- Importing Certificates from the Cisco UCM, page 46-15
- Task Flow for Configuring the Phone Proxy in a Mixed-mode Cisco UCM Cluster, page 46-16
- Creating Trustpoints and Generating Certificates, page 46-17
- Creating the CTL File, page 46-18
- Using an Existing CTL File, page 46-20
- Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster, page 46-20
- Creating the TLS Proxy for a Mixed-mode Cisco UCM Cluster, page 46-21
- Creating the Media Termination Instance, page 46-22
- Creating the Phone Proxy Instance, page 46-23
- Enabling the Phone Proxy with SIP and Skinny Inspection, page 46-25
- Configuring Linksys Routers for UDP Port Forwarding, page 46-26

Task Flow for Configuring the Phone Proxy in a Non-secure Cisco UCM Cluster

Follow these tasks to configure the phone proxy in a Non-secure Cisco UCM Cluster:

Step 1 Create trustpoints and generate certificates for each entity in the network (Cisco UCM, Cisco UCM and TFTP, TFTP server, CAPF) that the IP phone must trust. The certificates are used in creating the CTL file. See Creating Trustpoints and Generating Certificates, page 46-17.

Note Before you create the trustpoints and generate certificates, you must have imported the required certificates, which are stored on the Cisco UCM. See Certificates from the Cisco UCM, page 46-6 and Importing Certificates from the Cisco UCM, page 46-15

Step 2 Create the CTL file for the phone proxy. See Creating the CTL File, page 46-18.

Step 3 Create the TLS proxy instance. See Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster, page 46-20.

Step 4 Create the media termination instance for the phone proxy. See Creating the Media Termination Instance, page 46-22.

Step 5 Create the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

Step 6 Enable the phone proxy y with SIP and Skinny inspection. See Enabling the Phone Proxy with SIP and Skinny Inspection, page 46-25.

Importing Certificates from the Cisco UCM

For the TLS proxy used by the phone proxy to complete the TLS handshake successfully, it needs to verify the certificates from the IP phone (and the Cisco UCM if doing TLS with Cisco UCM). To validate the IP phone certificate, we need the CA Manufacturer certificate which is stored on the Cisco UCM. Follow these steps to import the CA Manufacturer certificate to the ASA.

Step 1 Go to the Cisco UCM Operating System Administration web page.

Step 2 Choose **Security** > **Certificate Management**.

Note Earlier versions of Cisco UCM have a different UI and way to locate the certificates. For example, in Cisco UCM version 4.x, certificates are located in the directory `C:\Program Files\Cisco\Certificates`. See your Cisco Unified Communications Manager (CallManager) documentation for information about locating certificates.

Step 3 Click Find and it will display all the certificates.

Step 4 Find the filename `Cisco_Manufacturing_CA`. This is the certificate need to verify the IP phone certificate. Click the .PEM file `Cisco_Manufacturing_CA.pem`. This will show you the certificate information and a dialog box that has the option to download the certificate.

Note If the certificate list contains more than one certificate with the filename `Cisco_Manufacturing_CA`, make you select the certificate `Cisco_Manufacturing_CA.pem`—the one with the .pem file extension.

Step 5 Click Download and save the file as a text file.

Step 6 On the ASA, create a trustpoint for the Cisco Manufacturing CA and enroll via terminal by entering the following commands. Enroll via terminal because you will paste the certificate you downloaded in Step 4.

```
hostname(config)# crypto ca trustpoint trustpoint_name
hostname(config-ca-trustpoint)# enrollment terminal
```

Step 7 Authenticate the trustpoint by entering the following command:

```
hostname(config)# crypto ca authenticate trustpoint
```

Step 8 You are prompted to “Enter the base 64 encoded CA Certificate.” Copy the .PEM file you downloaded in Step 4 and paste it at the command line. The file is already in base-64 encoding so no conversion is required. If the certificate is OK, you are prompted to accept it: “Do you accept this certificate? [yes/no].” Enter **yes**.

Note When you copy the certificate, make sure that you also copy also the lines with BEGIN and END.

Tip If the certificate is not ok, use the **debug crypto ca** command to show debug messages for PKI activity (used with CAs).

Step 9 Repeat the Step 1 through Step 8 for the next certificate. Table 46-3 shows the certificates that are required by the ASA.

Table 46-3 Certificates Required by the Security Appliance for the Phone Proxy

Certificate Name	Required for...
CallManager	Authenticating the Cisco UCM during TLS handshake; only required for mixed-mode clusters.
Cisco_Manufacturing_CA	Authenticating IP phones with a Manufacturer Installed Certificate (MIC).
CAP-RTP-001	Authenticating IP phones with a MIC.
CAP-RTP-002	Authenticating IP phones with a MIC.
CAPF	Authenticating IP phones with an LSC.

Task Flow for Configuring the Phone Proxy in a Mixed-mode Cisco UCM Cluster

Note For mixed-mode clusters, the phone proxy does not support the Cisco Unified Call Manager using TFTP to send encrypted configuration files to IP phones through the ASA.

Follow these tasks to configure the phone proxy in a Non-secure Cisco UCM Cluster:

Step 1 Create trustpoints and generate certificates for each entity in the network (Cisco UCM, Cisco UCM and TFTP, TFTP server, CAPF) that the IP phone must trust. The certificates are used in creating the CTL file. See Creating Trustpoints and Generating Certificates, page 46-17.

Note Before you create the trustpoints and generate certificates, you must have imported the required certificates, which are stored on the Cisco UCM. See Certificates from the Cisco UCM, page 46-6 and Importing Certificates from the Cisco UCM, page 46-15

Step 2 Create the CTL file for the phone proxy. See Creating the CTL File, page 46-18.

Note When the phone proxy is being configured to run in mixed-mode clusters, you have the following option to use an existing CTL file to install the trustpoints. See Using an Existing CTL File, page 46-20.

Step 3 Create the TLS proxy instance. See Creating the TLS Proxy for a Mixed-mode Cisco UCM Cluster, page 46-21.

Step 4 Create the media termination instance for the phone proxy. See Creating the Media Termination Instance, page 46-22.

Step 5 Create the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

Step 6 While configuring the phone proxy instance (in the Phone Proxy Configuration mode), enter the following command to configure the mode of the cluster to be mixed mode because the default is nonsecure:

```
hostname(config-phone-proxy)# cluster-mode mixed
```

Step 7 Enable the phone proxy y with SIP and Skinny inspection. See Enabling the Phone Proxy with SIP and Skinny Inspection, page 46-25.

Creating Trustpoints and Generating Certificates

Create trustpoints and generate certificates for each entity in the network (Cisco UCM, Cisco UCM and TFTP, TFTP server, CAPF) that the IP phone must trust. The certificates are used in creating the CTL file.

You need to create trustpoints for each Cisco UCM (primary and secondary if a secondary Cisco UCM is used) and TFTP server in the network. The trustpoints need to be in the CTL file for the phones to trust the Cisco UCM.

Prerequisites

Import the required certificates, which are stored on the Cisco UCM. See Certificates from the Cisco UCM, page 46-6 and Importing Certificates from the Cisco UCM, page 46-15.

	Command	Purpose

Step 1	`hostname(config)#` **`crypto key generate rsa label`** *`key-pair-label`* **`modulus`** *`size`*
	Example:
	`crypto key generate rsa label cucmtftp_kp modulus 1024`
		Creates a keypair that can be used for the trustpoints.

Step 2	`hostname(config)#` **`crypto ca trustpoint`** *`trustpoint_name`*
	Example:
	`crypto ca trustpoint cucm_tftp_server`
		Creates the trustpoints for each entity in the network (primary Cisco UCM, secondary Cisco UCM, and TFTP server).
		Note You are only required to create a separate trustpoint for the TFTP server when the TFTP server resides on a different server from the Cisco UCM. See Example 3: Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Different Servers, page 46-46 for an example of this configuration.

Step 3	`hostname(config-ca-trustpoint)#` **`enrollment self`**	Generates a self-signed certificate.

Step 4	`hostname(config-ca-trustpoint)#` **`keypair`** *`keyname`*
	Example:
	`keypair cucmtftp_kp`
		Specifies the keypair whose public key is being certified.

Step 5	`hostname(config-ca-trustpoint)#` **`exit`**	Exits from the Configure Trustpoint mode.

Step 6	`hostname(config)#` **`crypto ca enroll`** *`trustpoint`*
	Example:
	`crypto ca enroll cucm_tftp_server`
		Requests the certificate from the CA server and causes the ASA to generate the certificate.
		When prompted to include the device serial number in the subject name, type **Y** to include the serial number or type **N** to exclude it.
		When prompted to generate the self-signed certificate, type **Y**.

What to Do Next

Once you have created the trustpoints and generated the certificates, create the CTL file for the phone proxy. See Creating the CTL File, page 46-18.

If you are configuring the phone proxy in a mixed-mode cluster, you can use an existing CTL file. See Using an Existing CTL File, page 46-20.

Creating the CTL File

Create the CTL file that will be presented to the IP phones during the TFTP requests.

Prerequisites

If you are using domain names for your Cisco UCM and TFTP server, you must configure DNS lookup on the ASA. Add an entry for each of the outside interfaces on the ASA into your DNS server, if such entries are not already present. Each ASA outside IP address should have a DNS entry associated with it for lookups. These DNS entries must also be enabled for Reverse Lookup.

Enable DNS lookups on your ASA with the **dns domain-lookup** *interface_name* command (where the *interface_name* specifies the interface that has a route to your DNS server). Additionally, define your DNS server IP address on the ASA; for example: `dns name-server 10.2.3.4` (IP address of your DNS server).

Note You can enter the **dns domain-lookup** command multiple times to enable DNS lookup on multiple interfaces. If you enter multiple commands, the ASA tries each interface in the order it appears in the configuration until it receives a response.

See the *Cisco ASA 5500 Series Command Reference* for information about the **dns domain-lookup** command.

	Command	Purpose

Step 1	`hostname(config)# ctl-file ctl_name`
	Example:
	`ctl-file myctl`
		Creates the CTL file instance.

Step 2	`hostname(config-ctl-file)# record-entry tftp trustpoint trustpoint_name address TFTP_IP_address`
	Example:
	`record-entry cucm-tftp trustpoint cucm_tftp_server address 10.10.0.26`
		Creates the record entry for the TFTP server.
		Note Use the global or mapped IP address of the TFTP server or Cisco UCM if NAT is configured.

Step 3	`hostname(config-ctl-file)# record-entry cucm trustpoint trustpoint_name address IP_address`
	Example:
	`record-entry cucm trustpoint cucm_server address 10.10.0.26`
		Creates the record entry for the each Cisco UCM (primary and secondary).
		Note Use the global or mapped IP address of the Cisco UCM.

Step 4	`hostname(config-ctl-file)# record-entry capf trustpoint trust_point address`
	Example:
	`record-entry capf trustpoint capf address 10.10.0.26`
		Creates the record entry for CAPF.
		Note You only enter this command when LSC provisioning is required or you have LSC enabled IP phones.

Step 5	`hostname(config-ctl-file)# no shutdown`	Creates the CTL file. When the file is created, it creates an internal trustpoint used by the phone proxy to sign the TFTP files. The trustpoint is named **_internal_PP**_*ctl-instance_filename*.
Step 6	`hostname(config)# copy running-configuration startup-configuration`	Saves the certificate configuration to Flash memory.

What to Do Next

Once you have configured the CTL file for the phone proxy, create the TLS proxy instance. See Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster, page 46-20 to add the TLS proxy when configuring the phone proxy in a non-secure mode or see Creating the TLS Proxy for a Mixed-mode Cisco UCM Cluster, page 46-21 if the phone proxy is running in a mixed-mode cluster.

Using an Existing CTL File

Note Only when the phone proxy is running in mixed-mode clusters, you have the option to use an existing CTL file to install trustpoints.

If you have an existing CTL file that contains the correct IP addresses of the entities (namely, the IP address that the IP phones use for the Cisco UCM or TFTP servers), you can be use it to create a new CTL file thereby using the existing CTL file to install the trustpoints for each entity in the network (Cisco UCM, Cisco UCM and TFTP, TFTP server, CAPF) that the IP phones must trust.

Prerequisites

If a CTL file exists for the cluster, copy the CTL file to Flash memory. When you copy the CTL file to Flash memory, rename the file and do not name the file `CTLFile.tlv`.

If you are using domain names for your Cisco UCM and TFTP server, you must configure DNS lookup on the ASA. See the prerequisites for Creating the CTL File, page 46-18.

	Command	Purpose

Step 1	`hostname(config)#` **`ctl-file`** *`ctl_name`*
	`Example:`
	`ctl-file myctl`
		Creates the CTL file instance.

Step 2	`hostname(config-ctl-file)#` **`cluster-ctl-file`** *`filename_path`*
	`Example:`
	`hostname(config-ctl-file)# cluster-ctl-file disk0:/old_ctlfile.tlv`
		Uses the trustpoints that are already in the existing CTL file stored in Flash memory.
		Where the existing CTL file was saved to Flash memory with a filename other than `CTLFile.tlv`; for example, `old_ctlfile.tlv`.

What to Do Next

When using an existing CTL file to configure the phone proxy, you can add additional entries to the file as necessary. See Creating the CTL File, page 46-18.

Once you have configured the CTL file for the phone proxy, create the TLS proxy instance. See Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster, page 46-20 to add the TLS proxy when configuring the phone proxy in a non-secure mode or see Creating the TLS Proxy for a Mixed-mode Cisco UCM Cluster, page 46-21 if the phone proxy is running in a mixed-mode cluster.

Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster

Create the TLS proxy instance to handle the encrypted signaling.

	Command	Purpose

Step 1	`hostname(config)#` **`tls-proxy`** *`proxy_name`*
	`Example:`
	`tls-proxy mytls`
		Creates the TLS proxy instance.

Step 2	`hostname(config-tlsp)#` **`server trust-point _internal_PP_`***`ctl-instance_filename`*
	`Example:`
	`server trust-point _internal_PP_myctl`
		Configures the server trustpoint and references the internal trustpoint named **_internal_PP_***ctl-instance_filename*.

What to Do Next

Once you have created the TLS proxy instance, create the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

Creating the TLS Proxy for a Mixed-mode Cisco UCM Cluster

For mixed mode clusters, there might be IP phones that are already configured as encrypted so it requires TLS to the Cisco UCM. You must configure the LDC issuer for the TLS proxy.

	Command	Purpose

Step 1	`hostname(config)# crypto key generate rsa label key-pair-label modulus size`
	Examples:
	`hostname(config)# crypto key generate rsa label ldc_signer_key modulus 1024`
	`hostname(config)# crypto key generate rsa label phone_common modulus 1024`
		Creates the necessary RSA key pairs.
		Where the `key-pair-label` is the LDC signer key and the key for the IP phones.

Step 2	`hostname(config)# crypto ca trustpoint trustpoint_name`
	Example:
	`hostname(config)# crypto ca trustpoint ldc_server`
		Creates an internal local CA to sign the LDC for Cisco IP phones.
		Where the *trustpoint_name* is for the LDC.

Step 3	`hostname(config-ca-trustpoint)# enrollment self`	Generates a self-signed certificate.
Step 4	`hostname(config-ca-trustpoint)# proxy-ldc-issuer`	Defines the local CA role for the trustpoint to issue dynamic certificates for the TLS proxy.

Step 5	`hostname(config-ca-trustpoint)# fqdn fqdn`
	Example:
	`hostname(config-ca-trustpoint)# fqdn my_ldc_ca.example.com`
		Includes the indicated FQDN in the Subject Alternative Name extension of the certificate during enrollment.
		Where the *fqdn* is for the LDC.

Step 6	`hostname(config-ca-trustpoint)# subject-name X.500_name`
	Example:
	`hostname(config-ca-trustpoint)# subject-name cn=FW_LDC_SIGNER_172_23_45_200`
		Includes the indicated subject DN in the certificate during enrollment
		Where the *X.500_name* is for the LDC.
		Use commas to separate attribute-value pairs. Insert quotation marks around any value that contains commas or spaces.
		For example:
		`cn=crl,ou=certs,o="cisco systems, inc.",c=US`
		The maximum length is 500 characters.

Step 7	`hostname(config-ca-trustpoint)# keypair keypair`
	Example:
	`hostname(config-ca-trustpoint)# keypair ldc_signer_key`
		Specifies the key pair whose public key is to be certified.
		Where the *keypair* is for the LDC.

Step 8	`hostname(config)# crypto ca enroll ldc_server` **Example:** `hostname(config)# crypto ca enroll ldc_server`	Starts the enrollment process with the CA.

Step 9	`hostname(config)# tls-proxy proxy_name`
	Example:
	`tls-proxy mytls`
		Creates the TLS proxy instance.

	Command	Purpose

Step 10	`hostname(config-tlsp)# server trust-point _internal_PP_ctl-instance_filename`
	Example:
	`hostname(config-tlsp)# server trust-point _internal_PP_myctl`
		Configures the server trustpoint and references the internal trustpoint named **_internal_PP_***ctl-instance_filename*.

Step 11	`hostname(config-tlsp)# client ldc issuer ca_tp_name`
	Example:
	`client ldc issuer ldc_server`
		Specifies the local CA trustpoint to issue client dynamic certificates.

Step 12	`hostname(config-tlsp)# client ldc keypair key_label`
	Example:
	`hostname(config-tlsp)# client ldc keypair phone_common`
		Specifies the RSA keypair to be used by client dynamic certificates.

Step 13	`hostname(config-tlsp)# client cipher-suite cipher-suite`
	Example:
	`hostname(config-tlsp)# client cipher-suite aes128-sha1 aes256-sha1`
		Specifies the cipher suite.
		Options include des-sha1, 3des-sha1, aes128-sha1, aes256-sha1, or null-sha1.

Step 14		Exports the local CA certificate and installs it as a trusted certificate on the Cisco Unified Communications Manager server by performing one of the following actions.

•	`hostname(config)# crypto ca export trustpoint identity-certificate`
	Example:
	`hostname(config)# crypto ca export ldc_server identity-certificate`
		Exports the certificate if a trustpoint with proxy-ldc-issuer is used as the signer of the dynamic certificates.

•	`hostname(config)# show crypto ca server certificates`	Exports the certificate for the embedded local CA server LOCAL-CA-SERVER. After exporting the certificate, you must save the output to a file and import it on the Cisco Unified Communications Manager. You can use the Display Certificates function in the Cisco Unified Communications Manager software to verify the installed certificate. For information about performing these procedures, see the following URLs: http://www.cisco.com/en/US/docs/voice_ip_comm/cucm/cucos/5_0_4/iptpch6.html#wp1040848 http://www.cisco.com/en/US/docs/voice_ip_comm/cucm/cucos/5_0_4/iptpch6.html#wp1040354

What To Do Next

Once you have created the TLS proxy instance and installed the certificate on the Cisco Unified Communications Manager, create the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

Creating the Media Termination Instance

Create the media termination instance that you will use in the phone proxy.

	Command	Purpose

Step 1	`hostname(config)# media-termination instance_name`
	Example:
	`hostname(config)# media-termination mediaterm1`
		Creates the media termination instance that you attach to the phone proxy.

Step 2	`hostname(config-media-termination)# address ip_address [interface intf_name]`
	Examples:
	`hostname(config-media-termination)# address 192.0.2.25 interface inside`
	`hostname(config-media-termination)# address 10.10.0.25 interface outside`
		Configures the media-termination address used by the media termination instance. The phone proxy uses this address for SRTP and RTP.
		For the media termination instance, you can configure a global media-termination address for all interfaces or configure a media-termination address for different interfaces. However, you cannot use a global media-termination address and media-termination addresses configured for each interface at the same time.
		If you configure a media termination address for multiple interfaces, you must configure an address on each interface that the ASA uses when communicating with IP phones.
		The IP addresses are publicly routable addresses that are unused IP addresses within the address range on that interface.
		See Media Termination Instance Prerequisites, page 46-5 for the complete list of prerequisites that you must follow when creating the media termination instance and configuring the media termination addresses.

Step 3	(Optional)
	`hostname(config-media-termination)# rtp-min-port port1 rtp-max-port port2`
	Example:
	`hostname(config-media-termination)# rtp-min-port 2001 rtp-maxport 32770`
		Specifies the minimum and maximum values for the RTP port range for the media termination instance.
		Where *port1* can be a value from 1024 to 16384 and *port2* can be a value from 32767 to 65535.

What To Do Next

Once you have created the media termination instance, create the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

Creating the Phone Proxy Instance

Create the phone proxy instance.

Prerequisites

You must have already created the CTL file and TLS proxy instance for the phone proxy. See Creating the CTL File, page 46-18 and Creating the TLS Proxy Instance for a Non-secure Cisco UCM Cluster, page 46-20.

	Command	Purpose

Step 1	`hostname(config)#` **`phone-proxy`** *`phone_proxy_name`*
	`Example:`
	`hostname(config)# phone-proxy myphoneproxy`
		Creates the phone proxy instance.
		Only one phone proxy instance can be configured on the security appliance.

Step 2	`hostname(config-phone-proxy)#` **`media-termination`** *`instance_name`*
	`Examples:`
	`hostname(config-phone-proxy)# media-termination my_mt`
		Specifies the media termination instance used by the phone proxy for SRTP and RTP.
		Note You must create the media termination instance before you specify it in the phone proxy instance.
		See Creating the Media Termination Instance, page 46-22 for the steps to create the media termination instance.

Step 3	`hostname(config-phone-proxy)#` **`tftp-server address`** *`ip_address`* **`interface`** *`interface`*
	`Example:`
	`hostname(config-phone-proxy)# tftp-server address 192.0.2.101 interface inside`
		Creates the TFTP server using the actual internal address and specify the interface on which the TFTP server resides.

Step 4	`hostame(config-phone-proxy)#` **`tls-proxy`** *`proxy_name`*
	`Example:`
	`hostame(config-phone-proxy)# tls-proxy mytls`
		Configures the TLS proxy instance that you have already created.

Step 5	`hostname(config-phone-proxy)#` **`ctl-file`** *`ctl_name`*
	`Example:`
	`hostame(config-phone-proxy)# ctl-file myctl`
		Configures the CTL file instance that you have already created,

Step 6	`hostname(config-phone-proxy)#` **`proxy-server address`** *`ip_address`* `[`*`listen_port`*`]` **`interface`** *`ifc`*
	`Example:`
	`hostname(config-phone-proxy)# proxy-server 192.168.1.2 interface inside`
		(Optional) If the operational environment has an external HTTP proxy to which the IP phones direct all HTTP request, configures a proxy server.
		You can configure only one proxy server while the phone proxy is in use.
		By default, the Phone URL Parameters configured under the Enterprise Parameters use an FQDN in the URLs. The parameters might need to be changed to use an IP address if the DNS lookup for the HTTP proxy does not resolve the FQDNs.
		Note If the IP phones have already downloaded their configuration files after you have configured the proxy server, you must restart the IP phones so that they get the configuration file with the proxy server address in the file.

	Command	Purpose
Step 7	hostname(config-phone-proxy)# **cipc security-mode authenticated**	(Optional) Forces Cisco IP Communicator (CIPC) softphones to operate in authenticated mode when CIPC softphones are deployed in a voice and data VLAN scenario. See Cisco IP Communicator Prerequisites, page 46-9 for all requirements for using the phone proxy with CIPC.
Step 8	hostname(config-phone-proxy)# **no disable service-settings**	(Optional) Preserve the settings configured on the Cisco UCM for each IP phone configured. By default, the following settings are disabled on the IP phones: • PC Port • Gratuitous ARP • Voice VLAN access • Web Access • Span to PC Port

What to Do Next

Once you have created the phone proxy instance, configuring SIP and Skinny for the phone proxy. See Enabling the Phone Proxy with SIP and Skinny Inspection, page 46-25.

Enabling the Phone Proxy with SIP and Skinny Inspection

Enables the phone proxy instance that you created to inspect SIP and Skinny protocol traffic.

Prerequisites

You must have already created the phone proxy instance. See Creating the Phone Proxy Instance, page 46-23.

	Command	Purpose
Step 1	hostname(config)# **class-map** *class_map_name* **Example:** class-map sec_sccp	Configures the secure Skinny class of traffic to inspect. Traffic between the Cisco Unified Communications Manager and Cisco IP Phones uses SCCP and is handled by SCCP inspection. Where *class_map_name* is the name of the Skinny class map.
Step 2	hostname(config-cmap)# **match port tcp eq 2443**	Matches the TCP port 2443 to which you want to apply actions for secure Skinny inspection.
Step 3	hostname(config-cmap)# **exit**	Exits from the Class Map configuration mode.
Step 4	hostname(config)# **class-map** *class_map_name* **Example:** class-map sec_sip	Configures the secure SIP class of traffic to inspect. Where *class_map_name* is the name of the SIP class map.

	Command	Purpose
Step 5	hostname(config-cmap)# **match port tcp eq 5061**	Matches the TCP port 5061 to which you want to apply actions for secure SIP inspection
Step 6	hostname(config-cmap)# **exit**	Exits from the Class Map configuration mode.
Step 7	hostname(config)# **policy-map** *name* **Example:** policy-map pp_policy	Configure the policy map and attach the action to the class of traffic.
Step 8	hostname(config-pmap)# **class** *classmap-name* **Example:** class sec_sccp	Assigns a class map to the policy map so that you can assign actions to the class map traffic. Where *classmap_name* is the name of the Skinny class map.
Step 9	hostname(config-pmap-c)# **inspect skinny phone-proxy** *pp_name* **Example:** inspect skinny phone-proxy mypp	Enables SCCP (Skinny) application inspection and enables the phone proxy for the specified inspection session.
Step 10	hostnae(config-pmap)# **class** *classmap-name* **Example:** class sec_sip	Assigns a class map to the policy map so that you can assign actions to the class map traffic. Where *classmap_name* is the name of the SIP class map.
Step 11	hostname(config-pmap-c)# **inspect sip phone-proxy** *pp_name* **Example:** inspect sip phone-proxy mypp	Enables SIP application inspection and enables the phone proxy for the specified inspection session.
Step 12	hostname(config-pmap-c)# **exit**	Exits from Policy Map configuration mode.
Step 13	hostname(config)# **service-policy** *policymap_name* **interface** *intf* **Example:** service-policy pp_policy interface outside	Enables the service policy on the outside interface.

Configuring Linksys Routers for UDP Port Forwarding

When IP phones are behind a NAT-capable router, the router can be configured to forward the UDP ports to the IP address of the IP phone. Specifically, configure the router for UDP port forwarding when an IP phone is failing during TFTP requests and the failure is due to the router dropping incoming TFTP data packets. Configure the router to enable UDP port forwarding on port 69 to the IP phone.

As an alternative of explicit UDP forwarding, some Cable/DSL routers require you to designate the IP phone as a DMZ host. For Cable/DSL routers, this host is a special host that receives all incoming connections from the public network.

When configuring the phone proxy, there is no functional difference between an IP phone that has UDP ports explicitly forwarded or an IP phone designated as a DMZ host. The choice is entirely dependent upon the capabilities and preference of the end user.

Configuring Your Router

Your firewall/router needs to be configured to forward a range of UDP ports to the IP phone. This will allow the IP phone to receive audio when you make/receive calls.

Note Different Cable/DSL routers have different procedures for this configuration. Furthermore most NAT-capable routers will only allow a given port range to be forwarded to a single IP address

The configuration of each brand/model of firewall/router is different, but the task is the same. For specific instructions for your brand and model of router, please contact the manufacturer's website.

Linksys Routers

Step 1 From your web browser, connect to the router administrative web page. For Linksys, this is typically something like `http://192.168.1.1`.

Step 2 Click Applications & Gaming or the Port Forwarding tab (whichever is present on your router).

Step 3 Locate the table containing the port forwarding data and add an entry containing the following values:

Table 46-4 Port Forwarding Values to Add to Router

Application	Start	End	Protocol	IP Address	Enabled
IP phone	1024	65535	UDP	*Phone IP address*	**Checked**
TFTP	69	69	UDP	*Phone IP address*	**Checked**

Step 4 Click Save Settings. Port forwarding is configured.

Troubleshooting the Phone Proxy

This section includes the following topics:

- Debugging Information from the Security Appliance, page 46-27
- Debugging Information from IP Phones, page 46-31
- IP Phone Registration Failure, page 46-32
- Media Termination Address Errors, page 46-40
- Audio Problems with IP Phones, page 46-41
- Saving SAST Keys, page 46-42

Debugging Information from the Security Appliance

This section describes how to use the **debug**, **capture**, and **show** commands to obtain debugging information for the phone proxy. See the *Cisco ASA 5500 Series Command Reference* for detailed information about the syntax for these commands.

Table 46-5 lists the **debug** commands to use with the phone proxy.

Table 46-5 Security Appliance Debug Commands to Use with the Phone Proxy

To	Use the Command	Notes
To show error and event messages for TLS proxy inspection.	**debug inspect tls-proxy** [**events** | **errors**]	Use this command when your IP phone has successfully downloaded all TFTP files but is failing to complete the TLS handshake with the TLS proxy configured for the phone proxy.
To show error and event messages of media sessions for SIP and Skinny inspections related to the phone proxy.	**debug phone-proxy media** [**events** | **errors**]	Use this command in conjunction with the **debug sip** command and the **debug skinny** command if your IP phone is experiencing call failures or audio problems.
To show error and event messages of signaling sessions for SIP and Skinny inspections related to the phone proxy.	**debug phone-proxy signaling** [**events** | **errors**]	Use this command in conjunction with the **debug sip** command and the **debug skinny** command if your IP phone is failing to register with the Cisco UCM or if you are experiencing call failure.
To show error and event messages of TFTP inspection, including creation of the CTL file and configuration file parsing.	**debug phone-proxy tftp** [**events** | **errors**]	
To show debug messages for SIP application inspection.	**debug sip**	Use this command when your IP phones are experiencing connection problems; for example, you can connect within the network but cannot make calls off the network. In the output, check for 4XX or 5XX messages.
To show debug messages for SCCP (Skinny) application inspection.	**debug skinny**	Use this command when your IP phones are experiencing connection problems; for example, you can connect within the network but cannot make calls off the network. In the output, check for 4XX or 5XX messages.

Table 46-6 lists the capture commands to use with the phone proxy. Use the **capture** command on the appropriate interfaces (IP phones and Cisco UCM) to enable packet capture capabilities for packet sniffing and network fault isolation.

Table 46-6 Security Appliance Capture Commands to Use with the Phone Proxy

To	Use the Command	Notes
To capture packets on the ASA interfaces.	**capture** *capture_name* **interface** *interface_name*	Use this command if you are experiencing any problems that might require looking into the packets. For example, if there is a TFTP failure and the output from the **debug** command does not indicate the problem clearly, run the **capture** command on the interface on which the IP phone resides and the interface on which the TFTP server resides to see the transaction and where the problem could be.
To capture data from the TLS proxy when there is a non-secure IP phone connecting to the phone proxy on the inside interface.	**capture** *capture_name* **packet-length** *bytes* **interface inside buffer** *buf_size*	
To capture encrypted data from the TLS proxy when there are secure IP phones connecting to the phone proxy on the inside interface.	**capture** *capture_name* **type tls-proxy buffer** *buf_size* **packet-length** *bytes* **interface inside**	
To capture encrypted inbound and outbound data from the TLS proxy on one or more interfaces.	**capture** *capture_name* **type tls-proxy buffer** *buf_size* **packet-length** *bytes* **interface** *interface_name*e	If signaling fails, you might require capturing decrypted packets to see the contents of the SIP and SCCP signaling message. Use the **type tls-proxy** option in the **capture** command.

Table 46-7 lists the **show** commands to use with the phone proxy.

Table 46-7 Security Appliance Show Commands to Use with the Phone Proxy

<table>
<thead>
<tr><th>To</th><th>Use the Command</th><th>Notes</th></tr>
</thead>
<tbody>
<tr><td>To show the packets or connections dropped by the accelerated security path.</td><td><b>show asp drop</b></td><td>Use this command to troubleshoot audio quality issues with the IP phones or other traffic issues with the phone proxy. In addition to running this command, get call status from the phone to check for any dropped packets or jitter. See Debugging Information from IP Phones, page 46-31.</td></tr>
<tr><td>To show the classifier contents of the accelerated security path for the specific classifier domain.</td><td><b>show asp table classify domain</b> <i>domain_name</i></td><td>If the IP phones are not downloading TFTP files, use this command to check that the classification rule for the domain <code>inspect-phone-proxy</code> is set for hosts to the configured TFTP server under the phone proxy instance.
If the IP phones are failing to register, use this command to make sure there is a classification rule for the domain <code>app-redirect</code> set for the IP phones that cannot register.</td></tr>
<tr><td>To show the connections that are to the ASA or from the ASA, in addition to through-traffic connections.</td><td><b>show conn all</b></td><td>If you are experiencing problems with audio, use this command to make sure that there are connections opened from the IP phone to the media termination address.
<b>Note</b> Use the <b>show conn</b> command with following options to display TFTP connections that have replicated (unused) connections:<pre>hostname# show conn |
include p</pre>The output for the TFTP connections should have a “p” flag at the end:<pre>UDP out 64.169.58.181:9014 in
192.168.200.101:39420 idle 0:01:51
bytes 522 flags p</pre>Using this command shows that the phone proxy has connections that are going through “inspect-phone-proxy”, which inspects TFTP connections. Using this command verifies that the TFTP requests are being inspected because the p flag is there.</td></tr>
</tbody>
</table>

Table 46-7 Security Appliance Show Commands to Use with the Phone Proxy

To	Use the Command	Notes
To show the logs in the buffer and logging settings.	**show logging**	Before entering the **show logging** command, enable the **logging buffered** command so that the **show logging command** displays the current message buffer and the current settings. Use this command to determine if the phone proxy and IP phones are successfully completing the TLS handshake. **Note** Using the **show logging** command is useful for troubleshooting many problems where packets might be denied or there are translation failures.
To show the corresponding media sessions stored by the phone proxy.	**show phone-proxy media-sessions**	Use this command to display output from successful calls. Additionally, use this command to troubleshoot problems with IP phone audio, such as one-way audio.
To show the IP phones capable of Secure mode stored in the database.	**show phone-proxy secure-phones**	For any problems, make sure there is an entry for the IP phone in this output and that the port for this IP phone is non-zero, which indicates that it has successfully registered with the Cisco UCM.
To show the corresponding signaling sessions stored by the phone proxy.	**show phone-proxy signaling-sessions**	Use this command to troubleshoot media or signaling failure.
To show the configured service policies.	**show service-policy**	Use this command to show statistics for the service policy.
To show active TLS proxy sessions related to the phone proxy.	**show tls-proxy sessions**	If the IP phone has failed to register, use this command to see if the IP phone has successfully completed the handshake with the TLS proxy configured for the phone proxy.

Debugging Information from IP Phones

On the IP phone, perform the following actions:

- Check the Status messages on the IP phone by selecting the **Settings** button > Status > Status Messages and selecting the status item that you want to view.
- Collect the call-statistics data from the IP phone by selecting the **Settings** button > Status > Call Statistic. Data like the following displays:

```
RxType: G.729               TxType: G.729
RxSize:   20 ms             TxSize:  20 ms
RxCnt: 0                    TxCnt: 014174
AvgJtr:   10                MaxJtr:  59
RxDisc: 0000                RxLost: 014001
```

- Check the Security settings on the IP phone by selecting the **Settings** button > Security Configuration. Settings for web access, Security mode, MIC, LSC, CTL file, trust list, and CAPF appear. Under Security mode, make sure the IP phone is set to Encrypted.
- Check the IP phone to determine which certificates are installed on the phone by selecting the **Settings** button > Security Configuration > Trust List. In the trustlist, verify the following:
    - Make sure that there is an entry for each entity that the IP phone will need to contact. If there is a primary and backup Cisco UCM, the trustlist should contain entries for each Cisco UCM.
    - If the IP phone needs an LSC, the record entry should contain a CAPF entry.
    - Make sure that the IP addresses listed for each entry are the mapped IP addresses of the entities that the IP phone can reach.
- Open a web browser and access the IP phone console logs at the URL `http://`*`IP_phone_IP address`*. The device information appears in the page. In the Device Logs section in the left pane, click Console Logs.

IP Phone Registration Failure

The following errors can make IP phones unable to register with the phone proxy:

- TFTP Auth Error Displays on IP Phone Console, page 46-32
- Configuration File Parsing Error, page 46-33
- Configuration File Parsing Error: Unable to Get DNS Response, page 46-33
- Non-configuration File Parsing Error, page 46-34
- Cisco UCM Does Not Respond to TFTP Request for Configuration File, page 46-34
- IP Phone Does Not Respond After the Security Appliance Sends TFTP Data, page 46-35
- IP Phone Requesting Unsigned File Error, page 46-36
- IP Phone Unable to Download CTL File, page 46-36
- IP Phone Registration Failure from Signaling Connections, page 46-37
- SSL Handshake Failure, page 46-39
- Certificate Validation Errors, page 46-40

TFTP Auth Error Displays on IP Phone Console

Problem The IP phone displays the following Status message:

```
TFTP Auth Error
```

Solution This Status message can indicate a problem with the IP phone CTL file.

To correct problems with the IP phone CTL file, perform the following:

Step 1 From the IP phone, select the **Setting** button > Security Configuration > Trust List. Verify that each entity in the network—Primary Cisco UCM, Secondary Cisco UCM, TFTP server—has its own entry in the trustlist and that each entity IP address is reachable by the IP phone.

Step 2 From the ASA, verify that the CTL file for the phone proxy contains one record entry for each entity in the network—Primary Cisco UCM, Secondary Cisco UCM, TFTP server—by entering the following command:

```
hostname# show running-config all ctl-file [ctl_name]
```

Each of these record entries creates one entry on the IP phone trustlist. The phone proxy creates one entry internally with the function CUCM+TFTP.

Step 3 In the CTL file, verify that each IP address is the global or mapped IP address of the entity. If the IP phones are on multiple interfaces, additional addressing requirements apply. See Prerequisites for IP Phones on Multiple Interfaces, page 46-8.

Configuration File Parsing Error

Problem When the ASA receives the configuration file from the Cisco UCM and tries to parse it, the following error appears in the debug output (**debug phone-proxy tftp errors**):

```
PP: 192.168.10.5/49357 requesting SEP00010002003.cnf.xml.sgn
PP: opened 0x193166
.......
PP: Beginning of element tag is missing, got !
PP: error parsing config file
PP: Error modifying config file, dropping packet
```

Solution Perform the following actions to troubleshoot this problem:

Step 1 Enter the following URL in a web browser to obtain the IP phone configuration file from the Cisco Unified CM Administration console:

```
http://<cucm_ip>:6970/<config_file_name>
```

For example, if the Cisco UCM IP address is 128.106.254.2 and the IP phone configuration file name is SEP000100020003.cnf.xml, enter:

```
http://128.106.254.2:6970/SEP000100020003.cnf.xml
```

Step 2 Save this file, open a case with TAC and send them this file and the output from running the **debug phone-proxy tftp** command on the ASA.

Configuration File Parsing Error: Unable to Get DNS Response

Problem When the ASA receives the configuration file from the Cisco UCM and tries to parse it, the following error appears in the debug output (**debug phone-proxy tftp errors**):

```
PP: 192.168.10.5/49357 requesting SEP00010002003.cnf.xml.sgn
PP: opened 0x193166
.......
PP: Callback required for parsing config file
PP: Unable to get dns response for id 7
PP: Callback, error modifying config file
```

The error indicates that the Cisco UCM is configured as an FQDN and the phone proxy is trying to do a DNS lookup but failed to get a response.

Solution

Step 1 Verify that DNS lookup is configured on the ASA.

Step 2 If DNS lookup is configured, determine whether you can ping the FQDN for the Cisco UCM from the ASA.

Step 3 If ASA cannot ping the Cisco UCM FQDN, check to see if there is a problem with the DNS server.

Step 4 Additionally, use the **name** command to associate a name with an IP address with the FQDN. See the *Cisco ASA 5500 Series Command Reference* for information about using the **name** command.

Non-configuration File Parsing Error

Problem The ASA receives a file other than an IP phone configuration file from the Cisco UCM and attempts to parse it. The following error appears in the debug output (**debug phone-proxy tftp**):

```
PP: 192.168.10.5/49357 requesting SK72f64050-7ad5-4b47-9bfa-5e9ad9cd4aa9.xml.sgn
PP: opened 0x193166
.......
PP: Beginning of element tag is missing, got !
PP: error parsing config file
PP: Error modifying config file, dropping packet
```

Solution The phone proxy should parse only the IP phone configuration file. When the phone proxy TFTP state gets out of state, the phone proxy cannot detect when it is attempting to parse a file other than the IP phone configuration file and the error above appears in the ASA output from the **debug phone-proxy tftp** command.

Perform the following actions to troubleshoot this problem:

Step 1 Reboot the IP phone.

Step 2 On the ASA, enter the following command to obtain the error information from the first TFTP request to the point where the first error occurred.

```
hostname# debug phone-proxy tftp
```

Step 3 Capture the packets from the IP phone to the ASA. Make sure to capture the packets on the interface facing the IP phone and the interface facing the Cisco UCM. See Debugging Information from the Security Appliance, page 46-27.

Step 4 Save this troubleshooting data, open a case with TAC and give them this information.

Cisco UCM Does Not Respond to TFTP Request for Configuration File

Problem When the ASA forwards the TFTP request to the Cisco UCM for the IP phone configuration file, the Cisco UCM does not respond and the following errors appear in the debug output (**debug phone-proxy tftp**):

```
PP: 192.168.10.5/49355 requesting SEP001562106AF3.cnf.xml.sgn
PP: opened 0x17ccde
PP: 192.168.10.5/49355 requesting SEP001562106AF3.cnf.xml.sgn
```

```
PP: Client outside:192.168.10.5/49355 retransmitting request for Config file
SEP001562106AF3.cnf.xml.sgn
PP: opened 0x17ccde
PP: 192.168.10.5/49355 requesting SEP001562106AF3.cnf.xml.sgn
PP: Client outside:192.168.10.5/49355 retransmitting request for Config file
SEP001562106AF3.cnf.xml.sgn
PP: opened 0x17ccde
PP: 192.168.10.5/49355 requesting SEP001562106AF3.cnf.xml.sgn
PP: Client outside:192.168.10.5/49355 retransmitting request for Config file
SEP001562106AF3.cnf.xml.sgn
PP: opened 0x17ccde
```

Solution Perform the following actions to troubleshoot this problem:

Step 1 Determine why the Cisco UCM is not responding to the TFTP request by performing the following troubleshooting actions:

- Use the Cisco UCM to ping the ASA inside interface when PAT is configured for the outside interface so that the IP phone IP address is uses NAT for the ASA inside interface IP address.
- Use the Cisco UCM to ping the IP phone IP address when NAT and PAT are not configured.

Step 2 Verify that the ASA is forwarding the TFTP request. Capture the packets on the interface between the ASA and Cisco UCM. See Debugging Information from the Security Appliance, page 46-27.

IP Phone Does Not Respond After the Security Appliance Sends TFTP Data

Problem When the ASA receives a TFTP request from the IP phone for the CTL file and forwards the data to the IP phone, the phone might not see the data and the TFTP transaction fails.

The following errors appear in the debug output (**debug phone-proxy tftp**):

```
PP: Client outside:68.207.118.9/33606 retransmitting request for CTL file
CTLSEP001DA2B78E91.tlv
PP: opened 0x214b27a
PP: Data Block 1 forwarded from 168.215.146.220/20168 to 68.207.118.9/33606 ingress ifc
outside
PP: 68.207.118.9/33606 requesting CTLSEP001DA2B78E91.tlv
PP: Client outside:68.207.118.9/33606 retransmitting request for CTL file
CTLSEP001DA2B78E91.tlv
PP: 68.207.118.9/33606 requesting CTLSEP001DA2B78E91.tlv
PP: Client outside:68.207.118.9/33606 retransmitting request for CTL file
CTLSEP001DA2B78E91.tlv
```

Solution Perform the following actions to determine why the IP phone is not responding and to troubleshoot the problem:

Step 1 Verify that the ASA is forwarding the TFTP request by entering the following command to capture the packets on the interface between the ASA and the IP phone:

```
hostname# capture out interface outside
```

See the *Cisco ASA 5500 Series Command Reference* for more information about using the **capture** command.

Step 2 If the IP phone is behind a router, the router might be dropping the data. Make sure UDP port forwarding is enabled on the router.

Step 3 If the router is a Linksys router, see Configuring Linksys Routers for UDP Port Forwarding, page 46-26 for information on the configuration requirements.

IP Phone Requesting Unsigned File Error

Problem The IP phone should always request a signed file. Therefore, the TFTP file being requested always has the .SGN extension.

When the IP phone does not request a signed file, the following error appears in the debug output (**debug phone-proxy tftp errors**):

```
Error: phone requesting for unsigned config file
```

Solution Most likely, this error occurs because the IP phone has not successfully installed the CTL file from the ASA.

Determine whether the IP phone has successfully downloaded and installed the CTL file from the ASA by checking the Status messages on the IP phone. See Debugging Information from IP Phones, page 46-31 for information.

IP Phone Unable to Download CTL File

Problem The IP phone Status message indicates it cannot download its CTL file and the IP phone cannot be converted to Secure (encrypted) mode.

Solution If the IP phone did not have an existing CTL file, check the Status messages by selecting the **Settings** button > Status > Status Messages. If the list contains a Status message indicating the IP phone encountered a CTL File Auth error, obtain the IP phone console logs, open a TAC case, and send them the logs.

Solution This error can appear in the IP phone Status messages when the IP phone already has an existing CTL file.

Step 1 Check the IP phone to see if a CTL file already exists on it. This can occur if the IP phone previously registered with a mixed mode cluster Cisco UCM. On the IP phone, select the **Settings** button > Security Configuration > CTL file.

Step 2 Erase the existing CTL file by selecting the **Settings** button > Security Configuration > CTL file > Select. Press **# on the keypad and select Erase.

Solution Problems downloading the CTL file might be caused by issues with media termination. Enter the following command to determine if the media-termination address in the phone proxy configuration is set correctly:

```
hostname(config)# show running-config all phone-proxy
!
phone-proxy mypp
    media-termination address 10.10.0.25
    cipc security-mode authenticated
    cluster-mode mixed
    disable service-settings
    timeout secure-phones 0:05:00
hostname(config)#
```

Make sure that each media-termination instance is created correctly and that the address or addresses are set correctly. The ASA must meet specific criteria for media termination. See Media Termination Instance Prerequisites, page 46-5 for the complete list of prerequisites that you must follow when creating the media termination instance and configuring the media termination addresses.

IP Phone Registration Failure from Signaling Connections

Problem The IP phone is unable to complete the TLS handshake with the phone proxy and download its files using TFTP.

Solution

Step 1 Determine if the TLS handshake is occurring between the phone proxy and the IP phone, perform the following:

a. Enable logging with the following command:

```
hostname(config)# logging buffered debugging
```

b. To check the output from the syslogs captured by the **logging buffered** command, enter the following command:

```
hostname# show logging
```

The syslogs will contain information showing when the IP phone is attempting the TLS handshake, which happens after the IP phone downloads its configuration file.

Step 2 Determine if the TLS proxy is configured correctly for the phone proxy:

a. Display all currently running TLS proxy configurations by entering the following command:

```
hostname# show running-config tls-proxy
    tls-proxy proxy
    server trust-point _internal_PP_<ctl_file_instance_name>
    client ldc issuer ldc_signer
    client ldc key-pair phone_common
    no client cipher-suite
hostname#
```

b. Verify that the output contains the **server trust-point** command under the **tls-proxy** command (as shown in substep a.).

If you are missing the **server trust-point** command, modify the TLS proxy in the phone proxy configuration.

See Step 3 in the "Task Flow for Configuring the Phone Proxy in a Non-secure Cisco UCM Cluster" section on page 46-14, or Step 3 in the "Task Flow for Configuring the Phone Proxy in a Mixed-mode Cisco UCM Cluster" section on page 46-16.

Having this command missing from the TLS proxy configuration for the phone proxy will cause TLS handshake failure.

Step 3 Verify that all required certificates are imported into the ASA so that the TLS handshake will succeed.

a. Determine which certificates are installed on the ASA by entering the following command:

```
hostname# show running-config crypto
```

Additionally, determine which certificates are installed on the IP phones. See Debugging Information from IP Phones, page 46-31 for information about checking the IP phone to determine if it has MIC installed on it.

b. Verify that the list of installed certificates contains all required certificates for the phone proxy.

See Table 46-3, Certificates Required by the Security Appliance for the Phone Proxy, for information.

c. Import any missing certificates onto the ASA. See also Importing Certificates from the Cisco UCM, page 46-15.

Step 4 If the steps above fail to resolve the issue, perform the following actions to obtain additional troubleshooting information for Cisco Support.

a. Enter the following commands to capture additional debugging information for the phone proxy:

```
hostname# debug inspect tls-proxy error
hostname# show running-config ssl
hostname(config) show tls-proxy tls_name session host host_addr detail
```

b. Enable the **capture** command on the inside and outside interfaces (IP phones and Cisco UCM) to enable packet capture capabilities for packet sniffing and network fault isolation. See the *Cisco ASA 5500 Series Command Reference* for information.

Problem The TLS handshake succeeds, but signaling connections are failing.

Solution Perform the following actions:

- Check to see if SIP and Skinny signaling is successful by using the following commands:
  - **debug sip**
  - **debug skinny**
- If the TLS handshake is failing and you receive the following syslog, the SSL encryption method might not be set correctly:

```
%ASA-6-725001: Starting SSL handshake with client dmz:171.169.0.2/53097 for TLSv1
session.
%ASA-7-725010: Device supports the following 1 cipher(s).
%ASA-7-725011: Cipher[1] : RC4-SHA
%ASA-7-725008: SSL client dmz:171.169.0.2/53097 proposes the following 2 cipher(s).
%ASA-7-725011: Cipher[1] : AES256-SHA
%ASA-7-725011: Cipher[2] : AES128-SHA
%ASA-7-725014: SSL lib error. Function: SSL3_GET_CLIENT_HELLO Reason: no shared cipher
%ASA-6-725006: Device failed SSL handshake with dmz client:171.169.0.2/53097
```

Set the correct ciphers by completing the following procedure:

Step 1 To see the ciphers being used by the phone proxy, enter the following command:

```
hostname# show run all ssl
```

Step 2 To add the required ciphers, enter the following command:

```
hostname(config)# ssl encryption
```

The default is to have all algorithms available in the following order:

[3des-sha1] [des-sha1] [rc4-md5] [possibly others]

See the *Cisco ASA 5500 Series Command Reference* for more information about setting ciphers with the **ssl encryption** command.

SSL Handshake Failure

Problem The phone proxy is not functioning. Initial troubleshooting uncovered the following errors in the ASA syslogs:

```
%ASA-7-725014: SSL lib error. Function: SSL3_READ_BYTES Reason: ssl handshake failure
%ASA-7-725014: SSL lib error. Function: SSL3_GET_CLIENT_CERTIFICATE Reason: no certificate
returned
%ASA-6-725006: Device failed SSL handshake with outside client:72.146.123.158/30519
%ASA-3-717009: Certificate validation failed. No suitable trustpoints found to validate
certificate serial number: 62D06172000000143FCC, subject name:
cn=CP-7962G-SEP002155554502,ou=EVVBU,o=Cisco Systems Inc.
%ASA-3-717027: Certificate chain failed validation. No suitable trustpoint was found to
validate chain.
```

Solution

Verify that all required certificates are imported into the ASA so that the TLS handshake will succeed.

Step 1 Determine which certificates are installed on the ASA by entering the following command:

```
hostname# show running-config crypto
```

Additionally, determine which certificates are installed on the IP phones. See Debugging Information from IP Phones, page 46-31 for information about checking the IP phone to determine if it has MIC installed on it.

Step 2 Verify that the list of installed certificates contains all required certificates for the phone proxy.

See Table 46-3, Certificates Required by the Security Appliance for the Phone Proxy, for information.

Step 3 Import any missing certificates onto the ASA. See also Importing Certificates from the Cisco UCM, page 46-15.

Problem The phone proxy is not functioning. Initial troubleshooting uncovered the following errors in the ASA syslogs:

```
%ASA-6-725001: Starting SSL handshake with client dmz:171.169.0.2/53097 for TLSv1
session.
%ASA-7-725010: Device supports the following 1 cipher(s).
%ASA-7-725011: Cipher[1] : RC4-SHA
%ASA-7-725008: SSL client dmz:171.169.0.2/53097 proposes the following 2 cipher(s).
%ASA-7-725011: Cipher[1] : AES256-SHA
%ASA-7-725011: Cipher[2] : AES128-SHA
%ASA-7-725014: SSL lib error. Function: SSL3_GET_CLIENT_HELLO Reason: no shared cipher
%ASA-6-725006: Device failed SSL handshake with dmz client:171.169.0.2/53097
```

Solution the SSL encryption method might not be set correctly. Set the correct ciphers by completing the following procedure:

Step 1 To see the ciphers being used by the phone proxy, enter the following command:

```
hostname# show run all ssl
```

Step 2 To add the required ciphers, enter the following command:

```
hostname(config)# ssl encryption
```

The default is to have all algorithms available in the following order:

[3des-sha1] [des-sha1] [rc4-md5] [possibly others]

See the *Cisco ASA 5500 Series Command Reference* for more information about setting ciphers with the **ssl encryption** command.

Certificate Validation Errors

Problem Errors in the ASA log indicate that certificate validation errors occurred.

Entering the **show logging asdm** command, displayed the following errors:

```
3|Jun 19 2008 17:23:54|717009: Certificate validation failed. No suitable trustpoints
found to validate
certificate serial number: 348FD2760000000E6E27, subject name:
cn=CP-7961G-SEP001819A89CC3,ou=EVVBU,o=Cisco Systems Inc.
```

Solution

In order for the phone proxy to authenticate the MIC provided by the IP phone, it needs the Cisco Manufacturing CA (MIC) certificate imported into the ASA.

Verify that all required certificates are imported into the ASA so that the TLS handshake will succeed.

Step 1 Determine which certificates are installed on the ASA by entering the following command:

```
hostname# show running-config crypto
```

Additionally, determine which certificates are installed on the IP phones. The certificate information is shown under the Security Configuration menu. See Debugging Information from IP Phones, page 46-31 for information about checking the IP phone to determine if it has the MIC installed on it.

Step 2 Verify that the list of installed certificates contains all required certificates for the phone proxy.

See Table 46-3, Certificates Required by the Security Appliance for the Phone Proxy, for information.

Step 3 Import any missing certificates onto the ASA. See also Importing Certificates from the Cisco UCM, page 46-15.

Media Termination Address Errors

Problem Entering the **media-termination address** command displays the following errors:

```
hostname(config-phone-proxy)# media-termination address ip_address
ERROR: Failed to apply IP address to interface Virtual254, as the network overlaps with
interface GigabitEthernet0/0. Two interfaces cannot be in the same subnet.
ERROR: Failed to set IP address for the Virtual interface
ERROR: Could not bring up Phone proxy media termination interface
```

```
ERROR: Failed to find the HWIDB for the Virtual interface
```

Solution Enter the following command to determine if the media-termination address in the phone proxy configuration is set correctly:

```
hostname(config)# show running-config all phone-proxy
asa2(config)# show running-config all phone-proxy
!
phone-proxy mypp
    media-termination address 10.10.0.25
    cipc security-mode authenticated
    cluster-mode mixed
    disable service-settings
    timeout secure-phones 0:05:00
hostname(config)#
```

Make sure that each media-termination instance is created correctly and that the address or addresses are set correctly. The ASA must meet specific criteria for media termination. See Media Termination Instance Prerequisites, page 46-5 for the complete list of prerequisites that you must follow when creating the media termination instance and configuring the media termination addresses.

Audio Problems with IP Phones

The following audio errors can occur when the IP phones connecting through the phone proxy.

Media Failure for a Voice Call

Problem The call signaling completes but there is one way audio or no audio.

Solution

- Problems with one way or no audio might be caused by issues with media termination. Enter the following command to determine if the media-termination address in the phone proxy configuration is set correctly:

  ```
  hostname(config)# show running-config all phone-proxy
  asa2(config)# show running-config all phone-proxy
  !
  phone-proxy mypp
      media-termination address 10.10.0.25
      cipc security-mode authenticated
      cluster-mode mixed
      disable service-settings
      timeout secure-phones 0:05:00
  hostname(config)#
  ```

- Make sure that each media-termination instance is created correctly and that the address or addresses are set correctly. The ASA must meet specific criteria for media termination. See Media Termination Instance Prerequisites, page 46-5 for the complete list of prerequisites that you must follow when creating the media termination instance and configuring the media termination addresses.
- If each media-termination address meets the requirements, determine whether the IP addresses are reachable by all IP phones.
- If each IP address is set correctly and reachable by all IP phones, check the call statistics on an IP phone (see Debugging Information from IP Phones, page 46-31) and determine if there are Rcvr packets and Sender packets on the IP phone, or if there are any Rcvr Lost or Discarded packets.

Saving SAST Keys

Site Administrator Security Token (SAST) keys on the ASA can be saved in the event a recovery is required due to hardware failure and a replacement is required. The following steps shows how to recover the SAST keys and use them on the new hardware.

The SAST keys can be seen via the **show crypto key mypubkey rsa** command. The SAST keys are associated with a trustpoint that is labeled **_internal_***ctl-file_name***_SAST_***X* where *ctl-file-name* is the name of the CTL file instance that was configured, and *X* is an integer from 0 to N-1 where N is the number of SASTs configured for the CTL file (the default is 2).

Step 1 On the ASA, export all the SAST keys in PKCS-12 format by using the **crypto ca export** command:

```
hostname(config)# crypto ca export _internal_ctl-file_name_SAST_X pkcs12 passphrase

hostname(config)# Exported pkcs12 follows:
MIIGZwIBAzCCBiEGCSqGSIb3DQEHAaCCBhIEggYOMIIGCjCCBgYGCSqGSIb3DQEH

[snip]

MIIGZwIBAzCCBiEGCSqGSIb3DQEHAaCCBhIEggYOMIIGCjCCBgYGCSqGSIb3DQEH
---End - This line not part of the pkcs12---

hostname(config)# crypto ca export _internal_ctl-file_name_SAST_X pkcs12 passphrase

hostname(config)# Exported pkcs12 follows:
MIIGZwIBAzCCBiEGCSqGSIb3DQEHAaCCBhIEggYOMIIGCjCCBgYGCSqGSIb3DQEH

[snip]

mGF/hfDDNAICBAA=

---End - This line not part of the pkcs12---
hostname(config)#
```

Note Save this output somewhere secure.

Step 2 Import the SAST keys to a new ASA.

a. To import the SAST key, enter the following command:

```
hostname(config)# crypto ca import trustpoint pkcs12 passphrase
```

Where *trustpoint* is **_internal_***ctl-file_name***_SAST_***X* and *ctl-file-name* is the name of the CTL file instance that was configured, and *X* is an integer from 0 to 4 depending on what you exported from the ASA.

b. Using the PKCS-12 output you saved in Step 1, enter the following command and paste the output when prompted:

```
hostname(config)# crypto ca import _internal_ctl-file_name_SAST_X pkcs12 passphrase

hostname(config)# Enter the base 64 encoded pkcs12.
hostname(config)# End with the word "quit" on a line by itself:
MIIGZwIBAzCCBiEGCSqGSIb3DQEHAaCCBhIEggYOMIIGCjCCBgYGCSqGSIb3DQEH

[snip]

muMiZ6eClQICBAA=
hostname(config)# quit
INFO: Import PKCS12 operation completed successfully
```

```
hostname(config)# crypto ca import _internal_ctl-file_name_SAST_X pkcs12 passphrase

hostname(config)# Enter the base 64 encoded pkcs12.
hostname(config)# End with the word "quit" on a line by itself:
MIIGZwIBAzCCBiEGCSqGSIb3DQEHAaCCBhIEggYOMIIGCjCCBgYGCSqGSIb3DQEH

[snip]

mGF/hfDDNAICBAA=
hostname(config)# quit
INFO: Import PKCS12 operation completed successfully
hostname(config)#
```

Step 3 Create the CTL file instance on the new ASA using the same name as the one used in the SAST trustpoints created in Step 2 by entering the following commands. Create trustpoints for each Cisco UMC (primary and secondary).

```
hostname(config)# ctl-file ctl_name
hostname(config-ctl-file)# record-entry cucm trustpoint trust_point address address
hostname(config-ctl-file)# record-entry capf trustpoint trust_point address address
hostname(config-ctl-file)# no shutdown
```

Configuration Examples for the Phone Proxy

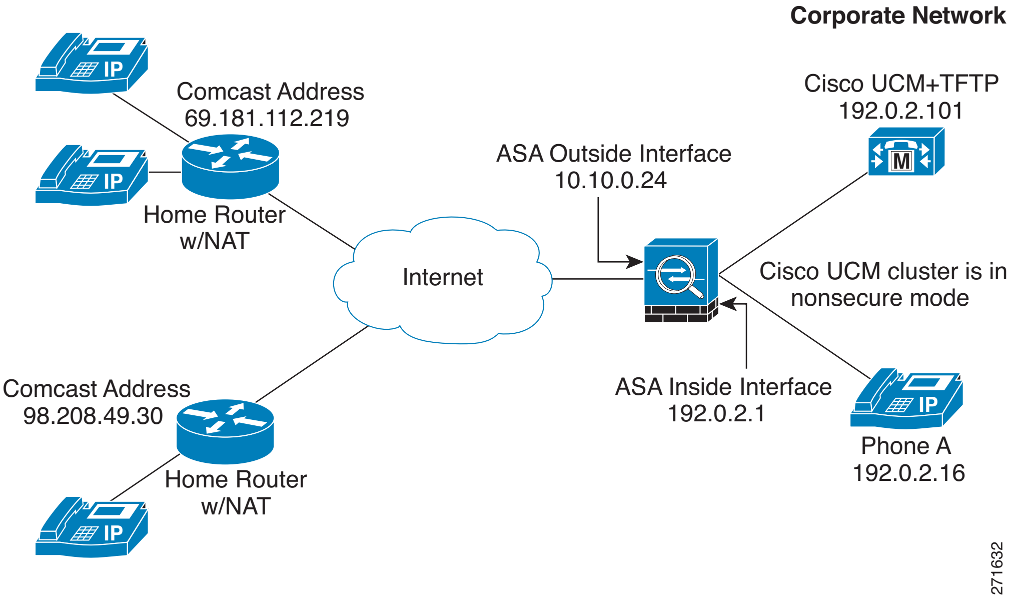
This section includes the following topics:

- Example 1: Nonsecure Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher, page 46-43
- Example 2: Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher, page 46-45
- Example 3: Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Different Servers, page 46-46
- Example 4: Mixed-mode Cisco UCM cluster, Primary Cisco UCM, Secondary and TFTP Server on Different Servers, page 46-47
- Example 5: LSC Provisioning in Mixed-mode Cisco UCM cluster; Cisco UCM and TFTP Server on Publisher, page 46-49
- Example 6: VLAN Transversal, page 46-51

Example 1: Nonsecure Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher

Figure 46-2 shows an example of the configuration for a non-secure Cisco UCM cluster using the following topology.

Figure 46-2 Nonsecure Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher

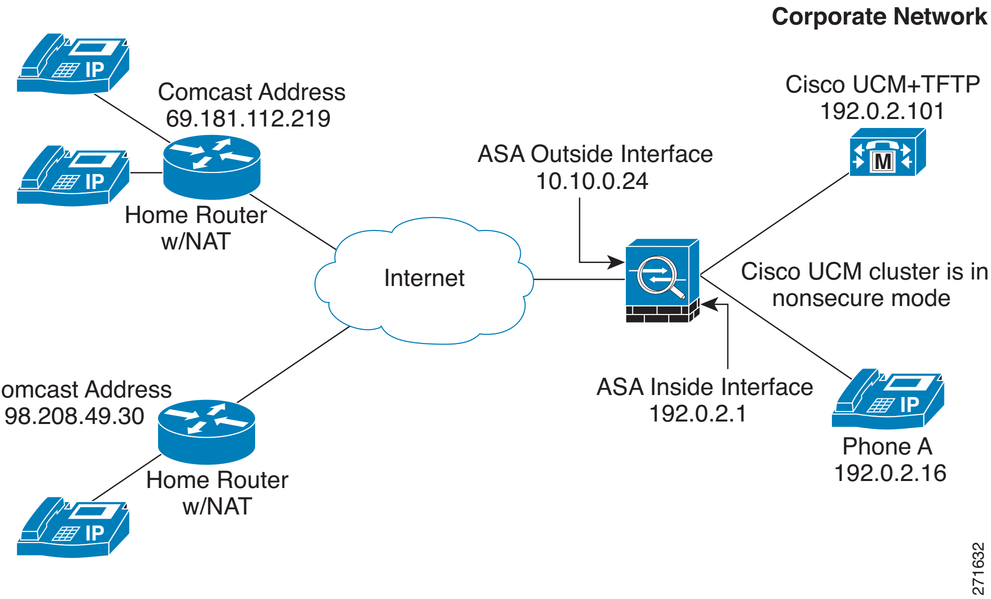


```
static (inside,outside) 10.10.0.26 192.0.2.101
access-list pp extended permit udp any host 10.10.0.26 eq 69
access-group pp in interface outside
crypto key generate rsa label cucmtftp_kp modulus 1024
crypto ca trustpoint cucm_tftp_server
    enrollment self
    keypair cucmtftp_kp
crypto ca enroll cucm_tftp_server
ctl-file myctl
    record-entry cucm-tftp trustpoint cucm_tftp_server address 10.10.0.26
    no shutdown
tls-proxy mytls
    server trust-point _internal_PP_myctl
media-termination my_mediaterm
    address 192.0.2.25 interface inside
    address 10.10.0.25 interface outside
phone-proxy mypp
    media-termination my_mediaterm
    tftp-server address 192.0.2.101 interface inside
    tls-proxy mytls
    ctl-file myctl
class-map sec_sccp
    match port tcp 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface outside
```

Example 2: Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher

Figure 46-3 shows an example of the configuration for a mixed-mode Cisco UCM cluster using the following topology.

Figure 46-3 Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Publisher



```
static (inside,outside) 10.10.0.26 192.0.2.101
access-list pp extended permit udp any host 10.10.0.26 eq 69
access-group pp in interface outside
crypto key generate rsa label cucmtftp_kp modulus 1024
crypto ca trustpoint cucm_tftp_server
    enrollment self
    keypair cucmtftp_kp
crypto ca enroll cucm_tftp_server
ctl-file myctl
    record-entry cucm-tftp trustpoint cucm_tftp_server address 10.10.0.26
    no shutdown
crypto key generate rsa label ldc_signer_key modulus 1024
crypto key generate rsa label phone_common modulus 1024
crypto ca trustpoint ldc_server
    enrollment self
    proxy_ldc_issuer
    fqdn my-ldc-ca.exmaple.com
    subject-name cn=FW_LDC_SIGNER_172_23_45_200
    keypair ldc_signer_key
    crypto ca enroll ldc_server
tls-proxy my_proxy
    server trust-point _internal_PP_myctl
    client ldc issuer ldc_server
    client ldc keypair phone_common
    client cipher-suite aes128-sha1 aes256-sha1
media-termination my_mediaterm
    address 192.0.2.25 interface inside
    address 10.10.0.25 interface outside
phone-proxy mypp
```

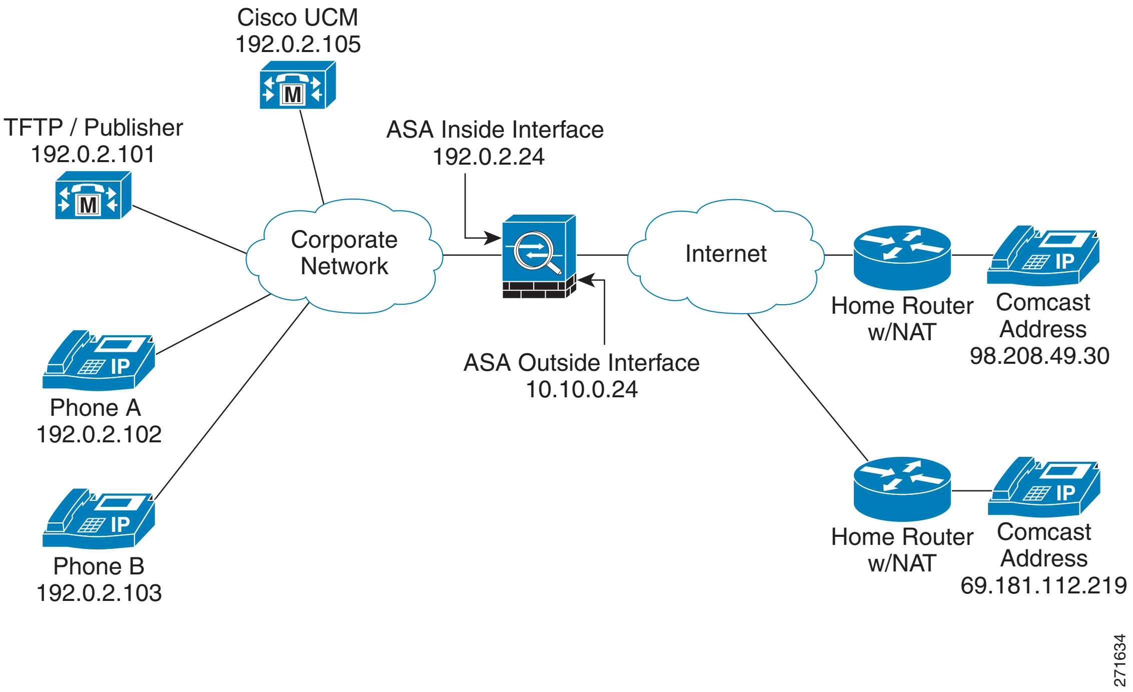
```
    media-termination my_mediaterm
    tftp-server address 192.0.2.101 interface inside
    tls-proxy mytls
    ctl-file myctl
    cluster-mode mixed
class-map sec_sccp
    match port tcp 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface outside
```

Example 3: Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Different Servers

Figure 46-4 shows an example of the configuration for a mixed-mode Cisco UCM cluster using the following topology where the TFTP server resides on a different server from the Cisco UCM.

In this sample, the static interface PAT for the TFTP server is configured to appear like the ASA's outside interface IP address.

Figure 46-4 Mixed-mode Cisco UCM cluster, Cisco UCM and TFTP Server on Different Servers



```
static (inside,outside) 10.10.0.26 192.0.2.105
static (inside,outside) udp interface 69 192.0.2.101 69
access-list pp extended permit udp any host 10.10.0.24 eq 69
access-group pp in interface outside
crypto key generate rsa label cucm_kp modulus 1024
crypto ca trustpoint cucm
```

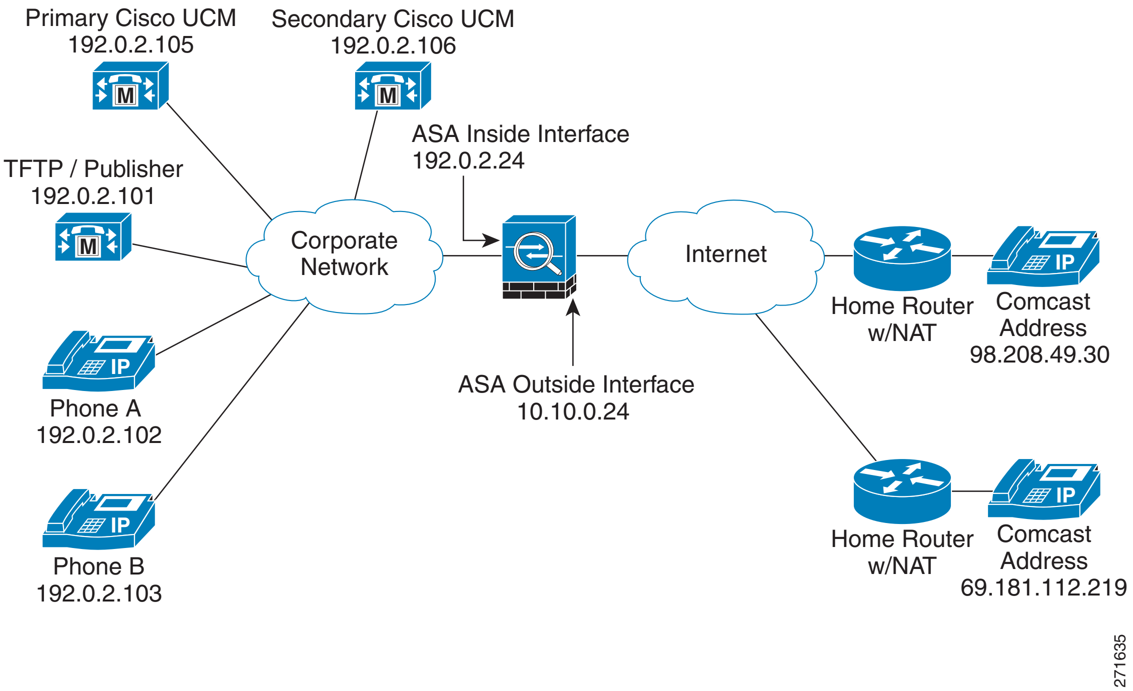
```
    enrollment self
    keypair cucm_kp
crypto ca enroll cucm
crypto key generate rsa label tftp_kp modulus 1024
crypto ca trustpoint tftp_server
    enrollment self
    keypair tftp_kp
crypto ca enroll tftp_server
ctl-file myctl
    record-entry cucm trustpoint cucm_server address 10.10.0.26
    no shutdown
crypto key generate rsa label ldc_signer_key modulus 1024
crypto key generate rsa label phone_common modulus 1024
crypto ca trustpoint ldc_server
    enrollment self
    proxy_ldc_issuer
    fqdn my-ldc-ca.exmaple.com
    subject-name cn=FW_LDC_SIGNER_172_23_45_200
    keypair ldc_signer_key
    crypto ca enroll ldc_server
tls-proxy my_proxy
    server trust-point _internal_PP_myctl
    client ldc issuer ldc_server
    client ldc keypair phone_common
    client cipher-suite aes128-sha1 aes256-sha1
media-termination my_mediaterm
    address 192.0.2.25 interface inside
    address 10.10.0.25 interface outside
phone-proxy mypp
    media-termination my_mediaterm
    tftp-server address 192.0.2.101 interface inside
    tls-proxy mytls
    ctl-file myctl
    cluster-mode mixed
class-map sec_sccp
    match port tcp 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface outside
```

Example 4: Mixed-mode Cisco UCM cluster, Primary Cisco UCM, Secondary and TFTP Server on Different Servers

Figure 46-5 shows an example of the configuration for a mixed-mode Cisco UCM cluster using the following topology where the TFTP server resides on a different server from the primary and secondary Cisco UCMs.

In this sample, the static interface PAT for the TFTP server is configured to appear like the ASA’s outside interface IP address.

Figure 46-5 Mixed-mode Cisco UCM cluster, Primary Cisco UCM, Secondary Cisco UCM, and TFTP Server on Different Servers



```
static (inside,outside) 10.10.0.27 192.0.2.105
static (inside,outside) 10.10.0.26 192.0.2.106
static (inside,outside) udp interface 69 192.0.2.101 69
access-list pp extended permit udp any host 10.10.0.24 eq 69
access-group pp in interface outside
crypto key generate rsa label cluster_kp modulus 1024
crypto ca trustpoint pri_cucm
    enrollment self
    keypair cluster_kp
crypto ca enroll pri_cucm
crypto ca trustpoint sec_cucm
    enrollment self
    serial-number
    keypair cluster_kp
crypto ca enroll sec_cucm
crypto ca trustpoint tftp_server
    enrollment self
    fqdn my_tftp.example.com
    keypair cluster_kp
crypto ca enroll tftp_server
ctl-file myctl
    record-entry tftp trustpoint tftp_server address 10.10.0.24
    record-entry cucm trustpoint pri_cucm_server address 10.10.0.27
    record-entry cucm trustpoint sec_cucm_server address 10.10.0.2
    no shutdown
crypto key generate rsa label ldc_signer_key modulus 1024
crypto key generate rsa label phone_common modulus 1024
crypto ca trustpoint ldc_server
    enrollment self
    proxy_ldc_issuer
    fqdn my-ldc-ca.exmaple.com
    subject-name cn=FW_LDC_SIGNER_172_23_45_200
    keypair ldc_signer_key
    crypto ca enroll ldc_server
tls-proxy my_proxy
    server trust-point _internal_PP_myctl
    client ldc issuer ldc_server
    client ldc keypair phone_common
    client cipher-suite aes128-sha1 aes256-sha1
media-termination my_mediaterm
    address 192.0.2.25 interface inside
    address 10.10.0.25 interface outside
phone-proxy mypp
    media-termination my_mediaterm
    tftp-server address 192.0.2.101 interface inside
    tls-proxy mytls
    ctl-file myctl
    cluster-mode mixed
class-map sec_sccp
    match port tcp 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface outside
```

Example 5: LSC Provisioning in Mixed-mode Cisco UCM cluster; Cisco UCM and TFTP Server on Publisher

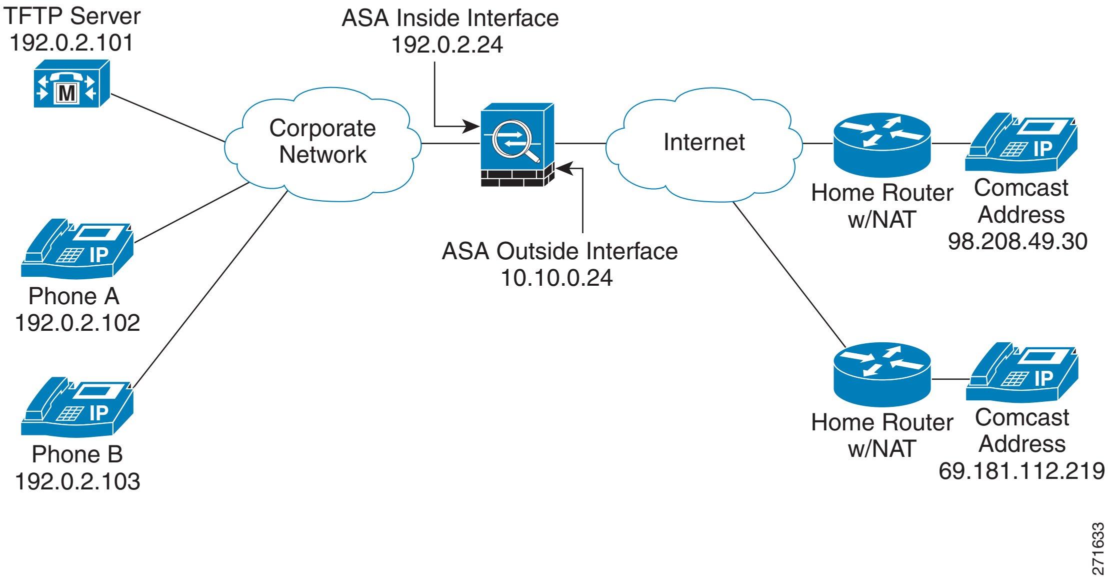
Figure 46-6 shows an example of the configuration for a mixed-mode Cisco UCM cluster where LSC provisioning is required using the following topology.

Note Doing LSC provisioning for remote IP phones is not recommended because it requires that the IP phones first register and they have to register in nonsecure mode. Having the IP phones register in nonsecure mode requires the Administrator to open the nonsecure signaling port for SIP and SCCP on the ASA. If possible, LSC provisioning should be done inside the corporate network before giving the IP phones to the end-users.

In this sample, you create an access list to allow the IP phones to contact the TFTP server and to allow the IP phones to register in nonsecure mode by opening the nonsecure port for SIP and SCCP as well as the CAPF port for LSC provisioning.

Additionally, you create the CAPF trustpoint by copying and pasting the CAPF certificate from the Cisco UCM Certificate Management software.

Figure 46-6 LSC Provisioning in Mixed-mode Cisco UCM cluster; Cisco UCM and TFTP Server on Publisher



```
static (inside,outside) 10.10.0.26 192.0.2.105
static (inside,outside) udp interface 69 192.0.2.101 69
access-list pp extended permit udp any host 10.10.0.24 eq 69
access-list pp extended permit tcp any host 10.10.0.26 eq 2000
access-list pp extended permit tcp any host 10.10.0.26 eq 5060
access-list pp extended permit tcp any host 10.10.0.26 eq 3804
access-group pp in interface outside
crypto key generate rsa label cluster_kp modulus 1024
crypto ca trustpoint cucm
    enrollment self
    keypair cluster_kp
crypto ca enroll cucm
crypto ca trustpoint tftp_server
    enrollment self
    serial-number
    keypair cluster_kp
crypto ca enroll tftp_server
crypto ca trustpoint capf
    enroll terminal
crypto ca authenticate capf
ctl-file myctl
    record-entry cucm trustpoint cucm_server address 10.10.0.26
    record-entry capf trustpoint capf address 10.10.0.26
    no shutdown
crypto key generate rsa label ldc_signer_key modulus 1024
crypto key generate rsa label phone_common modulus 1024
crypto ca trustpoint ldc_server
    enrollment self
    proxy_ldc_issuer
    fqdn my-ldc-ca.exmaple.com
    subject-name cn=FW_LDC_SIGNER_172_23_45_200
    keypair ldc_signer_key
    crypto ca enroll ldc_server
tls-proxy my_proxy
    server trust-point _internal_PP_myctl
    client ldc issuer ldc_server
    client ldc keypair phone_common
    client cipher-suite aes128-sha1 aes256-sha1
```

```
media-termination my_mediaterm
    address 192.0.2.25 interface inside
    address 10.10.0.25 interface outside
phone-proxy mypp
    media-termination my_mediaterm
    tftp-server address 192.0.2.101 interface inside
    tls-proxy mytls
    ctl-file myctl
    cluster-mode mixed
class-map sec_sccp
    match port tcp 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface outside
```

Example 6: VLAN Transversal

Figure 46-7 shows an example of the configuration to force Cisco IP Communicator (CIPC) softphones to operate in authenticated mode when CIPC softphones are deployed in a voice and data VLAN scenario. VLAN transversal is required between CIPC softphones on the data VLAN and hard phones on the voice VLAN.

In this sample, the Cisco UCM cluster mode is nonsecure.

In this sample, you create an access list to allow the IP phones to contact the TFTP server and to allow the IP phones to register in nonsecure mode by opening the nonsecure port for SIP and SCCP as well as the CAPF port for LSC provisioning.

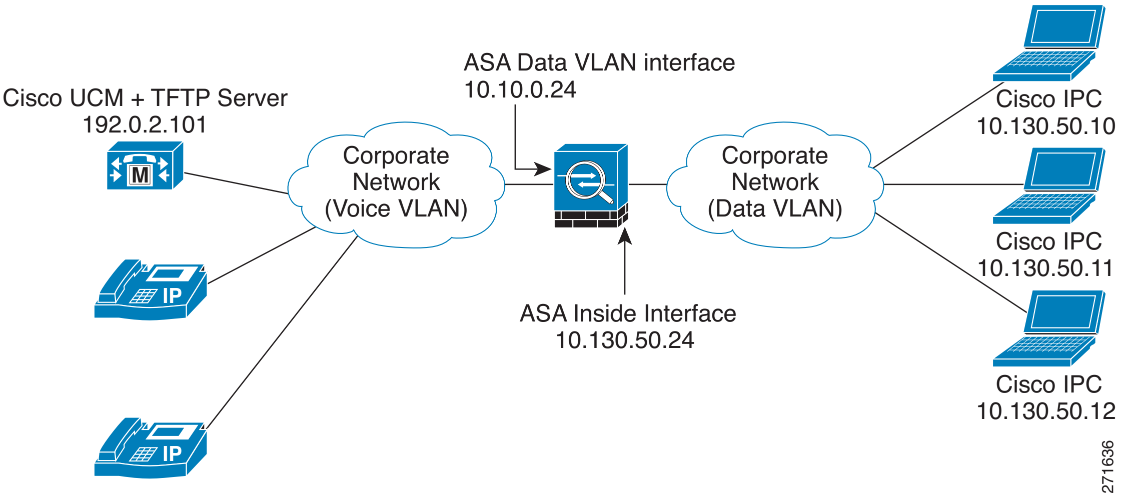
In this sample, you configure NAT for the CIPC by using PAT so that each CIPC is mapped to an IP address space in the Voice VLAN.

Additionally, you create the CAPF trustpoint by copying and pasting the CAPF certificate from the Cisco UCM Certificate Management software.

Note Cisco IP Communicator supports authenticated mode only and does not support encrypted mode; therefore, there is no encrypted voice traffic (SRTP) flowing from the CIPC softphones.

The phone proxy and CIPC are not supported when CIPC is installed on computers in remote locations, such that the calls from those computers traverse the Internet, terminating at theASA, to reach IP phones residing on the network behind theASA. The computers where CIPC is installed must be on the network to reach the IP phones behind the ASA.

Figure 46-7 VLAN Transversal Between CIPC Softphones on the Data VLAN and Hard Phones on the Voice VLAN



```
static (voice,data) 10.130.50.5 192.0.2.101
nat (data) 101 10.130.50.0 255.255.255.0 outside
global (voice) 101 192.0.2.10
access-list pp extended permit udp any host 10.130.50.5 eq 69
access-list pp extended permit tcp any host 10.130.50.5 eq 2000
access-list pp extended permit tcp any host 10.130.50.5 eq 5060
access-list pp extended permit tcp any host 10.130.50.5 eq 3804
access-group pp in interface data
crypto ca generate rsa label cucmtftp_kp modulus 1024
crypto ca trustpoint cucm_tftp_server
    enrollment self
    keypair cucmtftp_kp
crypto ca enroll cucm_tftp_server
crypto ca trustpoint capf
    enrollment terminal
crypto ca authenticate capf
ctl-file myctl
    record-entry cucm-tftp trustpoint cucm_tftp_server address 10.130.50.5
    record-entry capf trustpoint capf address 10.130.50.5
    no shutdown
tls-proxy mytls
    server trust-point _internal_PP_myctl
media-termination my_mediaterm
    address 10.130.50.2
phone-proxy mypp
    media-termination my_mediaterm
    tftp-server address 10.10.0.20 interface inside
    tls-proxy mytls
    ctl-file myctl
    cipc security-mode authenticated
class-map sec_sccp
    match port tcp eq 2443
class-map sec_sip
    match port tcp eq 5061
policy-map pp_policy
    class sec_sccp
        inspect skinny phone-proxy mypp
    class sec_sip
        inspect sip phone-proxy mypp
service-policy pp_policy interface data
```

Feature History for the Phone Proxy

Table 46-8 lists the release history for this feature.

Table 46-8 Feature History for Cisco Phone Proxy

Feature Name	Releases	Feature Information
Cisco Phone Proxy	8.0(4)	The phone proxy feature was introduced, which included the following new commands: **cipc security-mode authenticated**, **clear configure ctl**, **clear configure phone-proxy**, **cluster-ctl-file**, **cluster-mode nonsecure**, **ctl-file (global)**, **ctl-file (phone proxy)**, **debug phone proxy**, **disable service-settings**, **media-termination address**, **phone-proxy**, **proxy-server**, **record-entry**, **sast**, **show phone-proxy**, **show running-config ctl**, s**how running-config phone-proxy**, **timeout secure-phones**, **tftp-server address**.
NAT for the media termination address	8.1(2)	The **media-termination address** command was changed to allow for NAT: [**no**] **media-termination address** *ip_address* **interface** *intf_name* Where the **interface** *inft_name* keyword was added. The **rtp-min-port** and **rtp-max-ports** keywords were removed from the command syntax and included as a separate command: **rtp-min-port** *port1* **rtp-max-port** *port2*

CHAPTER 47

Configuring the TLS Proxy for Encrypted Voice Inspection

This chapter describes how to configure the adaptive security appliance for the TLS Proxy for Encrypted Voice Inspection feature.

This chapter includes the following sections:

- Information about the TLS Proxy for Encrypted Voice Inspection, page 47-1
- Licensing for the TLS Proxy, page 47-5
- Prerequisites for the TLS Proxy for Encrypted Voice Inspection, page 47-6
- Configuring the TLS Proxy for Encrypted Voice Inspection, page 47-6
- Monitoring the TLS Proxy, page 47-14
- Feature History for the TLS Proxy for Encrypted Voice Inspection, page 47-16

Information about the TLS Proxy for Encrypted Voice Inspection

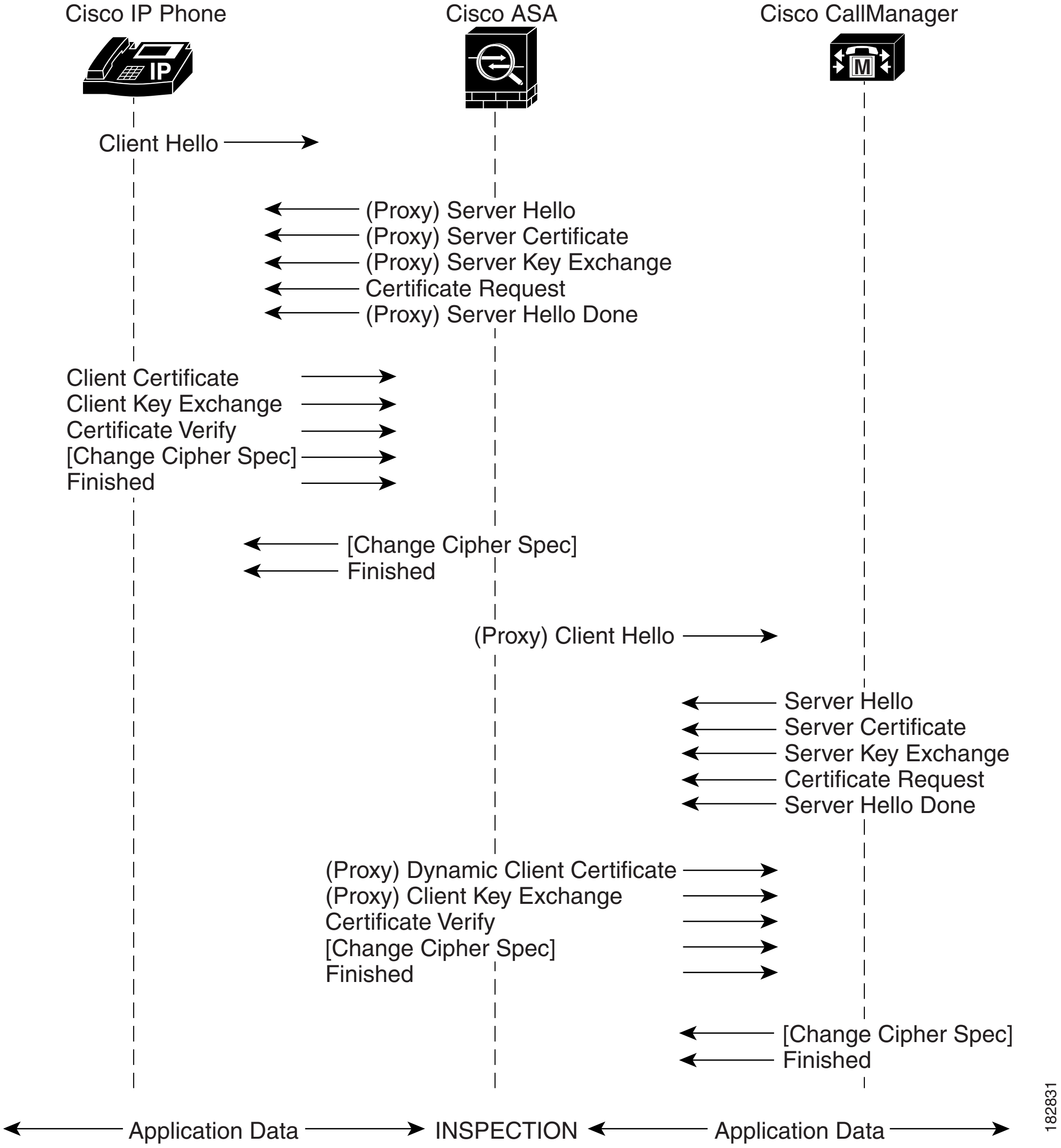
End-to-end encryption often leaves network security appliances “blind” to media and signaling traffic, which can compromise access control and threat prevention security functions. This lack of visibility can result in a lack of interoperability between the firewall functions and the encrypted voice, leaving businesses unable to satisfy both of their key security requirements.

The ASA is able to intercept and decrypt encrypted signaling from Cisco encrypted endpoints to the Cisco Unified Communications Manager (Cisco UCM), and apply the required threat protection and access control. It can also ensure confidentiality by re-encrypting the traffic onto the Cisco UCM servers.

Typically, the ASA TLS Proxy functionality is deployed in campus unified communications network. This solution is ideal for deployments that utilize end to end encryption and firewalls to protect Unified Communications Manager servers.

The security appliance in Figure 47-1 serves as a proxy for both client and server, with Cisco IP Phone and Cisco UCM interaction.

Figure 47-1 TLS Proxy Flow



Decryption and Inspection of Unified Communications Encrypted Signaling

With encrypted voice inspection, the security appliance decrypts, inspects and modifies (as needed, for example, performing NAT fixup), and re-encrypts voice signaling traffic while all of the existing VoIP inspection functions for Skinny and SIP protocols are preserved. Once voice signaling is decrypted, the plaintext signaling message is passed to the existing inspection engines.

The security appliance acts as a TLS proxy between the Cisco IP Phone and Cisco UCM. The proxy is transparent for the voice calls between the phone and theCisco UCM. Cisco IP Phones download a Certificate Trust List from the Cisco UCM before registration which contains identities (certificates) of the devices that the phone should trust, such as TFTP servers and Cisco UCM servers. To support server proxy, the CTL file must contain the certificate that the security appliance creates for the Cisco UCMs. To proxy calls on behalf of the Cisco IP Phone, the security appliance presents a certificate that the Cisco UCM can verify, which is a Local Dynamic Certificate for the phone, issued by the certificate authority on the security appliance.

TLS proxy is supported by the Cisco Unified CallManager Release 5.1 and later. You should be familiar with the security features of the Cisco UCM. For background and detailed description of Cisco UCM security, see the Cisco Unified CallManager document:

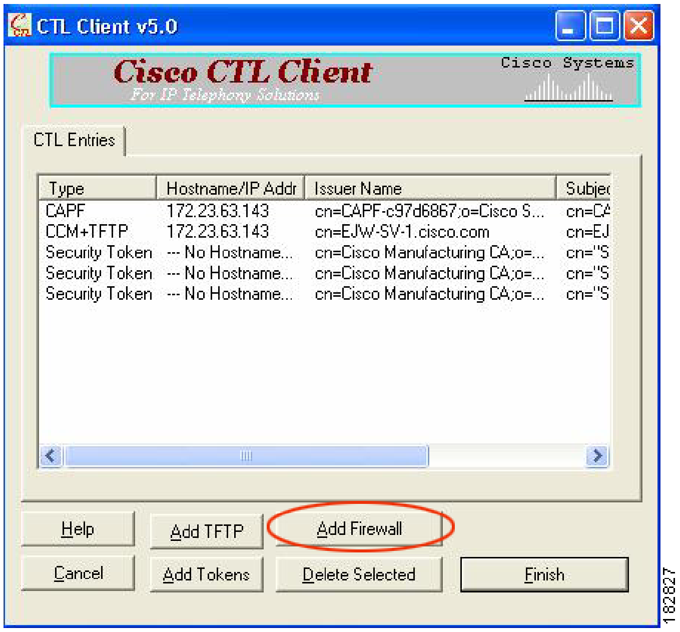
http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/5_0/sec_vir/ae/sec504/index.htm

TLS proxy applies to the encryption layer and must be configured with an application layer protocol inspection. You should be familiar with the inspection features on the ASA, especially Skinny and SIP inspection.

CTL Client Overview

The CTL Client application supplied by Cisco Unified CallManager Release 5.1 and later supports a TLS proxy server (firewall) in the CTL file. Figure 47-2 through Figure 47-5 illustrate the TLS proxy features supported in the CTL Client.

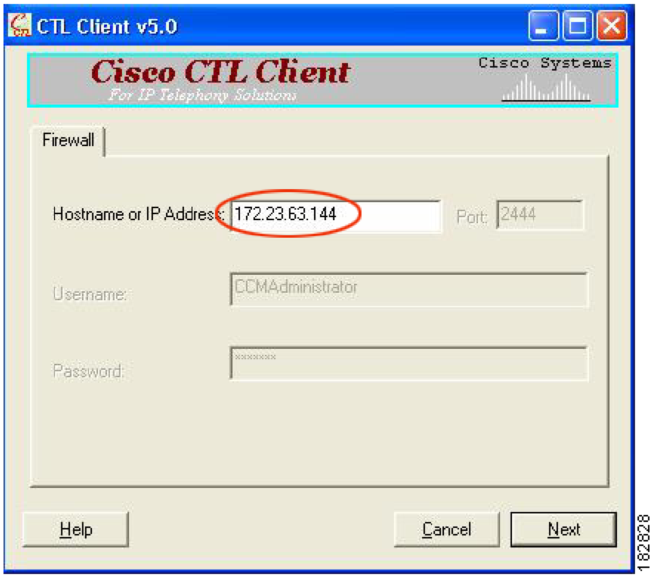
Figure 47-2 CTL Client TLS Proxy Features — Add Firewall



Type	Hostname/IP Addr	Issuer Name	Subjec
CAPF	172.23.63.143	cn=CAPF-c97d6867;o=Cisco S...	cn=CA
CCM+TFTP	172.23.63.143	cn=EJW-SV-1.cisco.com	cn=EJ
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S

Figure 47-2 shows support for adding a CTL entry consisting of the security appliance as the TLS proxy.

Figure 47-3 CTL Client TLS Proxy Features — ASA IP Address or Domain Name



Hostname or IP Address: 172.23.63.144

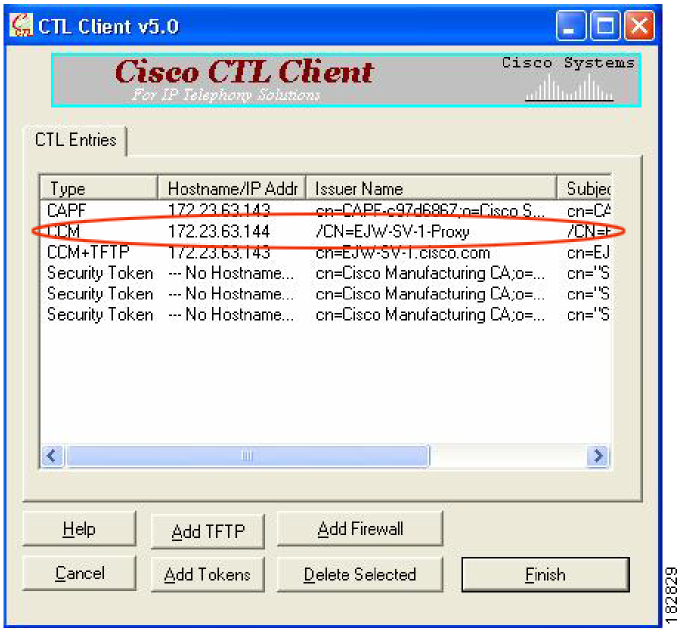
Port: 2444

Username: CCMAdministrator

Password: *******

Figure 47-3 shows support for entering the security appliance IP address or domain name in the CTL Client.

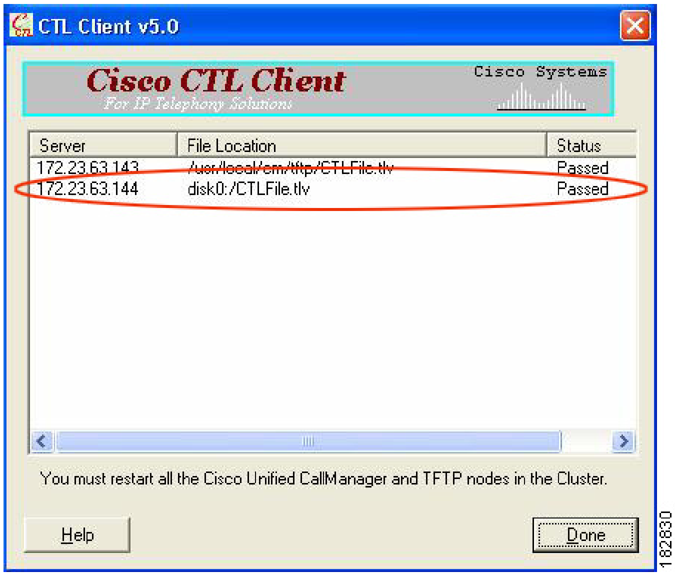
Figure 47-4 CTL Client TLS Proxy Features — CTL Entry for ASA



Type	Hostname/IP Addr	Issuer Name	Subjec
CAPF	172.23.63.143	cn=CAPF-c97d6867;o=Cisco S...	cn=C
CCM	172.23.63.144	/CN=EJW-SV-1-Proxy	/CN=
CCM+TFTP	172.23.63.143	cn=EJW-SV-1.cisco.com	cn=EJ
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S
Security Token	--- No Hostname...	cn=Cisco Manufacturing CA;o=...	cn="S

Figure 47-4 shows that the CTL entry for the security appliance as the TLS proxy has been added. The CTL entry is added after the CTL Client connects to the CTL Provider service on the security appliance and retrieves the proxy certificate.

Figure 47-5 CTL Client TLS Proxy Features — CTL File Installed on the ASA



Server	File Location	Status
172.23.63.143	/usr/local/cm/tftp/CTLFile.tlv	Passed
172.23.63.144	disk0:/CTLFile.tlv	Passed

You must restart all the Cisco Unified CallManager and TFTP nodes in the Cluster.

The security appliance does not store the raw CTL file in the flash, rather, it parses the CTL file and installs appropriate trustpoints. Figure 47-5 indicates the installation was successful.

Licensing for the TLS Proxy

The TLS proxy for encrypted voice inspection feature supported by the ASA require a Unified Communications Proxy license.

The TLS proxy for encrypted voice inspection feature is licensed by TLS session. For the TLS proxy, each endpoint utilizes one Unified Communications Proxy session.

Table 47-1 shows the Unified Communications Proxy license details by platform.

Table 47-1 License Requirements for the Security Appliance

Security Appliance Platform	Max UC Proxy Licenses	Tiers for UC Proxy Licenses
ASA 5505	24	24
ASA 5510	100	24, 50, 100
ASA 5520	1,000	24, 50, 100, 250, 500, 750, 1000
ASA 5540	2,000	24, 50, 100, 250, 500, 750, 1000, 2000
ASA 5550	3,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000
ASA 5580	10,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000, 5000, 10000

Table 47-2 shows the default and maximum TLS session details by platform.

Table 47-2 Default and Maximum TLS Sessions on the Security Appliance

Security Appliance Platform	Default TLS Sessions	Maximum TLS Sessions
ASA 5505	10	80
ASA 5510	100	200
ASA 5520	300	1200
ASA 5540	1000	4500
ASA 5550	2000	4500
ASA 5580	4000	13,000

A Unified Communications Proxy license is applied the same way as other licensed features (such as, SSL VPN), via the **activation-key** command. For more information about licensing, see Chapter 3, "Managing Feature Licenses."

Prerequisites for the TLS Proxy for Encrypted Voice Inspection

Before configuring TLS proxy, the following prerequisites are required:

- You must set clock on the security appliance before configuring TLS proxy. To set the clock manually and display clock, use the **clock set** and **show clock** commands. We recommend that the security appliance use the same NTP server as the Cisco Unified CallManager cluster. TLS handshake may fail due to certificate validation failure if clock is out of sync between the security appliance and the Cisco Unified CallManager server.
- 3DES-AES license is needed to interoperate with the Cisco Unified CallManager. AES is the default cipher used by the Cisco Unified CallManager and Cisco IP Phone.
- Import the following certificates which are stored on the Cisco UCM. These certificates are required by the ASA for the phone proxy.
  - Cisco_Manufacturing_CA
  - CAP-RTP-001
  - CAP-RTP-002
  - CAPF certificate (Optional)

    If LSC provisioning is required or you have LSC enabled IP phones, you must import the CAPF certificate from the Cisco UCM. If the Cisco UCM has more than one CAPF certificate, you must import all of them to the ASA.

  See Chapter 46, "Configuring the Cisco Phone Proxy."For example, the CA Manufacturer certificate is required by the phone proxy to validate the IP phone certificate.

Configuring the TLS Proxy for Encrypted Voice Inspection

This section includes the following topics:

- Task flow for Configuring the TLS Proxy for Encrypted Voice Inspection, page 47-7
- Creating Trustpoints and Generating Certificates, page 47-8

- Creating an Internal CA, page 47-9
- Creating a CTL Provider Instance, page 47-10
- Creating the TLS Proxy Instance, page 47-11
- Enabling the TLS Proxy Instance for Skinny or SIP Inspection, page 47-12

Task flow for Configuring the TLS Proxy for Encrypted Voice Inspection

To configure the security appliance for TLS proxy, perform the following steps:

Step 1 (Optional) Set the maximum number of TLS proxy sessions to be supported by the security appliance using the following command, for example:

```
hostname(config)# tls-proxy maximum-sessions 1200
```

Note The **tls-proxy maximum-sessions** command controls the memory size reserved for cryptographic applications such as TLS proxy. Crypto memory is reserved at the time of system boot. You may need to reboot the security appliance for the configuration to take effect if the configured maximum sessions number is greater than the currently reserved.

Step 2 Create trustpoints and generate certificates for the TLS Proxy for Encrypted Voice Inspection. See Creating Trustpoints and Generating Certificates, page 47-8.

Step 3 Create the internal CA to sign the LDC for Cisco IP Phones. See Creating an Internal CA, page 47-9.

Step 4 Create the CTL provider instance. See Creating a CTL Provider Instance, page 47-10.

Step 5 Create the TLS proxy instance. See Creating the TLS Proxy Instance, page 47-11.

Step 6 Enable the TLS proxy y with SIP and Skinny inspection. See Enabling the TLS Proxy Instance for Skinny or SIP Inspection, page 47-12.

Step 7 Export the local CA certificate (ldc_server) and install it as a trusted certificate on the Cisco UCM server.

a. Use the following command to export the certificate if a trust-point with **proxy-ldc-issuer** is used as the signer of the dynamic certificates, for example:

```
hostname(config)# crypto ca export ldc_server identity-certificate
```

b. For the embedded local CA server LOCAL-CA-SERVER, use the following command to export its certificate, for example:

```
hostname(config)# show crypto ca server certificate
```

Save the output to a file and import the certificate on the Cisco UCM. For more information, see the Cisco Unified CallManager document:
http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/5_0/iptp_adm/504/iptpch6.htm#wp1040848

After this step, you may use the Display Certificates function on the Cisco Unified CallManager GUI to verify the installed certificate:

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/5_0/iptp_adm/504/iptpch6.htm#wp1040354

Step 8 Run the CTL Client application to add the server proxy certificate (ccm_proxy) to the CTL file and install the CTL file on the security appliance. See the Cisco Unified CallManager document for information on how to configure and use CTL Client:

http://www.cisco.com/univercd/cc/td/doc/product/voice/c_callmg/5_1/nci/p08/secuauth.htm

Note You will need the CTL Client that is released with Cisco Unified CallManager Release 5.1 to interoperate with the security appliance. See the "CTL Client Overview" section on page 47-3 for more information regarding TLS proxy support.

Creating Trustpoints and Generating Certificates

The Cisco UCM proxy certificate could be self-signed or issued by a third-party CA. The certificate is exported to the CTL client.

Prerequisites

Import the required certificates, which are stored on the Cisco UCM. See the "Certificates from the Cisco UCM" section on page 46-6 and the "Importing Certificates from the Cisco UCM" section on page 46-15.

	Command	Purpose
Step 1	hostname(config)# **crypto key generate rsa label** *key-pair-label* **modulus** *size* **Examples:** hostname(config)# **crypto key generate rsa label ccm_proxy_key modulus 1024** hostname(config)# **crypto key generate rsa label ldc_signer_key modulus 1024** hostname(config)# **crypto key generate rsa label phone_common modulus 1024**	Creates the RSA keypair that can be used for the trustpoints. The keypair is used by the self-signed certificate presented to the local domain containing the Cisco UP (proxy for the remote entity). **Note** We recommend that you create a different key pair for each role.
Step 2	hostname(config)# **crypto ca trustpoint** *trustpoint_name* **Example:** hostname(config)# **! for self-signed CCM proxy certificate** hostname(config)# **crypto ca trustpoint ccm_proxy**	Enters the trustpoint configuration mode for the specified trustpoint so that you can create the trustpoint for the Cisco UMA server. A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA.
Step 3	hostname(config-ca-trustpoint)# **enrollment self**	Generates a self-signed certificate.
Step 4	hostname(config-ca-trustpoint)# **fqdn none**	Specifies not to include a fully qualified domain name (FQDN) in the Subject Alternative Name extension of the certificate during enrollment.

	Command	Purpose

Step 5	`hostname(config-ca-trustpoint)# subject-name X.500_name`
	Example:
	`hostname(config-ca-trustpoint)# subject-name cn=EJW-SV-1-Proxy`
		Includes the indicated subject DN in the certificate during enrollment
		Cisco IP Phones require certain fields from the X.509v3 certificate to be present to validate the certificate via consulting the CTL file. Consequently, the **subject-name** entry must be configured for a proxy certificate trustpoint. The subject name must be composed of the ordered concatenation of the CN, OU and O fields. The CN field is mandatory; the others are optional.
		Note Each of the concatenated fields (when present) are separated by a semicolon, yielding one of the following forms:
		CN=xxx;OU=yyy;O=zzz
		CN=xxx;OU=yyy
		CN=xxx;O=zzz
		CN=xxx

Step 6	`hostname(config-ca-trustpoint)# keypair keyname`
	Example:
	`hostname(config-ca-trustpoint)# keypair ccm_proxy_key`
		Specifies the key pair whose public key is to be certified.

Step 7	`hostname(config-ca-trustpoint)# exit`	Exits from the CA Trustpoint configuration mode.

Step 8	`hostname(config)# crypto ca enroll trustpoint`
	Example:
	`hostname(config)# crypto ca enroll ccm_proxy`
		Starts the enrollment process with the CA and specifies the name of the trustpoint to enroll with.

What to Do Next

Once you have created the trustpoints and generated the certificates, create the internal CA to sign the LDC for Cisco IP Phones. See Creating an Internal CA, page 47-9.

Creating an Internal CA

Create an internal local CA to sign the LDC for Cisco IP Phones.

This local CA is created as a regular self-signed trustpoint with **proxy-ldc-issuer** enabled. You can use the embedded local CA LOCAL-CA-SERVER on the ASA to issue the LDC.

	Command	Purpose

Step 1	`hostname(config)# crypto ca trustpoint trustpoint_name`
	Example:
	`hostname(config)# ! for the internal local LDC issuer`
	`hostname(config)# crypto ca trustpoint ldc_server`
		Enters the trustpoint configuration mode for the specified trustpoint so that you can create the trustpoint for the LDC issurer.

Step 2	`hostname(config-ca-trustpoint)# enrollment self`	Generates a self-signed certificate.

	Command	Purpose
Step 3	`hostname(config-ca-trustpoint)# proxy-ldc-issuer`	Issues TLS proxy local dynamic certificates. The **proxy-ldc-issuer** command grants a crypto trustpoint the role as local CA to issue the LDC and can be accessed from crypto ca trustpoint configuration mode. The **proxy-ldc-issuer** command defines the local CA role for the trustpoint to issue dynamic certificates for TLS proxy. This command can only be configured under a trustpoint with "enrollment self."

Step 4	`hostname(config-ca-trustpoint)# fqdn fqdn`
	Example:
	`hostname(config-ca-trustpoint)# fqdn my-ldc-ca.exmaple.com`
		Includes the indicated FQDN in the Subject Alternative Name extension of the certificate during enrollment.

Step 5	`hostname(config-ca-trustpoint)# subject-name X.500_name`
	Example:
	`hostname(config-ca-trustpoint)# subject-name cn=FW_LDC_SIGNER_172_23_45_200`
		Includes the indicated subject DN in the certificate during enrollment

Step 6	`hostname(config-ca-trustpoint)# keypair keyname`
	Example:
	`hostname(config-ca-trustpoint)# keypair ldc_signer_key`
		Specifies the key pair whose public key is to be certified.

Step 7	`hostname(config-ca-trustpoint)# exit`	Exits from the CA Trustpoint configuration mode.

Step 8	`hostname(config)# crypto ca enroll trustpoint`
	Example:
	`hostname(config)# crypto ca enroll ldc_server`
		Starts the enrollment process with the CA and specifies the name of the trustpoint to enroll with.

What to Do Next

Once you have created the internal CA, create the CTL provider instance. See Creating a CTL Provider Instance, page 47-10.

Creating a CTL Provider Instance

Create a CTL Provider instance in preparation for a connection from the CTL Client.

The default port number listened by the CTL Provider is TCP 2444, which is the default CTL port on the Cisco UCM. Use the **service port** command to change the port number if a different port is used by the Cisco UCM cluster.

	Command	Purpose
Step 1	hostname(config)# **ctl-provider** *ctl_name* **Example:** hostname(config)# **ctl-provider my_ctl**	Enters the CTL provider configuration mode so that you can create the Certificate Trust List provider instance.
Step 2	hostname(config-ctl-provider)# **client interface** *if_name ipv4_addr* **Example:** hostname(config-ctl-provider)# **client interface inside address 172.23.45.1**	Specifies clients allowed to connect to the Certificate Trust List provider. Where **interface** *if_name* specifies the interface allowed to connect and *ipv4_addr* specifies the IP address of the client. More than one command may be issued to define multiple clients.
Step 3	hostname(config-ctl-provider)# **client username** *user_name* **password** *password* **encrypted** **Example:** hostname(config-ctl-provider)# **client username CCMAdministrator password XXXXXX encrypted**	Specifies the username and password for client authentication. The username and password must match the username and password for Cisco UCM administration.
Step 4	hostname(config-ctl-provider)# **export certificate** *trustpoint_name* **Example:** hostname(config-ctl-provider)# **export certificate**	Specifies the certificate to be exported to the client. The certificate will be added to the Certificate Trust List file composed by the CTL client. The trustpoint name in the **export** command is the proxy certificate for the Cisco UCM server.
Step 5	hostname(config-ctl-provider)# **ctl install**	Enables the CTL provider to parse the CTL file from the CTL client and install trustpoints for entries from the CTL file. Ttrustpoints installed by this command have names prefixed with "_internal_CTL_<ctl_name>."

What to Do Next

Once you have created the CTL provider instance, create the TLS proxy instance. See Creating the TLS Proxy Instance, page 47-11.

Creating the TLS Proxy Instance

Create the TLS proxy instance to handle the encrypted signaling.

	Command	Purpose

Step 1	`hostname(config)#` **`tls-proxy`** *`proxy_name`*
	`Example:`
	`hostname(config)# tls-proxy my_proxy`
		Creates the TLS proxy instance.

Step 2	`hostname(config-tlsp)#` **`server trust-point`** *`proxy_trustpoint`*
	`Example:`
	`hostname(config-tlsp)# server trust-point ccm_proxy`
		Specifies the proxy trustpoint certificate to present during TLS handshake.
		The **server** command configures the proxy parameters for the original TLS server. In other words, the parameters for the ASA to act as the server during a TLS handshake, or facing the original TLS client.

Step 3	`hostname(config-tlsp)#` **`client ldc issuer`** *`ca_tp_name`*
	`Example:`
	`hostname(config-tlsp)# client ldc issuer ldc_server`
		Sets the local dynamic certificate issuer. The local CA to issue client dynamic certificates is defined by the **crypto ca trustpoint** command and the trustpoint must have **proxy-ldc-issuer** configured, or the default local CA server (LOCAL-CA-SERVER).
		Where **`ldc issuer`** *`ca_tp_name`* specifies the local CA trustpoint to issue client dynamic certificates.

Step 4	`hostname(config-tlsp)#` **`client ldc key-pair`** *`key_label`*
	`Example:`
	`hostname(config-tlsp)# client ldc key-pair phone_common`
		Sets the keypair.
		The keypair value must have been generated with the crypto key generate command.

Step 5	`hostname(config-tlsp)#` **`client cipher-suite`** *`cipher_suite`*
	`Example:`
	`hostname(config-tlsp)# client cipher-suite aes128-sha1 aes256-sha1`
		Sets the user-defined cipher suite.
		For client proxy (the proxy acts as a TLS client to the server), the user-defined cipher suite replaces the default cipher suite, or the one defined by the ssl encryption command. You can use this command to achieve difference ciphers between the two TLS sessions. You should use AES ciphers with the CallManager server.

What to Do Next

Once you have created TLS proxy instance, enable the TLS proxy instance for Skinny and SIP inspection. See Enabling the TLS Proxy Instance for Skinny or SIP Inspection, page 47-12.

Enabling the TLS Proxy Instance for Skinny or SIP Inspection

Enable TLS proxy for the Cisco IP Phones and Cisco UCMs in Skinny or SIP inspection. The following procedure shows how to enable the TLS proxy instance for Skinny inspection.

	Command	Purpose

Step 1	`hostname(config)# class-map class_map_name`
	Example:
	`hostname(config)# class-map sec_skinny`
		Configures the secure Skinny class of traffic to inspect.
		Where *class_map_name* is the name of the Skinny class map.

Step 2	`hostname(config-cmap)# match port tcp eq 2443`	Matches the TCP port 2443 to which you want to apply actions for secure Skinny inspection
Step 3	`hostname(config-cmap)# exit`	

Step 4	`hostname(config)# policy-map type inspect skinny policy_map_name`
	Example:
	`hostname(config)# policy-map type inspect skinny skinny_inspect`
		Defines special actions for Skinny inspection application traffic.

Step 5	`hostname(config-pmap)# parameters`
	`hostname(config-pmap-p)# ! Skinny inspection parameters`
		Specifies the parameters for Skinny inspection. Parameters affect the behavior of the inspection engine.
		The commands available in parameters configuration mode depend on the application.

Step 6	`hostname(config-pmap-p)# exit`	Exits from Policy Map configuration mode.

Step 7	`hostname(config)# policy-map name`
	Example:
	`hostname(config)# policy-map global_policy`
		Configure the policy map and attach the action to the class of traffic.

Step 8	`hostname(config-pmap)# class inspection_default`	Specifies the default class map. The configuration includes a default Layer 3/4 class map that the ASA uses in the default global policy. It is called **inspection_default** and matches the default inspection traffic,

Step 9	`hostname(config-pmap-c)# inspect skinny skinny_map`
	Example:
	`hostname(config-pmap-c)# inspect skinny skinny_inspect`
		Enables SCCP (Skinny) application inspection.

Step 10	`hostname(config-pmap)# class classmap_name`
	Example:
	`hostname(config-pmap)# class sec_skinny`
		Assigns a class map to the policy map where you can assign actions to the class map traffic.

Step 11	`hostname(config-pmap-c)# inspect skinny skinny_map tls-proxy proxy_name`
	Example:
	`hostname(config-pmap-c)# inspect skinny skinny_inspect tls-proxy my_proxy`
		Enables TLS proxy for the specified inspection session.

Step 12	`hostname(config-pmap-c)# exit`	Exits from the Policy Map configuration mode.

Step 13	`hostname(config)# service-policy policymap_name global`
	Example:
	`hostname(config)# service-policy global_policy global`
		Enables the service policy on all interfaces.

Monitoring the TLS Proxy

You can enable TLS proxy debug flags along with SSL syslogs to debug TLS proxy connection problems. For example, using the following commands to enable TLS proxy-related debug and syslog output only:

```
hostname(config)# debug inspect tls-proxy events
hostname(config)# debug inspect tls-proxy errors
hostname(config)# logging enable
hostname(config)# logging timestamp
hostname(config)# logging list loglist message 711001
hostname(config)# logging list loglist message 725001-725014
hostname(config)# logging list loglist message 717001-717038
hostname(config)# logging buffer-size 1000000
hostname(config)# logging buffered loglist
hostname(config)# logging debug-trace
```

The following is sample output reflecting a successful TLS proxy session setup for a SIP phone:

```
hostname(config)# show log

Apr 17 2007 23:13:47: %ASA-6-725001: Starting SSL handshake with client
outside:133.9.0.218/49159 for TLSv1 session.
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Set up proxy for Client
outside:133.9.0.218/49159 <-> Server inside:195.168.2.201/5061
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Using trust point 'local_ccm' with the
Client, RT proxy cbae1538
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Waiting for SSL handshake from Client
outside:133.9.0.218/49159.
Apr 17 2007 23:13:47: %ASA-7-725010: Device supports the following 4 cipher(s).
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[1] : RC4-SHA
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[2] : AES128-SHA
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[3] : AES256-SHA
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[4] : DES-CBC3-SHA
Apr 17 2007 23:13:47: %ASA-7-725008: SSL client outside:133.9.0.218/49159 proposes the
following 2 cipher(s).
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[1] : AES256-SHA
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[2] : AES128-SHA
Apr 17 2007 23:13:47: %ASA-7-725012: Device chooses cipher : AES128-SHA for the SSL
session with client outside:133.9.0.218/49159
Apr 17 2007 23:13:47: %ASA-7-725014: SSL lib error. Function: SSL23_READ Reason: ssl
handshake failure
Apr 17 2007 23:13:47: %ASA-7-717025: Validating certificate chain containing 1
certificate(s).
Apr 17 2007 23:13:47: %ASA-7-717029: Identified client certificate within certificate
chain. serial number: 01, subject name: cn=SEP0017593F50A8.
Apr 17 2007 23:13:47: %ASA-7-717030: Found a suitable trustpoint
_internal_ejw-sv-2_cn=CAPF-08a91c01 to validate certificate.
Apr 17 2007 23:13:47: %ASA-6-717022: Certificate was successfully validated. serial
number: 01, subject name:  cn=SEP0017593F50A8.
Apr 17 2007 23:13:47: %ASA-6-717028: Certificate chain was successfully validated with
warning, revocation status was not checked.
Apr 17 2007 23:13:47: %ASA-6-725002: Device completed SSL handshake with client
outside:133.9.0.218/49159
Apr 17 2007 23:13:47: %ASA-6-725001: Starting SSL handshake with server
inside:195.168.2.201/5061 for TLSv1 session.
Apr 17 2007 23:13:47: %ASA-7-725009: Device proposes the following 2 cipher(s) to server
inside:195.168.2.201/5061
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[1] : AES128-SHA
Apr 17 2007 23:13:47: %ASA-7-725011: Cipher[2] : AES256-SHA
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Generating LDC for client
'cn=SEP0017593F50A8', key-pair 'phone_common', issuer 'LOCAL-CA-SERVER', RT proxy cbae1538
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Started SSL handshake with Server
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Data channel ready for the Client
Apr 17 2007 23:13:47: %ASA-7-725013: SSL Server inside:195.168.2.201/5061 choose cipher :
AES128-SHA
Apr 17 2007 23:13:47: %ASA-7-717025: Validating certificate chain containing 1
certificate(s).
Apr 17 2007 23:13:47: %ASA-7-717029: Identified client certificate within certificate
chain. serial number: 76022D3D9314743A, subject name: cn=EJW-SV-2.inside.com.
Apr 17 2007 23:13:47: %ASA-6-717022: Certificate was successfully validated. Certificate
is resident and trusted, serial number: 76022D3D9314743A, subject name:
cn=EJW-SV-2.inside.com.
Apr 17 2007 23:13:47: %ASA-6-717028: Certificate chain was successfully validated with
revocation status check.
Apr 17 2007 23:13:47: %ASA-6-725002: Device completed SSL handshake with server
inside:195.168.2.201/5061
Apr 17 2007 23:13:47: %ASA-7-711001: TLSP cbad5120: Data channel ready for the Server
```

Use the **show tls-proxy** commands with different options to check the active TLS proxy sessions. The following are some sample outputs:

```
hostname(config-tlsp)# show tls-proxy
Maximum number of sessions: 1200

TLS-Proxy 'sip_proxy': ref_cnt 1, seq# 3
    Server proxy:
        Trust-point: local_ccm
    Client proxy:
        Local dynamic certificate issuer: LOCAL-CA-SERVER
        Local dynamic certificate key-pair: phone_common
        Cipher suite:  aes128-sha1 aes256-sha1
    Run-time proxies:
        Proxy 0xcbae1538: Class-map: sip_ssl, Inspect: sip
            Active sess 1, most sess 3, byte 3456043

TLS-Proxy 'proxy': ref_cnt 1, seq# 1
    Server proxy:
        Trust-point: local_ccm
    Client proxy:
        Local dynamic certificate issuer: ldc_signer
        Local dynamic certificate key-pair: phone_common
        Cipher-suite: <unconfigured>
    Run-time proxies:
        Proxy 0xcbadf720: Class-map: skinny_ssl, Inspect: skinny
            Active sess 1, most sess 1, byte 42916

hostname(config-tlsp)# show tls-proxy session count
2 in use, 4 most used

hostname(config-tlsp)# show tls-proxy session
2 in use, 4 most used
outside 133.9.0.211:50437 inside 195.168.2.200:2443 P:0xcbadf720(proxy) S:0xcbc48a08 byte
42940
outside 133.9.0.218:49159 inside 195.168.2.201:5061 P:0xcbae1538(sip_proxy) S:0xcbad5120
byte 8786

hostname(config-tlsp)# show tls-proxy session detail
2 in use, 4 most used
outside 133.9.0.211:50437 inside 195.168.2.200:2443 P:0xcbadf720(proxy) S:0xcbc48a08 byte
42940
    Client: State SSLOK  Cipher AES128-SHA Ch 0xca55e498 TxQSize 0 LastTxLeft 0 Flags 0x1
    Server: State SSLOK  Cipher AES128-SHA Ch 0xca55e478 TxQSize 0 LastTxLeft 0 Flags 0x9
Local Dynamic Certificate
    Status: Available
    Certificate Serial Number: 29
    Certificate Usage: General Purpose
    Public Key Type: RSA (1024 bits)
    Issuer Name:
        cn=TLS-Proxy-Signer
    Subject Name:
        cn=SEP0002B9EB0AAD
        o=Cisco Systems Inc
        c=US
    Validity Date:
        start date: 09:25:41 PDT Apr 16 2007
        end   date: 09:25:41 PDT Apr 15 2008
    Associated Trustpoints:

outside 133.9.0.218:49159 inside 195.168.2.201:5061 P:0xcbae1538(sip_proxy) S:0xcbad5120
byte 8786
    Client: State SSLOK  Cipher AES128-SHA Ch 0xca55e398 TxQSize 0 LastTxLeft 0 Flags 0x1
    Server: State SSLOK  Cipher AES128-SHA Ch 0xca55e378 TxQSize 0 LastTxLeft 0 Flags 0x9
Local Dynamic Certificate
    Status: Available
    Certificate Serial Number: 2b
    Certificate Usage: General Purpose
    Public Key Type: RSA (1024 bits)
    Issuer Name:
        cn=F1-ASA.default.domain.invalid
    Subject Name:
        cn=SEP0017593F50A8
    Validity Date:
        start date: 23:13:47 PDT Apr 16 2007
        end   date: 23:13:47 PDT Apr 15 2008
    Associated Trustpoints:
```

Feature History for the TLS Proxy for Encrypted Voice Inspection

Table 47-3 lists the release history for this feature.

Table 47-3 Feature History for Cisco Phone Proxy

Feature Name	Releases	Feature Information
TLS Proxy for Encrypted Voice Inspection	8.0(2)	The TLS Proxy feature was introduced, which included the following new command: **tls-proxy**

CHAPTER 48

Configuring Cisco Mobility Advantage

This chapter describes how to configure the adaptive security appliance for the Cisco Unified Communications Mobility Advantage Proxy features.

This chapter includes the following sections:

- Information about the Cisco Mobility Advantage Proxy Feature, page 48-1
- Licensing for the Mobility Advantage Proxy, page 48-6
- Configuring Cisco Mobility Advantage, page 48-6
- Monitoring for Cisco Mobility Advantage Proxy, page 48-10
- Configuration Examples for Cisco Mobility Advantage, page 48-11
- Feature History for Cisco Mobility Advantage, page 48-14

Information about the Cisco Mobility Advantage Proxy Feature

This section contains the following topics:

- Cisco Mobility Advantage Proxy Functionality, page 48-1
- Mobility Advantage Proxy Deployment Scenarios, page 48-2
- Trust Relationships for Cisco UMA Deployments, page 48-5

Cisco Mobility Advantage Proxy Functionality

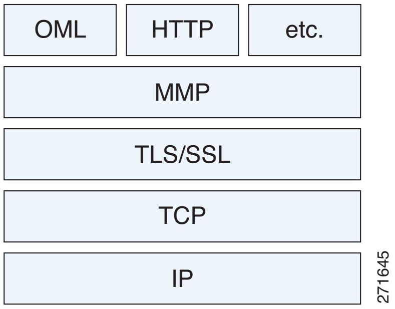
To support Cisco UMA for the Cisco Mobility Advantage solution, the mobility proxy (implemented as a TLS proxy) includes the following functionality:

- The ability to allow no client authentication during the handshake with clients.
- Allowing an imported PKCS-12 certificate to server as a proxy certificate.

The ASA includes an inspection engine to validate the Cisco UMA Mobile Multiplexing Protocol (MMP).

MMP is a data transport protocol for transmitting data entities between Cisco UMA clients and servers. As shown in Figure 48-1, MMP must be run on top of a connection-oriented protocol (the underlying transport) and is intended to be run on top of a secure transport protocol such as TLS. The Orative Markup Language (OML) protocol is intended to be run on top of MMP for the purposes of data synchronization, as well as the HTTP protocol for uploading and downloading large files.

Figure 48-1 MMP Stack



The TCP/TLS default port is 5443. There are no embedded NAT or secondary connections.

Cisco UMA client and server communications can be proxied via TLS, which decrypts the data, passes it to the inspect MMP module, and re-encrypt the data before forwarding it to the endpoint. The inspect MMP module verifies the integrity of the MMP headers and passes the OML/HTTP to an appropriate handler. The ASA takes the following actions on the MMP headers and data:

- Verifies that client MMP headers are well-formed. Upon detection of a malformed header, the TCP session is terminated.
- Verifies that client to server MMP header lengths are not exceeded. If an MMP header length is exceeded (4096), then the TCP session is terminated.
- Verifies that client to server MMP content lengths are not exceeded. If an entity content length is exceeded (4096), the TCP session is terminated.

Note 4096 is the value currently used in MMP implementations.

Because MMP headers and entities can be split across packets, the ASA buffers data to ensure consistent inspection. The SAPI (stream API) handles data buffering for pending inspection opportunities. MMP header text is treated as case insensitive and a space is present between header text and values. Reclaiming of MMP state is performed by monitoring the state of the TCP connection.

Mobility Advantage Proxy Deployment Scenarios

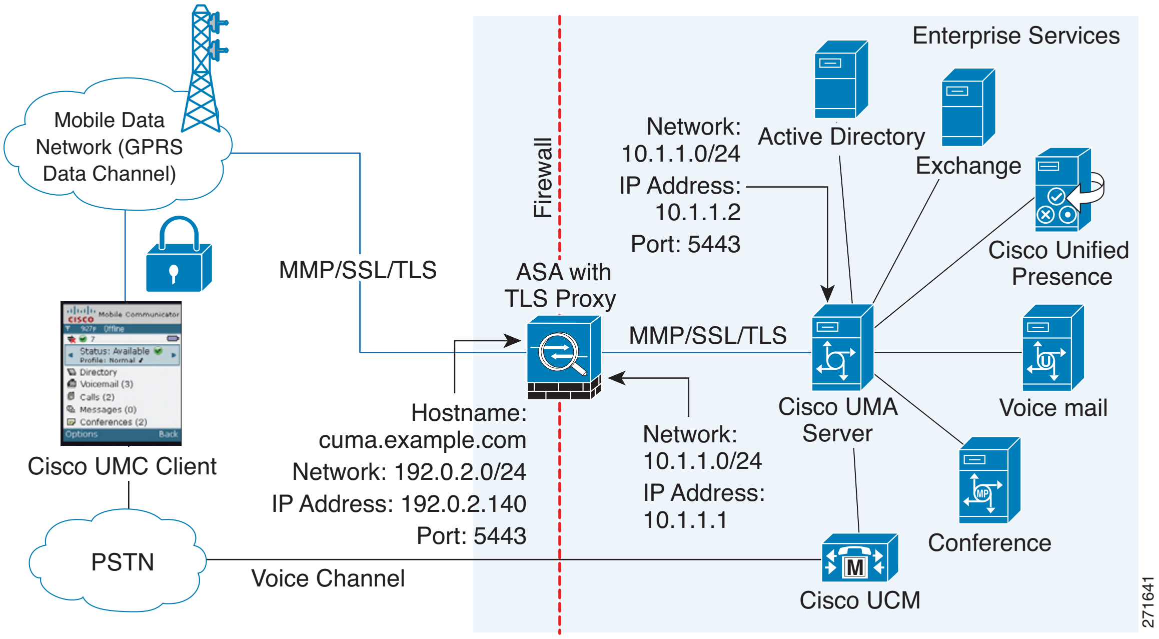
Figure 48-2 and Figure 48-3 show the two deployment scenarios for the TLS proxy used by the Cisco Mobility Advantage solution. In scenario 1 (the recommended deployment architecture), the ASA functions as both the firewall and TLS proxy. In scenario 2, the ASA functions as the TLS proxy only and works with an existing firewall. In both scenarios, the clients connect from the Internet.

In the scenario 1 deployment, the ASA is between a Cisco UMA client and a Cisco UMA server. The Cisco UMA client is an executable that is downloaded to each smartphone. The Cisco UMA client applications establishes a data connection, which is a TLS connection, to the corporate Cisco UMA server. The ASA intercepts the connections and inspects the data that the client sends to the Cisco UMA server.

Note The TLS proxy for the Cisco Mobility Advantage solution does not support client authentication because the Cisco UMA client cannot present a certificate. The following commands can be used to disable authentication during the TLS handshake.

```
hostname(config)# tls-proxy my_proxy
hostname(config-tlsp)# no server authenticate-client
```

Figure 48-2 Security Appliance as Firewall with Mobility Proxy and MMP Inspection



In Figure 48-2, the ASA performs static NAT by translating the Cisco UMA server 10.1.1.2 IP address to 192.0.2.140.

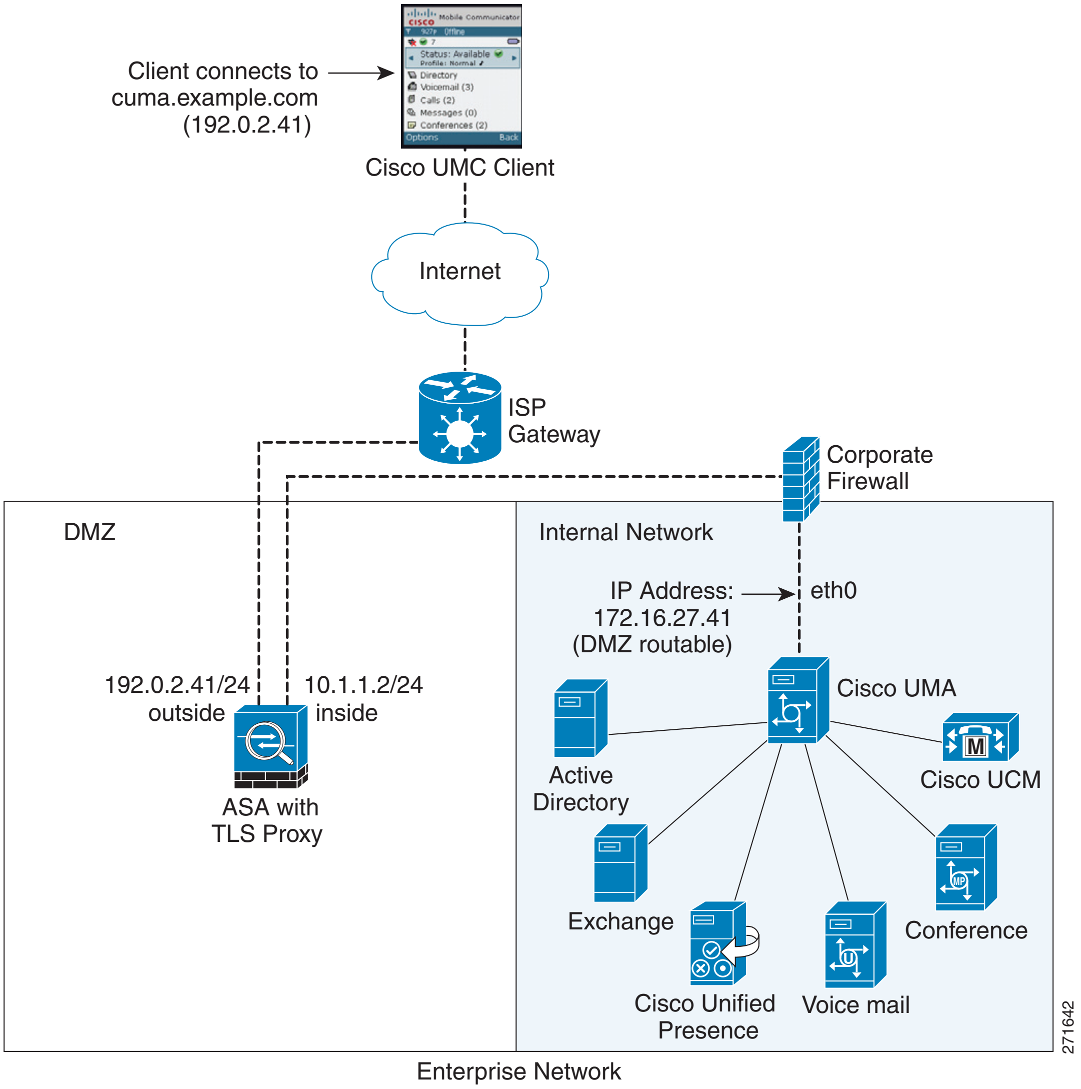
Figure 48-3 shows deployment scenario 2, where the ASA functions as the TLS proxy only and does not function as the corporate firewall. In this scenario, the ASA and the corporate firewall are performing NAT. The corporate firewall will not be able to predict which client from the Internet needs to connect to the corporate Cisco UMA server. Therefore, to support this deployment, you can take the following actions:

- Set up a NAT rule for inbound traffic that translates the destination IP address 192.0.2.41 to 172.16.27.41.
- Set up an interface PAT rule for inbound traffic translating the source IP address of every packet so that the corporate firewall does not need to open up a wildcard pinhole. The Cisco UMA server receives packets with the source IP address 192.0.12.183.

```
hostname(config)# nat (outside) 1 0.0.0.0 0.0.0.0 outside
hostname(config)# global (inside) 1 192.0.2.183 netmask 255.255.255.255
```

Note This interface PAT rule converges the Cisco UMA client IP addresses on the outside interface of the ASA into a single IP address on the inside interface by using different source ports. Performing this action is often referred as “outside PAT”. “Outside PAT” is not recommended when TLS proxy for Cisco Mobility Advantage is enabled on the same interface of the ASA with phone proxy, Cisco Unified Presence, or any other features involving application inspection. “Outside PAT” is not supported completely by application inspection when embedded address translation is needed.

Figure 48-3 Cisco UMC/Cisco UMA Architecture – Scenario 2: Security Appliance as Mobility Proxy Only



Mobility Advantage Proxy Using NAT/PAT

In both scenarios (Figure 48-2 and Figure 48-3), NAT can be used to hide the private address of the Cisco UMA servers.

In scenario 2 (Figure 48-3), PAT can be used to converge all client traffic into one source IP, so that the firewall does not have to open up a wildcard pinhole for inbound traffic.

```
hostname(config)# access-list cumc extended permit tcp any host 172.16.27.41 eq 5443
```

versus

```
hostname(config)# access-list cumc extended permit tcp host 192.0.2.183 host 172.16.27.41
eq 5443
```

Trust Relationships for Cisco UMA Deployments

To establish a trust relationship between the Cisco UMC client and the ASA, the ASA uses the Cisco UMA server certificate and keypair or the ASA obtains a certificate with the Cisco UMA server FQDN (certificate impersonation). Between the ASA and the Cisco UMA server, the ASA and Cisco UMA server use self-signed certificates or certificates issued by a local certificate authority.

Figure 48-4 shows how you can import the Cisco UMA server certificate onto the ASA. When the Cisco UMA server has already enrolled with a third-party CA, you can import the certificate with the private key onto the ASA. Then, the ASA has the full credentials of the Cisco UMA server. When a Cisco UMA client connects to the Cisco UMA server, the ASA intercepts the handshake and uses the Cisco UMA server certificate to perform the handshake with the client. The ASA also performs a handshake with the server.

Figure 48-4 How the Security Appliance Represents Cisco UMA – Private Key Sharing

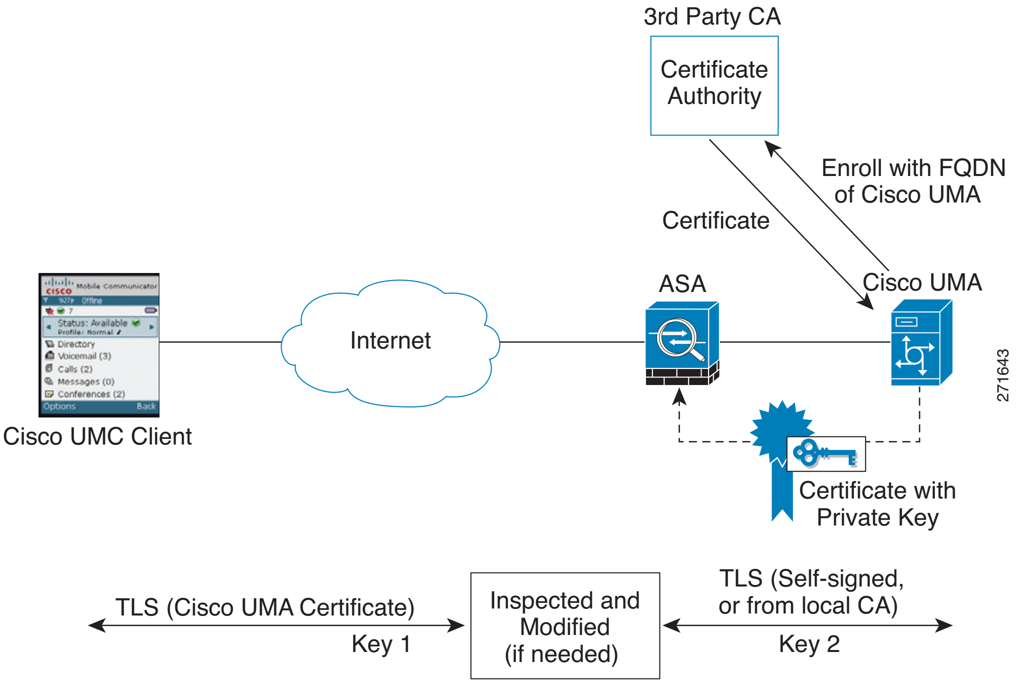
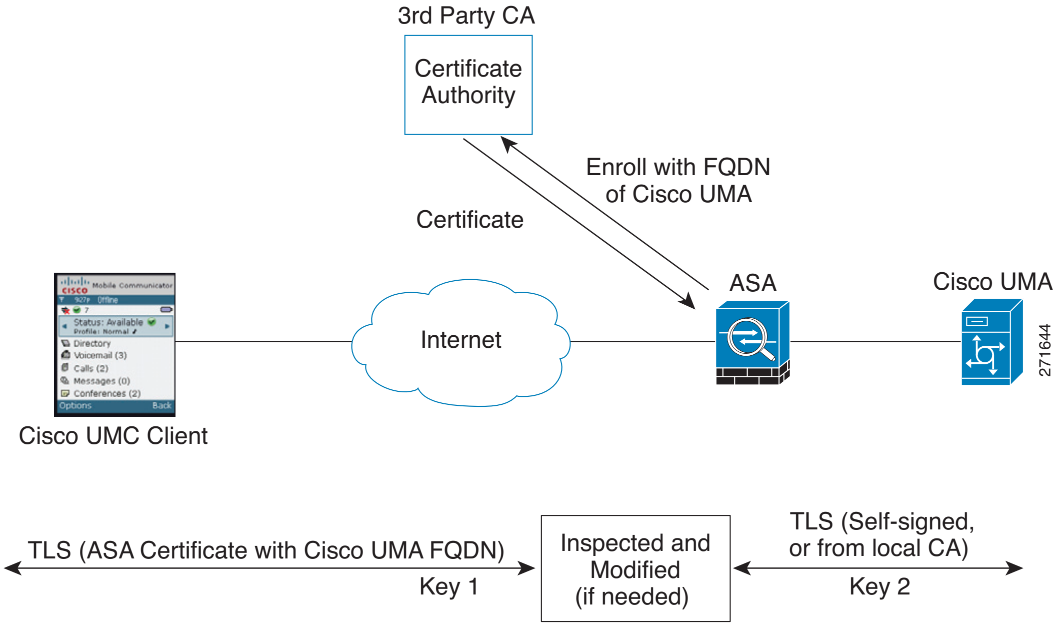

3rd Party CA
Certificate Authority
Enroll with FQDN of Cisco UMA
Certificate
ASA
Cisco UMA
Internet
Cisco UMC Client
Certificate with Private Key
271643
TLS (Cisco UMA Certificate)
Key 1
Inspected and Modified (if needed)
TLS (Self-signed, or from local CA)
Key 2

Figure 48-5 shows another way to establish the trust relationship. Figure 48-5 shows a green field deployment, because each component of the deployment has been newly installed. The ASA enrolls with the third-party CA by using the Cisco UMA server FQDN as if the ASA is the Cisco UMA server. When the Cisco UMA client connects to the ASA, the ASA presents the certificate that has the Cisco UMA server FQDN. The Cisco UMA client believes it is communicating to with the Cisco UMA server.

Figure 48-5 How the Security Appliance Represents Cisco UMA – Certificate Impersonation


3rd Party CA
Certificate Authority
Enroll with FQDN of Cisco UMA
Certificate
ASA
Cisco UMA
Internet
Cisco UMC Client
271644
TLS (ASA Certificate with Cisco UMA FQDN)
Key 1
Inspected and Modified (if needed)
TLS (Self-signed, or from local CA)
Key 2

A trusted relationship between the ASA and the Cisco UMA server can be established with self-signed certificates. The ASA's identity certificate is exported, and then uploaded on the Cisco UMA server truststore. The Cisco UMA server certificate is downloaded, and then uploaded on the ASA truststore by creating a trustpoint and using the **crypto ca authenticate** command.

Licensing for the Mobility Advantage Proxy

The Cisco Unified Communications proxy features (Cisco Phone Proxy, TLS proxy for encrypted voice inspection, and the Cisco Presence Federation Proxy) supported by the ASA require a Unified Communications Proxy license. However, in Version 8.2(2) and later, the Mobility Advantage proxy no longer requires a Unified Communications Proxy license.

The following table shows the licensing requirements for the Mobility Advantage proxy:

Table 48-1 Licensing for the Mobility Advantage Proxy

Model	License Requirement
All models	Base License

For more information about licensing, see Chapter 3, “Managing Feature Licenses.”

Configuring Cisco Mobility Advantage

This section includes the following topics:

- Task Flow for Configuring Cisco Mobility Advantage, page 48-7
- Installing the Cisco UMA Server Certificate, page 48-7

- Creating the TLS Proxy Instance, page 48-8
- Enabling the TLS Proxy for MMP Inspection, page 48-9

Task Flow for Configuring Cisco Mobility Advantage

To configure for the ASA to perform TLS proxy and MMP inspection as shown in Figure 48-2 and Figure 48-3, perform the following tasks.

It is assumed that self-signed certificates are used between the ASA and the Cisco UMA server.

Prerequisites

Export the Cisco UMA server certificate and keypair in PKCS-12 format so that you can import it onto the ASA. The certificate will be used during the handshake with the Cisco UMA clients.

Step 1 Create the static NAT for the Cisco UMA server by entering the following command:

```
hostname(config)# static (real_ifc,mapped_ifc) mapped_ip real_ip netmask mask
```

Step 2 Import the Cisco UMA server certificate onto the ASA by entering the following commands:

```
hostname(config)# crypto ca import trustpoint pkcs12 passphrase
[paste base 64 encoded pkcs12]
hostname(config)# quit
```

Step 3 Install the Cisco UMA server certificate on the ASA. See Installing the Cisco UMA Server Certificate, page 48-7.

Step 4 Create the TLS proxy instance for the Cisco UMA clients connecting to the Cisco UMA server. See Creating the TLS Proxy Instance, page 48-8.

Step 5 Enable the TLS proxy for MMP inspection. See Enabling the TLS Proxy for MMP Inspection, page 48-9.

Installing the Cisco UMA Server Certificate

Install the Cisco UMA server self-signed certificate in the ASA truststore. This task is necessary for the ASA to authenticate the Cisco UMA server during the handshake between the ASA proxy and Cisco UMA server.

Prerequisites

Export the Cisco UMA server certificate and keypair in PKCS-12 format so that you can import it onto the ASA.

	Command	Purpose

Step 1	`hostname(config)# crypto ca trustpoint trustpoint_name`
	Example:
	`hostname(config)# crypto ca trustpoint cuma_server`
		Enters the trustpoint configuration mode for the specified trustpoint so that you can create the trustpoint for the Cisco UMA server.
		A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA.

Step 2	`hostname(config-ca-trustpoint)# enrollment terminal`	Specifies cut and paste enrollment with this trustpoint (also known as manual enrollment).
Step 3	`hostname(config-ca-trustpoint)# exit`	Exits from the CA Trustpoint configuration mode.
Step 4		Installs and authenticates the CA certificates associated with a trustpoint created for the Cisco UMA server. Where *trustpoint* specifies the trustpoint from which to obtain the CA certificate. Maximum name length is 128 characters. The ASA prompts you to paste the base-64 formatted CA certificate onto the terminal.

Step 4

```
hostname(config)# crypto ca authenticate trustpoint
Example:
hostname(config)# crypto ca authenticate cuma_server
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line
by itself

  [ certificate data omitted ]

Certificate has the following attributes:
Fingerprint: 21B598D5 4A81F3E5 0B24D12E 3F89C2E4
% Do you accept this certificate? [yes/no]: yes
Trustpoint CA certificate accepted.
% Certificate successfully imported
hostname(config)#
```

What to Do Next

Once you have created the trustpoints and installed the Cisco UMA certificate on the ASA, create the TLS proxy instance. See Creating the TLS Proxy Instance, page 48-8.

Creating the TLS Proxy Instance

Create a TLS proxy instance for the Cisco UMA clients connecting to the Cisco UMA server.

Prerequisites

Before you can create the TLS proxy instance, you must have installed the Cisco UMA server self-signed certificate in the ASA truststore.

	Command	Purpose

Step 1	`hostname(config)# tls-proxy proxy_name`
	Example:
	`tls-proxy cuma_tlsproxy`
		Creates the TLS proxy instance.

Step 2	`hostname(config-tlsp)# server trust-point proxy_name`
	Example:
	`hostname(config-tlsp)# server trust-point cuma_proxy`
		Specifies the proxy trustpoint certificate presented during TLS handshake.
		The certificate must be owned by the ASA (identity certificate).

	Command	Purpose
Step 3	hostname(config-tlsp)# **client trust-point** *proxy_name* **Example:** hostname(config-tlsp)# client trust-point cuma_proxy	Specifies the trustpoint and associated certificate that the ASA uses in the TLS handshake when the ASA assumes the role of the TLS client. The certificate must be owned by the ASA (identity certificate).
Step 4	hostname(config-tlsp)# **no server authenticate-client**	Disables client authentication. Disabling TLS client authentication is required when the ASA must interoperate with a Cisco UMA client or clients such as a Web browser that are incapable of sending a client certificate.
Step 5	hostname(config-tlsp)# **client cipher-suite** *cipher_suite* **Example:** hostname(config-tlsp)# client cipher-suite aes128-sha1 aes256-sha1	Specifies cipher suite configuration. For client proxy (the proxy acts as a TLS client to the server), the user-defined cipher suite replaces the default cipher suite.

What to Do Next

Once you have created the TLS proxy instance, enable it for MMP inspection. See Enabling the TLS Proxy for MMP Inspection, page 48-9.

Enabling the TLS Proxy for MMP Inspection

Cisco UMA client and server communications can be proxied via TLS, which decrypts the data, passes it to the inspect MMP module, and re-encrypt the data before forwarding it to the endpoint. The inspect MMP module verifies the integrity of the MMP headers and passes the OML/HTTP to an appropriate handler.

	Command	Purpose
Step 1	hostname(config)# **class-map** *class_map_name* **Example:** hostname(config)# class-map cuma_tlsproxy	Configures the class of traffic to inspect. Traffic between the Cisco UMA server and client uses MMP and is handled by MMP inspection. Where *class_map_name* is the name of the MMP class map.
Step 2	hostname(config-cmap)# **match port tcp eq** *port* **Example:** hostname(config-cmap)# match port tcp eq 5443	Matches the TCP port to which you want to apply actions for MMP inspection. The TCP/TLS default port for MMP inspection is 5443.
Step 3	hostname(config-cmap)# **exit**	Exits from the Class Map configuration mode.
Step 4	hostname(config)# **policy-map** *name* **Example:** hostname(config)# policy-map global_policy	Configures the policy map and attaches the action to the class of traffic.
Step 5	hostname(config-pmap)# **class** *classmap-name* **Example:** hostname(config-pmap)# class cuma_proxy	Assigns a class map to the policy map so that you can assign actions to the class map traffic. Where *classmap_name* is the name of the Skinny class map.

	Command	Purpose

Step 6	`hostname(config-pmap)#` **`inspect mmp tls-proxy`** *`proxy_name`*
	`Example:`
	`hostname(config-pmap)# inspect mmp tls-proxy cuma_proxy`
		Enables SCCP (Skinny) application inspection and enables the phone proxy for the specified inspection session.

Step 7	`hostname(config-pmap)#` **`exit`**	Exits from the Policy Map configuration mode.

Step 8	`hostname(config)#` **`service-policy`** *`policy_map_name`* **`global`**
	`Example:`
	`service-policy global_policy global`
		Enables the service policy on all interfaces.

Monitoring for Cisco Mobility Advantage Proxy

Mobility proxy can be debugged the same way as IP Telephony. You can enable TLS proxy debug flags along with SSL syslogs to debug TLS proxy connection problems.

For example, using the following commands to enable TLS proxy-related debugging and syslog output only:

```
hostname# debug inspect tls-proxy events
hostname# debug inspect tls-proxy errors
hostname# config terminal
hostname(config)# logging enable
hostname(config)# logging timestamp
hostname(config)# logging list loglist message 711001
hostname(config)# logging list loglist message 725001-725014
hostname(config)# logging list loglist message 717001-717038
hostname(config)# logging buffer-size 1000000
hostname(config)# logging buffered loglist
hostname(config)# logging debug-trace
```

For information about TLS proxy debugging techniques and sample output, see the Monitoring the TLS Proxy, page 47-14.

Enable the **debug mmp** command for MMP inspection engine debugging:

```
MMP:: received 60 bytes from outside:1.1.1.1/2000 to inside:2.2.2.2/5443
MMP:: version OLWP-2.0
MMP:: forward 60/60 bytes from outside:1.1.1.1/2000 to inside:2.2.2.2/5443
MMP:: received 100 bytes from inside:2.2.2.2/5443 to outside:1.1.1.1/2000
MMP:: session-id: ABCD_1234
MMP:: status: 201
MMP:: forward 100/100 bytes from inside:2.2.2.2/5443 to outside 1.1.1.1/2000
MMP:: received 80 bytes from outside:1.1.1.1/2000 to inside:2.2.2.2/5443
MMP:: content-type: http/1.1
MMP:: content-length: 40
```

You can also capture the raw and decrypted data by the TLS proxy by entering the following commands:

```
hostname# capture mycap interface outside (capturing raw packets)
hostname# capture mycap-dec type tls-proxy interface outside (capturing decrypted data)
hostname# show capture capture_name
hostname# copy /pcap capture:capture_name tftp://tftp_location
```

Configuration Examples for Cisco Mobility Advantage

- Example 1: Cisco UMC/Cisco UMA Architecture – Security Appliance as Firewall with TLS Proxy and MMP Inspection, page 48-11
- Example 2: Cisco UMC/Cisco UMA Architecture – Security Appliance as TLS Proxy Only, page 48-12

This section describes sample configurations that apply to two deployment scenarios for the TLS proxy used by the Cisco Mobility Advantage solution—scenario 1 where the ASA functions as both the firewall and TLS proxy and scenario 2 where the ASA functions as the TLS proxy only. In both scenarios, the clients connect from the Internet.

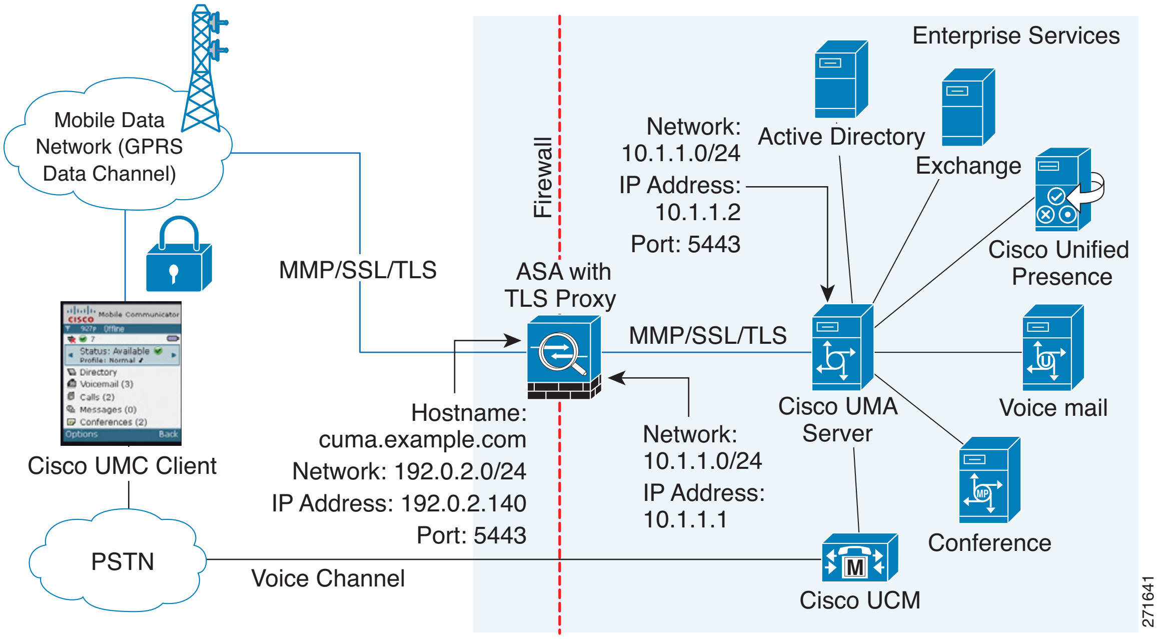
In the samples, you export the Cisco UMA server certificate and key-pair in PKCS-12 format and import it to the ASA. The certificate will be used during handshake with the Cisco UMA clients.

Installing the Cisco UMA server self-signed certificate in the ASA truststore is necessary for the ASA to authenticate the Cisco UMA server during handshake between the ASA proxy and Cisco UMA server. You create a TLS proxy instance for the Cisco UMA clients connecting to the Cisco UMA server. Lastly, you must enable TLS proxy for MMP inspection.

Example 1: Cisco UMC/Cisco UMA Architecture – Security Appliance as Firewall with TLS Proxy and MMP Inspection

As shown in Figure 48-6 (scenario 1—the recommended architecture), the ASA functions as both the firewall and TLS proxy. In the scenario 1 deployment, the ASA is between a Cisco UMA client and a Cisco UMA server. In this scenario, the ASA performs static NAT by translating the Cisco UMA server 10.1.1.2 IP address to 192.0.2.140.

Figure 48-6 Cisco UMC/Cisco UMA Architecture – Scenario 1: Security Appliance as Firewall with TLS Proxy and MMP Inspection



```
static (inside,outside) 192.0.2.140 10.1.1.2 netmask 255.255.255.255
```

```
crypto ca import cuma_proxy pkcs12 sample_passphrase
    <cut-paste base 64 encoded pkcs12 here>
    quit
! for CUMA server’s self-signed certificate
crypto ca trustpoint cuma_server
    enrollment terminal
crypto ca authenticate cuma_server
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself
MIIDRTCCAu+gAwIBAgIQKVcqP/KW74VP0NZzL+JbRTANBgkqhkiG9w0BAQUFADCB
    [ certificate data omitted ]
/7QEM8izy0EOTSErKu7Nd76jwf5e4qttkQ==
quit
tls-proxy cuma_proxy
    server trust-point cuma_proxy
    no server authenticate-client
    client cipher-suite aes128-sha1 aes256-sha1
class-map cuma_proxy
    match port tcp eq 5443
policy-map global_policy
    class cuma_proxy
        inspect mmp tls-proxy cuma_proxy
service-policy global_policy global
```

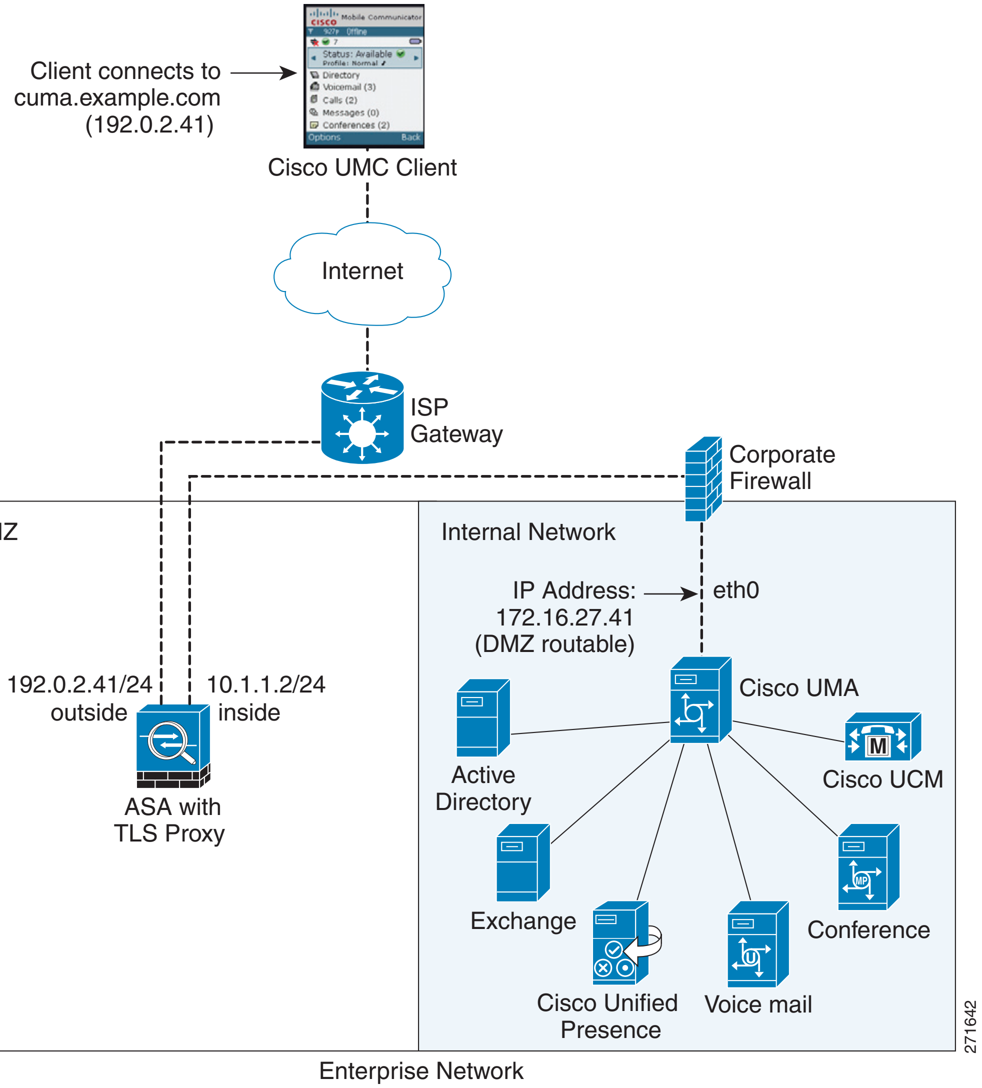
Example 2: Cisco UMC/Cisco UMA Architecture – Security Appliance as TLS Proxy Only

As shown in Figure 48-7 (scenario 2), the ASA functions as the TLS proxy only and works with an existing firewall. The ASA and the corporate firewall are performing NAT. The corporate firewall will not be able to predict which client from the Internet needs to connect to the corporate Cisco UMA server. Therefore, to support this deployment, you can take the following actions:

- Set up a NAT rule for inbound traffic that translates the destination IP address 192.0.2.41 to 172.16.27.41.
- Set up an interface PAT rule for inbound traffic translating the source IP address of every packet so that the corporate firewall does not need to open up a wildcard pinhole. The Cisco UMA server receives packets with the source IP address 67.11.12.183.

```
hostname(config)# nat (outside) 1 0.0.0.0 0.0.0.0 outside
hostname(config)# global (inside) 1 10.1.1.2 netmask 255.255.255.255
```

Figure 48-7 Cisco UMC/Cisco UMA Architecture – Scenario 2: Security Appliance as TLS Proxy Only



```
static (inside,outside) 192.0.2.41 172.16.27.41 netmask 255.255.255.255
nat (outside) 1 0.0.0.0 0.0.0.0 outside
global (inside) 1 10.1.1.2 netmask 255.255.255.255
crypto ca import cuma_proxy pkcs12 sample_passphrase
    <cut-paste base 64 encoded pkcs12 here>
    quit
! for CUMA server’s self-signed certificate
crypto ca trustpoint cuma_server
    enrollment terminal
crypto ca authenticate cuma_server
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself
MIIDRTCCAu+gAwIBAgIQKVcqP/KW74VP0NZzL+JbRTANBgkqhkiG9w0BAQUFADCB
    [ certificate data omitted ]
/7QEM8izy0EOTSErKu7Nd76jwf5e4qttkQ==
quit
tls-proxy cuma_proxy
    server trust-point cuma_proxy
    no server authenticate-client
    client cipher-suite aes128-sha1 aes256-sha1
class-map cuma_proxy
    match port tcp eq 5443
policy-map global_policy
    class cuma_proxy
        inspect mmp tls-proxy cuma_proxy
service-policy global_policy global
```

Feature History for Cisco Mobility Advantage

Table 48-2 lists the release history for this feature.

Table 48-2 Feature History for Cisco Phone Proxy

Feature Name	Releases	Feature Information
Cisco Mobility Advantage Proxy	8.0(4)	The Mobility Advantage proxy feature was introduced, which included the following new commands: • **inspect mmp tls-proxy** • **debug mmp**
Licensing for Cisco Mobility Advantage Proxy	8.2(2)	The Cisco Unified Communications proxy features (Cisco Phone Proxy, TLS proxy for encrypted voice inspection, and the Cisco Presence Federation Proxy) supported by the ASA require a Unified Communications Proxy license. However, in Version 8.2(2) and later, the Mobility Advantage proxy no longer requires a Unified Communications Proxy license.

CHAPTER 49

Configuring Cisco Unified Presence

This chapter describes how to configure the adaptive security appliance for Cisco Unified Presence.

This chapter includes the following sections:

- Information About Cisco Unified Presence, page 49-1
- Licensing for Cisco Unified Presence, page 49-4
- Configuring Cisco Unified Presence, page 49-5
- Monitoring Cisco Unified Presence, page 49-10
- Configuration Example for Cisco Unified Presence, page 49-11
- Feature History for Cisco Unified Presence, page 49-13

Information About Cisco Unified Presence

This section includes the following topics:

- Architecture for Cisco Unified Presence, page 49-1
- Trust Relationship in the Presence Federation, page 49-3
- Security Certificate Exchange Between Cisco UP and the Security Appliance, page 49-4

Architecture for Cisco Unified Presence

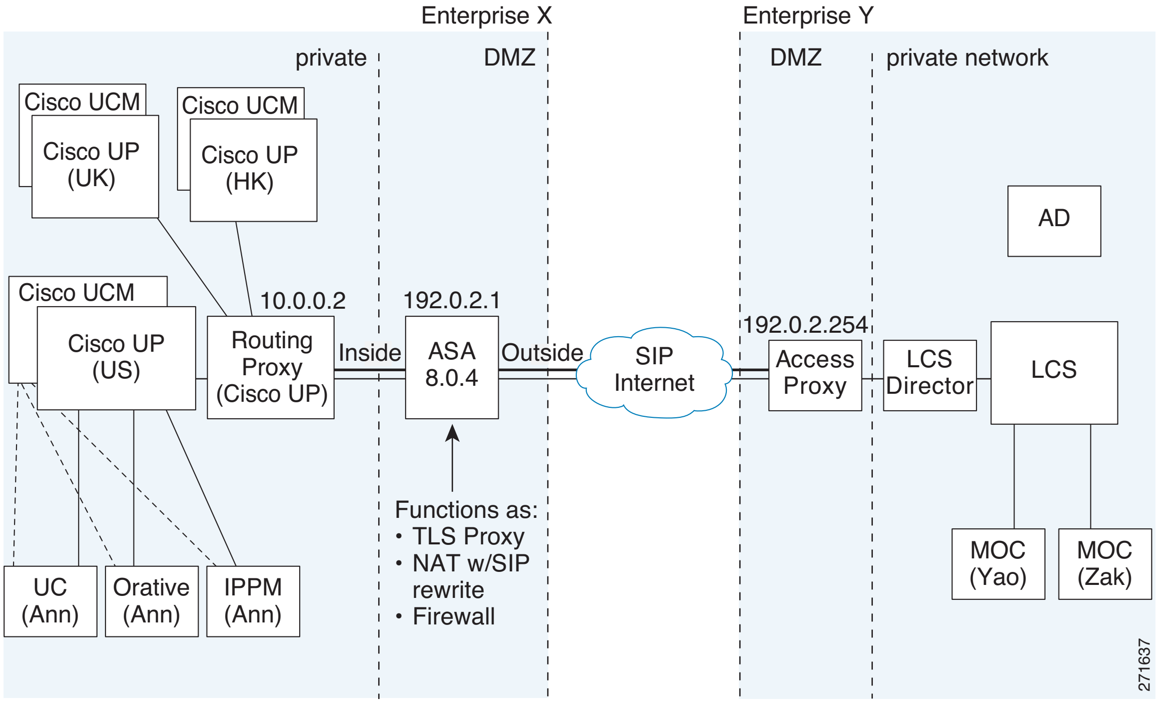
Figure 49-1 depicts a Cisco Unified Presence/LCS Federation scenario with the ASA as the presence federation proxy (implemented as a TLS proxy). The two entities with a TLS connection are the "Routing Proxy" (a dedicated Cisco UP) in Enterprise X and the Microsoft Access Proxy in Enterprise Y. However, the deployment is not limited to this scenario. Any Cisco UP or Cisco UP cluster could be deployed on the left side of the ASA; the remote entity could be any server (an LCS, an OCS, or another Cisco UP).

The following architecture is generic for two servers using SIP (or other ASA inspected protocols) with a TLS connection.

Entity X: Cisco UP/Routing Proxy in Enterprise X

Entity Y: Microsoft Access Proxy/Edge server for LCS/OCS in Enterprise Y

Figure 49-1 Typical Cisco Unified Presence/LCS Federation Scenario



In the above architecture, the ASA functions as a firewall, NAT, and TLS proxy, which is the recommended architecture. However, the ASA can also function as NAT and the TLS proxy alone, working with an existing firewall.

Either server can initiate the TLS handshake (unlike IP Telephony or Cisco Unified Mobility, where only the clients initiate the TLS handshake). There are by-directional TLS proxy rules and configuration. Each enterprise can have an ASA as the TLS proxy.

In Figure 49-1, NAT or PAT can be used to hide the private address of Entity X. In this situation, static NAT or PAT must be configured for foreign server (Entity Y) initiated connections or the TLS handshake (inbound). Typically, the public port should be 5061. The following static PAT command is required for the Cisco UP that accepts inbound connections:

```
hostname(config)# static (inside,outside) tcp 192.0.2.1 5061 10.0.0.2 5061 netmask
255.255.255.255
```

The following static PAT must be configured for each Cisco UP that could initiate a connection (by sending SIP SUBSCRIBE) to the foreign server.

For Cisco UP with the address 10.0.0.2, enter the following command:

```
hostname(config)# static (inside,outside) tcp 192.0.2.1 5062 10.0.0.2 5062 netmask
255.255.255.255
hostname(config)# static (inside,outside) udp 192.0.2.1 5070 10.0.0.2 5070 netmask
255.255.255.255
hostname(config)# static (inside,outside) tcp 192.0.2.1 5060 10.0.0.2 5060 netmask
255.255.255.255
```

For another Cisco UP with the address 10.0.0.3, you must use a different set of PAT ports, such as 45062 or 45070:

```
hostname(config)# static (inside,outside) tcp 192.0.2.1 45061 10.0.0.3 5061 netmask
255.255.255.255
```

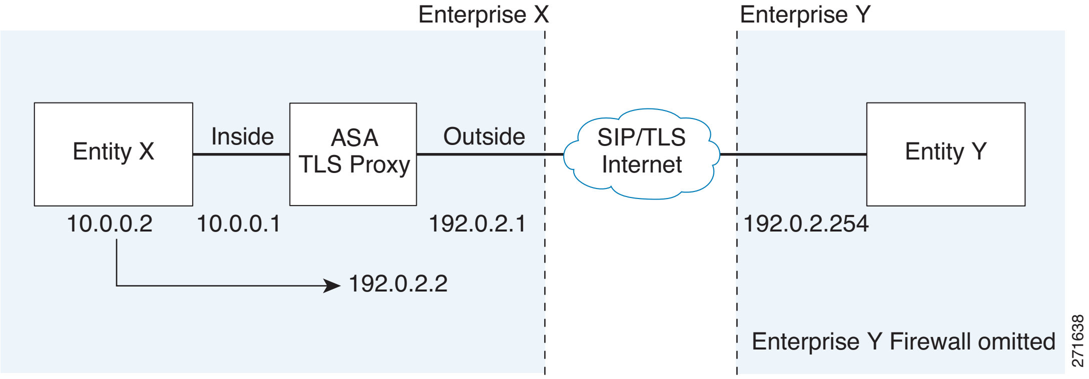
```
hostname(config)# static (inside,outside) tcp 192.0.2.1 45062 10.0.0.3 5062 netmask
255.255.255.255
hostname(config)# static (inside,outside) udp 192.0.2.1 45070 10.0.0.3 5070 netmask
255.255.255.255
hostname(config)# static (inside,outside) tcp 192.0.2.1 5070 10.0.0.2 5070 netmask
255.255.255.255
hostname(config)# static (inside,outside) tcp 192.0.2.1 45060 10.0.0.3 5060 netmask
255.255.255.255
```

Dynamic NAT or PAT can be used for the rest of the outbound connections or the TLS handshake. The ASA SIP inspection engine takes care of the necessary translation (fixup).

```
hostname(config)# global (outside) 102 192.0.2.1 netmask 255.255.255.255
hostname(config)# nat (inside) 102 0.0.0.0 0.0.0.0
```

Figure 49-2 illustrates an abstracted scenario with Entity X connected to Entity Y through the presence federation proxy on the ASA. The proxy is in the same administrative domain as Entity X. Entity Y could have another ASA as the proxy but this is omitted for simplicity.

Figure 49-2 Abstracted Presence Federation Proxy Scenario between Two Server Entities



For the Entity X domain name to be resolved correctly when the ASA holds its credential, the ASA could be configured to perform NAT for Entity X, and the domain name is resolved as the Entity X public address for which the ASA provides proxy service.

Trust Relationship in the Presence Federation

Within an enterprise, setting up a trust relationship is achievable by using self-signed certificates or you can set it up on an internal CA.

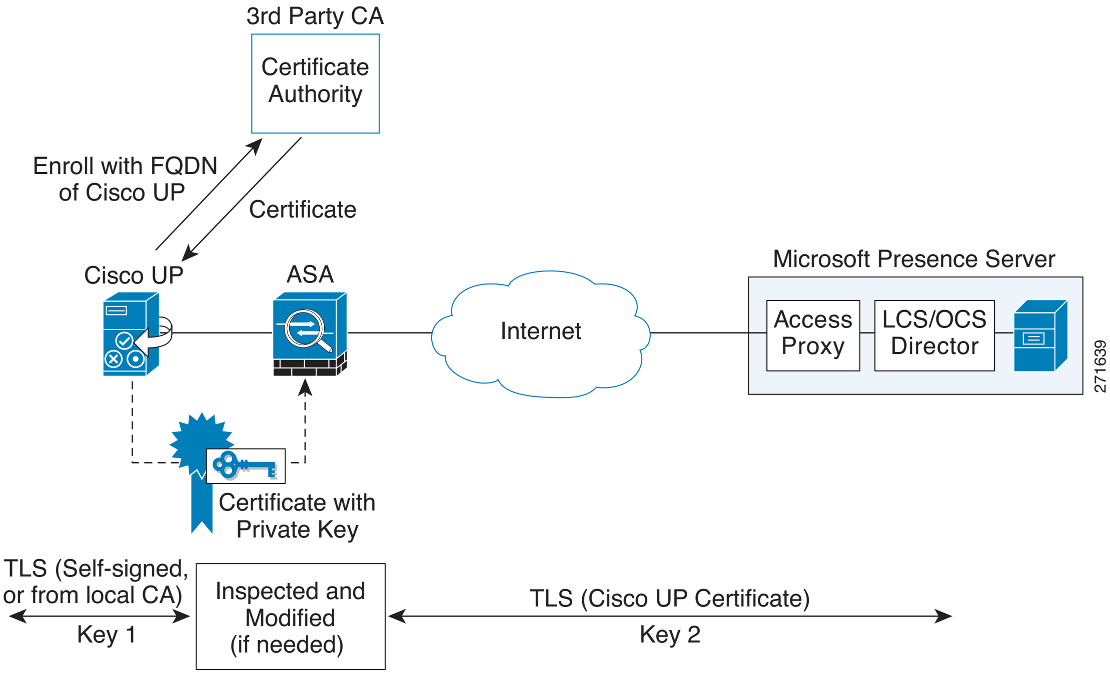
Establishing a trust relationship cross enterprises or across administrative domains is key for federation. Cross enterprises you must use a trusted third-party CA (such as, VeriSign). The ASA obtains a certificate with the FQDN of the Cisco UP (certificate impersonation).

For the TLS handshake, the two entities could validate the peer certificate via a certificate chain to trusted third-party certificate authorities. Both entities enroll with the CAs. The ASA as the TLS proxy must be trusted by both entities. The ASA is always associated with one of the enterprises. Within that enterprise (Enterprise X in Figure 49-1), the entity and the ASA could authenticate each other via a local CA, or by using self-signed certificates.

To establish a trusted relationship between the ASA and the remote entity (Entity Y), the ASA can enroll with the CA on behalf of Entity X (Cisco UP). In the enrollment request, the Entity X identity (domain name) is used.

Figure 49-3 shows the way to establish the trust relationship. The ASA enrolls with the third party CA by using the Cisco UP FQDN as if the ASA is the Cisco UP.

Figure 49-3 How the Security Appliance Represents Cisco Unified Presence – Certificate Impersonate


3rd Party CA
Certificate Authority
Enroll with FQDN of Cisco UP
Certificate
Cisco UP
ASA
Internet
Microsoft Presence Server
Access Proxy
LCS/OCS Director
271639
Certificate with Private Key
TLS (Self-signed, or from local CA)
Key 1
Inspected and Modified (if needed)
TLS (Cisco UP Certificate)
Key 2

Security Certificate Exchange Between Cisco UP and the Security Appliance

You need to generate the keypair for the certificate (such as `cup_proxy_key`) used by the ASA, and configure a trustpoint to identify the self-signed certificate sent by the ASA to Cisco UP (such as `cup_proxy`) in the TLS handshake.

For the ASA to trust the Cisco UP certificate, you need to create a trustpoint to identify the certificate from the Cisco UP (such as `cert_from_cup`), and specify the enrollment type as terminal to indicate that you will paste the certificate received from the Cisco UP into the terminal.

Licensing for Cisco Unified Presence

The Cisco Unified Presence feature supported by the ASA require a Unified Communications Proxy license.

The Cisco Unified Presence feature is licensed by TLS session. For the federation proxy, each endpoint utilizes one Unified Communications Proxy session.

Table 49-1 shows the Unified Communications Proxy license details by platform.

Table 49-1 License Requirements for the Security Appliance

Security Appliance Platform	Max UC Proxy Licenses	Tiers for UC Proxy Licenses
ASA 5505	24	24
ASA 5510	100	24, 50, 100
ASA 5520	1,000	24, 50, 100, 250, 500, 750, 1000
ASA 5540	2,000	24, 50, 100, 250, 500, 750, 1000, 2000
ASA 5550	3,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000
ASA 5580	10,000	24, 50, 100, 250, 500, 750, 1000, 2000, 3000, 5000, 10000

A Unified Communications Proxy license is applied the same way as other licensed features (such as, SSL VPN), via the **activation-key** command. For more information about licensing, see Chapter 3, "Managing Feature Licenses."

Configuring Cisco Unified Presence

This section contains the following topics:

- Task Flow for Configuring Cisco Unified Presence, page 49-5
- Creating Trustpoints and Generating Certificates, page 49-6
- Installing Certificates, page 49-7
- Creating the TLS Proxy Instance, page 49-8
- Enabling the TLS Proxy for SIP Inspection, page 49-9

Task Flow for Configuring Cisco Unified Presence

To configure a Cisco Unified Presence/LCS Federation scenario with the ASA as the TLS proxy where there is a single Cisco UP that is in the local domain and self-signed certificates are used between the Cisco UP and the ASA (like the scenario shown in Figure 49-1), perform the following tasks.

Step 1 Create the following static NAT for the local domain containing the Cisco UP.

For the inbound connection to the local domain containing the Cisco UP, create static PAT by entering the following command:

```
hostname(config)# static (real_ifc,mapped_ifc) tcp mapped_ip mapped_port netmask mask
```

Note For each Cisco UP that could initiate a connection (by sending SIP SUBSCRIBE) to the foreign server, you must also configure static PAT by using a different set of PAT ports.

For outbound connections or the TLS handshake, use dynamic NAT or PAT. The ASA SIP inspection engine takes care of the necessary translation (fixup).

```
hostname(config)# global (mapped_ifc) nat_id mapped_ip netmask mask
hostname(config)# nat (real_ifc) nat_id real_ip mask
```

Step 2 Create the necessary RSA keypairs and proxy certificate, which is a self-signed certificate, for the remote entity. See Creating Trustpoints and Generating Certificates, page 49-6.

Step 3 Install the certificates. See Installing Certificates, page 49-7.

Step 4 Create the TLS proxy instance for the Cisco UP clients connecting to the Cisco UP server. See Creating the TLS Proxy Instance, page 49-8.

Step 5 Enable the TLS proxy for SIP inspection. See Enabling the TLS Proxy for SIP Inspection, page 49-9.

Creating Trustpoints and Generating Certificates

You need to generate the keypair for the certificate (such as `cup_proxy_key`) used by the ASA, and configure a trustpoint to identify the self-signed certificate sent by the ASA to Cisco UP (such as `cup_proxy`) in the TLS handshake.

	Command	Purpose
Step 1	hostname(config)# **crypto key generate rsa label** *key-pair-label* **modulus** *size* **Example:** crypto key generate rsa label ent_y_proxy_key modulus 1024 INFO: The name for the keys will be: ent_y_proxy_key Keypair generation process begin. Please wait... hostname(config)#	Creates the RSA keypair that can be used for the trustpoints. The keypair is used by the self-signed certificate presented to the local domain containing the Cisco UP (proxy for the remote entity).
Step 2	hostname(config)# **crypto ca trustpoint** *trustpoint_name* **Example:** hostname(config)# crypto ca trustpoint ent_y_proxy	Enters the trustpoint configuration mode for the specified trustpoint so that you can create the trustpoint for the remote entity. A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA.
Step 3	hostname(config-ca-trustpoint)# **enrollment self**	Generates a self-signed certificate.
Step 4	hostname(config-ca-trustpoint)# **fqdn none**	Specifies not to include a fully qualified domain name (FQDN) in the Subject Alternative Name extension of the certificate during enrollment.
Step 5	hostname(config-ca-trustpoint)# **subject-name** *X.500_name* **Example:** hostname(config-ca-trustpoint)# subject-name cn=Ent-Y-Proxy	Includes the indicated subject DN in the certificate during enrollment
Step 6	hostname(config-ca-trustpoint)# **keypair** *keyname* **Example:** hostname(config-ca-trustpoint)# keypair ent_y_proxy_key	Specifies the key pair whose public key is to be certified.
Step 7	hostname(config-ca-trustpoint)# **exit**	Exits from the CA Trustpoint configuration mode.
Step 8	hostname(config)# **crypto ca enroll** *trustpoint* **Example:** hostname(config)# crypto ca enroll ent_y_proxy	Starts the enrollment process with the CA and specifies the name of the trustpoint to enroll with.

What to Do Next

Install the certificate on the local entity truststore. You could also enroll the certificate with a local CA trusted by the local entity. See Installing Certificates, page 49-7.

Installing Certificates

Export the self-signed certificate for the ASA created in Creating Trustpoints and Generating Certificates, page 49-6 and install it as a trusted certificate on the local entity. This task is necessary for local entity to authenticate the ASA.

Prerequisites

To create a proxy certificate on the ASA that is trusted by the remote entity, obtain a certificate from a trusted CA. For information about obtaining a certificate from a trusted CA, see Configuring Digital Certificates, page 73-8.

	Command	Purpose

Step 1	`hostname(config)# crypto ca export trustpoint identity-certificate`
	Example:
	`hostname(config)# crypto ca export ent_y_proxy identity-certificate`
		Export the ASA self-signed (identity) certificate.

Step 2	`hostname(config)# crypto ca trustpoint trustpoint_name`
	Example:
	`hostname(config)# crypto ca trustpoint ent_x_cert`
	`! for Entity X's self-signed certificate`
		Enters the trustpoint configuration mode for the specified trustpoint so that you can create the trustpoint for the local entity.
		A trustpoint represents a CA identity and possibly a device identity, based on a certificate issued by the CA.

Step 3	`hostname(config-ca-trustpoint)# enrollment terminal`	Specifies cut and paste enrollment with this trustpoint (also known as manual enrollment). If the local entity uses a self-signed certificate, the self-signed certificate must be installed; if the local entity uses a CA-issued certificate, the CA certificate needs to be installed. This configuration shows the commands for using a self-signed certificate.
Step 4	`hostname(config-ca-trustpoint)# exit`	Exits from the CA Trustpoint configuration mode.
Step 5		Installs and authenticates the CA certificates associated with a trustpoint created for the local entity. Where *trustpoint* specifies the trustpoint from which to obtain the CA certificate. Maximum name length is 128 characters. The ASA prompts you to paste the base-64 formatted CA certificate onto the terminal.

Step 5

```
hostname(config)# crypto ca authenticate trustpoint
Example:
hostname(config)# crypto ca authenticate ent_x_cert
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line
by itself
    [ certificate data omitted ]
Certificate has the following attributes:
Fingerprint: 21B598D5 4A81F3E5 0B24D12E 3F89C2E4
% Do you accept this certificate? [yes/no]: yes
Trustpoint CA certificate accepted.
% Certificate successfully imported
```

Step 6

```
hostname(config)# crypto ca trustpoint
trustpoint_name
Example:
hostname(config)# crypto ca trustpoint ent_y_ca
! for Entity Y's CA certificate
```

Install the CA certificate that signs the remote entity certificate on the ASA by entering the following commands. This step is necessary for the ASA to authenticate the remote entity.

Step 7

```
hostname(config-ca-trustpoint)# enrollment terminal
```

Specifies cut and paste enrollment with this trustpoint (also known as manual enrollment).

Step 8

```
hostname(config-ca-trustpoint)# exit
```

Exits from the CA Trustpoint configuration mode.

Step 9

```
hostname(config)# crypto ca authenticate trustpoint
Example:
hostname(config)# crypto ca authenticate ent_y_ca
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line
by itself
MIIDRTCCAu+gAwIBAgIQKVcqP/KW74VP0NZzL+JbRTANBgkqhkiG
9w0BAQUFADCB
    [ certificate data omitted ]
/7QEM8izy0EOTSErKu7Nd76jwf5e4qttkQ==
```

Installs and authenticates the CA certificates associated with a trustpoint created for the local entity.

The ASA prompts you to paste the base-64 formatted CA certificate onto the terminal.

What to Do Next

Once you have created the trustpoints and installed the certificates for the local and remote entities on the ASA, create the TLS proxy instance. See Creating the TLS Proxy Instance, page 49-8.

Creating the TLS Proxy Instance

Because either server can initiate the TLS handshake (unlike IP Telephony or Cisco Unified Mobility, where only the clients initiate the TLS handshake), you must configure by-directional TLS proxy rules. Each enterprise can have an ASA as the TLS proxy.

Create TLS proxy instances for the local and remote entity initiated connections respectively. The entity that initiates the TLS connection is in the role of "TLS client". Because the TLS proxy has a strict definition of "client" and "server" proxy, two TLS proxy instances must be defined if either of the entities could initiate the connection.

Step 1

```
! Local entity to remote entity
hostname(config)# tls-proxy proxy_name
Example:
hostname(config)# tls-proxy ent_x_to_y
```

Creates the TLS proxy instance.

Step 2

```
hostname(config-tlsp)# server trust-point proxy_name
Example:
hostname(config-tlsp)# server trust-point
ent_y_proxy
```

Specifies the proxy trustpoint certificate presented during TLS handshake.

The certificate must be owned by the ASA (identity certificate).

Where the *proxy_name* for the **server trust-point** command is the remote entity proxy name.

	Command	Purpose

Step 3	`hostname(config-tlsp)# client trust-point proxy_trustpoint`
	Example:
	`hostname(config-tlsp)# client trust-point ent_x_proxy`
		Specifies the trustpoint and associated certificate that the ASA uses in the TLS handshake when the ASA assumes the role of the TLS client.
		The certificate must be owned by the ASA (identity certificate).
		Where the *proxy_trustpoint* for the **client trust-point** command is the local entity proxy.

Step 4	`hostname(config-tlsp)# client cipher-suite cipher_suite`
	Example:
	`hostname(config-tlsp)# client cipher-suite aes128-sha1 aes256-sha1 3des-sha1 null-sha1`
		Specifies cipher suite configuration.
		For client proxy (the proxy acts as a TLS client to the server), the user-defined cipher suite replaces the default cipher suite.

Step 5	`! Remote entity to local entity`
	`hostname(config)# tls-proxy proxy_name`
	Example:
	`tls-proxy ent_y_to_x`
		Creates the TLS proxy instance.

Step 6	`hostname(config-tlsp)# server trust-point proxy_name`
	Example:
	`hostname(config-tlsp)# server trust-point ent_x_proxy`
		Specifies the proxy trustpoint certificate presented during TLS handshake.
		Where the *proxy_name* for the **server trust-point** command is the local entity proxy name

Step 7	`hostname(config-tlsp)# client trust-point proxy_trustpoint`
	Example:
	`hostname(config-tlsp)# client trust-point ent_y_proxy`
		Specifies the trustpoint and associated certificate that the ASA uses in the TLS handshake when the ASA assumes the role of the TLS client.
		Where the *proxy_trustpoint* for the **client trust-point** command is the remote entity proxy.

Step 8	`hostname(config-tlsp)# client cipher-suite cipher_suite`
	Example:
	`hostname(config-tlsp)# client cipher-suite aes128-sha1 aes256-sha1 3des-sha1 null-sha1`
		Specifies cipher suite configuration.

What to Do Next

Once you have created the TLS proxy instance, enable it for SIP inspection. See Enabling the TLS Proxy for SIP Inspection, page 49-9.

Enabling the TLS Proxy for SIP Inspection

Enable the TLS proxy for SIP inspection and define policies for both entities that could initiate the connection. For more information about SIP application inspection,

	Command	Purpose
Step 1	hostname(config)# **access-list** *id* **extended permit tcp host** *src_ip* **host** *dest_ip* **eq** *port* **Examples:** access-list ent_x_to_y extended permit tcp host 10.0.0.2 host 192.0.2.254 eq 5061 access-list ent_y_to_x extended permit tcp host 192.0.2.254 host 192.0.2.1 eq 5061	Adds an Access Control Entry. The access list is used to specify the class of traffic to inspect.
Step 2	hostname(config)# **class-map** *class_map_name* **Example:** hostname(config)# class-map ent_x_to_y	Configures the secure SIP class of traffic to inspect. Where *class_map_name* is the name of the SIP class map.
Step 3	hostname(config-cmap)# **match access-list** *access_list_name* **Example:** hostname(config-cmap)# match access-list ent_x_to_y	Identifies the traffic to inspect.
Step 4	hostname(config-cmap)# **exit**	Exits from Class Map configuration mode.
Step 5	hostname(config)# **policy-map type inspect sip** *policy_map_name* **Example:** hostname(config)# policy-map type inspect sip sip_inspect	Defines special actions for SIP inspection application traffic.
Step 6	hostname(config-pmap)# **parameters** ! SIP inspection parameters	Specifies the parameters for SIP inspection. Parameters affect the behavior of the inspection engine. The commands available in parameters configuration mode depend on the application.
Step 7	hostname(config-pmap)# **exit**	Exits from Policy Map configuration mode.
Step 8	hostname(config)# **policy-map** name **Example:** hostname(config)# policy-map global_policy	Configure the policy map and attach the action to the class of traffic.
Step 9	hostname(config-pmap)# **class** classmap*_name* **Example:** hostname(config-pmap)# class ent_x_to_y	Assigns a class map to the policy map so that you can assign actions to the class map traffic. Where *classmap_name* is the name of the SIP class map.
Step 10	hostname(config-pmap)# **inspect sip** *sip_map* **tls-proxy** *proxy_name* hostname(config-pmap)# inspect sip sip_inspect tls-proxy ent_x_to_y	Enables TLS proxy for the specified SIP inspection session.
Step 11	hostname(config-pmap)# **exit**	Exits from Policy Map configuration mode.
Step 12	hostname(config)# **service-policy** *policy_map_name* **global** **Example:** hostname(config)# service-policy global_policy global	Enables the service policy for SIP inspection for all interfaces.. Where name for the policy-map command is the name of the global policy map.

Monitoring Cisco Unified Presence

Debugging is similar to debugging TLS proxy for IP Telephony. You can enable TLS proxy debug flags along with SSL syslogs to debug TLS proxy connection problems.

For example, use the following commands to enable TLS proxy-related debug and syslog output only:

```
hostname(config)# debug inspect tls-proxy events
hostname(config)# debug inspect tls-proxy errors
hostname(config)# logging enable
hostname(config)# logging timestamp
hostname(config)# logging list loglist message 711001
hostname(config)# logging list loglist message 725001-725014
hostname(config)# logging list loglist message 717001-717038
hostname(config)# logging buffer-size 1000000
hostname(config)# logging buffered loglist
hostname(config)# logging debug-trace
```

For information about TLS proxy debugging techniques and sample output, see Monitoring the TLS Proxy, page 47-14.

Enable the **debug sip** command for SIP inspection engine debugging. See the *Cisco ASA 5500 Series Command Reference*.

Additionally, you can capture the raw and decrypted data by the TLS proxy by entering the following commands:

```
hostname# capture mycap interface outside (capturing raw packets)
hostname# capture mycap-dec type tls-proxy interface outside (capturing decrypted data)
hostname# show capture capture_name
hostname# copy /pcap capture:capture_name tftp://tftp_location
```

Configuration Example for Cisco Unified Presence

The following sample illustrates the necessary configuration for the ASA to perform TLS proxy for Cisco Unified Presence as shown in Figure 49-4. It is assumed that a single Cisco UP (Entity X) is in the local domain and self-signed certificates are used between Entity X and the ASA.

For each Cisco UP that could initiate a connection (by sending SIP SUBSCRIBE) to the foreign server, you must also configure static PAT and if you have another Cisco UP with the address (10.0.0.3 in this sample), it must use a different set of PAT ports (such as 45062 or 45070). Dynamic NAT or PAT can be used for outbound connections or TLS handshake. The ASA SIP inspection engine takes care of the necessary translation (fixup).

When you create the necessary RSA key pairs, a key pair is used by the self-signed certificate presented to Entity X (proxy for Entity Y). When you create a proxy certificate for Entity Y, the certificate is installed on the Entity X truststore. It could also be enrolled with a local CA trusted by Entity X.

Exporting the ASA self-signed certificate (ent_y_proxy) and installing it as a trusted certificate on Entity X is necessary for Entity X to authenticate the ASA. Exporting the Entity X certificate and installing it on the ASA is needed for the ASA to authenticate Entity X during handshake with X. If Entity X uses a self-signed certificate, the self-signed certificate must be installed; if Entity X uses a CA issued the certificate, the CA’s certificated needs to be installed.

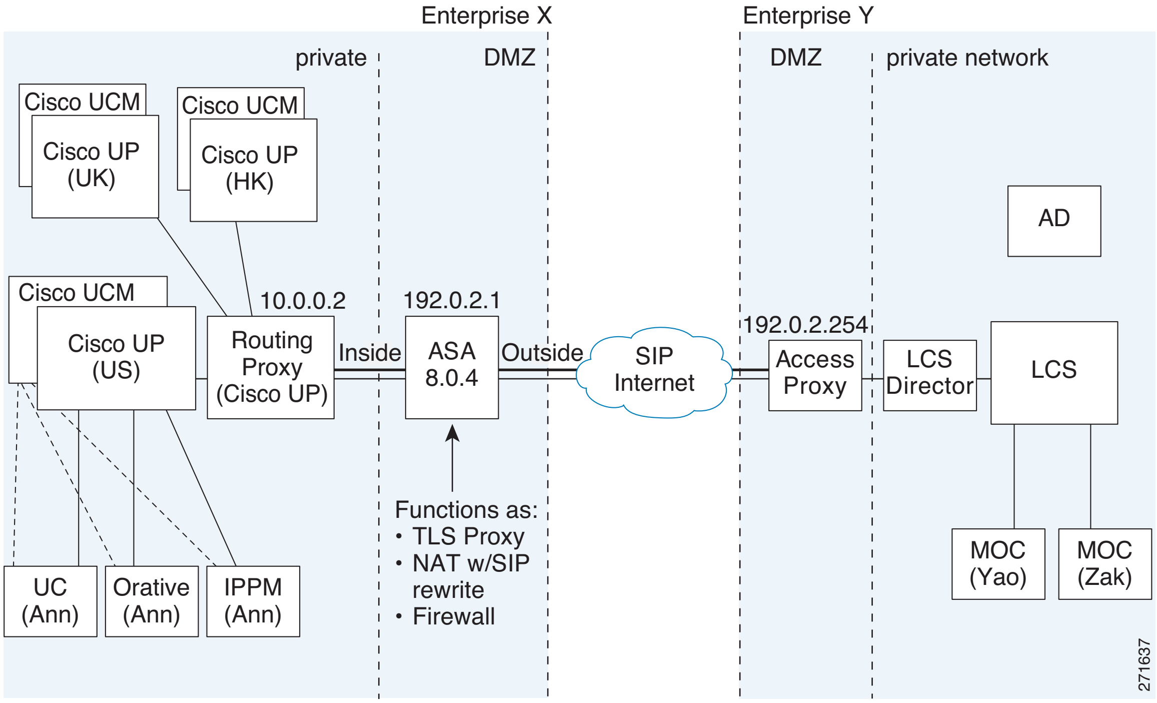
For about obtaining a certificate from a trusted CA, see Configuring Digital Certificates, page 73-8.

Installing the CA certificate that signs the Entity Y certificate on the ASA is necessary for the ASA to authenticate Entity Y.

When creating TLS proxy instances for Entity X and Entity Y, the entity that initiates the TLS connection is in the role of “TLS client”. Because the TLS proxy has strict definition of “client” and “server” proxy, two TLS proxy instances must be defined if either of the entities could initiate the connection.

When enabling the TLS proxy for SIP inspection, policies must be defined for both entities that could initiate the connection.

Figure 49-4 Typical Cisco Unified Presence/LCS Federation Scenario



```
static (inside,outside) tcp 192.0.2.1 5061 10.0.0.2 5061 netmask 255.255.255.255
static (inside,outside) tcp 192.0.2.1 5062 10.0.0.2 5062 netmask 255.255.255.255
static (inside,outside) udp 192.0.2.1 5070 10.0.0.2 5070 netmask 255.255.255.255
static (inside,outside) tcp 192.0.2.1 45062 10.0.0.3 5062 netmask 255.255.255.255
static (inside,outside) udp 192.0.2.1 45070 10.0.0.3 5070 netmask 255.255.255.255
global (outside) 102 192.0.2.1 netmask 255.255.255.255
nat (inside) 102 0.0.0.0 0.0.0.0
crypto key generate rsa label ent_y_proxy_key modulus 1024
    ! for self-signed Entity Y proxy certificate
crypto ca trustpoint ent_y_proxy
    enrollment self
    fqdn none
    subject-name cn=Ent-Y-Proxy
    keypair ent_y_proxy_key
crypto ca enroll ent_y_proxy
crypto ca export ent_y_proxy identity-certificate
! for Entity X's self-signed certificate
crypto ca trustpoint ent_x_cert
    enrollment terminal
crypto ca authenticate ent_x_cert
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself
    [ certificate data omitted ]
quit
! for Entity Y's CA certificate
crypto ca trustpoint ent_y_ca
    enrollment terminal
crypto ca authenticate ent_y_ca
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself
MIIDRTCCAu+gAwIBAgIQKVcqP/KW74VP0NZzL+JbRTANBgkqhkiG9w0BAQUFADCB
    [ certificate data omitted ]
/7QEM8izy0EOTSErKu7Nd76jwf5e4qttkQ==
quit
```

```
! Entity X to Entity Y
tls-proxy ent_x_to_y
    server trust-point ent_y_proxy
    client trust-point ent_x_proxy
    client cipher-suite aes128-sha1 aes256-sha1 3des-sha1 null-sha1
! Entity Y to Entity X
tls-proxy ent_y_to_x
    server trust-point ent_x_proxy
    client trust-point ent_y_proxy
    client cipher-suite aes128-sha1 aes256-sha1 3des-sha1 null-sha1
access-list ent_x_to_y extended permit tcp host 10.0.0.2 host 192.0.2.254 eq 5061
access-list ent_y_to_x extended permit tcp host 192.0.2.254 host 192.0.2.1 eq 5061
class-map ent_x_to_y
    match access-list ent_x_to_y
class-map ent_y_to_x
    match access-list ent_y_to_x
policy-map type inspect sip sip_inspect
    parameters
        ! SIP inspection parameters
policy-map global_policy
    class ent_x_to_y
        inspect sip sip_inspect tls-proxy ent_x_to_y
    class ent_y_to_x
        inspect sip sip_inspect tls-proxy ent_y_to_x
service-policy global_policy global
```

Feature History for Cisco Unified Presence

Table 49-2 lists the release history for this feature.

Table 49-2 Feature History for Cisco Phone Proxy

Feature Name	Releases	Feature Information
Cisco Unified Presence	8.0(4)	The Presence Federation Proxy feature was introduced.

PART 9

Configuring Advanced Connection Settings

CHAPTER 50

Configuring Threat Detection

This chapter describes how to configure threat detection statistics and scanning threat detection, and includes the following sections:

- Information About Threat Detection, page 50-1
- Configuring Basic Threat Detection Statistics, page 50-1
- Configuring Advanced Threat Detection Statistics, page 50-6
- Configuring Scanning Threat Detection, page 50-13
- Configuration Examples for Threat Detection, page 50-17

Information About Threat Detection

The threat detection feature consists of different levels of statistics gathering for various threats, as well as scanning threat detection, which determines when a host is performing a scan. You can optionally shun any hosts determined to be a scanning threat.

Threat detection statistics can help you manage threats to your ASA; for example, if you enable scanning threat detection, then viewing statistics can help you analyze the threat. You can configure two types of threat detection statistics:

- Basic threat detection statistics—include information about attack activity for the system as a whole. Basic threat detection statistics are enabled by default and have no performance impact.
- Advanced threat detection—statistics track activity at an object level, so the ASA can report activity for individual hosts, ports, protocols, or access lists. Advanced threat detection statistics can have a major performance impact, depending on the statistics gathered, so only the access list statistics are enabled by default.

Configuring Basic Threat Detection Statistics

Basic threat detection statistics include activity that might be related to an attack, such as a DoS attack.

This section includes the following topics:

- Information About Basic Threat Detection Statistics, page 50-2
- Guidelines and Limitations, page 50-2
- Default Settings, page 50-3

- Configuring Basic Threat Detection Statistics, page 50-4
- Monitoring Basic Threat Detection Statistics, page 50-5
- Feature History for Basic Threat Detection Statistics, page 50-6

Information About Basic Threat Detection Statistics

Using basic threat detection statistics, the ASA monitors the rate of dropped packets and security events due to the following reasons:

- Denial by access lists
- Bad packet format (such as invalid-ip-header or invalid-tcp-hdr-length)
- Connection limits exceeded (both system-wide resource limits, and limits set in the configuration)
- DoS attack detected (such as an invalid SPI, Stateful Firewall check failure)
- Basic firewall checks failed (This option is a combined rate that includes all firewall-related packet drops in this bulleted list. It does not include non-firewall-related drops such as interface overload, packets failed at application inspection, and scanning attack detected.)
- Suspicious ICMP packets detected
- Packets failed application inspection
- Interface overload
- Scanning attack detected (This option monitors scanning attacks; for example, the first TCP packet is not a SYN packet, or the TCP connection failed the 3-way handshake. Full scanning threat detection (see the "Configuring Scanning Threat Detection" section on page 50-13) takes this scanning attack rate information and acts on it by classifying hosts as attackers and automatically shunning them, for example.)
- Incomplete session detection such as TCP SYN attack detected or no data UDP session attack detected

When the ASA detects a threat, it immediately sends a system log message (733100). The ASA tracks two types of rates: the average event rate over an interval, and the burst event rate over a shorter burst interval. The burst rate interval is 1/30th of the average rate interval or 10 seconds, whichever is higher. For each received event, the ASA checks the average and burst rate limits; if both rates are exceeded, then the ASA sends two separate system messages, with a maximum of one message for each rate type per burst period.

Basic threat detection affects performance only when there are drops or potential threats; even in this scenario, the performance impact is insignificant.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Security Context Guidelines

- Supported in single mode only. Multiple mode is not supported.

Firewall Mode Guidelines

- Supported in routed and transparent firewall mode.

Types of Traffic Monitored

Only through-the-box traffic is monitored; to-the-box traffic is not included in threat detection.

Default Settings

Basic threat detection statistics are enabled by default.

Table 50-1 lists the default settings. You can view all these default settings using the **show running-config all threat-detection** command.

Table 50-1 Basic Threat Detection Default Settings

	Trigger Settings	
Packet Drop Reason	**Average Rate**	**Burst Rate**
• DoS attack detected • Bad packet format • Connection limits exceeded • Suspicious ICMP packets detected	100 drops/sec over the last 600 seconds.	400 drops/sec over the last 20 second period.
	80 drops/sec over the last 3600 seconds.	320 drops/sec over the last 120 second period.
Scanning attack detected	5 drops/sec over the last 600 seconds.	10 drops/sec over the last 20 second period.
	4 drops/sec over the last 3600 seconds.	8 drops/sec over the last 120 second period.
Incomplete session detected such as TCP SYN attack detected or no data UDP session attack detected (combined)	100 drops/sec over the last 600 seconds.	200 drops/sec over the last 20 second period.
	80 drops/sec over the last 3600 seconds.	160 drops/sec over the last 120 second period.
Denial by access lists	400 drops/sec over the last 600 seconds.	800 drops/sec over the last 20 second period.
	320 drops/sec over the last 3600 seconds.	640 drops/sec over the last 120 second period.
• Basic firewall checks failed • Packets failed application inspection	400 drops/sec over the last 600 seconds.	1600 drops/sec over the last 20 second period.
	320 drops/sec over the last 3600 seconds.	1280 drops/sec over the last 120 second period.
Interface overload	2000 drops/sec over the last 600 seconds.	8000 drops/sec over the last 20 second period.
	1600 drops/sec over the last 3600 seconds.	6400 drops/sec over the last 120 second period.

Configuring Basic Threat Detection Statistics

This section describes how to configure basic threat detection statistics, including enabling or disabling it and changing the default limits.

Detailed Steps

	Command	Purpose
Step 1	**threat-detection basic-threat** **Example:** `hostname(config)# threat-detection basic-threat`	Enables basic threat detection statistics (if you previously disabled it). Basic threat detection is enabled by default.
Step 2	**threat-detection rate** {**acl-drop** | **bad-packet-drop** | **conn-limit-drop** | **dos-drop** | **fw-drop** | **icmp-drop** | **inspect-drop** | **interface-drop** | **scanning-threat** | **syn-attack**} **rate-interval** *rate_interval* **average-rate** *av_rate* **burst-rate** *burst_rate* **Example:** `hostname(config)# threat-detection rate dos-drop rate-interval 600 average-rate 60 burst-rate 100`	(Optional) Changes the default settings for one or more type of event. For a description of each event type, see the "Information About Basic Threat Detection Statistics" section on page 50-2. When you use this command with the **scanning-threat** keyword, it is also used in the scanning threat detection feature (see the "Configuring Scanning Threat Detection" section). If you do not configure basic threat detection, you can still use this command with the **scanning-threat** keyword to configure the rate limits for scanning threat detection. You can configure up to three different rate intervals for each event type.

Monitoring Basic Threat Detection Statistics

To monitor basic threat detection statistics, perform one of the following tasks:

Command	Purpose
show threat-detection rate [**min-display-rate** *min_display_rate*] [**acl-drop** | **bad-packet-drop** | **conn-limit-drop** | **dos-drop** | **fw-drop** | **icmp-drop** | **inspect-drop** | **interface-drop** | **scanning-threat** | **syn-attack**]	Displays basic threat detection statistics. where the **min-display-rate** *min_display_rate* argument limits the display to statistics that exceed the minimum display rate in events per second. You can set the *min_display_rate* between 0 and 2147483647. For a description of each event type, see the "Information About Basic Threat Detection Statistics" section on page 50-2. The output shows the average rate in events/sec over two fixed time periods: the last 10 minutes and the last 1 hour. It also shows: the current burst rate in events/sec over the last completed burst interval, which is 1/30th of the average rate interval or 10 seconds, whichever is larger; the number of times the rates were exceeded (triggered); and the total number of events over the time periods. The security appliance stores the count at the end of each burst period, for a total of 30 completed burst intervals. The unfinished burst interval presently occurring is not included in the average rate. For example, if the average rate interval is 20 minutes, then the burst interval is 20 seconds. If the last burst interval was from 3:00:00 to 3:00:20, and you use the **show** command at 3:00:25, then the last 5 seconds are not included in the output. The only exception to this rule is if the number of events in the unfinished burst interval already exceeds the number of events in the oldest burst interval (#1 of 30) when calculating the total events. In that case, the ASA calculates the total events as the last 29 complete intervals, plus the events so far in the unfinished burst interval. This exception lets you monitor a large increase in events in real time.
clear threat-detection rate	Clears basic threat statistics.

Examples

The following is sample output from the **show threat-detection rate** command:

```
hostname# show threat-detection rate

                          Average(eps)    Current(eps) Trigger         Total events
  10-min ACL  drop:                  0               0       0                   16
  1-hour ACL  drop:                  0               0       0                  112
  1-hour SYN attck:                  5               0       2                21438
  10-min  Scanning:                  0               0      29                  193
  1-hour  Scanning:                106               0      10               384776
  1-hour Bad  pkts:                 76               0       2               274690
  10-min  Firewall:                  0               0       3                   22
  1-hour  Firewall:                 76               0       2               274844
  10-min DoS attck:                  0               0       0                    6
  1-hour DoS attck:                  0               0       0                   42
  10-min Interface:                  0               0       0                  204
  1-hour Interface:                 88               0       0               318225
```

Feature History for Basic Threat Detection Statistics

Table 50-2 lists the release history for this feature.

Table 50-2 Feature History for Basic Threat Detection Statistics

Feature Name	Releases	Feature Information
Basic threat detection statistics	8.0(2)	The following commands were introduced: **threat-detection basic-threat**, **threat-detection rate**, **show threat-detection rate**, **clear threat-detection rate**.
Burst rate interval changed to 1/30th of the average rate.	8.2(1)	In earlier releases, the burst rate interval was 1/60th of the average rate. To maximize memory usage, the sampling interval was reducded to 30 times during the average rate.

Configuring Advanced Threat Detection Statistics

You can configure the ASA to collect extensive statistics. This section includes the following topics:

- Information About Advanced Threat Detection Statistics, page 50-6
- Guidelines and Limitations, page 50-6
- Default Settings, page 50-7
- Configuring Advanced Threat Detection Statistics, page 50-7
- Monitoring Advanced Threat Detection Statistics, page 50-9
- Feature History for Advanced Threat Detection Statistics, page 50-13

Information About Advanced Threat Detection Statistics

Advanced threat detection statistics show both allowed and dropped traffic rates for individual objects such as hosts, ports, protocols, or access lists.

Caution Enabling advanced statistics can affect the ASA performance, depending on the type of statistics enabled. The **threat-detection statistics host** command affects performance in a significant way; if you have a high traffic load, you might consider enabling this type of statistics temporarily. The **threat-detection statistics port** command, however, has modest impact.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Security Context Guidelines

- Only TCP Intercept statistics are available in multiple mode.

Firewall Mode Guidelines

- Supported in routed and transparent firewall mode.

Types of Traffic Monitored

Only through-the-box traffic is monitored; to-the-box traffic is not included in threat detection.

Default Settings

By default, statistics for access lists are enabled.

Configuring Advanced Threat Detection Statistics

By default, statistics for access lists are enabled. To enable other statistics, perform the following steps:

	Command	Purpose

Step 1	`threat-detection statistics`
	Example:
	`hostname(config)# threat-detection statistics`
		(Optional) Enables *all* statistics.
		To enable only certain statistics, enter this command for each statistic type (shown in this table), and do not also enter the command without any options. You can enter **threat-detection statistics** (without any options) and then customize certain statistics by entering the command with statistics-specific options (for example, **threat-detection statistics host number-of-rate 2**). If you enter **threat-detection statistics** (without any options) and then enter a command for specific statistics, but without any statistic-specific options, then that command has no effect because it is aready enabled.
		If you enter the **no** form of this command, it removes all **threat-detection statistics** commands, including the **threat-detection statistics access-list** command, which is enabled by default.

Step 2	`threat-detection statistics access-list`
	Example:
	`hostname(config)# threat-detection statistics access-list`
		(Optional) Enables statistics for access lists (if they were disabled previously). Statistics for access lists are enabled by default. Access list statistics are only displayed using the **show threat-detection top access-list** command. This command is enabled by default.

	Command	Purpose
Step 3	**threat-detection statistics host** [**number-of-rate** {**1** | **2** | **3**}] **Example:** `hostname(config)# threat-detection statistics host number-of-rate 2`	(Optional) Enables statistics for hosts. The **number-of-rate** keyword sets the number of rate intervals maintained for host statistics. Because host statistics use a lot of memory, reducing the number of rate intervals from the default of 3 reduces the memory usage. By default, the **show threat-detection statistics host** command shows information for three rate intervals, for example, for the last 1 hour, 8 hours, and 24 hours. If you set this keyword to **1**, then only the shortest rate interval statistics are maintained. If you set the value to **2**, then the two shortest intervals are maintained. The host statistsics accumulate for as long as the host is active and in the scanning threat host database. The host is deleted from the database (and the statistics cleared) after 10 minutes of inactivity.
Step 4	**threat-detection statistics port** **Example:** `hostname(config)# threat-detection statistics port`	(Optional) Enables statistics for TCP and UDP ports.
Step 5	**threat-detection statistics protocol** **Example:** `hostname(config)# threat-detection statistics protocol`	(Optional) Enables statistics for non-TCP/UDP IP protocols.
Step 6	**threat-detection statistics tcp-intercept** [**rate-interval** *minutes*] [**burst-rate** *attacks_per_sec*] [**average-rate** *attacks_per_sec*] **Example:** `hostname(config)# threat-detection statistics tcp-intercept rate-interval 60 burst-rate 800 average-rate 600`	(Optional) Enables statistics for attacks intercepted by TCP Intercept (see the Chapter 53, “Configuring Connection Limits and Timeouts,” to enable TCP Intercept). The **rate-interval** keyword sets the size of the history monitoring window, between 1 and 1440 minutes. The default is 30 minutes. During this interval, the security appliance samples the number of attacks 30 times. The **burst-rate** keyword sets the threshold for syslog message generation, between 25 and 2147483647. The default is 400 per second. When the burst rate is exceeded, syslog message 733104 is generated. The **average-rate** keyword sets the average rate threshold for syslog message generation, between 25 and 2147483647. The default is 200 per second. When the average rate is exceeded, syslog message 733105 is generated. **Note** This command is available in multiple context mode.

Monitoring Advanced Threat Detection Statistics

The display output shows the following:

- The average rate in events/sec over fixed time periods.
- The current burst rate in events/sec over the last completed burst interval, which is 1/30th of the average rate interval or 10 seconds, whichever is larger
- The number of times the rates were exceeded (for dropped traffic statistics only)
- The total number of events over the fixed time periods.

The security appliance stores the count at the end of each burst period, for a total of 30 completed burst intervals. The unfinished burst interval presently occurring is not included in the average rate. For example, if the average rate interval is 20 minutes, then the burst interval is 20 seconds. If the last burst interval was from 3:00:00 to 3:00:20, and you use the **show** command at 3:00:25, then the last 5 seconds are not included in the output.

The only exception to this rule is if the number of events in the unfinished burst interval already exceeds the number of events in the oldest burst interval (#1 of 30) when calculating the total events. In that case, the ASA calculates the total events as the last 29 complete intervals, plus the events so far in the unfinished burst interval. This exception lets you monitor a large increase in events in real time.

To monitor advanced threat detection statistics, perform one of the following tasks:

Command	Purpose
`show threat-detection statistics [min-display-rate min_display_rate] top [[access-list | host | port-protocol] [rate-1 | rate-2 | rate-3] | tcp-intercept [all] detail]]`	Displays the top 10 statistics. The **min-display-rate** *min_display_rate* argument limits the display to statistics that exceed the minimum display rate in events per second. You can set the *min_display_rate* between 0 and 2147483647. If you do not enter any options, the top 10 statistics are shown for all categories. To view the top 10 ACEs that match packets, including both permit and deny ACEs., use the **access-list** keyword. Permitted and denied traffic are not differentiated in this display. If you enable basic threat detection using the **threat-detection basic-threat** command, you can track access list denies using the **show threat-detection rate acl-drop** command. To view only host statistics, use the **host** keyword. **Note**: Due to the threat detection algorithm, an interface used for a failover link or state link could appear as one of the top 10 hosts. This occurrence is more likely when you use one interface for both the failover and state link. This is expected behavior, and you can ignore this IP address in the display. To view statistics for ports and protocols, use the **port-protocol** keyword. The **port-protocol** keyword shows the combined statistics of TCP/UDP port and IP protocol types. TCP (protocol 6) and UDP (protocol 17) are not included in the display for IP protocols; TCP and UDP ports are, however, included in the display for ports. If you only enable statistics for one of these types, port or protocol, then you will only view the enabled statistics. To view TCP Intercept statistics, use the **tcp-intercept** keyword. The display includes the top 10 protected servers under attack. The **all** keyword to shows the history data of all the traced servers. The **detail** keyword shows history sampling data. The ASA samples the number of attacks 30 times during the rate interval, so for the default 30 minute period, statistics are collected every 60 seconds. The **rate-1** keyword shows the statistics for the smallest fixed rate intervals available in the display; **rate-2** shows the next largest rate interval; and **rate-3**, if you have three intervals defined, shows the largest rate interval. For example, the display shows statistics for the last 1 hour, 8 hours, and 24 hours. If you set the **rate-1** keyword, the ASA shows only the 1 hour time interval.
`show threat-detection statistics [min-display-rate min_display_rate] host [ip_address [mask]]`	Displays statistics for all hosts or for a specific host or subnet.

Command	Purpose
show threat-detection statistics [**min-display-rate** *min_display_rate*] **port** [*start_port*[-*end_port*]]	Displays statistics for all ports or for a specific port or range of ports.
show threat-detection statistics [**min-display-rate** *min_display_rate*] **protocol** [*protocol_number* | **ah** | **eigrp** | **esp** | **gre** | **icmp** | **igmp** | **igrp** | **ip** | **ipinip** | **ipsec** | **nos** | **ospf** | **pcp** | **pim** | **pptp** | **snp** | **tcp** | **udp**]	Displays statistics for all IP protocols or for a specific protocol. The *protocol_number* argument is an integer between 0 and 255.

Examples

The following is sample output from the **show threat-detection statistics host** command:

```
hostname# show threat-detection statistics host

                          Average(eps)    Current(eps) Trigger         Total events
Host:10.0.0.1: tot-ses:289235 act-ses:22571 fw-drop:0 insp-drop:0 null-ses:21438 bad-acc:0
  1-hour Sent byte:               2938              0       0              10580308
  8-hour Sent byte:                367              0       0              10580308
 24-hour Sent byte:                122              0       0              10580308
  1-hour Sent pkts:                 28              0       0                104043
  8-hour Sent pkts:                  3              0       0                104043
 24-hour Sent pkts:                  1              0       0                104043
  20-min Sent drop:                  9              0       1                 10851
  1-hour Sent drop:                  3              0       1                 10851
  1-hour Recv byte:               2697              0       0               9712670
  8-hour Recv byte:                337              0       0               9712670
 24-hour Recv byte:                112              0       0               9712670
  1-hour Recv pkts:                 29              0       0                104846
  8-hour Recv pkts:                  3              0       0                104846
 24-hour Recv pkts:                  1              0       0                104846
  20-min Recv drop:                 42              0       3                 50567
  1-hour Recv drop:                 14              0       1                 50567
Host:10.0.0.0: tot-ses:1 act-ses:0 fw-drop:0 insp-drop:0 null-ses:0 bad-acc:0
  1-hour Sent byte:                  0              0       0                   614
  8-hour Sent byte:                  0              0       0                   614
 24-hour Sent byte:                  0              0       0                   614
  1-hour Sent pkts:                  0              0       0                     6
  8-hour Sent pkts:                  0              0       0                     6
 24-hour Sent pkts:                  0              0       0                     6
  20-min Sent drop:                  0              0       0                     4
  1-hour Sent drop:                  0              0       0                     4
  1-hour Recv byte:                  0              0       0                   706
  8-hour Recv byte:                  0              0       0                   706
 24-hour Recv byte:                  0              0       0                   706
  1-hour Recv pkts:                  0              0       0                     7
```

Table 50-3 shows each field description.

Table 50-3 show threat-detection statistics host Fields

Field	Description
Host	Shows the host IP address.
tot-ses	Shows the total number of sessions for this host since it was added to the database.
act-ses	Shows the total number of active sessions that the host is currently involved in.

Table 50-3 show threat-detection statistics host Fields (continued)

Field	Description
fw-drop	Shows the number of firewall drops. Firewall drops is a combined rate that includes all firewall-related packet drops tracked in basic threat detection, including access list denials, bad packets, exceeded connection limits, DoS attack packets, suspicious ICMP packets, TCP SYN attack packets, and no data UDP attack packets. It does not include non-firewall-related drops such as interface overload, packets failed at application inspection, and scanning attack detected.
insp-drop	Shows the number of packets dropped because they failed application inspection.
null-ses	Shows the number of null sessions, which are TCP SYN sessions that did not complete within the 3-second timeout, and UDP sessions that did not have any data sent by its server 3 seconds after the session starts.
bad-acc	Shows the number of bad access attempts to host ports that are in a closed state. When a port is determined to be in a null session (see above), the port state of the host is set to HOST_PORT_CLOSE. Any client accessing the port of the host is immediately classified as a bad access without the need to wait for a timeout.
Average(eps)	Shows the average rate in events/sec over each time period. The security appliance stores the count at the end of each burst period, for a total of 30 completed burst intervals. The unfinished burst interval presently occurring is not included in the average rate. For example, if the average rate interval is 20 minutes, then the burst interval is 20 seconds. If the last burst interval was from 3:00:00 to 3:00:20, and you use the **show** command at 3:00:25, then the last 5 seconds are not included in the output. The only exception to this rule is if the number of events in the unfinished burst interval already exceeds the number of events in the oldest burst interval (#1 of 30) when calculating the total events. In that case, the ASA calculates the total events as the last 29 complete intervals, plus the events so far in the unfinished burst interval. This exception lets you monitor a large increase in events in real time.
Current(eps)	Shows the current burst rate in events/sec over the last completed burst interval, which is 1/30th of the average rate interval or 10 seconds, whichever is larger. For the example specified in the Average(eps) description, the current rate is the rate from 3:19:30 to 3:20:00
Trigger	Shows the number of times the dropped packet rate limits were exceeded. For valid traffic identified in the sent and received bytes and packets rows, this value is always 0, because there are no rate limits to trigger for valid traffic.
Total events	Shows the total number of events over each rate interval. The unfinished burst interval presently occurring is not included in the total events. The only exception to this rule is if the number of events in the unfinished burst interval already exceeds the number of events in the oldest burst interval (#1 of 30) when calculating the total events. In that case, the ASA calculates the total events as the last 29 complete intervals, plus the events so far in the unfinished burst interval. This exception lets you monitor a large increase in events in real time.

Table 50-3 show threat-detection statistics host Fields (continued)

Field	Description
20-min, 1-hour, 8-hour, and 24-hour	Shows statistics for these fixed rate intervals.
Sent byte	Shows the number of successful bytes sent from the host.
Sent pkts	Shows the number of successful packets sent from the host.
Sent drop	Shows the number of packets sent from the host that were dropped because they were part of a scanning attack.
Recv byte	Shows the number of successful bytes received by the host.
Recv pkts	Shows the number of successful packets received by the host.
Recv drop	Shows the number of packets received by the host that were dropped because they were part of a scanning attack.

Feature History for Advanced Threat Detection Statistics

Table 50-4 lists the release history for this feature.

Table 50-4 Feature History for Advanced Threat Detection Statistics

Feature Name	Releases	Feature Information
Advanced threat detection statistics	8.0(2)	The following commands were introduced: **threat-detection statistics**, **show threat-detection statistics**.
TCP Intercept statistics	8.0(4)/8.1(2)	The **tcp-intercept** keyword was added to the **threat-detection statistics top** and **show threat-detection statistics** commands. The **clear threat-detection statistics** command was introduced.
Customize host statistics rate intervals	8.1(2)	The **number-of-rates** keyword was added to the **threat-detection statistics host** command.
Burst rate interval changed to 1/30th of the average rate.	8.2(1)	In earlier releases, the burst rate interval was 1/60th of the average rate. To maximize memory usage, the sampling interval was reducded to 30 times during the average rate.

Configuring Scanning Threat Detection

This section includes the following topics:

- Information About Scanning Threat Detection, page 50-14
- Guidelines and Limitations, page 50-14
- Default Settings, page 50-14
- Configuring Scanning Threat Detection, page 50-15
- Monitoring Shunned Hosts, Attackers, and Targets, page 50-16

- Feature History for Scanning Threat Detection, page 50-16

Information About Scanning Threat Detection

A typical scanning attack consists of a host that tests the accessibility of every IP address in a subnet (by scanning through many hosts in the subnet or sweeping through many ports in a host or subnet). The scanning threat detection feature determines when a host is performing a scan. Unlike IPS scan detection that is based on traffic signatures, the ASA scanning threat detection feature maintains an extensive database that contains host statistics that can be analyzed for scanning activity.

The host database tracks suspicious activity such as connections with no return activity, access of closed service ports, vulnerable TCP behaviors such as non-random IPID, and many more behaviors.

If the scanning threat rate is exceeded, then the ASA sends a system message, and optionally shuns the attacker. The ASA tracks two types of rates: the average event rate over an interval, and the burst event rate over a shorter burst interval. The burst event rate is 1/30th of the average rate interval or 10 seconds, whichever is higher. For each event detected that is considered to be part of a scanning attack, the ASA checks the average and burst rate limits. If either rate is exceeded for traffic sent from a host, then that host is considered to be an attacker. If either rate is exceeded for traffic received by a host, then that host is considered to be a target.

Caution The scanning threat detection feature can affect the ASA performance and memory significantly while it creates and gathers host- and subnet-based data structure and information.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Security Context Guidelines

- Supported in single mode only. Multiple mode is not supported.

Firewall Mode Guidelines

- Supported in routed and transparent firewall mode.

Types of Traffic Monitored

- Only through-the-box traffic is monitored; to-the-box traffic is not included in threat detection.
- Traffic that is denied by an access list does not trigger scanning threat detection; only traffic that is allowed through the ASA and that creates a flow is affected by scanning threat detection.

Default Settings

Table 50-5 lists the default rate limits for scanning threat detection.

Table 50-5 Default Rate Limits for Scanning Threat Detection

Average Rate	Burst Rate
5 drops/sec over the last 600 seconds.	10 drops/sec over the last 20 second period.
5 drops/sec over the last 3600 seconds.	10 drops/sec over the last 120 second period.

The burst rate is calculated as the average rate every *N* seconds, where *N* is the burst rate interval. The burst rate interval is 1/30th of the rate interval or 10 seconds, whichever is larger.

Configuring Scanning Threat Detection

To configure scanning threat detection, perform the following steps:

	Command	Purpose
Step 1	**threat-detection scanning-threat** [**shun** [**except** {**ip-address** *ip_address mask* | **object-group** *network_object_group_id*}]] **Example:** `hostname(config)# threat-detection scanning-threat shun except ip-address 10.1.1.0 255.255.255.0`	Enables scanning threat detection. By default, the system log message 733101 is generated when a host is identified as an attacker. Enter this command multiple times to identify multiple IP addresses or network object groups to exempt from shunning.
Step 2	**threat-detection scanning-threat shun duration** *seconds* **Example:** `hostname(config)# threat-detection rate scanning-threat rate-interval 1200 average-rate 10 burst-rate 20`	(Optional) Sets the duration of the shun for attacking hosts.

Step 3	**threat-detection rate scanning-threat rate-interval** *rate_interval* **average-rate** *av_rate* **burst-rate** *burst_rate*
	Example:
	`hostname(config)# threat-detection rate scanning-threat rate-interval 1200 average-rate 10 burst-rate 20`
	`hostname(config)# threat-detection rate scanning-threat rate-interval 2400 average-rate 10 burst-rate 20`
		(Optional) Changes the default event limit for when the ASA identifies a host as an attacker or as a target. If you already configured this command as part of the basic threat detection configuration (see the "Configuring Basic Threat Detection Statistics" section on page 50-1), then those settings are shared with the scanning threat detection feature; you cannot configure separate rates for basic and scanning threat detection. If you do not set the rates using this command, the default values are used for both the scanning threat detection feature and the basic threat detection feature. You can configure up to three different rate intervals, by entering separate commands.

Monitoring Shunned Hosts, Attackers, and Targets

To monitor shunned hosts and attackers and targets, perform one of the following tasks:

Command	Purpose
show threat-detection shun	Displays the hosts that are currently shunned.
clear threat-detection shun [*ip_address* [*mask*]]	Releases a host from being shunned. If you do not specify an IP address, all hosts are cleared from the shun list.
show threat-detection scanning-threat [**attacker** | **target**]	Displays hosts that the ASA decides are attackers (including hosts on the shun list), and displays the hosts that are the target of an attack. If you do not enter an option, both attackers and target hosts are displayed.

Examples

The following is sample output from the **show threat-detection shun** command:

```
hostname# show threat-detection shun
Shunned Host List:
10.1.1.6
198.1.6.7
```

To release the host at 10.1.1.6, enter the following command:

```
hostname# clear threat-detection shun 10.1.1.6
```

The following is sample output from the **show threat-detection scanning-threat attacker** command:

```
hostname# show threat-detection scanning-threat attacker
10.1.2.3
10.8.3.6
209.165.200.225
```

Feature History for Scanning Threat Detection

Table 50-6 lists the release history for this feature.

Table 50-6 Feature History for Scanning Threat Detection

Feature Name	Releases	Feature Information
Scanning threat detection	8.0(2)	The following commands were introduced: **threat-detection scanning-threat**, **threat-detection rate scanning-threat**, **show threat-detection scanning-threat**, **show threat-detection shun**, **clear threat-detection shun**.

Table 50-6 Feature History for Scanning Threat Detection (continued)

Feature Name	Releases	Feature Information
Shun duration	8.0(4)/8.1(2)	The **duration** keyword was added to the **threat-detection scanning-threat shun** command.
Burst rate interval changed to 1/30th of the average rate.	8.2(1)	In earlier releases, the burst rate interval was 1/60th of the average rate. To maximize memory usage, the sampling interval was reducded to 30 times during the average rate.

Configuration Examples for Threat Detection

The following example configures basic threat detection statistics, and changes the DoS attack rate settings. All advanced threat detection statistics are enabled, with the host statistics number of rate intervals lowered to 2. The TCP Intercept rate interval is also customized. Scanning threat detection is enabled with automatic shunning for all addresses except 10.1.1.0/24. The scanning threat rate intervals are customized.

```
threat-detection basic-threat
threat-detection rate dos-drop rate-interval 600 average-rate 60 burst-rate 100
threat-detection statistics
threat-detection statistics host number-of-rate 2
threat-detection statistics tcp-intercept rate-interval 60 burst-rate 800 average-rate 600
threat-detection scanning-threat shun except ip-address 10.1.1.0 255.255.255.0
threat-detection rate scanning-threat rate-interval 1200 average-rate 10 burst-rate 20
threat-detection rate scanning-threat rate-interval 2400 average-rate 10 burst-rate 20
```

CHAPTER 51

Configuring TCP State Bypass

This chapter describes how to configure TCP state bypass, which lets outbound and inbound flows go through separate ASAs. This chapter includes the following sections:

- Information About TCP State Bypass, page 51-1
- Licensing Requirements for TCP State Bypass, page 51-2
- Guidelines and Limitations, page 51-2
- Default Settings, page 51-3
- Configuring TCP State Bypass, page 51-3
- Monitoring TCP State Bypass, page 51-4
- Configuration Examples for TCP State Bypass, page 51-4
- Feature History for TCP State Bypass, page 51-5

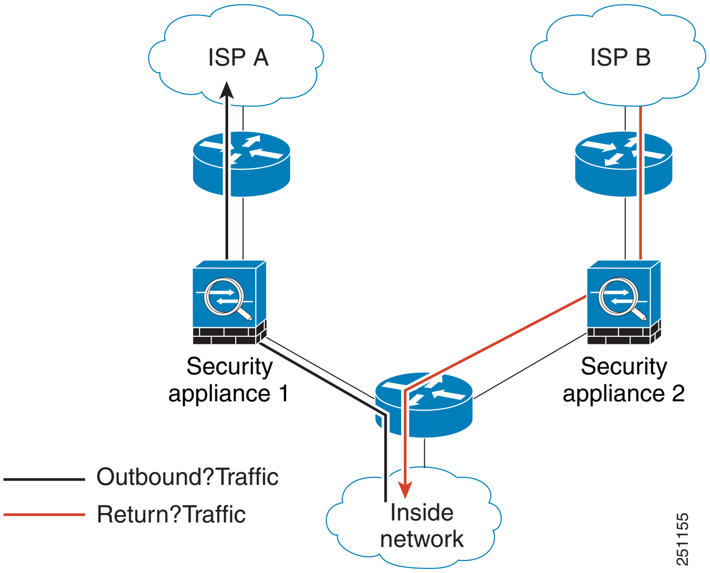
Information About TCP State Bypass

By default, all traffic that goes through the ASA is inspected using the Adaptive Security Algorithm and is either allowed through or dropped based on the security policy. The ASA maximizes the firewall performance by checking the state of each packet (is this a new connection or an established connection?) and assigning it to either the session management path (a new connection SYN packet), the fast path (an established connection), or the control plane path (advanced inspection). See the "Stateful Inspection Overview" section on page 1-13 for more detailed information about the stateful firewall.

TCP packets that match existing connections in the fast path can pass through the ASA without rechecking every aspect of the security policy. This feature maximizes performance. However, the method of establishing the session in the fast path using the SYN packet, and the checks that occur in the fast path (such as TCP sequence number), can stand in the way of asymmetrical routing solutions: both the outbound and inbound flow of a connection must pass through the same ASA.

For example, a new connection goes to ASA 1. The SYN packet goes through the session management path, and an entry for the connection is added to the fast path table. If subsequent packets of this connection go through ASA 1, then the packets will match the entry in the fast path, and are passed through. But if subsequent packets go to ASA 2, where there was not a SYN packet that went through the session management path, then there is no entry in the fast path for the connection, and the packets are dropped. Figure 51-1 shows an asymmetric routing example where the outbound traffic goes through a different ASA than the inbound traffic:

Figure 51-1 Asymmetric Routing



If you have asymmetric routing configured on upstream routers, and traffic alternates between two ASAs, then you can configure TCP state bypass for specific traffic. TCP state bypass alters the way sessions are established in the fast path and disables the fast path checks. This feature treats TCP traffic much as it treats a UDP connection: when a non-SYN packet matching the specified networks enters the ASA, and there is not an fast path entry, then the packet goes through the session management path to establish the connection in the fast path. Once in the fast path, the traffic bypasses the fast path checks.

Licensing Requirements for TCP State Bypass

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent mode.

Failover Guidelines

Failover is supported.

Unsupported Features

The following features are not supported when you use TCP state bypass:

- Application inspection—Application inspection requires both inbound and outbound traffic to go through the same ASA, so application inspection is not supported with TCP state bypass.
- AAA authenticated sessions—When a user authenticates with one ASA, traffic returning via the other ASA will be denied because the user did not authenticate with that ASA.
- TCP Intercept, maximum embryonic connection limit, TCP sequence number randomization—The ASA does not keep track of the state of the connection, so these features are not applied.
- TCP normalization—The TCP normalizer is disabled.
- SSM and SSC functionality—You cannot use TCP state bypass and any application running on an SSM or SSC, such as IPS or CSC.

NAT Guidelines

Because the translation session is established separately for each ASA, be sure to configure static NAT on both ASAs for TCP state bypass traffic; if you use dynamic NAT, the address chosen for the session on ASA 1 will differ from the address chosen for the session on ASA 2.

Default Settings

TCP state bypass is disabled by default.

Configuring TCP State Bypass

This section describes how to configure TCP state bypass.

	Command	Purpose
Step 1	**`class-map`** *name* **Example:** `hostname(config)# class-map bypass_traffic`	Creates a class map to identify the traffic for which you want to disable stateful firewall inspection.
Step 2	**`match`** *parameter* **Example:** `hostname(config-cmap)# match access-list bypass`	Specifies the traffic in the class map. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 for more information.
Step 3	**`policy-map`** *name* **Example:** `hostname(config)# policy-map tcp_bypass_policy`	Adds or edits a policy map that sets the actions to take with the class map traffic.

	Command	Purpose

Step 4	**`class`** *`name`*
	Example:
	`hostname(config-pmap)# class bypass_traffic`
		Identifies the class map you created in Step 1

Step 5	**`set connection advanced-options tcp-state-bypass`**
	Example:
	`hostname(config-pmap-c)# set connection advanced-options tcp-state-bypass`
		Enables TCP state bypass.

Step 6	**`service-policy`** *`policymap_name`* {**`global`** | **`interface`** *`interface_name`*}
	Example:
	`hostname(config)# service-policy tcp_bypass_policy outside`
		Activates the policy map on one or more interfaces. **global** applies the policy map to all interfaces, and **interface** applies the policy to one interface. Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

Monitoring TCP State Bypass

To monitor TCP state bypass, perform one of the following tasks:

Command	Purpose
`show conn`	If you use the **show conn** command, the display for connections that use TCP state bypass includes the flag “b.”

Configuration Examples for TCP State Bypass

The following is a sample configuration for TCP state bypass:

```
hostname(config)# access-list tcp_bypass extended permit tcp 10.1.1.0 255.255.255.224 any

hostname(config)# class-map tcp_bypass
hostname(config-cmap)# description "TCP traffic that bypasses stateful firewall"
hostname(config-cmap)# match access-list tcp_bypass

hostname(config-cmap)# policy-map tcp_bypass_policy
hostname(config-pmap)# class tcp_bypass
hostname(config-pmap-c)# set connection advanced-options tcp-state-bypass

hostname(config-pmap-c)# service-policy tcp_bypass_policy outside

hostname(config-pmap-c)# static (inside,outside) 209.165.200.224 10.1.1.0 netmask
255.255.255.224
```

Feature History for TCP State Bypass

Table 51-1 lists the release history for this feature.

Table 51-1 Feature History for TCP State Bypass

Feature Name	Releases	Feature Information
TCP state bypass	8.2(1)	This feature was introduced. The following command was introduced: **set connection advanced-options tcp-state-bypass.**

CHAPTER 52

Configuring TCP Normalization

The TCP normalization feature identifies abnormal packets that the ASA can act on when they are detected; for example, the ASA can allow, drop, or clear the packets. TCP normalization helps protect the ASA from attacks. TCP normalization is always enabled, but you can customize how some features behave.

This chapter includes the following sections:

- Information About TCP Normalization, page 52-1
- Customizing the TCP Normalizer, page 52-1
- Configuration Examples for TCP Normalization, page 52-6

Information About TCP Normalization

The TCP normalizer includes non-configurable actions and configurable actions. Typically, non-configurable actions that drop or clear connections apply to packets that are always bad. Configurable actions (as detailed in "Customizing the TCP Normalizer" section on page 52-1) might need to be customized depending on your network needs.

See the following guidelines for TCP normalization:

- The normalizer does not protect from SYN floods. The ASA includes SYN flood protection in other ways.
- The normalizer always sees the SYN packet as the first packet in a flow unless the ASA is in loose mode due to failover.

Customizing the TCP Normalizer

This feature uses Modular Policy Framework, so that customizing TCP normalization consists of identifying traffic, specifying the TCP normalization actions, and activating TCP normalization customization on an interface. See Chapter 9, "Using Modular Policy Framework," for more information.

To customize TCP normalization, perform the following steps:

Step 1 To specify the TCP normalization criteria that you want to look for, create a TCP map by entering the following command:

```
hostname(config)# tcp-map tcp-map-name
```

For each TCP map, you can customize one or more settings.

Step 2 (Optional) Configure the TCP map criteria by entering one or more of the following commands (see Table 52-1). If you want to customize some settings, then the defaults are used for any commands you do not enter. The default configuration includes the following settings:

```
no check-retransmission
no checksum-verification
exceed-mss allow
queue-limit 0 timeout 4
reserved-bits allow
syn-data allow
synack-data drop
invalid-ack drop
seq-past-window drop
tcp-options range 6 7 clear
tcp-options range 9 255 clear
tcp-options selective-ack allow
tcp-options timestamp allow
tcp-options window-scale allow
ttl-evasion-protection
urgent-flag clear
window-variation allow-connection
```

Table 52-1 tcp-map Commands

Command	Notes
check-retransmission	Prevents inconsistent TCP retransmissions.
checksum-verification	Verifies the checksum.
exceed-mss {**allow** | **drop**}	Sets the action for packets whose data length exceeds the TCP maximum segment size. (Default) The **allow** keyword allows packets whose data length exceeds the TCP maximum segment size. The **drop** keyword drops packets whose data length exceeds the TCP maximum segment size.
invalid-ack {**allow** | **drop**}	Sets the action for packets with an invalid ACK. You might see invalid ACKs in the following instances: • In the TCP connection SYN-ACK-received status, if the ACK number of a received TCP packet is not exactly same as the sequence number of the next TCP packet sending out, it is an invalid ACK. • Whenever the ACK number of a received TCP packet is greater than the sequence number of the next TCP packet sending out, it is an invalid ACK. The **allow** keyword allows packets with an invalid ACK. (Default) The **drop** keyword drops packets with an invalid ACK. **Note** TCP packets with an invalid ACK are automatically allowed for WAAS connections.

Table 52-1 tcp-map Commands (continued)

Command	Notes
queue-limit *pkt_num* [**timeout** *seconds*]	Sets the maximum number of out-of-order packets that can be buffered and put in order for a TCP connection, between 1 and 250 packets. The default is 0, which means this setting is disabled and the default system queue limit is used depending on the type of traffic: • Connections for application inspection (the **inspect** command), IPS (the **ips** command), and TCP check-retransmission (the TCP map **check-retransmission** command) have a queue limit of 3 packets. If the ASA receives a TCP packet with a different window size, then the queue limit is dynamically changed to match the advertised setting. • For other TCP connections, out-of-order packets are passed through untouched. If you set the **queue-limit** command to be 1 or above, then the number of out-of-order packets allowed for all TCP traffic matches this setting. For example, for application inspection, IPS, and TCP check-retransmission traffic, any advertised settings from TCP packets are ignored in favor of the **queue-limit** setting. For other TCP traffic, out-of-order packets are now buffered and put in order instead of passed through untouched. The **timeout** *seconds* argument sets the maximum amount of time that out-of-order packets can remain in the buffer, between 1 and 20 seconds; if they are not put in order and passed on within the timeout period, then they are dropped. The default is 4 seconds. You cannot change the timeout for any traffic if the *pkt_num* argument is set to 0; you need to set the limit to be 1 or above for the **timeout** keyword to take effect.
reserved-bits {**allow** | **clear** | **drop**}	Sets the action for reserved bits in the TCP header. (Default) The **allow** keyword allows packets with the reserved bits in the TCP header. The **clear** keyword clears the reserved bits in the TCP header and allows the packet. The **drop** keyword drops the packet with the reserved bits in the TCP header.
seq-past-window {**allow** | **drop**}	Sets the action for packets that have past-window sequence numbers, namely the sequence number of a received TCP packet is greater than the right edge of the TCP receiving window. The **allow** keyword allows packets that have past-window sequence numbers. This action is only allowed if the **queue-limit** command is set to 0 (disabled). (Default) The **drop** keyword drops packets that have past-window sequence numbers.

Table 52-1 tcp-map Commands (continued)

Command	Notes
synack-data {**allow** | **drop**}	Sets the action for TCP SYNACK packets that contain data. The **allow** keyword allows TCP SYNACK packets that contain data. (Default) The **drop** keyword drops TCP SYNACK packets that contain data.
syn-data {**allow** | **drop**}	Sets the action for SYN packets with data. (Default) The **allow** keyword allows SYN packets with data. The **drop** keyword drops SYN packets with data.

tcp-options {**selective-ack** | **timestamp** | **window-scale**} {**allow** | **clear**}
Or
tcp-options range *lower upper* {**allow** | **clear** | **drop**}
	Sets the action for packets with TCP options, including the selective-ack, timestamp, or window-scale TCP options.
	(Default) The **allow** keyword allows packets with the specified option.
	(Default for **range**) The **clear** keyword clears the option and allows the packet.
	The **drop** keyword drops the packet with the specified option.
	The **selective-ack** keyword sets the action for the SACK option.
	The **timestamp** keyword sets the action for the timestamp option. Clearing the timestamp option disables PAWS and RTT.
	The **widow-scale** keyword sets the action for the window scale mechanism option.
	The **range** keyword specifies a range of options. The *lower* argument sets the lower end of the range as 6, 7, or 9 through 255.
	The *upper* argument sets the upper end of the range as 6, 7, or 9 through 255.

ttl-evasion-protection	Disables the TTL evasion protection. Do not enter this command it you want to prevent attacks that attempt to evade security policy. For example, an attacker can send a packet that passes policy with a very short TTL. When the TTL goes to zero, a router between the ASA and the endpoint drops the packet. It is at this point that the attacker can send a malicious packet with a long TTL that appears to the ASA to be a retransmission and is passed. To the endpoint host, however, it is the first packet that has been received by the attacker. In this case, an attacker is able to succeed without security preventing the attack.

Table 52-1 tcp-map Commands (continued)

Command	Notes
urgent-flag {**allow** | **clear**}	Sets the action for packets with the URG flag. The URG flag is used to indicate that the packet contains information that is of higher priority than other data within the stream. The TCP RFC is vague about the exact interpretation of the URG flag, therefore end systems handle urgent offsets in different ways, which may make the end system vulnerable to attacks. The **allow** keyword allows packets with the URG flag. (Default) The **clear** keyword clears the URG flag and allows the packet.
window-variation {**allow** | **drop**}	Sets the action for a connection that has changed its window size unexpectedly. The window size mechanism allows TCP to advertise a large window and to subsequently advertise a much smaller window without having accepted too much data. From the TCP specification, "shrinking the window" is strongly discouraged. When this condition is detected, the connection can be dropped. (Default) The **allow** keyword allows connections with a window variation. The **drop** keyword drops connections with a window variation.

Step 3 To identify the traffic, add a class map using the **class-map** command. See the "Creating a Layer 3/4 Class Map for Through Traffic" section on page 9-13 for more information.

For example, you can match all traffic using the following commands:

```
hostname(config)# class-map TCPNORM
hostname(config-cmap)# match any
```

To match specific traffic, you can match an access list:

```
hostname(config)# access list TCPNORM extended permit ip any 10.1.1.1 255.255.255.255
hostname(config)# class-map TCP_norm_class
hostname(config-cmap)# match access-list TCPNORM
```

Step 4 To add or edit a policy map that sets the actions to take with the class map traffic, enter the following commands:

```
hostname(config)# policy-map name
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

where the *class_map_name* is the class map from Step 3.

For example:

```
hostname(config)# policy-map TCP_norm_policy
hostname(config-pmap)# class TCP_norm_class
hostname(config-pmap-c)#
```

Step 5 Apply the TCP map to the class map by entering the following command.

```
hostname(config-pmap-c)# set connection advanced-options tcp-map-name
```

Step 6 To activate the policy map on one or more interfaces, enter the following command:

```
hostname(config)# service-policy policymap_name {global | interface interface_name}
```

Where **global** applies the policy map to all interfaces, and **interface** applies the policy to one interface. Only one global policy is allowed. Interface service policies take precedence over the global service policy for a given feature. For example, if you have a global policy with inspections, and an interface policy with TCP normalization, then both inspections and TCP normalization are applied to the interface. However, if you have a global policy with inspections, and an interface policy with inspections, then only the interface policy inspections are applied to that interface.

Configuration Examples for TCP Normalization

For example, to allow urgent flag and urgent offset packets for all traffic sent to the range of TCP ports between the well known FTP data port and the Telnet port, enter the following commands:

```
hostname(config)# tcp-map tmap
hostname(config-tcp-map)# urgent-flag allow
hostname(config-tcp-map)# class-map urg-class
hostname(config-cmap)# match port tcp range ftp-data telnet
hostname(config-cmap)# policy-map pmap
hostname(config-pmap)# class urg-class
hostname(config-pmap-c)# set connection advanced-options tmap
hostname(config-pmap-c)# service-policy pmap global
```

CHAPTER 53

Configuring Connection Limits and Timeouts

This chapter describes how to set maximum TCP and UDP connections, maximum embryonic connections, maximum per-client connections, connection timeouts, dead connection detection, and how to disable TCP sequence randomization. You can set limits for connections that go through the ASA, or for management connections to the ASA. This chapter contains the following sections:

- Information About Connection Limits, page 53-1
- Configuring Connection Limits and Timeouts, page 53-3
- Configuration Examples for Connection Limits and Timeouts, page 53-5

Note You can also configure maximum connections, maximum embryonic connections, and TCP sequence randomization in the NAT configuration. If you configure these settings for the same traffic using both methods, then the ASA uses the lower limit. For TCP sequence randomization, if it is disabled using either method, then the ASA disables TCP sequence randomization.

Information About Connection Limits

This section describes why you might want to limit connections, and includes the following topics:

- TCP Intercept, page 53-1
- Disabling TCP Intercept for Management Packets for Clientless SSL Compatibility, page 53-2
- Dead Connection Detection (DCD), page 53-2
- TCP Sequence Randomization, page 53-2

TCP Intercept

Limiting the number of embryonic connections protects you from a DoS attack. The ASA uses the per-client limits and the embryonic connection limit to trigger TCP Intercept, which protects inside systems from a DoS attack perpetrated by flooding an interface with TCP SYN packets. An embryonic connection is a connection request that has not finished the necessary handshake between source and destination. TCP Intercept uses the SYN cookies algorithm to prevent TCP SYN-flooding attacks. A SYN-flooding attack consists of a series of SYN packets usually originating from spoofed IP addresses. The constant flood of SYN packets keeps the server SYN queue full, which prevents it from servicing connection requests. When the embryonic connection threshold of a connection is crossed, the ASA acts as a proxy for the server and generates a SYN-ACK response to the client SYN request. When the ASA receives an ACK back from the client, it can then authenticate the client and allow the connection to the server.

To view TCP Intercept statistics, including the top 10 servers under attack, see Chapter 50, "Configuring Threat Detection."

Disabling TCP Intercept for Management Packets for Clientless SSL Compatibility

By default, TCP management connections have TCP Intercept always enabled. When TCP Intercept is enabled, it intercepts the 3-way TCP connection establishment handshake packets and thus deprives the ASA from processing the packets for clientless SSL. Clientless SSL requires the ability to process the 3-way handshake packets to provide selective ACK and other TCP options for clientless SSL connections. To disable TCP Intercept for management traffic, you can set the embryonic connection limit; only after the embryonic connection limit is reached is TCP Intercept enabled.

Dead Connection Detection (DCD)

DCD detects a dead connection and allows it to expire, without expiring connections that can still handle traffic. You configure DCD when you want idle, but valid connections to persist.

When you enable DCD, idle timeout behavior changes. With idle timeout, DCD probes are sent to each of the two end-hosts to determine the validity of the connection. If an end-host fails to respond after probes are sent at the configured intervals, the connection is freed, and reset values, if configured, are sent to each of the end-hosts. If both end-hosts respond that the connection is valid, the activity timeout is updated to the current time and the idle timeout is rescheduled accordingly.

Enabling DCD changes the behavior of idle-timeout handling in the TCP normalizer. DCD probing resets the idle timeout on the connections seen in the **show conn** command. To determine when a connection that has exceeded the configured timeout value in the timeout command but is kept alive due to DCD probing, the **show service-policy** command includes counters to show the amount of activity from DCD.

TCP Sequence Randomization

Each TCP connection has two ISNs: one generated by the client and one generated by the server. The ASA randomizes the ISN of the TCP SYN passing in both the inbound and outbound directions.

Randomizing the ISN of the protected host prevents an attacker from predecting the next ISN for a new connection and potentially hijacking the new session.

TCP initial sequence number randomization can be disabled if required. For example:

- If another in-line firewall is also randomizing the initial sequence numbers, there is no need for both firewalls to be performing this action, even though this action does not affect the traffic.
- If you use eBGP multi-hop through the ASA, and the eBGP peers are using MD5. Randomization breaks the MD5 checksum.
- You use a WAAS device that requires the ASA not to randomize the sequence numbers of connections.

Configuring Connection Limits and Timeouts

To set connection limits and timeouts, perform the following steps:

Step 1 To identify the traffic, add a class map using the **class-map** command. See the "Creating a Layer 3/4 Class Map for Through Traffic" section on page 9-13 or the "Creating a Layer 3/4 Class Map for Management Traffic" section on page 9-15 for more information.

For example, you can match all traffic using the following commands:

```
hostname(config)# class-map CONNS
hostname(config-cmap)# match any
```

To match specific traffic, you can match an access list:

```
hostname(config)# access list CONNS extended permit ip any 10.1.1.1 255.255.255.255
hostname(config)# class-map CONNS
hostname(config-cmap)# match access-list CONNS
```

Step 2 To add or edit a policy map that sets the actions to take with the class map traffic, enter the following commands:

```
hostname(config)# policy-map name
hostname(config-pmap)# class class_map_name
hostname(config-pmap-c)#
```

where the *class_map_name* is the class map from Step 1.

For example:

```
hostname(config)# policy-map CONNS
hostname(config-pmap)# class CONNS
hostname(config-pmap-c)#
```

Step 3 To set maximum connection limits or whether TCP sequence randomization is enabled, enter the following command:

```
hostname(config-pmap-c)# set connection {[conn-max n] [embryonic-conn-max n]
[per-client-embryonic-max n] [per-client-max n] [random-sequence-number {enable |
disable}]}
```

where the **conn-max** *n* argument sets the maximum number of simultaneous TCP and/or UDP connections that are allowed, between 0 and 65535. The default is 0, which allows unlimited connections.

If two servers are configured to allow simultaneous TCP and/or UDP connections, the connection limit is applied to each configured server separately.

The **embryonic-conn-max** *n* argument sets the maximum number of simultaneous embryonic connections allowed, between 0 and 65535. The default is 0, which allows unlimited connections.

The **per-client-embryonic-max** *n* argument sets the maximum number of simultaneous embryonic connections allowed per client, between 0 and 65535. The default is 0, which allows unlimited connections.

The **per-client-max** *n* argument sets the maximum number of simultaneous connections allowed per client, between 0 and 65535. The default is 0, which allows unlimited connections.

The **random-sequence-number** {**enable** | **disable**} keyword enables or disables TCP sequence number randomization. See the "TCP Sequence Randomization" section on page 53-2 section for more information.

You can enter this command all on one line (in any order), or you can enter each attribute as a separate command. The ASA combines the command into one line in the running configuration.

Note For management traffic, you can only set the **conn-max** and **embryonic-conn-max** keywords.

Step 4 To set connection timeouts, enter the following command:

```
hostname(config-pmap-c)# set connection timeout {[embryonic hh:mm:ss] {idle hh:mm:ss
[reset]] [half-closed hh:mm:ss] [dcd hh:mm:ss [max_retries]]}
```

where the **embryonic** *hh***:***mm:ss* keyword sets the timeout period until a TCP embryonic (half-open) connection is closed, between 0:0:5 and 1193:00:00. The default is 0:0:30. You can also set this value to 0, which means the connection never times out.

The **idle** *hh***:***mm:ss* keyword sets the idle timeout for all protocols between 0:5:0 and 1193:00:00. The default is 1:0:0. You can also set this value to 0, which means the connection never times out. For TCP traffic, the **reset** keyword sends a reset to TCP endpoints when the connection times out.

The **half-closed** *hh***:***mm:ss* keyword sets the idle timeout between 0:5:0 and 1193:00:00. The default is 0:10:0. Half-closed connections are not affected by DCD. Also, the ASA does not send a reset when taking down half-closed connections.

The **dcd** keyword enables DCD. DCD detects a dead connection and allows it to expire, without expiring connections that can still handle traffic. You configure DCD when you want idle, but valid connections to persist. After a TCP connection times out, the ASA sends DCD probes to the end hosts to determine the validity of the connection. If one of the end hosts fails to respond after the maximum retries are exhausted, the ASA frees the connection. If both end hosts respond that the connection is valid, the ASA updates the activity timeout to the current time and reschedules the idle timeout accordingly. The *retry-interval* sets the time duration in *hh***:***mm***:***ss* format to wait after each unresponsive DCD probe before sending another probe, between 0:0:1 and 24:0:0. The default is 0:0:15. The *max-retries* sets the number of consecutive failed retries for DCD before declaring the connection as dead. The minimum value is 1 and the maximum value is 255. The default is 5.

You can enter this command all on one line (in any order), or you can enter each attribute as a separate command. The command is combined onto one line in the running configuration.

Note This command is not available for management traffic.

Step 5 To activate the policy map on one or more interfaces, enter the following command:

```
hostname(config)# service-policy policymap_name {global | interface interface_name}
```

where *policy_map_name* is the policy map you configured in Step 2. To apply the policy map to traffic on all the interfaces, use the **global** keyword. To apply the policy map to traffic on a specific interface, use the **interface** *interface_name* option, where *interface_name* is the name assigned to the interface with the **nameif** command.

Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

Configuration Examples for Connection Limits and Timeouts

The following example sets the connection limits and timeouts for all traffic:

```
hostname(config)# class-map CONNS
hostname(config-cmap)# match any
hostname(config-cmap)# policy-map CONNS
hostname(config-pmap)# class CONNS
hostname(config-pmap-c)# set connection conn-max 1000 embryonic-conn-max 3000
hostname(config-pmap-c)# set connection timeout tcp 2:0:0 embryonic 0:40:0 half-closed
0:20:0 dcd
hostname(config-pmap-c)# service-policy CONNS interface outside
```

You can enter **set connection** commands with multiple parameters or you can enter each parameter as a separate command. The ASA combines the commands into one line in the running configuration. For example, if you entered the following two commands in class configuration mode:

```
hostname(config-pmap-c)# set connection conn-max 600
hostname(config-pmap-c)# set connection embryonic-conn-max 50
```

the output of the **show running-config policy-map** command would display the result of the two commands in a single, combined command:

```
set connection conn-max 600 embryonic-conn-max 50
```

CHAPTER 54

Configuring the Botnet Traffic Filter

Malware is malicious software that is installed on an unknowing host. Malware that attempts network activity such as sending private data (passwords, credit card numbers, key strokes, or proprietary data) can be detected by the Botnet Traffic Filter when the malware starts a connection to a known bad IP address. The Botnet Traffic Filter checks incoming and outgoing connections against a dynamic database of known bad domain names and IP addresses (the *blacklist*), and then logs or blocks any suspicious activity.

You can also supplement the Cisco dynamic database with blacklisted addresses of your choosing by adding them to a static blacklist; if the dynamic database includes blacklisted addresses that you think should not be blacklisted, you can manually enter them into a static *whitelist*. Whitelisted addresses still generate syslog messages, but because you are only targeting blacklist syslog messages, they are informational.

Note If you do not want to use the Cisco dynamic database at all, because of internal requirements, you can use the static blacklist alone if you can identify all the malware sites that you want to target.

This chapter describes how to configure the Botnet Traffic Filter, and includes the following sections:

- Information About the Botnet Traffic Filter, page 54-1
- Licensing Requirements for the Botnet Traffic Filter, page 54-5
- Guidelines and Limitations, page 54-5
- Default Settings, page 54-6
- Configuring the Botnet Traffic Filter, page 54-6
- Monitoring the Botnet Traffic Filter, page 54-16
- Configuration Examples for the Botnet Traffic Filter, page 54-18
- Where to Go Next, page 54-20
- Feature History for the Botnet Traffic Filter, page 54-21

Information About the Botnet Traffic Filter

This section includes information about the Botnet Traffic Filter, and includes the following topics:

- Botnet Traffic Filter Address Categories, page 54-2
- Botnet Traffic Filter Actions for Known Addresses, page 54-2

- Botnet Traffic Filter Databases, page 54-2
- How the Botnet Traffic Filter Works, page 54-4

Botnet Traffic Filter Address Categories

Addresses monitored by the Botnet Traffic Filter include:

- Known malware addresses—These addresses are on the blacklist identified by the dynamic database and the static blacklist.
- Known allowed addresses—These addresses are on the whitelist. The whitelist is useful when an address is blacklisted by the dynamic database and also identified by the static whitelist.
- Ambiguous addresses—These addresses are associated with multiple domain names, but not all of these domain names are on the blacklist. These addresses are on the *greylist*.
- Unlisted addresses—These addresses are unknown, and not included on any list.

Botnet Traffic Filter Actions for Known Addresses

You can configure the Botnet Traffic Filter to log suspicious activity, and you can optionally configure it to block suspicious traffic automatically.

Unlisted addresses do not generate any syslog messages, but addresses on the blacklist, whitelist, and greylist generate syslog messages differentiated by type. See the "Botnet Traffic Filter Syslog Messaging" section on page 54-16 for more information.

Botnet Traffic Filter Databases

The Botnet Traffic Filter uses two databases for known addresses. You can use both databases together, or you can disable use of the dynamic database and use the static database alone. This section includes the following topics:

- Information About the Dynamic Database, page 54-2
- Information About the Static Database, page 54-3
- Information About the DNS Reverse Lookup Cache and DNS Host Cache, page 54-3

Information About the Dynamic Database

The Botnet Traffic Filter can receive periodic updates for the dynamic database from the Cisco update server. This database lists thousands of known bad domain names and IP addresses.

The ASA uses the dynamic database as follows:

1. When the domain name in a DNS reply matches a name in the dynamic database, the Botnet Traffic Filter adds the name and IP address to the *DNS reverse lookup cache*.
2. When the infected host starts a connection to the IP address of the malware site, then the ASA sends a syslog message informing you of the suspicious activity and optionally drops the traffic if you configured the ASA to do so.
3. In some cases, the IP address itself is supplied in the dynamic database, and the Botnet Traffic Filter logs or drops any traffic to that IP address without having to inspect DNS requests.

The database files are stored in running memory; they are not stored in Flash memory. If you need to delete the database, use the **dynamic-filter database purge** commandinstead. Be sure to first disable use of the database by entering the **no dynamic-filter use-database** command.

Note To use the database, be sure to configure a domain name server for the ASA so that it can access the URL.

To use the domain names in the dynamic database, you need to enable DNS packet inspection with Botnet Traffic Filter snooping; the ASA looks inside the DNS packets for the domain name and associated IP address.

Information About the Static Database

You can manually enter domain names or IP addresses (host or subnet) that you want to tag as bad names in a blacklist. Static blacklist entries are always designated with a Very High threat level. You can also enter names or IP addresses in a whitelist, so that names or addresses that appear on both the *dynamic* blacklist and the whitelist are identified only as whitelist addresses in syslog messages and reports. Note that you see syslog messages for whitelisted addresses even if the address is not also in the dynamic blacklist.

When you add a domain name to the static database, the ASA waits 1 minute, and then sends a DNS request for that domain name and adds the domain name/IP address pairing to the *DNS host cache*. (This action is a background process, and does not affect your ability to continue configuring the ASA). We recommend also enabling DNS packet inspection with Botnet Traffic Filter snooping. The ASA uses Botnet Traffic Filter snooping instead of the regular DNS lookup to resolve static blacklist domain names in the following circumstances:

- The ASA DNS server is unavailable.
- A connection is initiated during the 1 minute waiting period before the ASA sends the regular DNS request.

If DNS snooping is used, when an infected host sends a DNS request for a name on the static database, the ASA looks inside the DNS packets for the domain name and associated IP address and adds the name and IP address to the DNS reverse lookup cache.

If you do not enable Botnet Traffic Filter snooping, and one of the above circumstances occurs, then that traffic will not be monitored by the Botnet Traffic Filter.

Information About the DNS Reverse Lookup Cache and DNS Host Cache

When you use the dynamic database with DNS snooping, entries are added to the DNS reverse lookup cache. If you use the static database, entries are added to the DNS host cache (see the "Information About the Static Database" section on page 54-3 about using the static database with DNS snooping and the DNS reverse lookup cache).

Entries in the DNS reverse lookup cache and the DNS host cache have a time to live (TTL) value provided by the DNS server. The largest TTL value allowed is 1 day (24 hours); if the DNS server provides a larger TTL, it is truncated to 1 day maximum.

For the DNS reverse lookup cache, after an entry times out, the ASA renews the entry when an infected host initiates a connection to a known address, and DNS snooping occurs.

For the DNS host cache, after an entry times out, the ASA periodically requests a refresh for the entry.

For the DNS host cache, the maximum number of blacklist entries and whitelist entries is 1000 each.

Table 54-1 lists the maximum number of entries in the DNS reverse lookup cache per model.

Table 54-1 DNS Reverse Lookup Cache Entries per Model

ASA Model	Maximum Entries
ASA 5505	5000
ASA 5510	10,000
ASA 5520	20,000
ASA 5540	40,000
ASA 5550	40,000
ASA 5580	100,000

How the Botnet Traffic Filter Works

Figure 54-1 shows how the Botnet Traffic Filter works with the dynamic database plus DNS inspection with Botnet Traffic Filter snooping.

Figure 54-1 How the Botnet Traffic Filter Works with the Dynamic Database

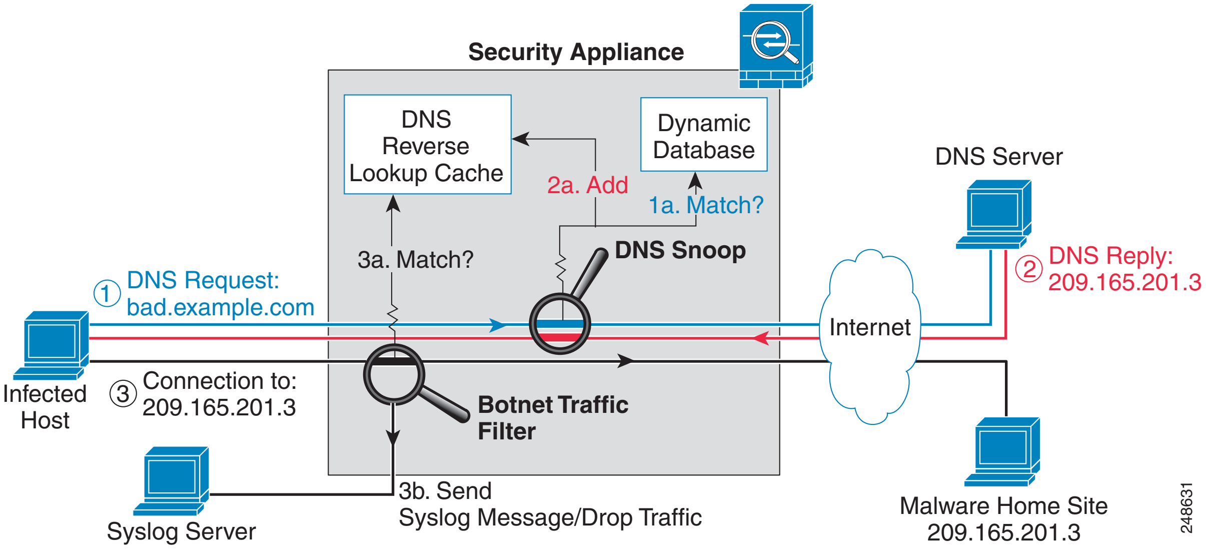
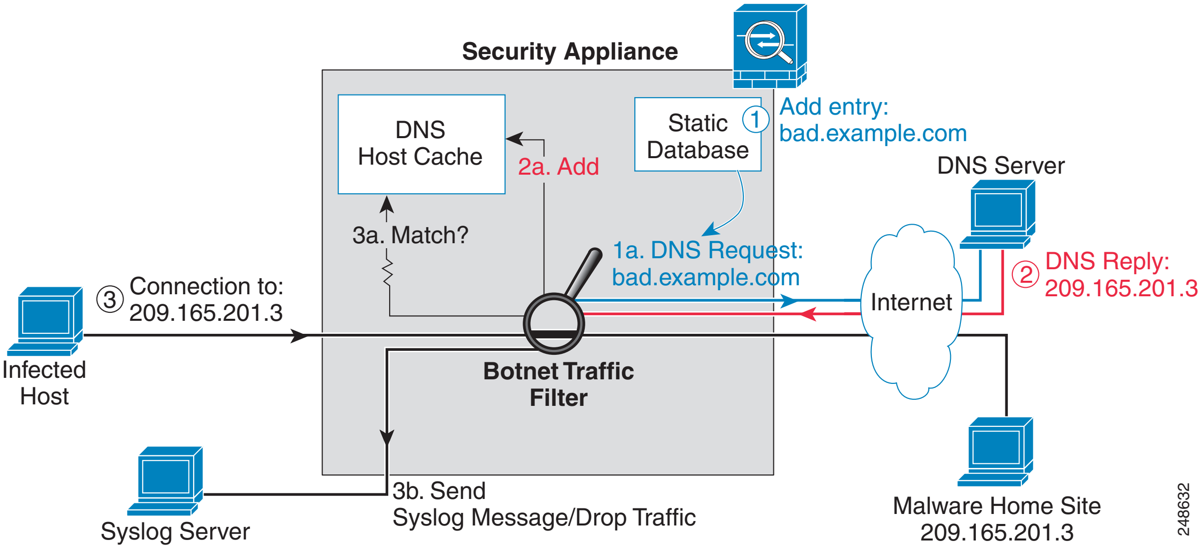


Figure 54-2 shows how the Botnet Traffic Filter works with the static database.

Figure 54-2 How the Botnet Traffic Filter Works with the Static Database


Security Appliance
DNS Host Cache
2a. Add
Static Database
① Add entry: bad.example.com
DNS Server
3a. Match?
1a. DNS Request: bad.example.com
Internet
② DNS Reply: 209.165.201.3
③ Connection to: 209.165.201.3
Infected Host
Botnet Traffic Filter
Syslog Server
3b. Send Syslog Message/Drop Traffic
Malware Home Site 209.165.201.3
248632

Licensing Requirements for the Botnet Traffic Filter

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	You need the following licenses: • Botnet Traffic Filter License. • Strong Encryption (3DES/AES) License to download the dynamic database.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

Failover Guidelines

Does not support replication of the DNS reverse lookup cache, DNS host cache, or the dynamic database in Stateful Failover.

IPv6 Guidelines

Does not support IPv6.

Additional Guidelines and Limitations

- TCP DNS traffic is not supported.
- You can add up to 1000 blacklist entries and 1000 whitelist entries in the static database.

Default Settings

By default, the Botnet Traffic Filter is disabled, as is use of the dynamic database.

For DNS inspection, which is enabled by default, Botnet Traffic Filter snooping is disabled by default.

Configuring the Botnet Traffic Filter

This section includes the following topics:

- Task Flow for Configuring the Botnet Traffic Filter, page 54-6
- Configuring the Dynamic Database, page 54-7
- Enabling DNS Snooping, page 54-9
- Adding Entries to the Static Database, page 54-8
- Enabling Traffic Classification and Actions for the Botnet Traffic Filter, page 54-11
- Blocking Botnet Traffic Manually, page 54-14
- Searching the Dynamic Database, page 54-15

Task Flow for Configuring the Botnet Traffic Filter

To configure the Botnet Traffic Filter, perform the following steps:

Step 1 Enable use of the dynamic database. See the "Configuring the Dynamic Database" section on page 54-7.

This procedure enables database updates from the Cisco update server, and also enables use of the downloaded dynamic database by the ASA. Disallowing use of the downloaded database is useful in multiple context mode so you can configure use of the database on a per-context basis.

Step 2 (Optional) Add static entries to the database. See the "Adding Entries to the Static Database" section on page 54-8.

This procedure lets you augment the dynamic database with domain names or IP addresses that you want to blacklist or whitelist. You might want to use the static database instead of the dynamic database if you do not want to download the dynamic database over the Internet.

Step 3 Enable DNS snooping. See the "Enabling DNS Snooping" section on page 54-9.

This procedure enables inspection of DNS packets, compares the domain name with those in the dynamic database or the static database (when a DNS server for the ASA is unavailable), and adds the name and IP address to the DNS reverse lookup cache. This cache is then used by the Botnet Traffic Filter when connections are made to the suspicious address.

Step 4 Enable traffic classification and actions for the Botnet Traffic Filter. See the "Enabling Traffic Classification and Actions for the Botnet Traffic Filter" section on page 54-11.

This procedure enables the Botnet Traffic Filter, which compares the source and destination IP address in each initial connection packet to the IP addresses in the dynamic database, static database, DNS reverse lookup cache, and DNS host cache, and sends a syslog message or drops any matching traffic.

Step 5 (Optional) Block traffic manually based on syslog message information. See the "Blocking Botnet Traffic Manually" section on page 54-14.

If you choose not to block malware traffic automatically, you can block traffic manually by configuring an access list to deny traffic, or by using the **shun** command to block all traffic to and from a host.

Configuring the Dynamic Database

This procedure enables database updates, and also enables use of the downloaded dynamic database by the ASA. Disabling use of the downloaded database is useful in multiple context mode so you can configure use of the database on a per-context basis.

By default, downloading and using the dynamic database is disabled.

Prerequisites

Enable ASA use of a DNS server according to the "Configuring the DNS Server" section on page 8-6.

Detailed Steps

	Command	Purpose

Step 1	**`dynamic-filter updater-client enable`**
	Example:
	`hostname(config)# dynamic-filter updater-client enable`
		Enables downloading of the dynamic database from the Cisco update server. In multiple context mode, enter this command in the system execution space. If you do not have a database already installed on the ASA, it downloads the database after approximately 2 minutes. The update server determines how often the ASA polls the server for future updates, typically every hour.

Step 2	(Multiple context mode only)
	`changeto context` *`context_name`*
	Example:
	`hostname# changeto context admin`
	`hostname/admin#`
		Changes to the context so that you can configure use of the database on a per-context basis.

Step 3	**`dynamic-filter use-database`**
	Example:
	`hostname(config)# dynamic-filter use-database`
		Enables use of the dynamic database. In multiple context mode, enter this command in the context execution space.

Examples

The following multiple mode example enables downloading of the dynamic database, and enables use of the database in context1 and context2:

```
hostname(config)# dynamic-filter updater-client enable
hostname(config)# changeto context context1
hostname/context1(config)# dynamic-filter use-database
hostname/context1(config)# changeto context context2
hostname/context2(config)# dynamic-filter use-database
```

The following single mode example enables downloading of the dynamic database, and enables use of the database:

```
hostname(config)# dynamic-filter updater-client enable
hostname(config)# dynamic-filter use-database
```

What to Do Next

See the "Adding Entries to the Static Database" section on page 54-8.

Adding Entries to the Static Database

The static database lets you augment the dynamic database with domain names or IP addresses that you want to blacklist or whitelist. Static blacklist entries are always designated with a Very High threat level. See the "Information About the Static Database" section on page 54-3 for more information.

Prerequisites

- In multiple context mode, perform this procedure in the context execution space.
- Enable ASA use of a DNS server according to the "Configuring the DNS Server" section on page 8-6.

Detailed Steps

	Command	Purpose

Step 1	**`dynamic-filter blacklist`**
	Example:
	`hostname(config)# dynamic-filter blacklist`
		Edits the Botnet Traffic Filter blacklist.

Step 2	Enter one or both of the following:	

	`name` *`domain_name`*
	Example:
	`hostname(config-llist)# name bad.example.com`
		Adds a name to the blacklist. You can enter this command multiple times for multiple entries. You can add up to 1000 blacklist entries.

	Command	Purpose
	address *ip_address mask* **Example:** `hostname(config-llist)# address 10.1.1.1 255.255.255.255`	Adds an IP address to the blacklist. You can enter this command multiple times for multiple entries. The *mask* can be for a single host or for a subnet.
Step 3	**dynamic-filter whitelist** **Example:** `hostname(config)# dynamic-filter whitelist`	Edits the Botnet Traffic Filter whitelist.
Step 4	Enter one or both of the following:	
	name *domain_name* **Example:** `hostname(config-llist)# name good.example.com`	Adds a name to the whitelist. You can enter this command multiple times for multiple entries. You can add up to 1000 whitelist entries.
	address *ip_address mask* **Example:** `hostname(config-llist)# address 10.1.1.2 255.255.255.255`	Adds an IP address to the whitelist. You can enter this command multiple times for multiple entries. The *mask* can be for a single host or for a subnet.

Examples

The following example creates entries for the blacklist and whitelist:

```
hostname(config)# dynamic-filter blacklist
hostname(config-llist)# name bad1.example.com
hostname(config-llist)# name bad2.example.com
hostname(config-llist)# address 10.1.1.1 255.255.255.0
hostname(config-llist)# dynamic-filter whitelist
hostname(config-llist)# name good.example.com
hostname(config-llist)# name great.example.com
hostname(config-llist)# name awesome.example.com
hostname(config-llist)# address 10.1.1.2 255.255.255.255
```

What to Do Next

See the "Enabling DNS Snooping" section on page 54-9.

Enabling DNS Snooping

This procedure enables inspection of DNS packets and enables Botnet Traffic Filter snooping, which compares the domain name with those on the dynamic database or static database, and adds the name and IP address to the Botnet Traffic Filter DNS reverse lookup cache. This cache is then used by the Botnet Traffic Filter when connections are made to the suspicious address.

The following procedure creates an interface-specific service policy for DNS inspection. See the "DNS Inspection" section on page 41-1 and Chapter 9, "Configuring Modular Policy Framework," for detailed information about configuring advanced DNS inspection options using the Modular Policy Framework.

Prerequisites

In multiple context mode, perform this procedure in the context execution space.

Restrictions

TCP DNS traffic is not supported.

Default DNS Inspection Configuration and Recommended Configuration

The default configuration for DNS inspection inspects all UDP DNS traffic on all interfaces, and does not have DNS snooping enabled.

We suggest that you enable DNS snooping only on interfaces where external DNS requests are going. Enabling DNS snooping on all UDP DNS traffic, including that going to an internal DNS server, creates unnecessary load on the ASA.

For example, if the DNS server is on the outside interface, you should enable DNS inspection with snooping for all UDP DNS traffic on the outside interface. See the "Examples" section for the recommended commands for this configuration.

Detailed Steps

	Command	Purpose

Step 1	**class-map** *name*
	Example:
	`hostname(config)# class-map dynamic-filter_snoop_class`
		Creates a class map to identify the traffic for which you want to inspect DNS.

Step 2	**match** *parameters* **Example:** `hostname(config-cmap)# match port udp eq domain`	Specifies traffic for the class map. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 for more information about available parameters. For example, you can specify an access list for DNS traffic to and from certain addresses, or you can specify all UDP DNS traffic.
Step 3	**policy-map** *name* **Example:** `hostname(config)# policy-map dynamic-filter_snoop_policy`	Adds or edits a policy map so you can set the actions to take with the class map traffic.

	Command	Purpose

Step 4	**class** *name*
	
	Example:
	`hostname(config-pmap)# class dynamic-filter_snoop_class`
		Identifies the class map you created in Step 1.

Step 5	**inspect dns** [*map_name*] **dynamic-filter-snoop** **Example:** `hostname(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop`	Enables DNS inspection with Botnet Traffic Filter snooping. To use the default DNS inspection policy map for the *map_name*, specify **preset_dns_map** for the map name. See the "DNS Inspection" section on page 41-1 for more information about creating a DNS inspection policy map.
Step 6	**service-policy** *policymap_name* **interface** *interface_name* **Example:** `hostname(config)# service-policy dynamic-filter_snoop_policy interface outside`	Activates the policy map on an interface. The interface-specific policy overrides the global policy. You can only apply one policy map to each interface.

Examples

The following recommended configuration creates a class map for all UDP DNS traffic, enables DNS inspection and Botnet Traffic Filter snooping with the default DNS inspection policy map, and applies it to the outside interface:

```
hostname(config)# class-map dynamic-filter_snoop_class
hostname(config-cmap)# match port udp eq domain
hostname(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname(config-pmap)# class dynamic-filter_snoop_class
hostname(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface outside
```

What to Do Next

See the "Enabling Traffic Classification and Actions for the Botnet Traffic Filter" section on page 54-11.

Enabling Traffic Classification and Actions for the Botnet Traffic Filter

This procedure enables the Botnet Traffic Filter. The Botnet Traffic Filter compares the source and destination IP address in each initial connection packet to the following:

- Dynamic database IP addresses
- Static database IP addresses
- DNS reverse lookup cache (for dynamic database domain names)
- DNS host cache (for static database domain names)

When an address matches, the ASA sends a syslog message. The only additional action currently available is to drop the connection.

Prerequisites

In multiple context mode, perform this procedure in the context execution space.

Recommended Configuration

Although DNS snooping is not required, we recommend configuring DNS snooping for maximum use of the Botnet Traffic Filter (see the "Enabling DNS Snooping" section on page 54-9). Without DNS snooping for the dynamic database, the Botnet Traffic Filter uses only the static database entries, plus any IP addresses in the dynamic database; domain names in the dynamic database are not used.

We recommend enabling the Botnet Traffic Filter on all traffic on the Internet-facing interface, and enabling dropping of traffic with a severity of moderate and higher. See the "Examples" section for the recommended commands used for this configuration.

Detailed Steps

	Command	Purpose

Step 1	(Optional)
	access-list *access_list_name* **extended** {**deny** | **permit**} *protocol source_address mask* [*operator port*] *dest_address mask* [*operator port*]
	Example:
	`hostname(config)# access-list dynamic-filter_acl extended permit tcp any any eq 80`
	`hostname(config)# access-list dynamic-filter_acl_subset extended permit tcp 10.1.1.0 255.255.255.0 any eq 80`
		Identifies the traffic that you want to monitor or drop. If you do not create an access list for monitoring, by default you monitor all traffic. You can optionally use an access list to identify a subset of monitored traffic that you want to drop; be sure the access list is a subset of the monitoring access list. See Chapter 11, "Adding an Extended Access List," for more information about creating an access list.

Step 2	**dynamic-filter enable** [**interface** *name*] [**classify-list** *access_list*] **Example:** `hostname(config)# dynamic-filter enable interface outside classify-list dynamic-filter_acl`	Enables the Botnet Traffic Filter; without any options, this command monitors all traffic. We recommend enabling the Botnet Traffic Filter on all traffic on the Internet-facing interface using the **interface** keyword. You can optionally limit monitoring to specific traffic by using the **classify-list** keyword with an access list. You can enter this command one time for each interface and one time for the global policy (where you do not specify the **interface** keyword). Each interface and global command can have an optional **classify-list** keyword. Any interface-specific commands take precedence over the global command.

	Command	Purpose
Step 3	(Optional) **dynamic-filter drop blacklist** [**interface** *name*] [**action-classify-list** *subset_access_list*] [**threat-level** {**eq** *level* | **range** *min max*}] **Example:** `hostname(config)# dynamic-filter drop blacklist interface outside action-classify-list dynamic-filter_acl_subset threat-level range moderate very-high`	Automatically drops malware traffic. To manually drop traffic, see the "Blocking Botnet Traffic Manually" section on page 54-14. Be sure to first configure a **dynamic-filter enable** command to monitor any traffic you also want to drop. The **action-classify-list** keyword limits the traffic dropped to a subset of monitored traffic. The dropped traffic must always be equal to or a subset of the monitored traffic. For example, if you specify an access list for the **dynamic-filter enable** command, and you specify the **action-classify-list** for this command, then it must be a subset of the **dynamic-filter enable** access list. You can set an interface policy using the **interface** keyword, or a global policy (where you do not specify the **interface** keyword). Any interface-specific commands take precedence over the global command. You can enter this command multiple times for each interface and global policy. Make sure you do not specify overlapping traffic in multiple commands for a given interface/global policy. Because you cannot control the exact order that commands are matched, overlapping traffic means you do not know which command will be matched. For example, do not specify both a command that matches all traffic (without the **action-classify-list** keyword) as well as a command with the **action-classify-list** keyword for a given interface. In this case, the traffic might never match the command with the **action-classify-list** keyword. Similarly, if you specify multiple commands with the **action-classify-list** keyword, make sure each access list is unique, and that the networks do not overlap. You can additionally limit the traffic dropped by setting the threat level. If you do not explicitly set a threat level, the level used is **threat-level range moderate very-high**. **Note** We highly recommend using the default setting unless you have strong reasons for changing the setting. The *level* and *min* and *max* options are: • **very-low** • **low** • **moderate** • **high** • **very-high** **Note** Static blacklist entries are always designated with a Very High threat level.

	Command	Purpose

Step 4	(Optional)
	`dynamic-filter ambiguous-is-black`
	Example:
	`hostname(config)# dynamic-filter ambiguous-is-black`
		If you configured the **dynamic-filter drop blacklist** command, then this command treats greylisted traffic as blacklisted traffic for dropping purposes. If you do not enable this command, greylisted traffic will not be dropped. See the "Botnet Traffic Filter Address Categories" section on page 54-2 for more information about the greylist.

Examples

The following recommended configuration monitors all traffic on the outside interface and drops all traffic at a threat level of moderate or higher:

```
hostname(config)# dynamic-filter enable interface outside
hostname(config)# dynamic-filter drop blacklist interface outside
```

If you decide not to monitor all traffic, you can limit the traffic using an access list. The following example monitors only port 80 traffic on the outside interface, and drops traffic threat level very-high only:

```
hostname(config)# access-list dynamic-filter_acl extended permit tcp any any eq 80
hostname(config)# dynamic-filter enable interface outside classify-list dynamic-filter_acl
hostname(config)# dynamic-filter drop blacklist interface outside threat-level eq
very-high
```

Blocking Botnet Traffic Manually

If you choose not to block malware traffic automatically (see the "Enabling Traffic Classification and Actions for the Botnet Traffic Filter" section on page 54-11), you can block traffic manually by configuring an access list to deny traffic, or by using the **shun** command tool to block all traffic to and from a host.

For example, you receive the following syslog message:

```
ASA-4-338002: Dynamic Filter permitted black listed TCP traffic from inside:10.1.1.45/6798
(209.165.201.1/7890) to outside:209.165.202.129/80 (209.165.202.129/80), destination
209.165.202.129 resolved from dynamic list: bad.example.com
```

You can then perform one of the following actions:

- Create an access list to deny traffic.

  For example, using the syslog message above, you might want to deny traffic from the infected host at 10.1.1.45 to the malware site at 209.165.202.129. Or, if there are many connections to different blacklisted addresses, you can create an access list to deny all traffic from 10.1.1.45 until you resolve the infection on the host computer. For example, the following commands deny all traffic from 10.1.1.5 to 209.165.202.129, but permits all other traffic on the inside interface:

  ```
  hostname(config)# access-list BLOCK_OUT extended deny ip host 10.1.1.45 host
  209.165.202.129
  hostname(config)# access-list BLOCK_OUT extended permit ip any any
  hostname(config)# access-group BLOCK_OUT in interface inside
  ```

  See Chapter 11, "Adding an Extended Access List," for more information about creating an access list andapplying the access list to the interface.

Note Access lists block all future connections. To block the current connection, if it is still active, enter the **clear conn** command. For example, to clear only the connection listed in the syslog message, enter the **clear conn address 10.1.1.45 address 209.165.202.129** command. See the *Cisco ASA 5500 Series Command Reference* for more information.

- Shun the infected host.

  Shunning blocks all connections from the host, so you should use an access list if you want to block connections to certain destination addresses and ports. To shun a host, enter the following command. To drop the current connection as well as blocking all future connections, enter the destination address, source port, destination port, and optional protocol.

  ```
  hostname(config)# shun src_ip [dst_ip src_port dest_port [protocol]]
  ```

  For example, to block future connections from 10.1.1.45, and also drop the current connection to the malware site in the syslog message, enter:

  ```
  hostname(config)# shun 10.1.1.45 209.165.202.129 6798 80
  ```

  See the "Blocking Unwanted Connections" section on page 57-2 for more information about shunning.

After you resolve the infection, be sure to remove the access list or the shun. To remove the shun, enter **no shun** *src_ip*.

Searching the Dynamic Database

If you want to check if a domain name or IP address is included in the dynamic database, you can search the database for a string.

Detailed Steps

Command	Purpose
dynamic-filter database find *string* **Example:** `hostname# dynamic-filter database find`	Searches the dynamic database for a domain name or IP address. The *string* can be the complete domain name or IP address, or you can enter part of the name or address, with a minimum search string of 3 characters. If there are multiple matches, the first two matches are shown. To refine your search for a more specific match, enter a longer string. **Note** Regular expressions are not supported for the database search.

Examples

The following example searches on the string "example.com", and finds 1 match:

```
hostname# dynamic-filter database find bad.example.com

   bad.example.com
Found 1 matches
```

The following example searches on the string "bad", and finds more than 2 matches:

```
hostname# dynamic-filter database find bad
```

```
   bad.example.com
   bad.example.net
Found more than 2 matches, enter a more specific string to find an exact
match
```

Monitoring the Botnet Traffic Filter

Whenever a known address is classified by the Botnet Traffic Filter, then a syslog message is generated. You can also monitor Botnet Traffic Filter statistics and other parameters by entering commands on the ASA. This section includes the following topics:

- Botnet Traffic Filter Syslog Messaging, page 54-16
- Botnet Traffic Filter Commands, page 54-16

Botnet Traffic Filter Syslog Messaging

The Botnet Traffic Filter generates detailed syslog messages numbered 338*nnn*. Messages differentiate between incoming and outgoing connections, blacklist, whitelist, or greylist addresses, and many other variables. (The greylist includes addresses that are associated with multiple domain names, but not all of these domain names are on the blacklist.)

See the *Cisco ASA 5500 Series System Log Messages* for detailed information about syslog messages.

Botnet Traffic Filter Commands

To monitor the Botnet Traffic Filter, enter one of the following commands:

Command	Purpose
show dynamic-filter statistics [**interface** *name*] [**detail**]	Shows how many connections were classified as whitelist, blacklist, and greylist connections, and how many connections were dropped. (The greylist includes addresses that are associated with multiple domain names, but not all of these domain names are on the blacklist.) The **detail** keyword shows how many packets at each threat level were classified or dropped. To clear the statistics, enter the **clear dynamic-filter statistics** [**interface** *name*] command.
show dynamic-filter reports top [**malware-sites** | **malware-ports** | **infected-hosts**]	Generates reports of the top 10 malware sites, ports, and infected hosts monitored. The top 10 malware-sites report includes the number of connections dropped, and the threat level and category of each site. This report is a snapshot of the data, and may not match the top 10 items since the statistics started to be collected. To clear the report data, enter the **clear dynamic-filter reports top** command.

Command	Purpose
show dynamic-filter reports infected-hosts {**max-connections** | **latest-active** | **highest-threat** | **subnet** *ip_address netmask* | **all**}	Generates reports about infected hosts. These reports contain detailed history about infected hosts, showing the correlation between infected hosts, visited malware sites, and malware ports. The **max-connections** keyword shows the 20 infected hosts with the most number of connections. The **latest-active** keyword shows the 20 hosts with the most recent activity. The **highest-threat** keyword shows the 20 hosts that connected to the malware sites with the highest threat level. The **subnet** keyword shows up to 20 hosts within the specified subnet. The **all** keyword shows all buffered infected-hosts information. This display might include thousands of entries. You might want to use ASDM to generate a PDF file instead of using the CLI. To clear the report data, enter the **clear dynamic-filter reports infected-hosts** command.
show dynamic-filter updater-client	Shows information about the updater server, including the server IP address, the next time the ASA will connect with the server, and the database version last installed.
show dynamic-filter dns-snoop [**detail**]	Shows the Botnet Traffic Filter DNS snooping summary, or with the **detail** keyword, the actual IP addresses and names. All inspected DNS data is included in this output, and not just matching names in the blacklist. DNS data from static entries are not included. To clear the DNS snooping data, enter the **clear dynamic-filter dns-snoop** command.
show dynamic-filter data	Shows information about the dynamic database, including when the dynamic database was last downloaded, the version of the database, how many entries the database contains, and 10 sample entries.
show asp table dynamic-filter [**hits**]	Shows the Botnet Traffic Filter rules that are installed in the accelerated security path.

Examples

The following is sample output from the **show dynamic-filter statistics** command:

```
hostname# show dynamic-filter statistics
Enabled on interface outside
 Total conns classified 11, ingress 11, egress 0
 Total whitelist classified 0, ingress 0, egress 0
 Total greylist classified 0, dropped 0, ingress 0, egress 0
 Total blacklist classified 11, dropped 5, ingress 11, egress 0
Enabled on interface inside
 Total conns classified 1182, ingress 1182, egress 0
 Total whitelist classified 3, ingress 3, egress 0
 Total greylist classified 0, dropped 0, ingress 0, egress 0
 Total blacklist classified 1179, dropped 1000, ingress 1179, egress 0
```

The following is sample output from the **show dynamic-filter reports top malware-sites** command:

```
hostname# show dynamic-filter reports top malware-sites
Site                                 Connections logged dropped Threat Level Category
-------------------------------------------------------------------------------------
bad1.example.com (10.67.22.34)                    11     0           2      Botnet
bad2.example.com (209.165.200.225)                 8     8           3      Virus
bad1.cisco.example(10.131.36.158)                  6     6           3      Virus
bad2.cisco.example(209.165.201.1)                  2     2           3      Trojan
```

```
horrible.example.net(10.232.224.2)                  2     2          3      Botnet
nono.example.org(209.165.202.130)                   1     1          3      Virus

Last clearing of the top sites report: at 13:41:06 UTC Jul 15 2009
```

The following is sample output from the **show dynamic-filter reports top malware-ports** command:

```
hostname# show dynamic-filter reports top malware-ports
Port                                       Connections logged
----------------------------------------------------------------------
tcp 1000                                           617
tcp 2001                                           472
tcp 23                                              22
tcp 1001                                            19
udp 2000                                            17
udp 2001                                            17
tcp 8080                                             9
tcp 80                                               3
tcp >8192                                            2

Last clearing of the top sites report: at 13:41:06 UTC Jul 15 2009
```

The following is sample output from the **show dynamic-filter reports top infected-hosts** command:

```
hostname# show dynamic-filter reports top infected-hosts
Host                                       Connections logged
----------------------------------------------------------------------
10.10.10.51(inside)                               1190
10.12.10.10(inside)                                10
10.10.11.10(inside)                                 5

Last clearing of the top infected-hosts report: at 13:41:06 UTC Jul 15 2009
```

Configuration Examples for the Botnet Traffic Filter

This section includes the recommended configuration for single and multiple context mode, as well as other possible configurations. This section includes the following topics:

- Recommended Configuration Example, page 54-18
- Other Configuration Examples, page 54-19

Recommended Configuration Example

The following recommended example configuration for single context mode enables downloading of the dynamic database, and enables use of the database. It creates a class map for all UDP DNS traffic, enables DNS inspection and Botnet Traffic Filter snooping with the default DNS inspection policy map, and applies it to the outside interface, the Internet-facing interface.

Example 54-1 Single Mode Botnet Traffic Filter Recommended Example

```
hostname(config)# dynamic-filter updater-client enable
hostname(config)# dynamic-filter use-database
hostname(config)# class-map dynamic-filter_snoop_class
hostname(config-cmap)# match port udp eq domain
hostname(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname(config-pmap)# class dynamic-filter_snoop_class
hostname(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface outside
hostname(config)# dynamic-filter enable interface outside
hostname(config)# dynamic-filter drop blacklist interface outside
```

The following recommended example configuration for multiple context mode enables the Botnet Traffic Filter for two contexts:

Example 54-2 Multiple Mode Botnet Traffic Filter Recommended Example

```
hostname(config)# dynamic-filter updater-client enable

hostname(config)# changeto context context1

hostname/context1(config)# dynamic-filter use-database
hostname/context1(config)# class-map dynamic-filter_snoop_class
hostname/context1(config-cmap)# match port udp eq domain
hostname/context1(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname/context1(config-pmap)# class dynamic-filter_snoop_class
hostname/context1(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname/context1(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface
outside
hostname/context1(config)# dynamic-filter enable interface outside
hostname/context1(config)# dynamic-filter drop blacklist interface outside

hostname/context1(config)# changeto context context2

hostname/context2(config)# dynamic-filter use-database
hostname/context2(config)# class-map dynamic-filter_snoop_class
hostname/context2(config-cmap)# match port udp eq domain
hostname/context2(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname/context2(config-pmap)# class dynamic-filter_snoop_class
hostname/context2(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname/context2(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface
outside
hostname/context2(config)# dynamic-filter enable interface outside
hostname/context2(config)# dynamic-filter drop blacklist interface outside
```

Other Configuration Examples

The following sample configuration adds static entries are to the blacklist and to the whitelist. Then, it monitors all port 80 traffic on the outside interface, and drops blacklisted traffic. It also treats greylist addresses as blacklisted addresses.

```
hostname(config)# dynamic-filter updater-client enable

hostname(config)# changeto context context1

hostname/context1(config)# dynamic-filter use-database
hostname/context1(config)# class-map dynamic-filter_snoop_class
hostname/context1(config-cmap)# match port udp eq domain
hostname/context1(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname/context1(config-pmap)# class dynamic-filter_snoop_class
hostname/context1(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname/context1(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface
outside
hostname/context1(config-pmap-c)# dynamic-filter blacklist
hostname/context1(config-llist)# name bad1.example.com
hostname/context1(config-llist)# name bad2.example.com
```

```
hostname/context1(config-llist)# address 10.1.1.1 255.255.255.0
hostname/context1(config-llist)# dynamic-filter whitelist
hostname/context1(config-llist)# name good.example.com
hostname/context1(config-llist)# name great.example.com
hostname/context1(config-llist)# name awesome.example.com
hostname/context1(config-llist)# address 10.1.1.2 255.255.255.255
hostname/context1(config-llist)# access-list dynamic-filter_acl extended permit tcp any
any eq 80
hostname/context1(config)# dynamic-filter enable interface outside classify-list
dynamic-filter_acl
hostname/context1(config)# dynamic-filter drop blacklist interface outside
hostname/context1(config)# dynamic-filter ambiguous-is-black

hostname/context1(config)# changeto context context2

hostname/context2(config)# dynamic-filter use-database
hostname/context2(config)# class-map dynamic-filter_snoop_class
hostname/context2(config-cmap)# match port udp eq domain
hostname/context2(config-cmap)# policy-map dynamic-filter_snoop_policy
hostname/context2(config-pmap)# class dynamic-filter_snoop_class
hostname/context2(config-pmap-c)# inspect dns preset_dns_map dynamic-filter-snoop
hostname/context2(config-pmap-c)# service-policy dynamic-filter_snoop_policy interface
outside
hostname/context2(config-pmap-c)# dynamic-filter blacklist
hostname/context2(config-llist)# name bad1.example.com
hostname/context2(config-llist)# name bad2.example.com
hostname/context2(config-llist)# address 10.1.1.1 255.255.255.0
hostname/context2(config-llist)# dynamic-filter whitelist
hostname/context2(config-llist)# name good.example.com
hostname/context2(config-llist)# name great.example.com
hostname/context2(config-llist)# name awesome.example.com
hostname/context2(config-llist)# address 10.1.1.2 255.255.255.255
hostname/context2(config-llist)# access-list dynamic-filter_acl extended permit tcp any
any eq 80
hostname/context2(config)# dynamic-filter enable interface outside classify-list
dynamic-filter_acl
hostname/context2(config)# dynamic-filter drop blacklist interface outside
hostname/context2(config)# dynamic-filter ambiguous-is-black
```

Where to Go Next

- To configure the syslog server, see Chapter 74, "Configuring Logging."
- To configure an access list to block traffic, see Chapter 11, "Adding an Extended Access List."
- To shun connections, see the "Blocking Unwanted Connections" section on page 57-2.

Feature History for the Botnet Traffic Filter

Table 54-2 lists each feature change and the platform release in which it was implemented.

Table 54-2 Feature History for the Botnet Traffic Filter

Feature Name	Platform Releases	Feature Information
Botnet Traffic Filter	8.2(1)	This feature was introduced.
Automatic blocking, and blacklist category and threat level reporting.	8.2(2)	The Botnet Traffic Filter now supports automatic blocking of blacklisted traffic based on the threat level. You can also view the category and threat level of malware sites in statistics and reports. The following commands were introduced or modified: **dynamic-filter ambiguous-is-black**, **dynamic-filter drop blacklist**, **show dynamic-filter statistics**, **show dynamic-filter reports infected-hosts**, and **show dynamic-filter reports top**.

CHAPTER 55

Configuring QoS

Have you ever participated in a long-distance phone call that involved a satellite connection? The conversation might be interrupted with brief, but perceptible, gaps at odd intervals. Those gaps are the time, called the latency, between the arrival of packets being transmitted over the network. Some network traffic, such as voice and video, cannot tolerate long latency times. Quality of service (QoS) is a feature that lets you give priority to critical traffic, prevent bandwidth hogging, and manage network bottlenecks to prevent packet drops.

This chapter describes how to apply QoS policies and includes the following sections:

- Information About QoS, page 55-1
- Licensing Requirements for QoS, page 55-5
- Guidelines and Limitations, page 55-5
- Configuring QoS, page 55-6
- Monitoring QoS, page 55-15
- Feature History for QoS, page 55-18

Information About QoS

You should consider that in an ever-changing network environment, QoS is not a one-time deployment, but an ongoing, essential part of network design.

Note QoS is only available in single context mode.

This section describes the QoS features supported by the ASA and includes the following topics:

- Supported QoS Features, page 55-2
- What is a Token Bucket?, page 55-2
- Information About Policing, page 55-3
- Information About Priority Queuing, page 55-3
- Information About Traffic Shaping, page 55-4
- DSCP and DiffServ Preservation, page 55-5

Supported QoS Features

The ASA supports the following QoS features:

- Policing—To prevent individual flows from hogging the network bandwidth, you can limit the maximum bandwidth used per flow. See the "Information About Policing" section on page 55-3 for more information.
- Priority queuing—For critical traffic that cannot tolerate latency, such as Voice over IP (VoIP), you can identify traffic for Low Latency Queuing (LLQ) so that it is always transmitted ahead of other traffic. See the "Information About Priority Queuing" section on page 55-3 for more information.
- Traffic shaping—If you have a device that transmits packets at a high speed, such as a ASA with Fast Ethernet, and it is connected to a low speed device such as a cable modem, then the cable modem is a bottleneck at which packets are frequently dropped. To manage networks with differing line speeds, you can configure the ASA to transmit packets at a fixed slower rate. See the "Information About Traffic Shaping" section on page 55-4 for more information.

What is a Token Bucket?

A token bucket is used to manage a device that regulates the data in a flow. For example, the regulator might be a traffic policer or a traffic shaper. A token bucket itself has no discard or priority policy. Rather, a token bucket discards tokens and leaves to the flow the problem of managing its transmission queue if the flow overdrives the regulator.

A token bucket is a formal definition of a rate of transfer. It has three components: a burst size, an average rate, and a time interval. Although the average rate is generally represented as bits per second, any two values may be derived from the third by the relation shown as follows:

average rate = burst size / time interval

Here are some definitions of these terms:

- Average rate—Also called the committed information rate (CIR), it specifies how much data can be sent or forwarded per unit time on average.
- Burst size—Also called the Committed Burst (Bc) size, it specifies in bits or bytes per burst how much traffic can be sent within a given unit of time to not create scheduling concerns. (For traffic shaping, it specifies bits per burst; for policing, it specifies bytes per burst.)
- Time interval—Also called the measurement interval, it specifies the time quantum in seconds per burst.

In the token bucket metaphor, tokens are put into the bucket at a certain rate. The bucket itself has a specified capacity. If the bucket fills to capacity, newly arriving tokens are discarded. Each token is permission for the source to send a certain number of bits into the network. To send a packet, the regulator must remove from the bucket a number of tokens equal in representation to the packet size.

If not enough tokens are in the bucket to send a packet, the packet either waits until the bucket has enough tokens (in the case of traffic shaping) or the packet is discarded or marked down (in the case of policing). If the bucket is already full of tokens, incoming tokens overflow and are not available to future packets. Thus, at any time, the largest burst a source can send into the network is roughly proportional to the size of the bucket.

Note that the token bucket mechanism used for traffic shaping has both a token bucket and a data buffer, or queue; if it did not have a data buffer, it would be a policer. For traffic shaping, packets that arrive that cannot be sent immediately are delayed in the data buffer.

For traffic shaping, a token bucket permits burstiness but bounds it. It guarantees that the burstiness is bounded so that the flow will never send faster than the token bucket capacity, divided by the time interval, plus the established rate at which tokens are placed in the token bucket. See the following formula:

(token bucket capacity in bits / time interval in seconds) + established rate in bps = maximum flow speed in bps

This method of bounding burstiness also guarantees that the long-term transmission rate will not exceed the established rate at which tokens are placed in the bucket.

Information About Policing

Policing is a way of ensuring that no traffic exceeds the maximum rate (in bits/second) that you configure, thus ensuring that no one traffic flow or class can take over the entire resource. When traffic exceeds the maximum rate, the ASA drops the excess traffic. Policing also sets the largest single burst of traffic allowed.

Information About Priority Queuing

LLQ priority queuing lets you prioritize certain traffic flows (such as latency-sensitive traffic like voice and video) ahead of other traffic.

The ASA supports two types of priority queuing:

- Standard priority queuing—Standard priority queuing uses an LLQ priority queue on an interface (see the "Configuring the Standard Priority Queue for an Interface" section on page 55-7), while all other traffic goes into the "best effort" queue. Because queues are not of infinite size, they can fill and overflow. When a queue is full, any additional packets cannot get into the queue and are dropped. This is called *tail drop*. To avoid having the queue fill up, you can increase the queue buffer size. You can also fine-tune the maximum number of packets allowed into the transmit queue. These options let you control the latency and robustness of the priority queuing. Packets in the LLQ queue are always transmitted before packets in the best effort queue.
- Hierarchical priority queuing—Hierarchical priority queuing is used on interfaces on which you enable a traffic shaping queue. A subset of the shaped traffic can be prioritized. The standard priority queue is not used. See the following guidelines about hierarchical priority queuing:
  - Priority packets are always queued at the head of the shape queue so they are always transmitted ahead of other non-priority queued packets.
  - Priority packets are never dropped from the shape queue unless the sustained rate of priority traffic exceeds the shape rate.
  - For IPsec-encrypted packets, you can only match traffic based on the DSCP or precedence setting.
  - IPsec-over-TCP is not supported for priority traffic classification.

Information About Traffic Shaping

Traffic shaping is used to match device and link speeds, thereby controlling packet loss, variable delay, and link saturation, which can cause jitter and delay.

Note Traffic shaping is not supported on the ASA 5580.

- Traffic shaping must be applied to all outgoing traffic on a physical interface or in the case of the ASA 5505, on a VLAN. You cannot configure traffic shaping for specific types of traffic.
- Traffic shaping is implemented when packets are ready to be transmitted on an interface, so the rate calculation is performed based on the actual size of a packet to be transmitted, including all the possible overhead such as the IPsec header and L2 header.
- The shaped traffic includes both through-the-box and from-the-box traffic.
- The shape rate calculation is based on the standard token bucket algorithm. The token bucket size is twice the Burst Size value. See the "What is a Token Bucket?" section on page 55-2.
- When bursty traffic exceeds the specified shape rate, packets are queued and transmitted later. Following are some characteristics regarding the shape queue (for information about hierarchical priority queuing, see the "Information About Priority Queuing" section on page 55-3):
  - The queue size is calculated based on the shape rate. The queue can hold the equivalent of 200-milliseconds worth of shape rate traffic, assuming a 1500-byte packet. The minimum queue size is 64.
  - When the queue limit is reached, packets are tail-dropped.
  - Certain critical keep-alive packets such as OSPF Hello packets are never dropped.
  - The time interval is derived by *time_interval* = *burst_size* / *average_rate*. The larger the time interval is, the burstier the shaped traffic might be, and the longer the link might be idle. The effect can be best understood using the following exaggerated example:

    Average Rate = 1000000

    Burst Size = 1000000

    In the above example, the time interval is 1 second, which means, 1 Mbps of traffic can be bursted out within the first 10 milliseconds of the 1-second interval on a 100 Mbps FE link and leave the remaining 990 milliseconds idle without being able to send any packets until the next time interval. So if there is delay-sensitive traffic such as voice traffic, the Burst Size should be reduced compared to the average rate so the time interval is reduced.

How QoS Features Interact

You can configure each of the QoS features alone if desired for the ASA. Often, though, you configure multiple QoS features on the ASA so you can prioritize some traffic, for example, and prevent other traffic from causing bandwidth problems.

See the following supported feature combinations per interface:

- Standard priority queuing (for specific traffic) + Policing (for the rest of the traffic).

  You cannot configure priority queuing and policing for the same set of traffic.
- Traffic shaping (for all traffic on an interface) + Hierarchical priority queuing (for a subset of traffic).

You cannot configure traffic shaping and standard priority queuing for the same interface; only hierarchical priority queuing is allowed. For example, if you configure standard priority queuing for the global policy, and then configure traffic shaping for a specific interface, the feature you configured last is rejected because the global policy overlaps the interface policy.

Typically, if you enable traffic shaping, you do not also enable policing for the same traffic, although the ASA does not restrict you from configuring this.

DSCP and DiffServ Preservation

- DSCP markings are preserved on all traffic passing through the ASA.
- The ASA does not locally mark/remark any classified traffic, but it honors the Expedited Forwarding (EF) DSCP bits of every packet to determine if it requires “priority” handling and will direct those packets to the LLQ.
- DiffServ marking is preserved on packets when they traverse the service provider backbone so that QoS can be applied in transit (QoS tunnel pre-classification).

Licensing Requirements for QoS

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single context mode only. Does not support multiple context mode.

Firewall Mode Guidelines

Supported in routed firewall mode only. Does not support transparent firewall mode.

IPv6 Guidelines

Does not support IPv6.

Model Guidelines

Traffic shaping is not supported on the ASA 5580.

Additional Guidelines and Limitations

- For traffic shaping, you can only use the **class-default** class map, which is automatically created by the ASA, and which matches all traffic.

- For priority traffic, you cannot use the **class-default** class map.
- For hierarchical priority queuing, for encrypted VPN traffic, you can only match traffic based on the DSCP or precedence setting; you cannot match a tunnel group.
- For hierarchical priority queuing, IPsec-over-TCP traffic is not supported.
- You cannot configure traffic shaping and standard priority queuing for the same interface; only hierarchical priority queuing is allowed.
- For standard priority queuing, the queue must be configured for a physical interface or for a VLAN on the ASA 5505.
- You cannot create a standard priority queue for a Ten Gigabit Ethernet interface; priority queuing is not necessary for an interface with high bandwidth.

Configuring QoS

This section includes the following topics:

- Determining the Queue and TX Ring Limits for a Standard Priority Queue, page 55-6
- Configuring the Standard Priority Queue for an Interface, page 55-7
- Configuring a Service Rule for Standard Priority Queuing and Policing, page 55-9
- Configuring a Service Rule for Traffic Shaping and Hierarchical Priority Queuing, page 55-12

Determining the Queue and TX Ring Limits for a Standard Priority Queue

To determine the priority queue and TX ring limits, use the worksheets below.

Table 55-1 shows how to calculate the priority queue size. Because queues are not of infinite size, they can fill and overflow. When a queue is full, any additional packets cannot get into the queue and are dropped (called *tail drop*). To avoid having the queue fill up, you can adjust the queue buffer size according to the "Configuring the Standard Priority Queue for an Interface" section on page 55-7.

Table 55-1 Queue Limit Worksheet

Step 1	__________ *Outbound bandwidth (Mbps or Kbps)*[1]	Mbps	**x**	**125**	**=**	__________ *# of bytes/ms*		
		Kbps	**x**	**.125**	**=**	__________ *# of bytes/ms*		
Step 2	__________ *# of bytes/ms from Step 1*	**÷**	__________ *Average packet size (bytes)*[2]	**x**	__________ *Delay (ms)*[3]	**=**	__________ *Queue limit (# of packets)*	

1. For example, DSL might have an uplink speed of 768 Kbps. Check with your provider.
2. Determine this value from a codec or sampling size. For example, for VoIP over VPN, you might use 160 bytes. We recommend 256 bytes if you do not know what size to use.
3. The delay depends on your application. For example, the recommended maximum delay for VoIP is 200 ms. We recommend 500 ms if you do not know what delay to use.

Table 55-2 shows how to calculate the TX ring limit. This limit determines the maximum number of packets allowed into the Ethernet transmit driver before the driver pushes back to the queues on the interface to let them buffer packets until the congestion clears. This setting guarantees that the hardware-based transmit ring imposes a limited amount of extra latency for a high-priority packet.

Table 55-2 TX Ring Limit Worksheet

Step 1	__________ *Outbound bandwidth (Mbps or Kbps)*[1]	Mbps	x	**125**	=	__________ *# of bytes/ms*	
		Kbps	x	**0.125**	=	__________ *# of bytes/ms*	
Step 2	__________ *# of bytes/ms from Step 1*	÷	__________ *Maximum packet size (bytes)*[2]	x	__________ *Delay (ms)*[3]	=	__________ *TX ring limit (# of packets)*

1. For example, DSL might have an uplink speed of 768 Kbps.Check with your provider.
2. Typically, the maximum size is 1538 bytes, or 1542 bytes for tagged Ethernet. If you allow jumbo frames (if supported for your platform), then the packet size might be larger.
3. The delay depends on your application. For example, to control jitter for VoIP, you should use 20 ms.

Configuring the Standard Priority Queue for an Interface

If you enable standard priority queuing for traffic on a physical interface, then you need to also create the priority queue on each interface. Each physical interface uses two queues: one for priority traffic, and the other for all other traffic. For the other traffic, you can optionally configure policing.

Note The standard priority queue is not required for hierarchical priority queuing with traffic shaping; see the "Information About Priority Queuing" section on page 55-3 for more information.

Restrictions

You cannot create a priority queue for a Ten Gigabit Ethernet interface; priority queuing is not necessary for an interface with high bandwidth.

Detailed Steps

	Command	Purpose

Step 1	**`priority-queue`** *`interface_name`*
	Example:
	`hostname(config)# priority-queue inside`
		Creatse the priority queue, where the *interface_name* argument specifies the physical interface name on which you want to enable the priority queue, or for the ASA 5505, the VLAN interface name.

Step 2	**`queue-limit`** *`number_of_packets`*
	Example:
	`hostname(config-priority-queue)# queue-limit 260`
		Changes the size of the priority queues. The default queue limit is 1024 packets. Because queues are not of infinite size, they can fill and overflow. When a queue is full, any additional packets cannot get into the queue and are dropped (called *tail drop*). To avoid having the queue fill up, you can use the **queue-limit** command to increase the queue buffer size.
		The upper limit of the range of values for the **queue-limit** command is determined dynamically at run time. To view this limit, enter **queue-limit ?** on the command line. The key determinants are the memory needed to support the queues and the memory available on the device.
		The **queue-limit** that you specify affects both the higher priority low-latency queue and the best effort queue.

Step 3	**`tx-ring-limit`** *`number_of_packets`*
	Example:
	`hostname(config-priority-queue)# tx-ring-limit 3`
		Specifies the depth of the priority queues. The default tx-ring-limit is 128 packets. This command sets the maximum number of low-latency or normal priority packets allowed into the Ethernet transmit driver before the driver pushes back to the queues on the interface to let them buffer packets until the congestion clears. This setting guarantees that the hardware-based transmit ring imposes a limited amount of extra latency for a high-priority packet.
		The upper limit of the range of values for the **tx-ring-limit** command is determined dynamically at run time. To view this limit, enter **tx-ring-limit ?** on the command line. The key determinants are the memory needed to support the queues and the memory available on the device.
		The **tx-ring-limit** that you specify affects both the higher priority low-latency queue and the best-effort queue.

Examples

The following example establishes a priority queue on interface “outside” (the GigabitEthernet0/1 interface), with the default queue-limit and tx-ring-limit:

```
hostname(config)# priority-queue outside
```

The following example establishes a priority queue on the interface “outside” (the GigabitEthernet0/1 interface), sets the queue-limit to 260 packets, and sets the tx-ring-limit to 3:

```
hostname(config)# priority-queue outside
hostname(config-priority-queue)# queue-limit 260
hostname(config-priority-queue)# tx-ring-limit 3
```

Configuring a Service Rule for Standard Priority Queuing and Policing

You can configure standard priority queuing and policing for different class maps within the same policy map. See the "How QoS Features Interact" section on page 55-4 for information about valid QoS configurations.

To create a policy map, perform the following steps.

Restrictions

- You cannot use the **class-default** class map for priority traffic.
- You cannot configure traffic shaping and standard priority queuing for the same interface; only hierarchical priority queuing is allowed.

Guidelines

- For priority traffic, identify only latency-sensitive traffic.
- For policing traffic, you can choose to police all other traffic, or you can limit the traffic to certain types.

Detailed Steps

	Command	Purpose
Step 1	`class-map` *priority_map_name* **Example:** `hostname(config)# class-map priority_traffic`	For priority traffic, creates a class map to identify the traffic for which you want to perform priority queuing.
Step 2	`match` *parameter* **Example:** `hostname(config-cmap)# match access-list priority`	Specifies the traffic in the class map. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 for more information.
Step 3	`class-map` *policing_map_name* **Example:** `hostname(config)# class-map policing_traffic`	For policing traffic, creates a class map to identify the traffic for which you want to perform policing.
Step 4	`match` *parameter* **Example:** `hostname(config-cmap)# match access-list policing`	Specifies the traffic in the class map. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 for more information.
Step 5	`policy-map` *name* **Example:** `hostname(config)# policy-map QoS_policy`	Adds or edits a policy map.

	Command	Purpose

Step 6	**class** *priority_map_name*
	Example:
	`hostname(config-pmap)# class priority_class`
		Identifies the class map you created for prioritized traffic in Step 1.

Step 7	**priority** **Example:** `hostname(config-pmap-c)# priority`	Configures priority queuing for the class.

Step 8	**class** *policing_map_name*
	Example:
	`hostname(config-pmap)# class policing_class`
		Identifies the class map you created for policed traffic in Step 3.

Step 9	**police** {**output** | **input**} *conform-rate* [*conform-burst*] [**conform-action** [**drop** | **transmit**]] [**exceed-action** [**drop** | **transmit**]] **Example:** `hostname(config-pmap-c)# police output 56000 10500`	Configures policing for the class. See the followingoptions: • *conform-burst argument*—Specifies the maximum number of instantaneous bytes allowed in a sustained burst before throttling to the conforming rate value, between 1000 and 512000000 bytes. • **conform-action**—Sets the action to take when the rate is less than the *conform_burst* value. • *conform-rate*—Sets the rate limit for this traffic flow; between 8000 and 2000000000 bits per second.] • **drop**—Drops the packet. • **exceed-action**—Sets the action to take when the rate is between the *conform-rate* value and the *conform-burst* value. • **input**—Enables policing of traffic flowing in the input direction. • **output**—Enables policing of traffic flowing in the output direction. • **transmit**—Transmits the packet.

Step 10	**service-policy** *policymap_name* {**global** | **interface** *interface_name*}
	Example:
	`hostname(config)# service-policy QoS_policy interface inside`
		Activates the policy map on one or more interfaces. **global** applies the policy map to all interfaces, and **interface** applies the policy to one interface. Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

Examples

Example 55-1 Class Map Examples for VPN Traffic

In the following example, the **class-map** command classifies all non-tunneled TCP traffic, using an access list named tcp_traffic:

```
hostname(config)# access-list tcp_traffic permit tcp any any
hostname(config)# class-map tcp_traffic
hostname(config-cmap)# match access-list tcp_traffic
```

In the following example, other, more specific match criteria are used for classifying traffic for specific, security-related tunnel groups. These specific match criteria stipulate that a match on tunnel-group (in this case, the previously-defined Tunnel-Group-1) is required as the first match characteristic to classify traffic for a specific tunnel, and it allows for an additional match line to classify the traffic (IP differential services code point, expedited forwarding).

```
hostname(config)# class-map TG1-voice
hostname(config-cmap)# match tunnel-group tunnel-grp1
hostname(config-cmap)# match dscp ef
```

In the following example, the **class-map** command classifies both tunneled and non-tunneled traffic according to the traffic type:

```
hostname(config)# access-list tunneled extended permit ip 10.10.34.0 255.255.255.0
192.168.10.0 255.255.255.0
hostname(config)# access-list non-tunneled extended permit tcp any any
hostname(config)# tunnel-group tunnel-grp1 type IPsec_L2L

hostname(config)# class-map browse
hostname(config-cmap)# description "This class-map matches all non-tunneled tcp traffic."
hostname(config-cmap)# match access-list non-tunneled

hostname(config-cmap)# class-map TG1-voice
hostname(config-cmap)# description "This class-map matches all dscp ef traffic for
tunnel-grp 1."
hostname(config-cmap)# match dscp ef
hostname(config-cmap)# match tunnel-group tunnel-grp1

hostname(config-cmap)# class-map TG1-BestEffort
hostname(config-cmap)# description "This class-map matches all best-effort traffic for
tunnel-grp1."
hostname(config-cmap)# match tunnel-group tunnel-grp1
hostname(config-cmap)# match flow ip destination-address
```

The following example shows a way of policing a flow within a tunnel, provided the classed traffic is not specified as a tunnel, but does go *through* the tunnel. In this example, 192.168.10.10 is the address of the host machine on the private side of the remote tunnel, and the access list is named "host-over-l2l". By creating a class-map (named "host-specific"), you can then police the "host-specific" class before the LAN-to-LAN connection polices the tunnel. In this example, the "host-specific" traffic is rate-limited before the tunnel, then the tunnel is rate-limited:

```
hostname(config)# access-list host-over-l2l extended permit ip any host 192.168.10.10
hostname(config)# class-map host-specific
hostname(config-cmap)# match access-list host-over-l2l
```

The following example builds on the configuration developed in the previous section. As in the previous example, there are two named class-maps: tcp_traffic and TG1-voice.

```
hostname(config)# class-map TG1-best-effort
hostname(config-cmap)# match tunnel-group Tunnel-Group-1
hostname(config-cmap)# match flow ip destination-address
```

Adding a third class map provides a basis for defining a tunneled and non-tunneled QoS policy, as follows, which creates a simple QoS policy for tunneled and non-tunneled traffic, assigning packets of the class TG1-voice to the low latency queue and setting rate limits on the tcp_traffic and TG1-best-effort traffic flows.

Example 55-2 Priority and Policing Example

In this example, the maximum rate for traffic of the tcp_traffic class is 56,000 bits/second and a maximum burst size of 10,500 bytes per second. For the TC1-BestEffort class, the maximum rate is 200,000 bits/second, with a maximum burst of 37,500 bytes/second. Traffic in the TC1-voice class has no policed maximum speed or burst rate because it belongs to a priority class.

```
hostname(config)# access-list tcp_traffic permit tcp any any
hostname(config)# class-map tcp_traffic
hostname(config-cmap)# match access-list tcp_traffic

hostname(config)# class-map TG1-voice
hostname(config-cmap)# match tunnel-group tunnel-grp1
hostname(config-cmap)# match dscp ef

hostname(config-cmap)# class-map TG1-BestEffort
hostname(config-cmap)# match tunnel-group tunnel-grp1
hostname(config-cmap)# match flow ip destination-address

hostname(config)# policy-map qos
hostname(config-pmap)# class tcp_traffic
hostname(config-pmap-c)# police output 56000 10500

hostname(config-pmap-c)# class TG1-voice
hostname(config-pmap-c)# priority

hostname(config-pmap-c)# class TG1-best-effort
hostname(config-pmap-c)# police output 200000 37500

hostname(config-pmap-c)# class class-default
hostname(config-pmap-c)# police output 1000000 37500

hostname(config-pmap-c)# service-policy qos global
```

Configuring a Service Rule for Traffic Shaping and Hierarchical Priority Queuing

You can configure traffic shaping for all traffic on an interface, and optionally hierarchical priority queuing for a subset of latency-sensitive traffic.

This section includes the following topics:

- (Optional) Configuring the Hierarchical Priority Queuing Policy, page 55-12
- Configuring the Service Rule, page 55-13

(Optional) Configuring the Hierarchical Priority Queuing Policy

You can optionally configure priority queuing for a subset of latency-sensitive traffic.

Guidelines

- `One side-effect of priority queuing is packet re-ordering. For IPsec packets, out-of-order packets that are not within the anti-replay window generate warning syslog messages. These warnings are false alarms in the case of priority queuing. You can configure the IPsec anti-replay window size to avoid possible false alarms.` See the **crypto ipsec security-association replay** command in the *Cisco ASA 5500 Series Command Reference*.For hierarchical priority queuing, you do not need to create a priority queue on an interface.

Restrictions

- For hierarchical priority queuing, for encrypted VPN traffic, you can only match traffic based on the DSCP or precedence setting; you cannot match a tunnel group.
- For hierarchical priority queuing, IPsec-over-TCP traffic is not supported.

Detailed Steps

	Command	Purpose

Step 1	**`class-map`** *`priority_map_name`*
	Example:
	`hostname(config)# class-map priority_traffic`
		For hierarchical priority queuing, creates a class map to identify the traffic for which you want to perform priority queuing.

Step 2	**`match`** *`parameter`*
	Example:
	`hostname(config-cmap)# match access-list priority`
		Specifies the traffic in the class map. See the "Identifying Traffic (Layer 3/4 Class Map)" section on page 9-13 for more information. For encrypted VPN traffic, you can only match traffic based on the DSCP or precedence setting; you cannot match a tunnel group.

Step 3	**`policy-map`** *`priority_map_name`*
	Example:
	`hostname(config)# policy-map priority-sub-policy`
		Creates a policy map.

Step 4	**`class`** *`priority_map_name`*
	Example:
	`hostname(config-pmap)# class priority-sub-map`
		Specifies the class map you created in Step 1.

Step 5	**`priority`**
	Example:
	`hostname(config-pmap-c)# priority`
		Applies the priority queuing action to a class map.
		Note This policy has not yet been activated. You must activate it as part of the shaping policy. See the "Configuring the Service Rule" section on page 55-13.

Configuring the Service Rule

To configure traffic shaping and optional hiearchical priority queuing, perform the following steps.

Restrictions

- Traffic shaping is not supported on the ASA 5580.
- For traffic shaping, you can only use the **class-default** class map, which is automatically created by the ASA, and which matches all traffic.
- You cannot configure traffic shaping and standard priority queuing for the same interface; only hierarchical priority queuing is allowed. See the "How QoS Features Interact" section on page 55-4 for information about valid QoS configurations.
- You cannot configure traffic shaping in the global policy.

Detailed Steps

	Command	Purpose
Step 1	**policy-map** *name* **Example:** `hostname(config)# policy-map shape_policy`	Adds or edits a policy map. This policy map must be different from the hierarchical priority-queuing map.

Step 2	**class class-default**
	Example:
	`hostname(config-pmap)# class class-default`
		Identifies all traffic for traffic shaping; you can only use the **class-default** class map, which is defined as **match any**, because the ASA requires all traffic to be matched for traffic shaping.

Step 3	**shape average** *rate* [*burst_size*] **Example:** `hostname(config-pmap-c)# shape average 70000 4000`	Enables traffic shaping, where the **average** *rate* argument sets the average rate of traffic in bits per second over a given fixed time period, between 64000 and 154400000. Specify a value that is a multiple of 8000. See the "Information About Traffic Shaping" section on page 55-4 for more information about how the time period is calculated. The *burst_size* argument sets the average burst size in bits that can be transmitted over a given fixed time period, between 2048 and 154400000. Specify a value that is a multiple of 128. If you do not specify the *burst_size*, the default value is equivalent to 4-milliseconds of traffic at the specified average rate. For example, if the average rate is 1000000 bits per second, 4 ms worth = 1000000 * 4/1000 = 4000.
Step 4	(Optional) **service-policy** *priority_policy_map_name* **Example:** `hostname(config-pmap-c)# service-policy priority-sub-policy`	Configures hierarchical priority queuing, where the *priority_policy_map_name* is the policy map you created for prioritized traffic in the "(Optional) Configuring the Hierarchical Priority Queuing Policy" section on page 55-12.
Step 5	**service-policy** *policymap_name* **interface** *interface_name* **Example:** `hostname(config)# service-policy shape-policy interface inside`	Activates the shaping policy map on an interface.

Examples

The following example enables traffic shaping on the outside interface, and limits traffic to 2 Mbps; priority queuing is enabled for VoIP traffic that is tagged with DSCP EF and AF13 and for IKE traffic:

```
hostname(config)# access-list ike permit udp any any eq 500
hostname(config)# class-map ike
hostname(config-cmap)# match access-list ike

hostname(config-cmap)# class-map voice_traffic
hostname(config-cmap)# match dscp EF AF13

hostname(config-cmap)# policy-map qos_class_policy
hostname(config-pmap)# class voice_traffic
hostname(config-pmap-c)# priority
hostname(config-pmap-c)# class ike
hostname(config-pmap-c)# priority

hostname(config-pmap-c)# policy-map qos_outside_policy
hostname(config-pmap)# class class-default
hostname(config-pmap-c)# shape average 2000000 16000
hostname(config-pmap-c)# service-policy qos_class_policy

hostname(config-pmap-c)# service-policy qos_outside_policy interface outside
```

Monitoring QoS

This section includes the following topics:

- Viewing QoS Police Statistics, page 55-15
- Viewing QoS Standard Priority Statistics, page 55-16
- Viewing QoS Shaping Statistics, page 55-16
- Viewing QoS Standard Priority Queue Statistics, page 55-17

Viewing QoS Police Statistics

To view the QoS statistics for traffic policing, use the **show service-policy** command with the **police** keyword:

```
hostname# show service-policy police
```

The following is sample output for the **show service-policy police** command:

```
hostname# show service-policy police

Global policy:
    Service-policy: global_fw_policy

Interface outside:
    Service-policy: qos
        Class-map: browse
            police Interface outside:
                cir 56000 bps, bc 10500 bytes
                conformed 10065 packets, 12621510 bytes; actions: transmit
                exceeded 499 packets, 625146 bytes; actions: drop
                conformed 5600 bps, exceed 5016 bps
        Class-map: cmap2
            police Interface outside:
                cir 200000 bps, bc 37500 bytes
                conformed 17179 packets, 20614800 bytes; actions: transmit
                exceeded 617 packets, 770718 bytes; actions: drop
                conformed 198785 bps, exceed 2303 bps
```

Viewing QoS Standard Priority Statistics

To view statistics for service policies implementing the **priority** command, use the **show service-policy** command with the **priority** keyword:

```
hostname# show service-policy priority
```

The following is sample output for the **show service-policy priority** command:

```
hostname# show service-policy priority
Global policy:
    Service-policy: global_fw_policy
Interface outside:
    Service-policy: qos
        Class-map: TG1-voice
            Priority:
                Interface outside: aggregate drop 0, aggregate transmit 9383
```

Note “Aggregate drop” denotes the aggregated drop in this interface; “aggregate transmit” denotes the aggregated number of transmitted packets in this interface.

Viewing QoS Shaping Statistics

To view statistics for service policies implementing the **shape** command, use the **show service-policy** command with the **shape** keyword:

```
hostname# show service-policy shape
```

The following is sample output for the **show service-policy shape** command:

```
hostname# show service-policy shape
Interface outside
  Service-policy: shape
    Class-map: class-default

      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 0/0/0
      (pkts output/bytes output) 0/0

      shape (average) cir 2000000, bc 8000, be 8000
```

The following is sample output of the **show service policy shape** command, which includes service policies that include the **shape** command and the **service-policy** command that calls the hierarchical priority policy and the related statistics:

```
hostname# show service-policy shape

Interface outside:
  Service-policy: shape
    Class-map: class-default

      Queueing
      queue limit 64 packets
      (queue depth/total drops/no-buffer drops) 0/0/0
      (pkts output/bytes output) 0/0

      shape (average) cir 2000000, bc 16000, be 16000
      Service-policy: voip
        Class-map: voip

          Queueing
          queue limit 64 packets
          (queue depth/total drops/no-buffer drops) 0/0/0
          (pkts output/bytes output) 0/0
        Class-map: class-default

          queue limit 64 packets
          (queue depth/total drops/no-buffer drops) 0/0/0
          (pkts output/bytes output) 0/0
```

Viewing QoS Standard Priority Queue Statistics

To display the priority-queue statistics for an interface, use the **show priority-queue statistics** command in privileged EXEC mode. The results show the statistics for both the best-effort (BE) queue and the low-latency queue (LLQ). The following example shows the use of the **show priority-queue statistics** command for the interface named test, and the command output.

```
hostname# show priority-queue statistics test

Priority-Queue Statistics interface test

Queue Type         = BE
Packets Dropped    = 0
Packets Transmit   = 0
Packets Enqueued   = 0
Current Q Length   = 0
Max Q Length       = 0

Queue Type         = LLQ
Packets Dropped    = 0
Packets Transmit   = 0
Packets Enqueued   = 0
Current Q Length   = 0
Max Q Length       = 0
hostname#
```

In this statistical report, the meaning of the line items is as follows:

- "Packets Dropped" denotes the overall number of packets that have been dropped in this queue.
- "Packets Transmit" denotes the overall number of packets that have been transmitted in this queue.
- "Packets Enqueued" denotes the overall number of packets that have been queued in this queue.
- "Current Q Length" denotes the current depth of this queue.
- "Max Q Length" denotes the maximum depth that ever occurred in this queue.

Feature History for QoS

Table 55-3 lists each feature change and the platform release in which it was implemented.

Table 55-3 Feature History for QoS

Feature Name	Platform Releases	Feature Information
Priority queuing and policing	7.0(1)	We introduced QoS priority queuing and policing. We introduced the following commands: **priority-queue**, **queue-limit**, **tx-ring-limit**, **priority, police, show priority-queue statistics, show service-policy police, show service-policy priority, show running-config priority-queue, clear configure priority-queue** .
Shaping and hierarchical priority queuing	7.2(4)/8.0(4)	We introduced QoS shaping and hierarchical priority queuing. We introduced the following commands: **shape**, **show service-policy shape**.

CHAPTER 56

Configuring Web Cache Services Using WCCP

This chapter describes how to configure web caching services using WCCP, and includes the following sections:

- Information About WCCP, page 56-1
- Guidelines and Limitations, page 56-1
- Enabling WCCP Redirection, page 56-2
- Feature History for WCCP, page 56-3

Information About WCCP

The purpose of web caching is to reduce latency and network traffic. Previously-accessed web pages are stored in a cache buffer, so if a user needs the page again, they can retrieve it from the cache instead of the web server.

WCCP specifies interactions between the ASA and external web caches. The feature transparently redirects selected types of traffic to a group of web cache engines to optimize resource usage and lower response times. The ASA only supports WCCP version 2.

Using a ASA as an intermediary eliminates the need for a separate router to do the WCCP redirect because the ASA takes care of redirecting requests to cache engines. When the ASA knows when a packet needs redirection, it skips TCP state tracking, TCP sequence number randomization, and NAT on these traffic flows.

Guidelines and Limitations

Supported WCCP Features

The following WCCPv2 features are supported with the ASA:

- Redirection of multiple TCP/UDP port-destined traffic.
- Authentication for cache engines in a service group.

Unsupported WCCP Features

The following WCCPv2 features are not supported with the ASA:

- Multiple routers in a service group is not supported. Multiple Cache Engines in a service group is still supported.

- Multicast WCCP is not supported.
- The Layer 2 redirect method is not supported; only GRE encapsulation is supported.
- WCCP source address spoofing is not supported.
- WAAS devices are not supported.

WCCP Interaction With Other Features

In the ASA implementation of WCCP, the following applies as to how the protocol interacts with other configurable features:

- Cut-through proxy will not work in combination with WCCP.
- An ingress access list entry always takes higher priority over WCCP. For example, if an access list does not permit a client to communicate with a server then traffic will not be redirected to a cache engine. Both ingress interface access lists and egress interface access lists will be applied.
- TCP intercept, authorization, URL filtering, inspect engines, and IPS features are not applied to a redirected flow of traffic.
- When a cache engine cannot service a request and packet is returned, or when a cache miss happens on a cache engine and it requests data from a web server, then the contents of the traffic flow will be subject to all the other configured features of the ASA.
- In failover, WCCP redirect tables are not replicated to standby units. After a failover, packets will not be redirected until the tables are rebuilt. Sessions redirected prior to failover will likely be reset by the web server.
- If you have two WCCP services and they use two different redirection ACLs that overlap and match the same packets (with a deny or a permit action), the packets behave according to the first service-group found and installed rules. The packets are not passed thorugh all service-groups.

Enabling WCCP Redirection

There are two steps to configuring WCCP redirection on the ASA. The first involves identifying the service to be redirected with the **wccp** command, and the second is defining on which interface the redirection occurs with the **wccp redirect** command. The **wccp** command can optionally also define which cache engines can participate in the service group, and what traffic should be redirected to the cache engine.

WCCP redirect is supported only on the ingress of an interface. The only topology that the ASA supports is when client and cache engine are behind the same interface of the ASA and the cache engine can directly communicate with the client without going through the ASA.

The following configuration tasks assume you have already installed and configured the cache engines you wish to include in your network.

To configure WCCP redirection, perform the following steps:

	Command	Purpose
Step 1	`wccp {web-cache	service_number} [redirect-list access_list] [group-list access_list] [password password]` **Example:** `hostname(config)# wccp web-cache`	Enables a WCCP service group The standard service is **web-cache**, which intercepts TCP port 80 (HTTP) traffic and redirects that traffic to the cache engines, but you can identify a service number if desired between 0 and 254. For example, to transparently redirect native FTP traffic to a cache engine, use WCCP service 60. You can enter this command multiple times for each service group you want to enable. The **redirect-list** *access_list* argument controls traffic redirected to this service group. The **group-list** *access_list* argument determines which web cache IP addresses are allowed to participate in the service group. The **password** *password* argument specifies MD5 authentication for messages received from the service group. Messages that are not accepted by the authentication are discarded.
Step 2	`wccp interface interface_name {web-cache	service_number} redirect in` **Example:** `hostname(config)# wccp interface inside web-cache redirect in`	Enables WCCP redirection on an interface. The standard service is **web-cache**, which intercepts TCP port 80 (HTTP) traffic and redirects that traffic to the cache engines, but you can identify a service number if desired between 0 and 254. For example, to transparently redirect native FTP traffic to a cache engine, use WCCP service 60. You can enter this command multiple times for each service group you want to enable.

Examples

For example, to enable the standard **web-cache** service and redirect HTTP traffic that enters the inside interface to a web cache, enter the following commands:

```
hostname(config)# wccp web-cache
hostname(config)# wccp interface inside web-cache redirect in
```

Feature History for WCCP

Table 56-1 lists the release history for this feature.

Table 56-1 Feature History for WCCP

Feature Name	Releases	Feature Information
WCCP	7.2(1)	This feature was introduced.

CHAPTER 57

Preventing Network Attacks

This chapter describes how to prevent network attacks, and includes the following sections:

- Preventing IP Spoofing, page 57-1
- Configuring the Fragment Size, page 57-2
- Blocking Unwanted Connections, page 57-2
- Configuring IP Audit for Basic IPS Support, page 57-3

Preventing IP Spoofing

This section lets you enable Unicast Reverse Path Forwarding on an interface. Unicast RPF guards against IP spoofing (a packet uses an incorrect source IP address to obscure its true source) by ensuring that all packets have a source IP address that matches the correct source interface according to the routing table.

Normally, the ASA only looks at the destination address when determining where to forward the packet. Unicast RPF instructs the ASA to also look at the source address; this is why it is called Reverse Path Forwarding. For any traffic that you want to allow through the ASA, the ASA routing table must include a route back to the source address. See RFC 2267 for more information.

For outside traffic, for example, the ASA can use the default route to satisfy the Unicast RPF protection. If traffic enters from an outside interface, and the source address is not known to the routing table, the ASA uses the default route to correctly identify the outside interface as the source interface.

If traffic enters the outside interface from an address that is known to the routing table, but is associated with the inside interface, then the ASA drops the packet. Similarly, if traffic enters the inside interface from an unknown source address, the ASA drops the packet because the matching route (the default route) indicates the outside interface.

Unicast RPF is implemented as follows:

- ICMP packets have no session, so each packet is checked.
- UDP and TCP have sessions, so the initial packet requires a reverse route lookup. Subsequent packets arriving during the session are checked using an existing state maintained as part of the session. Non-initial packets are checked to ensure they arrived on the same interface used by the initial packet.

To enable Unicast RPF, enter the following command:

```
hostname(config)# ip verify reverse-path interface interface_name
```

Configuring the Fragment Size

By default, the ASA allows up to 24 fragments per IP packet, and up to 200 fragments awaiting reassembly. You might need to let fragments on your network if you have an application that routinely fragments packets, such as NFS over UDP. However, if you do not have an application that fragments traffic, we recommend that you do not allow fragments through the ASA. Fragmented packets are often used as DoS attacks. To set disallow fragments, enter the following command:

```
hostname(config)# fragment chain 1 [interface_name]
```

Enter an interface name if you want to prevent fragmentation on a specific interface. By default, this command applies to all interfaces.

Blocking Unwanted Connections

If you know that a host is attempting to attack your network (for example, system log messages show an attack), then you can block (or shun) connections based on the source IP address and other identifying parameters. No new connections can be made until you remove the shun.

Note If you have an IPS that monitors traffic, such as an AIP SSM, then the IPS can shun connections automatically.

To shun a connection manually, perform the following steps:

Step 1 If necessary, view information about the connection by entering the following command:

```
hostname# show conn
```

The ASA shows information about each connection, such as the following:

```
TCP out 64.101.68.161:4300 in 10.86.194.60:23 idle 0:00:00 bytes 1297 flags UIO
```

Step 2 To shun connections from the source IP address, enter the following command:

```
hostname(config)# shun src_ip [dst_ip src_port dest_port [protocol]] [vlan vlan_id]
```

If you enter only the source IP address, then all future connections are shunned; existing connections remain active.

To drop an existing connection, as well as blocking future connections from the source IP address, enter the destination IP address, source and destination ports, and the protocol. By default, the protocol is 0 for IP.

For multiple context mode, you can enter this command in the admin context, and by specifying a VLAN ID that is assigned to an interface in other contexts, you can shun the connection in other contexts.

Step 3 To remove the shun, enter the following command:

```
hostname(config)# no shun src_ip [vlan vlan_id]
```

Configuring IP Audit for Basic IPS Support

The IP audit feature provides basic IPS support for a ASA that does not have an AIP SSM. It supports a basic list of signatures, and you can configure the ASA to perform one or more actions on traffic that matches a signature.

To enable IP audit, perform the following steps:

Step 1 To define an IP audit policy for informational signatures, enter the following command:

```
hostname(config)# ip audit name name info [action [alarm] [drop] [reset]]
```

Where **alarm** generates a system message showing that a packet matched a signature, **drop** drops the packet, and **reset** drops the packet and closes the connection. If you do not define an action, then the default action is to generate an alarm.

Step 2 To define an IP audit policy for attack signatures, enter the following command:

```
hostname(config)# ip audit name name attack [action [alarm] [drop] [reset]]
```

Where **alarm** generates a system message showing that a packet matched a signature, **drop** drops the packet, and **reset** drops the packet and closes the connection. If you do not define an action, then the default action is to generate an alarm.

Step 3 To assign the policy to an interface, enter the following command:

```
ip audit interface interface_name policy_name
```

Step 4 To disable signatures, or for more information about signatures, see the **ip audit signature** command in the *Cisco ASA 5500 Series Command Reference*.

PART 10

Configuring Applications on SSMs and SSCs

CHAPTER 58

Managing Services Modules

This chapter describes how to manage the following module types:

- Security Services Cards (SSCs)
- Security Services Modules (SSMs)
- Security Services Processors (SSPs)

Modules run advanced security applications, such as IPS and Content Security and Control. See the *Cisco ASA 5500 Series Hardware and Software Compatibility Matrix* for a list of supported modules and ASA models:

http://www.cisco.com/en/US/docs/security/asa/compatibility/asamatrx.html

Note For information about the 4GE SSM, which is an interface module and does not run intelligent software, see Chapter 6, "Starting Interface Configuration (ASA 5510 and Higher)."

The core SSP for the ASA 5585-X runs ASA software, and is not covered in this chapter.

This chapter includes the following sections:

- Information About Modules, page 58-1
- Guidelines and Limitations, page 58-3
- Default Settings, page 58-4
- Configuring the SSC Management Interface, page 58-4
- Sessioning to the Module, page 58-6
- Troubleshooting the Module, page 58-6
- Monitoring SSMs and SSCs, page 58-9
- Where to Go Next, page 58-11
- Feature History for the Module, page 58-11

Information About Modules

This section describes SSMs and SSCs, and includes the following topics:

- Supported Applications, page 58-2
- Information About Management Access, page 58-2

Supported Applications

The following applications are supported on the SSM:

- IPS software (on the AIP SSM)
- Content Security and Control software (on the CSC SSM)

The following applications are supported on the SSC:

- IPS software (on the AIP SSC)

The following applications are supported on the SSP:

- IPS software (on the IPS SSP)

Note You cannot change the software type installed on the SSM/SSC; if you purchase an AIP SSM, you cannot later install CSC software on it.

Information About Management Access

You can manage the module application using ASDM or by using the module application CLI. This section includes the following topics:

- Sessioning to the Module, page 58-2
- Using ASDM, page 58-2
- Using SSH or Telnet, page 58-3
- Other Uses for the Module Management Interface, page 58-3
- Routing Considerations for Accessing the Management Interface, page 58-3

Sessioning to the Module

If you have CLI access to the ASA, then you can session to the module over the backplane and access the module CLI. See the "Sessioning to the Module" section on page 58-6.

Using ASDM

After you launch ASDM on the ASA, ASDM connects to the module management interface to configure the module application.

- On the SSM and SSP—ASDM connects to an external Gigabit Ethernet port. If you cannot use the default address, you can change the interface IP address and other network parameters by sessioning to the module and setting the parameters at the module CLI. See the documentation for the module application for more information.
- On the SSC—You can configure a VLAN as a management VLAN to allow access to an internal management IP address over the backplane. To change the network parameters, see the "Configuring the SSC Management Interface" section on page 58-4.

See the "Default Settings" section on page 58-4 for information about the default management interface parameters.

Using SSH or Telnet

You can access the module CLI directly using SSH or Telnet to the module management interface. (Telnet access requires additional configuration in the module application). See the "Using ASDM" section on page 58-2 for more information about the management interface.

Other Uses for the Module Management Interface

The module management interface can be used for sending syslog messages or allowing updates for the module application, such as signature database updates on the AIP SSM or SSC.

Routing Considerations for Accessing the Management Interface

To make sure ASDM can manage the module, be sure that the ASA can access the module management interface address.

- For the SSC—Be sure to configure an IP address for the ASA VLAN that you are also using for the SSC management interface, and assign that VLAN to a switch port so the SSC interface is physically connected to the network. The SSC management interface will then be on a directly-connected network for the ASA, so ASDM can access the management interface without any additional routing configuration.
- For the SSM and SSP—The external management interface is not considered to be an ASA interface, so it is not automatically on a directly-connected network. Depending on how you cable your network, the module external interface can be on the same network as an ASA interface (through a switch), or you can put it on a different network (through a router).

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

See the chapter for each SSM or SSC application for context mode guidelines.

Firewall Mode Guidelines

See the chapter for each SSM or SSC application for firewall mode guidelines.

Failover Guidelines

For the SSC, make sure you configure the management IP addresses on both units to be on the same subnet and VLAN.

Model Guidelines

For a complete list of supported ASA software, models, and modules, see *Cisco ASA 5500 Series Hardware and Software Compatibility*:

http://www.cisco.com/en/US/docs/security/asa/compatibility/asamatrx.html

Additional Guidelines

- You cannot change the software type installed on the module; if you purchase an IPS module, you cannot later install CSC software on it.

- You cannot set up the SSC in ASDM if you use an IP address that goes through NAT.
- The AIP SSC-5 does not support virtualization, unretiring default retired signatures, creating custom signatures, adding signatures, cloning signatures, or anomaly detection.

Default Settings

Table 58-1 lists the default network settings for modules.

Table 58-1 Default Network Parameters

Parameters	Default
Management VLAN (SSC only)	VLAN 1
Management IP address	192.168.1.2/24
Management hosts (SSC only)	192.168.1.0/24
Gateway	192.168.1.1

Note The default management IP address on the ASA is 192.168.1.1/24.

Configuring the SSC Management Interface

An SSC does not have any external interfaces. You can configure a VLAN as a management VLAN to allow access to an internal management IP address over the backplane. By default, VLAN 1 is enabled for the SSC management address. You can only assign one VLAN as the SSC management VLAN. This section describes how to change the management VLAN. It also describes how to change the default management IP address, allowed hosts, and gateway. See the "Default Settings" section on page 58-4 for more information about defaults.

Prerequisites

For the VLAN you want to use for the SSC management interface, configure the switch port and VLAN interface on the ASA 5505 according to the procedures listed in Chapter 6, "Starting Interface Configuration (ASA 5505)." This configuration is required so the SSC interface is physically connected to the network.

Restrictions

Do not configure NAT for the management address if you intend to access it using ASDM. For initial setup with ASDM, you need to access the real address. After initial setup (where you set the the password in the SSC), you can configure NAT and supply ASDM with the translated address when you want to access the SSC.

Detailed Steps

	Command	Purpose

Step 1	**`interface vlan`** *`number`*
	Example:
	`hostname(config)# interface vlan 1`
		Specifies the current management VLAN for which you want to disable SSC management. By default, this is VLAN 1.

Step 2	**`no allow-ssc-mgmt`**
	Example:
	`hostname(config-if)# no allow-ssc-mgmt`
		Disables SSC management for the old VLAN so that you can enable it for a different VLAN.

Step 3	**`interface vlan`** *`number`*
	Example:
	`hostname(config)# interface vlan 20`
		Specifies the VLAN you want to use as the SSC management VLAN.

Step 4	**`allow-ssc-mgmt`**
	Example:
	`hostname(config-if)# allow-ssc-mgmt`
		Sets this interface as the SSC management interface.

Step 5	**`hw-module module 1 ip`** *`ip_address netmask gateway`*
	Example:
	`hostname# hw-module module 1 ip 209.165.200.225 255.255.255.224 209.165.200.245`
		Configures the management IP address for the SSC. Make sure this address is on the same subnet as the ASA 5505 VLAN interface.
		If the management station is on a directly-connected ASA network, then set the gateway to be the ASA 5505 VLAN interface address. If the management station is on a remote network, then set the gateway to the address of an upstream router on the management VLAN.
		Note These settings are written to the SSC application configuration, not the ASA 5505 configuration. You can view these settings from the ASA 5505 using the **show module details** command.
		You can alternatively use the SSC application **setup** command to configure this setting from the SSC CLI.

Step 6	**`hw-module module 1 allow-ip`** *`ip_address netmask`*
	Example:
	`hostname# hw-module module 1 allow-ip 209.165.201.29 255.255.255.224`
		Sets the hosts that are allowed to access the management IP address.
		Note These settings are written to the SSC application configuration, not the ASA 5505 configuration. You can view these settings from the ASA 5505 using the **show module details** command.
		You can alternatively use the SSC application **setup** command to configure this setting from the SSC CLI.

Examples

The following example configures VLAN 20 as the SSC management VLAN. This VLAN is restricted to management traffic only. Only the host at 10.1.1.30 can access the SSC management IP address. VLAN 20 is assigned to switch port Ethernet 0/0. When you connect to ASDM on ASA interface 10.1.1.1, ASDM then accesses the SSC on 10.1.1.2.

```
hostname(config)# interface vlan 1
hostname(config-if)# no allow-ssc-mgmt

hostname(config-if)# interface vlan 20
hostname(config-if)# nameif inside
hostname(config-if)# ip address 10.1.1.1 255.255.255.0
hostname(config-if)# security-level 100
hostname(config-if)# allow-ssc-mgmt
hostname(config-if)# no shutdown
hostname(config-if)# management-only

hostname(config-if)# hw-module module 1 ip 10.1.1.2 255.255.255.0 10.1.1.1
hostname(config)# hw-module module 1 allow-ip 10.1.1.30 255.255.255.255

hostname(config)# interface ethernet 0/0
hostname(config-if)# switchport access vlan 20
hostname(config-if)# no shutdown
```

Sessioning to the Module

To begin configuring the module, session to the module from the ASA. To session to the module from the ASA, enter the following command:

Command	Purpose

session 1
Example:
`hostname# session 1`
`Opening command session with slot 1.`
`Connected to slot 1. Escape character sequence is 'CTRL-^X'.`
	Accesses the module over the backplane. You are prompted for the username and password. The default username is "cisco" and the default password is "cisco."
	Note The first time you log in to the module, you are prompted to change the default password. Passwords must be at least eight characters long and not a word in the dictionary.

Troubleshooting the Module

This section includes procedures that help you recover or troubleshoot the module, and includes the following topics:

- Installing an Image on the Module, page 58-7
- Resetting the Password, page 58-8
- Reloading or Resetting the Module, page 58-8
- Shutting Down the Module, page 58-8

Installing an Image on the Module

If the module suffers a failure and the module application image cannot run, you can transfer application images from a TFTP server to the module using the ASA CLI. The ASA can communicate with the module ROMMON application to transfer the image.

Note This process can take approximately 15 minutes to complete, depending on your network and the size of the image.

Do not use the **upgrade** command within the SSM or SSC software to install the image.

Prerequisites

Be sure the TFTP server that you specify can transfer files up to 60 MB in size.

Detailed Steps

	Command	Purpose
Step 1	**`hw-module module 1 recover configure`** **Example:**	Prompts you for the URL for the TFTP server, the management interface IP address and netmask, gateway address, and VLAN ID (the SSC uses the VLAN you configured for management in the "Configuring the SSC Management Interface" section on page 58-4.) These network parameters are configured in the ROMMON module; the network parameters you configured in the module application configuration (for example in the "Configuring the SSC Management Interface" section on page 58-4) are not available to ROMMON, so you must set them separately here. If you are modifying a configuration, you can keep the previously configured value by pressing **Enter** when prompted. You can view the recovery configuration using the **show module 1 recover** command. In multiple context mode, enter this command in the system execution space.

```
hostname# hw-module module 1 recover
configure
Image URL [tftp://127.0.0.1/myimage]:
tftp://10.1.1.1/ids-newimg
Port IP Address [127.0.0.2]: 10.1.2.10
Port Mask [255.255.255.254]: 255.255.255.0
Gateway IP Address [1.1.2.10]: 10.1.2.254
VLAN ID [0]: 100
```

	Command	Purpose

Step 2	**`hw-module module 1 recover boot`**
	Example:
	`hostname# hw-module module 1 recover boot`
		Transfers the image from the TFTP server to the module and restarts the module.

Step 3	**`show module 1 details`**
	Example:
	`hostname# show module 1 details`
		Checks the progress of the image transfer and module restart process.
		The Status field in the output indicates the operational status of the module. A module operating normally shows a status of "Up." While the ASA transfers an application image to the module, the Status field in the output reads "Recover." When the ASA completes the image transfer and restarts the module, the newly transferred image is running.

Resetting the Password

To reset the module password to the default of “cisco,” enter the following command:

Command	Purpose

`hw-module module 1 password-reset`
Example:
`hostname# hw-module module 1 password-reset`
	Resets the module password to “cisco.”

Reloading or Resetting the Module

To reload or reset the module, enter one of the following commands:

Command	Purpose

`hw-module module 1 reload`
Example:
`hostname# hw-module module 1 reload`
	Reloads the module software.

`hw-module module 1 reset`
Example:
`hostname# hw-module module 1 reset`
	Performs a hardware reset, and then reloads the module.

Shutting Down the Module

To shut down the module, enter the following command:

Command	Purpose

`hw-module module 1 shutdown`
Example:
`hostname# hw-module module 1 shutdown`
	Shuts down the module.

Monitoring SSMs and SSCs

To check the status of an SSM or SSC, enter one of the following commands:

Command	Purpose
`show module`	Displays the status.
`show module 1 details`	Displays additional status information.
`show module 1 recover`	Displays the network parameters for transferring an image to the module.

Examples

The following is sample output from the **show module** command for an ASA with a CSC SSM installed.

```
hostname# show module
Mod Card Type                                    Model              Serial No.
--- -------------------------------------------- ------------------ -----------
  0 ASA 5520 Adaptive Security Appliance         ASA5520            JMX1241L05S
  1 ASA 5500 Series Content Security Services Mo ASA-SSM-CSC-10     AF1234BQQL

Mod SSM Application Name           Status           SSM Application Version
--- ------------------------------ ---------------- --------------------------
  1 CSC SSM                        Down             6.2.1599.0
```

The following is sample output from the **show module details** command, which provides additional information about an ASA with a CSC SSM installed.

```
hostname# show module 1 details
Getting details from the Service Module, please wait...
ASA 5500 Series Security Services Module-20
Model: ASA-SSM-20
Hardware version: 1.0
Serial Number: JAF10333331
Firmware version: 1.0(10)0
Software version: Trend Micro InterScan Security Module Version 6.2
App. name: Trend Micro InterScan Security Module
App. version: Version 6.2
Data plane Status: Up
Status: Up
HTTP Service: Up
Mail Service: Up
FTP Service: Up
Activated: Yes
Mgmt IP addr: 209.165.200.225
Mgmt web port: 8443
```

The following is sample output from the **show module recover** command, which includes recovery details for an ASA with a CSC SSM installed.

```
hostname# show module 1 recover
Module 1 recover parameters. . .
Boot Recovery Image: Yes
Image URL: tftp://10.21.18.1/ids-oldimg
Port IP Address: 209.165.200.230
Port Mask: 255.255.224.0
Gateway IP Address: 209.165.200.254
```

The following is sample output from the **show module details** command, which provides additional information for an ASA with an SSC installed.

```
hostname# show module 1 details
Getting details from the Service Module, please wait...
ASA 5500 Series Security Services Card-5
Hardware version: 0.1
Serial Number: JAB11370240
Firmware version: 1.0(14)3
Software version: 6.2(1)E2
MAC Address Range: 001d.45c2.e832 to 001d.45c2.e832
App. Name: IPS
App. Status: Up
App. Status Desc: Not Applicable
App. Version: 6.2(1)E2
Data plane Status: Up
Status: Up
```

```
Mgmt IP Addr: 209.165.201.29
Mgmt Network Mask: 255.255.224.0
Mgmt Gateway: 209.165.201.30
Mgmt Access List: 209.165.201.31/32
                   209.165.202.158/32
                   209.165.200.254/24
Mgmt Vlan: 20
```

Where to Go Next

To configure the IPS module, see Chapter 59, "Configuring the IPS Module."

To configure the CSC module, see Chapter 60, "Configuring the Content Security and Control Application on the CSC SSM."

Feature History for the Module

Table 58-2 lists the release history for this feature.

Table 58-2 Feature History for the SSM and SSC

Feature Name	Releases	Feature Information
AIP SSM and CSC SSM	ASA 7.0(1), ASDM 5.0(1)	SSMs were introduced to support IPS and CSC applications. The following commands were introduced to manage the SSM: **hw-module module {recover | reload | reset | shutdown}**, **show module**, and **session**.
Password reset	ASA 7.2(2), ASDM 5.2(2)	The **hw-module module password-reset** command was introduced.
AIP SSC	ASA 8.2(1), ASDM 6.2(1)	The AIP SSC was introduced. The following commands were introduced: **allow-ssc-mgmt**, **hw-module module ip**, and **hw-module module allow-ip**.
IPS SSP	ASA 8.2(4.4), ASDM 6.3(5)	The IPS SSP was introduced.

CHAPTER 59

Configuring the IPS Module

This chapter describes how to configure the IPS application that runs on the following module types:

- Security Services Cards (SSCs)
- Security Services Modules (SSMs)
- Security Services Processors (SSPs)

For a list of supported IPS modules per ASA model, see the *Cisco ASA 5500 Series Hardware and Software Compatibility*:

http://www.cisco.com/en/US/docs/security/asa/compatibility/asamatrx.html

This chapter includes the following sections:

- Information About the IPS Module, page 59-1
- Licensing Requirements for the IPS Module, page 59-4
- Guidelines and Limitations, page 59-4
- Configuring the IPS Module, page 59-5
- Monitoring the IPS Module, page 59-10
- Configuration Examples for the IPS Module, page 59-10
- Feature History for the IPS Module, page 59-11

Information About the IPS Module

The IPS module runs advanced IPS software that provides proactive, full-featured intrusion prevention services to stop malicious traffic, including worms and network viruses, before they can affect your network. This section includes the following topics:

- How the IPS Module Works with the Adaptive Security Appliance, page 59-2
- Operating Modes, page 59-2
- Using Virtual Sensors (ASA 5510 and Higher), page 59-3
- Differences Between Modules, page 59-4

How the IPS Module Works with the Adaptive Security Appliance

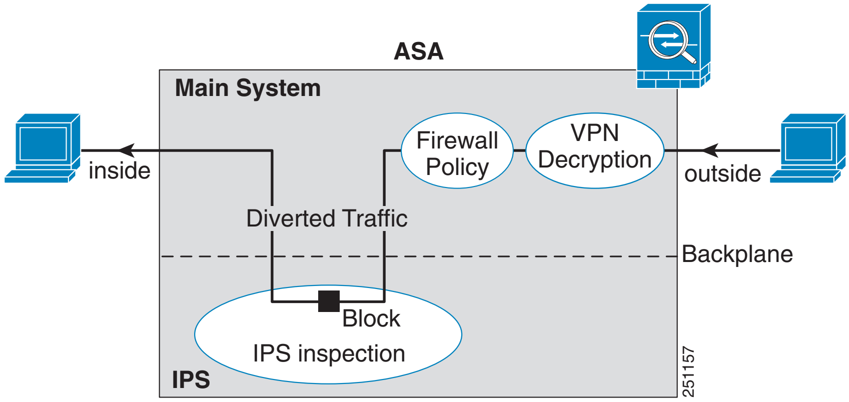
The IPS module runs a separate application from the ASA. It is, however, integrated into the ASA traffic flow. The IPS module does not contain any external interfaces itself (except for the management interface on the SSM only). When you identify traffic for IPS inspection on the ASA, traffic flows through the ASA and the IPS module in the following way:

1. Traffic enters the ASA.
2. Incoming VPN traffic is decrypted.
3. Firewall policies are applied.
4. Traffic is sent to the IPS module over the backplane.

   See the "Operating Modes" section on page 59-2 for information about only sending a copy of the traffic to the IPS module.
5. The IPS module applies its security policy to the traffic, and takes appropriate actions.
6. Valid traffic is sent back to the adaptive security appliance over the backplane; the IPS module might block some traffic according to its security policy, and that traffic is not passed on.
7. Outgoing VPN traffic is encrypted.
8. Traffic exits the adaptive security appliance.

Figure 59-1 shows the traffic flow when running the IPS module in inline mode. In this example, the IPS module automatically blocks traffic that it identified as an attack. All other traffic is forwarded through the ASA.

Figure 59-1 IPS Module Traffic Flow in the Adaptive Security Appliance: Inline Mode



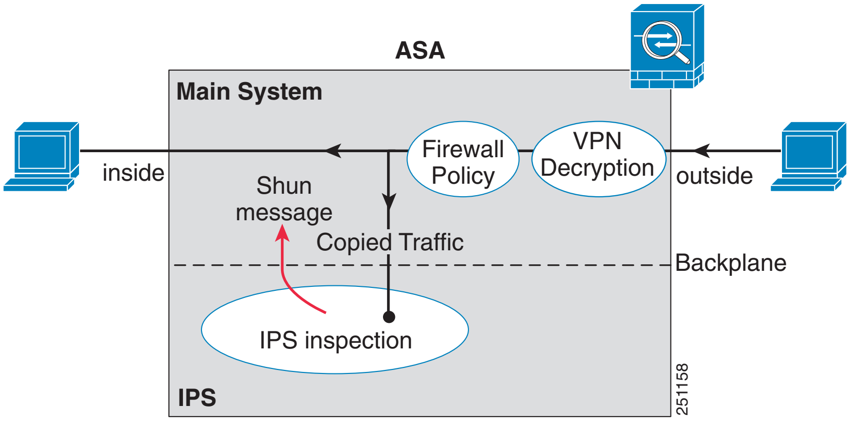
Operating Modes

You can send traffic to the IPS module using one of the following modes:

- Inline mode—This mode places the IPS module directly in the traffic flow (see Figure 59-1). No traffic that you identified for IPS inspection can continue through the ASA without first passing through, and being inspected by, the IPS module. This mode is the most secure because every packet that you identify for inspection is analyzed before being allowed through. Also, the IPS module can implement a blocking policy on a packet-by-packet basis. This mode, however, can affect throughput.

- Promiscuous mode—This mode sends a duplicate stream of traffic to the IPS module. This mode is less secure, but has little impact on traffic throughput. Unlike the inline mode, in promiscuous mode the IPS module can only block traffic by instructing the adaptive ASA to shun the traffic or by resetting a connection on the ASA. Also, while the IPS module is analyzing the traffic, a small amount of traffic might pass through the adaptive ASA before the IPS module can shun it. Figure 59-2 shows the IPS module in promiscuous mode. In this example, the IPS module sends a shun message to the ASA for traffic it identified as a threat.

Figure 59-2 IPS Module Traffic Flow in the Adaptive Security Appliance: Promiscuous Mode



Using Virtual Sensors (ASA 5510 and Higher)

The IPS module running IPS software Version 6.0 and above can run multiple virtual sensors, which means you can configure multiple security policies on the IPS module. You can assign each context or single mode ASA to one or more virtual sensors, or you can assign multiple security contexts to the same virtual sensor. See the IPS documentation for more information about virtual sensors, including the maximum number of sensors supported.

Figure 59-3 shows one security context paired with one virtual sensor (in inline mode), while two security contexts share the same virtual sensor.

Figure 59-3 Security Contexts and Virtual Sensors

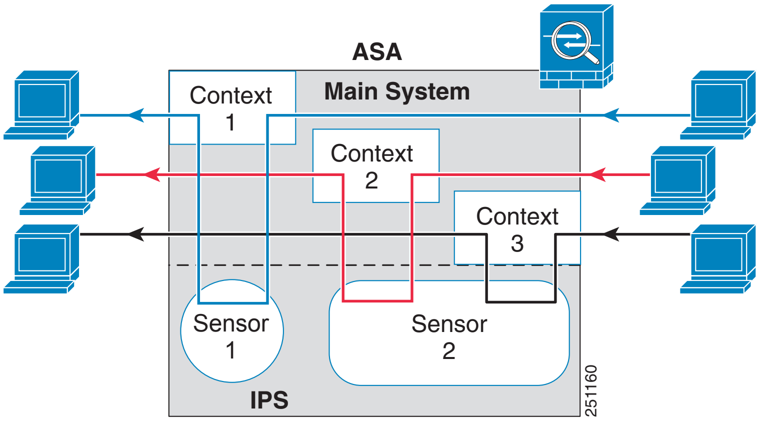
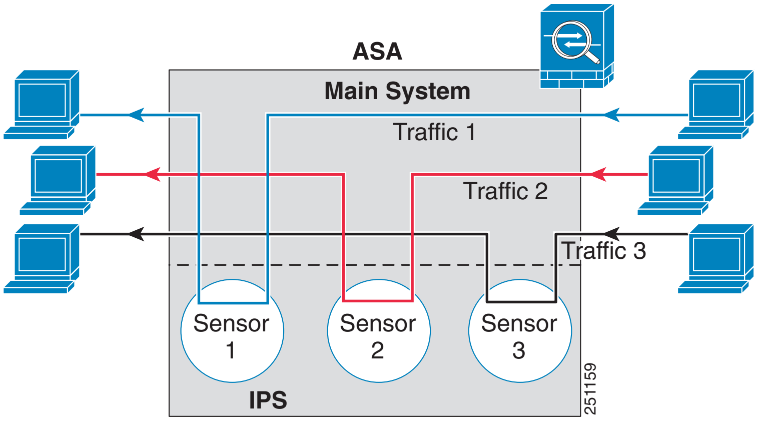


Figure 59-4 shows a single mode ASA paired with multiple virtual sensors (in inline mode); each defined traffic flow goes to a different sensor.

Figure 59-4 Single Mode Security Appliance with Multiple Virtual Sensors



Differences Between Modules

The IPS module for the ASA 5510 and higher supports higher performance requirements, while the IPS module for the ASA 5505 is designed for a small office installation. The following features are supported for the ASA 5510 and higher, and not for the ASA 5505:

- Virtual sensors
- Anomaly detection
- Unretirement of default retired signatures
- Custom signatures

Licensing Requirements for the IPS Module

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

The IPS application on the IPS module requires a separate Cisco Services for IPS license in order to support signature updates. All other updates are available without a license.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

The ASA 5505 adaptive security appliance does not support multiple context mode, so multiple context features, such as virtual sensors, are not supported on the AIP SSC.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

Model Guidelines

- The SSC is supported on the ASA 5505 only. For a complete list of supported ASA software, models, and modules, see *Cisco ASA 5500 Series Hardware and Software Compatibility*:

  http://www.cisco.com/en/US/docs/security/asa/compatibility/asamatrx.html
- The ASA 5505 adaptive security appliance does not support multiple context mode, so multiple context features, such as virtual sensors, are not supported on the AIP SSC.

Configuring the IPS Module

This section describes how to configure IPS for the IPS module, and includes the following topics:

- IPS Module Task Overview, page 59-5
- Configuring the Security Policy on the IPS Module, page 59-5
- Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher), page 59-6
- Diverting Traffic to the IPS Module, page 59-8

IPS Module Task Overview

Configuring the IPS module is a process that includes configuration of the IPS software on the SSM/SSC and then configuration of the ASA 5500 series adaptive security appliance. To configure the IPS module, perform the following steps:

Step 1 On the IPS module, configure the inspection and protection policy, which determines how to inspect traffic and what to do when an intrusion is detected. (ASA 5510 and higher) Configure the inspection and protection policy for each virtual sensor if you want to run the IPS module in multiple sensor mode. See the "Configuring the Security Policy on the IPS Module" section on page 59-5.

Step 2 (ASA 5510 and higher) On the ASA in multiple context mode, specify which IPS virtual sensors are available for each context (if you configured virtual sensors). See the "Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)" section on page 59-6.

Step 3 On the ASA, identify traffic to divert to the IPS module. See the "Diverting Traffic to the IPS Module" section on page 59-8.

Configuring the Security Policy on the IPS Module

This section describes how to access the IPS application in the IPS module.

Note You can alternatively use ASDM to configure the IPS module. See the ASDM documentation for more information.

See also the "Configuring the SSC Management Interface" section on page 58-4 to configure the SSC management interface for ASDM access and other uses.

Detailed Steps

Step 1 Session from the ASA to the IPS module. See the "Sessioning to the Module" section on page 58-6

Step 2 To run the setup utility for initial configuration of the IPS module, enter the following command:

```
sensor# setup
```

You are prompted for basic settings.

Step 3 Configure the IPS security policy.

(ASA 5510 and higher) If you configure virtual sensors in IPS Version 6.0 or above, you identify one of the sensors as the default. If the ASA 5500 series adaptive ASA does not specify a virtual sensor name in its configuration, the default sensor is used.

Because the IPS software that runs on the IPS module is beyond the scope of this document, detailed configuration information is available in the IPS documents at the following location:

http://www.cisco.com/en/US/products/hw/vpndevc/ps4077/tsd_products_support_series_home.html

Step 4 When you are done configuring the IPS module, exit the IPS software by entering the following command:

```
sensor# exit
```

If you sessioned to the IPS module from the ASA, you return to the ASA prompt.

What to Do Next

For the ASA in multiple context mode, see the "Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)" section on page 59-6.

For the ASA in single context mode, see the "Diverting Traffic to the IPS Module" section on page 59-8.

Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)

If the ASA is in multiple context mode, then you can assign one or more IPS virtual sensors to each context. Then, when you configure the context to send traffic to the IPS module, you can specify a sensor that is assigned to the context; you cannot specify a sensor that you did not assign to the context. If you do not assign any sensors to a context, then the default sensor configured on the IPS module is used. You can assign the same sensor to multiple contexts.

Note You do not need to be in multiple context mode to use virtual sensors; you can be in single mode and use different sensors for different traffic flows.

Prerequisites

For more information about configuring contexts, see the "Configuring a Security Context" section on page 5-16.

Detailed Steps

	Command	Purpose

Step 1	**`context`** *`name`*
	
	`Example:`
	`hostname(config)# context admin`
	`hostname(config-ctx)#`
		Identifies the context you want to configure. Enter this command in the system execution space.

Step 2	**`allocate-ips`** *`sensor_name`* `[`*`mapped_name`*`]` `[`**`default`**`]`
	
	`Example:`
	`hostname(config-ctx)# allocate-ips sensor1 highsec`
		Enter this command for each sensor you want to assign to the context.
		
		The *sensor _name* argument is the sensor name configured on the IPS module. To view the sensors that are configured on the IPS module, enter **allocate-ips ?**. All available sensors are listed. You can also enter the **show ips** command. In the system execution space, the **show ips** command lists all available sensors; if you enter it in the context, it shows the sensors you already assigned to the context. If you specify a sensor name that does not yet exist on the IPS module, you get an error, but the **allocate-ips** command is entered as is. Until you create a sensor of that name on the IPS module, the context assumes the sensor is down.
		
		Use the *mapped_name* argument as an alias for the sensor name that can be used within the context instead of the actual sensor name. If you do not specify a mapped name, the sensor name is used within the context. For security purposes, you might not want the context administrator to know which sensors are being used by the context. Or you might want to genericize the context configuration. For example, if you want all contexts to use sensors called "sensor1" and "sensor2," then you can map the "highsec" and "lowsec" sensors to sensor1 and sensor2 in context A, but map the "medsec" and "lowsec" sensors to sensor1 and sensor2 in context B.
		
		The **default** keyword sets one sensor per context as the default sensor; if the context configuration does not specify a sensor name, the context uses this default sensor. You can only configure one default sensor per context. If you want to change the default sensor, enter the **no allocate-ips** *sensor_name* command to remove the current default sensor before you allocate a new default sensor. If you do not specify a sensor as the default, and the context configuration does not include a sensor name, then traffic uses the default sensor on the IPS module.

Step 3	**`changeto context`** *`context_name`*
	
	`Example:`
	`hostname# changeto context customer1`
		Changes to the context so you can configure the IPS security policy as described in "Diverting Traffic to the IPS Module" section on page 59-8.

Examples

The following example assigns sensor1 and sensor2 to context A, and sensor1 and sensor3 to context B. Both contexts map the sensor names to “ips1” and “ips2.” In context A, sensor1 is set as the default sensor, but in context B, no default is set so the default that is configured on the IPS module is used.

```
hostname(config-ctx)# context A
hostname(config-ctx)# allocate-interface gigabitethernet0/0.100 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/0.102 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/0.110-gigabitethernet0/0.115
int3-int8
hostname(config-ctx)# allocate-ips sensor1 ips1 default
hostname(config-ctx)# allocate-ips sensor2 ips2
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/test.cfg
hostname(config-ctx)# member gold

hostname(config-ctx)# context sample
hostname(config-ctx)# allocate-interface gigabitethernet0/1.200 int1
hostname(config-ctx)# allocate-interface gigabitethernet0/1.212 int2
hostname(config-ctx)# allocate-interface gigabitethernet0/1.230-gigabitethernet0/1.235
int3-int8
hostname(config-ctx)# allocate-ips sensor1 ips1
hostname(config-ctx)# allocate-ips sensor3 ips2
hostname(config-ctx)# config-url ftp://user1:passw0rd@10.1.1.1/configlets/sample.cfg
hostname(config-ctx)# member silver

hostname(config-ctx)# changeto context A
...
```

What to Do Next

Change to each context to configure the IPS security policy as described in “Diverting Traffic to the IPS Module” section on page 59-8.

Diverting Traffic to the IPS Module

This section identifies traffic to divert from the adaptive ASA to the IPS module.

Prerequisites

In multiple context mode, perform these steps in each context execution space.

Detailed Steps

	Command	Purpose

Step 1	**class-map** *name*
	Example:
	`hostname(config)# class-map ips_class`
		Creates a class map to identify the traffic for which you want to send to the IPS module.
		If you want to send multiple traffic classes to the IPS module, you can create multiple class maps for use in the security policy.

Step 2	**match** *parameter* **Example:** `hostname(config-cmap)# match access-list ips_traffic`	Specifies the traffic in the class map. See the “Identifying Traffic (Layer 3/4 Class Map)” section on page 9-13 for more information.

	Command	Purpose
Step 3	**policy-map** *name* **Example:** `hostname(config)# policy-map ips_policy`	Adds or edits a policy map that sets the actions to take with the class map traffic.

Step 4	**class** *name*
	Example:
	`hostname(config-pmap)# class ips_class`
		Identifies the class map you created in Step 1.

Step 5	**ips** {**inline** | **promiscuous**} {**fail-close** | **fail-open**} [**sensor** {*sensor_name* | *mapped_name*}] **Example:** `hostname(config-pmap-c)# ips promiscuous fail-close`	Specifies that the traffic should be sent to the IPS module. The **inline** and **promiscuous** keywords control the operating mode of the IPS module. See the "Operating Modes" section on page 59-2 for more details. The **fail-close** keyword sets the adaptive security appliance to block all traffic if the IPS module is unavailable. The **fail-open** keyword sets the adaptive security appliance to allow all traffic through, uninspected, if the IPS module is unavailable. (ASA 5510 and higher) If you use virtual sensors, you can specify a sensor name using the **sensor** *sensor_name* argument. To see available sensor names, enter the **ips ... sensor ?** command. Available sensors are listed. You can also use the **show ips** command. If you use multiple context mode on the ASA, you can only specify sensors that you assigned to the context (see the "Assigning Virtual Sensors to a Security Context (ASA 5510 and Higher)" section on page 59-6). Use the *mapped_name* if configured in the context. If you do not specify a sensor name, then the traffic uses the default sensor. In multiple context mode, you can specify a default sensor for the context. In single mode or if you do not specify a default sensor in multiple mode, the traffic uses the default sensor that is set on the IPS module. If you enter a name that does not yet exist on the IPS module, you get an error, and the command is rejected.

Step 6	(Optional)
	class *name2*
	Example:
	`hostname(config-pmap)# class ips_class2`
		If you created multiple class maps for IPS traffic, you can specify another class for the policy.
		See the "Information About Layer 3/4 Policy Maps" section on page 9-5 for detailed information about how the order of classes matters within a policy map. Traffic cannot match more than one class map for the same action type; so if you want network A to go to sensorA, but want all other traffic to go to sensorB, then you need to enter the **class** command for network A before you enter the **class** command for all traffic; otherwise all traffic (including network A) will match the first **class** command, and will be sent to sensorB.

	Command	Purpose
Step 7	(Optional) **ips** {**inline** | **promiscuous**} {**fail-close** | **fail-open**} [**sensor** {*sensor_name* | *mapped_name*}] **Example:** `hostname(config-pmap-c)# ips promiscuous fail-close`	Specifies that the second class of traffic should be sent to the IPS module.

Step 8	**service-policy** *policymap_name* {**global** | **interface** *interface_name*}
	Example:
	`hostname(config)# service-policy tcp_bypass_policy outside`
		Activates the policy map on one or more interfaces. **global** applies the policy map to all interfaces, and **interface** applies the policy to one interface. Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

Monitoring the IPS Module

See the "Monitoring SSMs and SSCs" section on page 58-9.

Configuration Examples for the IPS Module

The following example diverts all IP traffic to the IPS module in promiscuous mode, and blocks all IP traffic if the IPS module card fails for any reason:

```
hostname(config)# access-list IPS permit ip any any
hostname(config)# class-map my-ips-class
hostname(config-cmap)# match access-list IPS
hostname(config-cmap)# policy-map my-ips-policy
hostname(config-pmap)# class my-ips-class
hostname(config-pmap-c)# ips promiscuous fail-close
hostname(config-pmap-c)# service-policy my-ips-policy global
```

The following example diverts all IP traffic destined for the 10.1.1.0 network and the 10.2.1.0 network to the IPS module in inline mode, and allows all traffic through if the IPS module fails for any reason. For the my-ips-class traffic, sensor1 is used; for the my-ips-class2 traffic, sensor2 is used.

```
hostname(config)# access-list my-ips-acl permit ip any 10.1.1.0 255.255.255.0
hostname(config)# access-list my-ips-acl2 permit ip any 10.2.1.0 255.255.255.0
hostname(config)# class-map my-ips-class
hostname(config-cmap)# match access-list my-ips-acl
hostname(config)# class-map my-ips-class2
hostname(config-cmap)# match access-list my-ips-acl2
hostname(config-cmap)# policy-map my-ips-policy
hostname(config-pmap)# class my-ips-class
hostname(config-pmap-c)# ips inline fail-open sensor sensor1
hostname(config-pmap)# class my-ips-class2
hostname(config-pmap-c)# ips inline fail-open sensor sensor2
hostname(config-pmap-c)# service-policy my-ips-policy interface outside
```

Feature History for the IPS Module

Table 59-1 lists the release history for this feature.

Table 59-1 Feature History for the IPS Module

Feature Name	Releases	Feature Information
AIP SSM	7.0(1)	We introduced support for the AIP SSM for the ASA 5510, 5520, and 5540. The following command was introduced: **ips**.
Virtual sensors (ASA 5510 and higher)	8.0(2)	Virtual sensor support was introduced. Virtual sensors let you configure multiple security policies on the IPS module. The following command was introduced: **allocate-ips**.
AIP SSC for the ASA 5505	8.2(1)	We introduced support for the AIP SSC for the ASA 5505. The following commands were introduced: **allow-ssc-mgmt**, **hw-module module ip**, and **hw-module module allow-ip**.
Support for the IPS SSP-10, -20, -40, and -60 for the ASA 5585-X	8.2(4.4)	We introduced support for the IPS SSP-10, -20, -40, and -60 for the ASA 5585-X. You can only install the IPS SSP with a matching-level SSP; for example, SSP-10 and IPS SSP-10.

CHAPTER 60

Configuring the Content Security and Control Application on the CSC SSM

This chapter describes how to configure the Content Security and Control (CSC) application that is installed in a CSC SSM in the ASA.

The chapter includes the following sections:

- Information About the CSC SSM, page 60-1
- Licensing Requirements for the CSC SSM, page 60-4
- Prerequisites for the CSC SSM, page 60-5
- Guidelines and Limitations, page 60-5
- Default Settings, page 60-6
- Configuring the CSC SSM, page 60-6
- Monitoring the CSC SSM, page 60-10
- Configuration Examples for the CSC SSM, page 60-10
- Additional References, page 60-11
- Feature History for the CSC SSM, page 60-12

Information About the CSC SSM

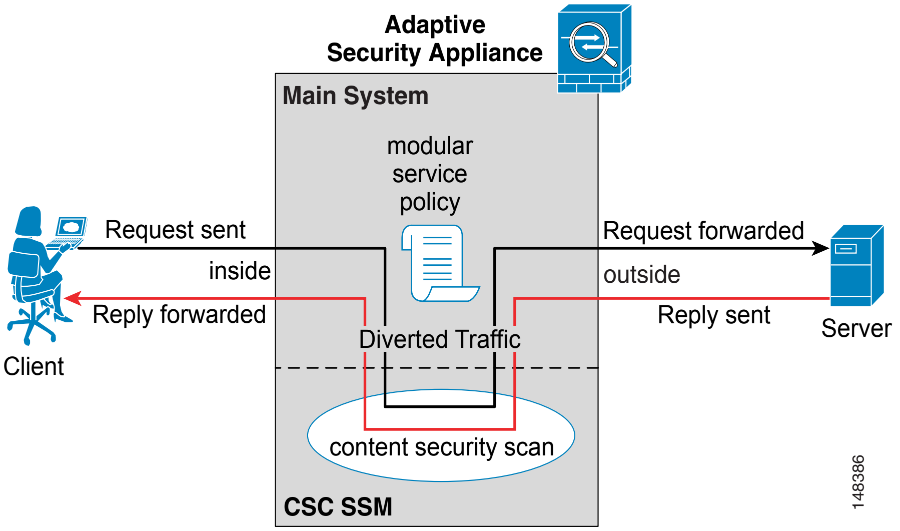
The ASA 5500 series ASA supports the CSC SSM, which runs Content Security and Control software. The CSC SSM provides protection against viruses, spyware, spam, and other unwanted traffic by scanning the FTP, HTTP, POP3, and SMTP packets that you configure the ASA to send to it.

Figure 60-1 shows the flow of traffic through an ASA that has the following:

- A CSC SSM installed and configured.
- A service policy that determines what traffic is diverted to the CSC SSM for scanning.

In this example, the client could be a network user who is accessing a website, downloading files from an FTP server, or retrieving mail from a POP3 server. SMTP scans differ in that you should configure the ASA to scan traffic sent from the outside to SMTP servers protected by the ASA.

Figure 60-1 Flow of Scanned Traffic with CSC SSM



You use ASDM for system setup and monitoring of the CSC SSM. For advanced configuration of content security policies in the CSC SSM software, you access the web-based GUI for the CSC SSM by clicking links within ASDM.

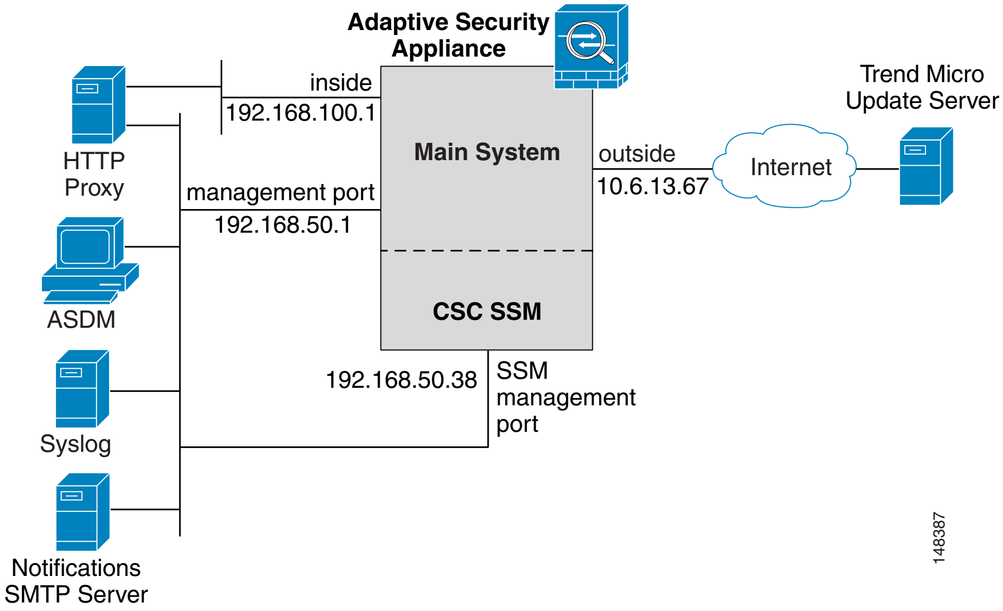
Note ASDM and the CSC SSM maintain separate passwords. You can configure their passwords to be identical; however, changing one of these two passwords does not affect the other password.

The connection between the host running ASDM and the ASA is made through a management port on the ASA. The connection to the CSC SSM GUI is made through the SSM management port. Because these two connections are required to manage the CSC SSM, any host running ASDM must be able to reach the IP address of both the ASA management port and the SSM management port.

Figure 60-2 shows an ASA with a CSC SSM that is connected to a dedicated management network. While use of a dedicated management network is not required, we recommend it. In this configuration, the following items are of particular interest:

- An HTTP proxy server is connected to the inside network and to the management network. This HTTP proxy server enables the CSC SSM to contact the Trend Micro update server.
- The management port of the ASA is connected to the management network. To allow management of the ASA and the CSC SSM, hosts running ASDM must be connected to the management network.
- The management network includes an SMTP server for e-mail notifications for the CSC SSM and a syslog server to which the CSC SSM can send syslog messages.

Figure 60-2 CSC SSM Deployment with a Management Network



Determining What Traffic to Scan

The CSC SSM can scan FTP, HTTP, POP3, and SMTP traffic only when the destination port of the packet requesting the connection is the well-known port for the specified protocol. The CSC SSM can scan only the following connections:

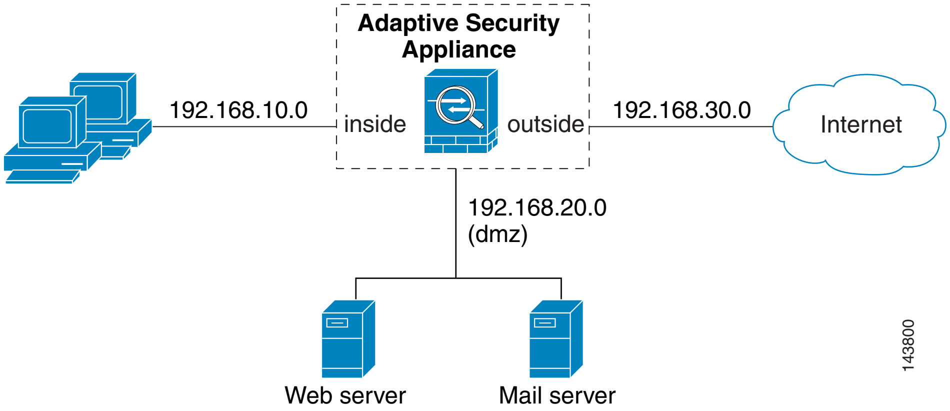
- FTP connections opened to TCP port 21.
- HTTP connections opened to TCP port 80.
- POP3 connections opened to TCP port 110.
- SMTP connections opened to TCP port 25.

You can choose to scan traffic for all of these protocols or any combination of them. For example, if you do not allow network users to receive POP3 e-mail, do not configure the ASA to divert POP3 traffic to the CSC SSM. Instead, block this traffic.

To maximize performance of the ASA and the CSC SSM, divert only the traffic to the CSC SSM that you want the CSC SSM to scan. Diverting traffic that you do not want scanned, such as traffic between a trusted source and destination, can adversely affect network performance.

Based on the configuration shown in Figure 60-3, configure the ASA to divert to the CSC SSM only requests from clients on the inside network for HTTP, FTP, and POP3 connections to the outside network, and incoming SMTP connections from outside hosts to the mail server on the DMZ network. Exclude from scanning HTTP requests from the inside network to the web server on the DMZ network.

Figure 60-3 Common Network Configuration for CSC SSM Scanning



Licensing Requirements for the CSC SSM

The following table shows the licensing requirements for this feature:

Model	**License Requirement**
ASA 5505	No support.
ASA 5510	Security Plus License: 2 contexts. *Optional license: 5 contexts.*
ASA 5520	Base License: 2 contexts. *Optional licenses: 5, 10, or 20 contexts.*
ASA 5540	Base License: 2 contexts. *Optional licenses: 5, 10, 20, or 50 contexts.*

For the ASA 5510, 5520, and 5540:

- With a Base License, the features enabled by default are SMTP virus scanning, POP3 virus scanning and content filtering, webmail virus scanning, HTTP file blocking, FTP virus scanning and file blocking, logging, and automatic updates.
- With a Security Plus License, the additional features enabled by default are SMTP anti-spam, SMTP content filtering, POP3 anti-spam, URL blocking, and URL filtering.

Prerequisites for the CSC SSM

The CSC SSM has the following prerequisites:

- A CSC SSM card must be installed in the ASA.
- A Product Authorization Key (PAK) for use in registering the CSC SSM.
- Activation keys that you receive by e-mail after you register the CSC SSM.
- The management port of the CSC SSM must be connected to your network to allow management and automatic updates of the CSC SSM software.
- The CSC SSM management port IP address must be accessible by the hosts used to run ASDM.
- You must obtain the following information to use in configuring the CSC SSM:
  - The CSC SSM management port IP address, netmask, and gateway IP address.
  - DNS server IP address.
  - HTTP proxy server IP address (needed only if your security policies require the use of a proxy server for HTTP access to the Internet).
  - Domain name and hostname for the CSC SSM.
  - An e-mail address and an SMTP server IP address and port number for e-mail notifications.
  - IP addresses of hosts or networks that are allowed to manage the CSC SSM. The IP addresses for the CSC SSM management port and the ASA management interface can be in different subnets.
  - Password for the CSC SSM.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context modes.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

Failover Guidelines

Does not support sessions in Stateful Failover. The CSC SSM does not maintain connection information, and therefore cannot provide the failover unit with the required information. The connections that a CSC SSM is scanning are dropped when the ASA in which the CSC SSM is installed fails. When the standby ASA becomes active, it forwards the scanned traffic to the CSC SSM and the connections are reset.

IPv6 Guidelines

Does not support IPv6.

Model Guidelines

Supported on the ASA 5510, ASA 5520, and ASA 5540 only.

Default Settings

Table 60-1 lists the default settings for the CSC SSM.

Table 60-1 Default CSC SSM Parameters

Parameter	Default
FTP inspection on the ASA	Enabled
All features included in the license(s) that you have purchased	Enabled

Configuring the CSC SSM

This section describes how to configure the CSC SSM, and includes the following topics:

- Before Configuring the CSC SSM, page 60-6
- Diverting Traffic to the CSC SSM, page 60-7

Before Configuring the CSC SSM

Before configuring the ASA and the CSC SSM, perform the following steps:

Step 1 If the CSC SSM did not come pre-installed in a Cisco ASA 5500 series ASA, install it and connect a network cable to the management port of the SSM. For assistance with installation and connecting the SSM, see the "Additional References" section on page 60-11.

The management port of the CSC SSM must be connected to your network to allow management of and automatic updates to the CSC SSM software. Additionally, the CSC SSM uses the management port for e-mail notifications and syslog messages.

Step 2 You should have received a Product Authorization Key (PAK) with the CSC SSM. Use the PAK to register the CSC SSM at the following URL.

http://www.cisco.com/go/license

After you register, you receive activation keys by e-mail. The activation keys are required before you can complete Step 6.

Step 3 Obtain the following information for use in Step 6:

- Activation keys
- The CSC SSM management port IP address, netmask, and gateway IP address
- DNS server IP address
- HTTP proxy server IP address (needed only if your security policies require the use of a proxy server for HTTP access to the Internet)
- Domain name and hostname for the CSC SSM
- An e-mail address and an SMTP server IP address and port number for e-mail notifications
- IP addresses of hosts or networks allowed to manage the CSC SSM
- Password for the CSC SSM

Step 4 In a web browser, access ASDM for the ASA in which the CSC SSM is installed.

> **Note** If you are accessing ASDM for the first time, see the "Additional References" section on page 60-11.

For more information about enabling ASDM access, see the "Allowing HTTPS Access for ASDM" section on page 37-4.

Step 5 Verify time settings on the ASA. Time setting accuracy is important for logging of security events and for automatic updates of CSC SSM software. Do one of the following:

- If you manually control time settings, verify the clock settings, including time zone. Choose **Configuration > Properties > Device Administration > Clock**.
- If you are using NTP, verify the NTP configuration. Choose **Configuration > Properties > Device Administration > NTP**.

Step 6 Access the ASDM GUI in a supported web browser and in the Home pane, click the **Content Security** tab.

Step 7 Run the CSC Setup Wizard. To access the CSC Setup Wizard, choose **Configuration > Trend Micro Content Security > CSC Setup > Wizard Setup > Launch Setup Wizard**.

The CSC Setup Wizard appears. For assistance with the CSC Setup Wizard, click the **Help** button.

Step 8 On the ASA 5500 series ASA, identify traffic to divert to the CSC SSM. For instructions, see the "Diverting Traffic to the CSC SSM" section on page 60-7.

Step 9 (Optional) Review the default content security policies in the CSC SSM GUI, which are suitable for most implementations. You review the content security policies by viewing the enabled features in the CSC SSM GUI. For the availability of features, see the "Licensing Requirements for the CSC SSM" section on page 60-4. For the default settings, see the "Default Settings" section on page 60-6.

To access the CSC SSM GUI, in ASDM choose **Configuration > Trend Micro Content Security**, and then click one of the following: **Web**, **Mail**, **File Transfer**, or **Updates**.

Diverting Traffic to the CSC SSM

You use Modular Policy Framework commands to configure the ASA to divert traffic to the CSC SSM.

Prerequisites

Before configuring the ASA to divert traffic to the CSC SSM, see Chapter 9, "Using Modular Policy Framework," which introduces Modular Policy Framework concepts and common commands.

Detailed Steps

	Command	Purpose

Step 1	`access-list extended`
	Example:
	`hostname(config)# access-list extended`
		Creates an access list that matches the traffic you want scanned by the CSC SSM. Create as many ACEs as are needed to match all the traffic. For example, to specify FTP, HTTP, POP3, and SMTP traffic, you need four ACEs. For guidance on identifying the traffic that you want to scan, see the "Diverting Traffic to the CSC SSM" section on page 60-7.

Step 2	`class-map class_map_name`
	Example:
	`hostname(config)# class-map class_map_name`
		Creates a class map to identify the traffic that should be diverted to the CSC SSM. The *class_map_name* argument is the name of the traffic class. When you enter the **class-map** command, the CLI enters class map configuration mode.

Step 3	`match access-list acl-name`
	Example:
	`hostname(config-cmap)# match access-list acl-name`
		Identifies the traffic to be scanned with the access list that you created in Step 1. The *acl-name* argument is the name of the access list.

Step 4	`policy-map policy_map_name`
	Example:
	`hostname(config-cmap)# policy-map policy_map_name`
		Creates a policy map or modify an existing policy map that you want to use to send traffic to the CSC SSM. The *policy_map_name* argument is the name of the policy map. When you enter the **policy-map** command, the CLI enters policy map configuration mode.

Step 5	`class class_map_name`
	Example:
	`hostname(config-pmap)# class class_map_name`
		Specifies the class map, created in Step 2, that identifies the traffic to be scanned. The *class_map_name* argument is the name of the class map that you created in Step 2. The CLI enters the policy map class configuration mode.

Step 6	`set connection per-client-max n`
	Example:
	`hostname(config-pmap-c)# set connection per-client-max 5`
		Lets you configure limits to thwart DoS attacks. The **per-client-max** parameter limits the maximum number of connections that individual clients can open. If a client uses more network resources simultaneously than is desired, you can enforce a per-client limit for simultaneous connections that the ASA diverts to the CSC SSM. The *n* argument is the maximum number of simultaneous connections that the ASA allows per client. This command prevents a single client from abusing the services of the CSC SSM or any server protected by the SSM, including prevention of attempts at DoS attacks on HTTP, FTP, POP3, or SMTP servers that the CSC SSM protects.

	Command	Purpose
Step 7	**csc** {**fail-close** | **fail-open**} **Example:** `hostname(config-pmap-c)# csc {fail-close	fail-open}`	Enables traffic scanning with the CSC SSM and assigns the traffic identified by the class map as traffic to be sent to the CSC SSM. Must be part of a service policy, which can be applied globally or to specific interfaces. Ensures that all unencrypted connections through the ASA are scanned by the CSC SSM; however, this setting may mean that traffic from trusted sources is needlessly scanned. If enabled in interface-specific service policies, this command is bi-directional. Bi-directionality means that when the ASA opens a new connection, if this command is active on either the inbound or the outbound interface of the connection and the class map for the policy identifies traffic for scanning, the ASA diverts this traffic to the CSC SSM. However, bi-directionality also means that if you divert any of the supported traffic types that cross a given interface to the CSC SSM, it is probably performing unnecessary scans on traffic from your trusted inside networks. Therefore, to further limit the traffic selected by the class maps of CSC SSM service policies, we recommend using access lists that match the following: • HTTP connections to outside networks. • FTP connections from clients inside the ASA to servers outside the ASA. • POP3 connections from clients inside the security appliance to servers outside the ASA. • Incoming SMTP connections destined to inside mail servers. The **fail-close** and **fail-open** keywords control how the ASA handles traffic when the CSC SSM is unavailable. For more information about the operating modes and failure behavior, see the "Guidelines and Limitations" section on page 60-5.
Step 8	**service-policy** *policy_map_name* [**global** | **interface** *interface_ID*] **Example:** `hostname(config-pmap-c)# service-policy policy_map_name [global	interface interface_ID]`	Applies the policy map globally or to a specific interface. The *policy_map_name* argument is the policy map that you configured in Step 4. To apply the policy map to traffic on all the interfaces, use the **global** keyword.To apply the policy map to traffic on a specific interface, use the **interface** *interface_ID* option, where *interface_ID* is the name assigned to the interface with the **nameif** command. Only one global policy is allowed. You can override the global policy on an interface by applying a service policy to that interface. You can only apply one policy map to each interface.

Monitoring the CSC SSM

For information about how to monitor the CSC SSM, see the "Monitoring SSMs and SSCs" section on page 58-9.

Configuration Examples for the CSC SSM

To identify the traffic that you want to scan, you can configure the ASA in different ways. One approach is to define two service policies, one on the inside interface and one on the outside interface, each with an access list that matches traffic to be scanned. The following example is based on the network shown in Figure 60-3 and shows the creation of two service policies for a common CSC SSM scanning scenario:

- The first policy, csc_out_policy, is applied to the inside interface and uses the csc_out access list to ensure that all outbound requests for FTP and POP3 are scanned. The csc_out access list also ensures that HTTP connections from inside to networks on the outside interface are scanned, but it includes a deny ACE to exclude HTTP connections from inside to servers on the DMZ network.
- The second policy, csc_in_policy, is applied to the outside interface and uses the csc_in access list to ensure that requests for SMTP and HTTP originating on the outside interface and destined for the DMZ network are scanned by the CSC SSM. Scanning HTTP requests protects the web server from HTTP file uploads.

```
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 21
hostname(config)# access-list csc_out deny tcp 192.168.10.0 255.255.255.0 192.168.20.0
255.255.255.0 eq 80
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 80
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 110

hostname(config)# class-map csc_outbound_class
hostname(config-cmap)# match access-list csc_out

hostname(config-cmap)# policy-map csc_out_policy
hostname(config-pmap)# class csc_outbound_class
hostname(config-pmap-c)# csc fail-close

hostname(config-pmap-c)# service-policy csc_out_policy interface inside

hostname(config)# access-list csc_in permit tcp any 192.168.20.0 255.255.255.0 eq 25
hostname(config)# access-list csc_in permit tcp any 192.168.20.0 255.255.255.0 eq 80

hostname(config)# class-map csc_inbound_class
hostname(config-cmap)# match access-list csc_in

hostname(config-cmap)# policy-map csc_in_policy
hostname(config-pmap)# class csc_inbound_class
hostname(config-pmap-c)# csc fail-close

hostname(config-pmap-c)# service-policy csc_in_policy interface outside
```

The following example shows how to use an access list to exempt the traffic from being matched by the policy map and prevent the ASA from sending traffic to the CSC SSM:

```
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 21
hostname(config)# access-list csc_out deny tcp 192.168.10.0 255.255.255.0 192.168.20.0
255.255.255.0 eq 80
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 80
hostname(config)# access-list csc_out permit tcp 192.168.10.0 255.255.255.0 any eq 110
```

The following example shows how to add an ACE to the csc_out access list to exclude HTTP connections between the trusted external web server and inside hosts from being scanned by the CSC SSM:

```
hostname(config)# access-list csc_out deny tcp 192.168.10.0 255.255.255.0 209.165.201.7
255.255.255.255 eq 80
```

The following example shows how to use the access list on the service policy applied to the outside interface:

```
hostname(config)# access-list csc_in permit tcp any 192.168.20.0 255.255.255.0 eq 25
```

The following example shows how to add an ACE to the csc_in access list to use the CSC SSM to protect the web server on a DMZ network from infected files uploaded by HTTP from external hosts:

```
hostname(config)# access-list csc_in permit tcp any 192.168.20.0 255.255.255.0 eq 80
```

Additional References

For additional information related to implementing the CSC SSM, see the following documents:

Related Topic	Document Title
Instructions on use of the CSC SSM GUI. Additional licensing requirements of specific windows available in the CSC SSM GUI. Reviewing the default content security policies in the CSC SSM GUI before modifying them or entering advanced configuration settings.	*Trend Micro InterScan for Cisco CSC SSM Administrator Guide*
Accessing ASDM for the first time and assistance with the Startup Wizard.	*Cisco ASA 5500 Series Adaptive Security Appliance Getting Started Guide*
Assistance with SSM hardware installation and connection to the ASA.	*Cisco ASA 5500 Series Hardware Installation Guide*
Technical Documentation, Marketing, and Support-related information	See the following URL: http://www.cisco.com/en/US/products/ps6823/index.html.

Feature History for the CSC SSM

Table 60-2 lists the release history for this feature.

Table 60-2 Feature History for the CSC SSM

Feature Name	Releases	Feature Information
CSC SSM	7.0(1)	The CSC SSM runs Content Security and Control software, which provides protection against viruses, spyware, spam, and other unwanted traffic. The following commands were introduced: • **csc {fail-close | fail-open}** • **hw-module module 1** [**recover** | **reload** | **reset** | **shutdown**] • **session** • **show module** [**all** | *slot* [**details** | **recover**]]
Password reset	7.2(2)	The **hw-module module password-reset** command was introduced.
CSC SSM	8.1(1), 8.1(2)	This feature is not supported.

PART 11

Configuring VPN

CHAPTER 61

Configuring IPsec and ISAKMP

This chapter describes how to configure the IPsec and ISAKMP standards to build Virtual Private Networks. It includes the following sections:

- Tunneling Overview, page 61-1
- IPsec Overview, page 61-2
- Configuring ISAKMP, page 61-2
- Configuring Certificate Group Matching, page 61-9
- Configuring IPsec, page 61-11
- Clearing Security Associations, page 61-27
- Clearing Crypto Map Configurations, page 61-27
- Supporting the Nokia VPN Client, page 61-28

Tunneling Overview

Tunneling makes it possible to use a public TCP/IP network, such as the Internet, to create secure connections between remote users and a private corporate network. Each secure connection is called a tunnel.

The ASA uses the ISAKMP and IPsec tunneling standards to build and manage tunnels. ISAKMP and IPsec accomplish the following:

- Negotiate tunnel parameters
- Establish tunnels
- Authenticate users and data
- Manage security keys
- Encrypt and decrypt data
- Manage data transfer across the tunnel
- Manage data transfer inbound and outbound as a tunnel endpoint or router

The ASA functions as a bidirectional tunnel endpoint. It can receive plain packets from the private network, encapsulate them, create a tunnel, and send them to the other end of the tunnel where they are unencapsulated and sent to their final destination. It can also receive encapsulated packets from the public network, unencapsulate them, and send them to their final destination on the private network.

IPsec Overview

The ASA uses IPsec for LAN-to-LAN VPN connections, and provides the option of using IPsec for client-to-LAN VPN connections. In IPsec terminology, a *peer* is a remote-access client or another secure gateway. For both connection types, the ASA supports only Cisco peers. Because we adhere to VPN industry standards, ASAs may work with other vendors' peers; however, we do not support them.

During tunnel establishment, the two peers negotiate security associations that govern authentication, encryption, encapsulation, and key management. These negotiations involve two phases: first, to establish the tunnel (the IKE SA); and second, to govern traffic within the tunnel (the IPsec SA).

A LAN-to-LAN VPN connects networks in different geographic locations. In IPsec LAN-to-LAN connections, the ASA can function as initiator or responder. In IPsec client-to-LAN connections, the ASA functions only as responder. Initiators propose SAs; responders accept, reject, or make counter-proposals—all in accordance with configured SA parameters. To establish a connection, both entities must agree on the SAs.

Note When the ASA is configured for IPsec VPN, you cannot enable security contexts (also called firewall multimode) or Active/Active stateful failover. Therefore, these features are unavailable.

Configuring ISAKMP

This section describes the Internet Key Exchange protocol which is also called the Internet Security Association and Key Management Protocol. The ASA IKE commands use ISAKMP as a keyword, which this guide echoes. ISAKMP works with IPsec to make VPNs more scalable. This section includes the following topics:

- ISAKMP Overview, page 61-2
- Configuring ISAKMP Policies, page 61-5
- Enabling ISAKMP on the Outside Interface, page 61-6
- Disabling ISAKMP in Aggressive Mode, page 61-6
- Determining an ID Method for ISAKMP Peers, page 61-6
- Enabling IPsec over NAT-T, page 61-7
- Enabling IPsec over TCP, page 61-8
- Waiting for Active Sessions to Terminate Before Rebooting, page 61-9
- Alerting Peers Before Disconnecting, page 61-9

ISAKMP Overview

IKE, also called ISAKMP, is the negotiation protocol that lets two hosts agree on how to build an IPsec security association. ISAKMP separates negotiation into two phases: Phase 1 and Phase 2.

Phase 1 creates the first tunnel, which protects later ISAKMP negotiation messages. Phase 2 creates the tunnel that protects data.

To set the terms of the ISAKMP negotiations, you create an ISAKMP policy, which includes the following:

- An authentication method, to ensure the identity of the peers.
- An encryption method, to protect the data and ensure privacy.
- A Hashed Message Authentication Codes (HMAC) method to ensure the identity of the sender, and to ensure that the message has not been modified in transit.
- A Diffie-Hellman group to determine the strength of the encryption-key-determination algorithm. The ASA uses this algorithm to derive the encryption and hash keys.
- A limit to the time the ASA uses an encryption key before replacing it.

Table 61-1 provides information about the ISAKMP policy keywords and their values.

Table 61-1 ISAKMP Policy Keywords for CLI Commands

Command	Keyword	Meaning	Description
crypto isakmp policy authentication	rsa-sig	A digital certificate with keys generated by the RSA signatures algorithm	Specifies the authentication method the ASA uses to establish the identity of each IPsec peer.
	crack	Challenge/Response for Authenticated Cryptographic Keys	CRACK provides strong mutual authentication when the client authenticates using a legacy method such as RADIUS and the server uses public key authentication.
	pre-share (default)	Preshared keys	Preshared keys do not scale well with a growing network but are easier to set up in a small network.
crypto isakmp policy encryption	des	56-bit DES-CBC	Specifies the symmetric encryption algorithm that protects data transmitted between two IPsec peers. The default is 168-bit Triple DES.
	3des (default)	168-bit Triple DES	
	aes aes-192 aes-256		The Advanced Encryption Standard supports key lengths of 128, 192, 256 bits.
crypto isakmp policy hash	sha (default)	SHA-1 (HMAC variant)	Specifies the hash algorithm used to ensure data integrity. It ensures that a packet comes from where it says it comes from, and that it has not been modified in transit.
	md5	MD5 (HMAC variant)	The default is SHA-1. MD5 has a smaller digest and is considered to be slightly faster than SHA-1. A successful (but extremely difficult) attack against MD5 has occurred; however, the HMAC variant IKE uses prevents this attack.

Table 61-1 ISAKMP Policy Keywords for CLI Commands (continued)

Command	Keyword	Meaning	Description
crypto isakmp policy group	1 2 (default) 5	Group 1 (768-bit) Group 2 (1024-bit) Group 5 (1536-bit)	Specifies the Diffie-Hellman group identifier, which the two IPsec peers use to derive a shared secret without transmitting it to each other. The lower the Diffie-Hellman group number, the less CPU time it requires to execute. The higher the Diffie-Hellman group no., the greater the security. Cisco VPN Client Version 3.x or higher requires a minimum of Group 2. (If you configure DH Group 1, the Cisco VPN Client cannot connect.) AES support is available on security appliances licensed for VPN-3DES only. To support the large key sizes required by AES, ISAKMP negotiation should use Diffie-Hellman (DH) Group 5.
crypto isakmp policy lifetime	integer value (86400 = default)	120 to 2147483647 seconds	Specifies the SA lifetime. The default is 86,400 seconds or 24 hours. As a general rule, a shorter lifetime provides more secure ISAKMP negotiations (up to a point). However, with shorter lifetimes, the ASA sets up future IPsec SAs more quickly.

Each configuration supports a maximum of 20 ISAKMP policies, each with a different set of values. Assign a unique priority to each policy you create. The lower the priority number, the higher the priority.

When ISAKMP negotiations begin, the peer that initiates the negotiation sends all of its policies to the remote peer, and the remote peer tries to find a match. The remote peer checks all of the peer's policies against each of its configured policies in priority order (highest priority first) until it discovers a match.

A match exists when both policies from the two peers contain the same encryption, hash, authentication, and Diffie-Hellman parameter values, and when the remote peer policy specifies a lifetime less than or equal to the lifetime in the policy the initiator sent. If the lifetimes are not identical, the ASA uses the shorter lifetime. If no acceptable match exists, ISAKMP refuses negotiation and the SA is not established.

There is an implicit trade-off between security and performance when you choose a specific value for each parameter. The level of security the default values provide is adequate for the security requirements of most organizations. If you are interoperating with a peer that supports only one of the values for a parameter, your choice is limited to that value.

Note New ASA configurations do not have a default ISAKMP policy.

Configuring ISAKMP Policies

To configure ISAKMP policies, in global configuration mode, use the **crypto isakmp policy** command with its various arguments. The syntax for ISAKMP policy commands is as follows:

crypto isakmp policy *priority* **attribute_name** [**attribute_value** | *integer*]

You must include the priority in each of the ISAKMP commands. The priority number uniquely identifies the policy, and determines the priority of the policy in ISAKMP negotiations.

To enable and configure ISAKMP, complete the following steps, using the examples as a guide:

Note If you do not specify a value for a given policy parameter, the default value applies.

Step 1 Specify the encryption algorithm. The default is Triple DES. This example sets encryption to DES.

```
crypto isakmp policy priority encryption [aes | aes-192 | aes-256 | des | 3des]
```

For example:

```
hostname(config)# crypto isakmp policy 2 encryption des
```

Step 2 Specify the hash algorithm. The default is SHA-1. This example configures MD5.

```
crypto isakmp policy priority hash [md5 | sha]
```

For example:

```
hostname(config)# crypto isakmp policy 2 hash md5
```

Step 3 Specify the authentication method. The default is preshared keys. This example configures RSA signatures.

```
crypto isakmp policy priority authentication [pre-share | crack | rsa-sig]
```

For example:

```
hostname(config)# crypto isakmp policy 2 authentication rsa-sig
```

Step 4 Specify the Diffie-Hellman group identifier. The default is Group 2. This example configures Group 5.

```
crypto isakmp policy priority group [1 | 2 | 5]
```

For example:

```
hostname(config)# crypto isakmp policy 2 group  5
```

Step 5 Specify the SA lifetime. This examples sets a lifetime of 4 hours (14400 seconds). The default is 86400 seconds (24 hours).

```
crypto isakmp policy priority lifetime seconds
```

For example:

```
hostname(config)# crypto isakmp policy 2 lifetime 14400
```

Enabling ISAKMP on the Outside Interface

You must enable ISAKMP on the interface that terminates the VPN tunnel. Typically this is the outside, or public interface.

To enable ISAKMP, enter the following command:

```
crypto isakmp enable interface-name
```

For example:

```
hostname(config)# crypto isakmp enable outside
```

Disabling ISAKMP in Aggressive Mode

Phase 1 ISAKMP negotiations can use either main mode or aggressive mode. Both provide the same services, but aggressive mode requires only two exchanges between the peers totaling 3 messages, rather than three exchanges totaling 6 messages. Aggressive mode is faster, but does not provide identity protection for the communicating parties. Therefore, the peers must exchange identification information prior to establishing a secure SA. Aggressive mode is enabled by default.

- Main mode is slower, using more exchanges, but it protects the identities of the communicating peers.
- Aggressive mode is faster, but does not protect the identities of the peers.

To disable ISAKMP in aggressive mode, enter the following command:

```
crypto isakmp am-disable
```

For example:

```
hostname(config)# crypto isakmp am-disable
```

If you have disabled aggressive mode, and want to revert to back to it, use the **no** form of the command. For example:

```
hostname(config)# no crypto isakmp am-disable
```

Note Disabling aggressive mode prevents Cisco VPN clients from using preshared key authentication to establish tunnels to the ASA. However, they may use certificate-based authentication (that is, ASA or RSA) to establish tunnels.

Determining an ID Method for ISAKMP Peers

During Phase I ISAKMP negotiations the peers must identify themselves to each other. You can choose the identification method from the following options:

Address	Uses the IP addresses of the hosts exchanging ISAKMP identity information.
Automatic	Determines ISAKMP negotiation by connection type: • IP address for preshared key. • Cert Distinguished Name for certificate authentication.
Hostname	Uses the fully qualified domain name of the hosts exchanging ISAKMP identity information (default). This name comprises the hostname and the domain name.
Key ID	Uses the string the remote peer uses to look up the preshared key.

The ASA uses the Phase I ID to send to the peer. This is true for all VPN scenarios except LAN-to-LAN connections in main mode that authenticate with preshared keys.

The default setting is hostname.

To change the peer identification method, enter the following command:

```
crypto isakmp identity {address | hostname | key-id id-string | auto}
```

For example, the following command sets the peer identification method to automatic:

```
hostname(config)# crypto isakmp identity auto
```

Enabling IPsec over NAT-T

NAT-T lets IPsec peers establish a connection through a NAT device. It does this by encapsulating IPsec traffic in UDP datagrams, using port 4500, thereby providing NAT devices with port information. NAT-T auto-detects any NAT devices, and only encapsulates IPsec traffic when necessary. This feature is disabled by default.

With the exception of the home zone on the Cisco ASA 5505, the ASA can simultaneously support standard IPsec, IPsec over TCP, NAT-T, and IPsec over UDP, depending on the client with which it is exchanging data.

The following breakdown shows the connections with each option enabled:

Options	Enabled Feature	Client Position	Feature Used
Option 1	If NAT-T is enabled	and client is behind NAT, then	NAT-T is used
		and no NAT exists, then	Native IPsec (ESP) is used
Option 2	If IPsec over UDP is enabled	and client is behind NAT, then	IPsec over UDP is used
		and no NAT exists, then	IPsec over UDP is used
Option 3	If both NAT-T and IPsec over UDP are enabled	and client is behind NAT, then	NAT-T is used
		and no NAT exists, then	IPsec over UDP is used

Note When IPsec over TCP is enabled, it takes precedence over all other connection methods.

When you enable NAT-T, the ASA automatically opens port 4500 on all IPsec enabled interfaces.

The ASA supports multiple IPsec peers behind a single NAT/PAT device operating in one of the following networks, but not both:

- LAN-to-LAN
- Remote access

In a mixed environment, the remote access tunnels fail the negotiation because all peers appear to be coming from the same public IP address, that of the NAT device. Also, remote access tunnels fail in a mixed environment because they often use the same name as the LAN-to-LAN tunnel group (that is, the IP address of the NAT device). This match can cause negotiation failures among multiple peers in a mixed LAN-to-LAN and remote access network of peers behind the NAT device.

Using NAT-T

To use NAT-T, you must perform the following tasks:

Step 1 Enter the following command to enable IPsec over NAT-T globally on the ASA.

```
crypto isakmp nat-traversal natkeepalive
```

natkeepalive is in the range 10 to 3600 seconds. The default is 20 seconds.

For example, enter the following command to enable NAT-T and set the keepalive to one hour.

```
hostname(config)# crypto isakmp nat-traversal 3600
```

Step 2 Select the "before-fragmentation" option for the IPsec fragmentation policy.

This option lets traffic travel across NAT devices that do not support IP fragmentation. It does not impede the operation of NAT devices that do support IP fragmentation.

Enabling IPsec over TCP

IPsec over TCP enables a Cisco VPN client to operate in an environment in which standard ESP or ISAKMP cannot function, or can function only with modification to existing firewall rules. IPsec over TCP encapsulates both the ISAKMP and IPsec protocols within a TCP-like packet, and enables secure tunneling through both NAT and PAT devices and firewalls. This feature is disabled by default.

Note This feature does not work with proxy-based firewalls.

IPsec over TCP works with remote access clients. You enable it globally, and it works on all ISAKMP enabled interfaces. It is a client to ASA feature only. It does not work for LAN-to-LAN connections.

The ASA can simultaneously support standard IPsec, IPsec over TCP, NAT-Traversal, and IPsec over UDP, depending on the client with which it is exchanging data. IPsec over TCP, if enabled, takes precedence over all other connection methods.

The VPN 3002 hardware client, which supports one tunnel at a time, can connect using standard IPsec, IPsec over TCP, NAT-Traversal, or IPsec over UDP.

You enable IPsec over TCP on both the ASA and the client to which it connects.

You can enable IPsec over TCP for up to 10 ports that you specify. If you enter a well-known port, for example port 80 (HTTP) or port 443 (HTTPS), the system displays a warning that the protocol associated with that port no longer works on the public interface. The consequence is that you can no longer use a browser to manage the ASA through the public interface. To solve this problem, reconfigure the HTTP/HTTPS management to different ports.

The default port is 10000.

You must configure TCP port(s) on the client as well as on the ASA. The client configuration must include at least one of the ports you set for the ASA.

To enable IPsec over TCP globally on the ASA, enter the following command:

```
crypto isakmp ipsec-over-tcp [port port 1...port0]
```

This example enables IPsec over TCP on port 45:

```
hostname(config)# crypto isakmp ipsec-over-tcp port 45
```

Waiting for Active Sessions to Terminate Before Rebooting

You can schedule a ASA reboot to occur only when all active sessions have terminated voluntarily. This feature is disabled by default.

To enable waiting for all active sessions to voluntarily terminate before the ASA reboots, enter the following command:

```
crypto isakmp reload-wait
```

For example:

```
hostname(config)# crypto isakmp reload-wait
```

Use the **reload** command to reboot the ASA. If you set the **reload-wait** command, you can use the **reload quick** command to override the **reload-wait** setting. The **reload** and **reload-wait** commands are available in privileged EXEC mode; neither includes the **isakmp** prefix.

Alerting Peers Before Disconnecting

Remote access or LAN-to-LAN sessions can drop for several reasons, such as: a ASA shutdown or reboot, session idle timeout, maximum connection time exceeded, or administrator cut-off.

The ASA can notify qualified peers (in LAN-to-LAN configurations), Cisco VPN clients and VPN 3002 hardware clients of sessions that are about to be disconnected. The peer or client receiving the alert decodes the reason and displays it in the event log or in a pop-up pane. This feature is disabled by default.

Qualified clients and peers include the following:

- Security appliances with Alerts enabled.
- Cisco VPN clients running version 4.0 or later software (no configuration required).
- VPN 3002 hardware clients running version 4.0 or later software, and with Alerts enabled.
- VPN 3000 series concentrators running version 4.0 or later software, with Alerts enabled.

To enable disconnect notification to IPsec peers, enter the **crypto isakmp disconnect-notify** command.

For example:

```
hostname(config)# crypto isakmp disconnect-notify
```

Configuring Certificate Group Matching

Tunnel groups define user connection terms and permissions. Certificate group matching lets you match a user to a tunnel group using either the Subject DN or Issuer DN of the user certificate.

To match users to tunnel groups based on these fields of the certificate, you must first create rules that define a matching criteria, and then associate each rule with the desired tunnel group.

To create a certificate map, **use the crypto ca certificate map** command. To define a tunnel group, use the **tunnel-group** command.

You must also configure a certificate group matching policy that sets one of the following methods for identifying the permission groups of certificate users:

- Match the group from the rules
- Match the group from the organizational unit (OU) field
- Use a default group for all certificate users

You can use any or all of these methods.

Creating a Certificate Group Matching Rule and Policy

To configure the policy and rules by which certificate-based ISAKMP sessions map to tunnel groups, and to associate the certificate map entries with tunnel groups, enter the **tunnel-group-map** command in global configuration mode.

The syntax follows:

tunnel-group-map enable {*rules* | *ou* | *ike-id* | *peer ip*}

tunnel-group-map [*rule-index*] **enable** *policy*

policy	Specifies the policy for deriving the tunnel group name from the certificate. *Policy* can be one of the following: *ike-id*—Indicates that if a tunnel-group is not determined based on a rule lookup or taken from the ou, then the certificate-based ISAKMP sessions are mapped to a tunnel group based on the content of the phase1 ISAKMP ID. *ou*—Indicates that if a tunnel-group is not determined based on a rule lookup, then use the value of the OU in the subject distinguished name (DN). *peer-ip*—Indicates that if a tunnel-group is not determined based on a rule lookup or taken from the ou or ike-id methods, then use the peer IP address. *rules*—Indicates that the certificate-based ISAKMP sessions are mapped to a tunnel group based on the certificate map associations configured by this command.
rule index	(Optional) Refers to parameters specified by the **crypto ca certificate map** command. The values are 1 to 65535.

Be aware of the following:

- You can invoke this command multiple times as long as each invocation is unique and you do not reference a map index more than once.
- Rules cannot be longer than 255 characters.
- You can assign multiple rules to the same group. To do that, you add the rule priority and group first. Then you define as many criteria statements as you need for each group. When multiple rules are assigned to the same group, a match results for the first rule that tests true.
- Create a single rule if you want to require all criteria to match before assigning a user to a specific tunnel group. Requiring all criteria to match is equivalent to a logical AND operation. Alternatively, create one rule for each criterion if you want to require that only one match before assigning a user to a specific tunnel group. Requiring only one criterion to match is equivalent to a logical OR operation.

The following example enables mapping of certificate-based ISAKMP sessions to a tunnel group based on the content of the phase1 ISAKMP ID:

```
hostname(config)# tunnel-group-map enable ike-id
hostname(config)#
```

The following example enables mapping of certificate-based ISAKMP sessions to a tunnel group based on the IP address of the peer:

```
hostname(config)# tunnel-group-map enable peer-ip
hostname(config)#
```

The following example enables mapping of certificate-based ISAKMP sessions based on the organizational unit (OU) in the subject distinguished name (DN):

```
hostname(config)# tunnel-group-map enable ou
hostname(config)#
```

The following example enables mapping of certificate-based ISAKMP sessions based on established rules:

```
hostname(config)# tunnel-group-map enable rules
hostname(config)#
```

Using the Tunnel-group-map default-group Command

This command specifies a default tunnel group to use when the configuration does not specify a tunnel group.

The syntax is **tunnel-group-map** [*rule-index*] **default-group** *tunnel-group-name* where the *rule-index* is the priority for the rule, and *tunnel-group name* must be for a tunnel group that already exists.

Configuring IPsec

This section provides background information about IPsec and describes the procedures required to configure the ASA when using IPsec to implement a VPN. It contains the following topics:

- Understanding IPsec Tunnels, page 61-11
- Understanding Transform Sets, page 61-12
- Defining Crypto Maps, page 61-12
- Applying Crypto Maps to Interfaces, page 61-19
- Using Interface Access Lists, page 61-19
- Changing IPsec SA Lifetimes, page 61-22
- Creating a Basic IPsec Configuration, page 61-22
- Using Dynamic Crypto Maps, page 61-24
- Providing Site-to-Site Redundancy, page 61-26
- Viewing an IPsec Configuration, page 61-26

Understanding IPsec Tunnels

IPsec tunnels are sets of SAs that the ASA establishes between peers. The SAs define the protocols and algorithms to apply to sensitive data, and also specify the keying material the peers use. IPsec SAs control the actual transmission of user traffic. SAs are unidirectional, but are generally established in pairs (inbound and outbound).

The peers negotiate the settings to use for each SA. Each SA consists of the following:

- Transform sets
- Crypto maps
- Access lists
- Tunnel groups
- Prefragmentation policies

Understanding Transform Sets

A transform set is a combination of security protocols and algorithms that define how the ASA protects data. During IPsec SA negotiations, the peers must identify a transform set that is the same at both peers. The ASA then applies the matching transform set to create an SA that protects data flows in the access list for that crypto map.

The ASA tears down the tunnel if you change the definition of the transform set used to create its SA. See "Clearing Security Associations" for further information.

Note If you clear or delete the only element in a transform set, the ASA automatically removes the crypto map references to it.

Defining Crypto Maps

Crypto maps define the IPsec policy to be negotiated in the IPsec SA. They include the following:

- Access list to identify the packets that the IPsec connection permits and protects.
- Peer identification
- Local address for the IPsec traffic (See "Applying Crypto Maps to Interfaces" for more details.)
- Up to six transform sets with which to attempt to match the peer security settings.

A *crypto map set* consists of one or more crypto maps that have the same map name. You create a crypto map set when you create its first crypto map. The following command syntax creates or adds to a crypto map:

```
crypto map map-name seq-num match address access-list-name
```

You can continue to enter this command to add crypto maps to the crypto map set. In the following example, "mymap" is the name of the crypto map set to which you might want to add crypto maps:

```
crypto map mymap 10 match address 101
```

The *sequence number* (seq-num) shown in the syntax above distinguishes one crypto map from another one with the same name. The sequence number assigned to a crypto map also determines its priority among the other crypto maps within a crypto map set. The lower the sequence number, the higher the priority. After you assign a crypto map set to an interface, the ASA evaluates all IP traffic passing through the interface against the crypto maps in the set, beginning with the crypto map with the lowest sequence number.

The ACL assigned to a crypto map consists of all of the ACEs that have the same access-list-name, as shown in the following command syntax:

```
access-list access-list-name {deny | permit} ip source source-netmask destination 
destination-netmask
```

Each ACL consists of one or more ACEs that have the same access-list-name. You create an ACL when you create its first ACE. The following command syntax creates or adds to an ACL:

```
access-list access-list-name {deny | permit} ip source source-netmask destination 
destination-netmask
```

In the following example, the ASA applies the IPsec protections assigned to the crypto map to all traffic flowing from the 10.0.0.0 subnet to the 10.1.1.0 subnet.

```
access-list 101 permit ip 10.0.0.0 255.255.255.0 10.1.1.0 255.255.255.0
```

The crypto map that matches the packet determines the security settings used in the SA negotiations. If the local ASA initiates the negotiation, it uses the policy specified in the static crypto map to create the offer to send to the specified peer. If the peer initiates the negotiation, the ASA attempts to match the policy to a static crypto map, and if that fails, any dynamic crypto maps in the crypto map set, to decide whether to accept or reject the peer offer.

For two peers to succeed in establishing an SA, they must have at least one compatible crypto map. To be compatible, a crypto map must meet the following criteria:

- The crypto map must contain compatible crypto ACLs (for example, mirror image ACLs). If the responding peer uses dynamic crypto maps, so must the ASA as a requirement to apply IPsec.
- Each crypto map identifies the other peer (unless the responding peer uses dynamic crypto maps).
- The crypto maps have at least one transform set in common.

You can apply only one crypto map set to a single interface. Create more than one crypto map for a particular interface on the ASA if any of the following conditions exist:

- You want specific peers to handle different data flows.
- You want different IPsec security to apply to different types of traffic.

For example, create a crypto map and assign an ACL to identify traffic between two subnets and assign one transform set. Create another crypto map with a different ACL to identify traffic between another two subnets and apply a transform set with different VPN parameters.

If you create more than one crypto map for an interface, specify a sequence number (seq-num) for each map entry to determine its priority within the crypto map set.

Each ACE contains a permit or deny statement. Table 61-2 explains the special meanings of permit and deny ACEs in ACLs applied to crypto maps.

Table 61-2 Special Meanings of Permit and Deny in Crypto Access Lists Applied to Outbound Traffic

Result of Crypto Map Evaluation	Response
Match criterion in an ACE containing a permit statement	Halt further evaluation of the packet against the remaining ACEs in the crypto map set, and evaluate the packet security settings against those in the transform sets assigned to the crypto map. After matching the security settings to those in a transform set, the ASA applies the associated IPsec settings. Typically for outbound traffic, this means that it decrypts, authenticates, and routes the packet.
Match criterion in an ACE containing a deny statement	Interrupt further evaluation of the packet against the remaining ACEs in the crypto map under evaluation, and resume evaluation against the ACEs in the next crypto map, as determined by the next seq-num assigned to it.
Fail to match all tested permit ACEs in the crypto map set	Route the packet without encrypting it.

ACEs containing deny statements filter out outbound traffic that does not require IPsec protection (for example, routing protocol traffic). Therefore, insert initial deny statements to filter outbound traffic that should not be evaluated against permit statements in a crypto access list.

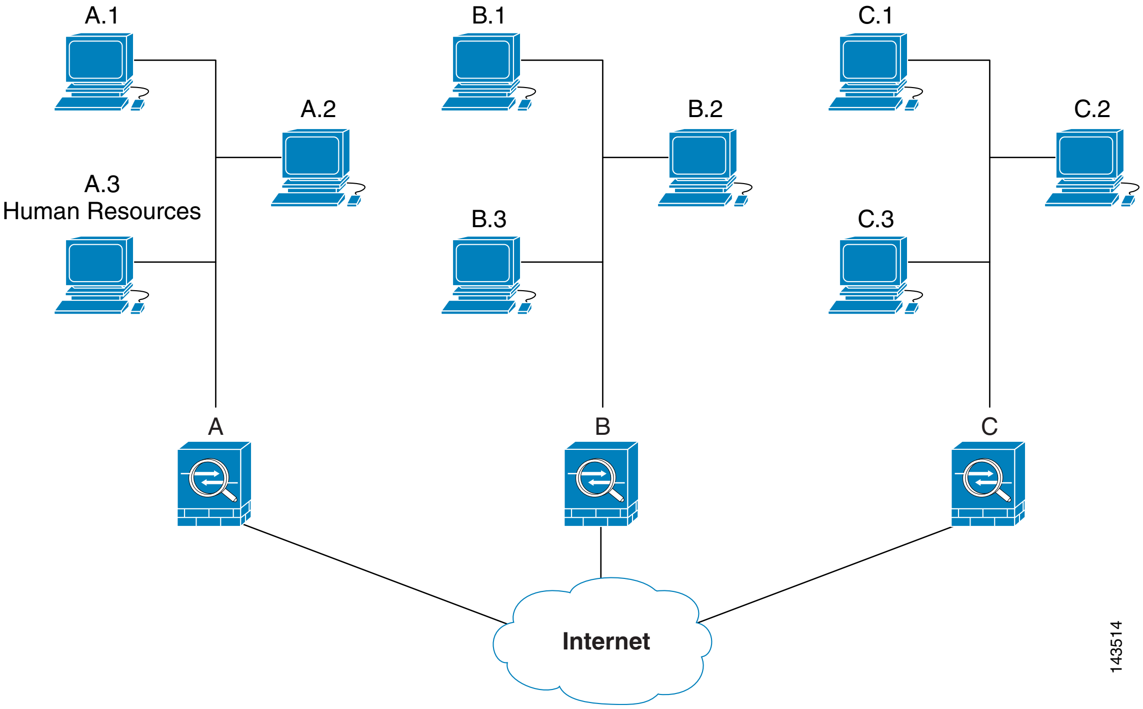
For an inbound, encrypted packet, the security appliance uses the source address and ESP SPI to determine the decryption parameters. After the security appliance decrypts the packet, it compares the inner header of the decrypted packet to the permit ACEs in the ACL associated with the packet SA. If the inner header fails to match the proxy, the security appliance drops the packet. It the inner header matches the proxy, the security appliance routes the packet.

When comparing the inner header of an inbound packet that was not encrypted, the security appliance ignores all deny rules because they would prevent the establishment of a Phase 2 SA.

Note To route inbound, unencrypted traffic as clear text, insert deny ACEs before permit ACEs.

Figure 61-1 shows an example LAN-to-LAN network of ASAs.

Figure 61-1 Effect of Permit and Deny ACEs on Traffic (Conceptual Addresses)



The simple address notation shown in this figure and used in the following explanation is an abstraction. An example with real IP addresses follows the explanation.

The objective in configuring Security Appliances A, B, and C in this example LAN-to-LAN network is to permit tunneling of all traffic originating from one of the hosts shown in Figure 61-1 and destined for one of the other hosts. However, because traffic from Host A.3 contains sensitive data from the Human Resources department, it requires strong encryption and more frequent rekeying than the other traffic. So we want to assign a special transform set for traffic from Host A.3.

To configure Security Appliance A for outbound traffic, we create two crypto maps, one for traffic from Host A.3 and the other for traffic from the other hosts in Network A, as shown in the following example:

```
Crypto Map Seq_No_1
    deny packets from A.3 to B
    deny packets from A.3 to C
    permit packets from A to B
    permit packets from A to C
Crypto Map Seq_No_2
    permit packets from A.3 to B
    permit packets from A.3 to C
```

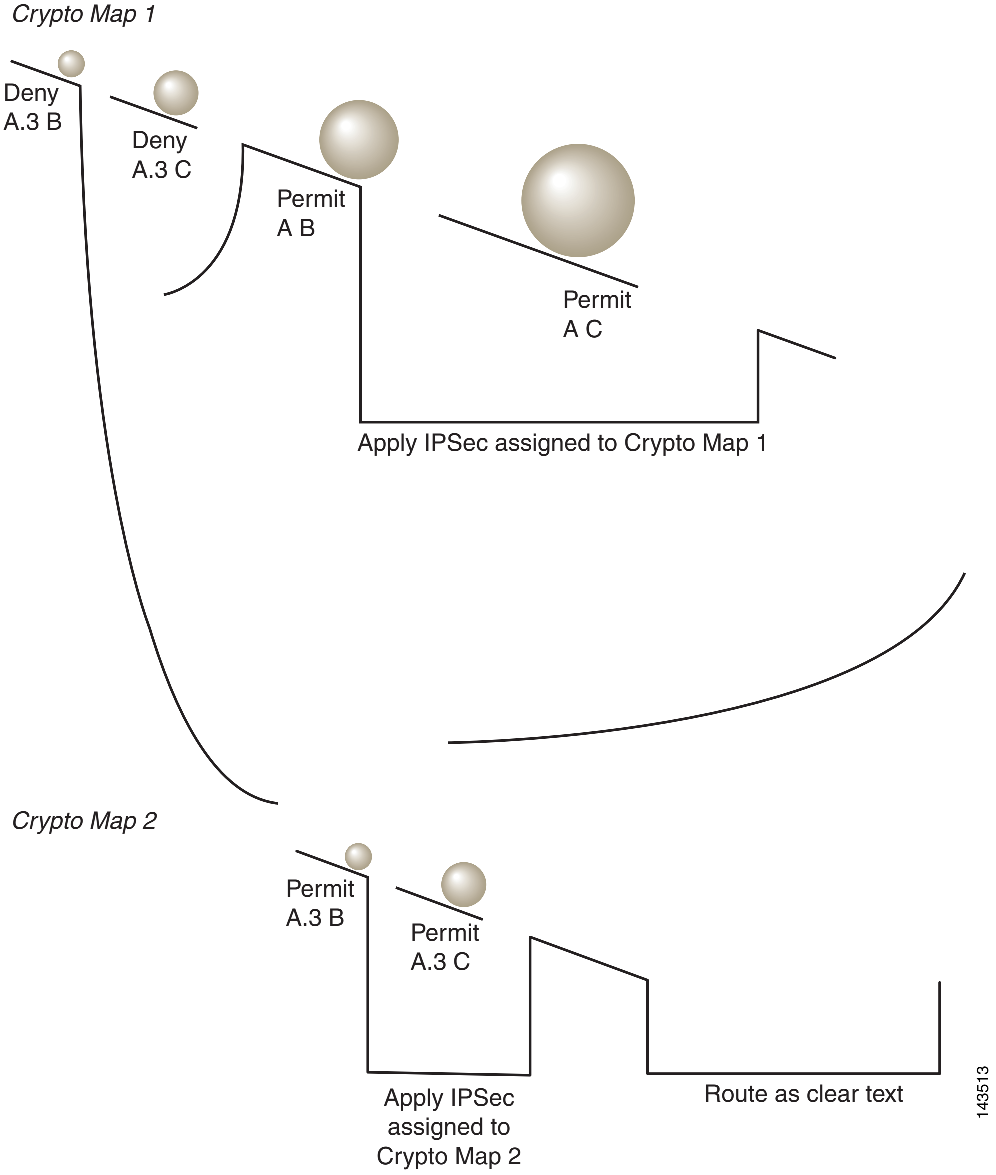
After creating the ACLs, you assign a transform set to each crypto map to apply the required IPsec to each matching packet.

Cascading ACLs involves the insertion of deny ACEs to bypass evaluation against an ACL and resume evaluation against a subsequent ACL in the crypto map set. Because you can associate each crypto map with different IPsec settings, you can use deny ACEs to exclude special traffic from further evaluation in the corresponding crypto map, and match the special traffic to permit statements in another crypto map to provide or require different security. The sequence number assigned to the crypto ACL determines its position in the evaluation sequence within the crypto map set.

Figure 61-2 shows the cascading ACLs created from the conceptual ACEs above. The meaning of each symbol in the figure follows.

╲	Crypto map within a crypto map set.
╲ ╲	(Gap in a straight line) Exit from a crypto map when a packet matches an ACE.
●	Packet that fits the description of one ACE. Each size ball represents a different packet matching the respective ACE in the figure. The differences in size merely represent differences in the source and destination of each packet.
╯	Redirection to the next crypto map in the crypto map set.
⊔	Response when a packet either matches an ACE or fails to match all of the permit ACEs in a crypto map set.

Figure 61-2 Cascading ACLs in a Crypto Map Set



Security Appliance A evaluates a packet originating from Host A.3 until it matches a permit ACE and attempts to assign the IPsec security associated with the crypto map. Whenever the packet matches a deny ACE, the ASA ignores the remaining ACEs in the crypto map and resumes evaluation against the next crypto map, as determined by the sequence number assigned to it. So in the example, if Security Appliance A receives a packet from Host A.3, it matches the packet to a deny ACE in the first crypto map and resumes evaluation of the packet against the next crypto map. When it matches the packet to the permit ACE in that crypto map, it applies the associated IPsec security (strong encryption and frequent rekeying).

To complete the security appliance configuration in the example network, we assign mirror crypto maps to Security Appliances B and C. However, because security appliances ignore deny ACEs when evaluating inbound, encrypted traffic, we can omit the mirror equivalents of the deny A.3 B and deny A.3 C ACEs, and therefore omit the mirror equivalents of Crypto Map 2. So the configuration of cascading ACLs in Security Appliances B and C is unnecessary.

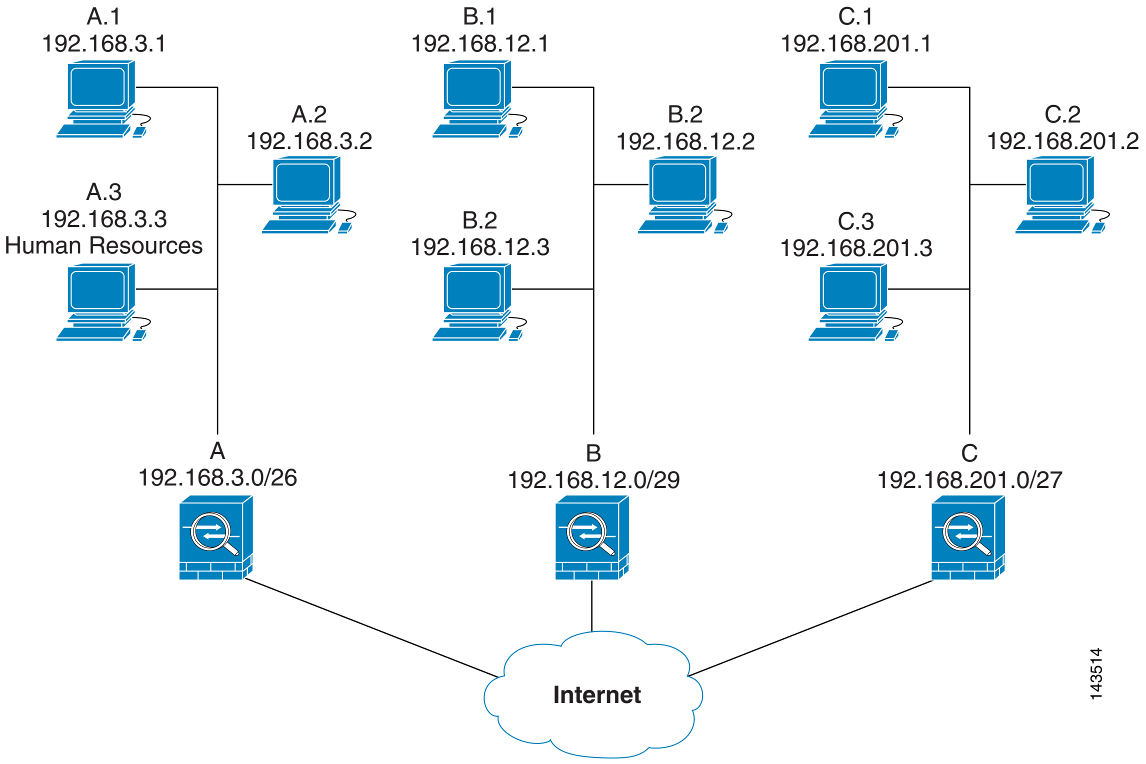
Table 61-3 shows the ACLs assigned to the crypto maps configured for all three ASAs in Figure 61-1.

Table 61-3 Example Permit and Deny Statements (Conceptual)

Security Appliance A		**Security Appliance B**		**Security Appliance C**	
Crypto Map Sequence No.	**ACE Pattern**	**Crypto Map Sequence No.**	**ACE Pattern**	**Crypto Map Sequence No.**	**ACE Pattern**
1	deny A.3 B	1	permit B A	1	permit C A
	deny A.3 C				
	permit A B				
	permit A C		permit B C		permit C B
2	permit A.3 B				
	permit A.3 C				

Figure 61-3 maps the conceptual addresses shown in Figure 61-1 to real IP addresses.

Figure 61-3 Effect of Permit and Deny ACEs on Traffic (Real Addresses)



The tables that follow combine the IP addresses shown in Figure 61-3 to the concepts shown in Table 61-3. The real ACEs shown in these tables ensure that all IPsec packets under evaluation within this network receive the proper IPsec settings.

Table 61-4 Example Permit and Deny Statements for Security Appliance A

Security Appliance	Crypto Map Sequence No.	ACE Pattern	Real ACEs
A	1	deny A.3 B	deny 192.168.3.3 255.255.255.192 192.168.12.0 255.255.255.248
		deny A.3 C	deny 192.168.3.3 255.255.255.192 192.168.201.0 255.255.255.224
		permit A B	permit 192.168.3.0 255.255.255.192 192.168.12.0 255.255.255.248
		permit A C	permit 192.168.3.0 255.255.255.192 192.168.201.0 255.255.255.224
	2	permit A.3 B	permit 192.168.3.3 255.255.255.192 192.168.12.0 255.255.255.248
		permit A.3 C	permit 192.168.3.3 255.255.255.192 192.168.201.0 255.255.255.224
B	None needed	permit B A	permit 192.168.12.0 255.255.255.248 192.168.3.0 255.255.255.192
		permit B C	permit 192.168.12.0 255.255.255.248 192.168.201.0 255.255.255.224
C	None needed	permit C A	permit 192.168.201.0 255.255.255.224 192.168.3.0 255.255.255.192
		permit C B	permit 192.168.201.0 255.255.255.224 192.168.12.0 255.255.255.248

You can apply the same reasoning shown in the example network to use cascading ACLs to assign different security settings to different hosts or subnets protected by a Cisco ASA.

Note By default, the ASA does not support IPsec traffic destined for the same interface from which it enters. (Names for this type of traffic include U-turn, hub-and-spoke, and hairpinning.) However, you might want IPsec to support U-turn traffic. To do so, insert an ACE to permit traffic to and from the network. For example, to support U-turn traffic on Security Appliance B, add a conceptual "permit B B" ACE to ACL1. The actual ACE would be as follows:

```
permit 192.168.12.0 255.255.255.248 192.168.12.0 255.255.255.248
```

Applying Crypto Maps to Interfaces

You must assign a crypto map set to each interface through which IPsec traffic flows. The ASA supports IPsec on all interfaces. Assigning the crypto map set to an interface instructs the ASA to evaluate all the traffic against the crypto map set and to use the specified policy during connection or SA negotiation.

Assigning a crypto map to an interface also initializes run-time data structures, such as the SA database and the security policy database. Reassigning a modified crypto map to the interface resynchronizes the run-time data structures with the crypto map configuration. Also, adding new peers through the use of new sequence numbers and reassigning the crypto map does not tear down existing connections.

Using Interface Access Lists

By default, the ASA lets IPsec packets bypass interface ACLs. If you want to apply interface access lists to IPsec traffic, use the **no** form of the **sysopt connection permit-vpn** command.

The crypto map access list bound to the outgoing interface either permits or denies IPsec packets through the VPN tunnel. IPsec authenticates and deciphers packets that arrive from an IPsec tunnel, and subjects them to evaluation against the ACL associated with the tunnel.

Access lists define which IP traffic to protect. For example, you can create access lists to protect all IP traffic between two subnets or two hosts. (These access lists are similar to access lists used with the **access-group** command. However, with the **access-group** command, the access list determines which traffic to forward or block at an interface.)

Before the assignment to crypto maps, the access lists are not specific to IPsec. Each crypto map references the access lists and determines the IPsec properties to apply to a packet if it matches a permit in one of the access lists.

Access lists assigned to IPsec crypto maps have four primary functions:

- Select outbound traffic to be protected by IPsec (permit = protect).
- Trigger an ISAKMP negotiation for data travelling without an established SA.
- Process inbound traffic to filter out and discard traffic that should have been protected by IPsec.
- Determine whether to accept requests for IPsec SAs when processing IKE negotiation from the peer. (Negotiation applies only to **ipsec-isakmp crypto map** entries.) The peer must “permit” a data flow associated with an **ipsec-isakmp crypto map** command entry to ensure acceptance during negotiation.

Regardless of whether the traffic is inbound or outbound, the ASA evaluates traffic against the access lists assigned to an interface. You assign IPsec to an interface as follows:

Step 1 Create the access lists to be used for IPsec.

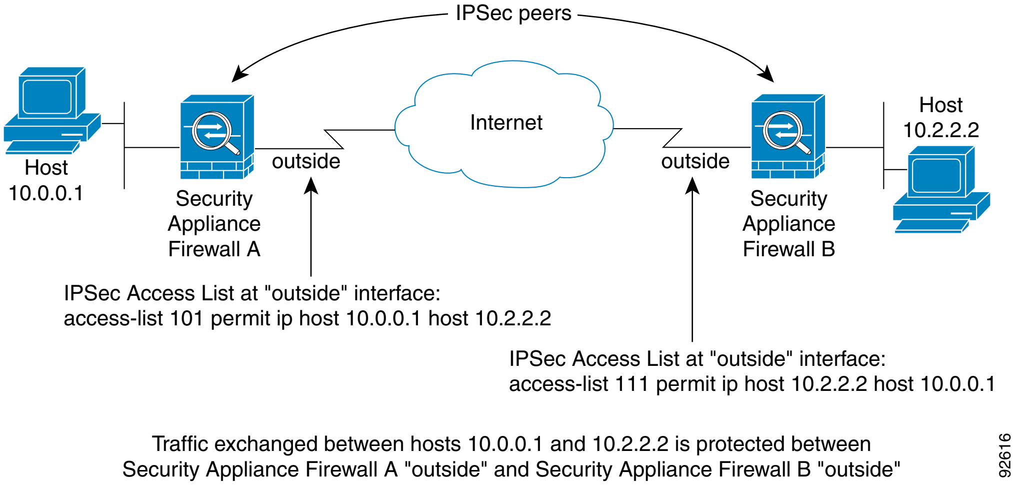
Step 2 Map the lists to one or more crypto maps, using the same crypto map name.

Step 3 Map the transform sets to the crypto maps to apply IPsec to the data flows.

Step 4 Apply the crypto maps collectively as a “crypto map set” by assigning the crypto map name they share to the interface.

In Figure 61-4, IPsec protection applies to traffic between Host 10.0.0.1 and Host 10.2.2.2 as the data exits the outside interface on Security Appliance A toward Host 10.2.2.2.

Figure 61-4 How Crypto Access Lists Apply to IPsec


IPSec peers
Internet
Host
10.0.0.1
Security
Appliance
Firewall A
outside
outside
Security
Appliance
Firewall B
Host
10.2.2.2
IPSec Access List at "outside" interface:
access-list 101 permit ip host 10.0.0.1 host 10.2.2.2
IPSec Access List at "outside" interface:
access-list 111 permit ip host 10.2.2.2 host 10.0.0.1
Traffic exchanged between hosts 10.0.0.1 and 10.2.2.2 is protected between
Security Appliance Firewall A "outside" and Security Appliance Firewall B "outside"
92616

Security Appliance A evaluates traffic from Host 10.0.0.1 to Host 10.2.2.2, as follows:

- source = host 10.0.0.1
- dest = host 10.2.2.2

Security Appliance A also evaluates traffic from Host 10.2.2.2 to Host 10.0.0.1, as follows:

- source = host 10.2.2.2
- dest = host 10.0.0.1

The first permit statement that matches the packet under evaluation determines the scope of the IPsec SA.

Note If you delete the only element in an access list, the ASA also removes the associated crypto map.

If you modify an access list currently referenced by one or more crypto maps, use the **crypto map interface** command to reinitialize the run-time SA database. See the **crypto map** command for more information.

We recommend that for every crypto access list specified for a static crypto map that you define at the local peer, you define a “mirror image” crypto access list at the remote peer. The crypto maps should also support common transforms and refer to the other system as a peer. This ensures correct processing of IPsec by both peers.

Note Every static crypto map must define an access list and an IPsec peer. If either is missing, the crypto map is incomplete and the ASA drops any traffic that it has not already matched to an earlier, complete crypto map. Use the **show conf** command to ensure that every crypto map is complete. To fix an incomplete crypto map, remove the crypto map, add the missing entries, and reapply it.

We discourage the use of the **any** keyword to specify source or destination addresses in crypto access lists because they cause problems. We strongly discourage the **permit any any** command statement because it does the following:

- Protects all outbound traffic, including all protected traffic sent to the peer specified in the corresponding crypto map.

- Requires protection for all inbound traffic.

  In this scenario, the ASA silently drops all inbound packets that lack IPsec protection.

Be sure that you define which packets to protect. If you use the **any** keyword in a **permit** statement, preface it with a series of **deny** statements to filter out traffic that would otherwise fall within that **permit** statement that you do not want to protect.

Note Decrypted "through" traffic is permitted from the client despite having an access-group on the outside interface, which calls a "deny ip any any" access-list, while **no sysopt connection permit-vpn** is configured.

Users who want to control access to the protected network via Site-to-Site or remote access VPN using the **no sysopt permit** command in conjunction with an access control list (ACL) on the outside interface are not successful.

In this situation, when management-access inside is enabled, the ACL is not applied, and users can still connect using SSH to the security appliance. Traffic to hosts on the inside network are blocked correctly by the ACL, but can't block decrypted "through" traffic to the inside interface.

The **ssh** and **http** commands are of a higher priority than the ACLs. In other words, to deny ssh, telnet, or ICMP traffic to the box from the VPN session, use ssh, telnet and icmp commands, which denies the IP local pool should be added.

Changing IPsec SA Lifetimes

You can change the global lifetime values that the ASA uses when negotiating new IPsec SAs. You can override these global lifetime values for a particular crypto map.

IPsec SAs use a derived, shared, secret key. The key is an integral part of the SA; they time out together to require the key to refresh. Each SA has two lifetimes: “timed” and “traffic-volume.” An SA expires after the respective lifetime and negotiations begin for a new one. The default lifetimes are 28,800 seconds (eight hours) and 4,608,000 kilobytes (10 megabytes per second for one hour).

If you change a global lifetime, the ASA drops the tunnel. It uses the new value in the negotiation of subsequently established SAs.

When a crypto map does not have configured lifetime values and the ASA requests a new SA, it inserts the global lifetime values used in the existing SA into the request sent to the peer. When a peer receives a negotiation request, it uses the smaller of either the lifetime value the peer proposes or the locally configured lifetime value as the lifetime of the new SA.

The peers negotiate a new SA before crossing the lifetime threshold of the existing SA to ensure that a new SA is ready when the existing one expires. The peers negotiate a new SA when about 5 to 15 percent of the lifetime of the existing SA remains.

Creating a Basic IPsec Configuration

You can create basic IPsec configurations with static or dynamic crypto maps.

To create a basic IPsec configuration using a static crypto map, perform the following steps:

Step 1 To create an access list to define the traffic to protect, enter the following command:

```
access-list access-list-name {deny | permit} ip source source-netmask destination
destination-netmask
```

For example:

```
access-list 101 permit ip 10.0.0.0 255.255.255.0 10.1.1.0 255.255.255.0
```

In this example, the **permit** keyword causes all traffic that matches the specified conditions to be protected by crypto.

Step 2 To configure a transform set that defines how to protect the traffic, enter the following command:

```
crypto ipsec transform-set transform-set-name encryption [authentication]
```

For example:

```
crypto ipsec transform-set myset1 esp-des esp-sha-hmac
crypto ipsec transform-set myset2 esp-3des esp-sha-hmac
crypto ipsec transform-set aes_set esp-md5-hmac esp-aes-256
```

In this example, “myset1” and “myset2” and “aes_set” are the names of the transform sets.

Step 3 To create a crypto map, perform the following steps:

a. Assign an access list to a crypto map:

```
crypto map map-name seq-num match address access-list-name
```

In the following example, “mymap” is the name of the crypto map set. The map set sequence number 10, which is used to rank multiple entries within one crypto map set. The lower the sequence number, the higher the priority.

```
crypto map mymap 10 match address 101
```

In this example, the access list named 101 is assigned to crypto map “mymap.”

b. Specify the peer to which the IPsec protected traffic can be forwarded:

```
crypto map map-name seq-num set peer ip-address
```

For example:

```
crypto map mymap 10 set peer 192.168.1.100
```

The ASA sets up an SA with the peer assigned the IP address 192.168.1.100. Specify multiple peers by repeating this command.

c. Specify which transform sets are allowed for this crypto map. List multiple transform sets in order of priority (highest priority first). You can specify up to 6 transform sets in a crypto map.

```
crypto map map-name seq-num set transform-set transform-set-name1
[transform-set-name2, …transform-set-name6]
```

For example:

```
crypto map mymap 10 set transform-set myset1 myset2
```

In this example, when traffic matches access list 101, the SA can use either “myset1” (first priority) or “myset2” (second priority) depending on which transform set matches the transform set of the peer.

d. (Optional) Specify an SA lifetime for the crypto map if you want to override the global lifetime.

```
crypto map map-name seq-num set security-association lifetime {seconds seconds |
kilobytes kilobytes}
```

For example:

```
crypto map mymap 10 set security-association lifetime seconds 2700
```

This example shortens the timed lifetime for the crypto map “mymap 10” to 2700 seconds (45 minutes). The traffic volume lifetime is not changed.

e. (Optional) Specify that IPsec require perfect forward secrecy when requesting new SA for this crypto map, or require PFS in requests received from the peer:

```
crypto map map-name seq-num set pfs [group1 | group2 | group5]
```

For example:

```
crypto map mymap 10 set pfs group2
```

This example requires PFS when negotiating a new SA for the crypto map “mymap 10.” The ASA uses the 1024-bit Diffie-Hellman prime modulus group in the new SA.

Step 4 Apply a crypto map set to an interface for evaluating IPsec traffic:

```
crypto map map-name interface interface-name
```

For example:

```
crypto map mymap interface outside
```

In this example, the ASA evaluates the traffic going through the outside interface against the crypto map “mymap” to determine whether it needs to be protected.

Using Dynamic Crypto Maps

A dynamic crypto map is a crypto map without all of the parameters configured. It acts as a policy template where the missing parameters are later dynamically learned, as the result of an IPsec negotiation, to match the peer requirements. The ASA applies a dynamic crypto map to let a peer negotiate a tunnel if its IP address is not already identified in a static crypto map. This occurs with the following types of peers:

- Peers with dynamically assigned public IP addresses.

  Both LAN-to-LAN and remote access peers can use DHCP to obtain a public IP address. The ASA uses this address only to initiate the tunnel.

- Peers with dynamically assigned private IP addresses.

  Peers requesting remote access tunnels typically have private IP addresses assigned by the headend. Generally, LAN-to-LAN tunnels have a predetermined set of private networks that are used to configure static maps and therefore used to establish IPsec SAs.

As an administrator configuring static crypto maps, you might not know the IP addresses that are dynamically assigned (via DHCP or some other method), and you might not know the private IP addresses of other clients, regardless of how they were assigned. VPN clients typically do not have static IP addresses; they require a dynamic crypto map to allow IPsec negotiation to occur. For example, the headend assigns the IP address to a Cisco VPN client during IKE negotiation, which the client then uses to negotiate IPsec SAs.

Note A dynamic crypto map requires only the **transform-set** parameter.

Dynamic crypto maps can ease IPsec configuration and we recommend them for use in networks where the peers are not always predetermined. Use dynamic crypto maps for Cisco VPN clients (such as mobile users) and routers that obtain dynamically assigned IP addresses.

Tip Use care when using the **any** keyword in **permit** entries in dynamic crypto maps. If the traffic covered by such a **permit** entry could include multicast or broadcast traffic, insert **deny** entries for the appropriate address range into the access list. Remember to insert **deny** entries for network and subnet broadcast traffic, and for any other traffic that IPsec should not protect.

Dynamic crypto maps work only to negotiate SAs with remote peers that initiate the connection. The ASA cannot use dynamic crypto maps to initiate connections to a remote peer. With a dynamic crypto map, if outbound traffic matches a permit entry in an access list and the corresponding SA does not yet exist, the ASA drops the traffic.

A crypto map set may include a dynamic crypto map. Dynamic crypto map sets should be the lowest priority crypto maps in the crypto map set (that is, they should have the highest sequence numbers) so that the ASA evaluates other crypto maps first. It examines the dynamic crypto map set only when the other (static) map entries do not match.

Similar to static crypto map sets, a dynamic crypto map set consists of all of the dynamic crypto maps with the same dynamic-map-name. The dynamic-seq-num differentiates the dynamic crypto maps in a set. If you configure a dynamic crypto map, insert a permit ACL to identify the data flow of the IPsec peer for the crypto access list. Otherwise the ASA accepts any data flow identity the peer proposes.

Caution Do not assign static (default) routes for traffic to be tunneled to a ASA interface configured with a dynamic crypto map set. To identify the traffic that should be tunneled, add the ACLs to the dynamic crypto map. Use care to identify the proper address pools when configuring the ACLs associated with remote access tunnels. Use Reverse Route Injection to install routes only after the tunnel is up.

The procedure for using a dynamic crypto map entry is the same as the basic configuration described in "Creating a Basic IPsec Configuration," except that instead of creating a static crypto map, you create a dynamic crypto map entry. You can also combine static and dynamic map entries within a single crypto map set.

Create a crypto dynamic map entry as follows:

Step 1 (Optional) Assign an access list to a dynamic crypto map:

```
crypto dynamic-map dynamic-map-name dynamic-seq-num match address access-list-name
```

This determines which traffic should be protected and not protected.

For example:

```
crypto dynamic-map dyn1 10 match address 101
```

In this example, access list 101 is assigned to dynamic crypto map "dyn1." The map sequence number is 10.

Step 2 Specify which transform sets are allowed for this dynamic crypto map. List multiple transform sets in order of priority (highest priority first).

```
crypto dynamic-map dynamic-map-name dynamic-seq-num set transform-set transform-set-name1,
[transform-set-name2, …transform-set-name9]
```

For example:

```
crypto dynamic-map dyn 10 set transform-set myset1 myset2
```

In this example, when traffic matches access list 101, the SA can use either “myset1” (first priority) or “myset2” (second priority), depending on which transform set matches the transform sets of the peer.

Step 3 (Optional) Specify the SA lifetime for the crypto dynamic map entry if you want to override the global lifetime value:

```
crypto dynamic-map dynamic-map-name dynamic-seq-num set security-association lifetime
{seconds seconds | kilobytes kilobytes}
```

For example:

```
crypto dynamic-map dyn1 10 set security-association lifetime seconds 2700
```

This example shortens the timed lifetime for dynamic crypto map “dyn1 10” to 2700 seconds (45 minutes). The time volume lifetime is not changed.

Step 4 (Optional) Specify that IPsec ask for PFS when requesting new SAs for this dynamic crypto map, or should demand PFS in requests received from the peer:

```
crypto dynamic-map dynamic-map-name dynamic-seq-num set pfs [group1 | group2 | group5 |
group7]
```

For example:

```
crypto dynamic-map dyn1 10 set pfs group5
```

Step 5 Add the dynamic crypto map set into a static crypto map set.

Be sure to set the crypto maps referencing dynamic maps to be the lowest priority entries (highest sequence numbers) in a crypto map set.

```
crypto map map-name seq-num ipsec-isakmp dynamic dynamic-map-name
```

For example:

```
crypto map mymap 200 ipsec-isakmp dynamic dyn1
```

Providing Site-to-Site Redundancy

You can define multiple peers by using crypto maps to provide redundancy. This configuration is useful for site-to-site VPNs.

If one peer fails, the ASA establishes a tunnel to the next peer associated with the crypto map. It sends data to the peer that it has successfully negotiated with, and that peer becomes the “active” peer. The “active” peer is the peer that the ASA keeps trying first for follow-on negotiations until a negotiation fails. At that point the ASA goes on to the next peer. The ASA cycles back to the first peer when all peers associated with the crypto map have failed.

Viewing an IPsec Configuration

Table 61-5 lists commands you can enter to view information about your IPsec configuration.

Table 61-5 Commands to View IPsec Configuration Information

Command	Purpose
show running-configuration crypto	Displays the entire crypto configuration, including IPsec, crypto maps, dynamic crypto maps, and ISAKMP.
show running-config crypto ipsec	Displays the complete IPsec configuration.
show running-config crypto isakmp	Displays the complete ISAKMP configuration.
show running-config crypto map	Displays the complete crypto map configuration.
show running-config crypto dynamic-map	Displays the dynamic crypto map configuration.
show all crypto map	View all of the configuration parameters, including those with default values.

Clearing Security Associations

Certain configuration changes take effect only during the negotiation of subsequent SAs. If you want the new settings to take effect immediately, clear the existing SAs to reestablish them with the changed configuration. If the ASA is actively processing IPsec traffic, clear only the portion of the SA database that the configuration changes affect. Reserve clearing the full SA database for large-scale changes, or when the ASA is processing a small amount of IPsec traffic.

Table 61-6 lists commands you can enter to clear and reinitialize IPsec SAs.

Table 61-6 Commands to Clear and Reinitialize IPsec SAs

Command	Purpose
clear configure crypto	Removes an entire crypto configuration, including IPsec, crypto maps, dynamic crypto maps, and ISAKMP.
clear configure crypto ca trustpoint	Removes all trustpoints.
clear configure crypto dynamic-map	Removes all dynamic crypto maps. Includes keywords that let you remove specific dynamic crypto maps.
clear configure crypto map	Removes all crypto maps. Includes keywords that let you remove specific crypto maps.
clear configure crypto isakmp	Removes the entire ISAKMP configuration.
clear configure crypto isakmp policy	Removes all ISAKMP policies or a specific policy.
clear crypto isakmp sa	Removes the entire ISAKMP SA database.

Clearing Crypto Map Configurations

The **clear configure crypto** command includes arguments that let you remove elements of the crypto configuration, including IPsec, crypto maps, dynamic crypto maps, CA trustpoints, all certificates, certificate map configurations, and ISAKMP.

Be aware that if you enter the **clear configure crypto** command without arguments, you remove the entire crypto configuration, including all certificates.

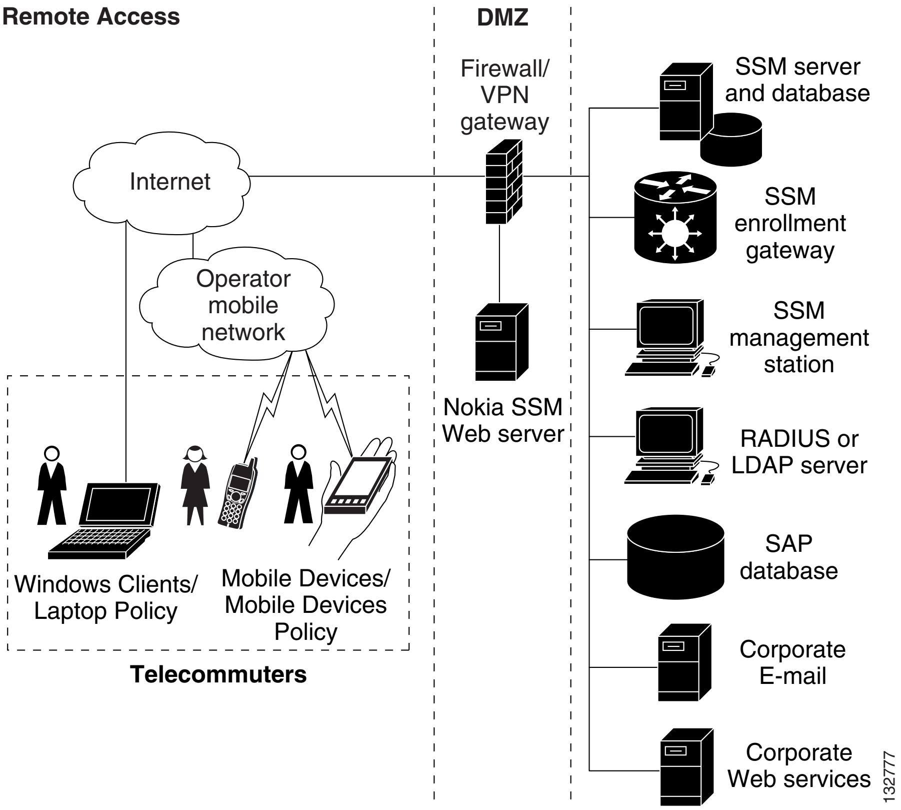
For more information, see the **clear configure crypto** command in the *Cisco ASA 5500 Series Command Reference*.

Supporting the Nokia VPN Client

The ASA supports connections from Nokia VPN Clients on Nokia 92xx Communicator series phones using the Challenge/Response for Authenticated Cryptographic Keys (CRACK) protocol. CRACK is ideal for mobile IPsec-enabled clients that use legacy authentication techniques instead of digital certificates. It provides mutual authentication when the client uses a legacy based secret-key authentication technique such as RADIUS and the gateway uses public-key authentication.

The Nokia back-end services must be in place to support both Nokia clients and the CRACK protocol. This requirement includes the Nokia Security Services Manager (NSSM) and Nokia databases as shown in Figure 61-5.

Figure 61-5 Nokia 92xx Communicator Service Requirement



To support the Nokia VPN Client, perform the following step on the ASA:

- Enable CRACK authentication using the **crypto isakmp policy** *priority* **authentication** command with the **crack** keyword in global configuration mode. For example:

```
hostname(config)# crypto isakmp policy 2
hostname(config-isakmp-policy)# authentication crack
```

If you are using digital certificates for client authentication, perform the following additional steps:

Step 1 Configure the trustpoint and remove the requirement for a fully qualified domain name. The trustpoint might be NSSM or some other CA. In this example, the trustpoint is named CompanyVPNCA:

```
hostname(config)# crypto ca trustpoint CompanyVPNCA
hostname(config-ca-trustpoint)# fqdn none
```

Step 2 To configure the identity of the ISAKMP peer, perform one of the following steps:

a. Use the **crypto isakmp identity** command with the **hostname** keyword. For example:

```
hostname(config)# crypto isakmp identity hostname
```

–or–

b. Use the **crypto isakmp identity** command with the **auto** keyword to configure the identity to be automatically determined from the connection type. For example:

```
hostname(config)# crypto isakmp identity auto
```

Note If you use the **crypto isakmp identity auto** command, you must be sure that the DN attribute order in the client certificate is CN, OU, O, C, St, L.

To learn more about the Nokia services required to support the CRACK protocol on Nokia clients, and to ensure they are installed and configured properly, contact your local Nokia representative.

CHAPTER 62

Configuring L2TP over IPsec

This chapter describes how to configure L2TP over IPsec on the ASA. This chapter includes the following topics:

- Information About L2TP over IPsec, page 62-1
- Licensing Requirements for L2TP over IPsec, page 62-3
- Prerequisites for Configuring L2TP over IPsec, page 62-3
- Guidelines and Limitations, page 62-4
- Configuring L2TP over IPsec, page 62-4
- Configuration Examples for L2TP over IPsec, page 62-7
- Feature History for L2TP over IPsec, page 62-7

Information About L2TP over IPsec

Layer 2 Tunneling Protocol (L2TP) is a VPN tunneling protocol which allows remote clients to use the public IP network to securely communicate with private corporate network servers. L2TP uses PPP over UDP (port 1701) to tunnel the data.

L2TP protocol is based on the client/server model. The function is divided between the L2TP Network Server (LNS), and the L2TP Access Concentrator (LAC). The LNS typically runs on a network gateway such as a router, while the LAC can be a dial-up Network Access Server (NAS) or an endpoint device with a bundled L2TP client such as Microsoft Windows, Apple iPhone, or Android.

The primary benefit of configuring L2TP with IPsec/IKEv1 in a remote access scenario is that remote users can access a VPN over a public IP network without a gateway or a dedicated line, which enables remote access from virtually anyplace with POTS. An additional benefit is that no additional client software, such as Cisco VPN client software, is required.

To configure L2TP over IPsec, first configure IPsec transport mode to enable IPsec with L2TP. Then configure L2TP with a virtual private dial-up network VPDN group.

The configuration of L2TP with IPsec supports certificates using the pre-shared keys or RSA signature methods, and the use of dynamic (as opposed to static) crypto maps. This summary of tasks assumes completion of IKE, as well as pre-shared keys or RSA signature configuration. See “Chapter 73, “Configuring Digital Certificates,”” for the steps to configure pre-shared keys, RSA, and dynamic crypto maps.

Note L2TP with IPsec on the ASA allows the LNS to interoperate with native VPN clients integrated in such operating systems as Windows, MAC OS X, Android, and Cisco IOS. Only L2TP with IPsec is supported, native L2TP itself is not supported on ASA.
The minimum IPsec security association lifetime supported by the Windows client is 300 seconds. If the lifetime on the ASA is set to less than 300 seconds, the Windows client ignores it and replaces it with a 300 second lifetime.

IPsec Transport and Tunnel Modes

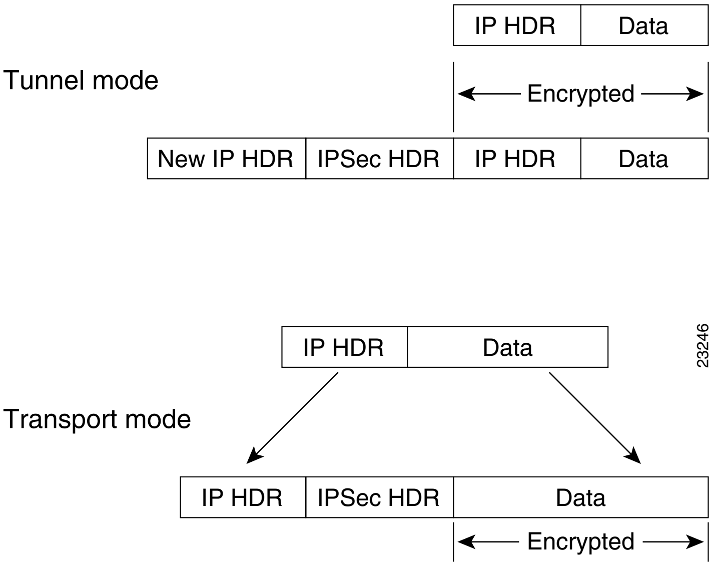
By default, the ASA uses IPsec tunnel mode—the entire original IP datagram is encrypted, and it becomes the payload in a new IP packet. This mode allows a network device, such as a router, to act as an IPsec proxy. That is, the router performs encryption on behalf of the hosts. The source router encrypts packets and forwards them along the IPsec tunnel. The destination router decrypts the original IP datagram and forwards it on to the destination system. The major advantage of tunnel mode is that the end systems do not need to be modified to receive the benefits of IPsec. Tunnel mode also protects against traffic analysis; with tunnel mode, an attacker can only determine the tunnel endpoints and not the true source and destination of the tunneled packets, even if they are the same as the tunnel endpoints.

However, the Windows L2TP/IPsec client uses IPsec transport mode—only the IP payload is encrypted, and the original IP headers are left intact. This mode has the advantages of adding only a few bytes to each packet and allowing devices on the public network to see the final source and destination of the packet. Figure 62-1 illustrates the differences between IPsec Tunnel and Transport modes.

In order for Windows L2TP/IPsec clients to connect to the ASA, you must configure IPsec transport mode for a transform set using the **crypto ipsec transform-set trans_name mode transport** command. This command is the configuration procedure that follows, **.**

With this transport capability, you can enable special processing (for example, QoS) on the intermediate network based on the information in the IP header. However, the Layer 4 header is encrypted, which limits the examination of the packet. Unfortunately, if the IP header is transmitted in clear text, transport mode allows an attacker to perform some traffic analysis.

Figure 62-1 IPsec in Tunnel and Transport Modes



Licensing Requirements for L2TP over IPsec

The following table shows the licensing requirements for this feature:

Model	License Requirement
ASA 5505	Base License: 10 sessions (25 combined IPSec and SSL VPN[1]). Security Plus License: 25 sessions (25 combined IPSec and SSL VPN[1]).
ASA 5510	Base and Security Plus License: 250 sessions (250 combined IPSec and SSL VPN[1]).
ASA 5520	Base and Security Plus License: 750 sessions (750 combined IPSec and SSL VPN[1]).
ASA 5540	Base and Security Plus License: 5000 sessions (5000 combined IPSec and SSL VPN[1]).
ASA 5550 and 5580	Base and Security Plus License: 5000 sessions (5000 combined IPSec and SSL VPN[1]).

[1] Although the maximum IPSec and SSL VPN sessions add up to more than the maximum VPN sessions, the combined sessions should not exceed the VPN session limit. If you exceed the maximum VPN sessions, you can overload the ASA, so be sure to size your network appropriately.

Prerequisites for Configuring L2TP over IPsec

Configuring L2TP over IPsec has the following prerequisites:

- You can configure the default group policy (DfltGrpPolicy) or a user-defined group policy for L2TP/IPsec connections. In either case, the group policy must be configured to use the L2TP/IPsec tunneling protocol. If the L2TP/IPsec tunning protocol is not configured for your user-defined group policy, configure the DfltGrpPolicy for the L2TP/IPsec tunning protocol and allow your user-defined group policy to inherit this attribute.

- You need to configure the default connection proflie (tunnel group), DefaultRAGroup, if you are performing “pre-shared key” authentication. If you are performing certificate-based authentication, you can use a user-defined connection profile that can be chosen based on certificate identifiers.
- IP connectivity needs to be established between the peers. To test connectivity, try to ping the IP address of the ASA from your endpoint and try to ping the IP address of your endpoint from the ASA.
- Make sure that UDP port 1701 is not blocked anywhere along the path of the connection.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single context mode. Multiple context mode is not supported.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

Failover Guidelines

L2TP over IPsec sessions are not supported by stateful failover.

Configuring L2TP over IPsec

This section provides the required ASA IKEv1 (ISAKMP) policy settings that allow native VPN clients, integrated with the operating system on an endpoint, to make a VPN connection to the ASA using L2TP over IPsec protocol.

- IKE phase 1—3DES encryption with SHA1 hash method.
- IPSec phase 2—3DES or AES encryption with MD5 or SHA hash method.
- PPP Authentication—PAP, MS-CHAPv1, or MSCHAPv2 (preferred).
- Pre-shared key (only for iPhone).

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single context mode. Multiple context mode is not supported.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

Failover Guidelines

L2TP over IPsec sessions are not supported by stateful failover.

Authentication Guidelines

The ASA only supports the PPP authentications PAP and Microsoft CHAP, Versions 1 and 2, on the local database. EAP and CHAP are performed by proxy authentication servers. Therefore, if a remote user belongs to a tunnel group configured with the **authentication eap-proxy** or **authentication chap** commands, and the ASA is configured to use the local database, that user will not be able to connect.

Supported PPP Authentication Types

L2TP over IPsec connections on the ASA support only the PPP authentication types shown in Table 62-2.

L2TP/IPsec Tunnel with Windows 2000

The ASA does not establish an L2TP/IPsec tunnel with Windows 2000 if either the Cisco VPN Client Version 3.x or the Cisco VPN 3000 Client Version 2.5 is installed. To work around this problem, disable the *Cisco VPN Service* for the Cisco VPN Client Version 3.x, or the *ANetIKE Service* for the Cisco VPN 3000 Client Version 2.5 from the Services panel in Windows 2000 (click **Start>Programs>Administrative Tools>Services**). Then restart the IPSec Policy Agent Service from the **Services** panel and reboot the PC.

Table 62-1 AAA Server Support and PPP Authentication Types

AAA Server Type	Supported PPP Authentication Types
LOCAL	PAP, MSCHAPv1, MSCHAPv2
RADIUS	PAP, CHAP, MSCHAPv1, MSCHAPv2, EAP-Proxy
TACACS+	PAP, CHAP, MSCHAPv1
LDAP	PAP
NT	PAP
Kerberos	PAP
SDI	SDI

Table 62-2 PPP Authentication Type Characteristics

Keyword	Authentication Type	Characteristics
chap	CHAP	In response to the server challenge, the client returns the encrypted [challenge plus password] with a cleartext username. This protocol is more secure than the PAP, but it does not encrypt data.
eap-proxy	EAP	Enables EAP which permits the security appliance to proxy the PPP authentication process to an external RADIUS authentication server.
ms-chap-v1 **ms-chap-v2**	Microsoft CHAP, Version 1 Microsoft CHAP, Version, 2	Similar to CHAP but more secure in that the server stores and compares only encrypted passwords rather than cleartext passwords as in CHAP. This protocol also generates a key for data encryption by MPPE.
pap	PAP	Passes cleartext username and password during authentication and is not secure.

Detailed Steps

Configuration Examples for L2TP over IPsec

Feature History for L2TP over IPsec

Table 62-3 lists the release history for this feature.

Table 62-3 Feature History for L2TP over IPsec

Feature Name	Releases	Feature Information
L2TP over IPsec	7.2(1)	L2TP/IPsec provides the capability to deploy and administer an L2TP VPN solution alongside the IPsec VPN and firewall services in a single platform. The primary benefit of configuring L2TP with IPsec in a remote access scenario is that remote users can access a VPN over a public IP network without a gateway or a dedicated line, enabling remote access from virtually anyplace with POTS. An additional benefit is that the only client requirement for VPN access is the use of Windows 2000 with Microsoft Dial-Up Networking (DUN). No additional client software, such as Cisco VPN client software, is required. The following commands were introduced or modified: **authentication eap-proxy**, **authentication ms-chap-v1**, **authentication ms-chap-v2**, **authentication pap**, **l2tp tunnel hello**, **vpn-tunnel-protocol l2tp-ipsec**.

CHAPTER 63

Setting General IPsec or SSL VPN Parameters

The ASA implementation of virtual private networking includes useful features that do not fit neatly into categories. This chapter describes some of these features. It includes the following sections:

- Configuring VPNs in Single, Routed Mode, page 63-1
- Configuring IPsec or SSL VPN to Bypass ACLs, page 63-1
- Permitting Intra-Interface Traffic (Hairpinning), page 63-2
- Setting Maximum Active IPsec or SSL VPN Sessions, page 63-4
- Using Client Update to Ensure Acceptable IPsec Client Revision Levels, page 63-4
- Understanding Load Balancing, page 63-6
- Configuring Load Balancing, page 63-11
- Configuring VPN Session Limits, page 63-16
- General Considerations, page 63-17

Note SSL VPN in this chapter refers to the SSL VPN client (AnyConnect 2.x or its predecessor, SVC 1.x), unless clientless (browser-based) SSL VPN is specified.

Configuring VPNs in Single, Routed Mode

VPNs work only in single, routed mode. VPN functionality is unavailable in configurations that include either security contexts, also referred to as multi-mode firewall, or Active/Active stateful failover.

The exception to this caveat is that you can configure and use one connection for administrative purposes to (not through) the ASA in transparent mode.

Configuring IPsec or SSL VPN to Bypass ACLs

To permit any packets that come from an IPsec or SSL VPN tunnel without checking ACLs for the source and destination interfaces, enter the **sysopt connection permit-vpn** command in global configuration mode.

You might want to bypass interface ACLs for IPsec or SSL VPN traffic if you use a separate VPN concentrator behind the ASA and want to maximize the ASA performance. Typically, you create an ACL that permits IPsec or SSL VPN packets using the **access-list** command and apply it to the source interface. Using an ACL is more secure because you can specify the exact traffic you want to allow through the ASA.

The syntax is **sysopt connection permit-vpn**. The command has no keywords or arguments.

The following example enables IPsec or SSL VPN traffic through the ASA without checking ACLs:

```
hostname(config)# sysopt connection permit-vpn
```

Note Decrypted "through" traffic is permitted from the client despite having an access-group on the outside interface, which calls a "deny ip any any" access-list, while **no sysopt connection permit-vpn** is configured.

Users who want to control access to the protected network via Site-to-Site or remote access VPN using the **no sysopt permit-vpn** command in conjunction with an access control list (ACL) on the outside interface are not successful.

In this situation, when management-access inside is enabled, the ACL is not applied, and users can still connect to the security appliance using SSH. Traffic to hosts on the inside network is blocked correctly by the ACL, but decrypted "through" traffic to the inside interface is not blocked.

The **ssh** and **http** commands are of a higher priority than the ACLs. In other words, to deny ssh, telnet, or ICMP traffic to the box from the VPN session, use ssh, telnet and icmp commands, which denies the IP local pool should be added.

Permitting Intra-Interface Traffic (Hairpinning)

The ASA includes a feature that lets a VPN client send IPsec-protected traffic to another VPN user by allowing such traffic in and out of the same interface. Also called “hairpinning”, this feature can be thought of as VPN spokes (clients) connecting through a VPN hub (security appliance).

In another application, this feature can redirect incoming VPN traffic back out through the same interface as unencrypted traffic. This would be useful, for example, to a VPN client that does not have split tunneling but needs to both access a VPN and browse the Web.

Figure 63-1 shows VPN Client 1 sending secure IPsec or SSL VPN traffic to VPN Client 2 while also sending unencrypted traffic to a public Web server.

Figure 63-1 VPN Client Using Intra-Interface feature for Hairpinning

To configure this feature, use the **same-security-traffic** command in global configuration mode with its **intra-interface** argument.

The command syntax is **same-security-traffic permit** {**inter-interface** | **intra-interface**}.

The following example shows how to enable intra-interface traffic:

```
hostname(config)# same-security-traffic permit intra-interface
hostname(config)#
```

Note You use the **same-security-traffic** command, but with the **inter-interface** argument, to permit communication between interfaces that have the same security level. This feature is not specific to IPsec or SSL VPN connections. For more information, see the "Configuring Interface Parameters" chapter of this guide.

To use hairpinning, you must apply the proper NAT rules to the security appliance interface, as discussed in the following section.

NAT Considerations for Intra-Interface Traffic

For the security appliance to send unencrypted traffic back out through the interface, you must enable NAT for the interface so that publicly routable addresses replace your private IP addresses (unless you already use public IP addresses in your local IP address pool). The following example applies an interface PAT rule to traffic sourced from the client IP pool:

```
hostname(config)# ip local pool clientpool 192.168.0.10-192.168.0.100
hostname(config)# global (outside) 1 interface
hostname(config)# nat (outside) 1 192.168.0.0 255.255.255.0
```

When the security appliance sends encrypted VPN traffic back out this same interface, however, NAT is optional. The VPN-to-VPN hairpinning works with or without NAT. To apply NAT to all outgoing traffic, implement only the commands above. To exempt the VPN-to-VPN traffic from NAT, add commands (to the example above) that implement NAT exemption for VPN-to-VPN traffic, such as:

```
hostname(config)# access-list nonat permit ip 192.168.0.0 255.255.255.0 192.168.0.0
255.255.255.0
hostname(config)# nat (outside) 0 access-list nonat
```

For more information on NAT rules, see the “Applying NAT” chapter of this guide.

Setting Maximum Active IPsec or SSL VPN Sessions

To limit VPN sessions to a lower value than the ASA allows, enter the **vpn-sessiondb max-session-limit** command in global configuration mode.

- This command applies to all types of VPN sessions, including SSL VPN.
- This limit affects the calculated load percentage for VPN Load Balancing.

The syntax is **vpn-sessiondb max-session-limit** {*session-limit*}**.**

The following example shows how to set a maximum VPN session limit of 450:

```
hostname (config)# vpn-sessiondb max-session-limit 450
hostname (config)#
```

The next example shows how to set both SSL VPN client and clientless max sessions limit:

```
hostname (config)# vpn-sessiondb max-webvpn-session-limit {session-limit}.
hostname (config)#
```

Using Client Update to Ensure Acceptable IPsec Client Revision Levels

Note The information in this section applies to IPsec connections only.

The client update feature lets administrators at a central location automatically notify VPN client users that it is time to update the VPN client software and the VPN 3002 hardware client image.

Remote users might be using outdated VPN software or hardware client versions. You can use the **client-update** command at any time to enable updating client revisions; specify the types and revision numbers of clients to which the update applies; provide a URL or IP address from which to get the update; and, in the case of Windows clients, optionally notify users that they should update their VPN client version. For Windows clients, you can provide a mechanism for users to accomplish that update. For VPN 3002 hardware client users, the update occurs automatically, with no notification. This command applies only to the IPsec remote-access tunnel-group type.

To perform client update, enter the **client-update** command in either general configuration mode or tunnel-group ipsec-attributes configuration mode. If the client is already running a software version on the list of revision numbers, it does not need to update its software. If the client is not running a software version on the list, it should update. The following procedure tells how to perform a client-update:

Step 1 In global configuration mode, enable client update by entering the command:

```
hostname(config)# client-update enable
hostname(config)#
```

Step 2 In global configuration mode, specify the parameters for the client update that you want to apply to all clients of a particular type. That is, specify the type of client, the URL or IP address from which to get the updated image, and the acceptable revision number or numbers for that client. You can specify up to four revision numbers, separated by commas.

If the user's client revision number matches one of the specified revision numbers, there is no need to update the client. This command specifies the client-update values for all clients of the specified type across the entire ASA

The syntax of the command to do this is:

```
hostname(config)# client-update type type url url-string rev-nums rev-numbers
hostname(config)#
```

The available client types are **win9X** (includes Windows 95, Windows 98 and Windows ME platforms), **winnt** (includes Windows NT 4.0, Windows 2000 and Windows XP platforms), **windows** (Includes all Windows based platforms), and **vpn3002** (VPN 3002 hardware client).

If the client is already running a software version on the list of revision numbers, it does not need to update its software. If the client is not running a software version on the list, it should update. You can specify up to three of these client update entries. The keyword **windows** covers all of the allowable Windows platforms. If you specify **windows**, do not specify the individual Windows client types.

Note For all Windows clients, you must use the protocol http:// or https:// as the prefix for the URL. For the VPN 3002 hardware client, you must specify protocol tftp:// instead.

The following example configures client update parameters for the remote-access tunnel-group. It designates the revision number, 4.6.1 and the URL for retrieving the update, which is https://support/updates:

```
hostname(config)# client-update type windows url https://support/updates/ rev-nums 4.6.1
hostname(config)#
```

Alternatively, you can configure client update just for individual tunnel-groups, rather than for all clients of a particular type. (See Step 3.)

VPN 3002 clients update without user intervention and users receive no notification message. The following example applies only to VPN 3002 Hardware Clients. Entered in tunnel-group ipsec-attributes configuration mode, it configures client update parameters for the IPsec remote-access tunnel-group "salesgrp". It designates the revision number, 4.7 and uses the TFTP protocol for retrieving the updated software from the site with the IP address 192.168.1.1:

```
hostname(config)# tunnel-group salesgrp type ipsec-ra
hostname(config)# tunnel-group salesgrp ipsec-attributes
hostname(config-tunnel-ipsec)# client-update type vpn3002 url tftp:192.168.1.1 rev-nums
4.7
hostname(config-tunnel-ipsec)#
```

Note You can have the browser automatically start an application by including the application name at the end of the URL; for example: `https://support/updates/vpnclient.exe.`

Step 3 To define a set of client-update parameters for a particular ipsec-ra tunnel group, do the following. In tunnel-group ipsec-attributes mode, specify the tunnel-group name and its type, the URL or IP address from which to get the updated image, and a revision number. If the user's client's revision number matches one of the specified revision numbers, there is no need to update the client; for example, for a Windows client:

```
hostname(config)# tunnel-group remotegrp type ipsec-ra
hostname(config)# tunnel-group remotegrp ipsec-attributes
hostname(config-tunnel-ipsec)# client-update type windows url https://support/updates/
rev-nums 4.6.1
hostname(config-tunnel-ipsec)#
```

Step 4 Optionally, you can send a notice to active users with outdated Windows clients that their client needs updating. For these users, a pop-up window appears, offering them the opportunity to launch a browser and download the updated software from the site that you specified in the URL. The only part of this message that you can configure is the URL. (See Step 2 or 3.) Users who are not active get a notification message the next time they log on. You can send this notice to all active clients on all tunnel groups, or you can send it to clients on a particular tunnel group. For example, to notify all active clients on all tunnel groups, you would enter the following command in privileged EXEC mode:

```
hostname# client-update all
hostname#
```

If the user's client's revision number matches one of the specified revision numbers, there is no need to update the client, and no notification message is sent to the user. VPN 3002 clients update without user intervention and users receive no notification message.

Note If you specify the client-update type as **windows** (specifying all Windows-based platforms) and later want to enter a client-update type of **win9x** or **winnt** for the same entity, you must first remove the windows client type with the **no** form of the command, then use new client-update commands to specify the new client types.

Understanding Load Balancing

If you have a remote-access configuration in which you are using two or more ASAs or VPN Concentrators connected on the same network, you can configure these devices to share their session load. This feature is called *load balancing*. To implement load balancing, you group together logically two or more devices on the same private LAN-to-LAN network, private subnet, and public subnet into a *virtual cluster.*

All devices in the virtual cluster carry session loads. Load balancing directs session traffic to the least loaded device in the cluster, thus distributing the load among all devices. It makes efficient use of system resources and provides increased performance and high availability.

One device in the virtual cluster, the *virtual cluster master*, directs incoming traffic to the other devices, called *backup devices*. The virtual cluster master monitors all devices in the cluster, keeps track of how busy each is, and distributes the session load accordingly. The role of virtual cluster master is not tied to a physical device; it can shift among devices. For example, if the current virtual cluster master fails, one of the backup devices in the cluster takes over that role and immediately becomes the new virtual cluster master.

The virtual cluster appears to outside clients as a single *virtual cluster IP address*. This IP address is not tied to a specific physical device. It belongs to the current virtual cluster master; hence, it is virtual. A VPN client attempting to establish a connection connects first to this virtual cluster IP address. The virtual cluster master then sends back to the client the public IP address of the least-loaded available host in the cluster. In a second transaction (transparent to the user), the client connects directly to that host. In this way, the virtual cluster master directs traffic evenly and efficiently across resources.

Note All clients other than the Cisco VPN Client or the Cisco 3002 Hardware Client should connect directly to the ASA as usual; they do not use the virtual cluster IP address.

If a machine in the cluster fails, the terminated sessions can immediately reconnect to the virtual cluster IP address. The virtual cluster master then directs these connections to another active device in the cluster. Should the virtual cluster master itself fail, a backup device in the cluster immediately and automatically takes over as the new virtual session master. Even if several devices in the cluster fail, users can continue to connect to the cluster as long as any one device in the cluster is up and available.

Comparing Load Balancing to Failover

Both load balancing and failover are high-availability features, but they function differently and have different requirements. In some circumstances you can use both load balancing and failover. The following sections describe the differences between these features.

Load Balancing

Load balancing is a mechanism for equitably distributing remote-access VPN traffic among the devices in a virtual cluster. It is based on simple distribution of traffic without taking into account throughput or other factors. A load-balancing cluster consists of two or more devices, one of which is the virtual master, and the others backup. These devices do not need to be of the exact same type, or have identical software versions or configurations.

All active devices in a virtual cluster carry session loads. Load balancing directs traffic to the least loaded device in the cluster, distributing the load among all devices. It makes efficient use of system resources and provides increased performance and high availability.

Failover

A failover configuration requires two identical ASAs connected to each other through a dedicated failover link and, optionally, a stateful failover link. The health of the active interfaces and units is monitored to determine when specific failover conditions are met. If those conditions occur, failover occurs. Failover supports both VPN and firewall configurations.

The ASA supports two failover configurations, Active/Active failover and Active/Standby failover. VPN connections run only in Active/Standby, single routed mode. Active/Active failover requires multi-context mode, so does not support VPN connections.

With Active/Active failover, both units can pass network traffic. This is not true load balancing, although it might appear to have the same effect. When failover occurs, the remaining active unit takes over passing the combined traffic, based on he configured parameters. Therefore, when configuring Active/Active failover, you must make sure that the combined traffic for both units is within the capacity of each unit.

With Active/Standby failover, only one unit passes traffic, while the other unit waits in a standby state and does not pass traffic. Active/Standby failover lets you use a second ASAto take over the functions of a failed unit. When the active unit fails, it changes to the standby state, while the standby unit changes to the active state. The unit that becomes active assumes the IP addresses (or, for transparent firewall, the management IP address) and MAC addresses of the failed unit and begins passing traffic. The unit that is now in standby state takes over the standby IP addresses of the active unit. If an active unit fails, the standby takes over without any interruption to the client VPN tunnel.

Implementing Load Balancing

Enabling load balancing involves:

- Configuring the load-balancing cluster by establishing a common virtual cluster IP address, UDP port (if necessary), and IPsec or SSL VPN shared secret for the cluster. You configure these values identically for every device in the cluster.
- Configuring the participating device by enabling load balancing on the device and defining device-specific properties. These values vary from device to device.

Note VPN load balancing requires an active 3DES/AES license. The security appliance checks for the existence of this crypto license before enabling load balancing. If it does not detect an active 3DES or AES license, the security appliance prevents the enabling of load balancing and also prevents internal configuration of 3DES by the load balancing system unless the license permits this usage.

Prerequisites

Load balancing is disabled by default. You must explicitly enable load balancing.

You must have first configured the public (outside) and private (inside) interfaces and also have previously configured the interface to which the virtual cluster IP address refers. You can use the **interface** and **nameif** commands to configure different names for these interfaces. Subsequent references in this section use the names outside and inside.

All devices that participate in a cluster must share the same cluster-specific values: IP address, encryption settings, encryption key, and port.

Eligible Platforms

A load-balancing cluster can include ASA models ASA 5510 (with a Plus license) and Model 5520 and above. You can also include VPN 3000 Series Concentrators in the cluster. While mixed configurations are possible, administration is generally simpler if the cluster is homogeneous.

Eligible Clients

Load balancing is effective only on remote sessions initiated with the following clients:

- Cisco AnyConnect VPN Client (Release 2.0 and later)
- Cisco VPN Client (Release 3.0 and later)
- Cisco ASA 5505 Security Appliance (when acting as an Easy VPN client)

- Cisco VPN 3002 Hardware Client (Release 3.5 or later)
- Cisco PIX 501/506E when acting as an Easy VPN client
- IOS EZVPN Client devices supporting IKE-redirect (IOS 831/871)
- Clientless SSL VPN (not a client)

Load balancing works with IPsec clients and SSL VPN client and clientless sessions. All other VPN connection types (L2TP, PPTP, L2TP/IPsec), including LAN-to-LAN, can connect to an ASA on which load balancing is enabled, but they cannot participate in load balancing.

VPN Load Balancing Algorithm

The master device maintains a sorted list of backup cluster members in ascending IP address order. The load of each backup cluster member is computed as an integer percentage (the number of active sessions). AnyConnect inactive sessions do not count towards the SSL VPN load for load balancing. The master device redirects the IPsec or SSL VPN tunnel to the device with the lowest load until it is 1% higher than the rest. When all backup cluster members are 1% higher than the master, the master device redirects to itself.

For example, if you have one master and two backup cluster members, the following cycle applies:

Note All nodes start with 0%.

1. The master device redirects tunnels to the first backup device (the one with the lowest inside IP address) until it reaches 1%.
2. The master device then redirects tunnels to the backup secondary device (the one with the highest inside IP address) until it also reaches 1%.
3. The master device redirects tunnels to itself only when the two backup devices both reach 1% load.
4. The cycle repeats when all three devices reach 1% load.

VPN Load-Balancing Cluster Configurations

A load-balancing cluster can consist of ASAs of the same release, of mixed releases, as well as VPN 3000 concentrators, or a mixture of these, subject to the following restrictions:

- Load-balancing clusters that consist of same release ASAs, or all VPN 3000 concentrators can run load balancing for a mixture of IPsec, AnyConnect, and clientless SSL VPN sessions.
- Load-balancing clusters that consist of both same release ASAs and VPN 3000 concentrators can run load balancing for a mixture of IPsec, AnyConnect, and clientless SSL VPN client and clientless sessions.
- Load-balancing clusters that include mixed release ASAs or same release ASAs and VPN 3000 concentrators or both can support only IPsec sessions. In such a configuration, however, the ASAs might not reach their full IPsec capacity. Scenario 1: Mixed Cluster with No SSL VPN Connections, illustrates this situation.

Since Release 7.1(1), IPsec and SSL VPN sessions count or weigh equally in determining the load that each device in the cluster carries. This represents a departure from the load balancing calculation for the ASA Release 7.0(x) software and the VPN 3000 concentrator, in that these platforms both use a weighting algorithm that, on some hardware platforms, calculates SSL VPN session load differently from IPsec session load.

The virtual master of the cluster assigns session requests to the members of the cluster. The ASA regards all sessions, SSL VPN or IPsec, as equal and assigns them accordingly. You can configure the number of IPsec and SSL VPN sessions to allow, up to the maximum allowed by your configuration and license. See Configuring VPN Session Limits for a description of how to set these limits.

We have tested up to ten nodes in a load-balancing cluster. Larger clusters might work, but we do not officially support such topologies.

Some Typical Mixed Cluster Scenarios

If you have a mixed configuration—that is, if your load-balancing cluster includes devices running a mixture of ASA software releases or at least one ASA running ASA Release 7.1(1) or later and a VPN 3000 concentrator—the difference in weighting algorithms becomes an issue if the initial cluster master fails and another device takes over as master.

The following scenarios illustrate the use of VPN load balancing in clusters consisting of a mixture of ASAs running ASA Release 7.1(1) and ASA Release 7.0(x) software, as well as VPN 3000 Series Concentrators.

Scenario 1: Mixed Cluster with No SSL VPN Connections

In this scenario, the cluster consists of a mixture of ASAs and VPN 3000 Concentrators. Some of the ASA cluster peers are running ASA Release 7.0(x), and some are running Release 7.1(1). The pre-7.1(1) and VPN 3000 peers do not have any SSL VPN connections, and the 7.1(1) cluster peers have only the base SSL VPN license, which allows two SSL VPN sessions, but there are no SSL VPN connections. In this case, all the connections are IPsec, and load balancing works fine.

The two SSL VPN licenses have a very small effect on the user's taking advantage of the maximum IPsec session limit, and then only when a VPN 3000 Concentrator is the cluster master. In general, the smaller the number of SSL VPN licenses is on a ASA in a mixed cluster, the smaller the effect on the ASA 7.1(1) device being able to reach its IPsec session limit in a scenario where there are only IPsec sessions.

Scenario 2: Mixed Cluster Handling SSL VPN Connections

Suppose, for example, a ASA running ASA Release 7.1(1) software is the initial cluster master; then that device fails. Another device in the cluster takes over automatically as master and applies its own load-balancing algorithm to determine processor loads within the cluster. A cluster master running ASA Release 7.1(1) software cannot weight session loads in any way other than what that software provides. Therefore, it cannot assign a combination of IPsec and SSL VPN session loads properly to ASA devices running earlier versions nor to VPN 3000 Concentrators. Conversely, a VPN 3000 Concentrator acting as the cluster master cannot assign loads properly to an ASA Release 7.1(1) ASA. The following scenario illustrates this dilemma.

This scenario is similar to the previous one, in that the cluster consists of a mixture of ASAs and VPN 3000 Concentrators. Some of the ASA cluster peers are running ASA Release 7.0,(x) and some are running Release 7.1(1). In this case, however, the cluster is handling SSL VPN connections as well as IPsec connections.

If a device that is running software earlier than ASA Release 7.1(1) is the cluster master, the master applies the protocol and logic in effect prior to Release 7.1(1). That is, sessions might be directed to load-balancing peers that have exceeded their session limit. In that case, the user is denied access.

If the cluster master is a device running ASA Release 7.0(x) software, the old session-weighting algorithm applies only to the pre-7.1(1) peers in the cluster. No one should be denied access in this case. Because the pre-7.1(1) peers use the session-weighting algorithm, they are more lightly loaded.

An issue arises, however, because you cannot guarantee that the 7.1(1) peer is always the cluster master. If the cluster master fails, another peer assumes the role of master. The new master might be any of the eligible peers. Because of the innately unpredictability of the results, we recommend that you avoid configuring this type of cluster.

Configuring Load Balancing

To use load balancing, configure the following elements for each device that participates in the cluster.

- Public and private interfaces
- VPN load-balancing cluster attributes

Note All participants in the cluster must have an identical cluster configuration, except for the device priority within the cluster.

Note The Local CA feature is not supported if you use active/active failover or VPN load-balancing. The Local CA cannot be subordinate to another CA; it can act only as the Root CA.

Configuring the Public and Private Interfaces for Load Balancing

To configure the public (outside) and private (inside) interfaces for the load-balancing cluster devices, do the following steps:

Step 1 Configure the public interface on the ASA by entering the **interface** command with the **lbpublic** keyword in vpn-load-balancing configuration mode. This command specifies the name or IP address of the public interface for load balancing for this device:

```
hostname(config)# vpn load-balancing
hostname(config-load-balancing)# interface lbpublic outside
hostname(config-load-balancing)#
```

Step 2 Configure the private interface on the ASA by entering the **interface** command with the **lbprivate** keyword in vpn-load-balancing configuration mode. This command specifies the name or IP address of the private interface for load balancing for this device:

```
hostname(config-load-balancing)# interface lbprivate inside
hostname(config-load-balancing)#
```

Step 3 Set the priority to assign to this device within the cluster. The range is from 1 to 10. The priority indicates the likelihood of this device becoming the virtual cluster master, either at start-up or when an existing master fails. The higher you set the priority (for example, 10), the more likely it is that this device becomes the virtual cluster master.

```
hostname(config-load-balancing)# priority number
hostname(config-load-balancing)#
```

For example, to assign this device a priority of 6 within the cluster, enter the following command:

```
hostname(config-load-balancing)# priority 6
hostname(config-load-balancing)#
```

Step 4 If you want to apply network address translation for this device, enter the **nat** command with the NAT assigned address for the device:

```
hostname(config-load-balancing)# nat ip_address
hostname(config-load-balancing)#
```

For example, to assign this device a NAT address of 192.168.30.3, enter the following command:

```
hostname(config-load-balancing)# nat 192.168.30.3
hostname(config-load-balancing)#
```

Configuring the Load Balancing Cluster Attributes

To configure the load-balancing cluster attributes for each device in the cluster, do the following steps:

Step 1 Set up VPN load balancing by entering the vpn load-balancing command in global configuration mode:

```
hostname(config)# vpn load-balancing
hostname(config-load-balancing)#
```

This enters vpn-load-balancing configuration mode, in which you can configure the remaining load-balancing attributes.

Step 2 Configure the IP address of the cluster to which this device belongs. This command specifies the single IP address that represents the entire virtual cluster. Choose an IP address that is within the public subnet address range shared by all the ASAs in the virtual cluster

```
hostname(config-load-balancing)# cluster ip address ip_address
hostname(config-load-balancing)#
```

For example, to set the cluster IP address to 192.168.10.10, enter the following command:

```
hostname(config-load-balancing)# cluster ip address 192.168.10.10
hostname(config-load-balancing)#
```

Step 3 Configure the cluster port.This command specifies the UDP port for the virtual cluster in which this device is participating. The default value is 9023. If another application is using this port, enter the UDP destination port number you want to use for load balancing.

```
hostname(config-load-balancing)# cluster port port_number
hostname(config-load-balancing)#
```

For example, to set the cluster port to 4444, enter the following command:

```
hostname(config-load-balancing)# cluster port 4444
hostname(config-load-balancing)#
```

Step 4 Optionally, enable IPsec encryption for the cluster. The default is no encryption. This command enables or disables IPsec encryption. If you configure this check attribute, you must first specify and verify a shared secret.The ASAs in the virtual cluster communicate via LAN-to-LAN tunnels using IPsec. To ensure that all load-balancing information communicated between the devices is encrypted, enable this attribute.

```
hostname(config-load-balancing)# cluster encryption
hostname(config-load-balancing)#
```

Note When using encryption, you must have previously configured the load-balancing inside interface. If that interface is not enabled on the load-balancing inside interface, you get an error message when you try to configure cluster encryption.

If the load-balancing inside interface was enabled when you configured cluster encryption, but was disabled before you configured the participation of the device in the virtual cluster, you get an error message when you enter the **participate** command (or, in ASDM, select the Participate in Load Balancing Cluster check box), and encryption is not enabled for the cluster.

To use cluster encryption, you musts enable isakmp on the inside interface, using the **crypto isakmp enable** command with the inside interface specified.

Step 5 If you enable cluster encryption, you must also specify the IPsec shared secret by entering the **cluster key** command. This command specifies the shared secret to between IPsec peers when you have enabled IPsec encryption. The value you enter in the box appears as consecutive asterisk characters

```
hostname(config-load-balancing)# cluster key shared_secret
hostname(config-load-balancing)#
```

For example, to set the shared secret to 123456789, enter the following command:

```
hostname(config-load-balancing)# cluster key 123456789
hostname(config-load-balancing)#
```

Step 6 Enable this device’s participation in the cluster by entering the participate command:

```
hostname(config-load-balancing)# participate
hostname(config-load-balancing)#
```

Enabling Redirection Using a Fully-qualified Domain Name

To enable or disable redirection using a fully-qualified domain name in vpn load-balancing mode, use the **redirect-fqdn enable** command in global configuration mode. This behavior is disabled by default.

By default, the ASA sends only IP addresses in load-balancing redirection to a client. If certificates are in use that are based on DNS names, the certificates will be invalid when redirected to a backup device.

As a VPN cluster master, this ASA can send a fully qualified domain name (FQDN), using reverse DNS lookup, of a cluster device (another ASA in the cluster), instead of its outside IP address, when redirecting VPN client connections to that cluster device.

All of the outside and inside network interfaces on the load-balancing devices in a cluster must be on the same IP network.

To do SSL VPN load Balancing using FQDNs rather than IP addresses, perform the following configuration steps:

Step 1 Enable the use of FQDNs for Load Balancing with the **redirect-fqdn enable** command:

redirect-fqdn {enable | disable}
no redirect-fqdn {enable | disable}

For example, `hostname(config)# vpn load-balancing`

```
hostname(config-load-balancing)# redirect-fqdn enable
hostname(config-load-balancing)#
```

Step 2 Add an entry for each of your ASA outside interfaces into your DNS server, if such entries are not already present. Each ASA outside IP address should have a DNS entry associated with it for lookups. These DNS entries must also be enabled for Reverse Lookup.

Step 3 Enable DNS lookups on your ASA with the command - “dns domain-lookup inside” (or whichever interface has a route to your DNS server).

Step 4 Define your DNS server IP address on the ASA; for example: `dns name-server 10.2.3.4` (IP address of your DNS server).

The following is an example of a VPN load-balancing command sequence that includes an interface command that enables redirection for a fully-qualified domain name, specifies the public interface of the cluster as “test” and the private interface of the cluster as “foo”:

```
hostname(config)# interface GigabitEthernet 0/1
hostname(config-if)# ip address 209.165.202.159 255.255.255.0
hostname(config)# nameif test
hostname(config)# interface GigabitEthernet 0/2
hostname(config-if)# ip address 209.165.201.30 255.255.255.0
hostname(config)# nameif foo
hostname(config)# vpn load-balancing
hostname(config-load-balancing)# nat 192.168.10.10
hostname(config-load-balancing)# priority 9
hostname(config-load-balancing)# interface lbpublic test
hostname(config-load-balancing)# interface lbprivate foo
hostname(config-load-balancing)# cluster ip address 209.165.202.224
hostname(config-load-balancing)# cluster key 123456789
hostname(config-load-balancing)# cluster encryption
hostname(config-load-balancing)# cluster port 9023
hostname(config-load-balancing)# redirect-fqdn enable
hostname(config-load-balancing)# participate
```

Monitoring Load Balancing

The load balancing cluster master receives a periodic message from each ASA in the cluster with the number of active AnyConnect and clientless sessions, as well as the maximum allowed sessions based on the configured or license limits. If an ASA in the cluster shows 100% full capacity, the cluster master cannot redirect more connections to it. Although the ASA may show as full, some users may be in Inactive/wait-to-resume state, wasting the licenses. As a workaround, each ASA provides the total number of sessions minus the sessions in inactive state, instead of the total number of sessions. In other words, the inactive sessions are not reported to the cluster master. Even if the ASA is full (with some inactive sessions), the cluster master still redirects connections to it if necessary. When the ASA receives the new connection, the session that has been inactive the longest is logged off, allowing new connections to take its license.

The following example shows 100 SSL sessions (Active only) and a 2% SSL load. These numbers do not include the inactive sessions. In other words, inactive sessions do not count towards the load for load balancing.

```
nmeka-asa2# sh vpn load-balancing
    Status :       enabled
    Role :         Master
    Failover :     Active
    Encryption :   enabled
    Cluster IP :   192.168.1.100
    Peers :        1

                                              Load %
Sessions
    Public IP      Role    Pri     Model          IPsec   SSL     IPSec SSL
    192.168.1.9    Master  7       ASA-5540       4       2       216     100
    192.168.1.19   Backup  9       ASA-5520       0       0       0       0
```

Frequently Asked Questions About Load Balancing

IP Address Pool Exhaustion

Q: Does the ASA consider IP address pool exhaustion as part of its VPN load balancing mechanism?

A: No. If the remote access VPN session is directed to a device that has exhausted its IP address pools, the session does not establish. The load balancing algorithm is based on load, and is computed as an integer percentage (number of active/maximum sessions) that each backup cluster member supplies.

Unique IP Address Pools

Q: To implement VPN load balancing, must the IP address pools for AnyConnect clients or IPsec clients on different ASAs be unique?

A: Yes. IP address pools must be unique for each device.

Using Load Balancing and Failover on the Same Device

Q: Can a single device use both load balancing and failover?

A: Yes. In this configuration, the client connects to the IP address of the cluster and is redirected to the least-loaded ASA in the cluster. If that device fails, the standby unit takes over immediately, and there is no impact to the VPN tunnel.

Load Balancing on Multiple Interfaces

Q: If we enable SSL VPN on multiple interfaces, is it possible to implement load balancing for both of the interfaces?

A: You can define only one interface to participate in the cluster as the public interface. The idea is to balance the CPU loads. Multiple interfaces converge on the same CPU, so the concept of load balancing on multiple interfaces has no meaning.

Maximum Simultaneous Sessions for Load Balancing Clusters

Q: Consider a deployment of two ASA 5520s, each with a 100-user SSL VPN license. In a load balancing cluster, does the maximum total number of users allow 200 simultaneous session, or only 100? If we add a third device later with a 100-user license, can we now support 300 simultaneous sessions?

A: With VPN load balancing, all devices are active, so the maximum number of sessions that your cluster can support is the total of the number of sessions for each of the devices in the cluster, in this case 300.

Configuring VPN Session Limits

You can run as many IPsec and SSL VPN sessions as your platform and license for the ASA supports. To view the licensing information for your ASA, enter the **show version** command in global configuration mode. The following example shows the command and the licensing information excerpted from the output of this command:

```
hostname(config)# show version


Cisco Adaptive Security Appliance Software Version 7.1(0)182
Device Manager Version 5.1(0)128

Licensed features for this platform:
Maximum Physical Interfaces : Unlimited
Maximum VLANs               : 100
Inside Hosts                : Unlimited
Failover                    : Active/Active
VPN-DES                     : Enabled
VPN-3DES-AES                : Enabled
Security Contexts           : 10
GTP/GPRS                    : Enabled
VPN Peers                   : 750
WebVPN Peers                : 500

This platform has an ASA 5520 VPN Plus license.
```

To limit the maximum number of active IPsec VPN sessions to a lower value than the ASA allows, enter the **vpn-sessiondb max-session-limit** command in global configuration mode. This limit affects the calculated load percentage for VPN Load Balancing.

```
hostname(config)# vpn-sessiondb max-session-limit number_of_sessions
hostname(config)#
```

For example, if the ASA license allows 750 IPsec sessions, and you want to limit the number of IPsec sessions to 500, enter the following command:

```
hostname(config)# vpn-sessiondb max-session-limit 500
hostname(config)#
```

To remove the session limit, use the **no** version of this command.:

```
hostname(config)# no vpn-sessiondb max-session-limit
hostname(config)#
```

To limit SSL VPN sessions to a lower value than the ASA allows, use the **vpn-sessiondb max-webvpn-session-limit** command in global configuration mode. To remove the session limit, use the **no** version of this command.

```
hostname(config)# vpn-sessiondb max-webvpn-session-limit number_of_sessions
hostname(config)#
```

For example, if the ASA license allows 500 SSL VPN sessions, and you want to limit the number of SSL VPN sessions to 250, enter the following command:

```
hostname(config)# vpn-sessiondb max-webvpn-session-limit 250
hostname(config)#
```

To remove the session limit, use the **no** version of this command.:

```
hostname(config)# no vpn-sessiondb max-webvpn-session-limit
hostname(config)#
```

For a complete description of the features available with each license, see Appendix A, Feature Licenses and Specifications.

General Considerations

The following section provides questions and answers that you should consider as you set up VPN load balancing.

Q. Does the ASA consider IP Pool exhaustion as part of its VPN load balancing mechanism?

A. No. If the VPN remote access session is directed to the least_loaded unit, which has exhausted its IP pools, then the session will fail to establish. The algorithm is based on Load, and is computed as an integer percentage (# of active/max sessions) supplied by each secondary cluster member.

Q. There are four ASAs in a cluster using a VIP via the ASA's own internal load balancing. Can we use the same group-url on all four members of the cluster w/o issues? And from a DNS perspective, can we just create an A record pointing at the VIP; or do we have to do something else?

A. It appears that on each cluster member that we cannot use **group-url https://vpn.rob.com/eng enable**. Instead we have to use the real IP address (not the VIP) of the ASA. If we use the URL and/or the VIP IP, Anyconnect is unable to connect.

For example: I have a 2 ASA cluster setup and it turns out I have both the FQDN and IP address for group-url. When trying to access the cluster the ASA will use the IP address of the machines in the cluster. I removed the FQDN group-url and it stopped working.

ASA1 with **`group-url group-url`** **https://10.94.147.93/BasicGroup**

and

ASA2 with **group-url group-url https://10.94.147.92/BasicGroup**

I can then access the cluster and BasicGroup using the cluster name and group-url: **cvc-asa.cisco.com/BasicGroup**.

Q. When we implement VPN load balancing, shouldn’t the address pools for AnyConnect clients (or IPSec or SSL clients) on different ASA's participating in cluster be different?

A. Correct. If using address pools, they must be unique per device

Q. Can load load balancing and failover be combined?

A. Yes.

You can also have a configuration that combines both load balancing and failover. For example, the client connects to the IP address of the cluster and is redirected to the least-loaded ASA in the cluster. If that ASA goes down, the standby unit takes over immediately, and there is no impact to the client's tunnel.

Note Only the Active units participate in load balancing. Should the Active unit of a failover pair go down, then its Standby mate would become active and then join the Load Balancing cluster mechanism to distribute the VPN session load.

Q. If we have SSL VPN (AnyConnect and clientless) enabled on multiple interfaces, is it possible to have VPN load balancing implemented for both of them?

A. You can only define one interface to participate in the cluster as the ‘public’ interface. The idea is to balance the CPU loads. Multiple interfaces still converge on the same cpu, so the concept of load-balancing on interfaces doesn't have any value. At this time there is no plans to support this.

Q. By default, when a cluster master redirects an incoming connection, it redirects it by IP address so it would show up at the ASA with an IP address rather than FQDN.

A. The options are to add a group-url for the local ASA https://ip_address/group-url or add the following command to the ASA to allow them to forward by FQDN rather than IP address:

```
(config)# vpn load-balancing
(config-load-balancing)# redirect-fqdn enable
```

Q. When trying to implement SSL licensing and failover, consider the following deployment:

Two ASA5520’s , each with 100-user SSL VPN licenses, in a load balancing cluster.

Does the maximum total number of users allow 200 simultaneous users or only a maximum of 100? If you add a third device later with 100 users, can you now support 300 simultaneous users?

A. With VPN load balancing, all devices are active. This allows you to take the licensed amount per device, and add them together to determine the maximum number of users that your cluster can support. For this example, 200 sessions for twoASAs and 300 sessions for three ASAs, respectively.

Q. Is there a limit on the number of appliances that can participate in load balancing clustering?

A. There is no hard limit. Engineering tests up to ten nodes in a cluster. Additional nodes may work, but we do not officially support that topology.

Q. How does load balancing work for the adapative security appliance?

A. Basically, load balancing works like this:

- The phase 1 negotiation is done on the virtual master.
- An IKE redirect packet with the IP of a slave device was sent by the virtual master to the client.
- The client will start a new phase 1 and 2 negotiation on the slave device just like a standalone vpn connection.

For remote access, there is no need to setup any route manually. The situation is the same for a standalone as well as a load balancing redirected tunnel. Basically, a host route of the assigned IP address pointing to the public ip of the client device is installed on the inside interface of the ASA. The **show route** command displays the host route. Because of this reverse route, the inside interface of the ASA will respond to the ARP request of the client's assigned IP and hence, can return traffic from a server on the inside network to the client through the tunnel.

Load balancing works for IPSec or SSL Hardware Clients (VPN3002, PIX501, ASA5505)client/PAT mode and Network Extension Mode(NEM) as well.

CHAPTER 64

Configuring Connection Profiles, Group Policies, and Users

This chapter describes how to configure VPN connection profiles (formerly called “tunnel groups”), group policies, and users. This chapter includes the following sections.

- Overview of Connection Profiles, Group Policies, and Users, page 64-1
- Configuring Connection Profiles, page 64-6
- Group Policies, page 64-37
- Configuring User Attributes, page 64-79

In summary, you first configure connection profiles to set the values for the connection. Then you configure group policies. These set values for users in the aggregate. Then you configure users, which can inherit values from groups and configure certain values on an individual user basis. This chapter describes how and why to configure these entities.

Overview of Connection Profiles, Group Policies, and Users

Groups and users are core concepts in managing the security of virtual private networks (VPNs) and in configuring the ASA. They specify attributes that determine user access to and use of the VPN. A *group* is a collection of users treated as a single entity. *Users* get their attributes from *group policies. A connection profile* identifies the group policy for a specific connection. If you do not assign a particular group policy to a user, the default group policy for the connection applies.

Note You configure connection profiles using **tunnel-group** commands. In this chapter, the terms “connection profile” and “tunnel group” are often used interchangeably.

Connection profiles and group policies simplify system management. To streamline the configuration task, the ASA provides a default LAN-to-LAN connection profile, a default remote access connection profile, a default connection profile for SSL VPN, and a default group policy (DfltGrpPolicy). The default connection profiles and group policy provide settings that are likely to be common for many users. As you add users, you can specify that they “inherit” parameters from a group policy. Thus you can quickly configure VPN access for large numbers of users.

If you decide to grant identical rights to all VPN users, then you do not need to configure specific connection profiles or group policies, but VPNs seldom work that way. For example, you might allow a finance group to access one part of a private network, a customer support group to access another part, and an MIS group to access other parts. In addition, you might allow specific users within MIS to access systems that other MIS users cannot access. Connection profiles and group policies provide the flexibility to do so securely.

Note The ASA also includes the concept of object groups, which are a superset of network lists. Object groups let you define VPN access to ports as well as networks. Object groups relate to ACLs rather than to group policies and connection profiles. For more information about using object groups, see Chapter 16, "Configuring Object Groups."

The security appliance can apply attribute values from a variety of sources. It applies them according to the following hierarchy:

1. Dynamic Access Policy (DAP) record
2. Username
3. Group policy
4. Group policy for the connection profile
5. Default group policy

Therefore, DAP values for an attribute have a higher priority than those configured for a user, group policy, or connection profile.

When you enable or disable an attribute for a DAP record, the ASA applies that value and enforces it. For example, when you disable HTTP proxy in dap webvpn mode, the security appliance looks no further for a value. When you instead use the **no** value for the **http-proxy** command, the attribute is not present in the DAP record, so the security appliance moves down to the AAA attribute in the username, and if necessary, the group policy to find a value to apply. We recommend that you use ASDM to configure DAP.

Connection Profiles

A connection profile consists of a set of records that determines tunnel connection policies. These records identify the servers to which the tunnel user is authenticated, as well as the accounting servers, if any, to which connection information is sent. They also identify a default group policy for the connection, and they contain protocol-specific connection parameters. Connection profiles include a small number of attributes that pertain to creating the tunnel itself. Connection profiles include a pointer to a group policy that defines user-oriented attributes.

The ASA provides the following default connection profiles: DefaultL2Lgroup for LAN-to-LAN connections, DefaultRAgroup for remote access connections, and DefaultWEBVPNGroup for SSL VPN (browser-based) connections. You can modify these default connection profiles, but you cannot delete them. You can also create one or more connection profiles specific to your environment. Connection profiles are local to the ASA and are not configurable on external servers.

Connection profiles specify the following attributes:

- General Connection Profile Connection Parameters, page 64-3
- IPSec Tunnel-Group Connection Parameters, page 64-4
- Connection Profile Connection Parameters for SSL VPN Sessions, page 64-5

General Connection Profile Connection Parameters

General parameters are common to all VPN connections. The general parameters include the following:

- Connection profile name—You specify a connection-profile name when you add or edit a connection profile. The following considerations apply:
  - For clients that use preshared keys to authenticate, the connection profile name is the same as the group name that a client passes to the ASA.
  - Clients that use certificates to authenticate pass this name as part of the certificate, and the ASA extracts the name from the certificate.
- Connection type—Connection types include IPSec remote access, IPSec LAN-to-LAN, and SSL VPN. A connection profile can have only one connection type.
- Authentication, Authorization, and Accounting servers—These parameters identify the server groups or lists that the ASA uses for the following purposes:
  - Authenticating users
  - Obtaining information about services users are authorized to access
  - Storing accounting records

  A server group can consist of one or more servers.
- Default group policy for the connection—A group policy is a set of user-oriented attributes. The default group policy is the group policy whose attributes the ASA uses as defaults when authenticating or authorizing a tunnel user.
- Client address assignment method—This method includes values for one or more DHCP servers or address pools that the ASA assigns to clients.
- Override account disabled—This parameter lets you override the “account-disabled” indicator received from a AAA server.
- Password management—This parameter lets you warn a user that the current password is due to expire in a specified number of days (the default is 14 days), then offer the user the opportunity to change the password.
- Strip group and strip realm—These parameters direct the way the ASA processes the usernames it receives. They apply only to usernames received in the form user@realm. A realm is an administrative domain appended to a username with the @ delimiter (user@abc).

  When you specify the **strip-group** command, the ASA selects the connection profile for user connections by obtaining the group name from the username presented by the VPN client. The ASA then sends only the user part of the username for authorization/authentication. Otherwise (if disabled), the ASA sends the entire username, including the realm.

  Strip-realm processing removes the realm from the username when sending the username to the authentication or authorization server. If the command is enabled, the ASA sends only the user part of the username authorization/authentication. Otherwise, the ASA sends the entire username.
- Authorization required—This parameter lets you require authorization before a user can connect, or turn off that requirement.
- Authorization DN attributes—This parameter specifies which Distinguished Name attributes to use when performing authorization.

IPSec Tunnel-Group Connection Parameters

IPSec parameters include the following:

- A client authentication method: preshared keys, certificates, or both.
  - For IKE connections based on preshared keys, this is the alphanumeric key itself (up to 128 characters long), associated with the connection policy.
  - Peer-ID validation requirement—This parameter specifies whether to require validating the identity of the peer using the peer's certificate.
  - If you specify certificates or both for the authentication method, the end user must provide a valid certificate in order to authenticate.
- An extended hybrid authentication method: XAUTH and hybrid XAUTH.

  You use **isakmp ikev1-user-authentication** command to implement hybrid XAUTH authentication when you need to use digital certificates for ASA authentication and a different, legacy method for remote VPN user authentication, such as RADIUS, TACACS+ or SecurID.
- ISAKMP (IKE) keepalive settings. This feature lets the ASA monitor the continued presence of a remote peer and report its own presence to that peer. If the peer becomes unresponsive, the ASA removes the connection. Enabling IKE keepalives prevents hung connections when the IKE peer loses connectivity.

  There are various forms of IKE keepalives. For this feature to work, both the ASA and its remote peer must support a common form. This feature works with the following peers:
  - Cisco AnyConnect VPN Client
  - Cisco VPN Client (Release 3.0 and above)
  - Cisco VPN 3000 Client (Release 2.x)
  - Cisco VPN 3002 Hardware Client
  - Cisco VPN 3000 Series Concentrators
  - Cisco IOS software
  - Cisco Secure PIX Firewall

  Non-Cisco VPN clients do not support IKE keepalives.

  If you are configuring a group of mixed peers, and some of those peers support IKE keepalives and others do not, enable IKE keepalives for the entire group. The feature does not affect the peers that do not support it.

  If you disable IKE keepalives, connections with unresponsive peers remain active until they time out, so we recommend that you keep your idle timeout short. To change your idle timeout, see "Configuring Group Policies" section on page 64-39.

Note To reduce connectivity costs, disable IKE keepalives if this group includes any clients connecting via ISDN lines. ISDN connections normally disconnect if idle, but the IKE keepalive mechanism prevents connections from idling and therefore from disconnecting.

If you do disable IKE keepalives, the client disconnects only when either its IKE or IPSec keys expire. Failed traffic does not disconnect the tunnel with the Peer Timeout Profile values as it does when IKE keepalives are enabled.

Note If you have a LAN-to-LAN configuration using IKE main mode, make sure that the two peers have the same IKE keepalive configuration. Both peers must have IKE keepalives enabled or both peers must have it disabled.

- If you configure authentication using digital certificates, you can specify whether to send the entire certificate chain (which sends the peer the identity certificate and all issuing certificates) or just the issuing certificates (including the root certificate and any subordinate CA certificates).
- You can notify users who are using outdated versions of Windows client software that they need to update their client, and you can provide a mechanism for them to get the updated client version. For VPN 3002 hardware client users, you can trigger an automatic update. You can configure and change the client-update, either for all connection profiles or for particular connection profiles.
- If you configure authentication using digital certificates, you can specify the name of the trustpoint that identifies the certificate to send to the IKE peer.

Connection Profile Connection Parameters for SSL VPN Sessions

Table 64-1 provides a list of connection profile attributes that are specific to SSL VPN (AnyConnect client and clientless) connections. In addition to these attributes, you configure general connection profile attributes common to all VPN connections. For step-by-step information about configuring connection profiles, see Configuring Connection Profiles for Clientless SSL VPN Sessions, page 64-21.

Note In earlier releases, “connection profiles” were known as “tunnel groups.” You configure a connection profile with tunnel-group commands. This chapter often uses these terms interchangeably.

Table 64-1 Connection Profile Attributes for SSL VPN

Command	Function
authentication	Sets the authentication method, AAA or certificate.
customization	Identifies the name of a previously defined customization to apply. Customizations determine the appearance of the windows that the user sees upon login. You configure the customization parameters as part of configuring clientless SSL VPN.
nbns-server	Identifies the name of the NetBIOS Name Service server (nbns-server) to use for CIFS name resolution.
group-alias	Specifies one or more alternate names by which the server can refer to a connection profile. At login, the user selects the group name from a dropdown menu.
group-url	Identifies one or more group URLs. If you configure this attribute, users coming in on a specified URL need not select a group at login.
dns-group	Identifies the DNS server group that specifies the DNS server name, domain name, name server, number of retries, and timeout values for a DNS server to use for a connection profile.
hic-fail-group-policy	Specifies a VPN feature policy if you use the Cisco Secure Desktop Manager to set the Group-Based Policy attribute to “Use Failure Group-Policy” or “Use Success Group-Policy, if criteria match.”

Table 64-1 Connection Profile Attributes for SSL VPN

Command	Function
override-svc-download	Overrides downloading the group-policy or username attributes configured for downloading the AnyConnect VPN client to the remote user.
radius-reject-message	Enables the display of the RADIUS reject message on the login screen when authentication is rejected.

Configuring Connection Profiles

The following sections describe the contents and configuration of connection profiles:

- Maximum Connection Profiles, page 64-6
- Default IPSec Remote Access Connection Profile Configuration, page 64-7
- Specifying a Name and Type for the IPSec Remote Access Connection Profile, page 64-8
- Configuring IPSec Remote-Access Connection Profiles, page 64-7
- Configuring LAN-to-LAN Connection Profiles, page 64-17
- Configuring Connection Profiles for Clientless SSL VPN Sessions, page 64-21
- Customizing Login Windows for Users of Clientless SSL VPN sessions, page 64-28
- Configuring the Connection Profile for RADIUS/SDI Message Support for the AnyConnect Client, page 64-35

You can modify the default connection profiles, and you can configure a new connection profile as any of the three tunnel-group types. If you don’t explicitly configure an attribute in a connection profile, that attribute gets its value from the default connection profile. The default connection-profile type is remote access. The subsequent parameters depend upon your choice of tunnel type. To see the current configured and default configuration of all your connection profiles, including the default connection profile, enter the **show running-config all tunnel-group** command.

Maximum Connection Profiles

The maximum number of connection profiles (tunnel groups) that an ASA can support is a function of the maximum number of concurrent VPN sessions for the platform + 5. For example, an ASA5505 can support a maximum of 25 concurrent VPN sessions allowing for 30 tunnel groups (25+5). Attempting to add an additional tunnel group beyond the limit results in the following message: "ERROR: The limit of 30 configured tunnel groups has been reached"

Table Table 64-2specifies the maximum VPN sessions and connection profiles for each ASA platform.

Table 64-2 Maximum VPN Sessions and Connection Profiles Per ASA Platform

	5505 Base/ Security Plus	5510/Base/ Security Plus	5520	5540	5550	5580-20	5580-40
Maximum VPN Sessions	10/25	250	750	5000	5000	10,000	10,000
Maximum Connection Profiles	15/30	255	755	5005	5005	10,005	10,005

Default IPSec Remote Access Connection Profile Configuration

The contents of the default remote-access connection profile are as follows:

```
tunnel-group DefaultRAGroup type remote-access
tunnel-group DefaultRAGroup general-attributes
 no address-pool
 no ipv6-address-pool
 authentication-server-group LOCAL
 accounting-server-group RADIUS
 default-group-policy DfltGrpPolicy
 no dhcp-server
 no strip-realm
 no password-management
 no override-account-disable
 no strip-group
 no authorization-required
 authorization-dn-attributes CN OU
tunnel-group DefaultRAGroup webvpn-attributes
 hic-fail-group-policy DfltGrpPolicy
 customization DfltCustomization
 authentication aaa
 no override-svc-download
 no radius-reject-message
 dns-group DefaultDNS
tunnel-group DefaultRAGroup ipsec-attributes
 no pre-shared-key
 peer-id-validate req
 no chain
 no trust-point
 isakmp keepalive threshold 1500 retry 2
 no radius-sdi-xauth
 isakmp ikev1-user-authentication xauth
tunnel-group DefaultRAGroup ppp-attributes
 no authentication pap
 authentication chap
 authentication ms-chap-v1
 no authentication ms-chap-v2
 no authentication eap-proxy
```

Configuring IPSec Tunnel-Group General Attributes

The general attributes are common across more than one tunnel-group type. IPSec remote access and clientless SSL VPN tunnels share most of the same general attributes. IPSec LAN-to-LAN tunnels use a subset. Refer to the *Cisco ASA 5500 Series Command Reference* for complete descriptions of all commands. The following sections describe, in order, how to configure IPSec remote-access connection profiles, IPSec LAN-to-LAN connection profiles, and clientless SSL VPN connection profiles.

Configuring IPSec Remote-Access Connection Profiles

Use an IPSec remote-access connection profile when setting up a connection between a remote client and a central-site ASA, using a hardware or software client.To configure an IPSec remote-access connection profile, first configure the tunnel-group general attributes, then the IPSec remote-access attributes. An IPSec Remote Access VPN connection profile applies only to remote-access IPSec client connections. To configure an IPSec remote-access connection profile, see the following sections:

- Specifying a Name and Type for the IPSec Remote Access Connection Profile, page 64-8.
- Configuring IPSec Remote-Access Connection Profile General Attributes, page 64-8.
- Configuring IPSec Remote-Access Connection Profile IPSec Attributes, page 64-14.

Specifying a Name and Type for the IPSec Remote Access Connection Profile

Create the connection profile, specifying its name and type, by entering the **tunnel-group** command. For an IPSec remote-access tunnel, the type is **remote-access**

```
hostname(config)# tunnel-group tunnel_group_name type remote-access
hostname(config)#
```

For example, to create an IPSec remote-access connection profile named TunnelGroup1, enter the following command:

```
hostname(config)# tunnel-group TunnelGroup1 type remote-access
hostname(config)#
```

Configuring IPSec Remote-Access Connection Profile General Attributes

To configure or change the connection profile general attributes, specify the parameters in the following steps.

Step 1 To configure the general attributes, enter the **tunnel-group general-attributes** command, which enters tunnel-group general-attributes configuration mode. The prompt changes to indicate the change in mode.

```
hostname(config)# tunnel-group tunnel_group_name general-attributes
hostname(config-tunnel-general)#
```

Step 2 Specify the name of the authentication-server group, if any, to use. If you want to use the LOCAL database for authentication if the specified server group fails, append the keyword **LOCAL**:

```
hostname(config-tunnel-general)# authentication-server-group [(interface_name)] groupname
[LOCAL]
hostname(config-tunnel-general)#
```

The name of the authentication server group can be up to 16 characters long.

You can optionally configure interface-specific authentication by including the name of an interface after the group name. The interface name, which specifies where the IPSec tunnel terminates, must be enclosed in parentheses. The following command configures interface-specific authentication for the interface named test using the server named servergroup1 for authentication:

```
hostname(config-tunnel-general)# authentication-server-group (test) servergroup1
hostname(config-tunnel-general)#
```

Step 3 Specify the name of the authorization-server group, if any, to use. When you configure this value, users must exist in the authorization database to connect:

```
hostname(config-tunnel-general)# authorization-server-group groupname
hostname(config-tunnel-general)#
```

The name of the authorization server group can be up to 16 characters long. For example, the following command specifies the use of the authorization-server group FinGroup:

```
hostname(config-tunnel-general)# authorization-server-group FinGroup
hostname(config-tunnel-general)#
```

Step 4 Specify the name of the accounting-server group, if any, to use:

```
hostname(config-tunnel-general)# accounting-server-group groupname
hostname(config-tunnel-general)#
```

The name of the accounting server group can be up to 16 characters long. For example, the following command specifies the use of the accounting-server group named comptroller:

```
hostname(config-tunnel-general)# accounting-server-group comptroller
hostname(config-tunnel-general)#
```

Step 5 Specify the name of the default group policy:

```
hostname(config-tunnel-general)# default-group-policy policyname
hostname(config-tunnel-general)#
```

The name of the group policy can be up to 64 characters long. The following example sets DfltGrpPolicy as the name of the default group policy:

```
hostname(config-tunnel-general)# default-group-policy DfltGrpPolicy
hostname(config-tunnel-general)#
```

Step 6 Specify the names or IP addresses of the DHCP server (up to 10 servers), and the names of the DHCP address pools (up to 6 pools). The defaults are no DHCP server and no address pool.

```
hostname(config-tunnel-general)# dhcp-server server1 [...server10]
hostname(config-tunnel-general)# address-pool [(interface name)] address_pool1
[...address_pool6]
hostname(config-tunnel-general)#
```

Note If you specify an interface name, you must enclosed it within parentheses.

You configure address pools with the **ip local pool** command in global configuration mode.

Step 7 Specify the name of the NAC authentication server group, if you are using Network Admission Control, to identify the group of authentication servers to be used for Network Admission Control posture validation. Configure at least one Access Control Server to support NAC. Use the **aaa-server** command to name the ACS group. Then use the **nac-authentication-server-group** command, using the same name for the server group.

The following example identifies acs-group1 as the authentication server group to be used for NAC posture validation:

```
hostname(config-group-policy)# nac-authentication-server-group acs-group1
hostname(config-group-policy)
```

The following example inherits the authentication server group from the default remote access group.

```
hostname(config-group-policy)# no nac-authentication-server-group
hostname(config-group-policy)
```

Note NAC requires a Cisco Trust Agent on the remote host.

Step 8 Specify whether to strip the group or the realm from the username before passing it on to the AAA server. The default is not to strip either the group name or the realm.

```
hostname(config-tunnel-general)# strip-group
hostname(config-tunnel-general)# strip-realm
hostname(config-tunnel-general)#
```

A realm is an administrative domain. If you strip the realm, the ASA uses the username and the group (if present) authentication. If you strip the group, the ASA uses the username and the realm (if present) for authentication.Enter the **strip-realm** command to remove the realm qualifier, and use the strip-group command to remove the group qualilfier from the username during authentication. If you remove both qualifiers, authentication is based on the *username* alone. Otherwise, authentication is based on the full *username@realm* or *username<delimiter> group* string. You must specify **strip-realm** if your server is unable to parse delimiters.

Note The **strip-group command**, for tunnel group switching, does not work when MS-CHAPv2 is used for PPP authentication. This is due to a limitation on MS-CHAPv2 protocol. That is due to the hash computation during MS-CHAPv2 being bound to the *username* string.

Step 9 Optionally, if your server is a RADIUS, RADIUS with NT, or LDAP server, you can enable password management.

Note If you are using an LDAP directory server for authentication, password management is supported with the Sun Microsystems JAVA System Directory Server (formerly named the Sun ONE Directory Server) and the Microsoft Active Directory.

Sun—The DN configured on the ASA to access a Sun directory server must be able to access the default password policy on that server. We recommend using the directory administrator, or a user with directory administrator privileges, as the DN. Alternatively, you can place an ACI on the default password policy.

Microsoft—You must configure LDAP over SSL to enable password management with Microsoft Active Directory.

See the "Setting the LDAP Server Type" section on page 36-14 for more information.

This feature, which is enabled by default, warns a user when the current password is about to expire. The default is to begin warning the user 14 days before expiration:

```
hostname(config-tunnel-general)# password-management
hostname(config-tunnel-general)#
```

If the server is an LDAP server, you can specify the number of days (0 through 180) before expiration to begin warning the user about the pending expiration:

```
hostname(config-tunnel-general)# password-management [password-expire in days n]
hostname(config-tunnel-general)#
```

Note The **password-management** command, entered in tunnel-group general-attributes configuration mode replaces the deprecated **radius-with-expiry** command that was formerly entered in tunnel-group ipsec-attributes mode.

When you configure the **password-management** command, the ASA notifies the remote user at login that the user's current password is about to expire or has expired. The ASA then offers the user the opportunity to change the password. If the current password has not yet expired, the user can still log in using that password. The ASA ignores this command if RADIUS or LDAP authentication has not been configured.

Note that this does not change the number of days before the password expires, but rather, the number of days ahead of expiration that the ASA starts warning the user that the password is about to expire.

If you do specify the **password-expire-in-days** keyword, you must also specify the number of days.

Specifying this command with the number of days set to 0 disables this command. The ASA does not notify the user of the pending expiration, but the user can change the password after it expires.

See Configuring Microsoft Active Directory Settings for Password Management, page 64-29 for more information.

Note The ASA, releases 7.1 and later, generally supports password management for the AnyConnect VPN Client, the Cisco IPSec VPN Client, the SSL VPN full-tunneling client, and Clientless connections when authenticating with LDAP or with any RADIUS connection that supports MS-CHAPv2. Password management is *not* supported for any of these connection types for Kerberos/AD (Windows password) or NT 4.0 Domain.

Some RADIUS servers that support MS-CHAP do not currently support MS-CHAPv2. The **password-management** command requires MS-CHAPv2, so please check with your vendor.

The RADIUS server (for example, Cisco ACS) could proxy the authentication request to another authentication server. However, from the ASA perspective, it is talking only to a RADIUS server.

For LDAP, the method to change a password is proprietary for the different LDAP servers on the market. Currently, the ASA implements the proprietary password management logic only for Microsoft Active Directory and Sun LDAP servers. Native LDAP requires an SSL connection. You must enable LDAP over SSL before attempting to do password management for LDAP. By default, LDAP uses port 636.

Step 10 Optionally, configure the ability to override an account-disabled indicator from a AAA server, by entering the **override-account-disable** command:

```
hostname(config-tunnel-general)# override-account-disable
hostname(config-tunnel-general)#
```

Note Allowing override-account-disable is a potential security risk.

Step 11 Specify the attribute or attributes to use in deriving a name for an authorization query from a certificate. This attribute specifies what part of the subject DN field to use as the username for authorization:

```
hostname(config-tunnel-general)# authorization-dn-attributes {primary-attribute
[secondary-attribute] | use-entire-name}
```

For example, the following command specifies the use of the CN attribute as the username for authorization:

```
hostname(config-tunnel-general)# authorization-dn-attributes CN
hostname(config-tunnel-general)#
```

The authorization-dn-attributes are **C** (Country), **CN** (Common Name), **DNQ** (DN qualifier), **EA** (E-mail Address), **GENQ** (Generational qualifier), **GN** (Given Name), **I** (Initials), **L** (Locality), **N** (Name), **O** (Organization), **OU** (Organizational Unit), **SER** (Serial Number), **SN** (Surname), **SP** (State/Province), **T** (Title), **UID** (User ID), and **UPN** (User Principal Name).

Step 12 Specify whether to require a successful authorization before allowing a user to connect. The default is not to require authorization.

```
hostname(config-tunnel-general)# authorization-required
hostname(config-tunnel-general)#
```

Configuring Double Authentication

Double authentication is an optional feature that requires a user to enter an additional authentication credential, such as a second username and password, on the login screen. Specify the following commands to configure double authentication.

Step 1 Specify the secondary authentication server group. This command specifies the AAA server group to use as the secondary AAA server.

Note This command applies only to SSL VPN—that is, Clientless and AnyConnect client—connections.

The secondary server group cannot specify an SDI server group. By default, no secondary authentication is required.

```
hostname(config-tunnel-general)# secondary-authentication-server-group [interface_name]
{none | LOCAL | groupname [LOCAL]} [use-primary-name]
```

If you use the none keyword, no secondary authentication is required. The *groupname* value specifies the AAA server group name. Local specifies the use of the internal server database, and when used with the groupname value, LOCAL specifies fallback. For example, to set the primary authentication server group to sdi_group and the secondary authentication server group to ldap_server, enter the following commands:

```
hostname(config-tunnel-general)# authentication-server-group
hostname(config-tunnel-general)# secondary-authentication-server-group
```

Note If you specify the **use-primary-name** keyword, then the login dialog requests only one username. In addition, if the usernames are extracted from a digital certificate, only the primary username is used for authentication.

Step 2 If obtaining the secondary username from a certificate, specify the secondary-username-from-certificate command:

```
hostname(config-tunnel-general)# secondary-username-from-certificate C | CN | ... |
use-script
```

The values for the DN fields to extract from the certificate for use as a secondary username are the same as for the primary **username-from-certificate** command. Alternatively, you can specify the use-script keyword, which directs the ASA to use a script file generated by ASDM.

For example, to specify the Common Name as the primary username field and Organizational Unit as the secondary username field, enter the following commands:

```
hostname(config-tunnel-general)# tunnel-group test1 general-attributes
hostname(config-tunnel-general)# username-from-certificate cn
hostname(config-tunnel-general)# secondary-username-from-certificate ou
```

Step 3 Specify the **secondary-pre-fill-username** command in tunnel-group webvpn-attributes mode to enable extracting a secondary username from a client certificate for use in authentication. Use the keywords to specify whether this command applies to a clientless connection or an SSL VPN (AnyConnect) client connection and whether you want to hide the extracted username from the end user. This feature is disabled by default. Clientless and SSL-client options can both exist at the same time, but you must configure them in separate commands.

```
hostname(config-tunnel-general)# secondary-pre-fill-username-from-certificate {clientless
| ssl-client} [hide]
```

For example, to specify the use of pre-fill-username for both the primary and secondary authentication for a connection, enter the following commands:

```
hostname(config-tunnel-general)# tunnel-group test1 general-attributes
hostname(config-tunnel-general)# pre-fill-username ssl-client
hostname(config-tunnel-general)# secondary-pre-fill-username ssl-client
```

Step 4 Specify which authentication server to use to obtain the authorization attributes to apply to the connection. The primary authentication server is the default selection. This command is meaningful only for double authentication.

```
hostname(config-tunnel-general)# authentication-attr-from-server {primary | secondary}
```

For example, to specify the use of the secondary authentication server, enter the following commands:

```
hostname(config-tunnel-general)# tunnel-group test1 general-attributes
hostname(config-tunnel-general)# authentication-attr-from-server secondary
```

Step 5 Specify which authentication username, primary or secondary, to associate with the session. The default value is primary. With double authentication enabled, it is possible that two distinct usernames are authenticated for the session. The administrator must designate one of the authenticated usernames as the session username. The session username is the username provided for accounting, session database, syslogs, and debug output.

```
hostname(config-tunnel-general)# authenticated-session-username {primary | secondary}
```

For example, to specify that the authentication username associated with the session must come from the secondary authentication server, enter the following commands:

```
hostname(config-tunnel-general)# tunnel-group test1 general-attributes
hostname(config-tunnel-general)# authenticated-session-username secondary
```

Enabling IPv6 VPN Access

The ASA allows access to IPv6 resources over a public IPv4 connection (Windows XP SP2, Windows Vista, Mac OSX, and Linux only). If you want to configure IPv6 access, you must use the command-line interface to configure IPv6; ASDM does not support IPv6.

You enable IPv6 access using the **ipv6 enable** command as part of enabling SSL VPN connections. The following is an example for an IPv6 connection that enables IPv6 on the outside interface:

```
hostname(config)# interface GigabitEthernet0/0
hostname(config-if)# ipv6 enable
```

To enable IPV6 SSL VPN, do the following general actions:

1. Enable IPv6 on the outside interface.
2. Enable IPv6 and an IPv6 address on the inside interface.
3. Configure an IPv6 address local pool for client assigned IP Addresses.
4. Configure an IPv6 tunnel default gateway.

To implement this procedure, do the following steps:

Step 1 Configure Interfaces:

```
interface GigabitEthernet0/0
     nameif outside
     security-level 0
     ip address 192.168.0.1 255.255.255.0
     ipv6 enable          ; Needed for IPv6.
    !
interface GigabitEthernet0/1
     nameif inside
     security-level 100
     ip address 10.10.0.1 255.255.0.0
     ipv6 address 2001:DB8::1/32        ; Needed for IPv6.
     ipv6 enable          ; Needed for IPv6.
```

Step 2 Configure an 'ipv6 local pool' (used for IPv6 address assignment):

```
ipv6 local pool ipv6pool 2001:DB8:1:1::5/32 100     ; Use your IPv6 prefix here
```

Note You still need to configure an IPv4 address pool when using IPv6 (using the ip local pool command)

Step 3 Add the ipv6 address pool to your tunnel group policy (or group-policy):

```
tunnel-group YourTunGrp1 general-attributes  ipv6-address-pool ipv6pool
```

Note Again, you must also configure an IPv4 address pool here as well (using the 'address-pool' command).

Step 4 Configure an IPv6 tunnel default gateway:

```
ipv6 route inside ::/0 X:X:X:X::X tunneled
```

Configuring IPSec Remote-Access Connection Profile IPSec Attributes

To configure the IPSec attributes for a remote-access connection profile, do the following steps. The following description assumes that you have already created the IPSec remote-access connection profile. IPSec remote-access connection profiles have more attributes than IPSec LAN-to-LAN connection profiles:

Step 1 To specify the attributes of an IPSec remote-access tunnel-group, enter tunnel-group ipsec-attributes mode by entering the following command. The prompt changes to indicate the mode change:

```
hostname(config)# tunnel-group tunnel-group-name ipsec-attributes
hostname(config-tunnel-ipsec)#
```

This command enters tunnel-group ipsec-attributes configuration mode, in which you configure the remote-access tunnel-group IPSec attributes.

For example, the following command designates that the tunnel-group ipsec-attributes mode commands that follow pertain to the connection profile named TG1. Notice that the prompt changes to indicate that you are now in tunnel-group ipsec-attributes mode:

```
hostname(config)# tunnel-group TG1 type remote-access
hostname(config)# tunnel-group TG1 ipsec-attributes
hostname(config-tunnel-ipsec)#
```

Step 2 Specify the preshared key to support IKE connections based on preshared keys. For example, the following command specifies the preshared key xyzx to support IKE connections for an IPSec remote access connection profile:

```
hostname(config-tunnel-ipsec)# pre-shared-key xyzx
hostname(config-tunnel-ipsec)#
```

Step 3 Specify whether to validate the identity of the peer using the peer's certificate:

```
hostname(config-tunnel-ipsec)# peer-id-validate option
hostname(config-tunnel-ipsec)#
```

The available options are **req** (required), **cert (**if supported by certificate), and **nocheck (**do not check). The default is **req**.

For example, the following command specifies that peer-id validation is required:

```
hostname(config-tunnel-ipsec)# peer-id-validate req
hostname(config-tunnel-ipsec)#
```

Step 4 Specify whether to

Step 5 Specify whether to enable sending of a certificate chain. The following command includes the root certificate and any subordinate CA certificates in the transmission:

```
hostname(config-tunnel-ipsec)# chain
hostname(config-tunnel-ipsec)#
```

This attribute applies to all IPSec tunnel-group types.

Step 6 Specify the name of a trustpoint that identifies the certificate to be sent to the IKE peer:

```
hostname(config-tunnel-ipsec)# trust-point trust-point-name
hostname(config-tunnel-ipsec)#
```

The following command specifies mytrustpoint as the name of the certificate to be sent to the IKE peer:

```
hostname(config-ipsec)# trust-point mytrustpoint
```

Step 7 Specify the ISAKMP (IKE) keepalive threshold and the number of retries allowed.

```
hostname(config-tunnel-ipsec)# isakmp keepalive threshold <number> retry <number>
hostname(config-tunnel-ipsec)#
```

The **threshold** parameter specifies the number of seconds (10 through 3600) that the peer is allowed to idle before beginning keepalive monitoring. The **retry** parameter is the interval (2 through 10 seconds) between retries after a keepalive response has not been received. IKE keepalives are enabled by default. To disable IKE keepalives, enter the **no** form of the **isakmp** command:

For example, the following command sets the IKE keepalive threshold value to 15 seconds and sets the retry interval to 10 seconds:

```
hostname(config-tunnel-ipsec)# isakmp keepalive threshold 15 retry 10
hostname(config-tunnel-ipsec)#
```

The default value for the **threshold** parameter is 300 for remote-access and 10 for LAN-to-LAN, and the default value for the retry parameter is 2.

To specify that the central site ("head end") should never initiate ISAKMP monitoring, enter the following command:

```
hostname(config-tunnel-ipsec)# isakmp keepalive threshold infinite
hostname(config-tunnel-ipsec)#
```

Step 8 Specify the ISAKMP hybrid authentication method, XAUTH or hybrid XAUTH.

You use **isakmp ikev1-user-authentication** command to implement hybrid XAUTH authentication when you need to use digital certificates for ASA authentication and a different, legacy method for remote VPN user authentication, such as RADIUS, TACACS+ or SecurID. Hybrid XAUTH breaks phase 1 of IKE down into the following two steps, together called hybrid authentication:

a. The ASA authenticates to the remote VPN user with standard public key techniques. This establishes an IKE security association that is unidirectionally authenticated.

b. An XAUTH exchange then authenticates the remote VPN user. This extended authentication can use one of the supported legacy authentication methods.

Note Before the authentication type can be set to hybrid, you must configure the authentication server, create a preshared key, and configure a trustpoint.

You can use the **isakmp ikev1-user-authentication** command with the optional **interface** parameter to specify a particular interface. When you omit the **interface** parameter, the command applies to all the interfaces and serves as a back-up when the per-interface command is not specified. When there are two **isakmp ikev1-user-authentication** commands specified for a connection profile, and one uses the **interface** parameter and one does not, the one specifying the interface takes precedence for that particular interface.

For example, the following commands enable hybrid XAUTH on the inside interface for a connection profile called example-group:

```
hostname(config)# tunnel-group example-group type remote-access
hostname(config)# tunnel-group example-group ipsec-attributes
hostname(config-tunnel-ipsec)# isakmp ikev1-user-authentication (inside) hybrid
hostname(config-tunnel-ipsec)#
```

Configuring IPSec Remote-Access Connection Profile PPP Attributes

To configure the Point-to-Point Protocol attributes for a remote-access connection profile, do the following steps. PPP attributes apply *only* to IPSec remote-access connection profiles. The following description assumes that you have already created the IPSec remote-access connection profile.

Step 1 Enter tunnel-group ppp-attributes configuration mode, in which you configure the remote-access tunnel-group PPP attributes, by entering the following command. The prompt changes to indicate the mode change:

```
hostname(config)# tunnel-group tunnel-group-name type remote-access
hostname(config)# tunnel-group tunnel-group-name ppp-attributes
hostname(config-tunnel-ppp)#
```

For example, the following command designates that the tunnel-group ppp-attributes mode commands that follow pertain to the connection profile named TG1. Notice that the prompt changes to indicate that you are now in tunnel-group ppp-attributes mode:

```
hostname(config)# tunnel-group TG1 type remote-access
hostname(config)# tunnel-group TG1 ppp-attributes
hostname(config-tunnel-ppp)#
```

Step 2 Specify whether to enable authentication using specific protocols for the PPP connection. The protocol value can be:

- pap—Enables the use of Password Authentication Protocol for the PPP connection.
- chap—Enables the use of Challenge Handshake Authentication Protocol for the PPP connection.
- ms-chap-v1 or ms-chap-v2—Enables the use of Microsoft Challenge Handshake Authentication Protocol, version 1 or version 2 for the PPP connection.
- eap—Enables the use of Extensible Authentication protocol for the PPP connection.

CHAP and MSCHAPv1 are enabled by default.

The syntax of this command is:

```
hostname(config-tunnel-ppp)# authentication protocol
hostname(config-tunnel-ppp)#
```

To disable authentication for a specific protocol, use the **no** form of the command:

```
hostname(config-tunnel-ppp)# no authentication protocol
hostname(config-tunnel-ppp)#
```

For example, the following command enables the use of the PAP protocol for a PPP connection.

```
hostname(config-tunnel-ppp)# authentication pap
hostname(config-tunnel-ppp)#
```

The following command enables the use of the MS-CHAP, version 2 protocol for a PPP connection:

```
hostname(config-tunnel-ppp)# authentication ms-chap-v2
hostname(config-tunnel-ppp)#
```

The following command enables the use of the EAP-PROXY protocol for a PPP connection:

```
hostname(config-tunnel-ppp)# authentication pap
hostname(config-tunnel-ppp)#
```

The following command disables the use of the MS-CHAP, version 1 protocol for a PPP connection:

```
hostname(config-tunnel-ppp)# no authentication ms-chap-v1
hostname(config-tunnel-ppp)#
```

Configuring LAN-to-LAN Connection Profiles

An IPSec LAN-to-LAN VPN connection profile applies only to LAN-to-LAN IPSec client connections. While many of the parameters that you configure are the same as for IPSec remote-access connection profiles, LAN-to-LAN tunnels have fewer parameters. To configure a LAN-to-LAN connection profile, follow the steps in this section.

Default LAN-to-LAN Connection Profile Configuration

The contents of the default LAN-to-LAN connection profile are as follows:

```
tunnel-group DefaultL2LGroup type ipsec-l2l
```

```
tunnel-group DefaultL2LGroup general-attributes
 no accounting-server-group
 default-group-policy DfltGrpPolicy
tunnel-group DefaultL2LGroup ipsec-attributes
 no pre-shared-key
 peer-id-validate req
 no chain
 no trust-point
 isakmp keepalive threshold 10 retry 2
```

LAN-to-LAN connection profiles have fewer parameters than remote-access connection profiles, and most of these are the same for both groups. For your convenience in configuring the connection, they are listed separately here. Any parameters that you do not explicitly configure inherit their values from the default connection profile.

Specifying a Name and Type for a LAN-to-LAN Connection Profile

To specify a name and a type for a connection profile, enter the **tunnel-group** command, as follows:

```
hostname(config)# tunnel-group tunnel_group_name type tunnel_type
```

For a LAN-to-LAN tunnel, the type is **ipsec-l2l**.; for example, to create the LAN-to-LAN connection profile named docs, enter the following command:

```
hostname(config)# tunnel-group docs type ipsec-l2l
hostname(config)#
```

Configuring LAN-to-LAN Connection Profile General Attributes

To configure the connection profile general attributes, do the following steps:

Step 1 Enter tunnel-group general-attributes mode by specifying the general-attributes keyword:

```
hostname(config)# tunnel-group_tunnel-group-name general-attributes
hostname(config-tunnel-general)#
```

The prompt changes to indicate that you are now in config-general mode, in which you configure the tunnel-group general attributes.

For example, for the connection profile named docs, enter the following command:

```
hostname(config)# tunnel-group_docs general-attributes
hostname(config-tunnel-general)#
```

Step 2 Specify the name of the accounting-server group, if any, to use:

```
hostname(config-tunnel-general)# accounting-server-group groupname
hostname(config-tunnel-general)#
```

For example, the following command specifies the use of the accounting-server group acctgserv1:

```
hostname(config-tunnel-general)# accounting-server-group acctgserv1
hostname(config-tunnel-general)#
```

Step 3 Specify the name of the default group policy:

```
hostname(config-tunnel-general)# default-group-policy policyname
hostname(config-tunnel-general)#
```

For example, the following command specifies that the name of the default group policy is MyPolicy:

```
hostname(config-tunnel-general)# default-group-policy MyPolicy
hostname(config-tunnel-general)#
```

Configuring LAN-to-LAN IPSec Attributes

To configure the IPSec attributes, do the following steps:

Step 1 To configure the tunnel-group IPSec attributes, enter tunnel-group ipsec-attributes configuration mode by entering the tunnel-group command with the IPSec-attributes keyword.

```
hostname(config)# tunnel-group tunnel-group-name ipsec-attributes
hostname(config-tunnel-ipsec)#
```

For example, the following command enters config-ipsec mode so you can configure the parameters for the connection profile named TG1:

```
hostname(config)# tunnel-group TG1 ipsec-attributes
hostname(config-tunnel-ipsec)#
```

The prompt changes to indicate that you are now in tunnel-group ipsec-attributes configuration mode.

Step 2 Specify the preshared key to support IKE connections based on preshared keys.

```
hostname(config-tunnel-ipsec)# pre-shared-key key
hostname(config-tunnel-ipsec)#
```

For example, the following command specifies the preshared key XYZX to support IKE connections for an IPSec LAN-to-LAN connection profile:

```
hostname(config-tunnel-ipsec)# pre-shared-key xyzx
hostname(config-tunnel-general)#
```

Step 3 Specify whether to validate the identity of the peer using the peer's certificate:

```
hostname(config-tunnel-ipsec)# peer-id-validate option
hostname(config-tunnel-ipsec)#
```

The available options are **req** (required), **cert (**if supported by certificate), and **nocheck (**do not check). The default is **req**. For example, the following command sets the peer-id-validate option to **nocheck**:

```
hostname(config-tunnel-ipsec)# peer-id-validate nocheck
hostname(config-tunnel-ipsec)#
```

Step 4 Specify whether to enable sending of a certificate chain. This action includes the root certificate and any subordinate CA certificates in the transmission:

```
hostname(config-tunnel-ipsec)# chain
hostname(config-tunnel-ipsec)#
```

You can apply this attribute to all tunnel-group types.

Step 5 Specify the name of a trustpoint that identifies the certificate to be sent to the IKE peer:

```
hostname(config-tunnel-ipsec)# trust-point trust-point-name
hostname(config-tunnel-ipsec)#
```

For example, the following command sets the trustpoint name to mytrustpoint:

```
hostname(config-tunnel-ipsec)# trust-point mytrustpoint
hostname(config-tunnel-ipsec)#
```

You can apply this attribute to all tunnel-group types.

Step 6 Specify the ISAKMP(IKE) keepalive threshold and the number of retries allowed. The **threshold** parameter specifies the number of seconds (10 through 3600) that the peer is allowed to idle before beginning keepalive monitoring. The **retry** parameter is the interval (2 through 10 seconds) between retries after a keepalive response has not been received. IKE keepalives are enabled by default. To disable IKE keepalives, enter the **no** form of the **isakmp** command:

```
hostname(config)# isakmp keepalive threshold <number> retry <number>
hostname(config-tunnel-ipsec)#
```

For example, the following command sets the ISAKMP keepalive threshold to 15 seconds and sets the retry interval to 10 seconds.:

```
hostname(config-tunnel-ipsec)# isakmp keepalive threshold 15 retry 10
hostname(config-tunnel-ipsec)#
```

The default value for the **threshold** parameter for LAN-to-LAN is 10, and the default value for the retry parameter is 2.

To specify that the central site (“head end”) should never initiate ISAKMP monitoring, enter the following command:

```
hostname(config-tunnel-ipsec)# isakmp keepalive threshold infinite
hostname(config-tunnel-ipsec)#
```

Step 7 Specify the ISAKMP hybrid authentication method, XAUTH or hybrid XAUTH.

You use **isakmp ikev1-user-authentication** command to implement hybrid XAUTH authentication when you need to use digital certificates for ASA authentication and a different, legacy method for remote VPN user authentication, such as RADIUS, TACACS+ or SecurID. Hybrid XAUTH breaks phase 1 of IKE down into the following two steps, together called hybrid authentication:

a. The ASA authenticates to the remote VPN user with standard public key techniques. This establishes an IKE security association that is unidirectionally authenticated.

b. An XAUTH exchange then authenticates the remote VPN user. This extended authentication can use one of the supported legacy authentication methods.

Note Before the authentication type can be set to hybrid, you must configure the authentication server, create a preshared key, and configure a trustpoint.

You can use the **isakmp ikev1-user-authentication** command with the optional **interface** parameter to specify a particular interface. When you omit the **interface** parameter, the command applies to all the interfaces and serves as a back-up when the per-interface command is not specified. When there are two **isakmp ikev1-user-authentication** commands specified for a connection profile, and one uses the **interface** parameter and one does not, the one specifying the interface takes precedence for that particular interface.

For example, the following commands enable hybrid XAUTH on the inside interface for a connection profile called example-group:

```
hostname(config)# tunnel-group example-group type remote-access
hostname(config)# tunnel-group example-group ipsec-attributes
hostname(config-tunnel-ipsec)# isakmp ikev1-user-authentication (inside) hybrid
hostname(config-tunnel-ipsec)#
```

Configuring Connection Profiles for Clientless SSL VPN Sessions

The tunnel-group general attributes for clientless SSL VPN connection profiles are the same as those for IPSec remote-access connection profiles, except that the tunnel-group type is webvpn and the **strip-group** and **strip-realm** commands do not apply. You define the attribute specific to clientless SSL VPN separately. The following sections describe how to configure clientless SSL VPN connection profiles.

Specifying a Connection Profile Name and Type for Clientless SSL VPN Sessions

Create the connection profile, specifying its name and type by entering the **tunnel-group** command in global configuration mode. For an IPSec remote-access tunnel, the type is **webvpn**

```
hostname(config)# tunnel-group tunnel_group_name type webvpn
hostname(config)#
```

For example, to create a clientless SSL VPN tunnel-group named TunnelGroup3, enter the following command:

```
hostname(config)# tunnel-group TunnelGroup3 type webvpn
hostname(config)#
```

Configuring General Tunnel-Group Attributes for Clientless SSL VPN Sessions

To configure or change the connection profile general attributes, specify the parameters in the following steps.

Step 1 To configure the general attributes, enter **tunnel-group general-attributes** command, which enters tunnel-group general-attributes configuration mode. Note that the prompt changes:

```
hostname(config)# tunnel-group tunnel_group_name general-attributes
hostname(config-tunnel-general)#
```

To configure the general attributes for TunnelGroup3, created in the previous section, enter the following command:

```
hostname(config)# tunnel-group TunnelGroup3 general-attributes
hostname(config-tunnel-general)#
```

Step 2 Specify the name of the authentication-server group, if any, to use. If you want to use the LOCAL database for authentication if the specified server group fails, append the keyword LOCAL:

```
hostname(config-tunnel-general)# authentication-server-group groupname [LOCAL]
hostname(config-tunnel-general)#
```

For example, to configure the authentication server group named test, and to provide fallback to the LOCAL server if the authentication server group fails, enter the following command:

```
hostname(config-tunnel-general)# authentication-server-group test LOCAL
hostname(config-tunnel-general)#
```

The authentication-server-group name identifies a previously configured authentication server or group of servers. Use the **aaa-server** command to configure authentication servers. The maximum length of the group tag is 16 characters.

You can also configure interface-specific authentication by including the name of an interface in parentheses before the group name. The following interfaces are available by default:

- inside—Name of interface GigabitEthernet0/1
- outside— Name of interface GigabitEthernet0/0

Other interfaces you have configured (using the **interface** command) are also available. The following command configures interface-specific authentication for the interface named outside using the server servergroup1 for authentication:

```
hostname(config-tunnel-general)# authentication-server-group (outside) servergroup1
hostname(config-tunnel-general)#
```

Step 3 Optionally, specify the name of the authorization-server group, if any, to use. If you are not using authorization, go to Step 6. When you configure this value, users must exist in the authorization database to connect:

```
hostname(config-tunnel-general)# authorization-server-group groupname
hostname(config-tunnel-general)#
```

Use the **aaa-server** command to configure authorization servers. The maximum length of the group tag is 16 characters.

For example, the following command specifies the use of the authorization-server group FinGroup:

```
hostname(config-tunnel-general)# authorization-server-group FinGroup
hostname(config-tunnel-general)#
```

Step 4 Specify whether to require a successful authorization before allowing a user to connect. The default is not to require authorization.

```
hostname(config-tunnel-general)# authorization-required
hostname(config-tunnel-general)#
```

Step 5 Specify the attribute or attributes to use in deriving a name for an authorization query from a certificate. This attribute specifies what part of the subject DN field to use as the username for authorization:

```
hostname(config-tunnel-general)# authorization-dn-attributes {primary-attribute
[secondary-attribute] | use-entire-name}
```

For example, the following command specifies the use of the CN attribute as the username for authorization:

```
hostname(config-tunnel-general)# authorization-dn-attributes CN
hostname(config-tunnel-general)#
```

The authorization-dn-attributes are **C** (Country), **CN** (Common Name), **DNQ** (DN qualifier), **EA** (E-mail Address), **GENQ** (Generational qualifier), **GN** (Given Name), **I** (Initials), **L** (Locality), **N** (Name), **O** (Organization), **OU** (Organizational Unit), **SER** (Serial Number), **SN** (Surname), **SP** (State/Province), **T** (Title), **UID** (User ID), and **UPN** (User Principal Name).

Step 6 Optionally, specify the name of the accounting-server group, if any, to use. If you are not using accounting, go to Step 7. Use the **aaa-server** command to configure accounting servers. The maximum length of the group tag is 16 characters.:

```
hostname(config-tunnel-general)# accounting-server-group groupname
hostname(config-tunnel-general)#
```

For example, the following command specifies the use of the accounting-server group comptroller:

```
hostname(config-tunnel-general)# accounting-server-group comptroller
hostname(config-tunnel-general)#
```

Step 7 Optionally, specify the name of the default group policy. The default value is DfltGrpPolicy:

```
hostname(config-tunnel-general)# default-group-policy policyname
hostname(config-tunnel-general)#
```

The following example sets MyDfltGrpPolicy as the name of the default group policy:

```
hostname(config-tunnel-general)# default-group-policy MyDfltGrpPolicy
hostname(config-tunnel-general)#
```

Step 8 Optionally, specify the name or IP address of the DHCP server (up to 10 servers), and the names of the DHCP address pools (up to 6 pools). Separate the list items with spaces. The defaults are no DHCP server and no address pool.

```
hostname(config-tunnel-general)# dhcp-server server1 [...server10]
hostname(config-tunnel-general)# address-pool [(interface name)] address_pool1
[...address_pool6]
hostname(config-tunnel-general)#
```

Note The interface name must be enclosed in parentheses.

You configure address pools with the **ip local pool** command in global configuration mode. See Chapter 65, "Configuring IP Addresses for VPNs" for information about configuring address pools.

Step 9 Optionally, if your server is a RADIUS, RADIUS with NT, or LDAP server, you can enable password management.

Note If you are using an LDAP directory server for authentication, password management is supported with the Sun Microsystems JAVA System Directory Server (formerly named the Sun ONE Directory Server) and the Microsoft Active Directory.

- Sun—The DN configured on the ASA to access a Sun directory server must be able to access the default password policy on that server. We recommend using the directory administrator, or a user with directory administrator privileges, as the DN. Alternatively, you can place an ACI on the default password policy.
- Microsoft—You must configure LDAP over SSL to enable password management with Microsoft Active Directory.

See the "Setting the LDAP Server Type" section on page 36-14 for more information.

This feature, which is enabled by default, warns a user when the current password is about to expire. The default is to begin warning the user 14 days before expiration:

```
hostname(config-tunnel-general)# password-management
hostname(config-tunnel-general)#
```

If the server is an LDAP server, you can specify the number of days (0 through 180) before expiration to begin warning the user about the pending expiration:

```
hostname(config-tunnel-general)# password-management [password-expire in days n]
hostname(config-tunnel-general)#
```

Note The **password-management** command, entered in tunnel-group general-attributes configuration mode replaces the deprecated **radius-with-expiry** command that was formerly entered in tunnel-group ipsec-attributes mode.

When you configure this command, the ASA notifies the remote user at login that the user's current password is about to expire or has expired. The ASA then offers the user the opportunity to change the password. If the current password has not yet expired, the user can still log in using that password. The ASA ignores this command if RADIUS or LDAP authentication has not been configured.

Note that this does not change the number of days before the password expires, but rather, the number of days ahead of expiration that the ASA starts warning the user that the password is about to expire.

If you do specify the **password-expire-in-days** keyword, you must also specify the number of days.

See Configuring Microsoft Active Directory Settings for Password Management, page 64-29 for more information.

Step 10 Specifying this command with the number of days set to 0 disables this command. The ASA does not notify the user of the pending expiration, but the user can change the password after it expires.Optionally, configure the ability to override an account-disabled indicator from the AAA server, by entering the **override-account-disable** command:

```
hostname(config-tunnel-general)# override-account-disable
hostname(config-tunnel-general)#
```

Note Allowing override account-disabled is a potential security risk.

Configuring Tunnel-Group Attributes for Clientless SSL VPN Sessions

To configure the parameters specific to a clientless SSL VPN connection profile, follow the steps in this section. Clientless SSL VPN was formerly known as WebVPN, and you configure these attributes in tunnel-group webvpn-attributes mode.

Step 1 To specify the attributes of a clientless SSL VPN tunnel-group, enter tunnel-group webvpn-attributes mode by entering the following command. The prompt changes to indicate the mode change:

```
hostname(config)# tunnel-group tunnel-group-name webvpn-attributes
hostname(config-tunnel-ipsec)#
```

For example, to specify the webvpn-attributes for the clientless SSL VPN tunnel-group named sales, enter the following command:

```
hostname(config)# tunnel-group sales webvpn-attributes
hostname(config-tunnel-webvpn)#
```

Step 2 To specify the authentication method to use: AAA, digital certificates, or both, enter the **authentication** command. You can specify either aaa or certificate or both, in any order.

```
hostname(config-tunnel-webvpn)# authentication authentication_method
hostname(config-tunnel-webvpn)#
```

For example, The following command allows both AAA and certificate authentication:

```
hostname(config-tunnel-webvpn)# authentication aaa certificate
hostname(config-tunnel-webvpn)#
```

Applying Customization

Customizations determine the appearance of the windows that the user sees upon login. You configure the customization parameters as part of configuring clientless SSL VPN.

To apply a previously defined web-page customization to change the look-and-feel of the web page that the user sees at login, enter the customization command in username webvpn configuration mode:

```
hostname(config-username-webvpn)# customization {none | value customization_name}
hostname(config-username-webvpn)#
```

For example, to use the customization named blueborder, enter the following command:

```
hostname(config-username-webvpn)# customization value blueborder
hostname(config-username-webvpn)#
```

You configure the customization itself by entering the **customization** command in webvpn mode.

The following example shows a command sequence that first establishes a customization named "123" that defines a password prompt. The example then defines a clientless SSL VPN tunnel-group named "test" and uses the **customization** command to specify the use of the customization named "123":

```
hostname(config)# webvpn
hostname(config-webvpn)# customization 123
hostname(config-webvpn-custom)# password-prompt Enter password
hostname(config-webvpn)# exit
hostname(config)# tunnel-group test type webvpn
hostname(config)# tunnel-group test webvpn-attributes
hostname(config-tunnel-webvpn)# customization value 123
hostname(config-tunnel-webvpn)#
```

Step 3 The ASA queries NetBIOS name servers to map NetBIOS names to IP addresses. Clientless SSL VPN requires NetBIOS to access or share files on remote systems. Clientless SSL VPN uses NetBIOS and the CIFS protocol to access or share files on remote systems. When you attempt a file-sharing connection to a Windows computer by using its computer name, the file server you specify corresponds to a specific NetBIOS name that identifies a resource on the network.

To make the NBNS function operational, you must configure at least one NetBIOS server (host). You can configure up to three NBNS servers for redundancy. The ASA uses the first server on the list for NetBIOS/CIFS name resolution. If the query fails, it uses the next server.

To specify the name of the NBNS (NetBIOS Name Service) server to use for CIFS name resolution, use the **nbns-server** command. You can enter up to three server entries. The first server you configure is the primary server, and the others are backups, for redundancy. You can also specify whether this is a master browser (rather than just a WINS server), the timeout interval, and the number of retries. A WINS server or a master browser is typically on the same network as the ASA, or reachable from that network. You must specify the timeout interval before the number of retries:

```
hostname(config-tunnel-webvpn)# nbns-server {host-name | IP_address} [master]
[timeout seconds] [retry number]
hostname(config-tunnel-webvpn)#
```

For example, to configure the server named nbnsprimary as the primary server and the server 192.168.2.2 as the secondary server, each allowing three retries and having a 5-second timeout, enter the following command:

```
hostname(config)# name 192.168.2.1 nbnsprimary
hostname(config-tunnel-webvpn)# nbns-server nbnsprimary master timeout 5 retry 3
hostname(config-tunnel-webvpn)# nbns-server 192.168.2.2 timeout 5 retry 3
hostname(config-tunnel-webvpn)#
```

The timeout interval can range from 1 through 30 seconds (default 2), and the number of retries can be in the range 0 through 10 (default 2).

The **nbns-server** command in tunnel-group webvpn-attributes configuration mode replaces the deprecated **nbns-server** command in webvpn configuration mode.

Step 4 To specify alternative names for the group, use the **group-alias** command. Specifying the group alias creates one or more alternate names by which the user can refer to a tunnel-group. The group alias that you specify here appears in the drop-down list on the user's login page. Each group can have multiple aliases or no alias, each specified in separate commands. This feature is useful when the same group is known by several common names, such as "Devtest" and "QA".

For each group alias, enter a **group-alias** command. Each alias is enabled by default. You can optionally explicitly enable or disable each alias:

```
hostname(config-tunnel-webvpn)# group-alias alias [enable | disable]
hostname(config-tunnel-webvpn)#
```

For example, to enable the aliases QA and Devtest for a tunnel-group named QA, enter the following commands:

```
hostname(config-tunnel-webvpn)# group-alias QA enable
hostname(config-tunnel-webvpn)# group-alias Devtest enable
hostname(config-tunnel-webvpn)#
```

Note The webvpn tunnel-group-list must be enabled for the (dropdown) group list to appear.

Step 5 To specify incoming URLs or IP addresses for the group, use the **group-url** command. Specifying a group URL or IP address eliminates the need for the user to select a group at login. When a user logs in, the ASA looks for the user's incoming URL or address in the tunnel-group-policy table. If it finds the URL or address and if group-url is enabled in the connection profile, then the ASA automatically selects the associated connection profile and presents the user with only the username and password fields in the login window. This simplifies the user interface and has the added advantage of never exposing the list of groups to the user. The login window that the user sees uses the customizations configured for that connection profile.

If the URL or address is disabled and group-alias is configured, then the dropdown list of groups is also displayed, and the user must make a selection.

You can configure multiple URLs or addresses (or none) for a group. Each URL or address can be enabled or disabled individually. You must use a separate **group-url** command for each URL or address specified. You must specify the entire URL or address, including either the http or https protocol.

You cannot associate the same URL or address with multiple groups. The ASA verifies the uniqueness of the URL or address before accepting the URL or address for a connection profile.

For each group URL or address, enter a **group-url** command. You can optionally explicitly enable (the default) or disable each URL or alias:

```
hostname(config-tunnel-webvpn)# group-url url [enable | disable]
hostname(config-tunnel-webvpn)#
```

For example, to enable the group URLs http://www.cisco.com and http://192.168.10.10 for the tunnel-group named RadiusServer, enter the following commands:

```
hostname(config)# tunnel-group RadiusServer type webvpn
hostname(config)# tunnel-group RadiusServer general-attributes
hostname(config-tunnel-general)# authentication server-group RADIUS
hostname(config-tunnel-general)# accounting-server-group RADIUS
hostname(config-tunnel-general)# tunnel-group RadiusServer webvpn-attributes
hostname(config-tunnel-webvpn)# group-alias "Cisco Remote Access" enable
hostname(config-tunnel-webvpn)# group-url http://www.cisco.com enable
hostname(config-tunnel-webvpn)# group-url http://192.168.10.10 enable
hostname(config-tunnel-webvpn)#
```

For a more extensive example, see Customizing Login Windows for Users of Clientless SSL VPN sessions, page 64-28.

Step 6 To exempt certain users from running Cisco Secure Desktop on a per connection profile basis if they enter one of the group-urls, enter the following command:

```
hostname(config-tunnel-webvpn)# without-csd
hostname(config-tunnel-webvpn)#
```

Note Entering this command prevents the detection of endpoint conditions for these sessions, so you may need to adjust the dynamic access policy (DAP) configuration.

Step 7 To specify the DNS server group to use for a connection profile for clientless SSL VPN sessions, use the **dns-group** command. The group you specify must be one you already configured in global configuration mode (using the **dns server-group** and **name-server** commands).

By default, the connection profile uses the DNS server group *DefaultDNS*. However, this group must be configured before the security appliance can resolve DNS requests.

The following example configures a new DNS server group named *corp_dns* and specifies that server group for the connection profile *telecommuters*:

```
hostname(config)# dns server-group corp_dns
hostname(config-dns-server-group)# domain-name cisco.com
hostname(config-dns-server-group)# name-server 209.165.200.224

hostname(config)# tunnel-group telecommuters webvpn-attributes
hostname(config-tunnel-webvpn)# dns-group corp_dns
hostname(config-tunnel-webvpn)#
```

Step 8 (Optional) To enable extracting a username from a client certificate for use in authentication and authorization, use the **pre-fill-username** command in tunnel-group webvpn-attributes mode. There is no default value.

```
hostname(config)# pre-fill-username {ssl-client | clientless}
```

The **pre-fill-username** command enables the use of a username extracted from the certificate field specified in the **username-from-certificate** command (in tunnel-group general-attributes mode) as the username for username/password authentication and authorization. To use this pre-fill username from certificate feature, you must configure both commands.

Note In Release 8.0.4, the username is not pre-filled; instead, any data sent in the username field is ignored.

The following example, entered in global configuration mode, creates an IPSec remote access tunnel group named remotegrp, enables getting the username from a certificate, and specifies that the name for an authentication or authorization query for an SSL VPN client must be derived from a digital certificate:

```
hostname(config)# tunnel-group remotegrp type ipsec_ra
hostname(config)# tunnel-group remotegrp general-attributes
hostname(config-tunnel-general)# username-from-certificate CN OU
hostname(config)# tunnel-group remotegrp webvpn-attributes
hostname(config-tunnel-webvpn)# pre-fill-username ssl-client
hostname(config-tunnel-webvpn)#
```

Step 9 (Optional) To specify whether to override the group policy or username attributes configuration for downloading an AnyConnect or SSL VPN client, use the override-svc-download command. This feature is disabled by default.

The security appliance allows clientless, AnyConnect, or SSL VPN client connections for remote users based on whether clientless and/or SSL VPN is enabled in the group policy or username attributes with the **vpn-tunnel-protocol** command. The **svc ask** command further modifies the client user experience by prompting the user to download the client or return to the WebVPN home page.

However, you might want clientless users logging in under specific tunnel groups to not experience delays waiting for the download prompt to expire before being presented with the clientless SSL VPN home page. You can prevent delays for these users at the connection profile level with the **override-svc-download** command. This command causes users logging through a connection profile to be immediately presented with the clientless SSL VPN home page regardless of the **vpn-tunnel-protocol** or **svc ask** command settings.

In the following example, the you enter tunnel-group webvpn attributes configuration mode for the connection profile *engineering* and enable the connection profile to override the group policy and username attribute settings for client download prompts:

```
hostname(config)# tunnel-group engineering webvpn-attributes
hostname(config-tunnel-webvpn)# override-svc-download
```

Step 10 (Optional) To enable the display of a RADIUS reject message on the login screen when authentication is rejected, use the **radius-eject-message** command:

The following example enables the display of a RADIUS rejection message for the connection profile named engineering:

```
hostname(config)# tunnel-group engineering webvpn-attributes
hostname(config-tunnel-webvpn)# radius-reject-message
```

Customizing Login Windows for Users of Clientless SSL VPN sessions

You can set up different login windows for different groups by using a combination of customization profiles and connection profiles. For example, assuming that you had created a customization profile called salesgui, you can create a connection profile for clientless SSL VPN sessions called sales that uses that customization profile, as the following example shows:

Step 1 In webvpn mode, define a customization for clientless SSL VPN access, in this case named salesgui and change the default logo to mycompanylogo.gif. You must have previously loaded mycompanylogo.gif onto the flash memory of the ASA and saved the configuration. See "Chapter 71, "Configuring Clientless SSL VPN"" for details.

```
hostname# webvpn
hostname (config-webvpn)# customization value salesgui
hostname(config-webvpn-custom)# logo file disk0:\mycompanylogo.gif
hostname(config-webvpn-custom)#
```

Step 2 In global configuration mode, set up a username and associate with it the customization for clientless SSL VPN that you've just defined:

```
hostname# username seller attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# customization value salesgui
hostname(config-username-webvpn)# exit
hostname(config-username)# exit
hostname#
```

Step 3 In global configuration mode, create a tunnel-group for clientless SSL VPN sessions named sales:

```
hostname# tunnel-group sales type webvpn
hostname(config-tunnel-webvpn)#
```

Step 4 Specify that you want to use the salesgui customization for this connection profile:

```
hostname# tunnel-group sales webvpn-attributes
hostname(config-tunnel-webvpn)# customization salesgui
```

Step 5 Set the group URL to the address that the user enters into the browser to log in to the ASA; for example, if the ASA has the IP address 192.168.3.3, set the group URL to https://192.168.3.3:

```
hostname(config-tunnel-webvpn)# group-url https://192.168.3.3.
hostname(config-tunnel-webvpn)#
```

If a port number is required for a successful login, include the port number, preceded by a colon. The ASA maps this URL to the sales connection profile and applies the salesgui customization profile to the login screen that the user sees upon logging in to https://192.168.3.3.

Configuring Microsoft Active Directory Settings for Password Management

Note If you are using an LDAP directory server for authentication, password management is supported with the Sun Microsystems JAVA System Directory Server (formerly named the Sun ONE Directory Server) and the Microsoft Active Directory.

- Sun—The DN configured on the ASA to access a Sun directory server must be able to access the default password policy on that server. We recommend using the directory administrator, or a user with directory administrator privileges, as the DN. Alternatively, you can place an ACI on the default password policy.
- Microsoft—You must configure LDAP over SSL to enable password management with Microsoft Active Directory.

See the “Setting the LDAP Server Type” section on page 36-14 for more information.

To use password management with Microsoft Active Directory, you must set certain Active Directory parameters as well as configuring password management on the ASA. This section describes the Active Directory settings associated with various password management actions. These descriptions assume that you have also enabled password management on the ASA and configured the corresponding password management attributes. The specific steps in the following sections refer to Active Directory terminology under Windows 2000.

- Using Active Directory to Force the User to Change Password at Next Logon, page 64-30.
- Using Active Directory to Specify Maximum Password Age, page 64-31.
- Using Active Directory to Override an Account Disabled AAA Indicator, page 64-32
- Using Active Directory to Enforce Password Complexity, page 64-34.

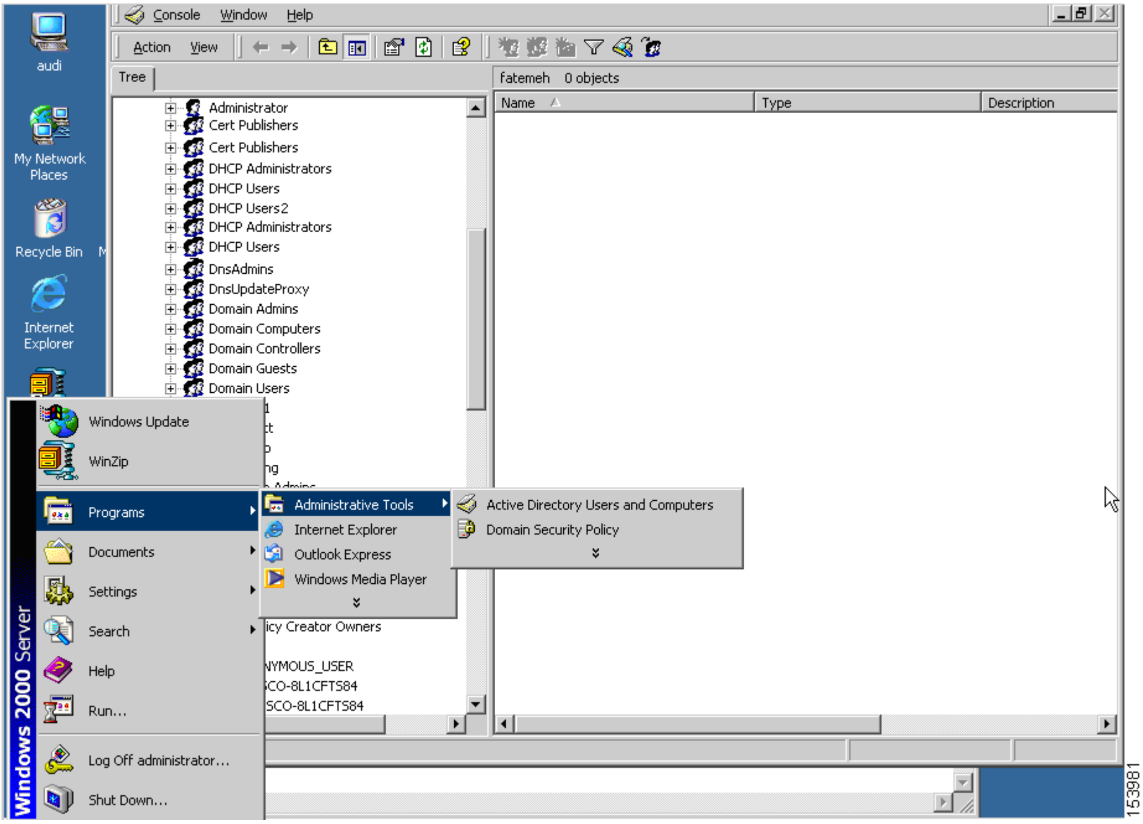
The following sections assume that you are using an LDAP directory server for authentication.

Using Active Directory to Force the User to Change Password at Next Logon

To force a user to change the user password at the next logon, specify the **password-management** command in tunnel-group general-attributes configuration mode on the ASA and do the following steps under Active Directory:

Step 1 Select to Start > Programs > Administrative Tools > Active Directory Users and Computers (Figure 64-1).

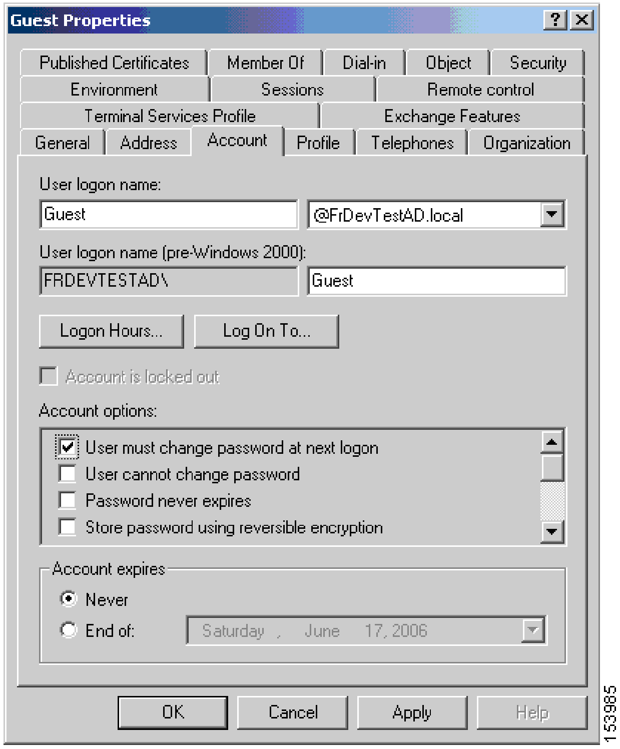
Figure 64-1 Active Directory—Administrative Tools Menu



Step 2 Right-click Username > Properties > Account.

Step 3 Check the check box for User must change password at next logon (Figure 64-2).

Figure 64-2 Active Directory—User Must Change Password at Next Logon



User logon name: Guest @FrDevTestAD.local

User logon name (pre-Windows 2000): FRDEVTESTAD\ Guest

☐ Account is locked out

Account options:

☑ User must change password at next logon
☐ User cannot change password
☐ Password never expires
☐ Store password using reversible encryption

Account expires

● Never
○ End of: Saturday , June 17, 2006

The next time this user logs on, the ASA displays the following prompt: "New password required. Password change required. You must enter a new password with a minimum length *n* to continue." You can set the minimum required password length, *n*, as part of the Active Directory configuration at Start > Programs > Administrative Tools > Domain Security Policy > Windows Settings > Security Settings > Account Policies > Password Policy. Select Minimum password length.

Using Active Directory to Specify Maximum Password Age

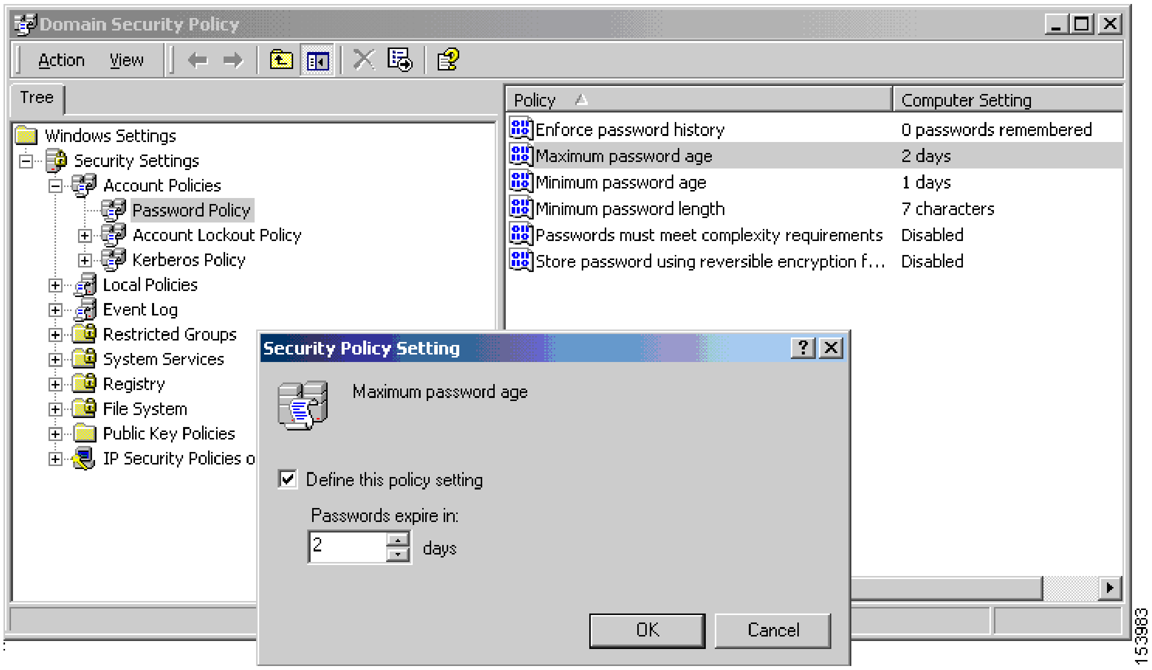
To enhance security, you can specify that passwords expire after a certain number of days. To specify a maximum password age for a user password, specify the **password-management** command in tunnel-group general-attributes configuration mode on the ASA and do the following steps under Active Directory:

Step 1 Select Start > Programs > Administrative Tools > Domain Security Policy > Windows Settings > Security Settings > Account Policies > Password Policy.

Step 2 Double-click Maximum password age. This opens the Security Policy Setting dialog box.

Step 3 Check the Define this policy setting check box and specify the maximum password age, in days, that you want to allow.

Figure 64-3 Active Directory—Maximum Password Age



Policy	Computer Setting
Enforce password history	0 passwords remembered
Maximum password age	2 days
Minimum password age	1 days
Minimum password length	7 characters
Passwords must meet complexity requirements	Disabled
Store password using reversible encryption f...	Disabled

Maximum password age

☑ Define this policy setting

Passwords expire in:

2 days

Note The **radius-with-expiry** command, formerly configured as part of tunnel-group remote-access configuration to perform the password age function, is deprecated. The **password-management** command, entered in tunnel-group general-attributes mode, replaces it.

Using Active Directory to Override an Account Disabled AAA Indicator

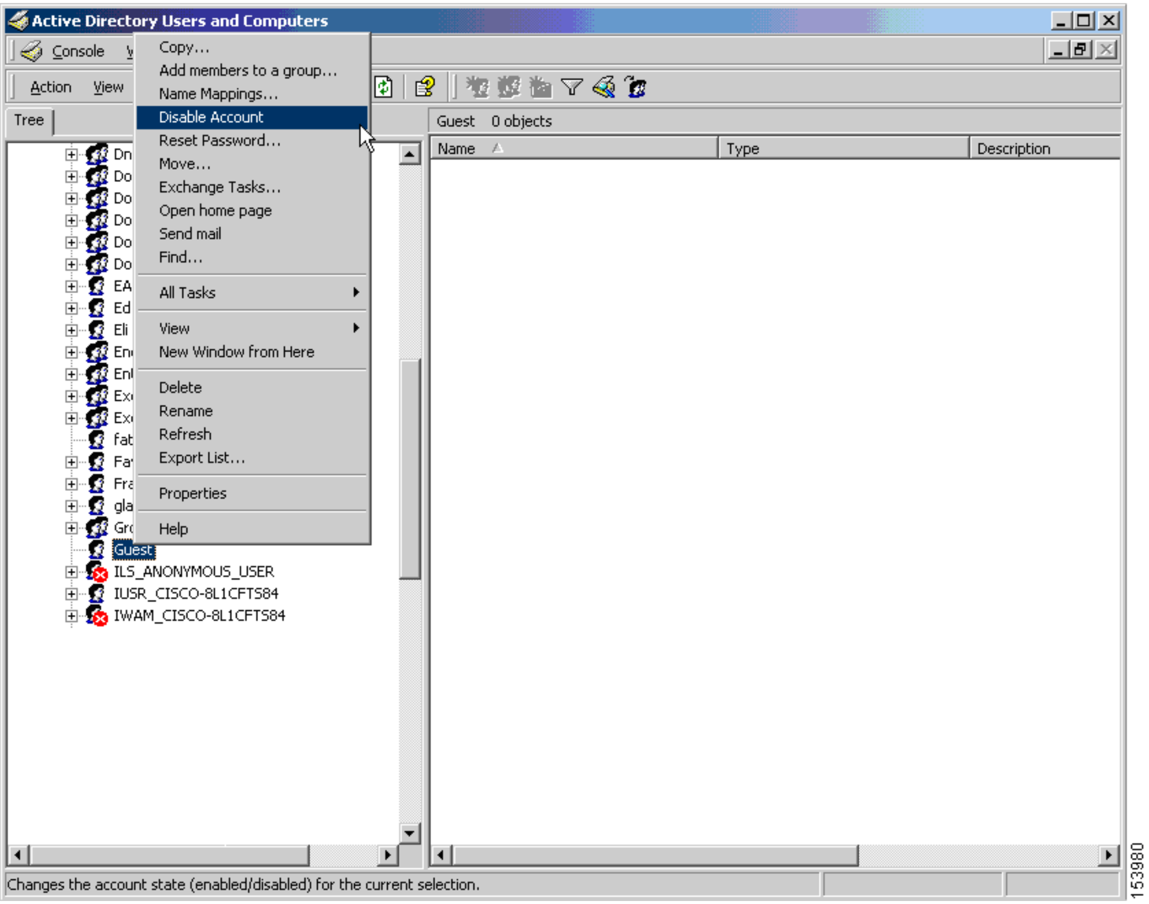
To override an account-disabled indication from a AAA server, specify the **override-account-disable** command in tunnel-group general-attributes configuration mode on theASA and do the following steps under Active Directory:

Note Allowing override account-disabled is a potential security risk.

Step 1 Select Start > Programs > Administrative Tools > Active Directory Users and Computers.

Step 2 Right-click Username > Properties > Account and select Disable Account from the menu.

Figure 64-4 Active Directory—Override Account Disabled



Changes the account state (enabled/disabled) for the current selection.

The user should be able to log on successfully, even though a AAA server provides an account-disabled indicator.

Using Active Directory to Enforce Minimum Password Length

To enforce a minimum length for passwords, specify the **password-management** command in tunnel-group general-attributes configuration mode on the ASA and do the following steps under Active Directory:

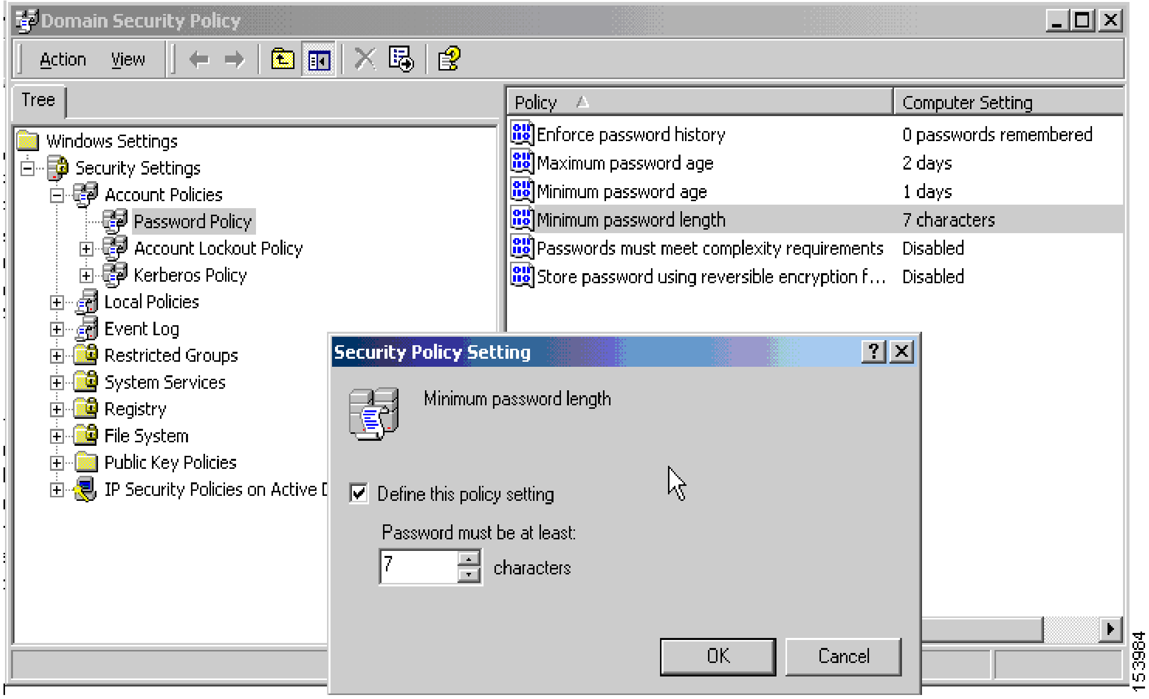
Step 1 Select Start > Programs > Administrative Tools > Domain Security Policy.

Step 2 Select Windows Settings > Security Settings > Account Policies > Password Policy.

Step 3 Double-click Minimum Password Length. This opens the Security Policy Setting dialog box.

Step 4 Check the Define this policy setting check box and specify the minimum number of characters that the password must contain.

Figure 64-5 Active Directory—Minimum Password Length



Policy	Computer Setting
Enforce password history	0 passwords remembered
Maximum password age	2 days
Minimum password age	1 days
Minimum password length	7 characters
Passwords must meet complexity requirements	Disabled
Store password using reversible encryption f...	Disabled

Minimum password length

☑ Define this policy setting

Password must be at least:

7 characters

Using Active Directory to Enforce Password Complexity

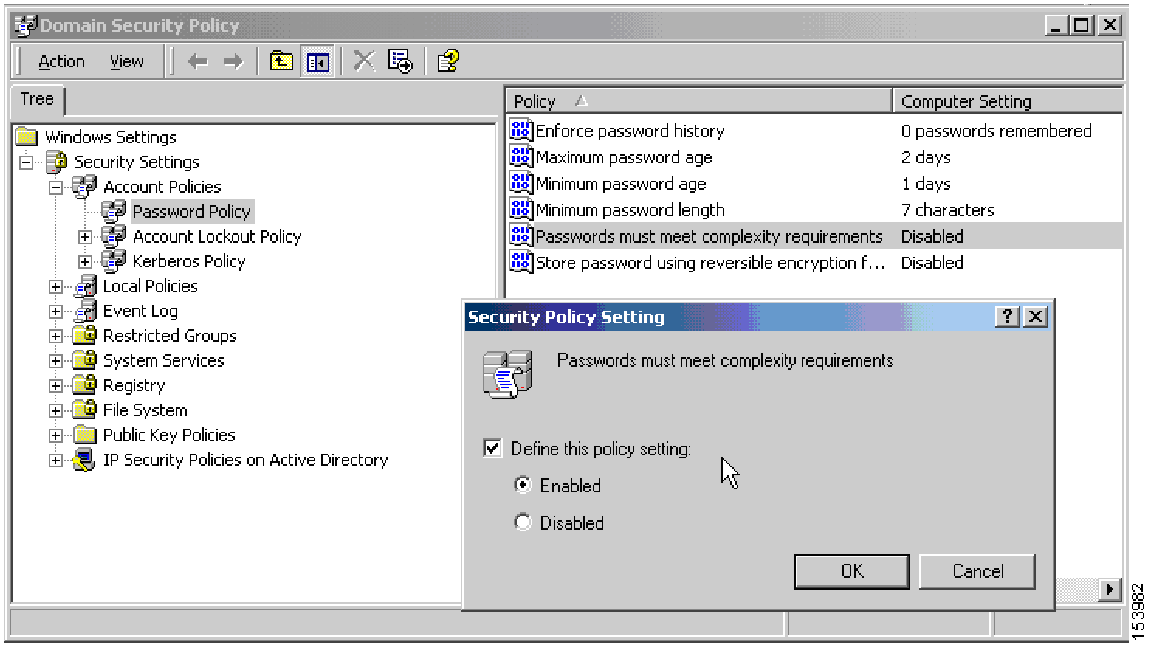
To enforce complex passwords—for example, to require that a password contain upper- and lowercase letters, numbers, and special characters—specify the **password-management** command in tunnel-group general-attributes configuration mode on the ASA and do the following steps under Active Directory:

Step 1 Select Start > Programs > Administrative Tools > Domain Security Policy. Select Windows Settings > Security Settings > Account Policies > Password Policy.

Step 2 Double-click Password must meet complexity requirements to open the Security Policy Setting dialog box.

Step 3 Check the Define this policy setting check box and select Enable.

Figure 64-6 Active Directory—Enforce Password Complexity



Policy	Computer Setting
Enforce password history	0 passwords remembered
Maximum password age	2 days
Minimum password age	1 days
Minimum password length	7 characters
Passwords must meet complexity requirements	Disabled
Store password using reversible encryption f...	Disabled

Security Policy Setting

Passwords must meet complexity requirements

☑ Define this policy setting:

● Enabled

○ Disabled

Enforcing password complexity takes effect only when the user changes passwords; for example, when you have configured Enforce password change at next login or Password expires in *n* days. At login, the user receives a prompt to enter a new password, and the system will accept only a complex password.

Configuring the Connection Profile for RADIUS/SDI Message Support for the AnyConnect Client

This section describes procedures to ensure that the AnyConnect VPN client using RSA SecureID Software tokens can properly respond to user prompts delivered to the client through a RADIUS server proxying to an SDI server(s). This section contains the following topics:

- AnyConnect Client and RADIUS/SDI Server Interaction
- Configuring the Security Appliance to Support RADIUS/SDI Messages

Note If you have configured the double-authentication feature, SDI authentication is supported only on the primary authentication server.

AnyConnect Client and RADIUS/SDI Server Interaction

When a remote user connects to the ASA with the AnyConnect VPN client and attempts to authenticate using an RSA SecurID token, the ASA communicates with the RADIUS server, which in turn, communicates with the SDI server about the authentication.

During authentication, the RADIUS server presents access challenge messages to the ASA. Within these challenge messages are reply messages containing text from the SDI server. The message text is different when the ASA is communicating directly with an SDI server than when communicating through the RADIUS proxy. Therefore, in order to appear as a native SDI server to the AnyConnect client, the ASA must interpret the messages from the RADIUS server.

Also, because the SDI messages are configurable on the SDI server, the message text on the ASA must match (in whole or in part) the message text on the SDI server. Otherwise, the prompts displayed to the remote client user may not be appropriate for the action required during authentication. The AnyConnect client may fail to respond and authentication may fail.

The following section describes how to configure the ASA to ensure successful authentication between the client and the SDI server:

Configuring the Security Appliance to Support RADIUS/SDI Messages

The following section describes the steps to configure the ASA to interpret SDI-specific RADIUS reply messages and prompt the AnyConnect user for the appropriate action:

Step 1 Configure a connection profile (tunnel group) to forward RADIUS reply messages in a manner that simulates direct communication with an SDI server using the **proxy-auth sdi** command from tunnel-group webvpn configuration mode. Users authenticating to the SDI server must connect over this connection profile.

For example:

```
hostname(config)# tunnel-group sales webvpn attributes
hostname(tunnel-group-webvpn)# proxy-auth sdi
```

Step 2 Configure the RADIUS reply message text on the ASA to match (in whole or in part) the message text sent by the RADIUS server with the **proxy-auth_map sdi** command from tunnel-group webvpn configuration mode.

The default message text used by the ASA is the default message text used by Cisco Secure Access Control Server (ACS). If you are using Cisco Secure ACS, and it is using the default message text, you do not need to configure the message text on the ASA. Otherwise, use the **proxy-auth_map sdi** command to ensure the message text matches.

Table 64-3 shows the message code, the default RADIUS reply message text, and the function of each message. Because the security appliance searches for strings in the order that they appear in the table, you must ensure that the string you use for the message text is not a subset of another string.

For example, “new PIN” is a subset of the default message text for both new-pin-sup and next-ccode-and-reauth. If you configure new-pin-sup as “new PIN”, when the security appliance receives “new PIN with the next card code” from the RADIUS server, it will match the text to the new-pin-sup code instead of the next-ccode-and-reauth code.

Table 64-3 SDI Op-codes, Default Message Text, and Message Function

Message Code	Default RADIUS Reply Message Text	Function
next-code	Enter Next PASSCODE	Indicates the user must enter the NEXT tokencode without the PIN.
new-pin-sup	Please remember your new PIN	Indicates the new system PIN has been supplied and displays that PIN for the user.

Message Code	Default RADIUS Reply Message Text	Function
new-pin-meth	Do you want to enter your own pin	Requests from the user which new PIN method to use to create a new PIN.
new-pin-req	Enter your new Alpha-Numerical PIN	Indicates a user-generated PIN and requests that the user enter the PIN.
new-pin-reenter	Reenter PIN:	Used internally by the ASA for user-supplied PIN confirmation. The client confirms the PIN without prompting the user.
new-pin-sys-ok	New PIN Accepted	Indicates the user-supplied PIN was accepted.
next-ccode-and-reauth	new PIN with the next card code	Follows a PIN operation and indicates the user must wait for the next tokencode and to enter both the new PIN and next tokencode to authenticate.
ready-for-sys-pin	ACCEPT A SYSTEM GENERATED PIN	Used internally by the ASA to indicate the user is ready for the system-generated PIN.

The following example enters aaa-server-host mode and changes the text for the RADIUS reply message new-pin-sup:

```
hostname(config)# aaa-server radius_sales host 10.10.10.1
hostname(config-aaa-server-host)# proxy-auth_map sdi new-pin-sup "This is your new PIN"
```

Group Policies

This section describes group policies and how to configure them. It includes the following sections:

- Default Group Policy, page 64-38
- Configuring Group Policies, page 64-39

A group policy is a set of user-oriented attribute/value pairs for IPSec connections that are stored either internally (locally) on the device or externally on a RADIUS server. The connection profile uses a group policy that sets terms for user connections after the tunnel is established. Group policies let you apply whole sets of attributes to a user or a group of users, rather than having to specify each attribute individually for each user.

Enter the **group-policy** commands in global configuration mode to assign a group policy to users or to modify a group policy for specific users.

The ASA includes a default group policy. In addition to the default group policy, which you can modify but not delete, you can create one or more group policies specific to your environment.

You can configure internal and external group policies. Internal groups are configured on the ASA's internal database. External groups are configured on an external authentication server, such as RADIUS. Group policies include the following attributes:

- Identity
- Server definitions
- Client firewall settings
- Tunneling protocols
- IPSec settings

- Hardware client settings
- Filters
- Client configuration settings
- Connection settings

Default Group Policy

The ASA supplies a default group policy. You can modify this default group policy, but you cannot delete it. A default group policy, named DfltGrpPolicy, always exists on the ASA, but this default group policy does not take effect unless you configure the ASA to use it. When you configure other group policies, any attribute that you do not explicitly specify takes its value from the default group policy. To view the default group policy, enter the following command:

```
hostname(config)# show running-config all group-policy DfltGrpPolicy
hostname(config)#
```

To configure the default group policy, enter the following command:

```
hostname(config)# group-policy DfltGrpPolicy internal
hostname(config)#
```

Note The default group policy is always internal. Despite the fact that the command syntax is `hostname(config)#` **`group-policy DfltGrpPolicy`** {**`internal`** | **`external`**}, you cannot change its type to external.

To change any of the attributes of the default group policy, use the **group-policy attributes** command to enter attributes mode, then specify the commands to change whatever attributes that you want to modify:

```
hostname(config)# group-policy DfltGrpPolicy attributes
```

Note The attributes mode applies only to internal group policies.

The default group policy, DfltGrpPolicy, that the ASA provides is as follows:

```
group-policy DfltGrpPolicy internal
group-policy DfltGrpPolicy attributes
 banner none
 wins-server none
 dns-server none
 dhcp-network-scope none
 vpn-access-hours none
 vpn-simultaneous-logins 2000
 vpn-idle-timeout none
 vpn-session-timeout none
 vpn-filter none
 vpn-tunnel-protocol IPSec webvpn
 password-storage enable
 ip-comp disable
 re-xauth disable
 group-lock none
 pfs disable
 ipsec-udp disable
 ipsec-udp-port 10000
 split-tunnel-policy tunnelall
 split-tunnel-network-list none
 default-domain none
 split-dns none
 intercept-dhcp 255.255.255.255 disable
 secure-unit-authentication disable
 user-authentication disable
 user-authentication-idle-timeout 30
 ip-phone-bypass disable
 leap-bypass disable
 nem disable
 backup-servers keep-client-config
 msie-proxy server none
 msie-proxy method no-modify
 msie-proxy except-list none
 msie-proxy local-bypass disable
 nac disable
 nac-sq-period 300
 nac-reval-period 36000
 nac-default-acl none
 address-pools value vpn_users
 client-firewall none
 client-access-rule none
 webvpn
  html-content-filter none
  homepage none
  keep-alive-ignore 4
  http-comp gzip
  filter none
  url-list value MyURLs
  customization value DfltCustomization
  port-forward none
  port-forward-name value Application Access
  sso-server none
  deny-message value Login was successful, but because certain criteria have not been met
or due to some specific group policy, you do not have permission to use any of the VPN
features. Contact your IT administrator for more information
  svc none
  svc keep-installer none
  svc keepalive none
  svc rekey time none
  svc rekey method none
  svc dpd-interval client none
  svc dpd-interval gateway none
  svc compression deflate
 no vpn-nac-exempt
hostname(config-group-policy)#
```

You can modify the default group policy, and you can also create one or more group policies specific to your environment.

Configuring Group Policies

A group policy can apply to any kind of tunnel. In each case, if you do not explicitly define a parameter, the group takes the value from the default group policy. To configure a group policy, follow the steps in the subsequent sections.

Configuring an External Group Policy

External group policies take their attribute values from the external server that you specify. For an external group policy, you must identify the AAA server group that the ASA can query for attributes and specify the password to use when retrieving attributes from the external AAA server group. If you are using an external authentication server, and if your external group-policy attributes exist in the same RADIUS server as the users that you plan to authenticate, you have to make sure that there is no name duplication between them.

Note External group names on the ASA refer to user names on the RADIUS server. In other words, if you configure external group X on the ASA, the RADIUS server sees the query as an authentication request for user X. So external groups are really just user accounts on the RADIUS server that have special meaning to the ASA. If your external group attributes exist in the same RADIUS server as the users that you plan to authenticate, there must be no name duplication between them.

The ASA supports user authorization on an external LDAP or RADIUS server. Before you configure the ASA to use an external server, you must configure the server with the correct ASA authorization attributes and, from a subset of these attributes, assign specific permissions to individual users. Follow the instructions in Configuring an External RADIUS Server, page D-30 to configure your external server.

To configure an external group policy, do the following steps specify a name and type for the group policy, along with the server-group name and a password:

```
hostname(config)# group-policy group_policy_name type server-group server_group_name
password server_password
hostname(config)#
```

Note For an external group policy, RADIUS is the only supported AAA server type.

For example, the following command creates an external group policy named ExtGroup that gets its attributes from an external RADIUS server named ExtRAD and specifies that the password to use when retrieving the attributes is newpassword:

```
hostname(config)# group-policy ExtGroup external server-group ExtRAD password newpassword
hostname(config)#
```

Note You can configure several vendor-specific attributes (VSAs), as described in Configuring an External RADIUS Server, page D-30. If a RADIUS server is configured to return the Class attribute (#25), the ASA uses that attribute to authenticate the Group Name. On the RADIUS server, the attribute must be formatted as: OU=*groupname*; where *groupname* is identical to the Group Name configured on the ASA—for example, OU=Finance.

Configuring an Internal Group Policy

To configure an internal group policy, specify a name and type for the group policy:

```
hostname(config)# group-policy group_policy_name type
hostname(config)#
```

For example, the following command creates the internal group policy named GroupPolicy1:

```
hostname(config)# group-policy GroupPolicy1 internal
hostname(config)#
```

The default type is **internal**.

You can initialize the attributes of an internal group policy to the values of a preexisting group policy by appending the keyword **from** and specifying the name of the existing policy:

```
hostname(config)# group-policy group_policy_name internal from group_policy_name
hostname(config-group-policy)#
hostname(config-group-policy)#
```

Configuring Group Policy Attributes

For internal group policies, you can specify particular attribute values. To begin, enter group-policy attributes mode, by entering the **group-policy attributes** command in global configuration mode.

```
hostname(config)# group-policy name attributes
hostname(config-group-policy)#
```

The prompt changes to indicate the mode change. The group-policy-attributes mode lets you configure attribute-value pairs for a specified group policy. In group-policy-attributes mode, explicitly configure the attribute-value pairs that you do not want to inherit from the default group. The commands to do this are described in the following sections.

Configuring WINS and DNS Servers

You can specify primary and secondary WINS servers and DNS servers. The default value in each case is none. To specify these servers, do the following steps:

Step 1 Specify the primary and secondary WINS servers:

```
hostname(config-group-policy)# wins-server value {ip_address [ip_address] | none}
hostname(config-group-policy)#
```

The first IP address specified is that of the primary WINS server. The second (optional) IP address is that of the secondary WINS server. Specifying the **none** keyword instead of an IP address sets WINS servers to a null value, which allows no WINS servers and prevents inheriting a value from a default or specified group policy.

Every time that you enter the **wins-server** command, you overwrite the existing setting. For example, if you configure WINS server x.x.x.x and then configure WINS server y.y.y.y, the second command overwrites the first, and y.y.y.y becomes the sole WINS server. The same is true for multiple servers. To add a WINS server rather than overwrite previously configured servers, include the IP addresses of all WINS servers when you enter this command.

The following example shows how to configure WINS servers with the IP addresses 10.10.10.15 and 10.10.10.30 for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# wins-server value 10.10.10.15 10.10.10.30
hostname(config-group-policy)#
```

Step 2 Specify the primary and secondary DNS servers:

```
hostname(config-group-policy)# dns-server value {ip_address [ip_address] | none}
hostname(config-group-policy)#
```

The first IP address specified is that of the primary DNS server. The second (optional) IP address is that of the secondary DNS server. Specifying the **none** keyword instead of an IP address sets DNS servers to a null value, which allows no DNS servers and prevents inheriting a value from a default or specified group policy.

Every time that you enter the **dns-server** command you overwrite the existing setting. For example, if you configure DNS server x.x.x.x and then configure DNS server y.y.y.y, the second command overwrites the first, and y.y.y.y becomes the sole DNS server. The same is true for multiple servers. To add a DNS server rather than overwrite previously configured servers, include the IP addresses of all DNS servers when you enter this command.

The following example shows how to configure DNS servers with the IP addresses 10.10.10.15, and 10.10.10.30 for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# dns-server value 10.10.10.15 10.10.10.30
hostname(config-group-policy)#
```

Step 3 Configure the DHCP network scope:

```
hostname(config-group-policy)# dhcp-network-scope {ip_address | none}
hostname(config-group-policy)#
```

DHCP scope specifies the range of IP addresses (that is, a subnetwork) that the ASA DHCP server should use to assign addresses to users of this group policy.

The following example shows how to set an IP subnetwork of 10.10.85.0 (specifying the address range of 10.10.85.0 through 10.10.85.255) for the group policy named First Group:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# dhcp-network-scope 10.10.85.0
```

Configuring VPN-Specific Attributes

Follow the steps in this section to set the VPN attribute values. The VPN attributes control the access hours, the number of simultaneous logins allowed, the timeouts, the egress VLAN or ACL to apply to VPN sessions, and the tunnel protocol:

Step 1 Set the VPN access hours. To do this, you associate a group policy with a configured time-range policy, using the **vpn-access-hours** command in group-policy configuration mode.

```
hostname(config-group-policy)# vpn-access-hours value {time-range | none}
```

A group policy can inherit a time-range value from a default or specified group policy. To prevent this inheritance, enter the **none** keyword instead of the name of a time-range in this command. This keyword sets VPN access hours to a null value, which allows no time-range policy.

The time-range variable is the name of a set of access hours defined in global configuration mode using the **time-range** command. The following example shows how to associate the group policy named FirstGroup with a time-range policy called 824:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# vpn-access-hours value 824
```

Step 2 Specify the number of simultaneous logins allowed for any user, using the **vpn-simultaneous-logins** command in group-policy configuration mode.

```
hostname(config-group-policy)# vpn-simultaneous-logins integer
```

The default value is 3. The range is an integer in the range 0 through 2147483647. A group policy can inherit this value from another group policy. Enter 0 to disable login and prevent user access. The following example shows how to allow a maximum of 4 simultaneous logins for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# vpn-simultaneous-logins 4
hostname(config-group-policy)#
```

Note While the maximum limit for the number of simultaneous logins is very large, allowing several simultaneous logins could compromise security and affect performance.

Stale AnyConnect, IPSec Client, or Clientless sessions (sessions that are terminated abnormally) might remain in the session database, even though a "new" session has been established with the same username.

If the value of vpn-simultaneous-logins is 1, and the same user logs in again after an abnormal termination, then the stale session is removed from the database and the new session is established. If, however, the existing session is still an active connection and the same user logs in again, perhaps from another PC, the first session is logged off and removed from the database, and the new session is established.

If the number of simultaneous logins is a value greater than 1, then, when you have reached that maximum number and try to log in again, the session with the longest idle time is logged off. If all current sessions have been idle an equally long time, then the oldest session is logged off. This action frees up a session and allows the new login.

Step 3 Configure the user timeout period by entering the **vpn-idle-timeout** command in group-policy configuration mode or in username configuration mode:

```
hostname(config-group-policy)# vpn-idle-timeout {minutes | none}
hostname(config-group-policy)#
```

The minimum time is 1 minute, and the maximum time is 35791394 minutes. The default is 30 minutes. If there is no communication activity on the connection in this period, the ASA terminates the connection.

A group policy can inherit this value from another group policy. To prevent inheriting a value, enter the **none** keyword instead of specifying a number of minutes with this command. The none keyword also permits an unlimited idle timeout period. It sets the idle timeout to a null value, thereby disallowing an idle timeout.

The following example shows how to set a VPN idle timeout of 15 minutes for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# vpn-idle-timeout 15
hostname(config-group-policy)#
```

Step 4 Configure a maximum amount of time for VPN connections, using the **vpn-session-timeout** command in group-policy configuration mode or in username configuration mode.

```
hostname(config-group-policy)# vpn-session-timeout {minutes | none}
hostname(config-group-policy)#
```

The minimum time is 1 minute, and the maximum time is 35791394 minutes. There is no default value. At the end of this period of time, the ASA terminates the connection.

A group policy can inherit this value from another group policy. To prevent inheriting a value, enter the **none** keyword instead of specifying a number of minutes with this command. Specifying the **none** keyword permits an unlimited session timeout period and sets session timeout with a null value, which disallows a session timeout.

The following example shows how to set a VPN session timeout of 180 minutes for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# vpn-session-timeout 180
hostname(config-group-policy)#
```

Step 5 Choose one of the following options to specify an egress VLAN (also called "VLAN mapping") for remote access or specify an ACL to filter the traffic:

- Enter the following command in group-policy configuration mode to specify the egress VLAN for remote access VPN sessions assigned to this group policy or to a group policy that inherits this group policy:

  ```
  hostname(config-group-policy)# [no] vlan {vlan_id |none}
  ```

  `no vlan` removes the *vlan_id* from the group policy. The group policy inherits the vlan value from the default group policy.

  `vlan none` removes the *vlan_id* from the group policy and disables VLAN mapping for this group policy. The group policy does not inherit the vlan value from the default group policy.

  vlan_id in the command `vlan` *vlan_id* is the number of the VLAN, in decimal format, to assign to remote access VPN sessions that use this group policy. The VLAN must be configured on this ASA per the instructions in the "Configuring VLAN Subinterfaces and 802.1Q Trunking" section on page 6-14.

  none disables the assignment of a VLAN to the remote access VPN sessions that match this group policy.

  Note The egress VLAN feature works for HTTP connections, but not for FTP and CIFS.

- Specify the name of the ACL to apply to VPN session, using the **vpn-filter** command in group policy mode. (You can also configure this attribute in username mode, in which case the value configured under username supersedes the group-policy value.)

  ```
  hostname(config-group-policy)# vpn-filter {value ACL name | none}
  hostname(config-group-policy)#
  ```

  You configure ACLs to permit or deny various types of traffic for this group policy. You then enter the **vpn-filter** command to apply those ACLs.

  To remove the ACL, including a null value created by entering the **vpn-filter none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from another group policy.

  A group policy can inherit this value from another group policy. To prevent inheriting a value, enter the **none** keyword instead of specifying an ACL name. The **none** keyword indicates that there is no access list and sets a null value, thereby disallowing an access list.

  The following example shows how to set a filter that invokes an access list named acl_vpn for the group policy named FirstGroup:

  ```
  hostname(config)# group-policy FirstGroup attributes
  hostname(config-group-policy)# vpn-filter acl_vpn
  hostname(config-group-policy)#
  ```

A **vpn-filter** command is applied to post-decrypted traffic after it exits a tunnel and pre-encrypted traffic before it enters a tunnel. An ACL that is used for a vpn-filter should NOT also be used for an interface access-group. When a **vpn-filter** command is applied to a group policy that governs Remote Access VPN client connections, the ACL should be configured with the client assigned IP addresses in the **src_ip** position of the ACL and the local network in the **dest_ip** position of the ACL.

When a **vpn-filter** command is applied to a group-policy that governs a LAN to LAN VPN connection, the ACL should be configured with the remote network in the **src_ip** position of the ACL and the local network in the **dest_ip** position of the ACL.

Caution should be used when constructing the ACLs for use with the vpn-filter feature. The ACLs are constructed with the post-decrypted traffic in mind. However, ACLs are also applied to the traffic in the opposite direction. For this pre-encrypted traffic that is destined for the tunnel, the ACLs are constructed with the **src_ip** and **dest_ip** positions swapped.

In the following example, the vpn-filter is used with a Remote Access VPN client.
This example assumes that the client assigned IP address is 10.10.10.1/24 and the local network is 192.168.1.0/24.

The following ACE will allow the Remote Access VPN client to telnet to the local network:

```
hostname(config-group-policy)# access-list vpnfilt-ra permit 10.10.10.1 255.255.255.255
192.168.1.0 255.255.255.0 eq 23
```

The following ACE will allow the local network to telnet to the Remote Access client:

```
hostname(config-group-policy)# access-list vpnfilt-ra permit 10.10.10.1 255.255.255.255 eq
23 192.168.1.0 255.255.255.0
```

Note Note: The ACE access-list vpnfilt-ra permit 10.10.10.1 255.255.255.255 192.168.1.0 255.255.255.0 eq 23 will allow the local network to initiate a connection to the Remote Access client on any TCP port if it uses a source port of 23. The ACE access-list vpnfilt-ra permit 10.10.10.1 255.255.255.255 eq 23 192.168.1.0 255.255.255.0 will allow the Remote Access client to initiate a connection to the local network on any TCP port if it uses a source port of 23.

In the next example, the vpn-filter is used with a LAN to LAN VPN connection. This example assumes that the remote network is 10.0.0.0/24 and the local network is 192.168.1.0/24.
The following ACE will allow remote network to telnet to the local network:

```
hostname(config-group-policy)# access-list vpnfilt-l2l permit 10.0.0.0 255.255.255.0
192.168.1.0 255.255.255.0 eq 23
```

The following ACE will allow the local network to telnet to the remote network:

```
hostname(config-group-policy)# access-list vpnfilt-l2l permit 10.0.0.0 255.255.255.0 eq 23
192.168.1.0 255.255.255.0
```

Note Note: The ACE access-list vpnfilt-l2l permit 10.0.0.0 255.255.255.0 192.168.1.0 255.255.255.0 eq 23 will allow the local network to initiate a connection to the remote network on any TCP port if it uses a source port of 23. The ACE access-list vpnfilt-l2l permit 10.0.0.0 255.255.255.0 eq 23 192.168.1.0 255.255.255.0 will allow the remote network to initiate a connection to the local network on any TCP port if it uses a source port of 23.

Step 6 Specify the VPN tunnel type for this group policy.

```
hostname(config-group-policy)# vpn-tunnel-protocol {webvpn | IPSec | l2tp-ipsec}
hostname(config-group-policy)#
```

The default is IPSec. To remove the attribute from the running configuration, enter the **no** form of this command.

```
hostname(config-group-policy)# no vpn-tunnel-protocol [webvpn | IPSec | l2tp-ipsec]
hostname(config-group-policy)#
```

The parameter values for this command follow:

- **IPSec**—Negotiates an IPSec tunnel between two peers (a remote access client or another secure gateway). Creates security associations that govern authentication, encryption, encapsulation, and key management.
- **webvpn**—Provides VPN services to remote users via an HTTPS-enabled web browser, and does not require a client.
- **l2tp-ipsec**—Negotiates an IPSec tunnel for an L2TP connection

Enter this command to configure one or more tunneling modes. You must configure at least one tunneling mode for users to connect over a VPN tunnel.

The following example shows how to configure the IPSec tunneling mode for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# vpn-tunnel-protocol IPSec
hostname(config-group-policy)#
```

Configuring Security Attributes

The attributes in this section specify certain security settings for the group:

Step 1 Specify whether to let users store their login passwords on the client system, using the **password-storage** command with the **enable** keyword in group-policy configuration mode. To disable password storage, use the **password-storage** command with the **disable** keyword.

```
hostname(config-group-policy)# password-storage {enable | disable}
hostname(config-group-policy)#
```

For security reasons, password storage is disabled by default. Enable password storage only on systems that you know to be in secure sites.

To remove the password-storage attribute from the running configuration, enter the **no** form of this command:

```
hostname(config-group-policy)# no password-storage
hostname(config-group-policy)#
```

Specifying the **no** form enables inheritance of a value for password-storage from another group policy.

This command does not apply to interactive hardware client authentication or individual user authentication for hardware clients.

The following example shows how to enable password storage for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# password-storage enable
hostname(config-group-policy)#
```

Step 2 Specify whether to enable IP compression, which is disabled by default.

```
hostname(config-group-policy)# ip-comp {enable | disable}
hostname(config-group-policy)#
```

To enable LZS IP compression, enter the **ip-comp** command with the **enable** keyword in group-policy configuration mode. To disable IP compression, enter the **ip-comp** command with the **disable** keyword.

To remove the **ip-comp** attribute from the running configuration, enter the **no** form of this command. This enables inheritance of a value from another group policy.

```
hostname(config-group-policy)# no ip-comp
hostname(config-group-policy)#
```

Enabling data compression might speed up data transmission rates for remote dial-in users connecting with modems.

Caution Data compression increases the memory requirement and CPU usage for each user session and consequently decreases the overall throughput of the ASA. For this reason, we recommend that you enable data compression only for remote users connecting with a modem. Design a group policy specific to modem users, and enable compression only for them.

Step 3 Specify whether to require that users reauthenticate on IKE rekey by using the **re-xauth** command with the **enable** keyword in group-policy configuration mode. If you enable reauthentication on IKE rekey, the ASA prompts the user to enter a username and password during initial Phase 1 IKE negotiation and also prompts for user authentication whenever an IKE rekey occurs. Reauthentication provides additional security.

If the configured rekey interval is very short, users might find the repeated authorization requests inconvenient. To avoid repeated authorization requests, disable reauthentication. To check the configured rekey interval, in monitoring mode, enter the **show crypto ipsec sa** command to view the security association lifetime in seconds and lifetime in kilobytes of data. To disable user reauthentication on IKE rekey, enter the **disable** keyword. Reauthentication on IKE rekey is disabled by default.

```
hostname(config-group-policy)# re-xauth {enable | disable}
hostname(config-group-policy)#
```

To enable inheritance of a value for reauthentication on IKE rekey from another group policy, remove the re-xauth attribute from the running configuration by entering the **no** form of this command.

```
hostname(config-group-policy)# no re-xauth
hostname(config-group-policy)#
```

Note Reauthentication fails if there is no user at the other end of the connection.

Step 4 Specify whether to restrict remote users to access only through the connection profile, using the **group-lock** command in group-policy configuration mode.

```
hostname(config-group-policy)# group-lock {value tunnel-grp-name | none}
hostname(config-group-policy)# no group-lock
hostname(config-group-policy)#
```

The *tunnel-grp-name* variable specifies the name of an existing connection profile that the ASA requires for the user to connect. Group-lock restricts users by checking if the group configured in the VPN client is the same as the connection profile to which the user is assigned. If it is not, the ASA prevents the user from connecting. If you do not configure group-lock, the ASA authenticates users without regard to the assigned group. Group locking is disabled by default.

To remove the **group-lock** attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value from another group policy.

To disable group-lock, enter the **group-lock** command with the **none** keyword. The none keyword sets group-lock to a null value, thereby allowing no group-lock restriction. It also prevents inheriting a group-lock value from a default or specified group policy

Step 5 Specify whether to enable perfect forward secrecy. In IPSec negotiations, perfect forward secrecy ensures that each new cryptographic key is unrelated to any previous key. A group policy can inherit a value for perfect forward secrecy from another group policy. Perfect forward secrecy is disabled by default. To enable perfect forward secrecy, use the **pfs** command with the **enable** keyword in group-policy configuration mode.

```
hostname(config-group-policy)# pfs {enable | disable}
hostname(config-group-policy)#
```

To disable perfect forward secrecy, enter the **pfs** command with the **disable** keyword.

To remove the perfect forward secrecy attribute from the running configuration and prevent inheriting a value, enter the **no** form of this command.

```
hostname(config-group-policy)# no pfs
hostname(config-group-policy)#
```

Configuring the Banner Message

Specify the banner, or welcome message, if any, that you want to display. The default is no banner. The message that you specify is displayed on remote clients when they connect. To specify a banner, enter the **banner** command in group-policy configuration mode. The banner text can be up to 510 characters long. Enter the “\n” sequence to insert a carriage return.

Note A carriage-return/line-feed included in the banner counts as two characters.

To delete a banner, enter the **no** form of this command. Be aware that using the **no** version of the command deletes all banners for the group policy.

A group policy can inherit this value from another group policy. To prevent inheriting a value, enter the **none** keyword instead of specifying a value for the banner string, as follows:

```
hostname(config-group-policy)# banner {value banner_string | none}
```

The following example shows how to create a banner for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# banner value Welcome to Cisco Systems 7.0.
```

Configuring IPSec-UDP Attributes

IPSec over UDP, sometimes called IPSec through NAT, lets a Cisco VPN client or hardware client connect via UDP to a ASA that is running NAT. It is disabled by default. IPSec over UDP is proprietary; it applies only to remote-access connections, and it requires mode configuration. The ASA exchanges configuration parameters with the client while negotiating SAs. Using IPSec over UDP may slightly degrade system performance.

To enable IPSec over UDP, configure the **ipsec-udp** command with the **enable** keyword in group-policy configuration mode, as follows:

```
hostname(config-group-policy)# ipsec-udp {enable | disable}
hostname(config-group-policy)# no ipsec-udp
```

To use IPSec over UDP, you must also configure the **ipsec-udp-port** command, as described below.

To disable IPSec over UDP, enter the **disable** keyword. To remove the IPSec over UDP attribute from the running configuration, enter the **no** form of this command. This enables inheritance of a value for IPSec over UDP from another group policy.

The Cisco VPN client must also be configured to use IPSec over UDP (it is configured to use it by default). The VPN 3002 requires no configuration to use IPSec over UDP.

The following example shows how to set IPSec over UDP for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# ipsec-udp enable
```

If you enabled IPSec over UDP, you must also configure the **ipsec-udp-port** command in group-policy configuration mode. This command sets a UDP port number for IPSec over UDP. In IPSec negotiations, the ASA listens on the configured port and forwards UDP traffic for that port even if other filter rules drop UDP traffic. The port numbers can range from 4001 through 49151. The default port value is 10000.

To disable the UDP port, enter the **no** form of this command. This enables inheritance of a value for the IPSec over UDP port from another group policy.

```
hostname(config-group-policy)# ipsec-udp-port port
```

The following example shows how to set an IPSec UDP port to port 4025 for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# ipsec-udp-port 4025
```

Configuring Split-Tunneling Attributes

Split tunneling lets a remote-access IPSec client conditionally direct packets over an IPSec tunnel in encrypted form or to a network interface in clear text form. With split tunneling enabled, packets not bound for destinations on the other side of the IPSec tunnel do not have to be encrypted, sent across the tunnel, decrypted, and then routed to a final destination. This command applies this split tunneling policy to a specific network.

Setting the Split-Tunneling Policy

Set the rules for tunneling traffic by specifying the split-tunneling policy:

```
hostname(config-group-policy)# split-tunnel-policy {tunnelall | tunnelspecified |
excludespecified}
hostname(config-group-policy)# no split-tunnel-policy
```

The default is to tunnel all traffic. To set a split tunneling policy, enter the **split-tunnel-policy** command in group-policy configuration mode. To remove the **split-tunnel-policy** attribute from the running configuration, enter the **no** form of this command. This enables inheritance of a value for split tunneling from another group policy.

The **excludespecified** keyword defines a list of networks to which traffic goes in the clear. This feature is useful for remote users who want to access devices on their local network, such as printers, while they are connected to the corporate network through a tunnel. This option applies only to the Cisco VPN client.

The **tunnelall** keyword specifies that no traffic goes in the clear or to any other destination than the ASA. This, in effect, disables split tunneling. Remote users reach Internet networks through the corporate network and do not have access to local networks. This is the default option.

The **tunnelspecified** keyword tunnels all traffic from or to the specified networks. This option enables split tunneling. It lets you create a network list of addresses to tunnel. Data to all other addresses travels in the clear and is routed by the remote user's Internet service provider.

Note Split tunneling is primarily a traffic management feature, not a security feature. For optimum security, we recommend that you do not enable split tunneling.

The following example shows how to set a split tunneling policy of tunneling only specified networks for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# split-tunnel-policy tunnelspecified
```

Creating a Network List for Split-Tunneling

Create a network list for split tunneling using the **split-tunnel-network-list** command in group-policy configuration mode.

```
hostname(config-group-policy)# split-tunnel-network-list {value access-list_name | none}
hostname(config-group-policy)# no split-tunnel-network-list value [access-list_name]
```

Split tunneling network lists distinguish networks that require traffic to travel across the tunnel from those that do not require tunneling. The ASA makes split tunneling decisions on the basis of a network list, which is an ACL that consists of a list of addresses on the private network. Only standard-type ACLs are allowed.

If you use extended ACLs, the source network determines the split-tunneling network. The destination network is ignored. In addition, because *any* is not an actual IP address or network address, do not use the term for the source in the ACL.

The **value** *access-list name* parameter identifies an access list that enumerates the networks to tunnel or not tunnel.

The **none** keyword indicates that there is no network list for split tunneling; the ASA tunnels all traffic. Specifying the **none** keyword sets a split tunneling network list with a null value, thereby disallowing split tunneling. It also prevents inheriting a default split tunneling network list from a default or specified group policy.

To delete a network list, enter the **no** form of this command. To delete all split tunneling network lists, enter the **no split-tunnel-network-list** command without arguments. This command deletes all configured network lists, including a null list if you created one by entering the **none** keyword.

When there are no split tunneling network lists, users inherit any network lists that exist in the default or specified group policy. To prevent users from inheriting such network lists, enter the **split-tunnel-network-list none** command.

The following example shows how to set a network list called FirstList for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# split-tunnel-network-list FirstList
```

Configuring Domain Attributes for Tunneling

You can specify a default domain name for tunneled packets or a list of domains to be resolved through the split tunnel. The following sections describe how to set these domains.

Defining a Default Domain Name for Tunneled Packets

The ASA passes the default domain name to the IPSec client to append to DNS queries that omit the domain field. When there are no default domain names, users inherit the default domain name in the default group policy. To specify the default domain name for users of the group policy, enter the **default-domain** command in group-policy configuration mode. To delete a domain name, enter the **no** form of this command.

```
hostname(config-group-policy)# default-domain {value domain-name | none}
hostname(config-group-policy)# no default-domain [domain-name]
```

The **value** *domain-name* parameter identifies the default domain name for the group. To specify that there is no default domain name, enter the **none** keyword. This command sets a default domain name with a null value, which disallows a default domain name and prevents inheriting a default domain name from a default or specified group policy.

To delete all default domain names, enter the **no default-domain** command without arguments. This command deletes all configured default domain names, including a null list if you created one by entering the **default-domain** command with the **none** keyword. The **no** form allows inheriting a domain name.

The following example shows how to set a default domain name of FirstDomain for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# default-domain value FirstDomain
```

Defining a List of Domains for Split Tunneling

Enter a list of domains to be resolved through the split tunnel. Enter the **split-dns** command in group-policy configuration mode. To delete a list, enter the **no** form of this command.

Note The AnyConnect client does not support split DNS.

When there are no split tunneling domain lists, users inherit any that exist in the default group policy. To prevent users from inheriting such split tunneling domain lists, enter the **split-dns** command with the **none** keyword.

To delete all split tunneling domain lists, enter the **no split-dns** command without arguments. This deletes all configured split tunneling domain lists, including a null list created by issuing the **split-dns** command with the **none** keyword.

The parameter **value** *domain-name* provides a domain name that the ASA resolves through the split tunnel. The **none** keyword indicates that there is no split DNS list. It also sets a split DNS list with a null value, thereby disallowing a split DNS list, and prevents inheriting a split DNS list from a default or specified group policy. The syntax of the command is as follows:

```
hostname(config-group-policy)# split-dns {value domain-name1 [domain-name2...
domain-nameN] | none}
hostname(config-group-policy)# no split-dns [domain-name domain-name2 domain-nameN]
```

Enter a single space to separate each entry in the list of domains. There is no limit on the number of entries, but the entire string can be no longer than 255 characters. You can use only alphanumeric characters, hyphens (-), and periods (.). If the default domain name is to be resolved through the tunnel, you must explicitly include that name in this list.

The following example shows how to configure the domains Domain1, Domain2, Domain3, and Domain4 to be resolved through split tunneling for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# split-dns value Domain1 Domain2 Domain3 Domain4
```

Configuring DHCP Intercept

A Microsoft XP anomaly results in the corruption of domain names if split tunnel options exceed 255 bytes. To avoid this problem, the ASA limits the number of routes it sends to 27 to 40 routes, with the number of routes dependent on the classes of the routes.

DHCP Intercept lets Microsoft Windows XP clients use split-tunneling with the ASA. The ASA replies directly to the Microsoft Windows XP client DHCP Inform message, providing that client with the subnet mask, domain name, and classless static routes for the tunnel IP address. For Windows clients prior to Windows XP, DHCP Intercept provides the domain name and subnet mask. This is useful in environments in which using a DHCP server is not advantageous.

The **intercept-dhcp** command enables or disables DHCP intercept. The syntax of this command is as follows:

[no] intercept-dhcp

```
hostname(config-group-policy)# intercept-dhcp netmask {enable | disable}
hostname(config-group-policy)#
```

The *netmask* variable provides the subnet mask for the tunnel IP address. The **no** version of the command removes the DHCP intercept from the configuration.

The following example shows how to set DHCP Intercepts for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# intercept-dhcp enable
```

Configuring Attributes for VPN Hardware Clients

The commands in this section enable or disable secure unit authentication and user authentication, and set a user authentication timeout value for VPN hardware clients. They also let you allow Cisco IP phones and LEAP packets to bypass individual user authentication and allow hardware clients using Network Extension Mode to connect.

Configuring Secure Unit Authentication

Secure unit authentication provides additional security by requiring VPN hardware clients to authenticate with a username and password each time that the client initiates a tunnel. With this feature enabled, the hardware client does not have a saved username and password. Secure unit authentication is disabled by default.

Note With this feature enabled, to bring up a VPN tunnel, a user must be present to enter the username and password.

Secure unit authentication requires that you have an authentication server group configured for the connection profile the hardware client(s) use. If you require secure unit authentication on the primary ASA, be sure to configure it on any backup servers as well.

Specify whether to enable secure unit authentication by entering the **secure-unit-authentication** command with the **enable** keyword in group-policy configuration mode.

```
hostname(config-group-policy)# secure-unit-authentication {enable | disable}
hostname(config-group-policy)# no secure-unit-authentication
```

To disable secure unit authentication, enter the **disable** keyword. To remove the secure unit authentication attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value for secure unit authentication from another group policy.

The following example shows how to enable secure unit authentication for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# secure-unit-authentication enable
```

Configuring User Authentication

User authentication is disabled by default. When enabled, user authentication requires that individual users behind a hardware client authenticate to gain access to the network across the tunnel. Individual users authenticate according to the order of authentication servers that you configure.

Specify whether to enable user authentication by entering the **user-authentication** command with the **enable** keyword in group-policy configuration mode.

```
hostname(config-group-policy)# user-authentication {enable | disable}
hostname(config-group-policy)# no user-authentication
```

To disable user authentication, enter the **disable** keyword. To remove the user authentication attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value for user authentication from another group policy.

If you require user authentication on the primary ASA, be sure to configure it on any backup servers as well.

The following example shows how to enable user authentication for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# user-authentication enable
```

Configuring an Idle Timeout

Set an idle timeout for individual users behind hardware clients by entering the **user-authentication-idle-timeout** command in group-policy configuration mode. If there is no communication activity by a user behind a hardware client in the idle timeout period, the ASA terminates the client's access:

```
hostname(config-group-policy)# user-authentication-idle-timeout {minutes | none}
hostname(config-group-policy)# no user-authentication-idle-timeout
```

Note This timer terminates only the client's access through the VPN tunnel, not the VPN tunnel itself.

The idle timeout indicated in response to the **show uauth** command is always the idle timeout value of the user who authenticated the tunnel on the Cisco Easy VPN remote device.

The *minutes* parameter specifies the number of minutes in the idle timeout period. The minimum is 1 minute, the default is 30 minutes, and the maximum is 35791394 minutes.

To delete the idle timeout value, enter the **no** form of this command. This option allows inheritance of an idle timeout value from another group policy.

To prevent inheriting an idle timeout value, enter the **user-authentication-idle-timeout** command with the **none** keyword. This command sets the idle timeout with a null value, which disallows an idle timeout and prevents inheriting an user authentication idle timeout value from a default or specified group policy.

The following example shows how to set an idle timeout value of 45 minutes for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# user-authentication-idle-timeout 45
```

Configuring IP Phone Bypass

You can allow Cisco IP phones to bypass individual user authentication behind a hardware client. To enable IP Phone Bypass, enter the **ip-phone-bypass** command with the **enable** keyword in group-policy configuration mode. IP Phone Bypass lets IP phones behind hardware clients connect without undergoing user authentication processes. IP Phone Bypass is disabled by default. If enabled, secure unit authentication remains in effect.

To disable IP Phone Bypass, enter the **disable** keyword. To remove the IP phone Bypass attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value for IP Phone Bypass from another group policy:

```
hostname(config-group-policy)# ip-phone-bypass {enable | disable}
hostname(config-group-policy)# no ip-phone-bypass
```

Note You must configure mac-exempt to exempt the clients from authentication. Refer to the "Configuring Device Pass-Through" section on page 68-8 for more information.

Configuring LEAP Bypass

When LEAP Bypass is enabled, LEAP packets from wireless devices behind a VPN 3002 hardware client travel across a VPN tunnel prior to user authentication. This action lets workstations using Cisco wireless access point devices establish LEAP authentication and then authenticate again per user authentication. LEAP Bypass is disabled by default.

To allow LEAP packets from Cisco wireless access points to bypass individual users authentication, enter the **leap-bypass** command with the **enable** keyword in group-policy configuration mode. To disable LEAP Bypass, enter the **disable** keyword. To remove the LEAP Bypass attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value for LEAP Bypass from another group policy:

```
hostname(config-group-policy)# leap-bypass {enable | disable}
hostname(config-group-policy)# no leap-bypass
```

Note IEEE 802.1X is a standard for authentication on wired and wireless networks. It provides wireless LANs with strong mutual authentication between clients and authentication servers, which can provide dynamic per-user, per session wireless encryption privacy (WEP) keys, removing administrative burdens and security issues that are present with static WEP keys.

Cisco Systems has developed an 802.1X wireless authentication type called Cisco LEAP. LEAP (Lightweight Extensible Authentication Protocol) implements mutual authentication between a wireless client on one side of a connection and a RADIUS server on the other side. The credentials used for authentication, including a password, are always encrypted before they are transmitted over the wireless medium.

Cisco LEAP authenticates wireless clients to RADIUS servers. It does not include RADIUS accounting services.

This feature does not work as intended if you enable interactive hardware client authentication.

Caution There might be security risks to your network in allowing any unauthenticated traffic to traverse the tunnel.

The following example shows how to set LEAP Bypass for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# leap-bypass enable
```

Enabling Network Extension Mode

Network extension mode lets hardware clients present a single, routable network to the remote private network over the VPN tunnel. IPSec encapsulates all traffic from the private network behind the hardware client to networks behind the ASA. PAT does not apply. Therefore, devices behind the ASA have direct access to devices on the private network behind the hardware client over the tunnel, and only over the tunnel, and vice versa. The hardware client must initiate the tunnel, but after the tunnel is up, either side can initiate data exchange.

Enable network extension mode for hardware clients by entering the **nem** command with the **enable** keyword in group-policy configuration mode:

```
hostname(config-group-policy)# nem {enable | disable}
hostname(config-group-policy)# no nem
```

To disable NEM, enter the **disable** keyword. To remove the NEM attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value from another group policy.

The following example shows how to set NEM for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# nem enable
```

Configuring Backup Server Attributes

Configure backup servers if you plan on using them. IPSec backup servers let a VPN client connect to the central site when the primary ASA is unavailable.When you configure backup servers, the ASA pushes the server list to the client as the IPSec tunnel is established. Backup servers do not exist until you configure them, either on the client or on the primary ASA.

Configure backup servers either on the client or on the primary ASA. If you configure backup servers on the ASA, it pushes the backup server policy to the clients in the group, replacing the backup server list on the client if one is configured.

Note If you are using hostnames, it is wise to have backup DNS and WINS servers on a separate network from that of the primary DNS and WINS servers. Otherwise, if clients behind a hardware client obtain DNS and WINS information from the hardware client via DHCP, and the connection to the primary server is lost, and the backup servers have different DNS and WINS information, clients cannot be updated until the DHCP lease expires. In addition, if you use hostnames and the DNS server is unavailable, significant delays can occur.

To configure backup servers, enter the **backup-servers** command in group-policy configuration mode:

```
hostname(config-group-policy)# backup-servers {server1 server2... server10 |
clear-client-config | keep-client-config}
```

To remove a backup server, enter the **no** form of this command with the backup server specified. To remove the backup-servers attribute from the running configuration and enable inheritance of a value for backup-servers from another group policy, enter the **no** form of this command without arguments.

```
hostname(config-group-policy)# no backup-servers [server1 server2... server10 |
clear-client-config | keep-client-config]
```

The **clear-client-config** keyword specifies that the client uses no backup servers. The ASA pushes a null server list.

The **keep-client-config** keyword specifies that the ASA sends no backup server information to the client. The client uses its own backup server list, if configured. This is the default.

The *server1 server 2.... server10* parameter list is a space-delimited, priority-ordered list of servers for the VPN client to use when the primary ASA is unavailable. This list identifies servers by IP address or hostname. The list can be 500 characters long, and it can contain up to10 entries.

The following example shows how to configure backup servers with IP addresses 10.10.10.1 and 192.168.10.14, for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# backup-servers 10.10.10.1 192.168.10.14
```

Configuring Microsoft Internet Explorer Client Parameters

The following commands configure the proxy server parameters for a Microsoft Internet Explorer client.

Step 1 Configure a Microsoft Internet Explorer browser proxy server and port for a client PC by entering the **msie-proxy server** command in group-policy configuration mode:

```
hostname(config-group-policy)# msie-proxy server {value server[:port] | none}
hostname(config-group-policy)#
```

The default value is **none**. To remove the attribute from the configuration, use the **no** form of the command.

```
hostname(config-group-policy)# no msie-proxy server
hostname(config-group-policy)#
```

The line containing the proxy server IP address or hostname and the port number must be less than 100 characters long.

The following example shows how to configure the IP address 192.168.10.1 as a Microsoft Internet Explorer proxy server, using port 880, for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# msie-proxy server value 192.168.21.1:880
hostname(config-group-policy)#
```

Step 2 Configure the Microsoft Internet Explorer browser proxy actions ("methods") for a client PC by entering the **msie-proxy method** command in group-policy configuration mode.

```
hostname(config-group-policy)# msie-proxy method [auto-detect | no-modify | no-proxy |
use-server]
hostname(config-group-policy)#
```

The default value is **use-server**. To remove the attribute from the configuration, use the **no** form of the command.

```
hostname(config-group-policy)# no msie-proxy method [auto-detect |no-modify | no-proxy |
use-server]
hostname(config-group-policy)#
```

The available methods are as follows:

- **auto-detect**—Enables the use of automatic proxy server detection in Internet Explorer for the client PC.
- **no-modify**—Leaves the HTTP browser proxy server setting in Internet Explorer unchanged for this client PC.
- **no-proxy—**Disables the HTTP proxy setting in Internet Explorer for the client PC.
- **use-server—**Sets the HTTP proxy server setting in Internet Explorer to use the value configured in the **msie-proxy server** command.

The line containing the proxy server IP address or hostname and the port number must be less than 100 characters long.

The following example shows how to configure auto-detect as the Microsoft Internet Explorer proxy setting for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# msie-proxy method auto-detect
hostname(config-group-policy)#
```

The following example configures the Microsoft Internet Explorer proxy setting for the group policy named FirstGroup to use the server QAserver, port 1001 as the server for the client PC:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# msie-proxy server QAserver:port 1001
hostname(config-group-policy)# msie-proxy method use-server
hostname(config-group-policy)#
```

Step 3 Configure Microsoft Internet Explorer browser proxy exception list settings for a local bypass on the client PC by entering the **msie-proxy except-list** command in group-policy configuration mode. These addresses are not accessed by a proxy server. This list corresponds to the Exceptions box in the Proxy Settings dialog box in Internet Explorer.

```
hostname(config-group-policy)# msie-proxy except-list {value server[:port] | none}
hostname(config-group-policy)#
```

To remove the attribute from the configuration, use the **no** form of the command.

```
hostname(config-group-policy)# no msie-proxy except-list
hostname(config-group-policy)#
```

- **value** *server:port*—Specifies the IP address or name of an MSIE server and port that is applied for this client PC. The port number is optional.
- **none—**Indicates that there is no IP address/hostname or port and prevents inheriting an exception list.

By default, msie-proxy except-list is disabled.

The line containing the proxy server IP address or hostname and the port number must be less than 100 characters long.

The following example shows how to set a Microsoft Internet Explorer proxy exception list, consisting of the server at IP address 192.168.20.1, using port 880, for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# msie-proxy except-list value 192.168.20.1:880
hostname(config-group-policy)#
```

Step 4 Enable or disable Microsoft Internet Explorer browser proxy local-bypass settings for a client PC by entering the **msie-proxy local-bypass** command in group-policy configuration mode.

```
hostname(config-group-policy)# msie-proxy local-bypass {enable | disable}
hostname(config-group-policy)#
```

To remove the attribute from the configuration, use the **no** form of the command.

```
hostname(config-group-policy)# no msie-proxy local-bypass {enable | disable}
hostname(config-group-policy)#
```

By default, msie-proxy local-bypass is disabled.

The following example shows how to enable Microsoft Internet Explorer proxy local-bypass for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# msie-proxy local-bypass enable
hostname(config-group-policy)#
```

Configuring Network Admission Control Parameters

The group-policy NAC commands in this section all have default values. Unless you have a good reason for changing them, accept the default values for these parameters.

The security appliance uses Extensible Authentication Protocol (EAP) over UDP (EAPoUDP) messaging to validate the posture of remote hosts. Posture validation involves the checking of a remote host for compliancy with safety requirements before the assignment of a network access policy. An Access Control Server must be configured for Network Admission Control before you configure NAC on the security appliance.

The Access Control Server downloads the posture token, an informational text string configurable on the ACS, to the security appliance to aid in system monitoring, reporting, debugging, and logging. A typical posture token is Healthy, Checkup, Quarantine, Infected, or Unknown. Following posture validation or clientless authentication, the ACS downloads the access policy for the session to the security appliance.

The following parameters let you configure Network Admission Control settings for the default group policy or an alternative group policy.

Step 1 (*Optional*) Configure the status query timer period. The security appliance starts the status query timer after each successful posture validation and status query response. The expiration of this timer triggers a query for changes in the host posture, referred to as a status query. Enter the number of seconds in the range 30 through 1800. The default setting is 300.

To specify the interval between each successful posture validation in a Network Admission Control session and the next query for changes in the host posture, use the **nac-sq-period** command in group-policy configuration mode:

```
hostname(config-group-policy)# nac-sq-period seconds
hostname(config-group-policy)#
```

To inherit the value of the status query timer from the default group policy, access the alternative group policy from which to inherit it, then use the **no** form of this command:

```
hostname(config-group-policy)# no nac-sq-period [seconds]
hostname(config-group-policy)#
```

The following example changes the value of the status query timer to 1800 seconds:

```
hostname(config-group-policy)# nac-sq-period 1800
hostname(config-group-policy)
```

The following example inherits the value of the status query timer from the default group policy:

```
hostname(config-group-policy)# no nac-sq-period
hostname(config-group-policy)#
```

Step 2 (*Optional*) Configure the NAC revalidation period. The security appliance starts the revalidation timer after each successful posture validation. The expiration of this timer triggers the next unconditional posture validation. The security appliance maintains posture validation during revalidation. The default group policy becomes effective if the Access Control Server is unavailable during posture validation or revalidation. Enter the interval in seconds between each successful posture validation. The range is 300 through 86400. The default setting is 36000.

To specify the interval between each successful posture validation in a Network Admission Control session, use the **nac-reval-period** command in group-policy configuration mode:

```
hostname(config-group-policy)# nac-reval-period seconds
hostname(config-group-policy)#
```

To inherit the value of the Revalidation Timer from the default group policy, access the alternative group policy from which to inherit it, then use the **no** form of this command:

```
hostname(config-group-policy)# no nac-reval-period [seconds]
hostname(config-group-policy)#
```

The following example changes the revalidation timer to 86400 seconds:

```
hostname(config-group-policy)# nac-reval-period 86400
hostname(config-group-policy)
```

The following example inherits the value of the revalidation timer from the default group policy:

```
hostname(config-group-policy)# no nac-reval-period
hostname(config-group-policy)#
```

Step 3 (*Optional*) Configure the default ACL for NAC. The security appliance applies the security policy associated with the selected ACL if posture validation fails. Specify **none** or an extended ACL. The default setting is **none**. If the setting is **none** and posture validation fails, the security appliance applies the default group policy.

To specify the ACL to be used as the default ACL for Network Admission Control sessions that fail posture validation, use the **nac-default-acl** command in group-policy configuration mode:

```
hostname(config-group-policy)# nac-default-acl {acl-name | none}
hostname(config-group-policy)#
```

To inherit the ACL from the default group policy, access the alternative group policy from which to inherit it, then use the **no** form of this command:

```
hostname(config-group-policy)# no nac-default-acl [acl-name | none]
hostname(config-group-policy)#
```

The elements of this command are as follows:

- *acl-name*—Specifies the name of the posture validation server group, as configured on the ASA using the **aaa-server host** command. The name must match the server-tag variable specified in that command.
- **none—**Disables inheritance of the ACL from the default group policy and does not apply an ACL to NAC sessions that fail posture validation.

Because NAC is disabled by default, VPN traffic traversing the ASA is not subject to the NAC Default ACL until NAC is enabled.

The following example identifies acl-1 as the ACL to be applied when posture validation fails:

```
hostname(config-group-policy)# nac-default-acl acl-1
hostname(config-group-policy)
```

The following example inherits the ACL from the default group policy:

```
hostname(config-group-policy)# no nac-default-acl
hostname(config-group-policy)
```

The following example disables inheritance of the ACL from the default group policy and does not apply an ACL to NAC sessions that fail posture validation:

```
hostname(config-group-policy)# nac-default-acl none
hostname(config-group-policy)#
```

Step 4 Configure NAC exemptions for VPN. By default, the exemption list is empty.The default value of the filter attribute is **none**. Enter the **vpn-nac-exempt** once for each operating system (and ACL) to be matched to exempt remote hosts from posture validation.

To add an entry to the list of remote computer types that are exempt from posture validation, use the **vpn-nac-exempt** command in group-policy configuration mode.

```
hostname(config-group-policy)# vpn-nac-exempt os "os name" [filter {acl-name | none}]
[disable]
hostname(config-group-policy)#
```

To disable inheritance and specify that all hosts are subject to posture validation, use the **none** keyword immediately following **vpn-nac-exempt**.

```
hostname(config-group-policy)# vpn-nac-exempt none
hostname(config-group-policy)#
```

To remove an entry from the exemption list, use the **no** form of this command and name the operating system (and ACL) in the entry to be removed.

```
hostname(config-group-policy)# no vpn-nac-exempt [os "os name"] [filter {acl-name | none}]
[disable]
hostname(config-group-policy)#
```

To remove all entries from the exemption list associated with this group policy and inherit the list from the default group policy, use the **no** form of this command without specifying additional keywords.

```
hostname(config-group-policy)# no vpn-nac-exempt
hostname(config-group-policy)#
```

The syntax elements for these commands are as follows:

- *acl-name*—Name of the ACL present in the ASA configuration.
- **disable—**Disables the entry in the exemption list without removing it from the list.
- **filter**—(*Optional*) filter to apply an ACL to filter the traffic if the computer matches the os name.
- **none—**When entered immediately after **vpn-nac-exempt**, this keyword disables inheritance and specifies that all hosts will be subject to posture validation.When entered immediately after **filter**, this keyword indicates that the entry does not specify an ACL.
- **OS—**Exempts an operating system from posture validation.
- *os name*—Operating system name. Quotation marks are required only if the name includes a space (for example, “Windows XP”).

The following example adds all hosts running Windows XP to the list of computers that are exempt from posture validation:

```
hostname(config-group-policy)# vpn-nac-exempt os "Windows XP"
hostname(config-group-policy)
```

The following example exempts all hosts running Windows 98 that match an ACE in the ACL named acl-1:

```
hostname(config-group-policy)# vpn-nac-exempt os "Windows 98" filter acl-1
hostname(config-group-policy)
```

The following example adds the same entry to the exemption list, but disables it:

```
hostname(config-group-policy)# vpn-nac-exempt os "Windows 98" filter acl-1 disable
hostname(config-group-policy)
```

The following example removes the same entry from the exemption list, regardless of whether it is disabled:

```
hostname(config-group-policy)# no vpn-nac-exempt os "Windows 98" filter acl-1
hostname(config-group-policy)
```

The following example disables inheritance and specifies that all hosts will be subject to posture validation:

```
hostname(config-group-policy)# no vpn-nac-exempt none
hostname(config-group-policy)
```

The following example removes all entries from the exemption list:

```
hostname(config-group-policy)# no vpn-nac-exempt
hostname(config-group-policy)
```

Step 5 Enable or disable Network Admission Control by entering the following command:

```
hostname(config-group-policy)# nac {enable | disable}
hostname(config-group-policy)#
```

To inherit the NAC setting from the default group policy, access the alternative group policy from which to inherit it, then use the **no** form of this command:

```
hostname(config-group-policy)# no nac [enable | disable]
hostname(config-group-policy)#
```

By default, NAC is disabled. Enabling NAC requires posture validation for remote access. If the remote computer passes the validation checks, the ACS server downloads the access policy for the ASA to enforce. NAC is disabled by default.

An Access Control Server must be present on the network.

The following example enables NAC for the group policy:

```
hostname(config-group-policy)# nac enable
hostname(config-group-policy)#
```

Configuring Address Pools

Configure a list of address pools for allocating addresses to remote clients by entering the **address-pools** command in group-policy attributes configuration mode:

```
hostname(config-group-policy)# address-pools value address_pool1 [...address_pool6]
hostname(config-group-policy)#
```

The address-pools settings in this command override the local pool settings in the group. You can specify a list of up to six local address pools to use for local address allocation.

The order in which you specify the pools is significant. The ASA allocates addresses from these pools in the order in which the pools appear in this command.

To remove the attribute from the group policy and enable inheritance from other sources of group policy, use the **no** form of this command:

```
hostname(config-group-policy)# no address-pools value address_pool1 [...address_pool6]
hostname(config-group-policy)#
```

The command **address-pools none** disables this attribute from being inherited from other sources of policy, such as the DefaultGrpPolicy:

```
hostname(config-group-policy)# address-pools none
hostname(config-group-policy)#
```

The command **no address pools none** removes the **address-pools none** command from the configuration, restoring the default value, which is to allow inheritance.

```
hostname(config-group-policy)# no address-pools none
hostname(config-group-policy)#
```

The syntax elements of this command are as follows:

- *address_pool*—Specifies the name of the address pool configured with the **ip local pool** command. You can specify up to 6 local address pools.
- **none—**Specifies that no address pools are configured and disables inheritance from other sources of group policy.
- **value—**Specifies a list of up to 6 address pools from which to assign addresses.

The following example entered in config-general configuration mode, configures pool 1 and pool20 as lists of address pools to use for allocating addresses to remote clients for GroupPolicy1:

```
hostname(config)# ip local pool pool 192.168.10.1-192.168.10.100 mask 255.255.0.0
hostname(config)# ip local pool pool20 192.168.20.1-192.168.20.200 mask 255.255.0.0
hostname(config)# group-policy GroupPolicy1 attributes
hostname(config-group-policy)# address-pools value pool1 pool20
hostname(config-group-policy)#
```

Configuring Firewall Policies

A *firewall* isolates and protects a computer from the Internet by inspecting each inbound and outbound individual packet of data to determine whether to allow or drop it. Firewalls provide extra security if remote users in a group have split tunneling configured. In this case, the firewall protects the user's PC, and thereby the corporate network, from intrusions by way of the Internet or the user's local LAN. Remote users connecting to the ASA with the VPN client can choose the appropriate firewall option.

Set personal firewall policies that the ASA pushes to the VPN client during IKE tunnel negotiation by using the **client-firewall** command in group-policy configuration mode. To delete a firewall policy, enter the **no** form of this command.

To delete all firewall policies, enter the **no client-firewall** command without arguments. This command deletes all configured firewall policies, including a null policy if you created one by entering the **client-firewall** command with the **none** keyword.

When there are no firewall policies, users inherit any that exist in the default or other group policy. To prevent users from inheriting such firewall policies, enter the **client-firewall** command with the **none** keyword.

The Add or Edit Group Policy window, Client Firewall tab, lets you configure firewall settings for VPN clients for the group policy being added or modified.

Note Only VPN clients running Microsoft Windows can use these firewall features. They are currently not available to hardware clients or other (non-Windows) software clients.

In the first scenario, a remote user has a personal firewall installed on the PC. The VPN client enforces firewall policy defined on the local firewall, and it monitors that firewall to make sure it is running. If the firewall stops running, the VPN client drops the connection to the ASA. (This firewall enforcement mechanism is called *Are You There (AYT)*, because the VPN client monitors the firewall by sending it periodic "are you there?" messages; if no reply comes, the VPN client knows the firewall is down and terminates its connection to the ASA.) The network administrator might configure these PC firewalls originally, but with this approach, each user can customize his or her own configuration.

In the second scenario, you might prefer to enforce a centralized firewall policy for personal firewalls on VPN client PCs. A common example would be to block Internet traffic to remote PCs in a group using split tunneling. This approach protects the PCs, and therefore the central site, from intrusions from the Internet while tunnels are established. This firewall scenario is called *push policy* or *Central Protection Policy (CPP)*. On the ASA, you create a set of traffic management rules to enforce on the VPN client, associate those rules with a filter, and designate that filter as the firewall policy. The ASA pushes this policy down to the VPN client. The VPN client then in turn passes the policy to the local firewall, which enforces it.

Supporting a Zone Labs Integrity Server

This section introduces the Zone Labs Integrity Server, also called Check Point Integrity Server, and presents an example procedure for configuring the ASA to support the Zone Labs Integrity Server. The Integrity server is a central management station for configuring and enforcing security policies on remote PCs. If a remote PC does not conform to the security policy dictated by the Integrity Server, it will not be granted access to the private network protected by the Integrity Server and ASA.

This section includes the following topics:

- Overview of Integrity Server and Security Appliance Interaction, page 64-64
- Configuring Integrity Server Support, page 64-65

Overview of Integrity Server and Security Appliance Interaction

The VPN client software and the Integrity client software are co-resident on a remote PC. The following steps summarize the actions of the remote PC, ASA, and Integrity server in the establishment of a session between the PC and the enterprise private network:

1. The VPN client software (residing on the same remote PC as the Integrity client software) connects to the ASA and tells the ASA what type of firewall client it is.
2. Once it approves the client firewall type, the ASA passes Integrity server address information back to the Integrity client.
3. With the ASA acting as a proxy, the Integrity client establishes a restricted connection with the Integrity server. A restricted connection is only between the Integrity client and server.
4. The Integrity server determines if the Integrity client is in compliance with the mandated security policies. If the client is in compliance with security policies, the Integrity server instructs the ASA to open the connection and provide the client with connection details.
5. On the remote PC, the VPN client passes connection details to the Integrity client and signals that policy enforcement should begin immediately and the client can no enter the private network.
6. Once the connection is established, the server continues to monitor the state of the client using client heartbeat messages.

Note The current release of the security appliance supports one Integrity Server at a time even though the user interfaces support the configuration of up to five Integrity Servers. If the active Server fails, configure another Integrity Server on the ASA and then reestablish the client VPN session.

Configuring Integrity Server Support

This section describes an example procedure for configuring the ASA to support the Zone Labs Integrity Servers. The procedure involves configuring address, port, connection fail timeout and fail states, and SSL certificate parameters.

First, you must configure the hostname or IP address of the Integrity server. The following example commands, entered in global configuration mode, configure an Integrity server using the IP address 10.0.0.5. They also specify port 300 (the default port is 5054) and the inside interface for communications with the Integrity server.

```
hostname(config)# zonelabs-integrity server-address 10.0.0.5
hostname(config)# zonelabs-integrity port 300
hostname(config)# zonelabs-integrity interface inside
hostname(config)#
```

If the connection between the ASA and the Integrity server fails, the VPN client connections remain open by default so that the enterprise VPN is not disrupted by the failure of an Integrity server. However, you may want to close the VPN connections if the Zone Labs Integrity Server fails. The following commands ensure that the ASA waits 12 seconds for a response from either the active or standby Integrity servers before declaring an the Integrity server as failed and closing the VPN client connections:

```
hostname(config)# zonelabs-integrity fail-timeout 12
hostname(config)# zonelabs-integrity fail-close
hostname(config)#
```

The following command returns the configured VPN client connection fail state to the default and ensures the client connections remain open:

```
hostname(config)# zonelabs-integrity fail-open
hostname(config)#
```

The following example commands specify that the Integrity server connects to port 300 (default is port 80) on the ASA to request the server SSL certificate. While the server SSL certificate is always authenticated, these commands also specify that the client SSL certificate of the Integrity server be authenticated.

```
hostname(config)# zonelabs-integrity ssl-certificate-port 300
hostname(config)# zonelabs-integrity ssl-client-authentication
hostname(config)#
```

To set the firewall client type to the Zone Labs Integrity type, use the **client-firewall** command as described in the "Configuring Firewall Policies" section on page 64-63. The command arguments that specify firewall policies are not used when the firewall type is **zonelabs-integrity** because the Integrity server determines the policies.

Setting Up Client Firewall Parameters

Enter the following commands to set the appropriate client firewall parameters. You can configure only one instance of each command. Table 64-4 lists the syntax elements of these commands:

Cisco Integrated Firewall

```
hostname(config-group-policy)# client-firewall {opt | req} cisco-integrated acl-in ACL
acl-out ACL
```

Cisco Security Agent

```
hostname(config-group-policy)# client-firewall {opt | req} cisco-security-agent
```

No Firewall

```
hostname(config-group-policy)# client-firewall none
```

Custom Firewall

```
hostname(config-group-policy)# client-firewall {opt | req} custom vendor-id num product-id
num policy {AYT | CPP acl-in ACL acl-out ACL} [description string]
```

Zone Labs Firewalls

```
hostname(config-group-policy)# client-firewall {opt | req} zonelabs-integrity
```

Note When the firewall type is **zonelabs-integrity**, do not include arguments. The Zone Labs Integrity Server determines the policies.

```
hostname(config-group-policy)# client-firewall {opt | req} zonelabs-zonealarm policy {AYT
| CPP acl-in ACL acl-out ACL}
```

```
hostname(config-group-policy)# client-firewall {opt | req} zonelabs-zonealarmorpro policy
{AYT | CPP acl-in ACL acl-out ACL}
```

```
client-firewall {opt | req} zonelabs-zonealarmpro policy {AYT | CPP acl-in ACL acl-out
ACL}
```

Sygate Personal Firewalls

```
hostname(config-group-policy)# client-firewall {opt | req} sygate-personal
```

```
hostname(config-group-policy)# client-firewall {opt | req} sygate-personal-pro
```

```
hostname(config-group-policy)# client-firewall {opt | req} sygate-security-agent
```

Network Ice, Black Ice Firewall:

```
hostname(config-group-policy)# client-firewall {opt | req} networkice-blackice
```

Table 64-4 client-firewall Command Keywords and Variables

Parameter	Description
acl-in *ACL*	Provides the policy the client uses for inbound traffic.
acl-out *ACL*	Provides the policy the client uses for outbound traffic.
AYT	Specifies that the client PC firewall application controls the firewall policy. The ASA checks to make sure that the firewall is running. It asks, "Are You There?" If there is no response, the ASA tears down the tunnel.

Table 64-4 client-firewall Command Keywords and Variables

cisco-integrated	Specifies Cisco Integrated firewall type.
cisco-security-agent	Specifies Cisco Intrusion Prevention Security Agent firewall type.
CPP	Specifies Policy Pushed as source of the VPN client firewall policy.
custom	Specifies Custom firewall type.
description *string*	Describes the firewall.
networkice-blackice	Specifies Network ICE Black ICE firewall type.
none	Indicates that there is no client firewall policy. Sets a firewall policy with a null value, thereby disallowing a firewall policy. Prevents inheriting a firewall policy from a default or specified group policy.
opt	Indicates an optional firewall type.
product-id	Identifies the firewall product.
req	Indicates a required firewall type.
sygate-personal	Specifies Sygate Personal firewall type.
sygate-personal-pro	Specifies Sygate Personal Pro firewall type.
sygate-security-agent	Specifies Sygate Security Agent firewall type.
vendor-id	Identifies the firewall vendor.
zonelabs-integrity	Specifies Zone Labs Integrity Server firewall type.
zonelabs-zonealarm	Specifies Zone Labs Zone Alarm firewall type.
zonelabs-zonealarmorpro policy	Specifies Zone Labs Zone Alarm or Pro firewall type.
zonelabs-zonealarmpro policy	Specifies Zone Labs Zone Alarm Pro firewall type.

The following example shows how to set a client firewall policy that requires Cisco Intrusion Prevention Security Agent for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# client-firewall req cisco-security-agent
hostname(config-group-policy)#
```

Configuring Client Access Rules

Configure rules that limit the remote access client types and versions that can connect via IPSec through the ASA by using the **client-access-rule** command in group-policy configuration mode. Construct rules according to these guidelines:

- If you do not define any rules, the ASA permits all connection types.
- When a client matches none of the rules, the ASA denies the connection. If you define a deny rule, you must also define at least one permit rule; otherwise, the ASA denies all connections.
- For both software and hardware clients, type and version must exactly match their appearance in the **show vpn-sessiondb remote** display.
- The * character is a wildcard, which you can enter multiple times in each rule. For example, **client-access rul**e **3 deny type * version 3.*** creates a priority 3 client access rule that denies all client types running release versions 3.x software.

- You can construct a maximum of 25 rules per group policy.
- There is a limit of 255 characters for an entire set of rules.
- You can enter n/a for clients that do not send client type and/or version.

To delete a rule, enter the **no** form of this command. This command is equivalent to the following command:

```
hostname(config-group-policy)# client-access-rule 1 deny type "Cisco VPN Client" version
4.0
```

To delete all rules, enter the **no client-access-rule command** without arguments. This deletes all configured rules, including a null rule if you created one by issuing the **client-access-rule** command with the **none** keyword.

By default, there are no access rules. When there are no client access rules, users inherit any rules that exist in the default group policy.

To prevent users from inheriting client access rules, enter the **client-access-rule** command with the **none** keyword. The result of this command is that all client types and versions can connect.

```
hostname(config-group-policy)# client-access rule priority {permit | deny} type type
version {version | none}

hostname(config-group-policy)# no client-access rule [priority{permit | deny} type type
version version]
```

Table 64-5 explains the meaning of the keywords and parameters in these commands.

Table 64-5 client-access rule Command Keywords and Variables

Parameter	Description
deny	Denies connections for devices of a particular type and/or version.
none	Allows no client access rules. Sets client-access-rule to a null value, thereby allowing no restriction. Prevents inheriting a value from a default or specified group policy.
permit	Permits connections for devices of a particular type and/or version.
priority	Determines the priority of the rule. The rule with the lowest integer has the highest priority. Therefore, the rule with the lowest integer that matches a client type and/or version is the rule that applies. If a lower priority rule contradicts, the ASA ignores it.
type *type*	Identifies device types via free-form strings, for example VPN 3002. A string must match exactly its appearance in the **show vpn-sessiondb remote** display, except that you can enter the * character as a wildcard.
version *version*	Identifies the device version via free-form strings, for example 7.0. A string must match exactly its appearance in the **show vpn-sessiondb remote** display, except that you can enter the * character as a wildcard.

The following example shows how to create client access rules for the group policy named FirstGroup. These rules permit Cisco VPN clients running software version 4.x, while denying all Windows NT clients:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# client-access-rule 1 deny type WinNT version *
hostname(config-group-policy)# client-access-rule 2 permit “Cisco VPN Client” version 4.*
```

Note The “type” field is a free-form string that allows any value, but that value must match the fixed value that the client sends to the ASA at connect time.

Configuring Group-Policy Attributes for Clientless SSL VPN Sessions

Clientless SSL VPN lets users establish a secure, remote-access VPN tunnel to the ASA using a web browser. There is no need for either a software or hardware client. Clientless SSL VPN provides easy access to a broad range of web resources and web-enabled applications from almost any computer that can reach HTTPS Internet sites. Clientless SSL VPN uses SSL and its successor, TLS1, to provide a secure connection between remote users and specific, supported internal resources that you configure at a central site. The ASA recognizes connections that need to be proxied, and the HTTP server interacts with the authentication subsystem to authenticate users. By default, clientless SSL VPN is disabled.

You can customize a configuration of clientless SSL VPN for specific internal group policies.

Note The webvpn mode that you enter from global configuration mode lets you configure global settings for clientless SSL VPN sessions. The webvpn mode described in this section, which you enter from group-policy configuration mode, lets you customize a configuration of group policies specifically for clientless SSL VPN sessions.

In group-policy webvpn configuration mode, you can specify whether to inherit or customize the following parameters, each of which is described in the subsequent sections:

- customizations
- html-content-filter
- homepage
- filter
- url-list
- port-forward
- port-forward-name
- sso server (single-signon server)
- auto-signon
- deny message
- SSL VPN Client (SVC)
- keep-alive ignore
- HTTP compression

In many instances, you define the webvpn attributes as part of configuring clientless SSL VPN, then you apply those definitions to specific groups when you configure the group-policy webvpn attributes. Enter group-policy webvpn configuration mode by using the **webvpn** command in group-policy configuration mode. Webvpn commands for group policies define access to files, URLs and TCP applications over clientless SSL VPN sessions. They also identify ACLs and types of traffic to filter. Clientless SSL VPN is disabled by default. See the description of *Chapter 71, “Configuring Clientless SSL VPN”* for more information about configuring the attributes for clientless SSL VPN sessions.

To remove all commands entered in group-policy webvpn configuration mode, enter the **no** form of this command. These webvpn commands apply to the username or group policy from which you configure them.

```
hostname(config-group-policy)# webvpn
hostname(config-group-policy)# no webvpn
```

The following example shows how to enter group-policy webvpn configuration mode for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)#
```

Applying Customization

Customizations determine the appearance of the windows that the user sees upon login. You configure the customization parameters as part of configuring clientless SSL VPN. To apply a previously defined web-page customization to change the look-and-feel of the web page that the user sees at login, enter the customization command in group-policy webvpn configuration mode:

```
hostname(config-group-webvpn)# customization customization_name
hostname(config-group-webvpn)#
```

For example, to use the customization named blueborder, enter the following command:

```
hostname(config-group-webvpn)# customization blueborder
hostname(config-group-webvpn)#
```

You configure the customization itself by entering the **customization** command in webvpn mode.

The following example shows a command sequence that first establishes a customization named 123 that defines a password prompt. The example then defines a group policy named testpolicy and uses the **customization** command to specify the use of the customization named 123 for clientless SSL VPN sessions:

```
hostname(config)# webvpn
hostname(config-webvpn)# customization 123
hostname(config-webvpn-custom)# password-prompt Enter password
hostname(config-webvpn)# exit
hostname(config)# group-policy testpolicy nopassword
hostname(config)# group-policy testpolicy attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# customization value 123
hostname(config-group-webvpn)#
```

Specifying a "Deny" Message

You can specify the message delivered to a remote user who logs into a clientless SSL VPN session successfully, but has no VPN privileges, by entering the **deny-message** command in group-policy webvpn configuration mode:

```
hostname(config-group-webvpn)# deny-message value "message"
hostname(config-group-webvpn)# no deny-message value "message"
hostname(config-group-webvpn)# deny-message none
```

The **no deny-message value** command removes the message string, so that the remote user does not receive a message.

The **no deny-message none** command removes the attribute from the connection profile policy configuration. The policy inherits the attribute value.

The message can be up to 491 alphanumeric characters long, including special characters, spaces, and punctuation, but not counting the enclosing quotation marks. The text appears on the remote user's browser upon login. When typing the string in the **deny-message value** command, continue typing even if the command wraps.

The default deny message is: "Login was successful, but because certain criteria have not been met or due to some specific group policy, you do not have permission to use any of the VPN features. Contact your IT administrator for more information."

The first command in the following example creates an internal group policy named group2. The subsequent commands modify the attributes, including the webvpn deny message associated with that policy.

```
hostname(config)# group-policy group2 internal
hostname(config)# group-policy group2 attributes
hostname(config-group)# webvpn
hostname(config-group-webvpn)# deny-message value "Your login credentials are OK. However,
you have not been granted rights to use the VPN features. Contact your administrator for
more information."
hostname(config-group-webvpn)
```

Configuring Group-Policy Filter Attributes for Clientless SSL VPN Sessions

Specify whether to filter Java, ActiveX, images, scripts, and cookies from clientless SSL VPN sessions for this group policy by using the **html-content-filter** command in webvpn mode. HTML filtering is disabled by default.

To remove a content filter, enter the **no** form of this command. To remove all content filters, including a null value created by issuing the **html-content-filter** command with the **none** keyword, enter the **no** form of this command without arguments. The **no** option allows inheritance of a value from another group policy. To prevent inheriting an html content filter, enter the **html-content-filter** command with the **none** keyword.

Using the command a second time overrides the previous setting.

```
hostname(config-group-webvpn)# html-content-filter {java | images | scripts | cookies |
none}

hostname(config-group-webvpn)# no html-content-filter [java | images | scripts | cookies |
none]
```

Table 64-6 describes the meaning of the keywords used in this command.

Table 64-6 filter Command Keywords

Keyword	Meaning
cookies	Removes cookies from images, providing limited ad filtering and privacy.
images	Removes references to images (removes <IMG> tags).
java	Removes references to Java and ActiveX (removes <EMBED>, <APPLET>, and <OBJECT> tags).
none	Indicates that there is no filtering. Sets a null value, thereby disallowing filtering. Prevents inheriting filtering values.
scripts	Removes references to scripting (removes <SCRIPT> tags).

The following example shows how to set filtering of JAVA and ActiveX, cookies, and images for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# html-content-filter java cookies images
hostname(config-group-webvpn)#
```

Specifying the User Home Page

Specify a URL for the web page that displays when a user in this group logs in by using the **homepage** command in group-policy webvpn configuration mode. There is no default home page.

To remove a configured home page, including a null value created by issuing the **homepage none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from another group policy. To prevent inheriting a home page, enter the **homepage none** command.

The **none** keyword indicates that there is no home page for clientless SSL VPN sessions. It sets a null value, thereby disallowing a home page and prevents inheriting an home page.

The *url-string* variable following the keyword **value** provides a URL for the home page. The string must begin with either http:// or https://.

```
hostname(config-group-webvpn)# homepage {value url-string | none}
hostname(config-group-webvpn)# no homepage
hostname(config-group-webvpn)#
```

Configuring Auto-Signon

The **auto-signon** command is a single sign-on method for users of clientless SSL VPN sessions. It passes the login credentials (username and password) to internal servers for authentication using NTLM authentication, basic authentication, or both. Multiple auto-signon commands can be entered and are processed according to the input order (early commands take precedence).

You can use the auto-signon feature in three modes: webvpn configuration, webvpn group configuration, or webvpn username configuration mode. The typical precedence behavior applies where username supersedes group, and group supersedes global. The mode you choose depends upon the desired scope of authentication.

To disable auto-signon for a particular user to a particular server, use the **no** form of the command with the original specification of IP block or URI. To disable authentication to all servers, use the **no** form without arguments. The **no** option allows inheritance of a value from the group policy.

The following example, entered in group-policy webvpn configuration mode, configures auto-signon for the user named anyuser, using basic authentication, to servers with IP addresses ranging from 10.1.1.0 to 10.1.1.255:

The following example commands configure auto-signon for users of clientless SSL VPN sessions, using either basic or NTLM authentication, to servers defined by the URI mask https://*.example.com/*:

```
hostname(config)# group-policy ExamplePolicy attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# auto-signon allow uri https://*.example.com/* auth-type all
hostname(config-group-webvpn)#
```

The following example commands configure auto-signon for users of clientless SSL VPN sessions, using either basic or NTLM authentication, to the server with the IP address 10.1.1.0, using subnet mask 255.255.255.0:

```
hostname(config)# group-policy ExamplePolicy attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# auto-signon allow ip 10.1.1.0 255.255.255.0 auth-type all
hostname(config-group-webvpn)#
```

Specifying the Access List for Clientless SSL VPN Sessions

Specify the name of the access list to use for clientless SSL VPN sessions for this group policy or username by using the **filter** command in webvpn mode. Clientless SSL VPN access lists do not apply until you enter the **filter** command to specify them.

To remove the access list, including a null value created by issuing the **filter none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from another group policy. To prevent inheriting filter values, enter the **filter value none** command.

Access lists for clientless SSL VPN sessions do not apply until you enter the **filter** command to specify them.

You configure ACLs to permit or deny various types of traffic for this group policy. You then enter the **filter** command to apply those ACLs for clientless SSL VPN traffic.

```
hostname(config-group-webvpn)# filter {value ACLname | none}
hostname(config-group-webvpn)# no filter
```

The **none** keyword indicates that there is no **webvpntype** access list. It sets a null value, thereby disallowing an access list and prevents inheriting an access list from another group policy.

The *ACLname* string following the keyword **value** provides the name of the previously configured access list.

Note Clientless SSL VPN sessions do not use ACLs defined in the **vpn-filter** command.

The following example shows how to set a filter that invokes an access list named *acl_in* for the group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# filter acl_in
hostname(config-group-webvpn)#
```

Applying a URL List

You can specify a list of URLs to appear on the clientless SSL VPN home page for a group policy. First, you must create one or more named lists by entering the **url-list** command in global configuration mode. To apply a list of servers and URLs for clientless SSL VPN sessions to a particular group policy, allowing access to the URLs in a list for a specific group policy, use the name of the list or lists you create there with the **url-list** command in group-policy webvpn configuration mode. There is no default URL list.

To remove a list, including a null value created by using the **url-list none** command**,** use the **no** form of this command. The **no** option allows inheritance of a value from another group policy. To prevent inheriting a URL list, use the **url-list none** command. Using the command a second time overrides the previous setting:

```
hostname(config-group-webvpn)# url-list {value name | none} [index]
hostname(config-group-webvpn)# no url-list
```

Table 64-7 shows the **url-list** command parameters and their meanings.

Table 64-7 url-list Command Keywords and Variables

Parameter	Meaning
index	Indicates the display priority on the home page.
none	Sets a null value for url lists. Prevents inheriting a list from a default or specified group policy.
value *name*	Specifies the name of a previously configured list of urls. To configure such a list, use the **url-list** command in global configuration mode.

The following example sets a URL list called FirstGroupURLs for the group policy named FirstGroup and specifies that this should be the first URL list displayed on the homepage:

```
hostname(config)# group-policy FirstGroup attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# url-list value FirstGroupURLs 1
hostname(config-group-webvpn)#
```

Enabling ActiveX Relay for a Group Policy

ActiveX Relay lets a user who has established a Clientless SSL VPN session use the browser to launch Microsoft Office applications. The applications use the session to download and upload Microsoft Office documents. The ActiveX relay remains in force until the Clientless SSL VPN session closes.

To enable or disable ActiveX controls on Clientless SSL VPN sessions, enter the following command in group-policy webvpn configuration mode:

activex-relay {**enable** | **disable**}

To inherit the **activex-relay** command from the default group policy, enter the following command:

no activex-relay

The following commands enable ActiveX controls on clientless SSL VPN sessions associated with a given group policy:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# activex-relay enable
hostname(config-group-webvpn)
```

Enabling Application Access on Clientless SSL VPN Sessions for a Group Policy

To enable application access for this group policy, enter the **port-forward** command in group-policy webvpn configuration mode. Port forwarding is disabled by default.

Before you can enter the **port-forward** command in group-policy webvpn configuration mode to enable application access, you must define a list of applications that you want users to be able to use in a clientless SSL VPN session. Enter the **port-forward** command in global configuration mode to define this list.

To remove the port forwarding attribute from the group-policy configuration, including a null value created by issuing the **port-forward none** command, enter the **no** form of this command. The **no** option allows inheritance of a list from another group policy. To prevent inheriting a port forwarding list, enter the **port-forward** command with the **none** keyword. The **none** keyword indicates that there is no filtering. It sets a null value, thereby disallowing a filtering, and prevents inheriting filtering values.

The syntax of the command is as follows:

```
hostname(config-group-webvpn)# port-forward {value listname | none}
hostname(config-group-webvpn)# no port-forward
```

The *listname* string following the keyword **value** identifies the list of applications users of clientless SSL VPN sessions can access. Enter the port-forward command in webvpn configuration mode to define the list.

Using the command a second time overrides the previous setting.

The following example shows how to set a port-forwarding list called *ports1* for the internal group policy named FirstGroup:

```
hostname(config)# group-policy FirstGroup internal attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# port-forward value ports1
hostname(config-group-webvpn)#
```

Configuring the Port-Forwarding Display Name

Configure the display name that identifies TCP port forwarding to end users for a particular user or group policy by using the **port-forward-name** command in group-policy webvpn configuration mode. To delete the display name, including a null value created by using the **port-forward-name none** command**,** enter the **no** form of the command. The **no** option restores the default name, Application Access. To prevent a display name, enter the **port-forward none** command. The syntax of the command is as follows:

```
hostname(config-group-webvpn)# port-forward-name {value name | none}
hostname(config-group-webvpn)# no port-forward-name
```

The following example shows how to set the name, Remote Access TCP Applications, for the internal group policy named *FirstGroup*:

```
hostname(config)# group-policy FirstGroup internal attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# port-forward-name value Remote Access TCP Applications
hostname(config-group-webvpn)#
```

Configuring the Maximum Object Size to Ignore for Updating the Session Timer

Network devices exchange short keepalive messages to ensure that the virtual circuit between them is still active. The length of these messages can vary. The **keep-alive-ignore** command lets you tell the ASA to consider all messages that are less than or equal to the specified size as keepalive messages and not as traffic when updating the session timer. The range is 0 through 900 KB. The default is 4 KB.

To specify the upper limit of the HTTP/HTTPS traffic, per transaction, to ignore, use the **keep-alive-ignore** command in group-policy attributes webvpn configuration mode:

```
hostname(config-group-webvpn)# keep-alive-ignore size
hostname(config-group-webvpn)#

The no form of the command removes this specification from the configuration:
hostname(config-group-webvpn)# no keep-alive-ignore
hostname(config-group-webvpn)#
```

The following example sets the maximum size of objects to ignore as 5 KB:

```
hostname(config-group-webvpn)# keep-alive-ignore 5
hostname(config-group-webvpn)#
```

Specifying HTTP Compression

Enable compression of http data over a clientless SSL VPN session for a specific group or user by entering the **http-comp** command in the group policy webvpn mode.

```
hostname(config-group-webvpn)# http-comp {gzip | none}
hostname(config-group-webvpn)#
```

To remove the command from the configuration and cause the value to be inherited, use the **no** form of the command:

```
hostname(config-group-webvpn)# no http-comp {gzip | none}
hostname(config-group-webvpn)#
```

The syntax of this command is as follows:

- **gzip—**Specifies compression is enabled for the group or user. This is the default value.
- **none—**Specifies compression is disabled for the group or user.

For clientless SSL VPN sessions, the **compression** command configured from global configuration mode overrides the **http-comp** command configured in group policy and username webvpn modes.

In the following example, compression is disabled for the group-policy sales:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# http-comp none
hostname(config-group-webvpn)#
```

Specifying the SSO Server

Single sign-on support, available only for clientless SSL VPN sessions, lets users access different secure services on different servers without reentering a username and password more than once. The **sso-server value** command, when entered in group-policy-webvpn mode, lets you assign an SSO server to a group policy.

To assign an SSO server to a group policy, use the **sso-server value** command in group-policy-webvpn configuration mode. This command requires that your configuration include CA SiteMinder command.

```
hostname(config-group-webvpn)# sso-server value server_name
hostname(config-group-webvpn)#
```

To remove the assignment and use the default policy, use the **no** form of this command. To prevent inheriting the default policy, use the **sso-server none** command.

```
hostname(config-group-webvpn)# sso-server {value server_name | none}
hostname(config-group-webvpn)# [no] sso-server value server_name
```

The default policy assigned to the SSO server is DfltGrpPolicy.

The following example creates the group policy “my-sso-grp-pol” and assigns it to the SSO server named “example”:

```
hostname(config)# group-policy my-sso-grp-pol internal
hostname(config)# group-policy my-sso-grp-pol attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# sso-server value example
hostname(config-group-webvpn)#
```

Configuring SVC

The SSL VPN Client (SVC) is a VPN tunneling technology that gives remote users the benefits of an IPSec VPN client without the need for network administrators to install and configure IPSec VPN clients on remote computers. The SVC uses the SSL encryption that is already present on the remote computer as well as the clientless SSL VPN sessions login and authentication of the ASA.

To establish an SVC session, the remote user enters the IP address of an interface of the security appliance configured to support clientless SSL VPN sessions. The browser connects to that interface and displays the clientless SSL VPN login screen. If the user satisfies the login and authentication, and the ASA identifies the user as *requiring* the SVC, the ASA downloads the SVC to the remote computer. If the ASA identifies the user as having the *option* to use the SVC, the ASA downloads the SVC to the remote computer while presenting a link on the user screen to skip the SVC installation.

After downloading, the SVC installs and configures itself, and then the SVC either remains or uninstalls itself (depending on the configuration) from the remote computer when the connection terminates.

The ASA might have several unique SVC images residing in cache memory for different remote computer operating systems. When the user attempts to connect, the ASA can consecutively download portions of these images to the remote computer until the image and operating system match, at which point it downloads the entire SVC. You can order the SVC images to minimize connection setup time, with the first image downloaded representing the most commonly-encountered remote computer operating system. For complete information about installing and using SVC, see Chapter 72, "Configuring AnyConnect VPN Client Connections".

After enabling SVC, as described in Chapter 72, "Configuring AnyConnect VPN Client Connections", you can enable or require SVC features for a specific group. This feature is disabled by default. If you enable or require SVC, you can then enable a succession of svc commands, described in this section. To enable SVC and its related svc commands, do the following steps in group-policy webvpn configuration mode:

Step 1 To enable the ASA to download SVC files to remote computers, enter the **svc enable** command. By default, this command is disabled. The ASA does not download SVC files. To remove the **svc enable** command from the configuration, use the **no** form of this command.

```
hostname(config-group-webvpn)# svc {none | enable | required}
hostname(config-group-webvpn)#
```

Note Entering the **no svc enable** command does not terminate active SVC sessions.

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc enable
hostname(config-group-webvpn)#
```

Step 2 To enable compression of HTTP data over an SVC connection, for a specific group, enter the svc compression command. By default, SVC compression is set to **deflate** (enabled). To disable compression for a specific group, use the **none** keyword. To remove the svc compression command and cause the value to be inherited, use the **no** form of the command:

```
hostname(config-group-webvpn)# svc compression {deflate | none}
hostname(config-group-webvpn)#
```

The following example disables SVC compression for the group policy named sales:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc compression none
hostname(config-group-webvpn)#
```

Step 3 To enable dead-peer-detection (DPD) on the ASA and to set the frequency with which either the SVC or the ASA performs DPD, use the **svc dpd-interval** command. To remove the **svc dpd-interval** command from the configuration, use the **no** form of the command. To disable SVC DPD for this group, use the **none** keyword:

```
hostname(config-group-webvpn)# svc dpd-interval {[gateway {seconds | none}] | [client
{seconds | none}]}
hostname(config-group-webvpn)#
```

DPD checking is disabled by default.

The gateway refers to the ASA. You can specify the frequency with which the ASA performs the DPD test as a range of from 30 to 3600 seconds (1 hour). Specifying **none** disables the DPD testing that the ASA performs.

The client refers to the SVC. You can specify the frequency with which the client performs the DPD test as a range of from 30 to 3600 seconds (1 hour). Specifying **none** disables the DPD testing that the client performs.

In the following example, the user configures the DPD frequency performed by the ASA (gateway) to 3000 seconds, and the DPD frequency performed by the client to 1000 seconds for the existing group policy named sales:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc dpd-interval gateway 3000
hostname(config-group-webvpn)# svc dpd-interval client 1000
hostname(config-group-webvpn)#
```

Step 4 You can adjust the frequency of keepalive messages (specified by *seconds)*, to ensure that an SVC connection through a proxy, firewall, or NAT device remains open, even if the device limits the time that the connection can be idle.

Adjusting the frequency also ensures that the SVC does not disconnect and reconnect when the remote user is not actively running a socket-based application, such as Microsoft Outlook or Microsoft Internet Explorer.

To configure the frequency (15 through 600 seconds) which an SVC on a remote computer sends keepalive messages to the security appliance, use the **svc keepalive** command. Use the **no** form of the command to remove the command from the configuration and cause the value to be inherited:

```
    hostname(config-group-webvpn)# svc keepalive {none | seconds}
    hostname(config-group-webvpn)# no svc keepalive {none | seconds}
    hostname(config-group-webvpn)#
```

SVC keepalives are disabled by default. Using the keyword **none** disables SVC keepalive messages.

The following example configures the security appliance to enable the SVC to send keepalive messages, with a frequency of 300 seconds (5 minutes):

```
hostname(config-group-webvpn)# svc keepalive 300
hostname(config-group-webvpn)#
```

Step 5 To enable the permanent installation of an SVC onto a remote computer, use the **svc keep-installer** command with the **installed** keyword. To remove the command from the configuration, use the **no** form of this command:

```
hostname(config-group-webvpn)# svc keep-installer {installed | none}
hostname(config-group-webvpn)# no svc keep-installer {installed | none}
hostname(config-group-webvpn)#
```

The default is that permanent installation of the SVC is disabled. The SVC uninstalls from the remote computer at the end of the SVC session.

The following example configures the ASA to keep the SVC installed on the remote computer for this group:

```
hostname(config-group-webvpn)# svc keep-installer installed
hostname(config-group-webvpn)#
```

Step 6 To enable the SVC to perform a rekey on an SVC session, use the **svc rekey** command. To disable rekey and remove the command from the configuration, use the **no** form of this command:

```
hostname(config-group-webvpn)# svc rekey {method {ssl | new-tunnel} | time minutes | 
none}}
hostname(config-group-webvpn)# no svc rekey {method {ssl | new-tunnel} | time minutes | 
none}}
hostname(config-group-webvpn)#
```

By default, SVC rekey is disabled.

Specifying the method as new-tunnel specifies that the SVC establishes a new tunnel during SVC rekey. Specifying the method as none disables SVC rekey. Specifying the method as ssl specifies that SSL renegotiation takes place during SVC rekey. instead of specifying the method, you can specify the time; that is, the number of minutes from the start of the session until the re-key takes place, from 1 through 10080 (1 week).

For the **no** form of the command, only the minimum is necessary, as the following example shows:

```
hostname(config-username-webvpn)# no svc rekey method
hostname(config-username-webvpn)#
```

If, however, you specify the method as new-tunnel:

```
hostname(config-username-webvpn)# no svc rekey method new-tunnel
hostname(config-username-webvpn)#
```

but the current method is ssl, then the command fails, because the values don't match.

In the following example, the user configures the SVC to renegotiate with SSL during rekey and configures the rekey to occur 30 minutes after the session begins:

```
hostname(config-group-webvpn)# svc rekey method ssl
hostname(config-group-webvpn)# svc rekey time 30
hostname(config-group-webvpn)#
```

Configuring User Attributes

This section describes user attributes and how to configure them. It includes the following sections:

- Viewing the Username Configuration, page 64-80
- Configuring Attributes for Specific Users, page 64-80

By default, users inherit all user attributes from the assigned group policy. The ASA also lets you assign individual attributes at the user level, overriding values in the group policy that applies to that user. For example, you can specify a group policy giving all users access during business hours, but give a specific user 24-hour access.

Viewing the Username Configuration

To display the configuration for all usernames, including default values inherited from the group policy, enter the **all** keyword with the **show running-config username** command, as follows:

```
hostname# show running-config all username
hostname#
```

This displays the encrypted password and the privilege level. for all users, or, if you supply a username, for that specific user. If you omit the **all** keyword, only explicitly configured values appear in this list. The following example displays the output of this command for the user named testuser:

```
hostname# show running-config all username testuser
username testuser password 12RsxXQnphyr/I9Z encrypted privilege 15
```

Configuring Attributes for Specific Users

To configure specific users, you assign a password (or no password) and attributes to a user using the **username** command, which enters username mode. Any attributes that you do not specify are inherited from the group policy.

The internal user authentication database consists of the users entered with the **username** command. The **login** command uses this database for authentication. To add a user to the ASA database, enter the **username** command in global configuration mode. To remove a user, use the **no** version of this command with the username you want to remove. To remove all usernames, use the **clear configure username** command without appending a username.

Setting a User Password and Privilege Level

Enter the **username** command to assign a password and a privilege level for a user. You can enter the **nopassword** keyword to specify that this user does not require a password. If you do specify a password, you can specify whether that password is stored in an encrypted form.

The optional **privilege** keyword lets you set a privilege level for this user. Privilege levels range from 0 (the lowest) through 15. System administrators generally have the highest privilege level. The default level is 2.

```
hostname(config)# username name {nopassword | password password [encrypted]} [privilege
priv_level]}

hostname(config)# no username [name]
```

Table 64-8 describes the meaning of the keywords and variables used in this command.

Table 64-8 username Command Keywords and Variables

Keyword/Variable	Meaning
encrypted	Indicates that the password is encrypted.
name	Provides the name of the user.
nopassword	Indicates that this user needs no password.

password *password*	Indicates that this user has a password, and provides the password.
privilege *priv_level*	Sets a privilege level for this user. The range is from 0 to 15, with lower numbers having less ability to use commands and administer the ASA. The default privilege level is 2. The typical privilege level for a system administrator is 15.

By default, VPN users that you add with this command have no attributes or group policy association. You must explicitly configure all values.

The following example shows how to configure a user named anyuser with an encrypted password of pw_12345678 and a privilege level of 12:

```
hostname(config)# username anyuser password pw_12345678 encrypted privilege 12
hostname(config)#
```

Configuring User Attributes

After configuring the user's password (if any) and privilege level, you set the other attributes. These can be in any order. To remove any attribute-value pair, enter the **no** form of the command.

Enter username mode by entering the **username** command with the **attributes** keyword:

```
hostname(config)# username name attributes
hostname(config-username)#
```

The prompt changes to indicate the new mode. You can now configure the attributes.

Configuring VPN User Attributes

The VPN user attributes set values specific to VPN connections, as described in the following sections.

Configuring Inheritance

You can let users inherit from the group policy the values of attributes that you have not configured at the username level. To specify the name of the group policy from which this user inherits attributes, enter the **vpn-group-policy** command. By default, VPN users have no group-policy association:

```
hostname(config-username)# vpn-group-policy group-policy-name
hostname(config-username)# no vpn-group-policy group-policy-name
```

For an attribute that is available in username mode, you can override the value of an attribute in a group policy for a particular user by configuring it in username mode.

The following example shows how to configure a user named anyuser to use attributes from the group policy named FirstGroup:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-group-policy FirstGroup
hostname(config-username)#
```

Configuring Access Hours

Associate the hours that this user is allowed to access the system by specifying the name of a configured time-range policy:

To remove the attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a time-range value from another group policy. To prevent inheriting a value, enter the **vpn-access-hours none** command. The default is unrestricted access.

```
hostname(config-username)# vpn-access-hours value {time-range | none}
hostname(config-username)# vpn-access-hours value none
hostname(config)#
```

The following example shows how to associate the user named anyuser with a time-range policy called 824:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-access-hours 824
hostname(config-username)#
```

Configuring Maximum Simultaneous Logins

Specify the maximum number of simultaneous logins allowed for this user. The range is 0 through 2147483647. The default is 3 simultaneous logins. To remove the attribute from the running configuration, enter the **no** form of this command. Enter 0 to disable login and prevent user access.

```
hostname(config-username)# vpn-simultaneous-logins integer
hostname(config-username)# no vpn-simultaneous-logins
hostname(config-username)#
```

Note While the maximum limit for the number of simultaneous logins is very large, allowing several could compromise security and affect performance.

The following example shows how to allow a maximum of 4 simultaneous logins for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-simultaneous-logins 4
hostname(config-username)#
```

Configuring the Idle Timeout

Specify the idle timeout period in minutes, or enter **none** to disable the idle timeout. If there is no communication activity on the connection in this period, the ASA terminates the connection.

The range is 1 through 35791394 minutes. The default is 30 minutes. To allow an unlimited timeout period, and thus prevent inheriting a timeout value, enter the **vpn-idle-timeout** command with the **none** keyword. To remove the attribute from the running configuration, enter the **no** form of this command.

```
hostname(config-username)# vpn-idle-timeout {minutes | none}
hostname(config-username)# no vpn-idle-timeout
hostname(config-username)#
```

The following example shows how to set a VPN idle timeout of 15 minutes for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-idle-timeout 30
hostname(config-username)#
```

Configuring the Maximum Connect Time

Specify the maximum user connection time in minutes, or enter **none** to allow unlimited connection time and prevent inheriting a value for this attribute. At the end of this period of time, the ASA terminates the connection.

The range is 1 through 35791394 minutes. There is no default timeout. To allow an unlimited timeout period, and thus prevent inheriting a timeout value, enter the **vpn-session-timeout** command with the **none** keyword. To remove the attribute from the running configuration, enter the **no** form of this command.

```
hostname(config-username)# vpn-session-timeout {minutes | none}
hostname(config-username)# no vpn-session-timeout
hostname(config-username)#
```

The following example shows how to set a VPN session timeout of 180 minutes for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-session-timeout 180
hostname(config-username)#
```

Applying an ACL Filter

Specify the name of a previously-configured, user-specific ACL to use as a filter for VPN connections. To disallow an access list and prevent inheriting an access list from the group policy, enter the **vpn-filter** command with the none keyword. To remove the ACL, including a null value created by issuing the **vpn-filter none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from the group policy. There are no default behaviors or values for this command.

You configure ACLs to permit or deny various types of traffic for this user. You then use the **vpn-filter** command to apply those ACLs.

```
hostname(config-username)# vpn-filter {value ACL_name | none}
hostname(config-username)# no vpn-filter
hostname(config-username)#
```

Note Clientless SSL VPN does not use ACLs defined in the **vpn-filter** command.

The following example shows how to set a filter that invokes an access list named acl_vpn for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-filter value acl_vpn
hostname(config-username)#
```

Specifying the IP Address and Netmask

Specify the IP address and netmask to assign to a particular user. To remove the IP address, enter the **no** form of this command.

```
hostname(config-username)# vpn-framed-ip-address {ip_address}
hostname(config-username)# no vpn-framed-ip-address
hostname(config-username)
```

The following example shows how to set an IP address of 10.92.166.7 for a user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-framed-ip-address 10.92.166.7
hostname(config-username)
```

Specify the network mask to use with the IP address specified in the previous step. If you used the **no vpn-framed-ip-address** command, do not specify a network mask. To remove the subnet mask, enter the **no** form of this command. There is no default behavior or value.

```
hostname(config-username)# vpn-framed-ip-netmask {netmask}
hostname(config-username)# no vpn-framed-ip-netmask
hostname(config-username)
```

The following example shows how to set a subnet mask of 255.255.255. 254 for a user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-framed-ip-netmask 255.255.255.254
hostname(config-username)
```

Specifying the Tunnel Protocol

Specify the VPN tunnel types (IPSec or clientless SSL VPN) that this user can use. The default is taken from the default group policy, the default for which is IPSec. To remove the attribute from the running configuration, enter the **no** form of this command.

```
hostname(config-username)# vpn-tunnel-protocol {webvpn | IPSec}
hostname(config-username)# no vpn-tunnel-protocol [webvpn | IPSec]
hostname(config-username)
```

The parameter values for this command are as follows:

- **IPSec—**Negotiates an IPSec tunnel between two peers (a remote access client or another secure gateway). Creates security associations that govern authentication, encryption, encapsulation, and key management.
- **webvpn—**Provides clientless SSL VPN access to remote users via an HTTPS-enabled web browser, and does not require a client

Enter this command to configure one or more tunneling modes. You must configure at least one tunneling mode for users to connect over a VPN tunnel.

The following example shows how to configure clientless SSL VPN and IPSec tunneling modes for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# vpn-tunnel-protocol webvpn
hostname(config-username)# vpn-tunnel-protocol IPSec
hostname(config-username)
```

Restricting Remote User Access

Configure the **group-lock** attribute with the **value** keyword to restrict remote users to access only through the specified, preexisting connection profile. Group-lock restricts users by checking whether the group configured in the VPN client is the same as the connection profile to which the user is assigned. If it is not, the ASA prevents the user from connecting. If you do not configure group-lock, the ASA authenticates users without regard to the assigned group.

To remove the **group-lock** attribute from the running configuration, enter the **no** form of this command. This option allows inheritance of a value from the group policy. To disable group-lock, and to prevent inheriting a group-lock value from a default or specified group policy, enter the **group-lock** command with the **none** keyword.

```
hostname(config-username)# group-lock {value tunnel-grp-name | none}
hostname(config-username)# no group-lock
hostname(config-username)
```

The following example shows how to set group lock for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# group-lock value tunnel-group-name
hostname(config-username)
```

Enabling Password Storage for Software Client Users

Specify whether to let users store their login passwords on the client system. Password storage is disabled by default. Enable password storage only on systems that you know to be in secure sites. To disable password storage, enter the **password-storage** command with the **disable** keyword. To remove the password-storage attribute from the running configuration, enter the **no** form of this command. This enables inheritance of a value for password-storage from the group policy.

```
hostname(config-username)# password-storage {enable | disable}
hostname(config-username)# no password-storage
hostname(config-username)
```

This command has no bearing on interactive hardware client authentication or individual user authentication for hardware clients.

The following example shows how to enable password storage for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# password-storage enable
hostname(config-username)
```

Configuring Clientless SSL VPN Access for Specific Users

The following sections describe how to customize a configuration for specific users of clientless SSL VPN sessions. Enter username webvpn configuration mode by using the **webvpn** command in username configuration mode. Clientless SSL VPN lets users establish a secure, remote-access VPN tunnel to the ASA using a web browser. There is no need for either a software or hardware client. Clientless SSL VPN provides easy access to a broad range of web resources and web-enabled applications from almost any computer that can reach HTTPS Internet sites. Clientless SSL VPN uses SSL and its successor, TLS1, to provide a secure connection between remote users and specific, supported internal resources that you configure at a central site. The ASA recognizes connections that need to be proxied, and the HTTP server interacts with the authentication subsystem to authenticate users.

The username webvpn configuration mode commands define access to files, URLs and TCP applications over clientless SSL VPN sessions. They also identify ACLs and types of traffic to filter. Clientless SSL VPN is disabled by default. These **webvpn** commands apply only to the username from which you configure them. Notice that the prompt changes, indicating that you are now in username webvpn configuration mode.

```
hostname(config-username)# webvpn
hostname(config-username-webvpn)#
```

To remove all commands entered in username webvpn configuration mode, use the **no** form of this command:

```
hostname(config-username)# no webvpn
hostname(config-username)#
```

You do not need to configure clientless SSL VPN to use e-mail proxies.

The security appliance does not support the Microsoft Outlook Exchange (MAPI) proxy. Neither port forwarding nor the smart tunnel feature that provides application access through a clientless SSL VPN session supports MAPI. For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.

Note The webvpn mode that you enter from global configuration mode lets you configure global settings for clientless SSL VPN sessions. The username webvpn configuration mode described in this section, which you enter from username mode, lets you customize the configuration of specific users specifically for clientless SSL VPN sessions.

In username webvpn configuration mode, you can customize the following parameters, each of which is described in the subsequent steps:

- customizations
- deny message
- html-content-filter
- homepage
- filter
- url-list
- port-forward
- port-forward-name
- sso server (single-signon server)
- auto-signon
- SSL VPN Client (SVC)
- keep-alive ignore
- HTTP compression

The following example shows how to enter username webvpn configuration mode for the username anyuser attributes:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)#
```

Specifying the Content/Objects to Filter from the HTML

To filter Java, ActiveX, images, scripts, and cookies for clientless SSL VPN sessions for this user, enter the **html-content-filter** command in username webvpn configuration mode. To remove a content filter, enter the **no** form of this command. To remove all content filters, including a null value created by issuing the **html-content-filter none** command, enter the **no** form of this command without arguments. The **no** option allows inheritance of a value from the group policy. To prevent inheriting an HTML content filter, enter the **html-content-filter none** command. HTML filtering is disabled by default.

Using the command a second time overrides the previous setting.

```
hostname(config-username-webvpn)# html-content-filter {java | images | scripts | cookies |
none}
```

```
hostname(config-username-webvpn)# no html-content-filter [java | images | scripts |
cookies | none]
```

The keywords used in this command are as follows:

- **cookies—**Removes cookies from images, providing limited ad filtering and privacy.
- **images—**Removes references to images (removes <IMG> tags).
- **java—**Removes references to Java and ActiveX (removes <EMBED>, <APPLET>, and <OBJECT> tags.
- **none—**Indicates that there is no filtering. Sets a null value, thereby disallowing filtering. Prevents inheriting filtering values.
- **scripts**—Removes references to scripting (removes <SCRIPT> tags).

The following example shows how to set filtering of JAVA and ActiveX, cookies, and images for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# html-content-filter java cookies images
hostname(config-username-webvpn)#
```

Specifying the User Home Page

To specify a URL for the web page that displays when this user logs into clientless SSL VPN session, enter the **homepage** command in username webvpn configuration mode. To remove a configured home page, including a null value created by issuing the **homepage none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from the group policy. To prevent inheriting a home page, enter the **homepage none** command.

The **none** keyword indicates that there is no clientless SSL VPN home page. It sets a null value, thereby disallowing a home page and prevents inheriting a home page.

The *url-string* variable following the keyword **value** provides a URL for the home page. The string must begin with either http:// or https://.

There is no default home page.

```
hostname(config-username-webvpn)# homepage {value url-string | none}
hostname(config-username-webvpn)# no homepage
hostname(config-username-webvpn)#
```

The following example shows how to specify www.example.com as the home page for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# homepage value www.example.com
hostname(config-username-webvpn)#
```

Applying Customization

Customizations determine the appearance of the windows that the user sees upon login. You configure the customization parameters as part of configuring clientless SSL VPN. To apply a previously defined web-page customization to change the look-and-feel of the web page that the user sees at login, enter the customization command in username webvpn configuration mode:

```
hostname(config-username-webvpn)# customization {none | value customization_name}
hostname(config-username-webvpn)#
```

For example, to use the customization named blueborder, enter the following command:

```
hostname(config-username-webvpn)# customization value blueborder
hostname(config-username-webvpn)#
```

You configure the customization itself by entering the **customization** command in webvpn mode.

The following example shows a command sequence that first establishes a customization named 123 that defines a password prompt. The example then defines a tunnel-group named test and uses the **customization** command to specify the use of the customization named 123:

```
hostname(config)# webvpn
hostname(config-webvpn)# customization 123
hostname(config-webvpn-custom)# password-prompt Enter password
hostname(config-webvpn)# exit
hostname(config)# username testuser nopassword
hostname(config)# username testuser attributes
hostname(config-username-webvpn)# webvpn
hostname(config-username-webvpn)# customization value 123
hostname(config-username-webvpn)#
```

Specifying a “Deny” Message

You can specify the message delivered to a remote user who logs into clientless SSL VPN session successfully, but has no VPN privileges by entering the **deny-message** command in username webvpn configuration mode:

```
hostname(config-username-webvpn)# deny-message value "message"
hostname(config-username-webvpn)# no deny-message value "message"
hostname(config-username-webvpn)# deny-message none
```

The **no deny-message value** command removes the message string, so that the remote user does not receive a message.

The **no deny-message none** command removes the attribute from the connection profile policy configuration. The policy inherits the attribute value.

The message can be up to 491 alphanumeric characters long, including special characters, spaces, and punctuation, but not counting the enclosing quotation marks. The text appears on the remote user’s browser upon login. When typing the string in the **deny-message value** command, continue typing even if the command wraps.

The default deny message is: “Login was successful, but because certain criteria have not been met or due to some specific group policy, you do not have permission to use any of the VPN features. Contact your IT administrator for more information.”

The first command in the following example enters username mode and configures the attributes for the user named anyuser. The subsequent commands enter username webvpn configuration mode and modify the deny message associated with that user.

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# deny-message value "Your login credentials are OK.
However, you have not been granted rights to use the VPN features. Contact your
administrator for more information."
hostname(config-username-webvpn)
```

Specifying the Access List for Clientless SSL VPN Sessions

To specify the name of the access list to use for clientless SSL VPN sessions for this user, enter the **filter** command in username webvpn configuration mode. To remove the access list, including a null value created by issuing the **filter none** command, enter the **no** form of this command. The **no** option allows inheritance of a value from the group policy. To prevent inheriting filter values, enter the **filter value none** command.

Clientless SSL VPN access lists do not apply until you enter the **filter** command to specify them.

You configure ACLs to permit or deny various types of traffic for this user. You then enter the **filter** command to apply those ACLs for clientless SSL VPN traffic.

```
hostname(config-username-webvpn)# filter {value ACLname | none}
hostname(config-username-webvpn)# no filter
hostname(config-username-webvpn)#
```

The **none** keyword indicates that there is no **webvpntype** access list. It sets a null value, thereby disallowing an access list and prevents inheriting an access list from another group policy.

The *ACLname* string following the keyword **value** provides the name of the previously configured access list.

Note Clientless SSL VPN does not use ACLs defined in the **vpn-filter** command.

The following example shows how to set a filter that invokes an access list named *acl_in* for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# filter acl_in
hostname(config-username-webvpn)#
```

Applying a URL List

You can specify a list of URLs to appear on the home page for a user who has established a clientless SSL VPN session. First, you must create one or more named lists by entering the **url-list** command in global configuration mode. To apply a list of servers and URLs to a particular user of clientless SSL VPN, enter the **url-list** command in username webvpn configuration mode.

To remove a list, including a null value created by using the **url-list none** command**,** enter the **no** form of this command. The **no** option allows inheritance of a value from the group policy. To prevent inheriting a url list, enter the **url-list none** command.

```
hostname(config-username-webvpn)# url-list {listname displayname url | none}
hostname(config-username-webvpn)# no url-list
```

The keywords and variables used in this command are as follows:

- *displayname*—Specifies a name for the URL. This name appears on the portal page in the clientless SSL VPN session.
- *listname*—Identifies a name by which to group URLs.
- **none**—Indicates that there is no list of URLs. Sets a null value, thereby disallowing a URL list. Prevents inheriting URL list values.
- *url*—Specifies a URL that users of clientless SSL VPN can access.

There is no default URL list.

Using the command a second time overrides the previous setting.

The following example shows how to set a URL list called AnyuserURLs for the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# url-list value AnyuserURLs
hostname(config-username-webvpn)#
```

Enabling ActiveX Relay for a User

ActiveX Relay lets a user who has established a Clientless SSL VPN session use the browser to launch Microsoft Office applications. The applications use the session to download and upload Microsoft Office documents. The ActiveX relay remains in force until the Clientless SSL VPN session closes.

To enable or disable ActiveX controls on Clientless SSL VPN sessions, enter the following command in username webvpn configuration mode:

activex-relay {**enable** | **disable**}

To inherit the **activex-relay** command from the group policy, enter the following command:

no activex-relay

The following commands enable ActiveX controls on Clientless SSL VPN sessions associated with a given username:

```
hostname(config-username-policy)# webvpn
hostname(config-username-webvpn)# activex-relay enable
hostname(config-username-webvpn)
```

Enabling Application Access for Clientless SSL VPN Sessions

To enable application access for this user, enter the **port-forward** command in username webvpn configuration mode. Port forwarding is disabled by default.

To remove the port forwarding attribute from the configuration, including a null value created by issuing the **port-forward none** command, enter the **no** form of this command. The **no** option allows inheritance of a list from the group policy. To disallow filtering and prevent inheriting a port forwarding list, enter the **port-forward** command with the **none** keyword.

```
hostname(config-username-webvpn)# port-forward {value listname | none}
hostname(config-username-webvpn)# no port-forward
hostname(config-username-webvpn)#
```

The *listname* string following the keyword **value** identifies the list of applications users of clientless SSL VPN can access. Enter the **port-forward** command in configuration mode to define the list.

Using the command a second time overrides the previous setting.

Before you can enter the **port-forward** command in username webvpn configuration mode to enable application access, you must define a list of applications that you want users to be able to use in a clientless SSL VPN session. Enter the **port-forward** command in global configuration mode to define this list.

The following example shows how to configure a portforwarding list called ports1:

```
hostname(config-group-policy)# webvpn
hostname(config-username-webvpn)# port-forward value ports1
hostname(config-username-webvpn)#
```

Configuring the Port-Forwarding Display Name

Configure the display name that identifies TCP port forwarding to end users for a particular user by using the **port-forward-name** command in username webvpn configuration mode. To delete the display name, including a null value created by using the **port-forward-name none** command**,** enter the **no** form of the command. The **no** option restores the default name, Application Access. To prevent a display name, enter the **port-forward none** command.

```
hostname(config-username-webvpn)# port-forward-name {value name | none}
hostname(config-username-webvpn)# no port-forward-name
```

The following example shows how to configure the port-forward name test:

```
hostname(config-group-policy)# webvpn
hostname(config-username-webvpn)# port-forward-name value test
hostname(config-username-webvpn)#
```

Configuring the Maximum Object Size to Ignore for Updating the Session Timer

Network devices exchange short keepalive messages to ensure that the virtual circuit between them is still active. The length of these messages can vary. The **keep-alive-ignore** command lets you tell the ASA to consider all messages that are less than or equal to the specified size as keepalive messages and not as traffic when updating the session timer. The range is 0 through 900 KB. The default is 4 KB.

To specify the upper limit of the HTTP/HTTPS traffic, per transaction, to ignore, use the **keep-alive-ignore** command in group-policy attributes webvpn configuration mode:

```
hostname(config-group-webvpn)# keep-alive-ignore size
hostname(config-group-webvpn)#

The no form of the command removes this specification from the configuration:
hostname(config-group-webvpn)# no keep-alive-ignore
hostname(config-group-webvpn)#
```

The following example sets the maximum size of objects to ignore as 5 KB:

```
hostname(config-group-webvpn)# keep-alive-ignore 5
hostname(config-group-webvpn)#
```

Configuring Auto-Signon

To automatically submit the login credentials of a particular user of clientless SSL VPN to internal servers using NTLM, basic HTTP authentication or both, use the **auto-signon** command in username webvpn configuration mode.

The **auto-signon** command is a single sign-on method for users of clientless SSL VPN sessions. It passes the login credentials (username and password) to internal servers for authentication using NTLM authentication, basic authentication, or both. Multiple auto-signon commands can be entered and are processed according to the input order (early commands take precedence).

You can use the auto-signon feature in three modes: webvpn configuration, webvpn group configuration, or webvpn username configuration mode. The typical precedence behavior applies where username supersedes group, and group supersedes global. The mode you choose will depend upon the desired scope of authentication.

To disable auto-signon for a particular user to a particular server, use the **no** form of the command with the original specification of IP block or URI. To disable authentication to all servers, use the **no** form without arguments. The **no** option allows inheritance of a value from the group policy.

The following example commands configure auto-signon for a user of clientless SSL VPN named anyuser, using either basic or NTLM authentication, to servers defined by the URI mask https://*.example.com/*:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# auto-signon allow uri https://*.example.com/* auth-type
all
```

The following example commands configure auto-signon for a user of clientless SSL VPN named anyuser, using either basic or NTLM authentication, to the server with the IP address 10.1.1.0, using subnet mask 255.255.255.0:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# auto-signon allow ip 10.1.1.0 255.255.255.0 auth-type
all
hostname(config-username-webvpn)#
```

Specifying HTTP Compression

Enable compression of http data over a clientless SSL VPN session for a specific user by entering the **http-comp** command in the username webvpn configuration mode.

```
hostname(config-username-webvpn)# http-comp {gzip | none}
hostname(config-username-webvpn)#
```

To remove the command from the configuration and cause the value to be inherited, use the **no** form of the command:

```
hostname(config-username-webvpn)# no http-comp {gzip | none}
hostname(config-username-webvpn)#
```

The syntax of this command is as follows:

- **gzip—**Specifies compression is enabled for the group or user. This is the default value.
- **none—**Specifies compression is disabled for the group or user.

For clientless SSL VPN session, the **compression** command configured from global configuration mode overrides the **http-comp** command configured in group policy and username webvpn modes.

In the following example, compression is disabled for the username testuser:

```
hostname(config)# username testuser internal
hostname(config)# username testuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# http-comp none
hostname(config-username-webvpn)#
```

Specifying the SSO Server

Single sign-on support, available only for clientless SSL VPN sessions, lets users access different secure services on different servers without reentering a username and password more than once. The **sso-server value** command, when entered in username-webvpn mode, lets you assign an SSO server to a user.

To assign an SSO server to a user, use the **sso-server value** command in username-webvpn configuration mode. This command requires that your configuration include CA SiteMinder command.

```
hostname(config-username-webvpn)# sso-server value server_name
hostname(config-username-webvpn)#
```

To remove the assignment and use the default policy, use the **no** form of this command. To prevent inheriting the default policy, use the **sso-server none** command.

```
hostname(config-username-webvpn)# sso-server {value server_name | none}
hostname(config-username-webvpn)# [no] sso-server value server_name
```

The default policy assigned to the SSO server is DfltGrpPolicy.

The following example assigns the SSO server named example to the user named anyuser:

```
hostname(config)# username anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# sso-server value example
hostname(config-username-webvpn)#
```

Configuring SVC

The SSL VPN Client (SVC) is a VPN tunneling technology that gives remote users the benefits of an IPSec VPN client without the need for network administrators to install and configure IPSec VPN clients on remote computers. The SVC uses the SSL encryption that is already present on the remote computer as well as the login and authentication required to access the ASA.

To establish an SVC session, the remote user enters the IP address of an interface of the ASA configured to support clientless SSL VPN sessions. The browser connects to that interface and displays the login screen. If the user satisfies the login and authentication, and the ASA identifies the user as *requiring* the SVC, the ASA downloads the SVC to the remote computer. If the ASA identifies the user as having the *option* to use the SVC, the ASA downloads the SVC to the remote computer while presenting a link on the user screen to skip the SVC installation.

After downloading, the SVC installs and configures itself, and then the SVC either remains or uninstalls itself (depending on the configuration) from the remote computer when the connection terminates.

The ASA might have several unique SVC images residing in cache memory for different remote computer operating systems. When the user attempts to connect, the ASA can consecutively download portions of these images to the remote computer until the image and operating system match, at which point it downloads the entire SVC. You can order the SVC images to minimize connection setup time, with the first image downloaded representing the most commonly-encountered remote computer operating system. For complete information about installing and using SVC, see Chapter 72, “Configuring AnyConnect VPN Client Connections”.

After enabling SVC, as described in Chapter 72, “Configuring AnyConnect VPN Client Connections”, you can enable or require SVC features for a specific user. This feature is disabled by default. If you enable or require SVC, you can then enable a succession of svc commands, described in this section. To enable SVC and its related svc commands, do the following steps in username webvpn configuration mode:

Step 1 To enable the ASA to download SVC files to remote computers, enter the **svc enable** command. By default, this command is disabled. The ASA does not download SVC files. To remove the **svc enable** command from the configuration, use the **no** form of this command.

```
hostname(config-username-webvpn)# svc {none | enable | required}
hostname(config-username-webvpn)#
```

Note Entering the **no svc enable** command does not terminate active SVC sessions.

```
hostname(config)# username sales attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# svc enable
hostname(config-username-webvpn)#
```

Step 2 To enable compression of HTTP data over an SVC connection, for a specific user, enter the svc compression command. By default, SVC compression is set to **deflate** (enabled). To disable compression for a specific user, use the **none** keyword. To remove the svc compression command and cause the value to be inherited, use the **no** form of the command:

```
hostname(config-username-webvpn)# svc compression {deflate | none}
hostname(config-username-webvpn)#
```

The following example disables SVC compression for the user named sales:

```
hostname(config)# username sales attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# svc compression none
hostname(config-username-webvpn)#
```

Step 3 To enable dead-peer-detection (DPD) on the ASA and to set the frequency with which either the SVC or the ASA performs DPD, use the **svc dpd-interval** command. To remove the **svc dpd-interval** command from the configuration, use the **no** form of the command. To disable SVC DPD for this user, use the **none** keyword:

```
hostname(config-username-webvpn)# svc dpd-interval {[gateway {seconds | none}] | [client
{seconds | none}]}
hostname(config-username-webvpn)#
```

DPD checking is disabled by default.

The gateway refers to the ASA. You can specify the frequency with which the ASA performs the DPD test as a range of from 30 to 3600 seconds (1 hour). Specifying **none** disables the DPD testing that the ASA performs.

The client refers to the SVC. You can specify the frequency with which the client performs the DPD test as a range of from 30 to 3600 seconds (1 hour). Specifying **none** disables the DPD testing that the client performs.

In the following example, the user configures the DPD frequency performed by the ASA (gateway) to 3000 seconds, and the DPD frequency performed by the client to 1000 seconds for the existing user named sales:

```
hostname(config)# username sales attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# svc dpd-interval gateway 3000
hostname(config-username-webvpn)# svc dpd-interval client 1000
hostname(config-username-webvpn)#
```

Step 4 You can adjust the frequency of keepalive messages (specified by *seconds)*, to ensure that an SVC connection through a proxy, firewall, or NAT device remains open, even if the device limits the time that the connection can be idle.

Adjusting the frequency also ensures that the SVC does not disconnect and reconnect when the remote user is not actively running a socket-based application, such as Microsoft Outlook or Microsoft Internet Explorer.

To configure the frequency (15 through 600 seconds) which an SVC on a remote computer sends keepalive messages to the security appliance, use the **svc keepalive** command. Use the **no** form of the command to remove the command from the configuration and cause the value to be inherited:

```
hostname(config-username-webvpn)# svc keepalive {none | seconds}
hostname(config-username-webvpn)# no svc keepalive {none | seconds}
hostname(config-username-webvpn)#
```

SVC keepalives are disabled by default. Using the keyword **none** disables SVC keepalive messages.

In the following example, the user configures the security appliance to enable the SVC to send keepalive messages, with a frequency of 300 seconds (5 minutes):

```
hostname(config-username-webvpn)# svc keepalive 300
hostname(config-username-webvpn)#
```

Step 5 To enable the permanent installation of an SVC onto a remote computer, use the **svc keep-installer** command with the **installed** keyword. To remove the command from the configuration, use the **no** form of this command:

```
hostname(config-username-webvpn)# svc keep-installer {installed | none}
hostname(config-username-webvpn)# no svc keep-installer {installed | none}
hostname(config-username-webvpn)#
```

The default is that permanent installation of the SVC is disabled. The SVC uninstalls from the remote computer at the end of the SVC session.

The following example configures the ASA to keep the SVC installed on the remote computer for this user:

```
hostname(config-username-webvpn)# svc keep-installer installed
hostname(config-username-webvpn)#
```

Step 6 To enable the SVC to perform a rekey on an SVC session, use the **svc rekey** command:

```
hostname(config-username-webvpn)# svc rekey {method {ssl | new-tunnel} | time minutes | 
none}}
```

To disable rekey and remove the command from the configuration, use the **no** form of this command:

```
hostname(config-username-webvpn)# no svc rekey [method {ssl | new-tunnel} | time minutes | 
none}]
hostname(config-username-webvpn)#
```

By default, SVC rekey is disabled.

Specifying the method as new-tunnel specifies that the SVC establishes a new tunnel during SVC rekey. Specifying the method as none disables SVC rekey. Specifying the method as ssl specifies that SSL renegotiation takes place during SVC rekey. instead of specifying the method, you can specify the time; that is, the number of minutes from the start of the session until the re-key takes place, from 1 through 10080 (1 week).

For the **no** form of the command, only the minimum is necessary. The following example is correct:

```
hostname(config-username-webvpn)# no svc rekey method
hostname(config-username-webvpn)#
```

If, however, you specify the method as new-tunnel:

```
hostname(config-username-webvpn)# no svc rekey method new-tunnel
hostname(config-username-webvpn)#
```

and the current method is ssl, then the command fails, because the values don't match.

In the following example, the user configures the SVC to renegotiate with SSL during rekey and configures the rekey to occur 30 minutes after the session begins:

```
hostname(config-username-webvpn)# svc rekey method ssl
hostname(config-username-webvpn)# svc rekey time 30
hostname(config-username-webvpn)#
```

CHAPTER 65

Configuring IP Addresses for VPNs

This chapter describes IP address assignment methods.

IP addresses make internetwork connections possible. They are like telephone numbers: both the sender and receiver must have an assigned number to connect. But with VPNs, there are actually two sets of addresses: the first set connects client and server on the public network. Once that connection is made, the second set connects client and server through the VPN tunnel.

In ASA address management, we are dealing with the second set of IP addresses: those private IP addresses that connect a client with a resource on the private network, through the tunnel, and let the client function as if it were directly connected to the private network. Furthermore, we are dealing only with the private IP addresses that get assigned to clients. The IP addresses assigned to other resources on your private network are part of your network administration responsibilities, not part of VPN management. Therefore, when we discuss IP addresses here, we mean those IP addresses available in your private network addressing scheme that let the client function as a tunnel endpoint.

This chapter includes the following sections:

- Configuring an IP Address Assignment Method, page 65-1
- Configuring Local IP Address Pools, page 65-2
- Configuring AAA Addressing, page 65-2
- Configuring DHCP Addressing, page 65-3

Configuring an IP Address Assignment Method

The ASA can use one or more of the following methods for assigning IP addresses to remote access clients. If you configure more than one address assignment method, the ASA searches each of the options until it finds an IP address. By default, all methods are enabled. To view the current configuration, enter the **show running-config all vpn-addr-assign** command.

- **aaa**—Retrieves addresses from an external authentication server on a per-user basis. If you are using an authentication server that has IP addresses configured, we recommend using this method.
- **dhcp**—Obtains IP addresses from a DHCP server. If you want to use DHCP, you must configure a DHCP server. You must also define the range of IP addresses that the DHCP server can use.
- **local**—**Use an internal address pool.** Internally configured address pools are the easiest method of address pool assignment to configure. If you choose local, you must also use the **ip-local-pool** command to define the range of IP addresses to use.

To specify a method for assigning IP addresses to remote access clients, enter the **vpn-addr-assign** command in global configuration mode. The syntax is **vpn-addr-assign {aaa | dhcp | local}**.

Configuring Local IP Address Pools

To configure IP address pools to use for VPN remote access tunnels, enter the **ip local pool** command in global configuration mode. To delete address pools, enter the **no** form of this command.

The ASA uses address pools based on the tunnel group for the connection. If you configure more than one address pool for a tunnel group, the ASA uses them in the order in which they are configured.

If you assign addresses from a non-local subnet, we suggest that you add pools that fall on subnet boundaries to make adding routes for these networks easier.

A summary of the configuration of local address pools follows:

```
hostname(config)# vpn-addr-assign local
hostname(config)# ip local pool firstpool 10.20.30.40-10.20.30.50 mask 255.255.255.0
hostname(config)
```

Step 1 To configure IP address pools as the address assignment method, enter the **vpn-addr-assign** command with the **local** argument:

```
hostname(config)# vpn-addr-assign local
hostname(config)#
```

Step 2 To configure an address pool, enter the **ip local pool** command. **The syntax is ip local pool** *poolname first-address—last-address* **mask** *mask*.

The following example configures an IP address pool named firstpool. The starting address is 10.20.30.40 and the ending address is 10.20.30.50. The network mask is 255.255.255.0.

```
hostname(config)# ip local pool firstpool 10.20.30.40-10.20.30.50 mask 255.255.255.0
hostname(config)
```

Configuring AAA Addressing

To use a AAA server to assign addresses for VPN remote access clients, you must first configure a AAA server or server group. See the **aaa-server protocol** command in the *Cisco ASA 5500 Series Command Reference* and the “Identifying AAA Server Groups and Servers” section on page 36-9.

In addition, the user must match a tunnel group configured for RADIUS authentication.

The following examples illustrate how to define a AAA server group called RAD2 for the tunnel group named firstgroup. It includes one more step than is necessary, in that previously you might have named the tunnel group and defined the tunnel group type. This step appears in the following example as a reminder that you have no access to subsequent tunnel-group commands until you set these values.

An overview of the configuration that these examples create follows:

```
hostname(config)# vpn-addr-assign aaa
hostname(config)# tunnel-group firstgroup type ipsec-ra
hostname(config)# tunnel-group firstgroup general-attributes
hostname(config-general)# authentication-server-group RAD2
```

To configure AAA for IP addressing, perform the following steps:

Step 1 To configure AAA as the address assignment method, enter the **vpn-addr-assign** command with the **aaa** argument:

```
hostname(config)# vpn-addr-assign aaa
hostname(config)#
```

Step 2 To establish the tunnel group called firstgroup as a remote access or LAN-to-LAN tunnel group, enter the **tunnel-group** command with the **type** keyword. The following example configures a remote access tunnel group.

```
hostname(config)# tunnel-group firstgroup type ipsec-ra
hostname(config)#
```

Step 3 To enter general-attributes configuration mode, which lets you define a AAA server group for the tunnel group called firstgroup, enter the **tunnel-group** command with the **general-attributes** argument.

```
hostname(config)# tunnel-group firstgroup general-attributes
hostname(config-general)#
```

Step 4 To specify the AAA server group to use for authentication, enter the **authentication-server-group** command.

```
hostname(config-general)# authentication-server-group RAD2
hostname(config-general)#
```

This command has more arguments that this example includes. For more information, see the *Cisco ASA 5500 Series Command Reference*.

Configuring DHCP Addressing

To use DHCP to assign addresses for VPN clients, you must first configure a DHCP server and the range of IP addresses that the DHCP server can use. Then you define the DHCP server on a tunnel group basis. Optionally, you can also define a DHCP network scope in the group policy associated with the tunnel group or username. This is either an IP network number or IP Address that identifies to the DHCP server which pool of IP addresses to use.

The following examples define the DHCP server at IP address 172.33.44.19 for the tunnel group named firstgroup. They also define a DHCP network scope of 192.86.0.0 for the group policy called remotegroup. (The group policy called remotegroup is associated with the tunnel group called firstgroup). If you do not define a network scope, the DHCP server assigns IP addresses in the order of the address pools configured. It goes through the pools until it identifies an unassigned address.

The following configuration includes more steps than are necessary, in that previously you might have named and defined the tunnel group type as remote access, and named and identified the group policy as internal or external. These steps appear in the following examples as a reminder that you have no access to subsequent tunnel-group and group-policy commands until you set these values.

A summary of the configuration that these examples create follows:

```
hostname(config)# vpn-addr-assign dhcp
hostname(config)# tunnel-group firstgroup type ipsec-ra
hostname(config)# tunnel-group firstgroup general-attributes
hostname(config-general)# dhcp-server 172.33.44.19
hostname(config-general)# exit
hostname(config)# group-policy remotegroup internal
hostname(config)# group-policy remotegroup attributes
hostname(config-group-policy)# dhcp-network-scope 192.86.0.0
```

To define a DHCP server for IP addressing, perform the following steps.

Step 1 To configure DHCP as the address assignment method, enter the **vpn-addr-assign** command with the **dhcp** argument:

```
hostname(config)# vpn-addr-assign dhcp
hostname(config)#
```

Step 2 To establish the tunnel group called firstgroup as a remote access or LAN-to-LAN tunnel group, enter the **tunnel-group** command with the **type** keyword. The following example configures a remote access tunnel group.

```
hostname(config)# tunnel-group firstgroup type ipsec-ra
hostname(config)#
```

Step 3 To enter general-attributes configuration mode, which lets you configure a DHCP server, enter the **tunnel-group** command with the **general-attributes** argument.

```
hostname(config)# tunnel-group firstgroup general-attributes
hostname(config)#
```

Step 4 To define the DHCP server, enter the **dhcp-server** command. The following example configures a DHCP server at IP address 172.33.44.19.

```
hostname(config-general)# dhcp-server 172.33.44.19
hostname(config-general)#
```

Step 5 Exit tunnel-group mode.

```
hostname(config-general)# exit
hostname(config)#
```

Step 6 To define the group policy called remotegroup as an internally or externally configured group, enter the **group-policy** command with the **internal** or **external** argument. The following example configures an internal group.

```
hostname(config)# group-policy remotegroup internal
hostname(config)#
```

Step 7 (Optional) To enter group-policy attributes configuration mode, which lets you configure a subnetwork of IP addresses for the DHCP server to use, enter the **group-policy** command with the **attributes** keyword.

```
hostname(config)# group-policy remotegroup attributes
hostname(config-group-policy)#
```

Step 8 (Optional) To specify the range of IP addresses the DHCP server should use to assign addresses to users of the group policy called remotegroup, enter the dhcp-network-scope command. The following example configures at network scope of 192.86.0.0.

```
hostname(config-group-policy)# dhcp-network-scope 192.86.0.0
hostname(config-group-policy)#
```

CHAPTER 66

Configuring Remote Access IPsec VPNs

This chapter describes how to configure Remote Access IPsec VPNs and includes the following sections:

- Information About Remote Access IPsec VPNs, page 66-1
- Licensing Requirements for Remote Access IPsec VPNs, page 66-2
- Guidelines and Limitations, page 66-2
- Configuring Remote Access IPsec VPNs, page 66-2
- Configuration Examples for Remote Access IPsec VPNs, page 66-9
- Feature History for Remote Access IPsec VPNs, page 66-10

Information About Remote Access IPsec VPNs

Remote access VPNs allow users to connect to a central site through a secure connection over a TCP/IP network such as the Internet. The Internet Security Association and Key Management Protocol, also called IKE, is the negotiation protocol that lets the IPsec client on the remote PC and the ASA agree on how to build an IPsec Security Association. Each ISAKMP negotiation is divided into two sections called Phase1 and Phase2.

Phase 1 creates the first tunnel to protect later ISAKMP negotiation messages. Phase 2 creates the tunnel that protects data travelling across the secure connection.

To set the terms of the ISAKMP negotiations, you create an ISAKMP policy. It includes the following:

- An authentication method, to ensure the identity of the peers.
- An encryption method, to protect the data and ensure privacy.
- A Hashed Message Authentication Codes (HMAC) method to ensure the identity of the sender and to ensure that the message has not been modified in transit.
- A Diffie-Hellman group to set the size of the encryption key.
- A time limit for how long the ASA uses an encryption key before replacing it.

A transform set combines an encryption method and an authentication method. During the IPsec security association negotiation with ISAKMP, the peers agree to use a particular transform set to protect a particular data flow. The transform set must be the same for both peers.

A transform set protects the data flows for the access list specified in the associated crypto map entry. You can create transform sets in the ASA configuration, and then specify a maximum of 11 of them in a crypto map or dynamic crypto map entry. For more overview information, including a table that lists valid encryption and authentication methods, see Creating a Transform Set in Chapter 70, "Configuring LAN-to-LAN IPsec VPNs" of this guide.

Licensing Requirements for Remote Access IPsec VPNs

The following table shows the licensing requirements for this feature:

Model	**License Requirement**
ASA 5505	Base License: 10 sessions (25 combined IPSec and SSL VPN[1]). Security Plus License: 25 sessions (25 combined IPSec and SSL VPN[1]).
ASA 5510	Base and Security Plus License: 250 sessions (250 combined IPSec and SSL VPN[1]).
ASA 5520	Base and Security Plus License: 750 sessions (750 combined IPSec and SSL VPN[1]).
ASA 5540	Base and Security Plus License: 5000 sessions (5000 combined IPSec and SSL VPN[1]).
ASA 5550 and 5580	Base and Security Plus License: 5000 sessions (5000 combined IPSec and SSL VPN[1]).

[1] Although the maximum IPSec and SSL VPN sessions add up to more than the maximum VPN sessions, the combined sessions should not exceed the VPN session limit. If you exceed the maximum VPN sessions, you can overload the ASA, so be sure to size your network appropriately.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single context mode only. Does not support multiple context mode.

Firewall Mode Guidelines

Not supported in routed or transparent firewall mode.

Failover Guidelines

IPsec VPN sessions are replicated in Active/Standby failover configurations only. Active/Active failover configurations are not supported.

IPv6 Guidelines

Does not support IPv6.

Configuring Remote Access IPsec VPNs

This section describes how to configure remote access VPNs and includes the following topics:

- Configuring Interfaces, page 66-3

- Configuring ISAKMP Policy and Enabling ISAKMP on the Outside Interface, page 66-4
- Configuring an Address Pool, page 66-5
- Adding a User, page 66-5
- Creating a Transform Set, page 66-6
- Defining a Tunnel Group, page 66-6
- Creating a Dynamic Crypto Map, page 66-7
- Creating a Crypto Map Entry to Use the Dynamic Crypto Map, page 66-8
- Saving the Security Appliance Configuration, page 66-9

Configuring Interfaces

An ASA has at least two interfaces, referred to here as outside and inside. Typically, the outside interface is connected to the public Internet, while the inside interface is connected to a private network and is protected from public access.

To begin, configure and enable two interfaces on the ASA. Then assign a name, IP address and subnet mask. Optionally, configure its security level, speed and duplex operation on the security appliance.

To configure interfaces, perform the following steps, using the command syntax in the examples:

Detailed Steps

	Command	Purpose

Step 1	**interface** {*interface*}
	Example:
	`hostname(config)# interface ethernet0`
	`hostname(config-if)#`
		Enters interface configuration mode from global configuration mode.

Step 1	**ip address** *ip_address* [*mask*] [**standby** *ip_address*]
	Example:
	`hostname(config)# interface ethernet0`
	`hostname(config-if)#`
	`hostname(config-if)# ip address 10.10.4.200 255.255.0.0`
		Sets the IP address and subnet mask for the interface.

Step 2	**nameif** *name*
	Example:
	`hostname(config-if)# nameif outside`
	`hostname(config-if)#`
		Specifies a name for the interface (maximum of 48 characters). You cannot change this name after you set it.

Step 3	**shutdown**
	Example:
	`hostname(config-if)# no shutdown`
	`hostname(config-if)#`
		Enables the interface. By default, interfaces are disabled.

Configuring ISAKMP Policy and Enabling ISAKMP on the Outside Interface

This section describes the procedure to configure an ISAKMP policy on the outside interface and how to enable the policy.

Detailed Steps

Perform the following steps and use the command syntax in the following examples as a guide.

	Command	Purpose

Step 1	**isakmp policy** *priority* **authentication** {**crack** | **pre-share** | **rsa-sig**}
	Example:
	`hostname(config)# isakmp policy 1 authentication pre-share`
	`hostname(config)#`
		Specifies the authentication method and the set of parameters to use during IKE negotiation.
		Priority uniquely identifies the Internet Key Exchange (IKE) policy and assigns a priority to the policy. Use an integer from 1 to 65,534, with 1 being the highest priority and 65,534 the lowest.
		In this example and the steps that follow, we set the priority to 1.

Step 2	**isakmp policy** *priority* **encryption** {**aes** | **aes-192** | **aes-256** | **des** | **3des**}
	Example:
	`hostname(config)# isakmp policy 1 encryption 3des`
	`hostname(config)#`
		Specifies the encryption method to use within an IKE policy.

Step 3	**isakmp policy** *priority* **hash** {**md5** | **sha**}
	Example:
	`hostname(config)# isakmp policy 1 hash sha`
	`hostname(config)#`
		Specifies the hash algorithm for an IKE policy (also called the HMAC variant).

Step 4	**isakmp policy** *priority* **group** {**1** | **2** | **5**}
	Example:
	`hostname(config)# isakmp policy 1 group 2`
	`hostname(config)#`
		Specifies the Diffie-Hellman group for the IKE policy—the crypto protocol that allows the IPsec client and the ASA to establish a shared secret key.

Step 5	**isakmp policy** *priority* **lifetime** {*seconds*}
	Example:
	`hostname(config)# isakmp policy 1 lifetime 43200`
	`hostname(config)#`
		Specifies the encryption key lifetime—the number of seconds each security association should exist before expiring.
		The range for a finite lifetime is 120 to 2147483647 seconds. Use 0 seconds for an infinite lifetime.

	Command	Purpose

Step 6	**isakmp enable** *interface-name*
	
	Example:
	`hostname(config)# isakmp enable outside`
	`hostname(config)#`
		Enables ISAKMP on the interface named *outside*.

Step 7	**write memory**
	
	Example:
	`hostname(config-if)# write memory`
	`Building configuration...`
	`Cryptochecksum: 0f80bf71 1623a231 63f27ccf 8700ca6d`
	
	`11679 bytes copied in 3.390 secs (3893 bytes/sec)`
	`[OK]`
	`hostname(config-if)#`
		Saves the changes to the configuration.

Configuring an Address Pool

The ASA requires a method for assigning IP addresses to users. This section uses address pools as an example. Use the command syntax in the following examples as a guide.

Command	Purpose

ip local pool *poolname first-address***—***last-address* [**mask** *mask*]
 	
Example:
`hostname(config)# ip local pool testpool 192.168.0.10-192.168.0.15`
`hostname(config)#`
	Creates an address pool with a range of IP addresses, from which the ASA assigns addresses to the clients.
	The address mask is optional. However, You must supply the mask value when the IP addresses assigned to VPN clients belong to a non-standard network and the data could be routed incorrectly if you use the default mask. A typical example is when the IP local pool contains 10.10.10.0/255.255.255.0 addresses, since this is a Class A network by default. This could cause routing issues when the VPN client needs to access different subnets within the 10 network over different interfaces.

Adding a User

This section shows how to configure usernames and passwords. Use the command syntax in the following examples as a guide.

Command	Purpose

username *name* {**nopassword** | **password** *password* [**mschap** | **encrypted** | **nt-encrypted**]} [**privilege** *priv_level*]
 	
Example:
`hostname(config)# username testuser password 12345678`
`hostname(config)#`
	Creates a user, password, and privilege level.

Creating a Transform Set

This section shows how to configure a transform set, which combines an encryption method and an authentication method.

Use the command syntax in the following examples as a guide.

Command	Purpose

`crypto ipsec transform-set` *`transform-set-name encryption-method`* `[`*`authentication`*`]`
Example:
`hostname(config)# crypto ipsec transform set FirstSet esp-3des esp-md5-hmac`
`hostname(config)#`
	Configures a transform set that specifies the IPsec encryption and hash algorithms to be used to ensure data integrity.
	Use one of the following values for *encryption*:
	• **esp-aes** to use AES with a 128-bit key.
	• **esp-aes-192** to use AES with a 192-bit key.
	• **esp-aes-256** to use AES with a 256-bit key.
	• **esp-des** to use 56-bit DES-CBC.
	• **esp-3des** to use triple DES algorithm.
	• **esp-null** to not use encryption.
	Use one of the following values for *authentication*:
	• **esp-md5-hmac** to use the MD5/HMAC-128 as the hash algorithm.
	• **esp-sha-hmac** to use the SHA/HMAC-160 as the hash algorithm.
	• **esp-none** to not use HMAC authentication.

Defining a Tunnel Group

This section describes how to configure a tunnel group, which is a set of records that contain tunnel connection policies. You configure a tunnel group to identify AAA servers, specify connection parameters, and define a default group policy. The ASA stores tunnel groups internally.

There are two default tunnel groups in the ASA system: DefaultRAGroup, which is the default IPsec remote-access tunnel group, and DefaultL2Lgroup, which is the default IPsec LAN-to-LAN tunnel group. You can change them but not delete them. The ASA uses these groups to configure default tunnel parameters for remote access and LAN-to-LAN tunnel groups when there is no specific tunnel group identified during tunnel negotiation.

Use the command syntax in the following examples as a guide.

Detailed Steps

	Command	Purpose

Step 1	**`tunnel-group`** *`name`* **`type`** *`type`*
	Example:
	`hostname(config)# tunnel-group testgroup type ipsec-ra`
	`hostname(config)#`
		Creates an IPsec remote access tunnel-group (also called connection profile).

Step 2	**`tunnel-group`** *`name`* **`general-attributes`**
	Example:
	`hostname(config)# tunnel-group testgroup general-attributes`
	`hostname(config-tunnel-general)#`
		Enters tunnel group general attributes mode where you can enter an authentication method.

Step 3	**`address-pool`** `[(`*`interface name`*`)]` **`address_pool1`** `[...address_pool6]`
	Example:
	`hostname(config-general)# address-pool testpool`
		Specifies an address pool to use for the tunnel group.

Step 4	**`tunnel-group`** *`name`* **`ipsec-attributes`**
	Example:
	`hostname(config)# tunnel-group testgroup ipsec-attributes`
	`hostname(config-tunnel-ipsec)#`
		Enters tunnel group ipsec attributes mode where you can enter ipsec-specific attributes.

Step 5	**`pre-shared-key`** *`key`*
	Example:
	`hostname(config-tunnel-ipsec)# pre-shared-key 44kkaol59636jnfx`
		(Optional) Configures a pre-shared key. The key can be an alphanumeric string from 1-128 characters.
		The keys for the adaptive security appliance and the client must be identical. If a Cisco VPN Client with a different preshared key size tries to connect, the client logs an error message indicating it failed to authenticate the peer.

Creating a Dynamic Crypto Map

This section describes how to configure dynamic crypto maps, which define a policy template where all the parameters do not have to be configured. These dynamic crypto maps let the ASA receive connections from peers that have unknown IP addresses. Remote access clients fall in this category.

Dynamic crypto map entries identify the transform set for the connection. You also enable reverse routing, which lets the ASA learn routing information for connected clients, and advertise it via RIP or OSPF.

Use the command syntax in the following examples as a guide.

Detailed Steps

	Command	Purpose

Step 1	**crypto dynamic-map** *dynamic-map-name seq-num* **set transform-set** *transform-set-name*
	Example:
	`hostname(config)# crypto dynamic-map dyn1 1 set transform-set FirstSet`
	`hostname(config)#`
		Creates a dynamic crypto map and specifies a transform set for the map.

Step 2	**crypto dynamic-map** *dynamic-map-name dynamic-seq-num* **set reverse-route**
	Example:
	`hostname(config)# crypto dynamic-map dyn1 1 set reverse route`
	`hostname(config)#`
		(Optional) Enables Reverse Route Injection for any connection based on this crypto map entry.

Creating a Crypto Map Entry to Use the Dynamic Crypto Map

This section describes how to create a crypto map entry that lets the ASA use the dynamic crypto map to set the parameters of IPsec security associations.

In the following examples for this command, the name of the crypto map is *mymap*, the sequence number is 1, and the name of the dynamic crypto map is *dyn1*, which you created in the previous section, "Creating a Dynamic Crypto Map."

Use the command syntax in the following examples as a guide.

Detailed Steps

	Command	Purpose

Step 1	**crypto map** *map-name seq-num* **ipsec-isakmp dynamic** *dynamic-map-name*
	Example:
	`hostname(config)# crypto map mymap 1 ipsec-isakmp dynamic dyn1`
	`hostname(config)#`
		Creates a crypto map entry that uses a dynamic crypto map.

Step 2	**crypto map** *map-name* **interface** *interface-name*
	Example:
	`hostname(config)# crypto map mymap interface outside`
	`hostname(config)#`
		Applies the crypto map to the outside interface.

Saving the Security Appliance Configuration

After performing the preceding configuration tasks, be sure to save your configuration changes as shown in this example:

Command	Purpose
`write memory` **Example:**	Saves the changes to the configuration.

```
hostname(config-if)# write memory
Building configuration...
Cryptochecksum: 0f80bf71 1623a231 63f27ccf 8700ca6d

11679 bytes copied in 3.390 secs (3893 bytes/sec)
[OK]
hostname(config-if)#
```

Configuration Examples for Remote Access IPsec VPNs

The following example shows how to configure Remote Access IPsec VPNs:

```
hostname(config)# interface ethernet0
hostname(config-if)# ip address 10.10.4.200 255.255.0.0
hostname(config-if)# nameif outside
hostname(config-if)# no shutdown
hostname(config)# isakmp policy 1 authentication pre-share
hostname(config)# isakmp policy 1 encryption 3des
hostname(config)# isakmp policy 1 hash sha
hostname(config)# isakmp policy 1 group 2
hostname(config)# isakmp policy 1 lifetime 43200
hostname(config)# isakmp enable outside
hostname(config)# ip local pool testpool 192.168.0.10-192.168.0.15
hostname(config)# username testuser password 12345678
hostname(config)# crypto ipsec transform set FirstSet esp-3des esp-md5-hmac
hostname(config)# tunnel-group testgroup type ipsec-ra
hostname(config)# tunnel-group testgroup general-attributes
hostname(config-general)# address-pool testpool
hostname(config)# tunnel-group testgroup ipsec-attributes
hostname(config-ipsec)# pre-shared-key 44kkaol59636jnfx
hostname(config)# crypto dynamic-map dyn1 1 set transform-set FirstSet
hostname(config)# crypto dynamic-map dyn1 1 set reverse-route
hostname(config)# crypto map mymap 1 ipsec-isakmp dynamic dyn1
hostname(config)# crypto map mymap interface outside
hostname(config)# write memory
```

Feature History for Remote Access IPsec VPNs

Table 66-1 lists the release history for this feature.

Table 66-1 Feature History for Feature-1

Feature Name	Releases	Feature Information
Remote access VPNs	7.0	Remote access VPNs allow users to connect to a central site through a secure connection over a TCP/IP network such as the Internet.

CHAPTER 67

Configuring Network Admission Control

This chapter includes the following sections:

- Overview, page 67-1
- Uses, Requirements, and Limitations, page 67-2
- Viewing the NAC Policies on the Security Appliance, page 67-2
- Adding, Accessing, or Removing a NAC Policy, page 67-4
- Configuring a NAC Policy, page 67-4
- Assigning a NAC Policy to a Group Policy, page 67-7
- Changing Global NAC Framework Settings, page 67-8

Overview

Network Admission Control protects the enterprise network from intrusion and infection from worms, viruses, and rogue applications by performing endpoint compliancy and vulnerability checks as a condition for production access to the network. We refer to these checks as *posture validation*. You can configure posture validation to ensure that the anti-virus files, personal firewall rules, or intrusion protection software on a host with an IPSec or WebVPN session are up-to-date before providing access to vulnerable hosts on the intranet. Posture validation can include the verification that the applications running on the remote hosts are updated with the latest patches. NAC occurs only after user authentication and the setup of the tunnel. NAC is especially useful for protecting the enterprise network from hosts that are not subject to automatic network policy enforcement, such as home PCs.

The establishment of a tunnel between the endpoint and the ASA triggers posture validation.

You can configure the ASA to pass the IP address of the client to an optional audit server if the client does not respond to a posture validation request. The audit server, such as a Trend server, uses the host IP address to challenge the host directly to assess its health. For example, it may challenge the host to determine whether its virus checking software is active and up-to-date. After the audit server completes its interaction with the remote host, it passes a token to the posture validation server, indicating the health of the remote host.

Following successful posture validation or the reception of a token indicating the remote host is healthy, the posture validation server sends a network access policy to the ASA for application to the traffic on the tunnel.

In a *NAC Framework* configuration involving the ASA, only a Cisco Trust Agent running on the client can fulfill the role of posture agent, and only a Cisco Access Control Server (ACS) can fulfill the role of posture validation server. The ACS uses dynamic ACLs to determine the access policy for each client.

As a RADIUS server, the ACS can authenticate the login credentials required to establish a tunnel, in addition to fulfilling its role as posture validation server.

Note Only a NAC Framework policy configured on the ASA supports the use of an audit server.

In its role as posture validation server, the ACS uses access control lists. If posture validation succeeds and the ACS specifies a redirect URL as part of the access policy it sends to the ASA, the ASA redirects all HTTP and HTTPS requests from the remote host to the redirect URL. Once the posture validation server uploads an access policy to the ASA, all of the associated traffic must pass both the Security Appliance and the ACS (or vice versa) to reach its destination.

The establishment of a tunnel between an IPSec or WebVPN client and the ASA triggers posture validation if a NAC Framework policy is assigned to the group policy. The NAC Framework policy can, however, identify operating systems that are exempt from posture validation and specify an optional ACL to filter such traffic.

Uses, Requirements, and Limitations

When configured to support NAC, the ASA functions as a client of a Cisco Secure Access Control Server, requiring that you install a minimum of one Access Control Server on the network to provide NAC authentication services.

Following the configuration of one or more Access Control Servers on the network, you must use the **aaa-server** command to name the Access Control Server group. Then follow the instructions in the “Configuring a NAC Policy” procedure on page 67-4.

ASA support for NAC Framework is limited to remote access IPSec and WebVPN client sessions. The NAC Framework configuration supports only single mode.

NAC on the ASA does not support Layer 3 (non-VPN) traffic and IPv6 traffic.

Viewing the NAC Policies on the Security Appliance

Before configuring the NAC policies to be assigned to group policies, we recommend that you view any that may already be set up on the ASA. To do so, enter the following command in privileged EXEC mode:

show running-config nac-policy

The default configuration does not contain NAC policies, however, entering this command is a useful way to determine whether anyone has added any. If so, you may decide that the policies already configured are suitable and disregard the section on configuring a NAC policy.

The following example shows the configuration of a NAC policy named nacframework1:

```
hostname# show running-config nac-policy
nac-policy nacframework1 nac-framework
 default-acl acl-1
 reval-period 36000
 sq-period 300
 exempt-list os "Windows XP" filter acl-2
hostname#
```

The first line of each NAC policy indicates its name and type (nac-framework). Table 67-1 explains the nac-framework attributes displayed in response to the **`show running-config nac-policy`** command.

Table 67-1 show running-config nac-policy Command Fields

Field	Description
default-acl	NAC default ACL applied before posture validation. Following posture validation, the security appliance replaces the default ACL with the one obtained from the Access Control Server for the remote host. The ASA retains the default ACL if posture validation fails.
reval-period	Number of seconds between each successful posture validation in a NAC Framework session.
sq-period	Number of seconds between each successful posture validation in a NAC Framework session and the next query for changes in the host posture
exempt-list	Operating system names that are exempt from posture validation. Also shows an optional ACL to filter the traffic if the remote computer's operating system matches the name.
authentication-server-group	name of the of authentication server group to be used for NAC posture validation.

To display the assignment of NAC policies to group policies, enter the following command in privileged EXEC mode:

show nac-policy

In addition to listing the NAC policy-to-group policy assignments, the CLI shows which NAC policies are unassigned and the usage count for each NAC policy, as follows:

```
asa2(config)# show nac-policy
nac-policy framework1 nac-framework
  applied session count = 0
  applied group-policy count = 2
  group-policy list:    GroupPolicy2    GroupPolicy1
nac-policy framework2 nac-framework is not in use.
asa2(config)#
```

The CLI shows the text "is not in use" next to the policy type if the policy is not assigned to any group policies. Otherwise, the CLI displays the policy name and type on the first line and the usage data for the group policies in subsequent lines. Table 67-2 explains the fields in the **`show nac-policy`** command.

Table 67-2 show nac-policy Command Fields

Field	Description
applied session count	Cumulative number of VPN sessions to which this ASA applied the NAC policy.
applied group-policy count	Cumulative number of group polices to which this ASA applied the NAC policy.
group-policy list	List of group policies to which this NAC policy is assigned. In this case, the usage of a group policy does not determine whether it appears in this list; if the NAC policy is assigned to a group policy in the running configuration, then the group policy appears in this list.

Refer to the following sections to create a NAC policy or modify one that is already present.

Adding, Accessing, or Removing a NAC Policy

Enter the following command in global configuration mode to add or modify a NAC policy:

[**no**] **nac-policy** *nac-policy-name* **nac-framework**

Use the **no** version of the command to remove a NAC policy from the configuration. Alternatively, you can enter the **clear configure nac-policy** command to remove all NAC policies from the configuration except for those that are assigned to group policies. When entering the command to remove or prepare to modify a NAC policy, you must specify both the name and type of the policy.

nac-policy-name is the name of a new NAC policy or one that is already present. The name is a string of up to 64 characters. The **show running-config nac-policy** command displays the name and configuration of each NAC policy already present on the security appliance.

nac-framework specifies that a NAC Framework configuration will provide a network access policy for remote hosts. A Cisco Access Control Server must be present on the network to provide NAC Framework services for the ASA. When you specify this type, the prompt indicates you are in `nac-policy-nac-framework` configuration mode. This mode lets you configure the NAC Framework policy.

You can create more than one NAC Framework policy, but you can assign no more than one to a group policy.

For example, the following command creates and accesses a NAC Framework policy named nac-framework1:

```
hostname(config)# nac-policy nac-framework1 nac-framework
hostname(config-nac-policy-nac-framework)
```

Configuring a NAC Policy

After you use the **nac-policy** command to name a NAC Framework policy, use the following sections to assign values to its attributes before you assign it to a group policy.

Specifying the Access Control Server Group

You must configure at least one Cisco Access Control Server to support NAC. Use the **aaa-server host** command to name the Access Control Server group even if the group contains only one server.

You can enter the following command to display the AAA server configuration:

show running-config aaa-server

For example:

```
hostname(config)# show running-config aaa-server
aaa-server acs-group1 protocol radius
aaa-server acs-group1 (outside) host 192.168.22.44
 key secret
 radius-common-pw secret
hostname(config)#
```

Enter the following command in nac-policy-nac-framework configuration mode to specify the group to be used for NAC posture validation:

[`no`] **authentication-server-group** *server-group*

Use the **no** form of the command if you want to remove the command from the NAC policy.

server-group must match the server-tag variable specified in the **aaa-server host** command. It is optional if you are using the **no** version of the command.

For example, enter the following command to specify acs-group1 as the authentication server group to be used for NAC posture validation:

```
hostname(config-nac-policy-nac-framework)# authentication-server-group acs-group1
hostname(config-nac-policy-nac-framework)
```

Setting the Query-for-Posture-Changes Timer

After each successful posture validation, the ASA starts a status query timer. The expiration of this timer triggers a query to the remote host for changes in posture since the last posture validation. A response indicating no change resets the status query timer. A response indicating a change in posture triggers an unconditional posture revalidation. The ASA maintains the current access policy during revalidation.

By default, the interval between each successful posture validation and the status query, and each subsequent status query, is 300 seconds (5 minutes). Enter the following command in nac-policy-nac-framework configuration mode to change the status query interval:

[`no`] **sq-period** *seconds*

Use the **no** form of the command if you want to turn off the status query timer. If you turn off this timer and enter **show running-config nac-policy**, the CLI displays a `0` next to the `sq-period` attribute, which means the timer is turned off.

seconds must be in the range 30 to 1800 seconds (5 to 30 minutes). It is optional if you are using the **no** version of the command.

The following example changes the status query timer to 1800 seconds:

```
hostname(config-group-policy)# sq-period 1800
hostname(config-group-policy)
```

Setting the Revalidation Timer

After each successful posture validation, the ASA starts a revalidation timer. The expiration of this timer triggers the next unconditional posture validation. The ASA maintains the current access policy during revalidation.

By default, the interval between each successful posture validation is 36000 seconds (10 hours). To change it, enter the following command in nac-policy-nac-framework configuration mode:

[`no`] **reval-period** *seconds*

Use the **no** form of the command if you want to turn off the status query timer. If you turn off this timer and enter **show running-config nac-policy**, the CLI displays a `0` next to the `sq-period` attribute, which means the timer is turned off.

seconds must be in the range is 300 to 86400 seconds (5 minutes to 24 hours). It is optional if you are using the **no** version of the command.

For example, enter the following command to change the revalidation timer to 86400 seconds:

```
hostname(config-nac-policy-nac-framework)# reval-period 86400
hostname(config-nac-policy-nac-framework)
```

Configuring the Default ACL for NAC

Each group policy points to a default ACL to be applied to hosts that match the policy and are eligible for NAC. The ASA applies the NAC default ACL before posture validation. Following posture validation, the ASA replaces the default ACL with the one obtained from the Access Control Server for the remote host. The ASA retains the default ACL if posture validation fails.

The ASA also applies the NAC default ACL if clientless authentication is enabled (which is the default setting).

Enter the following command in nac-policy-nac-framework configuration mode to specify the ACL to be used as the default ACL for NAC sessions:

[**no**] **default-acl** *acl-name*

Use the **no** form of the command if you want to remove the command from the NAC Framework policy. In that case, specifying the *acl-name* is optional.

acl-name is the name of the access control list to be applied to the session.

The following example identifies acl-2 as the ACL to be applied before posture validation succeeds:

```
hostname(config-nac-policy-nac-framework)# default-acl acl-2
hostname(config-nac-policy-nac-framework)
```

Configuring Exemptions from NAC

The ASA configuration stores a list of exemptions from NAC posture validation. You can specify the operating systems that are exempt. If you specify an ACL, the client running the operating system specified is exempt from posture validation and the client traffic is subject to the ACL.

To add an entry to the list of remote computer types that are exempt from NAC posture validation, enter the following command in nac-policy-nac-framework configuration mode:

[no] exempt-list os "*os-name*" [**disable** | **filter** *acl-name* [**disable**]]

The **no exempt-list** command removes all exemptions from the NAC Framework policy. Specifying an entry when issuing the **no** form of the command removes the entry from the exemption list.

Note When the command specifies an operating system, it does not overwrite the previously added entry to the exception list; enter the command once for each operating system and ACL you want to exempt.

os exempts an operating system from posture validation.

os-name is the operating system name. Use quotation marks if the name includes a space (for example, "Windows XP").

filter applies an ACL to filter the traffic if the computer's operating system matches the *os name*. The **filter**/*acl-name* pair is optional.

disable performs one of two functions, as follows:

- If you enter it after the "os-name," the ASA ignores the exemption, and applies NAC posture validation to the remote hosts that are running that operating system.
- If you enter it after the *acl-name*, ASA exempts the operating system, but does not apply the ACL to the associated traffic.

acl-name is the name of the ACL present in the ASA configuration. When specified, it must follow the **filter** keyword.

For example, enter the following command to add all hosts running Windows XP to the list of computers that are exempt from posture validation:

```
hostname(config-group-policy)# exempt-list os "Windows XP"
hostname(config-group-policy)
```

The following example exempts all hosts running Windows XP and applies the ACL acl-2 to traffic from those hosts:

```
hostname(config-nac-policy-nac-framework)# exempt-list os "Windows XP" filter acl-2
hostname(config-nac-policy-nac-framework)
```

The following example removes the same entry from the exemption list:

```
hostname(config-nac-policy-nac-framework)# no exempt-list os "Windows XP" filter acl-2
hostname(config-nac-policy-nac-framework)
```

The following example removes all entries from the exemption list:

```
hostname(config-nac-policy-nac-framework)# no exempt-list
hostname(config-nac-policy-nac-framework)
```

Assigning a NAC Policy to a Group Policy

Upon completion of each tunnel setup, the ASA applies the NAC policy, if it is assigned to the group policy, to the session.

To assign a NAC policy to a group policy, use the **`nac-settings`** command in group-policy configuration mode, as follows:

[**`no`**] **`nac-settings`** { **value** *nac-policy-name* | **none** }

`no nac-settings` removes the *nac-policy-name* from the group policy. The group policy inherits the nac-settings value from the default group policy.

`nac-settings none` removes the *nac-policy-name* from the group policy and disables the use of a NAC policy for this group policy. The group policy does not inherit the nac-settings value from the default group policy.

`nac-settings value` assigns the NAC policy you name to the group policy. To display the name and configuration of each NAC policy, enter the **`show running-config nac-policy`** command.

By default, the **`nac-settings`** command is not present in the configuration of each group policy. The ASA automatically enables NAC for a group policy when you assign a NAC policy to it.

The following example command assigns the NAC policy named framework1 to the group policy:

```
hostname(config-group-policy)# nac-settings value framework1
hostname(config-group-policy)
```

Changing Global NAC Framework Settings

The ASA provides default settings for a NAC Framework configuration. Use the instructions in this section to adjust these settings for adherence to the policies in force in your network.

Changing Clientless Authentication Settings

NAC Framework support for clientless authentication is configurable. It applies to hosts that do not have a Cisco Trust Agent to fulfill the role of posture agent. The ASA applies the default access policy, sends the EAP over UDP request for posture validation, and the request times out. If the ASA is not configured to request a policy for clientless hosts from the Access Control Server, it retains the default access policy already in use for the clientless host. If the ASA is configured to request a policy for clientless hosts from the Access Control Server, it does so and the Access Control Server downloads the access policy to be enforced by the ASA.

Enabling and Disabling Clientless Authentication

Enter the following command in global configuration mode to enable clientless authentication for a NAC Framework configuration:

[**no**] **eou allow** {**audit** | **clientless** | **none**}

audit uses an audit server to perform clientless authentication.

clientless uses a Cisco Access Control Server to perform clientless authentication.

no removes the command from the configuration.

none disables clientless authentication.

The default configuration contains the **eou allow clientless** configuration.

Note The **eou** commands apply *only* to NAC Framework sessions.

Clientless authentication is enabled by default.

The following example shows how to configure the ASA to use an audit server to perform clientless authentication:

```
hostname(config)# eou allow audit
hostname(config)#
```

The following example shows how to disable the use of an audit server:

```
hostname(config)# no eou allow audit
hostname(config)#
```

Changing the Login Credentials Used for Clientless Authentication

When clientless authentication is enabled, and the ASA fails to receive a response to a validation request from the remote host, it sends a clientless authentication request on behalf of the remote host to the Access Control Server. The request includes the login credentials that match those configured for clientless authentication on the Access Control Server. The default username and password for clientless authentication on the ASA matches the default username and password on the Access Control Server; the default username and password are both “clientless”. If you change these values on the Access Control Server, you must also do so on the ASA.

Enter the following command in global configuration mode to change the username used for clientless authentication:

eou clientless username *username*

username must match the username configured on the Access Control Server to support clientless hosts. Enter 1 to 64 ASCII characters, excluding leading and trailing spaces, pound signs (#), question marks (?), quotation marks ("), asterisks (*), and angle brackets (< and >).

Enter the following command in global configuration mode to change the password used for clientless authentication:

eou clientless password *password*

password must match the password configured on the Access Control Server to support clientless hosts. Enter 4 – 32 ASCII characters.

You can specify only the username, only the password, or both. For example, enter the following commands to change the username and password for clientless authentication to sherlock and 221B-baker, respectively:

```
hostname(config)# eou clientless username sherlock
hostname(config)# eou clientless password 221B-baker
hostname(config)#
```

To change the username to its default value, enter the following command:

no eou clientless username

For example:

```
hostname(config)# no eou clientless username
hostname(config)#
```

To change the password to its default value, enter the following command:

no eou clientless password

For example:

```
hostname(config)# no eou clientless password
hostname(config)#
```

Changing NAC Framework Session Attributes

The ASA provides default settings for the attributes that specify communications between the ASA and the remote host. These attributes specify the port no. to communicate with posture agents on remote hosts and the expiration counters that impose limits on the communications with the posture agents. These attributes, the default settings, and the commands you can enter to change them are as follows:

- Port no. on the client endpoint to be used for EAP over UDP communication with posture agents.

  The default port no. is 21862. Enter the following command in global communication mode to change it:

  eou port *port_number*

  port_number must match the port number configured on the CTA. Enter a value in the range 1024 to 65535.

  For example, enter the following command to change the port number for EAP over UDP communication to 62445:

  ```
  hostname(config)# eou port 62445
  hostname(config)#
  ```

  To change the port number to its default value, use the **no** form of this command, as follows:

  no eou port

  For example:

  ```
  hostname(config)# no eou port
  hostname(config)#
  ```

- Retransmission retry timer

  When the ASA sends an EAP over UDP message to the remote host, it waits for a response. If it fails to receive a response within *n* seconds, it resends the EAP over UDP message. By default, the retransmission timer is 3 seconds. To change this value, enter the following command in global configuration mode:

  eou timeout retransmit *seconds*

  seconds is a value in the range 1 to 60.

  The following example changes the retransmission timer to 6 seconds:

  ```
  hostname(config)# eou timeout retransmit 6
  hostname(config)#
  ```

  To change the retransmission retry timer to its default value, use the **no** form of this command, as follows:

  no eou timeout **retransmit**

  For example:

  ```
  hostname(config)# no eou timeout retransmit
  hostname(config)#
  ```

- Retransmission retries

When the ASA sends an EAP over UDP message to the remote host, it waits for a response. If it fails to receive a response, it resends the EAP over UDP message. By default, it retries up to 3 times. To change this value, enter the following command in global configuration mode:

eou max-retry *retries*

retries is a value in the range 1 to 3.

The following example limits the number of EAP over UDP retransmissions to 1:

```
hostname(config)# eou max-retry 1
hostname(config)#
```

To change the maximum number of retransmission retries to its default value, use the **no** form of this command, as follows:

no eou max-retry

For example:

```
hostname(config)# no eou max-retry
hostname(config)#
```

- Session reinitialization timer

  When the retransmission retry counter matches the max-retry value, the ASA terminates the EAP over UDP session with the remote host and starts the hold timer. When the hold timer equals *n* seconds, the ASA establishes a new EAP over UDP session with the remote host. By default, the maximum number of seconds to wait before establishing a new session is 180 seconds. To change this value, enter the following command in global configuration mode:

  eou timeout hold-period *seconds*

  seconds is a value in the range 60 to 86400.

  For example, enter the following command to change the wait period before initiating a new EAP over UDP association to 120 seconds:

```
hostname(config)# eou timeout hold-period 120
hostname(config)#
```

  To change the session reinitialization to its default value, use the **no** form of this command, as follows:

  no eou timeout hold-period

  For example:

```
hostname(config)# no eou timeout hold-period
hostname(config)#
```

CHAPTER 68

Configuring Easy VPN Services on the ASA 5505

This chapter describes how to configure the ASA 5505 as an Easy VPN hardware client. This chapter assumes you have configured the switch ports and VLAN interfaces of the ASA 5505 (see Chapter 6, "Starting Interface Configuration (ASA 5505)").

Note The Easy VPN hardware client configuration specifies the IP address of its primary and secondary (backup) Easy VPN servers. Any ASA, including another ASA 5505 configured as a headend, a VPN 3000 Series Concentrator, an IOS-based router, or a firewall can act as an Easy VPN server. An ASA 5505 cannot, however function as both a client and a server simultaneously. To configure an ASA 5505 as a server, see "Specifying the Client/Server Role of the Cisco ASA 5505" section on page 68-1. Then configure the ASA 5505 as you would any other ASA, beginning with the "Getting Started" section on page 2-1 of this guide.

This chapter includes the following sections:

- Specifying the Client/Server Role of the Cisco ASA 5505, page 68-1
- Specifying the Primary and Secondary Servers, page 68-2
- Specifying the Mode, page 68-3
- Configuring Automatic Xauth Authentication, page 68-4
- Configuring IPSec Over TCP, page 68-4
- Comparing Tunneling Options, page 68-5
- Specifying the Tunnel Group or Trustpoint, page 68-6
- Configuring Split Tunneling, page 68-8
- Configuring Device Pass-Through, page 68-8
- Configuring Remote Management, page 68-9
- Guidelines for Configuring the Easy VPN Server, page 68-10

Specifying the Client/Server Role of the Cisco ASA 5505

The Cisco ASA 5505 can function as a Cisco Easy VPN hardware client (also called "Easy VPN Remote") or as a server (also called a "headend"), but not both at the same time. It does not have a default role. Use one of the following commands in global configuration mode to specify its role:

- vpnclient enable to specify the role of the ASA 5505 as an Easy VPN Remote

- **no vpnclient enable** to specify the role of the ASA 5505 as server

The following example shows how to specify the ASA 5505 as an Easy VPN hardware client:

```
hostname(config)# vpnclient enable
hostname(config)#
```

The CLI responds with an error message indicating that you must remove certain data elements if you switch from server to hardware client, depending on whether the elements are present in the configuration. Table 68-1 lists the data elements that are permitted in both client and server configurations, and not permitted in client configurations.

Table 68-1 Configuration Privileges and Restrictions on the ASA 5505

Permitted in Both Client and Server Configurations	Not Permitted in Client Configurations
crypto ca trustpoints	tunnel-groups
digital certificates	isakmp policies
group-policies	crypto maps
crypto dynamic-maps	
crypto ipsec transform-sets	
crypto ipsec security-association lifetime	
crypto ipsec fragmentation before-encryption	
crypto ipsec df-bit copy-df	

An ASA 5505 configured as an Easy VPN hardware client retains the commands listed in the first column within its configuration, however, some have no function in the client role.

The following example shows how to specify the ASA 5505 as an Easy VPN server:

```
hostname(config)# no vpnclient enable
hostname(config)#
```

After entering the no version of this command, configure the ASA 5505 as you would any other ASA, beginning with "Getting Started" section on page 2-1 of this guide.

Specifying the Primary and Secondary Servers

Before establishing a connection with an Easy VPN hardware client, you must specify the IP address of an Easy VPN server to which it will connect. Any ASA can act as an Easy VPN server, including another ASA 5505 configured as a headend, a VPN 3000 Series Concentrator, an IOS-based router, or a firewall.

The ASA 5505 Client always tries to set up the tunnel to the headend primary VPN server. If unable to set up the tunnel to the primary server, it tries the connection to the secondary_1 VPN server, and then sequentially down the list of VPN servers at 8 second intervals. If the setup tunnel to the secondary_1 server fails, the primary comes online during this time, and the ASA proceeds to set up the tunnel to the secondary_2 VPN server.

Use the **vpnclient server** command in global configuration mode, as follows:

[**no**] **vpnclient server** *ip_primary* [*ip_secondary_1…ip_secondary_10*]

no removes the command from the running configuration.

ip_primary_address is the IP address or DNS name of the primary Easy VPN server.

ip_secondary_address_n (Optional) is a list of the IP addresses or DNS names of up to ten backup Easy VPN servers. Use a space to separate the items in the list.

For example, enter the following command to configure a VPN client to use Easy VPN Server 10.10.10.15 as the primary server, and 10.10.10.30 and 192.168.10.45 as alternate servers:

```
hostname(config)# vpnclient server 10.10.10.15 10.10.10.30 192.168.10.10
hostname(config)#
```

Specifying the Mode

The Easy VPN Client supports one of two modes of operation: Client Mode or Network Extension Mode (NEM). The mode of operation determines whether the inside hosts relative to the Easy VPN Client are accessible from the Enterprise network over the tunnel. Specifying a mode of operation is mandatory before making a connection because Easy VPN Client does not have a default mode.

Client mode, also called Port Address Translation (PAT) mode, isolates the IP addresses of all devices on the Easy VPN Client private network from those on the enterprise network. The Easy VPN Client performs PAT for all VPN traffic for its inside hosts. IP address management is neither required for the Easy VPN Client inside interface or the inside hosts.

NEM makes the inside interface and all inside hosts routeable across the enterprise network over the tunnel. Hosts on the inside network obtain their IP addresses from an accessible subnet (statically or via DHCP) pre-configured with static IP addresses. PAT does not apply to VPN traffic in NEM. This mode does not require a VPN configuration for each client. The Cisco ASA 5505 configured for NEM mode supports automatic tunnel initiation. The configuration must store the group name, user name, and password. Automatic tunnel initiation is disabled if secure unit authentication is enabled.

Note If the Easy VPN hardware client is using NEM and has connections to secondary servers, use the **crypto map set reverse-route** command on each headend device to configure dynamic announcements of the remote network using Reverse Route Injection (RRI).

To specify the mode for Easy VPN Clients, enter the following command in configuration mode:

[**no**] **vpnclient mode** {**client-mode** | **network-extension-mode**}

no removes the command from the running configuration.

NEM with Multiple Interfaces

If you have an ASA 5505 security appliance (version 7.2 (3) and higher) configured as an Easy VPN Client in Network Extension Mode with multiple interfaces configured, the security appliance builds a tunnel for locally encrypted traffic only from the interface with the highest security level.

For example, consider the following configuration:

```
vlan1 security level 100 nameif inside
vlan2 security level 0 nameif outside
vlan12 security level 75 nameif work
```

In this scenario, the security appliance builds the tunnel only for vlan1, the interface with the highest security level. If you want to encrypt traffic from vlan12, you must change the security level of interface vlan1 to a lower value than that of vlan 12.

Configuring Automatic Xauth Authentication

The ASA 5505 configured as an Easy VPN hardware client automatically authenticates when it connects to the Easy VPN server if all of the following conditions are true:

- Secure unit authentication is disabled on the server.
- The server requests IKE Extended Authenticate (Xauth) credentials.

  Xauth provides the capability of authenticating a user within IKE using TACACS+ or RADIUS. Xauth authenticates a user (in this case, the Easy VPN hardware client) using RADIUS or any of the other supported user authentication protocols.
- The client configuration contains an Xauth username and password.

Enter the following command in global configuration mode to configure the Xauth username and password:

vpnclient username *xauth_username* **password** *xauth password*

You can use up to 64 characters for each.

For example, enter the following command to configure the Easy VPN hardware client to use the XAUTH username testuser and password ppurkm1:

```
hostname(config)# vpnclient username testuser password ppurkm1
hostname(config)#
```

To remove the username and password from the running configuration, enter the following command:

no vpnclient username

For example:

```
hostname(config)# no vpnclient username
hostname(config)#
```

Configuring IPSec Over TCP

By default, the Easy VPN hardware client and server encapsulate IPSec in User Datagram Protocol (UDP) packets. Some environments, such as those with certain firewall rules, or NAT and PAT devices, prohibit UDP. To use standard Encapsulating Security Protocol (ESP, Protocol 50) or Internet Key Exchange (IKE, UDP 500) in such environments, you must configure the client and the server to encapsulate IPSec within TCP packets to enable secure tunneling. If your environment allows UDP, however, configuring IPSec over TCP adds unnecessary overhead.

To configure the Easy VPN hardware client to use TCP-encapsulated IPSec, enter the following command in global configuration mode:

vpnclient ipsec-over-tcp [**port** *tcp_port*]

The Easy VPN hardware client uses port 10000 if the command does not specify a port number.

If you configure an ASA 5505 to use TCP-encapsulated IPSec, enter the following command to let it send large packets over the outside interface:

```
hostname(config)# crypto ipsec df-bit clear-df outside
hostname(config)#
```

This command clears the Don't Fragment (DF) bit from the encapsulated header. A DF bit is a bit within the IP header that determines whether the packet can be fragmented. This command lets the Easy VPN hardware client send packets that are larger than the MTU size.

The following example shows how to configure the Easy VPN hardware client to use TCP-encapsulated IPSec, using the default port 10000, and to let it send large packets over the outside interface:

```
hostname(config)# vpnclient ipsec-over-tcp
hostname(config)# crypto ipsec df-bit clear-df outside
hostname(config)#
```

The next example shows how to configure the Easy VPN hardware client to use TCP-encapsulated IPSec, using the port 10501, and to let it send large packets over the outside interface:

```
hostname(config)# vpnclient ipsec-over-tcp port 10501
hostname(config)# crypto ipsec df-bit clear-df outside
hostname(config)#
```

To remove the attribute from the running configuration, use the **no** form of this command, as follows:

no vpnclient ipsec-over-tcp

For example:

```
hostname(config)# no vpnclient ipsec-over-tcp
hostname(config)#
```

Comparing Tunneling Options

The tunnel types the Cisco ASA 5505 configured as an Easy VPN hardware client sets up depends on a combination of the following factors:

- Use of the **split-tunnel-network-list** and the **split-tunnel-policy** commands on the headend to permit, restrict, or prohibit split tunneling. (See the Creating a Network List for Split-Tunneling, page 64-50 and "Setting the Split-Tunneling Policy" section on page 64-49, respectively.)

  Split tunneling determines the networks for which the remote-access client encrypts and sends data through the secured VPN tunnel, and determines which traffic it sends to the Internet in the clear.

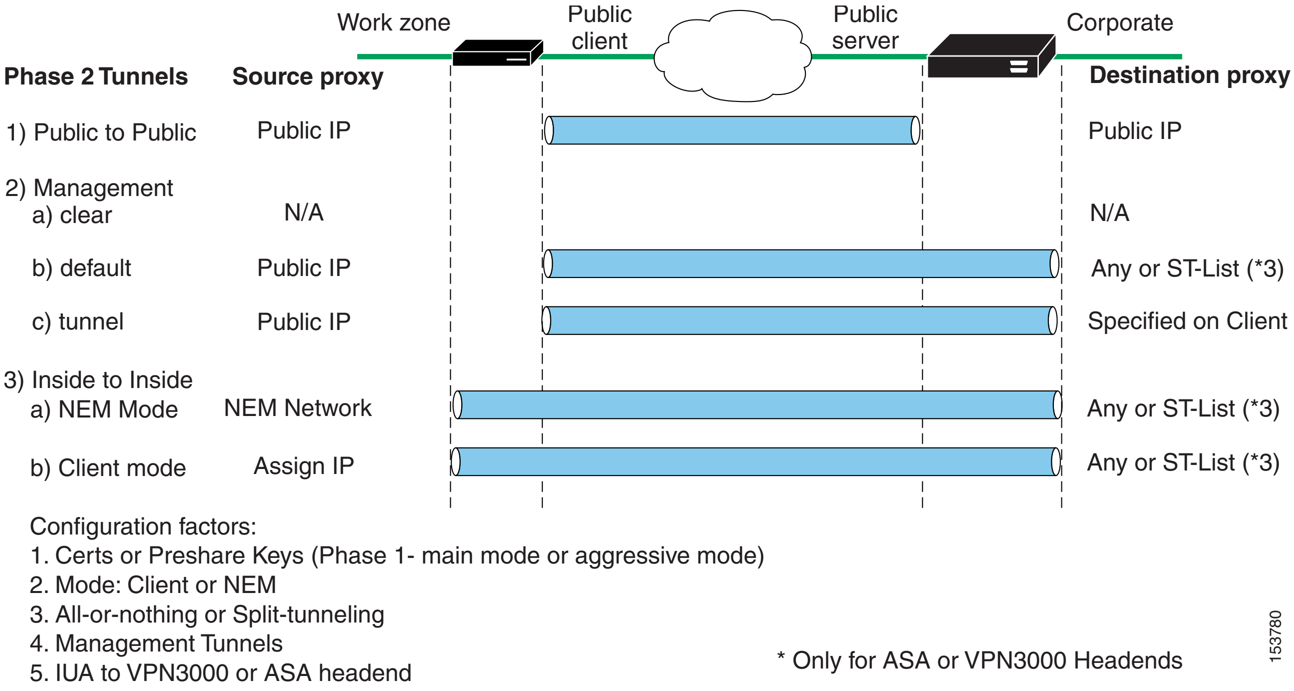
- Use of the **vpnclient management** command to specify one of the following automatic tunnel initiation options:
  - **tunnel** to limit administrative access to the client side by specific hosts or networks on the corporate side and use IPSec to add a layer of encryption to the management sessions over the HTTPS or SSH encryption that is already present.
  - **clear** to permit administrative access using the HTTPS or SSH encryption used by the management session.
  - **no** to prohibit management access

Caution Cisco does not support the use of the vpnclient management command if a NAT device is present between the client and the Internet.

- Use of the **vpnclient mode** command to specify one of the following modes of operation:
  - **client** to use Port Address Translation (PAT) mode to isolate the addresses of the inside hosts, relative to the client, from the enterprise network.
  - **network-extension-mode** to make those addresses accessible from the enterprise network.

Figure 68-1 shows the types of tunnels that the Easy VPN client initiates, based on the combination of the commands you enter.

Figure 68-1 Easy VPN Hardware Client Tunneling Options for the Cisco ASA 5505



The term "All-Or-Nothing" refers to the presence or absence of an access list for split tunneling. The access list ("ST-list") distinguishes networks that require tunneling from those that do not.

Specifying the Tunnel Group or Trustpoint

When configuring the Cisco ASA 5505 as an Easy VPN hardware client, you can specify a tunnel group or trustpoint configured on the Easy VPN server, depending on the Easy VPN server configuration. See the section that names the option you want to use:

- Specifying the Tunnel Group
- Specifying the Trustpoint

Specifying the Tunnel Group

Enter the following command in global configuration mode to specify the name of the VPN tunnel group and password for the Easy VPN client connection to the server:

vpnclient vpngroup *group_name* **password** *preshared_key*

group_name is the name of the VPN tunnel group configured on the Easy VPN server. You must configure this tunnel group on the server before establishing a connection.

preshared_key is the IKE pre-shared key used for authentication on the Easy VPN server.

For example, enter the following command to identify the VPN tunnel group named TestGroup1 and the IKE preshared key my_key123.

```
hostname(config)# vpnclient vpngroup TestGroup1 password my_key123
hostname(config)#
```

To remove the attribute from the running configuration, enter the following command:

no vpnclient vpngroup

If the configuration of the ASA 5505 running as an Easy VPN client does not specify a tunnel group, the client attempts to use an RSA certificate.

For example:

```
hostname(config)# no vpnclient vpngroup
hostname(config)#
```

Specifying the Trustpoint

A trustpoint represents a CA identity, and possibly a device identity, based on a certificate the CA issues. These parameters specify how the ASA obtains its certificate from the CA and define the authentication policies for user certificates issued by the CA.

First define the trustpoint using the **crypto ca trustpoint** command, as described in "Configuring Trustpoints" section on page 73-10. Then enter the following command in global configuration mode to name the trustpoint identifying the RSA certificate to use for authentication:

vpnclient trustpoint *trustpoint_name* [**chain**]

trustpoint_name names the trustpoint identifying the RSA certificate to use for authentication.

(Optional) **chain** sends the entire certificate chain.

For example, enter the following command to specify the identity certificate named central and send the entire certificate chain:

```
hostname(config)# crypto ca trustpoint central
hostname(config)# vpnclient trustpoint central chain
hostname(config)#
```

To remove the attribute from the running configuration, enter the following command:

no vpnclient trustpoint

For example:

```
hostname(config)# no vpnclient trustpoint
hostname(config)#
```

Configuring Split Tunneling

Split tunneling lets a remote-access IPSec client conditionally direct packets over an IPSec tunnel in encrypted form or to a network interface in clear text form.

The Easy VPN server pushes the split tunneling attributes from the group policy to the Easy VPN Client for use only in the work zone. See Configuring Split-Tunneling Attributes, page 64-49 to configure split tunneling on the Cisco ASA 5505.

Enter the following command in global configuration mode to enable the automatic initiation of IPSec tunnels when NEM and split tunneling are configured:

[**no**] **vpnclient nem-st-autoconnect**

no removes the command from the running configuration.

For example:

```
hostname(config)# vpnclient nem-st-autoconnect
hostname(config)#
```

Configuring Device Pass-Through

Devices such as Cisco IP phones, wireless access points, and printers are incapable of performing authentication. Enter the following command in global configuration mode to exempt such devices from authentication, thereby providing network access to them, if individual user authentication is enabled:

[**no**] **vpnclient mac-exempt** *mac_addr_1 mac_mask_1* [*mac_addr_2 mac_mask_2...mac_addr_n mac_mask_n*]

no removes the command from the running configuration.

mac_addr is the MAC address, in dotted hexadecimal notation, of the device to bypass individual user authentication.

mac_mask is the network mask for the corresponding MAC address. A MAC mask of ffff.ff00.0000 matches all devices made by the same manufacturer. A MAC mask of ffff.ffff.ffff matches a single device.

Only the first six characters of the specific MAC address are required if you use the MAC mask ffff.ff00.0000 to specify all devices by the same manufacturer. For example, Cisco IP phones have the Manufacturer ID 00036b, so the following command exempts any Cisco IP phone, including Cisco IP phones, you might add in the future:

```
hostname(config)# vpnclient mac-exempt 0003.6b00.0000 ffff.ff00.0000
hostname(config)#
```

The next example provides greater security but less flexibility because it exempts one specific Cisco IP phone:

```
hostname(config)# vpnclient mac-exempt 0003.6b54.b213 ffff.ffff.ffff
hostname(config)#
```

Note Make sure you have Individual User Authentication and User Bypass configured on the headend device. For example, if you have the ASA as a headend, configure the following under group policy:

```
hostname(config-group-policy)# user-authentication enable
hostname(config-group-policy)# ip-phone-bypass enable
```

Configuring Remote Management

The Cisco ASA 5505, operating as an Easy VPN hardware client, supports management access using SSH or HTTPS, with or without a second layer of additional encryption. You can configure the Cisco ASA 5505 to require IPSec encryption within the SSH or HTTPS encryption.

Use the **vpnclient management clear** command in global configuration mode to use normal routing to provide management access from the corporate network to the outside interface of the ASA 5505 (no tunneling management packets).

Caution Do not configure a management tunnel on a Cisco ASA 5505 configured as an Easy VPN hardware client if a NAT device is operating between the Easy VPN hardware client and the Internet. In that configuration, use the **vpnclient management clear** command.

Use the **vpnclient management tunnel** command in global configuration mode if you want to automate the creation of IPSec tunnels to provide management access from the corporate network to the outside interface of the ASA 5505. The Easy VPN hardware client and server create the tunnels automatically after the execution of the **vpnclient server** command. The syntax of the vpnclient management tunnel command follows:

vpnclient management tunnel *ip_addr_1 ip_mask_1* [*ip_addr_2 ip_mask_2...ip_addr_n ip_mask_n*]

Note Regardless of your configuration, DHCP requests (including renew messages) should not flow over IPsec tunnels. Even with a vpnclient management tunnel, DHCP traffic is prohibited.

For example, enter the following command to automate the creation of an IPSec tunnel to provide management access to the host with IP address 192.168.10.10:

```
hostname(config)# vpnclient management tunnel 192.198.10.10 255.255.255.0
hostname(config)#
```

The **no** form of this command sets up IPSec for management tunnels in accordance with the **split-tunnel-policy** and **split-tunnel-network-list** commands.

no vpnclient management

For example:

```
hostname(config)# no vpnclient management
hostname(config)#
```

Guidelines for Configuring the Easy VPN Server

The following sections address the Easy VPN hardware client considerations that apply to the Easy VPN server:

- Group Policy and User Attributes Pushed to the Client
- Authentication Options

Group Policy and User Attributes Pushed to the Client

Upon tunnel establishment, the Easy VPN server pushes the values of the group policy or user attributes stored in its configuration to the Easy VPN hardware client. Therefore, to change certain attributes pushed to the Easy VPN hardware client, you must modify them on the ASAs configured as the primary and secondary Easy VPN servers. This section identifies the group policy and user attributes pushed to the Easy VPN hardware client.

Note This section serves only as a reference. For complete instructions on configuring group policies and users, see Configuring Connection Profiles, Group Policies, and Users, page 64-1.

Use Table 68-2 as a guide for determining which commands to enter to modify the group policy or user attributes.

Table 68-2 Group Policy and User Attributes Pushed to the Cisco ASA 5505 Configured as an EasyVPN Hardware Client

Command	Description
backup-servers	Sets up backup servers on the client in case the primary server fails to respond.
banner	Sends a banner to the client after establishing a tunnel.
client-access-rule	Applies access rules.
client-firewall	Sets up the firewall parameters on the VPN client.
default-domain	Sends a domain name to the client.
dns-server	Specifies the IP address of the primary and secondary DNS servers, or prohibits the use of DNS servers.
dhcp-network-scope	Specifies the IP subnetwork to which the DHCP server assigns address to users within this group.
group-lock	Specifies a tunnel group to ensure that users connect to that group.
ipsec-udp	Uses UDP encapsulation for the IPSec tunnels.
ipsec-udp-port	Specifies the port number for IPSec over UDP.
nem	Enables or disables network extension mode.
password-storage	Lets the VPN user save a password in the user profile.
pfs	Commands the VPN client to use perfect forward secrecy.
re-xauth	Requires XAUTH authentication when IKE rekeys. **Note**: Disable re-xauth if secure unit authentication is enabled.

Table 68-2 Group Policy and User Attributes Pushed to the Cisco ASA 5505 Configured as an EasyVPN Hardware Client (continued)

Command	Description
secure-unit-authentication	Enables interactive authentication for VPN hardware clients.
split-dns	Pushes a list of domains for name resolution.
split-tunnel-network-list	Specifies one of the following: • No access list exists for split tunneling. All traffic travels across the tunnel. • Identifies the access list the security appliance uses to distinguish networks that require tunneling and those that do not. Split tunneling lets a remote-access IPSec client conditionally direct packets over an IPSec tunnel in encrypted form, or to a network interface in cleartext form. With split-tunneling enabled, packets not bound for destinations on the other side of the IPSec tunnel do not have to be encrypted, sent across the tunnel, decrypted, and then routed to a final destination.
split-tunnel-policy	Lets a remote-access IPSec client conditionally direct packets over an IPSec tunnel in encrypted form, or to a network interface in cleartext form. Options include the following: • split-tunnel-policy—Indicates that you are setting rules for tunneling traffic. • excludespecified—Defines a list of networks to which traffic goes in the clear. • tunnelall—Specifies that no traffic goes in the clear or to any other destination than the Easy VPN server. Remote users reach Internet networks through the corporate network and do not have access to local networks. • tunnelspecified—Tunnels all traffic from or to the specified networks. This option enables split tunneling. It lets you create a network list of addresses to tunnel. Data to all other addresses travels in the clear, and is routed by the remote user's internet service provider.
user-authentication	Enables individual user authentication for hardware-based VPN clients.
vpn-access-hours	Restricts VPN access hours.
vpn-filter	Applies a filter to VPN traffic.
vpn-idle-timeout	Specifies the number of minutes a session can be idle before it times out.
vpn-session-timeout	Specifies the maximum number of minutes for VPN connections.
vpn-simultaneous-logins	Specifies the maximum number of simultaneous logins.
vpn-tunnel-protocol	Specifies the permitted tunneling protocols.
wins-server	Specifies the IP address of the primary and secondary WINS servers, or prohibits the use of WINS servers.

Note IPSec NAT-T connections are the only IPSec connection types supported on the home VLAN of a Cisco ASA 5505. IPSec over TCP and native IPSec connections are not supported.

Authentication Options

The ASA 5505 supports the following authentication mechanisms, which it obtains from the group policy stored on the Easy VPN Server. The following list identifies the authentication options supported by the Easy VPN hardware client, however, you must configure them on the Easy VPN server:

- Secure unit authentication (SUA, also called Interactive unit authentication)

  Ignores the **vpnclient username** Xauth command (described in "Configuring Automatic Xauth Authentication" section on page 68-4) and requires the user to authenticate the ASA 5505 by entering a password. By default, SUA is disabled. You can use the **secure-unit-authentication enable** command in group-policy configuration mode to enable SUA. See Configuring Secure Unit Authentication, page 64-53.

- Individual user authentication

  Requires users behind the ASA 5505 to authenticate before granting them access to the enterprise VPN network. By default, IUA is disabled. To enable the IUA, use the **user-authentication enable** command in group-policy configuration mode. See Configuring User Authentication, page 64-53.

  The security appliance works correctly from behind a NAT device, and if the ASA5505 is configured in NAT mode, the provisioned IP (to which the clients all PAT) is injected into the routing table on the central-site device.

  Caution Do not configure IUA on a Cisco ASA 5505 configured as an Easy VPN server if a NAT device is operating between the server and the Easy VPN hardware client.

  Use the **user-authentication-idle-timeout** command to set or remove the idle timeout period after which the Easy VPN Server terminates the client's access. See Configuring an Idle Timeout, page 64-54.

- Authentication by HTTP redirection

  The Cisco Easy VPN server intercepts HTTP traffic and redirects the user to a login page if one of the following is true:

  - SUA or the username and password are not configured on the Easy VPN hardware client.
  - IAU is enabled.

  HTTP redirection is automatic and does not require configuration on the Easy VPN Server.

- Preshared keys, digital certificates, tokens and no authentication

  The ASA 5505 supports preshared keys, token-based (e.g., SDI one-time passwords), and "no user authentication" for user authentication. **NOTE**: The Cisco Easy VPN server can use the digital certificate as part of user authorization. See Chapter 61, "Configuring IPsec and ISAKMP" for instructions.

CHAPTER 69

Configuring the PPPoE Client

This section describes how to configure the PPPoE client provided with the ASA. It includes the following topics:

- PPPoE Client Overview, page 69-1
- Configuring the PPPoE Client Username and Password, page 69-2
- Enabling PPPoE, page 69-3
- Using PPPoE with a Fixed IP Address, page 69-3
- Monitoring and Debugging the PPPoE Client, page 69-4
- Using Related Commands, page 69-5

PPPoE Client Overview

PPPoE combines two widely accepted standards, Ethernet and PPP, to provide an authenticated method of assigning IP addresses to client systems. PPPoE clients are typically personal computers connected to an ISP over a remote broadband connection, such as DSL or cable service. ISPs deploy PPPoE because it supports high-speed broadband access using their existing remote access infrastructure and because it is easier for customers to use.

PPPoE provides a standard method of employing the authentication methods of the Point-to-Point Protocol (PPP) over an Ethernet network. When used by ISPs, PPPoE allows authenticated assignment of IP addresses. In this type of implementation, the PPPoE client and server are interconnected by Layer 2 bridging protocols running over a DSL or other broadband connection.

PPPoE is composed of two main phases:

- Active Discovery Phase—In this phase, the PPPoE client locates a PPPoE server, called an access concentrator. During this phase, a Session ID is assigned and the PPPoE layer is established.
- PPP Session Phase—In this phase, PPP options are negotiated and authentication is performed. Once the link setup is completed, PPPoE functions as a Layer 2 encapsulation method, allowing data to be transferred over the PPP link within PPPoE headers.

At system initialization, the PPPoE client establishes a session with the access concentrator by exchanging a series of packets. Once the session is established, a PPP link is set up, which includes authentication using Password Authentication protocol (PAP). Once the PPP session is established, each packet is encapsulated in the PPPoE and PPP headers.

Note PPPoE is not supported when failover is configured on the ASA, or in multiple context or transparent mode. PPPoE is only supported in single, routed mode, without failover.

Configuring the PPPoE Client Username and Password

To configure the username and password used to authenticate the ASA to the access concentrator, use the **vpdn** command. To use the **vpdn** command, you first define a VPDN group and then create individual users within the group.

To configure a PPPoE username and password, perform the following steps:

Step 1 Define the VPDN group to be used for PPPoE using the following command:

```
hostname(config)# vpdn group group_name request dialout pppoe
```

In this command, replace *group_name* with a descriptive name for the group, such as “pppoe-sbc.”

Step 2 If your ISP requires authentication, select an authentication protocol by entering the following command:

```
hostname(config)# vpdn group group_name ppp authentication {chap | mschap | pap}
```

Replace *group_name* with the same group name you defined in the previous step. Enter the appropriate keyword for the type of authentication used by your ISP:

- CHAP—Challenge Handshake Authentication Protocol
- MS-CHAP—Microsoft Challenge Handshake Authentication Protocol Version 1
- PAP—Password Authentication Protocol

Note When using CHAP or MS-CHAP, the username may be referred to as the remote system name, while the password may be referred to as the CHAP secret.

Step 3 Associate the username assigned by your ISP to the VPDN group by entering the following command:

```
hostname(config)# vpdn group group_name localname username
```

Replace *group_name* with the VPDN group name and *username* with the username assigned by your ISP.

Step 4 Create a username and password pair for the PPPoE connection by entering the following command:

```
hostname(config)# vpdn username username password password [store-local]
```

Replace *username* with the username and *password* with the password assigned by your ISP.

Note The **store-local** option stores the username and password in a special location of NVRAM on the ASA. If an Auto Update Server sends a **clear config** command to the ASA and the connection is then interrupted, the ASA can read the username and password from NVRAM and re-authenticate to the Access Concentrator.

Enabling PPPoE

Note You must complete the configuration using the **vpdn** command, described in "Configuring the PPPoE Client Username and Password," before enabling PPPoE.

The PPPoE client functionality is turned off by default. To enable PPPoE, perform the following steps:

Step 1 Enable the PPPoE client by entering the following command from interface configuration mode:

```
hostname(config-if)# ip address pppoe [setroute]
```

The **setroute** option sets the default routes when the PPPoE client has not yet established a connection. When using the **setroute** option, you cannot have a statically defined route in the configuration.

PPPoE is not supported in conjunction with DHCP because with PPPoE the IP address is assigned by PPP. The **setroute** option causes a default route to be created if no default route exists. The default router is the address of the access concentrator. The maximum transmission unit (MTU) size is automatically set to 1492 bytes, which is the correct value to allow PPPoE transmission within an Ethernet frame.

Reenter this command to reset the DHCP lease and request a new lease.

Note If PPPoE is enabled on two interfaces (such as a primary and backup interface), and you do not configure dual ISP support (see the "Monitoring a Static or Default Route" section on page 19-5), then the ASA can only send traffic through the first interface to acquire an IP address.

For example:

```
hostname(config)# interface gigabitethernet 0/0
hostname(config-if)# ip address pppoe
```

Step 2 Specify a VPDN group for the PPPoE client to use with the following command from interface configuration mode (optional):

```
hostname(config-if)# pppoe client vpdn group grpname
```

grpname is the name of a VPDN *group.*

Note If you have multiple VPDN groups configured, and you do not specify a group with the **pppoe client vpdn group** command, the ASA may randomly choose a VPDN group. To avoid this, specify a VPDN group.

Using PPPoE with a Fixed IP Address

You can also enable PPPoE by manually entering the IP address, using the ip address command from interface configuration mode in the following format:

```
hostname(config-if)# ip address ipaddress mask pppoe
```

This command causes the ASA to use the specified address instead of negotiating with the PPPoE server to assign an address dynamically. Replace *ipaddress* and *mask* with the IP address and subnet mask assigned to your ASA.

For example:

```
hostname(config-if)# ip address outside 201.n.n.n 255.255.255.0 pppoe
```

Note The **setroute** option is an option of the **ip address** command that you can use to allow the access concentrator to set the default routes when the PPPoE client has not yet established a connection. When using the **setroute** option, you cannot have a statically defined route in the configuration.

Monitoring and Debugging the PPPoE Client

Use the following command to display the current PPPoE client configuration information:

```
hostname# show ip address outside pppoe
```

Use the following command to enable or disable debugging for the PPPoE client:

```
hostname# [no] debug pppoe {event | error | packet}
```

The following summarizes the function of each keyword:

- **event**—Displays protocol event information
- **error**—Displays error messages
- **packet**—Displays packet information

Use the following command to view the status of PPPoE sessions:

```
hostname# show vpdn session [l2tp | pppoe] [id sess_id | packets | state | window]
```

The following example shows a sample of information provided by this command:

```
hostname# show vpdn

Tunnel id 0, 1 active sessions
     time since change 65862 secs
     Remote Internet Address 10.0.0.1
    Local Internet Address 199.99.99.3
     6 packets sent, 6 received, 84 bytes sent, 0 received
Remote Internet Address is 10.0.0.1
     Session state is SESSION_UP
       Time since event change 65865 secs, interface outside
       PPP interface id is 1
       6 packets sent, 6 received, 84 bytes sent, 0 received
hostname#
hostname# show vpdn session
PPPoE Session Information (Total tunnels=1 sessions=1)
Remote Internet Address is 10.0.0.1
  Session state is SESSION_UP
    Time since event change 65887 secs, interface outside
    PPP interface id is 1
    6 packets sent, 6 received, 84 bytes sent, 0 received
hostname#
hostname# show vpdn tunnel
PPPoE Tunnel Information (Total tunnels=1 sessions=1)
Tunnel id 0, 1 active sessions
   time since change 65901 secs
   Remote Internet Address 10.0.0.1
   Local Internet Address 199.99.99.3
   6 packets sent, 6 received, 84 bytes sent, 0 received
hostname#
```

Clearing the Configuration

To remove all **vpdn group** commands from the configuration, use the **clear configure vpdn group** command in global configuration mode:

```
hostname(config)# clear configure vpdn group
```

To remove all **vpdn username** commands, use the **clear configure vpdn username** command:

```
hostname(config)# clear configure vpdn username
```

Entering either of these commands has no affect upon active PPPoE connections.

Using Related Commands

Use the following command to cause the DHCP server to use the WINS and DNS addresses provided by the access concentrator as part of the PPP/IPCP negotiations:

```
hostname(config)# dhcpd auto_config [client_ifx_name]
```

This command is only required if the service provider provides this information as described in RFC 1877. The *client_ifx_name* parameter identifies the interface supported by the DHCP **auto_config** option. At this time, this keyword is not required because the PPPoE client is only supported on a single outside interface.

CHAPTER 70

Configuring LAN-to-LAN IPsec VPNs

A LAN-to-LAN VPN connects networks in different geographic locations.

Note The ASA supports LAN-to-LAN IPsec connections with Cisco peers, and with third-party peers that comply with all relevant standards.

This chapter describes how to build a LAN-to-LAN VPN connection. It includes the following sections:

- Summary of the Configuration, page 70-1
- Configuring Interfaces, page 70-2
- Configuring ISAKMP Policy and Enabling ISAKMP on the Outside Interface, page 70-2
- Creating a Transform Set, page 70-4
- Configuring an ACL, page 70-4
- Defining a Tunnel Group, page 70-5
- Creating a Crypto Map and Applying It To an Interface, page 70-6

Summary of the Configuration

This section provides a summary of the example LAN-to-LAN configuration this chapter creates. Later sections provide step-by-step instructions.

```
hostname(config)# interface ethernet0
hostname(config-if)# ip address 10.10.4.100 255.255.0.0
hostname(config-if)# no shutdown
hostname(config)# isakmp policy 1 authentication pre-share
hostname(config)# isakmp policy 1 encryption 3des
hostname(config)# isakmp policy 1 hash sha
hostname(config)# isakmp policy 1 group 2
hostname(config)# isakmp policy 1 lifetime 43200
hostname(config)# isakmp enable outside
hostname(config)# crypto ipsec transform set FirstSet esp-3des esp-md5-hmac
hostname(config)# access-list l2l_list extended permit ip 192.168.0.0 255.255.0.0 
150.150.0.0 255.255.0.0
hostname(config)# tunnel-group 10.10.4.108 type ipsec-l2l
hostname(config)# tunnel-group 10.10.4.108 ipsec-attributes
hostname(config-ipsec)# pre-shared-key 44kkaol59636jnfx
hostname(config)# crypto map abcmap 1 match address l2l_list
hostname(config)# crypto map abcmap 1 set peer 10.10.4.108
hostname(config)# crypto map abcmap 1 set transform-set FirstSet
hostname(config)# crypto map abcmap interface outside
hostname(config)# write memory
```

Configuring Interfaces

A ASA has at least two interfaces, referred to here as outside and inside. Typically, the outside interface is connected to the public Internet, while the inside interface is connected to a private network and is protected from public access.

To begin, configure and enable two interfaces on the ASA. Then, assign a name, IP address and subnet mask. Optionally, configure its security level, speed, and duplex operation on the security appliance.

To configure interfaces, perform the following steps, using the command syntax in the examples:

Step 1 To enter Interface configuration mode, in global configuration mode enter the **interface** command with the default name of the interface to configure. In the following example the interface is ethernet0.

```
hostname(config)# interface ethernet0
hostname(config-if)#
```

Step 2 To set the IP address and subnet mask for the interface, enter the **ip address** command. In the following example the IP address is 10.10.4.100 and the subnet mask is 255.255.0.0.

```
hostname(config-if)# ip address 10.10.4.100 255.255.0.0
hostname(config-if)#
```

Step 3 To name the interface, enter the **nameif** command, maximum of 48 characters. You cannot change this name after you set it. In the following example the name of the ethernet0 interface is outside.

```
hostname(config-if)# nameif outside
hostname(config-if)##
```

Step 4 To enable the interface, enter the **no** version of the **shutdown** command. By default, interfaces are disabled.

```
hostname(config-if)# no shutdown
hostname(config-if)#
```

Step 5 To save your changes, enter the **write memory** command.

```
hostname(config-if)# write memory
hostname(config-if)#
```

Step 6 To configure a second interface, use the same procedure.

Configuring ISAKMP Policy and Enabling ISAKMP on the Outside Interface

The Internet Security Association and Key Management Protocol, also called IKE, is the negotiation protocol that lets two hosts agree on how to build an IPsec security association. Each ISAKMP negotiation is divided into two sections called Phase1 and Phase 2.

Phase 1 creates the first tunnel, which protects later ISAKMP negotiation messages. Phase 2 creates the tunnel that protects data travelling across the secure connection.

To set the terms of the ISAKMP negotiations, you create an ISAKMP policy, which includes the following:

- An authentication method, to ensure the identity of the peers.
- An encryption method, to protect the data and ensure privacy.
- A Hashed Message Authentication Codes method to ensure the identity of the sender and to ensure that the message has not been modified in transit.
- A Diffie-Hellman group to establish the strength of the encryption-key-determination algorithm. The ASA uses this algorithm to derive the encryption and hash keys.
- A time limit for how long the ASA uses an encryption key before replacing it.

See on page 61-3 in the “Configuring IPsec and ISAKMP” chapter of this guide for detailed information about the IKE policy keywords and their values.

To configure ISAKMP policies, in global configuration mode use the **isakmp policy** command with its various arguments. The syntax for ISAKMP policy commands is as follows:

isakmp policy *priority* **attribute_name** [**attribute_value** | *integer*].

Perform the following steps and use the command syntax in the following examples as a guide.

Step 1 Set the authentication method. The following example configures a preshared key. The priority is 1 in this and all following steps.

```
hostname(config)# isakmp policy 1 authentication pre-share
hostname(config)#
```

Step 2 Set the encryption method. The following example configures 3DES.

```
hostname(config)# isakmp policy 1 encryption 3des
hostname(config)#
```

Step 3 Set the HMAC method. The following example configures SHA-1.

```
hostname(config)# isakmp policy 1 hash sha
hostname(config)#
```

Step 4 Set the Diffie-Hellman group. The following example configures Group 2.

```
hostname(config)# isakmp policy 1 group 2
hostname(config)#
```

Step 5 Set the encryption key lifetime. The following example configures 43,200 seconds (12 hours).

```
hostname(config)# isakmp policy 1 lifetime 43200
hostname(config)#
```

Step 6 Enable ISAKMP on the interface named outside.

```
hostname(config)# isakmp enable outside
hostname(config)#
```

Step 7 To save your changes, enter the **write memory** command.

```
hostname(config)# write memory
hostname(config)#
```

Creating a Transform Set

A transform set combines an encryption method and an authentication method. During the IPsec security association negotiation with ISAKMP, the peers agree to use a particular transform set to protect a particular data flow. The transform set must be the same for both peers.

A transform set protects the data flows for the access list specified in the associated crypto map entry. You can create transform sets in the ASA configuration, and then specify a maximum of 11 of them in a crypto map or dynamic crypto map entry.

Table 70-1 lists valid encryption and authentication methods.

Table 70-1 Valid Encryption and Authentication Methods

Valid Encryption Methods	Valid Authentication Methods
esp-des	esp-md5-hmac
esp-3des (default)	esp-sha-hmac (default)
esp-aes (128-bit encryption)	
esp-aes-192	
esp-aes-256	
esp-null	

Tunnel Mode is the usual way to implement IPsec between two ASAs that are connected over an untrusted network, such as the public Internet. Tunnel mode is the default and requires no configuration.

To configure a transform set, perform the following steps:

Step 1 In global configuration mode enter the **crypto ipsec transform-set** command. The following example configures a transform set with the name FirstSet, esp-3des encryption, and esp-md5-hmac authentication. The syntax is as follows:

crypto ipsec transform-set *transform-set-name* ***encryption-method authentication-method***

```
hostname(config)# crypto ipsec transform-set FirstSet esp-3des esp-md5-hmac
hostname(config)#
```

Step 2 Save your changes.

```
hostname(config)# write memory
hostname(config)#
```

Configuring an ACL

The ASA uses access control lists to control network access. By default, the ASA denies all traffic. You need to configure an ACL that permits traffic. For more information about ACLs, see Chapter 10, “Information About Access Lists.”

The ACLs that you configure for this LAN-to-LAN VPN control connections are based on the source and translated destination IP addresses. Configure ACLs that mirror each other on both sides of the connection.

Note An ACL for VPN traffic uses the translated address. For more information, see the "IP Addresses Used for Access Lists When You Use NAT" section on page 10-3.

To configure an ACL, perform the following steps:

Step 1 Enter the **access-list extended** command. The following example configures an ACL named l2l_list that lets traffic from IP addresses in the 192.168.0.0 network travel to the 150.150.0.0 network. The syntax is **access-list** *listname* **extended permit ip** *source-ipaddress source-netmask destination-ipaddress destination-netmask.*

```
hostname(config)# access-list l2l_list extended permit ip 192.168.0.0 255.255.0.0
150.150.0.0 255.255.0.0
hostname(config)#
```

Step 2 Configure an ACL for the ASA on the other side of the connection that mirrors the ACL above. In the following example the prompt for the peer is hostname2.

```
hostname2(config)# access-list l2l_list extended permit ip 150.150.0.0 255.255.0.0
192.168.0.0 255.255.0.0
hostname(config)#
```

Note For more information on configuring an ACL with a vpn-filter, see "Configuring VPN-Specific Attributes" section on page 64-42.

Defining a Tunnel Group

A tunnel group is a set of records that contain tunnel connection policies. You configure a tunnel group to identify AAA servers, specify connection parameters, and define a default group policy. The ASA stores tunnel groups internally.

There are two default tunnel groups in the ASA system: DefaultRAGroup, which is the default IPsec remote-access tunnel group, and DefaultL2Lgroup, which is the default IPsec LAN-to-LAN tunnel group. You can modify them but not delete them. You can also create one or more new tunnel groups to suit your environment. The ASA uses these groups to configure default tunnel parameters for remote access and LAN-to-LAN tunnel groups when there is no specific tunnel group identified during tunnel negotiation.

To establish a basic LAN-to-LAN connection, you must set two attributes for a tunnel group:

- Set the connection type to IPsec LAN-to-LAN.
- Configure an authentication method, in the following example, preshared key.

Note To use VPNs, including tunnel groups, the ASA must be in single-routed mode. The commands to configure tunnel-group parameters do not appear in any other mode.

Step 1 To set the connection type to IPsec LAN-to-LAN, enter the **tunnel-group** command. The syntax is **tunnel-group** *name* **type** *type,* where *name* is the name you assign to the tunnel group, and *type* is the type of tunnel. The tunnel types as you enter them in the CLI are:

- **ipsec-ra** (IPsec remote access)

- **ipsec-l2l** (IPsec LAN to LAN)

In the following example the name of the tunnel group is the IP address of the LAN-to-LAN peer, 10.10.4.108.

```
hostname(config)# tunnel-group 10.10.4.108 type ipsec-l2l
hostname(config)#
```

Note LAN-to-LAN tunnel groups that have names that are not an IP address can be used only if the tunnel authentication method is Digital Certificates and/or the peer is configured to use Aggressive Mode.

Step 2 To set the authentication method to preshared key, enter the ipsec-attributes mode and then enter the **pre-shared-key** command to create the preshared key. You need to use the same preshared key on both ASAs for this LAN-to-LAN connection.

The key is an alphanumeric string of 1-128 characters. In the following example the preshared key is 44kkaol59636jnfx.

```
hostname(config)# tunnel-group 10.10.4.108 ipsec-attributes
hostname(config-tunnel-ipsec)# pre-shared-key 44kkaol59636jnfx
```

Step 3 Save your changes.

```
hostname(config)# write memory
hostname(config)#
```

Creating a Crypto Map and Applying It To an Interface

Crypto map entries pull together the various elements of IPsec security associations, including the following:

- Which traffic IPsec should protect, which you define in an access list.
- Where to send IPsec-protected traffic, by identifying the peer.
- What IPsec security applies to this traffic, which a transform set specifies.
- The local address for IPsec traffic, which you identify by applying the crypto map to an interface.

For IPsec to succeed, both peers must have crypto map entries with compatible configurations. For two crypto map entries to be compatible, they must, at a minimum, meet the following criteria:

- The crypto map entries must contain compatible crypto access lists (for example, mirror image access lists). If the responding peer uses dynamic crypto maps, the entries in the ASA crypto access list must be “permitted” by the peer’s crypto access list.
- The crypto map entries each must identify the other peer (unless the responding peer is using a dynamic crypto map).
- The crypto map entries must have at least one transform set in common.

If you create more than one crypto map entry for a given interface, use the sequence number (seq-num) of each entry to rank it: the lower the seq-num, the higher the priority. At the interface that has the crypto map set, the ASA evaluates traffic against the entries of higher priority maps first.

Create multiple crypto map entries for a given interface if either of the following conditions exist:

- Different peers handle different data flows.

- You want to apply different IPsec security to different types of traffic (to the same or separate peers), for example, if you want traffic between one set of subnets to be authenticated, and traffic between another set of subnets to be both authenticated and encrypted. In this case, define the different types of traffic in two separate access lists, and create a separate crypto map entry for each crypto access list.

To create a crypto map and apply it to the outside interface in global configuration mode, enter several of the **crypto map** commands. These commands use a variety of arguments, but the syntax for all of them begin with **crypto map** *map-name-seq-num*. In the following example the map-name is abcmap, the sequence number is 1.

Enter these commands in global configuration mode:

Step 1 To assign an access list to a crypto map entry, enter the **crypto map match address** command.

The syntax is **crypto map** *map-name seq-num* **match address** *aclname*. In the following example the map name is abcmap, the sequence number is 1, and the access list name is `l2l_list`.

```
hostname(config)# crypto map abcmap 1 match address l2l_list
hostname(config)#
```

Step 2 To identify the peer (s) for the IPsec connection, enter the **crypto map set peer** command.

The syntax is **crypto map** *map-name seq-num* **set peer** {*ip_address1* | *hostname1*}[... *ip_address10* | *hostname10*]. In the following example the peer name is 10.10.4.108.

```
hostname(config)# crypto map abcmap 1 set peer 10.10.4.108
hostname(config)#
```

Step 3 To specify a transform set for a crypto map entry, enter the **crypto map set transform-set** command.

The syntax is **crypto map** *map-name seq-num* **set transform-set** *transform-set-name*. In the following example the transform set name is FirstSet.

```
hostname(config)# crypto map abcmap 1 set transform-set FirstSet
hostname(config)#
```

Applying Crypto Maps to Interfaces

You must apply a crypto map set to each interface through which IPsec traffic travels. The ASA supports IPsec on all interfaces. Applying the crypto map set to an interface instructs the ASA to evaluate all interface traffic against the crypto map set and to use the specified policy during connection or security association negotiations.

Binding a crypto map to an interface also initializes the runtime data structures, such as the security association database and the security policy database. When you later modify a crypto map in any way, the ASA automatically applies the changes to the running configuration. It drops any existing connections and reestablishes them after applying the new crypto map.

Step 1 To apply the configured crypto map to the outside interface, enter the **crypto map interface** command. The syntax is **crypto map** *map-name* **interface** *interface-name.*

```
hostname(config)# crypto map abcmap interface outside

hostname(config)#
```

Step 2 Save your changes.

```
hostname(config)# write memory
hostname(config)#
```

CHAPTER 71

Configuring Clientless SSL VPN

This chapter describes:

- Getting Started, page 71-1
- Creating and Applying Clientless SSL VPN Policies for Accessing Resources, page 71-24
- Configuring Connection Profile Attributes for Clientless SSL VPN, page 71-25
- Configuring Group Policy and User Attributes for Clientless SSL VPN, page 71-26
- Configuring Browser Access to Plug-ins, page 71-27
- Configuring Application Access, page 71-33
- Configuring File Access, page 71-50
- Using Clientless SSL VPN with PDAs, page 71-52
- Using E-Mail over Clientless SSL VPN, page 71-53
- Configuring Portal Access Rules, page 71-55
- Optimizing Clientless SSL VPN Performance, page 71-55
- Clientless SSL VPN End User Setup, page 71-61
- Capturing Data, page 71-88

Getting Started

Note When the ASA is configured for Clientless SSL VPN, you cannot enable security contexts (also called firewall multimode) or Active/Active stateful failover. Therefore, these features become unavailable.

Clientless SSL VPN lets users establish a secure, remote-access VPN tunnel to a ASA using a web browser. Users do not need a software or hardware client.

Clientless SSL VPN provides secure and easy access to a broad range of web resources and web-enabled applications from almost any computer on the Internet. They include:

- Internal websites
- Web-enabled applications
- NT/Active Directory file shares
- E-mail proxies, including POP3S, IMAP4S, and SMTPS

- MS Outlook Web Access
- Application Access (that is, smart tunnel or port forwarding access to other TCP-based applications)

Note The security appliance does not support the Microsoft Outlook Exchange (MAPI) proxy. Neither the smart tunnel feature nor port forwarding supports MAPI. For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.

Clientless SSL VPN uses Secure Sockets Layer Protocol and its successor, Transport Layer Security to provide the secure connection between remote users and specific, supported internal resources that you configure at a central site. The ASA recognizes connections that need to be proxied, and the HTTP server interacts with the authentication subsystem to authenticate users.

The network administrator provides access to resources by users of clientless SSL VPN sessions on a group basis. Users have no direct access to resources on the internal network.

The following sections address getting started with the configuration of clientless SSL VPN access:

- Observing Clientless SSL VPN Security Precautions
- Understanding Clientless SSL VPN System Requirements
- Understanding Features Not Supported in Clientless SSL VPN
- Using SSL to Access the Central Site
- Authenticating with Digital Certificates
- Enabling Cookies on Browsers for Clientless SSL VPN
- Managing Passwords
- Using Single Sign-on with Clientless SSL VPN
- Configuring SSO with Macro Substitution

Observing Clientless SSL VPN Security Precautions

Clientless SSL VPN connections on the ASA differ from remote access IPSec connections, particularly with respect to how they interact with SSL-enabled servers, and precautions to follow to reduce security risks.

In a clientless SSL VPN connection, the ASA acts as a proxy between the end user web browser and target web servers. When a user connects to an SSL-enabled web server, the ASA establishes a secure connection and validates the server SSL certificate. The browser never receives the presented certificate, so it cannot examine and validate the certificate.

The current implementation of clientless SSL VPN on the ASA does not permit communication with sites that present expired certificates. Nor does the ASA perform trusted CA certificate validation to those SSL-enabled sites. Therefore, users do not benefit from certificate validation of pages delivered from an SSL-enabled web server before they use a web-enabled service.

Caution By default, the ASA permits all portal traffic to all web resources (e.g., HTTPS, CIFS, RDP, and plug-ins). The ASA clientless service rewrites each URL to one that is meaningful only to itself; the user cannot use the rewritten URL displayed on the page accessed to confirm that they are on the site they requested. To avoid placing users at risk, please assign a web ACL to the policies configured for clientless access – group-policies, dynamic access policies, or both – to control traffic flows from the portal. For example, without such an ACL, users could receive an authentication request from an outside fraudulent banking or commerce site. Also, we recommend disabling URL Entry on these policies to prevent user confusion over what is accessible. We recommend that you do the following to minimize risks posed by clientless SSL VPN access:

Step 1 Configure a group policy for all users who need clientless SSL VPN access, and enable clientless SSL VPN only for that group policy.

Step 2 Create a web ACL to do one of the following: permit access only to specific targets within the private network, permit access only to the private network, deny Internet access, or permit access only to reputable sites. For instructions, see "Configuring Clientless SSL VPN." Assign the web ACL to any policies (group policies, dynamic access policies, or both) that you have configured for clientless access. To do so on a DAP, open an ASDM session with the ASA and select the web ACL on the **Network ACL Filters** tab.

Step 3 Disable URL entry on the *portal page*, the page that opens when the user establishes a browser-based connection. To disable URL entry on a group policy, enter the **url-entry disable** command in group-policy webvpn configuration mode. To disable URL entry on a DAP, use ASDM to edit the DAP record, click the **Functions** tab, and check **Disable** next to URL Entry.

Step 4 Instruct users to enter external URLs in the native browser address field above the portal page or open a separate browser window to visit external sites.

Understanding Clientless SSL VPN System Requirements

Clientless SSL VPN supports access from the following OSs and browsers.

OSs[1]	Browser and Java Versions	Feature Notes[2]
Windows Vista SP2 Vista SP1 with KB952876 or later.	Microsoft Internet Explorer 7 Firefox 2.0 or later.	Windows Vista does not support Windows Shares (CIFS) Web Folders. Additional requirements and limitations apply to smart tunnel and port forwarding.
Windows XP SP2 or later.	Microsoft Internet Explorer 7 and 6 Firefox 2.0 or later.	Windows XP SP2 or later requires Microsoft KB892211 hotfix to support Web Folders. Additional requirements and limitations apply to smart tunnel and port forwarding.
Windows 2000 SP4.	Microsoft Internet Explorer 7 and 6 Firefox 2.0 or later.	Windows Vista does not support Windows Shares (CIFS) Web Folders. Windows 2000 SP4 requires Microsoft KB892211 hotfix to support Web Folders. Additional requirements and limitations apply to smart tunnel and port forwarding.

OSs[1]	Browser and Java Versions	Feature Notes[2]
Apple: Mac OS X 10.4 and 10.5	Safari 2.0 or later, or Firefox 2.0 or later.	Certificate authentication, including the DoD Common Access Card and SmartCard, works with the Safari keychain only. Web folders do not support Mac OS. Additional requirements and limitations apply to smart tunnel and port forwarding.
Linux	Firefox 2.0 or later.	Web folders and smart tunnel do not support Linux. Additional requirements apply to port forwarding.

[1] Although Release 8.2 does not support Windows 7 with clientless SSL features, Release 8.2 does support the installation of HostScan and AnyConnect using WebLaunch over a clientless SSL connection established with Internet Explorer 8.0 on Windows 7. Following the initial installation of AnyConnect, users can start the AnyConnect application to establish a VPN session.

[2] For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.

ActiveX pages require that you use the ActiveX Relay default setting (Enable) on the associated group policy. If you do so or assign a smart tunnel list to the policy, and the browser proxy exception list on the endpoint specifies a proxy, the user must add a "shutdown.webvpn.relay." entry to that list.

Clientless SSL VPN access does not support Windows Shares (CIFS) Web Folders on Windows 7, Vista, Internet Explorer 8, Mac OS, and Linux. Windows XP SP2 requires a Microsoft hotfix to support Web Folders.

See the following sections for the platforms supported by the clientless applications named:

- Port Forwarding Requirements and Restrictions, page 71-42
- Smart Tunnel Requirements, Restrictions, and Limitations, page 71-34
- Plug-in Requirements and Restrictions, page 71-28

Understanding Features Not Supported in Clientless SSL VPN

The ASA does not support the following features for clientless SSL VPN connections:

- DSA certificates; The ASA does support RSA certificates.
- Remote HTTPS certificates.
- Requirements of some domain-based security products. Because the adaptive security appliance encodes the URL, requests actually originate from the ASA, which in some cases do not satisfy the requirements of domain-based security products.
- Inspection features under the Modular Policy Framework, inspecting configuration control.
- Functionality the filter configuration commands provide, including the **vpn-filter** command.
- VPN connections from hosts with IPv6 addresses. Hosts must use IPv4 addresses to establish Clientless SSL VPN or AnyConnect sessions. However, beginning with ASA 8.0(2), users can use these sessions to access internal IPv6-enabled resources.
- NAT, reducing the need for globally unique IP addresses.
- PAT, permitting multiple outbound sessions appear to originate from a single IP address.
- QoS, rate limiting using the **police** command and **priority-queue** command.
- Connection limits, checking either via the static or the Modular Policy Framework **set connection** command.

- The **established** command, allowing return connections from a lower security host to a higher security host if there is already an established connection from the higher level host to the lower level host.

Using SSL to Access the Central Site

Clientless SSL VPN uses SSL and its successor, TLS1 to provide a secure connection between remote users and specific, supported internal resources at a central site. This section includes the following topics:

- Using HTTPS for Clientless SSL VPN Sessions
- Configuring Clientless SSL VPN and ASDM Ports
- Configuring Support for Proxy Servers
- Configuring SSL/TLS Encryption Protocols

Using HTTPS for Clientless SSL VPN Sessions

Establishing clientless SSL VPN sessions requires the following:

- Enabling clientless SSL VPN sessions on the ASA interface that users connect to.
- Using HTTPS to access the ASA or load balancing cluster. In a web browser, users enter the ASA IP address in the format *https:// address* where *address* is the IP address or DNS hostname of the ASA interface.

To permit clientless SSL VPN sessions on an interface, perform the following steps:

Step 1 In global configuration mode, enter the **webvpn** command to enter webvpn mode.

Step 2 Enter the **enable** command with the name of the interface that you want to use for clientless SSL VPN sessions.

For example, to enable clientless SSL VPN sessions on the interface called outside, enter the following:

```
hostname(config)# webvpn
hostname(config-webvpn)# enable outside
```

Configuring Clientless SSL VPN and ASDM Ports

Beginning with Version 8.0(2), the ASA supports both clientless SSL VPN sessions and ASDM administrative sessions simultaneously on Port 443 of the outside interface. You do, however, have the option to configure these applications on different interfaces.

To change the SSL listening port for clientless SSL VPN, use the **port** *port_number* command in webvpn mode. The following example enables clientless SSL VPN on port 444 of the outside interface. HTTPS for ASDM is also configured on the outside interface and uses the default port (443). With this configuration, remote users initiating clientless SSL VPN sessions enter https://<outside_ip>:444 in the browser.

```
hostname(config)# http server enable
hostname(config)# http 192.168.3.0 255.255.255.0 outside
hostname(config)# webvpn
hostname(config-webvpn)# port 444
hostname(config-webvpn)# enable outside
```

To change the listening port for ASDM, use the *port* argument of the **http server enable** command in privileged EXEC mode. The following example specifies that HTTPS ASDM sessions use port 444 on the outside interface. Clientless SSL VPN is also enabled on the outside interface and uses the default port (443). With this configuration, remote users initiate ASDM sessions by entering https://<outside_ip>:444 in the browser.

```
hostname(config)# http server enable 444
hostname(config)# http 192.168.3.0 255.255.255.0 outside
hostname(config)# webvpn
hostname(config-webvpn)# enable outside
```

Configuring Support for Proxy Servers

The ASA can terminate HTTPS connections and forward HTTP and HTTPS requests to proxy servers. These servers act as intermediaries between users and the Internet. Requiring Internet access via a server that the organization controls provides another opportunity for filtering to assure secure Internet access and administrative control.

When configuring support for HTTP and HTTPS proxy services, you can assign preset credentials to send with each request for basic authentication. You can also specify URLs to exclude from HTTP and HTTPS requests.

You can specify a proxy autoconfiguration (PAC) file to download from an HTTP proxy server, however, you may not use proxy authentication when specifying the PAC file.

To configure the ASA to use an external proxy server to handle HTTP and HTTPS requests, use the **http-proxy and https-proxy** commands in webvpn mode.

- **http-proxy** *host* [*port*] [**exclude** `url`] [**username** *username* {**password** *password*}]
- **https-proxy** *host* [*port*] [**exclude** `url`] [**username** *username* {**password** *password*}]
- **http-proxy pac** `url`

exclude—(Optional) Enter this keyword to exclude URLs from those that can be sent to the proxy server.

*host***—**Enter the hostname or IP address for the external proxy server.

pac—Proxy autoconfiguration file to download to the browser. Once downloaded, the PAC file uses a JavaScript function to identify a proxy for each URL.

password—(Optional, and available only if you specify a *username*) Enter this keyword to accompany each proxy request with a password to provide basic, proxy authentication.

*password***—**Enter the password to send to the proxy server with each HTTP or HTTPS request.

*port***—**(Optional) Enter the port number used by the proxy server. The default HTTP port is 80. The default HTTPS port is 443. The ASA uses each of these ports if you do not specify an alternative value. The range is 1-65535.

`url`**—**If you entered **exclude**, enter a URL or a comma-delimited list of several URLs to exclude from those that can be sent to the proxy server. The string does not have a character limit, but the entire command cannot exceed 512 characters. You can specify literal URLs or use the following wildcards:

- ***** to match any string, including slashes (/) and periods (.). You must accompany this wildcard with an alphanumeric string.
- **?** to match any single character, including slashes and periods.

- [*x*-*y*] to match any single character in the range of *x* and *y*, where *x* represents one character and *y* represents another character in the ANSI character set.
- [**!***x*-*y*] to match any single character that is not in the range.

If you entered **http-proxy pac**, follow it with **http://** and type the URL of the proxy autoconfiguration file. If you omit the **http://** portion, the CLI ignores the command.

username—(Optional) Enter this keyword to accompany each HTTP proxy request with a username for basic, proxy authentication. Only the **http-proxy** *host* command supports this keyword.

*username***—**Enter the username the password to send to the proxy server with each HTTP or HTTPS request.

The ASA clientless SSL VPN configuration supports only one **http-proxy** and one **http-proxy** command each. For example, if one instance of the **http-proxy** command is already present in the running configuration and you enter another, the CLI overwrites the previous instance.

The following example shows how to configure use of an HTTP proxy server with an IP address of 209.165. 201.1 using the default port, send a username and password with each HTTP request:

```
hostname(config-webvpn)# http-proxy 209.165.201.1 jsmith password user mysecretdonttell
hostname(config-webvpn)
```

The following example shows the same command, except when the ASA receives the specific URL www.example.com in an HTTP request, it resolves the request instead of passing it on to the proxy server:

```
hostname(config-webvpn)# http-proxy 209.165.201.1 exclude www.example.com username jsmith
password mysecretdonttell
hostname(config-webvpn)
```

The following example shows how to specify a URL to serve a proxy autoconfiguration file to the browser:

```
hostname(config-webvpn)# http-proxy pac http://www.example.com/pac
hostname(config-webvpn)
```

Configuring SSL/TLS Encryption Protocols

When you set SSL/TLS encryption protocols, be aware of the following:

- Make sure that the ASA and the browser you use allow the same SSL/TLS encryption protocols.
- If you configure e-mail proxy, do not set the ASA SSL version to TLSv1 Only. Microsoft Outlook and Microsoft Outlook Express do not support TLS.
- TCP Port Forwarding requires Sun Microsystems Java Runtime Environment (JRE) version 1.4.x and 1.5.x. Port forwarding does not work when a user of clientless SSL VPN connects with some SSL versions, as follows:

Negotiate SSLv3	Java downloads
Negotiate SSLv3/TLSv1	Java downloads
Negotiate TLSv1	Java does NOT download
TLSv1Only	Java does NOT download
SSLv3Only	Java does NOT download

Authenticating with Digital Certificates

SSL uses digital certificates for authentication. The ASA creates a self-signed SSL server certificate when it boots; or you can install in the ASA an SSL certificate that has been issued in a PKI context. For HTTPS, this certificate must then be installed on the client. You need to install the certificate from a given ASA only once.

Because E-mail clients such as MS Outlook, MS Outlook Express, and Eudora lack the ability to access the certificate store, you may want to restrict these users from authenticating with digital certificates.

For more information on authentication and authorization using digital certificates, see "Using Certificates and User Login Credentials" in the "Configuring AAA Servers and the Local Database" chapter.

Enabling Cookies on Browsers for Clientless SSL VPN

Browser cookies are required for the proper operation of clientless SSL VPN. When cookies are disabled on the web browser, the links from the web portal home page open a new window prompting the user to log in once more.

Managing Passwords

Optionally, you can configure the ASA to warn end users when their passwords are about to expire. To do this, you specify the **password-management** command in tunnel-group general-attributes mode or enable the feature using ASDM at Configuration > Remote Access VPN > Clientless SSL VPN Access > Connection Profiles > Add or Edit > Advanced > General > Password Management.

The ASA supports password management for the RADIUS and LDAP protocols. It supports the "password-expire-in-days" option for LDAP only.

You can configure password management for IPSec remote access and SSL VPN tunnel-groups.

When you configure password management, the ASA notifies the remote user at login that the user's current password is about to expire or has expired. The ASA then offers the user the opportunity to change the password. If the current password has not yet expired, the user can still log in using that password.

This command is valid for AAA servers that support such notification. The ASA ignores this command if RADIUS or LDAP authentication has not been configured.

Note Some RADIUS servers that support MSCHAP currently do not support MSCHAPv2. This command requires MSCHAPv2 so please check with your vendor.

The ASA, releases 7.1 and later, generally supports password management for the following connection types when authenticating with LDAP or with any RADIUS configuration that supports MS-CHAPv2:

- AnyConnect VPN Client
- IPSec VPN Client
- Clientless SSL VPN

Password management is *not* supported for any of these connection types for Kerberos/Active Directory (Windows password) or NT 4.0 Domain.

The RADIUS server (for example, Cisco ACS) could proxy the authentication request to another authentication server. However, from the ASA perspective, it is talking only to a RADIUS server.

Note For LDAP, the method to change a password is proprietary for the different LDAP servers on the market. Currently, the ASA implements the proprietary password management logic only for Microsoft Active Directory and Sun LDAP servers.

Native LDAP requires an SSL connection. You must enable LDAP over SSL before attempting to do password management for LDAP. By default, LDAP uses port 636.

Note If you are using an LDAP directory server for authentication, password management is supported with the Sun Microsystems JAVA System Directory Server (formerly named the Sun ONE Directory Server) and the Microsoft Active Directory.

Sun—The DN configured on the ASA to access a Sun directory server must be able to access the default password policy on that server. We recommend using the directory administrator, or a user with directory administrator privileges, as the DN. Alternatively, you can place an ACI on the default password policy.

Microsoft—You must configure LDAP over SSL to enable password management with Microsoft Active Directory.

Note that this command does not change the number of days before the password expires, but rather, the number of days ahead of expiration that the ASA starts warning the user that the password is about to expire.

If you do specify the **password-expire-in-days** keyword, you must also specify the number of days.

Specifying this command with the number of days set to 0 disables this command. The ASA does not notify the user of the pending expiration, but the user can change the password after it expires.

The following example sets the days before password expiration to begin warning the user of the pending expiration to 90 for the connection profile “testgroup”:

```
hostname(config)# tunnel-group testgroup type webvpn
hostname(config)# tunnel-group testgroup general-attributes
hostname(config-general)# password-management password-expire-in-days 90
```

Using Single Sign-on with Clientless SSL VPN

Single sign-on support lets users of clientless SSL VPN enter a username and password only once to access multiple protected services and web servers. In general, the SSO mechanism either starts as part of the AAA process or just after successful user authentication to a AAA server. The clientless SSL VPN server running on the ASA acts as a proxy for the user to the authenticating server. When a user logs in, the clientless SSL VPN server sends an SSO authentication request, including username and password, to the authenticating server using HTTPS. If the server approves the authentication request, it returns an SSO authentication cookie to the clientless SSL VPN server. The ASA keeps this cookie on behalf of the user and uses it to authenticate the user to secure websites within the domain protected by the SSO server.

This section describes the three SSO authentication methods supported by clientless SSL VPN: HTTP Basic and NTLMv1 (NT LAN Manager) authentication, the Computer Associates eTrust SiteMinder SSO server (formerly Netegrity SiteMinder), and Version 1.1 of Security Assertion Markup Language (SAML), the POST-type SSO server authentication.

This section includes:

- Configuring SSO with HTTP Basic or NTLM Authentication
- Configuring SSO Authentication Using SiteMinder
- Configuring SSO Authentication Using SAML Browser Post Profile
- Configuring SSO with the HTTP Form Protocol
- Configuring SSO for Plug-ins
- Configuring SSO with Macro Substitution

Configuring SSO with HTTP Basic or NTLM Authentication

This section describes single sign-on with HTTP Basic or NTLM authentication. You can configure the ASA to implement SSO using either or both of these methods. The **auto-signon** command configures the ASA to automatically pass clientless SSL VPN user login credentials (username and password) on to internal servers. You can enter multiple **auto-signon** commands. The ASA processes them according to the input order (early commands take precedence). You specify the servers to receive the login credentials using either IP address and IP mask, or URI mask.

Use the **auto-signon** command in any of three modes: webvpn configuration, webvpn group-policy mode, or webvpn username mode. Username supersedes group, and group supersedes global. The mode you choose depends upon scope of authentication you want:

Mode	Scope
webvpn configuration	All clientless SSL VPN users globally
webvpn group-policy configuration	A subset of clientless SSL VPN users defined by a group policy
webvpn username configuration	An individual user of clientless SSL VPN

The following example commands present various possible combinations of modes and arguments.

All Users, IP Address Range, NTLM

To configure **auto-signon** for all users of clientless SSL VPN to servers with IP addresses ranging from 10.1.1.0 to 10.1.1.255 using NTLM authentication, for example, enter the following commands:

```
hostname(config)# webvpn
hostname(config-webvpn)# auto-signon allow ip 10.1.1.1 255.255.255.0  auth-type ntlm
```

All Users, URI Range, HTTP Basic

To configure **auto-signon** for all users of clientless SSL VPN, using basic HTTP authentication, to servers defined by the URI mask https://*.example.com/*, for example, enter the following commands:

```
hostname(config)# webvpn
hostname(config-webvpn)# auto-signon allow uri https://*.example.com/* auth-type basic
```

Group, URI Range, HTTP Basic and NTLM

To configure **auto-signon** for clientless SSL VPN sessions associated with the ExamplePolicy group policy, using either basic or NTLM authentication, to servers defined by the URI mask https://*.example.com/*, for example, enter the following commands:

```
hostname(config)# group-policy ExamplePolicy attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# auto-signon allow uri https://*.example.com/* auth-type all
```

Specific User, IP Address Range, HTTP Basic

To configure **auto-signon** for a user named Anyuser to servers with IP addresses ranging from 10.1.1.0 to 10.1.1.255 using HTTP Basic authentication, for example, enter the following commands:

```
hostname(config)# username Anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# auto-signon allow ip 10.1.1.1 255.255.255.0 auth-type
basic
```

Configuring SSO Authentication Using SiteMinder

This section describes configuring the ASA to support SSO with SiteMinder. You would typically choose to implement SSO with SiteMinder if your website security infrastucture already incorporates SiteMinder. With this method, SSO authentication is separate from AAA and happens once the AAA process completes. If you want to configure SSO for a user or group for clientless SSL VPN access, you must first configure a AAA server, such as a RADIUS or LDAP server. You can then set up SSO support for clientless SSL VPN. This section includes:

- Task Overview: Configuring SSO with SiteMinder
- Detailed Tasks: Configuring SSO with SiteMinder
- Adding the Cisco Authentication Scheme to SiteMinder

Task Overview: Configuring SSO with SiteMinder

This section presents an overview of the tasks necessary to configure SSO with SiteMinder SSO. These tasks are:

- Specifying the SSO server.
- Specifying the URL of the SSO server to which the ASA makes SSO authentication requests.
- Specifying a secret key to secure the communication between the ASA and the SSO server. This key is similar to a password: you create it, save it, and enter it on both the ASA and the SiteMinder Policy Server using the Cisco Java plug-in authentication scheme.

Optionally, you can do the following configuration tasks in addition to the required tasks:

- Configuring the authentication request timeout.
- Configuring the number of authentication request retries.

After you complete these tasks, assign an SSO server to a user or group policy.

Detailed Tasks: Configuring SSO with SiteMinder

This section presents specific steps for configuring the ASA to support SSO authentication with CA SiteMinder. To configure SSO with SiteMinder, perform the following steps:

Step 1 In webvpn configuration mode, enter the **sso-server** command with the **type** option to create an SSO server. For example, to create an SSO server named Example of type siteminder, enter the following:

```
hostname(config)# webvpn
hostname(config-webvpn)# sso-server Example type siteminder
hostname(config-webvpn-sso-siteminder)#
```

Step 2 Enter the **web-agent-url** command in webvpn-sso-siteminder configuration mode to specify the authentication URL of the SSO server. For example, to send authentication requests to the URL http://www.Example.com/webvpn, enter the following:

```
hostname(config-webvpn-sso-siteminder)# web-agent-url http://www.Example.com/webvpn
hostname(config-webvpn-sso-siteminder)#
```

Step 3 Specify a secret key to secure the authentication communications between the ASA and SiteMinder using the **policy-server-secret** command in webvpn-sso-siteminder configuration mode. You can create a key of any length using any regular or shifted alphanumeric character, but you must enter the same key on both the ASA and the SSO server.

For example, to create the secret key AtaL8rD8!, enter the following:

```
hostname(config-webvpn-sso-siteminder)# policy-server-secret AtaL8rD8!
hostname(config-webvpn-sso-siteminder)#
```

Step 4 Optionally, you can configure the number of seconds before a failed SSO authentication attempt times out using the **request-timeout** command in webvpn-sso-siteminder configuration mode. The default number of seconds is 5 seconds and the possible range is 1 to 30 seconds. To change the number of seconds before a request times out to 8, for example, enter the following:

```
hostname(config-webvpn-sso-siteminder)# request-timeout 8
hostname(config-webvpn-sso-siteminder)#
```

Step 5 Optionally, you can configure the number of times the ASA retries a failed SSO authentication attempt before the authentication times-out using the **max-retry-attempts** command in webvpn-sso-siteminder configuration mode. The default is 3 retry attempts and the possible range is 1 to 5 attempts. To configure the number of retries to be 4, for example, enter the following:

```
hostname(config-webvpn-sso-siteminder)# max-retry-attempts 4
hostname(config-webvpn-sso-siteminder)#
```

Step 6 After you configure the SSO server, you must specify SSO authentication for either a group or user. To specify SSO for a group, assign an SSO server to a group policy using the **sso-server value** command in group-policy-webvpn configuration mode. To specify SSO for a user, assign an SSO server to a user policy using the same command, **sso-server value**, but in username-webvpn configuration mode. For example, to assign the SSO server named Example to the user named Anyuser, enter the following:

```
hostname(config)# username Anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# sso-server value Example
hostname(config-username-webvpn)#
```

Step 7 Finally, you can test the SSO server configuration using the **test sso-server** command in privileged EXEC mode. For example, to test the SSO server named Example using the username Anyuser, enter the following:

```
hostname# test sso-server Example username Anyuser
```

```
INFO: Attempting authentication request to sso-server Example for user Anyuser
INFO: STATUS: Success
hostname#
```

Adding the Cisco Authentication Scheme to SiteMinder

In addition to configuring the ASA for SSO with SiteMinder, you must also configure your CA SiteMinder Policy Server with the Cisco authentication scheme, a Java plug-in you download from the Cisco web site.

Note Configuring the SiteMinder Policy Server requires experience with SiteMinder. This section presents general tasks, not a complete procedure.

To configure the Cisco authentication scheme on your SiteMinder Policy Server, perform the following tasks:

Step 1 With the SiteMinder Administration utility, create a custom authentication scheme, being sure to use the following specific arguments:

- In the Library field, enter **smjavaapi**.
- In the Secret field, enter the same secret configured on the ASA.

  You configure the secret on the ASA using the **policy-server-secret** command at the command line interface.
- In the Parameter field, enter **CiscoAuthApi**.

Step 2 Using your Cisco.com login, download the file **cisco_vpn_auth.jar** from http://www.cisco.com/cisco/software/navigator.html and copy it to the default library directory for the SiteMinder server. This .jar file is also available on the Cisco ASA CD.

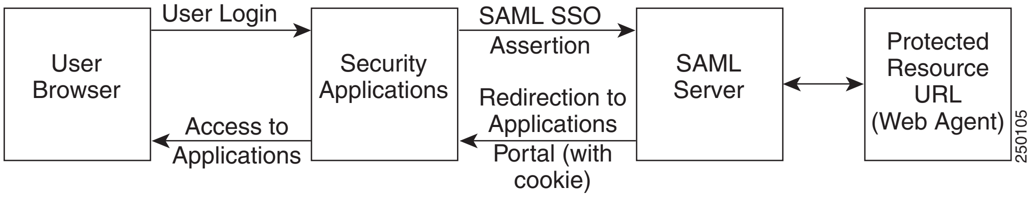
Configuring SSO Authentication Using SAML Browser Post Profile

This section describes configuring the ASA to support Security Assertion Markup Language (SAML), Version 1.1 POST profile Single Sign-On (SSO) for authorized users. SAML SSO is supported only for clientless SSL VPN sessions. This section includes:

- Task Overview: Configuring SSO with SAML Post Profile
- Detailed Tasks: Configuring SSO with SAML Post Profile
- SSO Server Configuration

After a session is initiated, the ASA authenticates the user against a configured AAA method. Next, the ASA (the asserting party) generates an assertion to the relying party, the consumer URL service provided by the SAML server. If the SAML exchange succeeds, the user is allowed access to the protected resource. Figure 71-1 shows the communication flow:

Figure 71-1 SAML Communication Flow



Note The SAML Browser Artifact method of exchanging assertions is not supported.

Task Overview: Configuring SSO with SAML Post Profile

This section presents an overview of the tasks necessary to configure SSO with SAML Browser Post Profile. These tasks are:

- Specify the SSO server with the **sso-server** command.
- Specify the URL of the SSO server for authentication requests (the **assertion-consumer-url** command)
- Specify the ASA hostname as the component issuing the authentication request (the **issuer** command)
- Specify the trustpoint certificates use for signing SAML Post Profile assertions (the **trustpoint** command)

Optionally, in addition to these required tasks, you can do the following configuration tasks:

- Configure the authentication request timeout (the **request-timeout** command)
- Configure the number of authentication request retries (the **max-retry-attempts** command)

After completing the configuration tasks, you assign an SSO server to a user or group policy.

Detailed Tasks: Configuring SSO with SAML Post Profile

This section presents specific steps for configuring the ASA to support SSO authentication with SAML Post Profile. To configure SSO with SAML-V1.1-POST, perform the following steps:

Step 1 In webvpn configuration mode, enter the **sso-server** command with the **type** option to create an SSO server. For example, to create an SSO server named Sample of type SAML-V1.1-POST, enter the following:

```
hostname(config)# webvpn
hostname(config-webvpn)# sso-server sample type SAML-V1.1-post
hostname(config-webvpn-sso-saml)#
```

Note The ASA currently supports only the Browser Post Profile type of SAML SSO Server.

Step 2 Enter the **assertion-consumer-url** command in webvpn-sso-saml configuration mode to specify the authentication URL of the SSO server. For example, to send authentication requests to the URL http://www.Example.com/webvpn, enter the following:

```
hostname(config-webvpn-sso-saml)# assertion-consumer-url http://www.sample.com/webvpn
hostname(config-webvpn-sso-saml)#
```

Step 3 Specify a unique string that identifies the ASA itself when it generates assertions. Typically, this issuer name is the hostname for the ASA as follows:

```
hostname(config-webvpn-sso-saml)# issuer myasa
hostname(config-webvpn-sso-saml)#
```

Step 4 Specify the identification certificate for signing the assertion with the **trust-point** command. An example follows:

```
hostname(config)# tunnel-group 209.165.200.225 type IPSec_L2L
hostname(config)# tunnel-group 209.165.200.225 ipsec-attributes
hostname(config-tunnel-ipsec)# trust-point mytrustpoint
```

Optionally, you can configure the number of seconds before a failed SSO authentication attempt times out using the **request-timeout** command in webvpn-sso-saml configuration mode. The default number of seconds is 5 seconds and the possible range is 1 to 30 seconds. To change the number of seconds before a request times out to 8, for example, enter the following:

```
hostname(config-webvpn-sso-saml)# request-timeout 8
hostname(config-webvpn-sso-saml)#
```

Step 5 Optionally, you can configure the number of times the ASA retries a failed SSO authentication attempt before the authentication times-out using the **max-retry-attempts** command in webvpn-sso-saml configuration mode. The default is 3 retry attempts and the possible range is 1 to 5 attempts. To configure the number of retries to be 4, for example, enter the following:

```
hostname(config-webvpn-sso-saml)# max-retry-attempts 4
hostname(config-webvpn-sso-saml)#
```

Step 6 After you configure the SSO server, you must specify SSO authentication for either a group or user. To specify SSO for a group, assign an SSO server to a group policy using the **sso-server value** command in group-policy-webvpn configuration mode. To specify SSO for a user, assign an SSO server to a user policy using the same command, **sso-server value**, but in username-webvpn configuration mode. For example, to assign the SSO server named Example to the user named Anyuser, enter the following:

```
hostname(config)# username Anyuser attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# sso-server value sample
hostname(config-username-webvpn)#
```

Step 7 Finally, you can test the SSO server configuration using the **test sso-server** command in privileged EXEC mode. For example, to test the SSO server, Example using the username Anyuser, enter:

```
hostname# test sso-server Example username Anyuser
INFO: Attempting authentication request to sso-server sample for user Anyuser
INFO: STATUS: Success
```

SSO Server Configuration

Use the SAML server documentation provided by the server software vendor to configure the SAML server in Relying Party mode.The following steps list the specific parameters required to configure the SAML Server for Browser Post Profile:

Step 1 Configure the SAML server parameters to represent the asserting party (the ASA):

- Recipient consumer url (same as the assertion consumer url configured on the ASA)
- Issuer ID, a string, usually the hostname of appliance

- Profile type -Browser Post Profile

Step 2 Configure certificates.

Step 3 Specify that asserting party assertions must be signed.

Step 4 Select how the SAML server identifies the user:

- Subject Name Type is DN
- Subject Name format is uid=<user>

Configuring SSO with the HTTP Form Protocol

Note To configure SSO with the HTTP protocol correctly, you must have a thorough working knowledge of authentication and HTTP protocol exchanges.

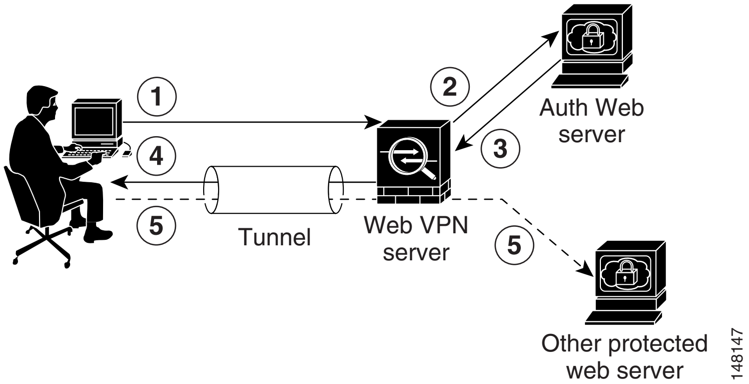
This section describes using the HTTP Form protocol for SSO. HTTP Form protocol is a common approach to SSO authentication that can also qualify as a AAA method. It provides a secure method for exchanging authentication information between users of clientless SSL VPN and authenticating web servers. As a common protocol, it is highly compatible with web servers and web-based SSO products, and you can use it in conjunction with other AAA servers such as RADIUS or LDAP servers.

Note It is important to remember that HTTP Form authentication can be used in conjunction with RADIUS or LDAP authorization, but *not* with RADIUS or LDAP authentication.

The ASA again serves as a proxy for users of clientless SSL VPN to an authenticating web server but, in this case, it uses HTTP Form protocol and the POST method for requests. You must configure the ASA to send and receive form data. Figure 71-2 illustrates the following SSO authentication steps:

1. A user of clientless SSL VPN first enters a username and password to log into the clientless SSL VPN server on the ASA.
2. The clientless SSL VPN server acts as a proxy for the user and forwards the form data (username and password) to an authenticating web server using a POST authentication request.
3. If the authenticating web server approves the user data, it returns an authentication cookie to the clientless SSL VPN server where it is stored on behalf of the user.
4. The clientless SSL VPN server establishes a tunnel to the user.
5. The user can now access other websites within the protected SSO environment without reentering a username and password.

Figure 71-2 SSO Authentication Using HTTP Forms



While you would expect to configure form parameters that let the ASA include POST data such as the username and password, you initially might not be aware of additional hidden parameters that the web server requires. Some authentication applications expect hidden data which is neither visible to nor entered by the user. You can, however, discover hidden parameters the authenticating web server expects by making a direct authentication request to the web server from your browser without the ASA in the middle acting as a proxy. Analyzing the web server response using an HTTP header analyzer reveals hidden parameters in a format similar to the following:

```
<param name>=<URL encoded value>&<param name>=<URL encoded>
```

Some hidden parameters are mandatory and some are optional. If the web server requires data for a hidden parameter, it rejects any authentication POST request that omits that data. Because a header analyzer does not tell you if a hidden parameter is mandatory or not, we recommend that you include all hidden parameters until you determine which are mandatory.

This section describes:

- Gathering HTTP Form Data
- Task Overview: Configuring SSO with HTTP Form Protocol
- Detailed Tasks: Configuring SSO with HTTP Form Protocol

Gathering HTTP Form Data

This section presents the steps for discovering and gathering necessary HTTP Form data. If you do not know what parameters the authenticating web server requires, you can gather parameter data by analyzing an authentication exchange using the following steps:

Note These steps require a browser and an HTTP header analyzer.

Step 1 Start your browser and HTTP header analyzer, and connect directly to the web server login page without going through the ASA.

Step 2 After the web server login page has loaded in your browser, examine the login sequence to determine if a cookie is being set during the exchange. If the web server has loaded a cookie with the login page, configure this login page URL as the *start-URL*.

Step 3 Enter the username and password to log in to the web server, and press Enter. This action generates the authentication POST request that you examine using the HTTP header analyzer.

An example POST request—with host HTTP header and body—follows:

```
POST
/emco/myemco/authc/forms/MCOlogin.fcc?TYPE=33554433&REALMOID=06-000430e1-7443-125c-ac05
-83846dc90034&GUID=&SMAUTHREASON=0&METHOD=GET&SMAGENTNAME=$SM$5FZmjnk3DRNwNjk2KcqVCFbIr
NT9%2bJ0H0KPshFtg6rB1UV2PxkHqLw%3d%3d&TARGET=https%3A%2F%2Fwww.example.com%2Femco%2Fmye
mco%2FHTTP/1.1
Host: www.example.com
(BODY)
SMENC=ISO-8859-1&SMLOCALE=US-EN&USERID=Anyuser&USER_PASSWORD=XXXXXX&target=https%3A%2F%
2Fwww.example.com%2Femco%2Fmyemco%2F&smauthreason=0
```

Step 4 Examine the POST request and copy the protocol, host, and the complete URL to configure the action-uri parameter.

Step 5 Examine the POST request body and copy the following:

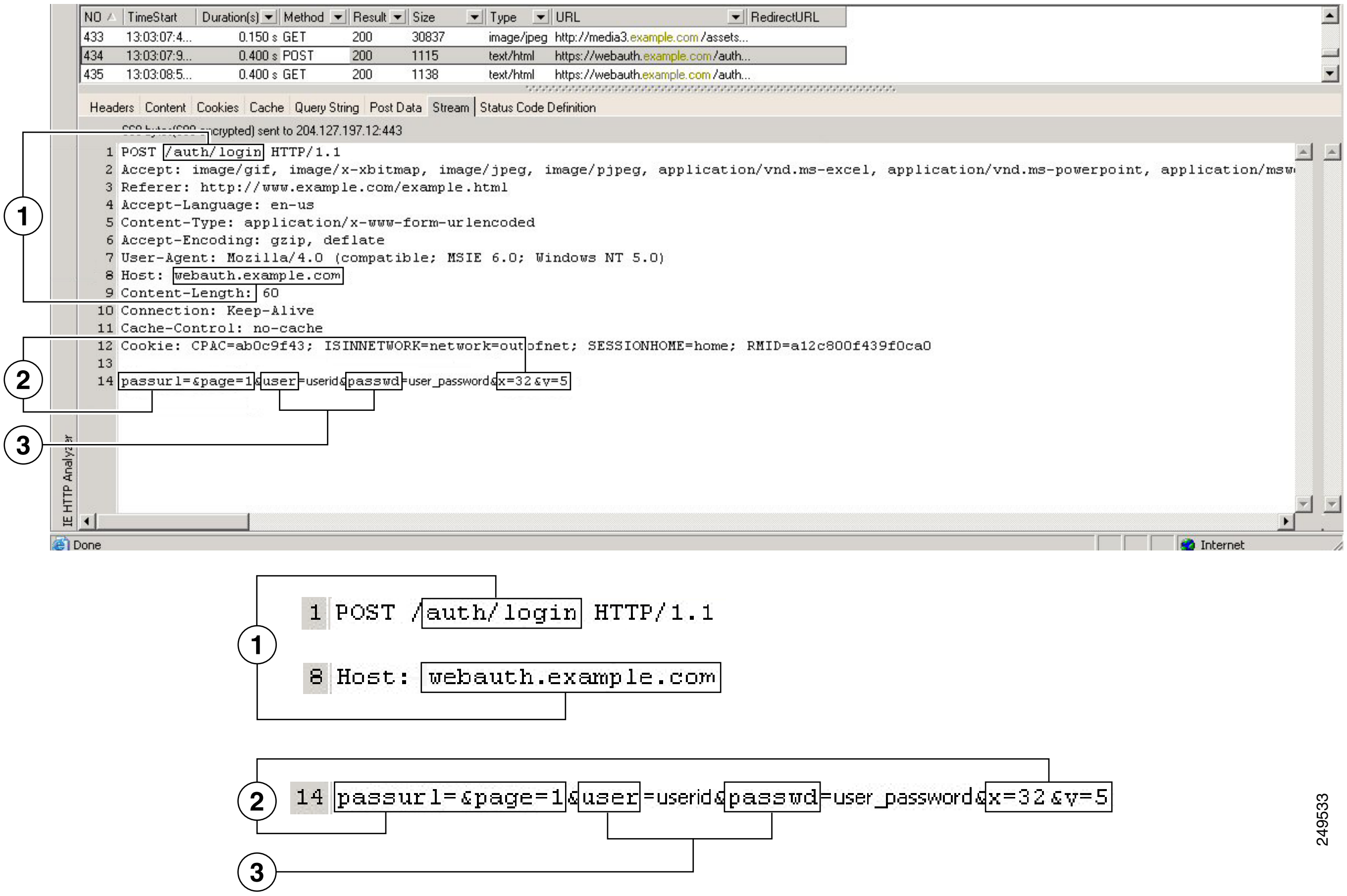
a. Username parameter. In the preceding example, this parameter is USERID, not the value anyuser.

b. Password parameter. In the preceding example, this parameter is USER_PASSWORD.

c. Hidden parameter. This parameter is everything in the POST body except the username and password parameters. In the preceding example, the hidden parameter is: SMENC=ISO-8859-1&SMLOCALE=US-EN&target=https%3A%2F%2Fwww.example.com%2Femco%2Fmyemco%2F&smauthreason=0

Figure 71-3 highlights the action URI, hidden, username and password parameters within sample output from an HTTP analyzer. This is only an example; output varies widely across different websites.

Figure 71-3 Action-uri, hidden, username and password parameters



NO	TimeStart	Duration(s)	Method	Result	Size	Type	URL	RedirectURL
433	13:03:07:4...	0.150 s	GET	200	30837	image/jpeg	http://media3.example.com/assets...	
434	13:03:07:9...	0.400 s	POST	200	1115	text/html	https://webauth.example.com/auth...	
435	13:03:08:5...	0.400 s	GET	200	1138	text/html	https://webauth.example.com/auth...	

```
POST /auth/login HTTP/1.1
Accept: image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/vnd.ms-excel, application/vnd.ms-powerpoint, application/msw
Referer: http://www.example.com/example.html
Accept-Language: en-us
Content-Type: application/x-www-form-urlencoded
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)
Host: webauth.example.com
Content-Length: 60
Connection: Keep-Alive
Cache-Control: no-cache
Cookie: CPAC=ab0c9f43; ISINNETWORK=network=outofnet; SESSIONHOME=home; RMID=a12c800f439f0ca0

passurl=&page=1&user=userid&passwd=user_password&x=32&y=5
```

1	Action URI parameter
2	Hidden parameters
3	Username and password parameters

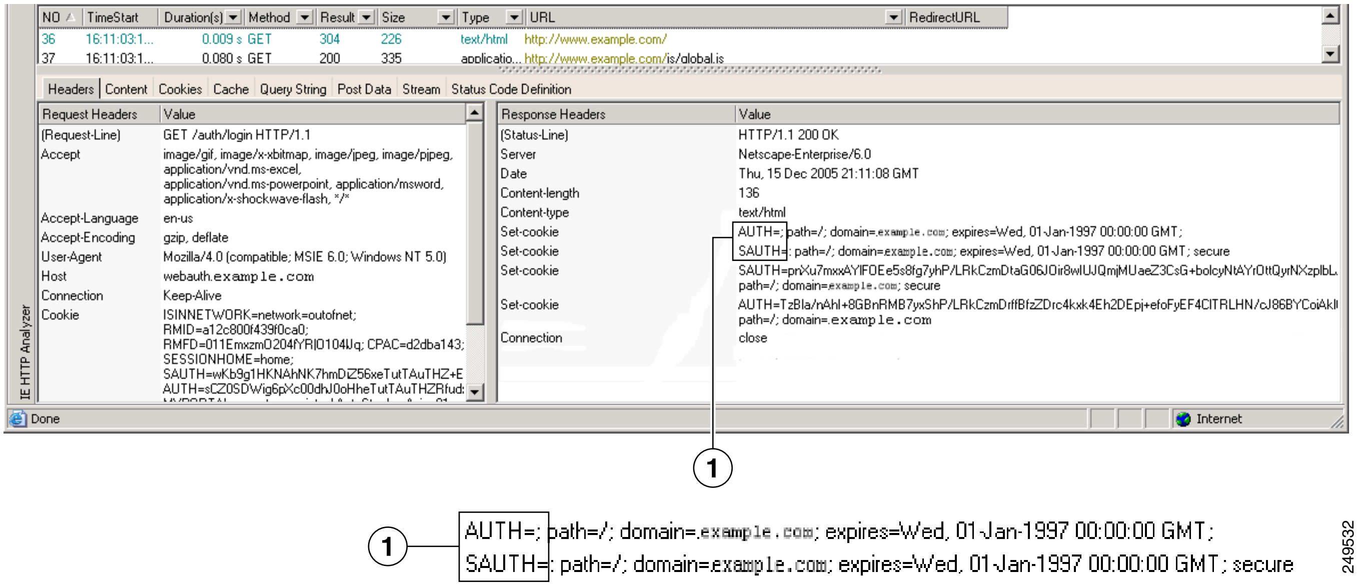
Step 6 If you successfully log in to the web server, examine the server response with the HTTP header analyzer to locate the name of the session cookie set by the server in your browser. This is the **auth-cookie-name** parameter.

In the following server response header, the name of the session cookie is SMSESSION. You just need the name, not the value.

```
Set-Cookie:
SMSESSION=yN4Yp5hHVNDgs4FT8dn7+Rwev41hsE49XlKc+1twie0gqnjbhkTkUnR8XWP3hvDH6PZP
bHIHtWLDKTa8ngDB/lbYTjIxrbDx8WPWwaG3CxVa3adOxHFR8yjD55GevK3ZF4ujgU1lhO6fta0dSS
OSepWvnsCb7IFxCw+MGiw0o88uHa2t4l+SillqfJvcpuXfiIAO06D/gtDF40Ow5YKHEl2KhDEvv+yQ
zxwfEz2cl7Ef5iMr8LgGcDK7qvMcvrgUqx68JQOK2+RSwtHQ15bCZmsDU5vQVCvSQWC8OMHNGwpS25
3XwRLvd/h6S/tM0k98QMv+i3N8oOdj1V7flBqecH7+kVrU01F6oFzr0zM1kMyLr5HhlVDh7B0k9wp0
dUFZiAzaf43jupD5f6CEkuLeudYW1xgNzsR8eqtPK6t1gFJyOn0s7QdNQ7q9knsPJsekRAH9hrLBhW
BLTU/3B1QS94wEGD2YTuiW36TiP14hYwOlCAYRj2/bY3+lYzVu7EmzMQ+UefYxh4cF2gYD8RZL2Rwm
P9JV5l48I3XBFPNUw/3V5jf7nRuLr/CdfK3OO8+Pa3V6/nNhokErSgyxjzMd88DVzM41LxxaUDhbcm
koHT9ImzBvKzJX0J+o7FoUDFOxEdIqlAN4GNqk49cpi2sXDbIarALp6Bl3+tbB4MlHGH+0CPscZXqo
i/kon9YmGauHyRs+0m6wthdlAmCnvlJCDfDoXtn8DpabgiW6VDTrvl3SGPyQtUv7Wdahuq5SxbUzjY
2JxQnrUtwB977NCzYu2sOtN+dsEReWJ6ueyJBbMzKyzUB4L3i5uSYN50B4PCv1w5KdRKa5p3N0Nfq6
RM6dfipMEJw0Ny1sZ7ohz3fbvQ/YZ7lw/k7ods/8VbaR15ivkE8dSCzuf/AInHtCzuQ6wApzEp9CUo
G8/dapWriHjNoi4llJOgCst33wEhxFxcWy2UWxs4EZSjsI5GyBnefSQTPVfma5dc/emWor9vWr0HnT
QaHP5rg5dTNqunkDEdMIHfbeP3F90cZejVzihM6igiS6P/CEJAjE;Domain=.example.com;Path=
/
```

Figure 71-4 shows an example of authorization cookies in HTTP analyzer output. This is only an example; output varies widely across different websites.

Figure 71-4 Authorization cookies in sample HTTP analyzer output



NO	TimeStart	Duration(s)	Method	Result	Size	Type	URL	RedirectURL
36	16:11:03:1...	0.009 s	GET	304	226	text/html	http://www.example.com/	
37	16:11:03:1...	0.080 s	GET	200	335	applicatio...	http://www.example.com/is/global.is	

Request Headers	Value
(Request-Line)	GET /auth/login HTTP/1.1
Accept	image/gif, image/x-xbitmap, image/jpeg, image/pjpeg, application/vnd.ms-excel, application/vnd.ms-powerpoint, application/msword, application/x-shockwave-flash, */*
Accept-Language	en-us
Accept-Encoding	gzip, deflate
User-Agent	Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)
Host	webauth.example.com
Connection	Keep-Alive

Cookie	ISINNETWORK=network=outofnet;
	RMID=a12c800f439f0ca0;
	RMFD=011Emxzm0204fYRI0104Jq; CPAC=d2dba143;
	SESSIONHOME=home;
	SAUTH=wKb9g1HKNAhNK7hmDiZ56xeTutTAuTHZ+E
	AUTH=sCZ0SDWig6pXc00dhJ0oHheTutTAuTHZRfud:

Response Headers	Value
(Status-Line)	HTTP/1.1 200 OK
Server	Netscape-Enterprise/6.0
Date	Thu, 15 Dec 2005 21:11:08 GMT
Content-length	136
Content-type	text/html
Set-cookie	AUTH=; path=/; domain=.example.com; expires=Wed, 01-Jan-1997 00:00:00 GMT;
Set-cookie	SAUTH=; path=/; domain=.example.com; expires=Wed, 01-Jan-1997 00:00:00 GMT; secure

Set-cookie	SAUTH=pnXu7mxxAYIFOEe5s8fg7yhP/LRkCzmDtaG06JOir8wlUJQmjMUaeZ3CsG+bolcyNtAYrOttQyrNXzplbL
	path=/; domain=.example.com; secure

Set-cookie	AUTH=TzBla/nAhl+8GBnRMB7yxShP/LRkCzmDrffBfzZDrc4kxk4Eh2DEpj+efoFyEF4CITRLHN/cJ86BYCoiAkl
	path=/; domain=.example.com

Connection	close

AUTH=; path=/; domain=.example.com; expires=Wed, 01-Jan-1997 00:00:00 GMT;
SAUTH=; path=/; domain=.example.com; expires=Wed, 01-Jan-1997 00:00:00 GMT; secure

1	Authorization cookies

Step 7 In some cases, the server may set the same cookie regardless of whether the authentication was successful or not, and such a cookie is unacceptable for SSO purposes. To confirm that the cookies are different, repeat Step 1 through Step 6 using invalid login credentials and then compare the "failure" cookie with the "success" cookie.

You now have the necessary parameter data to configure the ASA for SSO with HTTP Form protocol.

Task Overview: Configuring SSO with HTTP Form Protocol

This section presents an overview of configuring SSO with the HTTP Form protocol.To enable SSO using HTTP Forms, perform the following tasks:

- Configure the uniform resource identifier on the authenticating web server to receive and process the form data (**action-uri**).
- Configure the username parameter (**user-parameter**).
- Configure the user password parameter (**password-parameter**).

You might also need to do the following tasks depending upon the requirements of authenticating web server:

- Configure a starting URL if the authenticating web server requires a pre-login cookie exchange (**start-url**).
- Configure any hidden authentication parameters required by the authenticating web server (**hidden-parameter**).
- Configure the name of an authentication cookie set by the authenticating web server (**auth-cookie-name**).

Detailed Tasks: Configuring SSO with HTTP Form Protocol

This section presents the detailed tasks required to configure SSO with the HTTP Form protocol. Perform the following steps to configure the ASA to use HTTP Form protocol for SSO:

Step 1 If the authenticating web server requires it, enter the **start-url** command in aaa-server-host configuration mode to specify the URL from which to retrieve a pre-login cookie from the authenticating web server. For example, to specify the authenticating web server URL http://example.com/east/Area.do?Page-Grp1 in the testgrp1 server group with an IP address of 10.0.0.2, enter the following:

```
hostname(config)# aaa-server testgrp1 host 10.0.0.2
hostname(config-aaa-server-host)# start-url http://example.com/east/Area.do?Page-Grp1
hostname(config-aaa-server-host)#
```

Step 2 To specify a URI for an authentication program on the authenticating web server, enter the **action-uri** command in aaa-server- host configuration mode. A URI can be entered on multiple, sequential lines. The maximum number of characters per line is 255. The maximum number of characters for a complete URI is 2048. An example action URI follows:

```
http://www.example.com/auth/index.html/appdir/authc/forms/MCOlogin.fcc?TYPE=33554433&RE
ALMOID=06-000a1311-a828-1185-ab41-8333b16a0008&GUID=&SMAUTHREASON=0&METHOD=GET&SMAGENTN
AME=$SM$5FZmjnk3DRNwNjk2KcqVCFbIrNT9%2bJ0H0KPshFtg6rB1UV2PxkHqLw%3d%3d&TARGET=https%3A%
2F%2Fauth.example.com
```

To specify this action URI, enter the following commands:

```
hostname(config-aaa-server-host)# action-uri http://www.example.com/auth/index.htm
hostname(config-aaa-server-host)# action-uri l/appdir/authc/forms/MCOlogin.fcc?TYP
hostname(config-aaa-server-host)# action-uri 554433&REALMOID=06-000a1311-a828-1185
hostname(config-aaa-server-host)# action-uri -ab41-8333b16a0008&GUID=&SMAUTHREASON
hostname(config-aaa-server-host)# action-uri =0&METHOD=GET&SMAGENTNAME=$SM$5FZmjnk
hostname(config-aaa-server-host)# action-uri 3DRNwNjk2KcqVCFbIrNT9%2bJ0H0KPshFtg6r
hostname(config-aaa-server-host)# action-uri B1UV2PxkHqLw%3d%3d&TARGET=https%3A%2F
hostname(config-aaa-server-host)# action-uri %2Fauth.example.com
hostname(config-aaa-server-host)#
```

Note You must include the hostname and protocol in the action URI. In the preceding example, these appear at the start of the URI in http://www.example.com.

Step 3 To configure a username parameter for the HTTP POST request, enter the **user-parameter** command in aaa-server-host configuration mode. For example, the following command configures the username parameter userid:

```
hostname(config-aaa-server-host)# user-parameter userid
hostname(config-aaa-server-host)#
```

Step 4 To configure a user password parameter for the HTTP POST request, use the **password-parameter** command in aaa-server-host configuration mode. For example, the following command configures a user password parameter named user_password:

```
hostname(config-aaa-server-host)# password-parameter user_password
hostname(config-aaa-server-host)#
```

Step 5 To specify hidden parameters for exchange with the authenticating web server, use the **hidden-parameter** command in aaa-server-host configuration mode. An example hidden parameter excerpted from a POST request follows:

SMENC=ISO-8859-1&SMLOCALE=US-EN&target=https%3A%2F%2Fwww.example.com%2Femco%2Fappdir%2FAreaRoot.do%3FEMCOPageCode%3DENG&smauthreason=0

This hidden parameter includes four form entries and their values, separated by &. The four entries and their values are:

- SMENC with a value of ISO-8859-1
- SMLOCALE with a value of US-EN
- target with a value of https%3A%2F%2Fwww.example.com%2Femco%2Fappdir%2FAreaRoot.do
- %3FEMCOPageCode%3DENG
- smauthreason with a value of 0

To specify this hidden parameter, enter the following commands:

```
hostname(config)# aaa-server testgrp1 host example.com
hostname(config-aaa-server-host)# hidden-parameter SMENC=ISO-8859-1&SMLOCALE=US-EN&targe
hostname(config-aaa-server-host)# hidden-parameter t=https%3A%2F%2Fwww.example.com%2Femc
hostname(config-aaa-server-host)# hidden-parameter o%2Fappdir%2FAreaRoot.do%3FEMCOPageCo
hostname(config-aaa-server-host)# hidden-parameter de%3DENG&smauthreason=0
hostname(config-aaa-server-host)#
```

Step 6 To specify the name for the authentication cookie, enter the **auth-cookie-name** command in aaa-server-host configuration mode. This command is optional. The following example specifies the authentication cookie name of SsoAuthCookie:

```
hostname(config-aaa-server-host)# auth-cookie-name SsoAuthCookie
hostname(config-aaa-server-host)#
```

Configuring SSO for Plug-ins

Plug-ins support single sign-on (SSO). They use the same credentials (username and password) entered to authenticate the clientless SSL VPN session. Because the plug-ins do not support marcro substitution, you do not have the options to perform SSO on different fields such as the internal domain password or on an attribute on a Radius or LDAP server.

To configure SSO support for a plug-in, you install the plug-in and add a bookmark entry to display a link to the server, specifying SSO support using the csco_sso=1 parameter. The following examples show plug-in bookmarks enabled for SSO:

```
ssh://ssh-server/?cisco_sso=1
rdp://rdp-server/?Parameter1=value&Parameter2=value&csco_sso=1
```

Configuring SSO with Macro Substitution

This section describes using macro substitution for SSO. Configuring SSO with macro substitution allows for you to inject certain variables into bookmarks to substitute for dynamic values.

Note Smart tunnel bookmarks support auto-signon but not variable substitution. For example, a Sharepoint bookmark configured for smart tunnel uses the same username and password credentials to log into the application as the credentials used to log into clientless SSL VPN. You can use variable substitutions and auto signon simultaneously or separetely.

The following variables (or macros) allow for substitutions in bookmarks and forms-based HTTP POST operations:

- CSCO_WEBVPN_USERNAME — user login ID
- CSCO_WEBVPN_PASSWORD — user login password
- CSCO_WEBVPN_INTERNAL_PASSWORD — user internal (or domain) password. This cached credential is not authenticated against a AAA server. When you enter this value, the security appliance uses it as the password for auto signon, instead of the password/primary password value.

  Note You cannot use any of these three variables in GET-based http(s) bookmarks. Only POST-based http(s) and cifs bookmarks can use these variables.

- CSCO_WEBVPN_CONNECTION_PROFILE —user login group drop-down (connection profile alias)
- CSCO_WEBVPN_MACRO1 — set with the RADIUS-LDAP Vendor Specific Attribute (VSA). If you are mapping from LDAP with an ldap-attribute-map command, use the WebVPN-Macro-Substitution-Value1 Cisco attribute for this macro. See the Active Directory ldap-attribute-mapping examples at http://www.cisco.com/en/US/docs/security/asa/asa82/configuration/guide/ref_extserver.html#wp1572118.

  The CSCO_WEBVPN_MACRO1 macro substitution with RADIUS is performed by VSA#223 (see Table 71-1).

Table 71-1 VSA#223

WebVPN-Macro-Value1	Y	223	String	Single	Unbounded
WebVPN-Macro-Value2	Y	224	String	Single	Unbounded

A value such as www.cisco.com/email dynamically populates a bookmark on the Clientless SSL VPN portal, such as https://CSCO_WEBVPN_MACRO1 or https://CSCO_WEBVPN_MACRO2 for the particular DAP or group policy.

- CSCO_WEBVPN_MACRO2 —Set with RADIUS-LDAP Vendor Specific Attribute (VSA). If you are mapping from LDAP with an ldap-attribute-map command, use the WebVPN-Macro-Substitution-Value2 Cisco attribute for this macro. See the Active Directory ldap-attribute-mapping examples at http://www.cisco.com/en/US/docs/security/asa/asa82/configuration/guide/ref_extserver.html#wp1572118.

  The CSCO_WEBVPN_MACRO2 macro substitution with RADIUS is performed by VSA#224 (see Table 71-1).

Each time clientless SSL VPN recognizes one of these six strings in an end-user request (in the form of a bookmark or Post Form), it replaces the string with the user-specified value and then passes the request to a remote server.

Authenticating with Digital Certificates

Clientless SSL VPN users that authenticate using digital certificates do not use global authentication and authorization settings. Instead, they use an authorization server to authenticate once the certificate validation occurs. For more information on authentication and authorization using digital certificates, see “Using Certificates and User Login Credentials” in the “Configuring AAA Servers and the Local Database” chapter.

Creating and Applying Clientless SSL VPN Policies for Accessing Resources

Creating and applying policies for clientless SSL VPN that govern access to resources at the central site includes the following task:

- Assigning Users to Group Policies

Chapter 64, “Configuring Connection Profiles, Group Policies, and Users” includes step-by-step instructions for all of these tasks.

Assigning Users to Group Policies

Assigning users to group policies simplifies the configuration by letting you apply policies to many users. You can use an internal authentication server or a RADIUS server to assign users to group policies. See Chapter 64, “Configuring Connection Profiles, Group Policies, and Users”for a thorough explanation of ways to simplify configuration with group policies.

Using the Security Appliance Authentication Server

You can configure users to authenticate to the ASA internal authentication server, and assign these users to a group policy on the ASA.

Using a RADIUS Server

Using a RADIUS server to authenticate users, assign users to group policies by following these steps:

Step 1 Authenticate the user with RADIUS and use the Class attribute to assign that user to a particular group policy.

Step 2 Set the class attribute to the group policy name in the format OU=group_name

For example, to assign a user of clientless SSL VPN to the SSL_VPN group, set the RADIUS Class Attribute to a value of *OU=SSL_VPN;* (Do not omit the semicolon.)

Configuring Connection Profile Attributes for Clientless SSL VPN

Table 71-2 provides a list of connection profile attributes that are specific to clientless SSL VPN. In addition to these attributes, you configure general connection profile attributes common to all VPN connections. For step-by-step information on configuring connection profiles, see "Configuring Connection Profiles for Clientless SSL VPN Sessions" in Chapter 64, "Configuring Connection Profiles, Group Policies, and Users."

Note In earlier releases, "connection profiles" were known as "tunnel groups." You configure a connection profile with tunnel-group commands. This chapter often uses these terms interchangeably.

Table 71-2 Connection Profile Attributes for Clientless SSL VPN

Command	Function
authentication	Sets the authentication method.
customization	Identifies the name of a previously defined customization to apply.
nbns-server	Identifies the name of the NetBIOS Name Service server (nbns-server) to use for CIFS name resolution.
group-alias	Specifies the alternate names by which the server can refer to a connection profile
group-url	Identifies one or more group URLs. If you configure this attribute, users coming in on a specified URL need not select a group at login
dns-group	Identifies the DNS server group that specifies the DNS server name, domain name, name server, number of retries, and timeout values
hic-fail-group-policy	Specifies a VPN feature policy if you use the Cisco Secure Desktop Manager to set the Group-Based Policy attribute to "Use Failure Group-Policy" or "Use Success Group-Policy, if criteria match."
override-svc-download	Overrides downloading the group-policy or username attributes configured for downloading the AnyConnect VPN client to the remote user.
radius-reject-message	Enables the display of the RADIUS reject message on the login screen when authentication is rejected.

Configuring Group Policy and User Attributes for Clientless SSL VPN

Table 71-3 provides a list of group policy and user attributes for clientless SSL VPN. For step-by-step instructions on configuring group policy and user attributes, see "Configuring Group Policies" and "Configuring Attributes for Specific Users" in Chapter 64, "Configuring Connection Profiles, Group Policies, and Users."

Table 71-3 Group Policy and User Attributes for Clientless SSL VPN

Command	Function
activex-relay	Lets a user who has established a clientless SSL VPN session use the browser to launch Microsoft Office applications. The applications use the session to download and upload Microsoft Office documents. The ActiveX relay remains in force until the clientless SSL VPN session closes.
auto-signon	Sets values for auto signon, which requires only that the user enter username and password credentials only once for a clientless SSL VPN connection.
customization	Assigns a customization object to a group-policy or user.
deny-message	Specifies the message delivered to a remote user who logs into clientless SSL VPN successfully, but has no VPN privileges.
file-browsing	Enables CIFS file browsing for file servers and shares. Browsing requires NBNS (Master Browser or WINS)
file-entry	Allows users to enter file server names to access.
filter	Sets the name of the webtype access list.
hidden-shares	Controls the visibility of hidden shares for CIFS files.
homepage	Sets the URL of the web page that displays upon login.
html-content-filter	Configures the content and objects to filter from the HTML for this group policy.
http-comp	Configures compression.
http-proxy	Configures the ASA to use an external proxy server to handle HTTP requests.
keep-alive-ignore	Sets the maximum object size to ignore for updating the session timer.
port-forward	Applies a list of clientless SSL VPN TCP ports to forward. The user interface displays the applications on this list.
post-max-size	Sets the maximum object size to post.
smart-tunnel	Configures a list of programs to use smart tunnel.
sso-server	Sets the name of the SSO server.
storage-objects	Configures storage objects for the data stored between sessions.
svc	Configures SSL VPN Client attributes.
unix-auth-gid	Sets the UNIX group ID.
unix-auth-uid	Sets the UNIX user ID.
upload-max-size	Sets the maximum object size to upload.
url-entry	Controls the ability of the user to enter any HTTP/HTTP URL.

Table 71-3 Group Policy and User Attributes for Clientless SSL VPN

Command	Function
url-list	Applies a list of servers and URLs that Clientless SSL VPN portal page displays for end user access.
user-storage	Configures a location for storing user data between sessions.

Configuring Browser Access to Plug-ins

The following sections describe the integration of browser plug-ins for clientless SSL VPN browser access:

- Introduction to Browser Plug-Ins, page 71-27
- Plug-in Requirements and Restrictions, page 71-28
- Preparing the Security Appliance for a Plug-in, page 71-28
- Installing Plug-ins Redistributed by Cisco, page 71-29
- Providing Access to Third-Party Plug-ins, page 71-31
- Viewing the Plug-ins Installed on the Security Appliance, page 71-32

Introduction to Browser Plug-Ins

A browser plug-in is a separate program that a web browser invokes to perform a dedicated function, such as connect a client to a server within the browser window. The ASA lets you import plug-ins for download to remote browsers in clientless SSL VPN sessions. Of course, Cisco tests the plug-ins it redistributes, and in some cases, tests the connectivity of plug-ins we cannot redistribute. However, we do not recommend importing plug-ins that support streaming media at this time.

Note Per the GNU General Public License (GPL), Cisco redistributes plug-ins without having made any changes to them. Per the GPL, Cisco cannot directly enhance these plug-ins.

The ASA does the following when you install a plug-in onto the flash device:

- (Cisco-distributed plug-ins only) Unpacks the jar file specified in the *URL*.
- Writes the file to the `csco-config/97/plugin` directory on the ASA file system.
- Populates the drop-down menu next to the URL attributes in ASDM.
- Enables the plug-in for all future clientless SSL VPN sessions, and adds a main menu option and an option to the drop-down menu next to the Address field of the portal page.

  Table 71-4 shows the changes to the main menu and address field of the portal page when you add the plug-ins described in the following sections.

Table 71-4 Effects of Plug-ins on the Clientless SSL VPN Portal Page

Plug-in	Main Menu Option Added to Portal Page	Address Field Option Added to Portal Page
ica	Citrix Client	ica://
rdp	Terminal Servers	rdp://

Table 71-4 Effects of Plug-ins on the Clientless SSL VPN Portal Page

Plug-in	Main Menu Option Added to Portal Page	Address Field Option Added to Portal Page
rdp2	Terminal Servers Vista	rdp2://
ssh,telnet	SSH	ssh://
	Telnet	telnet://
vnc	VNC Client	vnc://

When the user in a clientless SSL VPN session clicks the associated menu option on the portal page, the portal page displays a window to the interface and displays a help pane. The user can select the protocol displayed in the drop-down menu and enter the URL in the Address field to establish a connection.

Note Some Java plug-ins may report a status of connected or online even when a session to the destination service is not set up. The open-source plug-in reports the status, not the ASA.

Plug-in Requirements and Restrictions

Clientless SSL VPN must be enabled on the ASA to provide remote access to the plug-ins.

The plug-ins do not work if the security appliance configures the clientless session to use a proxy server.

Note The remote desktop protocol plug-in does not support load balancing with a session broker. Because of the way the protocol handles the redirect from the session broker, the connection fails. If a session broker is not used, the plug-in works.

The minimum access rights required for remote use belong to the guest privilege mode.

A stateful failover does not retain sessions established using plug-ins. Users must reconnect following a failover.

Single Sign-On for Plug-ins

The plug-ins support single sign-on (SSO). Refer to the Configuring SSO for Plug-ins section for implementation details.

Preparing the Security Appliance for a Plug-in

Before installing a plug-in, prepare the ASA as follows:

Step 1 Make sure clientless SSL VPN (“webvpn”) is enabled on a ASA interface. To do so, enter the **show running-config** command.

Step 2 Install an SSL certificate onto the ASA interface to which remote users use a fully-qualified domain name (FQDN) to connect.

Note Do not specify an IP address as the common name (CN) for the SSL certificate. The remote user attempts to use the FQDN to communicate with the ASA. The remote PC must be able to use DNS or an entry in the System32\drivers\etc\hosts file to resolve the FQDN.

Go to the section that identifies the type of plug-in you want to provide for clientless SSL VPN access.

- Installing Plug-ins Redistributed by Cisco, page 71-29
- Providing Access to Third-Party Plug-ins, page 71-31

Installing Plug-ins Redistributed by Cisco

Cisco redistributes the following open-source, Java-based components to be accessed as plug-ins for web browsers in clientless SSL VPN sessions:

Table 71-5 Plug-ins Redistributed by Cisco

Cisco Download Link	Protocol	Description	Source of Redistributed Plug-in *
rdp-plugin.090915.jar	RDP	Accesses Microsoft Terminal Services hosted by Windows Vista and Windows 2003 R2. Supports Remote Desktop ActiveX Control. We recommend using this plug-in that supports both RDP and RDP2. Only versions up to 5.2 of the RDP and RDP2 protocols are supported. Version 5.2 and later are not supported.	Cisco redistributes this plug-in without any changes to it per GNU General Public License.
rdp2-plugin.090211.jar	RDP2	Accesses Microsoft Terminal Services hosted by Windows Vista and Windows 2003 R2. Supports Remote Desktop ActiveX Control. **Note** This legacy plug-in supports only RDP2.	Cisco redistributes this plug-in without any changes to it per the GNU General Public License.
rdp-plugin.080506.jar	RDP	Accesses Microsoft Terminal Services hosted by Windows 2003 R1. Supports Remote Desktop ActiveX Control. **Note** This legacy plug-in supports only RDP.	Cisco redistributes this plug-in without any changes to it per the GNU General Public License.

Table 71-5 Plug-ins Redistributed by Cisco

Cisco Download Link	Protocol	Description	Source of Redistributed Plug-in *
ssh-plugin.080430.jar	SSH	The Secure Shell-Telnet plug-in lets the remote user establish a Secure Shell (v1 or v2) or Telnet connection to a remote computer. **Note** Because keyboard-interactive authentication is not supported by JavaSSH, it cannot be supported with SSH plugin. (Keyboard interactive is a generic authentication method used to implement different authentication mechanisms.	Cisco redistributes this plug-in without any changes to it per the GNU General Public License. The web site containing the source of the redistributed plug-in is http://javassh.org/
vnc-plugin.080130.jar	VNC	The Virtual Network Computing plug-in lets the remote user use a monitor, keyboard, and mouse to view and control a computer with remote desktop sharing (also known as VNC server or service) turned on. This version changes the default color of the text and contains updated French and Japanese help files.	Cisco redistributes this plug-in without any changes to it per the GNU General Public License. The web site containing the source of the redistributed plug-in is http://www.tightvnc.com/

`* Consult the plug-in documentation for information on deployment configuration and restrictions.`

These plug-ins are available on the Cisco Adaptive Security Appliance Software Download site.

Before installing a plug-in:

- Make sure clientless SSL VPN ("webvpn") is enabled on an interface on the ASA. To do so, enter the **show running-config** command.
- Create a temporary directory named "plugins" on a local TFTP or FTP server (for example, with the hostname "local_tftp_server"), and download the plug-ins from the Cisco web site to the "plugins" directory.

To provide clientless SSL VPN browser access to a plug-in redistributed by Cisco, install the plug-in onto the flash device of the ASA by entering the following command in privileged EXEC mode.

import webvpn plug-in protocol [**rdp** | **rdp2** | **ssh,telnet** | **vnc**] *URL*

protocol is one of the following values:

ssh,telnet provides plug-in access to *both* Secure Shell and Telnet services.

Caution Do *not* enter this command once for SSH and once for Telnet. When typing the **ssh,telnet** string, do *not* insert a space. Use the **revert webvpn plug-in protocol** command to remove any **import webvpn plug-in protocol** commands that deviate from these requirements.

URL is the remote path to the plug-in .jar file. Enter the host name or address of the TFTP or FTP server and the path to the plug-in.

The following example command adds clientless SSL VPN support for SSH and Telnet:

```
hostname# import webvpn plug-in protocol ssh,telnet
tftp://local_tftp_server/plugins/ssh-plugin.jar
```

```
Accessing
tftp://local_tftp_server/plugins/ssh-plugin.jar...!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Writing file disk0:/csco_config/97/plugin/ssh...
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
238510 bytes copied in 3.650 secs (79503 bytes/sec)
```

Note The ASA does not retain the **import webvpn plug-in protocol** command in the configuration. Instead, it loads the contents of the `csco-config/97/plugin` directory automatically. A secondary ASA obtains the plug-ins from the primary ASA.

After you import a Java-based client plug-in, establish a clientless connection to the ASA, click the icon in the left menu of the SSL VPN home page, and type the URL.

To disable and remove clientless SSL VPN support for a plug-in, as well as to remove it from the flash drive of the ASA, use the following command:

revert webvpn plug-in protocol *protocol*

The following example command removes RDP:

```
hostname# revert webvpn plug-in protocol rdp
```

Providing Access to Third-Party Plug-ins

The open framework of the security appliance lets you add plug-ins to support third-party Java client/server applications.

Caution Cisco does not provide direct support for or recommend any particular plug-ins that are not redistributed by Cisco. As a provider of clientless SSL VPN services, you are responsible for reviewing and complying with any license agreements required for the use of plug-ins.

Example: Providing Access to a Citrix Java Presentation Server

The open framework of the security appliance lets you add plug-ins to support third-party Java client/server applications. As an example of how to provide Clientless SSL VPN browser access to third-party plug-ins, this section describes how to add Clientless SSL VPN support for the Citrix Presentation Server Client.

Caution Cisco does not provide direct support for or recommend any particular plug-ins that are not redistributed by Cisco. As a provider of Clientless SSL VPN services, you are responsible for reviewing and complying with any license agreements required for the use of plug-ins.

With a Citrix plug-in installed on the ASA, Clientless SSL VPN users can use a connection to the ASA to access Citrix MetaFrame services.

A stateful failover does not retain sessions established using the Citrix plug-in. Citrix users must reauthenticate after failover.

To provide access to the Citrix plug-in, follow the procedures in the following sections.

- Preparing the Citrix MetraFrame Server for Clientless SSL VPN Access
- Creating and Installing the Citrix Plug-in

Preparing the Citrix MetaFrame Server for Clientless SSL VPN Access

The ASA performs the connectivity functions of the Citrix secure gateway when the Citrix client connects to the Citrix MetaFrame Server. Therefore, you must configure the Citrix Web Interface software to operate in a mode that does not use the (Citrix) "secure gateway." Otherwise, the Citrix client cannot connect to the Citrix MetaFrame Server.

Note If you are not already providing support for a plug-in, you must follow the instructions in the"Preparing the Security Appliance for a Plug-in" section on page 71-28 before using this section.

Creating and Installing the Citrix Plug-in

To create and install the Citrix plug-in, perform the following steps:

Step 1 Download the ica-plugin.zip file from the Cisco Software Download website.

This file contains files that Cisco customized for use with the Citrix plug-in.

Step 2 Download the Citrix Java client from the Citrix site.

Step 3 Extract the following files from the Citrix Java client, then add them to the ica-plugin.zip file:

- JICA-configN.jar
- JICAEngN.jar

You can use WinZip to perform this step.

Step 4 Ensure the EULA included with the Citrix Java client grants you the rights and permissions to deploy the client on your web servers.

Step 5 Open a CLI session with the ASA and install the plug-in by entering the following command in privileged EXEC mode:

import webvpn plug-in protocol ica *URL*

URL is the host name or IP address and path to the ica-plugin.zip file.

Note After you import the plug-in, remote users can choose **ica** and enter *host*/**?DesiredColor=4&DesiredHRes=1024&DesiredVRes=768** into the Address field of the portal page to access Citrix services. We recommend that you add a bookmark to make it easy for users to connect. Adding a bookmark is required if you want to provide SSO support for Citrix sessions.

Step 6 Establish an SSL VPN Clientless session and click the bookmark or enter the URL for the citrix server.

Use the Client for Java Administrator's Guide as needed.

Viewing the Plug-ins Installed on the Security Appliance

Enter the following command in privileged EXEC mode to list the Java-based client applications available to users of clientless SSL VPN:

show import webvpn plug-in

For example:

```
hostname# show import webvpn plug-in
ssh
rdp
vnc
ica
```

Configuring Application Access

The following sections describe how to enable smart tunnel access and port forwarding on clientless SSL VPN sessions, specify the applications to be provided with such access, and provide notes on using it:

- Configuring Smart Tunnel Access
- Configuring Port Forwarding
- Application Access User Notes

Configuring Smart Tunnel Access

The following sections describe smart tunnels and how to configure them:

- About Smart Tunnels
- Why Smart Tunnels?
- Smart Tunnel Requirements, Restrictions, and Limitations
- Adding Applications to Be Eligible for Smart Tunnel Access
- Assigning a Smart Tunnel List
- Configuring Smart Tunnel Auto Sign-on
- Automating Smart Tunnel Access
- Enabling and Disabling Smart Tunnel Access

About Smart Tunnels

A smart tunnel is a connection between a TCP-based application and a private site, using a clientless (browser-based) SSL VPN session with the security appliance as the pathway, and the ASA as a proxy server. You can identify applications to which you want to grant smart tunnel access, and specify the local path to each application. For applications running on Microsoft Windows, you can also require a match of the SHA-1 hash of the checksum as a condition for granting smart tunnel access.

Lotus SameTime and Microsoft Outlook Express are examples of applications to which you might want to grant smart tunnel access.

Configuring smart tunnels requires one of the following procedures, depending on whether the application is a client or is a web-enabled application:

- Create one or more smart tunnel lists of the client applications, then assign the list to the group policies or local user policies for whom you want to provide smart tunnel access.
- Create one or more bookmark list entries that specify the URLs of the web-enabled applications eligible for smart tunnel access, then assign the list to the DAPs, group policies, or local user policies for whom you want to provide smart tunnel access.

You can also list web-enabled applications for which to automate the submission of login credentials in smart tunnel connections over clientless SSL VPN sessions.

Why Smart Tunnels?

Smart tunnel access lets a client TCP-based application use a browser-based VPN connection to connect to a service. It offers the following advantages to users, compared to plug-ins and the legacy technology, port forwarding:

- Smart tunnel offers better performance than plug-ins.
- Unlike port forwarding, smart tunnel simplifies the user experience by not requiring the user connection of the local application to the local port.
- Unlike port forwarding, smart tunnel does not require users to have administrator privileges.

The advantage of a plug-in is that it does not require the client application to be installed on the remote computer.

Smart Tunnel Requirements, Restrictions, and Limitations

The following sections categorize the smart tunnel requirements and limitations

General Requirements and Limitations

Smart tunnel has the following general requirements and limitations:

- The remote host originating the smart tunnel must be running a 32-bit version of Microsoft Windows Vista, Windows XP, or Windows 2000; or Mac OS 10.4 or 10.5.
- Smart tunnel auto sign-on supports only Microsoft Internet Explorer on Windows.
- The browser must be enabled with Java, Microsoft ActiveX, or both.
- Smart tunnel supports only proxies placed between computers running Microsoft Windows and the security appliance. Smart tunnel uses the Internet Explorer configuration (that is, the one intended for system-wide use in Windows). If the remote computer requires a proxy server to reach the ASA, the URL of the terminating end of the connection must be in the list of URLs excluded from proxy services. If the proxy configuration specifies that traffic destined for the ASA goes through a proxy, all smart tunnel traffic goes through the proxy.

  In an HTTP-based remote access scenario, sometimes a subnet does not provide user access to the VPN gateway. In this case, a proxy placed in front of the ASA to route traffic between the web and the end user's location provides web access. However, only VPN users can configure proxies placed in front of the ASA. When doing so, they must make sure these proxies support the CONNECT method. For proxies that require authentication, smart tunnel supports only the basic digest authentication type.
- When smart tunnel starts, the ASA by default passes all browser traffic through the VPN session if the browser process is the same. The ASA also does this if a tunnel-all policy applies. If the user starts another instance of the browser process, it passes all traffic through the VPN session. If the browser process is the same and the security appliance does not provide access to a URL, the user cannot open it. As a workaround, assign a tunnel policy that is not tunnel-all.
- A stateful failover does not retain smart tunnel connections. Users must reconnect following a failover.

Windows Requirements and Limitations

The following requirements and limitations apply to Windows only:

- Only Winsock 2, TCP-based applications are eligible for smart tunnel access.
- The security appliance does not support the Microsoft Outlook Exchange (MAPI) proxy. Neither port forwarding nor the smart tunnel supports MAPI. For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.
- Users of Microsoft Windows Vista who use smart tunnel or port forwarding must add the URL of the ASA to the Trusted Site zone. To access the Trusted Site zone, they must start Internet Explorer and choose the **Tools > Internet Options > Security** tab. Vista users can also disable Protected Mode to facilitate smart tunnel access; however, we recommend against this method because it increases vulnerability to attack.

Mac OS Requirements and Limitations

The following requirements and limitations apply to Mac OS only:

- Safari 3.1.1 or later, or Firefox 3.0 or later.
- Sun JRE 1.5 or later.
- Only applications started from the portal page can establish smart tunnel connections. This requirement includes smart tunnel support for Firefox. Using Firefox to start another instance of Firefox during the first use of a smart tunnel requires the user profile named csco_st. If this user profile is not present, the session prompts the user to create one.
- Applications using TCP that are dynamically linked to the SSL library can work over a smart tunnel.
- Smart tunnel does not support the following on Mac OS:
  - Proxy services.
  - Auto sign-on.
  - Applications that use two-level name spaces.
  - Console-based applications, such as Telnet, SSH, and cURL.
  - Applications using dlopen or dlsym to locate libsocket calls.
  - Statically linked applications to locate libsocket calls.

Adding Applications to Be Eligible for Smart Tunnel Access

The clientless SSL VPN configuration of each ASA supports *smart tunnel lists*, each of which identifies one or more applications eligible for smart tunnel access. Because each group policy or username supports only one smart tunnel list, you must group each set of applications to be supported into a smart tunnel list.

To add an entry to a list of applications that can use a clientless SSL VPN session to connect to private sites, enter the following command in webvpn configuration mode:

smart-tunnel list *list application path* [**platform** *OS*] [*hash*]

To remove an application from a list, use the **no** form of the command, specifying both the list and the name of the application.

no smart-tunnel list *list application*

To remove an entire list of applications from the ASA configuration, use the **no** form of the command, specifying only the list.

no smart-tunnel list *list*

- *list* is the name for a list of applications or programs. Use quotation marks around the name if it includes a space. The CLI creates the list if it is not present in the configuration. Otherwise, it adds the entry to the list.

  Note To view the smart tunnel list entries in the SSL VPN configuration, enter the **show running-config webvpn** command in privileged EXEC mode.

- *application* is a string that serves as a unique index to each entry in the smart tunnel list. It typically names the application to be granted smart tunnel access. To support multiple versions of an application for which you choose to specify different paths or hash values, you can use this attribute to differentiate entries, specifying the OS, and name and version of the application supported by each list entry. The string can be up to 64 characters. To change an entry already present in a smart tunnel list, enter the name of the entry to be changed.
- *path* is the filename and extension of the application; or a path to the application, including its filename and extension. The string can be up to 128 characters.

  Windows requires an exact match of this value to the right side of the application path on the remote host to qualify the application for smart tunnel access. If you specify only the filename for Windows, SSL VPN does not enforce a location restriction on the remote host to qualify the application for smart tunnel access.

  If you specify a path and the user installed the application in another location, that application does not qualify. The application can reside on any path as long as the right side of the string matches the value you enter.

  To authorize an application for smart tunnel access if it is present on one of several paths on the remote host, either specify only the name and extension of the application when you enter the *path* value; or enter the **smart-tunnel list** command once for each path, entering the same *list* string, but specifying the unique *application* string and *path* value in each command.

  Note A sudden problem with smart tunnel access may be an indication that a *Process Name* value is not up-to-date with an application upgrade. For example, the default path to an application sometimes changes following the acquisition of the company that produces the application and the next application upgrade.

  For Windows, if you want to add smart tunnel access to an application started from the command prompt, you must specify “cmd.exe” in the Process Name of one entry in the smart tunnel list, and specify the path to the application itself in another entry, because “cmd.exe” is the parent of the application.

  Mac OS requires the full path to the process, and is case-sensitive. To avoid specifying a path for each username, insert a tilde (~) before the partial path (e.g., ~/bin/vnc).

- **platform** is **windows** or **mac** to indicate the host OS of the application. The default value is **platform windows**.
- *hash* (Optional) To obtain this value, enter the checksum of the application (that is, the checksum of the executable file) into a utility that calculates a hash using the SHA-1 algorithm. One example of such a utility is the Microsoft File Checksum Integrity Verifier (FCIV), which is available at http://support.microsoft.com/kb/841290/. After installing FCIV, place a temporary copy of the

application to be hashed on a path that contains no spaces (for example, c:/fciv.exe), then enter **fciv.exe -sha1** *application* at the command line (for example, **fciv.exe -sha1 c:\msimn.exe**) to display the SHA-1 hash.

The SHA-1 hash is always 40 hexadecimal characters.

Before authorizing an application for smart tunnel access, clientless SSL VPN calculates the hash of the application matching the *path*. It qualifies the application for smart tunnel access if the result matches the value of *hash*.

Entering a hash provides a reasonable assurance that SSL VPN does not qualify an illegitimate file that matches the string you specified in the *path*. Because the checksum varies with each version or patch of an application, the *hash* you enter can only match one version or patch on the remote host. To specify a *hash* for more than one version of an application, enter the **smart-tunnel list** command once for each version, entering the same *list* string, but specifying a unique *application* string and a unique *hash* value.

Note You must maintain the smart tunnel list in the future if you enter *hash* values and you want to support future versions or patches of an application with smart tunnel access. A sudden problem with smart tunnel access may be an indication that the application list containing *hash* values is not up-to-date with an application upgrade. You can avoid this problem by not entering a *hash*.

Table 71-6 Example smart-tunnel Commands

Function	OS	Commands
Add Lotus SameTime to a smart tunnel list named lotus.	Windows (default platform)	`smart-tunnel list lotus LotusSametime connect.exe`

Add the Lotus 6.0 thick client with Domino Server 6.5.5	Windows	`smart-tunnel list lotus lotusnotes notes.exefs`
		`smart-tunnel list lotus lotusnlnotes nlnotes.exe`
		`smart-tunnel list lotus lotusntaskldr ntaskldr.exe`
		`smart-tunnel list lotus lotusnfileret nfileret.exe`

Add the command prompt to a smart tunnel list named apps. **Note**: This is necessary to provide smart tunnel access to a Microsoft Windows application started from the command prompt. You must also add the application itself to the list.	Windows	`smart-tunnel list apps CommandPrompt cmd.exe`
Add Windows Outlook Express.	Windows	`smart-tunnel list apps OutlookExpress msimn.exe`
Add Windows Outlook Express, permitting smart tunnel support for it only if its path on the remote host matches the string.	Windows	`smart-tunnel list apps OutlookExpress "\Program Files\Outlook Express\msimn.exe"`
Add Windows Outlook Express, permitting smart tunnel support for it only if its hash matches the string.	Windows	`smart-tunnel list apps OutlookExpress msimn.exe 4739647b255d3ea865554e27c3f96b9476e75061`
Add Safari, permitting smart tunnel support for it only if its path on the remote host matches the string.	Mac OS	`smart-tunnel list apps Safari "/Applications/Safari" platform mac`

Table 71-6 Example smart-tunnel Commands

Function	OS	Commands
Add smart tunnel support for a new Terminal window.	Mac OS	`smart-tunnel list apps Terminal terminal platform mac`
Add smart tunnel support for an application started from a Mac Terminal window. All words after Terminal inside the quotation marks enter the command line.	Mac OS	`smart-tunnel list apps Terminal "terminal open -a MacTelnet" platform mac`
Add smart tunnel support for VNC, regardless of the user path to the VNC executable file.	Mac OS	`smart-tunnel list apps vnc "~/bin/vnc" platform mac`

Following the configuration of a smart tunnel list, assign the list to group policies or usernames, as described in the next section.

Assigning a Smart Tunnel List

For each group policy and username, you can configure clientless SSL VPN to do one of the following:

- Start smart tunnel access automatically upon user login.
- Enable smart tunnel access upon user login, but require the user to start it manually, using the **Application Access** > **Start Smart Tunnels** button on the clientless SSL VPN Portal Page.

Note These options are mutually exclusive for each group policy and username. Use only one.

Table 71-7 lists the smart tunnel commands available to each group policy and username. The configuration of each group policy and username supports only one of these commands at a time, so when you enter one, the ASA replaces the one present in the configuration of the group policy or username in question with the new one, or in the case of the last command, simply removes the smart-tunnel command already present in the group policy or username.

Table 71-7 group-policy and username webvpn Smart Tunnel Commands

Command	Description
smart-tunnel auto-start *list*	Starts smart tunnel access automatically upon user login.
smart-tunnel enable *list*	Enables smart tunnel access upon user login, but requires the user to start smart tunnel access manually, using the **Application Access** > **Start Smart Tunnels** button on the clientless SSL VPN portal page.
smart-tunnel disable	Prevents smart tunnel access.
no smart-tunnel [**auto-start** *list* | **enable** *list* | **disable**]	Removes a **smart-tunnel** command from the group policy or username configuration, which then inherits the [**no**] **smart-tunnel** command from the default group-policy. The keywords following the **no smart-tunnel** command are optional, however, they restrict the removal to the named smart-tunnel command.

For details, go to the section that addresses the option you want to use.

Configuring Smart Tunnel Auto Sign-on

The following sections describe how to list the servers for which to provide auto sign-on in smart tunnel connections, and assign the lists to group policies or usernames.

Specifying Servers for Smart Tunnel Auto Sign-on

The Add Smart Tunnel Auto Sign-on Server List dialog box lets you add one or more lists of servers for which to automate the submission of login credentials during smart tunnel setup. The Edit Smart Tunnel Auto-signon Server List dialog box lets you modify the contents of these lists.

To create a list of servers for which to automate the submission of credentials in smart tunnel connections, enter the command in webvpn configuration mode.

[**no**] **smart-tunnel auto-signon** *list* [**use-domain**] {**ip** *ip-address* [*netmask*] | **host** *hostname-mask*}

Use this command for each server you want to add to a list. To remove an entry from a list, use the **no** form of the command, specifying both the list and the IP address or hostname, as it appears in the ASA configuration. To display the smart tunnel auto sign-on list entries, enter the **show running-config webvpn smart-tunnel** command in privileged EXEC mode.

To remove an entire list of servers from the ASA configuration, use the **no** form of the command, specifying only the list, as follows:

no smart-tunnel auto-signon *list*

- *list* names the list of remote servers. Use quotation marks around the name if it includes a space. The string can be up to 64 characters. The ASA creates the list if it is not already present in the configuration. Otherwise, it adds the entry to the list. Assign a name that will help you to distinguish its contents or purpose from other lists are likely to be configured.
- **use-domain** (optional) adds the Windows domain to the username if authentication requires it. If you enter this keyword, be sure to specify the domain name when assigning the smart tunnel list to one or more group policies, or usernames.
- **ip** specifies the server by its IP address and netmask.
- *ip-address* [*netmask*] identifies the sub-network of hosts to auto-authenticate to.
- **host** specifies the server by its host name or wildcard mask. Using this option protects the configuration from dynamic changes to IP addresses.
- *hostname-mask* is the host name or wildcard mask to auto-authenticate to.

The following command adds all hosts in the subnet and adds the Windows domain to the username if authentication requires it:

```
asa2(config-webvpn)# smart-tunnel auto-signon HR use-domain ip 192.32.22.56 255.255.255.0
```

The following command removes that entry from the list:

```
asa2(config-webvpn)# no smart-tunnel auto-signon HR use-domain ip 192.32.22.56
255.255.255.0
```

The command shown above also removes the list named HR if the entry removed is the only entry in the list. Otherwise, the following command removes the entire list from the ASA configuration:

```
asa2(config-webvpn)# no smart-tunnel auto-signon HR
```

The following command adds all hosts in the domain to the smart tunnel auto sign-on list named intranet:

```
asa2(config-webvpn)# smart-tunnel auto-signon intranet host *.exampledomain.com
```

The following command removes that entry from the list:

```
asa2(config-webvpn)# no smart-tunnel auto-signon intranet host *.exampledomain.com
```

Following the configuration of the smart tunnel auto sign-on server list, you must assign it to a group policy or a local user policy for it to become active, as described in the next section.

Adding or Editing a Smart Tunnel Auto Sign-on Server Entry

To enable smart tunnel auto sign-on in clientless (browser-based) SSL VPN sessions, use the **smart-tunnel auto-signon enable** command in group-policy webvpn configuration mode or username webvpn configuration mode.

[**no**] **smart-tunnel auto-signon enable** *list* [**domain** *domain*]

To remove the **smart-tunnel auto-signon enable** command from the group policy or username and inherit it from the default group-policy, use the **no** form of the command.

- *list* is the name of a smart tunnel auto sign-on list already present in the ASA webvpn configuration. To view the smart tunnel auto sign-on list entries in the SSL VPN configuration, enter the **show running-config webvpn smart-tunnel** command in privileged EXEC mode.
- **domain** *domain* (optional) is the name of the domain to be added to the username during authentication. If you enter a domain, enter the **use-domain** keyword in the list entries.

The smart-tunnel auto sign-on feature supports only applications communicating HTTP and HTTPS using the Microsoft WININET library. For example, Microsoft Internet Explorer uses the WININET dynamic linked library to communicate with web servers.

You must use the **smart-tunnel auto-signon** *list* command to create a list of servers first. You can assign only one list to a group policy or username.

The following commands enable the smart tunnel auto sign-on list named HR:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# smart-tunnel auto-signon enable HR
hostname(config-group-webvpn)
```

The following command enables the smart tunnel auto sign-on list named HR and adds the domain named CISCO to the username during authentication:

```
hostname(config-group-webvpn)# smart-tunnel auto-signon enable HR domain CISCO
```

The following command removes the smart tunnel auto sign-on list named HR from the group policy and inherits the smart tunnel auto sign-on list command from the default group policy:

```
hostname(config-group-webvpn)# no smart-tunnel auto-signon enable HR
```

Automating Smart Tunnel Access

To start smart tunnel access automatically upon user login, enter the following command in group-policy webvpn configuration mode or username webvpn configuration mode:

smart-tunnel auto-start *list*

list is the name of the smart tunnel list already present in the ASA webvpn configuration. You cannot assign more than smart tunnel list to a group policy or username. To view the smart tunnel list entries in the SSL VPN configuration, enter the **show running-config webvpn** command in privileged EXEC mode.

To remove the **smart-tunnel** command from the group policy or username and inherit the [**no**] **smart-tunnel** command from the default group-policy, use the **no** form of the command.

no smart-tunnel

The following commands assign the smart tunnel list named apps1 to the group policy:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# smart-tunnel auto-start apps1
```

Enabling and Disabling Smart Tunnel Access

By default, smart tunnels are disabled. If you enable smart tunnel access, the user will have to start it manually, using the **Application Access > Start Smart Tunnels** button on the clientless SSL VPN portal page. If you enter the **smart-tunnel auto-start** *list* command described in the previous section instead of the **smart-tunnel enable** *list* command, the user will not have to start smart tunnel access manually.

To enable smart tunnel access, enter the following command in group-policy webvpn configuration mode or username webvpn configuration mode:

smart-tunnel [**enable** *list* | **disable**]

list is the name of the smart tunnel list already present in the ASA webvpn configuration. You cannot assign more than smart tunnel list to a group policy or username. To view the smart tunnel list entries in the SSL VPN configuration, enter the **show running-config webvpn** command in privileged EXEC mode.

To remove the **smart-tunnel** command from the group policy or local user policy, and inherit the [**no**] **smart-tunnel** command from the default group-policy, use the **no** form of the command.

no smart-tunnel

The following commands assign the smart tunnel list named apps1 to the group policy:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# smart-tunnel enable apps1
```

The following command disables smart tunnel access:

```
hostname(config-group-webvpn)# smart-tunnel disable
```

Configuring Port Forwarding

The following sections describe port forwarding and how to configure it:

- About Port Forwarding
- Why Port Forwarding?
- Port Forwarding Requirements and Restrictions
- Configuring DNS for Port Forwarding
- Adding Applications to Be Eligible for Port Forwarding
- Assigning a Port Forwarding List
- Automating Port Forwarding
- Enabling and Disabling Port Forwarding

About Port Forwarding

Port forwarding lets users access TCP-based applications over a clientless SSL VPN connection. Such applications include the following:

- Lotus Notes
- Microsoft Outlook
- Microsoft Outlook Express
- Perforce
- Sametime
- Secure FTP (FTP over SSH)
- SSH
- TELNET
- Windows Terminal Service
- XDDTS

Other TCP-based applications may also work, but we have not tested them. Protocols that use UDP do not work.

Why Port Forwarding?

Port forwarding is the legacy technology for supporting TCP-based applications over a clientless SSL VPN connection. You may choose to use port forwarding because you have built earlier configurations that support this technology.

Please consider the following alternatives to port forwarding:

- Smart tunnel access offers the following advantages to users:
  - Smart tunnel offers better performance than plug-ins.
  - Unlike port forwarding, smart tunnel simplifies the user experience by not requiring the user connection of the local application to the local port.
  - Unlike port forwarding, smart tunnel does not require users to have administrator privileges.
- Unlike port forwarding and smart tunnel access, a plug-in does not require the client application to be installed on the remote computer.

When configuring port forwarding on the ASA, you specify the port the application uses. When configuring smart tunnel access, you specify the name of the executable file or its path.

Port Forwarding Requirements and Restrictions

The following restrictions apply to port forwarding:

- The remote host must be running a 32-bit version of one of the following:
  - Microsoft Windows Vista, Windows XP SP2 or SP3; or Windows 2000 SP4.
  - Apple Mac OS X 10.4 or 10.5 with Safari 2.0.4(419.3).
  - Fedora Core 4
- The remote host must also be running Sun JRE 1.5 or later.

- Browser-based users of Safari on Mac OS X 10.5.3 must identify a client certificate for use with the URL of the ASA, once with the trailing slash and once without it, because of the way Safari interprets URLs. For example,
  - https://example.com/
  - https://example.com

  For details, go to the Safari, Mac OS X 10.5.3: Changes in client certificate authentication.
- Users of Microsoft Windows Vista who use port forwarding or smart tunnels must add the URL of the ASA to the Trusted Site zone. To access the Trusted Site zone, they must start Internet Explorer and choose the **Tools > Internet Options > Security** tab. Vista users can also disable Protected Mode to facilitate smart tunnel access; however, we recommend against this method because it increases the computer's vulnerability to attack.
- Port forwarding supports only TCP applications that use static TCP ports. Applications that use dynamic ports or multiple TCP ports are not supported. For example, SecureFTP, which uses port 22, works over clientless SSL VPN port forwarding, but standard FTP, which uses ports 20 and 21, does not.
- Port forwarding does not support protocols that use UDP.
- The security appliance does not support the Microsoft Outlook Exchange (MAPI) proxy. For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.
- A stateful failover does not retain sessions established using Application Access (either port forwarding or smart tunnel access). Users must reconnect following a failover.
- Port forwarding does not support connections to personal digital assistants.
- Because port forwarding requires downloading the Java applet and configuring the local client, and because doing so requires administrator permissions on the local system, it is unlikely that users will be able to use applications when they connect from public remote systems.

Caution Make sure Sun Microsystems Java Runtime Environment (JRE) 1.5.x or later is installed on the remote computers to support port forwarding (application access) and digital certificates. If JRE 1.4.x is running and the user authenticates with a digital certificate, the application fails to start because JRE cannot access the web browser certificate store.

The Java applet displays in its own window on the end user HTML interface. It shows the contents of the list of forwarded ports available to the user, as well as which ports are active, and amount of traffic in bytes sent and received.

- The port forwarding applet displays the local port and the remote port as the same when the local IP address 127.0.0.1 is being used and cannot be updated by the clientless SSL VPN connection from the ASA. As a result, the ASA creates new IP addresses 127.0.0.2, 127.0.0.3, and so on for local proxy IDs. Because you can modify the hosts file and use different loopbacks, the remote port is used as the local port in the applet. To connect, you can use Telnet with the host name, without specifying the port. The correct local IP addresses are available in the local hosts file.

Configuring DNS for Port Forwarding

Port Forwarding forwards the domain name of the remote server or its IP address to the ASA for resolution and connection. In other words, the port forwarding applet accepts a request from the application and forwards it to the ASA. The ASA makes the appropriate DNS queries and establishes the connection on behalf of the port forwarding applet. The port forwarding applet only makes DNS queries to the ASA. It updates the host file so that when a port forwarding application attempts a DNS query, the query redirects to a loopback address. Configure the ASA to accept the DNS requests from the port forwarding applet as follows:

Step 1 Use the **dns server-group** command in global configuration mode to enter the dns server-group mode; then use the **domain-name** command to specify the domain name and **name-server** command to resolve the domain name to an IP address. The default **dns server-group** is DefaultDNS.

The following example configures a DNS server group named example.com:

```
hostname(config)# dns server-group example.com
hostname(config-dns-server-group)# domain-name example.com
hostname(config-dns-server-group)# name-server 192.168.10.10
```

Step 2 (Required only if you are using a **dns server-group** other than the default one [DefaultDNS])—The default setting for **dns-group** in a tunnel group is DefaultDNS. Use the **dns-group** command in tunnel-group webvpn configuration mode to specify the **dns server-group** the tunnel groups should use. By default, the security appliance assigns the DefaultWEBVPNGroup as the default tunnel group for clientless connections; follow this instruction if the ASA uses that tunnel group to assign settings to the clientless connections. Otherwise, follow this step for each tunnel configured for clientless connections.

For example,

```
asa2(config-dns-server-group)# exit
asa2(config)# tunnel-group DefaultWEBVPNGroup webvpn-attributes
asa2(config-tunnel-webvpn)# dns-group example.com
```

Adding Applications to Be Eligible for Port Forwarding

The clientless SSL VPN configuration of each ASA supports *port forwarding lists*, each of which specifies local and remote ports used by the applications for which you want to provide access. Because each group policy or username supports only one port forwarding list, you must group each set of applications to be supported into a list. To display the port forwarding list entries already present in the ASA configuration, enter the following command in privileged EXEC mode:

show run webvpn port-forward

To add a port forwarding entry to a list, enter the following command in webvpn configuration mode:

port-forward {*list_name local_port remote_server remote_port description*}

list_name—Name for a set of applications (technically, a set of forwarded TCP ports) for users of clientless SSL VPN sessions to access. The ASA creates a list using the name you enter if it does not recognize it. Otherwise, it adds the port forwarding entry to the list. Maximum 64 characters.

local_port—Port that listens for TCP traffic for an application running on the user's computer. You can use a local port number only once for each port forwarding list. Enter a port number in the range 1-65535 or port name. To avoid conflicts with existing services, use a port number greater than 1024.

remote_server—DNS name or IP address of the remote server for an application. The IP address can be in IPv4 or IPv6 format. We recommend a DNS name so that you do not have to configure the client applications for a specific IP address.

Caution The DNS name must match the one assigned to the tunnel group to establish the tunnel and resolve to an IP address, per the instructions in the previous section. The default setting for both the **domain-name group** and **dns-group** commands described in that section is DefaultDNS.

remote_port—Port to connect to for this application on the remote server. This is the actual port the application uses. Enter a port number in the range 1-65535 or port name.

description—Application name or short description that displays on the end user Port Forwarding Java applet screen. Maximum 64 characters.

To remove an entry from a list, use the **no** form of the command, specifying both the list and the local port. In this case, the remoteserver, remoteport, and description are optional.

no port-forward *list_name local_port*

The following table shows the values used for example applications.

Application	Local Port	Server DNS Name	Remote Port	Description
IMAP4S e-mail	20143	IMAP4Sserver	143	Get Mail
SMTPS e-mail	20025	SMTPSserver	25	Send Mail
DDTS over SSH	20022	DDTSserver	22	DDTS over SSH
Telnet	20023	Telnetserver	23	Telnet

The following example shows how to create a port forwarding list called *SalesGroupPorts* that provides access to these applications:

```
hostname(config)# webvpn
hostname(config-webvpn)# port-forward SalesGroupPorts 20143 IMAP4Sserver 143 Get Mail
hostname(config-webvpn)# port-forward SalesGroupPorts 20025 SMTPSserver 25 Send Mail
hostname(config-webvpn)# port-forward SalesGroupPorts 20022 DDTSserver 22 DDTS over SSH
hostname(config-webvpn)# port-forward SalesGroupPorts 20023 Telnetserver 23 Telnet
```

Following the configuration of a port forwarding list, assign the list to group policies or usernames, as described in the next section.

Assigning a Port Forwarding List

For each group policy and username, you can configure clientless SSL VPN to do one of the following:

- Start port forwarding access automatically upon user login.
- Enable port forwarding access upon user login, but require the user to start it manually, using the **Application Access** > **Start Applications** button on the clientless SSL VPN Portal Page.

Note These options are mutually exclusive for each group policy and username. Use only one.

Table 71-8 lists the **port-forward** commands available to each group policy and username. The configuration of each group policy and username supports only one of these commands at a time, so when you enter one, the ASA replaces the one present in the configuration of the group policy or username in question with the new one, or in the case of the last command, simply removes the **port-forward** command from the group policy or username configuration.

Table 71-8 group-policy and username webvpn port-forward Commands

Command	Description
port-forward auto-start *list_name*	Starts port forwarding automatically upon user login.
port-forward enable *list_name*	Enables port forwarding upon user login, but requires the user to start port forwarding manually, using the **Application Access** > **Start Applications** button on the clientless SSL VPN portal page.
port-forward disable	Prevents port forwarding.
no port-forward [**auto-start** *list_name* | **enable** *list_name* | **disable**]	Removes a **port-forward** command from the group policy or username configuration, which then inherits the [**no**] **port-forward** command from the default group-policy. The keywords following the **no port-forward** command are optional, however, they restrict the removal to the named **port-forward** command.

For details, go to the section that addresses the option you want to use.

Automating Port Forwarding

To start port forwarding automatically upon user login, enter the following command in group-policy webvpn configuration mode or username webvpn configuration mode:

port-forward auto-start *list_name*

list_name names the port forwarding list already present in the ASA webvpn configuration. You cannot assign more than one port forwarding list to a group policy or username. To display the port forwarding list entries present in the ASA configuration, enter the **show run webvpn port-forward** command in privileged EXEC mode.

To remove the **port-forward** command from the group policy or username and inherit the [**no**] **port-forward** command from the default group-policy, use the **no** form of the command.

no port-forward

The following commands assign the port forwarding list named apps1 to the group policy:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# port-forward auto-start apps1
```

Enabling and Disabling Port Forwarding

By default, port forwarding is disabled. If you enable port forwarding, the user will have to start it manually, using the **Application Access** > **Start Applications** button on the clientless SSL VPN portal page. If you enter the **port-forward auto-start** *list_name* command described in the previous section instead of the **port-forward enable** *list_name* command, the user will not have to start port forwarding manually to use it.

To enable or disable port forwarding, enter the following command in group-policy webvpn configuration mode or username webvpn configuration mode:

port-forward [**enable** *list_name* | **disable**] *list_name* is the name of the port forwarding list already present in the ASA webvpn configuration. You cannot assign more than one port forwarding list to a group policy or username. To view the port forwarding list entries, enter the **show running-config port-forward** command in privileged EXEC mode.

To remove the **port-forward** command from the group policy or username and inherit the [**no**] **port-forward** command from the default group-policy, use the **no** form of the command.

no port-forward

The following commands assign the port forwarding list named apps1 to the group policy:

```
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# port-forward enable apps1
```

The following command disables port forwarding:

```
hostname(config-group-webvpn)# port-forward disable
```

Application Access User Notes

The following sections provide information about using application access:

- Using Application Access on Vista
- Closing Application Access to Prevent hosts File Errors
- Recovering from hosts File Errors When Using Application Access

Note The security appliance does not support the Microsoft Outlook Exchange (MAPI) proxy. Neither the smart tunnel feature nor port forwarding supports MAPI. For Microsoft Outlook Exchange communication using the MAPI protocol, remote users must use AnyConnect.

Using Application Access on Vista

Users of Microsoft Windows Vista who use smart tunnels or port forwarding must add the URL of the ASA to the Trusted Site zone. To access the Trusted Site zone, they must start Internet Explorer and choose the Tools > Internet Options > Security tab. Vista users can also disable Protected Mode to facilitate smart tunnel access; however, we recommend against this method because it increases the computer’s vulnerability to attack.

Closing Application Access to Prevent hosts File Errors

To prevent hosts file errors that can interfere with Application Access, close the Application Access window properly when you finish using Application Access. To do so, click the close icon.

Recovering from hosts File Errors When Using Application Access

The following errors can occur if you do not close the Application Access window properly:

- The next time you try to start Application Access, it might be disabled; you receive a `Backup HOSTS File Found` error message.

- The applications themselves might be disabled or might malfunction, even when you are running them locally.

These errors can result from terminating the Application Access window in any improper way. For example:

- Your browser crashes while you are using Application Access.
- A power outage or system shutdown occurs while you are using Application Access.
- You minimize the Application Access window while you are working, then shut down your computer with the window active (but minimized).

This section includes the following topics:

- Understanding the hosts File
- Stopping Application Access Improperly
- Reconfiguring a hosts File Automatically Using Clientless SSL VPN
- Reconfiguring hosts File Manually

Understanding the hosts File

The hosts file on your local system maps IP addresses to host names. When you start Application Access, clientless SSL VPN modifies the hosts file, adding clientless SSL VPN-specific entries. Stopping Application Access by properly closing the Application Access window returns the file to its original state.

Before invoking Application Access...	hosts file is in original state.
When Application Access starts....	• Clientless SSL VPN copies the hosts file to hosts.webvpn, thus creating a backup. • Clientless SSL VPN then edits the hosts file, inserting clientless SSL VPN-specific information.
When Application Access stops...	• Clientless SSL VPN copies the backup file to the `hosts` file, thus restoring the hosts file to its original state. • Clientless SSL VPN deletes hosts.webvpn.
After finishing Application Access...	hosts file is in original state.

Note Microsoft anti-spyware software blocks changes that the port forwarding Java applet makes to the hosts file. See www.microsoft.com for information on how to allow hosts file changes when using anti-spyware software.

Stopping Application Access Improperly

When Application Access terminates abnormally, the `hosts` file remains in a clientless SSL VPN-customized state. Clientless SSL VPN checks the state the next time you start Application Access by searching for a hosts.webvpn file. If it finds one, a `Backup HOSTS File Found` error message appears, and Application Access is temporarily disabled.

Once you shut down Application Access improperly, you leave your remote access client/server applications in limbo. If you try to start these applications without using clientless SSL VPN, they might malfunction. You might find that hosts that you normally connect to are unavailable. This situation could commonly occur if you run applications remotely from home, fail to quit the Application Access window before shutting down the computer, then try to run the applications later from the office.

Reconfiguring a hosts File Automatically Using Clientless SSL VPN

If you are able to connect to your remote access server, follow these steps to reconfigure the hosts file and reenable both Application Access and the applications.

Step 1 Start clientless SSL VPN and log in. The home page opens.

Step 2 Click the **Applications Access** link. A `Backup HOSTS File Found` message appears.

Step 3 Choose one of the following options:

- **Restore from backup**—Clientless SSL VPN forces a proper shutdown. It copies the hosts.webvpn backup file to the `hosts` file, restoring it to its original state, then deletes hosts.webvpn. You then have to restart Application Access.
- **Do nothing**—Application Access does not start. The remote access home page reappears.
- **Delete backup**—Clientless SSL VPN deletes the hosts.webvpn file, leaving the hosts file in its clientless SSL VPN-customized state. The original `hosts` file settings are lost. Application Access then starts, using the clientless SSL VPN-customized hosts file as the new original. Choose this option only if you are unconcerned about losing hosts file settings. If you or a program you use might have edited the hosts file after Application Access has shut down improperly, choose one of the other options, or edit the hosts file manually. (See "Reconfiguring hosts File Manually.")

Reconfiguring hosts File Manually

If you are not able to connect to your remote access server from your current location, or if you have customized the hosts file and do not want to lose your edits, follow these steps to reconfigure the hosts file and reenable both Application Access and the applications.

Step 1 Locate and edit your hosts file. The most common location is c:\windows\sysem32\drivers\etc\hosts.

Step 2 Check to see if any lines contain the string: `# added by WebVpnPortForward`
If any lines contain this string, your hosts file is clientless SSL VPN-customized. If your hosts file is clientless SSL VPN-customized, it looks similar to the following example:

```
123.0.0.3 server1 # added by WebVpnPortForward
123.0.0.3 server1.example.com vpn3000.com # added by WebVpnPortForward
123.0.0.4 server2 # added by WebVpnPortForward
123.0.0.4 server2.example.com.vpn3000.com # added by WebVpnPortForward
123.0.0.5 server3 # added by WebVpnPortForward
123.0.0.5 server3.example.com vpn3000.com # added by WebVpnPortForward

# Copyright (c) 1993-1999 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
#      102.54.94.97     cisco.example.com          # source server
#       38.25.63.10     x.example.com              # x client host

123.0.0.1       localhost
```

Step 3 Delete the lines that contain the string: `# added by WebVpnPortForward`

Step 4 Save and close the file.

Step 5 Start clientless SSL VPN and log in.

The home page appears.

Step 6 Click the Application Access link.

The Application Access window appears. Application Access is now enabled.

Configuring File Access

Clientless SSL VPN serves remote users with HTTPS portal pages that interface with proxy CIFS and/or FTP clients running on the ASA. Using either CIFS or FTP, clientless SSL VPN provides users with network access to the files on the network, to the extent that the users meet user authentication requirements and the file properties do not restrict access. The CIFS and FTP clients are transparent; the portal pages delivered by clientless SSL VPN provide the appearance of direct access to the file systems.

When a user requests a list of files, clientless SSL VPN queries the server designated as the master browser for the IP address of the server containing the list. The ASA gets the list and delivers it to the remote user on a portal page.

Clientless SSL VPN lets the user invoke the following CIFS and FTP functions, depending on user authentication requirements and file properties:

- Navigate and list domains and workgroups, servers within a domain or workgroup, shares within a server, and files within a share or directory
- Create directories
- Download, upload, rename, move, and delete files

The ASA uses a master browser, WINS server, or DNS server, typically on the same network as the ASA or reachable from that network, to query the network for a list of servers when the remote user clicks Browse Networks in the menu of the portal page or on the toolbar displayed during the Clientless SSL VPN session.

The master browser or DNS server provides the CIFS/FTP client on the ASA with a list of the resources on the network, which clientless SSL VPN serves to the remote user.

Note Before configuring file access, you must configure the shares on the servers for user access.

CIFS File Access Requirement

To access `\\server\share\subfolder\personal` *`folder`*, the user must have list permission for all points above `personal` *`folder`*.

Adding Support for File Access

Configure file access as follows:

Note Step 1 of this procedure describes how to specify the master browser and WINS servers. As an alternative, you can use ASDM to configure URL lists and entries that provide access to file shares.

Adding a share in ASDM does not require a master browser or a WINS server. However, it does not provide support for the Browse Networks link. You can use a hostname or an IP address to refer to ServerA when entering this command. If you use a hostname, the ASA requires a DNS server to resolve it to an IP address.

Step 1 Use the **nbns-server** command in tunnel-group webvpn configuration mode once for each NetBIOS Name Server (NBNS). This step lets you browse a network or domain.

nbns-server {*IPaddress* | *hostname*} [**master**] [**timeout** *timeout*] [**retry** *retries*]

master is the computer designated as the master browser. The master browser maintains the list of computers and shared resources. Any NBNS server you identify with this command without entering the master portion of the command must be a Windows Internet Naming Server (WINS). Specify the master browser first, then specify the WINS servers. You can specify up to three servers, including the master browser, for a connection profile.

retries is the number of times to retry queries to the NBNS server. The ASA recycles through the list of servers this number of times before sending an error message. The default value is 2; the range is 1 through 10.

timeout is the number of seconds the ASA waits before sending the query again, to the same server if it is the only one, or another server if there are more than one. The default timeout is 2 seconds; the range is 1 to 30 seconds.

For example,

```
hostname(config-tunnel-webvpn)# nbns-server 192.168.1.20 master
hostname(config-tunnel-webvpn)# nbns-server 192.168.1.41
hostname(config-tunnel-webvpn)# nbns-server 192.168.1.47
```

Note Use the **show tunnel-group webvpn-attributes** command if you want to display the NBNS servers already present in the connection profile configuration.

Step 2 (Optional) Use the **character-encoding** command to specify the character set to encode in clientless SSL VPN portal pages to be delivered to remote users. By default, the encoding type set on the remote browser determines the character set for clientless SSL VPN portal pages, so you need to set the character encoding only if it is necessary to ensure proper encoding on the browser.

character-encoding *charset*

Charset is a string consisting of up to 40 characters, and equal to one of the valid character sets identified in http://www.iana.org/assignments/character-sets. You can use either the name or the alias of a character set listed on that page. Examples include iso-8859-1, shift_jis, and ibm850.

Note The character-encoding and file-encoding values do not exclude the font family to be used by the browser. You need to complement the setting of one these values with the **page style** command in webvpn customization command mode to replace the font family if you are using Japanese Shift_JIS character encoding, as shown in the following example, or enter the **no page style** command in webvpn customization command mode to remove the font family.

The following example sets the character-encoding attribute to support Japanese Shift_JIS characters, removes the font family, and retains the default background color:

```
hostname(config-webvpn)# character-encoding shift_jis
hostname(config-webvpn)# customization DfltCustomization
hostname(config-webvpn-custom)# page style background-color:white
```

Step 3 (Optional) Use the **file-encoding** command to specify the encoding for clientless SSL VPN portal pages from specific CIFS servers. Thus, you can use different file-encoding values for CIFS servers that require different character encodings.

file-encoding {server-name | server-ip-address} *charset*

The following example sets the file-encoding attribute of the CIFS server 10.86.5.174 to support IBM860 (alias “CP860”) characters:

```
hostname(config-webvpn)# file-encoding 10.86.5.174 cp860
```

For a complete description of these commands, see the *Cisco Security Appliance Command Reference*.

Ensuring Clock Accuracy for SharePoint Access

The clientless SSL VPN server on the ASA uses cookies to interact with applications such as Microsoft Word on the endpoint. The cookie expiration time set by the ASA can cause Word to malfunction when accessing documents on a SharePoint server if the time on the ASA is incorrect. To prevent this malfunction, set the ASA clock properly. We recommend configuring the ASA to dynamically synchronize the time with an NTP server. For instructions, see “Setting the Date and Time.”

Using Clientless SSL VPN with PDAs

You can access Clientless SSL VPN from your Pocket PC or other certified personal digital assistant device. Neither the ASA administrator nor the Clientless SSL VPN user need do anything special to use Clientless SSL VPN with a certified PDA.

Cisco has certified the following PDA platform:

HP iPaq H4150
Pocket PC 2003
Windows CE 4.20.0, build 14053

Pocket Internet Explorer (PIE)
ROM version 1.10.03ENG
ROM Date: 7/16/2004

Some differences in the PDA version of Clientless SSL VPN exist:

- A banner web page replaces the popup Clientless SSL VPN window.
- An icon bar replaces the standard Clientless SSL VPN floating toolbar. This bar displays the Go, Home and Logout buttons.
- The Show Toolbar icon is not included on the main Clientless SSL VPN portal page.
- Upon Clientless SSL VPN logout, a warning message provides instructions for closing the PIE browser properly. If you do not follow these instructions and you close the browser window in the common way, PIE does not disconnect from Clientless SSL VPN or any secure website that uses HTTPS.
- Clientless SSL VPN supports OWA 2000 and OWA 2003 Basic Authentication. If Basic Authentication is not configured on an OWA server and a Clientless SSL VPN user attempts to access that server, access is denied.
- Unsupported Clientless SSL VPN features:
  - Application Access and other Java-dependent features.
  - HTTP proxy.
  - Cisco Secure Desktop provides limited support for Microsoft Windows CE.
  - Microsoft Outlook Web Access (OWA) 5.5.
  - The Citrix Metaframe feature (if the PDA does not have the corresponding Citrix ICA client software).

Using E-Mail over Clientless SSL VPN

Clientless SSL VPN supports several ways to access e-mail. This section includes the following methods:

- Configuring E-mail Proxies
- Configuring Web E-mail: MS Outlook Web Access

Configuring E-mail Proxies

Clientless SSL VPN supports IMAP4S, POP3S, and SMTPS e-mail proxies. Table 71-9 lists attributes that apply globally to e-mail proxy users:

Table 71-9 Attributes for E-mail Proxy Users over Clientless SSL VPN

Function	Command	Default Value
Specifies the previously configured accounting servers to use with e-mail proxy.	**accounting-server-group**	None
Specifies the authentication method(s) for e-mail proxy users.	**authentication**	IMAP4S: Mailhost (required) POP3S Mailhost (required) SMTPS: AAA
Specifies the previously configured authentication servers to use with e-mail proxy.	**authentication-server-group**	LOCAL
Specifies the previously configured authorization servers to use with Clientless SSL VPN.	**authorization-server-group**	None
Requires users to authorize successfully to connect.	**authorization-required**	Disabled
Identifies the DN of the peer certificate to use as a username for authorization.	**authorization-dn-attributes**	Primary attribute: CN Secondary attribute: OU
Specifies the name of the group policy to use.	**default-group-policy**	DfltGrpPolicy
Enables e-mail proxy on the specified interface.	**enable**	Disabled
Defines the separator between the e-mail and VPN usernames and passwords.	**name-separator**	“:” (colon)
Configures the maximum number of outstanding non-authenticated sessions.	**outstanding**	20
Sets the port the e-mail proxy listens to.	**port**	IMAP4S:993 POP3S: 995 SMTPS: 988[1]
Specifies the default e-mail server.	**server**	None.
Defines the separator between the e-mail and server names.	**server-separator**	“@”

[1] With the Eudora e-mail client, SMTPS works only on port 465, even though the default port for SMTPS connections is 988.

E-mail Proxy Certificate Authentication

E-mail clients such as MS Outlook, MS Outlook Express, and Eudora lack the ability to access the certificate store.

Configuring Web E-mail: MS Outlook Web Access

The adaptive security appliance supports Microsoft Outlook Web Access to Exchange Server 2000, 2003, and 2007. It requires that users perform the following tasks:

- Enter the URL of the mail server in a browser in your Clientless SSL VPN session.
- When prompted, enter the e-mail server username in the format *domain\username*.
- Enter the e-mail password.

Configuring Portal Access Rules

This enhancement allows customers to configure a global clientless SSL VPN access policy to permit or deny clientless SSL VPN sessions based on the data present in the HTTP header. If the ASA denies a clientless SSL VPN session, it returns an error code to the endpoint immediately.

The ASA evaluates this access policy before the endpoint authenticates to the ASA. As a result, in the case of a denial, fewer ASA processing resources are consumed by additional connection attempts from the endpoint.

Prerequisites

Log on to the ASA and enter global configuration mode. In global configuration mode, the ASA displays this prompt: hostname(config)#

Detailed Steps

	Command	Purpose
Step 1	**webvpn** **Example:** `hostname(config)# webvpn`	Enter webvpn configuration mode.

Step 2	**portal-access-rule** *priority* [{**permit** | **deny** [**code** *code*]} {**any** | **user-agent match** *string*}
	Example:
	`hostname(config-webvpn)# portal-access-rule 1 deny code 403 user-agent match *Thunderbird*`
	`hostname(config-webvpn)# portal-access-rule 1 deny code 403 user-agent match “*my agent*”`
		Permit or deny the creation of a clientless SSL VPN session based on an HTTP header code or a string in the HTTP header.
		The second example shows the proper sytnax for specifying a string with a space. Surround the string with wildcards (*) and then quotes (“ ”).

Optimizing Clientless SSL VPN Performance

The ASA provides several ways to optimize Clientless SSL VPN performance and functionality. Performance improvements include caching and compressing web objects. Functionality tuning includes setting limits on content transformation and proxy-bypass. APCF provides an additional method of tuning content transformation. The following sections explain these features:

- Configuring Caching
- Configuring Content Transformation

Configuring Caching

Caching enhances Clientless SSL VPN performance. It stores frequently reused objects in the system cache, which reduces the need to perform repeated rewriting and compressing of content. It reduces traffic between Clientless SSL VPN and the remote servers, with the result that many applications run much more efficiently.

By default, caching is enabled. You can customize the way caching works for your environment by using the caching commands in cache mode, which you enter from webvpn mode, as in the following example.

```
hostname(config)#
hostname(config)# webvpn
hostname(config-webvpn)# cache
```

A list of caching commands and their functions follows:

Cache Command	Function
disable	Disables caching.
expiry-time	Configures an expiration time for caching objects.
lmfactor	Configures terms for revalidating cached objects.
max-object-size	Sets a maximum size for objects to cache.
min-object-size	Sets a minimum size for objects to cache.
cache-static-content	Caches all cacheable web objects, content not subject to rewriting. Examples include images and PDF files.

Configuring Content Transformation

By default, the ASA processes all Clientless SSL VPN traffic through a content transformation/rewriting engine that includes advanced elements such as JavaScript and Java to proxy HTTP traffic that may have different semantics and access control rules depending on whether the user is accessing an application within or independently of an SSL VPN device.

Some web resources require highly individualized treatment. The following sections describe functionality that provides such treatment:

- Configuring a Certificate for Signing Rewritten Java Content
- Disabling Content Rewrite
- Using Proxy Bypass
- Configuring Application Profile Customization Framework

Subject to the requirements of your organization and the web content involved, you might use one of these features.

Configuring a Certificate for Signing Rewritten Java Content

Java objects which have been transformed by Clientless SSL VPN can subsequently be signed using a PKCS12 digital certificate associated with a trustpoint. You import and employ the certificate using a combination of the **crypto ca import** and **java-trustpoint** commands.

The following example commands show the creation of a trustpoint named mytrustpoint and its assignment to signing Java objects:

```
hostname(config)# crypto ca import mytrustpoint pkcs12 mypassphrase
Enter the base 64 encoded PKCS12.
End with the word "quit" on a line by itself.
[ PKCS12 data omitted ]
quit
INFO: Import PKCS12 operation completed successfully.
hostname(config)# webvpn
hostname(config)# java-trustpoint mytrustpoint
```

Disabling Content Rewrite

You might not want some applications and web resources, for example, public websites, to go through the ASA. The ASA therefore lets you create rewrite rules that let users browse certain sites and applications without going through the ASA. This is similar to split-tunneling in an IPSec VPN connection.

Use the **rewrite** command with the **disable** option in webvpn mode to specify applications and resources to access outside a Clientless SSL VPN tunnel.

You can use the rewrite command multiple times. The order number of rules is important because the security appliance searches rewrite rules by order number, starting with the lowest, and applies the first rule that matches.

Using Proxy Bypass

You can configure the ASA to use proxy bypass when applications and web resources work better with the special content rewriting this feature provides. Proxy bypass is an alternative method of content rewriting that makes minimal changes to the original content. It is often useful with custom web applications.

You can use this command multiple times. The order in which you configure entries is unimportant. The interface and path mask or interface and port uniquely identify a proxy bypass rule.

If you configure proxy bypass using ports rather than path masks, depending on your network configuration, you might need to change your firewall configuration to allow these ports access to the ASA. Use path masks to avoid this restriction. Be aware, however, that path masks can change, so you might need to use multiple pathmask statements to exhaust the possibilities.

A path is everything in a URL after the .com or .org or other types of domain name. For example, in the URL www.mycompany.com/hrbenefits, *hrbenefits* is the path. Similarly, for the URL www.mycompany.com/hrinsurance, *hrinsurance* is the path. If you want to use proxy bypass for all hr sites, you can avoid using the command multiple times by using the * wildcard as follows: /hr*.

To configure proxy bypass, use the **proxy-bypass** command in webvpn mode.

Configuring Application Profile Customization Framework

An APCF profile for Clientless SSL VPN lets the ASA handle non-standard applications and web resources so that they display correctly over a Clientless SSL VPN connection. An APCF profile contains a script that specifies when (pre, post), where (header, body, request, response), and what data to transform for a particular application. The script is in XML and uses sed (stream editor) syntax for string/text transformation. Multiple APCF profiles can run in parallel on a ASA. Within an APCF profile script, multiple APCF rules can apply. In this case, the ASA processes the oldest rule first (based on configuration history), then the next oldest rule, and so forth.

You can store APCF profiles on the ASA flash memory, or on an HTTP, HTTPS, or TFTP server. Use the **apcf** command in webvpn mode to identify and locate an APCF profile that you want to load on the ASA.

Note We recommend that you configure an APCF profile only with the assistance of Cisco personnel.

The following example shows how to enable an APCF profile named apcf1.xml, located on flash memory.

```
hostname(config)# webvpn
hostname(config-webvpn)# apcf flash:/apcf/apcf1.xml
```

This example shows how to enable an APCF profile named apcf2.xml, located on an https server called myserver, port 1440 with the path being /apcf.

```
hostname(config)# webvpn
hostname(config-webvpn)# apcf https://myserver:1440/apcf/apcf2.xml
```

APCF Syntax

Caution Misuse of an APCF profile can result in reduced performance and undesired rendering of content. In most cases, Cisco Engineering supplies APCF profiles to solve specific application rendering issues.

APCF profiles use XML format, and sed script syntax, with the XML tags in Table 71-10.

Table 71-10 APCF XML Tags

Tag	Use
<APCF>...</APCF>	The mandatory root element that opens any APCF XML file.
<version>1.0</version>	The mandatory tag that specifies the APCF implementation version. Currently the only version is 1.0.
<application>...</application>	The mandatory tag that wraps the body of the XML description.
<id> text </id>	The mandatory tag that describes this particular APCF functionality.
<apcf-entities>...</apcf-entities>	The mandatory tag that wraps a single or multiple APCF entities.
<js-object>…</js-object> <html-object>…</html-object> <process-request-header>...</process-request-header> <process-response-header>...</process-response-header> <preprocess-response-body>...</preprocess-response-body> <postprocess-response-body>...</postprocess-response-body>	One of theses tags specifying type of content or the stage at which the APCF processing should take place is required.

Table 71-10 APCF XML Tags (continued)

Tag	Use
<conditions>… </conditions>	A child element of the pre/post-process tags that specifies criteria for processing such as: http-version (such as 1.1, 1.0, 0.9) http-method (get, put, post, webdav) http-scheme (http, https, other) server-regexp regular expression containing ("a".."z" | "A".."Z" | "0".."9" | ".-_*[]?")) server-fnmatch (regular expression containing ("a".."z" | "A".."Z" | "0".."9" | ".-_*[]?+()\{ },")), user-agent-regexp user-agent-fnmatch request-uri-regexp request-uri-fnmatch If more than one of condition tags is present, the ASA performs a logical AND for all tags.
<action> … </action>	Wraps one or more actions to perform on the content under specified conditions; you can use the following tags to define these actions (shown below): <do>, <sed-script>, <rewrite-header>, <add-header>, <delete-header>.
<do>…</do>	Child element of the action tag used to define one of the following actions: <no-rewrite/>—Do not mangle the content received from the remote server. <no-toolbar/>—Do not insert the toolbar. <no-gzip/>—Do not compress the content. <force-cache/>—Preserve the original caching instructions. <force-no-cache/>—Make object non-cacheable. < downgrade-http-version-on-backend>—Use HTTP/1.0 when sending the request to remote server.
<sed-script> TEXT </sed-script>	Child element of the action tag used to change the content of text-based objects. The Text must be a valid Sed script. The <sed-script> applies to the <conditions> tag defined before it.
<rewrite-header></rewrite-header>	Child element of the action tag. Changes the value of the HTTP header specified in the child element <header> tag shown below.
<add-header></add-header>	Child element of the action tag used to add a new HTTP header specified in the child element <header> tag shown below.

Table 71-10 APCF XML Tags (continued)

Tag	Use
<delete-header></delete-header>	Child element of the action tag used to delete the specified HTTP header specified by the child element <header> tag shownbelow.

<header></header>	Specifies the name HTTP header to be rewritten, added, or deleted. For example, the following tag changes the value of the HTTP header named Connection:
	`<rewrite-header>`
	`<header>Connection</header>`
	`<value>close</value>`
	`</rewrite-header>`

APCF Example 1

```
<APCF>
<version>1.0</version>
<application>
  <id>Do not compress content from notsogood.com</id>
  <apcf-entities>
      <process-request-header>
         <conditions>
           <server-fnmatch>*.notsogood.com</server-fnmatch>
         </conditions>
           <action>
             <do><no-gzip/></do>
           </action>
      </process-request-header>
  </apcf-entities>
</application>
</APCF>
```

APCF Example 2

```
<APCF>
<version>1.0</version>
<application>
 <id>Change MIME type for all .xyz objects</id>
 <apcf-entities>
      <process-response-header>
        <conditions>
            <request-uri-fnmatch>*.xyz</request-uri-fnmatch>
        </conditions>
         <action>
           <rewrite-header>
                <header>Content-Type</header>
                <value>text/html</value>
           </rewrite-header>
         </action>
      </process-response-header>
 </apcf-entities>
</application>
</APCF>
```

Clientless SSL VPN End User Setup

This section is for the system administrator who sets up Clientless SSL VPN for end users. It describes how to customize the end-user interface.

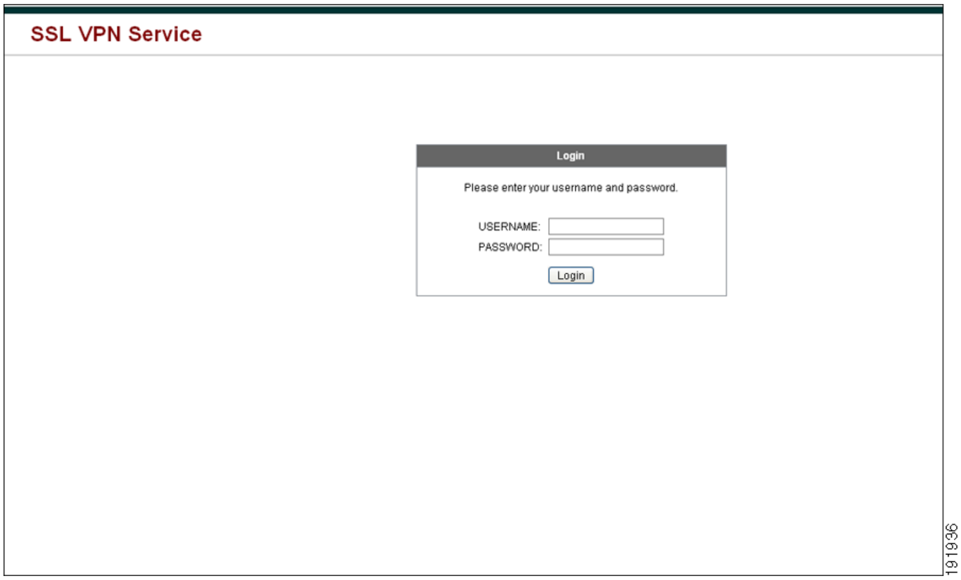
This section summarizes configuration requirements and tasks for a remote system. It specifies information to communicate to users to get them started using Clientless SSL VPN. It includes the following topics:

- Defining the End User Interface
- Customizing Clientless SSL VPN Pages, page 71-63
- Customizing Help, page 71-75
- Requiring Usernames and Passwords
- Communicating Security Tips
- Configuring Remote Systems to Use Clientless SSL VPN Features
- Translating the Language of User Messages

Defining the End User Interface

The Clientless SSL VPN end user interface consists of a series of HTML panels. A user logs on to Clientless SSL VPN by entering the IP address of a ASA interface in the format https://*address*. The first panel that displays is the login screen (Figure 71-5).

Figure 71-5 Clientless SSL VPN Login Screen



SSL VPN Service

Login

Please enter your username and password.

USERNAME:

PASSWORD:

Viewing the Clientless SSL VPN Home Page

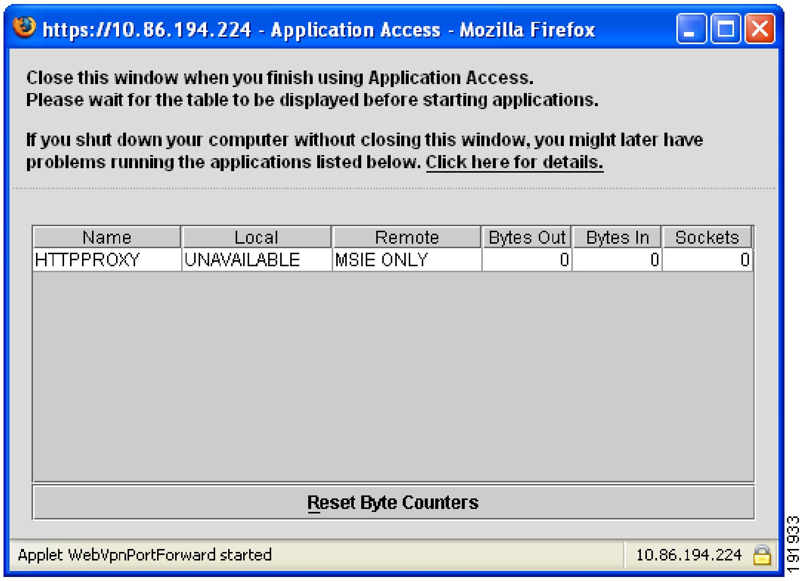
After the user logs in, the portal page opens.

The home page displays all of the Clientless SSL VPN features you have configured, and its appearance reflects the logo, text, and colors you have selected. This sample home page includes all available Clientless SSL VPN features with the exception of identifying specific file shares. It lets users browse the network, enter URLs, access specific websites, and use Application Access (port forwarding and smart tunnels) to access TCP applications.

Viewing the Clientless SSL VPN Application Access Panel

To start port forwarding or smart tunnels, a user clicks the Go button in the Application Access box. The Application Access window opens (Figure 71-6).

Figure 71-6 Clientless SSL VPN Application Access Window



https://10.86.194.224 - Application Access - Mozilla Firefox

Close this window when you finish using Application Access.
Please wait for the table to be displayed before starting applications.

If you shut down your computer without closing this window, you might later have problems running the applications listed below. Click here for details.

Name	Local	Remote	Bytes Out	Bytes In	Sockets
HTTPPROXY	UNAVAILABLE	MSIE ONLY	0	0	0

Applet WebVpnPortForward started

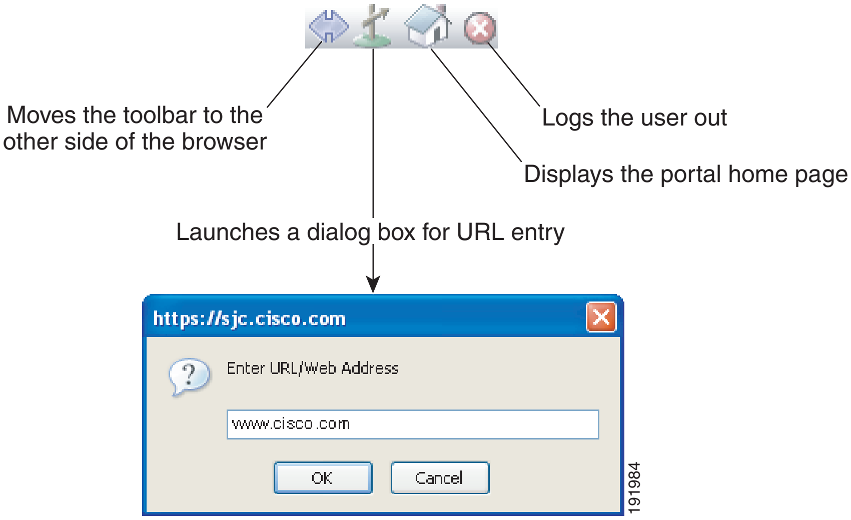
This window displays the TCP applications configured for this Clientless SSL VPN connection. To use an application with this panel open, the user starts the application in the normal way.

Note A stateful failover does not retain sessions established using Application Access. Users must reconnect following a failover.

Viewing the Floating Toolbar

The floating toolbar shown in Figure 71-7 represents the current Clientless SSL VPN session.

Figure 71-7 Clientless SSL VPN Floating Toolbar


Moves the toolbar to the other side of the browser
Logs the user out
Displays the portal home page
Launches a dialog box for URL entry
OK
Cancel
191984

https://sjc.cisco.com

Enter URL/Web Address

www.cisco.com

Be aware of the following characteristics of the floating toolbar:

- The toolbar lets you enter URLs, browse file locations, and choose preconfigured web connections without interfering with the main browser window.
- If you configure your browser to block popups, the floating toolbar cannot display.
- If you close the toolbar, the ASA prompts you to confirm that you want to end the Clientless SSL VPN session.

See Table 71-13 on page 71-80 for detailed information about using Clientless SSL VPN.

Customizing Clientless SSL VPN Pages

You can change the appearance of the portal pages displayed to Clientless SSL VPN users. This includes the Login page displayed to users when they connect to the security appliance, the Home page displayed to users after the security appliance authenticates them, the Application Access window displayed when users launch an application, and the Logout page displayed when users log out of Clientless SSL VPN sessions.

After you customize the portal pages, you can save your customization and apply it to a specific connection profile, group policy, or user. You can create and save many customization objects, enabling the security appliance to change the appearance of portal pages for individual users or groups of users.

This section contains the following topics and tasks:

- How Customization Works, page 71-64
- Exporting a Customization Template, page 71-64
- Editing the Customization Template, page 71-64
- Importing a Customization Object, page 71-70
- Applying Customizations to Connection Profiles, Group Policies and Users, page 71-70
- Login Screen Advanced Customization, page 71-71

How Customization Works

The ASA uses customization objects to define the appearance of user screens. A customization object is compiled from an XML file which contains XML tags for all the customizable screen items displayed to remote users. The ASA software contains a customization template that you can export to a remote PC. You can edit this template and import the template back into the ASA as a new customization object.

When you export a customization object, an XML file containing XML tags is created at the URL you specify. The XML file created by the customization object named *Template* contains empty XML tags, and provides the basis for creating new customization objects. This object cannot be changed or deleted from cache memory, but can be exported, edited, and imported back into the ASA as a new customization object.

Customization Objects, Connection Profiles, and Group Policies

Initially, when a user first connects, the default customization object (named *DfltCustomization*) identified in the connection profile (tunnel group) determines how the logon screen appears. If the connection profile list is enabled, and the user selects a different group, and that group has its own customization, the screen changes to reflect the customization object for that new group.

After the remote user is authenticated, the screen appearance is determined by whether a customization object that has been assigned to the group policy.

Exporting a Customization Template

When you export a customization object, an XML file is created at the URL you specify. The customization template (named *Template*) contains empty XML tags, and provides the basis for creating new customization objects. This object cannot be changed or deleted from cache memory, but can be exported, edited, and imported back into the ASA as a new customization object.

You can export a customization object using the **export webvpn customization** command, make changes to the XML tags, and import the file as a new object using the **import webvpn customization** command.

The following example exports the default customization object (DfltCustomization) and creates the XML file named *dflt_custom*:

```
hostname# export webvpn customization DfltCustomization tftp://209.165.200.225/dflt_custom
!!!!!!!!!!!!!!!INFO: Customization object 'DfltCustomization' was exported to
tftp://10.86.240.197/dflt_custom
hostname#
```

Editing the Customization Template

This section shows the contents of the customization template and has convenient figures to help you quickly choose the correct XML tag and make changes that affect the screens.

You can use a text editor or an XML editor to edit the XML file. The following example shows the XML tags of the customization template. Some redundant tags have been removed for easier viewing:

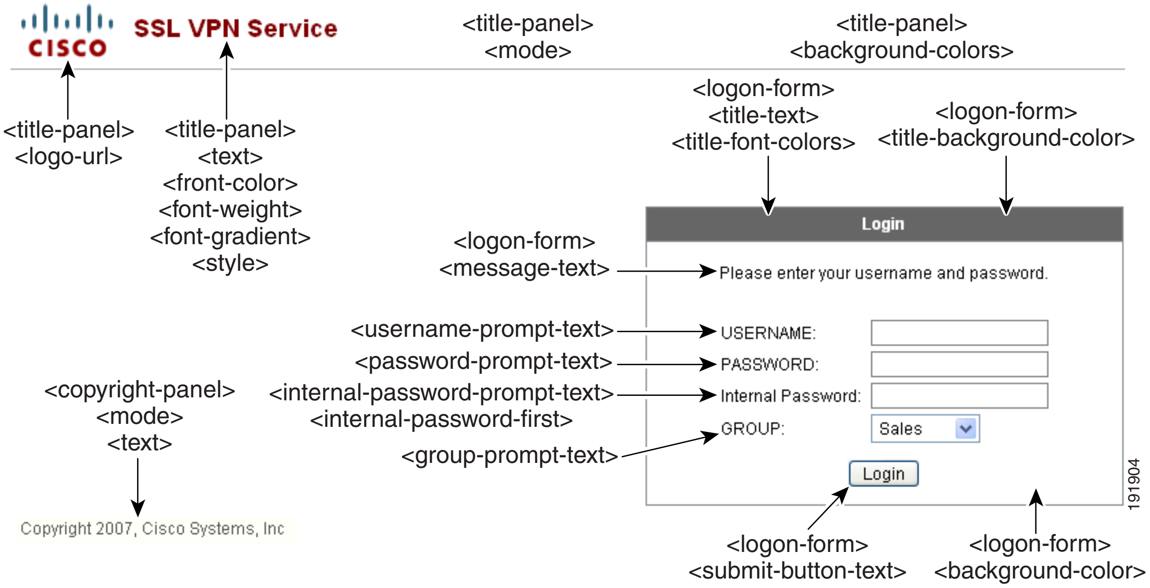
```
<custom>
   <localization>
      <languages>en,ja,zh,ru,ua</languages>
      <default-language>en</default-language>
   </localization>
    <auth-page>
      <window>
          <title-text l10n="yes"><![CDATA[SSL VPN Service]]></title-text>
      </window>
      <full-customization>
          <mode>disable</mode>
          <url></url>
      </full-customization>
      <language-selector>
        <mode>disable</mode>
        <title l10n="yes">Language:</title>
        <language>
          <code>en</code>
          <text>English</text>
        </language>
        <language>
          <code>zh</code>
          <text>ä¸-å›½ (Chinese)</text>
        </language>
        <language>
          <code>ja</code>
          <text>æ—¥æœ¬ (Japanese)</text>
        </language>
        <language>
          <code>ru</code>
          <text>Ð ÑƒÑÑÐºÐ¸Ð¹ (Russian)</text>
        </language>
        <language>
          <code>ua</code>
          <text>Ð£ÐºÑ€Ð°Ñ—Ð½ÑÑŒÐºÐ° (Ukrainian)</text>
        </language>
      </language-selector>
      <logon-form>
          <title-text l10n="yes"><![CDATA[Login]]></title-text>
          <title-background-color><![CDATA[#666666]]></title-background-color>
          <title-font-color><![CDATA[#ffffff]]></title-font-color>
          <message-text l10n="yes"><![CDATA[Please enter your username and
password.]]></message-text>
          <username-prompt-text l10n="yes"><![CDATA[USERNAME:]]></username-prompt-text>
          <password-prompt-text l10n="yes"><![CDATA[PASSWORD:]]></password-prompt-text>
          <internal-password-prompt-text l10n="yes">Internal
Password:</internal-password-prompt-text>
          <internal-password-first>no</internal-password-first>
          <group-prompt-text l10n="yes"><![CDATA[GROUP:]]></group-prompt-text>
          <submit-button-text l10n="yes"><![CDATA[Login]]></submit-button-text>
          <title-font-color><![CDATA[#ffffff]]></title-font-color>
          <title-background-color><![CDATA[#666666]]></title-background-color>
          <font-color>#000000</font-color>
          <background-color>#ffffff</background-color>
          <border-color>#858A91</border-color>
      </logon-form>
      <logout-form>
          <title-text l10n="yes"><![CDATA[Logout]]></title-text>
          <message-text l10n="yes"><![CDATA[Goodbye.<br>

For your own security, please:<br>

<li>Clear the browser's cache

<li>Delete any downloaded files

<li>Close the browser's window]]></message-text>
          <login-button-text l10n="yes">Logon</login-button-text>
          <hide-login-button>no</hide-login-button>
          <title-background-color><![CDATA[#666666]]></title-background-color>
          <title-font-color><![CDATA[#ffffff]]></title-font-color>
          <title-font-color><![CDATA[#ffffff]]></title-font-color>
          <title-background-color><![CDATA[#666666]]></title-background-color>
          <font-color>#000000</font-color>
          <background-color>#ffffff</background-color>
          <border-color>#858A91</border-color>
      </logout-form>
      <title-panel>
         <mode>enable</mode>
         <text l10n="yes"><![CDATA[SSL VPN Service]]></text>
         <logo-url l10n="yes">/+CSCOU+/csco_logo.gif</logo-url>
         <gradient>yes</gradient>
         <style></style>
         <background-color><![CDATA[#ffffff]]></background-color>
         <font-size><![CDATA[larger]]></font-size>
         <font-color><![CDATA[#800000]]></font-color>
         <font-weight><![CDATA[bold]]></font-weight>
      </title-panel>
      <info-panel>
        <mode>disable</mode>
        <image-url l10n="yes">/+CSCOU+/clear.gif</image-url>
        <image-position>above</image-position>
        <text l10n="yes"></text>
      </info-panel>
      <copyright-panel>
         <mode>disable</mode>
         <text l10n="yes"></text>
      </copyright-panel>
    </auth-page>
    <portal>
      <title-panel>
         <mode>enable</mode>
         <text l10n="yes"><![CDATA[SSL VPN Service]]></text>
         <logo-url l10n="yes">/+CSCOU+/csco_logo.gif</logo-url>
         <gradient>yes</gradient>
         <style></style>
         <background-color><![CDATA[#ffffff]]></background-color>
         <font-size><![CDATA[larger]]></font-size>
         <font-color><![CDATA[#800000]]></font-color>
         <font-weight><![CDATA[bold]]></font-weight>
      </title-panel>
      <browse-network-title l10n="yes">Browse Entire Network</browse-network-title>
      <access-network-title l10n="yes">Start AnyConnect</access-network-title>
      <application>
         <mode>enable</mode>
         <id>home</id>
         <tab-title l10n="yes">Home</tab-title>
         <order>1</order>
      </application>
      <application>
         <mode>enable</mode>
         <id>web-access</id>
         <tab-title l10n="yes"><![CDATA[Web Applications]]></tab-title>
         <url-list-title l10n="yes"><![CDATA[Web Bookmarks]]></url-list-title>
         <order>2</order>
      </application>
      <application>
         <mode>enable</mode>
         <id>file-access</id>
         <tab-title l10n="yes"><![CDATA[Browse Networks]]></tab-title>
         <url-list-title l10n="yes"><![CDATA[File Folder Bookmarks]]></url-list-title>
         <order>3</order>
      </application>
      <application>
         <mode>enable</mode>
         <id>app-access</id>
         <tab-title l10n="yes"><![CDATA[Application Access]]></tab-title>
```

```
      <order>4</order>
   </application>
   <application>
      <mode>enable</mode>
      <id>net-access</id>
      <tab-title l10n="yes">AnyConnect</tab-title>
      <order>4</order>
   </application>
   <application>
      <mode>enable</mode>
      <id>help</id>
      <tab-title l10n="yes">Help</tab-title>
      <order>1000000</order>
   </application>
   <toolbar>
      <mode>enable</mode>
      <logout-prompt-text l10n="yes">Logout</logout-prompt-text>
      <prompt-box-title l10n="yes">Address</prompt-box-title>
      <browse-button-text l10n="yes">Browse</browse-button-text>
   </toolbar>
   <column>
      <width>100%</width>
      <order>1</order>
   </column>
   <pane>
      <type>TEXT</type>
      <mode>disable</mode>
      <title></title>
      <text></text>
      <notitle></notitle>
      <column></column>
      <row></row>
      <height></height>
   </pane>
   <pane>
      <type>IMAGE</type>
      <mode>disable</mode>
      <title></title>
      <url l10n="yes"></url>
      <notitle></notitle>
      <column></column>
      <row></row>
      <height></height>
   </pane>
   <pane>
      <type>HTML</type>
      <mode>disable</mode>
      <title></title>
      <url l10n="yes"></url>
      <notitle></notitle>
      <column></column>
      <row></row>
      <height></height>
   </pane>
   <pane>
      <type>RSS</type>
      <mode>disable</mode>
      <title></title>
      <url l10n="yes"></url>
      <notitle></notitle>
      <column></column>
      <row></row>
      <height></height>
   </pane>
```

```
      <url-lists>
         <mode>group</mode>
      </url-lists>
      <home-page>
         <mode>standard</mode>
         <url></url>
      </home-page>
    </portal>
</custom>
```

Figure 71-8 shows the Logon page and its customizing XML tags. All these tags are nested within the higher-level tag <auth-page>.

Figure 71-8 Logon Page and Associated XML Tags



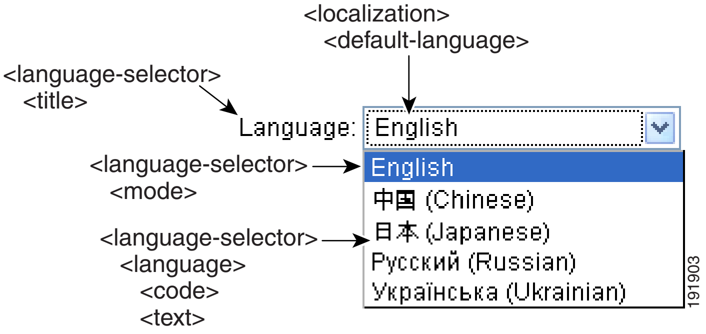
Please enter your username and password.

GROUP: Sales

Copyright 2007, Cisco Systems, Inc

Figure 71-9 shows the Language Selector drop-down list that is available on the Logon page, and the XML tags for customizing this feature. All these tags are nested within the higher-level <auth-page> tag.

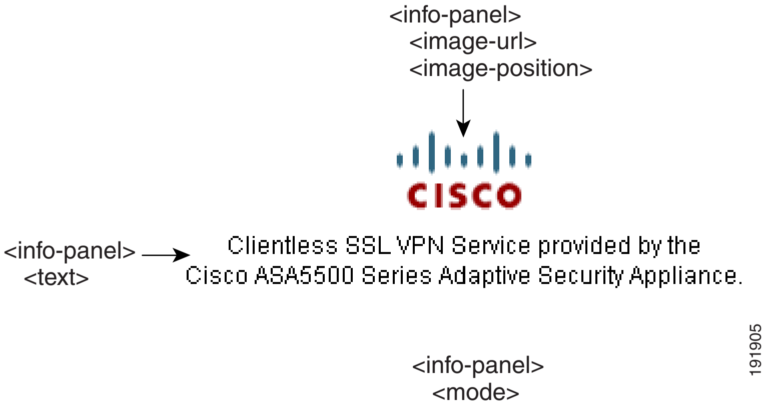
Figure 71-9 Language Selector on Logon Screen and Associated XML Tags



Language: English

Figure 71-10 shows the Information Panel that is available on the Logon page, and the XML tags for customizing this feature. This information can appear to the left or right of the login box. These tags are nested within the higher-level <auth-page> tag.

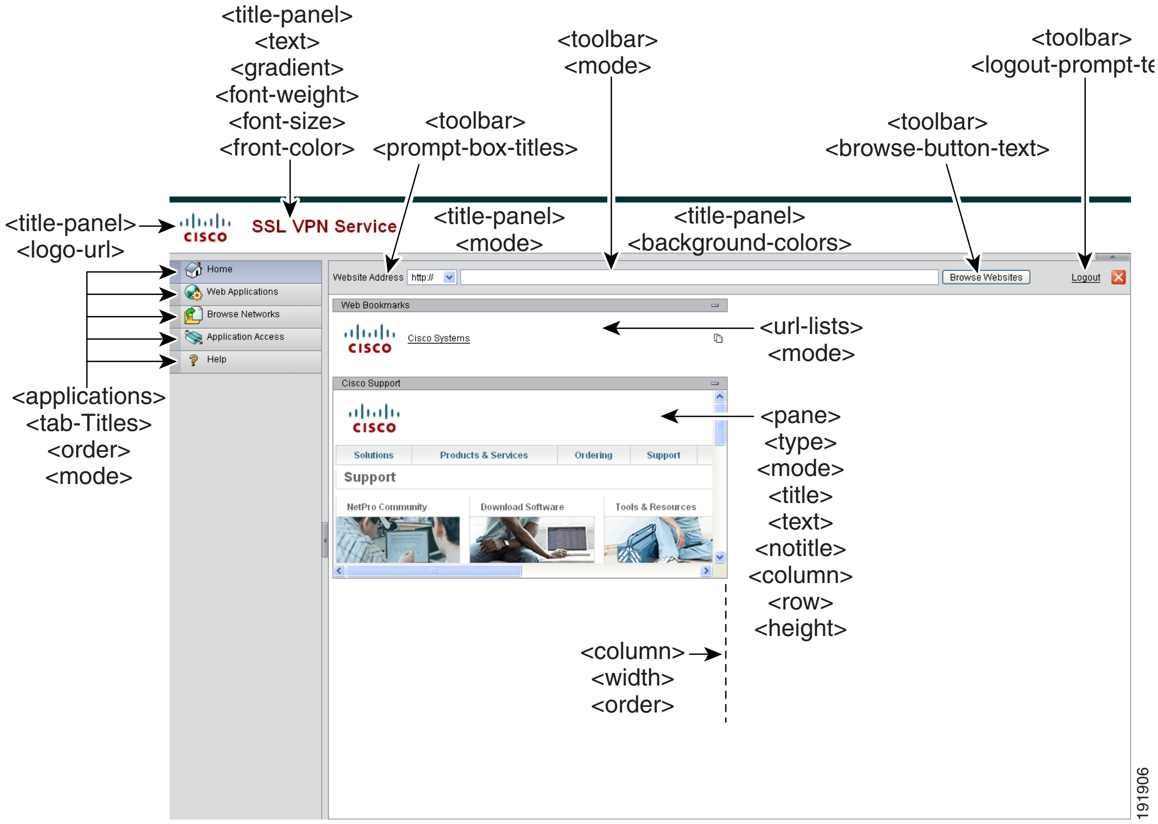
Figure 71-10 Information Panel on Logon Screen and Associated XML Tags



Clientless SSL VPN Service provided by the Cisco ASA5500 Series Adaptive Security Appliance.

Figure 71-11 shows the Portal page and the XML tags for customizing this feature. These tags are nested within the higher-level <auth-page> tag.

Figure 71-11 Portal Page and Associated XML Tags



Importing a Customization Object

After you edit and save the XML file, import it into cache memory of the ASA using the **import webvpn customization** command from EXEC mode. When you import the customization object, the ASA checks the XML code for validity. If the code is valid, the ASA stores the object in a hidden location in cache memory.

The following example imports the customization object *General.xml* from the URL 209.165.201.22/customization and names it *custom1*.

```
hostname# import webvpn customization custom1 tftp://209.165.201.22/customization
/General.xml
Accessing
tftp://209.165.201.22/customization/General.xml...!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Writing file disk0:/csco_config/97/custom1...
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
329994 bytes copied in 5.350 secs (65998 bytes/sec)
```

Applying Customizations to Connection Profiles, Group Policies and Users

After you create a customization, you can apply the customization to a connection profile, a group, or a user, with the **customization** command. The options displayed with this command are different depending on the mode you are in.

Note Connection profiles were previously referred to as tunnel groups.

For more information about configuring connection profiles, group policies, and users, see Chapter 64, "Configuring Connection Profiles, Group Policies, and Users.".

Applying Customizations to Connection Profiles

To apply a customization to a connection profile, use the **customization** command from tunnel-group webvpn mode:

[**no**] **customization** *name*

name is the name of a customization to apply to the connection profile.

To remove the command from the configuration, and remove a customization from the connection profile, use the **no** form of the command.

Enter the **customization command followed by a question mark (?)** to view a list of existing customizations.

In the following example, the user enters tunnel-group webvpn mode and enables the customization *cisco* for the connection profile *cisco_telecommuters*:

```
hostname(config)# tunnel-group cisco_telecommuters webvpn-attributes
hostname(tunnel-group-webvpn)# customization cisco
```

Applying Customizations to Groups and Users

To apply a customization to a group or user, use the **customization** command from group policy webvpn mode or username webvpn mode. In these modes, the **none** and **value** options are included:

[**no**] **customization {none | value** *name*}

none disables the customization for the group or user, prevents the value from being inherited, and displays the default Clientless SSL VPN pages.

value *name* is the name of a customization to apply to the group or user.

To remove the command from the configuration, and cause the value to be inherited, use the **no** form of the command.

Enter the **customization value command followed by a question mark (?)** to view a list of existing customizations.

In the following example, the user enters group policy webvpn mode, queries the security appliance for a list of customizations, and enables the customization *cisco* for the group policy *cisco_sales*:

```
hostname(config)# group-policy cisco_sales attributes
hostname(config-group-policy)# webvpn
hostname(config-username-webvpn)# customization value ?

config-username-webvpn mode commands/options:
Available configured customization profiles:
    DfltCustomization
    cisco
hostname(config-group-webvpn)# customization value cisco
```

In the next example, the user enters username webvpn mode and enables the customization *cisco* for the user *cisco_employee*:

```
hostname(config)# username cisco_employee attributes
hostname(config-username)# webvpn
hostname(config-username-webvpn)# customization value cisco
```

Login Screen Advanced Customization

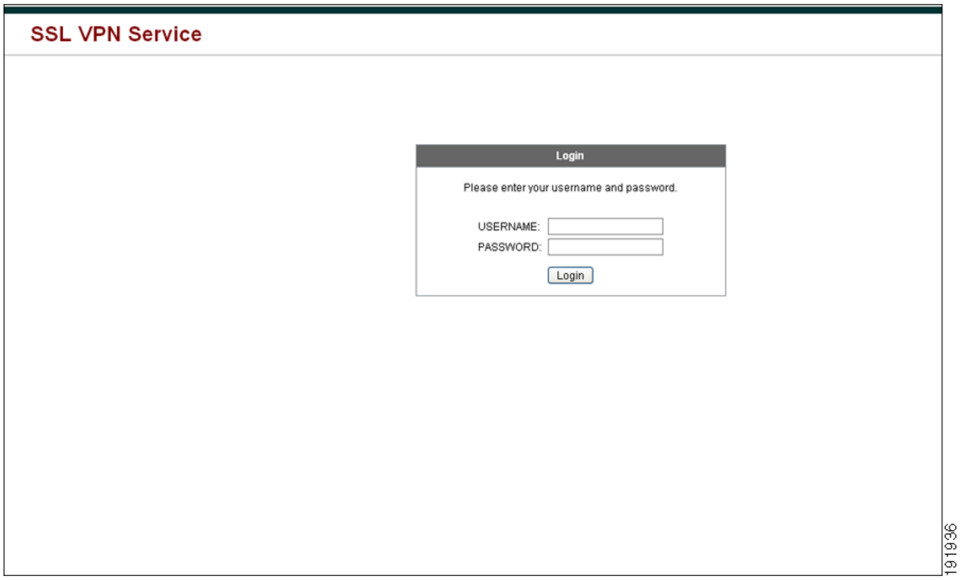
If you prefer to use your own, custom login screen, rather than changing specific screen elements of the login screen we provide, you can perform this advanced customization using the *Full Customization* feature.

With Full Customization, you provide the HTML for your own login screen, and you insert Cisco HTML code that calls functions on the ASA that create the Login form and the Language Selector drop-down list.

This section describes the modifications you need to make to your HTML code and the tasks required to configure the ASA to use your code.

Figure 71-12 shows the standard Cisco login screen that displays to Clientless SSL VPN users. The Login form is displayed by a function called by the HTML code.

Figure 71-12 Standard Cisco Login Page


SSL VPN Service

Login

Please enter your username and password.

USERNAME:

PASSWORD:

Figure 71-13 shows the Language Selector drop-down list. This feature is an option for Clientless SSL VPN users, and is also called by a function in the HTML code of the login screen.

Figure 71-13 Language Selector Drop-down List

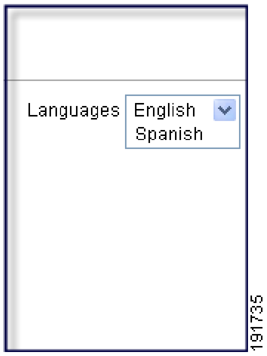
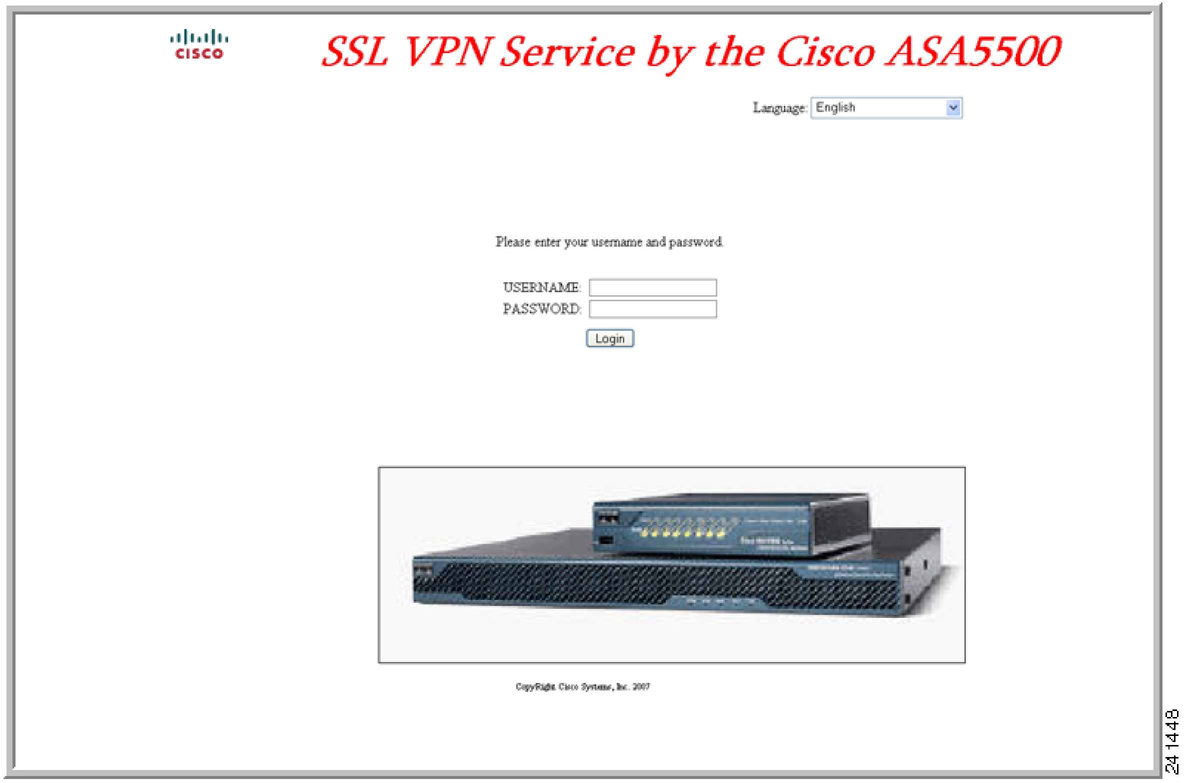


Figure 71-14 shows a simple example of a custom login screen enabled by the Full Customization feature.

Figure 71-14 Example of Full Customization of Login Screen



SSL VPN Service by the Cisco ASA5500

Language: English

Please enter your username and password.

USERNAME:
PASSWORD:

CopyRight Cisco Systems, Inc. 2007

Example HTML Code for Custom Login Screen File

The following HTML code is used as an example and is the code that displays the screen shown in Figure 71-14:

```
<head>
<meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<title>New Page 3</title>
<base target="_self">
</head>

<p align="center">
<img border="0" src="/+CSCOU+/cisco_logo.jpg" width="188" height="48"><font face="Snap
ITC" size="6" color="#FF00FF">
</font><font face="Snap ITC" color="#FF00FF" size="7">&nbsp;</font><i><b><font
color="#FF0000" size="7" face="Sylfaen"> SSL VPN Service by the Cisco
ASA5500</font></b></i></p>

    <body onload="csco_ShowLoginForm('lform');csco_ShowLanguageSelector('selector')">

    <table>

    <tr><td colspan=3 height=20 align=right><div id="selector" style="width:
    300px"></div></td></tr>
    <tr><td></td><td></td><td></td></tr>
    <tr>
    <td height="379"></td>
    <td height="379"></td>
    <td align=middle valign=middle>
    <div id=lform >
```

```
<p>&nbsp;</p>
<p>&nbsp;</p>
<p>&nbsp;</p>
<p>Loading...</p>
</div>
</td>
</tr>
<tr>
<td width="251"></td>
<td width="1"></td>
<td align=right valign=right width="800">
<img border="1" src="/+CSCOU+/asa5500.jpg" width="660" height="220" align="middle">
</td></tr>

</table>
```

The indented code injects the Login form and the Language Selector on the screen. The function **csco_ShowLoginForm('lform')** injects the logon form. **csco_ShowLanguageSelector('selector')** injects the Language Selector.

Full Customization Procedure

Follow these steps to modify your HTML file and configure the ASA to use the new file:

Step 1 Name your file **logon.inc**. When you import the file, the ASA recognizes this filename as the logon screen.

Step 2 Modify the paths of images used by the file to include **/+CSCOU+/**.

Files that are displayed to remote users before authentication must reside in a specific area of the ASA cache memory represented by the path /+CSCOU+/. Therefore, the source for each image in the file must include this path. For example:

```
src=”/+CSCOU+/asa5520.gif”
```

Step 3 Insert the special HTML code below. This code contains the Cisco functions, described earlier, that inject the login form and language selector onto the screen.

```
<body onload="csco_ShowLoginForm('lform');csco_ShowLanguageSelector('selector')">

<table>

<tr><td colspan=3 height=20 align=right><div id="selector" style="width:
300px"></div></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr>
<td height="379"></td>
<td height="379"></td>
<td align=middle valign=middle>
<div id=lform >
<p>&nbsp;</p>
<p>&nbsp;</p>
<p>&nbsp;</p>
<p>Loading...</p>
</div>
</td>
</tr>
<tr>
<td width="251"></td>
<td width="1"></td>
<td align=right valign=right width="800">
<img border="1" src="/+CSCOU+/asa5500.jpg" width="660" height="220" align="middle">
```

```
</td></tr>

</table>
```

Step 4 Import the file and images as Web Content using the **import webvpn webcontent** command from Privileged EXEC mode. For example:

```
hostname# import webvpn webcontent /+CSCOU+/login.inc tftp://209.165.200.225/login.inc
!!!!* Web resource `+CSCOU+/login.inc' was successfully initialized
hostname#
```

Step 5 Enable Full Customization in a customization object. First, export a customization template with the **export webvpn customization** command. For example:

```
hostname2# export webvpn customization template tftp://209.165.200.225/sales_vpn_login
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
%INFO: Customization object 'Template' was exported to tftp://10.21.50.120/sales
_vpn_login
```

Then change the full customization mode tag in the file to enable, and supply the URL of the login file stored in the ASA memory. For example:

```
<full-customization>
          <mode>enable</mode>
          <url>+CSCOU+/login.inc</url>
      </full-customization>
```

Now import the file as a new customization object. For example:

```
hostname# import webvpn customization sales_vpn_login tftp://10.21.50.120/sales_vpn_login$
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
%INFO: customization object 'sales_vpn_login' was successfully imported
```

Step 6 Apply the customization object to a Connection Profile (tunnel group). For example:

```
hostname(config)# tunnel-group Sales webvpn-attributes
hostname(config-tunnel-webvpn)#customization sales_vpn_login
```

Customizing Help

The ASA displays help content on the application panels during clientless SSL VPN sessions. You can customize the help files provided by Cisco or create help files in other languages. You then import them to flash memory for display during subsequent clientless sessions. You can also retrieve previously imported help content files, modify them, and reimport them to flash memory.

Each clientless application panel displays its own help file content using a predetermined filename. The prospective location of each is in the /+CSCOE+/help/*language*/ URL within flash memory of the ASA. Table 71-11 shows the details about each of the help files you can maintain for clientless SSL VPN sessions.

Table 71-11 Clientless SSL VPN Application Help Files

Application Type	Panel	URL of Help File in Flash Memory of the Security Appliance	Help File Provided By Cisco in English?
Standard	Application Access	/+CSCOE+/help/*language*/app-access-hlp.inc	Yes
Standard	Browse Networks	/+CSCOE+/help/*language*/file-access-hlp.inc	Yes

Table 71-11 Clientless SSL VPN Application Help Files

Application Type	Panel	URL of Help File in Flash Memory of the Security Appliance	Help File Provided By Cisco in English?
Standard	AnyConnect Client	/+CSCOE+/help/*language*/net-access-hlp.inc	Yes
Standard	Web Access	/+CSCOE+/help/*language*/web-access-hlp.inc	Yes
Plug-in	MetaFrame Access	/+CSCOE+/help/*language*/ica-hlp.inc	No
Plug-in	Terminal Servers	/+CSCOE+/help/*language*/rdp-hlp.inc	Yes
Plug-in	Telnet/SSH Servers	/+CSCOE+/help/*language*/ssh,telnet-hlp.inc	Yes
Plug-in	VNC Connections	/+CSCOE+/help/*language*/vnc-hlp.inc	Yes

language is the abbreviation of the language rendered by the browser. This field is *not* used for file translation; it indicates the language used in the file. To specify a particular language code, copy the language abbreviation from the list of languages rendered by your browser. For example, a dialog window displays the languages and associated language codes when you use one of the following procedures:

- Open Internet Explorer and choose **Tools > Internet Options > Languages > Add**.
- Open Mozilla Firefox and choose **Tools > Options > Advanced > General**, click **Choose** next to Languages, and click **Select a language to add**.

The following sections describe how to customize the help content visible on clientless sessions:

- Customizing a Help File Provided By Cisco, page 71-76
- Creating Help Files for Languages Not Provided by Cisco, page 71-77
- Importing a Help File to Flash Memory, page 71-77
- Exporting a Previously Imported Help File from Flash Memory, page 71-78

Customizing a Help File Provided By Cisco

To customize a help file provided by Cisco, you need to get a copy of the file from the flash memory card first. Get the copy and customize it as follows:

Step 1 Use your browser to establish a clientless SSL VPN session with the ASA.

Step 2 Display the help file by appending the string in “URL of Help File in Flash Memory of the Security Appliance” in Table 71-11, to the address of the ASA, then press Enter.

Note Enter **en** in place of *language* to get the help file in English.

The following example address displays the English version of the Terminal Servers help:

https://*address_of_security_appliance***/+CSCOE+/help/en/rdp-hlp.inc**

Step 3 Choose File > Save (Page) As.

Caution Do not change the contents of the File name box.

Step 4 Change the Save as type option to “Web Page, HTML only” and click Save.

Step 5 Use your preferred HTML editor to modify the file.

Note You can use most HTML tags, but do *not* use tags that define the document and its structure (e.g., do not use <html>, <title>, <body>, <head>, <h1>, <h2>, etc. You can use character tags, such as the <b> tag, and the <p>, <ol>, <ul>, and <li> tags to structure content.

Step 6 Save the file as HTML only, using the original filename and extension.

Step 7 Make sure the filename matches the one in Table 71-11, and that it does not have an extra filename extension.

See “Importing a Help File to Flash Memory” to import the modified file for display in clientless SSL VPN sessions.

Creating Help Files for Languages Not Provided by Cisco

Use HTML to create help files in other languages.

Note You can use most HTML tags, but do *not* use tags that define the document and its structure (e.g., do not use <html>, <title>, <body>, <head>, <h1>, <h2>, etc. You can use character tags, such as the <b> tag, and the <p>, <ol>, <ul>, and <li> tags to structure content.

We recommend creating a separate folder for each language you want to support.

Save the file as HTML only. Use the filename following the last slash in “URL of Help File in Flash Memory of the Security Appliance” in Table 71-11.

See the next section to import the files for display in clientless SSL VPN sessions.

Importing a Help File to Flash Memory

To import a help content file to flash memory for display in clientless SSL VPN sessions, enter the following command in Privileged EXEC mode:

import webvpn webcontent *destination_url source_url*

destination_url is the string in “URL of Help File in Flash Memory of the Security Appliance” in Table 71-11.

source_url is the URL of the file to import. Valid prefixes are ftp://, http://, and tftp://.

The following example command copies the help file *app-access-hlp.inc* to flash memory from the TFTP server at 209.165.200.225. The URL includes the abbreviation *en* for the English language.

```
hostname# import webvpn webcontent /+CSCOE+/help/en/app-access-hlp.inc
tftp://209.165.200.225/app-access-hlp.inc
```

Exporting a Previously Imported Help File from Flash Memory

To retrieve a previously imported help content file for subsequent edits, enter the following command in Privileged EXEC mode:

export webvpn webcontent *source_url destination_url*

source_url is the string in "URL of Help File in Flash Memory of the Security Appliance" in Table 71-11.

destination_url is **the target URL**. Valid prefixes are ftp:// and tftp://. The maximum number of characters is 255.

The following example command copies the English language help file *file-access-hlp.inc* displayed on the Browse Networks panel to TFTP Server 209.165.200.225:

```
hostname# export webvpn webcontent /+CSCOE+/help/en/file-access-hlp.inc
tftp://209.165.200.225/file-access-hlp.inc
```

Requiring Usernames and Passwords

Depending on your network, during a remote session users might have to log in to any or all of the following: the computer itself, an Internet service provider, clientless SSL VPN, mail or file servers, or corporate applications. Users might have to authenticate in many different contexts, requiring different information, such as a unique username, password, or PIN.

Table 71-12 lists the type of usernames and passwords that clientless SSL VPN users might need to know.

Table 71-12 Usernames and Passwords to Give to Users of Clientless SSL VPN Sessions

Login Username/ Password Type	Purpose	Entered When
Computer	Access the computer	Starting the computer
Internet Service Provider	Access the Internet	Connecting to an Internet service provider
Clientless SSL VPN	Access remote network	Starting clientless SSL VPN
File Server	Access remote file server	Using the clientless SSL VPN file browsing feature to access a remote file server
Corporate Application Login	Access firewall-protected internal server	Using the clientless SSL VPN web browsing feature to access an internal protected website
Mail Server	Access remote mail server via Clientless SSL VPN	Sending or receiving e-mail messages

Communicating Security Tips

Advise users to always click the logout icon on the toolbar to close the clientless SSL VPN session. (Closing the browser window does not close the session.)

Clientless SSL VPN ensures the security of data transmission between the remote PC or workstation and the ASA on the corporate network. Advise users that using clientless SSL VPN does not ensure that communication with every site is secure. If a user then accesses a non-HTTPS web resource (located on the Internet or on the internal network), the communication from the corporate ASA to the destination web server is not private because it is not encrypted.

"Observing Clientless SSL VPN Security Precautions" on page 2 addresses an additional tip to communicate with users, depending on the steps you follow within that section.

Configuring Remote Systems to Use Clientless SSL VPN Features

Table 71-13 includes the following information about setting up remote systems to use clientless SSL VPN:

- Starting clientless SSL VPN
- Using the clientless SSL VPN Floating Toolbar
- Web Browsing
- Network Browsing and File Management
- Using Applications (Port Forwarding)
- Using E-mail via Port Forwarding
- Using E-mail via Web Access
- Using E-mail via e-mail proxy

Table 71-13 also provides information about the following:

- Clientless SSL VPN requirements, by feature
- Applications supported by clientless SSL VPN
- Client application installation and configuration requirements
- Information you might need to provide end users
- Tips and use suggestions for end users

It is possible you have configured user accounts differently and that different clientless SSL VPN features are available to each user. Table 71-13 organizes information by feature, so you can skip over the information for unavailable features.

Table 71-13 Remote System Configuration and End User Requirements for Clientless SSL VPN

Task	Remote System or End User Requirements	Specifications or Use Suggestions
Starting clientless SSL VPN	Connection to the Internet	Any Internet connection is supported, including: • Home DSL, cable, or dial-ups • Public kiosks • Hotel hook-ups • Airport wireless nodes • Internet cafes
	Web browsers supported by clientless SSL VPN	See the *Cisco ASA 5500 Series VPN Compatibility Reference*
	Cookies enabled on browser	Cookies must be enabled on the browser in order to access applications via port forwarding.
	URL for clientless SSL VPN	An https address in the following form: https://*address* where *address* is the IP address or DNS hostname of an interface of the ASA (or load balancing cluster) on which clientless SSL VPN is enabled. For example: https://10.89.192.163 or https://cisco.example.com.
	Clientless SSL VPN username and password	—
	[Optional] Local printer	Clientless SSL VPN does not support printing from a web browser to a network printer. Printing to a local printer is supported.
Using the Floating Toolbar Displayed During a Clientless SSL VPN Session		A floating toolbar is available to simplify the use of clientless SSL VPN. The toolbar lets you enter URLs, browse file locations, and choose preconfigured web connections without interfering with the main browser window. If you configure your browser to block popups, the floating toolbar cannot display. The floating toolbar represents the current clientless SSL VPN session. If you click the **Close** button, the ASA prompts you to confirm that you want to close the clientless SSL VPN session. **Tip** TIP: To paste text into a text field, use Ctrl-V. (Right-clicking is disabled on the toolbar displayed during the clientless SSL VPN session.)

Table 71-13 Remote System Configuration and End User Requirements for Clientless SSL VPN (continued)

Task	Remote System or End User Requirements	Specifications or Use Suggestions
Web Browsing	Usernames and passwords for protected websites	Using clientless SSL VPN does not ensure that communication with every site is secure. See "Communicating Security Tips."
		The look and feel of web browsing with clientless SSL VPN might be different from what users are accustomed to. For example: • The title bar for clientless SSL VPN appears above each web page. • You access websites by: – Entering the URL in the Enter Web Address field on the clientless SSL VPN Home page – Clicking on a preconfigured website link on the clientless SSL VPN Home page – Clicking a link on a webpage accessed via one of the previous two methods Also, depending on how you configured a particular account, it might be that: • Some websites are blocked • Only the websites that appear as links on the clientless SSL VPN Home page are available
Network Browsing and File Management	File permissions configured for shared remote access	Only shared folders and files are accessible via clientless SSL VPN.
	Server name and passwords for protected file servers	—
	Domain, workgroup, and server names where folders and files reside	Users might not be familiar with how to locate their files through your organization network.
	—	Do not interrupt the **Copy File to Server** command or navigate to a different screen while the copying is in progress. Interrupting the operation can cause an incomplete file to be saved on the server.

Table 71-13 Remote System Configuration and End User Requirements for Clientless SSL VPN (continued)

Task	Remote System or End User Requirements	Specifications or Use Suggestions
Using Port Forwarding	**Note** On Macintosh OS X, only the Safari browser supports this feature.	
	Note Because this feature requires installing Sun Microsystems Java™ Runtime Environment and configuring the local clients, and because doing so requires administrator permissions on the local system or full control of C:\windows\System32\drivers\etc, it is unlikely that users will be able to use applications when they connect from public remote systems.	
	Caution Users should always close the Application Access window when they finish using applications by clicking the **Close** icon. Failure to quit the window properly can cause Application Access or the applications themselves to be disabled. See Recovering from hosts File Errors When Using Application Access for details.	
	Client applications installed	—
	Cookies enabled on browser	—
	Administrator privileges	User must have administrator access on the PC if you use DNS names to specify servers because modifying the hosts file requires it.
	Sun Microsystems Java Runtime Environment (JRE) version 1.4.x and 1.5.x installed. Javascript must be enabled on the browser. By default, it is enabled.	If JRE is not installed, a pop-up window displays, directing users to a site where it is available. On rare occasions, the port forwarding applet fails with JAVA exception errors. If this happens, do the following: 1. Clear the browser cache and close the browser. 2. Verify that no JAVA icons are in the computer task bar. Close all instances of JAVA. 3. Establish a clientless SSL VPN session and launch the port forwarding JAVA applet.
	Client applications configured, if necessary. **Note** The Microsoft Outlook client does not require this configuration step. All non-Windows client applications require configuration. To see if configuration is necessary for a Windows application, check the value of the Remote Server. • If the Remote Server contains the server hostname, you do not need to configure the client application. • If the Remote Server field contains an IP address, you must configure the client application.	To configure the client application, use the server's locally mapped IP address and port number. To find this information: 1. Start a clientless SSL VPN session and click the Application Access link on the Home page. The Application Access window appears. 2. In the Name column, find the name of the server you want to use, then identify its corresponding client IP address and port number (in the Local column). 3. Use this IP address and port number to configure the client application. Configuration steps vary for each client application.
	Note Clicking a URL (such as one in an -e-mail message) in an application running over a clientless SSL VPN session does not open the site over that session. To open a site over the session, paste the URL into the Enter Clientless SSL VPN (URL) Address field.	

Table 71-13 Remote System Configuration and End User Requirements for Clientless SSL VPN (continued)

Task	Remote System or End User Requirements	Specifications or Use Suggestions
Using E-mail via Application Access	Fulfill requirements for Application Access (See Using Applications)	To use mail, start Application Access from the clientless SSL VPN Home page. The mail client is then available for use.
	Note If you are using an IMAP client and you lose your mail server connection or are unable to make a new connection, close the IMAP application and restart clientless SSL VPN.	
	Other mail clients	We have tested Microsoft Outlook Express versions 5.5 and 6.0. Clientless SSL VPN should support other SMTPS, POP3S, or IMAP4S e-mail programs via port forwarding, such as Lotus Notes and Eudora, but we have not verified them.
Using E-mail via Web Access	Web-based e-mail product installed	Supported: • Microsoft Outlook Web Access to Exchange Server 2000, 2003, and 2007. For best results, use OWA on Internet Explorer 6.x or higher, or Firefox 2.0 or higher. • Lotus iNotes Other web-based e-mail products should also work, but we have not verified them.
Using E-mail via E-mail Proxy (legacy feature)	SSL-enabled mail application installed Do not set the ASA SSL version to TLSv1 Only. Outlook and Outlook Express do not support TLS.	Supported mail applications: • Microsoft Outlook 2000 and 2002 • Microsoft Outlook Express 5.5 and 6.0 • Eudora 4.2 for Windows 2000 Other SSL-enabled mail clients should also work, but we have not verified them.
	Mail application configured	See instructions and examples for your mail application in "Using E-Mail over Clientless SSL VPN."

Translating the Language of User Messages

The ASA provides language translation for the portal and screens displayed to users that initiate browser-based, clientless SSL VPN connections, as well as the interface displayed to Cisco AnyConnect VPN Client users.

This section describes how to configure the ASA to translate these user messages and includes the following sections:

- Understanding Language Translation, page 71-84
- Creating Translation Tables, page 71-85
- Referencing the Language in a Customization Object, page 71-86
- Changing a Group Policy or User Attributes to Use the Customization Object, page 71-88

Understanding Language Translation

Functional areas and their messages that are visible to remote users are organized into translation domains. Table 71-14 shows the translation domains and the functional areas translated.

Table 71-14 Translation Domains and Functional Areas Affected

Translation Domain	Functional Areas Translated
AnyConnect	*Messages displayed on the user interface of the Cisco AnyConnect VPN Client.*
CSD	Messages for Cisco Secure Desktop.
customization	*Messages on the logon and logout pages, portal page, and all the messages customizable by the user.*
banners	Banners displayed to remote users and messages when VPN access is denied.
PortForwarder	Messages displayed to Port Forwarding users.
url-list	Text that user specifies for URL bookmarks on the portal page.
webvpn	All the layer 7, AAA and portal messages that are not customizable.
plugin-ica	Messages for the Citrix plug-in.
plugin-rdp	Messages for the Remote Desktop Protocol plug-in.
plugin-telnet,ssh	Messages for the Telnet and SSH plug-in.
plugin-vnc	Messages for the VNC plug-in.

The software image package for the ASA includes a translation table template for each domain that is part of the standard functionality. The templates for plug-ins are included with the plug-ins and define their own translation domains.

You can export the template for a translation domain, which creates an XML file of the template at the URL you provide. The message fields in this file are empty. You can edit the messages and import the template to create a new translation table object that resides in flash memory.

You can also export an existing translation table. The XML file created displays the messages you edited previously. Reimporting this XML file with the same language name creates an new version of the translation table object, overwriting previous messages.

Some templates are static, but some change based on the configuration of the ASA. Because you can customize the *logon and logout pages, portal page, and URL bookmarks for clientless users,* the **ASA generates the customization** and **url-list** translation domain templates dynamically and the template automatically reflects your changes to these functional areas.

After creating translation tables, they are available to customization objects that you create and apply to group policies or user attributes. With the exception of the AnyConnect translation domain, a translation table has no affect and messages are not translated on user screens until you create a customization object, identify a translation table to use in that object, and specify that customization for the group policy or user. Changes to the translation table for the AnyConnect domain are immediately visible to AnyConnect client users.

Creating Translation Tables

The following procedure describes how to create translation tables:

Step 1 Export a translation table template to a computer with the **export webvpn translation-table** command from privileged EXEC mode.

In the following example, the **show webvpn translation-table** command shows available translation table templates and tables.

```
hostname# show import webvpn translation-table
Translation Tables' Templates:
customization
AnyConnect
CSD
PortForwarder
url-list
webvpn
Citrix-plugin
RPC-plugin
Telnet-SSH-plugin
VNC-plugin

Translation Tables:
```

The next example exports the translation table template for the customization domain, which affects messages displayed for users in clientless SSL VPN sessions. The filename of the XML file created is *portal* (user-specified) and contains empty message fields:

```
hostname# export webvpn translation-table customization template
tftp://209.165.200.225/portal
```

Step 2 Edit the translation table XML file.

The following example shows a portion of the template that was exported as *portal*. The end of this output includes a message ID field (msgid) and a message string field (msgstr) for the message *SSL VPN*, which is displayed on the portal page when a user establishes a clientless SSL VPN session. The complete template contains many pairs of message fields:

```
# Copyright (C) 2006 by Cisco Systems, Inc.
#
#, fuzzy
msgid ""
msgstr ""
"Project-Id-Version: ASA\n"
"Report-Msgid-Bugs-To: vkamyshe@cisco.com\n"
"POT-Creation-Date: 2007-03-12 18:57 GMT\n"
"PO-Revision-Date: YEAR-MO-DA HO:MI+ZONE\n"
"Last-Translator: FULL NAME <EMAIL@ADDRESS>\n"
"Language-Team: LANGUAGE <LL@li.org>\n"
"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=UTF-8\n"
"Content-Transfer-Encoding: 8bit\n"

#: DfltCustomization:24 DfltCustomization:64
msgid "Clientless SSL VPN Service"
msgstr ""
```

The message ID field (msgid) contains the default translation. The message string field (msgstr) that follows msgid provides the translation. To create a translation, enter the translated text between the quotes of the msgstr string.

Step 3 Import the translation table using the **import webvpn translation-table** command from privileged EXEC mode.

In the following example, the XML file is imported *es-us*—the abbreviation for Spanish spoken in the United States.

```
hostname# import webvpn translation-table customization language es-us
tftp://209.165.200.225/portal
hostname# !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
hostname# show import webvpn translation-table
Translation Tables' Templates:
AnyConnect
PortForwarder
csd
customization
keepout
url-list
webvpn
Citrix-plugin
RPC-plugin
Telnet-SSH-plugin
VNC-plugin

Translation Tables:
es-us customization
```

If you import a translation table for the AnyConnect domain, your changes are effective immediately. If you import a translation table for any other domain, you must continue to Step 4, where you create a customization object, identify the translation table to use in that object, and specify that customization object for the group policy or user.

Referencing the Language in a Customization Object

Now that you have created a translation table, you need to refer to this table in a customization object.

Steps 4 through 6 describe how to export the customization template, edit it, and import it as a customization object:

Step 4 Export a customization template to a URL where you can edit it using the **export webvpn customization template** command from privileged EXEC mode. The example below exports the template and creates the copy *sales* at the URL specified:

```
hostname# export webvpn customization template tftp://209.165.200.225/sales
```

Step 5 Edit the customization template and reference the previously-imported translation table.

There are two areas of XML code in the customization template that pertain to translation tables. The first area, shown below, specifies the translation tables to use:

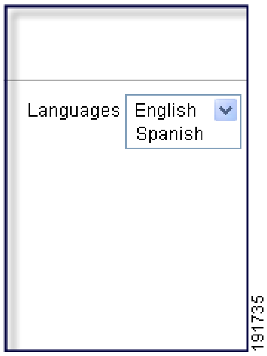
```
<localization>
   <languages>en,ja,zh,ru,ua</languages>
   <default-language>en</default-language>
</localization>
```

The <languages> tag in the XML code is followed by the names of the translation tables. In this example, they are en, ja, zh, ru, and ua. For the customization object to call these translation tables correctly, the tables must have been previously imported using the same names. These names must be compatible with language options of the browser.

The <default-language> tag specifies the language that the remote user first encounters when connecting to the ASA. In the example code above, the language is English.

Figure 71-15 shows the Language Selector that displays on the logon page. The Language Selector gives the remote user establishing an SSL VPN connection the ability to choose a language.

Figure 71-15 Language Selector



The XML code below affects the display of the Language Selector, and includes the <language selector> tag and the associated <language> tags that enable and customize the Language Selector:

```
<auth-page>
     ....
         <language-selector>
            <mode>enable</mode>
            <title l10n="yes">Language:</title>
          <language>
             <code>en</code>
             <text>English</text>
          </language>
          <language>
            <code>es-us</code>
            <text>Spanish</text>
          </language>
       </language-selector>
```

The <language-selector> group of tags includes the <mode> tag that enables and disables the displaying of the Language Selector, and the <title> tag that specifies the title of the drop-down box listing the languages.

The <language> group of tags includes the <code> and <text> tags that map the language name displayed in the Language Selector drop-down box to a specific translation table.

Make your changes to this file and save the file.

Step 6 Import the customization template as a new object using the **import webvpn customization** command from privileged EXEC mode. For example:

```
hostname# import webvpn customization sales tftp://209.165.200.225/sales
hostname# !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

The output of the **show import webvpn customization** command shows the new customization object *sales*:

```
hostname(config)# show import webvpn customization
Template
sales
hostname(config)#
```

Changing a Group Policy or User Attributes to Use the Customization Object

Now that you have created the customization object, you need to activate your changes for specific groups or users. Step 7 shows how to enable the customization object in a group policy:

Step 7 Enter the group policy webvpn configuration mode for a group policy and enable the customization object using the **customization** command. The following example shows the customization object *sales* enabled in the group policy *sales*:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# customization value sales
```

Capturing Data

The CLI **capture** command lets you log information about websites that do not display properly over a clientless SSL VPN session. This data can help your Cisco customer support engineer troubleshoot problems.

Note Enabling clientless SSL VPN capture affects the performance of the security appliance. Be sure to disable the capture after you generate the capture files needed for troubleshooting.

Perform the following steps to capture data about a clientless SSL VPN session to a file.

Step 1 To start the capture utility for clientless SSL VPN, use the **capture** command from privileged EXEC mode.

capture *capture_name* **type webvpn user** *webvpn_username*

where:

- *capture_name* is a name you assign to the capture, which is also prepended to the name of the capture files.
- *webvpn_user* is the username to match for capture.

The capture utility starts.

Step 2 A user logs in to begin a clientless SSL VPN session. The capture utility is capturing packets.

Stop the capture by using the **no** version of the command.

no capture *capture_name*

The capture utility creates a *capture_name*.zip file, which is encrypted with the password **koleso**.

Step 3 Send the .zip file to Cisco Systems, or attach it to a Cisco TAC service request.

Step 4 To look at the contents of the .zip file, unzip it using the password **koleso**.

The following example creates a capture named *hr*, which captures traffic for user2 to a file:

```
hostname# capture hr type webvpn user user2
WebVPN capture started.
   capture name   hr
   user name      user2
hostname# no capture hr
```

CHAPTER 72

Configuring AnyConnect VPN Client Connections

This section describes how to configure AnyConnect VPN Client Connections and covers the following topics:

- Information About AnyConnect VPN Client Connections, page 72-1
- Licensing Requirements for AnyConnect Connections, page 72-2
- Guidelines and Limitations, page 72-3
- Configuring AnyConnect Connections, page 72-4
- Configuring Advanced SSL VPN Features, page 72-13
- Feature History for AnyConnect Connections, page 72-18

Information About AnyConnect VPN Client Connections

The Cisco AnyConnect SSL VPN Client provides secure SSL connections to the ASA for remote users. Without a previously-installed client, remote users enter the IP address in their browser of an interface configured to accept SSL VPN connections. Unless the ASA is configured to redirect http:// requests to https://, users must enter the URL in the form https://<*address*>.

After entering the URL, the browser connects to that interface and displays the login screen. If the user satisfies the login and authentication, and the ASA identifies the user as requiring the client, it downloads the client that matches the operating system of the remote computer. After downloading, the client installs and configures itself, establishes a secure SSL connection and either remains or uninstalls itself (depending on the configuration) when the connection terminates.

In the case of a previously installed client, when the user authenticates, the ASA examines the revision of the client, and upgrades the client as necessary.

When the client negotiates an SSL VPN connection with the ASA, it connects using Transport Layer Security (TLS), and optionally, Datagram Transport Layer Security (DTLS). DTLS avoids latency and bandwidth problems associated with some SSL connections and improves the performance of real-time applications that are sensitive to packet delays.

The AnyConnect client can be downloaded from the ASA, or it can be installed manually on the remote PC by the system administrator. For more information about installing the client manually, see the *Cisco AnyConnect VPN Client Administrator Guide*.

The ASA downloads the client based on the group policy or username attributes of the user establishing the connection. You can configure the ASA to automatically download the client, or you can configure it to prompt the remote user about whether to download the client. In the latter case, if the user does not respond, you can configure the ASA to either download the client after a timeout period or present the login page.

Licensing Requirements for AnyConnect Connections

The following table shows the licensing requirements for this feature:

Model	**License Requirement**
ASA 5505	Use one of the following: • AnyConnect Premium SSL VPN license: – Base License: 2 sessions (10 combined IPSec and SSL VPN[1]). – Security Plus License: 2 sessions (25 combined IPSec and SSL VPN[1]). – *Optional permanent license: 10 or 25 sessions.* • AnyConnect Essentials license.[2]
ASA 5510	Use one of the following: • AnyConnect Premium SSL VPN license: – Base and Security Plus License: 2 sessions (250 combined IPSec and SSL VPN[1]). – *Optional permanent licenses: 10, 25, 50, 100, or 250 sessions.* – *Optional FLEX license: 250 sessions.* – *Optional Shared licenses[3]: Participant or Server. For the Server license, 500-50,000 in increments of 500 and 50,000-545,000 in increments of 1000.* • AnyConnect Essentials license.[2]
ASA 5520	Use one of the following: • AnyConnect Premium SSL VPN license: – Base and Security Plus License: 2 sessions (750 combined IPSec and SSL VPN[1]). – *Optional permanent licenses: 10, 25, 50, 100, 250, 500, or 750 sessions.* – *Optional FLEX licenses: 250 or 750 sessions.* – *Optional Shared licenses[3]: Participant or Server. For the Server license, 500-50,000 in increments of 500 and 50,000-545,000 in increments of 1000.* • AnyConnect Essentials license.[2]

Model	License Requirement
ASA 5540	Use one of the following: • AnyConnect Premium SSL VPN license: – Base and Security Plus License: 2 sessions (5000 combined IPSec and SSL VPN[1]). – *Optional permanent licenses: 10, 25, 50, 100, 250, 500, 750, 1000, or 2500 sessions.* – *Optional FLEX licenses: 250, 750, 1000, or 2500 sessions.* – *Optional Shared licenses*[3]*: Participant or Server. For the Server license, 500-50,000 in increments of 500 and 50,000-545,000 in increments of 1000.* • AnyConnect Essentials license.[2]
ASA 5550 and 5580	Use one of the following: • AnyConnect Premium SSL VPN license: – Base and Security Plus License: 2 sessions (5000 combined IPSec and SSL VPN[1]). – *Optional permanent licenses: 10, 25, 50, 100, 250, 500, 750, 1000, 2500, or 5000 sessions.* – *Optional FLEX licenses: 250, 750, 1000, 2500, or 5000 sessions.* – *Optional Shared licenses*[3]*: Participant or Server. For the Server license, 500-50,000 in increments of 500 and 50,000-545,000 in increments of 1000.* • AnyConnect Essentials license.[2]

1. Although the maximum IPSec and SSL VPN sessions add up to more than the maximum VPN sessions, the combined sessions should not exceed the VPN session limit. If you exceed the maximum VPN sessions, you can overload the ASA, so be sure to size your network appropriately.
2. The AnyConnect Essentials license lets you use the AnyConnect client to connect to the ASA, while supporting the platform limit for SSL VPN sessions. For example, you can use 25 sessions for the ASA 5505. Cisco Secure Desktop and clientless SSL VPN are not supported. The AnyConnect Essentials license is not compatible with the following licenses: AnyConnect Premium SSL VPN licenses (all types) and Advanced Endpoint Connection license. By default, the AnyConnect Essentials license is used instead of the above licenses, but you can disable the AnyConnect Essentials license in the configuration to restore use of the other licenses using the **no anyconnect-essentials** command.
3. A shared license lets the security appliance act as a shared license server for multiple client security appliances. The shared license pool is large, but the maximum number of sessions used by each individual security appliance cannot exceed the maximum number listed for permanent licenses.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Remote PC System Requirements

The AnyConnect client supports the following operating systems on the remote PC:

- Microsoft Vista
- Microsoft Windows 2000
- Microsoft Windows XP
- MAC Intel
- MAC Power PC
- Linux

The legacy SSL VPN Client (SVC) supports the following operating systems on the remote PC:

- Microsoft Windows 2000
- Microsoft Windows XP

Context Mode Guidelines

Supported in single context mode. Multiple context mode is not supported.

Firewall Mode Guidelines

Supported only in routed firewall mode. Transparent mode is not supported.

Failover Guidelines

L2TP over IPsec sessions are not supported by stateful failover.

Remote HTTPS Certificates Limitation

The ASA does not verify remote HTTPS certificates.

Configuring AnyConnect Connections

This section describes prerequisites, restrictions, and detailed tasks to configure the ASA to accept AnyConnect VPN client connections, and includes the following topics:

- Configuring the Security Appliance to Web-Deploy the Client, page 72-4
- Enabling Permanent Client Installation, page 72-6
- Configuring DTLS, page 72-6
- Prompting Remote Users, page 72-7
- Enabling AnyConnect Client Profile Downloads, page 72-8
- Enabling Additional AnyConnect Client Features, page 72-10
- Enabling Start Before Logon, page 72-10
- Translating Languages for AnyConnect User Messages, page 72-11
- Configuring Advanced SSL VPN Features, page 72-13
- Updating SSL VPN Client Images, page 72-17

Configuring the Security Appliance to Web-Deploy the Client

The section describes the steps to configure the ASA to web-deploy the AnyConnect client.

Prerequisites

Copy the client image package to the ASA using TFTP or another method.

Detailed Steps

	Command	Purpose
Step 1	**svc image** *filename order* **Example:** hostname(config-webvpn)# **svc image** **anyconnect-win-2.3.0254-k9.pkg 1** hostname(config-webvpn)# **svc image** **anyconnect-macosx-i386-2.3.0254-k9.pkg 2** hostname(config-webvpn)# **svc image** **anyconnect-linux-2.3.0254-k9.pkg 3**	Identifies a file on flash as an SSL VPN client package file. The ASA expands the file in cache memory for downloading to remote PCs. If you have multiple clients, assign an order to the client images with the order argument. If you receive the error message *ERROR: Unable to load SVC image*, use the **cache-fs limit** command to adjust the size of cache memory. The security appliance downloads portions of each client in the order you specify until it matches the operating system of the remote PC. Therefore, assign the lowest number to the image used by the most commonly-encountered operating system.
Step 2	**enable** *interface* **Example:** hostname(config)# **webvpn** hostname(config-webvpn)# **enable outside**	Enables clientless connections on an interface.
Step 3	**svc ebable**	Without issuing this command, AnyConnect does not function as expected, and **show webvpn svc** states that the "SSL VPN client is not enabled," instead of listing the installed AnyConnect packages.
Step 4	**ip local pool** *poolname startaddr-endaddr* **mask** *mask* **Example:** hostname(config)# **ip local pool vpn_users** **209.165.200.225-209.165.200.254** **mask 255.255.255.224**	(Optional) Creates an address pool. You can use another method of address assignment, such as DHCP and/or user-assigned addressing.
Step 5	**address-pool** *poolname* **Example:** hostname(config)# **tunnel-group** **telecommuters general-attributes** hostname(config-tunnel-general)# **address-pool vpn_users**	Assigns an address pool to a tunnel group.
Step 6	**default-group-policy** *name* **Example:** hostname(config-tunnel-general)# **default-group-policy sales**	Assigns a default group policy to the tunnel group.
Step 7	**group-alias** *name* **enable** **Example:** hostname(config)# **tunnel-group** **telecommuters webvpn-attributes** hostname(config-tunnel-webvpn)# **group-alias sales_department enable**	Creates and enables a group alias that displays in the group list on the login page of the clientless portal.

	Command	Purpose

Step 8	**`tunnel-group-list enable`**
	Example:
	`hostname(config)#` **`webvpn`**
	`hostname(config-webvpn)#` **`tunnel-group-list enable`**
		Enables the display of the tunnel-group list on the clientless portal login page.

Step 9	**`vpn-tunnel-protocol svc`**
	Example:
	`hostname(config)#` **`group-policy sales attributes`**
	`hostname(config-group-policy)#` **`webvpn`**
	`hostname(config-group-webvpn)#` **`vpn-tunnel-protocol svc`**
		Specifies SSL as a permitted VPN tunneling protocol for the group or user. You can also specify additional protocols. For more information, see the **vpn-tunnel-protocol** command in the *Cisco ASA 5500 Series Command Reference*.
		For more information about assigning users to group policies, see Chapter 6, Configuring Connection Profiles, Group Policies, and Users.

Enabling Permanent Client Installation

Enabling permanent client installation disables the automatic uninstalling feature of the client. The client remains installed on the remote computer for subsequent connections, reducing the connection time for the remote user.

To enable permanent client installation for a specific group or user, use the **svc keep-installer** command from group-policy or username webvpn modes:

svc keep-installer installed

The default is that permanent installation of the client is enabled. The client remains on the remote computer at the end of the session. The following example configures the existing group-policy *sales* to remove the client on the remote computer at the end of the session:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-policy)# svc keep-installer installed none
```

Configuring DTLS

Datagram Transport Layer Security (DTLS) allows the AnyConnect client establishing an SSL VPN connection to use two simultaneous tunnels—an SSL tunnel and a DTLS tunnel. Using DTLS avoids latency and bandwidth problems associated with SSL connections and improves the performance of real-time applications that are sensitive to packet delays.

By default, DTLS is enabled when SSL VPN access is enabled on an interface. If you disable DTLS, SSL VPN connections connect with an SSL VPN tunnel only.

Note In order for DTLS to fall back to a TLS connection, Dead Peer Detection (DPD) must be enabled. If you do not enable DPD, and the DTLS connection experiences a problem, the connection terminates instead of falling back to TLS. For more information on enabling DPD, see Enabling and Adjusting Dead Peer Detection, page 72-14

You can disable DTLS for all AnyConnect client users with the **enable** command **tls-only** option in webvpn configuration mode:

enable <*interface*> **tls-only**

For example:

hostname(config-webvpn)# **enable outside tls-only**

By default, DTLS is enabled for specific groups or users with the **svc dtls enable** command in group policy webvpn or username webvpn configuration mode:

[**no**] **svc dtls enable**

If you need to disable DTLS, use the **no** form of the command. For example:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# no svc dtls enable
```

Prompting Remote Users

You can enable the ASA to prompt remote SSL VPN client users to download the client with the **svc ask** command from group policy webvpn or username webvpn configuration modes:

[**no**] **svc ask** {**none** | **enable** [**default** {**webvpn** | **svc**} **timeout** *value*]}

svc ask enable prompts the remote user to download the client or go to the clientless portal page and waits indefinitely for user response.

svc ask enable default svc immediately downloads the client.

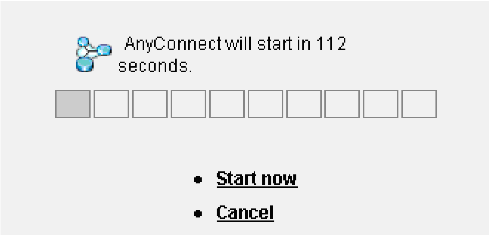
svc ask enable default webvpn immediately goes to the portal page.

svc ask enable default svc timeout *value* prompts the remote user to download the client or go to the clientless portal page and waits the duration of *value* before taking the default action—downloading the client.

svc ask enable default clientless timeout *value* prompts the remote user to download the client or go to the clientless portal page, and waits the duration of *value* before taking the default action—displaying the clientless portal page.

Figure 72-1 shows the prompt displayed to remote users when either **default svc timeout** *value or* **default webvpn timeout** *value is configured:*

Figure 72-1 Prompt Displayed to Remote Users for SSL VPN Client Download



AnyConnect will start in 112 seconds.

The following example configures the ASA to prompt the user to download the client or go to the clientless portal page and wait *10 seconds for a response* before downloading the client:

```
hostname(config-group-webvpn)# svc ask enable default svc timeout 10
```

Enabling AnyConnect Client Profile Downloads

An AnyConnect client profile is a group of configuration parameters, stored in an XML file, that the client uses to configure the connection entries that appear in the client user interface. These parameters (XML tags) include the names and addresses of host computers and settings to enable additional client features.

The AnyConnect client installation includes a profile template, named *AnyConnectProfile.tmpl*, that you can edit with a text editor and use as a basis to create other profile files. You can also set advanced parameters that are not available through the user interface. The installation also includes a complete XML schema file, named *AnyConnectProfile.xsd*.

After creating a profile, you must load the file on the ASA and configure the ASA to download it to remote client PCs.

Follow these steps to edit a profile and enable the ASA to download it to remote clients:

Step 1 Retrieve a copy of the profile file (AnyConnectProfile.tmpl) from a client installation. Table 72-1 shows the installation path for each operating system.

Table 72-1 Operating System and Profile File Installation Path

Operating System	Installation Path
Windows Vista	%ALLUSERSPROFILE%\Cisco\Cisco AnyConnect VPN Client\Profile[1]
Windows XP and 2000	%ALLUSERSPROFILE%/Application Data/Cisco/Cisco AnyConnect VPN Client/Profile[2]
Linux	/opt/cisco/vpn/profile
Mac OS X	/opt/cisco/vpn/profile

1. %ALLUSERSPROFILE% refers to the environmental variable by the same name for Windows Vista. In most installations, this is C:\Program Files.
2. %PROGRAMFILES% refers to the environmental variable by the same name for Windows XP and 2000. In most installations, this is C:\Program Files.

Step 2 Edit the profile file. The example below shows the contents of the profile file (AnyConnectProfile.tmpl) for Windows:

```
<?xml version="1.0" encoding="UTF-8"?>
<!--
    This is a template file that can be configured to support the
    identification of secure hosts in your network.

    The file needs to be renamed to cvcprofile.xml (for now).

    There is an ASA command to import updated profiles for downloading to
    client machines.  Provide some basic instruction.....
-->
<Configuration>
    <ClientInitialization>
        <UseStartBeforeLogon>false</UseStartBeforeLogon>
    </ClientInitialization>
    <HostProfile>
        <HostName></HostName>
        <HostAddress></HostAddress>
    </HostProfile>
    <HostProfile>
```

```
        <HostName></HostName>
        <HostAddress></HostAddress>
    </HostProfile>
</Configuration>
```

The <HostProfile> tags are frequently edited so that the AnyConnect client displays the names and addresses of host computers for remote users. The following example shows the <HostName> and <HostAddress> tags, with the name and address of a host computer inserted:

```
    <HostProfile>
        <HostName>Sales_gateway</HostName>
        <HostAddress>209.165.200.225</HostAddress>
    </HostProfile>
```

Step 3 Load the profile file into flash memory on the ASA and then use the **svc profiles** command from webvpn configuration mode to identify the file as a client profile to load into cache memory:

[no] svc profiles *name path}*

After the file is loaded into cache memory, the profile is available to group policies and username attributes of client users.

In the following example, the user previously created two new profile files (sales_hosts.xml and engineering_hosts.xml) from the AnyConnectProfile.tmpl file provided in the client installation and uploaded them to flash memory. Then the user specifies these files as profiles for use by group policies, specifying the names *sales* and *engineering*:

```
asa1(config-webvpn)# svc profiles sales disk0:/sales_hosts.xml
asa1(config-webvpn)# svc profiles engineering disk0:/engineering_hosts.xml
```

Entering the **dir cache:stc/profiles** command shows the profiles loaded into cache memory:

```
hostname(config-webvpn)# dir cache:/stc/profiles

Directory of cache:stc/profiles/

0      ----  774         11:54:41 Nov 22 2006  engineering.xml
0      ----  774         11:54:29 Nov 22 2006  sales.xml

2428928 bytes total (18219008 bytes free)
hostname(config-webvpn)#
```

Step 4 Enter group policy webvpn or username attributes webvpn configuration mode and specify a profile for the group or user with the **svc profiles** command:

[no] svc profiles *{***value** *profile* | **none***}*

In the following example, the user follows the **svc profiles value** command with a question mark (**?**) view the available profiles. Then the user configures the group policy to use the profile *sales*:

```
asa1(config-group-webvpn)# svc profiles value ?

config-group-webvpn mode commands/options:
Available configured profile packages:
  engineering
  sales
asa1(config-group-webvpn)# svc profiles sales
asa1(config-group-webvpn)#
```

Enabling Additional AnyConnect Client Features

To minimize download time, the client only requests downloads (from the ASA) of the core modules that it needs. As additional features become available for the AnyConnect client, you need to update the remote clients in order for them to use the features.

To enable new features, you must specify the new module names using the **svc modules** command from group policy webvpn or username webvpn configuration mode:

[no] svc modules {**none** | **value** *string*}

Separate multiple strings with commas.

For a list of values to enter for each client feature, see the release notes for the Cisco AnyConnect VPN Client.

Enabling Start Before Logon

Start Before Logon (SBL) allows login scripts, password caching, drive mapping, and more, for the AnyConnect client installed on a Windows PC. For SBL, you must enable the ASA to download the module which enables graphical identification and authentication (GINA) for the AnyConnect client. The following procedure shows how to enable SBL:

Step 1 Enable the ASA to download the GINA module for VPN connection to specific groups or users using the **svc modules** *vpngina* command from group policy webvpn or username webvpn configuration modes.

In the following example, the user enters group-policy attributes mode for the group policy *telecommuters*, enters webvpn configuration mode for the group policy, and specifies the string *vpngina*:

```
hostname(config)# group-policy telecommuters attributes
hostname(config-group-policy)# webvpn
hostame(config-group-webvpn)# svc modules value vpngina
```

Step 2 Retrieve a copy of the client profiles file (AnyConnectProfile.tmpl). For information on the location of the profiles file for each operating system, see Table 72-1 on page 72-8

Step 3 Edit the profiles file to specify that SBL is enabled. The example below shows the relevant portion of the profiles file (AnyConnectProfile.tmpl) for Windows:

```
<Configuration>
    <ClientInitialization>
        <UseStartBeforeLogon>false</UseStartBeforeLogon>
    </ClientInitialization>
```

The <UseStartBeforeLogon> tag determines whether the client uses SBL. To turn SBL on, replace *false* with *true*. The example below shows the tag with SBL turned on:

```
    <ClientInitialization>
        <UseStartBeforeLogon>true</UseStartBeforeLogon>
    </ClientInitialization>
```

Step 4 Save the changes to AnyConnectProfile.tmpl and update the profile file for the group or user on the ASA using the **svc profile** command from webvpn configuration mode. For example:

```
asa1(config-webvpn)# svc profiles sales disk0:/sales_hosts.xml
```

Translating Languages for AnyConnect User Messages

The ASA provides language translation for the portal and screens displayed to users that initiate browser-based, Clientless SSL VPN connections, as well as the interface displayed to Cisco AnyConnect VPN Client users.

This section describes how to configure the ASA to translate these user messages and includes the following sections:

- Understanding Language Translation, page 72-11
- Creating Translation Tables, page 72-11

Understanding Language Translation

Functional areas and their messages that are visible to remote users are organized into translation domains. All *messages displayed on the user interface of the Cisco AnyConnect VPN Client are located in the AnyConnect domain.*

The software image package for the ASA includes a translation table template for the AnyConnect domain. You can export the template, which creates an XML file of the template at the URL you provide. The message fields in this file are empty. You can edit the messages and import the template to create a new translation table object that resides in flash memory.

You can also export an existing translation table. The XML file created displays the messages you edited previously. Reimporting this XML file with the same language name creates an new version of the translation table object, overwriting previous messages. Changes to the translation table for the AnyConnect domain are immediately visible to AnyConnect client users.

Creating Translation Tables

The following procedure describes how to create translation tables for the AnyConnect domain:

Step 1 Export a translation table template to a computer with the **export webvpn translation-table** command from privileged EXEC mode.

In the following example, the **show webvpn translation-table** command shows available translation table templates and tables.

```
hostname# show import webvpn translation-table
Translation Tables' Templates:
customization
AnyConnect
CSD
PortForwarder
url-list
webvpn
Citrix-plugin
RPC-plugin
Telnet-SSH-plugin
VNC-plugin

Translation Tables:
```

Then the user exports the translation table for the AnyConnect translation domain. The filename of the XML file created is named *client* and contains empty message fields:

```
hostname# export webvpn translation-table AnyConnect template
tftp://209.165.200.225/client
```

In the next example, the user exports a translation table named *zh*, which was previously imported from a template. zh is the abbreviation by Microsoft Internet Explorer for the Chinese language.

```
hostname# export webvpn translation-table customization language zh
tftp://209.165.200.225/chinese_client
```

Step 2 Edit the Translation Table XML file. The following example shows a portion of the AnyConnect template. The end of this output includes a message ID field (msgid) and a message string field (msgstr) for the message *Connected*, which is displayed on the AnyConnect client GUI when the client establishes a VPN connection. The complete template contains many pairs of message fields:

```
# SOME DESCRIPTIVE TITLE.
# Copyright (C) YEAR THE PACKAGE'S COPYRIGHT HOLDER
# This file is distributed under the same license as the PACKAGE package.
# FIRST AUTHOR <EMAIL@ADDRESS>, YEAR.
#
#, fuzzy
msgid ""
msgstr ""
"Project-Id-Version: PACKAGE VERSION\n"
"Report-Msgid-Bugs-To: \n"
"POT-Creation-Date: 2006-11-01 16:39-0700\n"
"PO-Revision-Date: YEAR-MO-DA HO:MI+ZONE\n"
"Last-Translator: FULL NAME <EMAIL@ADDRESS>\n"
"Language-Team: LANGUAGE <LL@li.org>\n"
"MIME-Version: 1.0\n"
"Content-Type: text/plain; charset=CHARSET\n"
"Content-Transfer-Encoding: 8bit\n"

#: C:\cygwin\home\<user>\cvc\main\Api\AgentIfc.cpp:23
#: C:\cygwin\home\<user>\cvc\main\Api\check\AgentIfc.cpp:22
#: C:\cygwin\home\<user>\cvc\main\Api\save\AgentIfc.cpp:23
#: C:\cygwin\home\<user>\cvc\main\Api\save\AgentIfc.cpp~:20
#: C:\cygwin\home\<user>\cvc\main\Api\save\older\AgentIfc.cpp:22
msgid "Connected"
msgstr ""
```

The msgid contains the default translation. The msgstr that follows msgid provides the translation. To create a translation, enter the translated text between the quotes of the msgstr string. For example, to translate the message “Connected” with a Spanish translation, insert the Spanish text between the quotes:

```
msgid "Connected"
msgstr "Conectado"
```

Be sure to save the file.

Step 3 Import the translation table using the **import webvpn translation-table** command from privileged EXEC mode. Be sure to specify the name of the new translation table with the abbreviation for the language that is compatible with the browser.

In the following example, the XML file is imported *es-us*—the abbreviation used by Microsoft Internet Explorer for Spanish spoken in the United States.

```
hostname# import webvpn translation-table AnyConnect language es-us
tftp://209.165.200.225/client
hostname# !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
hostname# show import webvpn translation-table
Translation Tables' Templates:
AnyConnect
PortForwarder
```

```
csd
customization
keepout
url-list
webvpn
Citrix-plugin
RPC-plugin
Telnet-SSH-plugin
VNC-plugin

Translation Tables:
es-us AnyConnect
```

Configuring Advanced SSL VPN Features

The following section describes advanced features that fine-tune SSL VPN connections, and includes the following sections:

- Enabling Rekey, page 72-13
- Enabling and Adjusting Dead Peer Detection, page 72-14
- Enabling Keepalive, page 72-14
- Using Compression, page 72-15
- Adjusting MTU Size, page 72-16
- Updating SSL VPN Client Images, page 72-17

Enabling Rekey

When the ASA and the SSL VPN client perform a rekey, they renegotiate the crypto keys and initialization vectors, increasing the security of the connection.

To enable the client to perform a rekey on an SSL VPN connection for a specific group or user, use the **svc rekey** command from group-policy and username webvpn modes.

[no] svc rekey {**method** {**new-tunnel** | **none** | **ssl**} | **time** *minutes*}

method new-tunnel specifies that the client establishes a new tunnel during rekey.

method none disables rekey.

method ssl specifies that SSL renegotiation takes place during rekey.

time *minutes* specifies the number of minutes from the start of the session, or from the last rekey, until the rekey takes place, from 1 to 10080 (1 week).

In the following example, the client is configured to renegotiate with SSL during rekey, which takes place 30 minutes after the session begins, for the existing group-policy *sales*:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-policy)# svc rekey method ssl
hostname(config-group-policy)# svc rekey time 30
```

Enabling and Adjusting Dead Peer Detection

Dead Peer Detection (DPD) ensures that the ASA (gateway) or the client can quickly detect a condition where the peer is not responding, and the connection has failed.

To enable DPD on the ASA or client for a specific group or user, and to set the frequency with which either the ASA or client performs DPD, use the **svc dpd-interval** command from group-policy or username webvpn mode:

svc dpd-interval {[**gateway** {*seconds* | **none**}] | [**client** {*seconds* | **none**}]}

no svc dpd-interval {[**gateway** {*seconds* | **none**}] | [**client** {*seconds* | **none**}]}

Where:

gateway seconds enables DPD performed by the ASA (gateway) and specifies the frequency, from 5 to 3600 seconds, with which the ASA (gateway) performs DPD.

gateway none disables DPD performed by the ASA.

client *seconds* enable DPD performed by the client, and specifies the frequency, from 5 to 3600 seconds, with which the client performs DPD.

client none disables DPD performed by the client.

To remove the **svc dpd-interval** command from the configuration, use the **no** form of the command:

Note If you enable DTLS, enable Dead Peer Detection (DPD) also. DPD enables a failed DTLS connection to fallback to TLS. Otherwise, the connection terminates.

The following example sets the frequency of DPD performed by the ASA to 30 seconds, and the frequency of DPD performed by the client set to 10 seconds for the existing group-policy *sales*:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-policy)# svc dpd-interval gateway 30
hostname(config-group-policy)# svc dpd-interval client 10
```

Enabling Keepalive

You can adjust the frequency of keepalive messages to ensure that an SSL VPN connection through a proxy, firewall, or NAT device remains open, even if the device limits the time that the connection can be idle. Adjusting the frequency also ensures that the client does not disconnect and reconnect when the remote user is not actively running a socket-based application, such as Microsoft Outlook or Microsoft Internet Explorer.

Note Keepalives are enabled by default. If you disable keepalives, in the event of a failover event, SSL VPN client sessions are not carried over to the standby device.

To set the frequency of keepalive messages, use the **svc keepalive** command from group-policy webvpn or username webvpn configuration mode:

[no] svc keepalive {none | *seconds***}**

none disables client keepalive messages.

seconds enables the client to send keepalive messages, and specifies the frequency of the messages in the range of 15 to 600 seconds.

The default is keepalive messages are enabled.

Use the **no** form of the command to remove the command from the configuration and cause the value to be inherited:

In the following example, the ASA is configured to enable the client to send keepalive messages with a frequency of 300 seconds (5 minutes), for the existing group-policy *sales*:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc keepalive 300
```

Using Compression

Compression increases the communications performance between the ASA and the client by reducing the size of the packets being transferred for low-bandwidth connections. By default, compression for all SSL VPN connections is enabled on the ASA, both at the global level and for specific groups or users.

Compression must be turned-on globally using the **compression svc** command from global configuration mode, and then it can be set for specific groups or users with the **svc compression** command in group-policy and username webvpn modes.

Note When implementing compression on broadband connections, you must carefully consider the fact that compression relies on loss-less connectivity. This is the main reason that it is not enabled by default on boradband connections.

Changing Compression Globally

To change the global compression settings, use the **compression svc** command from global configuration mode:

compression svc

no compression svc

To remove the command from the configuration, use the **no** form of the command.

In the following example, compression is disabled for all SSL VPN connections globally:

```
hostname(config)# no compression svc
```

Changing Compression for Groups and Users

To change compression for a specific group or user, use the **svc compression** command in the group-policy and username webvpn modes:

svc compression {**deflate** | **none**}

no svc compression {**deflate** | **none**}

By default, for groups and users, SSL compression is set to *deflate* (enabled).

To remove the **svc compression** command from the configuration and cause the value to be inherited from the global setting, use the **no** form of the command:

In the following example, compression is disabled for the group-policy sales:

```
hostname(config)# group-policy sales attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc compression none
```

Adjusting MTU Size

You can adjust the MTU size (from 256 to 1406 bytes) for SSL VPN connections established by the client with the **svc mtu** command from group policy webvpn or username webvpn configuration mode:

[no] svc mtu *size*

This command affects only the AnyConnect client. The legacy Cisco SSL VPN Client (SVC) is not capable of adjusting to different MTU sizes.

The default for this command in the default group policy is **no svc mtu**. The MTU size is adjusted automatically based on the MTU of the interface that the connection uses, minus the IP/UDP/DTLS overhead.

This command affects client connections established in SSL and those established in SSL with DTLS.

Examples

The following example configures the MTU size to 1200 bytes for the group policy *telecommuters*:

```
hostname(config)# group-policy telecommuters attributes
hostname(config-group-policy)# webvpn
hostname(config-group-webvpn)# svc mtu 1200
```

Monitoring SSL VPN Sessions

You can monitor information about active sessions using the **show vpn-sessiondb** command in privileged EXEC mode:

show vpn-sessiondb svc

The Inactivity field shows the elapsed time since an AnyConnect session lost connectivity. If the session is active, 00:00m:00s appears in this field.

The following example shows the output of the **show vpn-sessiondb svc** command:

```
hostname# show vpn-sessiondb svc

Session Type: SSL VPN Client

Username    : lee
Index       : 1                  IP Addr        : 209.165.200.232
Protocol    : SSL VPN Client     Encryption     : 3DES
Hashing     : SHA1               Auth Mode      : userPassword
TCP Dst Port: 443                TCP Src Port   : 54230
Bytes Tx    : 20178              Bytes Rx       : 8662
Pkts Tx     : 27                 Pkts Rx        : 19
Client Ver  : Cisco STC 1.1.0.117
Client Type: Internet Explorer
Group       : DftlGrpPolicy
Login Time  : 14:32:03 UTC Wed Mar 20 2007
Duration    : 00h:00m:04s
Inactivity  : 0h:28m:48s
Filter Name:
```

Logging Off SVC Sessions

To log off all SSL VPN sessions, use the **vpn-sessiondb logoff svc** command in global configuration mode:

vpn-sessiondb logoff svc

The following example logs off all SSL VPN sessions:

```
hostname# vpn-sessiondb logoff svc
INFO: Number of sessions of type “svc” logged off : 1
```

You can log off individual sessions using either the **name option** or the **index option**:

vpn-session-db logoff name *name*

vpn-session-db logoff index *index*

You can find both the username and the index number (established by the order of the client images) in the output of the **show vpn-sessiondb svc** command. The following example shows the username *lee* and index number *1*.

```
hostname# show vpn-sessiondb svc

Session Type: SSL VPN Client

Username       : lee
Index          : 1                      IP Addr     : 209.165.200.232
Protocol       : SSL VPN Client         Encryption  : 2DES
Hashing        : SHA1                   Auth Mode   : userPassword
TCP Det Port   : 443                    TCP Src Port: 54230
Bytes Tx       : 20178                  Bytes Rx    : 8662
Pkts Tx        : 27                     Pkts Rx     : 19
Client Ver     : Cisco STC 1.1.0.117
Client Type    : Internet Explorer
Group          : DfltGrpPolicy
Login Time     : 14:32:03 UTC Wed Mar 26 2007
Duration       : 0h:00m:04s
Inactivity     : 0h:28m:48s
Filter Name    :
```

The following example terminates the session using the **name** option of the **vpn-session-db logoff** command:

```
hostname# vpn-sessiondb logoff name tester
Do you want to logoff the VPN session(s) [confirm]
INFO: Number of sessions with name “mkrupp” logged off : 0

hostname#
```

Updating SSL VPN Client Images

You can update the client images on the ASA at any time using the following procedure:

Step 1 Copy the new client images to the ASA using the **copy** command from privileged EXEC mode, or using another method.

Step 2 If the new client image files have the same filenames as the files already loaded, reenter the **svc image** command that is in the configuration. If the new filenames are different, uninstall the old files using the **no svc image** command. Then use the **svc image** command to assign an order to the images and cause the ASA to load the new images.

Monitoring AnyConnect Connections

To view information about active sessions use the **show vpn-sessiondb**:

Command	Purpose
`show vpn-sessiondb svc`	Displays information about active sessions.
`vpn-sessiondb logoff svc`	Logs off SSL VPN sessions.

Examples

```
hostname# show vpn-sessiondb svc

Session Type: SSL VPN Client

Username     : lee
Index        : 1                      IP Addr      : 209.165.200.232
Protocol     : SSL VPN Client         Encryption   : 3DES
Hashing      : SHA1                   Auth Mode    : userPassword
TCP Dst Port : 443                    TCP Src Port : 54230
Bytes Tx     : 20178                  Bytes Rx     : 8662
Pkts Tx      : 27                     Pkts Rx      : 19
Client Ver   : Cisco STC 1.1.0.117
Client Type  : Internet Explorer
Group        : DfltGrpPolicy
Login Time   : 14:32:03 UTC Wed Mar 20 2007
Duration     : 0h:00m:04s
Filter Name  :

hostname# vpn-sessiondb logoff svc
INFO: Number of sessions of type "svc" logged off : 1

hostname# vpn-sessiondb logoff name tester
Do you want to logoff the VPN session(s)? [confirm]
INFO: Number of sessions with name "tester" logged off : 1
```

Feature History for AnyConnect Connections

Table 72-2 lists the release history for this feature.

Table 72-2 Feature History for AnyConnect Connections

Feature Name	Releases	Feature Information
AnyConnect Connections	8.0(2)	The following commands were introduced or modified: **svc image**, **vpn-tunnel-protocol, vpn-sessiondb**.

CHAPTER 73

Configuring Digital Certificates

This chapter describes how to configure digital certificates, and includes the following sections:

- Information About Digital Certificates, page 73-1
- Licensing Requirements for Digital Certificates, page 73-7
- Prerequisites for Certificates, page 73-7
- Guidelines and Limitations, page 73-7
- Configuring Digital Certificates, page 73-8
- Monitoring Digital Certificates, page 73-43
- Feature History for Certificate Management, page 73-45

Information About Digital Certificates

CAs are responsible for managing certificate requests and issuing digital certificates. A digital certificate includes information that identifies a user or device, such as a name, serial number, company, department, or IP address. A digital certificate also includes a copy of the public key for the user or device. A CA can be a trusted third party, such as VeriSign, or a private (in-house) CA that you establish within your organization.

Tip For an example of a scenario that includes certificate configuration and load balancing, see the following URL:

https://supportforums.cisco.com/docs/DOC-5964

This section includes the following topics:

- Public Key Cryptography, page 73-2
- Certificate Scalability, page 73-2
- Key Pairs, page 73-2
- Trustpoints, page 73-3
- Revocation Checking, page 73-4
- The Local CA, page 73-6

Public Key Cryptography

Digital signatures, enabled by public key cryptography, provide a way to authenticate devices and users. In public key cryptography, such as the RSA encryption system, each user has a key pair containing both a public and a private key. The keys act as complements, and anything encrypted with one of the keys can be decrypted with the other.

In simple terms, a signature is formed when data is encrypted with a private key. The signature is attached to the data and sent to the receiver. The receiver applies the public key of the sender to the data. If the signature sent with the data matches the result of applying the public key to the data, the validity of the message is established.

This process relies on the receiver having a copy of the public key of the sender and a high degree of certainty that this key belongs to the sender, not to someone pretending to be the sender.

Obtaining the public key of a sender is normally handled externally or through an operation performed at installation. For example, most web browsers are configured with the root certificates of several CAs by default. For VPN, the IKE protocol, a component of IPSec, can use digital signatures to authenticate peer devices before setting up security associations.

Certificate Scalability

Without digital certificates, you must manually configure each IPSec peer for each peer with which it communicates; as a result, each new peer that you add to a network would require a configuration change on each peer with which it needs to communicate securely.

When you use digital certificates, each peer is enrolled with a CA. When two peers try to communicate, they exchange certificates and digitally sign data to authenticate each other. When a new peer is added to the network, you enroll that peer with a CA and none of the other peers need modification. When the new peer attempts an IPSec connection, certificates are automatically exchanged and the peer can be authenticated.

With a CA, a peer authenticates itself to the remote peer by sending a certificate to the remote peer and performing some public key cryptography. Each peer sends its unique certificate, which was issued by the CA. This process works because each certificate encapsulates the public key for the associated peer, each certificate is authenticated by the CA, and all participating peers recognize the CA as an authenticating authority. The process is called IKE with an RSA signature.

The peer can continue sending its certificate for multiple IPSec sessions, and to multiple IPSec peers, until the certificate expires. When its certificate expires, the peer administrator must obtain a new one from the CA.

CAs can also revoke certificates for peers that no longer participate in IPSec. Revoked certificates are not recognized as valid by other peers. Revoked certificates are listed in a CRL, which each peer may check before accepting a certificate from another peer.

Some CAs have an RA as part of their implementation. An RA is a server that acts as a proxy for the CA, so that CA functions can continue when the CA is unavailable.

Key Pairs

Key pairs are RSA keys, which have the following characteristics:

- RSA keys can be used for SSH or SSL.
- SCEP enrollment supports the certification of RSA keys.

- For the purposes of generating keys, the maximum key modulus for RSA keys is 2048 bits. The default size is 1024. Many SSL connections using identity certificates with RSA key pairs that exceed 1024 bits can cause a high CPU usage on the ASA and rejected clientless logins.
- For signature operations, the supported maximum key size is 4096 bits.
- You can generate a general purpose RSA key pair, used for both signing and encryption, or you can generate separate RSA key pairs for each purpose. Separate signing and encryption keys help to reduce exposure of the keys, because SSL uses a key for encryption but not for signing. However, IKE uses a key for signing but not encryption. By using separate keys for each, exposure of the keys is minimized.

Trustpoints

Trustpoints let you manage and track CAs and certificates. A trustpoint is a representation of a CA or identity pair. A trustpoint includes the identity of the CA, CA-specific configuration parameters, and an association with one, enrolled identity certificate.

After you have defined a trustpoint, you can reference it by name in commands requiring that you specify a CA. You can configure many trustpoints.

Note If an ASA has multiple trustpoints that share the same CA, only one of these trustpoints sharing the CA can be used to validate user certificates. To control which trustpoint sharing a CA is used for validation of user certificates issued by that CA, use the **support-user-cert-validation** command.

For automatic enrollment, a trustpoint must be configured with an enrollment URL, and the CA that the trustpoint represents must be available on the network and must support SCEP.

You can export and import the keypair and issued certificates associated with a trustpoint in PKCS12 format. This format is useful to manually duplicate a trustpoint configuration on a different ASA.

Certificate Enrollment

The ASA needs a CA certificate for each trustpoint and one or two certificates for itself, depending upon the configuration of the keys used by the trustpoint. If the trustpoint uses separate RSA keys for signing and encryption, the ASA needs two certificates, one for each purpose. In other key configurations, only one certificate is needed.

The ASA supports enrollment with SCEP and manual enrollment, which lets you paste a base-64-encoded certificate directly into the terminal. For site-to-site VPNs, you must enroll each ASA. For remote access VPNs, you must enroll each ASA and each remote access VPN client.

Revocation Checking

When a certificate is issued, it is valid for a fixed period of time. Sometimes a CA revokes a certificate before this time period expires; for example, because of security concerns or a change of name or association. CAs periodically issue a signed list of revoked certificates. Enabling revocation checking forces the ASA to check that the CA has not revoked a certificate each time that it uses the certificate for authentication.

When you enable revocation checking, the ASA checks certificate revocation status during the PKI certificate validation process, which can use either CRL checking, or OCSP, or both. OCSP is *only* used when the first method returns an error (for example, that the server is unavailable).

With CRL checking, the ASA retrieves, parses, and caches CRLs, which provide a complete list of revoked certificates. OCSP offers a more scalable method of checking revocation status in that it localizes certificate status through a validation authority, which it queries for status of a specific certificate.

Supported CA Servers

The ASA supports the following CA servers:

Cisco IOS CS, ASA Local CA, and third-party X.509 compliant CA vendors including, but not limited to:

- Baltimore Technologies
- Entrust
- Digicert
- Geotrust
- Godaddy
- iPlanet/Netscape
- Microsoft Certificate Services
- RSA Keon
- Thawte
- VeriSign

CRLs

CRLs provide the ASA with one way of determining whether a certificate that is within its valid time range has been revoked by the issuing CA. CRL configuration is part of configuration of a trustpoint.

You can configure the ASA to make CRL checks mandatory when authenticating a certificate by using the **revocation-check crl** command. You can also make the CRL check optional by using the **revocation-check crl none** command, which allows the certificate authentication to succeed when the CA is unavailable to provide updated CRL data.

The ASA can retrieve CRLs from CAs using HTTP, SCEP, or LDAP. CRLs retrieved for each trustpoint are cached for a configurable amount of time for each trustpoint.

When the ASA has cached a CRL for longer than the amount of time it is configured to cache CRLs, the ASA considers the CRL too old to be reliable, or “stale.” The ASA tries to retrieve a newer version of the CRL the next time that a certificate authentication requires a check of the stale CRL.

The ASA caches CRLs for an amount of time determined by the following two factors:

- The number of minutes specified with the **cache-time** command. The default value is 60 minutes.
- The NextUpdate field in the CRLs retrieved, which may be absent from CRLs. You control whether the ASA requires and uses the NextUpdate field with the **enforcenextupdate** command.

The ASA uses these two factors in the following ways:

- If the NextUpdate field is not required, the ASA marks CRLs as stale after the length of time defined by the **cache-time** command.
- If the NextUpdate field is required, the ASA marks CRLs as stale at the sooner of the two times specified by the **cache-time** command and the NextUpdate field. For example, if the **cache-time** command is set to 100 minutes and the NextUpdate field specifies that the next update is 70 minutes away, the ASA marks CRLs as stale in 70 minutes.

If the ASA has insufficient memory to store all CRLs cached for a given trustpoint, it deletes the least recently used CRL to make room for a newly retrieved CRL. For information about configuring CRL behavior for a trustpoint, see the "Obtaining Certificates Automatically with SCEP" section on page 73-20.

OCSP

OCSP provides the ASA with a way of determining whether a certificate that is within its valid time range has been revoked by the issuing CA. OCSP configuration is part of trustpoint configuration.

OCSP localizes certificate status on a validation authority (an OCSP server, also called the *responder*) which the ASA queries for the status of a specific certificate. This method provides better scalability and more up-to-date revocation status than does CRL checking, and helps organizations with large PKI installations deploy and expand secure networks.

Note The ASA allows a five-second time skew for OCSP responses.

You can configure the ASA to make OCSP checks mandatory when authenticating a certificate by using the **revocation-check ocsp** command. You can also make the OCSP check optional by using the **revocation-check ocsp none** command, which allows the certificate authentication to succeed when the validation authority is unavailable to provide updated OCSP data.

OCSP provides three ways to define the OCSP server URL. The ASA uses these servers in the following order:

1. The OCSP URL defined in a match certificate override rule by using the **match certificate** command).
2. The OCSP URL configured by using the **ocsp url** command.
3. The AIA field of the client certificate.

Note To configure a trustpoint to validate a self-signed OCSP responder certificate, you import the self-signed responder certificate into its own trustpoint as a trusted CA certificate. Then you configure the **match certificate** command in the client certificate validating trustpoint to use the trustpoint that includes the self-signed OCSP responder certificate to validate the responder certificate. Use the same procedure for configuring validating responder certificates external to the validation path of the client certificate.

The OCSP server (responder) certificate usually signs the OCSP response. After receiving the response, the ASA tries to verify the responder certificate. The CA normally sets the lifetime of the OCSP responder certificate to a relatively short period to minimize the chance of being compromised.The CA usually also includes an ocsp-no-check extension in the responder certificate, which indicates that this certificate does not need revocation status checking. However, if this extension is not present, the ASA tries to check revocation status using the same method specified in the trustpoint. If the responder certificate is not verifiable, revocation checks fail. To avoid this possibility, use the **revocation-check none** command to configure the responder certificate validating trustpoint, and use the r**evocation-check ocsp** command to configure the client certificate.

The Local CA

The local CA performs the following tasks:

- Integrates basic certificate authority operation on the ASA.
- Deploys certificates.
- Provides secure revocation checking of issued certificates.
- Provides a certificate authority on the adaptive security appliance for use with browser-based and client-based SSL VPN connections.
- Provides trusted digital certificates to users, without the need to rely on external certificate authorization.
- Provides a secure, in-house authority for certificate authentication and offers straightforward user enrollment by means of a website login.

The Local CA Server

After you configure a local CA server on the ASA, users can enroll for a certificate by logging into a website and entering a username and a one-time password that is provided by the local CA administrator to validate their eligibility for enrollment.

As shown in Figure 73-1, the local CA server resides on the ASA and handles enrollment requests from website users and CRL inquiries coming from other certificate validating devices and ASAs. Local CA database and configuration files are maintained either on the ASA flash memory (default storage) or on a separate storage device.

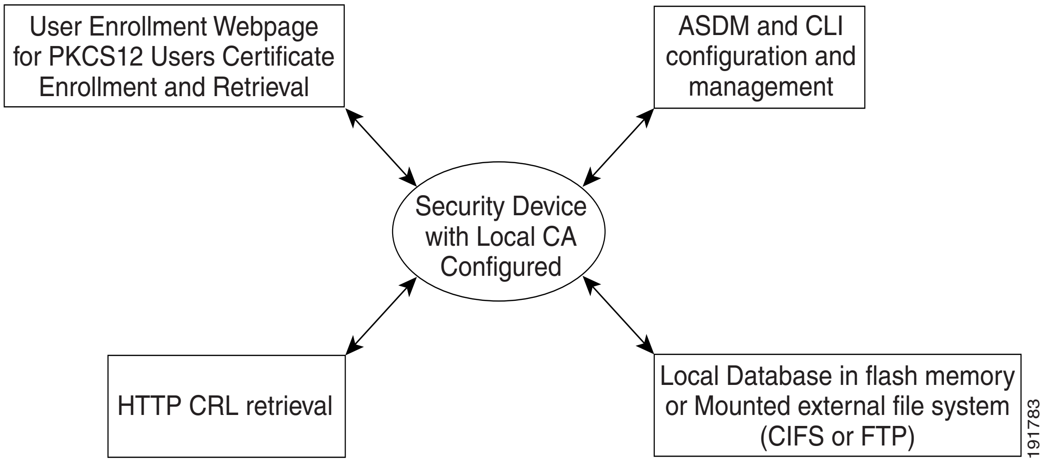

User Enrollment Webpage for PKCS12 Users Certificate Enrollment and Retrieval
ASDM and CLI configuration and management
Security Device with Local CA Configured
HTTP CRL retrieval
Local Database in flash memory or Mounted external file system (CIFS or FTP)
191783

Figure 73-1 The Local CA

Storage for Local CA Files

The ASA accesses and implements user information, issued certificates, and revocation lists using a local CA database. This database resides in local flash memory by default, or can be configured to reside on an external file system that is mounted and accessible to the ASA.

No limits exist on the number of users that can be stored in the local CA user database; however, if flash memory storage issues arise, syslogs are generated to alert the administrator to take action, and the local CA could be disabled until the storage issues are resolved. Flash memory can store a database with 3500 users or less; however, a database of more than 3500 users requires external storage.

Licensing Requirements for Digital Certificates

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Prerequisites for Certificates

Certificates have the following prerequisites:

- Make sure that the ASA is configured correctly to support certificates. An incorrectly configured ASA can cause enrollment to fail or request a certificate that includes inaccurate information.
- Make sure that the hostname and domain name of the ASA are configured correctly. To view the currently configured hostname and domain name, enter the **show running-config** command.
- Make sure that the ASA clock is set accurately before configuring the CA. Certificates have a date and time that they become valid and expire. When the ASA enrolls with a CA and obtains a certificate, the ASA checks that the current time is within the valid range for the certificate. If it is outside that range, enrollment fails.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature.

Context Mode Guidelines

Supported in single and multiple context mode.

Firewall Mode Guidelines

Supported in routed and transparent firewall mode.

Failover Guidelines

Does not support Active/Active Failover for the local CA.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines

- Does not support VPN load balancing for the local CA.
- The local CA cannot be subordinate to another CA; it can act only as the root CA.
- Only one local CA server at a time can be resident on an ASA.
- For ASAs that are configured as CA servers or clients, limit the validity period of the certificate to less than the recommended end date of 03:14:08 UTC, January 19, 2038. This guideline also applies to imported certificates from third-party vendors.

Configuring Digital Certificates

This section describes how to configure digital certificates, and includes the following topics:

- Configuring Key Pairs, page 73-9
- Removing Key Pairs, page 73-9
- Configuring Trustpoints, page 73-10
- Exporting a Trustpoint Configuration, page 73-15
- Importing a Trustpoint Configuration, page 73-15
- Configuring CA Certificate Map Rules, page 73-16
- Obtaining Certificates Manually, page 73-17
- Obtaining Certificates Automatically with SCEP, page 73-20
- Enabling the Local CA Server, page 73-22
- Configuring the Local CA Server, page 73-23
- Customizing the Local CA Server, page 73-25
- Debugging the Local CA Server, page 73-27
- Disabling the Local CA Server, page 73-27
- Deleting the Local CA Server, page 73-28
- Configuring Local CA Certificate Characteristics, page 73-28

Configuring Key Pairs

To generate key pairs, perform the following steps:

	Command	Purpose

Step 1	**`crypto key generate rsa`**
	Example:
	`hostname (config)# crypto key generate rsa`
		Generates one, general-purpose RSA key pair. The default key modulus is 1024. To specify other modulus sizes, use the **modulus** keyword.
		Note Many SSL connections using identity certificates with RSA key pairs that exceed 1024 bits can cause high CPU usage on the ASA and rejected clientless logins.

Step 2	**`crypto key generate rsa label`** *`key-pair-label`*
	Example:
	`hostname (config)# crypto key generate rsa label exchange`
		(Optional) Assigns a label to each key pair. The label is referenced by the trustpoint that uses the key pair. If you do not assign a label, the key pair is automatically labeled, *Default-RSA-Key*.

Step 3	**`show crypto key`** *`name of key`*
	Example:
	`hostname (config)# show crypto key examplekey`
		Verifies key pairs that you have generated.

Step 4	**`write memory`**
	Example:
	`hostname(config)# write memory`
		Saves the key pair that you have generated.

Removing Key Pairs

To remove key pairs, enter the following command:

Command	Purpose

`crypto key zeroize rsa`
Example:
`hostname(config)# crypto key zeroize rsa`
	Removes key pairs.

Examples

The following example shows how to remove key pairs:

```
hostname(config)# crypto key zeroize rsa
WARNING: All RSA keys will be removed.
WARNING: All device certs issued using these keys will also be removed.
```

```
Do you really want to remove these keys? [yes/no] y
```

Configuring Trustpoints

To configure a trustpoint, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca trustpoint`** *`trustpoint-name`*
	Example:
	`hostname (config)# crypto ca trustpoint Main`
		Creates a trustpoint that corresponds to the CA from which the ASA needs to receive a certificate. Enters the crypto ca trustpoint configuration mode, which controls CA-specific trustpoint parameters that you may configure starting in Step 3.

Step 2	Do one of the following:	

	`enrollment url` *`url`*
	Example:
	`hostname (config-ca-trustpoint)# enrollment url http://10.29.67.142:80/certsrv/mscep/mscep.dll`
		Requests automatic enrollment using SCEP with the specified trustpoint and configures the enrollment URL.

	`enrollment terminal`
	Example:
	`hostname (config-ca-trustpoint)# enrollment terminal`
		Requests manual enrollment with the specified trustpoint by pasting the certificate received from the CA into the terminal.

Step 3	**`revocation-check crl none`**
	`revocation-check crl`
	`revocation-check none`
	Example:
	`hostname (config-ca-trustpoint)# revocation-check crl none`
	`hostname (config-ca-trustpoint)# revocation-check crl`
	`hostname (config-ca-trustpoint)# revocation-check none`
		Specifies the available CRL configuration options.
		Note To enable either required or optional CRL checking, make sure that you configure the trustpoint for CRL management after obtaining certificates. To configure CRL management for a trustpoint, see the "Obtaining Certificates Automatically with SCEP" section on page 73-20.

Step 4	**`crl configure`**
	Example:
	`hostname (config-ca-trustpoint)# crl configure`
		Enters CRL configuration mode.

Step 5	**`email`** *`address`*
	Example:
	`hostname (config-ca-trustpoint)# email example@cisco.com`
		During enrollment, asks the CA to include the specified e-mail address in the Subject Alternative Name extension of the certificate.

	Command	Purpose

Step 6	**`enrollment retry period`**
	Example:
	`hostname (config-ca-trustpoint)# enrollment retry period 5`
		(Optional) Specifies a retry period in minutes, and applies *only* to SCEP enrollment.

Step 7	**`enrollment retry count`**
	Example:
	`hostname (config-ca-trustpoint)# enrollment retry period 2`
		(Optional) Specifies a maximum number of permitted retries, and applies *only* to SCEP enrollment.

Step 8	**`fqdn`** *`fqdn`*
	Example:
	`hostname (config-ca-trustpoint)# fqdn example.cisco.com`
		During enrollment, asks the CA to include the specified fully qualified domain name in the Subject Alternative Name extension of the certificate.

Step 9	**`ip-address`** *`ip-address`*
	Example:
	`hostname (config-ca-trustpoint)# ip-address 10.10.100.1`
		During enrollment, asks the CA to include the IP address of the ASA in the certificate.

Step 10	**`keypair`** *`name`*
	Example:
	`hostname (config-ca-trustpoint)# keypair exchange`
		Specifies the key pair whose public key is to be certified.

Step 11	**`match certificate map-name override ocsp`**
	Example:
	`hostname (config-ca-trustpoint)# match certificate examplemap override ocsp`
		Configures OCSP URL overrides and trustpoints to use for validating OCSP responder certificates.

Step 12	**`ocsp disable-nonce`**
	Example:
	`hostname (config-ca-trustpoint)# ocsp disable-nonce`
		Disables the nonce extension on an OCSP request. The nonce extension cryptographically binds requests with responses to avoid replay attacks.

Step 13	**`ocsp url`**
	Example:
	`hostname (config-ca-trustpoint)# ocsp url`
		Configures an OCSP server for the ASA to use to check all certificates associated with a trustpoint rather than the server specified in the AIA extension of the client certificate.

	Command	Purpose

Step 14	**`password`** *`string`*
	Example:
	`hostname (config-ca-trustpoint)# password mypassword`
		Specifies a challenge phrase that is registered with the CA during enrollment. The CA usually uses this phrase to authenticate a subsequent revocation request.

Step 15	**`revocation check`**
	Example:
	`hostname (config-ca-trustpoint)# revocation check`
		Sets one or more methods for revocation checking: CRL, OCSP, and none.

Step 16	**`subject-name`** *`X.500 name`*
	Example:
	`hostname (config-ca-trustpoint)# myname X.500 examplename`
		During enrollment, asks the CA to include the specified subject DN in the certificate. If a DN string includes a comma, enclose the value string within double quotes (for example, O=”Company, Inc.”).

Step 17	**`serial-number`**
	Example:
	`hostname (config-ca-trustpoint)# serial number JMX1213L2A7`
		During enrollment, asks the CA to include the ASA serial number in the certificate.

Step 18	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.

Configuring CRLs for a Trustpoint

To use mandatory or optional CRL checking during certificate authentication, you must configure CRLs for each trustpoint. To configure CRLs for a trustpoint, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca trustpoint`** *`trustpoint-name`*
	Example:
	`hostname (config)# crypto ca trustpoint Main`
		Enters crypto ca trustpoint configuration mode for the trustpoint whose CRL configuration you want to modify.
		Note Make sure that you have enabled CRLs before entering this command. In addition, the CRL must be available for authentication to succeed.

Step 2	**`crl configure`**
	Example:
	`hostname (config-ca-trustpoint)# crl configure`
		Enters crl configuration mode for the current trustpoint.
		Tip To set all CRL configuration parameters to default values, use the **default** command. At any time during CRL configuration, reenter this command to restart the procedure.

Step 3	Do one of the following:	

	`policy cdp`
	Example:
	`hostname (config-ca-crl)# policy cdp`
		Configures retrieval policy. CRLs are retrieved only from the CRL distribution points specified in authenticated certificates.
		Note SCEP retrieval is not supported by distribution points specified in certificates.
		To continue, go to Step 5.

	`policy static`
	Example:
	`hostname (config-ca-crl)# policy static`
		Configures retrieval policy. CRLs are retrieved only from URLs that you configure.
		To continue, go to Step 4.

	`policy both`
	Example:
	`hostname (config-ca-crl)# policy both`
		Configures retrieval policy. CRLs are retrieved from CRL distribution points specified in authenticated certificates and from URLs that you configure.
		To continue, go to Step 4.

Step 4	**`url`** *`n url`*
	Example:
	`hostname (config-ca-crl)# url 2 http://www.example.com`
		If you used the keywords **static** or **both** when you configured the CRL policy, you must configure URLs for CRL retrieval. You can enter up to five URLs, ranked 1 through 5. The *n* is the rank assigned to the URL. To remove a URL, use the **no url** *n* command.

	Command	Purpose

Step 5	**`protocol http | ldap | scep`**
	Example:
	`hostname (config-ca-crl)# protocol http`
		Configures the retrieval method. Specifies HTTP, LDAP, or SCEP as the CRL retrieval method.

Step 6	**`cache-time`** *`refresh-time`*
	Example:
	`hostname (config-ca-crl)# cache-time 420`
		Configures how long the ASA caches CRLs for the current trustpoint. *refresh-time* is the number of minutes that the ASA waits before considering a CRL stale.

Step 7	Do one of the following:	

	`enforcenextupdate`
	Example:
	`hostname (config-ca-crl)# enforcenextupdate`
		Requires the NextUpdate field in CRLs. This is the default setting.

	`no enforcenextupdate`
	Example:
	`hostname (config-ca-crl)# no enforcenextupdate`
		Allows the NextUpdate field to be absent in CRLs.

Step 8	**`ldap-defaults`** *`server`*
	Example:
	`hostname (config-ca-crl)# ldap-defaults ldap1`
		Identifies the LDAP server to the ASA if LDAP is specified as the retrieval protocol. You can specify the server by DNS hostname or by IP address. You can also provide a port number if the server listens for LDAP queries on a port other than the default of 389.
		Note If you use a hostname instead of an IP address to specify the LDAP server, make sure that you have configured the ASA to use DNS.

Step 9	**`ldap-dn`** *`admin-DN password`*
	Example:
	`hostname (config-ca-crl)# ldap-dn cn=admin,ou=devtest,o=engineering c00lRunZ`
		Allows CRL retrieval if the LDAP server requires credentials.

Step 10	**`crypto ca crl request`** *`trustpoint`*
	Example:
	`hostname (config-ca-crl)# crypto ca crl request Main`
		Retrieves the current CRL from the CA represented by the specified trustpoint and tests the CRL configuration for the current trustpoint.

Step 11	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.

Exporting a Trustpoint Configuration

To export a trustpoint configuration, enter the following command:

Command	Purpose

`crypto ca export` *`trustpoint`*
Example:
`hostname(config)# crypto ca export Main`
	Exports a trustpoint configuration with all associated keys and certificates in PKCS12 format. The ASA displays the PKCS12 data in the terminal. You can copy the data. The trustpoint data is password protected; however, if you save the trustpoint data in a file, make sure that the file is in a secure location.

Examples

The following example exports PKCS12 data for the trustpoint Main with the passphrase Wh0zits:

```
hostname (config)# crypto ca export Main pkcs12 Wh0zits

Exported pkcs12 follows:

[ PKCS12 data omitted ]

---End - This line not part of the pkcs12---
```

Importing a Trustpoint Configuration

To import a trustpoint configuration, enter the following command:

Command	Purpose

`crypto ca import` *`trustpoint`* **`pkcs12`**
Example:
`hostname(config)# crypto ca import Main pkcs12`
	Imports keypairs and issued certificates that are associated with a trustpoint configuration. The ASA prompts you to paste the text into the terminal in base 64 format. The key pair imported with the trustpoint is assigned a label that matches the name of the trustpoint that you create.
	Note If an ASA has trustpoints that share the same CA, you can use only one of the trustpoints that share the CA to validate user certificates. To control which trustpoint that shares a CA is used for validation of user certificates issued by that CA, use the **support-user-cert-validation** keyword.

Examples

The following example manually imports PKCS12 data to the trustpoint Main with the passphrase Wh0zits:

```
hostname (config)# crypto ca import Main pkcs12 Wh0zits

Enter the base 64 encoded pkcs12.
End with a blank line or the word "quit" on a line by itself:
[ PKCS12 data omitted ]
quit
INFO: Import PKCS12 operation completed successfully
```

The following example manually imports a certificate for the trustpoint Main:

```
hostname (config)# crypto ca import Main certificate
% The fully-qualified domain name in the certificate will be:
securityappliance.example.com

Enter the base 64 encoded certificate.
End with a blank line or the word "quit" on a line by itself
[ certificate data omitted ]
quit
INFO: Certificate successfully imported
```

Configuring CA Certificate Map Rules

You can configure rules based on the Issuer and Subject fields of a certificate. Using the rules you create, you can map IPSec peer certificates to tunnel groups with the **tunnel-group-map** command. The ASA supports one CA certificate map, which can include many rules.

To configure a CA certificate map rule, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca certificate map`** *`sequence-number`*
	Example:
	`hostname(config)# crypto ca certificate map 1`
		Enters CA certificate map configuration mode for the rule you want to configure and specifies the rule index number.

Step 2	**`issuer-name`** *`DN-string`*
	Example:
	`hostname(config-ca-cert-map)# issuer-name cn=asa.example.com`
		Specifies the distinguished name of all issued certificates. which is also the subject-name DN of the self-signed CA certificate. Use commas to separate attribute-value pairs. Insert quotation marks around any value that includes a comma. An issuer-name must be less than 500 alphanumeric characters. The default issuer-name is cn=*hostame.domain-name.*

	Command	Purpose

Step 3	**`subject-name attr`** *`tag`* **`eq`** `|` **`co`** `|` **`ne`** `|` **`nc`** *`string`*
	Example:
	`hostname(config-ca-cert-map)# subject-name attr cn eq mycert`
		Specifies tests that the ASA can apply to values found in the Subject field of certificates. The tests can apply to specific attributes or to the entire field. You can configure many tests per rule, and all the tests you specify with these commands must be true for a rule to match a certificate. The following are valid operators:
		• eq—The field or attribute must be identical to the value given.
		• ne—The field or attribute cannot be identical to the value given.
		• co—Part or all of the field or attribute must match the value given.
		• nc—No part of the field or attribute can match the value given.

Step 4	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.

Obtaining Certificates Manually

To obtain certificates manually, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca authenticate`** *`trustpoint`*
	Example:
	`hostname (config)# crypto ca authenticate Main`
		Obtains a base 64, encoded CA certificate from the CA represented by the trustpoint.
		Note This step assumes that you have already obtained a base-64 encoded CA certificate from the CA represented by the trustpoint.
		Whether a trustpoint requires that you manually obtain certificates is determined by the use of the **enrollment terminal** command when you configure the trustpoint. For more information, see the "Configuring Trustpoints" section on page 73-10.

Step 2	**`crypto ca enroll`** *`trustpoint`*
	Example:
	`hostname (config)#` **`crypto ca enroll Main`**
		Generates a certificate request.
		If you use separate RSA keys for signing and encryption, the output of the **crypto ca enroll** command displays two certificate requests, one for each key. To complete enrollment, obtain a certificate for each certificate request generated by the **crypto ca enroll** command. Make sure that the certificate is in base 64 format.

	Command	Purpose

Step 3	**`crypto ca import`** *`trustpoint`* **`certificate`**
	Example:
	`hostname (config)# crypto ca import Main certificate`
		Prompts you to paste each certificate that you receive from the CA into the terminal in base-64 format.
		If you use separate RSA key pairs for signing and encryption, perform this step for each certificate separately. The ASA determines automatically whether the certificate is for the signing or encryption key pair. The order in which you import the two certificates has no effect.

Step 4	**`show crypto ca server certificate`**
	Example:
	`hostname (config)# show crypto ca server certificate Main`
		Verifies that the enrollment process was successful and shows details of the certificate issued for the ASA and the CA certificate for the trustpoint.

Step 5	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.

Repeat these steps for each trustpoint that you configure for manual enrollment. When you have completed this procedure, the ASA will have received a CA certificate for the trustpoint and one or two certificates for signing and encryption purposes. If you use general-purpose RSA keys, the certificate received is for signing and encryption. If you use separate RSA keys for signing and encryption, the certificates received are used for each purpose exclusively.

Examples

The following example shows a CA certificate request for the trustpoint Main:

```
hostname (config)# crypto ca authenticate Main
Enter the base 64 encoded CA certificate.
End with a blank line or the word "quit" on a line by itself
MIIDRTCCAu+gAwIBAgIQKVcqP/KW74VP0NZzL+JbRTANBgkqhkiG9w0BAQUFADCB
[ certificate data omitted ]
/7QEM8izy0EOTSErKu7Nd76jwf5e4qttkQ==
quit

INFO: Certificate has the following attributes:
Fingerprint:     24b81433 409b3fd5 e5431699 8d490d34
Do you accept this certificate? [yes/no]: y
Trustpoint CA certificate accepted.

% Certificate successfully imported
```

The following example shows a certificate and encryption key request for the trustpoint Main, which is configured to use manual enrollment and general-purpose RSA keys for signing and encryption:

```
hostname (config)# crypto ca enroll Main
% Start certificate enrollment...

% The fully-qualified domain name in the certificate will be:
securityappliance.example.com
```

```
% Include the device serial number in the subject name? [yes/no]: n

Display Certificate Request to terminal? [yes/no]: y
Certificate Request follows:

MIIBoDCCAQkCAQAwIzEhMB8GCSqGSIb3DQEJAhYSRmVyYWxQaXguY2lzY28uY29t
[ certificate request data omitted ]
jF4waw68eOxQxVmdgMWeQ+RbIOYmvt8g6hnBTrd0GdqjjVLt

---End - This line not part of the certificate request---

Redisplay enrollment request? [yes/no]: n
```

Obtaining Certificates Automatically with SCEP

To obtain certificates automatically using SCEP, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca authenticate`** *`trustpoint`*
	Example:
	`hostname (config)# crypto ca authenticate Main`
		Obtains the CA certificate for the configured trustpoint.
		Note This step assumes that you have already obtained a base-64 encoded CA certificate from the CA represented by the trustpoint.
		When you configure the trustpoint, use of the **enrollment url** command determines whether or not you must obtain certificates automatically via SCEP. For more information, see the "Configuring Trustpoints" section on page 73-10.

Step 2	**`crypto ca enroll`** *`trustpoint`*
	Example:
	`hostname (config)# crypto ca enroll Main`
		Enrolls the ASA with the trustpoint. Retrieves a certificate for signing data and depending on the type of keys that you have configured, for encrypting data. Before entering this command, contact the CA administrator, who may need to authenticate the enrollment request manually before the CA grants certificates.
		If the ASA does not receive a certificate from the CA within one minute (the default) of sending a certificate request, it resends the certificate request. The ASA continues sending a certificate request each minute until a certificate is received.
		If the fully qualified domain name configured for the trustpoint is not identical to the fully qualified domain name of the ASA, including the case of the characters, a warning appears. To resolve this issue, exit the enrollment process, make any necessary corrections, and reenter the **crypto ca enroll** command.
		Note If the ASA reboots after you have issued the **crypto ca enroll** command but before you have received the certificate, reenter the **crypto ca enroll** command and notify the CA administrator.

	Command	Purpose

Step 3	**`show crypto ca server certificates`**
	Example:
	`hostname (config)# show crypto ca server certificates Main`
		Verifies that the enrollment process was successful by displaying certificate details issued for the ASA and the CA certificate for the trustpoint.

Step 4	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.

Repeat these steps for each trustpoint that you configure for automatic enrollment. When you have completed this procedure, the ASA will have received a CA certificate for the trustpoint and one or two certificates for signing and encryption purposes. If you use general-purpose RSA keys, the certificate received is for signing and encryption. If you use separate RSA keys for signing and encryption, the ASA receives separate certificates for each purpose.

Examples

The following example performs enrollment automatically with the trustpoint named Main, which represents a subordinate CA:

```
hostname (config)# crypto ca authenticate Main

INFO: Certificate has the following attributes:
Fingerprint:     3736ffc2 243ecf05 0c40f2fa 26820675
Do you accept this certificate? [yes/no]: y

Trustpoint 'Main' is a subordinate CA and holds a non self signed cert.
Trustpoint CA certificate accepted.
```

The following example performs enrollment with the trustpoint named Main:

```
hostname(config)# crypto ca enroll Main
%
% Start certificate enrollment...
% Create a challenge password. You will need to verbally provide this
% password to the CA Administrator in order to revoke your certificate.
% For security reasons your password will not be saved in the configuration.
% Please make a note of it.
Password: 2b0rn0t2b
Re-enter password: 2b0rn0t2b
% The subject name in the certificate will be: securityappliance.example.com
% The fully-qualified domain name in the certificate will be:
securityappliance.example.com
% Include the device serial number in the subject name? [yes/no]: no
Request certificate from CA [yes/no]: yes
% Certificate request sent to Certificate authority.
```

The following is a sample e-mail message that is sent to a new user:

```
Date: 12/22/06

To: wuser6@wuser.com

From: Wuseradmin

Subject: Certificate Enrollment Invitation
```

```
You have been granted access to enroll for a certificate.

The credentials below can be used to obtain your certificate.
Username: wuser6@wuser.com
One-time Password: C93BBB733CD80C74
Enrollment is allowed until: 15:54:31 UTC Thu Dec 27 2006

NOTE: The one-time password is also used as the passphrase to unlock the certificate file.

Please visit the following site to obtain your certificate:
https://wu5520-FO.frdevtestad.local/+CSCOCA+/enroll.html
You may be asked to verify the fingerprint/thumbprint of the CA certificate
during installation of the certificates. The fingerprint/thumbprint should be:
MD5: 76DD1439 AC94FDBC 74A0A89F CB815ACC
SHA1: 58754FFD 9F19F9FD B13B4B02 15B3E4BE B70B5A83
```

Enabling the Local CA Server

Before enabling the local CA server, you must first create a passphrase of at least seven characters to encode and archive a PKCS12 file that includes the local CA certificate and keypair to be generated. The passphrase unlocks the PKCS12 archive if the CA certificate or keypair is lost.

To enable the local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`no shutdown`**
	Example:
	`hostname (config-ca-server)# no shutdown`
		Enables the local CA server. Generates the local CA server certificate, keypair and necessary database files, and archives the local CA server certificate and keypair to storage in a PKCS12 file. Requires an 8-65 alphanumeric character password. After initial startup, you can disable the local CA without being prompted for the passphrase.
		Note After you enable the local CA server, save the configuration to make sure that the local CA certificate and keypair are not lost after a reboot occurs.

Examples

The following example enables the local CA server:

```
hostname (config)# crypto ca server
hostname (config-ca-server)# no shutdown

% Some server settings cannot be changed after CA certificate generation.
% Please enter a passphrase to protect the private key
% or type Return to exit

Password: caserver

Re-enter password: caserver

Keypair generation process begin. Please wait...
```

The following is sample output that shows local CA server configuration and status:

```
Certificate Server LOCAL-CA-SERVER:
    Status: enabled
    State: enabled
    Server's configuration is locked (enter "shutdown" to unlock it)
    Issuer name: CN=wz5520-1-16
    CA certificate fingerprint/thumbprint: (MD5)
        76dd1439 ac94fdbc 74a0a89f cb815acc
    CA certificate fingerprint/thumbprint: (SHA1)
        58754ffd 9f19f9fd b13b4b02 15b3e4be b70b5a83
    Last certificate issued serial number: 0x6
    CA certificate expiration timer: 14:25:11 UTC Jan 16 2008
    CRL NextUpdate timer: 16:09:55 UTC Jan 24 2007
    Current primary storage dir: flash:
```

Configuring the Local CA Server

To configure the local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Generates the local CA.

Step 2	**`smtp from-address`** *`e-mail_address`*
	Example:
	`hostname (config-ca-server) # smtp from-address SecurityAdmin@hostcorp.com`
		Specifies the SMTP from-address, a valid e-mail address that the local CA uses as a from address when sending e-mail messages that deliver OTPs for an enrollment invitation to users.

	Command	Purpose

Step 3	**`subject-name-default`** *`dn`*
	Example:
	`hostname (config-ca-server)# subject-name-default cn=engineer, o=asc systems, c=”US”`
		(Optional) Specifies the subject-name DN that is appended to each username on issued certificates.
		The subject-name DN and the username combine to form the DN in all user certificates that are issued by the local CA server. If you do not specify a subject-name DN, you must specify the exact subject name DN to be included in a user certificate each time that you add a user to the user database.
		Note Make sure that you review all optional parameters carefully before you enable the configured local CA, because you cannot change issuer-name and keysize server values after you enable the local CA for the first time.

Step 4	**`no shutdown`**
	Example:
	`hostname (config-ca-server)# no shutdown`
		Creates the self-signed certificate and associates it with the local CA on the ASA. The self-signed certificate key usage extension has key encryption, key signature, CRL signing, and certificate signing capabilities.
		Note After the self-signed local CA certificate has been generated, to change any characteristics, you must delete the existing local CA server and completely recreate it.
		The local CA server keeps track of user certificates, so the administrator can revoke or restore privileges as needed.

Examples

The following example shows how to configure and enable the local CA server using the predefined default values for all required parameters:

```
hostname (config)# crypto ca server
hostname (config-ca-server) # smtp from-address SecurityAdmin@hostcorp.com
hostname (config-ca-server)# subject-name-default cn=engineer, o=asc Systems, c=US
hostname (config-ca-server)# no shutdown
```

Customizing the Local CA Server

To configure a customized local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`issuer-name`** *`DN-string`*
	Example:
	`hostname (config-ca-server)# issuer-name cn=xx5520,cn=30.132.0.25,ou=DevTest,ou=QA,o=ASC Systems`
		Specifies parameters that do not have default values.

Step 3	**`smtp subject`** *`subject-line`*
	Example:
	`hostname (config-ca-server) # smtp subject Priority E-Mail: Enclosed Confidential Information is Required for Enrollment`
		Customizes the text that appears in the subject field of all e-mail messages sent from the local CA server

	Command	Purpose
Step 4	**smtp from-address** *e-mail_address*	Specifies the e-mail address that is to be used as the From: field of all e-mail messages that are generated by the local CA server.

Example:

```
hostname (config-ca-server) # smtp from-address
SecurityAdmin@hostcorp.com
```

	Command	Purpose
Step 5	**subject-name-default** *dn*	Specifies an optional subject-name DN to be appended to a username on issued certificates. The default subject-name DN becomes part of the username in all user certificates issued by the local CA server. The allowed DN attribute keywords are as follows: • C = Country • CN= Common Name • EA = E-mail Address • L = Locality • O = Organization Name • OU = Organization Unit • ST = State/Province • SN = Surname • ST = State/Province **Note** If you do not specify a subject-name-default to serve as a standard subject-name default, you must specify a DN each time that you add a user.

Example:

```
hostname (config-ca-server) # subject-name default
cn=engineer, o=ASC Systems, c=US
```

Debugging the Local CA Server

To debug the newly configured local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`debug crypto ca server`**
	Example:
	`hostname (config-ca-server)# debug crypto ca server`
		Displays debugging messages when you configure and enable the local CA server. Performs level 1 debugging functions; levels 1-255 are available.
		Note Debugging commands might slow down traffic on busy networks. Levels 5 and higher are reserved for raw data dumps and should be avoided during normal debugging because of excessive output.

Disabling the Local CA Server

To disable the local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`shutdown`**
	Example:
	`hostname (config-ca-server)# shutdown`
	`INFO: Local CA Server has been shutdown.`
		Disables the local CA server. Disables website enrollment and allows you to modify the local CA server configuration. Stores the current configuration and associated files. After initial startup, you can reenable the local CA without being prompted for the passphrase.

Deleting the Local CA Server

To delete an existing local CA server (either enabled or disabled), enter one of the following commands:

Command	Purpose
Do one of the following:	

`no crypto ca server`
Example:
`hostname (config)# no crypto ca server`
	Removes an existing local CA server (either enabled or disabled).
	Note Deleting the local CA server removes the configuration from the ASA. After the configuration has been deleted, it is unrecoverable.
	Make sure that you also delete the associated local CA server database and configuration files (that is, all files with the wildcard name, LOCAL-CA-SERVER.*).

`clear configure crypto ca server`
Example:
`hostname (config)# clear config crypto ca server`	

Configuring Local CA Certificate Characteristics

You can configure the following characteristics of local CA certificates:

- The name of the certificate issuer as it appears on all user certificates.
- The lifetime of the local CA certificates (server and user) and the CRL.
- The length of the public and private keypairs associated with local CA and user certificates.

This section includes the following topics:

- Configuring the Issuer Name, page 73-29
- Configuring the CA Certificate Lifetime, page 73-29
- Configuring the User Certificate Lifetime, page 73-31
- Configuring the CRL Lifetime, page 73-31
- Configuring the Server Keysize, page 73-32
- Setting Up External Local CA File Storage, page 73-33
- Downloading CRLs, page 73-35
- Storing CRLs, page 73-36
- Setting Up Enrollment Parameters, page 73-37
- Adding and Enrolling Users, page 73-38
- Renewing Users, page 73-40
- Restoring Users, page 73-41
- Removing Users, page 73-41
- Revoking Certificates, page 73-42
- Maintaining the Local CA Certificate Database, page 73-42

- Rolling Over Local CA Certificates, page 73-42
- Archiving the Local CA Server Certificate and Keypair, page 73-43

Configuring the Issuer Name

To configure the certificate issuer name, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`issuer-name`** *`DN-string`*
	Example:
	`hostname (config-ca-server)# issuer-name CN=xx5520,CN=30.132.0.25,ou=DevTest,ou=QA,O=ABC Systems`
		Specifies the local CA certificate subject name. The configured certificate issuer name is both the subject name and issuer name of the self-signed local CA certificate, as well as the issuer name in all issued client certificates and in the issued CRL. The default issuer name in the local CA is in the format, *hostname.domainname*.
		Note You cannot change the issuer name value after the local CA is first enabled.

Configuring the CA Certificate Lifetime

To configure the local CA server certificate lifetime, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

	Command	Purpose

Step 2	**`lifetime ca-certificate`** *`time`*
	Example:
	`hostname (config-ca-server)# lifetime ca-certificate 365`
		Determines the expiration date included in the certificate. The default lifetime of a local CA certificate is three years.
		Make sure that you limit the validity period of the certificate to less than the recommended end date of 03:14:08 UTC, January 19, 2038.

Step 3	**`no lifetime ca-certificate`**
	Example:
	`hostname (config-ca-server)# no lifetime ca-certificate`
		(Optional) Resets the local CA certificate lifetime to the default value of three years.
		The local CA server automatically generates a replacement CA certificate 30 days before it expires, which allows the replacement certificate to be exported and imported onto any other devices for certificate validation of user certificates that have been issued by the local CA certificate after the current local CA certificate has expired. The following preexpiration syslog message is generated:
		`%ASA-1-717049: Local CA Server certificate is due to expire in` *`days`* `days and a replacement certificate is available for export.`
		Note When notified of this automatic rollover, the administrator must make sure that the new local CA certificate is imported onto all required devices before it expires.

Configuring the User Certificate Lifetime

To configure the user certificate lifetime, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`lifetime certificate`** *`time`*
	Example:
	`hostname (config-ca-server)# lifetime certificate 60`
		Sets the length of time that you want user certificates to remain valid.
		Note Before a user certificate expires, the local CA server automatically initiates certificate renewal processing by granting enrollment privileges to the user several days ahead of the certificate expiration date, setting renewal reminders, and delivering an e-mail message that includes the enrollment username and OTP for certificate renewal. Make sure that you limit the validity period of the certificate to less than the recommended end date of 03:14:08 UTC, January 19, 2038.

Configuring the CRL Lifetime

To configure the CRL lifetime, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

	Command	Purpose

Step 2	**`lifetime crl`** *`time`*
	Example:
	`hostname (config-ca-server)# lifetime crl 10`
		Sets the length of time that you want the CRL to remain valid.
		The local CA updates and reissues the CRL each time that a user certificate is revoked or unrevoked, but if no revocation changes occur, the CRL is reissued automatically once each CRL lifetime. If you do not specify a CRL lifetime, the default time period is six hours.

Step 3	**`crypto ca server crl issue`**
	Example:
	`hostname(config)# crypto ca server crl issue`
	`A new CRL has been issued.`
		Forces the issuance of a CRL at any time, which immediately updates and regenerates a current CRL to overwrite the existing CRL.
		Note Do not use this command unless the CRL file has been removed in error or has been corrupted and must be regenerated.

Configuring the Server Keysize

To configure the server keysize, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`keysize server`**
	Example:
	`hostname (config-ca-server)# keysize server 2048`
		Specifies the size of the public and private keys generated at user-certificate enrollment. The keypair size options are 512, 768, 1024, 2048 bits, and the default value is 1024 bits.
		Note After you have enabled the local CA, you cannot change the local CA keysize, because all issued certificates would be invalidated. To change the local CA keysize, you must delete the current local CA and reconfigure a new one.

Examples

The following is sample output that shows two user certificates in the database.

```
Username: emily1

Renewal allowed until: Not Allowed

Number of times user notified: 0

PKCS12 file stored until: 12:45:52 UTC Fri Jan 4 2008
Certificates Issued:
serial:   0x71
```

```
issued:   12:45:52 UTC Thu Jan 3 2008
expired:  12:17:37 UTC Sun Dec 31 2017
status:   Not Revoked
Username: fred1
Renewal allowed until: Not Allowed
Number of times user notified: 0
PKCS12 file stored until: 12:27:59 UTC Fri Jan 4 2008
Certificates Issued:
serial:   0x2
issued:   12:27:59 UTC Thu Jan 3 2008
expired:  12:17:37 UTC Sun Dec 31 2017
status:   Not Revoked
<--- More --->
```

Setting Up External Local CA File Storage

You can store the local CA server configuration, users, issued certificates, and CRLs in the local CA server database either in flash memory or in an external local CA file system. To configure external local CA file storage, perform the following steps:

	Command	Purpose

Step 1	`mount name type`
	Example:
	`hostname (config)# mount mydata type cifs`
		Accesses configuration mode for the specific file system type.

Step 2	`mount name type cifs`
	Example:
	`hostname (config-mount-cifs)# mount mydata type cifs`
	`server 99.1.1.99 share myshare`
	`domain frqa.ASC.com`
	`username user6`
	`password ********`
	`status enable`
		Mounts a CIFS file system.
		Note Only the user who mounts a file system can unmount it with the **no mount** command.

Step 3	`crypto ca server`
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

	Command	Purpose

Step 4	**`database path`** *`mount-name directory-path`*
	Example:
	`hostname (config-ca-server)# database path mydata:newuser`
		Specifies the location of *mydata*, the premounted CIFS file system to be used for the local CA server database. Establishes a path to the server and then specifies the local CA file or folder name to use for storage and retrieval.
		Note To secure stored local CA files on an external server requires a premounted file system of file type CIFS or FTP that is username-protected and password-protected.

Step 5	**`write memory`**
	Example:
	`hostname (config)# write memory`
		Saves the running configuration.
		For external local CA file storage, each time that you save the ASA configuration, user information is saved from the ASA to the premounted file system and file location, *mydata:newuser.*
		For flash memory storage, user information is saved automatically to the default location for the start-up configuration.

Examples

The following example shows the list of local CA files that appear in flash memory or in external storage:

```
hostname (config-ca-server)# dir LOCAL* //
Directory of disk0:/LOCAL*

75      -rwx  32          13:07:49 Jan 20 2007  LOCAL-CA-SERVER.ser
77      -rwx  229         13:07:49 Jan 20 2007  LOCAL-CA-SERVER.cdb
69      -rwx  0           01:09:28 Jan 20 2007  LOCAL-CA-SERVER.udb
81      -rwx  232         19:09:10 Jan 20 2007  LOCAL-CA-SERVER.crl
72      -rwx  1603        01:09:28 Jan 20 2007  LOCAL-CA-SERVER.p12

127119360 bytes total (79693824 bytes free)
```

Downloading CRLs

To make the CRL available for HTTP download on a given interface or port, perform the following steps:

	Command	Purpose
Step 1	**crypto ca server** **Example:** `hostname (config)# crypto ca server`	Enters local CA server configuration mode. Allows you to configure and manage a local CA.
Step 2	**publish-crl interface** *interface* **port** *portnumber* **Example:** `hostname (config-ca-server)# publish-crl outside 70`	Opens a port on an interface to make the CRL accessible from that interface.The specified interface and port are used to listen for incoming requests for the CRL. The interface and optional port selections are as follows: • inside—name of interface/GigabitEthernet0/1 • management—name of interface/ Management0/0 • outside—name of interface/GigabitEthernet0/0 • Port numbers can range from 1-65535. TCP port 80 is the HTTP default port number. **Note** If you do not specify this command, the CRL is not accessible from the CDP location, because this command is required to open an interface to download the CRL file. The CDP URL can be configured to use the IP address of an interface, and the path of the CDP URL and the file name can also be configured (for example, http://10.10.10.100/user8/my_crl_file). In this case, only the interface with that IP address configured listens for CRL requests, and when a request comes in, the ASA matches the path, /user8/my_crl_file to the configured CDP URL. When the path matches, the ASA returns the stored CRL file. **Note** The protocol must be HTTP, so the prefix displayed is http://.

Storing CRLs

To establish a specific location for the automatically generated CRL of the local CA, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`cdp-url`** *`url`*
	Example:
	`hostname(config-ca-server)# cdp-url http://99.1.1.99/pathname/myca.crl`
		Specifies the CDP to be included in all issued certificates. If you do not configure a specific location for the CDP, the default URL location is http://*hostname.domain*/+CSCOCA+/asa_ca.crl.
		The local CA updates and reissues the CRL each time a user certificate is revoked or unrevoked. If no revocation changes occur, the CRL is reissued once each CRL lifetime. For more information, see the "Configuring the CRL Lifetime" section on page 73-31.
		If this command is set to serve the CRL directly from the local CA ASA, see the "Downloading CRLs" section on page 73-35 for instructions about opening a port on an interface to make the CRL accessible from that interface.
		The CRL exists for other devices to validate the revocation of certificates issued by the local CA. In addition, the local CA tracks all issued certificates and status within its own certificate database. Revocation checking is performed when a validating party needs to validate a user certificate by retrieving the revocation status from an external server, which might be the CA that issued the certificate or a server designated by the CA.

Setting Up Enrollment Parameters

To set up enrollment parameters, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`otp expiration`** *`timeout`*
	Example:
	`hostname(config-ca-server)# otp expiration 24`
		Specifies the number of hours for which an issued OTP for the local CA enrollment page is valid. The default expiration time is 72 hours.
		Note The user OTP to enroll for a certificate on the enrollment website is also used as the password to unlock the PKCS12 file that includes the issued certificate and keypair.

Step 3	**`enrollment-retrieval`** *`timeout`*
	Example:
	`hostname(config-ca-server)# enrollment-retrieval 120`
		Specifies the number of hours an already-enrolled user can retrieve a PKCS12 enrollment file.This time period begins when the user is successfully enrolled. The default retrieval period is 24 hours. Valid values for the retrieval period range from 1 to 720 hours. The enrollment retrieval period is independent of the OTP expiration period.
		After the enrollment-retrieval time expires, the user certificate and keypair are no longer available. The only way a user may receive a certificate is for the administrator to reinitialize certificate enrollment and allow a user to log in again.

Adding and Enrolling Users

To add a user who is eligible for enrollment in the local CA database, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server user-db add`** *`username`* `[`**`dn`** *`dn`*`] [`**`email`** *`emailaddress`*`]`
	Example:
	`hostname (config-ca-server)# crypto ca server user-db add jksmith dn jksmith@example.com, Engineer, Example Systems, US, email jksmith@example.com`
		Adds a new user to the local CA database. Options are as follows:
		• *username*—A string of 4-64 characters, which is the simple username for the user being added. The username can be an e-mail address, which then is used to contact the user as necessary for enrollment invitations.
		• *dn*—The distinguished name, a global, authoritative name of an entry in the OSI Directory (X.500) (for example, cn=maryjane@ASC.com, cn=Engineer, o=ASC Systems, c=US). For more information, see "Customizing the Local CA Server" section on page 73-25.
		• *e-mail-address*—The e-mail address of the new user to which OTPs and notices are to be sent.

Step 2	**`crypto ca server user-db allow`** *`user`*
	Example:
	`hostname (config-ca-server)# crypto ca server user-db allow user6`
		Provides user privileges to a newly added user.

Step 3	**`crypto ca server user-db email-otp`** *`username`*
	Example:
	`hostname (config-ca-server)# crypto ca server user-db email-otp jksmith`
		Notifies a user in the local CA database to enroll and download a user certificate, which automatically e-mails the OTP to that user.
		Note When an administrator wants to notify a user through e-mail, the administrator must specify the e-mail address in the username field or in the e-mail field when adding that user.

	Command	Purpose

Step 4	**`crypto ca server user-db show-otp`**
	Example:
	`hostname (config-ca-server)# crypto ca server user-db show-otp`
		Shows the issued OTP.

Step 5	**`otp expiration`** *`timeout`*
	Example:
	`hostname (config-ca-server)# otp expiration 24`
		Sets the enrollment time limit in hours. The default expiration time is 72 hours. The **otp expiration** command defines the amount of time that the OTP is valid for user enrollment. This time period begins when the user is allowed to enroll.
		After a user enrolls successfully within the time limit and with the correct OTP, the local CA server creates a PKCS12 file, which includes a keypair for the user and a user certificate that is based on the public key from the keypair generated and the subject-name DN specified when the user is added. The PKCS12 file contents are protected by a passphrase, the OTP. The OTP can be handled manually, or the local CA can e-mail this file to the user to download after the administrator allows enrollment.
		The PKCS12 file is saved to temporary storage with the name, *username.p12*. With the PKCS12 file in storage, the user can return within the enrollment-retrieval time period to download the PKCS12 file as many times as needed. When the time period expires, the PKCS12 file is removed from storage automatically and is no longer available to download.
		Note If the enrollment period expires before the user retrieves the PKCS12 file that includes the user certificate, enrollment is not permitted.
		To specify the expiration date for the user certificate, see the "Configuring the User Certificate Lifetime" section on page 73-31.

Renewing Users

To specify the timing of renewal notices, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`renewal-reminder`** *`time`*
	Example:
	`hostname(config-ca-server)# renewal-reminder 7`
		Specifies the number of days (1-90) before the local CA certificate expires that an initial reminder to reenroll is sent to certificate owners. If a certificate expires, it becomes invalid.
		Renewal notices and the times they are e-mailed to users are variable, and can be configured by the administrator during local CA server configuration.
		Three reminders are sent. An e-mail is automatically sent to the certificate owner for each of the three reminders, provided an e-mail address is specified in the user database. If no e-mail address exists for the user, a syslog message alerts you of the renewal requirement.
		The ASA automatically grants certificate renewal privileges to any user who holds a valid certificate that is about to expire, as long as the user still exists in the user database. Therefore, if an administrator does not want to allow a user to renew automatically, the administrator must remove the user from the database before the renewal time period.

Restoring Users

To restore a user and a previously revoked certificate that was issued by the local CA server, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`crypto ca server unrevoke`** *`cert-serial-no`*
	Example:
	`hostname (config)# crypto ca server unrevoke 782ea09f`
		Restores a user and unrevokes a previously revoked certificate that was issued by the local CA server.
		The local CA maintains a current CRL with serial numbers of all revoked user certificates. This list is available to external devices and can be retrieved directly from the local CA if it is configured to do so with the **cdp-url** command and the **publish-crl** command. When you revoke (or unrevoke) any current certificate by certificate serial number, the CRL automatically reflects these changes.

Removing Users

To delete a user from the user database by username, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`crypto ca server user-db remove`** *`username`*
	Example:
	`hostname (config)# crypto ca server user-db remove user1`
		Removes a user from the user database and allows revocation of any valid certificates that were issued to that user.

Revoking Certificates

To revoke a user certificate, perform the following steps:

	Command	Purpose

Step 1	**`crypto ca server`**
	Example:
	`hostname (config)# crypto ca server`
		Enters local CA server configuration mode. Allows you to configure and manage a local CA.

Step 2	**`crypto ca server revoke`** *`cert-serial-no`*
	Example:
	`hostname(config-ca-server)## crypto ca server revoke 782ea09f`
		Enters the certificate serial number in hexadecimal format. Marks the certificate as revoked in the certificate database on the local CA server and in the CRL, which is automatically reissued.
		Note The password is also required if the certificate for the ASA needs to be revoked, so make sure that you record it and store it in a safe place.

Maintaining the Local CA Certificate Database

To maintain the local CA certificate database, make sure that you save the certificate database file, LOCAL-CA-SERVER.cdb, with the **write memory** command each time that a change to the database occurs. The local CA certificate database includes the following files:

- The LOCAL-CA-SERVER.p12 file is the archive of the local CA certificate and keypair that is generated when the local CA server is initially enabled.
- The LOCAL-CA-SERVER.crl file is the actual CRL.
- The LOCAL-CA-SERVER.ser file keeps track of the issued certificate serial numbers.

Rolling Over Local CA Certificates

Thirty days before the local CA certificate expires, a rollover replacement certificate is generated, and a syslog message informs the administrator that it is time for local CA rollover. The new local CA certificate must be imported onto all necessary devices before the current certificate expires. If the administrator does not respond by installing the rollover certificate as the new local CA certificate, validations may fail.

The local CA certificate rolls over automatically after expiration using the same keypair. The rollover certificate is available for export in base 64 format.

Examples

The following example shows a base 64 encoded local CA certificate:

```
MIIXlwIBAzCCF1EGCSqGSIb3DQEHAaCCF0IEghc+MIIXOjCCFzYGCSqGSIb3DQEHBqCCFycwghcjAgEAMIIXHAYJKo
ZIhvcNAQcBMBsGCiqGSIb3DQEMAQMwDQQIjph4SxJoyTgCAQGAghbw3v4bFy+GGG2dJnB4OLphsUM+IG3SDOiDwZG9
n1SvtMieoxd7Hxknxbum06JDrujWKtHBIqkrm+td34qlNE1iGeP2YC94/NQ2z+4kS+uZzwcRhl1KEZTS1E4L0fSaC3
uMTxJq2NUHYWmoc8pi4CIeLj3h7VVMy6qbx2AC8I+q57+QG5vG5l5Hi5imwtYfaWwPEdPQxaWZPrzoG1J8BFqdPa1j
BGhAzzuSmElm3j/2dQ3Atro1G9nIsRHgV39fcBgwz4fEabHG7/Vanb+fj81d5nlOiJjDYYbP86tvbZ2yOVZR6aKFVI
0b2AfCr6PbwfC9U8Z/aF3BCyM2sN2xPJrXva94CaYrqyotZdAkSYA5KWScyEcgdqmuBeGDKOncTknfgy0XM+fG5rb3
qAXy1GkjyFI5Bm9Do6RUROoG1DSrQrKeq/hj….

END OF CERTIFICATE
```

Archiving the Local CA Server Certificate and Keypair

To archive the local CA server certificate and keypair, enter the following command:

Command	Purpose
copy **Example:** `hostname# copy LOCAL-CA-SERVER_0001.pl2 tftp://90.1.1.22/user6/`	Copies the local CA server certificate and keypair and all files from the ASA using either FTP or TFTP. **Note** Make sure that you back up all local CA files as often as possible.

Monitoring Digital Certificates

To display certificate configuration and database information, enter one or more of the following commands:

Command	Purpose
show crypto ca server	Shows local CA configuration and status.
show crypto ca server cert-db	Shows user certificates issued by the local CA.
show crypto ca server certificates	Shows local CA certificates on the console in base 64 format and the rollover certificate when available, including the rollover certificate thumbprint for verification of the new certificate during import onto other devices.
show crypto ca server crl	Shows CRLs.
show crypto ca server user-db	Shows users and their status, which can be used with the following qualifiers to reduce the number of displayed records: • allowed. Shows only users currently allowed to enroll. • enrolled. Shows only users that are enrolled and hold a valid certificate • expired. Shows only users holding expired certificates. • on-hold. Lists only users without a certificate and not currently allowed to enroll.

Command	Purpose
show crypto ca server user-db allowed	Shows users who are eligible to enroll.
show crypto ca server user-db enrolled	Shows enrolled users with valid certificates.
show crypto ca server user-db expired	Shows users with expired certificates.
show crypto ca server user-db on-hold	Shows users without certificates who are not allowed to enroll.
show crypto key *name of key*	Shows key pairs that you have generated.
show running-config	Shows local CA certificate map rules.

Examples

The following example shows an RSA general-purpose key:

```
hostname (config)# show crypto key mypubkey
Key pair was generated at: 16:39:47 central Feb 10 2005
Key name: <Default-RSA-Key>
 Usage: General Purpose Key
 Modulus Size (bits): 1024
 Key Data:

  30819f30 0d06092a 864886f7 0d010101 05000381 8d003081 89028181 00ea51b7
  0781848f 78bccac2 4a1b5b8d 2f3e30b4 4cae9f86 f4485207 159108c9 f5e49103
  9eeb0f5d 45fd1811 3b4aafce 292b3b64 b4124a6f 7a777b08 75b88df1 8092a9f8
  5508e9e5 2c271245 7fd1c0c3 3aaf1e04 c7c4efa4 600f4c4a 6afe56ad c1d2c01c
  e08407dd 45d9e36e 8cc0bfef 14f9e6ac eca141e4 276d7358 f7f50d13 79020301 0001
Key pair was generated at: 16:34:54 central Feb 10 2005
```

The following example shows the local CA CRL:

```
hostname (config)# show crypto ca server crl
Certificate Revocation List:
    Issuer: cn=xx5520-1-3-2007-1
    This Update: 13:32:53 UTC Jan 4 2008
    Next Update: 13:32:53 UTC Feb 3 2008
    Number of CRL entries: 2
    CRL size: 270 bytes
Revoked Certificates:
    Serial Number: 0x6f
    Revocation Date: 12:30:01 UTC Jan 4 2008
    Serial Number: 0x47
    Revocation Date: 13:32:48 UTC Jan 4 2008
```

The following example shows one user on-hold:

```
hostname (config)# show crypto ca server user-db on-hold
username: wilma101
email:    <None>
dn:       <None>
allowed:  <not allowed>
notified: 0
hostname (config)#
```

The following example shows output of the **show running-config** command, in which local CA certificate map rules appear.

```
crypto ca certificate map 1
 issuer-name co asc
 subject-name attr ou eq Engineering
```

Feature History for Certificate Management

Table 73-1 lists each feature change and the platform release in which it was implemented.

Table 73-1 Feature History for Certificate Management

Feature Name	Platform Releases	Feature Information
Certificate Management	7.0(1)	Digital certificates (including CA certificates, identity certificates, and code signer certificates) provide digital identification for authentication. A digital certificate includes information that identifies a device or user, such as the name, serial number, company, department, or IP address. CAs are trusted authorities that "sign" certificates to verify their authenticity, thereby guaranteeing the identity of the device or user. CAs issue digital certificates in the context of a PKI, which uses public-key or private-key encryption to ensure security.
	7.2(1)	The following commands were introduced: **issuer-name** *DN-string*, **revocation-check crl none, revocation-check crl,** and **revocation-check none**. The following commands were deprecated: **crl** {**required** | **optional** | **nocheck**}.
	8.0(2)	The following commands were introduced: **cdp-url**, **crypto ca server**, **crypto ca server crl issue**, **crypto ca server revoke** *cert-serial-no,* **crypto ca server unrevoke** *cert-serial-no,* **crypto ca server user-db add** *user* [**dn** *dn*] [**email** *e-mail-address*], **crypto ca server user-db allow** {*username* | **all-unenrolled** | **all-certholders**} [**display-otp**] [**email-otp**] [**replace-otp**], **crypto ca server user-db email-otp** {*username* | **all-unenrolled** | **all-certholders**}, **crypto ca server user-db remove** *username,* **crypto ca server user-db show-otp** {*username* | **all-certholders** | **all-unenrolled**}, **crypto ca server user-db write**, **[no] database path** *mount-name directory-path,* **debug crypto ca server** [*level*], **lifetime** {**ca-certificate** | **certificate** | **crl**} *time,* no shutdown, **otp expiration** *timeout,* **renewal-reminder** *time,* **show crypto ca server**, **show crypto ca server cert-db [user** *username* **| allowed | enrolled | expired | on-hold] [serial** *certificate-serial-number*], **show crypto ca server certificates**, **show crypto ca server crl**, **show crypto ca server user-db** [**expired** | **allowed** | **on-hold** | **enrolled**], **show crypto key** *name of key,* **show running-config**, and **shutdown**.

PART 12

Monitoring

CHAPTER 74

Configuring Logging

This chapter describes how to configure and manage logs for the ASA, and includes the following sections:

- Information About Logging, page 74-1
- Licensing Requirements for Logging, page 74-5
- Prerequisites for Logging, page 74-5
- Guidelines and Limitations, page 74-5
- Configuring Logging, page 74-5
- Monitoring Logging, page 74-17
- Configuration Examples for Logging, page 74-18
- Feature History for Logging, page 74-18

Information About Logging

The ASA system logs provide you with information for monitoring and troubleshooting the ASA. With the logging feature, you can do the following:

- Specify which syslog messages should be logged.
- Disable or change the severity level of a syslog message.
- Specify one or more locations where syslog messages should be sent, including an internal buffer, one or more syslog servers, ASDM, an SNMP management station, specified e-mail addresses, or to Telnet and SSH sessions.
- Configure and manage syslog messages in groups, such as by severity level or class of message.
- Specify whether a rate-limit is applied to syslog generation.
- Specify what happens to the contents of the internal buffer when the buffer becomes full: overwrite the buffer, send the buffer contents to an FTP server, or save the contents to internal flash memory.
- Filter syslog messages by locations, by the severity of the syslog message, the class of the syslog message, or by creating a custom syslog message list.

This section includes the following topics:

- Logging in Multiple Context Mode, page 74-2
- Analyzing Syslog Messages, page 74-2
- Syslog Message Format, page 74-2

- Severity Levels, page 74-3
- Filtering Syslog Messages, page 74-3
- Message Classes and Range of Syslog IDs, page 74-3

Logging in Multiple Context Mode

Each security context includes its own logging configuration and generates its own messages. If you log in to the system or admin context, and then change to another context, messages you view in your session are only those that are related to the current context.

Syslog messages that are generated in the system execution space, including failover messages, are viewed in the admin context along with messages generated in the admin context. You cannot configure logging or view any logging information in the system execution space.

You can configure the ASA to include the context name with each message, which helps you differentiate context messages that are sent to a single syslog server. This feature also helps you to determine which messages are from the admin context and which are from the system; messages that originate in the system execution space use a device ID of **system**, and messages that originate in the admin context use the name of the admin context as the device ID.

Analyzing Syslog Messages

The following are some examples of the type of information you can obtain from a review of various syslog messages:

- Connections that are allowed by ASA security policies. These messages help you spot “holes” that remain open in your security policies.
- Connections that are denied by ASA security policies. These messages show what types of activity are being directed toward your secured inside network.
- Using the ACE deny rate logging feature shows attacks that are occurring against your ASA.
- IDS activity messages can show attacks that have occurred.
- User authentication and command usage provide an audit trail of security policy changes.
- Bandwidth usage messages show each connection that was built and torn down, as well as the duration and traffic volume used.
- Protocol usage messages show the protocols and port numbers used for each connection.
- Address translation audit trail messages record NAT or PAT connections being built or torn down, which are useful if you receive a report of malicious activity coming from inside your network to the outside world.

For more information about analyzing syslog messages, see *Appendix E, “Configuring the Adaptive Security Appliance for Use with MARS.”*

Syslog Message Format

Syslog messages begin with a percent sign (%) and are structured as follows:

```
%ASA Level Message_number: Message_text
```

Field descriptions are as follows:

ASA	The syslog message facility code for messages that are generated by the ASA. This value is always ASA.
Level	1 through 7. The level reflects the severity of the condition described by the syslog message—the lower the number, the more severe the condition. See Table 74-1 for more information.
Message_number	A unique six-digit number that identifies the syslog message.
Message_text	A text string that describes the condition. This portion of the syslog message sometimes includes IP addresses, port numbers, or usernames.

Severity Levels

Table 74-1 lists the syslog message severity levels.

Table 74-1 Syslog Message Severity Levels

Level Number	Severity Level	Description
0	**emergencies**	System is unusable.
1	**alert**	Immediate action is needed.
2	**critical**	Critical conditions.
3	**error**	Error conditions.
4	**warning**	Warning conditions.
5	**notification**	Normal but significant conditions.
6	**informational**	Informational messages only.
7	**debugging**	Debugging messages only.

Note The ASA does not generate syslog messages with a severity level of zero (emergencies). This level is provided in the **logging** command for compatibility with the UNIX syslog feature, but is not used by the ASA.

Message Classes and Range of Syslog IDs

For a list of syslog message classes and the ranges of syslog message IDs that are associated with each class, see the *Cisco ASA 5500 Series System Log Messages*.

Filtering Syslog Messages

You can filter generated syslog messages so that only certain syslog messages are sent to a particular output destination. For example, you could configure the ASA to send all syslog messages to one output destination and to send a subset of those syslog messages to a different output destination.

Specifically, you can configure the ASA so that syslog messages are directed to an output destination according to the following criteria:

- Syslog message ID number
- Syslog message severity level
- Syslog message class (equivalent to a functional area of the ASA)

You customize these criteria by creating a message list that you can specify when you set the output destination. Alternatively, you can configure the ASA to send a particular message class to each type of output destination independently of the message list.

You can use syslog message classes in two ways:

- Specify an output location for an entire category of syslog messages using the **logging class** command.
- Create a message list that specifies the message class using the **logging list** command.

The syslog message class provides a method of categorizing syslog messages by type, equivalent to a feature or function of the ASA. For example, the "vpnc" class denotes the VPN client.

All syslog messages in a particular class share the same initial three digits in their syslog message ID numbers. For example, all syslog message IDs that begin with the digits 611 are associated with the vpnc (VPN client) class. Syslog messages associated with the VPN client feature range from 611101 to 611323.

In addition, most of the ISAKMP syslog messages have a common set of prepended objects to help identify the tunnel. These objects precede the descriptive text of a syslog message when available. If the object is not known at the time the syslog message is generated, the specific "*heading* = *value*" combination is not displayed.

The objects are prepended as follows:

"Group = *groupname*, Username = *user*, IP = *IP_address*"

Where the group identifies the tunnel-group, the username is the username from the local database or AAA server, and the IP address is the public IP address of the remote access client or L2L peer.

Using Custom Message Lists

Creating a custom message list is a flexible way to exercise fine control over which syslog messages are sent to which output destination. In a custom syslog message list, you specify groups of syslog messages using any or all of the following criteria: severity level, message IDs, ranges of syslog message IDs, or by message class.

For example, message lists can be used to do the following:

- Select syslog messages with severity levels of 1 and 2 and send them to one or more e-mail addresses.
- Select all syslog messages associated with a message class (such as "ha") and save them to the internal buffer.

A message list can include multiple criteria for selecting messages. However, you must add each message selection criteria with a new command entry. It is possible to create a message list containing overlapping message selection criteria. If two criteria in a message list select the same message, the message is logged only once.

Licensing Requirements for Logging

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Prerequisites for Logging

Logging has the following prerequisites:

- The syslog server must run a server program called “syslogd.” Windows (except for Windows 95 and Windows 98) provides a syslog server as part of its operating system. For Windows 95 and Windows 98, you must obtain a syslogd server from another vendor.
- To view logs generated by the ASA, you must specify a logging output destination. If you enable logging without specifying a logging output destination, the ASA generates messages, but does not save them to a location from which you can view them. You must specify each different logging output destination separately. For example, to designate more than one syslog server as an output destination, enter a new command for each syslog server.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single and multiple context modes.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines

ASDM may fail to load on ASA 8.2(2), because of insufficient DMA memory. This issue occurs if logging is enabled along with crypto IPSec and SSL tunnels. To resolve this issue, downgrade the ASA to Version 8.0.x or configure the logging queue to a value of 512 messages. After restoring the logging queue to the default value, reload the ASA to reclaim the required DMA memory.

Configuring Logging

This section describes how to configure logging, and includes the following topics:

- Enabling Logging, page 74-6
- Sending Syslog Messages to an SNMP Server, page 74-6

- Sending Syslog Messages to a Syslog Server, page 74-7
- Sending Syslog Messages to the Console Port, page 74-8
- Sending Syslog Messages to an E-mail Address, page 74-8
- Sending Syslog Messages to ASDM, page 74-9
- Sending Syslog Messages to a Telnet or SSH Session, page 74-9
- Sending Syslog Messages to the Internal Log Buffer, page 74-10
- Sending All Syslog Messages in a Class to a Specified Output Destination, page 74-11
- Creating a Custom Message List, page 74-12
- Enabling Secure Logging, page 74-13
- Configuring the Logging Queue, page 74-13
- Including the Date and Time in Syslog Messages, page 74-15
- Generating Syslog Messages in EMBLEM Format, page 74-15
- Including the Device ID in Syslog Messages, page 74-14
- Disabling a Syslog Message, page 74-15
- Changing the Severity Level of a Syslog Message, page 74-16
- Limiting the Rate of Syslog Message Generation, page 74-16
- Changing the Amount of Internal Flash Memory Available for Logs, page 74-17

Enabling Logging

To enable logging, enter the following command:

Command	Purpose

`logging enable`
Example:
`hostname(config)# logging enable`
	Enables logging. To disable logging, enter the **no logging enable** command.

Sending Syslog Messages to an SNMP Server

To enable SNMP logging, enter the following command:

Command	Purpose

`logging history` `[`*`logging_list`* `|` *`level`*`]`
Example:
`hostname(config)# logging history errors`
	Enables SNMP logging and specifies which messages are to be sent to SNMP servers. To disable SNMP logging, enter the **no logging history** command.

Sending Syslog Messages to a Syslog Server

To send syslog messages to a syslog server, perform the following steps:

	Command	Purpose
Step 1	**logging host** *interface_name ip_address* [**tcp**[**/***port*] | **udp**[**/***port*]] [**format emblem**] [**permit-hostdown**] **Example:** `hostname(config)# logging host dmz1 192.168.1.5`	Configures the ASA to send messages to a syslog server, which enables you to archive messages according to the available disk space on the server, and to manipulate logging data after it is saved. For example, you could specify actions to be executed when certain types of syslog messages are logged, extract data from the log and save the records to another file for reporting, or track statistics using a site-specific script. The **format emblem** keyword enables EMBLEM format logging for the syslog server (UDP only). The *interface_name* argument specifies the interface through which you access the syslog server. The *ip_address* argument specifies the IP address of the syslog server. The **tcp[/***port*] or **udp[/***port*] argument specifies that the ASA should use TCP or UDP to send syslog messages to the syslog server. The **permit-hostdown** keyword allows TCP logging to continue when the syslog server is down. You can configure the ASA to send data to a syslog server using either UDP or TCP, but not both. The default protocol is UDP. If you specify TCP, the ASA discovers when the syslog server fails and discontinues logging. If you specify UDP, the ASA continues to log messages whether or not the syslog server is operational. Valid port values are 1025 through 65535, for either protocol. The default UDP port is 514. The default TCP port is 1470.

Step 2	**logging trap** {*severity_level* | *message_list*}
	Example:
	`hostname(config)# logging trap errors`
		Specifies which syslog messages should be sent to the syslog server. You can specify the severity level number (0 through 7) or name. For example, if you set the severity level to 3, then the ASA sends syslog messages for severity levels 3, 2, 1, and 0. You can specify a custom message list that identifies the syslog messages to send to the syslog server.

Step 3	**logging facility** number **Example:** `hostname(config)# logging facility 21`	(Optional) Sets the logging facility to a value other than the default of 20, which is what most UNIX systems expect.

Sending Syslog Messages to the Console Port

To send syslog messages to the console port, enter the following command:

Command	Purpose

`logging console` `{severity_level | message_list}`
Example:
`hostname(config)# logging console errors`
	Specifies which syslog messages should be sent to the console port.

Sending Syslog Messages to an E-mail Address

To send syslog messages to an e-mail address, perform the following steps:

	Command	Purpose

Step 1	**`logging mail`** `{severity_level | message_list}`
	Example:
	`hostname(config)# logging mail high-priority`
		Specifies which syslog messages should be sent to an e-mail address. When sent by e-mail, a syslog message appears in the subject line of the e-mail message. For this reason, we recommend configuring this option to notify administrators of syslog messages with high severity levels, such as critical, alert, and emergency.

Step 2	**`logging from-address`** *`email_address`*
	Example:
	`hostname(config)# logging from-address xxx-001@example.com`
		Specifies the source e-mail address to be used when sending syslog messages to an e-mail address.

Step 3	**`logging recipient-address`** *`e-mail_address [severity_level]`*
	Example:
	`hostname(config)# logging recipient-address admin@example.com`
		Specifies the recipient e-mail address to be used when sending syslog messages to an e-mail address.

Step 4	**`smtp-server`** *`ip_address`*
	Example:
	`hostname(config)# smtp-server 10.1.1.1`
		Specifies the SMTP server to be used when sending syslog messages to an e-mail address.

Sending Syslog Messages to ASDM

To send syslog messages to ASDM, perform the following steps:

	Command	Purpose

Step 1	**`logging asdm`** {*`severity_level`* | *`message_list`*}
	Example:
	`hostname(config)# logging asdm 2`
		Specifies which syslog messages should go to ASDM. The ASA sets aside a buffer area for syslog messages waiting to be sent to ASDM and saves messages in the buffer as they occur. The ASDM log buffer is a different buffer than the internal log buffer. When the ASDM log buffer is full, the ASA deletes the oldest syslog message to make room in the buffer for new ones. To control the number of syslog messages retained in the ASDM log buffer, you can change the size of the buffer.

Step 2	**`logging asdm-buffer-size`** *`num_of_msgs`*
	Example:
	`hostname(config)# logging asdm-buffer-size 200`
		Specifies the number of syslog messages to be retained in the ASDM log buffer. To erase the current content of the ASDM log buffer, enter the **clear logging asdm** command.

Sending Syslog Messages to a Telnet or SSH Session

To send syslog messages to a Telnet or SSH session, perform the following steps:

	Command	Purpose

Step 1	**`logging monitor`** {*`severity_level`* | *`message_list`*}
	Example:
	`hostname(config)# logging monitor 6`
		Specifies which syslog messages should be sent to a Telnet or SSH session.

Step 2	**`terminal monitor`**
	Example:
	`hostname(config)# terminal monitor`
		Enables logging to the current session only. If you log out and then log in again, you need to reenter this command. To disable logging to the current session, enter the **terminal no monitor** command.

Sending Syslog Messages to the Internal Log Buffer

To send syslog messages to the internal log buffer, perform the following steps:

	Command	Purpose

Step 1	**`logging buffered`** {*`severity_level`* | *`message_list`*}
	Example:
	`hostname(config)# logging buffered critical`
	`hostname(config)# logging buffered level 2`
	`hostname(config)# logging buffered notif-list`
		Specifies which syslog messages should be sent to the internal log buffer, which serves as a temporary storage location. New messages are appended to the end of the list. When the buffer is full, that is, when the buffer wraps, old messages are overwritten as new messages are generated, unless you configure the ASA to save the full buffer to another location. To clear the log buffer, enter the **clear logging buffer** command.

Step 2	**`logging buffer-size`** *`bytes`*
	Example:
	`hostname(config)# logging buffer-size 16384`
		Changes the size of the internal log buffer. The default buffer size is 4 KB.

Step 3	Do one of the following:	

	`logging flash-bufferwrap`
	Example:
	`hostname(config)# logging flash-bufferwrap`
		When saving the buffer content to another location, the ASA creates log files with names that use the following default time-stamp format:
		`LOG-YYYY-MM-DD-HHMMSS.TXT`
		where *YYYY* is the year, *MM* is the month, *DD* is the day of the month, and *HHMMSS* is the time in hours, minutes, and seconds.
		The ASA continues to save new messages to the log buffer and saves the full log buffer content to internal flash memory.

	`logging ftp-bufferwrap`
	Example:
	`hostname(config)# logging ftp-bufferwrap`
		When saving the buffer content to another location, the ASA creates log files with names that use the following default time-stamp format:
		`LOG-YYYY-MM-DD-HHMMSS.TXT`
		where *YYYY* is the year, *MM* is the month, *DD* is the day of the month, and *HHMMSS* is the time in hours, minutes, and seconds.
		The ASA continues saving new messages to the log buffer and saves the full log buffer content to an FTP server.

	Command	Purpose
Step 4	**logging ftp-server** *server path username password* **Example:** `hostname(config)# logging ftp-server 10.1.1.1 /syslogs logsupervisor 1luvMy10gs`	Identifies the FTP server on which you want to store log buffer content. The *server* argument specifies the IP address of the external FTP server. The *path* argument specifies the directory path on the FTP server where the log buffer data is to be saved. This path is relative to the FTP root directory. The *username* argument specifies a username that is valid for logging into the FTP server. The *password* argument specifies the password for the username specified.
Step 5	**logging savelog** [*savefile*] **Example:** `hostname(config)# logging savelog latest-logfile.txt`	Saves the current log buffer content to internal flash memory.

Sending All Syslog Messages in a Class to a Specified Output Destination

To send all syslog messages in a class to a specified output destination, enter the following command:

Command	Purpose
logging class *message_class* {**buffered** | **console** | **history** | **mail** | **monitor** | **trap**} [*severity_level*] **Example:** `hostname(config)# logging class ha buffered alerts`	Overrides the configuration in the specific output destination command. For example, if you specify that messages at severity level 7 should go to the internal log buffer and that "ha" class messages at severity level 3 should go to the log buffer, then the latter configuration takes precedence. The **buffered**, **history**, **mail**, **monitor**, and **trap** keywords specify the output destination to which syslog messages in this class should be sent. The **history** keyword enables SNMP logging. The **monitor** keyword enables Telnet and SSH logging. The **trap** keyword enables syslog server logging. Select one destination per command line entry. To specify that a class should go to more than one destination, enter a new command for each output destination.

Creating a Custom Message List

To create a custom message list, perform the following steps:

	Command	Purpose

Step 1	**logging list** *name* {**level** *level* [**class** *message_class*] | **message** *start_id*[-*end_id*]}
	Example:
	`hostname(config)# logging list notif-list level 3`
		Specifies criteria for selecting messages to be saved in the log buffer. For example, if you set the severity level to 3, then the ASA sends syslog messages for severity levels 3, 2, 1, and 0. The *name* argument specifies the name of the list. The **level** *level* argument specifies the severity level. The **class** *message_class* argument specifies a particular message class. The **message** *start_id*[**-***end_id*] argument specifies an individual syslog message number or a range of numbers.
		Note Do not use the names of severity levels as the name of a syslog message list. Prohibited names include “emergencies,” “alert,” “critical,” “error,” “warning,” “notification,” “informational,” and “debugging.” Similarly, do not use the first three characters of these words at the beginning of a filename. For example, do not use a filename that starts with the characters “err.”

Step 2	**logging list** *name* {**level** *level* [**class** *message_class*] | **message** *start_id*[-*end_id*]}
	Example:
	`hostname(config)# logging list notif-list 104024-105999`
	`hostname(config)# logging list notif-list level critical`
	`hostname(config)# logging list notif-list level warning class ha`
		(Optional) Adds more criteria for message selection to the list. Enter the same command as in the previous step, specifying the name of the existing message list and the additional criterion. Enter a new command for each criterion that you want to add to the list. The specified criteria for syslog messages to be included in the list are the following:
		• Syslog message IDs that fall into the range of 104024 to 105999
		• All syslog messages with the critical severity level or higher (emergency, alert, or critical)
		• All “ha” class syslog messages with the warning severity level or higher (emergency, alert, critical, error, or warning)
		Note A syslog message is logged if it satisfies any of these conditions. If a syslog message satisfies more than one of the conditions, the message is logged only once.

Enabling Secure Logging

To enable secure logging, enter the following command:

Command	Purpose
logging host interface_name syslog_ip [**tcp**/port | **udp**/port] [**format emblem**] [**secure**] **Example:** `hostname(config)# logging host inside 10.0.0.1 TCP/1500 secure`	Enables secure logging. The *interface_name* argument specifies the *i*nterface on which the syslog server resides. The *syslog_ip* argument specifies the IP address of the syslog server. The *port* argument specifies the port (TCP or UDP) that the syslog server listens to for syslog messages. The **tcp** keyword specifies that the ASA should use TCP to send syslog messages to the syslog server. The **udp** keyword specifies that the ASA should use UDP to send syslog messages to the syslog server. The **format emblem** keyword enables EMBLEM format logging for the syslog server. The **secure** keyword specifies that the connection to the remote logging host should use SSL/TLS for TCP only. **Note** Secure logging does not support UDP; an error occurs if you try to use this protocol.

Configuring the Logging Queue

To configure the logging queue, enter the following command:

Command	Purpose
logging queue *message_count* **Example:** `hostname(config)# logging queue 300`	Specifies the number of syslog messages that the ASA can hold in its queue before sending them to the configured output destination. The ASA has a fixed number of blocks in memory that can be allocated for buffering syslog messages while they are waiting to be sent to the configured output destination. The number of blocks required depends on the length of the syslog message queue and the number of syslog servers specified. The default queue size is 512 syslog messages. Valid values are from 0 to 8192 messages, depending on the platform. A setting of zero indicates that an unlimited number of syslog messages are allowed, that is, the queue size is limited only by block memory availability. **Note** For the ASA 5505, the maximum queue size is 1024 messages. For the ASA 5510, the maximum queue size is 2048 messages. For all other platforms, the maximum queue size is 8192 messages.

Including the Device ID in Syslog Messages

To include the device ID in non-EMBLEM format syslog messages, enter the following command:

Command	Purpose

logging device-id [**context-name** | **hostname** | **ipaddress** *interface_name* | **string** *text*]
 	
Example:
`hostname(config)# logging device-id hostname`
 	
`hostname(config)# logging device-id context-name`
	Configures the ASA to include a device ID in non-EMBLEM-format syslog messages. You can specify only one type of device ID for syslog messages. The **context-name** keyword indicates that the name of the current context should be used as the device ID (applies to multiple context mode only). If you enable the logging device ID for the admin context in multiple context mode, messages that originate in the system execution space use a device ID of **system**, and messages that originate in the admin context use the name of the admin context as the device ID. The **hostname** keyword specifies that the hostname of the ASA should be used as the device ID. The **ipaddress** *interface_name* argument specifies that the IP address of the interface specified as *interface_name* should be used as the device ID. If you use the **ipaddress** keyword, the device ID becomes the specified ASA interface IP address, regardless of the interface from which the syslog message is sent. This keyword provides a single, consistent device ID for all syslog messages that are sent from the device. The **string** *text* argument specifies that the text string should be used as the device ID. The string can include as many as 16 characters. You cannot use blank spaces or any of the following characters:
	• & (ampersand)
	• ‘ (single quote)
	• “ (double quote)
	• < (less than)
	• > (greater than)
	• ? (question mark)
	Note If enabled, the device ID does not appear in EMBLEM-formatted syslog messages or SNMP traps.

Generating Syslog Messages in EMBLEM Format

To generate syslog messages in EMBLEM format, enter the following command:

Command	Purpose
Do one of the following:	
logging emblem **Example:** `hostname(config)# logging emblem`	Sends syslog messages in EMBLEM format to output destinations other than a syslog server.
logging host *interface_name ip_address* {**tcp**[/*port*] | **udp**[/*port*]] **[format emblem]** **Example:** `hostname(config)# logging host interface_1 122.243.006.123 udp format emblem`	Sends syslog messages in EMBLEM format to a syslog server over UDP using the default port of 514.

Including the Date and Time in Syslog Messages

To include the date and time in syslog messages, enter the following command:

Command	Purpose

logging timestamp
Example:
`hostname(config)# logging timestamp`
`LOG-2008-10-24-081856.TXT`
	Specifies that syslog messages should include the date and time that they were generated. To remove the date and time from syslog messages, enter the **no logging timestamp** command.

Disabling a Syslog Message

To disable a specified syslog message, enter the following command:

Command	Purpose
no logging message *message_number* **Example:**E `hostname(config)# no logging message 113019`	Prevents the ASA from generating a particular syslog message. To reenable a disabled syslog message, enter the **logging message** *message_number* command (for example, **logging message 113019**). To reenable logging of all disabled syslog messages, enter the **clear config logging disabled** command.

Changing the Severity Level of a Syslog Message

To change the severity level of a syslog message, enter the following command:

Command	Purpose
logging message *message_ID* **level** *severity_level* **Example:** `hostname(config)# logging message 113019 level 5`	Specifies the severity level of a syslog message. To reset the severity level of a syslog message to its default setting, enter the **no logging message** *message_ID* **level** *current_severity_level* command (for example, **no logging message 113019 level 5**). To reset the severity level of all modified syslog messages to their default settings, enter the **clear configure logging level** command.

Limiting the Rate of Syslog Message Generation

To limit the rate of syslog message generation, enter the following command:

Command	Purpose
logging rate-limit {unlimited | {*num* [*interval*]}} message *syslog_id* | level *severity_level* **Example:** `hostname(config)# logging rate-limit 1000 600 level 6`	Applies a specified severity level (1 through 7) to a set of messages or to an individual message within a specified time period. To reset the logging rate-limit to the default value, enter the **clear running-config logging rate-limit** command. To reset the logging rate-limit, enter the **clear configure logging rate-limit** command.

Changing the Amount of Internal Flash Memory Available for Logs

To change the amount of internal flash memory available for logs, perform the following steps:

	Command	Purpose
Step 1	**logging flash-maximum-allocation** *kbytes* **Example:** `hostname(config)# logging flash-maximum-allocation 1200`	Specifies the maximum amount of internal flash memory available for saving log files. By default, the ASA can use up to 1 MB of internal flash memory for log data. The default minimum amount of internal flash memory that must be free for the ASA to save log data is 3 MB. If a log file being saved to internal flash memory would cause the amount of free internal flash memory to fall below the configured minimum limit, the ASA deletes the oldest log files to ensure that the minimum amount of memory remains free after saving the new log file. If there are no files to delete or if, after all old files have been deleted, free memory is still below the limit, the ASA fails to save the new log file.
Step 2	**logging flash-minimum-free** *kbytes* **Example:** `hostname(config)# logging flash-minimum-free 4000`	Specifies the minimum amount of internal flash memory that must be free for the ASA to save a log file.

Monitoring Logging

To monitor logging, enter one of the following commands:

Command	Purpose
show logging	Shows the running logging configuration.
show logging message	Shows a list of syslog messages with modified severity levels and disabled syslog messages.
show logging message *message_ID*	Shows the severity level of a specific syslog message.
show logging queue	Shows the logging queue and queue statistics.
show logging rate-limit	Shows the disallowed syslog messages.
show running-config logging rate-limit	Shows the current logging rate-limit setting.

Examples

```
hostname(config)# show logging
Syslog logging: enabled
    Facility: 16
    Timestamp logging: disabled
    Standby logging: disabled
    Deny Conn when Queue Full: disabled
    Console logging: disabled
    Monitor logging: disabled
    Buffer logging: disabled
```

```
Trap logging: level errors, facility 16, 3607 messages logged
    Logging to infrastructure 10.1.2.3
History logging: disabled
Device ID: 'inside' interface IP address "10.1.1.1"
Mail logging: disabled
ASDM logging: disabled
```

Configuration Examples for Logging

The following examples show how to control both whether a syslog message is enabled and the severity level of the specified syslog message:

```
hostname(config)# show logging message 403503
syslog 403503: default-level errors (enabled)

hostname(config)# logging message 403503 level 1
hostname(config)# show logging message 403503
syslog 403503: default-level errors, current-level alerts (enabled)

hostname(config)# no logging message 403503
hostname(config)# show logging message 403503
syslog 403503: default-level errors, current-level alerts (disabled)

hostname(config)# logging message 403503
hostname(config)# show logging message 403503
syslog 403503: default-level errors, current-level alerts (enabled)

hostname(config)# no logging message 403503 level 3
hostname(config)# show logging message 403503
syslog 403503: default-level errors (enabled)
```

Feature History for Logging

Table 74-2 lists the release history for this feature.

Table 74-2 Feature History for Logging

Feature Name	Release	Feature Information
Logging	7.0(1)	Provides ASA network logging information through various output destinations, and includes the option to view and save log files.
Rate limit	7.0(4)	Limits the rate at which syslog messages are generated. The following command was introduced: **logging rate-limit**
Logging list	7.2(1)	Creates a logging list to use in other commands to specify messages by various criteria (logging level, event class, and message IDs). The following command was introduced: **logging list**
Secure logging	8.0(2)	Specifies that the connection to the remote logging host should use SSL/TLS. This option is valid only if the protocol selected is TCP. The following command was modified: **logging host**

Table 74-2 Feature History for Logging (continued)

Feature Name	Release	Feature Information
Logging class	8.0(4), 8.1(1)	Added support of another class (ipaa) for logging messages. The following command was modified: **logging class**
Logging class and saved logging buffers	8.2(1)	Added support of another class (dap) for logging messages. The following command was modified: **logging class** Added support to clear the saved logging buffers (ASDM, internal, FTP, and flash). The following command was introduced: **clear logging queue bufferwrap**

CHAPTER 75

Configuring NetFlow Secure Event Logging (NSEL)

This chapter describes how to configure NSEL, a security logging mechanism that is built on NetFlow Version 9 technology, and how to handle events and syslog messages through NSEL.

The chapter includes the following sections:

- Information About NSEL, page 75-1
- Licensing Requirements for NSEL, page 75-3
- Prerequisites for NSEL, page 75-3
- Guidelines and Limitations, page 75-3
- Configuring NSEL, page 75-4
- Monitoring NSEL, page 75-7
- Configuration Examples for NSEL, page 75-8
- Additional References, page 75-9
- Table 75-2Feature History for NSEL, page 75-10

Information About NSEL

The ASA supports NetFlow Version 9 services. For more information about NetFlow services, see RFCs, page 75-10.

The ASA implementation of NSEL is a stateful, IP flow tracking method that exports only those records that indicate significant events in a flow. In stateful flow tracking, tracked flows go through a series of state changes. NSEL events are used to export data about flow status, and are triggered by the event that caused the state change.

The significant events that are tracked include flow-create, flow-teardown, and flow-denied (excluding those flows that are denied by EtherType ACLs). Each NSEL record has an event ID and an extended event ID field, which describes the flow event.

The ASA implementation of NSEL provides the following major functions:

- Keeps track of flow-create, flow-teardown, and flow-denied events, and generates appropriate NSEL data records.
- Defines and exports templates that describe the progression of a flow. Templates describe the format of the data records that are exported through NetFlow. Each event has several record formats or templates associated with it.

- Tracks configured NSEL collectors and delivers templates and data records to these configured NSEL collectors through NetFlow over UDP only.
- Sends template information periodically to NSEL collectors. Collectors receive template definitions, normally before receiving flow records.
- Filters NSEL events based on the traffic and event type through Modular Policy Framework, and then sends records to different collectors. Traffic is matched based on the order in which classes are configured. After a match is found, no other classes are checked. The supported event types are flow-create, flow-denied, flow-teardown, and all. Records can be sent to different collectors. For example, with two collectors, you can do the following:
  - Log all flow-denied events that match access-list 1 to collector 1.
  - Log all flow-create events to collector 1.
  - Log all flow-teardown events to collector 2.
- Delays the export of flow-create events.

Using NSEL and Syslog Messages

Table 75-1 lists the syslog messages that have an equivalent NSEL event, event ID, and extended event ID. The extended event ID provides more detail about the event (for example, which ACL—ingress or egress—has denied a flow).

Note Enabling NetFlow to export flow information makes the syslog messages that are listed in Table 75-1 redundant. In the interest of performance, we recommend that you disable redundant syslog messages, because the same information is exported through NetFlow. You can enable or disable individual syslog messages by following the procedure in the "Disabling and Reenabling NetFlow-related Syslog Messages" section on page 75-7.

Table 75-1 Syslog Messages and Equivalent NSEL Events

Syslog Message	Description	NSEL Event ID	NSEL Extended Event ID
106100	Generated whenever an ACL is encountered.	1—Flow was created (if the ACL allowed the flow). 3—Flow was denied (if the ACL denied the flow).	0—If the ACL allowed the flow. 1001—Flow was denied by the ingress ACL. 1002—Flow was denied by the egress ACL.
106015	A TCP flow was denied because the first packet was not a SYN packet.	3—Flow was denied.	1004—Flow was denied because the first packet was not a TCP SYN packet.
106023	When a flow was denied by an ACL attached to an interface through the **access-group** command.	3—Flow was denied.	1001—Flow was denied by the ingress ACL. 1002—Flow was denied by the egress ACL.
302013, 302015, 302017, 302020	TCP, UDP, GRE, and ICMP connection creation.	1—Flow was created.	0—Ignore.

Table 75-1 Syslog Messages and Equivalent NSEL Events (continued)

Syslog Message	Description	NSEL Event ID	NSEL Extended Event ID
302014, 302016, 302018, 302021	TCP, UDP, GRE, and ICMP connection teardown.	2—Flow was deleted.	0—Ignore. > 2000—Flow was torn down.
313001	An ICMP packet to the device was denied.	3—Flow was denied.	1003—To-the-box flow was denied because of configuration.
313008	An ICMP v6 packet to the device was denied.	3—Flow was denied.	1003—To-the-box flow was denied because of configuration.
710003	An attempt to connect to the device interface was denied.	3—Flow was denied.	1003—To-the-box flow was denied because of configuration.

Note When NSEL and syslog messages are both enabled, there is no guarantee of chronological ordering between the two logging types.

Licensing Requirements for NSEL

The following table shows the licensing requirements for this feature:

Model	License Requirement
All models	Base License.

Prerequisites for NSEL

NSEL has the following prerequisites:

- IP address and hostname assignments must be unique throughout the NetFlow configuration.
- You must have at least one configured collector before you can use NSEL.
- You must configure NSEL collectors before you can configure filters via Modular Policy Framework.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single and multiple context modes.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

IPv6 Guidelines

Supports IPv6 for the **class-map**, **match access-list**, and **match any** commands.

Additional Guidelines and Limitations

- If you previously configured flow-export actions using the **flow-export enable** command, and you upgrade to a later version, then your configuration will be automatically converted to the new Modular Policy Framework **flow-export event-type** command, described under the **policy-map** command. For more information, see the *Release Notes for the Cisco ASA 5500 Series* for Version 8.1(2).
- Flow-export actions are not supported in interface-based policies. You can configure flow-export actions in a class-map *only* with the **match access-list**, **match any**, or **class-default** commands. You can only apply flow-export actions in a global service policy.

Configuring NSEL

This section describes how to configure NSEL, and includes the following topics:

- Configuring NSEL Collectors, page 75-4
- Configuring Flow-Export Actions Through Modular Policy Framework, page 75-5
- Configuring Template Timeout Intervals, page 75-6
- Delaying Flow-Create Events, page 75-6
- Disabling and Reenabling NetFlow-related Syslog Messages, page 75-7
- Clearing Runtime Counters, page 75-7

Configuring NSEL Collectors

To configure NSEL collectors, enter the following command:

Command	Purpose

`flow-export destination` *`interface-name ipv4-address|hostname udp-port`*
Example:
`hostname (config)# flow-export destination inside 209.165.200.225 2002`
	Configures an NSEL collector to which NetFlow packets are sent. The **destination** keyword indicates that a NSEL collector is being configured. The *interface-name* argument is the name of the ASA interface through which the collector is reached. The *ipv4-address* argument is the IP address of the machine running the collector application. The *hostname* argument is the destination IP address or name of the collector. The *udp-port* argument is the UDP port number to which NetFlow packets are sent. You can configure a maximum of five destinations. After a destination is configured, template records are automatically sent to all configured NSEL collectors.
	Note Make sure that collector applications use the Event Time field to correlate events.

Configuring Flow-Export Actions Through Modular Policy Framework

To export NSEL events by defining all classes with flow-export actions, perform the following steps:

	Command	Purpose

Step 1	**`class-map`** *`flow_export_class`*
	Example:
	`hostname (config-pmap)# class-map flow_export_class`
		Defines the class map that identifies traffic for which NSEL events need to be exported. The *flow_export_class* argument is the name of the class map.

Step 2	Do one of the following:	

	`match access-list` *`flow_export_acl`*
	Example:
	`hostname (config-cmap)# match access-list flow_export_acl`
		Configures the access list to match specific traffic. The *flow_export_acl* argument is the name of the access list.

	`match any`
	Example:
	`hostname (config-cmap)# match any`
		Matches any traffic.

Step 3	**`policy-map`** *`flow_export_policy`*
	Example:
	`hostname(config)# policy-map flow_export_policy`
		Defines the policy map to apply flow-export actions to the defined classes. The *flow_export_policy* argument is the name of the policy map.
		Note If you create a new policy map and apply it globally according to Step 6, the rest of the inspection policies will be deactivated.
		Alternatively, to insert a NetFlow class in the existing policy, enter the **class flow_export_class** command after the **policy-map global_policy** command.
		For more information about creating or modifying Modular Policy Framework, see the "Configuring Modular Policy Framework" section on page 9-12.

Step 4	**`class`** *`flow_export_class`*
	Example:
	`hostname (config-pmap)# class flow_export_class`
		Defines the class to apply flow-export actions. The *flow_export_class* argument is the name of the class.

	Command	Purpose

Step 5	**`flow-export event-type`** *`event-type`* **`destination`** *`flow_export_host1 [flow_export_host2]`*
	Example:
	`hostname (config-pmap-c)# flow-export event-type all destination 209.165.200.230`
		Configures a flow-export action. The **event_type** keyword is the name of the supported event being filtered. The supported event types are flow-create, flow-denied, flow-teardown, and all. The *flow_export_host* argument is the IP address of a host. The **destination** keyword is the IP address of the configured collector.

Step 6	**`service-policy`** *`flow_export_policy`* **`global`**
	Example:
	`hostname (config)# service-policy flow_export_policy global`
		Attaches the service policy globally. The *flow_export_policy* argument is the name of the policy map.

Configuring Template Timeout Intervals

To configure template timeout intervals, enter the following command:

Command	Purpose

`flow-export template timeout-rate` *`minutes`*
Example:
`hostname (config)# flow-export template timeout-rate 15`
	Specifies the interval at which template records are sent to all configured output destinations. The **template** keyword indicates the template-specific configurations. The **timeout-rate** keyword specifies the time before templates are resent. The *minutes* argument specifies the time interval in minutes at which the templates are resent. The default value is 30 minutes.

Delaying Flow-Create Events

To delay the sending of flow-create events, enter the following command:

Command	Purpose

`flow-export delay flow-create` *`seconds`*
Example:
`hostname (config)# flow-export delay flow-create 10`
	Delays the sending of a flow-create event. The *seconds* argument indicates the amount of time allowed for the delay in seconds. If this command is not configured, there is no delay, and the flow-create event is exported as soon as the flow is created. If the flow is torn down before the configured delay, the flow-create event is not sent; an extended flow teardown event is sent instead.

Disabling and Reenabling NetFlow-related Syslog Messages

To disable and reenable NetFlow-related syslog messages, perform the following steps:

	Command	Purpose

Step 1	**`logging flow-export syslogs disable`**
	Example:
	`hostname(config)# logging flow-export syslogs disable`
		Disables syslog messages that have become redundant because of NSEL.
		Note Although you execute this command in global configuration mode, it is not stored in the configuration. Only the **no logging message xxxxxx** commands are stored in the configuration.

Step 2	**`logging message`** *`xxxxxx`*
	Example:
	`hostname(config)# logging message 302013`
		Reenables syslog messages individually, where *xxxxxx* is the specified syslog message that you want to reenable.

Step 3	**`logging flow-export syslogs enable`**
	Example:
	`hostname(config)# logging flow-export syslogs enable`
		Reenables all NSEL events at the same time.

Clearing Runtime Counters

To reset runtime counters, enter the following command:

Command	Purpose

`clear flow-export counters`
`Examples`
`hostname# clear flow-export counters`
	Resets all runtime counters for NSEL to zero.

Monitoring NSEL

To monitor NSEL, enter one of the following commands:

Command	Purpose
`show flow-export counters`	Shows runtime counters, including statistical data and error data, for NSEL.
`show logging flow-export-syslogs`	Lists all syslog messages that are captured by NSEL events.
`show running-config logging`	Shows disabled syslog messages, which are redundant syslog messages, because they export the same information through NetFlow.

Examples

```
hostname (config)# show flow-export counters

destination: inside 209.165.200.225 2055

Statistics:
    packets sent                250
Errors:
    block allocation errors       0
    invalid interface             0
    template send failure         0

hostname# show logging flow-export-syslogs

Syslog ID       Type                           Status
302013          Flow Created                   Enabled
302015          Flow Created                   Enabled
302017          Flow Created                   Enabled
302020          Flow Created                   Enabled
302014          Flow Deleted                   Enabled
302016          Flow Deleted                   Enabled
302018          Flow Deleted                   Enabled
302021          Flow Deleted                   Enabled
106015          Flow Denied                    Enabled
106023          Flow Denied                    Enabled
313001          Flow Denied                    Enabled
313008          Flow Denied                    Enabled
710003          Flow Denied                    Enabled
106100          Flow Created/Denied             Enabled


hostname (config)# show running-config logging

no logging message 313008
no logging message 313001
```

Configuration Examples for NSEL

The following examples show how to filter NSEL events, with these collectors already configured:

- **flow-export destination inside 209.165.200.230**
- **flow-export destination outside 209.165.201.29 2055**
- **flow-export destination outside 209.165.201.27 2055**

Log all events between hosts 209.165.200.224 and hosts 209.165.201.224 to 209.165.200.230, and log all other events to 209.165.201.29:

```
hostname (config)# access-list flow_export_acl permit ip host 209.165.200.224 host
209.165.201.224
hostname (config)# class-map flow_export_class
hostname (config-cmap)# match access-list flow_export_acl
hostname (config)# policy-map flow_export_policy
hostname (config-pmap)# class flow_export_class
hostname (config-pmap-c)# flow-export event-type all destination 209.165.200.230
hostname (config-pmap)# class class-default
hostname (config-pmap-c)# flow-export event-type all destination 209.165.201.29
hostname (config)# service-policy flow_export_policy global
```

Log flow-create events to 209.165.200.230, flow-teardown events to 209.165.201.29, and flow-denied events to 209.165.201.27:

```
hostname (config)# policy-map flow_export_policy
hostname (config-pmap)# class class-default
hostname (config-pmap-c)# flow-export event-type flow-creation destination 209.165.200.230
hostname (config-pmap-c)# flow-export event-type flow-teardown destination 209.165.201.29
hostname (config-pmap-c)# flow-export event-type flow-denied destination 209.165.201.27
hostname (config)# service-policy flow_export_policy global
```

Log flow-create events between hosts 209.165.200.224 and 209.165.200.230 to 209.165.201.29, and log all flow-denied events to 209.165.201.27:

```
hostname (config)# access-list flow_export_acl permit ip host 209.165.200.224 host
209.165.200.230
hostname (config)# class-map flow_export_class
hostname (config)# match access-list flow_export_acl
hostname (config)# policy-map flow_export_policy
hostname (config-pmap)# class flow_export_class
hostname (config-pmap-c)# flow-export event-type flow-creation destination 209.165.200.29
hostname (config-pmap-c)# flow-export event-type flow-denied destination 209.165.201.27
hostname (config-pmap)# class class-default
hostname (config-pmap-c)# flow-export event-type flow-denied destination 209.165.201.27
hostname (config)# service-policy flow_export_policy global
```

Note You must enter the following command:

```
hostname (config-pmap-c)# flow-export event-type flow-denied destination 209.165.201.27
```

for *flow_export_acl*, because traffic is not checked after the first match, and you must explicitly define the action to log flow-denied events that match *flow_export_acl*.

Log all traffic except traffic between hosts 209.165.201.27 and 209.165.201.50 to 209.165.201.27:

```
hostname (config)# access-list flow_export_acl deny ip host 209.165.201.30 host
209.165.201.50
hostname (config)# access-list flow_export_acl permit ip any any
hostname (config)# class-map flow_export_class
hostname (config-cmap)# match access-list flow_export_acl
hostname (config)# policy-map flow_export_policy
hostname (config-pmap)# class flow_export_class
hostname (config-pmap-c)# flow-export event-type all destination 209.165.201.27
hostname (config)# service-policy flow_export_policy global
```

Additional References

For additional information related to implementing NSEL, see the following sections:

- Related Documents, page 75-10
- RFCs, page 75-10

Related Documents

Related Topic	**Document Title**
Using NSEL and Syslog Messages, page 75-2	*Cisco ASA 5500 Series System Log Messages*
Information about the implementation of NSEL on the ASA	*Implementation Note for NetFlow Collectors*

RFCs

RFC	**Title**
3954	Cisco Systems NetFlow Services Export Version 9

Feature History for NSEL

Table 75-2 lists the release history for this feature.

Table 75-2 Feature History for NSEL

Feature Name	**Release**	**Feature Information**
NetFlow	8.1(1)	The NetFlow feature enhances the ASA logging capabilities by logging flow-based events through the NetFlow protocol. NetFlow Version 9 services are used to export information about the progression of a flow from start to finish. The NetFlow implementation exports records that indicate significant events in the life of a flow. This implementation is different from traditional NetFlow, which exports data about flows at regular intervals. The NetFlow module also exports records about flows that are denied by access lists. You can configure an ASA 5580 to send the following events using NetFlow: flow create, flow teardown, and flow denied (only flows denied by ACLs are reported). The following commands were introduced: **clear flow-export counters, flow-export enable, flow-export destination, flow-export template timeout-rate, logging flow-export syslogs enable | disable, show flow-export counters, show logging flow-export-syslogs**
NetFlow Filtering	8.1(2)	You can filter NetFlow events based on traffic and event-type, and then send records to different collectors. For example, you can log all flow-create events to one collector, and log flow-denied events to a different collector. The following commands were modified: **class , class-map, flow-export event-type destination, match access-list, policy-map, service-policy** For short-lived flows, NetFlow collectors benefit from processing a single event instead of two events: flow create and flow teardown. You can configure a delay before sending the flow-create event. If the flow is torn down before the timer expires, only the flow teardown event is sent. The teardown event includes all information regarding the flow; no loss of information occurs. The **flow-export delay flow-create** command was introduced:
NSEL	8.2(1)	The NetFlow feature has been ported to all ASA 5500 series ASAs.

CHAPTER 76

Configuring SNMP

This chapter describes how to configure SNMP to monitor the ASA, and includes the following sections:

- Information about SNMP, page 76-1
- Licensing Requirements for SNMP, page 76-3
- Prerequisites for SNMP, page 76-3
- Guidelines and Limitations, page 76-3
- Troubleshooting Tips, page 76-8
- Monitoring SNMP, page 76-11
- Configuration Examples for SNMP, page 76-12
- Additional References, page 76-12
- Feature History for SNMP, page 76-14

Information about SNMP

The ASA provides support for network monitoring using SNMP Versions 1, 2c, and 3, and supports the use of all three versions simultaneously. The SNMP interface lets you monitor the ASA through network management systems, such as HP OpenView. The ASA supports SNMP read-only access through issuance of a GET request. SNMP write access is not allowed, so you cannot make changes with SNMP. In addition, the SNMP SET request is not supported.

You can configure the ASA to send traps, which are unsolicited comments from the managed device to the management station for certain events (event notifications) to an NMS, or you can use the NMS to browse the MIBs on the ASA. MIBs are a collection of definitions, and the ASA maintains a database of values for each definition. Browsing a MIB means issuing a series of GET-NEXT or GET-BULK requests of the MIB tree from the NMS to determine values.

Note In software versions 7.2(1), 8.0(2), and later, the SNMP information refreshes about every five seconds. As a result, we recommend that you wait for at least five seconds between consecutive polls.

This section includes the following topics:

- SNMP Version 3 Overview, page 76-2
- Security Models, page 76-2
- SNMP Groups, page 76-2

- SNMP Users, page 76-2
- SNMP Hosts, page 76-2
- Implementation Differences Between Adaptive Security Appliances and IOS, page 76-3

SNMP Version 3 Overview

SNMP Version 3 provides security enhancements that are not available in SNMP Version 1 or SNMP Version 2c. SNMP Versions 1 and 2c transmit data between the SNMP server and SNMP agent in clear text. SNMP Version 3 adds authentication and privacy options to secure protocol operations. In addition, this version controls access to the SNMP agent and MIB objects through the User-based Security Model (USM) and View-based Access Control Model (VACM). The ASA 5500 series ASAs also support the creation of SNMP groups and users, as well as hosts, which is required to enable transport authentication and encryption for secure SNMP communications.

Security Models

For configuration purposes, the authentication and privacy options are grouped together into security models. Security models apply to users and groups, and are divided into the following three types:

- NoAuthPriv—No Authentication and No Privacy, which means that no security is applied to messages.
- AuthNoPriv—Authentication but No Privacy, which means that messages are authenticated.
- AuthPriv—Authentication and Privacy, which means that messages are authenticated and encrypted.

SNMP Groups

An SNMP group is an access control policy to which users can be added. Each SNMP group is configured with a security model, and is associated with an SNMP view. A user within an SNMP group should match the security model of the SNMP group. These parameters specify what type of authentication and privacy a user within an SNMP group uses. Each SNMP group name and security model pair must be unique.

SNMP Users

SNMP users have a specified username, a group to which the user belongs, authentication password, encryption password, and authentication and encryption algorithms to use. The authentication algorithm options are MD5 and SHA. The encryption algorithm options are DES, 3DES, and AES (which is available in 128, 192, and 256 versions). When you create a user, you must associate it with an SNMP group. The user then inherits the security model of the group.

SNMP Hosts

An SNMP host is an IP address to which SNMP notifications and traps are sent. To configure SNMP Version 3 hosts, along with the target IP address, you must configure a username, because traps are only sent to a configured user. SNMP target IP addresses and target parameter names must be unique on the

ASA. Each SNMP host can have only one username associated with it. To receive SNMP traps, after you have added the **snmp-server host** command, make sure that you configure the user credentials on the NMS to match those configured on the ASA.

Implementation Differences Between Adaptive Security Appliances and IOS

The SNMP Version 3 implementation in ASAs differs from the SNMP Version 3 implementation in IOS in the following ways:

- The local-engine and remote-engine IDs are not configurable. The local engine ID is generated when the ASA starts or when a context is created.
- No support exists for view-based access control, which results in unrestricted MIB browsing.
- Support is restricted to the following MIBs: USM, VACM, FRAMEWORK, and TARGET.
- You must create users and groups with the correct security model.
- You must remove users, groups, and hosts in the correct sequence.
- Use of the **snmp-server host** command creates creates a firewall rule to allow incoming SNMP traffic.

Licensing Requirements for SNMP

The following table shows the licensing requirements for this feature:

Model	License Requirement
ASA 5505	Base License and Security Plus License: Base (DES). *Optional license: Strong (3DES/AES).*
All other models	Base License: Base (DES). *Optional license: Strong (3DES/AES).*

Note To determine whether or not you are entitled to use this feature, enter the **show version** command or **show activation-key** command.

Prerequisites for SNMP

SNMP has the following prerequisite:

You must have CiscoWorks for Windows or another SNMP MIB-II compliant browser to receive SNMP traps or browse a MIB.

Guidelines and Limitations

This section includes the guidelines and limitations for this feature:

Context Mode Guidelines

Supported in single and multiple context modes.

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

Failover Guidelines

- Supported in SNMP Version 3.
- The SNMP client in each ASA shares engine data with its peer. Engine data includes the engineID, engineBoots, and engineTime objects of the SNMP-FRAMEWORK-MIB.

IPv6 Guidelines

Does not support IPv6.

Additional Guidelines

- Does not support VACM.
- Does not support SNMP Version 3 for the AIP SSM or AIP SSC.
- Does not support SNMP debugging.
- When using NET-SNMP Version 5.4.2.1, only supports the encryption algorithm version of AES128. Does not support the encryption algorithm versions of AES246 or AES192.
- For SNMP Version 3, configuration must occur in the following order: group, user, host.
- Before a group is deleted, you must ensure that all users associated with that group are deleted.
- Before a user is deleted, you must ensure that no hosts are configured that are associated with that username.
- If users have been configured to belong to a particular group with a certain security model, and if the security level of that group is changed, you must do the following in this sequence:
  - Remove the users from that group.
  - Change the group security level.
  - Add users that belong to the new group.
- The creation of custom views to restrict user access to a subset of MIB objects is not supported.
- All requests and traps are available in the default Read/Notify View only.
- SNMP polling will fail if SNMP syslog messages exceed a high rate (approximately 4000 per second).

Configuring SNMP

This section describes how to configure SNMP, and includes the following topics:

- Enabling SNMP, page 76-5
- Compiling Cisco Syslog MIB Files, page 76-7

Enabling SNMP

The SNMP agent that runs on the ASA performs two functions:

- Replies to SNMP requests from NMSs.
- Sends traps (event notifications) to NMSs.

To enable the SNMP agent and identify an NMS that can connect to the SNMP server, perform the following steps:

	Command	Purpose

Step 1	**`snmp-server enable`**
	Example:
	`hostname(config)# snmp-server enable`
		Ensures that the SNMP server on the ASA is enabled. By default, the SNMP server is enabled.

Step 2	**`snmp-server group`** *`group-name`* **`v3`** `[`**`auth`** `|` **`noauth`** `|` **`priv`**`]`
	Example:
	`hostname(config)# snmp-server group testgroup1 v3 auth`
		Specifies a new SNMP group. When a community string is configured, two additional groups with the name that matches the community string are autogenerated: one for the Version 1 security model and one for the Version 2 security model. For more information about security models, see the "Security Models" section on page 76-2. The **auth** keyword enables packet authentication. The **noauth** keyword indicates no packet authentication or encryption is being used. The **priv** keyword enables packet encryption and authentication. No default values exist for the **auth** or **priv** keywords.
		For use *only* with SNMP Version 3.

	Command	Purpose

Step 3	**snmp-server user** *username group-name* {**v3** [**encrypted**]] [**auth** {**md5** | **sha**]} *auth-password* [**priv** [**des** | **3des** | **aes**] [**128** | **192** | **256**] *priv-password*
	Example:
	`hostname(config)# snmp-server user testuser1 testgroup1 v3 auth md5 testpassword aes 128 mypassword`
	`hostname(config)# snmp-server user testuser1 public v3 encrypted auth md5 00:11:22:33:44:55:66:77:88:99:AA:BB:CC:DD:EE:FF`
		Configures a new user for an SNMP group. The *username* argument is the name of the user on the host that belongs to the SNMP agent. The *group-name* argument is the name of the group to which the user belongs. The **v3** keyword specifies that the SNMP Version 3 security model should be used, and enables the use of the **encrypted, priv,** and the **auth** keywords. The **encrypted** keyword specifies the password in encrypted format. Encrypted passwords must be in hexadecimal format. The **auth** keyword specifies which authentication level (**md5** or **sha**) should be used. The **priv** keyword specifies the encryption level. No default values for the **auth** or **priv** keywords nor default passwords exist. For the encryption algorithm, you can specify either **des**, **3des**, or **aes**. You can also specify which version of the AES encryption algorithm to use: **128**, **192**, or **256**. The *auth-password* specifies the authentication user password. The *priv-password* specifies the encryption user password.
		Note If you forget a password, you cannot recover it, and must reconfigure the user. You can specify a plain-text password or a localized digest. The localized digest must match the authentication algorithm selected for the user, which can be either MD5 or SHA. When the user configuration is displayed on the console or is written to a file (for example, the startup-configuration file), the localized authentication and privacy digests are always displayed instead of a plain-text password (see the second example). The minimum length for a password is one character; however, we recommend that you use at least eight characters for security.
		For use *only* with SNMP Version 3.

Step 4	**snmp-server host** *interface* {*hostname* | *ip_address*} [**trap** | **poll**] [**community** *community-string*] [**version** {***1*** | ***2c*** | ***3*** *username*}] [**udp-port** *port*]
	Example:
	`hostname(config)# snmp-server host mgmt 10.7.14.90 version 3 testuser1`
	`hostname(config)# snmp-server host mgmt 10.7.26.5 version 3 testuser2`
	`hostname(config)# snmp-server host corp 172.18.154.159 community public`
		Specifies the recipient of an SNMP notification. Indicates the interface from which traps are sent. Identifies the name and IP address of the NMS or SNMP manager that can connect to the ASA. The **trap** keyword limits the NMS to receiving traps only. The **poll** keyword limits the NMS to sending requests (polling) only. By default, SNMP traps are enabled. By default, the UDP port is 162. The community string is a shared secret key between the ASA and the NMS. The key is a case-sensitive value up to 32 characters in length. Spaces are not permitted. The default community-string is "public." The ASA uses this key to determine whether the incoming SNMP request is valid. For example, you could designate a site with a community string and then configure the ASA and the management station with the same string. The ASA uses the specified string and does not respond to requests with an invalid community string. For more information about SNMP hosts, see the "SNMP Hosts" section on page 76-2.
		Note When SNMP Version 3 hosts are configured on the ASA, a user must be associated with that host. To receive traps, after you have added the **snmp-server host** command, make sure that you configure the user on the NMS with the same credentials as those configured on the ASA.

	Command	Purpose
Step 5	**snmp-server community** *community-string* **Example:** `hostname(config)# snmp-server community onceuponatime`	Sets the community string. For use *only* with SNMP Version 1 or 2c.

Step 6	**snmp-server** [**contact** | **location**] *text*
	Example:
	`hostname(config)# snmp-server location building 42`
	`hostname(config)# snmp-server contact EmployeeA`
		Sets the SNMP server location or contact information.

Step 7	**snmp-server enable traps** [**all** | **syslog** | **snmp** [*trap*] [...] | **entity** [*trap*] [...] | **ipsec** [*trap*] [...] | **remote-access** [*trap*]] **Example:** `hostname(config)# snmp-server enable traps snmp authentication linkup linkdown coldstart`	Sends individual traps, sets of traps, or all traps to the NMS. Enables syslog messages to be sent as traps to the NMS. The default configuration has all SNMP core traps enabled, as shown in the example. To disable these traps, use the **no snmp-server enable traps snmp** command. If you enter this command and do not specify a trap type, the default is the syslog trap. By default, the syslog trap is enabled. The default SNMP traps continue to be enabled along with the syslog trap. To restore the default enabling of SNMP traps, use the **clear configure snmp-server** command.

Compiling Cisco Syslog MIB Files

To receive security and failover SNMP traps from the ASA, compile the Cisco SMI MIB and the Cisco Syslog MIB into the SNMP management application. If you do not compile the Cisco Syslog MIB into your application, you only receive traps for linkup or linkdown, coldstart, and authentication failure.

To compile Cisco Syslog MIB files into your browser using CiscoWorks for Windows, perform the following steps:

Step 1 To download the Cisco MIBs, go to the following website:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

Step 2 From the Cisco Secure and VPN Products drop-down list, choose Adaptive Security Appliance.

The Adaptive Security Appliance MIB Support List appears.

Step 3 Click the **CISCO-SYSLOG-MIB.my** link and save the file to your desktop.

Step 4 Launch CiscoWorks for Windows.

Step 5 Choose **Config > Compile MIB**.

Step 6 Scroll to the bottom of the list, and click the last entry.

Step 7 Click **Add**.

Step 8 Locate the Cisco Syslog MIB files.

Note You must manually rename any files with the .my extension to the .mib extension, because only files with the .mib extension appear in the file selection window of CiscoWorks for Windows.

Step 9 Click **CISCO-FIREWALL-MIB.mib** and click **OK**.

Step 10 Scroll to the bottom of the list, and click the last entry.

Step 11 Click **Add**.

Step 12 Click **CISCO-MEMORY-POOL-MIB.mib** and click **OK**.

Step 13 Scroll to the bottom of the list, and click the last entry.

Step 14 Click **Add**.

Step 15 Click **CISCO-SMI-MIB.mib** and click **OK**.

Step 16 Scroll to the bottom of the list, and click the last entry.

Step 17 Click **Add**.

Step 18 Click **CISCO-SYSLOG-MIB.mib** and click **OK**.

Step 19 Click **Load All**.

Step 20 If no errors occur, relaunch CiscoWorks for Windows.

Troubleshooting Tips

To ensure that the SNMP process that receives incoming packets from the NMS is running, enter the following command:

```
hostname(config)# show process | grep snmp
```

To capture syslog messages from SNMP and have them appear on the ASA console, enter the following commands:

```
hostname(config)# logging list snmp message 212001-212015
hostname(config)# logging console snmp
```

To make sure that the SNMP process is sending and receiving packets, enter the following commands:

```
hostname(config)# clear snmp-server statistics
hostname(config)# show snmp-server statistics
```

The output is based on the SNMP group of the SNMPv2-MIB.

To make sure that SNMP packets are going through the ASA and to the SNMP process, enter the following commands:

```
hostname(config)# clear asp drop
hostname(config)# show asp drop
```

If the NMS cannot request objects successfully or is not handing incoming traps from the ASA correctly, use a packet capture to isolate the problem by entering the following commands:

```
hostname (config)# access-list snmp permit udp any eq snmptrap any
hostname (config)# access-list snmp permit udp any any eq snmp
hostname (config)# capture snmp type raw-data access-list snmp interface mgmt
hostname (config)# copy /pcap capture:snmp tftp://192.0.2.5/exampledir/snmp.pcap
```

If the ASA is not performing as expected, obtain information about network topology and traffic by doing the following:

- For the NMS configuration:
  - Number of timeouts
  - Retry count
  - Engine ID caching
  - Username and password used
- Run the following commands:
  - **show block**
  - **show interface**
  - **show process**
  - **show cpu**

If a fatal error occurs, to help in reproducing the error, send a traceback file and the output of the **show tech-support** command to Cisco TAC.

If SNMP traffic is not being allowed through the ASA interfaces, you might also need to permit ICMP traffic from the remote SNMP server using the **icmp permit** command.

For the ASA 5580, differences may appear in the physical interface statistics output and the logical interface statistics output between the **show interface** command and **show traffic** command.

Interface Types and Examples

The interface types that produce SNMP traffic statistics include the following:

- Logical—Statistics collected by the software driver, which are a subset of physical statistics.
- Physical—Statistics collected by the hardware driver. Each physical named interface has a set of logical and physical statistics associated with it. Each physical interface may have more than one VLAN interface associated with it. VLAN interfaces only have logical statistics. For a physical interface that has multiple VLAN interfaces associated with it, be aware of the following:

Note For a physical interface that has multiple VLAN interfaces associated with it, note that SNMP counters for ifInOctets and ifOutoctets OIDs match the aggregate traffic counters for that physical interface.

- VLAN-only—SNMP uses logical statistics for ifInOctets and ifOutOctets.

The examples in Table 76-1 show the differences in SNMP traffic statistics.

Table 76-1 SNMP Traffic Statistics for Physical and VLAN Interfaces

Example 1

The following example shows the difference in physical and logical output statistics for the **show interface** command and the **show traffic** command.

```
hostname#show interface GigabitEthernet3/2
interface GigabitEthernet3/2
    description fullt-mgmt
    nameif mgmt
    security-level 10
    ip address 10.7.14.201 255.255.255.0
    management-only

hostname#show traffic
(Condensed output)

Physical Statistics
GigabitEthernet3/2:
    received (in 121.760 secs)
        36 packets       3428 bytes
        0 pkts/sec      28 bytes/sec

Logical Statistics
mgmt:
    received (in 117.780 secs)
        36 packets       2780 bytes
        0 pkts/sec      23 bytes/sec
```

The following examples show the SNMP output statistics for the management interface and the physical interface. The ifInOctets value is close to the physical statistics output that appears in the **show traffic** command output, but not to the logical statistics output.

ifIndex of the mgmt interface:

```
IF_MIB::ifDescr.6 = Adaptive Security Appliance 'mgmt'
interface
```

ifInOctets that corresponds to the physical interface statistics:

```
IF-MIB::ifInOctets.6 = Counter32:3246
```

Example 2

The following example shows output statistics for a VLAN-only interface for the **show interface** command and the **show traffic** command. The example shows that the statistics are close to the output that appears for the **show traffic** command:

```
hostname# show interface GigabitEthernet0/0.100
interface GigabitEthernet0/0.100
    vlan 100
    nameif inside
    security-level 100
    ip address 47.7.1.101 255.255.255.0 standby
    47.7.1.102

hostname#show traffic
inside
    received (in 9921.450 secs)
        1977 packets       126528 bytes
        0 pkts/sec      12 bytes/sec
    transmitted (in 9921.450 secs)
        1978 packets       126556 bytes
        0 pkts/sec      12 bytes/sec
```

ifIndex of VLAN inside:

```
IF-MIB::ifDescr.9 = Adaptive Security Appliance
'inside' interface
IF-MIB::ifInOctets.9 = Counter32: 126318
```

Monitoring SNMP

To monitor SNMP, enter one of the following commands:

Command	Purpose
`clear snmp-server statistics`	Resets all SNMP counters to zero.
`show running-config [default] snmp-server`	Displays all SNMP server configuration information.
`show running-config snmp-server group`	Displays SNMP group configuration settings.
`show running-config snmp-server host`	Displays configuration settings used by SNMP to control messages and notifications sent to remote hosts.
`show running-config snmp-server user`	Displays SNMP user-based configuration settings.
`show snmp-server engineid`	Displays the ID of the SNMP engine configured.
`show snmp-server group`	Displays the names of configured SNMP groups. **Note** If the community string has already been configured, two extra groups appear by default in the output. This behavior is normal.
`show snmp-server statistics`	Displays the configured characteristics of the SNMP server.
`show snmp-server user`	Displays the configured characteristics of users.

Examples

```
hostname(config)# show snmp-server statistics
0 SNMP packets input
    0 Bad SNMP version errors
    0 Unknown community name
    0 Illegal operation for community name supplied
    0 Encoding errors
    0 Number of requested variables
    0 Number of altered variables
    0 Get-request PDUs
    0 Get-next PDUs
    0 Get-bulk PDUs
    0 Set-request PDUs (Not supported)
0 SNMP packets output
    0 Too big errors (Maximum packet size 512)
    0 No such name errors
    0 Bad values errors
    0 General errors
    0 Response PDUs
    0 Trap PDUs

hostname(config)# show running-config snmp-server
no snmp-server location
no snmp-server contact
snmp-server enable traps snmp authentication linkup linkdown coldstart
```

Configuration Examples for SNMP

This section includes the following topics:

- Configuration Example for SNMP Versions 1 and 2c, page 76-12
- Configuration Example for SNMP Version 3, page 76-12

Configuration Example for SNMP Versions 1 and 2c

The following example shows how the ASA can receive SNMP requests from host 192.0.2.5 on the inside interface, but does not send any SNMP syslog requests to any host:

```
hostname(config)# snmp-server host 192.0.2.5
hostname(config)# snmp-server location building 42
hostname(config)# snmp-server contact EmployeeA
hostname(config)# snmp-server community ohwhatakeyisthee
```

Configuration Example for SNMP Version 3

The following example show how the ASA can receive SNMP requests using the SNMP Version 3 security model, which requires that the configuration follow this specific order: group, followed by user, followed by host:

```
hostname(config)# snmp-server group v3 vpn-group priv
hostname(config)# snmp-server user admin vpn group v3 auth sha letmein priv 3des cisco123
hostname(config)# snmp-server host mgmt 10.0.0.1 version 3 priv admin
```

Additional References

For additional information related to implementing SNMP, see the following sections:

- RFCs for SNMP Version 3, page 76-12
- MIBs, page 76-13

RFCs for SNMP Version 3

RFC	Title
3410	*Introduction and Applicability Statements for Internet Standard Management Framework*
3411	*An Architecture for Describing SNMP Management Frameworks*
3412	*Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)*
3413	*Simple Network Management Protocol (SNMP) Applications*
3414	*User-based Security Model (USM) for Version 3 of the Simple Network Management Protocol (SNMP)*
3826	*The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model*

MIBs

For a list of supported MIBs and traps for the ASA by release, see the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

To obtain a list of the supported SNMP MIBs for a specified ASA, enter the following command:

```
hostname(config)# show snmp-server oidlist
```

Note Although the **oidlist** keyword does not appear in the options list for the **show snmp-server** command help, it is available.

The following is sample output from the **show snmp-server oidlist** command:

```
[0]     1.3.6.1.2.1.1.1.        sysDescr
[1]     1.3.6.1.2.1.1.2.        sysObjectID
[2]     1.3.6.1.2.1.1.3.        sysUpTime
[3]     1.3.6.1.2.1.1.4.        sysContact
[4]     1.3.6.1.2.1.1.5.        sysName
[5]     1.3.6.1.2.1.1.6.        sysLocation
[6]     1.3.6.1.2.1.1.7.        sysServices
[7]     1.3.6.1.2.1.2.1.        ifNumber
[8]     1.3.6.1.2.1.2.2.1.1.    ifIndex
[9]     1.3.6.1.2.1.2.2.1.2.    ifDescr
[10]    1.3.6.1.2.1.2.2.1.3.    ifType
[11]    1.3.6.1.2.1.2.2.1.4.    ifMtu
[12]    1.3.6.1.2.1.2.2.1.5.    ifSpeed
[13]    1.3.6.1.2.1.2.2.1.6.    ifPhysAddress
[14]    1.3.6.1.2.1.2.2.1.7.    ifAdminStatus
[15]    1.3.6.1.2.1.2.2.1.8.    ifOperStatus
[16]    1.3.6.1.2.1.2.2.1.9.    ifLastChange
[17]    1.3.6.1.2.1.2.2.1.10.   ifInOctets
[18]    1.3.6.1.2.1.2.2.1.11.   ifInUcastPkts
[19]    1.3.6.1.2.1.2.2.1.12.   ifInNUcastPkts
[20]    1.3.6.1.2.1.2.2.1.13.   ifInDiscards
[21]    1.3.6.1.2.1.2.2.1.14.   ifInErrors
[22]    1.3.6.1.2.1.2.2.1.16.   ifOutOctets
[23]    1.3.6.1.2.1.2.2.1.17.   ifOutUcastPkts
[24]    1.3.6.1.2.1.2.2.1.18.   ifOutNUcastPkts
[25]    1.3.6.1.2.1.2.2.1.19.   ifOutDiscards
[26]    1.3.6.1.2.1.2.2.1.20.   ifOutErrors
[27]    1.3.6.1.2.1.2.2.1.21.   ifOutQLen
[28]    1.3.6.1.2.1.2.2.1.22.   ifSpecific
[29]    1.3.6.1.2.1.4.1.        ipForwarding
[30]    1.3.6.1.2.1.4.20.1.1.   ipAdEntAddr
[31]    1.3.6.1.2.1.4.20.1.2.   ipAdEntIfIndex
[32]    1.3.6.1.2.1.4.20.1.3.   ipAdEntNetMask
[33]    1.3.6.1.2.1.4.20.1.4.   ipAdEntBcastAddr
[34]    1.3.6.1.2.1.4.20.1.5.   ipAdEntReasmMaxSize
[35]    1.3.6.1.2.1.11.1.       snmpInPkts
[36]    1.3.6.1.2.1.11.2.       snmpOutPkts
[37]    1.3.6.1.2.1.11.3.       snmpInBadVersions
[38]    1.3.6.1.2.1.11.4.       snmpInBadCommunityNames
[39]    1.3.6.1.2.1.11.5.       snmpInBadCommunityUses
[40]    1.3.6.1.2.1.11.6.       snmpInASNParseErrs
[41]    1.3.6.1.2.1.11.8.       snmpInTooBigs
[42]    1.3.6.1.2.1.11.9.       snmpInNoSuchNames
[43]    1.3.6.1.2.1.11.10.      snmpInBadValues
[44]    1.3.6.1.2.1.11.11.      snmpInReadOnlys
[45]    1.3.6.1.2.1.11.12.      snmpInGenErrs
```

```
[46]    1.3.6.1.2.1.11.13.      snmpInTotalReqVars
[47]    1.3.6.1.2.1.11.14.      snmpInTotalSetVars
[48]    1.3.6.1.2.1.11.15.      snmpInGetRequests
[49]    1.3.6.1.2.1.11.16.      snmpInGetNexts
[50]    1.3.6.1.2.1.11.17.      snmpInSetRequests
[51]    1.3.6.1.2.1.11.18.      snmpInGetResponses
[52]    1.3.6.1.2.1.11.19.      snmpInTraps
[53]    1.3.6.1.2.1.11.20.      snmpOutTooBigs
[54]    1.3.6.1.2.1.11.21.      snmpOutNoSuchNames
[55]    1.3.6.1.2.1.11.22.      snmpOutBadValues
[56]    1.3.6.1.2.1.11.24.      snmpOutGenErrs
[57]    1.3.6.1.2.1.11.25.      snmpOutGetRequests
[58]    1.3.6.1.2.1.11.26.      snmpOutGetNexts
[59]    1.3.6.1.2.1.11.27.      snmpOutSetRequests
[60]    1.3.6.1.2.1.11.28.      snmpOutGetResponses
[61]    1.3.6.1.2.1.11.29.      snmpOutTraps
[62]    1.3.6.1.2.1.11.30.      snmpEnableAuthenTraps
[63]    1.3.6.1.2.1.11.31.      snmpSilentDrops
[64]    1.3.6.1.2.1.11.32.      snmpProxyDrops
[65]    1.3.6.1.2.1.31.1.1.1.1. ifName
[66]    1.3.6.1.2.1.31.1.1.1.2. ifInMulticastPkts
[67]    1.3.6.1.2.1.31.1.1.1.3. ifInBroadcastPkts
[68]    1.3.6.1.2.1.31.1.1.1.4. ifOutMulticastPkts
[69]    1.3.6.1.2.1.31.1.1.1.5. ifOutBroadcastPkts
[70]    1.3.6.1.2.1.31.1.1.1.6. ifHCInOctets
--More--
```

Feature History for SNMP

Table 76-2 lists the release history for this feature.

Table 76-2 Feature History for SNMP

Feature Name	Release	Feature Information
SNMP Versions 1 and 2c	7.0(1)	Provides ASA network monitoring and event information by transmitting data between the SNMP server and SNMP agent through the clear text community string.
SNMP Version 3	8.2(1)	Provides 3DES or AES encryption and support for SNMP Version 3, the most secure form of the supported security models. This version allows you to configure users, groups, and hosts, as well as authentication characteristics by using the USM. In addition, this version allows access control to the agent and MIB objects, and includes additional MIB support. The following commands were introduced: • **show snmp-server engineid** • **show snmp-server group** • **show snmp-server user** • **snmp-server group** • **snmp-server user** The following command was modified: • **snmp-server host**
IF-MIB ifAlias OID support	8.2(5)	The ASA now supports the ifAlias OID. When you browse the IF-MIB, the ifAlias OID will be set to the value that has been set for the interface description.

CHAPTER 77

Configuring Anonymous Reporting and Smart Call Home

The Smart Call Home feature provides personalized, e-mail-based and web-based notification to customers about critical events involving their individual systems, often before customers know that a critical event has occurred.

The Anonymous Reporting feature is a subfeature of the Smart Call Home feature and allows Cisco to anonymously receive minimal error and health information from the device.

Note You might have received a popup dialog that invites you to do the following:

- Enable Anonymous Reporting to help improve the ASA platform.
- Register for Smart Home Notifications to receive personalized, proactive assistance from Cisco.

For information about the dialog, see the "Anonymous Reporting and Smart Call Home Prompt" section on page 77-3.

This chapter describes how to use and configure Anonymous Reporting and Smart Call Home, and it includes the following sections:

- Information About Anonymous Reporting and Smart Call Home, page 77-1
- Licensing Requirements for Anonymous Reporting and Smart Call Home, page 77-4
- Prerequisites for Smart Call Home and Anonymous Reporting, page 77-5
- Guidelines and Limitations, page 77-5
- Configuring Anonymous Reporting and Smart Call Home, page 77-6
- Monitoring Smart Call Home, page 77-19
- Configuration Example for Smart Call Home, page 77-19
- Feature History for Anonymous Reporting and Smart Call Home, page 77-20

Information About Anonymous Reporting and Smart Call Home

This section includes the following topics:

- Information About Anonymous Reporting, page 77-2
- Information About Smart Call Home, page 77-4

Information About Anonymous Reporting

Customers can help to improve the ASA platform by enabling Anonymous Reporting, which allows Cisco to securely receive minimal error and health information from the device. If you enable the feature, your customer identity will remain anonymous, and no identifying information will be sent.

Enabling Anonymous Reporting creates a trust point and installs a certificate. A CA certificate is required for your ASA to validate the server certificate present on the Smart Call Home web server and to form the HTTPS session so that your ASA can send messages securely. Cisco imports a certificate that is predefined in the software. If you decide to enable Anonymous Reporting, a certificate is installed on the ASA with a hardcoded trust point name: _SmartCallHome_ServerCA. When you enable Anonymous Reporting, this trust point is created, the appropriate certificate is installed, and you receive a message about this action. The certificate then shows up in your configuration.

If the appropriate certificate already exists in your configuration when you enable Anonymous Reporting, no trust point is created, and no certificate is installed.

Note When you enable Anonymous Reporting you acknowledge your consent to transfer the specified data to Cisco or to vendors operating on Cisco's behalf (including countries outside of the U.S.). Cisco maintains the privacy of all customers. For information about Cisco's treatment of personal information, see the Cisco Privacy Statement at the following URL: http://www.cisco.com/web/siteassets/legal/privacy.html

What is Sent to Cisco?

Messages are sent to Cisco once a month and whenever the ASA reloads. These messages are categorized by alert groups, which are predefined subsets of Smart Call Home alerts that are supported on the ASA: configuration alerts, inventory alerts, and crash information alerts.

Inventory alerts consist of output from the following commands:

- **show version**—Displays the ASA software version, hardware configuration, license key, and related uptime data for the device.
- **show environment**—Shows system environment information for ASA system components, such as hardware operational status for the chassis, drivers, fans, and power supplies, as well as temperature status, voltage, and CPU usage.
- **show inventory—**Retrieves and displays inventory information about each Cisco product that is installed in the networking device. Each product is identified by unique device information, called the UDI, which is a combination of three separate data elements: the product identifier (PID), the version identifier (VID), and the serial number (SN).
- **show failover state**—Displays the failover state of both units in a failover pair. The information displayed includes the primary or secondary status of the unit, the Active/Standby status of the unit, and the last reported reason for failover.
- **show module**—Shows information about any modules installed on the ASAs, for example, information about an AIP SSC installed on the ASA 5505 or information about an SSP installed on the ASA 5585-X, and information about an IPS SSP installed on an ASA 5585-X.

Configuration alerts consist of output from the following commands:

- **show context**—Shows allocated interfaces and the configuration file URL, the number of contexts configured, or, if you enable AR in the system execution space, from a list of all contexts.

- **show call-home registered-module status**—Displays the registered module status. If you use system configuration mode, the command displays system module status based on the entire device, not per context.

Upon a system crash, modified information from the following command is sent:

- **show crashinfo** (truncated)—Upon an unexpected software reload, the device sends a modified crash information file with only the traceback section of the file included, so only function calls, register values, and stack dumps are reported to Cisco.

For more information about ASA commands, see the Cisco ASA 5500 Series Command Reference document.

DNS Requirement

A DNS server must be configured properly for your ASA to reach the Cisco Smart Call Home server and send messages to Cisco. Because it is possible that your ASA resides in a private network and does not have access to the public network, Cisco verifies your DNS configuration and then configures it for you, if necessary, by doing the following:

1. Performing a DNS lookup for all DNS servers configured.
2. Getting the DNS server from the DHCP server by sending DHCPINFORM messages on the highest security-level interface.
3. Using the Cisco DNS servers for lookup.
4. Randomly using a static IP addresses for tools.cisco.com.

The above tasks are performed without changing the current configuration. (For example, the DNS server learned from DHCP will not be added to the configuration.)

If there is no DNS server configured, and your ASA cannot reach the Cisco Smart Call Home Server, Cisco generates a syslog message with the “warning” severity for every Smart Call Home message sent to remind you to configure DNS properly.

For information about system log messages, see the *Cisco ASA 5500 Series System Log Messages*.

Anonymous Reporting and Smart Call Home Prompt

When you enter configuration mode you receive a prompt that invites you to enable the Anonymous Reporting and Smart Call Home features if the following criteria are met:

At the prompt you may choose [Y]es, [N]o, [A]sk later. If you choose [A]sk later, then you are reminded again in seven days or when the ASA reloads. If you continue to choose [A]sk later, the ASA prompts two more times at seven-day intervals before it assumes a [N]o response and does not ask again.

At the ASDM prompt you can select from the following options:

Anonymous—Enables Anonymous Reporting.

Registered (enter an e-mail address)—Enables Smart Call Home and registers your ASA with Cisco TAC.

Do not enable Smart Call Home—Does not enable Smart Call Home and does not ask again.

Remind Me Later—Defers the decision. You are reminded again in seven days or whenever the ASA reloads. The ASA prompts two more times at seven-day intervals before it assumes a “Do not enable Smart Call Home response” and does not ask again.

If you did not receive the prompt, you may enable Anonymous Reporting or Smart Call Home by performing the steps in the "Configuring Anonymous Reporting" section on page 77-6 or the "Configuring Smart Call Home" section on page 77-7.

Information About Smart Call Home

When fully configured, Smart Call Home detects issues at your site and reports them back to Cisco or through other user-defined channels (such as e-mail or directly to you), often before you know that these issues exist. Depending upon the seriousness of these problems, Cisco responds to customers regarding their system configuration issues, product end-of-life announcements, security advisory issues, and so on.

In this manner, Smart Call Home offers proactive diagnostics and real-time alerts on the ASA and provides high network availability and increased operational efficiency through proactive and quick issue resolution by doing the following:

- Identifying issues quickly with continuous monitoring, real-time proactive alerts, and detailed diagnostics.
- Making you aware of potential problems through Smart Call Home notifications, in which a service request has been opened, with all diagnostic data attached.
- Resolving critical problems faster with direct, automatic access to experts in Cisco TAC.

Smart Call Home offers increased operational efficiency by providing you with the ability to do the following:

- Use staff resources more efficiently by reducing troubleshooting time.
- Generate service requests to Cisco TAC automatically, routed to the appropriate support team, which provides detailed diagnostic information that speeds problem resolution.

The Smart Call Home Portal offers quick, web-based access to required information that provides you with the ability to do the following:

- Review all Smart Call Home messages, diagnostics, and recommendations in one place.
- Check service request status quickly.
- View the most up-to-date inventory and configuration information for all Smart Call Home-enabled devices.

Licensing Requirements for Anonymous Reporting and Smart Call Home

The following table shows the licensing requirements for Anonymous Reporting and Smart Call Home:

Model	License Requirement
All models	Base License.

Prerequisites for Smart Call Home and Anonymous Reporting

Smart Call Home and Anonymous Reporting have the following prerequisites:

- DNS must be configured. (See the "DNS Requirement" section on page 77-3 and see the "Configuring the DNS Server" section on page 8-6.)

Guidelines and Limitations

Firewall Mode Guidelines

Supported in routed and transparent firewall modes.

Context Mode Guidelines

Supported in single mode and multiple context mode.

IPv6 Guidelines

Supports IPv6.

Additional Guidelines for Anonymous Reporting

- If an Anonymous Reporting message cannot be sent on the first try, the ASA retries two more times before dropping the message.
- Anonymous Reporting can coexist with other Smart Call Home configurations without changing the existing configuration. For example, if Smart Call Home is off before enabling Anonymous Reporting, it remains off, even after enabling Anonymous Reporting.
- Output from the **show running-config all** command shows details about the Anonymous Reporting user profile.
- If Anonymous Reporting is enabled, you cannot remove the trust point, and when Anonymous Reporting is disabled, the trust point remains. If Anonymous Reporting is disabled, users can remove the trustpoint, but disabling Anonymous Reporting will not cause the trustpoint to be removed.

Additional Guidelines for Smart Call Home

In multiple context mode, the **snapshots** command is divided into two commands: one to obtain information from the system context and one to obtain information from the regular context.

Configuring Anonymous Reporting and Smart Call Home

While Anonymous Reporting is a subfeature of the Smart Call Home feature and allows Cisco to anonymously receive minimal error and health information from the device, the Smart Call Home feature is more robust and allows for customized support of your system health, allowing Cisco TAC to monitor your devices and open a case when there is an issue, often before you know the issue occurred.

Generally speaking, you can have both features configured on your system at the same time, yet configuring the robust Smart Call Home feature provides the same functionality as Anonymous reporting, plus personalized service.

This section includes the following topics:

- Configuring Anonymous Reporting, page 77-6
- Configuring Smart Call Home, page 77-7

Configuring Anonymous Reporting

To configure Anonymous Reporting and securely provide minimal error and health information to Cisco, perform the following steps:

Detailed Steps

	Command	Purpose

Step 1	**`call-home reporting anonymous`**
	Example:
	`hostname(config)# call-home reporting anonymous`
		Enables the Anonymous Reporting feature and creates a new anonymous profile.
		Entering this command creates a trust point and installs a certificate that is used to verify the identity of the Cisco web server.

Step 2	**`call-home test reporting anonymous`**
	Example:
	`hostname(config)# call-home test reporting anonymous`
		(Optional) Tests that the Anonymous Reporting feature is fully enabled. Also ensures that you have connectivity to the server and that your system is able to send messages.
		A success or error message returns test results.

Configuring Smart Call Home

This section describes how to configure the Smart Call Home feature.

This section includes the following topics:

- Enabling Smart Call Home, page 77-7
- Declaring and Authenticating a CA Trust Point, page 77-8
- Configuring DNS, page 77-8
- Subscribing to Alert Groups, page 77-9
- Testing Call Home Communications, page 77-11
- Optional Configuration Procedures, page 77-13

Enabling Smart Call Home

This section contains information about performing basic setup for the Smart Call Home feature.

To enable Smart Call Home and activate your call-home profile, perform this task:

Step 1	**`service call-home`**
	Example:
	`hostname(config)# service call-home`
		Enables the smart call home service.

Step 2	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call-home configuration mode.

Step 3	**`contact-email-addr`** *`email`*
	Example:
	`hostname(cfg-call-home)# contact-email-addr username@example.com`
		Configures the mandatory contact address. The address should be the Cisco.com ID account associated with the device.

Step 4	**`profile`** *`profile-name`*
	Example:
	`hostname(cfg-call-home)# profile CiscoTAC-1`
		Enables the profile.
		The default profile name is CiscoTAC-1.

Step 5	**`active`**
	Example:
	`hostname(cfg-call-home-profile)# active`
		Activates the call home profile.
		To disable this profile, enter the **no active** command.

Step 6	**`destination transport-method http`**
	Example:
	`hostname(cfg-call-home-profile)# destination transport-method http`
		Configures the destination transport method for the smart call-home message receiver.
		The default destination transport method is e-mail.

Declaring and Authenticating a CA Trust Point

If Smart Call Home is configured to send messages to a web server through HTTPS, you need to configure the ASA to trust the certificate of the web server or the certificate of the Certificate Authority (CA) that issued the certificate. The Cisco Smart Call Home Production server certificate is issued by Verisign. The Cisco Smart Call Home Staging server certificate is issued by Digital Signature Trust Co.

Detailed Steps

To declare and authenticate the Cisco server security certificate and establish communication with the Cisco HTTPS server for Smart Call Home service, perform this task:

Step 1	**`crypto ca truspoint`** *`trustpoint-name`*
	Example:
	`hostname(config)# crypto ca trustpoint cisco`
		Configures a trustpoint and prepares for certificate enrollment.
		Note If you use HTTP as the transport method, you must install a security certificate through a trustpoint, which is required for HTTPS. Find the specific certificate to install at the following URL:
		http://www.cisco.com/en/US/docs/switches/lan/smart_call_home/SCH31_Ch6.html#wp1035380

Step 2	**`enroll terminal`**
	Example:
	`hostname(ca-trustpoint)# enroll terminal`
		Specifies a manual cut-and-paste method of certificate enrollment.

Step 3	**`exit`**
	`hostname(ca-trustpoint)# exit`
		Exits CA trustpoint configuration mode and returns to global configuration mode.

Step 4	**`crypto ca authenticate`** *`trustpoint`*
	Example:
	`hostname(ca-trustpoint)# crypto ca authenticate cisco`
		Authenticates the named CA. The CA name should match the trust point name specified in the **crypto ca trustpoint** command. At the prompt, paste the security certificate text.

Step 5	**`quit`**
	Example:
	`hostname(ca-trustpoint)# quit`
	`%Do you accept this certificate [yes/no]:`
	`yes`
		Specifies the end of the security certificate text and confirms acceptance of th entered security certificate.

Configuring DNS

You must configure DNS so that the HTTPS URLs in the Smart Call Home profile can successfully resolve.

To configure DNS, perform the following tasks:

Step 1	**`dns domain-lookup`** *`name`*
	Example:
	`hostname(config)# dns domain-lookup corp`
		Enables DNS lookup on a specific interface.

Step 2	**`dns server-group`** *`group name`*
	Example:
	`hostname(config)# DNS server-group DefaultDNS`
		Enters the server group submode to configure the parameters for that server group.
		We suggest that you use the default server group name: DefaultDNS.

Step 3	**`name-server`** *`name`*
	Example:
	`hostname(config-dns-server-group)# name-server 192.168.1.1`
		Specifies the IP address of the DNS server.

Step 4	(Optional)
	`domain-name` *`name`*
	Example:
	`hostname(config-dns-server-group)# domain name domainexample`
		Specifies the domain name.

Subscribing to Alert Groups

An alert group is a predefined subset of the Smart Call Home alerts that are supported on the ASA. Different types of Smart Call Home alerts are grouped into different alert groups depending upon their type.

This section includes the following alert group topics:

- Configuring Periodic Notification, page 77-9
- Information about the Message Severity Threshold, page 77-9
- Configuring Alert Group Subscription, page 77-10

Configuring Periodic Notification

When you subscribe a destination profile to either the Configuration or the Inventory alert group, you can choose to receive the alert group messages asynchronously or periodically at a specified time. The sending period can be one of the following:

- Daily—Specify the time of the day to send, using an hour:minute format *hh:mm*, with a 24-hour clock (for example, 14:30).
- Weekly—Specify the day of the week and time of day in the format *day hh:mm*, where the day of the week is spelled out (for example, monday).
- Monthly—Specify the numeric date, from 1 to 31, and the time of day, in the format *date hh:mm*.

Information about the Message Severity Threshold

When you subscribe a destination profile to certain alert groups, you can set a threshold for sending alert group messages based upon the message level severity. (See Table 77-1). Any message with a value lower than the destination profile's specified threshold is not sent to the destination.

Table 77-1 Severity and Syslog Level Mapping

Level	Keyword	Equivalent Syslog Level	Description
9	**catastrophic**	N/A	Network-wide catastrophic failure.
8	**disaster**	N/A	Significant network impact.
7	**fatal**	Emergency (0)	System is unusable.
6	**critical**	Alert (1)	Critical conditions, immediate attention needed.
5	**major**	Critical (2)	Major conditions.
4	**minor**	Error (3)	Minor conditions.
3	**warning**	Warning (4)	Warning conditions
2	**notification**	Notice (5)	Basic notification and informational messages. Possibly independently insignificant.
1	**normal**	Information (6)	Normal event signifying return to normal state.
0	**debugging**	Debug (7)	Debugging messages (default setting).

Configuring Alert Group Subscription

To subscribe a destination profile to an alert group, perform this task:

Detailed Steps

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config) # call-home`
		Enters call-home configuration mode.

Step 2	**`alert-group`** `{`**`all`** `|` **`configuration`** `|` **`diagnostic`** `|` **`environment`** `|` **`inventory`** `|` **`syslog`**`}`
	Example:
	`ciscoasa(cfg-call-home)# alert-group all`
		Enables the specified Smart Call Home group. Use the keyword **all** to enable all alert groups. By default, all alert groups are enabled.

Step 3	**`profile`** *`profile-name`*
	Example:
	`hostname(cfg-call-home)# profile profile1`
		Enters the profile configuration submode for the specified destination profile.

Step 4	**`subscribe-to-alert-group configuration`** `[`**`periodic`** `{`**`daily`** *`hh:mm`* `|` **`monthly`** *`date hh:mm`* `|` **`weekly`** *`day hh:mm`*`}]`
	Example:
	`hostname(cfg-call-home-profile)# subscribe-to-alert-group configuration periodic weekly Wednesday 23:30`
		Subscribes this destination profile to the configuration alert group. The configuration alert group can be configured for periodic notification, as described in the "Subscribing to Alert Groups" section on page 77-9.
		To subscribe to all available alert groups, use the **subscribe-to-alert-group all** command.

	Command	Purpose
Step 5	**subscribe-to-alert-group environment** [**severity** {**catastrophic** | **disaster** | **emergencies** | **alert** | **critical** | **errors** | **warnings** | **notifications** | **informational** | **debugging**}] **Example:** `hostname(cfg-call-home-profile)# subscribe-to-alert-group examplealertgroupname severity critical`	Subscribes to group events with the specified severity level. The alert group can be configured to filter messages based on severity, as described in Table 77-1.
Step 6	**subscribe-to-alert-group syslog [severity {catastrophic | disaster | fatal | critical | major | minor | warning | notification | normal | debugging} [pattern** *string*]] **Example:** `hostname(cfg-call-home-profile)# subscribe-to-alert-group syslog severity notification pattern UPDOWN`	Subscribes to syslog events with a severity level or message ID. The syslog alert group can be configured to filter messages based on severity, as described in Table 77-1.
Step 7	**subscribe-to-alert-group inventory [periodic {daily** *hh:mm* | **monthly** *date hh:mm* | **weekly** *day hh:mm*}] **Example:** `hostname(cfg-call-home-profile)# subscribe-to-alert-group inventory periodic daily 06:30`	Subscribes to inventory events. The configuration alert group can be configured for periodic notification, as described in the "Subscribing to Alert Groups" section on page 77-9.

Step 8	**subscribe-to-alert-group telemetry periodic** {**hourly** | **daily** | **monthly** *day* | **weekly** *day* [*hh:mm*]}
	Example:
	`hostname(cfg-call-home-profile)# subscribe-to-alert-group monthly 15`
		Subscribes to telemetry periodic events. The configuration alert group can be configured for periodic notification, as described in the "Subscribing to Alert Groups" section on page 77-9.

Step 9	**subscribe-to-alert-group snapshot periodic** {**interval minutes** | **hourly** | **daily** | **monthly** *day_of_month* | **weekly** *day_of_week* [*hh:mm*]}
	Example:
	`hostname(cfg-call-home-profile)# subscribe-to-alert-group snapshot periodic interval weekly wendesday 23:15`
		Subscribes to snapshot periodic events. The configuration alert group can be configured for periodic notification, as described in the "Subscribing to Alert Groups" section on page 77-9.

Testing Call Home Communications

You can test Smart Call Home communications by sending messages manually using two command types. To send a user-defined Smart Call Home test message, use the **call-home test** command. To send a specific alert group message, use the **call-home send** command.

These sections describe Smart Call Home communication:

- Sending a Smart Call Home Test Message Manually, page 77-12
- Sending a Smart Call Home Alert Group Message Manually, page 77-12
- Sending the Output of a Command, page 77-12

Sending a Smart Call Home Test Message Manually

To manually send a Smart Call Home test message, perform this task:

Command	Purpose

`call-home test` `[`*`test-message`*`]` **`profile`** *`profile-name`*
Example:
`hostname# call-home test [testing123] profile profile1`
	Sends a test message using a profile configuration.

Sending a Smart Call Home Alert Group Message Manually

To manually trigger a Call Home alert group message, perform this task:

Step 1	**`call-home send alert-group`** `{`**`inventory`** `|` **`configuration`** `|` **`snapshot`** `|` **`telemetry`**`}` `[`**`profile`** *`profile-name`*`]`
	Example:
	`hostname# call-home send alert-group inventory`
		Sends an inventory alert group message to one destination profile, if specified. If no profile is specified, sends messages to all profiles that are subscribed to the inventory or configuration group.

Sending the Output of a Command

You can use the **call-home send** command to execute a CLI command an e-mail the command output to Cisco or to an e-mail address that you specify.

When sending the output of a command, the following guidelines apply:

- The specified CLI command can be any run command, including commands for all modules.
- If you specify an e-mail address, the command output is sent to that address. If no e-mail address is specified, the output is sent to Cisco TAC. The e-mail is sent in log text format with the service number, if specified, in the subject line.
- The service number is required only if no e-mail address is specified or if a Cisco TAC e-mail address is specified.

To execute a CLI command and e-mail the command output, perform this task:

Command	Purpose

`call-home send` *`cli command`* **`[email`** *`email`***`]`**
Example:
`hostname# call-home send cli command email username@example.com`
	Sends command output to an e-mail address.

Optional Configuration Procedures

This section includes the following topics:

- Configuring Smart Call Home Customer Contact Information, page 77-13
- Configuring the Mail Server, page 77-15
- Configuring Call Home Traffic Rate Limiting, page 77-15
- Destination Profile Management, page 77-16

Configuring Smart Call Home Customer Contact Information

Obtain the following customer contact information to configure this task:

- E-mail address (required)
- Phone number (optional)
- Street address (optional)
- Contract ID (optional)
- Customer name (optional)
- Customer ID (optional)
- Site ID (optional)

To configure customer contact information, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`contact-email-addr`** *`email-address`*
	Example:
	`ciscoasa(cfg-call-home)# contact-email-addr username@example.com`
		Configures the mandatory customer contact e-mail address (if you have not already done so). The *email-address* should be the Cisco.com ID account that is associated with the device.

Step 3	(Optional)
	`phone-number phone-number-string`
	Example:
	`ciscoasa(cfg-call-home)# phone-number 8005551122`
		Specifies a customer phone number.

Step 4	(Optional)
	`street-address street-address`
	Example:
	`ciscoasa(cfg-call-home)# street-address “1234 Any Street, Any city, Any state, 12345”`
		Specifies the customer address, which is a free-format string that can be up to 255 characters long.

	Command	Purpose
Step 5	(Optional) **contact-name** *contact name* **Example:** `ciscoasa(cfg-call-home)# contact-name contactname1234`	Specifies the customer name, which can be up to 128 characters long.
Step 6	(Optional) **customer-id customer-id-string** **Example:** `ciscoasa(cfg-call-home)# customer-id customer1234`	Specifies the customer ID, which can be up to 64 characters long.
Step 7	(Optional) **site-id site-id-string** **Example:** `ciscoasa(cfg-call-home)# site-id site1234`	Specifies a customer site ID.
Step 8	(Optional) **contract-id** *contract-id-string* **Example:** `ciscoasa(cfg-call-home)# contract-id contract1234`	Specifies the customer contract identification, which can be up to 128 characters long.

This example shows the configuration of contact information:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# contact-email-addr username@example.com
ciscoasa(cfg-call-home)# phone-number 8005551122
ciscoasa(cfg-call-home)# street-address "1234 Any Street, Any city, Any state, 12345"
ciscoasa(cfg-call-home)# contact-name contactname1234
ciscoasa(cfg-call-home)# customer-id customer1234
ciscoasa(cfg-call-home)# site-id site1234
ciscoasa(cfg-call-home)# contract-id contract1234
```

Configuring the Mail Server

We recommend that you use HTTPS for message transport, as it is the most secure. However, you can configure an e-mail destination for Smart Call Home and then configure the mail server to use the e-mail message transport.

To configure the mail server, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`mail-server`** *`ip-address`* **|** **`name priority 1-100 all`**
	Example:
	`ciscoasa(cfg-call-home)# mail-server 10.10.1.1`
	`smtp.example.com priority 1`
		Specifies the SMTP mail server. Customers can specify up to five mail servers. At least one mail server is required for using e-mail transport for Smart Call Home messages.
		The lower the number, the higher the priority of the mail server.
		The **ip-address** option can be an IPv4 or IPv6 mail server address.

This example shows the configuration of a primary mail server (named”smtp.example.com”) and a secondary mail server at IP address 10.10.1.1:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# mail-server smtp.example.com priority 1
ciscoasa(cfg-call-home)# mail-server 10.10.1.1 priority 2
ciscoasa(cfg-call-home)# exit
hostname(config)#
```

Configuring Call Home Traffic Rate Limiting

You can configure this optional setting to specify the number of messages that Smart Call Home sends per minute.

To configure Smart Call Home traffic rate limiting, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`rate-limit`** *`msg-count`*
	Example:
	`ciscoasa(cfg-call-home)# rate-limit 5`
		Specifies the number of messages that Smart Call Home can send per minute. The default value is 10 messages per minute.

This example shows how to configure Smart Call Home traffic rate limiting:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# rate-limit 5
```

Destination Profile Management

These sections describe destination profile management:

- Configuring a Destination Profile, page 77-16
- Activating and Deactivating a Destination Profile, page 77-17
- Copying a Destination Profile, page 77-18
- Renaming a Destination Profile, page 77-18

Configuring a Destination Profile

To configure a destination profile for e-mail or for HTTP, perform this task:

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`profile`** *`profile-name`*
	Example:
	`hostname(cfg-call-home)# profile newprofile`
		Enters the profile configuration mode for the specified destination profile. If the specified destination profile does not exist, it is created.

Step 3	**`destination {email`** *`address`* **`| http`** *`url`***`} | message-size-limit`** *`size`* **`| preferred-msg-format {long-text | short-text | xml} transport-method {email | http}}`**
	Example:
	`hostname(cfg-call-home-profile)# destination address email username@example.com`
	`hostname(cfg-call-home-profile)# destination preferred-msg-format long-text`
		Configures the destination, message size, message format, and transport method for the smart call-home message receiver. The default message format is XML, and the default enabled transport method is e-mail. The e-mail-address is the e-mail address of the smart call-home receiver, which can be up to 100 characters long. By default, the maximum URL size is 5 MB.

Activating and Deactivating a Destination Profile

Smart Call Home destination profiles are automatically activated when you create them. If you do not want to use a profile right away, you can deactivate the profile.

To activate or deactivate a destination profile, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`profile`** *`profile-name`*
	Example:
	`hostname(cfg-call-home)# profile newprofile`
		Enters the profile configuration mode.
		Creates, edits, or deletes a profile, which can be up to 20 characters long.

Step 3	**`active`**
	Example:
	`ciscoasa(cfg-call-home-profile)# active`
		Enables or disables a profile. By default, a new profile is enabled when it is created.

Step 4	**`no active`**
	Example:
	`ciscoasa(cfg-call-home-profile)# no active`
		Disables the destination profile.

This example shows how to activate a destination profile:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# profile newprofile
ciscoasa(cfg-call-home-profile)# active
ciscoasa(cfg-call-home)# end
```

This example shows how to deactivate a destination profile:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# profile newprofile
ciscoasa(cfg-call-home-profile)# no active
ciscoasa(cfg-call-home)# end
```

Copying a Destination Profile

To create a new destination profile by copying an existing profile, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`profile`** *`profilename`*
	Example:
	`ciscoasa(cfg-call-home)# profile newprofile`
		Specifies the profile to copy.

Step 3	**`copy profile`** *`src-profile-name dest-profile-name`*
	Example:
	`ciscoasa(cfg-call-home)# copy profile profile1 profile2`
		Copies the content of an existing profile (src-profile-name, which can be up to 23 characters long) to a new profile (dest-profile-name, which can be up to 23 characters long).

This example shows how to copy an existing profile:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# profile newprofile
ciscoasa(cfg-call-home-profile)# copy profile profile1 profile2
```

Renaming a Destination Profile

To change the name of an existing profile, perform this task:

	Command	Purpose

Step 1	**`call-home`**
	Example:
	`hostname(config)# call-home`
		Enters call home configuration mode.

Step 2	**`profile`** *`profilename`*
	Example:
	`ciscoasa(cfg-call-home)# profile newprofile`
		Specifies the profile to rename.

Step 3	**`rename profile`** *`src-profile-name dest-profile-name`*
	Example:
	`ciscoasa(cfg-call-home)# rename profile profile1 profile2`
		Changes the name of an existing profile, the src-profile-name (an existing profile name can be up to 23 characters long), and the dest-profile-name (a new profile name can be up to 23 characters long).

This example shows how to rename an existing profile:

```
hostname# configure terminal
hostname(config)# call-home
ciscoasa(cfg-call-home)# profile newprofile
ciscoasa(cfg-call-home-profile)# rename profile profile1 profile2
```

Monitoring Smart Call Home

To monitor the Smart Call Home feature,enter one of the following commands:

Command	Purpose
show call-home detail	Shows the current Smart Call Home detail configuration.
show call-home mail-server status	Shows the current mail server status.
show call-home profile {*profile name* | **all**}	Shows the configuration of Smart Call Home profiles.
show call-home registered-module status [all]	Shows the registered module status.
show call-home statistics	Shows call-home detail status.
show call-home	Shows the current Smart Call Home configuration.
show running-config call-home	Shows the current Smart Call Home running configuration.
show smart-call-home alert-group	Shows the current status of Smart Call Home alert groups.

Configuration Example for Smart Call Home

The following example shows how to configure the Smart Call Home feature:

```
hostname (config)# service call-home
hostname (config)# call-home
hostname (cfg-call-home)# contact-email-addr customer@mail.server
hostname (cfg-call-home)# profile CiscoTAC-1
hostname (cfg-call-home-profile)# destination address http
https://example.cisco.com/its/service/example/services/ExampleService
hostname (cfg-call-home-profile)# destination address email callhome@example.com
hostname (cfg-call-home-profile)# destination transport-method http
hostname (cfg-call-home-profile)# subscribe-to-alert-group inventory periodic monthly
hostname (cfg-call-home-profile)# subscribe-to-alert-group configuration periodic monthly
hostname (cfg-call-home-profile)# subscribe-to-alert-group environment
hostname (cfg-call-home-profile)# subscribe-to-alert-group diagnostic
hostname (cfg-call-home-profile)# subscribe-to-alert-group telemetry periodic daily
```

Feature History for Anonymous Reporting and Smart Call Home

Table 77-2 lists each feature change and the platform release in which it was implemented. ASDM is backwards-compatible with multiple platform releases, so the specific ASDM release in which support was added is not listed.

Table 77-2 Feature History for Anonymous Reporting and Smart Call Home

Feature Name	Platform Releases	Feature Information
Smart Call Home	8.2(2)	The Smart Call Home feature offers proactive diagnostics and real-time alerts on the ASA, and provides higher network availability and increased operational efficiency. We introduced or modified the following commands: **active (call home), call-home, call-home send alert-group, call-home test, contact-email-addr, customer-id (call home), destination (call home), profile, rename profile, service call-home, show call-home, show call-home detail, show smart-call-home alert-group, show call-home profile, show call-home statistics, show call-home mail-server status, show running-config call-home, show call-home registered-module status all, site-id, street-address, subscribe-to-alert-group all, subscribe-to-alert-group configuration, subscribe-to-alert-group diagnostic, subscribe-to-alert-group environment, subscribe-to-alert-group inventory, subscribe-to-alert-group syslog.**
Anonymous Reporting	8.2(5)/8.4(2)	Customers can help to improve the ASA platform by enabling Anonymous Reporting, which allows Cisco to securely receive minimal error and health information from a device. We introduced the following commands: **call-home reporting anonymous**, **call-home test reporting anonymous**.

PART 13

System Administration

CHAPTER 78

Managing Software and Configurations

This chapter contains information about managing the ASA software and configurations, and includes the following sections:

- Copying Files to a Local File System on a UNIX Server, page 78-1
- Viewing Files in Flash Memory, page 78-1
- Retrieving Files from Flash Memory, page 78-2
- Removing Files from Flash Memory, page 78-2
- Downloading Software or Configuration Files to Flash Memory, page 78-2
- Configuring the Application Image and ASDM Image to Boot, page 78-4
- Configuring the File to Boot as the Startup Configuration, page 78-5
- Performing Zero Downtime Upgrades for Failover Pairs, page 78-5
- Backing Up Configuration Files, page 78-7
- Configuring Auto Update Support, page 78-19

Copying Files to a Local File System on a UNIX Server

The Server Message Block file-system protocol is used in LAN Managers and similar network operating systems to package data and exchange information with other systems.

To copy a file from one system to a local file system on a UNIX server, enter the following command:

```
hostname(config)# copy smb:/my_context.cfg smb:/my_context/my_context.cfg
```

Viewing Files in Flash Memory

You can view files in Flash memory and see information about the files.

- To view the files in Flash memory, enter the following command:

  ```
  hostname# dir [flash: | disk0: | disk1:]
  ```

  The **flash:** keyword represents the internal Flash memory on the PIX 500 series security appliance. You can enter **flash:** or **disk0:** for the internal Flash memory on the ASA 5500 series adaptive security appliance. The **disk1:** keyword represents the external Flash memory on the ASA. The internal Flash memory is the default.

For example:

```
hostname# dir

Directory of disk0:/
500    -rw-  4958208     22:56:20 Nov 29 2004  cdisk.bin
2513   -rw-  4634        19:32:48 Sep 17 2004  first-backup
2788   -rw-  21601       20:51:46 Nov 23 2004  backup.cfg
2927   -rw-  8670632     20:42:48 Dec 08 2004  asdmfile.bin
```

- To view extended information about a specific file, enter the following command:

  ```
  hostname# show file information [path:/]filename
  ```

  The default path is the root directory of the internal Flash memory (flash:/ or disk0:/).

  For example:

  ```
  hostname# show file information cdisk.bin

  disk0:/cdisk.bin:
    type is image (XXX) []
    file size is 4976640 bytes version 7.0(1)
  ```

  The file size listed is for example only.

Retrieving Files from Flash Memory

You can retrieve files directly from the Flash disk by using an HTTPS connection with the following URL, in which you supply values for the ASA IP address and the filename:

```
https://ASA_IP/disk0/filename
```

This option is useful for customers who wish to do the following:

- Copyfrom the ASA binary image (as a backup).
- Copy from WebVPN capture files.
- Copy any other Flash files to a secure desktop.

Removing Files from Flash Memory

You can remove files from Flash memory that you no longer need. To delete a file from Flash memory, enter the following command:

```
hostname# delete flash: filename
```

By default, the file is deleted from the current working directory if you do not specify a path. You may use wildcards when deleting files. You are prompted with the filename to delete, and then you must confirm the deletion.

Downloading Software or Configuration Files to Flash Memory

You can download application images, ASDM images, configuration files, and other files to the internal Flash memory or, for the ASA 5500 series adaptive security appliance, to the external Flash memory from a TFTP, FTP, HTTP, or HTTPS server.

Note You cannot have two files with the same name but with different letter case in the same directory in Flash memory. For example,if you attempt to download the file Config.cfg to a location that contains the file config.cfg, you recieve the error `%Error opening disk0:/Config.cfg (File exists).`

This section includes the following topics:

- Downloading a File to a Specific Location, page 78-3
- Downloading a File to the Startup or Running Configuration, page 78-4

Downloading a File to a Specific Location

This section describes how to download the application image, ASDM software, a configuration file, or any other file that needs to be downloaded to Flash memory. To download a file to the running or startup configuration, see the "Downloading a File to the Startup or Running Configuration" section on page 78-4.

For information about installing the Cisco SSL VPN client, see the the *Cisco AnyConnect VPN Client Administrator Guide*. For information about installing Cisco Secure Desktop on the security appliance, see the *Cisco Secure Desktop Configuration Guide for Cisco ASA 5500 Series Administrators*.

To configure the ASA to use a specific application image or ASDM image if you have more than one installed, or have installed them in external Flash memory see the "Configuring the Application Image and ASDM Image to Boot" section on page 78-4.

Note To successfully copy ASDM Version 6.0(1) to Flash memory, you must be running Version 8.0.

To configure the ASA to use a specific configuration as the startup configuration, see the "Configuring the File to Boot as the Startup Configuration" section on page 78-5.

For multiple context mode, you must be in the system execution space.

To download a file to Flash memory, see the following commands for each download server type:

- To copy from a TFTP server, enter the following command:

  ```
  hostname# copy tftp://server[/path]/filename {flash:/ | disk0:/ |
  disk1:/}[path/]filename
  ```

  The **flash:/** keyword represents the internal Flash memory on the PIX 500 series security appliance. You can enter **flash:/** or **disk0:/** for the internal Flash memory on the ASA 5500 series adaptive security appliance. The **disk1:/** keyword represents the external Flash memory on the ASA.

- To copy from an FTP server, enter the following command:

  ```
  hostname# copy ftp://[user[:password]@]server[/path]/filename {flash:/ | disk0:/ |
  disk1:/}[path/]filename
  ```

- To copy from an HTTP or HTTPS server, enter the following command:

  ```
  hostname# copy http[s]://[user[:password]@]server[:port][/path]/filename {flash:/ |
  disk0:/ | disk1:/}[path/]filename
  ```

- To use secure copy, first enable SSH, then enter the following command:

  ```
  hostname# ssh scopy enable
  ```

  Then from a Linux client enter the following command:

```
scp -v -pw password filename username@asa_address
```

The **-v** is for verbose, and if **-pw** is not specified you will be prompted for a password.

Downloading a File to the Startup or Running Configuration

You can download a text file to the running or startup configuration from a TFTP, FTP, or HTTP(S) server, or from the Flash memory.

To copy a file to the startup configuration or running configuration, enter one of the following commands for the appropriate download server.

Note When you copy a configuration to the running configuration, you merge the two configurations. A merge adds any new commands from the new configuration to the running configuration. If the configurations are the same, no changes occur. If commands conflict or if commands affect the running of the context, then the effect of the merge depends on the command. You might get errors, or you might have unexpected results.

- To copy from a TFTP server, enter the following command:

```
hostname# copy tftp://server[/path]/filename {startup-config | running-config}
```

- To copy from an FTP server, enter the following command:

```
hostname# copy ftp://[user[:password]@]server[/path]/filename {startup-config |
running-config}
```

- To copy from an HTTP or HTTPS server, enter the following command:

```
hostname# copy http[s]://[user[:password]@]server[:port][/path]/filename
{startup-config | running-config}
```

- To copy from Flash memory, enter the following command:

```
hostname# copy {flash:/ | disk0:/ | disk1:/}[path/]filename
{startup-config | running-config}
```

For example, to copy the configuration from a TFTP server, enter the following command:

```
hostname# copy tftp://209.165.200.226/configs/startup.cfg startup-config
```

To copy the configuration from an FTP server, enter the following command:

```
hostname# copy ftp://admin:letmein@209.165.200.227/configs/startup.cfg startup-config
```

To copy the configuration from an HTTP server, enter the following command:

```
hostname# copy http://209.165.200.228/configs/startup.cfg startup-config
```

Configuring the Application Image and ASDM Image to Boot

By default, the ASA boots the first application image it finds in internal Flash memory. It also boots the first ASDM image it finds in internal Flash memory, or of none exists there, then in external Flash memory. If you have more than one image, you should specify the image you want to boot. In the case of the ASDM image, if you do not specify the image to boot, even if you have only one image installed, then the ASA inserts the **asdm image** command into the running configuration. To avoid problems with Auto Update (if configured), and to avoid the image search at each startup, you should specify the ASDM image you want to boot in the startup configuration.

- To configure the application image to boot, enter the following command:

  ```
  hostname(config)# boot system url
  ```

  where *url* is one of the following:

  - {**flash:/** | **disk0:/** | **disk1:/**}[*path***/**]*filename*

    The **flash:/** keyword represents the internal Flash memory on the PIX 500 series security appliance. You can enter **flash:/** or **disk0:/** for the internal Flash memory on the ASA 5500 series adaptive ASA. The **disk1:/** keyword represents the external Flash memory on the ASA.

  - **tftp://**[*user*[**:***password*]@]*server*[:*port*]**/**[*path***/**]*filename*

    This option is only supported for the ASA 5500 series adaptive security appliance.

  You can enter up to four **boot system** command entries, to specify different images to boot from in order; the ASA boots the first image it finds. Only one **boot system tftp** command can be configured, and it must be the first one configured.

Note If the adaptive ASA is stuck in a cycle of contstant booting, you can reboot the ASA into ROMMON mode. For more information about the ROMMON mode, see Using the ROM Monitor to Load a Software Image, page 79-11.

- To configure the ASDM image to boot, enter the following command:

  ```
  hostname(config)# asdm image {flash:/ | disk0:/ | disk1:/}[path/]filename
  ```

Configuring the File to Boot as the Startup Configuration

By default, the ASA boots from a startup configuration that is a hidden file. You can alternatively set any configuration to be the startup configuration by entering the following command:

```
hostname(config)# boot config {flash:/ | disk0:/ | disk1:/}[path/]filename
```

The **flash:/** keyword represents the internal Flash memory on the PIX 500 series security appliance. You can enter **flash:/** or **disk0:/** for the internal Flash memory on the ASA 5500 series adaptive security appliance. The **disk1:/** keyword represents the external Flash memory on the ASA.

Performing Zero Downtime Upgrades for Failover Pairs

The two units in a failover configuration should have the same major (first number) and minor (second number) software version. However, you do not need to maintain version parity on the units during the upgrade process; you can have different versions on the software running on each unit and still maintain failover support. To ensure long-term compatibility and stability, we recommend upgrading both units to the same version as soon as possible.

Table 78-1 shows the supported scenarios for performing zero-downtime upgrades on a failover pair.

Table 78-1 Zero-Downtime Upgrade Support

Type of Upgrade	Support
Maintenance Release	You can upgrade from any maintenance release to any other maintenance release within a minor release. For example, you can upgrade from 7.0(1) to 7.0(4) without first installing the maintenance releases in between.
Minor Release	You can upgrade from a minor release to the next minor release. You cannot skip a minor release. For example, you can upgrade from 7.0 to 7.1. Upgrading from 7.0 directly to 7.2 is not supported for zero-downtime upgrades; you must first upgrade to 7.1.
Major Release	You can upgrade from the last minor release of the previous version to the next major release. For example, you can upgrade from 7.9 to 8.0, assuming that 7.9 is the last minor version in the 7.x release.

For more details about upgrading the software on a failover pair, refer to the following topics:

- Upgrading an Active/Standby Failover Configuration, page 78-6
- Upgrading and Active/Active Failover Configuration, page 78-7

Upgrading an Active/Standby Failover Configuration

To upgrade two units in an Active/Standby failover configuration, perform the following steps:

Step 1 Download the new software to both units, and specify the new image to load with the **boot system** command (see the "Configuring the Application Image and ASDM Image to Boot" section on page 78-4).

Step 2 Reload the standby unit to boot the new image by entering the following command on the active unit:

```
active# failover reload-standby
```

Step 3 When the standby unit has finished reloading, and is in the Standby Ready state, force the active unit to fail over to the standby unit by entering the following command on the active unit.

Note Use the **show failover** command to verify that the standby unit is in the Standby Ready state.

```
active# no failover active
```

Step 4 Reload the former active unit (now the new standby unit) by entering the following command:

```
newstandby# reload
```

Step 5 When the new standby unit has finished reloading, and is in the Standby Ready state, return the original active unit to active status by entering the following command:

```
newstandby# failover active
```

Upgrading and Active/Active Failover Configuration

To upgrade two units in an Active/Active failover configuration, perform the following steps:

Step 1 Download the new software to both units, and specify the new image to load with the **boot system** command (see the "Configuring the Application Image and ASDM Image to Boot" section on page 78-4).

Step 2 Make both failover groups active on the primary unit by entering the following command in the system execution space of the primary unit:

```
primary# failover active
```

Step 3 Reload the secondary unit to boot the new image by entering the following command in the system execution space of the primary unit:

```
primary# failover reload-standby
```

Step 4 When the secondary unit has finished reloading, and both failover groups are in the Standby Ready state on that unit, make both failover groups active on the secondary unit using the following command in the system execution space of the primary unit:

Note Use the **show failover** command to verify that both failover groups are in the Standby Ready state on the secondary unit.

```
primary# no failover active
```

Step 5 Make sure both failover groups are in the Standby Ready state on the primary unit, and then reload the primary unit using the following command:

```
primary# reload
```

Step 6 If the failover groups are configured with the **preempt** command, they will automatically become active on their designated unit after the preempt delay has passed. If the failover groups are not configured with the **preempt** command, you can return them to active status on their designated units using the **failover active group** command.

Backing Up Configuration Files

To back up your configuration, use one of the following methods:

- Backing up the Single Mode Configuration or Multiple Mode System Configuration, page 78-8
- Backing Up a Context Configuration in Flash Memory, page 78-8
- Backing Up a Context Configuration within a Context, page 78-8
- Copying the Configuration from the Terminal Display, page 78-9

Backing up the Single Mode Configuration or Multiple Mode System Configuration

In single context mode or from the system configuration in multiple mode, you can copy the startup configuration or running configuration to an external server or to the local Flash memory:

- To copy to a TFTP server, enter the following command:

```
hostname# copy {startup-config | running-config} tftp://server[/path]/filename
```

- To copy to a FTP server, enter the following command:

```
hostname# copy {startup-config | running-config}
ftp://[user[:password]@]server[/path]/filename
```

- To copy to local Flash memory, enter the following command:

```
hostname# copy {startup-config | running-config} {flash:/ | disk0:/ |
disk1:/}[path/]filename
```

  Be sure the destination directory exists. If it does not exist, first create the directory using the **mkdir** command.

  Backing up

Backing Up a Context Configuration in Flash Memory

In multiple context mode, copy context configurations that are on the local Flash memory by entering one of the following commands in the system execution space:

- To copy to a TFTP server, enter the following command:

```
hostname# copy disk:[path/]filename tftp://server[/path]/filename
```

- To copy to a FTP server, enter the following command:

```
hostname# copy disk:[path/]filename ftp://[user[:password]@]server[/path]/filename
```

- To copy to local Flash memory, enter the following command:

```
hostname# copy {flash:/ | disk0:/ | disk1:/}[path/]filename {flash:/ | disk0:/ |
disk1:/}[path/]newfilename
```

  Be sure the destination directory exists. If it does not exist, first create the directory using the **mkdir** command.

Backing Up a Context Configuration within a Context

In multiple context mode, from within a context, you can perform the following backups:

- To copy the running configuration to the startup configuration server (connected to the admin context), enter the following command:

```
hostname/contexta# copy running-config startup-config
```

- To copy the running configuration to a TFTP server connected to the context network, enter the following command:

```
hostname/contexta# copy running-config tftp:/server[/path]/filename
```

Copying the Configuration from the Terminal Display

To print the configuration to the terminal, enter the following command:

```
hostname# show running-config
```

Copy the output from this command, then paste the configuration in to a text file.

Backing Up Additional Files Using the Export and Import Commands

Additional files essential to your configuration might include the following:

- Files you import using the **import webvpn** command. Currently these files include customizations, URL lists, web contents, plug-ins, and language translations.
- DAP policies (dap.xml)
- CSD configurations (data.xml)
- Digital keys and certificates
- Local CA user database and certificate status files

The CLI lets you back up and restore individual elements of your configuration using the **export** and **import** commands. To back up these files, for example, those imported via the **import webvpn** command or certificates, follow these steps:

Step 1 Issue the appropriate **show** command(s). For example.

```
hostname # show import webvpn plug-in
ica
rdp
ssh,telnet
vnc
hostname#
```

Step 2 Issue the **export** command for the file you want to back up, in this example the rdp file.

```
hostname # export webvpn plug-in protocol rdp tftp://tftpserver/backupfilename
hostname #
```

Using a Script to Back Up and Restore Files

You can use a script to back up and restore the configuration files on your security appliance, including all of the extensions you import via the **import webvpn** CLI, the CSD configuration XML files, and the DAP configuration XML file. For security reasons, we do not recommend that you perform automated backups of digital keys and certificates or the Local CA key.

This section provides instructions for doing so, and includes a sample script that you can use as is or modify as your environment requires. The sample script is specific to a Linux system. To use it for a Microsoft Windows system, you need to modify it using the logic of the sample.

Note The existing CLI lets you back up and restore individual files using the **copy**, **export**, and **import** commands. It does not, however, have a facility that lets you back up all ASA configuration files in one operation. Running the script facilitates the use of multiple CLIs.

Prerequisites

To use a script to back up and restore an ASA configuration, first perform the following tasks:

- Install Perl with an Expect module.
- Install an SSH client that can reach the ASA.
- Install a TFTP server to send files from the ASA to the backup site.

Another option is to use a commercially available tool. You can put the logic of this script into such a tool.

Running the Script

To run a backup and restore script, follow these steps:

Step 1 Download or cut and paste the script file to any location on your system.

Step 2 At the command line, enter **Perl** ***scriptname***, where *scriptname* is the name of the script file.

Step 3 Press **Enter**.

Step 4 The system prompts you for values for each of the options. Alternatively, you can enter values for the options when you enter the **Perl** ***scriptname*** command before you press **Enter**. Either way, the script requires that you enter a value for each option.

Step 5 The script starts running, printing out the commands that it issues, which provides you with a record of the CLIs. You can use these CLIs for a later restore, particularly useful if you want to restore only one or two files.

Sample Script

```
#!/usr/bin/perl
#Function: Backup/restore configuration/extensions to/from a TFTP server.
#Description: The objective of this script is to show how to back up configurations/extensions
#        before the backup/restore command is developed.
#        It currently backs up the running configuration, all extensions imported via "import webvpn"
#        command, the CSD configuration XML file, and the DAP configuration XML file.
#Requirements: Perl with Expect, SSH to the ASA, and a TFTP server.
#Usage: backupasa -option option_value
#       -h: ASA hostname or IP address
#       -u: User name to log in via SSH
#       -w: Password to log in via SSH
#       -e: The Enable password on the security appliance
#       -p: Global configuration mode prompt
#       -s: Host name or IP address of the TFTP server to store the configurations
#       -r: Restore with an argument that specifies the the file name. This file is produced during backup.
#If you don't enter an option, the script will prompt for it prior to backup.
#
#Make sure that you can SSH to the ASA.

use Expect;
use Getopt::Std;

#global variables
%options=();
$restore = 0; #does backup by default
$restore_file = '';
$asa = '';
$storage = '';
$user = '';
$password = '';
$enable = '';
$prompt = '';
$date = `date +%F`;
chop($date);
my $exp = new Expect();

getopts("h:u:p:w:e:s:r:",\%options);
do process_options();

do login($exp);
do enable($exp);
if ($restore) {
  do restore($exp,$restore_file);
}
else {
  $restore_file = "$prompt-restore-$date.cli";
  open(OUT,">$restore_file") or die "Can't open $restore_file\n";
  do running_config($exp);
  do lang_trans($exp);
  do customization($exp);
  do plugin($exp);
  do url_list($exp);
  do webcontent($exp);
  do dap($exp);
  do csd($exp);
  close(OUT);
}
do finish($exp);

sub enable {
  $obj = shift;
  $obj->send("enable\n");
  unless ($obj->expect(15, 'Password:')) {
    print "timed out waiting for Password:\n";
  }
  $obj->send("$enable\n");
  unless ($obj->expect(15, "$prompt#")) {
    print "timed out waiting for $prompt#\n";
  }
}

sub lang_trans {
  $obj = shift;
  $obj->clear_accum();
  $obj->send("show import webvpn translation-table\n");
  $obj->expect(15, "$prompt#" );
  $output = $obj->before();
  @items = split(/\n+/, $output);

  for (@items) {
    s/^\s+//;
    s/\s+$//;
    next if /show import/ or /Translation Tables/;
    next unless (/^.+\s+.+$/);
    ($lang, $transtable) = split(/\s+/,$_);
    $cli = "export webvpn translation-table $transtable language $lang
$storage/$prompt-$date-$transtable-$lang.po";
```

```
    $ocli = $cli;
    $ocli =~ s/^export/import/;
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
   }
}

sub running_config {
  $obj = shift;
  $obj->clear_accum();
  $cli ="copy /noconfirm running-config $storage/$prompt-$date.cfg";
  print "$cli\n";
  $obj->send("$cli\n");
  $obj->expect(15, "$prompt#" );
}



sub customization {
  $obj = shift;
  $obj->clear_accum();
  $obj->send("show import webvpn customization\n");
  $obj->expect(15, "$prompt#" );
  $output = $obj->before();
  @items = split(/\n+/, $output);

  for (@items) {
    chop;
    next if /^Template/ or /show import/ or /^\s*$/;
    $cli = "export webvpn customization $_ $storage/$prompt-$date-cust-$_.xml";
    $ocli = $cli;
    $ocli =~ s/^export/import/;
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
  }
```

```
}

sub plugin {
  $obj = shift;
  $obj->clear_accum();
  $obj->send("show import webvpn plug-in\n");
  $obj->expect(15, "$prompt#" );
  $output = $obj->before();
  @items = split(/\n+/, $output);

  for (@items) {
    chop;
    next if /^Template/ or /show import/ or /^\s*$/;
    $cli = "export webvpn plug-in protocol $_ $storage/$prompt-$date-plugin-$_.jar";
    $ocli = $cli;
    $ocli =~ s/^export/import/;
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
  }
}

sub url_list {
  $obj = shift;
  $obj->clear_accum();
  $obj->send("show import webvpn url-list\n");
  $obj->expect(15, "$prompt#" );
  $output = $obj->before();
  @items = split(/\n+/, $output);

  for (@items) {
    chop;
    next if /^Template/ or /show import/ or /^\s*$/ or /No bookmarks/;
    $cli="export webvpn url-list $_ $storage/$prompt-$date-urllist-$_.xml";
    $ocli = $cli;
    $ocli =~ s/^export/import/;
    print "$cli\n";
```

```
      print OUT "$ocli\n";
      $obj->send("$cli\n");
      $obj->expect(15, "$prompt#" );
    }
  }

  sub dap {
    $obj = shift;
    $obj->clear_accum();
    $obj->send("dir dap.xml\n");
    $obj->expect(15, "$prompt#" );

    $output = $obj->before();
    return 0 if($output =~ /Error/);

    $cli="copy /noconfirm dap.xml $storage/$prompt-$date-dap.xml";
    $ocli="copy /noconfirm $storage/$prompt-$date-dap.xml disk0:/dap.xml";
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
  }

  sub csd {
    $obj = shift;
    $obj->clear_accum();
    $obj->send("dir sdesktop\n");
    $obj->expect(15, "$prompt#" );

    $output = $obj->before();
    return 0 if($output =~ /Error/);

    $cli="copy /noconfirm sdesktop/data.xml $storage/$prompt-$date-data.xml";
    $ocli="copy /noconfirm $storage/$prompt-$date-data.xml disk0:/sdesktop/data.xml";
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
```

```
}

sub webcontent {
  $obj = shift;
  $obj->clear_accum();
  $obj->send("show import webvpn webcontent\n");
  $obj->expect(15, "$prompt#" );
  $output = $obj->before();
  @items = split(/\n+/, $output);

  for (@items) {
    s/^\s+//;
    s/\s+$//;
    next if /show import/ or /No custom/;
    next unless (/^.+\s+.+$/);
    ($url, $type) = split(/\s+/,$_);
    $turl = $url;
    $turl =~ s/\/\+//;
    $turl =~ s/\+\//-/;
    $cli = "export webvpn webcontent $url $storage/$prompt-$date-$turl";
    $ocli = $cli;
    $ocli =~ s/^export/import/;
    print "$cli\n";
    print OUT "$ocli\n";
    $obj->send("$cli\n");
    $obj->expect(15, "$prompt#" );
  }
}

sub login {
   $obj = shift;
   $obj->raw_pty(1);
   $obj->log_stdout(0); #turn off console logging.
   $obj->spawn("/usr/bin/ssh $user\@$asa") or die "can't spawn ssh\n";
   unless ($obj->expect(15, "password:" )) {
       die "timeout waiting for password:\n";
   }
```

```
    $obj->send("$password\n");

    unless ($obj->expect(15, "$prompt>" )) {
        die "timeout waiting for $prompt>\n";
    }
}

sub finish {
    $obj = shift;
    $obj->hard_close();
    print "\n\n";

}

sub restore {
   $obj = shift;
   my $file = shift;
   my $output;
   open(IN,"$file") or die "can't open $file\n";
   while (<IN>) {
      $obj->send("$_");
      $obj->expect(15, "$prompt#" );
      $output = $obj->before();
      print "$output\n";
   }
   close(IN);
}

sub process_options {
  if (defined($options{s})) {
      $tstr= $options{s};
      $storage = "tftp://$tstr";
  }
  else {
      print "Enter TFTP host name or IP address:";
      chop($tstr=<>);
      $storage = "tftp://$tstr";
  }
```

```
if (defined($options{h})) {
   $asa = $options{h};
}
else {
   print "Enter ASA host name or IP address:";
   chop($asa=<>);
}

if (defined ($options{u})) {
   $user= $options{u};
}
else {
   print "Enter user name:";
   chop($user=<>);
}

if (defined ($options{w})) {
   $password= $options{w};
}
else {
   print "Enter password:";
   chop($password=<>);
}
if (defined ($options{p})) {
   $prompt= $options{p};
}
else {
   print "Enter ASA prompt:";
   chop($prompt=<>);
}
if (defined ($options{e})) {
   $enable = $options{e};
}
else {
   print "Enter enable password:";
   chop($enable=<>);
}
```

```
  if (defined ($options{r})) {
    $restore = 1;
    $restore_file = $options{r};
  }
}
```

Configuring Auto Update Support

Auto Update is a protocol specification that allows an Auto Update server to download configurations and software images to many ASAs, and can provide basic monitoring of the ASAs from a central location.

The ASA can be configured as either a client or a server. As an Auto Update client, it periodically polls the Auto Update server for updates to software images and configuration files. As an Auto Update server, it issues updates for ASAs configured as Auto Update clients.

Note Auto Update is supported in single context mode only.

This section includes the following topics:

- Configuring Communication with an Auto Update Server, page 78-19
- Configuring Client Updates as an Auto Update Server, page 78-21
- Viewing Auto Update Status, page 78-22

Configuring Communication with an Auto Update Server

To configure the ASA as an Auto Update client, perform the following steps:

Step 1 To specify the URL of the AUS, use the following command:

```
hostname(config)# auto-update server url [source interface] [verify-certificate]
```

Where *url* has the following syntax:

```
http[s]://[user:password@]server_ip[:port]/pathname
```

SSL is used when **https** is specified. The *user* and *password* arguments of the URL are used for Basic Authentication when logging in to the server. If you use the **write terminal**, **show configuration** or **show tech-support** commands to view the configuration, the user and password are replaced with '********'.

The default port is 80 for HTTP and 443 for HTTPS.

The **source** *interface* argument specifies which interface to use when sending requests to the AUS. If you specify the same interface specified by the **management-access** command, the Auto Update requests travel over the same IPSec VPN tunnel used for management access.

The **verify-certificate** keyword verifies the certificate returned by the AUS.

Step 2 (Optional) To identify the device ID to send when communicating with the AUS, enter the following command:

```
hostname(config)# auto-update device-id {hardware-serial | hostname | ipaddress [if-name]
| mac-address [if-name] | string text}
```

The identifier used is determined by using one of the following parameters:

- **hardware-serial**—Use the ASA serial number.
- **hostname**—Use the ASA hostname.
- **ipaddress**—Use the IP address of the specified interface. If the interface name is not specified, it uses the IP address of the interface used to communicate with the AUS.
- **mac-address**—Use the MAC address of the specified interface. If the interface name is not specified, it uses the MAC address of the interface used to communicate with the AUS.
- **string**—Use the specified text identifier, which cannot contain white space or the characters ‘, “, , >, & and ?.

Step 3 (Optional) To specify how often to poll the AUS for configuration or image updates, enter the following command:

```
hostname(config)# auto-update poll-period poll-period [retry-count [retry-period]]
```

The *poll-period* argument specifies how often (in minutes) to check for an update. The default is 720 minutes (12 hours).

The *retry-count* argument specifies how many times to try reconnecting to the server if the first attempt fails. The default is 0.

The *retry-period* argument specifies how long to wait (in minutes) between retries. The default is 5.

Step 4 (Optional) To schedule a specific time for the security appliance to poll the Auto Update server, use the following command:

```
hostname(config)# auto-update poll-at days-of-the-week time [randomize minutes] [retry_count
[retry_period]]
```

days-of-the-week is any single day or combination of days: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday. Other possible values are daily (Monday through Sunday), weekdays (Monday through Friday) and weekend (Saturday and Sunday).

time specifies the time in the format HH:MM at which to start the poll. For example, 8:00 is 8:00 AM and 20:00 is 8:00 PM

randomize minutes specifies the period to randomize the poll time following the specified start time. The range is from 1 to 1439 minutes.

retry_count specifies how many times to try reconnecting to the Auto Update Server if the first attempt fails. The default is 0.

retry_period specifies how long to wait between connection attempts. The default is 5 minutes. The range is from 1 and 35791 minutes.

Step 5 (Optional) If the Auto Update Server has not been contacted for a certain period of time, the following command will cause it to cease passing traffic:

```
hostname(config)# auto-update timeout period
```

Where *period* specifies the timeout period in minutes between 1 and 35791. The default is to never time out (0). To restore the default, enter the **no** form of this command.

Use this command to ensure that the ASA has the most recent image and configuration. This condition is reported with system log message 201008.

In the following example, a ASA is configured to poll an AUS with IP address 209.165.200.224, at port number 1742, from the outside interface, with certificate verification.

It is also configured to use the hostname of the ASA as the device ID. It is configured to poll every Friday and Saturday night at a random time between 10:00 p.m. and 11:00 p.m. On a failed polling attempt, it will try to reconnect to the AUS 10 times, and wait 3 minutes between attempts at reconnecting.

```
hostname(config)# auto-update server
https://jcrichton:farscape@209.165.200.224:1742/management source outside
verify-certificate
hostname(config)# auto-update device-id hostname
hostname(config)# auto-update poll-at Friday Saturday 22:00 randomize 60 2 10
```

Configuring Client Updates as an Auto Update Server

The **client-update** command lets you enable the update for ASAs configured as Auto Update clients. It lets you specify the type of software component (asdm or boot image), the type or family of ASA, revision numbers to which the update applies, and a URL or IP address from which to get the update.

To configure the ASA as an Auto Update server, perform the following steps:

Step 1 In global configuration mode, enable client update by entering the command:

```
hostname(config)# client-update enable
hostname(config)#
```

Step 2 Configure the parameters for the client update that you want to apply for the ASAs using the **client-update** command:

client-update {**component** {**asdm** | **image**} | **device-id** *dev_string* |
family *family_name* | **type** *type*} **url** *url-string* **rev-nums** *rev-nums*}

component {**asdm** | **image**} specifies the software component, either ASDM or the boot image of the ASA.

device-id *dev_string* specifies a unique string that the Auto Update client uses to identify itself. The maximum length is 63 characters.

family *family_name specifies the family name that the* Auto Update client uses to identify itself. It can be asa, pix, or a text string with a maximum length of 7 characters.

rev-nums *rev-nums* specifies the software or firmware images for this client. Enter up to 4, in any order, separated by commas.

type *type* specifies the type of clients to notify of a client update. Because this command is also used to update Windows clients, the list of clients includes several Windows operating systems. The ASAs in the list include the following:

- pix-515: Cisco PIX 515 Firewall
- pix-515e: Cisco PIX 515E Firewall
- pix-525: Cisco PIX 525 Firewall
- pix-535: Cisco PIX 535 Firewall
- asa5505: Cisco 5505 Adaptive Security Appliance
- asa5510: Cisco 5510 Adaptive Security Appliance
- asa5520: Cisco 5520 Adaptive Security Appliance

- asa5540: Cisco Adaptive Security Appliance

url *url-string* specifies the URL for the software/firmware image. This URL must point to a file appropriate for this client. For all Auto Update clients, you must use the protocol “http://” or “https://” as the prefix for the URL.

Configure the parameters for the client update that you want to apply to all ASAs of a particular type. That is, specify the type of ASA and the URL or IP address from which to get the updated image. In addition, you must specify a revision number. If the revision number of the remote ASA matches one of the specified revision numbers, there is no need to update—the client ignores the update.

The following example configures a client update for Cisco 5520 Adaptive Security Appliances:

```
hostname(config)# client-update type asa5520 component asdm url
http://192.168.1.114/aus/asdm601.bin rev-nums 8.0(1)
```

Viewing Auto Update Status

To view the Auto Update status, enter the following command:

```
hostname(config)# show auto-update
```

The following is sample output from the **show auto-update** command:

```
hostname(config)# show auto-update
Server: https://********@209.165.200.224:1742/management.cgi?1276
Certificate will be verified
Poll period: 720 minutes, retry count: 2, retry period: 5 minutes
Timeout: none
Device ID: host name [corporate]
Next poll in 4.93 minutes
Last poll: 11:36:46 PST Tue Nov 13 2004
Last PDM update: 23:36:46 PST Tue Nov 12 2004
```

CHAPTER 79

Troubleshooting

This chapter describes how to troubleshoot the ASA, and includes the following sections:

- Testing Your Configuration, page 79-1
- Reloading the Security Appliance, page 79-7
- Performing Password Recovery, page 79-7
- Using the ROM Monitor to Load a Software Image, page 79-11
- Erasing the Flash File System, page 79-12
- Other Troubleshooting Tools, page 79-13

Testing Your Configuration

This section describes how to test connectivity for the single mode ASA or for each security context, how to ping the ASA interfaces, and how to allow hosts on one interface to ping through to hosts on another interface.

We recommend that you only enable pinging and debug messages during troubleshooting. When you are done testing the ASA, follow the steps in "Disabling the Test Configuration" section on page 79-6.

This section includes the following topics:

- Enabling ICMP Debug Messages and System Log Messages, page 79-2
- Pinging Security Appliance Interfaces, page 79-2
- Pinging Through the Security Appliance, page 79-4
- Disabling the Test Configuration, page 79-6

Enabling ICMP Debug Messages and System Log Messages

Debug messages and system log messages can help you troubleshoot why your pings are not successful. The ASA only shows ICMP debug messages for pings to the ASA interfaces, and not for pings through the ASA to other hosts. To enable debugging and system log messages, perform the following steps:

	Command	Purpose
Step 1	**`debug icmp trace`**	Shows ICMP packet information for pings to the ASA interfaces.
Step 2	**`logging monitor debug`**	Sets system log messages to be sent to Telnet or SSH sessions. **Note** You can alternately use the **logging buffer debug** command to send log messages to a buffer, and then view them later using the **show logging** command.
Step 3	**`terminal monitor`**	Sends the system log messages to a Telnet or SSH session.
Step 4	**`logging on`**	Enables system log messages.

Examples

The following example shows a successful ping from an external host (209.165.201.2) to the ASA outside interface (209.165.201.1):

```
hostname(config)# debug icmp trace
Inbound ICMP echo reply (len 32 id 1 seq 256) 209.165.201.1 > 209.165.201.2
Outbound ICMP echo request (len 32 id 1 seq 512) 209.165.201.2 > 209.165.201.1
Inbound ICMP echo reply (len 32 id 1 seq 512) 209.165.201.1 > 209.165.201.2
Outbound ICMP echo request (len 32 id 1 seq 768) 209.165.201.2 > 209.165.201.1
Inbound ICMP echo reply (len 32 id 1 seq 768) 209.165.201.1 > 209.165.201.2
Outbound ICMP echo request (len 32 id 1 seq 1024) 209.165.201.2 > 209.165.201.1
Inbound ICMP echo reply (len 32 id 1 seq 1024) 209.165.201.1 > 209.165.201.2
```

This example shows the ICMP packet length (32 bytes), the ICMP packet identifier (1), and the ICMP sequence number (the ICMP sequence number starts at 0 and is incremented each time that a request is sent).

Pinging Security Appliance Interfaces

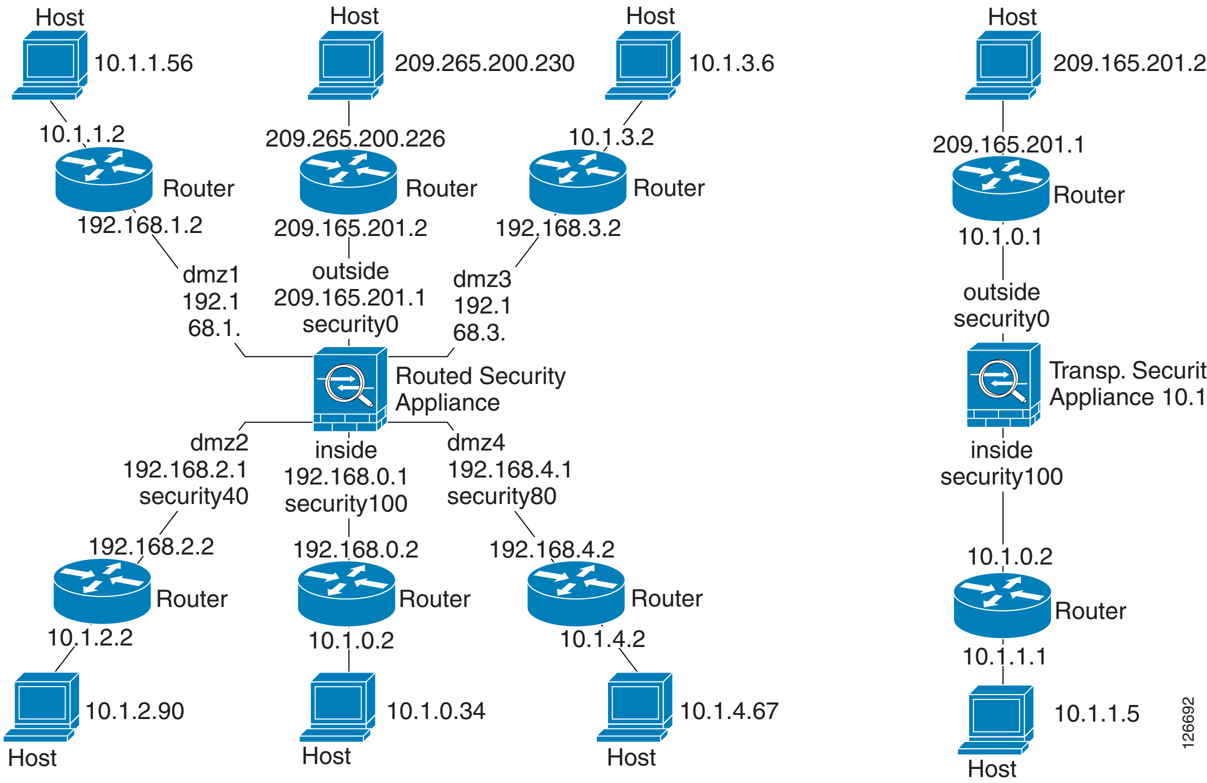
To test whether the ASA interfaces are up and running and that the ASA and connected routers are operating correctly, you can ping the ASA interfaces. To ping the ASA interfaces, perform the following steps:

Step 1 Draw a diagram of your single-mode ASA or security context that shows the interface names, security levels, and IP addresses.

Note Although this procedure uses IP addresses, the **ping** command also supports DNS names and names that are assigned to a local IP address with the **name** command.

The diagram should also include any directly connected routers, and a host on the other side of the router from which you will ping the ASA. You will use this information in this procedure and in the procedure in "Pinging Through the Security Appliance" section on page 79-4. For example:

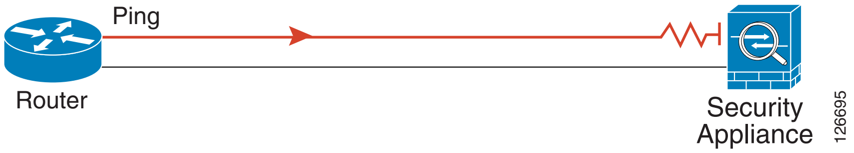
Figure 79-1 Network Diagram with Interfaces, Routers, and Hosts



Step 2 Ping each ASA interface from the directly connected routers. For transparent mode, ping the management IP address. This test ensures that the ASA interfaces are active and that the interface configuration is correct.

A ping might fail if the ASA interface is not active, the interface configuration is incorrect, or if a switch between the ASA and a router is down (see Figure 79-2). In this case, no debug messages or system log messages appear, because the packet never reaches the ASA.

Figure 79-2 Ping Failure at Security Appliance Interface

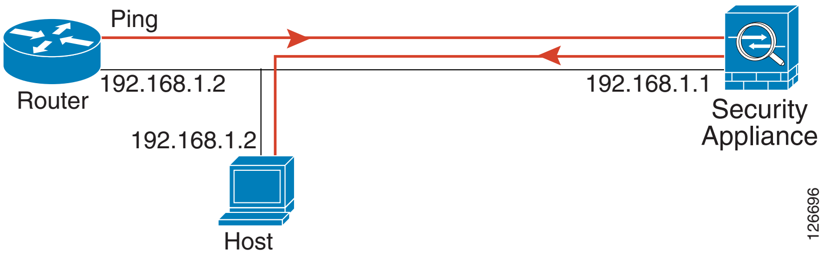


If the ping reaches the ASA, and the ASA responds, debug messages similar to the following appear:

```
ICMP echo reply (len 32 id 1 seq 256) 209.165.201.1 > 209.165.201.2
ICMP echo request (len 32 id 1 seq 512) 209.165.201.2 > 209.165.201.1
```

If the ping reply does not return to the router, then a switch loop or redundant IP addresses may exist (see Figure 79-3).

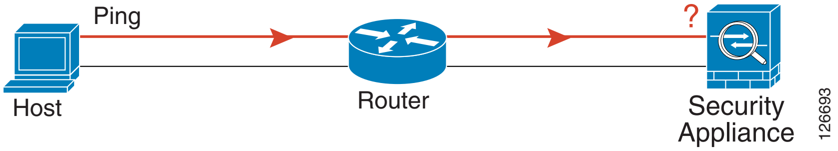
Figure 79-3 Ping Failure Because of IP Addressing Problems



Step 3 Ping each ASA interface from a remote host. For transparent mode, ping the management IP address. This test checks whether the directly connected router can route the packet between the host and the ASA, and whether the ASA can correctly route the packet back to the host.

A ping might fail if the ASA does not have a return route to the host through the intermediate router (see Figure 79-4). In this case, the debug messages show that the ping was successful, but system log message 110001 appears, indicating a routing failure.

Figure 79-4 Ping Failure Because the Security Appliance has no Return Route



Pinging Through the Security Appliance

After you successfully ping the ASA interfaces, make sure traffic can pass successfully through the ASA. For routed mode, this test shows that NAT is operating correctly, if configured. For transparent mode, which does not use NAT, this test confirms that the ASA is operating correctly. If the ping fails in transparent mode, contact Cisco TAC.

To ping between hosts on different interfaces, perform the following steps:

	Command	Purpose
Step 1	`access-list ICMPACL extended permit icmp any any`	Adds an access list allowing ICMP from any source host. **Note** By default, when hosts access a lower security interface, all traffic is allowed through. However, to access a higher security interface, you need the preceding access list.
Step 2	`access-group ICMPACL in interface` *`interface_name`*	Assigns the access list to each source interface. **Note** Repeat this command for each source interface.

Step 3

```
class-map ICMP-CLASS
match access-list ICMPACL
policy-map ICMP-POLICY
class ICMP-CLASS
inspect icmp
service-policy ICMP-POLICY global
```

Enables the ICMP inspection engine and ensure that ICMP responses may return to the source host.

Note Alternatively, you can also apply the ICMP access list to the destination interface to allow ICMP traffic back through the ASA.

Step 4

```
logging on
```

Enables system log messages.

Ping from the host or router through the source interface to another host or router on another interface.

Repeat this step for as many interface pairs as you want to check.

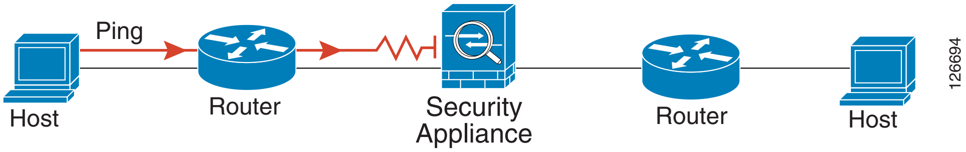
If the ping succeeds, a system log message appears to confirm the address translation for routed mode (305009 or 305011) and that an ICMP connection was established (302020). You can also enter either the **show xlate** or **show conns** command to view this information.

If the ping fails for transparent mode, contact Cisco TAC.

For routed mode, the ping might fail because NAT is not configured correctly (see Figure 79-5). This failure is more likely to occur if you enable NAT control. In this case, a system log message appears, showing that the NAT failed (305005 or 305006). If the ping is from an outside host to an inside host, and you do not have a static translation (required with NAT control), the following system log message appears: “106010: deny inbound icmp.”

Note The ASA only shows ICMP debug messages for pings to the ASA interfaces, and not for pings through the ASA to other hosts.

Figure 79-5 Ping Failure Because the Security Appliance is not Translating Addresses



Disabling the Test Configuration

After you complete your testing, disable the test configuration that allows ICMP to and through the ASA and that prints debug messages. If you leave this configuration in place, it can pose a serious security risk. Debug messages also slow the ASA performance.

To disable the test configuration, perform the following steps:

	Command	Purpose
Step 1	`no debug icmp trace`	Disables ICMP debug messages.
Step 2	`no logging on`	Disables logging
Step 3	`no access-list ICMPACL`	Removes the ICMPACL access list, and delete the related **access-group** commands.
Step 4	`no service-policy ICMP-POLICY`	(Optional) Disables the ICMP inspection engine.

Traceroute

You can trace the route of a packet using the traceroute feature, which is accessed with the **traceroute** command. A traceroute works by sending UDP packets to a destination on an invalid port. Because the port is not valid, the routers along the way to the destination respond with an ICMP Time Exceeded Message, and report that error to the security appliance.

Packet Tracer

In addition, you can trace the lifespan of a packet through the security appliance to see whether the packet is operating correctly with the packet tracer tool. This tool lets you do the following:

- Debug all packet drops in a production network.
- Verify the configuration is working as intended.
- Show all rules applicable to a packet, along with the CLI commands that caused the rule addition.
- Show a time line of packet changes in a data path.
- Inject tracer packets into the data path.

The **packet-tracer** command provides detailed information about the packets and how they are processed by the security appliance. If a command from the configuration did not cause the packet to drop, the **packet-tracer** command will provide information about the cause in an easily readable manner. For example, when a packet is dropped because of an invalid header validation, the following message appears: “packet dropped due to bad ip header (reason).”

Reloading the Security Appliance

In multiple mode, you can only reload from the system execution space. To reload the ASA, enter the following command:

Command	Purpose
`reload`	Reloads the ASA.

Performing Password Recovery

This section describes how to recover passwords if you have forgotten them or you are locked out because of AAA settings, and how to disable password recovery for extra security. This section includes the following topics:

- Recovering Passwords for the ASA 5500 Series Adaptive Security Appliance, page 79-7
- Recovering Passwords for the PIX 500 Series Security Appliance, page 79-8
- Disabling Password Recovery, page 79-10
- Resetting the Password on the SSM Hardware Module, page 79-10

Recovering Passwords for the ASA 5500 Series Adaptive Security Appliance

To recover passwords for the ASA 5500 Series adaptive ASA, perform the following steps:

Step 1 Connect to the adaptive ASA console port according to the instructions in "Accessing the Command-Line Interface" section on page 2-4.

Step 2 Power off the adaptive ASA, and then power it on.

Step 3 After startup, press the **Escape** key when you are prompted to enter ROMMON mode.

Step 4 To update the configuration register value, enter the following command:

```
rommon #1> confreg 0x41
Update Config Register (0x41) in NVRAM...
```

Step 5 To set the adaptive ASA to ignore the startup configuration, enter the following command:

```
rommon #1> confreg
```

The adaptive ASA displays the current configuration register value, and asks whether you want to change it:

```
Current Configuration Register: 0x00000041
Configuration Summary:
  boot default image from Flash
  ignore system configuration

Do you wish to change this configuration? y/n [n]: y
```

Step 6 Record the current configuration register value, so you can restore it later.

Step 7 At the prompt, enter **Y** to change the value.

The adaptive ASA prompts you for new values.

Step 8 Accept the default values for all settings. At the prompt, enter **Y**.

Step 9 Reload the adaptive ASA by entering the following command:

```
rommon #2> boot
Launching BootLoader...
Boot configuration file contains 1 entry.

Loading disk0:/asa800-226-k8.bin... Booting...Loading...
```

The adaptive ASA loads the default configuration instead of the startup configuration.

Step 10 Access the privileged EXEC mode by entering the following command:

```
hostname> enable
```

Step 11 When prompted for the password, press **Enter**.

The password is blank.

Step 12 Load the startup configuration by entering the following command:

```
hostname# copy startup-config running-config
```

Step 13 Access the global configuration mode by entering the following command:

```
hostname# configure terminal
```

Step 14 Change the passwords, as required, in the default configuration by entering the following commands:

```
hostname(config)# password password
hostname(config)# enable password password
hostname(config)# username name password password
```

Step 15 Load the default configuration by entering the following command:

```
hostname(config)# no config-register
```

The default configuration register value is 0x1. For more information about the configuration register, see the *Cisco ASA 5500 Series Command Reference*.

Step 16 Save the new passwords to the startup configuration by entering the following command:

```
hostname(config)# copy running-config startup-config
```

Recovering Passwords for the PIX 500 Series Security Appliance

Recovering passwords on the PIX 500 Series ASA erases the login password, enable password, and **aaa authentication console** commands. To recover passwords for the PIX 500 Series ASA, perform the following steps:

Step 1 Download the PIX password tool from Cisco.com to a TFTP server accessible from the ASA. For instructions, go to the following URL:

`http://www.cisco.com/en/US/products/hw/vpndevc/ps2030/products_password_recovery09186a008009478b.shtml`

Step 2 Connect to the ASA console port according to the instructions in "Accessing the Command-Line Interface" section on page 2-4.

Step 3 Power off the ASA, and then power it on.

Step 4 Immediately after the startup messages appear, press the **Escape** key to enter monitor mode.

Step 5 In monitor mode, configure the interface network settings to access the TFTP server by entering the following commands:

```
monitor> interface interface_id
monitor> address interface_ip
monitor> server tftp_ip
monitor> file pw_tool_name
monitor> gateway gateway_ip
```

Step 6 Download the PIX password tool from the TFTP server by entering the following command:

```
monitor> tftp
```

If you have trouble reaching the server, enter the **ping** *address* command to test the connection.

Step 7 At the "Do you wish to erase the passwords?" prompt, enter **Y**.

You can log in with the default login password of "cisco" and the blank enable password.

Examples

The following example shows password recovery on a PIX 500 Series ASA with the TFTP server on the outside interface:

```
monitor> interface 0
0: i8255X @ PCI(bus:0 dev:13 irq:10)
1: i8255X @ PCI(bus:0 dev:14 irq:7 )

Using 0: i82559 @ PCI(bus:0 dev:13 irq:10), MAC: 0050.54ff.82b9
monitor> address 10.21.1.99
address 10.21.1.99
monitor> server 172.18.125.3
server 172.18.125.3
monitor> file np70.bin
file np52.bin
monitor> gateway 10.21.1.1
gateway 10.21.1.1
monitor> ping 172.18.125.3
Sending 5, 100-byte 0xf8d3 ICMP Echoes to 172.18.125.3, timeout is 4 seconds:
!!!!!
Success rate is 100 percent (5/5)
monitor> tftp
tftp np52.bin@172.18.125.3 via 10.21.1.1
Received 73728 bytes

Cisco PIX password tool (4.0) #0: Tue Aug 22 23:22:19 PDT 2005
Flash=i28F640J5 @ 0x300
BIOS Flash=AT29C257 @ 0xd8000

Do you wish to erase the passwords? [yn] y
Passwords have been erased.

Rebooting....
```

Disabling Password Recovery

You might want to disable password recovery to ensure that unauthorized users cannot use the password recovery mechanism to compromise the ASA.

Command	Purpose
`no service password-recovery`	Disables password recovery.

On the ASA 5500 series adaptive security appliance, the **no service password-recovery** command prevents a user from entering ROMMON mode with the configuration intact. When a user enters ROMMON mode, the ASA prompts the user to erase all Flash file systems. The user cannot enter ROMMON mode without first performing this erasure. If a user chooses not to erase the Flash file system, the ASA reloads. Because password recovery depends on using ROMMON mode and maintaining the existing configuration, this erasure prevents you from recovering a password. However, disabling password recovery prevents unauthorized users from viewing the configuration or inserting different passwords. In this case, to restore the system to an operating state, load a new image and a backup configuration file, if available.

The **service password-recovery** command appears in the configuration file for information only. When you enter the command at the CLI prompt, the setting is saved in NVRAM. The only way to change the setting is to enter the command at the CLI prompt. Loading a new configuration with a different version of the command does not change the setting. If you disable password recovery when the ASA is configured to ignore the startup configuration at startup (in preparation for password recovery), then the ASA changes the setting to load the startup configuration as usual. If you use failover, and the standby unit is configured to ignore the startup configuration, then the same change is made to the configuration register when the **no service password recovery** command replicates to the standby unit.

On the PIX 500 series security appliance, the **no service password-recovery** command forces the PIX password tool to prompt the user to erase all Flash file systems. The user cannot use the PIX password tool without first performing this erasure. If a user chooses not to erase the Flash file system, the ASA reloads. Because password recovery depends on maintaining the existing configuration, this erasure prevents you from recovering a password. However, disabling password recovery prevents unauthorized users from viewing the configuration or inserting different passwords. In this case, to restore the system to an operating state, load a new image and a backup configuration file, if available.

Resetting the Password on the SSM Hardware Module

To reset the password to the default of “cisco” on the SSM hardware module, perform the following steps:

Note Make sure that the SSM hardware module is in the Up state and supports password reset.

Command	Purpose
hw-module module 1 password-reset	Where *1* is the specified slot number on the SSM hardware module. **Note** On the AIP SSM, entering this command reboots the hardware module. The module is offline until the rebooting is finished. Enter the **show module** command to monitor the module status. The AIP SSM supports this command in version 6.0 and later. On the CSC SSM, entering this command resets web services on the hardware module after the password has been reset. You may lose connection to ASDM or be logged out of the hardware module. The CSC SSM supports this command in the most recent version of 6.1, dated November 2006. `Reset the password on module in slot 1? [confirm] y.` Enter **y** to confirm.

Using the ROM Monitor to Load a Software Image

This section describes how to load a software image to an adaptive ASA from the ROM monitor mode using TFTP.

To load a software image to an adaptive security appliance, perform the following steps:

Step 1 Connect to the adaptive ASA console port according to the instructions in "Accessing the Command-Line Interface" section on page 2-4.

Step 2 Power off the adaptive ASA, and then power it on.

Step 3 During startup, press the **Escape** key when you are prompted to enter ROMMON mode.

Step 4 In ROMMOM mode, define the interface settings to the adaptive security appliance, including the IP address, TFTP server address, gateway address, software image file, and port, as follows:

```
rommon #1> ADDRESS=10.132.44.177
rommon #2> SERVER=10.129.0.30
rommon #3> GATEWAY=10.132.44.1
rommon #4> IMAGE=f1/asa800-232-k8.bin
rommon #5> PORT=Ethernet0/0
Ethernet0/0
Link is UP
MAC Address: 0012.d949.15b8
```

Note Be sure that the connection to the network already exists.

Step 5 To validate your settings, enter the **set** command.

```
rommon #6> set
ROMMON Variable Settings:
  ADDRESS=10.132.44.177
  SERVER=10.129.0.30
  GATEWAY=10.132.44.1
  PORT=Ethernet0/0
  VLAN=untagged
  IMAGE=f1/asa800-232-k8.bin
  CONFIG=
  LINKTIMEOUT=20
  PKTTIMEOUT=4
  RETRY=20
```

Step 6 Ping the TFTP server by entering the **ping server** command.

```
rommon #7> ping server
Sending 20, 100-byte ICMP Echoes to server 10.129.0.30, timeout is 4 seconds:

Success rate is 100 percent (20/20)
```

Step 7 Load the software image by entering the **tftp** command.

```
rommon #8> tftp
ROMMON Variable Settings:
  ADDRESS=10.132.44.177
  SERVER=10.129.0.30
  GATEWAY=10.132.44.1
  PORT=Ethernet0/0
  VLAN=untagged
  IMAGE=f1/asa800-232-k8.bin
  CONFIG=
  LINKTIMEOUT=20
  PKTTIMEOUT=4
  RETRY=20

tftp f1/asa800-232-k8.bin@10.129.0.30 via 10.132.44.1

Received 14450688 bytes

Launching TFTP Image...
Cisco PIX Security Appliance admin loader (3.0) #0: Mon Mar  5 16:00:07 MST 2007

Loading...
```

After the software image is successfully loaded, the adaptive security appliance automatically exits ROMMOM mode.

Step 8 To verify that the correct software image has been loaded into the adaptive security appliance, check the version in the adaptive security appliance by entering the following command:

```
hostname> show version
```

Erasing the Flash File System

Step 1 Connect to the adaptive ASA console port according to the instructions in "Accessing the Command-Line Interface" section on page 2-4.

Step 2 Power off the adaptive ASA, and then power it on.

Step 3 During startup, press the **Escape** key when you are prompted to enter ROMMON mode.

Step 4 To erase the file system, enter the **erase** command, which overwrites all files and erases the file system, including hidden system files.

```
rommon #1> erase [disk0: | disk1: | flash:]
```

Other Troubleshooting Tools

The ASA provides other troubleshooting tools that you can use. This section includes the following topics:

- Viewing Debug Messages, page 79-13
- Capturing Packets, page 79-13
- Viewing the Crash Dump, page 79-13
- Coredump, page 79-13

Viewing Debug Messages

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco TAC. Moreover, it is best to use **debug** commands during periods of less network traffic and fewer users. Debugging during these periods decreases the likelihood that increased debug command processing overhead will affect system use. To enable debug messages, see the **debug** commands in the *Cisco ASA 5500 Series Command Reference*.

Capturing Packets

Capturing packets is sometimes useful when troubleshooting connectivity problems or monitoring suspicious activity. We recommend contacting Cisco TAC if you want to use the packet capture feature. See the **capture** command in the *Cisco ASA 5500 Series Command Reference*.

Viewing the Crash Dump

If the ASA crashes, you can view the crash dump information. We recommend contacting Cisco TAC if you want to interpret the crash dump. See the **show crashdump** command in the *Cisco ASA 5500 Series Command Reference*.

Coredump

A coredump is a snapshot of the running program when the program has terminated abnormally —crashed. Coredumps are used to diagnose or debug errors and save a crash for later off-site analysis. Cisco TAC may request that users enable the coredump feature to troubleshoot application or system crashes on the ASA. See the coredump command in the *Cisco ASA 5500 Series Command Reference*

Common Problems

This section describes common problems with the ASA, and how you might resolve them.

Symptom The context configuration was not saved, and was lost when you reloaded.

Possible Cause You did not save each context within the context execution space. If you are configuring contexts at the command line, you did not save the current context before you changed to the next context.

Recommended Action Save each context within the context execution space using the **copy run start** command. You cannot save contexts from the system execution space.

Symptom You cannot make a Telnet or SSH connection to the ASA interface.

Possible Cause You did not enable Telnet or SSH to the ASA.

Recommended Action Enable Telnet or SSH to the ASA according to the instructions in "Allowing Telnet Access" section on page 37-1 or the "Allowing SSH Access" section on page 37-2.

Symptom You cannot ping the ASA interface.

Possible Cause You disabled ICMP to the ASA.

Recommended Action Enable ICMP to the ASA for your IP address using the **icmp** command.

Symptom You cannot ping through the ASA, although the access list allows it.

Possible Cause You did not enable the ICMP inspection engine or apply access lists on both the ingress and egress interfaces.

Recommended Action Because ICMP is a connectionless protocol, the ASA does not automatically allow returning traffic through. In addition to an access list on the ingress interface, you either need to apply an access list to the egress interface to allow replying traffic, or enable the ICMP inspection engine, which treats ICMP connections as stateful connections.

Symptom Traffic does not pass between two interfaces on the same security level.

Possible Cause You did not enable the feature that allows traffic to pass between interfaces at the same security level.

Recommended Action Enable this feature according to the instructions in "Allowing Same Security Level Communication" section on page 6-30.

Symptom IPSec tunnels do not duplicate during a failover to the standby device.

Possible Cause The switch port that the ASA is plugged into is set to 10/100 instead of 1000.

Recommended Action Set the switch port that the ASA is plugged into to 1000.

PART 14

Reference

APPENDIX A

Sample Configurations

This appendix illustrates and describes a number of common ways to implement the ASA, and includes the following sections:

- Example 1: Multiple Mode Firewall With Outside Access, page A-1
- Example 2: Single Mode Firewall Using Same Security Level, page A-6
- Example 3: Shared Resources for Multiple Contexts, page A-8
- Example 4: Multiple Mode, Transparent Firewall with Outside Access, page A-13
- Example 5: Single Mode, Transparent Firewall with NAT, page A-18
- Example 6: IPv6 Configuration, page A-19
- Example 7: Dual ISP Support Using Static Route Tracking, page A-20
- Example 8: Multicast Routing, page A-21
- Example 9: LAN-Based Active/Standby Failover (Routed Mode), page A-24
- Example 10: LAN-Based Active/Active Failover (Routed Mode), page A-25
- Example 11: LAN-Based Active/Standby Failover (Transparent Mode), page A-28
- Example 12: LAN-Based Active/Active Failover (Transparent Mode), page A-30
- Example 13: Cable-Based Active/Standby Failover (Routed Mode), page A-34
- Example 14: Cable-Based Active/Standby Failover (Transparent Mode), page A-35
- Example 15: ASA 5505 Base License, page A-36
- Example 16: ASA 5505 Security Plus License with Failover and Dual-ISP Backup, page A-38
- Example 17: AIP SSM in Multiple Context Mode, page A-40

Example 1: Multiple Mode Firewall With Outside Access

This configuration creates three security contexts plus the admin context, each with an inside and an outside interface. Both interfaces are configured as redundant interfaces.

The Customer C context includes a DMZ interface where a Websense server for HTTP filtering resides on the service provider premises (see Figure A-1).

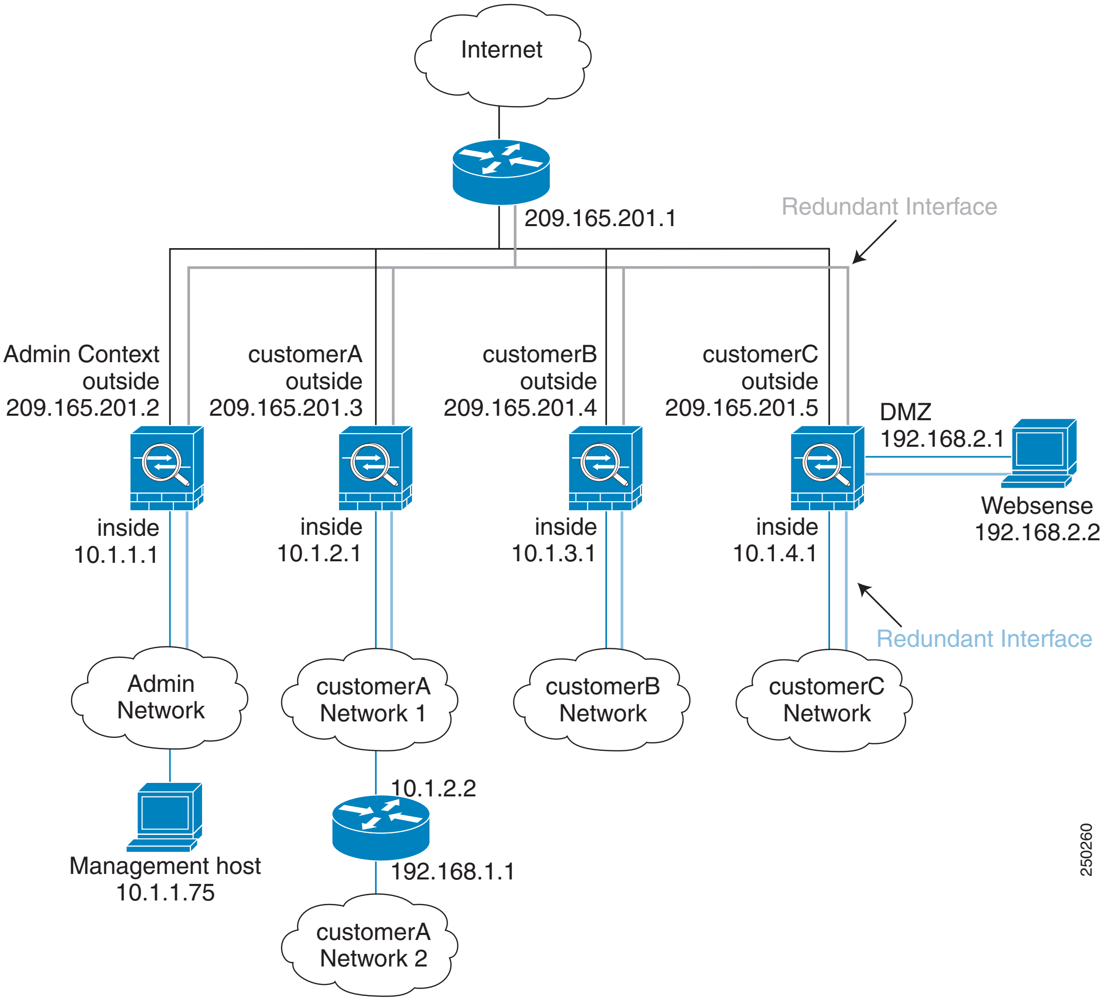
Inside hosts can access the Internet through the outside using dynamic NAT or PAT, but no outside hosts can access the inside.

The Customer A context has a second network behind an inside router.

The admin context allows SSH sessions to the ASA from one host.

Note Although inside IP addresses can be the same across contexts when the interfaces are unique, keeping them unique is easier to manage.

Figure A-1 Example 1



See the following sections for the configurations for this scenario:

- System Configuration for Example 1, page A-3
- Admin Context Configuration for Example 1, page A-4
- Customer A Context Configuration for Example 1, page A-4
- Customer B Context Configuration for Example 1, page A-5
- Customer C Context Configuration for Example 1, page A-5

System Configuration for Example 1

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
hostname Farscape
password passw0rd
enable password chr1cht0n
mac-address auto
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
admin-context admin
interface gigabitethernet 0/0
   no shutdown
interface gigabitethernet 0/1
   no shutdown
interface gigabitethernet 0/2
   no shutdown
interface gigabitethernet 0/3
   no shutdown
interface redundant 1
   member-interface gigabitethernet 0/0
   member-interface gigabitethernet 0/1
interface redundant 2
   member-interface gigabitethernet 0/2
   member-interface gigabitethernet 0/3
interface redundant 1.3
   vlan 3
   no shutdown
interface redundant 2.4
   vlan 4
   no shutdown
interface redundant 2.5
   vlan 5
   no shutdown
interface redundant 2.6
   vlan 6
   no shutdown
interface redundant 2.7
   vlan 7
   no shutdown
interface redundant 2.8
   vlan 8
   no shutdown
class gold
   limit-resource rate conns 2000
   limit-resource conns 20000
class silver
   limit-resource rate conns 1000
   limit-resource conns 10000
class bronze
   limit-resource rate conns 500
   limit-resource conns 5000
context admin
   allocate-interface redundant1.3 int1
   allocate-interface redundant2.4 int2
   config-url disk0://admin.cfg
   member default
context customerA
   description This is the context for customer A
   allocate-interface redundant1.3 int1
   allocate-interface redundant2.5 int2
   config-url disk0://contexta.cfg
   member gold
context customerB
   description This is the context for customer B
   allocate-interface redundant1.3 int1
   allocate-interface redundant2.6 int2
   config-url disk0://contextb.cfg
   member silver
context customerC
   description This is the context for customer C
   allocate-interface redundant1.3 int1
   allocate-interface redundant2.7-redundant2.8 int2-int3
   config-url disk0://contextc.cfg
   member bronze
```

Admin Context Configuration for Example 1

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

The host at 10.1.1.75 can access the context using SSH, which requires a key to be generated using the **crypto key generate** command.

```
hostname Admin
domain example.com
interface int1
   nameif outside
   security-level 0
   ip address 209.165.201.2 255.255.255.224
   no shutdown
interface int2
   nameif inside
   security-level 100
   ip address 10.1.1.1 255.255.255.0
   no shutdown
passwd secret1969
enable password h1andl0
route outside 0 0 209.165.201.1 1
ssh 10.1.1.75 255.255.255.255 inside
nat (inside) 1 10.1.1.0 255.255.255.0
! This context uses dynamic NAT for inside users that access the outside
global (outside) 1 209.165.201.10-209.165.201.29
! The host at 10.1.1.75 has access to the Websense server in Customer C, so
! it needs a static translation for use in Customer C's access list
static (inside,outside) 209.165.201.30 10.1.1.75 netmask 255.255.255.255
```

Customer A Context Configuration for Example 1

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface int1
   nameif outside
   security-level 0
   ip address 209.165.201.3 255.255.255.224
   no shutdown
interface int2
   nameif inside
   security-level 100
   ip address 10.1.2.1 255.255.255.0
   no shutdown
passwd hell0!
enable password enter55
route outside 0 0 209.165.201.1 1
! The Customer A context has a second network behind an inside router that requires a
! static route. All other traffic is handled by the default route pointing to the router.
route inside 192.168.1.0 255.255.255.0 10.1.2.2 1
nat (inside) 1 10.1.2.0 255.255.255.0
! This context uses dynamic PAT for inside users that access that outside. The outside
! interface address is used for the PAT address
global (outside) 1 interface
```

Customer B Context Configuration for Example 1

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface int1
   nameif outside
   security-level 0
   ip address 209.165.201.4 255.255.255.224
   no shutdown
interface int2
   nameif inside
   security-level 100
   ip address 10.1.3.1 255.255.255.0
   no shutdown
passwd tenac10us
enable password defen$e
route outside 0 0 209.165.201.1 1
nat (inside) 1 10.1.3.0 255.255.255.0
! This context uses dynamic PAT for inside users that access the outside
global (outside) 1 209.165.201.9 netmask 255.255.255.255
access-list INTERNET remark Inside users only access HTTP and HTTPS servers on the outside
access-list INTERNET extended permit tcp any any eq http
access-list INTERNET extended permit tcp any any eq https
access-group INTERNET in interface inside
```

Customer C Context Configuration for Example 1

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface int1
   nameif outside
   security-level 0
   ip address 209.165.201.5 255.255.255.224
   no shutdown
interface int2
   nameif inside
   security-level 100
   ip address 10.1.4.1 255.255.255.0
   no shutdown
interface int3
   nameif dmz
   security-level 50
   ip address 192.168.2.1 255.255.255.0
   no shutdown
passwd fl0wer
enable password treeh0u$e
route outside 0 0 209.165.201.1 1
url-server (dmz) vendor websense host 192.168.2.2 url-block block 50
url-cache dst 128
filter url http 10.1.4.0 255.255.255.0 0 0
! When inside users access an HTTP server, the ASA consults with a
! Websense server to determine if the traffic is allowed
nat (inside) 1 10.1.4.0 255.255.255.0
! This context uses dynamic NAT for inside users that access the outside
global (outside) 1 209.165.201.9 netmask 255.255.255.255
! A host on the admin context requires access to the Websense server for management using
! pcAnywhere, so the Websense server uses a static translation for its private address
static (dmz,outside) 209.165.201.6 192.168.2.2 netmask 255.255.255.255
access-list MANAGE remark Allows the management host to use pcAnywhere on the Websense
server
access-list MANAGE extended permit tcp host 209.165.201.30 host 209.165.201.6 eq
pcanywhere-data
access-list MANAGE extended permit udp host 209.165.201.30 host 209.165.201.6 eq
pcanywhere-status
access-group MANAGE in interface outside
```

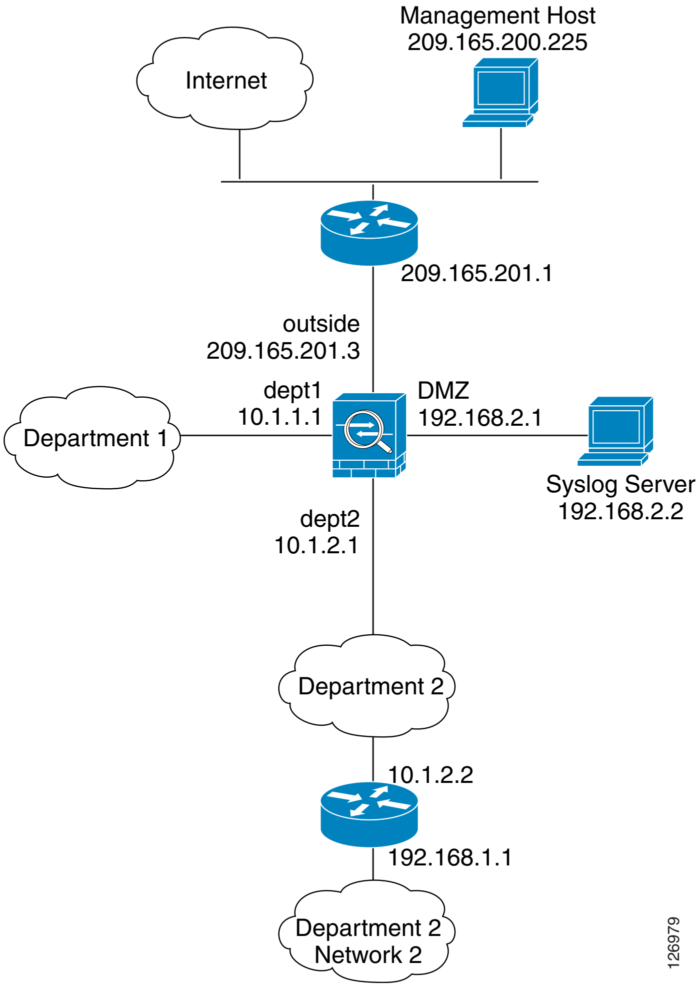
Example 2: Single Mode Firewall Using Same Security Level

This configuration creates three internal interfaces. Two of the interfaces connect to departments that are on the same security level, which allows all hosts to communicate without using access lists. The DMZ interface hosts a syslog server. The management host on the outside needs access to the Syslog server and the ASA. The ASA uses RIP on the inside interfaces to learn routes. The ASA does not advertise routes with RIP; the upstream router needs to use static routes for ASA traffic (see Figure A-2).

The Department networks are allowed to access the Internet, and use PAT.

Threat detection is enabled.

Figure A-2 Example 2



```
passwd g00fba11
enable password gen1u$
hostname Buster
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
interface gigabitethernet 0/0
   nameif outside
   security-level 0
   ip address 209.165.201.3 255.255.255.224
   no shutdown
interface gigabitethernet 0/1
   nameif dept2
   security-level 100
   ip address 10.1.2.1 255.255.255.0
   mac-address 000C.F142.4CDE standby 000C.F142.4CDF
   no shutdown
   rip authentication mode md5
   rip authentication key scorpius key_id 1
interface gigabitethernet 0/2
   nameif dept1
   security-level 100
   ip address 10.1.1.1 255.255.255.0
   no shutdown
```

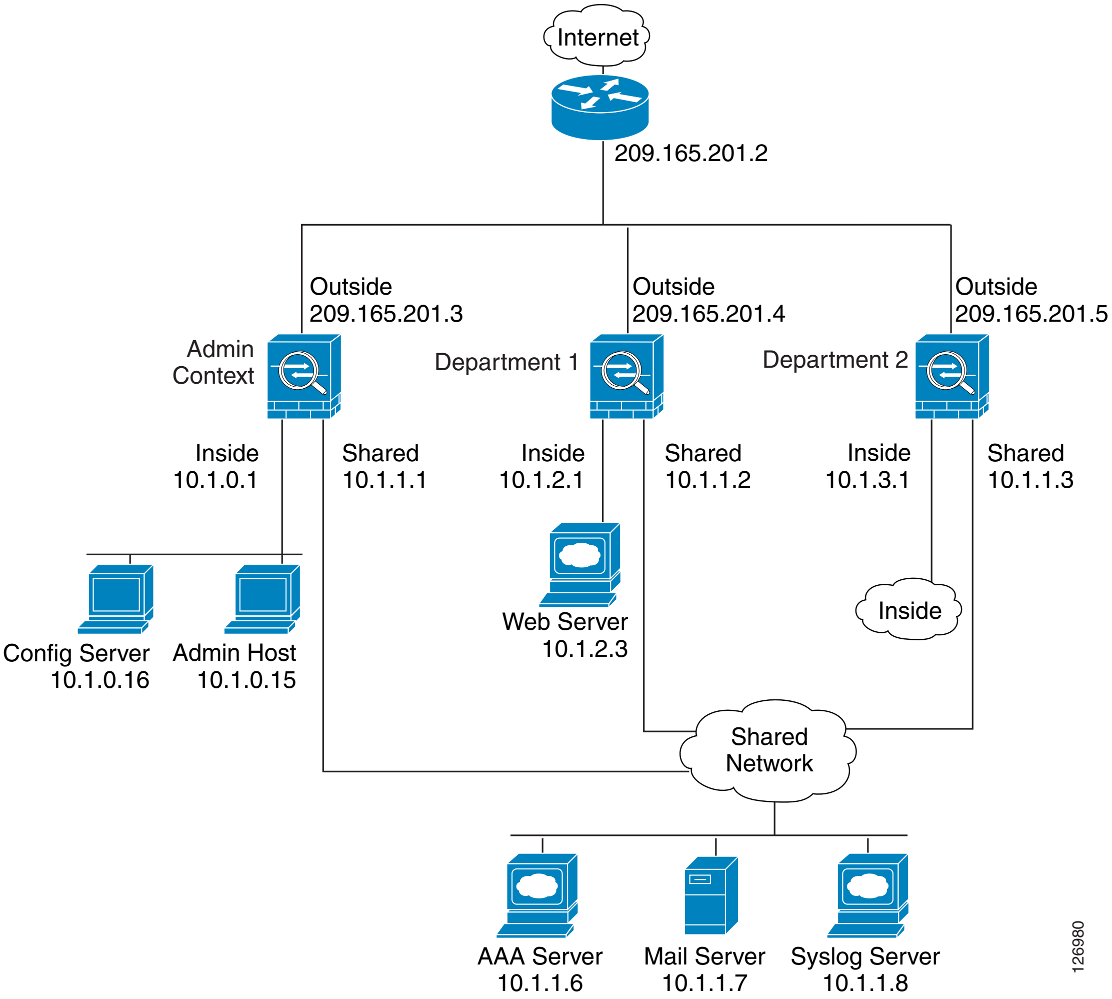
```
interface gigabitethernet 0/3
   nameif dmz
   security-level 50
   ip address 192.168.2.1 255.255.255.0
   no shutdown
same-security-traffic permit inter-interface
route outside 0 0 209.165.201.1 1
nat (dept1) 1 10.1.1.0 255.255.255.0
nat (dept2) 1 10.1.2.0 255.255.255.0
! The dept1 and dept2 networks use PAT when accessing the outside
global (outside) 1 209.165.201.9 netmask 255.255.255.255
! Because we perform dynamic NAT on these addresses for outside access, we need to perform
! NAT on them for all other interface access. This identity static statement just
! translates the local address to the same address.
static (dept1,dept2) 10.1.1.0 10.1.1.0 netmask 255.255.255.0
static (dept2,dept1) 10.1.2.0 10.1.2.0 netmask 255.255.255.0
! The syslog server uses a static translation so the outside management host can access
! the server
static (dmz,outside) 209.165.201.5 192.168.2.2 netmask 255.255.255.255
access-list MANAGE remark Allows the management host to access the syslog server
access-list MANAGE extended permit tcp host 209.165.200.225 host 209.165.201.5 eq ssh
access-group MANAGE in interface outside
! Advertises the ASA IP address as the default gateway for the downstream
! router. The ASA does not advertise a default route to the upstream
! router. Listens for RIP updates from the downstream router. The ASA does
! not listen for RIP updates from the upstream router because a default route to the
! upstream router is all that is required.
router rip
   network 10.0.0.0
   default information originate
   version 2
ssh 209.165.200.225 255.255.255.255 outside
logging trap 5
! System messages are sent to the syslog server on the DMZ network
logging host dmz 192.168.2.2
logging enable
! Enable basic threat detection:
threat-detection basic-threat
threat-detection rate dos-drop rate-interval 600 average-rate 60 burst-rate 100
! Enables scanning threat detection and automatically shun attackers,
! except for hosts on the 10.1.1.0 network:
threat-detection scanning-threat shun except ip-address 10.1.1.0 255.255.255.0
threat-detection rate scanning-threat rate-interval 1200 average-rate 10 burst-rate 20
threat-detection rate scanning-threat rate-interval 2400 average-rate 10 burst-rate 20
! Enable statistics for access-lists:
threat-detection statistics access-list
```

Example 3: Shared Resources for Multiple Contexts

This configuration includes multiple contexts for multiple departments within a company. Each department has its own security context so that each department can have its own security policy. However, the syslog, mail, and AAA servers are shared across all departments. These servers are placed on a shared interface (see Figure A-3).

Department 1 has a web server that outside users who are authenticated by the AAA server can access.

Figure A-3 Example 3



See the following sections for the configurations for this scenario:

- System Configuration for Example 3, page A-9
- Admin Context Configuration for Example 3, page A-10
- Department 1 Context Configuration for Example 3, page A-11
- Department 2 Context Configuration for Example 3, page A-12

System Configuration for Example 3

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
hostname Ubik
password pkd55
enable password deckard69
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
```

```
mac-address auto
admin-context admin
interface gigabitethernet 0/0
   no shutdown
interface gigabitethernet 0/0.200
! This is the shared outside interface
   vlan 200
   no shutdown
interface gigabitethernet 0/1
   no shutdown
interface gigabitethernet 0/1.201
! This is the inside interface for admin
   vlan 201
   no shutdown
interface gigabitethernet 0/1.202
! This is the inside interface for department 1
   vlan 202
   no shutdown
interface gigabitethernet 0/1.203
! This is the inside interface for department 2
   vlan 203
   no shutdown
interface gigabitethernet 0/1.300
! This is the shared inside interface
   vlan 300
   no shutdown
context admin
   allocate-interface gigabitethernet 0/0.200
   allocate-interface gigabitethernet 0/1.201
   allocate-interface gigabitethernet 0/1.300
   config-url disk0://admin.cfg
context department1
   allocate-interface gigabitethernet 0/0.200
   allocate-interface gigabitethernet 0/1.202
   allocate-interface gigabitethernet 0/1.300
   config-url ftp://admin:passw0rd@10.1.0.16/dept1.cfg
context department2
   allocate-interface gigabitethernet 0/0.200
   allocate-interface gigabitethernet 0/1.203
   allocate-interface gigabitethernet 0/1.300
   config-url ftp://admin:passw0rd@10.1.0.16/dept2.cfg
```

Admin Context Configuration for Example 3

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
hostname Admin
interface gigabitethernet 0/0.200
   nameif outside
   security-level 0
   ip address 209.165.201.3 255.255.255.224
   no shutdown
interface gigabitethernet 0/0.201
   nameif inside
   security-level 100
   ip address 10.1.0.1 255.255.255.0
   no shutdown
interface gigabitethernet 0/0.300
   nameif shared
   security-level 50
   ip address 10.1.1.1 255.255.255.0
   no shutdown
passwd v00d00
enable password d011
route outside 0 0 209.165.201.2 1
nat (inside) 1 10.1.0.0 255.255.255.0
! This context uses PAT for inside users that access the outside
global (outside) 1 209.165.201.6 netmask 255.255.255.255
! This context uses PAT for inside users that access the shared network
global (shared) 1 10.1.1.30
! Because this host can access the web server in the Department 1 context, it requires a
! static translation
static (inside,outside) 209.165.201.7 10.1.0.15 netmask 255.255.255.255
! Because this host has management access to the servers on the Shared interface, it
! requires a static translation to be used in an access list
static (inside,shared) 10.1.1.78 10.1.0.15 netmask 255.255.255.255
access-list SHARED remark -Allows only mail traffic from inside to exit shared interface
access-list SHARED remark -but allows the admin host to access any server.
access-list SHARED extended permit ip host 10.1.1.78 any
access-list SHARED extended permit tcp host 10.1.1.30 host 10.1.1.7 eq smtp
! Note that the translated addresses are used.
access-group SHARED out interface shared
! Allows 10.1.0.15 to access the admin context using Telnet. From the admin context, you
! can access all other contexts.
telnet 10.1.0.15 255.255.255.255 inside
aaa-server AAA-SERVER protocol tacacs+
aaa-server AAA-SERVER (shared) host 10.1.1.6
   key TheUauthKey
   server-port 16
! The host at 10.1.0.15 must authenticate with the AAA server to log in
aaa authentication telnet console AAA-SERVER
aaa authorization command AAA-SERVER LOCAL
aaa accounting command AAA-SERVER
logging trap 6
! System messages are sent to the syslog server on the Shared network
logging host shared 10.1.1.8
logging enable
```

Department 1 Context Configuration for Example 3

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface gigabitethernet 0/0.200
   nameif outside
   security-level 0
   ip address 209.165.201.4 255.255.255.224
   no shutdown
interface gigabitethernet 0/0.202
   nameif inside
   security-level 100
   ip address 10.1.2.1 255.255.255.0
   no shutdown
interface gigabitethernet 0/0.300
   nameif shared
   security-level 50
   ip address 10.1.1.2 255.255.255.0
   no shutdown
passwd cugel
enable password rhialto
nat (inside) 1 10.1.2.0 255.255.255.0
```

```
! The inside network uses PAT when accessing the outside
global (outside) 1 209.165.201.8 netmask 255.255.255.255
! The inside network uses dynamic NAT when accessing the shared network
global (shared) 1 10.1.1.31-10.1.1.37
! The web server can be accessed from outside and requires a static translation
static (inside,outside) 209.165.201.9 10.1.2.3 netmask 255.255.255.255
access-list WEBSERVER remark -Allows the management host (its translated address) on the
access-list WEBSERVER remark -admin context to access the web server for management
access-list WEBSERVER remark -it can use any IP protocol
access-list WEBSERVER extended permit ip host 209.165.201.7 host 209.165.201.9
access-list WEBSERVER remark -Allows any outside address to access the web server
access-list WEBSERVER extended permit tcp any eq http host 209.165.201.9 eq http
access-group WEBSERVER in interface outside
access-list MAIL remark -Allows only mail traffic from inside to exit out the shared int
! Note that the translated addresses are used.
access-list MAIL extended permit tcp host 10.1.1.31 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.32 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.33 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.34 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.35 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.36 eq smtp host 10.1.1.7 eq smtp
access-list MAIL extended permit tcp host 10.1.1.37 eq smtp host 10.1.1.7 eq smtp
access-group MAIL out interface shared
aaa-server AAA-SERVER protocol tacacs+
aaa-server AAA-SERVER (shared) host 10.1.1.6
   key TheUauthKey
   server-port 16
! All traffic matching the WEBSERVER access list must authenticate with the AAA server
aaa authentication match WEBSERVER outside AAA-SERVER
logging trap 4
! System messages are sent to the syslog server on the Shared network
logging host shared 10.1.1.8
logging enable
```

Department 2 Context Configuration for Example 3

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface gigabitethernet 0/0.200
   nameif outside
   security-level 0
   ip address 209.165.201.5 255.255.255.224
   no shutdown
interface gigabitethernet 0/0.203
   nameif inside
   security-level 100
   ip address 10.1.3.1 255.255.255.0
   no shutdown
interface gigabitethernet 0/0.300
   nameif shared
   security-level 50
   ip address 10.1.1.3 255.255.255.0
   no shutdown
passwd maz1r1an
enable password ly0ne$$e
route outside 0 0 209.165.201.2 1
nat (inside) 1 10.1.3.0 255.255.255.0
! The inside network uses PAT when accessing the outside
global (outside) 1 209.165.201.10 netmask 255.255.255.255
! The inside network uses PAT when accessing the shared network
```

```
global (shared) 1 10.1.1.38
access-list MAIL remark -Allows only mail traffic from inside to exit out the shared int
access-list MAIL extended permit tcp host 10.1.1.38 host 10.1.1.7 eq smtp
! Note that the translated PAT address is used.
access-group MAIL out interface shared
logging trap 3
! System messages are sent to the syslog server on the Shared network
logging host shared 10.1.1.8
logging enable
```

Example 4: Multiple Mode, Transparent Firewall with Outside Access

This configuration creates three security contexts plus the admin context. Each context allows OSPF traffic to pass between the inside and outside routers (see Figure A-4).

Inside hosts can access the Internet through the outside, but no outside hosts can access the inside.

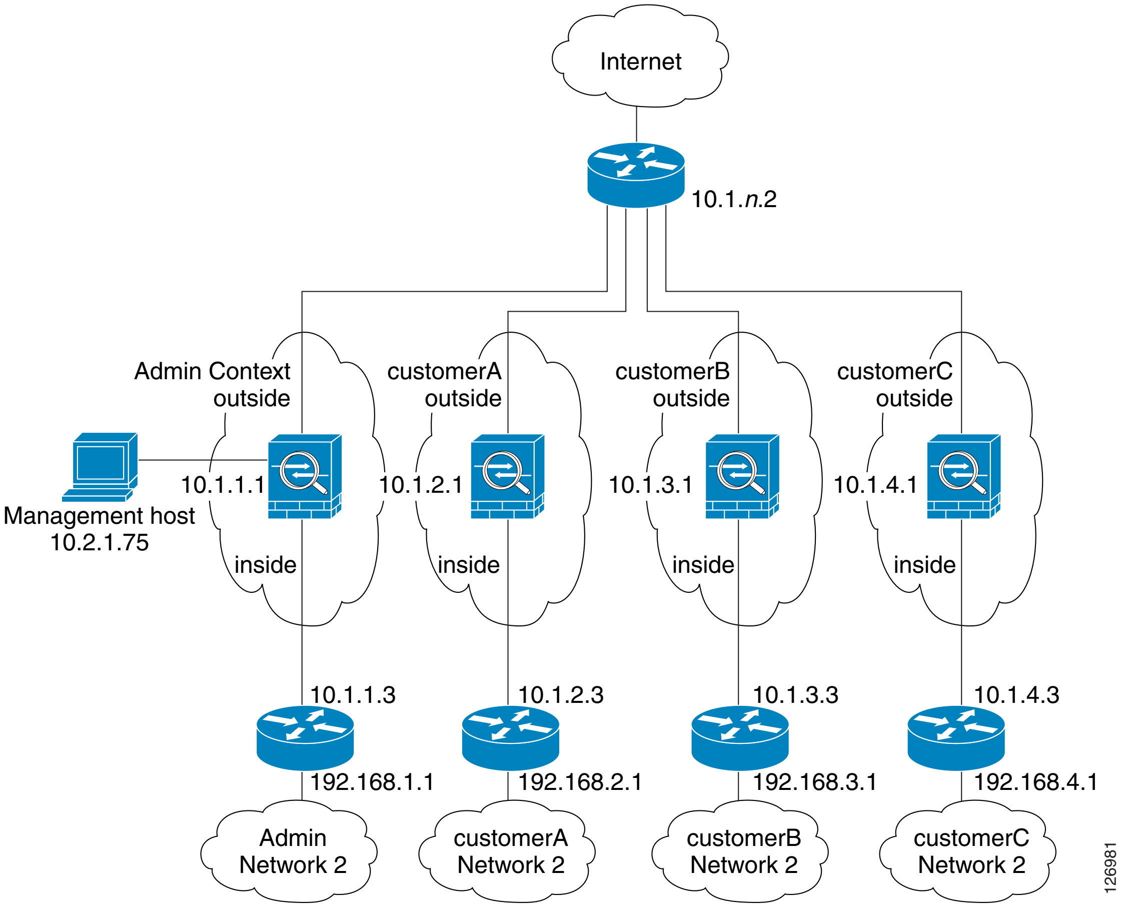
An out-of-band management host is connected to the Management 0/0 interface.

The admin context allows SSH sessions to the ASA from one host.

Connection limit settings for each context, except admin, limit the number of connections to guard against DoS attacks.

Note Although inside IP addresses can be the same across contexts, keeping them unique is easier to manage.

Figure A-4 Example 4



See the following sections for the configurations for this scenario:

- System Configuration for Example 4, page A-14
- Admin Context Configuration for Example 4, page A-15
- Customer A Context Configuration for Example 4, page A-16
- Customer B Context Configuration for Example 4, page A-16
- Customer C Context Configuration for Example 4, page A-17

System Configuration for Example 4

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
firewall transparent
hostname Farscape
password passw0rd
enable password chr1cht0n
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
mac-address auto
admin-context admin
```

```
interface gigabitethernet 0/0
   no shutdown
interface gigabitethernet 0/0.150
   vlan 150
   no shutdown
interface gigabitethernet 0/0.151
   vlan 151
   no shutdown
interface gigabitethernet 0/0.152
   vlan 152
   no shutdown
interface gigabitethernet 0/0.153
   vlan 153
   no shutdown
interface gigabitethernet 0/1
   shutdown
interface gigabitethernet 0/1.4
   vlan 4
   no shutdown
interface gigabitethernet 0/1.5
   vlan 5
   no shutdown
interface gigabitethernet 0/1.6
   vlan 6
   no shutdown
interface gigabitethernet 0/1.7
   vlan 7
   no shutdown
interface management 0/0
   no shutdown
context admin
   allocate-interface gigabitethernet 0/0.150
   allocate-interface gigabitethernet 0/1.4
   allocate-interface management 0/0
   config-url disk0://admin.cfg
context customerA
   description This is the context for customer A
   allocate-interface gigabitethernet 0/0.151
   allocate-interface gigabitethernet 0/1.5
   config-url disk0://contexta.cfg
context customerB
   description This is the context for customer B
   allocate-interface gigabitethernet 0/0.152
   allocate-interface gigabitethernet 0/1.6
   config-url disk0://contextb.cfg
context customerC
   description This is the context for customer C
   allocate-interface gigabitethernet 0/0.153
   allocate-interface gigabitethernet 0/1.7
   config-url disk0://contextc.cfg
```

Admin Context Configuration for Example 4

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

The host at 10.2.1.75 can access the context using SSH, which requires a key pair to be generated using the **crypto key generate** command.

```
hostname Admin
domain example.com
```

```
interface gigabitethernet 0/0.150
   nameif outside
   security-level 0
   no shutdown
interface gigabitethernet 0/1.4
   nameif inside
   security-level 100
   no shutdown
interface management 0/0
   nameif manage
   security-level 50
! Unlike other transparent interfaces, the management interface
! requires an IP address:
   ip address 10.2.1.1 255.255.255.0
   no shutdown
passwd secret1969
enable password h1andl0
ip address 10.1.1.1 255.255.255.0
route outside 0 0 10.1.1.2 1
ssh 10.2.1.75 255.255.255.255 manage
access-list OSPF remark -Allows OSPF
access-list OSPF extended permit 89 any any
access-group OSPF in interface outside
```

Customer A Context Configuration for Example 4

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface gigabitethernet 0/0.151
   nameif outside
   security-level 0
   no shutdown
interface gigabitethernet 0/1.5
   nameif inside
   security-level 100
   no shutdown
passwd hell0!
enable password enter55
ip address 10.1.2.1 255.255.255.0
route outside 0 0 10.1.2.2 1
access-list OSPF remark -Allows OSPF
access-list OSPF extended permit 89 any any
access-group OSPF in interface outside
```

Customer B Context Configuration for Example 4

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface gigabitethernet 0/0.152
   nameif outside
   security-level 0
   no shutdown
interface gigabitethernet 0/1.6
   nameif inside
   security-level 100
   no shutdown
```

```
passwd tenac10us
enable password defen$e
ip address 10.1.3.1 255.255.255.0
route outside 0 0 10.1.3.2 1
access-list OSPF remark -Allows OSPF
access-list OSPF extended permit 89 any any
access-group OSPF in interface outside
! The following commands add connection limits to the global policy.
class-map conn_limits
 match any
policy-map global_policy
   class conn_limits
      set connection conn-max 5000 embryonic-conn-max 2000
      set connection timeout tcp 2:0:0 reset half-close 0:5:0 embryonic 0:0:20 dcd 20 3
service-policy global_policy global
```

Customer C Context Configuration for Example 4

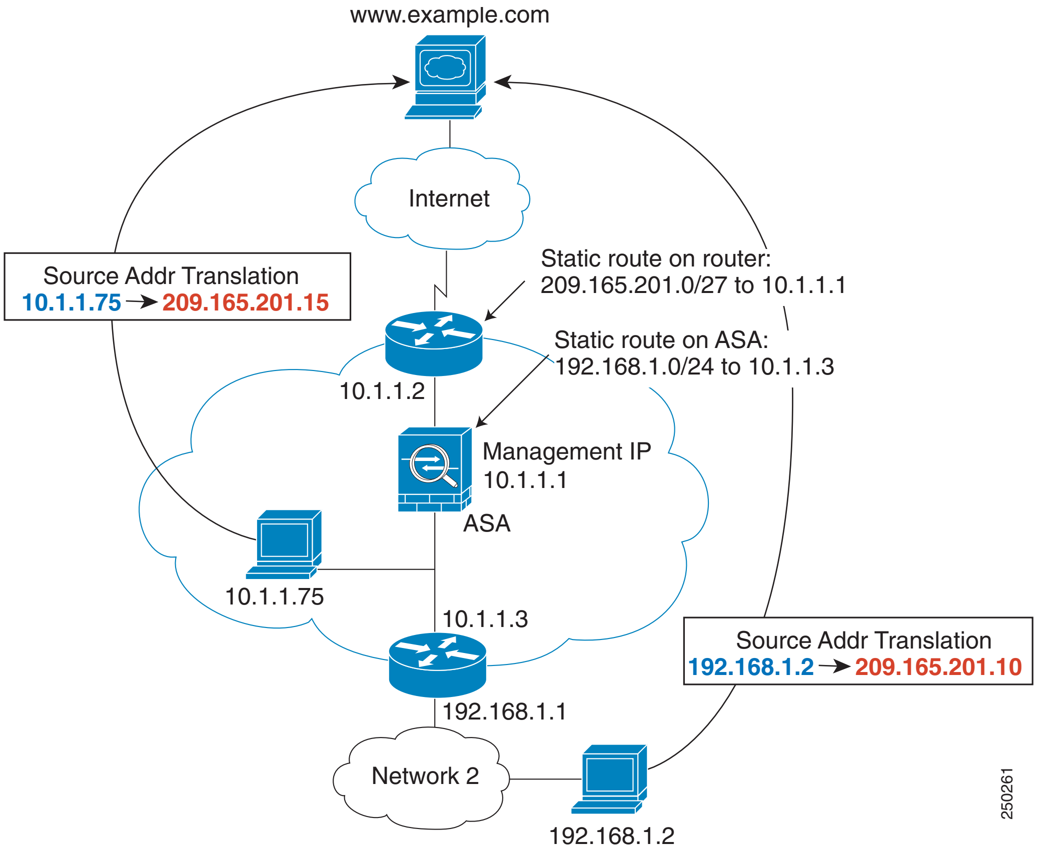
To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
interface gigabitethernet 0/0.153
   nameif outside
   security-level 0
   no shutdown
interface gigabitethernet 0/1.7
   nameif inside
   security-level 100
   no shutdown
passwd fl0wer
enable password treeh0u$e
ip address 10.1.4.1 255.255.255.0
route outside 0 0 10.1.4.2 1
access-list OSPF remark -Allows OSPF
access-list OSPF extended permit 89 any any
access-group OSPF in interface outside
! The following commands add connection limits to the global policy.
class-map conn_limits
 match any
policy-map global_policy
   class conn_limits
      set connection conn-max 5000 embryonic-conn-max 2000
      set connection timeout tcp 2:0:0 reset half-close 0:5:0 embryonic 0:0:20 dcd 20 3
service-policy global_policy global
```

Example 5: Single Mode, Transparent Firewall with NAT

This configuration shows how to configure NAT in transparent mode (see Figure A-5).

Figure A-5 Example 5



The host at 10.1.1.75 can access the ASA using SSH, which requires a key pair to be generated using the **crypto key generate** command.

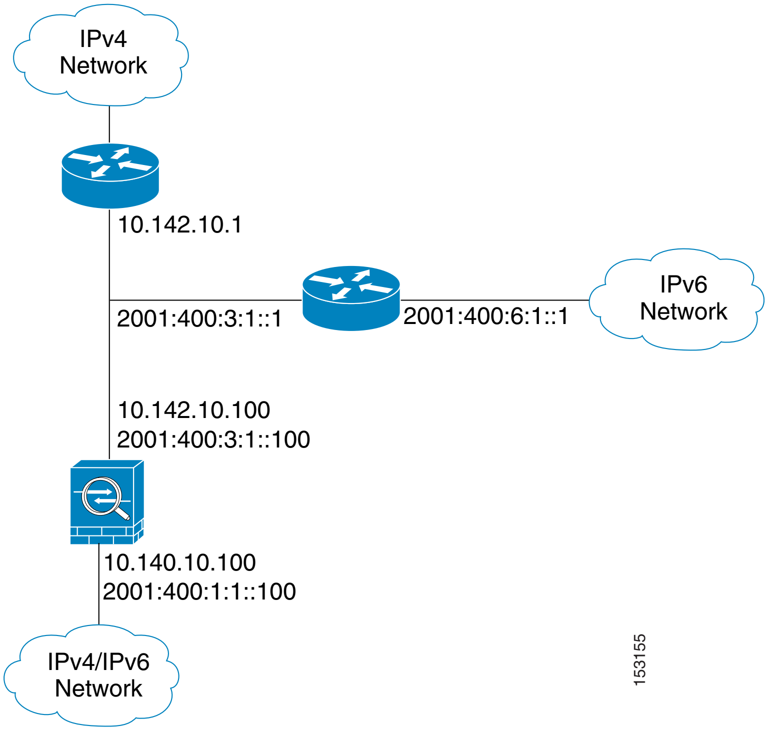
```
firewall transparent
hostname Farscape
password passw0rd
enable password chr1cht0n
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
hostname Moya
domain example.com
interface gigabitethernet 0/0
   nameif outside
   security-level 0
   no shutdown
interface gigabitethernet 0/1
   nameif inside
   security-level 100
   no shutdown
ip address 10.1.1.1 255.255.255.0
route outside 0 0 10.1.1.2 1
! The following route is required when you perform NAT
! on non-directly-connected networks:
route inside 192.168.1.0 255.255.255.0 10.1.1.3 1
ssh 10.1.1.75 255.255.255.255 inside
nat (inside) 1 10.1.1.0 255.255.255.0
nat (inside) 1 198.168.1.0 255.255.255.0
global (outside) 1 209.165.201.1-209.165.201.15
```

Example 6: IPv6 Configuration

This sample configuration shows several features of IPv6 support on the ASA:

- Each interface is configured with both IPv6 and IPv4 addresses.
- The IPv6 default route is set with the **ipv6 route** command.
- An IPv6 access list is applied to the outside interface.
- The enforcement of Modified-EUI64 format interface identifiers in the IPv6 addresses of hosts on the inside interface.
- The outside interface suppresses router advertisement messages.
- An IPv6 static route.

Figure A-6 IPv6 Dual Stack Configuration



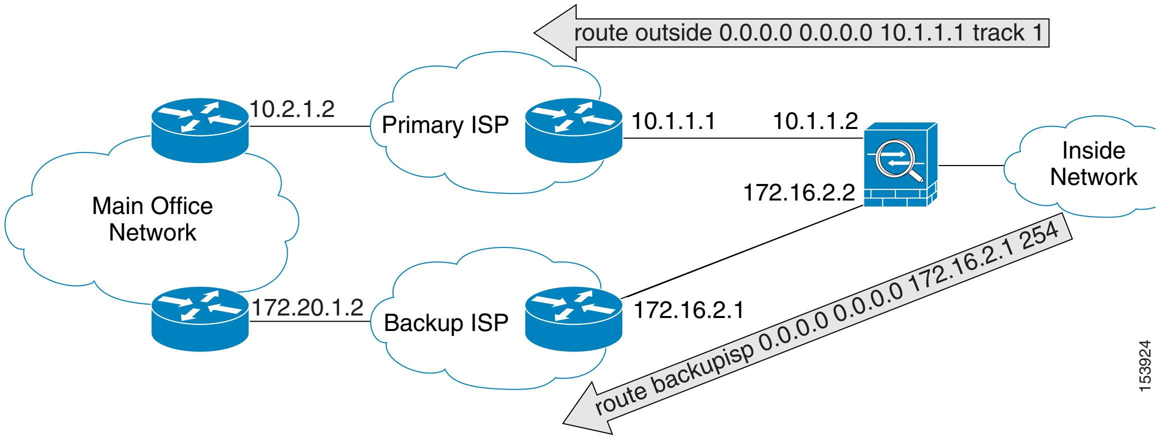
```
enable password myenablepassword
passwd mypassword
hostname coyupix
asdm image flash:/asdm.bin
boot system flash:/image.bin
```

```
interface gigabitethernet0/0
   nameif outside
   security-level 0
   ip address 10.142.10.100 255.255.255.0
   ipv6 address 2001:400:3:1::100/64
   ipv6 nd suppress-ra
   ospf mtu-ignore auto
   no shutdown
interface gigabitethernet0/1
   nameif inside
   security-level 100
   ip address 10.140.10.100 255.255.255.0
   ipv6 address 2001:400:1:1::100/64
   ospf mtu-ignore auto
   no shutdown
access-list allow extended permit icmp any any
ssh 10.140.10.75 255.255.255.255 inside
logging enable
logging buffered debugging
ipv6 enforce-eui64 inside
ipv6 route outside 2001:400:6:1::/64 2001:400:3:1::1
ipv6 route outside ::/0 2001:400:3:1::1
ipv6 access-list outacl permit icmp6 2001:400:2:1::/64 2001:400:1:1::/64
ipv6 access-list outacl permit tcp 2001:400:2:1::/64 2001:400:1:1::/64 eq telnet
ipv6 access-list outacl permit tcp 2001:400:2:1::/64 2001:400:1:1::/64 eq ftp
ipv6 access-list outacl permit tcp 2001:400:2:1::/64 2001:400:1:1::/64 eq www
access-group allow in interface outside
access-group outacl in interface outside
route outside 0.0.0.0 0.0.0.0 16.142.10.1 1
```

Example 7: Dual ISP Support Using Static Route Tracking

This configuration shows a remote office using static route tracking to use a backup ISP route if the primary ISP route fails. The ASA in the remote office uses ICMP echo requests to monitor the availability of the main office gateway. If that gateway becomes unavailable through the default route, the default route is removed from the routing table and the floating route to the backup ISP is used in its place.

Figure A-7 Dual ISP Support

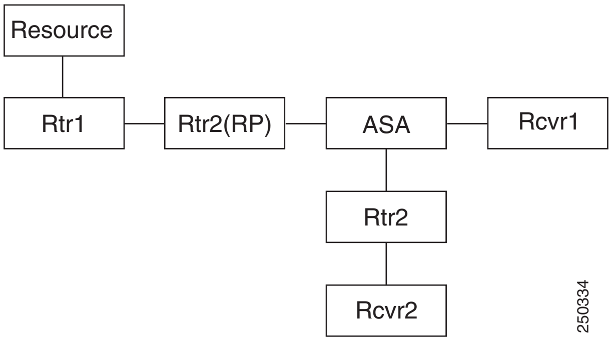


```
passwd password1
enable password password2
hostname myfirewall
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
!
interface gigabitethernet 0/0
   nameif outside
   security-level 0
   ip address 10.1.1.2 255.255.255.0
   no shutdown
!
interface gigabitethernet 0/1
   description backup isp link
   nameif backupisp
   security-level 100
   ip address 172.16.2.2 255.255.255.0
   no shutdown
!
sla monitor 123
   type echo protocol ipIcmpEcho 10.2.1.2 interface outside
   num-packets 3
   timeout 1000
   frequency 3
sla monitor schedule 123 life forever start-time now
!
track 1 rtr 123 reachability
!
route outside 0.0.0.0 0.0.0.0 10.1.1.1 track 1
! The above route is used while the tracked object, router 10.2.1.2
! is available. It is removed when the router becomes unavailable.
!
route backupisp 0.0.0.0 0.0.0.0 172.16.2.1 254
! The above route is a floating static route that is added to the
! routing table when the tracked route is removed.
```

Example 8: Multicast Routing

This configuration shows a source that is sending out multicast traffic with two listeners that are watching for messages. A network lies between the source and the receivers, and all devices need to build up the PIM tree properly for the traffic to flow. This includes the ASA 5505 adaptive security appliance, and all IOS routers.

Figure A-8 Multicast Routing Configuration



Note Multicast routing only works in single routed mode.

- For PIM Sparse Mode, page A-22
- For PIM bidir Mode, page A-23

For PIM Sparse Mode

This configuration enables multicast routing for PIM Sparse Mode.

```
hostname asa
multicast-routing

interface GigabitEthernet0/0
 nameif outside
 security-level 0
 ip address 10.1.1.1 255.255.255.0

interface GigabitEthernet0/1
 nameif inside
 security-level 100
 ip address 10.1.2.1 255.255.255.0

interface GigabitEthernet0/2
 nameif dmz
 security-level 50
 ip address 10.1.3.1 255.255.255.0
 igmp join-group 227.1.2.3

! Specify the RP
pim rp-address 10.1.1.2

! Specify ACL configuration on the interfaces
access-list mcast permit pim any any
access-list mcast permit igmp any any
access-list mcast permit ospf any any
access-list mcast permit icmp any any
access-list mcast permit tcp any any eq 80
access-list mcast permit udp any 224.0.0.0 240.0.0.0

no failover
access-group mcast in interface outside
access-group mcast in interface inside
```

```
access-group mcast in interface dmz

!   Configures unicast routing
router ospf 1
 network 10.1.1.0 255.255.255.0 area 0
 network 10.1.2.0 255.255.255.0 area 0
 network 10.1.3.0 255.255.255.0 area 0
 log-adj-changes
!
```

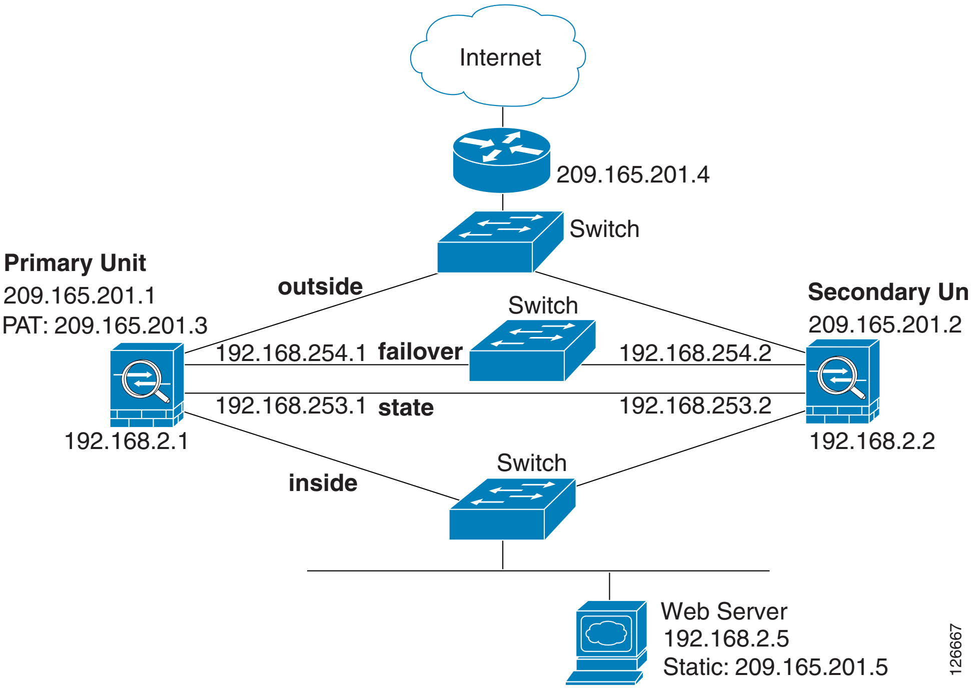
For PIM bidir Mode

```
hostname asa
multicast-routing
!
interface GigabitEthernet0/0
 nameif outside
 security-level 0
 ip address 10.1.1.1 255.255.255.0
!
interface GigabitEthernet0/1
 nameif inside
 security-level 100
 ip address 10.1.2.1 255.255.255.0
!
interface GigabitEthernet0/2
 nameif dmz
 security-level 50
 ip address 10.1.3.1 255.255.255.0
 igmp join-group 227.1.2.3

! Specify the RP

pim rp-address 10.1.1.2 bidir


! Specify ACL configuration on the interfaces
access-list mcast permit pim any any
access-list mcast permit igmp any any
access-list mcast permit ospf any any
access-list mcast permit icmp any any
access-list mcast permit tcp any any eq 80
access-list mcast permit udp any 224.0.0.0 240.0.0.0

no failover
access-group mcast in interface outside
access-group mcast in interface inside
access-group mcast in interface dmz

!   Configures unicast routing
router ospf 1
 network 10.1.1.0 255.255.255.0 area 0
 network 10.1.2.0 255.255.255.0 area 0
 network 10.1.3.0 255.255.255.0 area 0
 log-adj-changes
```

Example 9: LAN-Based Active/Standby Failover (Routed Mode)

Figure A-9 shows the network diagram for a failover configuration using an Ethernet failover link. The units are configured to detect unit failures and to fail over in under a second (see the **failover polltime unit** command in the primary unit configuration).

Figure A-9 LAN-Based Failover Configuration



See the following sections for primary or secondary unit configuration scenarios:

- Primary Unit Configuration for Example 9, page A-24
- Secondary Unit Configuration for Example 9, page A-25

Primary Unit Configuration for Example 9

```
hostname pixfirewall
enable password myenablepassword
password mypassword
interface gigabitethernet0/0
   nameif outside
   ip address 209.165.201.1 255.255.255.224 standby 209.165.201.2
   no shutdown
interface gigabitethernet0/1
   nameif inside
   ip address 192.168.2.1 255.255.255.0 standby 192.168.2.2
   no shutdown
interface gigabitethernet0/2
   description LAN Failover Interface
   no shutdown
interface gigabitethernet0/3
   description STATE Failover Interface
```

```
telnet 192.168.2.45 255.255.255.255 inside
access-list acl_out permit tcp any host 209.165.201.5 eq 80
failover
failover lan unit primary
failover lan interface failover gigabitethernet0/2
failover lan enable
! The failover lan enable command is required on the PIX ASA only.
failover polltime unit msec 200 holdtime msec 800
failover key key1
failover link state gigabitethernet0/3
failover interface ip failover 192.168.254.1 255.255.255.0 standby 192.168.254.2
failover interface ip state 192.168.253.1 255.255.255.0 standby 192.168.253.2
global (outside) 1 209.165.201.3 netmask 255.255.255.224
nat (inside) 1 0.0.0.0 0.0.0.0
static (inside,outside) 209.165.201.5 192.168.2.5 netmask 255.255.255.255 0 0
access-group acl_out in interface outside
route outside 0.0.0.0 0.0.0.0 209.165.201.4 1
```

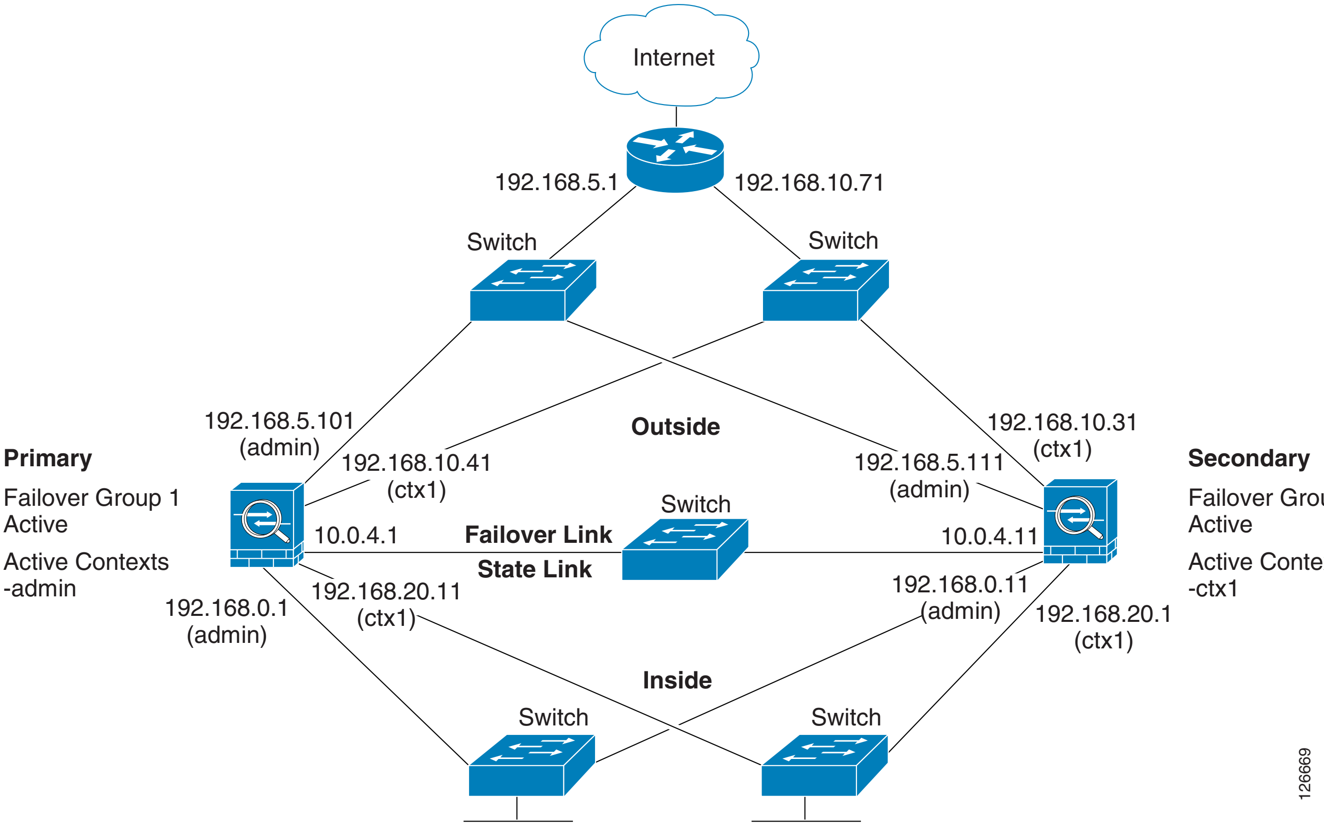
Secondary Unit Configuration for Example 9

```
failover
failover lan unit secondary
failover lan interface failover gigabitethernet0/2
failover lan enable
failover key key1
failover interface ip failover 192.168.254.1 255.255.255.0 standby 192.168.254.2
```

Example 10: LAN-Based Active/Active Failover (Routed Mode)

The following example shows how to configure Active/Active failover. In this example there are 2 user contexts, named admin and ctx1. Figure A-10 shows the network diagram for the example.

Figure A-10 Active/Active Failover Configuration



See the following sections for the configurations for this scenario:

- Primary Unit Configuration for Example 10, page A-26
- Secondary Unit Configuration for Example 10, page A-28

Primary Unit Configuration for Example 10

See the following sections for the primary unit configuration:

- Primary System Configuration for Example 10, page A-26
- Primary admin Context Configuration for Example 10, page A-27
- Primary ctx1 Context Configuration for Example 10, page A-28

Primary System Configuration for Example 10

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
hostname ciscopix
enable password farscape
password crichton
asdm image flash:/asdm.bin
```

```
boot system flash:/cdisk.bin
mac-address auto
interface gigabitethernet0/0
   description LAN/STATE Failover Interface
interface gigabitethernet0/1
   no shutdown
interface gigabitethernet0/2
   no shutdown
interface gigabitethernet0/3
   no shutdown
interface gigabitethernet1/0
   no shutdown
interface gigabitethernet1/1
   no shutdown
interface gigabitethernet1/2
   no shutdown
interface gigabitethernet1/3
   no shutdown
failover
failover lan unit primary
failover lan interface folink gigabitethernet0/0
failover link folink gigabitethernet0/0
failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
failover group 1
   primary
   preempt 60
failover group 2
   secondary
   preempt 60
admin-context admin
context admin
   description admin
   allocate-interface gigabitethernet0/1
   allocate-interface gigabitethernet0/2
   config-url flash:/admin.cfg
   join-failover-group 1
context ctx1
   description context 1
   allocate-interface gigabitethernet0/3
   allocate-interface gigabitethernet1/0
   config-url flash:/ctx1.cfg
   join-failover-group 2
```

Primary admin Context Configuration for Example 10

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
enable password frek
password elixir
hostname admin
interface gigabitethernet0/1
   nameif outside
   security-level 0
   ip address 192.168.5.101 255.255.255.0 standby 192.168.5.111
interface gigabitethernet0/2
   nameif inside
   security-level 100
   ip address 192.168.0.1 255.255.255.0 standby 192.168.0.11
monitor-interface outside
monitor-interface inside
route outside 0.0.0.0 0.0.0.0 192.168.5.1 1
```

```
ssh 192.168.0.2 255.255.255.255 inside
```

Primary ctx1 Context Configuration for Example 10

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
enable password quadrophenia
password tommy
hostname ctx1
interface gigabitethernet0/3
   nameif inside
   security-level 100
   ip address 192.168.20.1 255.255.255.0 standby 192.168.20.11
interface gigabitethernet1/0
   nameif outside
   security-level 0
   ip address 192.168.10.31 255.255.255.0 standby 192.168.10.41
   asr-group 1
access-list 201 extended permit ip any any
access-group 201 in interface outside
logging enable
logging console informational
monitor-interface inside
monitor-interface outside
route outside 0.0.0.0 0.0.0.0 192.168.10.71 1
```

Secondary Unit Configuration for Example 10

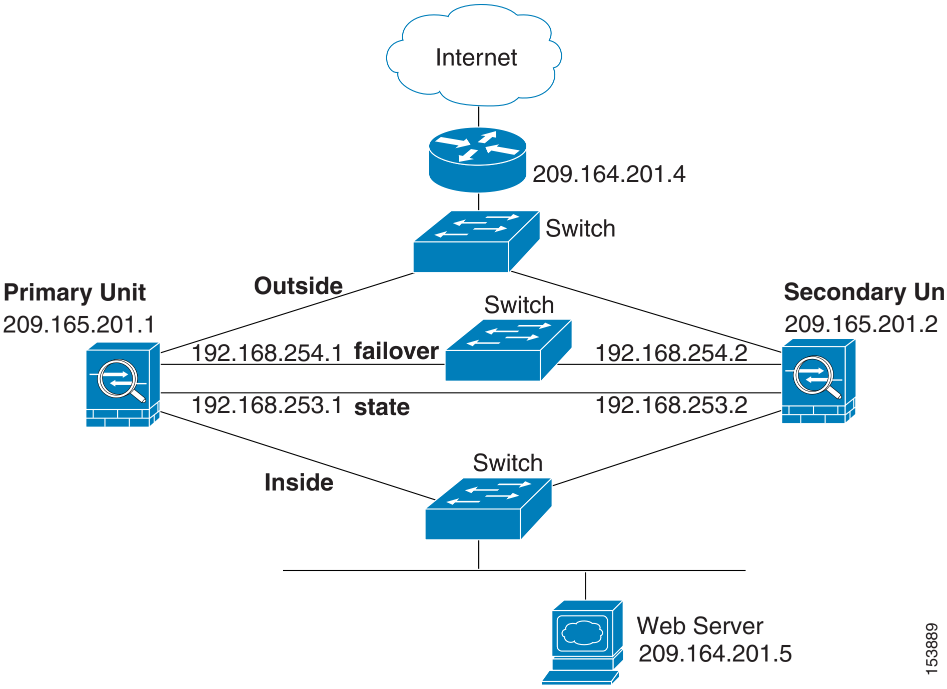
You only need to configure the secondary ASA to recognize the failover link. The secondary ASA obtains the context configurations from the primary ASA upon booting or when failover is first enabled. The **preempt** commands in the failover group configurations cause the failover groups to become active on their designated unit after the configurations have been synchronized and the preempt delay has passed.

```
failover
failover lan unit secondary
failover lan interface folink gigabitethernet0/0
failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
```

Example 11: LAN-Based Active/Standby Failover (Transparent Mode)

Figure A-11 shows the network diagram for a transparent mode failover configuration using an Ethernet failover link. The units are configured to detect unit failures and to fail over in under a second (see the **failover polltime unit** command in the primary unit configuration).

Figure A-11 Transparent Mode LAN-Based Failover Configuration



See the following sections for the configurations for this scenario:

- Primary Unit Configuration for Example 11, page A-29
- Secondary Unit Configuration for Example 11, page A-30

Primary Unit Configuration for Example 11

```
firewall transparent
hostname pixfirewall
enable password myenablepassword
password mypassword
interface gigabitethernet0/0
   nameif outside
   no shutdown
interface gigabitethernet0/1
   nameif inside
   no shutdown
interface gigabitethernet0/2
   description LAN Failover Interface
   no shutdown
interface gigabitethernet0/3
   description STATE Failover Interface
telnet 192.168.2.45 255.255.255.255 inside
access-list acl_out permit tcp any host 209.165.201.5 eq 80
ip address 209.165.201.1 255.255.255.0 standby 209.165.201.2
failover
failover lan unit primary
failover lan interface failover gigabitethernet0/2
failover lan enable
! The failover lan enable command is required on the PIX ASA only.
failover polltime unit msec 200 holdtime msec 800
failover key key1
failover link state gigabitethernet0/3
failover interface ip failover 192.168.254.1 255.255.255.0 standby 192.168.254.2
failover interface ip state 192.168.253.1 255.255.255.0 standby 192.168.253.2
access-group acl_out in interface outside
route outside 0.0.0.0 0.0.0.0 209.165.201.4 1
```

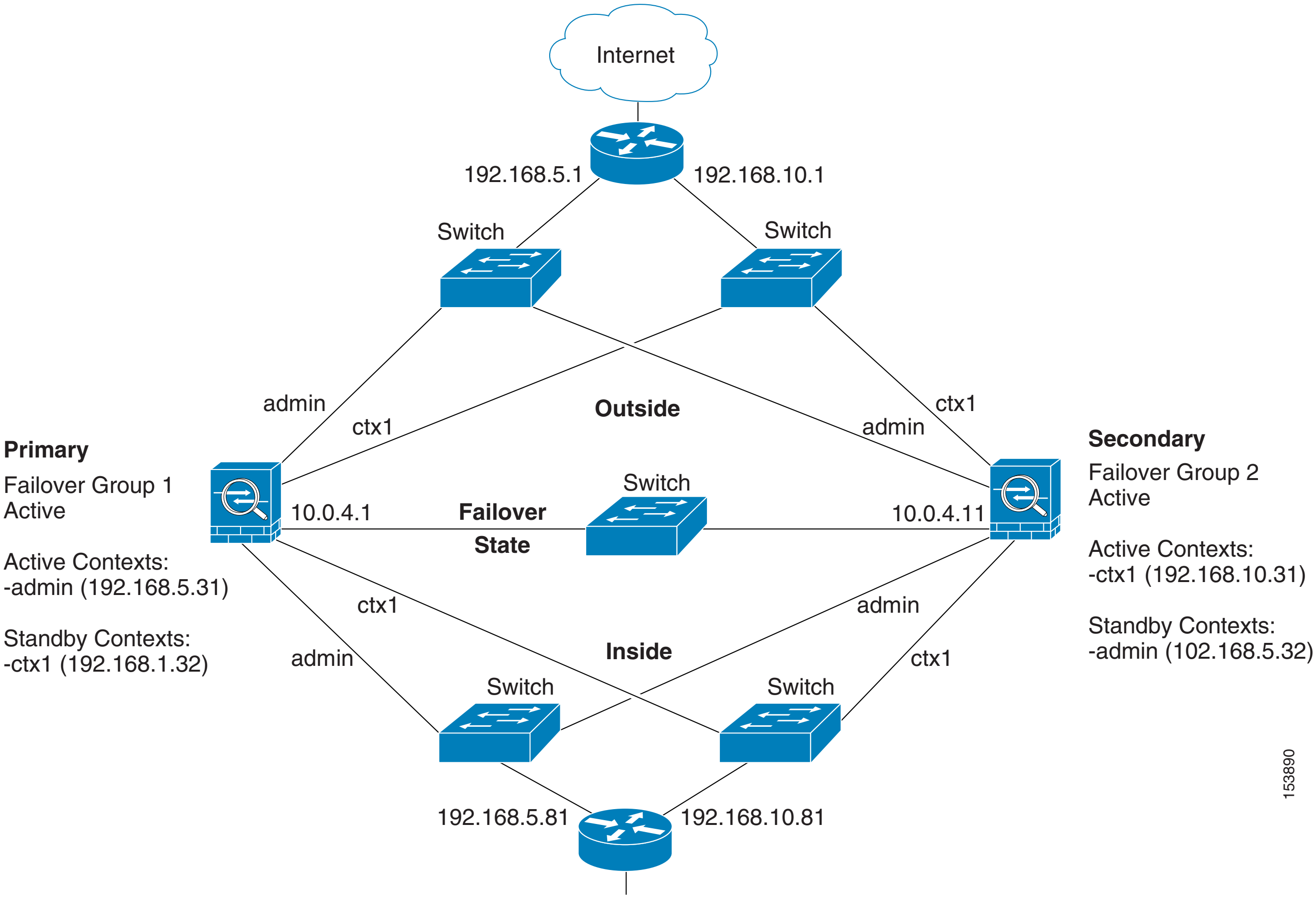
Secondary Unit Configuration for Example 11

```
firewall transparent
failover
failover lan unit secondary
failover lan interface failover gigabitethernet0/2
failover lan enable
failover key key1
failover interface ip failover 192.168.254.1 255.255.255.0 standby 192.168.254.2
```

Example 12: LAN-Based Active/Active Failover (Transparent Mode)

The following example shows how to configure transparent mode Active/Active failover. In this example there are 2 user contexts, named admin and ctx1. Figure A-12 shows the network diagram for the example.

Figure A-12 Transparent Mode Active/Active Failover Configuration



See the following sections for the configurations for this scenario:

- Primary Unit Configuration for Example 12, page A-31
- Secondary Unit Configuration for Example 12, page A-33

Primary Unit Configuration for Example 12

See the following sections for the primary unit configuration:

- Primary System Configuration for Example 12, page A-31
- Primary admin Context Configuration for Example 12, page A-32
- Primary ctx1 Context Configuration for Example 12, page A-33

Primary System Configuration for Example 12

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
firewall transparent
```

```
hostname ciscopix
enable password farscape
password crichton
asdm image flash:/asdm.bin
boot system flash:/cdisk.bin
mac-address auto
interface gigabitethernet0/0
   description LAN/STATE Failover Interface
interface gigabitethernet0/1
   no shutdown
interface gigabitethernet0/2
   no shutdown
interface gigabitethernet0/3
   no shutdown
interface gigabitethernet1/0
   no shutdown
interface gigabitethernet1/1
   no shutdown
interface gigabitethernet1/2
   no shutdown
interface gigabitethernet1/3
   no shutdown
failover
failover lan unit primary
failover lan interface folink gigabitethernet0/0
failover link folink gigabitethernet0/0
failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
failover group 1
   primary
   preempt
failover group 2
   secondary
   preempt
admin-context admin
context admin
   description admin
   allocate-interface gigabitethernet0/1
   allocate-interface gigabitethernet0/2
   config-url flash:/admin.cfg
   join-failover-group 1
context ctx1
   description context 1
   allocate-interface gigabitethernet0/3
   allocate-interface gigabitethernet1/0
   config-url flash:/ctx1.cfg
   join-failover-group 2
```

Primary admin Context Configuration for Example 12

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
enable password frek
password elixir
hostname admin
interface gigabitethernet0/1
   nameif outside
   security-level 0
interface gigabitethernet0/2
   nameif inside
   security-level 100
ip address 192.168.5.31 255.255.255.0 standby 192.168.5.32
```

```
monitor-interface outside
monitor-interface inside
route outside 0.0.0.0 0.0.0.0 192.168.5.1 1
ssh 192.168.5.72 255.255.255.255 inside
```

Primary ctx1 Context Configuration for Example 12

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
enable password quadrophenia
password tommy
hostname ctx1
interface gigabitethernet0/3
   nameif inside
   security-level 100
interface gigabitethernet1/0
   nameif outside
   security-level 0
access-list 201 extended permit ip any any
access-group 201 in interface outside
logging enable
logging console informational
ip address 192.168.10.31 255.255.255.0 standby 192.168.10.32
monitor-interface inside
monitor-interface outside
route outside 0.0.0.0 0.0.0.0 192.168.10.1 1
```

Secondary Unit Configuration for Example 12

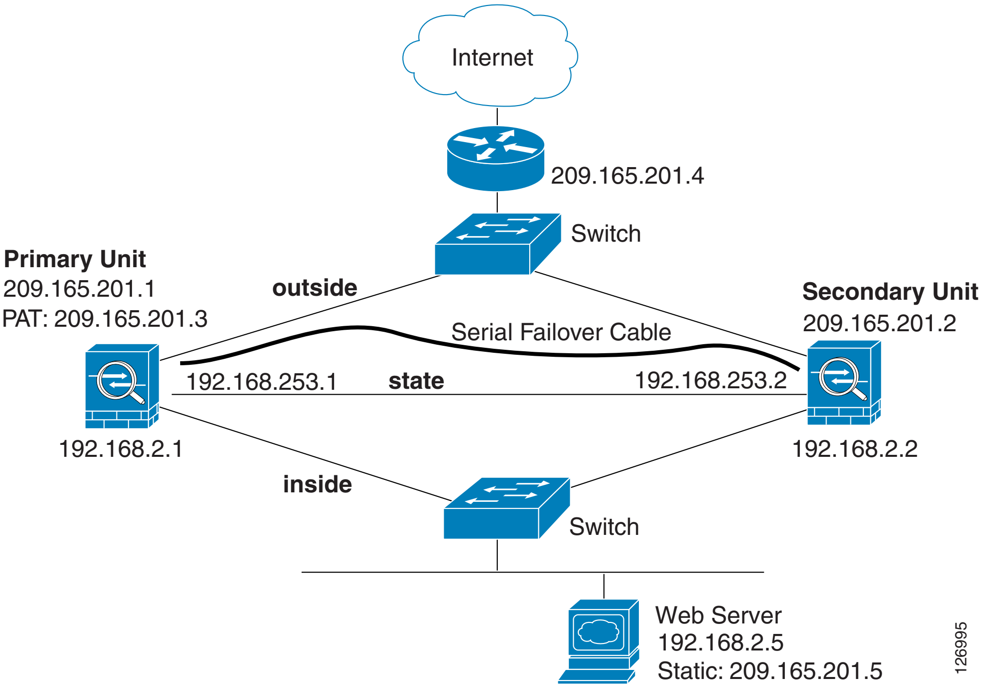
You only need to configure the secondary ASA to recognize the failover link. The secondary ASA obtains the context configurations from the primary ASA upon booting or when failover is first enabled. The **preempt** commands in the failover group configurations cause the failover groups to become active on their designated unit after the configurations have been synchronized and the preempt delay has passed.

```
firewall transparent
failover
failover lan unit secondary
failover lan interface folink gigabitethernet0/0
failover interface ip folink 10.0.4.1 255.255.255.0 standby 10.0.4.11
```

Example 13: Cable-Based Active/Standby Failover (Routed Mode)

Figure A-13 shows the network diagram for a failover configuration using a serial Failover cable. This configuration is only available on the PIX ASA. This example also specifies a stateful failover configuration.

Figure A-13 Cable-Based Failover Configuration



The following are the typical commands in a cable-based failover configuration.

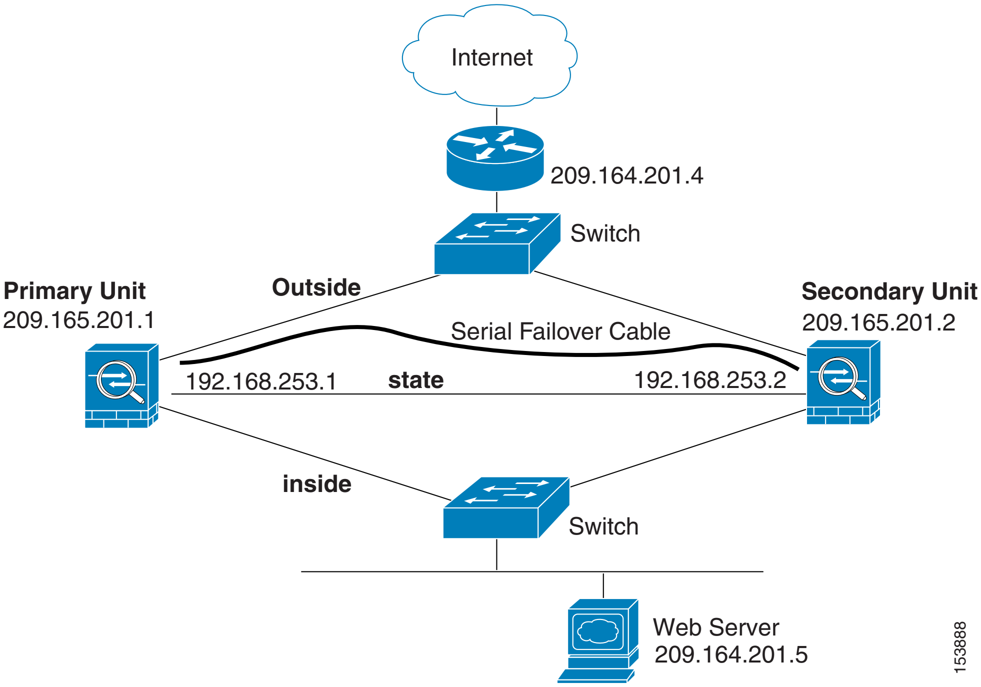
```
enable password myenablepassword
passwd mypassword
hostname pixfirewall
asdm image flash:/asdm.bin
boot system flash:/image.bin
interface Ethernet0
   nameif outside
   security-level 0
   speed 100
   duplex full
   ip address 209.165.201.1 255.255.255.224 standby 209.165.201.2
   no shutdown
interface Ethernet1
   nameif inside
   security-level 100
   speed 100
   duplex full
   ip address 192.168.2.1 255.255.255.0 standby 192.168.2.2
   no shutdown
interface Ethernet3
   description STATE Failover Interface
```

```
telnet 192.168.2.45 255.255.255.255 inside
access-list acl_in permit tcp any host 209.165.201.5 eq 80
access-group acl_in in interface outside
failover
! Enables cable-based failover on the PIX security appliance
failover link state Ethernet3
failover interface ip state 192.168.253.1 255.255.255.252 standby 192.168.253.2
! The previous two lines are necessary for a stateful failover
global (outside) 1 209.165.201.3 netmask 255.255.255.224
nat (inside) 1 0.0.0.0 0.0.0.0
static (inside,outside) 209.165.201.5 192.168.2.5 netmask 255.255.255.255 0 0
route outside 0.0.0.0 0.0.0.0 209.165.201.4 1
```

Example 14: Cable-Based Active/Standby Failover (Transparent Mode)

Figure A-14 shows the network diagram for a transparent mode failover configuration using a serial Failover cable. This configuration is only available on the PIX 500 series ASA.

Figure A-14 Transparent Mode Cable-Based Failover Configuration



The following are the typical commands in a cable-based, transparent firewall failover configuration.

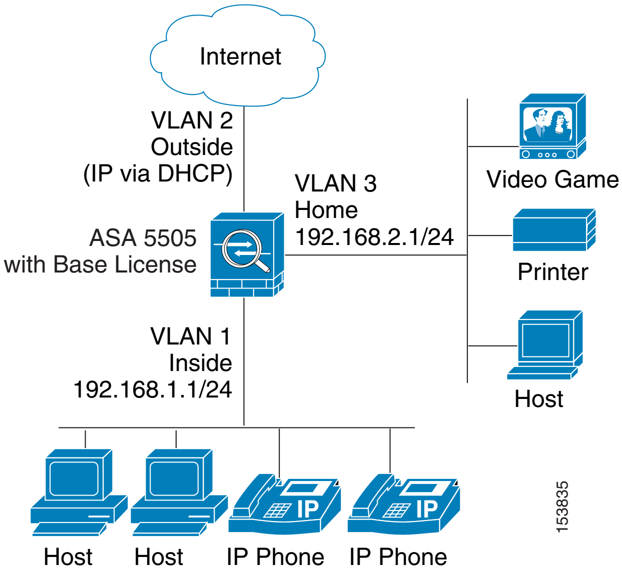
```
enable password myenablepassword
passwd mypassword
hostname pixfirewall
asdm image flash:/asdm.bin
boot system flash:/image.bin
firewall transparent
interface Ethernet0
```

```
   speed 100
   duplex full
   nameif outside
   security-level 0
   no shutdown
interface Ethernet1
   speed 100
   duplex full
   nameif inside
   security-level 100
   no shutdown
interface Ethernet3
   description STATE Failover Interface
telnet 192.168.2.45 255.255.255.255 mgmt
access-list acl_in permit tcp any host 209.165.201.5 eq 80
access-group acl_in in interface outside
ip address 209.165.201.1 255.255.255.0 standby 209.165.201.2
failover
failover link state Ethernet3
failover interface ip state 192.168.253.1 255.255.255.0 standby 192.168.253.2
route outside 0.0.0.0 0.0.0.0 209.165.201.4 1
```

Example 15: ASA 5505 Base License

This configuration creates three VLANs: inside (business), outside (Internet), and home (see Figure A-15). Both the home and inside VLANs can access the outside, but the home VLAN cannot access the inside VLAN. The inside VLAN can access the home VLAN so both VLANs can share a printer. Because the outside IP address is set using DHCP, the inside and home VLANs use interface PAT when accessing the Internet.

Figure A-15 ASA 5505 Base License



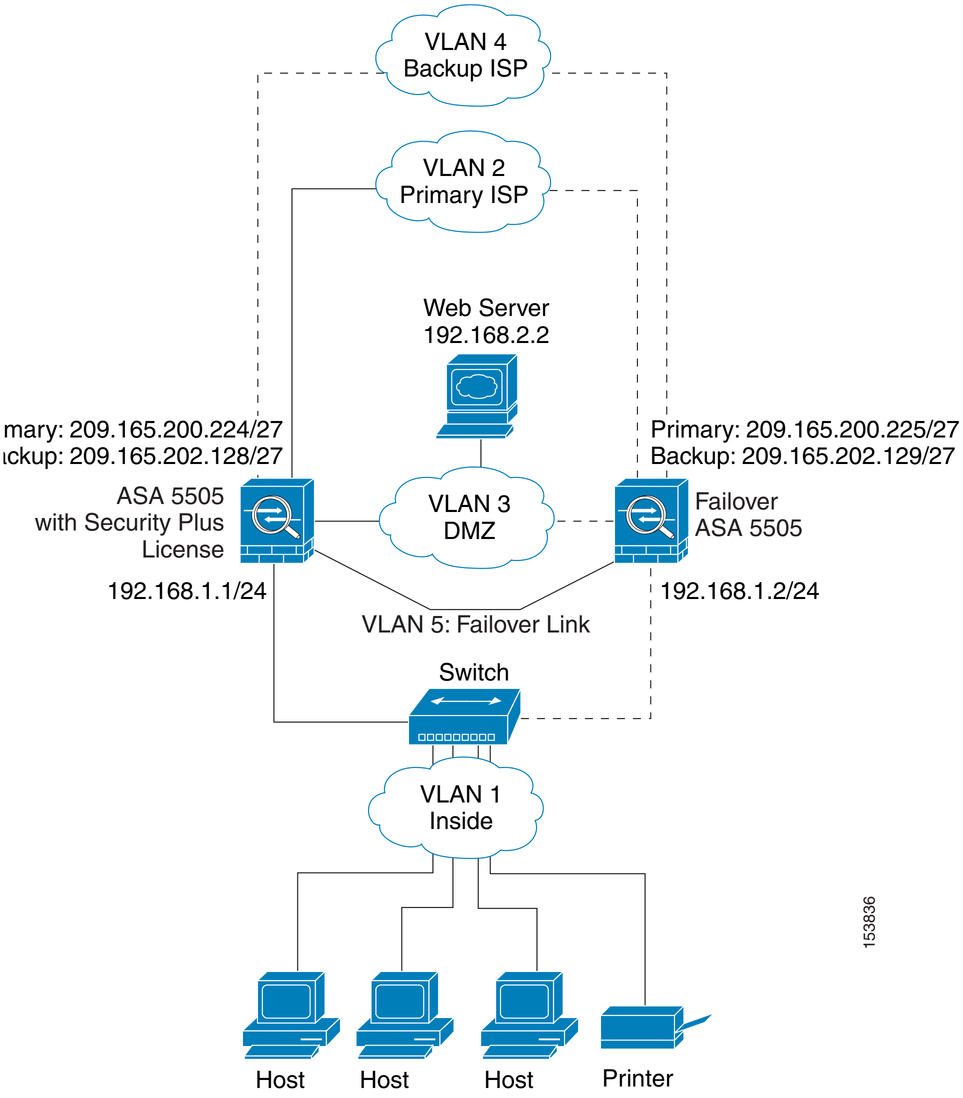
```
passwd g00fba11
enable password gen1u$
hostname Buster
```

```
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
interface vlan 2
   nameif outside
   security-level 0
   ip address dhcp setroute
   no shutdown
interface vlan 1
   nameif inside
   security-level 100
   ip address 192.168.1.1 255.255.255.0
   no shutdown
interface vlan 3
! This interface cannot communicate with the inside interface. This is required using
! the Base license
   no forward interface vlan 1
   nameif home
   security-level 50
   ip address 192.168.2.1 255.255.255.0
   no shutdown
interface ethernet 0/0
   switchport access vlan 2
   no shutdown
   interface ethernet 0/1
   switchport access vlan 1
   no shutdown
interface ethernet 0/2
   switchport access vlan 1
   no shutdown
interface ethernet 0/3
   switchport access vlan 3
   no shutdown
interface ethernet 0/4
   switchport access vlan 3
   no shutdown
interface ethernet 0/5
   switchport access vlan 3
   no shutdown
interface ethernet 0/6
   description PoE for IP phone1
   switchport access vlan 1
   no shutdown
interface ethernet 0/7
   description PoE for IP phone2
   switchport access vlan 1
   no shutdown
nat (inside) 1 0 0
nat (home) 1 0 0
global (outside) 1 interface
! The previous NAT statements match all addresses on inside and home, so you need to
! also perform NAT when hosts access the inside or home networks (as well as the outside).
! Or you can exempt hosts from NAT for inside <--> home traffic, as effected by the
! following:
access-list natexmpt-inside extended permit ip any 192.168.2.0 255.255.255.0
access-list natexmpt-home extended permit ip any 192.168.1.0 255.255.255.0
nat (inside) 0 access-list natexmpt-inside
nat (home) 0 access-list natexmpt-home
http server enable
http 192.168.1.0 255.255.255.0 inside
dhcpd address 192.168.1.2-192.168.1.254 inside
dhcpd auto_config outside
dhcpd enable inside
logging asdm informational
ssh 192.168.1.0 255.255.255.0 inside
```

Example 16: ASA 5505 Security Plus License with Failover and Dual-ISP Backup

This configuration creates five VLANs: inside, outside, dmz, backup-isp and faillink (see Figure A-16).

Figure A-16 ASA 5505 Security Plus License with Failover and Dual-ISP Backup



See the following sections for the configurations for this scenario:

- Primary Unit Configuration for Example 16, page A-38
- Secondary Unit Configuration for Example 16, page A-40

Primary Unit Configuration for Example 16

```
passwd g00fba11
enable password gen1u$
```

```
hostname Buster
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
interface vlan 2
   description Primary ISP interface
   nameif outside
   security-level 0
   ip address 209.165.200.224 standby 209.165.200.225
   backup interface vlan 4
   no shutdown
interface vlan 1
   nameif inside
   security-level 100
   ip address 192.168.1.1 255.255.255.0
   no shutdown
interface vlan 3
   nameif dmz
   security-level 50
   ip address 192.168.2.1 255.255.255.0
   no shutdown
interface vlan 4
   description Backup ISP interface
   nameif backup-isp
   security-level 0
   ip address 209.168.202.128 standby 209.168.202.129
   no shutdown
interface vlan 5
   description LAN Failover Interface
interface ethernet 0/0
   switchport access vlan 2
   no shutdown
interface ethernet 0/1
   switchport access vlan 4
   no shutdown
interface ethernet 0/2
   switchport access vlan 1
   no shutdown
interface ethernet 0/3
   switchport access vlan 3
   no shutdown
interface ethernet 0/4
   switchport access vlan 5
   no shutdown
failover
failover lan unit primary
failover lan interface faillink vlan5
failover lan faillink vlan5
failover polltime unit 3 holdtime 10
failover key key1
failover interface ip faillink 10.1.1.1 255.255.255.0 standby 10.1.1.2
nat (inside) 1 0 0
nat (home) 1 0 0
global (outside) 1 interface
! The previous NAT statements match all addresses on inside and home, so you need to
! also perform NAT when hosts access the inside or home networks (as well as the outside).
! Or you can exempt hosts from NAT for inside <--> home traffic, as effected by the
! following:
access-list natexmpt-inside extended permit ip any 192.168.2.0 255.255.255.0
access-list natexmpt-home extended permit ip any 192.168.1.0 255.255.255.0
nat (inside) 0 access-list natexmpt-inside
nat (home) 0 access-list natexmpt-home
sla monitor 123
 type echo protocol ipIcmpEcho 209.165.200.234 interface outside
 num-packets 2
 frequency 5
sla monitor schedule 123 life forever start-time now
track 1 rtr 123 reachability
route outside 0 0 209.165.200.234 1 track 1
! This route is for the primary ISP.
route backup-isp 0 0 209.165.202.154 2
! If the link goes down for the primary ISP, either due to a hardware failure
! or unplugged cable, then this route will be used.
http server enable
http 192.168.1.0 255.255.255.0 inside
dhcpd address 192.168.1.2-192.168.1.254 inside
dhcpd auto_config outside
dhcpd enable inside
logging asdm informational
ssh 192.168.1.0 255.255.255.0 inside
```

Secondary Unit Configuration for Example 16

You only need to configure the secondary ASA to recognize the failover link. The secondary ASA obtains the context configurations from the primary ASA upon booting or when failover is first enabled.

```
interface ethernet 0/4
   switchport access vlan 5
   no shutdown
failover
failover lan unit secondary
failover lan interface faillink vlan5
failover polltime unit 3 holdtime 10
failover key key1
failover interface ip faillink 10.1.1.1 255.255.255.0 standby 10.1.1.2
```

Example 17: AIP SSM in Multiple Context Mode

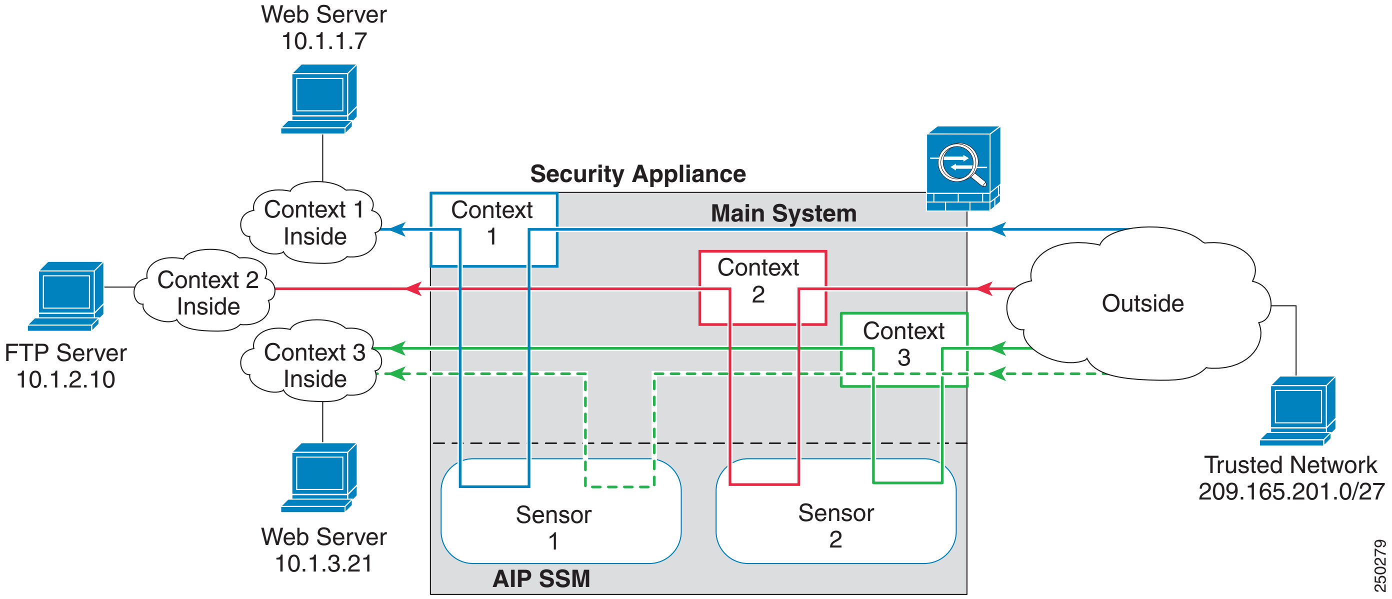
This configuration assigns two virtual IPS sensors to three contexts. Context 1 uses sensor 1, context 2 uses sensor 2 (for greater security), and context 3 uses sensor 2 for most traffic, but uses sensor 1 for a more trusted outside network (see Figure A-17).

For Context 1, only the trusted network is allowed to access a web server and manage the context using SSH.

For Context 2, any outside user can access the FTP server.

For Context 3, any outside user can access the web server, but the trusted network can access anything on the inside network.

Figure A-17 Security Contexts and Virtual Sensors



See the following sections for the configurations for this scenario:

- System Configuration for Example 17, page A-41
- Context 1 Configuration for Example 17, page A-42
- Context 2 Configuration for Example 17, page A-42
- Context 3 Configuration for Example 17, page A-43

System Configuration for Example 17

You must first enable multiple context mode using the **mode multiple** command. The mode is not stored in the configuration file, even though it endures reboots. Enter the **show mode** command to view the current mode.

```
hostname Farscape
password passw0rd
enable password chr1cht0n
mac-address auto
asdm image disk0:/asdm.bin
boot system disk0:/image.bin
admin-context context 1
interface gigabitethernet 0/0
   no shutdown
interface gigabitethernet 0/1
   no shutdown
interface gigabitethernet 0/2
   no shutdown
interface gigabitethernet 0/3
   no shutdown
context 1
   allocate-interface gigabitethernet0/0
   allocate-interface gigabitethernet0/3
   allocate-ips sensor1
   config-url ftp://user1:passw0rd@10.1.1.1/configlets/context1.cfg
context 2
```

```
   allocate-interface gigabitethernet0/1
   allocate-interface gigabitethernet0/3
   allocate-ips sensor2
   config-url ftp://user1:passw0rd@10.1.1.1/configlets/context2.cfg
context 3
   allocate-interface gigabitethernet0/2
   allocate-interface gigabitethernet0/3
   allocate-ips sensor1
   allocate-ips sensor2 default
   config-url ftp://user1:passw0rd@10.1.1.1/configlets/context3.cfg
```

Context 1 Configuration for Example 17

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
hostname context1
domain example.com
interface gigabitethernet 0/3
   nameif outside
   security-level 0
   ip address 209.165.200.225 255.255.255.224
   no shutdown
interface gigabitethernet 0/0
   nameif inside
   security-level 100
   ip address 10.1.1.1 255.255.255.0
   no shutdown
passwd seaandsand
enable password pinballwizard
route outside 0 0 209.165.200.230 1
ssh 209.165.201.0 255.255.255.224 outside
nat (inside) 1 10.1.1.0 255.255.255.0
global (outside) 1 209.165.200.252
! Trusted network can access the web server at 10.1.1.7
access-list INBOUND extended permit tcp 209.165.201.0 255.255.255.224 host 10.1.1.7 eq
http
access-group INBOUND in interface outside
! Any traffic allowed to the inside of context 1 must go through
! the IPS sensor assigned to the context.
! Traffic is in promiscuous mode (a separate stream is sent
! to the IPS sensor. If the sensor fails, traffic continues.
access-list IPS extended permit ip any any
class-map my-ips-class
   match access-list IPS
policy-map my-ips-policy
   class my-ips-class
      ips promiscous fail-open
service-policy my-ips-policy interface outside
```

Context 2 Configuration for Example 17

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
hostname context2
domain example.com
interface gigabitethernet 0/3
   nameif outside
   security-level 0
   ip address 209.165.200.226 255.255.255.224
   no shutdown
interface gigabitethernet 0/1
   nameif inside
   security-level 100
   ip address 10.1.2.1 255.255.255.0
   no shutdown
passwd drjimmy
enable password acidqueen
route outside 0 0 209.165.200.230 1
ssh 10.1.2.67 255.255.255.255 inside
nat (inside) 1 10.1.2.0 255.255.255.0
global (outside) 1 209.165.200.253
! All users can access the FTP server at 10.1.2.10
access-list FTP extended permit tcp any any eq ftp
access-group FTP in interface outside
! Any traffic allowed to the inside of context 2 must go through
! the IPS sensor assigned to the context.
! Traffic is in inline mode (traffic is sent
! to the IPS sensor before continuing to the inside.)
! If the sensor fails, traffic stops.
access-list IPS permit ip any any
class-map my-ips-class
   match access-list IPS
policy-map my-ips-policy
   class my-ips-class
      ips inline fail-close
service-policy my-ips-policy interface outside
```

Context 3 Configuration for Example 17

To change to a context configuration, enter the **changeto context** *name* command. To change back to the system, enter **changeto system**.

```
hostname context3
domain example.com
interface gigabitethernet 0/3
   nameif outside
   security-level 0
   ip address 209.165.200.227 255.255.255.224
   no shutdown
interface gigabitethernet 0/1
   nameif inside
   security-level 100
   ip address 10.1.3.1 255.255.255.0
   no shutdown
passwd lovereign
enable password underture
route outside 0 0 209.165.200.230 1
ssh 209.165.201.0 255.255.255.224 outside
nat (inside) 1 10.1.3.0 255.255.255.0
global (outside) 1 209.165.200.254
! All users can access the web server at 10.1.3.21
! The trusted network 209.165.201.0/27 can access all of the inside nw.
access-list IN_CONTEXT3 extended permit ip 209.165.201.0 255.255.255.224 any
access-list IN_CONTEXT3 extended permit tcp any host 10.1.3.21 eq http
access-group IN_CONTEXT3 in interface outside
! Traffic from 209.165.201.0/27 goes through IPS sensor 1.
! Traffic is in promiscuous mode (a separate stream is sent
! to the IPS sensor. If the sensor fails, traffic continues.
! All other traffic allowed to the inside of context 1 must go
! through sensor 2. Traffic is in inline mode (traffic is sent
! to the IPS sensor before continuing to the inside.)
! If the sensor fails, traffic stops.
access-list my-ips-acl permit ip 209.165.201.0 255.255.255.224 any
class-map my-ips-class
   match access-list my-ips-acl
access-list my-ips-acl2 permit ip any any
class-map my-ips-class2
   match access-list my-ips-acl2
policy-map my-ips-policy
   class my-ips-class
      ips promiscuous fail-open sensor sensor1
   class my-ips-class2
      ips inline fail-close sensor sensor2
service-policy my-ips-policy interface outside
```

APPENDIX B

Using the Command-Line Interface

This appendix describes how to use the CLI on the ASA, and includes the following sections:

- Firewall Mode and Security Context Mode, page B-1
- Command Modes and Prompts, page B-2
- Syntax Formatting, page B-3
- Abbreviating Commands, page B-3
- Command-Line Editing, page B-3
- Command Completion, page B-4
- Command Help, page B-4
- Filtering show Command Output, page B-4
- Command Output Paging, page B-6
- Adding Comments, page B-7
- Text Configuration Files, page B-7
- Supported Character Sets, page B-9

Note The CLI uses similar syntax and other conventions to the Cisco IOS CLI, but the ASA operating system is not a version of Cisco IOS software. Do not assume that a Cisco IOS CLI command works with or has the same function on the ASA.

Firewall Mode and Security Context Mode

The ASA runs in a combination of the following modes:

- Transparent firewall or routed firewall mode

  The firewall mode determines if the ASA runs as a Layer 2 or Layer 3 firewall.

- Multiple context or single context mode

  The security context mode determines if the ASA runs as a single device or as multiple security contexts, which act like virtual devices.

Some commands are only available in certain modes.

Command Modes and Prompts

The ASA CLI includes command modes. Some commands can only be entered in certain modes. For example, to enter commands that show sensitive information, you need to enter a password and enter a more privileged mode. Then, to ensure that configuration changes are not entered accidentally, you have to enter a configuration mode. All lower commands can be entered in higher modes, for example, you can enter a privileged EXEC command in global configuration mode.

Note The various types of prompts are all default prompts and when configured, they can be different.

- When you are in the system configuration or in single context mode, the prompt begins with the hostname:

  ```
  hostname
  ```

- When printing the prompt string, the prompt configuration is parsed and the configured keyword values are printed in the order in which you have set the **prompt** command. The keyword arguments can be any of the following and in any order: hostname, domain, context, priority, state.

  ```
  asa(config)# prompt hostname context priority state
  ```

- When you are within a context, the prompt begins with the hostname followed by the context name:

  ```
  hostname/context
  ```

The prompt changes depending on the access mode:

- User EXEC mode

  User EXEC mode lets you see minimum ASA settings. The user EXEC mode prompt appears as follows when you first access the ASA:

  ```
  hostname>
  ```

  ```
  hostname/context>
  ```

- Privileged EXEC mode

  Privileged EXEC mode lets you see all current settings up to your privilege level. Any user EXEC mode command will work in privileged EXEC mode. Enter the **enable** command in user EXEC mode, which requires a password, to start privileged EXEC mode. The prompt includes the number sign (#):

  ```
  hostname#
  ```

  ```
  hostname/context#
  ```

- Global configuration mode

  Global configuration mode lets you change the ASA configuration. All user EXEC, privileged EXEC, and global configuration commands are available in this mode. Enter the **configure terminal** command in privileged EXEC mode to start global configuration mode. The prompt changes to the following:

  ```
  hostname(config)#
  ```

  ```
  hostname/context(config)#
  ```

- Command-specific configuration modes

From global configuration mode, some commands enter a command-specific configuration mode. All user EXEC, privileged EXEC, global configuration, and command-specific configuration commands are available in this mode. For example, the **interface** command enters interface configuration mode. The prompt changes to the following:

```
hostname(config-if)#

hostname/context(config-if)#
```

Syntax Formatting

Command syntax descriptions use the following conventions:

Table B-1 Syntax Conventions

Convention	Description
bold	Bold text indicates commands and keywords that you enter literally as shown.
italics	Italic text indicates arguments for which you supply values.
[x]	Square brackets enclose an optional element (keyword or argument).
|	A vertical bar indicates a choice within an optional or required set of keywords or arguments.
[x | y]	Square brackets enclosing keywords or arguments separated by a vertical bar indicate an optional choice.
{x | y}	Braces enclosing keywords or arguments separated by a vertical bar indicate a required choice.
[x {y | z}]	Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.

Abbreviating Commands

You can abbreviate most commands down to the fewest unique characters for a command; for example, you can enter **`wr t`** to view the configuration instead of entering the full command **`write terminal`**, or you can enter **`en`** to start privileged mode and **`conf`** **t** to start configuration mode. In addition, you can enter **`0`** to represent **`0.0.0.0`**.

Command-Line Editing

The ASA uses the same command-line editing conventions as Cisco IOS software. You can view all previously entered commands with the **show history** command or individually with the up arrow or **^p** command. Once you have examined a previously entered command, you can move forward in the list with the down arrow or **^n** command. When you reach a command you wish to reuse, you can edit it or press the **Enter** key to start it. You can also delete the word to the left of the cursor with **^w**, or erase the line with **^u**.

The ASA permits up to 512 characters in a command; additional characters are ignored.

Command Completion

To complete a command or keyword after entering a partial string, press the **Tab** key. The ASA only completes the command or keyword if the partial string matches only one command or keyword. For example, if you enter **s** and press the **Tab** key, the ASA does not complete the command because it matches more than one command. However, if you enter **dis**, the **Tab** key completes the **disable** command.

Command Help

Help information is available from the command line by entering the following commands:

- **help** *command_name*

  Shows help for the specific command.

- *command_name* **?**

  Shows a list of arguments available.

- *string***?** (no space)

  Lists the possible commands that start with the string.

- **?** and **+?**

  Lists all commands available. If you enter **?**, the ASA shows only commands available for the current mode. To show all commands available, including those for lower modes, enter **+?**.

Note If you want to include a question mark (?) in a command string, you must press **Ctrl-V** before typing the question mark so that you do not inadvertently invoke CLI help.

Filtering show Command Output

You can use the vertical bar (|) with any **show** command and include a filter option and filtering expression. The filtering is performed by matching each output line with a regular expression, similar to Cisco IOS software. By selecting different filter options you can include or exclude all output that matches the expression. You can also display all output beginning with the line that matches the expression.

The syntax for using filtering options with the **show** command is as follows:

```
hostname# show command | {include | exclude | begin | grep [-v]} regexp
```

In this command string, the first vertical bar (|) is the operator and must be included in the command. This operator directs the output of the **show** command to the filter. In the syntax diagram, the other vertical bars (|) indicate alternative options and are not part of the command.

The **include** option includes all output lines that match the regular expression. The **grep** option without **-v** has the same effect. The **exclude** option excludes all output lines that match the regular expression. The **grep** option with **-v** has the same effect. The **begin** option shows all the output lines starting with the line that matches the regular expression.

Replace *regexp* with any Cisco IOS regular expression. The regular expression is not enclosed in quotes or double-quotes, so be careful with trailing white spaces, which will be taken as part of the regular expression.

When creating regular expressions, you can use any letter or number that you want to match. In addition, certain keyboard characters called *metacharacters* have special meaning when used in regular expressions.

Use **Ctrl+V** to escape all of the special characters in the CLI, such as a question mark (?) or a tab. For example, type **d[Ctrl+V]?g** to enter **d?g** in the configuration.

Table B-2 lists the metacharacters that have special meanings.

Table B-2 regex Metacharacters

Character	Description	Notes
.	Dot	Matches any single character. For example, **d.g** matches dog, dag, dtg, and any word that includes those characters, such as doggonnit.
(*exp***)**	Subexpression	A subexpression segregates characters from surrounding characters, so that you can use other metacharacters on the subexpression. For example, **d(o|a)g** matches dog and dag, but **do|ag** matches do and ag. A subexpression can also be used with repeat quantifiers to differentiate the characters meant for repetition. For example, **ab(xy){3}z** matches abxyxyxyz.
|	Alternation	Matches either expression it separates. For example, **dog|cat** matches dog or cat.
?	Question mark	A quantifier that indicates that there are 0 or 1 of the previous expression. For example, **lo?se** matches lse or lose. **Note** You must enter **Ctrl+V** and then the question mark or else the help function is invoked.
*	Asterisk	A quantifier that indicates that there are 0, 1 or any number of the previous expression. For example, **lo*se** matches lse, lose, loose, and so on.
+	Plus	A quantifier that indicates that there is at least 1 of the previous expression. For example, **lo+se** matches lose and loose, but not lse.
{*x*} or {*x*,}	Minimum repeat quantifier	Repeat at least *x* times. For example, **ab(xy){2,}z** matches abxyxyz, abxyxyxyz, and so on.
[*abc***]**	Character class	Matches any character in the brackets. For example, **[abc]** matches a, b, or c.
[^*abc***]**	Negated character class	Matches a single character that is not included within the brackets. For example, **[^abc]** matches any character other than a, b, or c. **[^A-Z]** matches any single character that is not an uppercase letter.

Table B-2 regex Metacharacters (continued)

Character	Description	Notes
[*a*-*c*]	Character range class	Matches any character in the range. **[a-z]** matches any lowercase letter. You can mix characters and ranges: **[abcq-z]** matches a, b, c, q, r, s, t, u, v, w, x, y, z, and so does [**a-cq-z**]. The dash (-) character is literal only if it is the last or the first character within the brackets: **[abc-]** or **[-abc]**.
“”	Quotation marks	Preserves trailing or leading spaces in the string. For example, “ **test**” preserves the leading space when it looks for a match.
^	Caret	Specifies the beginning of a line.
\	Escape character	When used with a metacharacter, matches a literal character. For example, **\[** matches the left square bracket.
char	Character	When character is not a metacharacter, matches the literal character.
\r	Carriage return	Matches a carriage return 0x0d.
\n	Newline	Matches a new line 0x0a.
\t	Tab	Matches a tab 0x09.
\f	Formfeed	Matches a form feed 0x0c.
\x*NN*	Escaped hexadecimal number	Matches an ASCII character using hexadecimal (exactly two digits).
\NNN	Escaped octal number	Matches an ASCII character as octal (exactly three digits). For example, the character 040 represents a space.

Command Output Paging

For commands such as **help** or**?**, **show**, **show xlate**, or other commands that provide long listings, you can determine if the information displays a screen and pauses, or lets the command run to completion. The **pager** command lets you choose the number of lines to display before the More prompt appears.

When paging is enabled, the following prompt appears:

```
<--- More --->
```

The More prompt uses syntax similar to the UNIX **more** command:

- To view another screen, press the **Space** bar.
- To view the next line, press the **Enter** key.
- To return to the command line, press the **q** key.

Adding Comments

You can precede a line with a colon (:) to create a comment. However, the comment only appears in the command history buffer and not in the configuration. Therefore, you can view the comment with the **show history** command or by pressing an arrow key to retrieve a previous command, but because the comment is not in the configuration, the **write terminal** command does not display it.

Text Configuration Files

This section describes how to format a text configuration file that you can download to the ASA, and includes the following topics:

- How Commands Correspond with Lines in the Text File, page B-7
- Command-Specific Configuration Mode Commands, page B-7
- Automatic Text Entries, page B-8
- Line Order, page B-8
- Commands Not Included in the Text Configuration, page B-8
- Passwords, page B-8
- Multiple Security Context Files, page B-8

How Commands Correspond with Lines in the Text File

The text configuration file includes lines that correspond with the commands described in this guide.

In examples, commands are preceded by a CLI prompt. The prompt in the following example is “hostname(config)#”:

```
hostname(config)# context a
```

In the text configuration file you are not prompted to enter commands, so the prompt is omitted:

```
context a
```

Command-Specific Configuration Mode Commands

Command-specific configuration mode commands appear indented under the main command when entered at the command line. Your text file lines do not need to be indented, as long as the commands appear directly following the main command. For example, the following unindented text is read the same as indented text:

```
interface gigabitethernet0/0
nameif inside
interface gigabitethernet0/1
    nameif outside
```

Automatic Text Entries

When you download a configuration to the ASA, the ASA inserts some lines automatically. For example, the ASA inserts lines for default settings or for the time the configuration was modified. You do not need to enter these automatic entries when you create your text file.

Line Order

For the most part, commands can be in any order in the file. However, some lines, such as ACEs, are processed in the order they appear, and the order can affect the function of the access list. Other commands might also have order requirements. For example, you must enter the **nameif** command for an interface first because many subsequent commands use the name of the interface. Also, commands in a command-specific configuration mode must directly follow the main command.

Commands Not Included in the Text Configuration

Some commands do not insert lines in the configuration. For example, a runtime command such as **show running-config** does not have a corresponding line in the text file.

Passwords

The login, enable, and user passwords are automatically encrypted before they are stored in the configuration. For example, the encrypted form of the password "cisco" might look like jMorNbK0514fadBh. You can copy the configuration passwords to another ASA in their encrypted form, but you cannot unencrypt the passwords yourself.

If you enter an unencrypted password in a text file, the ASA does not automatically encrypt them when you copy the configuration to the ASA. The ASA only encrypts them when you save the running configuration from the command line using the **copy running-config startup-config** or **write memory** command.

Multiple Security Context Files

For multiple security contexts, the entire configuration consists of multiple parts:

- The security context configurations
- The system configuration, which identifies basic settings for the ASA, including a list of contexts
- The admin context, which provides network interfaces for the system configuration

  The system configuration does not include any interfaces or network settings for itself. Rather, when the system needs to access network resources (such as downloading the contexts from the server), it uses a context that is designated as the admin context.

Each context is similar to a single context mode configuration. The system configuration differs from a context configuration in that the system configuration includes system-only commands (such as a list of all contexts) while other typical commands are not present (such as many interface parameters).

Supported Character Sets

The ASA CLI currently supports UTF-8 encoding only. UTF-8 is the particular encoding scheme for Unicode symbols, and has been designed to be compatible with an ASCII subset of symbols. ASCII characters are represented in UTF-8 as one-byte characters. All other characters are represented in UTF-8 as multi-byte symbols.

The ASCII printable characters (0x20 to 0x7e) are fully supported. The printable ASCII characters are the same as ISO 8859-1. UTF-8 is a superset of ISO 8859-1, so the first 256 characters (0-255) are the same as ISO 8859-1. The ASA CLI supports up to 255 characters (multi-byte characters) of ISO 8859-1.

APPENDIX C

Addresses, Protocols, and Ports

This appendix provides a quick reference for IP addresses, protocols, and applications. This appendix includes the following sections:

- IPv4 Addresses and Subnet Masks, page C-1
- IPv6 Addresses, page C-5
- Protocols and Applications, page C-11
- TCP and UDP Ports, page C-11
- Local Ports and Protocols, page C-14
- ICMP Types, page C-15

IPv4 Addresses and Subnet Masks

This section describes how to use IPv4 addresses in the ASA. An IPv4 address is a 32-bit number written in dotted-decimal notation: four 8-bit fields (octets) converted from binary to decimal numbers, separated by dots. The first part of an IP address identifies the network on which the host resides, while the second part identifies the particular host on the given network. The network number field is called the network prefix. All hosts on a given network share the same network prefix but must have a unique host number. In classful IP, the class of the address determines the boundary between the network prefix and the host number.

This section includes the following topics:

- Classes, page C-1
- Private Networks, page C-2
- Subnet Masks, page C-2

Classes

IP host addresses are divided into three different address classes: Class A, Class B, and Class C. Each class fixes the boundary between the network prefix and the host number at a different point within the 32-bit address. Class D addresses are reserved for multicast IP.

- Class A addresses (1.xxx.xxx.xxx through 126.xxx.xxx.xxx) use only the first octet as the network prefix.

- Class B addresses (128.0.xxx.xxx through 191.255.xxx.xxx) use the first two octets as the network prefix.
- Class C addresses (192.0.0.xxx through 223.255.255.xxx) use the first three octets as the network prefix.

Because Class A addresses have 16,777,214 host addresses, and Class B addresses 65,534 hosts, you can use subnet masking to break these huge networks into smaller subnets.

Private Networks

If you need large numbers of addresses on your network, and they do not need to be routed on the Internet, you can use private IP addresses that the Internet Assigned Numbers Authority (IANA) recommends (see RFC 1918). The following address ranges are designated as private networks that should not be advertised:

- 10.0.0.0 through 10.255.255.255
- 172.16.0.0 through 172.31.255.255
- 192.168.0.0 through 192.168.255.255

Subnet Masks

A subnet mask lets you convert a single Class A, B, or C network into multiple networks. With a subnet mask, you can create an extended network prefix that adds bits from the host number to the network prefix. For example, a Class C network prefix always consists of the first three octets of the IP address. But a Class C extended network prefix uses part of the fourth octet as well.

Subnet masking is easy to understand if you use binary notation instead of dotted decimal. The bits in the subnet mask have a one-to-one correspondence with the Internet address:

- The bits are set to 1 if the corresponding bit in the IP address is part of the extended network prefix.
- The bits are set to 0 if the bit is part of the host number.

Example 1: If you have the Class B address 129.10.0.0 and you want to use the entire third octet as part of the extended network prefix instead of the host number, you must specify a subnet mask of 11111111.11111111.11111111.00000000. This subnet mask converts the Class B address into the equivalent of a Class C address, where the host number consists of the last octet only.

Example 2: If you want to use only part of the third octet for the extended network prefix, then you must specify a subnet mask like 11111111.11111111.11111000.00000000, which uses only 5 bits of the third octet for the extended network prefix.

You can write a subnet mask as a dotted-decimal mask or as a */bits* ("slash *bits*") mask. In Example 1, for a dotted-decimal mask, you convert each binary octet into a decimal number: 255.255.255.0. For a */bits* mask, you add the number of 1s: /24. In Example 2, the decimal number is 255.255.248.0 and the /bits is /21.

You can also supernet multiple Class C networks into a larger network by using part of the third octet for the extended network prefix. For example, 192.168.0.0/20.

This section includes the following topics:

- Determining the Subnet Mask, page C-3
- Determining the Address to Use with the Subnet Mask, page C-3

Determining the Subnet Mask

To determine the subnet mask based on how many hosts you want, see Table C-1.

Table C-1 Hosts, Bits, and Dotted-Decimal Masks

Hosts[1]	/Bits Mask	Dotted-Decimal Mask
16,777,216	/8	255.0.0.0 Class A Network
65,536	/16	255.255.0.0 Class B Network
32,768	/17	255.255.128.0
16,384	/18	255.255.192.0
8192	/19	255.255.224.0
4096	/20	255.255.240.0
2048	/21	255.255.248.0
1024	/22	255.255.252.0
512	/23	255.255.254.0
256	/24	255.255.255.0 Class C Network
128	/25	255.255.255.128
64	/26	255.255.255.192
32	/27	255.255.255.224
16	/28	255.255.255.240
8	/29	255.255.255.248
4	/30	255.255.255.252
Do not use	/31	255.255.255.254
1	/32	255.255.255.255 Single Host Address

[1] The first and last number of a subnet are reserved, except for /32, which identifies a single host.

Determining the Address to Use with the Subnet Mask

The following sections describe how to determine the network address to use with a subnet mask for a Class C-size and a Class B-size network. This section includes the following topics:

- Class C-Size Network Address, page C-3
- Class B-Size Network Address, page C-4

Class C-Size Network Address

For a network between 2 and 254 hosts, the fourth octet falls on a multiple of the number of host addresses, starting with 0. For example, the 8-host subnets (/29) of 192.168.0.x are as follows:

Subnet with Mask /29 (255.255.255.248)	Address Range[1]
192.168.0.0	192.168.0.0 to 192.168.0.7
192.168.0.8	192.168.0.8 to 192.168.0.15

Subnet with Mask /29 (255.255.255.248)	Address Range[1]
192.168.0.16	192.168.0.16 to 192.168.0.31
…	…
192.168.0.248	192.168.0.248 to 192.168.0.255

[1] The first and last address of a subnet are reserved. In the first subnet example, you cannot use 192.168.0.0 or 192.168.0.7.

Class B-Size Network Address

To determine the network address to use with the subnet mask for a network with between 254 and 65,534 hosts, you need to determine the value of the third octet for each possible extended network prefix. For example, you might want to subnet an address like 10.1.*x*.0, where the first two octets are fixed because they are used in the extended network prefix, and the fourth octet is 0 because all bits are used for the host number.

To determine the value of the third octet, follow these steps:

Step 1 Calculate how many subnets you can make from the network by dividing 65,536 (the total number of addresses using the third and fourth octet) by the number of host addresses you want.

For example, 65,536 divided by 4096 hosts equals 16.

Therefore, there are 16 subnets of 4096 addresses each in a Class B-size network.

Step 2 Determine the multiple of the third octet value by dividing 256 (the number of values for the third octet) by the number of subnets:

In this example, 256/16 = 16.

The third octet falls on a multiple of 16, starting with 0.

Therefore, the 16 subnets of the network 10.1 are as follows:

Subnet with Mask /20 (255.255.240.0)	Address Range[1]
10.1.0.0	10.1.0.0 to 10.1.15.255
10.1.16.0	10.1.16.0 to 10.1.31.255
10.1.32.0	10.1.32.0 to 10.1.47.255
…	…
10.1.240.0	10.1.240.0 to 10.1.255.255

[1] The first and last address of a subnet are reserved. In the first subnet example, you cannot use 10.1.0.0 or 10.1.15.255.

IPv6 Addresses

IPv6 is the next generation of the Internet Protocol after IPv4. It provides an expanded address space, a simplified header format, improved support for extensions and options, flow labeling capability, and authentication and privacy capabilities. IPv6 is described in RFC 2460. The IPv6 addressing architecture is described in RFC 3513.

This section describes the IPv6 address format and architecture and includes the following topics:

- IPv6 Address Format, page C-5
- IPv6 Address Types, page C-6
- IPv6 Address Prefixes, page C-10

Note This section describes the IPv6 address format, the types, and prefixes. For information about configuring the ASA to use IPv6, see the "Configuring IPv6 Addressing" section on page 6-27

IPv6 Address Format

IPv6 addresses are represented as a series of eight 16-bit hexadecimal fields separated by colons (:) in the format: x:x:x:x:x:x:x:x. The following are two examples of IPv6 addresses:

- 2001:0DB8:7654:3210:FEDC:BA98:7654:3210
- 2001:0DB8:0000:0000:0008:0800:200C:417A

Note The hexadecimal letters in IPv6 addresses are not case-sensitive.

It is not necessary to include the leading zeros in an individual field of the address. But each field must contain at least one digit. So the example address 2001:0DB8:0000:0000:0008:0800:200C:417A can be shortened to 2001:0DB8:0:0:8:800:200C:417A by removing the leading zeros from the third through sixth fields from the left. The fields that contained all zeros (the third and fourth fields from the left) were shortened to a single zero. The fifth field from the left had the three leading zeros removed, leaving a single 8 in that field, and the sixth field from the left had the one leading zero removed, leaving 800 in that field.

It is common for IPv6 addresses to contain several consecutive hexadecimal fields of zeros. You can use two colons (::) to compress consecutive fields of zeros at the beginning, middle, or end of an IPv6 address (the colons represent the successive hexadecimal fields of zeros). Table C-2 shows several examples of address compression for different types of IPv6 address.

Table C-2 IPv6 Address Compression Examples

Address Type	Standard Form	Compressed Form
Unicast	2001:0DB8:0:0:0:BA98:0:3210	2001:0DB8::BA98:0:3210
Multicast	FF01:0:0:0:0:0:0:101	FF01::101
Loopback	0:0:0:0:0:0:0:1	::1
Unspecified	0:0:0:0:0:0:0:0	::

Note Two colons (::) can be used only once in an IPv6 address to represent successive fields of zeros.

An alternative form of the IPv6 format is often used when dealing with an environment that contains both IPv4 and IPv6 addresses. This alternative has the format x:x:x:x:x:x:y.y.y.y, where x represent the hexadecimal values for the six high-order parts of the IPv6 address and y represent decimal values for the 32-bit IPv4 part of the address (which takes the place of the remaining two 16-bit parts of the IPv6 address). For example, the IPv4 address 192.168.1.1 could be represented as the IPv6 address 0:0:0:0:0:0:FFFF:192.168.1.1, or ::FFFF:192.168.1.1.

IPv6 Address Types

The following are the three main types of IPv6 addresses:

- **Unicast**—A unicast address is an identifier for a single interface. A packet sent to a unicast address is delivered to the interface identified by that address. An interface may have more than one unicast address assigned to it.
- **Multicast**—A multicast address is an identifier for a set of interfaces. A packet sent to a multicast address is delivered to all addresses identified by that address.
- **Anycast**—An anycast address is an identifier for a set of interfaces. Unlike a multicast address, a packet sent to an anycast address is only delivered to the "nearest" interface, as determined by the measure of distances for the routing protocol.

Note There are no broadcast addresses in IPv6. Multicast addresses provide the broadcast functionality.

This section includes the following topics:

- Unicast Addresses, page C-6
- Multicast Address, page C-8
- Anycast Address, page C-9
- Required Addresses, page C-10

Unicast Addresses

This section describes IPv6 unicast addresses. Unicast addresses identify an interface on a network node.

This section includes the following topics:

- Global Address, page C-7
- Site-Local Address, page C-7
- Link-Local Address, page C-7
- IPv4-Compatible IPv6 Addresses, page C-7
- Unspecified Address, page C-8
- Loopback Address, page C-8
- Interface Identifiers, page C-8

Global Address

The general format of an IPv6 global unicast address is a global routing prefix followed by a subnet ID followed by an interface ID. The global routing prefix can be any prefix not reserved by another IPv6 address type (see IPv6 Address Prefixes, page C-10, for information about the IPv6 address type prefixes).

All global unicast addresses, other than those that start with binary 000, have a 64-bit interface ID in the Modified EUI-64 format. See Interface Identifiers, page C-8, for more information about the Modified EUI-64 format for interface identifiers.

Global unicast address that start with the binary 000 do not have any constraints on the size or structure of the interface ID portion of the address. One example of this type of address is an IPv6 address with an embedded IPv4 address (see IPv4-Compatible IPv6 Addresses, page C-7).

Site-Local Address

Site-local addresses are used for addressing within a site. They can be use to address an entire site without using a globally unique prefix. Site-local addresses have the prefix FEC0::/10, followed by a 54-bit subnet ID, and end with a 64-bit interface ID in the modified EUI-64 format.

Site-local Routers do not forward any packets that have a site-local address for a source or destination outside of the site. Therefore, site-local addresses can be considered private addresses.

Link-Local Address

All interfaces are required to have at least one link-local address. You can configure multiple IPv6 addresses per interfaces, but only one link-local address.

A link-local address is an IPv6 unicast address that can be automatically configured on any interface using the link-local prefix FE80::/10 and the interface identifier in modified EUI-64 format. Link-local addresses are used in the neighbor discovery protocol and the stateless autoconfiguration process. Nodes with a link-local address can communicate; they do not need a site-local or globally unique address to communicate.

Routers do not forward any packets that have a link-local address for a source or destination. Therefore, link-local addresses can be considered private addresses.

IPv4-Compatible IPv6 Addresses

There are two types of IPv6 addresses that can contain IPv4 addresses.

The first type is the “IPv4-compatibly IPv6 address.” The IPv6 transition mechanisms include a technique for hosts and routers to dynamically tunnel IPv6 packets over IPv4 routing infrastructure. IPv6 nodes that use this technique are assigned special IPv6 unicast addresses that carry a global IPv4 address in the low-order 32 bits. This type of address is termed an “IPv4-compatible IPv6 address” and has the format ::y.y.y.y, where y.y.y.y is an IPv4 unicast address.

Note The IPv4 address used in the “IPv4-compatible IPv6 address” must be a globally-unique IPv4 unicast address.

The second type of IPv6 address which holds an embedded IPv4 address is called the “IPv4-mapped IPv6 address.” This address type is used to represent the addresses of IPv4 nodes as IPv6 addresses. This type of address has the format ::FFFF:y.y.y.y, where y.y.y.y is an IPv4 unicast address.

Unspecified Address

The unspecified address, 0:0:0:0:0:0:0:0, indicates the absence of an IPv6 address. For example, a newly initialized node on an IPv6 network may use the unspecified address as the source address in its packets until it receives its IPv6 address.

Note The IPv6 unspecified address cannot be assigned to an interface. The unspecified IPv6 addresses must not be used as destination addresses in IPv6 packets or the IPv6 routing header.

Loopback Address

The loopback address, 0:0:0:0:0:0:0:1, may be used by a node to send an IPv6 packet to itself. The loopback address in IPv6 functions the same as the loopback address in IPv4 (127.0.0.1).

Note The IPv6 loopback address cannot be assigned to a physical interface. A packet that has the IPv6 loopback address as its source or destination address must remain within the node that created the packet. IPv6 routers do not forward packets that have the IPv6 loopback address as their source or destination address.

Interface Identifiers

Interface identifiers in IPv6 unicast addresses are used to identify the interfaces on a link. They need to be unique within a subnet prefix. In many cases, the interface identifier is derived from the interface link-layer address. The same interface identifier may be used on multiple interfaces of a single node, as long as those interfaces are attached to different subnets.

For all unicast addresses, except those that start with the binary 000, the interface identifier is required to be 64 bits long and to be constructed in the Modified EUI-64 format. The Modified EUI-64 format is created from the 48-bit MAC address by inverting the universal/local bit in the address and by inserting the hexadecimal number FFFE between the upper three bytes and lower three bytes of the of the MAC address.

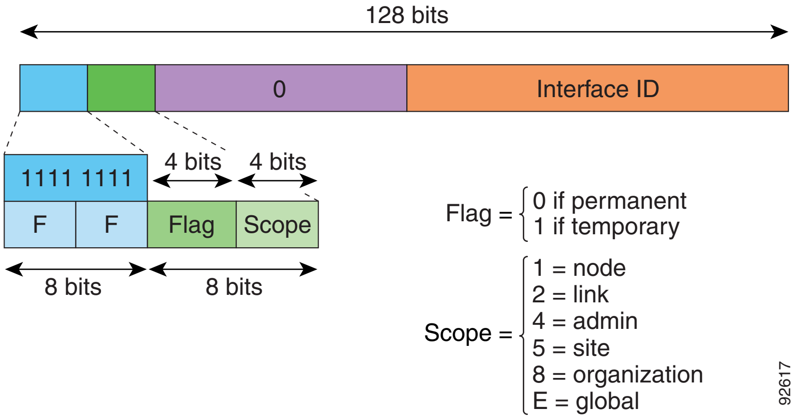
For example, and interface with the MAC address of 00E0.b601.3B7A would have a 64-bit interface ID of 02E0:B6FF:FE01:3B7A.

Multicast Address

An IPv6 multicast address is an identifier for a group of interfaces, typically on different nodes. A packet sent to a multicast address is delivered to all interfaces identified by the multicast address. An interface may belong to any number of multicast groups.

An IPv6 multicast address has a prefix of FF00::/8 (1111 1111). The octet following the prefix defines the type and scope of the multicast address. A permanently assigned (“well known”) multicast address has a flag parameter equal to 0; a temporary (“transient”) multicast address has a flag parameter equal to 1. A multicast address that has the scope of a node, link, site, or organization, or a global scope has a scope parameter of 1, 2, 5, 8, or E, respectively. For example, a multicast address with the prefix FF02::/16 is a permanent multicast address with a link scope. Figure C-1 shows the format of the IPv6 multicast address.

Figure C-1 IPv6 Multicast Address Format



IPv6 nodes (hosts and routers) are required to join the following multicast groups:

- The All Nodes multicast addresses:
  - FF01:: (interface-local)
  - FF02:: (link-local)
- The Solicited-Node Address for each IPv6 unicast and anycast address on the node: FF02:0:0:0:0:1:FFXX:XXXX/104, where XX:XXXX is the low-order 24-bits of the unicast or anycast address.

Note Solicited-Node addresses are used in Neighbor Solicitation messages.

IPv6 routers are required to join the following multicast groups:

- FF01::2 (interface-local)
- FF02::2 (link-local)
- FF05::2 (site-local)

Multicast address should not be used as source addresses in IPv6 packets.

Note There are no broadcast addresses in IPv6. IPv6 multicast addresses are used instead of broadcast addresses.

Anycast Address

The IPv6 anycast address is a unicast address that is assigned to more than one interface (typically belonging to different nodes). A packet that is routed to an anycast address is routed to the nearest interface having that address, the nearness being determined by the routing protocol in effect.

Anycast addresses are allocated from the unicast address space. An anycast address is simply a unicast address that has been assigned to more than one interface, and the interfaces must be configured to recognize the address as an anycast address.

The following restrictions apply to anycast addresses:

- An anycast address cannot be used as the source address for an IPv6 packet.

- An anycast address cannot be assigned to an IPv6 host; it can only be assigned to an IPv6 router.

Note Anycast addresses are not supported on the ASA.

Required Addresses

IPv6 hosts must, at a minimum, be configured with the following addresses (either automatically or manually):

- A link-local address for each interface.
- The loopback address.
- The All-Nodes multicast addresses
- A Solicited-Node multicast address for each unicast or anycast address.

IPv6 routers must, at a minimum, be configured with the following addresses (either automatically or manually):

- The required host addresses.
- The Subnet-Router anycast addresses for all interfaces for which it is configured to act as a router.
- The All-Routers multicast addresses.

IPv6 Address Prefixes

An IPv6 address prefix, in the format ipv6-prefix/prefix-length, can be used to represent bit-wise contiguous blocks of the entire address space. The IPv6-prefix must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons. The prefix length is a decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). For example, 2001:0DB8:8086:6502::/32 is a valid IPv6 prefix.

The IPv6 prefix identifies the type of IPv6 address. Table C-3 shows the prefixes for each IPv6 address type.

Table C-3 IPv6 Address Type Prefixes

Address Type	Binary Prefix	IPv6 Notation
Unspecified	000...0 (128 bits)	::/128
Loopback	000...1 (128 bits)	::1/128
Multicast	11111111	FF00::/8
Link-Local (unicast)	1111111010	FE80::/10
Site-Local (unicast)	1111111111	FEC0::/10
Global (unicast)	All other addresses.	
Anycast	Taken from the unicast address space.	

Protocols and Applications

Table C-4 lists the protocol literal values and port numbers; either can be entered in ASA commands.

Table C-4 Protocol Literal Values

Literal	Value	Description
ah	51	Authentication Header for IPv6, RFC 1826.
eigrp	88	Enhanced Interior Gateway Routing Protocol.
esp	50	Encapsulated Security Payload for IPv6, RFC 1827.
gre	47	Generic Routing Encapsulation.
icmp	1	Internet Control Message Protocol, RFC 792.
icmp6	58	Internet Control Message Protocol for IPv6, RFC 2463.
igmp	2	Internet Group Management Protocol, RFC 1112.
igrp	9	Interior Gateway Routing Protocol.
ip	0	Internet Protocol.
ipinip	4	IP-in-IP encapsulation.
ipsec	50	IP Security. Entering the ipsec protocol literal is equivalent to entering the esp protocol literal.
nos	94	Network Operating System (Novell's NetWare).
ospf	89	Open Shortest Path First routing protocol, RFC 1247.
pcp	108	Payload Compression Protocol.
pim	103	Protocol Independent Multicast.
pptp	47	Point-to-Point Tunneling Protocol. Entering the pptp protocol literal is equivalent to entering the gre protocol literal.
snp	109	Sitara Networks Protocol.
tcp	6	Transmission Control Protocol, RFC 793.
udp	17	User Datagram Protocol, RFC 768.

Protocol numbers can be viewed online at the IANA website:

http://www.iana.org/assignments/protocol-numbers

TCP and UDP Ports

Table C-5 lists the literal values and port numbers; either can be entered in ASA commands. See the following caveats:

- The ASA uses port 1521 for SQL*Net. This is the default port used by Oracle for SQL*Net. This value, however, does not agree with IANA port assignments.
- The ASA listens for RADIUS on ports 1645 and 1646. If your RADIUS server uses the standard ports 1812 and 1813, you can configure the ASA to listen to those ports using the **authentication-port** and **accounting-port** commands.

- To assign a port for DNS access, use the **domain** literal value, not **dns**. If you use **dns**, the ASA assumes you meant to use the **dnsix** literal value.

Port numbers can be viewed online at the IANA website:

http://www.iana.org/assignments/port-numbers

Table C-5 Port Literal Values

Literal	TCP or UDP?	Value	Description
aol	TCP	5190	America Online
bgp	TCP	179	Border Gateway Protocol, RFC 1163
biff	UDP	512	Used by mail system to notify users that new mail is received
bootpc	UDP	68	Bootstrap Protocol Client
bootps	UDP	67	Bootstrap Protocol Server
chargen	TCP	19	Character Generator
citrix-ica	TCP	1494	Citrix Independent Computing Architecture (ICA) protocol
cmd	TCP	514	Similar to **exec** except that **cmd** has automatic authentication
ctiqbe	TCP	2748	Computer Telephony Interface Quick Buffer Encoding
daytime	TCP	13	Day time, RFC 867
discard	TCP, UDP	9	Discard
domain	TCP, UDP	53	DNS
dnsix	UDP	195	DNSIX Session Management Module Audit Redirector
echo	TCP, UDP	7	Echo
exec	TCP	512	Remote process execution
finger	TCP	79	Finger
ftp	TCP	21	File Transfer Protocol (control port)
ftp-data	TCP	20	File Transfer Protocol (data port)
gopher	TCP	70	Gopher
https	TCP	443	HTTP over SSL
h323	TCP	1720	H.323 call signalling
hostname	TCP	101	NIC Host Name Server
ident	TCP	113	Ident authentication service
imap4	TCP	143	Internet Message Access Protocol, version 4
irc	TCP	194	Internet Relay Chat protocol
isakmp	UDP	500	Internet Security Association and Key Management Protocol
kerberos	TCP, UDP	750	Kerberos

Table C-5 Port Literal Values (continued)

Literal	TCP or UDP?	Value	Description
klogin	TCP	543	KLOGIN
kshell	TCP	544	Korn Shell
ldap	TCP	389	Lightweight Directory Access Protocol
ldaps	TCP	636	Lightweight Directory Access Protocol (SSL)
lpd	TCP	515	Line Printer Daemon - printer spooler
login	TCP	513	Remote login
lotusnotes	TCP	1352	IBM Lotus Notes
mobile-ip	UDP	434	MobileIP-Agent
nameserver	UDP	42	Host Name Server
netbios-ns	UDP	137	NetBIOS Name Service
netbios-dgm	UDP	138	NetBIOS Datagram Service
netbios-ssn	TCP	139	NetBIOS Session Service
nntp	TCP	119	Network News Transfer Protocol
ntp	UDP	123	Network Time Protocol
pcanywhere-status	UDP	5632	pcAnywhere status
pcanywhere-data	TCP	5631	pcAnywhere data
pim-auto-rp	TCP, UDP	496	Protocol Independent Multicast, reverse path flooding, dense mode
pop2	TCP	109	Post Office Protocol - Version 2
pop3	TCP	110	Post Office Protocol - Version 3
pptp	TCP	1723	Point-to-Point Tunneling Protocol
radius	UDP	1645	Remote Authentication Dial-In User Service
radius-acct	UDP	1646	Remote Authentication Dial-In User Service (accounting)
rip	UDP	520	Routing Information Protocol
secureid-udp	UDP	5510	SecureID over UDP
smtp	TCP	25	Simple Mail Transport Protocol
snmp	UDP	161	Simple Network Management Protocol
snmptrap	UDP	162	Simple Network Management Protocol - Trap
sqlnet	TCP	1521	Structured Query Language Network
ssh	TCP	22	Secure Shell
sunrpc (rpc)	TCP, UDP	111	Sun Remote Procedure Call
syslog	UDP	514	System Log
tacacs	TCP, UDP	49	Terminal Access Controller Access Control System Plus
talk	TCP, UDP	517	Talk
telnet	TCP	23	RFC 854 Telnet

Table C-5 Port Literal Values (continued)

Literal	TCP or UDP?	Value	Description
tftp	UDP	69	Trivial File Transfer Protocol
time	UDP	37	Time
uucp	TCP	540	UNIX-to-UNIX Copy Program
who	UDP	513	Who
whois	TCP	43	Who Is
www	TCP	80	World Wide Web
xdmcp	UDP	177	X Display Manager Control Protocol

Local Ports and Protocols

Table C-6 lists the protocols, TCP ports, and UDP ports that the ASA may open to process traffic destined to the ASA. Unless you enable the features and services listed in Table C-6, the ASA does *not* open any local protocols or any TCP or UDP ports. You must configure a feature or service for the ASA to open the default listening protocol or port. In many cases you can configure ports other than the default port when you enable a feature or service.

Table C-6 Protocols and Ports Opened by Features and Services

Feature or Service	Protocol	Port Number	Comments
DHCP	UDP	67,68	—
Failover Control	108	N/A	—
HTTP	TCP	80	—
HTTPS	TCP	443	—
ICMP	1	N/A	—
IGMP	2	N/A	Protocol only open on destination IP address 224.0.0.1
ISAKMP/IKE	UDP	500	Configurable.
IPSec (ESP)	50	N/A	—
IPSec over UDP (NAT-T)	UDP	4500	—
IPSec over UDP (Cisco VPN 3000 Series compatible)	UDP	10000	Configurable.
IPSec over TCP (CTCP)	TCP	—	No default port is used. You must specify the port number when configuring IPSec over TCP.
NTP	UDP	123	—
OSPF	89	N/A	Protocol only open on destination IP address 224.0.0.5 and 224.0.0.6

Table C-6 Protocols and Ports Opened by Features and Services (continued)

Feature or Service	Protocol	Port Number	Comments
PIM	103	N/A	Protocol only open on destination IP address 224.0.0.13
RIP	UDP	520	—
RIPv2	UDP	520	Port only open on destination IP address 224.0.0.9
SNMP	UDP	161	Configurable.
SSH	TCP	22	—
Stateful Update	105	N/A	—
Telnet	TCP	23	—
VPN Load Balancing	UDP	9023	Configurable.
VPN Individual User Authentication Proxy	UDP	1645, 1646	Port accessible only over VPN tunnel.

ICMP Types

Table C-7 lists the ICMP type numbers and names that you can enter in ASA commands:

Table C-7 ICMP Types

ICMP Number	ICMP Name
0	echo-reply
3	unreachable
4	source-quench
5	redirect
6	alternate-address
8	echo
9	router-advertisement
10	router-solicitation
11	time-exceeded
12	parameter-problem
13	timestamp-request
14	timestamp-reply
15	information-request
16	information-reply
17	mask-request
18	mask-reply
31	conversion-error
32	mobile-redirect

APPENDIX D

Configuring an External Server for Authorization and Authentication

This appendix describes how to configure an external LDAP, RADIUS, or TACACS+ server to support AAA on the ASA. Before you configure the ASA to use an external server, you must configure the server with the correct ASA authorization attributes and, from a subset of these attributes, assign specific permissions to individual users.

This appendix includes the following sections:

- Understanding Policy Enforcement of Permissions and Attributes, page D-2
- Configuring an External LDAP Server, page D-3
- Configuring an External RADIUS Server, page D-30
- Configuring an External TACACS+ Server, page D-39

Understanding Policy Enforcement of Permissions and Attributes

The ASA supports several methods of applying user authorization attributes (also called user entitlements or permissions) to VPN connections. You can configure the ASA to obtain user attributes from a Dynamic Access Policy (DAP) on the ASA, from an external authentication and/or authorization AAA server (RADIUS or LDAP), from a group policy on the security appliance, or from all three.

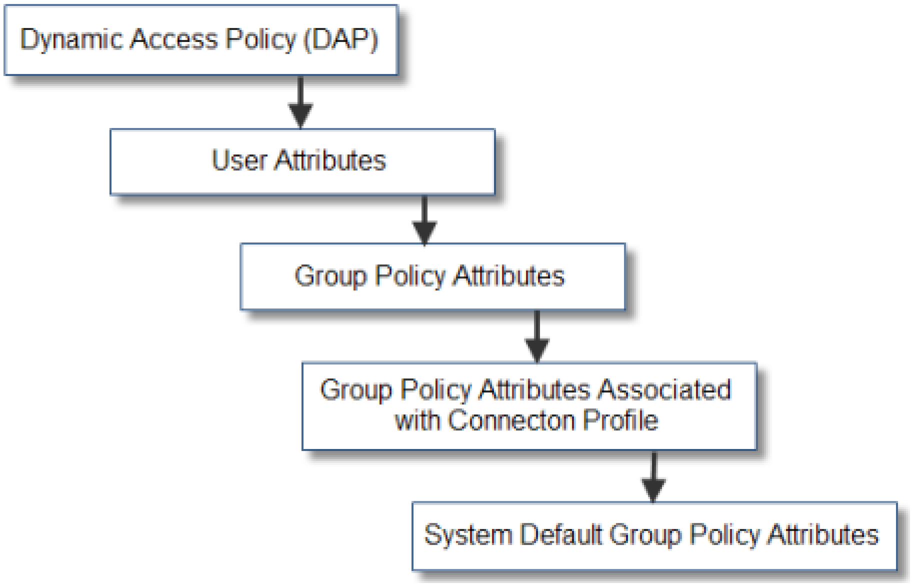
If the security appliance receives attributes from all sources, the attributes are evaluated, merged, and applied to the user policy. If there are conflicts between attributes coming from the DAP, the AAA server, or the group policy, those attributes obtained from the DAP always take precedence.

The security appliance applies attributes in the following order (also illustrated in Figure D-1:

1. DAP attributes on the ASA—Introduced in Version 8.0, take precedence over all others. If you set a bookmark/URL list in DAP, it overrides a bookmark/URL list set in the group policy.
2. User attributes on the AAA server—The server returns these after successful user authentication and/or authorization. Do not confuse these with attributes that are set for individual users in the local AAA database on the ASA (User Accounts in ASDM).
3. Group policy configured on the ASA—If a RADIUS server returns the value of the RADIUS CLASS attribute IETF-Class-25 (OU=<group-policy>) for the user, the ASA places the user in the group policy of the same name and enforces any attributes in the group policy that are not returned by the server.

   For LDAP servers, any attribute name can be used to set the group policy for the session. The LDAP attribute map you configure on the ASA maps the LDAP attribute to the Cisco attribute IETF-Radius-Class.
4. Group policy assigned by the Connection Profile (called tunnel-group in CLI)—The Connection Profile has the preliminary settings for the connection, and includes a default group policy applied to the user before authentication. All users connecting to the ASA initially belong to this group which provides any attributes that are missing from the DAP, user attributes returned by the server, or the group policy assigned to the user.
5. Default group policy assigned by the ASA (DfltGrpPolicy)—System default attributes provide any values that are missing from the DAP, user attributes, group policy, or connection profile.

Figure D-1 Policy Enforcement Flow


Dynamic Access Policy (DAP)
User Attributes
Group Policy Attributes
Group Policy Attributes Associated with Connecton Profile
System Default Group Policy Attributes

Configuring an External LDAP Server

The VPN 3000 Concentrator and the ASA/PIX 7.0 required a Cisco LDAP schema for authorization operations. Beginning with Version 7.1.x, the ASA performs authentication *and* authorization, using the native LDAP schema, and the Cisco schema is no longer needed.

You configure authorization (permission policy) using an LDAP attribute map. For examples, see Active Directory/LDAP VPN Remote Access Authorization Use Cases, page D-16.

This section describes the structure, schema, and attributes of an LDAP server. It includes the following topics:

- Organizing the Security Appliance for LDAP Operations, page D-3
- Defining the Security Appliance LDAP Configuration, page D-6
- Active Directory/LDAP VPN Remote Access Authorization Use Cases, page D-16

The specific steps of these processes vary, depending on which type of LDAP server you are using.

Note For more information on the LDAP protocol, see RFCs 1777, 2251, and 2849.

Organizing the Security Appliance for LDAP Operations

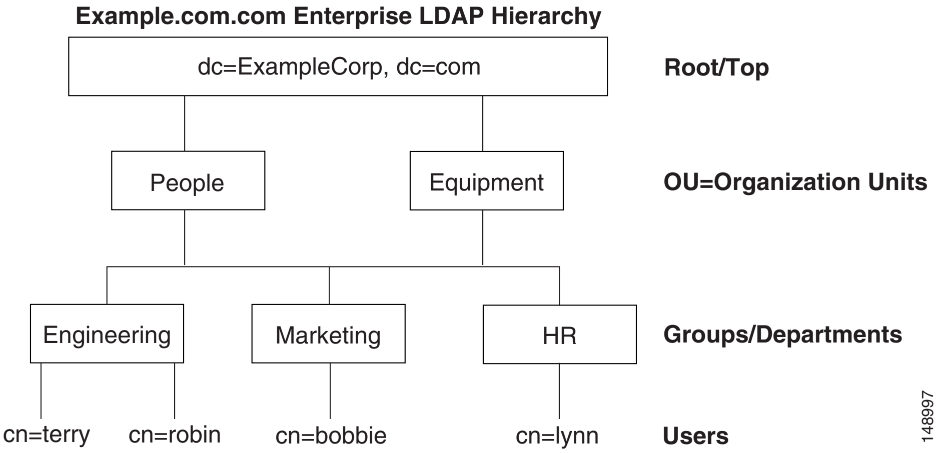
This section describes how to perform searches within the LDAP hierarchy and authenticated binding to the LDAP server on the ASA. It includes the following topics:

- Searching the Hierarchy, page D-4
- Binding the Security Appliance to the LDAP Server, page D-5
- Login DN Example for Active Directory, page D-5

Your LDAP configuration should reflect the logical hierarchy of your organization. For example, suppose an employee at your company, Example Corporation, is named Terry. Terry works in the Engineering group. Your LDAP hierarchy could have one or many levels. You might decide to set up a shallow, single-level hierarchy in which Terry is considered a member of Example Corporation. Or, you could set up a multi-level hierarchy in which Terry is considered to be a member of the department Engineering, which is a member of an organizational unit called People, which is itself a member of Example Corporation. See Figure D-2 for an example of this multi-level hierarchy.

A multi-level hierarchy has more granularity, but a single level hierarchy is quicker to search.

Figure D-2 A Multi-Level LDAP Hierarchy



Searching the Hierarchy

The ASA lets you tailor the search within the LDAP hierarchy. You configure the following three fields on the ASA to define where in the LDAP hierarchy your search begins, the extent, and the type of information it is looking for. Together these fields allow you to limit the search of the hierarchy to only the part of the tree that contains the user permissions.

- LDAP Base DN defines where in the LDAP hierarchy the server should begin searching for user information when it receives an authorization request from the ASA.
- Search Scope defines the extent of the search in the LDAP hierarchy. The search proceeds this many levels in the hierarchy below the LDAP Base DN. You can choose to have the server search only the level immediately below, or it can search the entire subtree. A single level search is quicker, but a subtree search is more extensive.
- Naming Attribute(s) defines the RDN that uniquely identifies an entry in the LDAP server. Common naming attributes can include cn (Common Name), sAMAccountName, and userPrincipalName.

Figure D-2 shows a possible LDAP hierarchy for Example Corporation. Given this hierarchy, you could define your search in different ways. Table D-1 shows two possible search configurations.

In the first example configuration, when Terry establishes the IPSec tunnel with LDAP authorization required, the ASA sends a search request to the LDAP server indicating it should search for Terry in the Engineering group. This search is quick.

In the second example configuration, the ASA sends a search request indicating the server should search for Terry within Example Corporation. This search takes longer.

Table D-1 Example Search Configurations

#	LDAP Base DN	Search Scope	Naming Attribute	Result
1	group= Engineering,ou=People,dc=ExampleCorporation, dc=com	One Level	cn=Terry	Quicker search
2	dc=ExampleCorporation,dc=com	Subtree	cn=Terry	Longer search

Binding the Security Appliance to the LDAP Server

Some LDAP servers (including the Microsoft Active Directory server) require the ASA to establish a handshake via authenticated binding before they accept requests for any other LDAP operations. The ASA uses the Login Distinguished Name (DN) and Login Password to establish trust (bind) with an LDAP server. The Login DN represents a user record in the LDAP server that the administrator uses for binding.

When binding, the ASA authenticates to the server using the Login DN and the Login Password. When performing a Microsoft Active Directory read-only operation (such as for authentication, authorization, or group-search), the security appliance can bind with a Login DN with less privileges. For example, the Login DN can be a user whose AD "Member Of" designation is part of Domain Users. For VPN password management operations, the Login DN needs elevated privileges and must be part of the Account Operators AD group.

An example of a Login DN includes:

cn=Binduser1,ou=Admins,ou=Users,dc=company_A,dc=com

The security appliance supports:

- Simple LDAP authentication with an unencrypted password on port 389
- Secure LDAP (LDAP-S) on port 636
- Simple Authentication and Security Layer (SASL) MD5
- SASL Kerberos.

The security appliance does not support anonymous authentication.

Note As an LDAP client, the ASA does not support sending anonymous binds or requests.

Login DN Example for Active Directory

The Login DN is a username on the LDAP server that the ASA uses to establish a trust between itself (the LDAP client) and the LDAP server during the Bind exchange, before a user search can take place.

For VPN authentication/authorization operations, and beginning with version 8.0.4 for retrieval of AD Groups, (which are read operations only when password-management changes are not required), the you can use the Login DN with fewer privileges. For example, the Login DN can be a user who is a memberOf the Domain Users group.

For VPN password-management changes, the Login DN must have Account Operators privileges.

In either of these cases, Super-user level privileges are not required for the Login/Bind DN. Refer to your LDAP Administrator guide for specific Login DN requirements.

Defining the Security Appliance LDAP Configuration

This section describes how to define the LDAP AV-pair attribute syntax. It includes the following topics:

- Supported Cisco Attributes for LDAP Authorization, page D-6
- Cisco AV Pair Attribute Syntax, page D-13
- Cisco AV Pairs ACL Examples, page D-15

Note The ASA enforces the LDAP attributes based on attribute name, not numeric ID. RADIUS attributes, on the other hand, are enforced by numeric ID, not by name.

Authorization refers to the process of enforcing permissions or attributes. An LDAP server defined as an authentication or authorization server will enforce permissions or attributes if they are configured.

For software Version 7.0, LDAP attributes include the cVPN3000 prefix. For Version 7.1 and later, this prefix was removed.

Supported Cisco Attributes for LDAP Authorization

This section provides a complete list of attributes (Table D-2) for the ASA 5500, VPN 3000, and PIX 500 series ASAs. The table includes attribute support information for the VPN 3000 and PIX 500 series to assist you configure networks with a mixture of these ASAs.

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
Access-Hours	Y	Y	Y	String	Single	Name of the time-range (for example, Business-Hours)
Allow-Network-Extension- Mode	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
Authenticated-User-Idle- Timeout	Y	Y	Y	Integer	Single	1 - 35791394 minutes
Authorization-Required	Y			Integer	Single	0 = No 1 = Yes
Authorization-Type	Y			Integer	Single	0 = None 1 = RADIUS 2 = LDAP
Banner1	Y	Y	Y	String	Single	Banner string for clientless and client SSL VPN, and IPSec clients.
Banner2	Y	Y	Y	String	Single	Banner string for clientless and client SSL VPN, and IPSec clients.

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
Cisco-AV-Pair	Y	Y	Y	String	Multi	An octet string in the following format: [Prefix] [Action] [Protocol] [Source] [Source Wildcard Mask] [Destination] [Destination Wildcard Mask] [Established] [Log] [Operator] [Port] For more information, see “Cisco AV Pair Attribute Syntax.”
Cisco-IP-Phone-Bypass	Y	Y	Y	Integer	Single	0 = Disabled 1 = Enabled
Cisco-LEAP-Bypass	Y	Y	Y	Integer	Single	0 = Disabled 1 = Enabled
Client-Intercept-DHCP-Configure-Msg	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
Client-Type-Version-Limiting	Y	Y	Y	String	Single	IPSec VPN client version number string
Confidence-Interval	Y	Y	Y	Integer	Single	10 - 300 seconds
DHCP-Network-Scope	Y	Y	Y	String	Single	IP address
DN-Field	Y	Y	Y	String	Single	Possible values: UID, OU, O, CN, L, SP, C, EA, T, N, GN, SN, I, GENQ, DNQ, SER, use-entire-name.
Firewall-ACL-In		Y	Y	String	Single	Access list ID
Firewall-ACL-Out		Y	Y	String	Single	Access list ID
Group-Policy		Y	Y	String	Single	Sets the group policy for the remote access VPN session. For version 8.2 and later, use this attribute instead of IETF-Radius-Class. You can use one of the three following formats: • <group policy name> • OU=<group policy name> • OU=<group policy name>;
IE-Proxy-Bypass-Local				Boolean	Single	0=Disabled 1=Enabled
IE-Proxy-Exception-List				String	Single	A list of DNS domains. Entries must be separated by the new line character sequence (\n).

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
IE-Proxy-Method	Y	Y	Y	Integer	Single	1 = Do not modify proxy settings 2 = Do not use proxy 3 = Auto detect 4 = Use ASA setting
IE-Proxy-Server	Y	Y	Y	Integer	Single	IP Address
IETF-Radius-Class	Y	Y	Y		Single	Sets the group policy for the remote access VPN session. For version 8.2 and later, we recommend that you use the Group-Policy attribute. You can use one of the three following formats: • <group policy name> • OU=<group policy name> • OU=<group policy name>;
IETF-Radius-Filter-Id	Y	Y	Y	String	Single	access list name that is defined on the ASA
IETF-Radius-Framed-IP-Address	Y	Y	Y	String	Single	An IP address
IETF-Radius-Framed-IP-Netmask	Y	Y	Y	String	Single	An IP address mask
IETF-Radius-Idle-Timeout	Y	Y	Y	Integer	Single	seconds
IETF-Radius-Service-Type	Y	Y	Y	Integer	Single	1 = Login 2 = Framed 6 = Administrative 7 = NAS Prompt
IETF-Radius-Session-Timeout	Y	Y	Y	Integer	Single	seconds
IKE-Keep-Alives	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Allow-Passwd-Store	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Authentication	Y	Y	Y	Integer	Single	0 = None 1 = RADIUS 2 = LDAP (authorization only) 3 = NT Domain 4 = SDI (RSA) 5 = Internal 6 = RADIUS with Expiry 7 = Kerberos/Active Directory
IPSec-Auth-On-Rekey	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Backup-Server-List	Y	Y	Y	String	Single	Server Addresses (space delimited)
IPSec-Backup-Servers	Y	Y	Y	String	Single	1 = Use Client-Configured list 2 = Disabled and clear client list 3 = Use Backup Server list

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
IPSec-Client-Firewall-Filter- Name	Y			String	Single	Specifies the name of the filter to be pushed to the client as firewall policy.
IPSec-Client-Firewall-Filter-Optional	Y	Y	Y	Integer	Single	0 = Required 1 = Optional
IPSec-Default-Domain	Y	Y	Y	String	Single	Specifies the single default domain name to send to the client (1 - 255 characters).
IPSec-Extended-Auth-On-Rekey		Y	Y	String	Single	
IPSec-IKE-Peer-ID-Check	Y	Y	Y	Integer	Single	1 = Required 2 = If supported by peer certificate 3 = Do not check
IPSec-IP-Compression	Y	Y	Y	Integer	Single	0 = Disabled 1 = Enabled
IPSec-Mode-Config	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Over-UDP	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Over-UDP-Port	Y	Y	Y	Integer	Single	4001 - 49151; default = 10000
IPSec-Required-Client-Firewall-Capability	Y	Y	Y	Integer	Single	0 = None 1 = Policy defined by remote FW Are-You-There (AYT) 2 = Policy pushed CPP 4 = Policy from server
IPSec-Sec-Association	Y			String	Single	Name of the security association
IPSec-Split-DNS-Names	Y	Y	Y	String	Single	Specifies the list of secondary domain names to send to the client (1 - 255 characters).
IPSec-Split-Tunneling-Policy	Y	Y	Y	Integer	Single	0 = Tunnel everything 1 = Split tunneling 2 = Local LAN permitted
IPSec-Split-Tunnel-List	Y	Y	Y	String	Single	Specifies the name of the network or access list that describes the split tunnel inclusion list.
IPSec-Tunnel-Type	Y	Y	Y	Integer	Single	1 = LAN-to-LAN 2 = Remote access
IPSec-User-Group-Lock	Y			Boolean	Single	0 = Disabled 1 = Enabled

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
L2TP-Encryption	Y			Integer	Single	Bitmap: 1 = Encryption required 2 = 40 bit 4 = 128 bits 8 = Stateless-Req 15 = 40/128-Encr/Stateless-Req
L2TP-MPPC-Compression	Y			Integer	Single	0 = Disabled 1 = Enabled
MS-Client-Subnet-Mask	Y	Y	Y	String	Single	An IP address
PFS-Required	Y	Y	Y	Boolean	Single	0 = No 1 = Yes
Port-Forwarding-Name	Y	Y		String	Single	Name string (for example, “Corporate-Apps”)
PPTP-Encryption	Y			Integer	Single	Bitmap: 1 = Encryption required 2 = 40 bits 4 = 128 bits 8 = Stateless-Required Example: 15 = 40/128-Encr/Stateless-Req
PPTP-MPPC-Compression	Y			Integer	Single	0 = Disabled 1 = Enabled
Primary-DNS	Y	Y	Y	String	Single	An IP address
Primary-WINS	Y	Y	Y	String	Single	An IP address
Privilege-Level						
Required-Client-Firewall-Vendor-Code	Y	Y	Y	Integer	Single	1 = Cisco Systems (with Cisco Integrated Client) 2 = Zone Labs 3 = NetworkICE 4 = Sygate 5 = Cisco Systems (with Cisco Intrusion Prevention Security Agent)
Required-Client-Firewall-Description	Y	Y	Y	String	Single	String

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
Required-Client-Firewall-Product-Code	Y	Y	Y	Integer	Single	Cisco Systems Products: 1 = Cisco Intrusion Prevention Security Agent or Cisco Integrated Client (CIC) Zone Labs Products: 1 = Zone Alarm 2 = Zone AlarmPro 3 = Zone Labs Integrity NetworkICE Product: 1 = BlackIce Defender/Agent Sygate Products: 1 = Personal Firewall 2 = Personal Firewall Pro 3 = Security Agent
Require-HW-Client-Auth	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
Require-Individual-User-Auth	Y	Y	Y	Integer	Single	0 = Disabled 1 = Enabled
Secondary-DNS	Y	Y	Y	String	Single	An IP address
Secondary-WINS	Y	Y	Y	String	Single	An IP address
SEP-Card-Assignment				Integer	Single	Not used
Simultaneous-Logins	Y	Y	Y	Integer	Single	0-2147483647
Strip-Realm	Y	Y	Y	Boolean	Single	0 = Disabled 1 = Enabled
TACACS-Authtype	Y	Y	Y	Interger	Single	
TACACS-Privilege-Level	Y	Y	Y	Interger	Single	
Tunnel-Group-Lock		Y	Y	String	Single	Name of the tunnel group or “none”
Tunneling-Protocols	Y	Y	Y	Integer	Single	1 = PPTP 2 = L2TP 4 = IPSec 8 = L2TP/IPSec 16 = WebVPN 32 = SVC 8 and 4 are mutually exclusive (0 - 11, 16 - 27, 32 - 43, 48 - 59 are legal values)
Use-Client-Address	Y			Boolean	Single	0 = Disabled 1 = Enabled
User-Auth-Server-Name	Y			String	Single	IP address or hostname
User-Auth-Server-Port	Y			Integer	Single	Port number for server protocol

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
User-Auth-Server-Secret	Y			String	Single	Server password
WebVPN-ACL-Filters		Y		String	Single	Webtype Access-List name
WebVPN-Apply-ACL-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled With version 8.0 and later, this attribute is not required.
WebVPN-Citrix-Support-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled With version 8.0 and later, this attribute is not required.
WebVPN-Enable-functions				Integer	Single	Not used - deprecated
WebVPN-Exchange-Server-Address				String	Single	Not used - deprecated
WebVPN-Exchange-Server-NETBIOS-Name				String	Single	Not used - deprecated
WebVPN-File-Access-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-File-Server-Browsing-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-File-Server-Entry-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Forwarded-Ports		Y		String	Single	Port-Forward list name
WebVPN-Homepage	Y	Y		String	Single	A URL such as http://example-portal.com.
WebVPN-Macro-Substitution-Value1	Y	Y		String	Single	See *SSL VPN Deployment Guide* for examples and use cases at this URL: http://supportwiki.cisco.com/ViewWiki/index.php/Cisco_ASA_5500_SSL_VPN_Deployment_Guide%2C_Version_8.x
WebVPN-Macro-Substitution-Value2	Y	Y		String	Single	See *SSL VPN Deployment Guide* for examples and use cases at this URL: http://supportwiki.cisco.com/ViewWiki/index.php/Cisco_ASA_5500_SSL_VPN_Deployment_Guide%2C_Version_8.x
WebVPN-Port-Forwarding-Auto-Download-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Port-Forwarding- Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled

Table D-2 Security Appliance Supported Cisco Attributes for LDAP Authorization (continued)

Attribute Name/	VPN 3000	ASA	PIX	Syntax/ Type	Single or Multi-Valued	Possible Values
WebVPN-Port-Forwarding-Exchange-Proxy-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Port-Forwarding-HTTP-Proxy-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Single-Sign-On-Server-Name		Y		String	Single	Name of the SSO Server (1 - 31 characters).
WebVPN-SVC-Client-DPD	Y	Y		Integer	Single	0 = Disabled n = Dead Peer Detection value in seconds (30 - 3600)
WebVPN-SVC-Compression	Y	Y		Integer	Single	0 = None 1 = Deflate Compression
WebVPN-SVC-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-SVC-Gateway-DPD	Y	Y		Integer	Single	0 = Disabled n = Dead Peer Detection value in seconds (30 - 3600)
WebVPN-SVC-Keepalive	Y	Y		Integer	Single	0 = Disabled n = Keepalive value in seconds (15 - 600)
WebVPN-SVC-Keep-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-SVC-Rekey-Method	Y	Y		Integer	Single	0 = None 1 = SSL 2 = New tunnel 3 = Any (sets to SSL)
WebVPN-SVC-Rekey-Period	Y	Y		Integer	Single	0 = Disabled n = Retry period in minutes (4 - 10080)
WebVPN-SVC-Required-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-URL-Entry-Enable	Y	Y		Integer	Single	0 = Disabled 1 = Enabled
WebVPN-URL-List		Y		String	Single	URL-list name

Cisco AV Pair Attribute Syntax

The Cisco Attribute Value (AV) pair (ID# 26/9/1) can be used to enforce access lists from a Radius server (like Cisco ACS), or from an LDAP server via an ldap-attribute-map.

The syntax of each Cisco-AV-Pair rule is as follows:

[Prefix] [Action] [Protocol] [Source] [Source Wildcard Mask] [Destination] [Destination Wildcard Mask] [Established] [Log] [Operator] [Port]

Table D-3 describes the syntax rules.

Table D-3 AV-Pair Attribute Syntax Rules

Field	Description
Prefix	A unique identifier for the AV pair. For example: `ip:inacl#1=` (for standard access lists) or `webvpn:inacl#` (for clientless SSL VPN access lists). This field only appears when the filter has been sent as an AV pair.
Action	Action to perform if rule matches: deny, permit.
Protocol	Number or name of an IP protocol. Either an integer in the range 0 - 255 or one of the following keywords: icmp, igmp, ip, tcp, udp.
Source	Network or host that sends the packet. Specify it as an IP address, a hostname, or the keyword “any.” If using an IP address, the source wildcard mask must follow. This field does not apply to Clientless SSL VPN because the ASA plays the role of the source/proxy
Source Wildcard Mask	The wildcard mask that applies to the source address. This field does not apply to Clientless SSL VPN because the ASA plays the role of the source/proxy
Destination	Network or host that receives the packet. Specify as an IP address, a hostname, or the keyword “any.” If using an IP address, the source wildcard mask must follow.
Destination Wildcard Mask	The wildcard mask that applies to the destination address.
Log	Generates a FILTER log message. You must use this keyword to generate events of severity level 9.
Operator	Logic operators: greater than, less than, equal to, not equal to.
Port	The number of a TCP or UDP port in the range 0 - 65535.

Cisco AV Pairs ACL Examples

Table D-4 shows examples of Cisco AV pairs and describes the allow or deny actions that result.

Note Each ACL # in `inacl#` must be unique. However, they do not need to be sequential (i.e. 1, 2, 3, 4). For example, they could be 5, 45, 135.

Table D-4 Examples of Cisco AV Pairs and their Permitting or Denying Action

Cisco AV Pair Example	Permitting or Denying Action
`ip:inacl#1=deny ip 10.155.10.0 0.0.0.255 10.159.2.0 0.0.0.255 log`	Allows IP traffic between the two hosts using full tunnel IPsec or SSL VPN client.
`ip:inacl#2=permit TCP any host 10.160.0.1 eq 80 log`	Allows TCP traffic from all hosts to the specific host on port 80 only using full tunnel IPsec or SSL VPN client.

`webvpn:inacl#1=permit url http://www.website.com`
`webvpn:inacl#2=deny url smtp://server`
`webvpn:inacl#3=permit url cifs://server/share`
	Allows clientless traffic to the URL specified, denies smtp traffic to a specific server, and allows file share access (CIFS) to the specified server.

`webvpn:inacl#1=permit tcp 10.86.1.2 eq 2222 log`
`webvpn:inacl#2=deny tcp 10.86.1.2 eq 2323 log`
	Denies telnet and permits SSH on non-default ports 2323 and 2222, respectively.

`webvpn:inacl#1=permit url ssh://10.86.1.2`
`webvpn:inacl#35=permit tcp 10.86.1.5 eq 22 log`
`webvpn:inacl#48=deny url telnet://10.86.1.2`
`webvpn:inacl#100=deny tcp 10.86.1.6 eq 23`
	Allows SSH to default port 22 and 23, respectively. For this example, we assume you are using telnet/ssh java plugins enforced by these ACLs.

URL Types supported in ACLs

The URL may be a partial URL, contain wildcards for the server, or contain a port.

The following URL types are supported:

any All URLs	http://	nfs://	sametime://	telnet://
cifs://	https://	pop3://	smart-tunnel://	tn3270://
citrix://	ica://	post://	smtp://	tn5250://
citrixs://	imap4://	rdp://	ssh://	vnc://
ftp://				

Note The URLs listed above appear in CLI or ASDM menus based on whether the associated plugin is enabled.

Guidelines for using Cisco-AV Pairs (ACLs)

- Use Cisco-AV pair entries with the ip:inacl# prefix to enforce access lists for remote IPSec and SSL VPN Client (SVC) tunnels.
- Use Cisco-AV pair entries with the webvpn:inacl# prefix to enforce access lists for SSL VPN clientless (browser-mode) tunnels.
- For Webtype ACLs, you don’t specify the source because the ASA is the source.

Table D-5 lists the tokens for the Cisco-AV-pair attribute:

Table D-5 Security Appliance-Supported Tokens

Token	**Syntax Field**	**Description**
ip:inacl#*Num*=	N/A (Identifier)	(Where *Num* is a unique integer.) Starts all AV pair access control lists. Enforces access lists for remote IPSec and SSL VPN (SVC) tunnels.
webvpn:inacl#*Num*=	N/A (Identifier)	(Where *Num* is a unique integer.) Starts all clientless SSL AV pair access control lists. Enforces access lists for clientless (browser-mode) tunnels.
deny	Action	Denies action. (Default)
permit	Action	Allows action.
icmp	Protocol	Internet Control Message Protocol (ICMP)
1	Protocol	Internet Control Message Protocol (ICMP)
IP	Protocol	Internet Protocol (IP)
0	Protocol	Internet Protocol (IP)
TCP	Protocol	Transmission Control Protocol (TCP)
6	Protocol	Transmission Control Protocol (TCP)
UDP	Protocol	User Datagram Protocol (UDP)
17	Protocol	User Datagram Protocol (UDP)
any	Hostname	Rule applies to any host.
host	Hostname	Any alpha-numeric string that denotes a hostname.
log	Log	When the event is hit, a filter log message appears. (Same as permit and log or deny and log.)
lt	Operator	Less than value
gt	Operator	Greater than value
eq	Operator	Equal to value
neq	Operator	Not equal to value
range	Operator	Inclusive range. Should be followed by two values.

Active Directory/LDAP VPN Remote Access Authorization Use Cases

This section presents example procedures for configuring authentication and authorization on the ASA using the Microsoft Active Directory server. It includes the following use cases:

- User-Based Attributes Policy Enforcement, page D-18
- Placing LDAP users in a specific Group-Policy, page D-20
- Enforcing Static IP Address Assignment for AnyConnect Tunnels, page D-22
- Enforcing Dial-in Allow or Deny Access, page D-25
- Enforcing Logon Hours and Time-of-Day Rules, page D-28

Other configuration examples available on Cisco.com include the following TechNotes:

- *ASA/PIX: Mapping VPN Clients to VPN Group Policies Through LDAP Configuration Example* at:

http://www.cisco.com/en/US/products/ps6120/products_configuration_example09186a008089149d.shtml

- *PIX/ASA 8.0: Use LDAP Authentication to Assign a Group Policy at Login* at:

  http://www.cisco.com/en/US/partner/products/ps6120/products_configuration_example09186a00808d1a7c.shtml

User-Based Attributes Policy Enforcement

Any standard LDAP attribute can be mapped to a well-known Vendor Specific Attribute (VSA) Likewise, one or more LDAP attribute(s) can be mapped to one or more Cisco LDAP attributes.

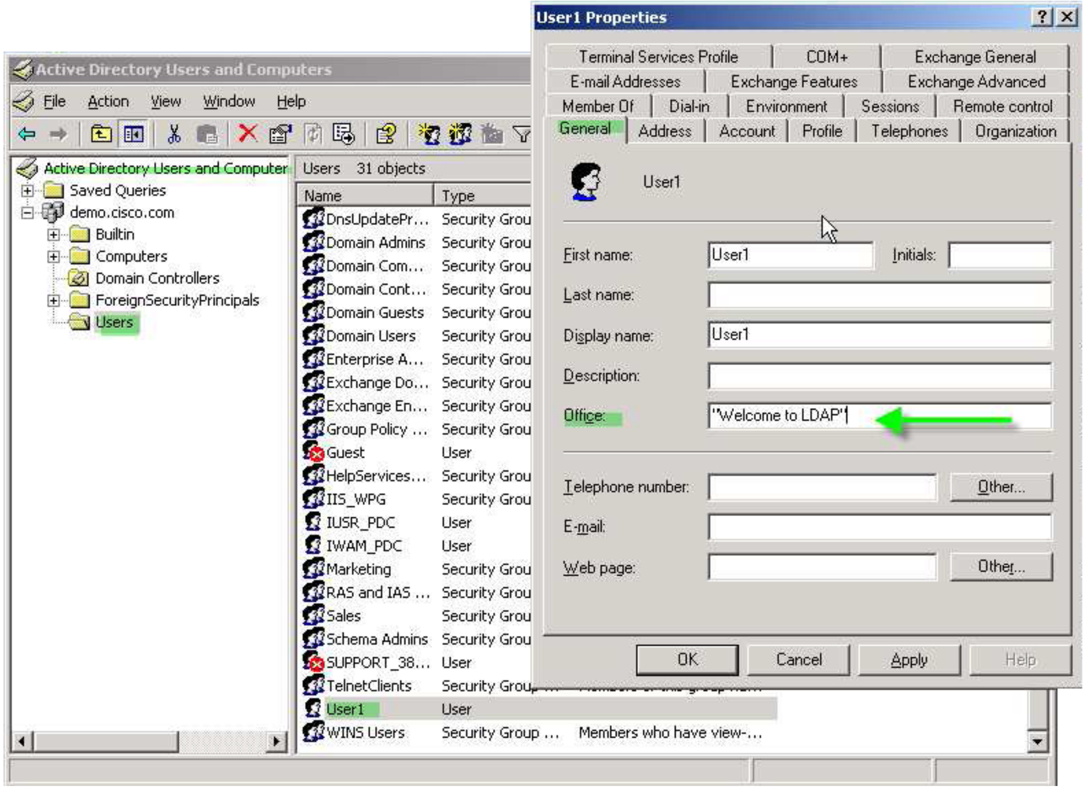
In this use case we configure the ASA to enforce a simple banner for a user configured on an AD LDAP server. For this case, on the server, we use the Office field in the General tab to enter the banner text. This field uses the attribute named *physicalDeliveryOfficeName*. On the ASA, we create an attribute map that maps *physicalDeliveryOfficeName* to the Cisco attribute *Banner1*. During authentication, the ASA retrieves the value of physicalDeliveryOfficeName from the server, maps the value to the Cisco attribute Banner1, and displays the banner to the user.

This case applies to any connection type, including the IPSec VPN client, AnyConnect SSL VPN client, or clientless SSL VPN. For the purposes of this case, User1 is connecting through a clientless SSL VPN connection.

Step 1 Configure the attributes for a user on the AD/LDAP Server.

Right-click a user. The properties window displays (Figure D-3). Click the General tab and enter some banner text in the Office field. The Office field uses the AD/LDAP attribute *physicalDeliveryOfficeName*.

Figure D-3 Figure 3 LDAP User configuration



Users 31 objects

Name	Type	
DnsUpdatePr...	Security Grou	
Domain Admins	Security Grou	
Domain Com...	Security Grou	
Domain Cont...	Security Grou	
Domain Guests	Security Grou	
Domain Users	Security Grou	
Enterprise A...	Security Grou	
Exchange Do...	Security Grou	
Exchange En...	Security Grou	
Group Policy ...	Security Grou	
Guest	User	
HelpServices...	Security Grou	
IIS_WPG	Security Grou	
IUSR_PDC	User	
IWAM_PDC	User	
Marketing	Security Grou	
RAS and IAS ...	Security Grou	
Sales	Security Grou	
Schema Admins	Security Grou	
SUPPORT_38...	User	
TelnetClients	Security Group ...	
User1	User	
WINS Users	Security Group ...	Members who have view-...

User1

First name: User1
Initials:
Last name:
Display name: User1
Description:
Office: "Welcome to LDAP"
Telephone number:
E-mail:
Web page:

Step 2 Create an LDAP attribute map on the ASA:

The following example creates the map *Banner*, and maps the AD/LDAP attribute *physicalDeliveryOfficeName* to the Cisco attribute *Banner1*:

```
hostname(config)# ldap attribute-map Banner
hostname(config-ldap-attribute-map)# map-name physicalDeliveryOfficeName Banner1
```

Step 3 Associate the LDAP attribute map to the AAA server.

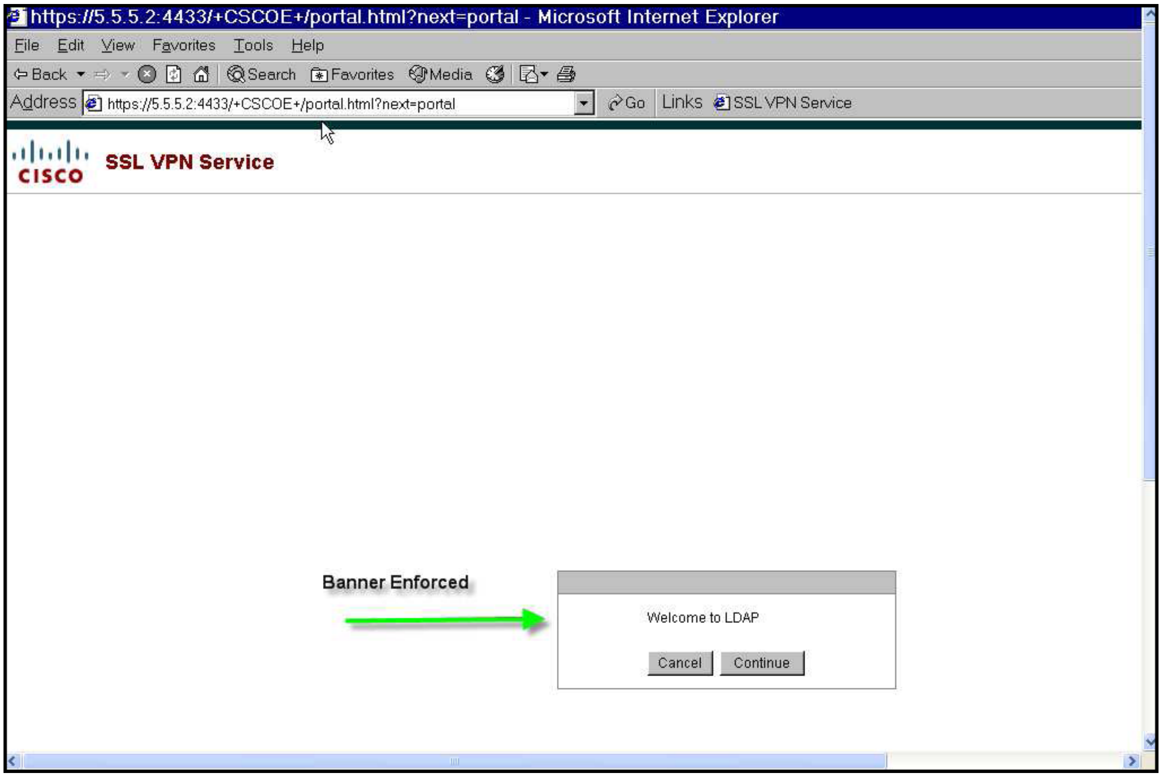
The following example enters the aaa server host configuration more for the host *3.3.3.4*, in the AAA server group *MS_LDAP*, and associates the attribute map *Banner* that you created in step 2:

```
hostname(config)# aaa-server MS_LDAP host 3.3.3.4
hostname(config-aaa-server-host)# ldap-attribute-map Banner
```

Step 4 Test the banner enforcement.

This example shows a clientless SSL connection and the banner enforced through the attribute map after the user authenticates (Figure D-4).

Figure D-4 Banner Displayed



https://5.5.5.2:4433/+CSCOE+/portal.html?next=portal - Microsoft Internet Explorer

Address: https://5.5.5.2:4433/+CSCOE+/portal.html?next=portal

SSL VPN Service

Banner Enforced

Welcome to LDAP

Placing LDAP users in a specific Group-Policy

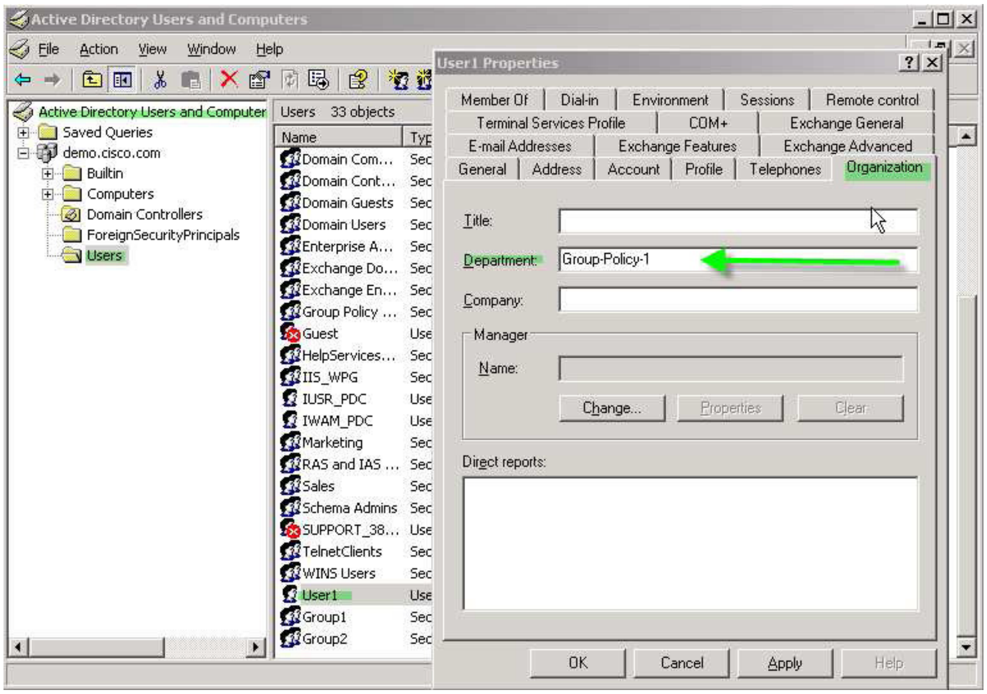
In this case we authenticate User1 on the AD LDAP server to a specific group policy on the ASA. On the server, we use the *Department* field of the Organization tab to enter the name of the group policy. Then we create an attribute map and map Department to the Cisco attribute *IETF-Radius-Class*. During authentication, the ASA retrieves the value of Department from the server, maps the value to the IETF-Radius-Class, and places User1 in the group policy.

This case applies to any connection type, including the IPSec VPN client, AnyConnect SSL VPN client, or clientless SSL VPN. For the purposes of this case, user1 is connecting through a clientless SSL VPN connection.

Step 1 Configure the attributes for the user on the AD LDAP Server.

Right-click the user. The Properties window displays (Figure D-5). Click the Organization tab and enter *Group-Policy-1* in the Department field.

Figure D-5 AD LDAP Department attribute



Department: Group-Policy-1

Step 2 Define an attribute map for the LDAP configuration shown in Step 1.

In this case we map the AD attribute Department to the Cisco attribute IETF-Radius-Class. For example:

```
hostname(config)# ldap attribute-map group_policy
hostname(config-ldap-attribute-map)# map-name Department IETF-Radius-Class
```

Step 3 Associate the LDAP attribute map to the AAA server.

The following example enters the aaa server host configuration mode for the host *3.3.3.4*, in the AAA server group *MS_LDAP*, and associates the attribute map *group_policy* that you created in step 2:

```
hostname(config)# aaa-server MS_LDAP host 3.3.3.4
hostname(config-aaa-server-host)# ldap-attribute-map group_policy
```

Step 4 Add the new group-policy on the ASA and configure the required policy attributes that will be assigned to the user. For this case, we created the Group-policy-1, the name entered in the Department field on the server:

```
hostname(config)# group-policy Group-policy-1 external server-group LDAP_demo
hostname(config-aaa-server-group)#
```

Step 5 Establish the VPN connection as the user would, and verify that the session inherits the attributes from Group-Policy1 (and any other applicable attributes from the default group-policy)

You can monitor the communication between the ASA and the server by enabling the **debug ldap 255** command from privileged EXEC mode. Below is sample output of this command. The output has been edited to provide the key messages:

```
[29] Authentication successful for user1 to 3.3.3.4
[29] Retrieving user attributes from server 3.3.3.4
[29] Retrieved Attributes:
[29] department: value = Group-Policy-1
[29] mapped to IETF-Radius-Class: value = Group-Policy-1
```

Enforcing Static IP Address Assignment for AnyConnect Tunnels

In this case we configure the AnyConnect client user *Web1* to receive a static IP Address. We enter the address in the *Assign Static IP Address* field of the Dialin tab on the AD LDAP server. This field uses the *msRADIUSFramedIPAddress* attribute. We create an attribute map that maps it to the Cisco attribute *IETF-Radius-Framed-IP-Address*.

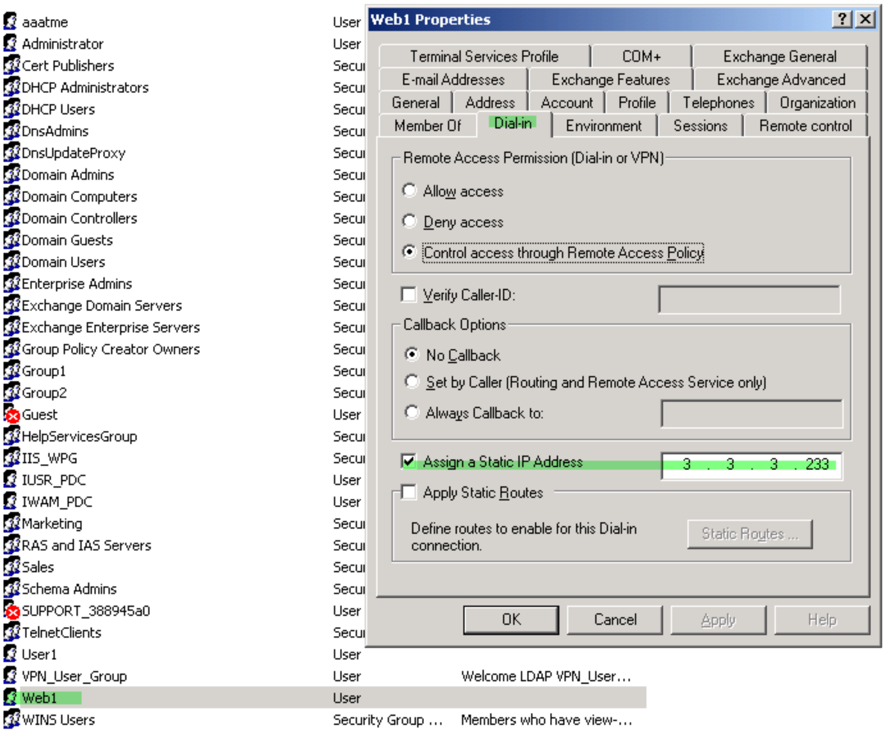
During authentication, the ASA retrieves the value of msRADIUSFramedIPAddress from the server, maps the value to the Cisco attribute IETF-Radius-Framed-IP-Address, and provides the static address to User1 .

This case applies to full-tunnel clients, including the IPSec client and the SSL VPN clients (AnyConnect client 2.x and the legacy SSL VPN client).

Step 1 Configure the user attributes on the AD LDAP server.

Right-click on the user name. The Properties window displays (Figure D-6). Click the Dialin tab, check *Assign Static IP Address*, and enter an IP address. For this case we use 3.3.3.233.

Figure D-6 Assign Static IP Address



aaatme	User	
Administrator	User	
Cert Publishers	Secu	
DHCP Administrators	Secu	
DHCP Users	Secu	
DnsAdmins	Secu	
DnsUpdateProxy	Secu	
Domain Admins	Secu	
Domain Computers	Secu	
Domain Controllers	Secu	
Domain Guests	Secu	
Domain Users	Secu	
Enterprise Admins	Secu	
Exchange Domain Servers	Secu	
Exchange Enterprise Servers	Secu	
Group Policy Creator Owners	Secu	
Group1	Secu	
Group2	Secu	
Guest	User	
HelpServicesGroup	Secu	
IIS_WPG	Secu	
IUSR_PDC	User	
IWAM_PDC	User	
Marketing	Secu	
RAS and IAS Servers	Secu	
Sales	Secu	
Schema Admins	Secu	
SUPPORT_388945a0	User	
TelnetClients	Secu	
User1	User	
VPN_User_Group	User	Welcome LDAP VPN_User...
Web1	User	
WINS Users	Security Group ...	Members who have view-...

Remote Access Permission (Dial-in or VPN)

○ Allow access

○ Deny access

● Control access through Remote Access Policy

☐ Verify Caller-ID:

Callback Options

● No Callback

○ Set by Caller (Routing and Remote Access Service only)

○ Always Callback to:

☑ Assign a Static IP Address 3 . 3 . 3 . 233

☐ Apply Static Routes

Define routes to enable for this Dial-in connection.

Step 2 Create an attribute map for the LDAP configuration shown in Step 1.

In this case we map the AD attribute *msRADIUSFramedIPAddress* used by the Static Address field to the Cisco attribute *IETF-Radius-Framed-IP-Address*.

For example:

```
hostname(config)# ldap attribute-map static_address
hostname(config-ldap-attribute-map)# map-name msRADIUSFramedIPAddress
IETF-Radius-Framed-IP-Address
```

Step 3 Associate the LDAP attribute map to the AAA server.

The following example enters the aaa server host configuration mode for the host *3.3.3.4*, in the AAA server group *MS_LDAP*, and associates the attribute map *static_address* that you created in step 2:

```
hostname(config)# aaa-server MS_LDAP host 3.3.3.4
hostname(config-aaa-server-host)# ldap-attribute-map static_address
```

Step 4 Verify the **vpn-address-assigment** command is configured to specify aaa by viewing this part of the configuration with the **show run all vpn-addr-assign command**:

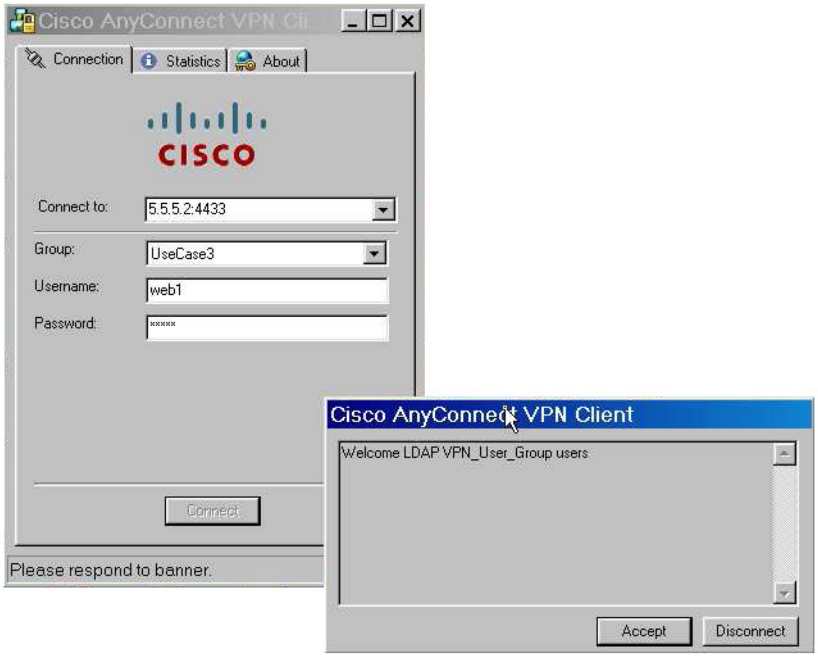
vpn-addr-assign aaa

```
hostname(config)# show run all vpn-addr-assign
vpn-addr-assign aaa   <<<< ensure this configured.
no vpn-addr-assign dhcp
vpn-addr-assign local
hostname(config)#
```

Step 5 Establish a connection to the ASA with the AnyConnect client. Observe the following:

- The banner is received in the same sequence as a clientless connection (Figure D-7).
- The user receives the IP address configured on the server and mapped to the ASA (Figure D-8).

Figure D-7 Verify the Banner for the AnyConnect Session



Connect to: 5.5.5.2:4433

Group: UseCase3

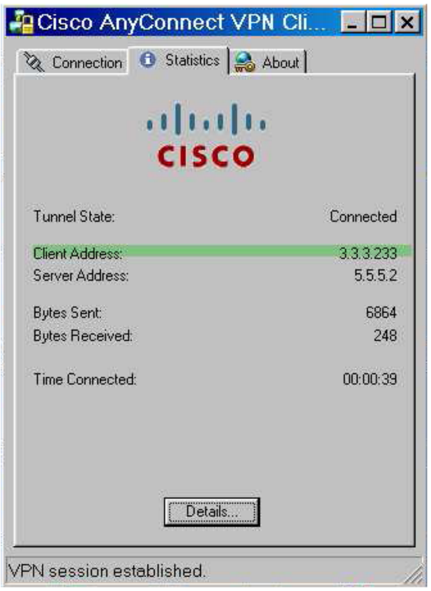
Username: web1

Password: *****

Welcome LDAP VPN_User_Group users

Please respond to banner.

Figure D-8   AnyConnect Session Established



Tunnel State: Connected

Client Address: 3.3.3.233
Server Address: 5.5.5.2

Bytes Sent: 6864
Bytes Received: 248

Time Connected: 00:00:39

VPN session established.

You can use the **show vpn-sessiondb svc** command to view the session details and verify the address assigned:

```
hostname# show vpn-sessiondb svc

Session Type: SVC
Username     : web1                   Index        : 31
Assigned IP  : 3.3.3.233              Public IP    : 10.86.181.70
Protocol     : Clientless SSL-Tunnel DTLS-Tunnel
Encryption   : RC4 AES128             Hashing      : SHA1
Bytes Tx     : 304140                 Bytes Rx     : 470506
Group Policy : VPN_User_Group         Tunnel Group : UseCase3_TunnelGroup
Login Time   : 11:13:05 UTC Tue Aug 28 2007
Duration     : 0h:01m:48s
NAC Result   : Unknown
VLAN Mapping : N/A                    VLAN         : none

BXB-ASA5540#
```

Enforcing Dial-in Allow or Deny Access

In this case, we create an LDAP attribute map that specifies the tunneling protocols allowed by the user. We map the Allow Access and Deny Access settings on the Dialin tab to the Cisco attribute Tunneling-Protocols. The Cisco Tunneling-Protocols supports the bit-map values shown in Table D-6:

Table D-6 Bitmap Values for Cisco Tunneling-Protocol Attribute

Value	Tunneling Protocol
1	PPTP
2	L2TP
4[1]	IPSec
8[2]	L2TP/IPSEC
16	clientless SSL
32	SSL Client—AnyConnect or legacy SSL VPN client

1. IPSec and L2TP over IPSec are not supported simultaneously. Therefore, the values 4 and 8 are mutually exclusive.
2. See note 1.

Using this attribute, we create an Allow Access (TRUE) or a Deny Access (FALSE) condition for the protocols and enforce what method the user is allowed access with.

For this simplified example, by mapping the tunnel-protocol IPSec (4), we can create an allow (true) condition for the IPSec Client. We also map WebVPN (16) and SVC/AC (32) which is mapped as value of 48 (16+32) and create a deny (false) condition. This allows the user to connect to the ASA using IPSec, but any attempt to connect using clientless SSL or the AnyConnect client is denied.

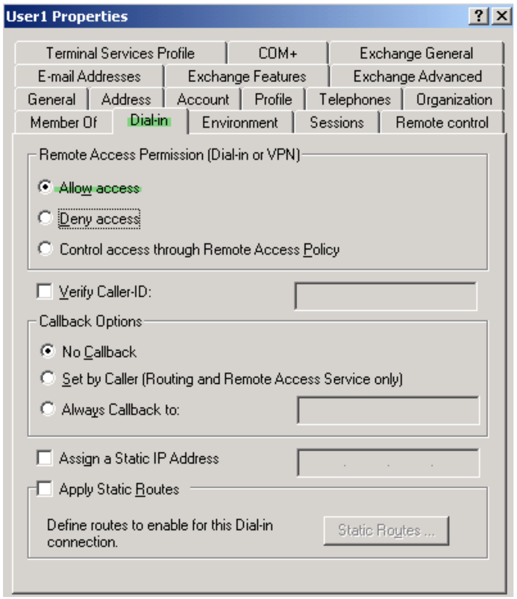
Another example of enforcing Dial-in Allow Acess or Deny Access can be found in the Tech Note *ASA/PIX: Mapping VPN Clients to VPN Group Policies Through LDAP Configuration Example,* at this URL:

http://www.cisco.com/en/US/products/ps6120/products_configuration_example09186a008089149d.shtml

Step 1 Configure the user attributes on the AD LDAP server.

Right-click on the user. The Properties window displays. Click the Dial-in tab. Select **Allow Access** (Figure D-9).

Figure D-9 AD-LDAP user1 - Allow access



Remote Access Permission (Dial-in or VPN)

● Allow access

○ Deny access

○ Control access through Remote Access Policy

☐ Verify Caller-ID:

Callback Options

● No Callback

○ Set by Caller (Routing and Remote Access Service only)

○ Always Callback to:

☐ Assign a Static IP Address

☐ Apply Static Routes

Define routes to enable for this Dial-in connection.

Note If you select the third option "Control access through the Remote Access Policy", then a value is not returned from the server, and the permissions that are enforced are based on the internal group policy settings of the ASA.

Step 2 Create an attribute map to allow both an IPSec and AnyConnect connection, but deny a clientless SSL connection.

In this case we create the map *tunneling_protocols*, and map the AD attribute *msNPAllowDialin* used by the Allow Access setting to the Cisco attribute *Tunneling-Protocols* using the **map-name** command, and add map values with the **map-value** command,

For example:

```
hostname(config)# ldap attribute-map tunneling_protocols
hostname(config-ldap-attribute-map)# map-name msNPAllowDialin Tunneling-Protocols
hostname(config-ldap-attribute-map)# map-value msNPAllowDialin FALSE  48
hostname(config-ldap-attribute-map)# map-value msNPAllowDialin TRUE 4
```

Step 3 Associate the LDAP attribute map to the AAA server.

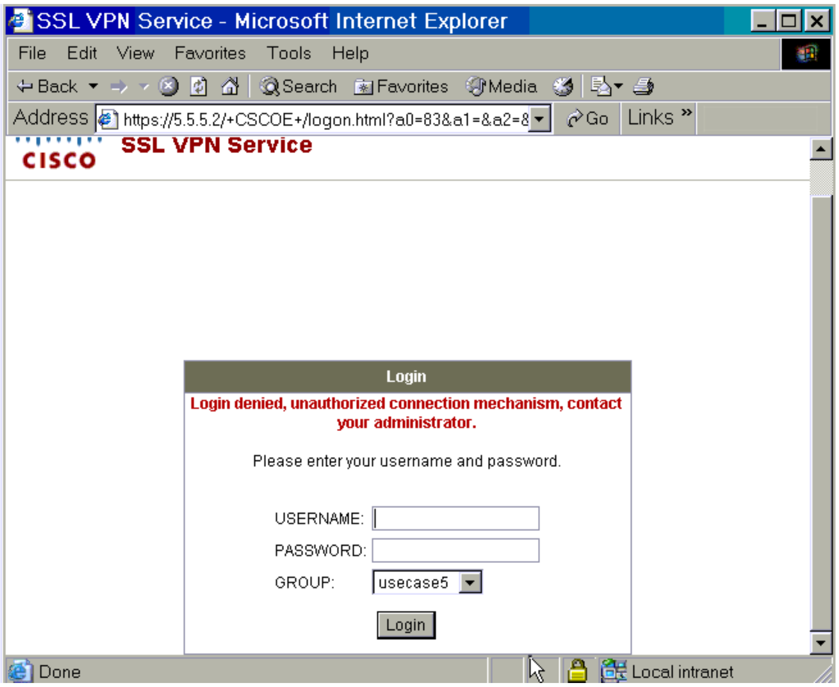
The following example enters the aaa server host configuration mode for the host *3.3.3.4*, in the AAA server group *MS_LDAP*, and associates the attribute map *tunneling_protocols* that you created in step 2:

```
hostname(config)# aaa-server MS_LDAP host 3.3.3.4
hostname(config-aaa-server-host)# ldap-attribute-map tunneling_protocols
```

Step 4 Verify the attribute map works as configured.

Using a PC as a remote user would, attempt connections using clientless SSL, the AnyConnect client, and the IPSec client. The clientless and AnyConnect connections should fail and the user should be informed that an unauthorized connection mechanism was the reason for the failed connection. The IPSec client should connect because IPSec is an allowed tunneling protocol according to attribute map.

Figure D-10 Login Denied Message for Clientless User



SSL VPN Service - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address https://5.5.5.2/+CSCOE+/logon.html?a0=83&a1=&a2=8
Go Links
CISCO
SSL VPN Service
Login

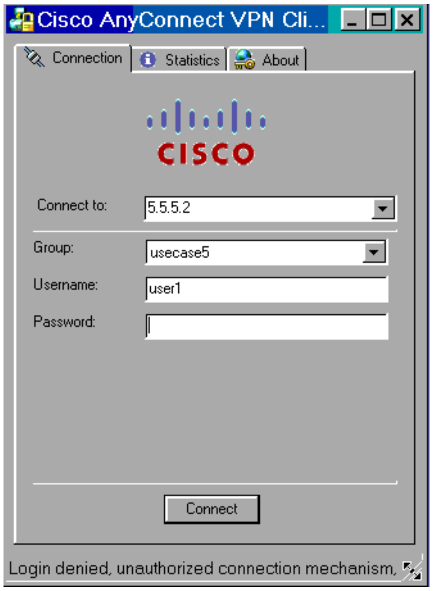
Login denied, unauthorized connection mechanism, contact your administrator.

Please enter your username and password.

USERNAME:
PASSWORD:
GROUP: usecase5

Login
Done
Local intranet

Figure D-11 Login Denied Message for AnyConnect Client User.



Connect to: 5.5.5.2
Group: usecase5
Username: user1
Password:

Login denied, unauthorized connection mechanism,

Enforcing Logon Hours and Time-of-Day Rules

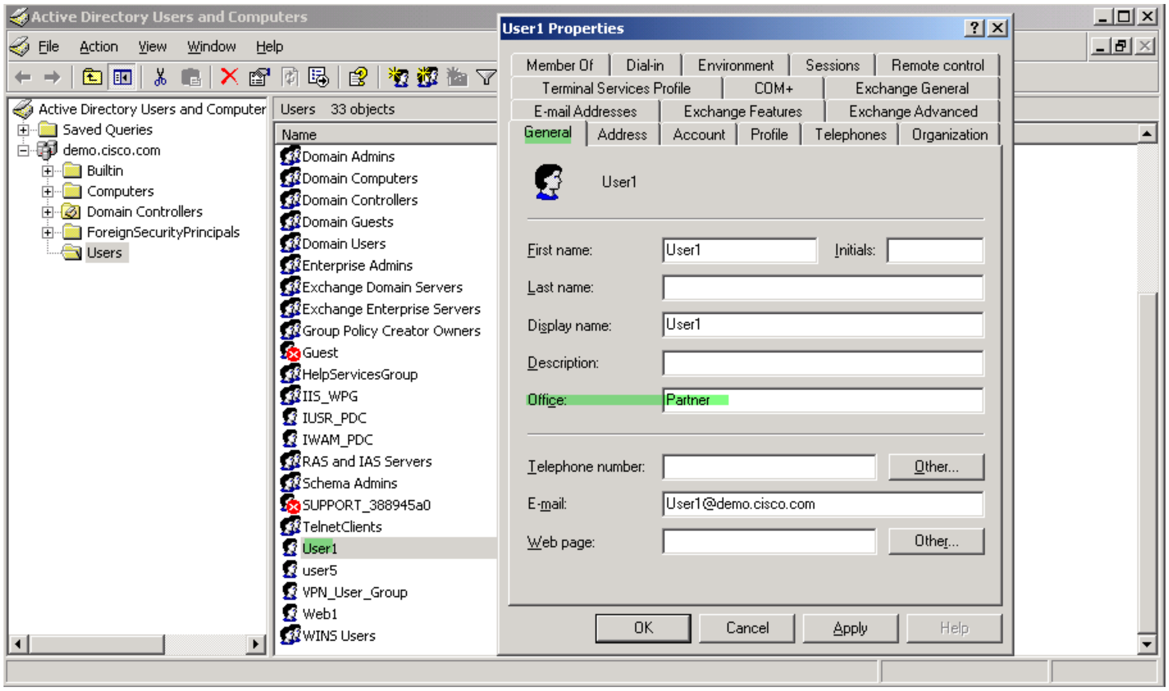
In this use case we configure and enforce the hours that a clientless SSL user is allowed to access the network. A good example of this is when you want to allow a business partner access to the network only during normal business hours.

For this case, on the AD server, we use the *Office* field to enter the name of the partner. This field uses the *physicalDeliveryOfficeName* attribute. Then we create an attribute map on the ASA to map that attribute to the Cisco attribute *Access-Hours.* During authentication, the ASA retrieves the value of physicalDeliveryOfficeName *(*the Office field*)* and maps it to Access-Hours.

Step 1 Configure the user attributes on the AD LDAP server.

Select the user. Right click on Properties. The Properties window displays (Figure D-12). For this case, we use the Office field of the General tab:

Figure D-12 Active Directory - Time-range



User1

First name: User1 Initials:

Last name:

Display name: User1

Description:

Office: Partner

Telephone number:

E-mail: User1@demo.cisco.com

Web page:

Step 2 Create an attribute map.

In this case we create the attribute map access_hours and map the AD attribute *physicalDeliveryOfficeName* used by the Office field to the Cisco attribute *Access-Hours*.

For example:

```
hostname(config)# ldap attribute-map access_hours
hostname(config-ldap-attribute-map)# map-name physicalDeliveryOfficeName Access-Hours
```

Step 3 Associate the LDAP attribute map to the AAA server.

The following example enters the aaa server host configuration mode for the host *3.3.3.4*, in the AAA server group *MS_LDAP*, and associates the attribute map *access_hours* that you created in step 2:

```
hostname(config)# aaa-server MS_LDAP host 3.3.3.4
hostname(config-aaa-server-host)# ldap-attribute-map access_hours
```

Step 4 Configure time ranges for each value allowed on the server. In this case, we entered Partner in the Office field for User1. Therefore, there must be a time range configured for Partner. The following example configures Partner access hours from 9am to 5pm Monday through Friday:

```
hostname(config)# time-range Partner
hostname(config-time-range)# periodic weekdays 09:00 to 17:00
```

Configuring an External RADIUS Server

This section presents an overview of the RADIUS configuration procedure and defines the Cisco RADIUS attributes. It includes the following topics:

- Reviewing the RADIUS Configuration Procedure, page D-30
- Security Appliance RADIUS Authorization Attributes, page D-30
- Security Appliance IETF RADIUS Authorization Attributes, page D-38

Reviewing the RADIUS Configuration Procedure

This section describes the RADIUS configuration steps required to support authentication and authorization of the ASA users. Follow these steps to set up the RADIUS server to inter operate with the ASA.

Step 1 Load the ASA attributes into the RADIUS server. The method you use to load the attributes depends on which type of RADIUS server you are using:

- If you are using Cisco ACS: the server already has these attributes integrated. You can skip this step.
- If you are using a FUNK RADIUS server: Cisco supplies a dictionary file that contains all the ASA attributes. Obtain this dictionary file, `cisco3k.dct`, from Software Center on CCO or from the ASA CD-ROM. Load the dictionary file on your server.
- For other vendors' RADIUS servers (for example, Microsoft Internet Authentication Service): you must manually define each ASA attribute. To define an attribute, use the attribute name or number, type, value, and vendor code (3076). For a list of ASA RADIUS authorization attributes and values, see

Step 2 Set up the users or groups with the permissions and attributes to send during IPSec or SSL tunnel establishment.

Security Appliance RADIUS Authorization Attributes

Authorization refers to the process of enforcing permissions or attributes. A RADIUS server defined as an authentication server enforces permissions or attributes if they are configured.

Table D-7 lists all the possible ASA supported RADIUS attributes that can be used for user authorization.

Note RADIUS attribute names do not contain the cVPN3000 prefix. Cisco Secure ACS 4.x supports this new nomenclature, but attribute names in pre-4.0 ACS releases still include the cVPN3000 prefix. The appliances enforce the RADIUS attributes based on attribute numeric ID, not attribute name. LDAP attributes are enforced by their name, not by the ID.

Table D-7 Security Appliance Supported RADIUS Attributes and Values

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
Access-Hours	Y	Y	Y	1	String	Single	Name of the time range, for example, Business-hours
Simultaneous-Logins	Y	Y	Y	2	Integer	Single	An integer 0 to 2147483647
Primary-DNS	Y	Y	Y	5	String	Single	An IP address
Secondary-DNS	Y	Y	Y	6	String	Single	An IP address
Primary-WINS	Y	Y	Y	7	String	Single	An IP address
Secondary-WINS	Y	Y	Y	8	String	Single	An IP address
SEP-Card-Assignment				9	Integer	Single	Not used
Tunneling-Protocols	Y	Y	Y	11	Integer	Single	1 = PPTP 2 = L2TP 4 = IPSec 8 = L2TP/IPSec 16 = WebVPN 4 and 8 are mutually exclusive; 0-11, 16-27, 32-43, 48-59 are legal values.
IPSec-Sec-Association	Y			12	String	Single	Name of the security association
IPSec-Authentication	Y			13	Integer	Single	0 = None 1 = RADIUS 2 = LDAP (authorization only) 3 = NT Domain 4 = SDI 5 = Internal 6 = RADIUS with Expiry 7 = Kerberos/Active Directory
Banner1	Y	Y	Y	15	String	Single	Banner string
IPSec-Allow-Passwd-Store	Y	Y	Y	16	Boolean	Single	0 = Disabled 1 = Enabled
Use-Client-Address	Y			17	Boolean	Single	0 = Disabled 1 = Enabled
PPTP-Encryption	Y			20	Integer	Single	Bitmap: 1 = Encryption required 2 = 40 bits 4 = 128 bits 8 = Stateless-Required 15= 40/128-Encr/Stateless-Req

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
L2TP-Encryption	Y			21	Integer	Single	Bitmap: 1 = Encryption required 2 = 40 bit 4 = 128 bits 8 = Stateless-Req 15= 40/128-Encr/Stateless-Req
Group-Policy		Y	Y	25	String	Single	Sets the group policy for the remote access VPN session. For version 8.2 and later, use this attribute instead of IETF-Radius-Class. You can use one of the three following formats: • <group policy name> • OU=<group policy name> • OU=<group policy name>;
IPSec-Split-Tunnel-List	Y	Y	Y	27	String	Single	Specifies the name of the network/access list that describes the split tunnel inclusion list
IPSec-Default-Domain	Y	Y	Y	28	String	Single	Specifies the single default domain name to send to the client (1-255 characters)
IPSec-Split-DNS-Names	Y	Y	Y	29	String	Single	Specifies the list of secondary domain names to send to the client (1-255 characters)
IPSec-Tunnel-Type	Y	Y	Y	30	Integer	Single	1 = LAN-to-LAN 2 = Remote access
IPSec-Mode-Config	Y	Y	Y	31	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-User-Group-Lock	Y			33	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Over-UDP	Y	Y	Y	34	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Over-UDP-Port	Y	Y	Y	35	Integer	Single	4001 - 49151, default = 10000
Banner2	Y	Y	Y	36	String	Single	A banner string that is concatenated to the Banner1 string, if configured.
PPTP-MPPC-Compression	Y			37	Integer	Single	0 = Disabled 1 = Enabled

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
L2TP-MPPC-Compression	Y			38	Integer	Single	0 = Disabled 1 = Enabled
IPSec-IP-Compression	Y	Y	Y	39	Integer	Single	0 = Disabled 1 = Enabled
IPSec-IKE-Peer-ID-Check	Y	Y	Y	40	Integer	Single	1 = Required 2 = If supported by peer certificate 3 = Do not check
IKE-Keep-Alives	Y	Y	Y	41	Boolean	Single	0 = Disabled 1 = Enabled
IPSec-Auth-On-Rekey	Y	Y	Y	42	Boolean	Single	0 = Disabled 1 = Enabled
Required-Client- Firewall-Vendor-Code	Y	Y	Y	45	Integer	Single	1 = Cisco Systems (with Cisco Integrated Client) 2 = Zone Labs 3 = NetworkICE 4 = Sygate 5 = Cisco Systems (with Cisco Intrusion Prevention Security Agent)
Required-Client-Firewall-Product-Code	Y	Y	Y	46	Integer	Single	Cisco Systems Products: 1 = Cisco Intrusion Prevention Security Agent or Cisco Integrated Client (CIC) Zone Labs Products: 1 = Zone Alarm 2 = Zone AlarmPro 3 = Zone Labs Integrity NetworkICE Product: 1 = BlackIce Defender/Agent Sygate Products: 1 = Personal Firewall 2 = Personal Firewall Pro 3 = Security Agent
Required-Client-Firewall-Description	Y	Y	Y	47	String	Single	String
Require-HW-Client-Auth	Y	Y	Y	48	Boolean	Single	0 = Disabled 1 = Enabled
Required-Individual-User-Auth	Y	Y	Y	49	Integer	Single	0 = Disabled 1 = Enabled
Authenticated-User-Idle-Timeout	Y	Y	Y	50	Integer	Single	1-35791394 minutes

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
Cisco-IP-Phone-Bypass	Y	Y	Y	51	Integer	Single	0 = Disabled 1 = Enabled
IPSec-Split-Tunneling-Policy	Y	Y	Y	55	Integer	Single	0 = No split tunneling 1 = Split tunneling 2 = Local LAN permitted
IPSec-Required-Client-Firewall-Capability	Y	Y	Y	56	Integer	Single	0 = None 1 = Policy defined by remote FW Are-You-There (AYT) 2 = Policy pushed CPP 4 = Policy from server
IPSec-Client-Firewall-Filter-Name	Y			57	String	Single	Specifies the name of the filter to be pushed to the client as firewall policy
IPSec-Client-Firewall-Filter-Optional	Y	Y	Y	58	Integer	Single	0 = Required 1 = Optional
IPSec-Backup-Servers	Y	Y	Y	59	String	Single	1 = Use Client-Configured list 2 = Disable and clear client list 3 = Use Backup Server list
IPSec-Backup-Server-List	Y	Y	Y	60	String	Single	Server Addresses (space delimited)
DHCP-Network-Scope	Y	Y	Y	61	String	Single	IP Address
Intercept-DHCP-Configure-Msg	Y	Y	Y	62	Boolean	Single	0 = Disabled 1 = Enabled
MS-Client-Subnet-Mask	Y	Y	Y	63	Boolean	Single	An IP address
Allow-Network-Extension-Mode	Y	Y	Y	64	Boolean	Single	0 = Disabled 1 = Enabled
Authorization-Type	Y	Y	Y	65	Integer	Single	0 = None 1 = RADIUS 2 = LDAP
Authorization-Required	Y			66	Integer	Single	0 = No 1 = Yes
Authorization-DN-Field	Y	Y	Y	67	String	Single	Possible values: UID, OU, O, CN, L, SP, C, EA, T, N, GN, SN, I, GENQ, DNQ, SER, use-entire-name
IKE-KeepAlive-Confidence-Interval	Y	Y	Y	68	Integer	Single	10-300 seconds
WebVPN-Content-Filter-Parameters	Y	Y		69	Integer	Single	1 = Java ActiveX 2 = Java Script 4 = Image 8 = Cookies in images

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
WebVPN-URL-List		Y		71	String	Single	URL-List name
WebVPN-Port-Forward-List		Y		72	String	Single	Port-Forward list name
WebVPN-Access-List		Y		73	String	Single	Access-List name
Cisco-LEAP-Bypass	Y	Y	Y	75	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Homepage	Y	Y		76	String	Single	A URL such as http://example-portal.com
Client-Type-Version-Limiting	Y	Y	Y	77	String	Single	IPSec VPN version number string
WebVPN-Port-Forwarding-Name	Y	Y		79	String	Single	String name (example, “Corporate-Apps”). This text replaces the default string, “Application Access,” on the clientless portal home page.
IE-Proxy-Server	Y			80	String	Single	IP address
IE-Proxy-Server-Policy	Y			81	Integer	Single	1 = No Modify 2 = No Proxy 3 = Auto detect 4 = Use Concentrator Setting
IE-Proxy-Exception-List	Y			82	String	Single	newline (\n) separated list of DNS domains
IE-Proxy-Bypass-Local	Y			83	Integer	Single	0 = None 1 = Local
IKE-Keepalive-Retry-Interval	Y	Y	Y	84	Integer	Single	2 - 10 seconds
Tunnel-Group-Lock		Y	Y	85	String	Single	Name of the tunnel group or “none”
Access-List-Inbound		Y	Y	86	String	Single	Access list ID
Access-List-Outbound		Y	Y	87	String	Single	Access list ID
Perfect-Forward-Secrecy-Enable	Y	Y	Y	88	Boolean	Single	0 = No 1 = Yes
NAC-Enable	Y			89	Integer	Single	0 = No 1 = Yes
NAC-Status-Query-Timer	Y			90	Integer	Single	30 - 1800 seconds
NAC-Revalidation-Timer	Y			91	Integer	Single	300 - 86400 seconds
NAC-Default-ACL	Y			92	String		Access list
WebVPN-URL-Entry-Enable	Y	Y		93	Integer	Single	0 = Disabled 1 = Enabled

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
WebVPN-File-Access-Enable	Y	Y		94	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-File-Server-Entry-Enable	Y	Y		95	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-File-Server-Browsing-Enable	Y	Y		96	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Port-Forwarding-Enable	Y	Y		97	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Outlook-Exchange-Proxy-Enable	Y	Y		98	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Port-Forwarding-HTTP-Proxy	Y	Y		99	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Auto-Applet-Download-Enable	Y	Y		100	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Citrix-Metaframe-Enable	Y	Y		101	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-Apply-ACL	Y	Y		102	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-SSL-VPN-Client-Enable	Y	Y		103	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-SSL-VPN-Client-Required	Y	Y		104	Integer	Single	0 = Disabled 1 = Enabled
WebVPN-SSL-VPN-Client-Keep-Installation	Y	Y		105	Integer	Single	0 = Disabled 1 = Enabled
SVC-Keepalive	Y	Y		107	Integer	Single	0 = Off 15 - 600 seconds
SVC-DPD-Interval-Client	Y	Y		108	Integer	Single	0 = Off 5 - 3600 seconds
SVC-DPD-Interval-Gateway	Y	Y		109	Integer	Single	0 = Off) 5 - 3600 seconds
SVC-Rekey-Time		Y		110	Integer	Single	0 = Disabled 1- 10080 minutes
WebVPN-Deny-Message		Y		116	String	Single	Valid string(up to 500 characters)
Extended-Authentication-On-Rekey		Y	Y	122	Integer	Single	0 = Disabled 1 = Enabled
SVC-DTLS		Y		123	Integer	Single	0 = False 1 = True

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
SVC-MTU		Y		125	Integer	Single	MTU value 256 - 1406 in bytes
SVC-Modules		Y		127	String	Single	String (name of a module)
SVC-Profiles		Y		128	String	Single	String (name of a profile)
SVC-Ask		Y		131	String	Single	0 = Disabled 1 = Enabled 3 = Enable default service 5 = Enable default clientless (2 and 4 not used)
SVC-Ask-Timeout		Y		132	Integer	Single	5 - 120 seconds
IE-Proxy-PAC-URL		Y		133	String	Single	PAC Address String
Strip-Realm	Y	Y	Y	135	Boolean	Single	0 = Disabled 1 = Enabled
Smart-Tunnel		Y		136	String	Single	Name of a Smart Tunnel
WebVPN-ActiveX-Relay		Y		137	Integer	Single	0 = Disabled Otherwise = Enabled
Smart-Tunnel-Auto		Y		138	Integer	Single	0 = Disabled 1 = Enabled 2 = AutoStart
Smart-Tunnel-Auto-Signon-Enable		Y		139	String	Single	Name of a Smart Tunnel Auto Signon list appended by the domain name
VLAN		Y		140	Integer	Single	0 - 4094
NAC-Settings		Y		141	String	Single	Name of NAC policy
Member-Of		Y	Y	145	String	Single	Comma delimited string, for example: `Engineering, Sales` This is an administrative attribute that can be used in dynamic access policies. It does not set a group policy.
Address-Pools		Y	Y	217	String	Single	Name of IP local pool
IPv6-Address-Pools		Y		218	String	Single	Name of IP local pool-IPv6
IPv6-VPN-Filter		Y		219	String	Single	ACL value
Privilege-Level		Y	Y	220	Integer	Single	An integer between 0 and 15.

Table D-7 Security Appliance Supported RADIUS Attributes and Values (continued)

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
WebVPN-Macro-Value1		Y		223	String	Single	Unbounded. See the *SSL VPN Deployment Guide* for examples and use cases at this URL: http://supportwiki.cisco.com/ViewWiki/index.php/Cisco_ASA_5500_SSL_VPN_Deployment_Guide%2C_Version_8.x
WebVPN-Macro-Value2		Y		224	String	Single	Unbounded. See the *SSL VPN Deployment Guide* for examples and use cases at this URL: http://supportwiki.cisco.com/ViewWiki/index.php/Cisco_ASA_5500_SSL_VPN_Deployment_Guide%2C_Version_8.x

Security Appliance IETF RADIUS Authorization Attributes

Table D-8 list all the possible IETF Radius attributes.

Table D-8 Security Appliance Supported IETF RADIUS Attributes and Values

Attribute Name	VPN 3000	ASA	PIX	Attr. #	Syntax/ Type	Single or Multi-Valued	Description or Value
IETF-Radius-Class	Y	Y	Y	25		Single	Sets the group policy for the remote access VPN session. For 8.2 and later, we recommend that you use the Group-Policy attribute. You can use one of the three following formats: • <group policy name> • OU=<group policy name> • OU=<group policy name>;
IETF-Radius-Filter-Id	Y	Y	Y	11	String	Single	Access list name that is defined on the ASA. This applies only to full tunnel IPsec and SSL VPN clients
IETF-Radius-Framed-IP-Address	Y	Y	Y	n/a	String	Single	An IP address
IETF-Radius-Framed-IP-Netmask	Y	Y	Y	n/a	String	Single	An IP address mask
IETF-Radius-Idle-Timeout	Y	Y	Y	28	Integer	Single	seconds

Table D-8 Security Appliance Supported IETF RADIUS Attributes and Values

IETF-Radius-Service-Type	Y	Y	Y	6	Integer	Single	seconds. Possible Service Type values: .Administrative—user is allowed access to configure prompt. .NAS-Prompt—user is allowed access to exec prompt. .remote-access—user is allowed network access
IETF-Radius-Session-Timeout	Y	Y	Y	27	Integer	Single	seconds

Configuring an External TACACS+ Server

The ASA provides support for TACACS+ attributes. TACACS+ separates the functions of authentication, authorization, and accounting. The protocol supports two types of attributes: mandatory and optional. Both the server and client must understand a mandatory attribute, and the mandatory attribute must be applied to the user. An optional attribute may or may not be understood or used.

Note To use TACACS+ attributes, make sure you have enabled AAA services on the NAS.

Table D-9 lists supported TACACS+ authorization response attributes for cut-through-proxy connections. Table D-10 lists supported TACACS+ accounting attributes.

Table D-9 Supported TACACS+ Authorization Response Attributes

Attribute	Description
acl	Identifies a locally configured access list to be applied to the connection.
idletime	Indicates the amount of inactivity in minutes that is allowed before the authenticated user session is terminated.
timeout	Specifies the absolute amount of time in minutes that authentication credentials remain active before the authenticated user session is terminated.

Table D-10 Supported TACACS+ Accounting Attributes

Attribute	Description
bytes_in	Specifies the number of input bytes transferred during this connection (stop records only).
bytes_out	Specifies the number of output bytes transferred during this connection (stop records only).
cmd	Defines the command executed (command accounting only).
disc-cause	Indicates the numeric code that identifies the reason for disconnecting (stop records only).
elapsed_time	Defines the elapsed time in seconds for the connection (stop records only).

Table D-10 Supported TACACS+ Accounting Attributes (continued)

Attribute	Description
foreign_ip	Specifies the IP address of the client for tunnel connections. Defines the address on the lowest security interface for cut-through-proxy connections.
local_ip	Specifies the IP address that the client connected to for tunnel connections. Defines the address on the highest security interface for cut-through-proxy connections.
NAS port	Contains a session ID for the connection.
packs_in	Specifies the number of input packets transferred during this connection.
packs_out	Specifies the number of output packets transferred during this connection.
priv-level	Set to the user’s privilege level for command accounting requests or to 1 otherwise.
rem_iddr	Indicates the IP address of the client.
service	Specifies the service used. Always set to “shell” for command accounting only.
task_id	Specifies a unique task ID for the accounting transaction.
username	Indicates the name of the user.

APPENDIX E

Configuring the Adaptive Security Appliance for Use with MARS

MARS centrally aggregates logs and events from various network devices, including ASAs, which you can analyze for use in threat mitigation. MARS supports the following ASA versions: 7.0(7), 7.2(2), 7.2(3), 8.0(2), and 8.2(1).

This appendix describes how to configure the ASA and add it to MARS as a reporting device, and includes the following sections:

- Taskflow for Configuring MARS to Monitor Adaptive Security Appliances, page E-1
- Enabling Administrative Access to MARS on the Adaptive Security Appliance, page E-2
- Adding an Adaptive Security Appliance to Monitor, page E-3
- Setting the Logging Severity Level for Syslog Messages, page E-5
- Syslog Messages That Are Processed by MARS, page E-5
- Configuring Specific Features, page E-7

For more information about configuring devices and software to work with MARS, see the *Supported and Interoperable Devices and Software for Cisco Security MARS Local Controller* document and the *User Guide for Cisco Security MARS Local Controller*.

Taskflow for Configuring MARS to Monitor Adaptive Security Appliances

The taskflow for configuring MARS to monitor the ASA includes the following steps:

1. Configure the ASA to accept administrative sessions from MARS to discover settings. Configure this setting in the admin context.
2. Configure the ASA to publish its syslog messages to MARS. Configure this setting for the admin context and for each security context defined.

Note Each context requires a unique, routable IP address for sending syslog messages to MARS, and each context must have a unique name (usually in the *hostname.domain* name format).

3. To enable MARS to accept syslog message event data and to collect configuration settings from the ASA, perform the following tasks:
   - Enable logging for one or more interfaces.
   - Select the logging facility and queue size.

  - Specify the logging severity level as debugging (7) or indicate the desired severity level.
  - Identify the target MARS appliance, and the protocol and port pair on which it listens.

4. Within the MARS web interface, perform the following steps:
   - Define the ASA by providing the administrative connection information.
   - Define security contexts. For more information, see the "Adding Security Contexts" section on page E-4.
   - Add discovered contexts. For more information, see the "Adding Discovered Contexts" section on page E-4.
   - Edit discovered contexts. For more information, see the "Editing Discovered Contexts" section on page E-5.

Enabling Administrative Access to MARS on the Adaptive Security Appliance

To enable administrative access to MARS on the ASA, perform the following steps:

Step 1 To enable the MARS appliance to discover the ASA settings through SSH access, enter the following commands:

```
hostname# crypto key generate rsa modulus modulus
```

where *modulus* is the RSA modulus size specified in bits

```
hostname# ssh mars_ip netmask of the mars_ip interface name
```

where *mars_ip* is the IP address of the MARS appliance, *netmask of the mars_ip* is the netmask of the MARS appliance, and *interface name* can be inside, outside, or DMZ.

Step 2 To enable the MARS appliance to discover the ASA settings through Telnet access, enter the following command:

```
hostname# telnet mars_ip netmask of the mars_ip interface name
```

where *mars_ip* is the IP address of the MARS appliance, *netmask of the mars_ip* is the netmask of the MARS appliance, and *interface name* can be inside, outside, or DMZ.

Step 3 To enable the MARS appliance to discover the ASA settings through FTP access, make sure that you have added the MARS appliance configuration file to an FTP server.

Note If you choose the FTP access type, the MARS appliance cannot discover the non-admin context settings. Therefore, we do not recommend using this access type.

Step 4 To enable MARS to act as a target logging host, configure the ASA to publish syslog messages to MARS by entering the following commands:

```
hostname(config)# logging host interface name mars_ip
```

where *mars_ip* is the IP address of the MARS appliance and *interface name* can be inside, outside, or DMZ.

```
hostname(config)# logging trap 7
```

```
hostname(config)# logging enable
```

Note Make sure that you set the logging severity level to 7 (debugging), or configure the ASA to generate the desired set of syslog messages. The logging severity level generates the syslog message details that are required to track session-specific data.

Debugging messages are recommended for troubleshooting. The debugging logging severity level includes all alert, critical, error, warning, notification, and informational messages. This logging severity level also generates logs that identify the commands that are issued during FTP sessions and the URLs that are requested during HTTP sessions. If the ASA cannot sustain debugging-level messages because of performance considerations, use the informational logging severity level (6). For more information, see the "Setting the Logging Severity Level for Syslog Messages" section on page E-5.

In addition, do not use the EMBLEM format for syslog messages.

Step 5 To allow MARS to discover CPU usage and related information, enable the SNMP RO community string for the ASA by entering the following command:

```
hostname(config)# snmp-server host interface mars_ip poll community community
```

where *interface* can be inside, outside, or DMZ, *mars_ip* is the IP address of the MARS appliance, and *community* is the SNMP RO community string.

Step 6 Repeat Step 4 for each admin context and security context defined.

Adding an Adaptive Security Appliance to Monitor

Events that are published by a reporting device (the ASA) to MARS are not inspected until the reporting IP address of the ASA is defined in the MARS web interface.

To add an ASA to monitor, perform the following steps:

Step 1 In the MARS web interface, click **Admin > System Setup > Security and Monitor Devices > Add**.

Step 2 Choose the correct version of the ASA from the Device Type drop-down list. The basic device type represents the admin context.

Step 3 Specify values for the following Device Access fields:

Tip To enable SSH discovery, the MARS appliance must authenticate to the ASA. The default username is "pix" and the password is the one that you specified for the **password** command (unless you use AAA).

- Device Name, which MARS maps to the reporting IP address
- Access IP, which is usually the same as the reporting IP address
- Reporting IP, which is the interface that publishes syslog messages or SNMP notifications, or both
- Access Type
- Login
- Password

- Enable Password
- (Optional) SNMP RO, which allows MARS to retrieve MIBs that are related to CPU usage and network usage
- (Optional) Monitor Resource Usage (requires the SNMP RO setting), which allows MARS to monitor for anomalous consumption of resources, such as memory and CPU

Step 4 Click **Discover** to determine the ASA settings, including any security contexts and their settings.

Step 5 Click **Submit** to save these settings in the MARS database.

Step 6 Click **Activate to load these settings into the MARS appliance working memory**.

Step 7 Choose **Summary > Dashboard**.

Step 8 Under the Hotspot Graph, click **Full Topology Graph**, and verify that the selected ASA appears.

Adding Security Contexts

To add security contexts, perform the following steps:

Step 1 In the MARS web interface, click **Add Module**.

Step 2 Choose the correct version of the ASA from the Device Type drop-down list.

Step 3 Enter the name of the ASA in the Device Name field.

Step 4 Enter the name of the security context in the Context Name field. This name must match the context name defined on the ASA.

Step 5 Enter the IP address of the security context from which syslog messages or SNMP notifications, or both are published in the Reporting IP field.

Step 6 (Optional) Enter the ASA read-only community string in the SNMP RO Community field.

Step 7 Click **Discover** to discover the settings of the defined security context. MARS collects all route, NAT, and ACL-related information.

Step 8 Click **Submit** to save these settings in the MARS database.

Adding Discovered Contexts

To add discovered contexts, perform the following steps:

Step 1 In the MARS web interface, click **Add Available Module**.

Step 2 Choose the security context from the Select drop-down list, and click **Add**.

Step 3 Click **Submit** to save these settings in the MARS database.

Step 4 Repeat these steps for each discovered context.

Editing Discovered Contexts

To edit discovered contexts, perform the following steps:

Step 1 In the MARS web interface, choose the discovered context that you want to edit according to the selected device type.

Step 2 Click **Edit Module**.

Step 3 Enter the IP address from which the syslog messages of the security context are sent in the Reporting IP field.

Step 4 (Optional) Enter the ASA read-only community string in the SNMP RO Community field.

Step 5 (Optional) To enable MARS to monitor this context for anomalous resource usage, click **Yes** from the Monitor Resource Usage list.

Step 6 Click **Submit** to save these settings in the MARS database.

Step 7 Repeat these steps for each discovered context.

Setting the Logging Severity Level for Syslog Messages

You can change the logging severity level of the required syslog messages or turn off specific syslog messages using the **logging message** command. For more information, see Chapter 74, “Configuring Logging.”

Syslog Messages That Are Processed by MARS

MARS can correctly parse syslog messages at customized logging severity levels. Therefore, you can set syslog messages to a lower logging severity level (for example, logging severity level 6). By changing the logging severity level for syslog messages, you can reduce the logging load on the ASA by 5-15%. However, the primary consumer of resources are the session detail events.

MARS processes the following syslog messages, which are required for correct sessionization. If you change the logging severity level of the ASA, make sure that these syslog messages are generated at the new logging severity level so that the MARS appliance can receive them.

Table E-1 lists the syslog message classes, their definitions, and the ranges of syslog message numbers that are processed by MARS.

Table E-1 Syslog Message Classes and Associated Message Numbers

Class	Definition	Syslog Message Numbers
auth	User Authentication	109001-109003, 109005-109008, 109010-109014, 109016-109034, 113001, 113003-113020, 114001-114020, 611101-611104, 611301-611323
bridge	Transparent Firewall	110001
ca	PKI Certification Authority	717001-717019, 717021-717038

Table E-1 Syslog Message Classes and Associated Message Numbers (continued)

Class (continued)	Definition	Syslog Message Numbers
config	Command Interface	111001, 111003-111005, 111007-111009, 111111, 112001, 208005, 308001-308002, 504001-504002, 505001-505013, 506001
e-mail	E-mail Proxy	719001-719026
dap	Dynamic Access Policies	734
ha	High Availability (Failover)	101001-101005, 102001, 103001-103005, 104001-104004, 105001-105011, 105020-105021, 105031-105032, 105034-105040, 105042-105048, 210001-210003, 210005-210008, 210010, 210020-210022, 311001-311004, 709001-709007
ip	IP Stack	209003-209005, 215001, 313001, 313003-313005, 313008, 317001-317005, 322001-322004, 323001-323006, 324000-324007, 324300-324301, 325001-325003, 326001-326002, 326004-326017, 326019-326028, 327001-327003, 328001, 329001, 331001-331002, 332003-332004, 333001-333010, 334001-334008, 335001-335014, 408001-408003, 410001-410004, 411001-411004, 412001-412002, 413001-413004, 416001, 417001, 417004, 417006, 417008-417009, 418001, 419001-419002, 421001-421007, 422004-422006, 423001-423005, 424001-424002, 431001-431002, 450001, 507001-507002, 508001-508002, 509001
ipaa	IP Address Assignment	735
ips	Intrusion Protection Service	400000-400050, 401001-401005, 415001-415020, 420001-420003
np	Network Processor	319001-319004
npssl	NP SSL	725001-725014
ospf	OSPF Routing	318001-318009, 409001-409013, 409023, 503001, 613001-613003
rip	RIP Routing	107001-107003, 312001
rm	Resource Manager	321001-321004
session	User Session	106001-106002, 106006-106007, 106010-106027, 106100-106101, 108002-108003, 108005, 201002-201006, 201008-201013, 202001, 201005, 202011, 204001, 302001, 302003-302004, 302007-302010, 302012-302023, 302302, 303002-303005, 304001-304009, 305005-305012, 314001, 405001-405002, 405101-405107, 405201, 405300-405301, 406001-406002, 407001-407003, 500001-500004, 502101-502103, 502111-502112, 607001-607002, 608001-608005, 609001-609002, 616001, 617001-617004, 620001-620002, 621001-621003, 621006-621010, 622001, 622101-622102, 703001-703002, 710001-710006, 726001

Table E-1 Syslog Message Classes and Associated Message Numbers (continued)

Class (continued)	Definition	Syslog Message Numbers
snmp	SNMP	212001-212006
sys	System	199001-199003, 199005-199009, 211001, 211003, 216003, 217001, 218001-218004, 219002, 315004, 315011, 414001-414002, 604101-604104, 605004-605005, 606001-606004, 610001-610002, 610101, 612001-612003, 614001-614002, 615001-615002, 701001-701002, 711001-711002
vpdn	PPTP and L2TP Sessions	213001-213004, 403101-403104, 403106-403110, 403500-403507, 603101-603109
vpn	IKE and IPSec	316001, 320001, 402101-402103, 402106, 402114-402120, 402123, 404101-404102, 501101, 602101-602104, 602201-602203, 602301-602304, 702201-702212, 702301-702303, 702305, 702307, 713004, 713006, 713008-713010, 713012, 713014, 713016-713018, 713020, 713022, 713024-713037, 713039-713043, 713047-713052, 713056, 713059-713063, 713065-713066, 713068, 713072-713076, 713078, 713081-713086, 713088, 713092, 713094, 713098-713099, 713102-713105, 713107, 713109, 713112-713124, 713127-713149, 713152, 713154-713172, 713174, 713176-713179, 713182, 713184-713187, 713189-713190, 713193-713199, 713203-713206, 713208-713226, 713228-713251, 713900-713906, 714001-714007, 714011, 715001, 715004-715009, 715013, 715019-715022, 715027-715028, 715033-715042, 715044-715072, 715074-715079
vpnc	VPN Client	611101-611104, 611301-611323, 722001-722038
vpnfo	VPN Failover	720001-720073
vpnlb	VPN Load Balancing	718001-718081, 718084-718088
webvpn	Web-based VPN	716001-716056, 723001-723014, 724001-724002

Configuring Specific Features

You can configure ASAs to act as reporting devices and manual mitigation devices, because they perform multiple roles on your network. MARS can benefit from configuration of the following features:

- The built-in IDS and IPS signature matching features can be critical in detecting an attempted attack.
- The logging of accepted, as well as denied sessions, aids in false positive analysis.
- Administrative access ensures that MARS can obtain critical data, including the following:
  - *Route and ARP tables*, which aid in network discovery and MAC address mapping.
  - *NAT and PAT translation tables*, which aid in address resolution and attack path analysis, and expose the actual instigator of attacks.

  - *OS settings*, from which MARS determines the correct ACLs to block detected attacks, which you can use in a management session with the ASA.

GLOSSARY

Numerics | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X

Numerics

3DES	See DES.

A

AAA	Authentication, authorization, and accounting. See also TACACS+ and RADIUS.
ABR	Area Border Router. In OSPF, a router with interfaces in multiple areas.
ACE	Access Control Entry. Information entered into the configuration that lets you specify what type of traffic to permit or deny on an interface. By default, traffic that is not explicitly permitted is denied.
Access Modes	The ASA CLI uses several command modes. The commands available in each mode vary. See also user EXEC mode, privileged EXEC mode, global configuration mode, command-specific configuration mode.
ACL	Access Control List. A collection of ACEs. An ACL lets you specify what type of traffic to allow on an interface. By default, traffic that is not explicitly permitted is denied. ACLs are usually applied to the interface which is the source of inbound traffic. See also rule, outbound ACL.
ActiveX	A set of object-oriented programming technologies and tools used to create mobile or portable programs. An ActiveX program is roughly equivalent to a Java applet.
Address Resolution Protocol	See ARP.
address translation	The translation of a network address and/or port to another network address/or port. See also IP address, interface PAT, NAT, PAT, Static PAT, xlate.
AES	Advanced Encryption Standard. A symmetric block cipher that can encrypt and decrypt information. The AES algorithm is capable of using cryptographic keys of 128, 192 and 256 bits to encrypt and decrypt data in blocks of 128 bits. See also DES.
AH	Authentication Header. An IP protocol (type 51) that can ensure data integrity, authentication, and replay detection. AH is embedded in the data to be protected (a full IP datagram, for example). AH can be used either by itself or with ESP. This is an older IPSec protocol that is less important in most networks than ESP. AH provides authentication services but does not provide encryption services. It is provided to ensure compatibility with IPSec peers that do not support ESP, which provides both authentication and encryption. See also encryption and VPN. Refer to the RFC 2402.
AIP	Advanced Inspection and Prevention. For example, the AIP SSM or AIP SSC, which runs IPS software.

A record address	"A" stands for address, and refers to name-to-address mapped records in DNS.
APCF	Application Profile Customization Framework. Lets the security appliance handle non-standard applications so that they render correctly over a WebVPN connection.
ARP	Address Resolution Protocol. A low-level TCP/IP protocol that maps a hardware address, or MAC address, to an IP address. An example hardware address is 00:00:a6:00:01:ba. The first three groups of characters (00:00:a6) identify the manufacturer; the rest of the characters (00:01:ba) identify the system card. ARP is defined in RFC 826.
ASA	Adaptive Security Algorithm. Used by the ASA to perform inspections. ASA allows one-way (inside to outside) connections without an explicit configuration for each internal system and application. See also inspection engine.
ASA	adaptive ASA.
ASDM	Adaptive Security Device Manager. An application for managing and configuring a single ASA.
asymmetric encryption	Also called public key systems, asymmetric encryption allows anyone to obtain access to the public key of anyone else. Once the public key is accessed, one can send an encrypted message to that person using the public key. See also encryption, public key.
authentication	Cryptographic protocols and services that verify the identity of users and the integrity of data. One of the functions of the IPSec framework. Authentication establishes the integrity of datastream and ensures that it is not tampered with in transit. It also provides confirmation about the origin of the datastream. See also AAA, encryption, and VPN.
Auto Applet Download	Automatically downloads the WebVPN port-forwarding applet when the user first logs in to WebVPN.
auto-signon	This command provides a single sign-on method for WebVPN users. It passes the WebVPN login credentials (username and password) to internal servers for authentication using NTLM authentication, basic authentication, or both.

B

Backup Server	IPSec backup servers let a VPN client connect to the central site when the primary security appliance is unavailable.
BGP	Border Gateway Protocol. BGP performs interdomain routing in TCP/IP networks. BGP is an Exterior Gateway Protocol, which means that it performs routing between multiple autonomous systems or domains and exchanges routing and access information with other BGP systems. The ASA does not support BGP. See also EGP.
BLT stream	Bandwidth Limited Traffic stream. Stream or flow of packets whose bandwidth is constrained.
BOOTP	Bootstrap Protocol. Lets diskless workstations boot over the network as is described in RFC 951 and RFC 1542.
BPDU	Bridge Protocol Data Unit. Spanning-Tree Protocol hello packet that is sent out at configurable intervals to exchange information among bridges in the network. Protocol data unit is the OSI term for packet.

C

CA	Certificate Authority, Certification Authority. A third-party entity that is responsible for issuing and revoking certificates. Each device with the public key of the CA can authenticate a device that has a certificate issued by the CA. The term CA also refers to software that provides CA services. See also certificate, CRL, public key, RA.
cache	A temporary repository of information accumulated from previous task executions that can be reused, decreasing the time required to perform the tasks. Caching stores frequently reused objects in the system cache, which reduces the need to perform repeated rewriting and compressing of content.
CBC	Cipher Block Chaining. A cryptographic technique that increases the encryption strength of an algorithm. CBC requires an initialization vector (IV) to start encryption. The IV is explicitly given in the IPSec packet.
certificate	A signed cryptographic object that contains the identity of a user or device and the public key of the CA that issued the certificate. Certificates have an expiration date and may also be placed on a CRL if known to be compromised. Certificates also establish non-repudiation for IKE negotiation, which means that you can prove to a third party that IKE negotiation was completed with a specific peer.
CHAP	Challenge Handshake Authentication Protocol.
CIFS	Common Internet File System. It is a platform-independent file sharing system that provides users with network access to files, printers, and other machine resources. Microsoft implemented CIFS for networks of Windows computers, however, open source implementations of CIFS provide file access to servers running other operating systems, such as Linux, UNIX, and Mac OS X.
Citrix	An application that virtualizes client-server applications and optimizes web applications.
CLI	command line interface. The primary interface for entering configuration and monitoring commands to the ASA.
client/server computing	Distributed computing (processing) network systems in which transaction responsibilities are divided into two parts: client (front end) and server (back end). Also called distributed computing. See also RPC.
Client update	Lets you update revisions of clients to which the update applies; provide a URL or IP address from which to get the update; and, in the case of Windows clients, optionally notify users that they should update their VPN client version.
command-specific configuration mode	From global configuration mode, some commands enter a command-specific configuration mode. All user EXEC, privileged EXEC, global configuration, and command-specific configuration commands are available in this mode. See also global configuration mode, privileged EXEC mode, user EXEC mode.
Compression	The process of encoding information using fewer bits or other information-bearing units than an unencoded representation would use. Compression can reduce the size of transferring packets and increase communication performance.
configuration, config, config file	A file on the ASA that represents the equivalent of settings, preferences, and properties administered by ASDM or the CLI.

Content Rewriting/Transformation	Interprets and modifies applications so that they render correctly over a WebVPN connection.
cookie	A cookie is a object stored by a browser. Cookies contain information, such as user preferences, to persistent storage.
CPU	Central Processing Unit. Main processor.
CRC	Cyclical Redundancy Check. Error-checking technique in which the frame recipient calculates a remainder by dividing frame contents by a prime binary divisor and compares the calculated remainder to a value stored in the frame by the sending node.
CRL	Certificate Revocation List. A digitally signed message that lists all of the current but revoked certificates listed by a given CA. This is analogous to a book of stolen charge card numbers that allow stores to reject bad credit cards. When certificates are revoked, they are added to a CRL. When you implement authentication using certificates, you can choose to use CRLs or not. Using CRLs lets you easily revoke certificates before they expire, but the CRL is generally only maintained by the CA or an RA. If you are using CRLs and the connection to the CA or RA is not available when authentication is requested, the authentication request will fail. See also CA, certificate, public key, RA.
CRV	Call Reference Value. Used by H.225.0 to distinguish call legs signalled between two entities.
cryptography	Encryption, authentication, integrity, keys and other services used for secure communication over networks. See also VPN and IPSec.
crypto map	A data structure with a unique name and sequence number that is used for configuring VPNs on the ASA. A crypto map selects data flows that need security processing and defines the policy for these flows and the crypto peer that traffic needs to go to. A crypto map is applied to an interface. Crypto maps contain the ACLs, encryption standards, peers, and other parameters necessary to specify security policies for VPNs using IKE and IPSec. See also VPN.
CTIQBE	Computer Telephony Interface Quick Buffer Encoding. A protocol used in IP telephony between the Cisco CallManager and CTI TAPI and JTAPI applications. CTIQBE is used by the TAPI/JTAPI protocol inspection module and supports NAT, PAT, and bi-directional NAT. This enables Cisco IP SoftPhone and other Cisco TAPI/JTAPI applications to communicate with Cisco CallManager for call setup and voice traffic across the ASA.
cut-through proxy	Enables the ASA to provide faster traffic flow after user authentication. The cut-through proxy challenges a user initially at the application layer. After the security appliance authenticates the user, it shifts the session flow and all traffic flows directly and quickly between the source and destination while maintaining session state information.

D

data confidentiality	Describes any method that manipulates data so that no attacker can read it. This is commonly achieved by data encryption and keys that are only available to the parties involved in the communication.
data integrity	Describes mechanisms that, through the use of encryption based on secret key or public key algorithms, allow the recipient of a piece of protected data to verify that the data has not been modified in transit.

data origin authentication	A security service where the receiver can verify that protected data could have originated only from the sender. This service requires a data integrity service plus a key distribution mechanism, where a secret key is shared only between the sender and receiver.
decryption	Application of a specific algorithm or cipher to encrypted data so as to render the data comprehensible to those who are authorized to see the information. See also encryption.
DES	Data encryption standard. DES was published in 1977 by the National Bureau of Standards and is a secret key encryption scheme based on the Lucifer algorithm from IBM. Cisco uses DES in classic crypto (40-bit and 56-bit key lengths), IPSec crypto (56-bit key), and 3DES (triple DES), which performs encryption three times using a 56-bit key. 3DES is more secure than DES but requires more processing for encryption and decryption. See also AES, ESP.
DHCP	Dynamic Host Configuration Protocol. Provides a mechanism for allocating IP addresses to hosts dynamically, so that addresses can be reused when hosts no longer need them and so that mobile computers, such as laptops, receive an IP address applicable to the LAN to which it is connected.
Diffie-Hellman	A public key cryptography protocol that allows two parties to establish a shared secret over insecure communications channels. Diffie-Hellman is used within IKE to establish session keys. Diffie-Hellman is a component of Oakley key exchange.
Diffie-Hellman Group 1, Group 2, Group 5, Group 7	Diffie-Hellman refers to a type of public key cryptography using asymmetric encryption based on large prime numbers to establish both Phase 1 and Phase 2 SAs. Group 1 provides a smaller prime number than Group 2 but may be the only version supported by some IPSec peers. Diffe-Hellman Group 5 uses a 1536-bit prime number, is the most secure, and is recommended for use with AES. Group 7 has an elliptical curve field size of 163 bits and is for use with the Movian VPN client, but works with any peer that supports Group 7 (ECC). See also VPN and encryption. **Note** The **group 7** command option was **deprecated** in ASA version 8.0(4). Attempts to configure group 7 will generate an error message and use group 5 instead.
digital certificate	See certificate.
DMZ	See interface.
DN	Distinguished Name. Global, authoritative name of an entry in the OSI Directory (X.500).
DNS	Domain Name System (or Service). An Internet service that translates domain names into IP addresses.
DoS	Denial of Service. A type of network attack in which the goal is to render a network service unavailable.
DSL	digital subscriber line. Public network technology that delivers high bandwidth over conventional copper wiring at limited distances. DSL is provisioned via modem pairs, with one modem located at a central office and the other at the customer site. Because most DSL technologies do not use the whole bandwidth of the twisted pair, there is room remaining for a voice channel.
DSP	digital signal processor. A DSP segments a voice signal into frames and stores them in voice packets.
DSS	Digital Signature Standard. A digital signature algorithm designed by The US National Institute of Standards and Technology and based on public-key cryptography. DSS does not do user datagram encryption. DSS is a component in classic crypto, as well as the Redcreek IPSec card, but not in IPSec implemented in Cisco IOS software.

Dynamic NAT	See NAT and address translation.
Dynamic PAT	Dynamic Port Address Translation. Dynamic PAT lets multiple outbound sessions appear to originate from a single IP address. With PAT enabled, the ASA chooses a unique port number from the PAT IP address for each outbound translation slot (xlate). This feature is valuable when an ISP cannot allocate enough unique IP addresses for your outbound connections. The global pool addresses always come first, before a PAT address is used. See also NAT, Static PAT, and xlate.

E

ECHO	See Ping, ICMP. See also inspection engine.
EGP	Exterior Gateway Protocol. Replaced by BGP. The ASA does not support EGP. See also BGP.
EIGRP	Enhanced Interior Gateway Routing Protocol. The ASA does not support EIGRP.
EMBLEM	Enterprise Management BaseLine Embedded Manageability. A syslog format designed to be consistent with the Cisco IOS system log format and is more compatible with CiscoWorks management applications.
encryption	Application of a specific algorithm or cipher to data so as to render the data incomprehensible to those unauthorized to see the information. See also decryption.
ESMTP	Extended SMTP. Extended version of SMTP that includes additional functionality, such as delivery notification and session delivery. ESMTP is described in RFC 1869, SMTP Service Extensions.
ESP	Encapsulating Security Payload. An IPSec protocol, ESP provides authentication and encryption services for establishing a secure tunnel over an insecure network. For more information, refer to RFCs 2406 and 1827.

F

failover, failover mode	Failover lets you configure two ASAs so that one will take over operation if the other one fails. The ASA supports two failover configurations, Active/Active failover and Active/Standby failover. Each failover configuration has its own method for determining and performing failover. With Active/Active failover, both units can pass network traffic. This lets you configure load balancing on your network. Active/Active failover is only available on units running in multiple context mode. With Active/Standby failover, only one unit passes traffic while the other unit waits in a standby state. Active/Standby failover is available on units running in either single or multiple context mode.
Fixup	See inspection engine.
Flash, Flash memory	A nonvolatile storage device used to store the configuration file when the ASA is powered down.
FQDN/IP	Fully qualified domain name/IP address. IPSec parameter that identifies peers that are security gateways.

FragGuard	Provides IP fragment protection and performs full reassembly of all ICMP error messages and virtual reassembly of the remaining IP fragments that are routed through the ASA.
FTP	File Transfer Protocol. Part of the TCP/IP protocol stack, used for transferring files between hosts.

G

GGSN	gateway GPRS support node. A wireless gateway that allows mobile cell phone users to access the public data network or specified private IP networks.
global configuration mode	Global configuration mode lets you to change the ASA configuration. All user EXEC, privileged EXEC, and global configuration commands are available in this mode. See also user EXEC mode, privileged EXEC mode, command-specific configuration mode.
GMT	Greenwich Mean Time. Replaced by UTC (Coordinated Universal Time) in 1967 as the world time standard.
GPRS	general packet radio service. A service defined and standardized by the European Telecommunication Standards Institute. GPRS is an IP-packet-based extension of GSM networks and provides mobile, wireless, data communications
GRE	Generic Routing Encapsulation described in RFCs 1701 and 1702. GRE is a tunneling protocol that can encapsulate a wide variety of protocol packet types inside IP tunnels, creating a virtual point-to-point link to routers at remote points over an IP network. By connecting multiprotocol subnetworks in a single-protocol backbone environment, IP tunneling using GRE allows network expansion across a single protocol backbone environment.
GSM	Global System for Mobile Communication. A digital, mobile, radio standard developed for mobile, wireless, voice communications.
GTP	GPRS tunneling protocol. GTP handles the flow of user packet data and signaling information between the SGSN and GGSN in a GPRS network. GTP is defined on both the Gn and Gp interfaces of a GPRS network.

H

H.225	A protocol used for TCP signalling in applications such as video conferencing. See also H.323 and inspection engine.
H.225.0	An ITU standard that governs H.225.0 session establishment and packetization. H.225.0 actually describes several different protocols: RAS, use of Q.931, and use of RTP.
H.245	An ITU standard that governs H.245 endpoint control.
H.320	Suite of ITU-T standard specifications for video conferencing over circuit-switched media, such as ISDN, fractional T-1, and switched-56 lines. Extensions of ITU-T standard H.320 enable video conferencing over LANs and other packet-switched networks, as well as video over the Internet.

H.323	Allows dissimilar communication devices to communicate with each other by using a standardized communication protocol. H.323 defines a common set of CODECs, call setup and negotiating procedures, and basic data transport methods.
H.323 RAS	Registration, admission, and status signaling protocol. Enables devices to perform registration, admissions, bandwidth changes, and status and disengage procedures between VoIP gateway and the gatekeeper.
H.450.2	Call transfer supplementary service for H.323.
H.450.3	Call diversion supplementary service for H.323.
Hash, Hash Algorithm	A hash algorithm is a one way function that operates on a message of arbitrary length to create a fixed-length message digest used by cryptographic services to ensure its data integrity. MD5 has a smaller digest and is considered to be slightly faster than SHA-1. Cisco uses both SHA-1 and MD5 hashes within our implementation of the IPSec framework. See also encryption, HMAC, and VPN.
headend	A firewall, concentrator, or other host that serves as the entry point into a private network for VPN client connections over the public network. See also ISP and VPN.
HMAC	A mechanism for message authentication using cryptographic hashes such as SHA-1 and MD5.
host	The name for any device on a TCP/IP network that has an IP address. See also network and node.
host/network	An IP address and netmask used with other information to identify a single host or network subnet for ASA configuration, such as an address translation (xlate) or ACE.
HTTP	Hypertext Transfer Protocol. A protocol used by browsers and web servers to transfer files. When a user views a web page, the browser can use HTTP to request and receive the files used by the web page. HTTP transmissions are not encrypted.
HTTPS	Hypertext Transfer Protocol Secure. An SSL-encrypted version of HTTP.

I

IANA	Internet Assigned Number Authority. Assigns all port and protocol numbers for use on the Internet.
ICMP	Internet Control Message Protocol. Network-layer Internet protocol that reports errors and provides other information relevant to IP packet processing.
IDS	Intrusion Detection System. A method of detecting malicious network activity by signatures and then implementing a policy for that signature.
IETF	The Internet Engineering Task Force. A technical standards organization that develops RFC documents defining protocols for the Internet.
IGMP	Internet Group Management Protocol. IGMP is a protocol used by IPv4 systems to report IP multicast memberships to neighboring multicast routers.

IKE	Internet Key Exchange. IKE establishes a shared security policy and authenticates keys for services (such as IPSec) that require keys. Before any IPSec traffic can be passed, each ASA must verify the identity of its peer. This can be done by manually entering preshared keys into both hosts or by a CA service. IKE is a hybrid protocol that uses part Oakley and part of another protocol suite called SKEME inside ISAKMP framework. This is the protocol formerly known as ISAKMP/Oakley, and is defined in RFC 2409.
IKE Extended Authentication	IKE Extended Authenticate (Xauth) is implemented per the IETF draft-ietf-ipsec-isakmp-xauth-04.txt ("extended authentication" draft). This protocol provides the capability of authenticating a user within IKE using TACACS+ or RADIUS.
IKE Mode Configuration	IKE Mode Configuration is implemented per the IETF draft-ietf-ipsec-isakmp-mode-cfg-04.txt. IKE Mode Configuration provides a method for a security gateway to download an IP address (and other network level configuration) to the VPN client as part of an IKE negotiation.
ILS	Internet Locator Service. ILS is based on LDAP and is ILSv2 compliant. ILS was developed by Microsoft for use with its NetMeeting, SiteServer, and Active Directory products.
IMAP	Internet Message Access Protocol. Method of accessing e-mail or bulletin board messages kept on a mail server that can be shared. IMAP permits client e-mail applications to access remote message stores as if they were local without actually transferring the message.
implicit rule	An access rule automatically created by the ASA based on default rules or as a result of user-defined rules.
IMSI	International Mobile Subscriber Identity. One of two components of a GTP tunnel ID, the other being the NSAPI. See also NSAPI.
inside	The first interface, usually port 1, that connects your internal, "trusted" network protected by the ASA. See also interface, interface names.
inspection engine	The ASA inspects certain application-level protocols to identify the location of embedded addressing information in traffic. This allows NAT to translate these embedded addresses and to update any checksum or other fields that are affected by the translation. Because many protocols open secondary TCP or UDP ports, each application inspection engine also monitors sessions to determine the port numbers for secondary channels. The initial session on a well-known port is used to negotiate dynamically assigned port numbers. The application inspection engine monitors these sessions, identifies the dynamic port assignments, and permits data exchange on these ports for the duration of the specific session. Some of the protocols that the ASA can inspect are CTIQBE, FTP, H.323, HTTP, MGCP, SMTP, and SNMP.
interface	The physical connection between a particular network and a ASA.
interface ip_address	The IP address of a ASA network interface. Each interface IP address must be unique. Two or more interfaces must not be given the same IP address or IP addresses that are on the same IP network.
interface names	Human readable name assigned to a ASA network interface. The inside interface default name is "inside" and the outside interface default name is "outside." Any perimeter interface default names are "intf*n*", such as intf2 for the first perimeter interface, intf3 for the second perimeter interface, and so on to the last interface. The numbers in the intf string corresponds to the position of the interface card in the ASA. You can use the default names or, if you are an experienced user, give each interface a more meaningful name. See also inside, intfn, outside.

intf*n*	Any interface, usually beginning with port 2, that connects to a subset network of your design that you can custom name and configure.
interface PAT	The use of PAT where the PAT IP address is also the IP address of the outside interface. See Dynamic PAT, Static PAT.
Internet	The global network that uses IP. Not a LAN. See also intranet.
intranet	Intranetwork. A LAN that uses IP. See also network and Internet.
IP	Internet Protocol. IP protocols are the most popular nonproprietary protocols because they can be used to communicate across any set of interconnected networks and are equally well suited for LAN and WAN communications.
IPS	Intrusion Prevention Service. An in-line, deep-packet inspection-based solution that helps mitigate a wide range of network attacks.
IP address	An IP protocol address. A ASA interface ip_address. IP version 4 addresses are 32 bits in length. This address space is used to designate the network number, optional subnetwork number, and a host number. The 32 bits are grouped into four octets (8 binary bits), represented by 4 decimal numbers separated by periods, or dots. The meaning of each of the four octets is determined by their use in a particular network.
IP pool	A range of local IP addresses specified by a name, and a range with a starting IP address and an ending address. IP Pools are used by DHCP and VPNs to assign local IP addresses to clients on the inside interface.
IPSec	IP Security. A framework of open standards that provides data confidentiality, data integrity, and data authentication between participating peers. IPSec provides these security services at the IP layer. IPSec uses IKE to handle the negotiation of protocols and algorithms based on local policy and to generate the encryption and authentication keys to be used by IPSec. IPSec can protect one or more data flows between a pair of hosts, between a pair of security gateways, or between a security gateway and a host.
IPSec Phase 1	The first phase of negotiating IPSec, includes the key exchange and the ISAKMP portions of IPSec.
IPSec Phase 2	The second phase of negotiating IPSec. Phase two determines the type of encryption rules used for payload, the source and destination that will be used for encryption, the definition of interesting traffic according to access lists, and the IPSec peer. IPSec is applied to the interface in Phase 2.
IPSec transform set	A transform set specifies the IPSec protocol, encryption algorithm, and hash algorithm to use on traffic matching the IPSec policy. A transform describes a security protocol (AH or ESP) with its corresponding algorithms. The IPSec protocol used in almost all transform sets is ESP with the DES algorithm and HMAC-SHA for authentication.
ISAKMP	Internet Security Association and Key Management Protocol. A protocol framework that defines payload formats, the mechanics of implementing a key exchange protocol, and the negotiation of a security association. See IKE.
ISP	Internet Service Provider. An organization that provides connection to the Internet via their services, such as modem dial in over telephone voice lines or DSL.

J

JTAPI	Java Telephony Application Programming Interface. A Java-based API supporting telephony functions. See also TAPI.

K

key	A data object used for encryption, decryption, or authentication.

L

LAN	Local area network. A network residing in one location, such as a single building or campus. See also Internet, intranet, and network.
layer, layers	Networking models implement layers with which different protocols are associated. The most common networking model is the OSI model, which consists of the following 7 layers, in order: physical, data link, network, transport, session, presentation, and application.
LCN	Logical channel number.
LDAP	Lightweight Directory Access Protocol. LDAP provides management and browser applications with access to X.500 directories.

M

mask	A 32-bit mask that shows how an Internet address is divided into network, subnet, and host parts. The mask has ones in the bit positions to be used for the network and subnet parts, and zeros for the host part. The mask should contain at least the standard network portion, and the subnet field should be contiguous with the network portion.
MCR	See multicast.
MC router	Multicast (MC) routers route multicast data transmissions to the hosts on each LAN in an internetwork that are registered to receive specific multimedia or other broadcasts. See also multicast.
MD5	Message Digest 5. A one-way hashing algorithm that produces a 128-bit hash. Both MD5 and SHA-1 are variations on MD4 and are designed to strengthen the security of the MD4 hashing algorithm. SHA-1 is more secure than MD4 and MD5. Cisco uses hashes for authentication within the IPSec framework. Also used for message authentication in SNMP v.2. MD5 verifies the integrity of the communication, authenticates the origin, and checks for timeliness. MD5 has a smaller digest and is considered to be slightly faster than SHA-1.
MDI	Media dependent interface.
MDIX	Media dependent interface crossover.

Message Digest	A message digest is created by a hash algorithm, such as MD5 or SHA-1, that is used for ensuring message integrity.
MGCP	Media Gateway Control Protocol. Media Gateway Control Protocol is a protocol for the control of VoIP calls by external call-control elements known as media gateway controllers or call agents. MGCP merges the IPDC and SGCP protocols.
Mode	See Access Modes.
Mode Config	See IKE Mode Configuration.
Modular Policy Framework	Modular Policy Framework. A means of configuring ASA features in a manner to similar to Cisco IOS software Modular QoS CLI.
MS	mobile station. Refers generically to any mobile device, such as a mobile handset or computer, that is used to access network services. GPRS networks support three classes of MS, which describe the type of operation supported within the GPRS and the GSM mobile wireless networks. For example, a Class A MS supports simultaneous operation of GPRS and GSM services.
MS-CHAP	Microsoft CHAP.
MTU	Maximum transmission unit, the maximum number of bytes in a packet that can flow efficiently across the network with best response time. For Ethernet, the default MTU is 1500 bytes, but each network can have different values, with serial connections having the smallest values. The MTU is described in RFC 1191.
multicast	Multicast refers to a network addressing method in which the source transmits a packet to multiple destinations, a multicast group, simultaneously. See also PIM, SMR.

N

N2H2	A third-party, policy-oriented filtering application that works with the ASA to control user web access. N2H2 can filter HTTP requests based on destination host name, destination IP address, and username and password. The N2H2 corporation was acquired by Secure Computing in October, 2003.
NAT	Network Address Translation. Mechanism for reducing the need for globally unique IP addresses. NAT allows an organization with addresses that are not globally unique to connect to the Internet by translating those addresses into a globally routable address space.
NEM	Network Extension Mode. Lets VPN hardware clients present a single, routable network to the remote private network over the VPN tunnel.
NetBIOS	Network Basic Input/Output System. A Microsoft protocol that supports Windows host name registration, session management, and data transfer. The ASA supports NetBIOS by performing NAT of the packets for NBNS UDP port 137 and NBDS UDP port 138.
netmask	See mask.
network	In the context of ASA configuration, a network is a group of computing devices that share part of an IP address space and not a single host. A network consists of multiple nodes or hosts. See also host, Internet, intranet, IP, LAN, and node.

NMS	network management system. System responsible for managing at least part of a network. An NMS is generally a reasonably powerful and well-equipped computer, such as an engineering workstation. NMSs communicate with agents to help keep track of network statistics and resources.
node	Devices such as routers and printers that would not normally be called hosts. See also host, network.
nonvolatile storage, memory	Storage or memory that, unlike RAM, retains its contents without power. Data in a nonvolatile storage device survives a power-off, power-on cycle or reboot.
NSAPI	Network service access point identifier. One of two components of a GTP tunnel ID, the other component being the IMSI. See also IMSI.
NSSA	Not-so-stubby-area. An OSPF feature described by RFC 1587. NSSA was first introduced in Cisco IOS software release 11.2. It is a non-proprietary extension of the existing stub area feature that allows the injection of external routes in a limited fashion into the stub area.
NTLM	NT Lan Manager. A Microsoft Windows challenge-response authentication method.
NTP	Network time protocol.

O

Oakley	A key exchange protocol that defines how to acquire authenticated keying material. The basic mechanism for Oakley is the Diffie-Hellman key exchange algorithm. Oakley is defined in RFC 2412.
object grouping	Simplifies access control by letting you apply access control statements to groups of network objects, such as protocol, services, hosts, and networks.
OSPF	Open Shortest Path First. OSPF is a routing protocol for IP networks. OSPF is a routing protocol widely deployed in large networks because of its efficient use of network bandwidth and its rapid convergence after changes in topology. The ASA supports OSPF.
OU	Organizational Unit. An X.500 directory attribute.
outbound	Refers to traffic whose destination is on an interface with lower security than the source interface.
outbound ACL	An ACL applied to outbound traffic.
outside	The first interface, usually port 0, that connects to other “untrusted” networks outside the ASA; the Internet. See also interface, interface names, outbound.

P

PAC	PPTP Access Concentrator. A device attached to one or more PSTN or ISDN lines capable of PPP operation and of handling the PPTP protocol. The PAC need only implement TCP/IP to pass traffic to one or more PNSs. It may also tunnel non-IP protocols.
PAT	See Dynamic PAT, interface PAT, and Static PAT.
PDP	Packet Data Protocol.

Perfmon	The ASA feature that gathers and reports a wide variety of feature statistics, such as connections/second, xlates/second, etc.
PFS	Perfect Forwarding Secrecy. PFS enhances security by using different security key for the IPSec Phase 1 and Phase 2 SAs. Without PFS, the same security key is used to establish SAs in both phases. PFS ensures that a given IPSec SA key was not derived from any other secret (like some other keys). In other words, if someone were to break a key, PFS ensures that the attacker would not be able to derive any other key. If PFS were not enabled, someone could hypothetically break the IKE SA secret key, copy all the IPSec protected data, and then use knowledge of the IKE SA secret to compromise the IPSec SA setup by this IKE SA. With PFS, breaking IKE would not give an attacker immediate access to IPSec. The attacker would have to break each IPSec SA individually.
Phase 1	See IPSec Phase 1.
Phase 2	See IPSec Phase 2.
PIM	Protocol Independent Multicast. PIM provides a scalable method for determining the best paths for distributing a specific multicast transmission to a group of hosts. Each host has registered using IGMP to receive the transmission. See also PIM-SM.
PIM-SM	Protocol Independent Multicast-Sparse Mode. With PIM-SM, which is the default for Cisco routers, when the source of a multicast transmission begins broadcasting, the traffic is forwarded from one MC router to the next, until the packets reach every registered host. See also PIM.
Ping	An ICMP request sent by a host to determine if a second host is accessible.
PIX	Private Internet eXchange. The Cisco PIX 500-series ASAs range from compact, plug-and-play desktop models for small/home offices to carrier-class gigabit models for the most demanding enterprise and service provider environments. Cisco PIX ASAs provide robust, enterprise-class integrated network security services to create a strong multilayered defense for fast changing network environments.
PKCS12	A standard for the transfer of PKI-related data, such as private keys, certificates, and other data. Devices supporting this standard let administrators maintain a single set of personal identity information.
PNS	PPTP Network Server. A PNS is envisioned to operate on general-purpose computing/server platforms. The PNS handles the server side of PPTP. Because PPTP relies completely on TCP/IP and is independent of the interface hardware, the PNS may use any combination of IP interface hardware including LAN and WAN devices.
Policy NAT	Lets you identify local traffic for address translation by specifying the source and destination addresses (or ports) in an access list.
POP	Post Office Protocol. Protocol that client e-mail applications use to retrieve mail from a mail server.
Pool	See IP pool.
Port	A field in the packet headers of TCP and UDP protocols that identifies the higher level service which is the source or destination of the packet.
PPP	Point-to-Point Protocol. Developed for dial-up ISP access using analog phone lines and modems.

PPTP	Point-to-Point Tunneling Protocol. PPTP was introduced by Microsoft to provide secure remote access to Windows networks; however, because it is vulnerable to attack, PPTP is commonly used only when stronger security methods are not available or are not required. PPTP Ports are pptp, 1723/tcp, 1723/udp, and pptp. For more information about PPTP, see RFC 2637. See also PAC, PPTP GRE, PPTP GRE tunnel, PNS, PPTP session, and PPTP TCP.
PPTP GRE	Version 1 of GRE for encapsulating PPP traffic.
PPTP GRE tunnel	A tunnel defined by a PNS-PAC pair. The tunnel protocol is defined by a modified version of GRE. The tunnel carries PPP datagrams between the PAC and the PNS. Many sessions are multiplexed on a single tunnel. A control connection operating over TCP controls the establishment, release, and maintenance of sessions and of the tunnel itself.
PPTP session	PPTP is connection-oriented. The PNS and PAC maintain state for each user that is attached to a PAC. A session is created when end-to-end PPP connection is attempted between a dial user and the PNS. The datagrams related to a session are sent over the tunnel between the PAC and PNS.
PPTP TCP	Standard TCP session over which PPTP call control and management information is passed. The control session is logically associated with, but separate from, the sessions being tunneled through a PPTP tunnel.
preshared key	A preshared key provides a method of IKE authentication that is suitable for networks with a limited, static number of IPSec peers. This method is limited in scalability because the key must be configured for each pair of IPSec peers. When a new IPSec peer is added to the network, the preshared key must be configured for every IPSec peer with which it communicates. Using certificates and CAs provides a more scalable method of IKE authentication.
primary, primary unit	The ASA normally operating when two units, a primary and secondary, are operating in failover mode.
privileged EXEC mode	Privileged EXEC mode lets you to change current settings. Any user EXEC mode command will work in privileged EXEC mode. See also command-specific configuration mode, global configuration mode, user EXEC mode.
protocol, protocol literals	A standard that defines the exchange of packets between network nodes for communication. Protocols work together in layers. Protocols are specified in a ASA configuration as part of defining a security policy by their literal values or port numbers. Possible ASA protocol literal values are ahp, eigrp, esp, gre, icmp, igmp, igrp, ip, ipinip, ipsec, nos, ospf, pcp, snp, tcp, and udp.
Proxy-ARP	Enables the ASA to reply to an ARP request for IP addresses in the global pool. See also ARP.
public key	A public key is one of a pair of keys that are generated by devices involved in public key infrastructure. Data encrypted with a public key can only be decrypted using the associated private key. When a private key is used to produce a digital signature, the receiver can use the public key of the sender to verify that the message was signed by the sender. These characteristics of key pairs provide a scalable and secure method of authentication over an insecure media, such as the Internet.

Q

QoS	quality of service. Measure of performance for a transmission system that reflects its transmission quality and service availability.

R

RA	Registration Authority. An authorized proxy for a CA. RAs can perform certificate enrollment and can issue CRLs. See also CA, certificate, public key.
RADIUS	Remote Authentication Dial-In User Service. RADIUS is a distributed client/server system that secures networks against unauthorized access. RFC 2058 and RFC 2059 define the RADIUS protocol standard. See also AAA and TACACS+.
Refresh	Retrieve the running configuration from the ASA and update the screen. The icon and the button perform the same function.
registration authority	See RA.
replay-detection	A security service where the receiver can reject old or duplicate packets to defeat replay attacks. Replay attacks rely on the attacker sending out older or duplicate packets to the receiver and the receiver thinking that the bogus traffic is legitimate. Replay-detection is done by using sequence numbers combined with authentication, and is a standard feature of IPSec.
RFC	Request for Comments. RFC documents define protocols and standards for communications over the Internet. RFCs are developed and published by IETF.
RIP	Routing Information Protocol. Interior gateway protocol (IGP) supplied with UNIX BSD systems. The most common IGP in the Internet. RIP uses hop count as a routing metric.
RLLA	Reserved Link Local Address. Multicast addresses range from 224.0.0.0 to 239.255.255.255, however only the range 224.0.1.0 to 239.255.255.255 is available to us. The first part of the multicast address range, 224.0.0.0 to 224.0.0.255, is reserved and referred to as the RLLA. These addresses are unavailable. We can exclude the RLLA range by specifying: 224.0.1.0 to 239.255.255.255. 224.0.0.0 to 239.255.255.255 excluding 224.0.0.0 to 224.0.0.255. This is the same as specifying: 224.0.1.0 to 239.255.255.255.
route, routing	The path through a network.
routed firewall mode	In routed firewall mode, the ASA is counted as a router hop in the network. It performs NAT between connected networks and can use OSPF or RIP. See also transparent firewall mode.
RPC	Remote Procedure Call. RPCs are procedure calls that are built or specified by clients and executed on servers, with the results returned over the network to the clients.
RSA	A public key cryptographic algorithm (named after its inventors, Rivest, Shamir, and Adelman) with a variable key length. The main weakness of RSA is that it is significantly slow to compute compared to popular secret-key algorithms, such as DES. The Cisco implementation of IKE uses a Diffie-Hellman exchange to get the secret keys. This exchange can be authenticated with RSA (or preshared keys). With the Diffie-Hellman exchange, the DES key never crosses the network (not even in encrypted form), which is not the case with the RSA encrypt and sign technique. RSA is not public domain, and must be licensed from RSA Data Security.
RSH	Remote Shell. A protocol that allows a user to execute commands on a remote system without having to log in to the system. For example, RSH can be used to remotely examine the status of a number of access servers without connecting to each communication server, executing the command, and then disconnecting from the communication server.

RTCP	RTP Control Protocol. Protocol that monitors the QoS of an IPv6 RTP connection and conveys information about the on-going session. See also RTP.
RTP	Real-Time Transport Protocol. Commonly used with IP networks. RTP is designed to provide end-to-end network transport functions for applications transmitting real-time data, such as audio, video, or simulation data, over multicast or unicast network services. RTP provides such services as payload type identification, sequence numbering, timestamping, and delivery monitoring to real-time applications.
RTSP	Real Time Streaming Protocol. Enables the controlled delivery of real-time data, such as audio and video. RTSP is designed to work with established protocols, such as RTP and HTTP.
rule	Conditional statements added to the ASA configuration to define security policy for a particular situation. See also ACE, ACL, NAT.
running configuration	The configuration currently running in RAM on the ASA. The configuration that determines the operational characteristics of the ASA.

S

SA	security association. An instance of security policy and keying material applied to a data flow. SAs are established in pairs by IPSec peers during both phases of IPSec. SAs specify the encryption algorithms and other security parameters used to create a secure tunnel. Phase 1 SAs (IKE SAs) establish a secure tunnel for negotiating Phase 2 SAs. Phase 2 SAs (IPSec SAs) establish the secure tunnel used for sending user data. Both IKE and IPSec use SAs, although SAs are independent of one another. IPSec SAs are unidirectional and they are unique in each security protocol. A set of SAs are needed for a protected data pipe, one per direction per protocol. For example, if you have a pipe that supports ESP between peers, one ESP SA is required for each direction. SAs are uniquely identified by destination (IPSec endpoint) address, security protocol (AH or ESP), and Security Parameter Index. IKE negotiates and establishes SAs on behalf of IPSec. A user can also establish IPSec SAs manually. An IKE SA is used by IKE only, and unlike the IPSec SA, it is bidirectional.
SCCP	Skinny Client Control Protocol. A Cisco-proprietary protocol used between Cisco Call Manager and Cisco VoIP phones.
SCEP	Simple Certificate Enrollment Protocol. A method of requesting and receiving (also known as enrolling) certificates from CAs.
SDP	Session Definition Protocol. An IETF protocol for the definition of Multimedia Services. SDP messages can be part of SGCP and MGCP messages.
secondary unit	The backup ASA when two are operating in failover mode.
secret key	A secret key is a key shared only between the sender and receiver. See key, public key.
security context	You can partition a single ASA into multiple virtual firewalls, known as security contexts. Each context is an independent firewall, with its own security policy, interfaces, and administrators. Multiple contexts are similar to having multiple stand-alone firewalls.
security services	See cryptography.

serial transmission	A method of data transmission in which the bits of a data character are transmitted sequentially over a single channel.
SGCP	Simple Gateway Control Protocol. Controls VoIP gateways by an external call control element (called a call-agent).
SGSN	Serving GPRS Support Node. The SGSN ensures mobility management, session management and packet relaying functions.
SHA-1	Secure Hash Algorithm 1. SHA-1 [NIS94c] is a revision to SHA that was published in 1994. SHA is closely modeled after MD4 and produces a 160-bit digest. Because SHA produces a 160-bit digest, it is more resistant to brute-force attacks than 128-bit hashes (such as MD5), but it is slower. Secure Hash Algorithm 1 is a joint creation of the National Institute of Standards and Technology and the National Security Agency. This algorithm, like other hash algorithms, is used to generate a hash value, also known as a message digest, that acts like a CRC used in lower-layer protocols to ensure that message contents are not changed during transmission. SHA-1 is generally considered more secure than MD5.
SIP	Session Initiation Protocol. Enables call handling sessions, particularly two-party audio conferences, or “calls.” SIP works with SDP for call signaling. SDP specifies the ports for the media stream. Using SIP, the ASA can support any SIP VoIP gateways and VoIP proxy servers.
site-to-site VPN	A site-to-site VPN is established between two IPSec peers that connect remote networks into a single VPN. In this type of VPN, neither IPSec peer is the destination or source of user traffic. Instead, each IPSec peer provides encryption and authentication services for hosts on the LANs connected to each IPSec peer. The hosts on each LAN send and receive data through the secure tunnel established by the pair of IPSec peers.
SKEME	A key exchange protocol that defines how to derive authenticated keying material, with rapid key refreshment.
SMR	Stub Multicast Routing. SMR allows the ASA to function as a “stub router.” A stub router is a device that acts as an IGMP proxy agent. IGMP is used to dynamically register specific hosts in a multicast group on a particular LAN with a multicast router. Multicast routers route multicast data transmissions to hosts that are registered to receive specific multimedia or other broadcasts. A stub router forwards IGMP messages between hosts and MC routers.
SMTP	Simple Mail Transfer Protocol. SMTP is an Internet protocol that supports email services.
SNMP	Simple Network Management Protocol. A standard method for managing network devices using data structures called Management Information Bases.
split tunneling	Allows a remote VPN client simultaneous encrypted access to a private network and clear unencrypted access to the Internet. If you do not enable split tunneling, all traffic between the VPN client and the ASA is sent through an IPSec tunnel. All traffic originating from the VPN client is sent to the outside interface through a tunnel, and client access to the Internet from its remote site is denied.
spoofing	A type of attack designed to foil network security mechanisms such as filters and access lists. A spoofing attack sends a packet that claims to be from an address from which it was not actually sent.
SQL*Net	Structured Query Language Protocol. An Oracle protocol used to communicate between client and server processes.
SSC	Security Services Card for the ASA 5505. For example, the AIP SSC.

SSH	Secure Shell. An application running on top of a reliable transport layer, such as TCP/IP, that provides strong authentication and encryption capabilities.
SSL	Secure Sockets Layer. A protocol that resides between the application layer and TCP/IP to provide transparent encryption of data traffic.
SSM	Security Services Module. For example, the AIP SSM or CSC SSM.
standby unit	See secondary unit.
stateful inspection	Network protocols maintain certain data, called state information, at each end of a network connection between two hosts. State information is necessary to implement the features of a protocol, such as guaranteed packet delivery, data sequencing, flow control, and transaction or session IDs. Some of the protocol state information is sent in each packet while each protocol is being used. For example, a browser connected to a web server uses HTTP and supporting TCP/IP protocols. Each protocol layer maintains state information in the packets it sends and receives. The ASA and some other firewalls inspect the state information in each packet to verify that it is current and valid for every protocol it contains. This is called stateful inspection and is designed to create a powerful barrier to certain types of computer security threats.
Static PAT	Static Port Address Translation. Static PAT is a static address that also maps a local port to a global port. See also Dynamic PAT, NAT.
subnetmask	See mask.

T

TACACS+	Terminal Access Controller Access Control System Plus. A client-server protocol that supports AAA services, including command authorization. See also AAA, RADIUS.
TAPI	Telephony Application Programming Interface. A programming interface in Microsoft Windows that supports telephony functions.
TCP	Transmission Control Protocol. Connection-oriented transport layer protocol that provides reliable full-duplex data transmission.
TCP Intercept	With the TCP intercept feature, once the optional embryonic connection limit is reached, and until the embryonic connection count falls below this threshold, every SYN bound for the effected server is intercepted. For each SYN, the ASA responds on behalf of the server with an empty SYN/ACK segment. The ASA retains pertinent state information, drops the packet, and waits for the client acknowledgment. If the ACK is received, then a copy of the client SYN segment is sent to the server and the TCP three-way handshake is performed between the ASA and the server. If this three-way handshake completes, may the connection resume as normal. If the client does not respond during any part of the connection phase, then the ASA retransmits the necessary segment using exponential back-offs.

TDP	Tag Distribution Protocol. TDP is used by tag switching devices to distribute, request, and release tag binding information for multiple network layer protocols in a tag switching network. TDP does not replace routing protocols. Instead, it uses information learned from routing protocols to create tag bindings. TDP is also used to open, monitor, and close TDP sessions and to indicate errors that occur during those sessions. TDP operates over a connection-oriented transport layer protocol with guaranteed sequential delivery (such as TCP). The use of TDP does not preclude the use of other mechanisms to distribute tag binding information, such as piggybacking information on other protocols.
Telnet	A terminal emulation protocol for TCP/IP networks such as the Internet. Telnet is a common way to control web servers remotely; however, its security vulnerabilities have led to its replacement by SSH.
TFTP	Trivial File Transfer Protocol. TFTP is a simple protocol used to transfer files. It runs on UDP and is explained in depth in RFC 1350.
TID	Tunnel Identifier.
TLS	Transport Layer Security. A future IETF protocol to replace SSL.
traffic policing	The traffic policing feature ensures that no traffic exceeds the maximum rate (bits per second) that you configure, thus ensuring that no one traffic flow can take over the entire resource.
transform set	See IPSec transform set.
translate, translation	See xlate.
transparent firewall mode	A mode in which the ASA is not a router hop. You can use transparent firewall mode to simplify your network configuration or to make the ASA invisible to attackers. You can also use transparent firewall mode to allow traffic through that would otherwise be blocked in routed firewall mode. See also routed firewall mode.
transport mode	An IPSec encryption mode that encrypts only the data portion (payload) of each packet, but leaves the header untouched. Transport mode is less secure than tunnel mode.
TSP	TAPI Service Provider. See also TAPI.
tunnel mode	An IPSec encryption mode that encrypts both the header and data portion (payload) of each packet. Tunnel mode is more secure than transport mode.
tunnel	A method of transporting data in one protocol by encapsulating it in another protocol. Tunneling is used for reasons of incompatibility, implementation simplification, or security. For example, a tunnel lets a remote VPN client have encrypted access to a private network.
Turbo ACL	Increases ACL lookup speeds by compiling them into a set of lookup tables. Packet headers are used to access the tables in a small, fixed number of lookups, independent of the existing number of ACL entries.

U

UDP	User Datagram Protocol. A connectionless transport layer protocol in the IP protocol stack. UDP is a simple protocol that exchanges datagrams without acknowledgments or guaranteed delivery, which requires other protocols to handle error processing and retransmission. UDP is defined in RFC 768.
UMTS	Universal Mobile Telecommunication System. An extension of GPRS networks that moves toward an all-IP network by delivering broadband information, including commerce and entertainment services, to mobile users via fixed, wireless, and satellite networks
Unicast RPF	Unicast Reverse Path Forwarding. Unicast RPF guards against spoofing by ensuring that packets have a source IP address that matches the correct source interface according to the routing table.
URL	Uniform Resource Locator. A standardized addressing scheme for accessing hypertext documents and other services using a browser. For example, http://www.cisco.com.
user EXEC mode	User EXEC mode lets you to see the ASA settings. The user EXEC mode prompt appears as follows when you first access the ASA. See also command-specific configuration mode, global configuration mode, and privileged EXEC mode.
UTC	Coordinated Universal Time. The time zone at zero degrees longitude, previously called Greenwich Mean Time (GMT) and Zulu time. UTC replaced GMT in 1967 as the world time standard. UTC is based on an atomic time scale rather than an astronomical time scale.
UTRAN	Universal Terrestrial Radio Access Network. Networking protocol used for implementing wireless networks in UMTS. GTP allows multi-protocol packets to be tunneled through a UMTS/GPRS backbone between a GGSN, an SGSN and the UTRAN.
UUIE	User-User Information Element. An element of an H.225 packet that identifies the users implicated in the message.

V

VLAN	Virtual LAN. A group of devices on one or more LANs that are configured (using management software) so that they can communicate as if they were attached to the same physical network cable, when in fact they are located on a number of different LAN segments. Because VLANs are based on logical instead of physical connections, they are extremely flexible.
VoIP	Voice over IP. VoIP carries normal voice traffic, such as telephone calls and faxes, over an IP-based network. DSP segments the voice signal into frames, which then are coupled in groups of two and stored in voice packets. These voice packets are transported using IP in compliance with ITU-T specification H.323.
VPN	Virtual Private Network. A network connection between two peers over the public network that is made private by strict authentication of users and the encryption of all data traffic. You can establish VPNs between clients, such as PCs, or a headend, such as the ASA.

virtual firewall	See security context.
VSA	Vendor-specific attribute. An attribute in a RADIUS packet that is defined by a vendor rather than by RADIUS RFCs. The RADIUS protocol uses IANA-assigned vendor numbers to help identify VSAs. This lets different vendors have VSAs of the same number. The combination of a vendor number and a VSA number makes a VSA unique. For example, the cisco-av-pair VSA is attribute 1 in the set of VSAs related to vendor number 9. Each vendor can define up to 256 VSAs. A RADIUS packet contains any VSAs attribute 26, named Vendor-specific. VSAs are sometimes referred to as subattributes.

W

WAN	wide-area network. Data communications network that serves users across a broad geographic area and often uses transmission devices provided by common carriers.
WCCP	Web Cache Communication Protocol. Transparently redirects selected types of traffic to a group of web cache engines to optimize resource usage and lower response times.
Websense	A content filtering solution that manages employee access to the Internet. Websense uses a policy engine and a URL database to control user access to websites.
WEP	Wired Equivalent Privacy. A security protocol for wireless LANs, defined in the IEEE 802.11b standard.
WINS	Windows Internet Naming Service. A Windows system that determines the IP address associated with a particular network device, also known as “name resolution.” WINS uses a distributed database that is automatically updated with the NetBIOS names of network devices currently available and the IP address assigned to each one.WINS provides a distributed database for registering and querying dynamic NetBIOS names to IP address mapping in a routed network environment. It is the best choice for NetBIOS name resolution in such a routed network because it is designed to solve the problems that occur with name resolution in complex networks.

X

X.509	A widely used standard for defining digital certificates. X.509 is actually an ITU recommendation, which means that it has not yet been officially defined or approved for standardized usage.
xauth	See IKE Extended Authentication.
xlate	An xlate, also referred to as a translation entry, represents the mapping of one IP address to another, or the mapping of one IP address/port pair to another.

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