



System i
Security
Intrusion detection

Version 5 Release 4





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Intrusion detection

Version 5 Release 4

Note

Before using this information and the product it supports, read the information in “Notices,” on page 17.

First Edition (February 2006)

This edition applies to version 5, release 4, modification 0 of IBM i5/OS (product number 5722-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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Intrusion detection

Intrusion detection involves gathering information about unauthorized access attempts and attacks coming in over the TCP/IP network. Security administrators can analyze the audit records that intrusion detection provides to secure the System i™ network from these types of attacks.

“Intrusions” encompass many undesirable activities such as information theft and denial of service attacks. The objective of an intrusion might be to acquire information that a person is not authorized to have (information theft). The objective might be to cause a business harm by rendering a network, system, or application unusable (denial of service), or it might be to gain unauthorized use of a system as a means for further intrusions elsewhere. Most intrusions follow a pattern of information gathering, attempted access, and then destructive attacks. Some attacks can be detected and neutralized by the target system. Other attacks cannot be effectively neutralized by the target system. Most of the attacks also make use of *spoofed* packets, which are not easily traceable to their true origin. Many attacks make use of unwitting accomplices, which are machines or networks that are used without authorization to hide the identity of the attacker. For these reasons, a vital part of intrusion detection is gathering information, detecting access attempts, and system attacks.

You can create an intrusion detection policy that audits suspicious intrusion events that come in through the TCP/IP network. (See the “Details: Intrusion detection policy directives” on page 9.) Examples of problems that the intrusion detection function looks for includes:

- Denial of service attacks
- Port scans
- Malformed packets
- Internet Protocol (IP) fragments
- Restricted IP options and protocols
- Internet Control Message Protocol (ICMP) redirect messages
- Perpetual echo attacks on User Datagram Protocol (UDP) port 7 (the echo port)

You also can write an application to analyze the auditing data and report to the security administrator if TCP/IP intrusions are likely to be underway.

Important: The term *intrusion detection* is used two ways in i5/OS® documentation. In the first sense, intrusion detection refers to the prevention and detection of security exposures. For example, a hacker might be trying to break into the system using an invalid user ID, or an inexperienced user with too much authority might be altering important objects in system libraries. In the second sense, intrusion detection refers to the intrusion detection function that uses policies to monitor suspicious traffic on the system.

What’s new for V5R4

The entire intrusion detection topic is new in V5R4.

Using an intrusion detection policy, you can detect intrusions to the TCP/IP network and create audit records.

You can perform the following intrusion detection functions to keep your system secure:

- Create an intrusion detection policy in the `idspolicy.conf` file to monitor specific types of unauthorized access attempts and attacks to the TCP/IP network
- Audit suspicious intrusion activities

- Analyze the audit data and make recommendations to the security administrator if TCP/IP intrusions are likely to be underway

What is new as of February 2006

- | Use the “Details: Intrusion detection policy directives” on page 9 table to look up the intrusion types and
- | the associated directives.

To find other information about what’s new or changed this release, see the Memo to users.

Printable PDF

Use this to view and print a PDF of the intrusion detection information.

To view or download the PDF version of this document, select Intrusion detection (about 257 KB).

You can view or download these related topics:


- Plan and set up system security (3907 KB), which discusses techniques for detecting other types of intrusions.
- Quality of Service (QoS) (947 KB), which discusses how to use the QoS commands to activate an intrusion detection policy.

Saving PDF files

To save a PDF on your workstation for viewing or printing:

1. Right-click the PDF in your browser (right-click the link above).
2. Click the option that saves the PDF locally.
3. Navigate to the directory in which you want to save the PDF.
4. Click **Save**.

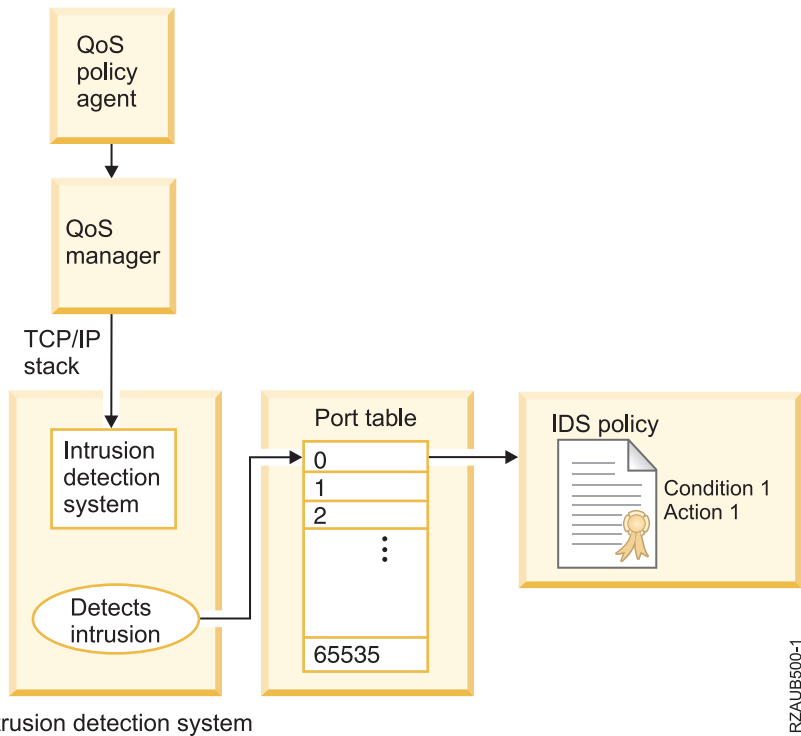
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Intrusion detection concepts

This topic describes how the intrusion detection system works.

Intrusion detection uses the `idspolicy.conf` file, which contains a set of policies for intrusion events. Each policy has an associated condition and action, but there might be more than one condition associated with the same action. The TCP/IP stack reports the most common potential intrusion events and audits them. You can write an application to analyze the data and report to the security administrator if intrusions are likely to be underway. The following diagram shows how the intrusion detection function works.



Intrusion detection system

The following list describes how the intrusion detection system (IDS) works.

1. Edit the `idspolicy.conf` file to detect specific types of intrusions, and then you start the QoS server.
2. The QoS policy agent reads the intrusion detection policy in the `idspolicy.conf` file.
3. The QoS policy agent sends a message with machine instructions to the QoS manager.
4. The QoS manager interprets the machine instructions and sends them to the intrusion detection system inside the TCP/IP stack. The TCP/IP stack manages outbound traffic and inbound traffic in the network, and routes requests to other computers in the network.
5. The intrusion detection system creates the policies in the port table. The port table entries represent ports 0 through port 65 535. For example, port 0, which contains conditions that apply to all ports, points to intrusion condition 1, which points to action 1. Similarly, port 1 points to condition 2, which points to action 2. Port 1 also points to condition 3, which points to action 1, and so on.
6. When the TCP/IP stack detects an intrusion, it looks for matching conditions in the port table and processes the specific action, for example, creating an IM audit record or keeping system statistics.
7. The system creates an intrusion monitor (IM) audit record that describes the type of intrusion event.
8. The system administrator analyzes the IM audit record to determine which security actions to take, such as ending the interface from which the intrusion originated.

Intrusion detection terminology

Definitions and descriptions of commonly used intrusion detection terms are included here.

denial-of-service attack

In computer security, an assault on a network that brings down one or more hosts on a network such that the host is unable to perform its functions properly. Network service is interrupted for some period.

ICMP scan

A check that determines if a host responds to Internet Control Message Protocol requests, such as a *ping*.

Internet Control Message Protocol (ICMP)

An Internet Protocol that is used by a gateway to communicate with a source host, for example, to report an error in a datagram.

intrusion detection system

A system program that detects attempts to hack into, disrupt, or deny service to the system.

port scan

| Software that searches systems in a network for open ports. A port scanner is used by
| administrators to check the security of a network, and by hackers or crackers to gain entry to the
| network.

Quality of Service (QoS)

Any operation that allows traffic priorities to be designated. Through QoS, different traffic throughout a network can be classified and administered.

traffic regulation anomaly

| A deviation from normal network traffic patterns that is detected by an intrusion detection
| system. These situations could indicate a denial-of-service attack or a hacker who is monitoring
| connections to a Web server.

User Datagram Protocol (UDP)

An Internet Protocol that provides unreliable, connectionless datagram service. It enables an application program on one machine or process to send a datagram to an application program on another machine or process.

Setting up an intrusion detection policy

| Intrusion detection allows you to set up policies to notify you of any network intrusions that are detected
| on your system.

Before you begin

An intrusion detection policy consists of two parts:

- An IDS condition that identifies the conditions (such as the port, protocol, or IP address) that apply to the intrusion detection policy.
- An IDS action that identifies the actions to take when a condition is met. Multiple conditions can point to the same action.

| The IDS policy file, `idspolicy.conf`, is included with the i5/OS operating system and stored in the
| `/QIBM/ProdData/OS400/QOS/idspolicy.conf` directory. A sample IDS policy, which is commented out, is
| included in this shipped file. This file is copied to `/QIBM/UserData/OS400/QOS/ETC` when installed.
| (Use Option 3 of i5/OS in the character-based interface.)

About this task

Ensure that you have authority to the `/QIBM/UserData/OS400/QOS/ETC/` directory and the `idspolicy.conf` file. To set up your intrusion detection policy for the first time, follow these steps:

- | 1. Type 2 to display the QAUDCTL system value. Enter *AUDLVL to activate QAUDLVL.
- | 2. Issue the following command to set IP QoS enablement to Yes: `CHGTCPA IPQ0SENB(*YES)`
- | 3. Issue the `WRKSYSVAL` command to set the auditing system values. You will see a list of system values.
- a. Type 2 (Change) to see the auditing options for the QAUDLVL system value.
 - b. Add *ATNEVT to the list of auditing options.

If there is no room in QAUDLVL to set *ATNEVT, be sure that *AUDLVL2 is set in QAUDLVL, as described below. Press F3 to exit.

- c. Type 2 (Change) to see the auditing options for the QAUDLVL2 system value.
 - d. Add *ATNEVT to the list of auditing options. Press F3 (Exit).
4. To configure the IDS policy file, edit the copy of idspolicy.conf in /QIBM/UserData/OS400/QOS/ETC/. If the file is not there, copy it from /QIBM/ProdData/OS400/QOS/.
 5. Edit the IDS policy file.
 6. Start the QoS server using the following command: `strtcpsvr *qos`
 7. Issue the Work with Active Jobs (WRKACTJOB) command to verify that the QoS server has started. You will see QTOQSRVR in the list of started servers.

What to do next

Now your system is ready to catch suspicious events coming in through the TCP/IP network.

Related tasks

“Editing the intrusion detection policy file”

Follow these steps to edit your intrusion detection policy file.

Related reference

“Overview: Intrusion detection policy directives” on page 7

Most of the directives in the intrusion detection policy file are supported in this release, but a few of them are not supported.

Editing the intrusion detection policy file

Follow these steps to edit your intrusion detection policy file.

1. Stop the QoS server using the following command: `endtcpsvr *qos`
2. Edit the IDS policy file in the /QIBM/UserData/OS400/QOS/ETC/ directory.
3. Start the QoS server using the following command: `strtcpsvr *qos`
4. Issue the Work with Active Jobs (WRKACTJOB) command to verify that the QoS server has started. You will see QTOQSRVR in the list of started servers.

Related tasks

“Setting up an intrusion detection policy” on page 4

Intrusion detection allows you to set up policies to notify you of any network intrusions that are detected on your system.

Example: Traffic regulation policy

This example traffic regulation policy traces suspicious traffic across the network, such as an unusually high rate of TCP connections.

Traffic regulation events correlate to completed handshakes for connections. The intrusion detection system generates statistics and when user-specified thresholds are met, the system generates an audit record. Use the **ibm-idsMaxEventMessage** parameter in the IDS policy file to limit the number of records written to the audit journal for a given action.

This policy points to a single IDS traffic regulation condition and a single IDS action. The IDS condition selects the TCP protocol, local port 8000, and a local host IP address.

The IDS action specifies a TCP connection limit of 1000 for the listening server, a statistics interval of 10 minutes, and 10 percent of the TR connections. This example shows the local host IP addresses as a range of addresses from 9.10.11.000 through 9.10.11.255. An audit record is created if more than 10 percent of all connections are to the IP addresses within the range of 9.10.11.000 through 9.10.11.255.

```
ibm-idsConditionAuxClass  rule1      # IDS condition
{
ibm-idsConditionType      TR
ibm-idsLocalPortRange    8000
```

```

ibm-idsProtocolRange      6
ibm-idsLocalHostIPAddress 2-9.10.11.000-24
ibm-policyIdsActionName   idsact1
}

ibm_idsActionAuxClass     idsact1 # IDS action
{
ibm-idsActionType         TR
ibm-idsStatInterval       10
ibm-idsTRtcpTotalConnections 1000
ibm-idsTRtcpPercentage    10
}

```

Example: Restricted IP options policy

This example is of an IDS attack-type policy that targets restricted IP options in the range of 200 to 205.

```

ibm-idsConditionAuxClass  idscond4 # IDS condition
{
ibm-idsConditionType      ATTACK
ibm-idsAttackType         RESTRICTED_IP_OPTIONS
ibm-idsProtocolRange      200-205
ibm-policyIdsActionName   idsact2
}

ibm-idsActionAuxClass     idsact2
{
ibm-idsActionType         ATTACK
ibm-idsMaxEventMessage    5
}

```

Example: Perpetual echo policy

This example is of an IDS attack-type policy that targets perpetual echoes on local port 7 and remote port 7.

UDP port 7 is the echo port. In an attack, if the header specifies the source and target ports as port 7, the UDP datagram echoes back and forth between the local port 7 and the remote UDP port 7.

This example uses the same IDS action, `idsact2`, as “Example: Restricted IP options policy.”

```

ibm-idsConditionAuxClass  idscond5 # IDS condition
{
ibm-idsConditionType      ATTACK
ibm-idsAttackType         PERPETUAL_ECHO
ibm-idsLocalPortRange     7
ibm-idsRemotePortRange    7
ibm-policyIdsActionName   idsact2
}

```

Example: Intrusion detection scan policy

This example shows a scan policy that uses a stand-alone condition and action.

The TCP/IP stack detects port scans on a port-by-port basis. The stack itself cannot detect a global scan. When a port scan is suspected, it generates a `SCAN_EVENT` that calls the intrusion detection system. The intrusion detection system processes the scan event and calls the `SCAN_GLOBAL` code to generate statistics and monitor thresholds.

- | This action implies that an audit record is cut if the number of scans within a 1-minute interval exceeds
- | 100, or if the number of scans within a 10-minute interval exceeds 200.

This IDS policy targets TCP ports 1 through 5000 for suspicious events.

```

|  ibm-idsConditionAuxClass  idscond10 # IDS condition
|  {
|  ibm-idsConditionType      SCAN_EVENT

```

```

|   ibm-policyIdsActionName      idsscan1
|   ibm-idsProtocolRange        6
|   ibm-idsLocalPortRange       1-5000
|   }
|   ibm-idsActionAuxClass        idsscan1 # IDS action
|   {
|   ibm-idsActionType            SCAN_GLOBAL
|   ibm-idsFSInterval            1
|   ibm-idsFSThreshold           100      # fast scanning threshold
|   ibm-idsSSInterval            10
|   ibm-idsSSThreshold           200      # slow scanning threshold
|   }

```

Overview: Intrusion detection policy directives

Most of the directives in the intrusion detection policy file are supported in this release, but a few of them are not supported.

Supported directives

The intrusion detection policy file contains the following supported directives:

- ibm-idsActionAuxClass
- ibm-idsActionType
- ibm-idsAttackType
- ibm-idsConditionAuxClass
- ibm-idsConditionType
- ibm-idsFSInterval
- ibm-idsFSThreshold
- ibm-ICMPRedirect
- ibm-idsIPOptionRange
- ibm-idsLocalHostIPAddress
- ibm-idsLocalPortRange
- ibm-idsMaxEventMessage
- ibm-idsProtocolRange
- ibm-idsRemoteHostIPAddress
- ibm-idsRemotePortRange
- ibm-idsSSInterval
- ibm-idsSSThreshold
- ibm-idsStatInterval
- ibm-idsTRtcpLimitScope
- ibm-idsTRtcpPercentage
- ibm-idsTRtcpTotalConnections
- ibm-idsTRudpQueueSize
- ibm-policyIdsActionName

Unsupported directives

The following directives in the intrusion detection policy file, while allowed, are ignored in this release.

ibm-idsLoggingLevel

```

|   Specifies a limit to the number of messages logged to a log file. (A limit can be imposed on the
|   number of audit records that are generated for a given action by using the ibm-idsMaxEventMessage
|   directive.)

```

ibm-idsMessageDest

Specifies to which queue the IDS-generated messages should go. (Currently, all messages result in audit records and are not sent to queues.)

ibm-idsNotification

Specifies whether the log file or the console gets notified. (Currently, all messages go to the audit journal only.)

ibm-idsScanExclusion

Specifies an array of IP addresses and ports that should be exempt from statistical bookkeeping if a scan is detected. (No IP addresses or ports are exempt from the statistics that are associated with a scan event.)

ibm-idsSensitivity

Specifies the priority of the condition. (All conditions are treated as having equal priority.)

ibm-idsTypeActions

Specifies the type of action to take for a condition. (The only action taken is to create an audit record.)

Related tasks

“Setting up an intrusion detection policy” on page 4

Intrusion detection allows you to set up policies to notify you of any network intrusions that are detected on your system.

Details: Intrusion detection policy directives

This table provides detailed information about the intrusion types and intrusion detection policy directives.

Key

D = Depends on type of attack
 I = Ignored
 O = Optional
 R = Required
 X = Not supported

Condition type

AT = Attack
 SE = SCAN_EVENT
 SG = SCAN_GLOBAL
 TR = Traffic regulation

Attack type

FL = FLOOD
 IF = IP_FRAGMENT
 IR = ICMP_REDIRECT
 MP = MALFORMED_PACKET
 OR = OUTBOUND_RAW
 PE = PERPETUAL_ECHO
 RO = RESTRICTED_IP_OPTIONS
 RP = RESTRICTED_IP_PROTOCOL

Table 1. Intrusion types and associated IDS policy directives

| Directive | ibm-idsConditionType | | | | ibm-idsAttackType | | | | | | | | |
|------------------------------------|----------------------|----|-----------------|----|-------------------|----|----|----|----|----|----|----|---|
| | TR | SE | SG ² | AT | MP | FL | OR | IR | PE | IF | RO | RP | |
| Condition directives | | | | | | | | | | | | | |
| ibm-idsIPOptionRange | X | X | I | D | X | X | X | X | X | X | X | R | X |
| ibm-idsLocalHostIPAddress | R | R | I | O | O | O | X | O | O | O | O | O | O |
| ibm-idsLocalPortRange ¹ | O | R | I | O | O | O | X | O | O | O | O | O | O |
| ibm-idsProtocolRange | R | X | I | D | X | X | X | X | X | X | X | X | X |
| ibm-idsRemoteHostIPAddress | O | O | I | O | O | O | X | O | O | O | O | O | O |
| ibm-idsRemotePortRange | O | O | I | O | O | O | X | O | O | O | O | O | O |
| ibm-policyIdsActionName | R | R | R | R | R | R | X | R | R | R | R | R | R |
| Action directives | | | | | | | | | | | | | |
| ibm-idsActionType | R | R | R | R | R | R | X | R | R | R | R | R | R |
| ibm-idsFSInterval ³ | X | O | O | X | X | X | X | X | X | X | X | X | X |
| ibm-idsFSThreshold | X | O | O | X | X | X | X | X | X | X | X | X | X |
| ibm-idsMaxEventMessage | O | O | O | O | O | O | X | O | O | O | O | O | O |
| ibm-idsSSIInterval | X | O | O | X | X | X | X | X | X | X | X | X | X |
| ibm-idsSSThreshold | X | O | O | X | X | X | X | X | X | X | X | X | X |
| ibm-idsStatInterval | O | I | I | O | O | O | X | O | O | O | O | O | O |
| ibm-idsTRtcpLimitScope | O | X | X | X | X | X | X | X | X | X | X | X | X |
| ibm-idsTRtcpPercentage | R | X | X | X | X | X | X | X | X | X | X | X | X |
| ibm-idsTRtcpTotalConnections | R | X | X | X | X | X | X | X | X | X | X | X | X |
| ibm-idsTRudpQueueSize | O | X | X | X | X | X | X | X | X | X | X | X | X |

Footnotes:

1. If no local port range is given, the condition applies to all local ports.
2. Although SCAN_GLOBAL conditions are not supported, SCAN_GLOBAL actions might be applied to SCAN_EVENT conditions. The TCP/IP stack can detect only single scan events.
3. If the scan action directives are not specifically assigned values in the policy file, these directives (ibm-idsFSInterval, ibm-idsFSThreshold, ibm-idsSSIInterval, and ibm-idsSSThreshold) are assigned the default values.

Note: For TR events, the QoS server has to be recycled to reset the percentage or the count of connections. When the ibm-idsMaxEventMessage value is reached for a given action, no more audit records are created for any condition associated with that action until the QoS server is recycled. The following directives that do not appear in the above table are ignored:

- ibm-ICMPRedirect
- ibm-idsLoggingLevel
- ibm-idsMessageDest

- | • ibm-idsNotification
- | • ibm-idsScanExclusion
- | • ibm-idsSensitivity
- | • ibm-idsTypeActions

| **Backing up the intrusion detection policy file**

You should back up your intrusion detection policies to eliminate the need to re-create your policies in the event of a system outage or power loss.

Before you begin

Your intrusion detection policies can be stored locally or exported to a directory server. Back up the intrusion detection policies in the following directories:

QIBM/UserData/OS400/QOS/ETC

QIBM/ProdData/OS400/QOS/

Also back up your directory server publishing agent for the QoS server. The publishing agent contains the directory server name, the distinguished name (DN) for the QoS server, port used to access the directory server, and authentication information.

About this task

Follow these steps to ensure that you can easily replace lost IDS policies:

1. Use integrated file systems backup and recovery programs.

The *Backup and recovery* book provides instructions on conducting backups from integrated file systems.

2. Print out the policies.

You can store the printouts wherever they are most likely to be secure and reenter the information as necessary.

3. Copy the information to a disk.

Copying has an advantage over printouts: rather than reentering manually, the information exists electronically. It provides you a straightforward method for transporting information from one online source to another.

Related information



Backup and Recovery PDF

Writing intrusion detection programs

You can create an intrusion detection program to send e-mail to alert system administrators to suspicious events and provide suggested responses.

About this task

You also can write a program to analyze the statistics for certain patterns. For example, the statistics might reveal that suspicious events are occurring during off-hours. The statistics might show that there were attempted attacks on the system. The statistics also might show that the network was misconfigured or not working correctly.

An intrusion detection program should take suspicious events into account as well as network problems that occur for other reasons such as hardware or configuration problems. For example, Internet Control Message Protocol (ICMP) redirect messages might indicate that a router is not fully configured yet. Sometimes routers are slow to figure out which router in a network is the best route to a destination.

Auditing intrusion detection activities

It is important to audit intrusion detection activities. If the intrusion detection system flags a suspicious event, it writes an Intrusion Monitor (IM) audit record.

Before you begin

The audit record is written to the security audit journal whenever the QAUDCTL system value contains *AUDLVL and when either the QAUDLVL or QAUDLVL2 system value contains *ATNEVT.

Note: To set *ATNEVT in the QAUDLVL2 system value, you must first set *AUDLVL2 in the QAUDLVL system value.

About this task

To view the IM audit records, follow these steps:

1. To display all of the audit journals, type the following command from the command line:

```
DSPJRN QAUDJRN
```

If you find an audit record of type IM, that means that IDS has flagged a suspicious event. If no IM audit records are displayed, IDS has not detected any suspicious events. (To display only the IM audit records, issue the DSPJRN QAUDJRN ENTYP(IM) command.)

2. Type 5 (Display Entire Entry) to view the contents of the IM audit record.

Note: Some fields in the IM record are in hexadecimal format. To view those hexadecimal fields, press F11 (Display hexadecimal format).

3. Report suspicious events to your systems administrator to take appropriate action, such as closing the port or locating the spoofed IP address.

What to do next

Now, you are ready to analyze the IM audit records. The audit record is the only way of alerting a system administrator that a suspicious event has taken place.

Related reference

“Analyzing the auditing data”

You can analyze the auditing data for intrusion detection activities, and obtain reference information about the fields in the IM audit record.

Analyzing the auditing data

You can analyze the auditing data for intrusion detection activities, and obtain reference information about the fields in the IM audit record.

- | The following example shows an Intrusion Monitor (IM) audit record entry with information about an intrusion event for a restricted Internet Protocol (IP).

```

Display Journal Entry
Object . . . . .:          Library . . . . .:
Member . . . . .:
Incomplete data . .: No      Minimized entry data: *NONE
Sequence . . . . .: 5
Code . . . . .: T - Audit trail entry
Type . . . . .: IM - Intrusion detection monitor

      Entry specific data
Column *...+...1...+...2...+...3...+4...+...5.
00001 'P2005-06-06-15.01.32.6482729999 000009.10.11.0 '
00051 '
00101 ' ,          ATTACK RESTPROT'

```

The following table shows the layout of the IM audit record. Use the information in this table to analyze and interpret the IM audit record.

Table 2. Layout of the IM audit record

| Field Type | Format | Description | Sample Entry |
|----------------------------|------------|---|--|
| Entry type | Char(1) | The potential intrusion event detected. | P |
| Time of event | TIMESTAMP | The timestamp of when the event was detected. | 2005-06-06-15.01.32.648272 |
| Detection point identifier | Char(4) | The unique identifier for the processing location that detected the intrusion event. This field is for use by service personnel. | 9999 |
| Local address family | Char(1) | The local IP address family associated with the detected event. | This field is hidden and appears blank. Press F11 (Display hexadecimal information). |
| Local port number | Zoned(5,0) | The local port number associated with the detected event. (A value of 00000 represents an intrusion on any port because there is no port 0.) | 00000 |
| Local IP address | Char(46) | The local IP address associated with the detected event. | 9.10.11.0 |
| Remote address family | Char(1) | The remote address family associated with the detected event. | This field is hidden and appears blank. Press F11 (Display hexadecimal information). |
| Remote port number | Zoned(5,0) | The remote port number associated with the detected event. | 00000 |
| Remote IP address | Char(46) | The remote IP address associated with the detected event. | 9.10.11.255 |
| Probe type identifier | Char(6) | The type of probe used to detect the potential intrusion. Possible values include: ATTACK Attack action event TR Traffic regulation trace action event SCANG Scan global action event SCANE Scan event action event | ATTACK |

Table 2. Layout of the IM audit record (continued)

| Field Type | Format | Description | Sample Entry |
|------------------|------------|---|--|
| Event correlator | Char(4) | The unique identifier for this specific intrusion event. You can use this identifier to correlate this audit record with other intrusion detection information. | This field is hidden and appears blank. Press F11 (Display hexadecimal information). |
| Event type | Char(8) | The type of potential intrusion that was detected. The possible values include: MALFPKT Malformed packet FLOOD Flood event ICMPRED Internet Control Message Protocol (ICMP) redirect PERPECH Perpetual echo IPFRAG IP fragment RESTPROT Restricted internet protocol (IP) | RESTPROT |
| Suspected packet | Char(1002) | The variable-length, binary field that might contain up to the first 1000 bytes of the IP packet that is associated with the detected event. The first 2 bytes of this field contain the length of the suspected packet information. | This field is hidden and appears blank. Press F11 (Display hexadecimal information). |

Related tasks

“Auditing intrusion detection activities” on page 11

It is important to audit intrusion detection activities. If the intrusion detection system flags a suspicious event, it writes an Intrusion Monitor (IM) audit record.

Scan events

The intrusion detection system detects scans to individual ports.

Through statistics gathering and auditing, the intrusion detection system determines whether the system has been the target of a global scan. When the TCP/IP stack detects an intrusion event, the stack calls the intrusion detection function and generates statistics and audit records.

- | If an IDS scan policy does not exist in the intrusion detection policy file, no action is taken. If an IDS scan
- | policy exists, the intrusion detection system creates an audit record, if the thresholds are exceeded, when
- | it detects a scan event.

Attack events

The intrusion detection system detects different types of attack events and writes an Intrusion Monitor (IM) audit record in the QAUDJRN audit journal.

The intrusion detection system detects the following types of attack events:

- Malformed packets
- Denial of service floods
- Internet Control Message Protocol (ICMP) redirect messages
- Perpetual echo on User Datagram Protocol (UDP) ports

- IP fragments
- Restricted IP options and protocols

| The number of audit records that the system generates depends on the value of the maximum event
| message in the actions of the intrusion detection policy file.

Malformed packet events

A malformed packet is built in such a way as to cause a system to crash or hang when it is processed. When the intrusion detection policy detects a malformed packet, it writes an audit record. The TCP/IP stack deletes the malformed packets.

Fragment restriction events

An unusable fragment overlays IP or transport headers in an attempt to bypass firewall checks. However, on the System i platform, it is not possible to overlay an IP header. The TCP/IP stack checks to ensure that the first fragment of a fragmented datagram is a minimum of 576 bytes. The stack also checks that each fragment beyond the first one has an offset of greater than 256 bytes.

The intrusion detection policy audits invalid IP fragments.

IP option restrictions

The IP options field in a datagram is a variable-length list of optional information. Some of the IP options, such as Loose Source Route, can be used in network attacks. You can use the intrusion detection policy to restrict which IP options an inbound packet can contain. For example, you can specify whether an inbound packet with a restricted IP option is ignored or audited. You can also generate statistics on the number of inbound packets that have restricted IP options.

IP protocol restrictions

The IP protocol field is an 8-bit field in the IP header. Undefined IP protocols are sometimes used to establish back door attacks on the network. You can use the intrusion detection policy to restrict which IP protocols that an inbound packet can contain. The policy can specify whether an inbound packet with a restricted IP protocol is audited. You can also generate statistics about the number of inbound packets that have restricted IP protocols.

SYN flood events

TCP synchronize sequence numbers (SYN) flood events create a large number of half-open sockets. These flood events fill up the socket connection backlog for a given application and deny valid connections from being accepted. A SYN flood event spoofs the source IP address with the address of an unreachable system. The intrusion detection policy flags SYN flood events and writes an audit record.

ICMP redirect events

You can use Internet Control Message Protocol (ICMP) redirect messages to override intended network routes.

Perpetual echo on UDP ports

You can use port 7, which is called the *echo port*, to test a UDP connection. (Both the source port and target port are set to port 7, which causes each port to echo back what it gets.) Whatever data is sent through UDP is echoed back. A perpetual echo is an attack on UDP port 7. The TCP/IP stack detects the
| event if the source port is equal to the target port. If there is an intrusion detection policy for this type of
| attack, the system writes an audit record whenever it detects a perpetual echo attack on the UDP port.

Related information

Listed here are the product manuals and IBM® Redbooks® (in PDF format), Web sites, and information center topics that relate to the Intrusion detection topic. You can view or print any of the PDFs.

Manuals

- iSeries® Security Reference  (13 682 KB)

Other information


- The Plan and set up system security topic which discusses techniques for detecting other types of intrusions.
- The Quality of service topic which discusses how to use the QoS commands to activate an intrusion detection policy.

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