Procedure 1 Con□gure the IOS CA platform

Procedure 5 Con□gure connectivity to the LAN

Step 1:

```
platform qos port-channel-aggregate 1
```

Tech Tip

Step 2:

Procedure 9 Con□gure IKEv2 and IPsec

ip nhrp redirect

```
interface Tunnel10
```

Example: MPLS hub border router–HY-MPLS1-ASR1002X-1

```
route-map SET-TAG-ALL permit 10
 description tag all routes advertised through the tunnel
 set tag 101

! All MPLS tunnel interfaces are in this IP address range
ip access-list standard DMVPN-1-SPOKES
 permit 10.6.34.0 0.0.1.255

route-map SET-TAG-DMVPN-1 permit 10
 description Tag all incoming routes advertised through LAN interface
 match ip route-source DMVPN-1-SPOKES
 set tag 101

route-map SET-TAG-DMVPN-1 permit 100
 description Advertise all other routes with no tag

router eigrp IWAN-EIGRP
 address-family ipv4 unicast autonomous-system 400
   topology base
    distribute-list route-map SET-TAG-DMVPN-1 out Port-channel1
    distribute-list route-map SET-TAG-ALL out Tunnel10
```

Step 2:

```
ip route 10.4.0.0 255.252.0.0 Null0 254
ip route 10.6.0.0 255.255.0.0 Null0 254
ip route 10.4.0.0 255.255.0.0 Null0 254
```

Step 3:

Step 3:

```
interface GigabitEthernet1/0/48
 description IE-ASA5545Xa Gig0/1

interface GigabitEthernet2/0/48
 description IE-ASA5545Xb Gig0/1

interface range GigabitEthernet1/0/48, GigabitEthernet2/0/48
 switchport trunk allowed vlan add 1118
 switchport mode trunk
 logging event link-status
 logging event trunk-status
```

Figure 3

Step 6:	Description	OK

Step 8: Service

Step 9: Description

Step 10:

PROCESS

Con□guring Remote-Site DMVPN Router

Step 2:

Table 16 Required DMVPN protocols

Step 2:

Figure 6 Adding second DMVPN con guration owchart

Table 28 DMVPN tunnel NHRP parameters: IWAN dual Internet design model

Step 2:

Step 4:

Option 2: BGP on the WAN

Step 1:

Step 4:

Step 1:

Example

Step 2:

Step 4:

```
interface  GigabitEthernet1/0/48
 description Link to RS12-2911-2 Gig0/2
 switchport trunk allowed vlan 64,69,99
 switchport mode trunk
 ip arp inspection trust
 spanning-tree portfast trunk
 logging event link-status
 logging event trunk-status
 ip dhcp snooping trust
 no shutdown
 load-interval 30
 macro apply EgressQoS
```

switchport trunk encapsulation dot1q

Procedure 10 Con□gure access layer interfaces

Step 1:

```
interface
```

Example: Layer 2 port-channel

```
interface PortChannel
```

Step 3:

Deploying an IWAN Remote-Site Distribution Layer

Configuring Remote-Site Router for Distribution Layer

Step 3:

Tech Tip

Step 2:

```
router ospf 100
 passive-interface default
 no passive-interface Port-channel1.50
```

Step 3:

Figure 12 IWAN hybrid design model: PfR hub location

Con guring Hub Master Controller

Step 4:

```
interface Port-channel 21
 description HY-MC-CSR1000v-1
 switchport trunk encapsulation dot1q
 switchport trunk allowed vlan 350
 switchport mode trunk
 logging event trunk-status
 logging event bundle-status
 spanning-tree portfast trunk
 no shutdown
```

Step 5:

```
router eigrp IWAN-EIGRP
 address-family ipv4 unicast autonomous-system 400
  af-interface Vlan350
   no passive-interface
   authentication mode md5
   authentication key-chain LAN-KEY
  exit-af-interface
 exit-address-family
```

Step 2:

Example

```
domain iwan
 vrf default
  master hub
   source-interface Loopback0
   site-preýxes preýx-list DC1-PREFIXES
   password c1sco123
   advanced
    channel-unreachable-timer 4
   enterprise-preýx  preýx-list ENTERPRISE-PREFIXES
   collector 10.4.48.36 port 9991
```

Step 2:

```
domain [name]
 vrf [name]
  master hub (conýgure the hub MC with additional commands)
   load-balance (load balance the trafýc not speciýed in a class)
   class [name] sequence [value] (repeat for each class)
    match dscp [value] policy [name] (repeat for each dscp value)
    path-preference [primary] fallback [secondary] (path names)
```

Example

Procedure 4 Con□gure PfR domn [D(n t6 b3(h-3.e Ph)1.6(rb B-6.62(R]TJ/.689 0.363 0.682 0.6593 scn/T1

Step 2:

```
domain [name]
 vrf [name]
  border (create the border)
   source-interface [interface]
   master [IP address of branch MC]
   Password [password]
```

Example

Step 2:

Table 59 Hub MC IP addresses

IWAN design model	Host name	Loopback0 IP address (Mgmt)	Loopback1 IP address (PfR)	Port-channel IP address
Dual Internet	DI-MC-ASR1004-1			

hold-queue in hold-queue out

```
interface Loopback1
 description PfR Loopback w/ IP Anycast
 ip address 10.6.32.252 255.255.255.254
 hold-queue 1024 in
 hold-queue 1024 out
```

Figure 15 IWAN dual Internet design model–Hub BR scalability

Procedure 3

Figure 16 IWAN hybrid design model–Second data center as a transit site

Step 3:

Example: INET hub border router—HY-INET1-ASR1002X-2

```
route-map SET-TAG-ALL permit 10
 description tt.84oarhtion
```

Example: POP2 INET1 border router—HY-INET1-ASR1002X-T2

```
ip community-list standard POP1-SPOKES permit 65100:10

route-map REDIST-BGP-TO-OSPF permit 10
 description Secondary POP1 with higher Metric
 match community POP1-SPOKES
 set metric 2200
 set metric-type type-1

route-map REDIST-BGP-TO-OSPF deny 20
 description
```

```
route-map REDIST-BGP-TO-OSPF permit 1000
 description Prefer POP1 with lower Metric
 set metric 1000
 set metric-type type-1

router ospf 100
 redistribute bgp 65100 subnets route-map REDIST-BGP-TO-OSPF
```

Example: POP1 INET1 border router—HY-INET1-ASR1002X-2

```
ip community-list standard POP2-SPOKES permit 65100:20

route-map REDIST-BGP-TO-OSPF permit 10
 description Secondary POP2 with higher Metric
 match community POP2-SPOKES
 set metric 2200
 set metric-type type-1

route-map REDIST-BGP-TO-OSPF deny 20
 description Block Null routes to be distributed from BGP to OSPF
 match ip address preýx-list DEFAULT-ROUTE ENTERPRISE-PREFIX LOCALDC-PREFIX

route-map REDIST-BGP-TO-OSPF permit 1000
 description Prefer POP1 with lower Metric
 set metric 1200
 set metric-type type-1

router ospf 100
 redistribute bgp 65100 subnets route-map REDIST-BGP-TO-OSPF
```

Step 11: Name

Step 12: Type Host Network

Step 13: IP Address

Step 14: Description OK

Table 80 Hub and transit site MC IP addresses

Step 2:

```
interface Loopback 0
  ip address
```

Step 2:

Step 1:

Step 2:

PROCESS

Con□guring Border Routers for Multiple WAN Transports

Step 2:

Option 2: BGP on the WAN

Step 2:

Table 97 DMVPN NAT address mapping for transit BRs

Hostname		

Table 100

```
domain iwan
 vrf default
  master hub
   load-balance
   class VOICE sequence 10
    match dscp ef policy voice
    path-preference MPLS1 MPLS2 fallback INET1 INET2
    path-last-resort INET4G
   class REAL_TIME_VIDEO sequence 20
    match dscp cs4 policy real-time-video
    match dscp af41 policy real-time-video
    match dscp af42 policy real-time-video
    match dscp af43 policy real-time-video
    path-preference MPLS1 MPLS2 fallback INET1 INET2
   class LOW_LATENCY_DATA sequence 30
    match dscp cs2 policy low-latency-data
    match dscp cs3 policy low-latency-data
    match dscp af21 policy low-latency-data
    match dscp af22 policy low-latency-data
    match dscp af23 policy low-latency-data
    path-preference MPLS1 MPLS2 fallback INET1 next-fallback INET2
    path-last-resort INET4G
   class BULK_DATA sequence 40
    match dscp af11 policy bulk-data
    match dscp af12 policy bulk-data
    match dscp af13 policy bulk-data
    path-preference INET1 INET2 fallback MPLS1 MPLS2
   class SCAVENGER sequence 50
    match dscp cs1 policy scavenger
    path-preference INET1 INET2 fallback blackhole
   class DEFAULT sequence 60
    match dscp default policy best-effort
    path-preference INET1 INET2 fallback MPLS1 MPLS2
```

PROCESS

Con□guring Remote-Site Routers for Multiple WAN Transports

Option 1: MPLS WAN Physical WAN Interface

Table 107 DMVPN tunnel NHRP parameters: MPLS2 and INET2

Step 2:

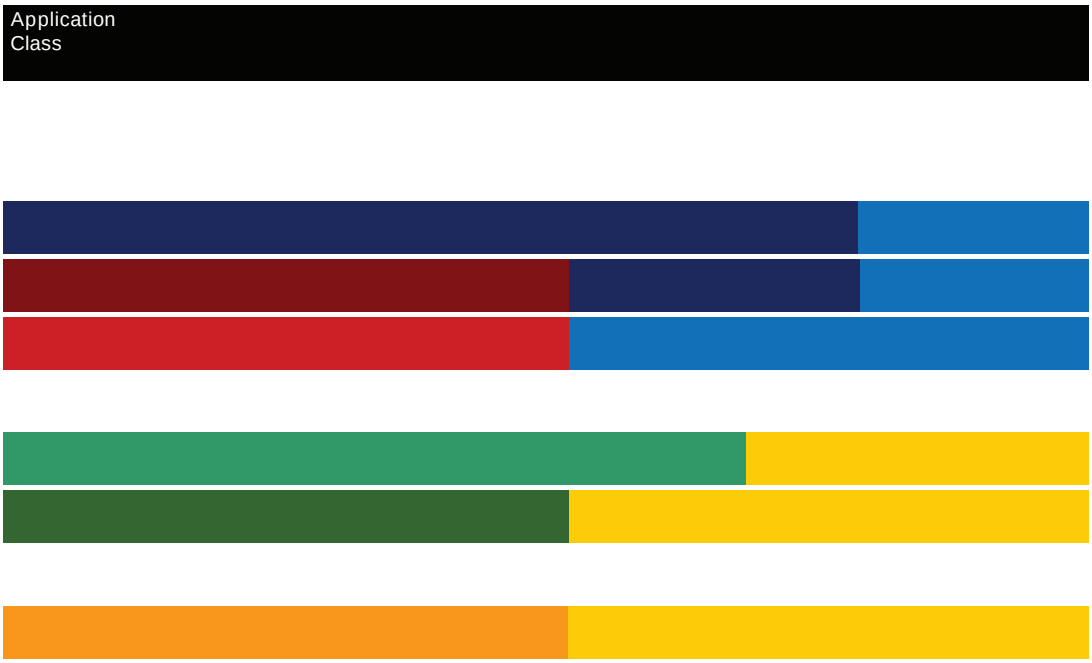
```
route-map POP-SELECT permit 1000
 description
```

Step 2:

```
interface Tunnel12
 ip pim dr-priority 0
```

Step 3:

Figure 19 QoS class model mapping: Tunnel mappings must match provider



Tech Tip

Step 8:

```
set dscp [dscp value]
```

Tech Tip

```
 set dscp cs6
class CALL-SIGNALING
 bandwidth remaining percent 4
 set dscp af21
 class CRITICAL-DATA
 bandwidth remaining percent 25
 random-detect dscp-based
 set dscp af21
class SCAVENGER
 bandwidth remaining percent 1
 set dscp af11
class VOICE
 priority level 1
 police cir percent 10
 set dscp ef
class class-default
 bandwidth remaining percent 25
 random-detect
```

```
  shape average 30000000
   service-policy WAN
policy-map RS-GROUP-20MBPS-POLICY
 class class-default
  shape average 20000000
  bandwidth remaining ratio 20
   service-policy WAN
policy-map RS-GROUP-10MBPS-POLICY
 class class-default
  shape average 10000000
  bandwidth remaining ratio 10
   service-policy WAN
policy-map RS-GROUP-4G-POLICY
 class class-default
  shape average 8000000
  bandwidth remaining ratio 8
   service-policy WAN
```

Example: Remote site router with dual-link for hybrid

```
policy-map POLICY-TRANSPORT-1
 class class-default
```

Step 1:

Table 114 Recommended FNF non-key elds for IWAN

Step 5:

Step 6:

Step 3:

```
þow monitor [monitor name]
 exporter [exporter name]
```

Example: Prime Infrastructure and LiveAction LiveNX

```
þow monitor Monitor-FNF-IWAN
 description IWAN Traffic Analysis
 record Record-FNF-IWAN
 exporter Export-FNF-Monitor-1
 exporter Export-FNF-Monitor-2
 cache timeout active 60
 cache timeout inactive 10
```

Step 4: show ow monitor

```
RS41-2921#show flow monitor
Flow Monitor Monitor-FNF-IWAN:

 c low Mecord-:       ecord-FNF-IWAN c low MEporter :     xport-FNF-Monitor-1
```

Appendix A: Product List

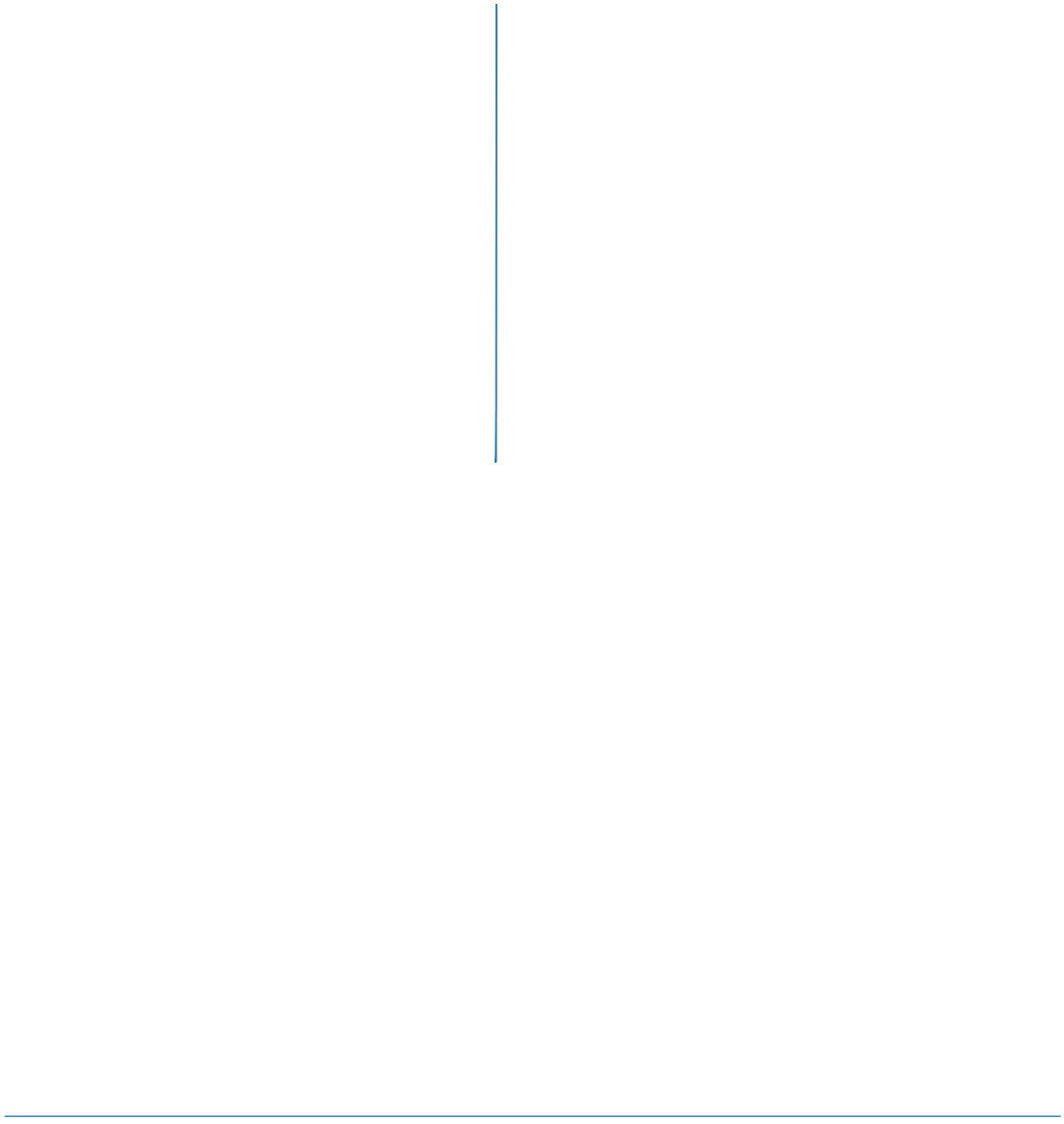
INTERNET EDGE

Appendix B: Technical Feature Supplement

FRONT DOOR VRF FOR DMVPN

Figure 20 IPsec tunnel

Figure 21 IPsec tunnel before/after default route injection



Appendix C: Common Sections

Tech Tip

Step 6:

CONFIGURE IKEV2 AND IPSEC FOR A DMVPN BORDER ROUTER

Example

```
crypto ikev2 policy AES/GCM/256
 match fvrf any
 proposal AES/GCM/256
```

show crypto ikev2 policy

```
show crypto ikev2 policy
 IKEv2 policy : AES/GCM/256
      Match fvrf : any
      Match address local : any
      Proposal    : AES/GCM/256       Match fvrf : any      Match address local : ay
```

```
      inbound esp sas:
       spi: 0x416B8951(1097566545)
         transform: esp-gcm 256 ,
         in use settings ={Transport, }
         conn id: 5392, þow_id: HW:3392, sibling_þags FFFFFFFF80000008, crypto
map: Tunnel10-head-0
         sa timing: remaining key lifetime (k/sec): (4591555/1700)
         IV size: 8 bytes
         replay detection support: Y  replay window size: 1024
         Status: ACTIVE(ACTIVE)
```

Step 8:

Step 4:

```
DI-INET2-ASR1002X-12 (conýg)# crypto pki enroll IWAN-CA

% Start certiýcate enrollment ..
% Create a challenge password. You will need to verbally provide this
   password to the CA Administrator in order to revoke your certiýcate.
   For security reasons your password will not be saved in the conýguration.
   Please make a note of it.

Password: c1sco123
Re-enter password: c1sco123

% The subject name in the certiýcate will include: DI-INET2-ASR1002X-12.cisco.
```

Step 7:

show crypto ipsec sa

```
DI-INET2-ASR1002X-12#show crypto ipsec sa
interface: Tunnel21
    Crypto map tag: Tunnel21-head-0, local addr 192.168.146.21

   protected vrf: (none)
   local  ident (addr/mask/prot/port): (192.168.146.21/255.255.255.255/47/0)
   remote ident (addr/mask/prot/port): (172.19.98.108/255.255.255.255/47/0)
   current_peer 172.19.98.108 port 4500
     PERMIT, þags={origin_is_acl,}
    #pkts encaps: 88955556, #pkts encrypt: 88955556, #pkts digest: 88955556
    #pkts decaps: 118171922, #pkts decrypt: 118171922, #pkts verify: 118171922
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0
    #pkts not decompressed: 0, #pkts decompress failed: 0
    #send errors 0, #recv errors 0

     local crypto endpt.: 192.168.146.21, remote crypto endpt.: 172.19.98.108
     plaintext mtu 1358, path mtu 1400, ip mtu 1400, ip mtu idb Tunnel21
    T*(   c1 spltbou erspi0)Tx3B1610D2(991301842
```

Step 3:

St 0 1e 5:

Example

```
crypto ipsec security-association replay window-size 1024
```

Tech Tip

Option 4:

Example: Second router of dual-router site for dual INET–RS14-2921-2

Step 7: