Enterprise Network Project

(CISA 4390)

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CISA4390-Networking Project Information – Physical devices in room SE1-207

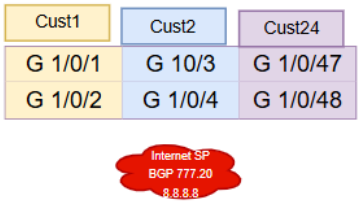
NOTE: The ISP and WAN devices are preconfigured

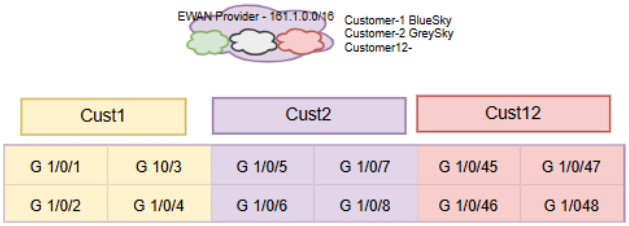
Pods	TS Ports	Bay#1 .241	Bay#2 .242	Bay#3 .243	Bay#4 .244	Bay#5 .245	Bay#6 .246	Bay#7 .247	Bay#8 .248
Pod-1	R1-2066 R2-2067 R3-2068 R4-2069 R5-2070 S1-2071 S2-2072 S3-2073					**Group 3**			
Pod-2	R1-2074 R2-2075 R3-2076 R4-2077 R5-2078 S1-2079 S2-2080 S3-2081		ISP WAN				ISP WAN		
Pod-3	R1-2082 R2-2083 R3-2084 R4-2085 R5-2086 S1-2087 S2-2088 S3-2089		N/A						

Bay2 and Bay6, there are 48-port Cisco 3650 switches one labeled ISP and one labeled WAN. They are configured as described in the diagram below.

Odd ports - 1-3-5-7-9-11	13-15-17-19-21-47 - 192.168.1.1/24
even ports - 2-4-6-8-10-12	14-16-18-20-22-48 - 192.168.1.5/24

Bay-2-ISP switch configured with BGP ASN 777.20 with these IPv4 addresses





Quad ports - 1,2,3,4 Cust1 5,6,7,8 Cust2	Quad ports - 9,10,11,12 Cust3 13,14,15,16 Cust4	Quad ports - 41,42,43,44 Cust11 45,46,47,48 Cust12

Bay-2-WAN Switch Bay-2-WAN Switch

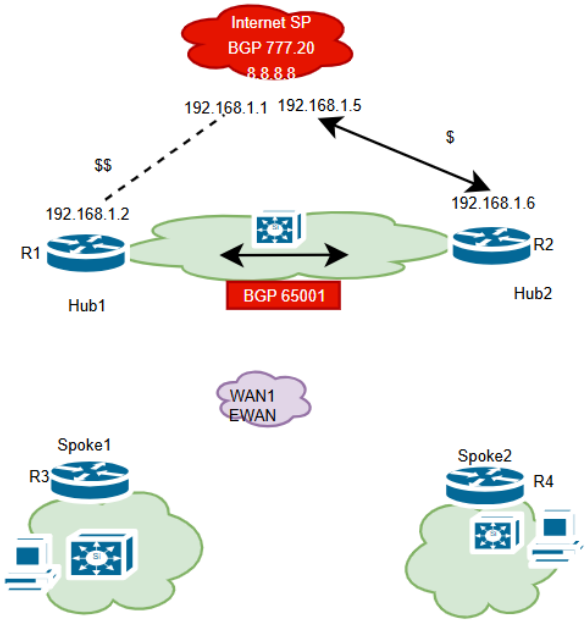
With the ISP switch, the odd ports are configured with 192.168.1.1/30 and even ports are with 192.168.1.5/30. The ISP switch is configured with BGP 777.20 to peer with enterprise BGP ASN 65001. The 192.168.1.0/30 link is authenticated with password “Skills4310-BCIT”. The second link over 192.168.4.0/30 peering is not authenticated.

You are to configure an HQ site with 64x /C subnets for IPv4 and IPv6. HQ site is dual connected to the WAN and to the ISP. The enterprise have 2 branch sites; Br1 has 32x /C and Br2 with 16x /C.

HQ LAN site configuration provides an opportunity for you to demonstrate structured LAN design concept acquired in CISA3310 course with VLANs, STP, EtherChannel’s, HSRP. If you are completing this project is on the hardware devices, you may use the switch modules inserted into R1, R2, and R3. All three routers have 8-port or 4-port Ethernet switch modules inserted into it. These switch modules CANNOT be configured as the routed-port with “no switchport” command; therefore, to assign IPv4 or IPv6 addressing information into it, you need to configure SVIs and assign addressing. If you are using virtual devices, there is no limitations for the number of switches to complete the project.

With CISA3310 course, you configured Data, Voice, Wireless, Guest, Mgmt, Native, and ParkingLot VLANs

To demonstrate the skills acquired CISA4310 course, you will first configure a private WAN between the three sites; with dual hub single-cloud DMVPN connectivity between the sites. Then provide Internet connectivity with BGP for the enterprise.



For network management and services skills demonstration, you may configure a Linux host for secure management access of the devices and some automation. You may use the Linux host installed on an external hard drive and connect through the USB-3 port.

Summary of the Project

The team designed an enterprise network using physical devices for BlueSky. First, the team created a topology and the IP addressing scheme for the network. After that, we chose which hardware devices that we will be using and chose which configuration and protocols we are going to apply for the network. We then connected all the cables to the routers and switches and started configuring those devices. For the Site1 where R1, R2 and S1 are located, we configured the inter switch link as trunk ports because R1 and R2 do not support EtherChannel configuration. We then configured a DataVLAN, VoiceVLAN, ServerVLAN, WlessVLAN, GuestVLAN, MgmtVLAN to R1 and configured VLAN 999 as the native VLAN to avoid VLAN hopping. The VLANs are configured with VLAN Trunking protocol where R1 and R2 are the servers and those VLANs will be distributed to S1 automatically. For S1 we configured trunking and changed the native VLAN to 999 and multiple inter switch link connected to R1 and R2. Finally, all the IP addresses were assigned to the VLANs and interfaces according to our IP addressing design.

The team decided to configure a HSRP for high availability by providing a single virtual default gateway for each VLANs for the HQ site between R1 and R2 where the R1 will be the active router and the R2 will be the standby router meaning when the R1 becomes unavailable the R2 will take over and became the active router and when the R1 goes back the R1 will became an active router and R2 will became a standby router.

The team configured Dual Hub Dynamic Multipoint Virtual Private Network (DMVPN) for R1, R2, R3, and R4 connected to the WAN. The R1 and R2 were configured as hub routers with static IP addresses, while the R3 and R4 were configured as spoke routers that receive their WAN IP addresses through DHCP. Configuring DMVN is quite complicated as we needed the underlay connection to work first before configuring DMVPN tunnels and overlay. After configuring the underlay and overlay, encryption was applied for site-to-site communication for privacy and security, but due to hardware limitations were unable to configure encryption in R3.

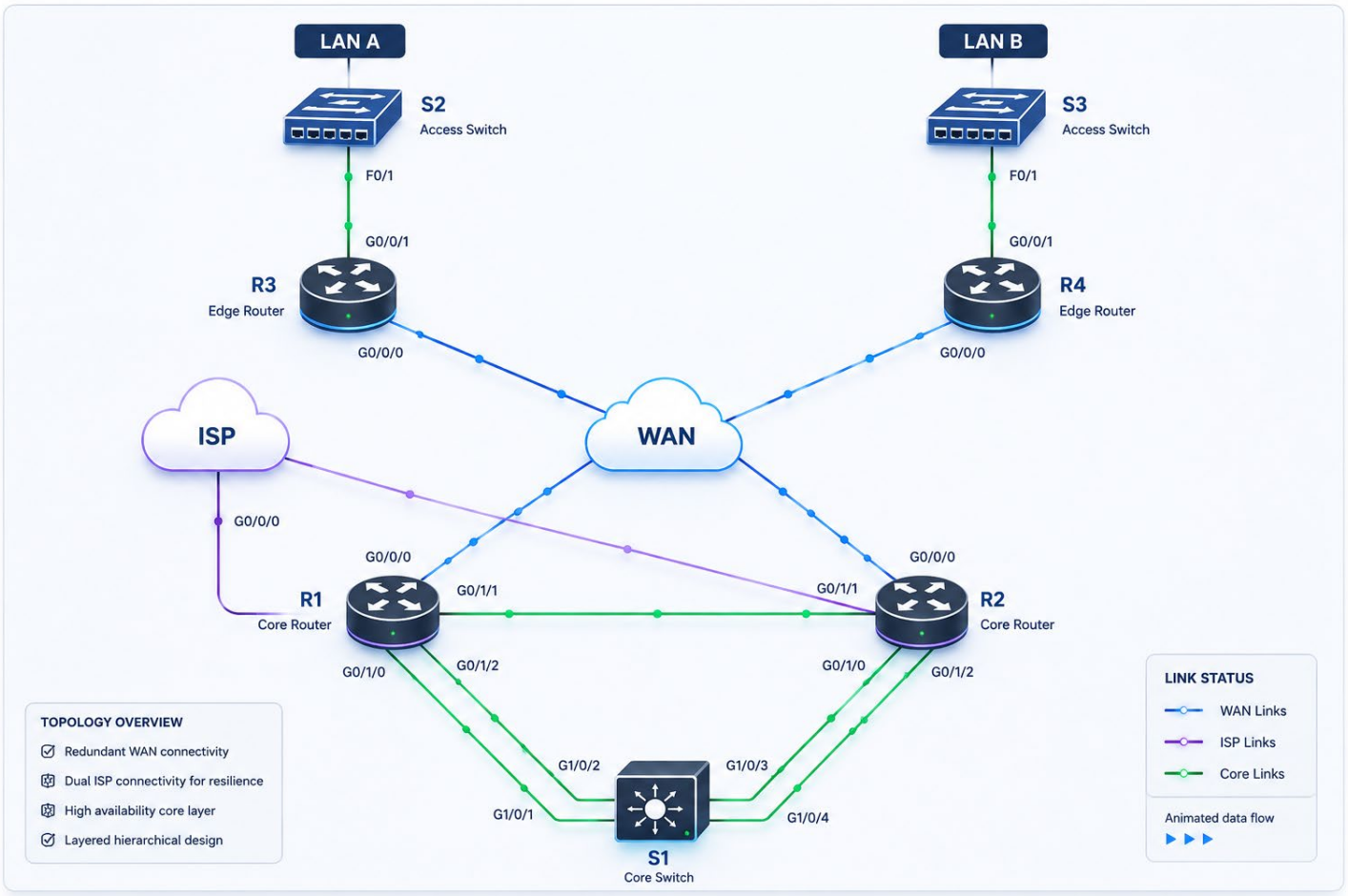
For dynamic routing protocol the team chose OSPF over EIGRP. OSPF is an open-standard protocol that supports vendor interoperability and is the industry standard that is recognized across all major hardware vendors, making it suitable for multi-vendor environments. Even though in this project we use Cisco hardware devices I still chose OSPF for scalability since we can use different vendor device.

To make the network reach the internet the team configured a Border Gateway Protocol (BGP) in R1 and R2 to make a neighbor adjacency with ISP. And the LAN and Management PC can reach the internet and configure the BGP for R3 to reach the internet via tunnel through R1. Configuring R3 to be able to reach internet is challenging as we need to configure a path to R1.

And lastly, we configured SSH on R1, R2, R3 and R4 for secured remote connection using a Management PC installed with LinuxOS via LAN from S3 connected to R4.

Completing this project is a huge milestone for our team. As we learn how to configure an enterprise network that we can share to our future co-workers and add it to our portfolio.

Network Topology:



IP addressing design

LAN sites: 172.3.0.0/16 and 2001:172:3::/48

BS-Site1-LAN		**172.30.0.0/18**	**2001:172:3:0::/58**
R1	Loopback 1	172.3.63.254/24	2001:172:3:2F::FE/64
R2	Loopback 1	172.3.62.254/24	2001:172:3:2E::FE/64
BS-Site2-LAN		**172.3.64.0/19**	**2001:172:3:30::/59**
R3	G0/0/1	172.3.64.254/24	2001:172:3:30::FE/64
	Loopback 1	172.3.95.254/24	2001:172:3:4F::FE/64
BS-Site3-LAN		**172.3.96.0/20**	**2001:172:3:50::/60**
R4	G0/0/1	172.3.96.254/24	2001:172:3:50::FE/64
	Loopback 1	172.3.111.254/24	2001:172:3:5F::FE/64

Inter-VLAN Addressing: 172.3.0.0/16 and 2001:172:3::/48

HQSite1-VLANs		**172.3.0.0/16**	**2001:172:3::/48**
R1			
	VLAN 10	172.3.10.253/24	2001:172:3:10::FE/64
	VLAN 11	172.3.11.253/24	2001:172:3:11::FE/64
	VLAN 12	172.3.12.253/24	2001:172:3:12::FE/64
	VLAN 13	172.3.13.253/24	2001:172:3:13::FE/64
	VLAN 14	172.3.14.253/24	2001:172:3:14::FE/64
	VLAN 15	172.3.15.253/24	2001:172:3:15::FE/64
R2			
	VLAN 10	172.3.10.252/24	2001:172:3:10::FD/64
	VLAN 11	172.3.11.252/24	2001:172:3:11::FD/64
	VLAN 12	172.3.12.252/24	2001:172:3:12::FD/64
	VLAN 13	172.3.13.252/24	2001:172:3:13::FD/64
	VLAN 14	172.3.14.252/24	2001:172:3:14::FD/64
	VLAN 15	172.3.15.252/24	2001:172:3:15::FD/64

IPv4 WAN Major Network = 160.3.0.0/16

R1			**DHCP Exclusion**
	G0/0/1	161.2.1.1/24	161.2.1.1 - 160.3.1.100
R2			
	G0/0/1	161.2.2.1/24	161.2.2.1-161.2.2.100
R3			
	G0/0/0	DHCP	161.2.3.1-161.2.3.100
R4			
	G0/0	DHCP	161.2.4.1-161.2.4.100

IPv4 DMVPN Major Network = 10.3.0.0/16 and 2001:10:3::/48

R1			
	Tunnel 0	10.3.1.1/24	2001:10:3:1::1/64
R2			
	Tunnel 0	10.3.1.2/24	2001:10:3:1::2/64
R3			
	Tunnel 0	10.3.1.3/24	2001:10:3:1::3/64
R4			
	Tunnel 0	10.3.1.4/24	2001:10:3:1::4/64

Screenshots

```
Group-3-R1#sh cdp nei
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
                  D - Remote, C - CVTA, M - Two-port Mac Relay

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
Group-3-S1       Gig 0/1/0         126             R S I  WS-C3650- Gig 1/0/1
Group-3-S1       Gig 0/1/2         125             R S I  WS-C3650- Gig 1/0/2
Group3-S2        Gig 0/0/1         106             R S I  WS-C3650- Gig 1/0/1
Group-3-R2.BestTechG3
                 Gig 0/1/1         130             R S I  ISR4321/K Gig 0/1/1
WAN2             Gig 0/0/1         165             R S I  WS-C3650- Gig 1/0/1
ISP1             Gig 0/0/0         157             R S I  WS-C3650- Gig 1/0/11

Total cdp entries displayed : 6
Group-3-R1#
```

```
Group-3-R2#sh cdp nei
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
                  D - Remote, C - CVTA, M - Two-port Mac Relay

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
Group-3-S1       Gig 0/1/0         150             R S I  WS-C3650- Gig 1/0/3
Group-3-S1       Gig 0/1/2         152             R S I  WS-C3650- Gig 1/0/4
Group3-S2        Gig 0/0/1         74              R S I  WS-C3650- Gig 1/0/2
Group-3-R1.BestTechG3
                 Gig 0/1/1         171             R S I  ISR4321/K Gig 0/1/1
WAN2             Gig 0/0/1         128             R S I  WS-C3650- Gig 1/0/2
ISP1             Gig 0/0/0         176             R S I  WS-C3650- Gig 1/0/12

Total cdp entries displayed : 6
Group-3-R2#
```

```
Group-3-S1#sh cdp nei
Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge
                  S - Switch, H - Host, I - IGMP, r - Repeater, P - Phone,
                  D - Remote, C - CVTA, M - Two-port Mac Relay

Device ID        Local Intrfce     Holdtme    Capability  Platform  Port ID
Group-3-R2.BestTechG3
                 Gig 1/0/4         174             R S I  ISR4321/K Gig 0/1/2
Group-3-R2.BestTechG3
                 Gig 1/0/3         135             R S I  ISR4321/K Gig 0/1/0
Group-3-R1.BestTechG3
                 Gig 1/0/2         156             R S I  ISR4321/K Gig 0/1/2
Group-3-R1.BestTechG3
                 Gig 1/0/1         170             R S I  ISR4321/K Gig 0/1/0

Total cdp entries displayed : 4
Group-3-S1#
```

Etherchannel Configuration:

R1 and R2 switch modules NM-4ESW are not supporting EtherChannel configuration, so I will configure the inter switch links only as trunk

```
Group-3-R1#sh int trunk

Port        Mode             Encapsulation  Status        Native vlan
Gi0/1/0     on               802.1q         trunking      999
Gi0/1/1     on               802.1q         trunking      999
Gi0/1/2     on               802.1q         trunking      999

Port        Vlans allowed on trunk
Gi0/1/0     1-4094
Gi0/1/1     1-4094
Gi0/1/2     1-4094

Port        Vlans allowed and active in management domain
Gi0/1/0     1,10-15,666,999
Gi0/1/1     1,10-15,666,999
Gi0/1/2     1,10-15,666,999

Port        Vlans in spanning tree forwarding state and not pruned
Gi0/1/0     1,10-15,666,999
Gi0/1/1     1,10-15,666,999
Gi0/1/2     1,10-15,666,999
Group-3-R1#
```

```
Group-3-R2#sh int trunk

Port        Mode             Encapsulation  Status        Native vlan
Gi0/1/0     on               802.1q         trunking      999
Gi0/1/1     on               802.1q         trunking      999
Gi0/1/2     on               802.1q         trunking      999

Port        Vlans allowed on trunk
Gi0/1/0     1-4094
Gi0/1/1     1-4094
Gi0/1/2     1-4094

Port        Vlans allowed and active in management domain
Gi0/1/0     1,10-15,666,999
Gi0/1/1     1,10-15,666,999
Gi0/1/2     1,10-15,666,999

Port        Vlans in spanning tree forwarding state and not pruned
Gi0/1/0     1,10-15,666,999
Gi0/1/1     1,10-15,666,999
Gi0/1/2     1,10-15,666,999
Group-3-R2#
```

```
Group-3-S1#sh int trunk

Port        Mode             Encapsulation  Status        Native vlan
Gi1/0/1     on               802.1q         trunking      999
Gi1/0/2     on               802.1q         trunking      999
Gi1/0/3     on               802.1q         trunking      999
Gi1/0/4     on               802.1q         trunking      999

Port        Vlans allowed on trunk
Gi1/0/1     1-4094
Gi1/0/2     1-4094
Gi1/0/3     1-4094
Gi1/0/4     1-4094

Port        Vlans allowed and active in management domain
Gi1/0/1     1,10-15,666,999
Gi1/0/2     1,10-15,666,999
Gi1/0/3     1,10-15,666,999
Gi1/0/4     1,10-15,666,999

Port        Vlans in spanning tree forwarding state and not pruned
Gi1/0/1     1,10-15,666,999
Gi1/0/2     none
Gi1/0/3     none

Port        Vlans in spanning tree forwarding state and not pruned
Gi1/0/4     none
Group-3-S1#
```

VLAN and distribute the VLANs with VTPv3.

```
Group-3-R1#sh vtp status
VTP Version capable             : 1 to 3
VTP version running             : 3
VTP Domain Name                 : BestTechG3
VTP Pruning Mode                : Disabled (Operationally Disabled)
VTP Traps Generation            : Disabled
Device ID                       : 501c.b02d.7cd0

Feature VLAN:
--------------
VTP Operating Mode                : Primary Server
Number of existing VLANs          : 13
Number of existing extended VLANs : 0
Maximum VLANs supported locally   : 64
Configuration Revision            : 6
Primary ID                        : 501c.b02d.7cd0
Primary Description               : Group-3-R1
MD5 digest                        : 0x5C 0x35 0x17 0xD7 0x9D 0x46 0x72 0x78
                                    0x41 0x6F 0x6D 0xB4 0xBB 0x17 0x0C 0x21


Feature MST:
--------------
VTP Operating Mode                : Transparent


Feature UNKNOWN:
--------------
VTP Operating Mode                : Transparent

Group-3-R1#
```

```
Group-3-R2(config)#vtp mode server
Setting device to VTP Server mode for VLANS.
Group-3-R2(config)#do sh vtp status
VTP Version capable             : 1 to 3
VTP version running             : 3
VTP Domain Name                 : BestTechG3
VTP Pruning Mode                : Disabled (Operationally Disabled)
VTP Traps Generation            : Disabled
Device ID                       : 003a.7da1.76d0

Feature VLAN:
--------------
VTP Operating Mode                : Server
Number of existing VLANs          : 13
Number of existing extended VLANs : 0
Maximum VLANs supported locally   : 64
Configuration Revision            : 6
Primary ID                        : 501c.b02d.7cd0
Primary Description               : Group-3-R1
MD5 digest                        : 0x5C 0x35 0x17 0xD7 0x9D 0x46 0x72 0x78
                                    0x41 0x6F 0x6D 0xB4 0xBB 0x17 0x0C 0x21


Feature MST:
--------------
VTP Operating Mode                : Transparent


Feature UNKNOWN:
--------------
VTP Operating Mode                : Transparent

Group-3-R2(config)#
```

```
Group-3-S1#sh vtp status
VTP Version capable             : 1 to 3
VTP version running             : 3
VTP Domain Name                 : BestTechG3
VTP Pruning Mode                : Disabled
VTP Traps Generation            : Disabled
Device ID                       : e4aa.5db4.5900

Feature VLAN:
--------------
VTP Operating Mode                : Client
Number of existing VLANs          : 13
Number of existing extended VLANs : 0
Maximum VLANs supported locally   : 4096
Configuration Revision            : 6
Primary ID                        : 501c.b02d.7cd0
Primary Description               : Group-3-R1
MD5 digest                        : 0x5C 0x35 0x17 0xD7 0x9D 0x46 0x72 0x78
                                    0x41 0x6F 0x6D 0xB4 0xBB 0x17 0x0C 0x21


Feature MST:
--------------
VTP Operating Mode                : Transparent


Feature UNKNOWN:
--------------
VTP Operating Mode                : Transparent

Group-3-S1#
```

The VLANs spreads in the entire network using VTP

```
Group-3-R1#sh vlan br

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gi0/1/3, Gi0/1/4, Gi0/1/5
                                                Gi0/1/6, Gi0/1/7
10   DataVLAN                         active
11   VoiceVLAN                        active
12   ServerVLAN                       active
13   WlessVLAN                        active
14   GuestVLAN                        active
15   MgmtVLAN                         active
666  ParkingLotVLAN                   active
999  NativeVLAN                       active
1002 fddi-default                     act/unsup
1003 trcrf-default                    act/unsup
1004 fddinet-default                  act/unsup
1005 trbrf-default                    act/unsup
Group-3-R1#
```

```
Group-3-R2(config)#do sh vlan br

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Gi0/1/3
10   DataVLAN                         active
11   VoiceVLAN                        active
12   ServerVLAN                       active
13   WlessVLAN                        active
14   GuestVLAN                        active
15   MgmtVLAN                         active
666  ParkingLotVLAN                   active
999  NativeVLAN                       active
1002 fddi-default                     act/unsup
1003 trcrf-default                    act/unsup
1004 fddinet-default                  act/unsup
1005 trbrf-default                    act/unsup
Group-3-R2(config)#
```

```
Group-3-S1#sh vlan br

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Gi1/0/5, Gi1/0/6, Gi1/0/7
                                                 Gi1/0/8, Gi1/0/9, Gi1/0/10
                                                 Gi1/0/11, Gi1/0/12, Gi1/0/13
                                                 Gi1/0/14, Gi1/0/15, Gi1/0/16
                                                 Gi1/0/18, Gi1/0/19, Gi1/0/20
                                                 Gi1/0/21, Gi1/0/22, Gi1/0/23
                                                 Gi1/0/24, Gi1/1/1, Gi1/1/2
                                                 Gi1/1/3, Gi1/1/4
10   DataVLAN                          active
11   VoiceVLAN                         active
12   ServerVLAN                        active
13   WlessVLAN                         active
14   GuestVLAN                         active
15   MgmtVLAN                          active    Gi1/0/17
666  ParkingLotVLAN                    active
999  NativeVLAN                        active
1002 fddi-default                      act/unsup
1003 trcrf-default                     act/unsup
1004 fddinet-default                   act/unsup
1005 trbrf-default                     act/unsup
Group-3-S1#
```

MST configuration

```
Group-3-R1#sh span root

                                        Root    Hello Max Fwd
MST Instance          Root ID           Cost    Time  Age Dly  Root Port
--------------- -------------------- --------- ----- --- ---  ------------
G0:MST0         24576 003a.7da1.7751         0    2   20  15  Gi0/1/1
G0:MST1         24577 003a.7da1.7751     20000    2   20  15  Gi0/1/1
G0:MST2         24578 501c.b02d.7d51         0    2   20  15
Group-3-R1#
```

```
Group-3-R2#sh span root

                                        Root    Hello Max Fwd
MST Instance          Root ID           Cost    Time  Age Dly  Root Port
--------------- -------------------- --------- ----- --- ---  ------------
G0:MST0         24576 003a.7da1.7751         0    2   20  15
G0:MST1         24577 003a.7da1.7751         0    2   20  15
G0:MST2         24578 501c.b02d.7d51     20000    2   20  15  Gi0/1/1
Group-3-R2#
```

```
Group-3-S1#sh span root

                                        Root    Hello Max Fwd
MST Instance          Root ID           Cost    Time  Age Dly  Root Port
--------------- -------------------- --------- ----- --- ---  ------------
MST0            24576 003a.7da1.7751         0    2   20  15  Gi1/0/4
MST1            24577 003a.7da1.7751     20000    2   20  15  Gi1/0/4
MST2            24578 501c.b02d.7d51     20000    2   20  15  Gi1/0/1
Group-3-S1#
```

IP assignment

```
Group-3-R1(config)#do sh ip int br
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   192.168.1.2     YES manual up                    up
GigabitEthernet0/0/1   161.2.1.1       YES manual up                    up
GigabitEthernet0/1/0   unassigned      YES unset  up                    up
GigabitEthernet0/1/1   unassigned      YES unset  up                    up
GigabitEthernet0/1/2   unassigned      YES unset  up                    up
GigabitEthernet0/1/3   unassigned      YES unset  down                  down
GigabitEthernet0/1/4   unassigned      YES unset  down                  down
GigabitEthernet0/1/5   unassigned      YES unset  down                  down
GigabitEthernet0/1/6   unassigned      YES unset  down                  down
GigabitEthernet0/1/7   unassigned      YES unset  down                  down
GigabitEthernet0       unassigned      YES unset  down                  down
Loopback1              172.3.63.254    YES manual up                    up
Tunnel0                10.3.1.1        YES manual up                    up
Vlan1                  unassigned      YES unset  up                    up
Vlan10                 172.3.10.253    YES manual up                    up
Vlan11                 172.3.11.253    YES manual up                    up
Vlan12                 172.3.12.253    YES manual up                    up
Vlan13                 172.3.13.253    YES manual up                    up
Vlan14                 172.3.14.253    YES manual up                    up
Vlan15                 172.3.15.253    YES manual up                    up
Group-3-R1(config)#
```

```
Group-3-R2(config)#do sh ip int br
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   192.168.1.6     YES manual up                    up
GigabitEthernet0/0/1   161.2.2.1       YES manual up                    up
GigabitEthernet0/1/0   unassigned      YES unset  up                    up
GigabitEthernet0/1/1   unassigned      YES unset  up                    up
GigabitEthernet0/1/2   unassigned      YES unset  up                    up
GigabitEthernet0/1/3   unassigned      YES unset  down                  down
GigabitEthernet0       unassigned      YES unset  down                  down
Loopback1              172.3.62.254    YES manual up                    up
Tunnel0                10.3.1.2        YES manual up                    up
Vlan1                  unassigned      YES unset  up                    up
Vlan10                 172.3.10.252    YES manual up                    up
Vlan11                 172.3.11.252    YES manual up                    up
Vlan12                 172.3.12.252    YES manual up                    up
Vlan13                 172.3.13.252    YES manual up                    up
Vlan14                 172.3.14.252    YES manual up                    up
Vlan15                 172.3.15.252    YES manual up                    up
Group-3-R2(config)#
```

```
Group-3-S1#sh ip int br
Any interface listed with OK? value "NO" does not have a valid configuration

Interface              IP-Address      OK? Method Status                Protocol
Vlan1                  unassigned      YES unset  up                    up
Vlan15                 172.3.15.1      YES manual up                    up
GigabitEthernet0/0     unassigned      NO  unset  down                  down
GigabitEthernet1/0/1   unassigned      YES unset  up                    up
GigabitEthernet1/0/2   unassigned      YES unset  up                    up
GigabitEthernet1/0/3   unassigned      YES unset  up                    up
GigabitEthernet1/0/4   unassigned      YES unset  up                    up
GigabitEthernet1/0/5   unassigned      YES unset  down                  down
GigabitEthernet1/0/6   unassigned      YES unset  down                  down
GigabitEthernet1/0/7   unassigned      YES unset  down                  down
GigabitEthernet1/0/8   unassigned      YES unset  down                  down
GigabitEthernet1/0/9   unassigned      YES unset  down                  down
GigabitEthernet1/0/10  unassigned      YES unset  down                  down
GigabitEthernet1/0/11  unassigned      YES unset  down                  down
GigabitEthernet1/0/12  unassigned      YES unset  down                  down
GigabitEthernet1/0/13  unassigned      YES unset  down                  down
GigabitEthernet1/0/14  unassigned      YES unset  down                  down
GigabitEthernet1/0/15  unassigned      YES unset  down                  down
GigabitEthernet1/0/16  unassigned      YES unset  down                  down
GigabitEthernet1/0/17  unassigned      YES unset  down                  down
GigabitEthernet1/0/18  unassigned      YES unset  down                  down
GigabitEthernet1/0/19  unassigned      YES unset  down                  down
GigabitEthernet1/0/20  unassigned      YES unset  down                  down
GigabitEthernet1/0/21  unassigned      YES unset  down                  down
GigabitEthernet1/0/22  unassigned      YES unset  down                  down
GigabitEthernet1/0/23  unassigned      YES unset  down                  down
GigabitEthernet1/0/24  unassigned      YES unset  down                  down
GigabitEthernet1/1/1   unassigned      YES unset  down                  down
GigabitEthernet1/1/2   unassigned      YES unset  down                  down
GigabitEthernet1/1/3   unassigned      YES unset  down                  down
GigabitEthernet1/1/4   unassigned      YES unset  down                  down
Group-3-S1#
```

```
Group-3-R3#sh ip int br
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   161.2.3.101     YES DHCP   up                    up
GigabitEthernet0/0/1   172.3.64.254    YES manual up                    up
GigabitEthernet0/1/0   unassigned      YES unset  down                  down
GigabitEthernet0/1/1   unassigned      YES unset  down                  down
GigabitEthernet0/1/2   unassigned      YES unset  down                  down
GigabitEthernet0/1/3   unassigned      YES unset  down                  down
GigabitEthernet0       unassigned      YES unset  down                  down
Loopback1              172.3.95.254    YES manual up                    up
Tunnel0                10.3.1.3        YES manual up                    up
Vlan1                  unassigned      YES unset  up                    down
Group-3-R3#
```

```
Group-3-R4#sh ip int br
Interface                  IP-Address      OK? Method Status                Protocol
Embedded-Service-Engine0/0 unassigned      YES unset  administratively down down
GigabitEthernet0/0         161.2.4.101     YES DHCP   up                    up
GigabitEthernet0/1         172.3.96.254    YES manual down                  down
Serial0/0/0                unassigned      YES unset  administratively down down
Serial0/0/1                unassigned      YES unset  administratively down down
Serial0/1/0                unassigned      YES unset  administratively down down
Serial0/1/1                unassigned      YES unset  administratively down down
Loopback1                  172.3.111.254   YES manual up                    up
Tunnel0                    10.3.1.4        YES manual up                    up
Group-3-R4#conf t
```

HSRP Configuration

```
Group-3-R1(config-if)#do sh standby br
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State   Active          Standby         Virtual IP
Vl10        10   105 P Active  local           172.3.10.252    172.3.10.254
Vl10        110  105 P Active  local           FE80::23A:7DFF:FEA1:7754
                                                               FE80::5:73FF:FEA0:6E
Vl11        11   105 P Active  local           172.3.11.252    172.3.11.254
Vl11        111  105 P Active  local           FE80::23A:7DFF:FEA1:7754
                                                               FE80::5:73FF:FEA0:6F
Vl12        12   105 P Active  local           172.3.12.252    172.3.12.254
Vl12        112  105 P Active  local           FE80::23A:7DFF:FEA1:7754
                                                               FE80::5:73FF:FEA0:70
Vl13        13   96  P Standby 172.3.13.252    local           172.3.13.254
Vl13        113  96  P Standby FE80::23A:7DFF:FEA1:7754
                                               local           FE80::5:73FF:FEA0:71
Vl14        14   96  P Standby 172.3.14.252    local           172.3.14.254
Vl14        114  96  P Standby FE80::23A:7DFF:FEA1:7754
                                               local           FE80::5:73FF:FEA0:72
Vl15        15   96  P Standby 172.3.15.252    local           172.3.15.254
Vl15        115  96  P Standby FE80::23A:7DFF:FEA1:7754
                                               local           FE80::5:73FF:FEA0:73
Group-3-R1(config-if)#
```

```
Group-3-R2(config-if)#do sh standby br
                     P indicates configured to preempt.
                     |
Interface   Grp  Pri P State   Active          Standby         Virtual IP
Vl10        10   96  P Standby 172.3.10.253    local           172.3.10.254
Vl10        110  96  P Standby FE80::521C:B0FF:FE2D:7D54
                                               local           FE80::5:73FF:FEA0:6E
Vl11        11   96  P Standby 172.3.11.253    local           172.3.11.254
Vl11        111  96  P Standby FE80::521C:B0FF:FE2D:7D54
                                               local           FE80::5:73FF:FEA0:6F
Vl12        12   96  P Standby 172.3.12.253    local           172.3.12.254
Vl12        112  96  P Standby FE80::521C:B0FF:FE2D:7D54
                                               local           FE80::5:73FF:FEA0:70
Vl13        13   105 P Active  local           172.3.13.253    172.3.13.254
Vl13        113  105 P Active  local           FE80::521C:B0FF:FE2D:7D54
                                                               FE80::5:73FF:FEA0:71
Vl14        14   105 P Active  local           172.3.14.253    172.3.14.254
Vl14        114  105 P Active  local           FE80::521C:B0FF:FE2D:7D54
                                                               FE80::5:73FF:FEA0:72
Vl15        15   105 P Active  local           172.3.15.253    172.3.15.254
Vl15        115  105 P Active  local           FE80::521C:B0FF:FE2D:7D54
                                                               FE80::5:73FF:FEA0:73
Group-3-R2(config-if)#
```

DMVPN Configuration

```
Group-3-R1(config-router)#do show dmvpn
Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
        N - NATed, L - Local, X - No Socket
        T1 - Route Installed, T2 - Nexthop-override, B - BGP
        C - CTS Capable, I2 - Temporary
        # Ent --> Number of NHRP entries with same NBMA peer
        NHS Status: E --> Expecting Replies, R --> Responding, W --> Waiting
        UpDn Time --> Up or Down Time for a Tunnel
==========================================================================

Interface: Tunnel0, IPv4 NHRP Details
Type:Hub, NHRP Peers:3,

 # Ent  Peer NBMA Addr Peer Tunnel Add State  UpDn Tm Attrb
 ----- --------------- --------------- ----- -------- -----
     1 161.2.2.1             10.3.1.2    UP 03:29:52     D
     1 161.2.3.101           10.3.1.3    UP 03:29:57     D
     1 161.2.4.101           10.3.1.4    UP 03:18:35     D

Interface: Tunnel0, IPv6 NHRP Details
Type:Hub, Total NBMA Peers (v4/v6): 3
    1.Peer NBMA Address: 161.2.2.1
        Tunnel IPv6 Address: 2001:10:3:1::2
        IPv6 Target Network: 2001:10:3:1::2/128
        # Ent: 1, Status: UP, UpDn Time: 03:30:00, Cache Attrib: D
    2.Peer NBMA Address: 161.2.3.101
        Tunnel IPv6 Address: 2001:10:3:1::3
        IPv6 Target Network: 2001:10:3:1::3/128
        # Ent: 1, Status: UP, UpDn Time: 03:29:55, Cache Attrib: D
    3.Peer NBMA Address: 161.2.4.101
        Tunnel IPv6 Address: 2001:10:3:1::4
        IPv6 Target Network: 2001:10:3:1::4/128
        # Ent: 1, Status: UP, UpDn Time: 03:18:35, Cache Attrib: D

Group-3-R1(config-router)#
```

```
Group-3-R2(config-router)#do sh dmvpn
Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
        N - NATed, L - Local, X - No Socket
        T1 - Route Installed, T2 - Nexthop-override, B - BGP
        C - CTS Capable, I2 - Temporary
        # Ent --> Number of NHRP entries with same NBMA peer
        NHS Status: E --> Expecting Replies, R --> Responding, W --> Waiting
        UpDn Time --> Up or Down Time for a Tunnel
==========================================================================

Interface: Tunnel0, IPv4 NHRP Details
Type:Hub/Spoke, NHRP Peers:3,

 # Ent  Peer NBMA Addr Peer Tunnel Add State  UpDn Tm Attrb
 ----- --------------- --------------- ----- -------- -----
     1 161.2.1.1             10.3.1.1    UP 03:31:04     S
     1 161.2.3.101           10.3.1.3    UP 04:32:54     D
     1 161.2.4.101           10.3.1.4    UP 04:32:50     D

Interface: Tunnel0, IPv6 NHRP Details
Type:Hub/Spoke, Total NBMA Peers (v4/v6): 3
    1.Peer NBMA Address: 161.2.1.1
        Tunnel IPv6 Address: 2001:10:3:1::1
        IPv6 Target Network: 2001:10:3:1::1/128
        # Ent: 1, Status: UP, UpDn Time: 03:31:11, Cache Attrib: S
    2.Peer NBMA Address: 161.2.3.101
        Tunnel IPv6 Address: 2001:10:3:1::3
        IPv6 Target Network: 2001:10:3:1::3/128
        # Ent: 1, Status: UP, UpDn Time: 04:32:54, Cache Attrib: D
    3.Peer NBMA Address: 161.2.4.101
        Tunnel IPv6 Address: 2001:10:3:1::4
        IPv6 Target Network: 2001:10:3:1::4/128
        # Ent: 1, Status: UP, UpDn Time: 04:32:53, Cache Attrib: D

Group-3-R2(config-router)#
```

```
Group3-R3(config-router)#do sh dmvpn
Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
        N - NATed, L - Local, X - No Socket
        T1 - Route Installed, T2 - Nexthop-override, B - BGP
        C - CTS Capable, I2 - Temporary
        # Ent --> Number of NHRP entries with same NBMA peer
        NHS Status: E --> Expecting Replies, R --> Responding, W --> Waiting
        UpDn Time --> Up or Down Time for a Tunnel
==========================================================================

Interface: Tunnel0, IPv4 NHRP Details
Type:Spoke, NHRP Peers:2,

 # Ent  Peer NBMA Addr Peer Tunnel Add State  UpDn Tm Attrb
 ----- --------------- --------------- ----- -------- -----
     1 161.2.1.1             10.3.1.1    UP 03:31:27     S
     1 161.2.2.1             10.3.1.2    UP 04:33:13     S

Interface: Tunnel0, IPv6 NHRP Details
Type:Spoke, Total NBMA Peers (v4/v6): 3
    1.Peer NBMA Address: 161.2.1.1
        Tunnel IPv6 Address: 2001:10:3:1::1
        IPv6 Target Network: 2001:10:3:1::1/128
        # Ent: 1, Status: UP, UpDn Time: 03:31:25, Cache Attrib: S
    2.Peer NBMA Address: 161.2.2.1
        Tunnel IPv6 Address: 2001:10:3:1::2
        IPv6 Target Network: 2001:10:3:1::2/128
        # Ent: 1, Status: UP, UpDn Time: 04:33:13, Cache Attrib: S
    3.Peer NBMA Address: 161.2.4.101
        Tunnel IPv6 Address: 2001:10:3:1::4
        IPv6 Target Network: 2001:10:3:1::4/128
        # Ent: 3, Status: UP, UpDn Time: 00:19:12, Cache Attrib: DT1
    4.Peer NBMA Address: 161.2.4.101
        Tunnel IPv6 Address: 2001:10:3:1::4
        IPv6 Target Network: 2001:172:3:5F::FE/128
        # Ent: 0, Status: UP, UpDn Time: 00:14:47, Cache Attrib: DT2
    5.Peer NBMA Address: 161.2.4.101
        Tunnel IPv6 Address: FE80::DA67:D9FF:FE84:160
        IPv6 Target Network: FE80::DA67:D9FF:FE84:160/128
        # Ent: 0, Status: UP, UpDn Time: 00:14:47, Cache Attrib: D

Group3-R3(config-router)#
```

```
Group3-R4(config-router)#do sh dmvpn
Legend: Attrb --> S - Static, D - Dynamic, I - Incomplete
        N - NATed, L - Local, X - No Socket
        T1 - Route Installed, T2 - Nexthop-override
        C - CTS Capable
        # Ent --> Number of NHRP entries with same NBMA peer
        NHS Status: E --> Expecting Replies, R --> Responding, W --> Waiting
        UpDn Time --> Up or Down Time for a Tunnel
==========================================================================

Interface: Tunnel0, IPv4 NHRP Details
Type:Spoke, NHRP Peers:2,

 # Ent  Peer NBMA Addr Peer Tunnel Add State  UpDn Tm Attrb
 ----- --------------- --------------- ----- -------- -----
     1 161.2.1.1             10.3.1.1    UP 04:33:19     S
     1 161.2.2.1             10.3.1.2    UP 04:33:19     S

Interface: Tunnel0, IPv6 NHRP Details
Type:Spoke, Total NBMA Peers (v4/v6): 2
    1.Peer NBMA Address: 161.2.1.1
        Tunnel IPv6 Address: 2001:10:3:1::1
        IPv6 Target Network: 2001:10:3:1::1/128
        # Ent: 1, Status: UP, UpDn Time: 04:33:19, Cache Attrib: S
    2.Peer NBMA Address: 161.2.2.1
        Tunnel IPv6 Address: 2001:10:3:1::2
        IPv6 Target Network: 2001:10:3:1::2/128
        # Ent: 1, Status: UP, UpDn Time: 04:33:19, Cache Attrib: S

Group3-R4(config-router)#
```

DMVPN Tunnel Encryption

```
Group-3-R1(config)#do show crypto ipsec sa

interface: Tunnel0
    Crypto map tag: Tunnel0-head-0, local addr 161.2.1.1

   protected vrf: (none)
   local  ident (addr/mask/prot/port): (161.2.1.1/255.255.255.255/47/0)
   remote ident (addr/mask/prot/port): (161.2.4.101/255.255.255.255/47/0)
   current_peer 161.2.4.101 port 500
     PERMIT, flags={origin_is_acl,}
    #pkts encaps: 131, #pkts encrypt: 131, #pkts digest: 131
    #pkts decaps: 120, #pkts decrypt: 120, #pkts verify: 120
    #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.: 161.2.1.1, remote crypto endpt.: 161.2.4.101
     plaintext mtu 1458, path mtu 1500, ip mtu 1500, ip mtu idb GigabitEthernet0/0/1
     current outbound spi: 0x65EEC1B2(1710145970)
     PFS (Y/N): N, DH group: none

     inbound esp sas:
      spi: 0x1B9AC2F7(463127287)
        transform: esp-aes esp-sha-hmac ,
        in use settings ={Transport, }
        conn id: 2003, flow_id: ESG:3, sibling_flags FFFFFFFF80004008, crypto map: Tunnel0-head-0, initiator : True
         sa timing: remaining key lifetime (k/sec): (4607984/3443)
        IV size: 16 bytes
        replay detection support: Y
```

```
Group-3-R2(config-if)#do sh crypto ipsec sa

interface: Tunnel0
    Crypto map tag: Tunnel0-head-0, local addr 161.2.2.1

   protected vrf: (none)
   local  ident (addr/mask/prot/port): (161.2.2.1/255.255.255.255/47/0)
   remote ident (addr/mask/prot/port): (161.2.4.101/255.255.255.255/47/0)
   current_peer 161.2.4.101 port 500
     PERMIT, flags={origin_is_acl,}
    #pkts encaps: 141, #pkts encrypt: 141, #pkts digest: 141
    #pkts decaps: 140, #pkts decrypt: 140, #pkts verify: 140
    #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.: 161.2.2.1, remote crypto endpt.: 161.2.4.101
     plaintext mtu 1458, path mtu 1500, ip mtu 1500, ip mtu idb GigabitEthernet0/0/1
     current outbound spi: 0xD8FBFCBA(3640392890)
     PFS (Y/N): N, DH group: none

     inbound esp sas:
      spi: 0x2D34C2D0(758432464)
        transform: esp-aes esp-sha-hmac ,
        in use settings ={Transport, }
        conn id: 2003, flow_id: ESG:3, sibling_flags FFFFFFFF80000008, crypto map: Tunnel0-head-0, initiator : False
         sa timing: remaining key lifetime (k/sec): (4607981/3390)
        IV size: 16 bytes
        replay detection support: Y
        Status: ACTIVE(ACTIVE)
```

```
Group3-R4(config-if)#do sh crypto ipsec sa

interface: Tunnel0
    Crypto map tag: Tunnel0-head-0, local addr 161.2.4.101

   protected vrf: (none)
   local  ident (addr/mask/prot/port): (161.2.4.101/255.255.255.255/47/0)
   remote ident (addr/mask/prot/port): (161.2.2.1/255.255.255.255/47/0)
   current_peer 161.2.2.1 port 500
     PERMIT, flags={origin_is_acl,}
    #pkts encaps: 176, #pkts encrypt: 176, #pkts digest: 176
    #pkts decaps: 178, #pkts decrypt: 178, #pkts verify: 178
    #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.: 161.2.4.101, remote crypto endpt.: 161.2.2.1
     plaintext mtu 1362, path mtu 1400, ip mtu 1400, ip mtu idb Tunnel0
     current outbound spi: 0x2D34C2D0(758432464)
     PFS (Y/N): N, DH group: none

     inbound esp sas:
      spi: 0xD8FBFCBA(3640392890)
        transform: esp-aes esp-sha-hmac ,
        in use settings ={Transport, }
        conn id: 2003, flow_id: Onboard VPN:3, sibling_flags 80004000, crypto map: Tunnel0-head-0
        sa timing: remaining key lifetime (k/sec): (4237107/3333)
        IV size: 16 bytes
        replay detection support: Y
        Status: ACTIVE(ACTIVE)

     inbound ah sas:
```

The R3 router doesn't support the IPsec encryption due to hardware limitations

OSPF Routing Configuration

```
Group-3-R1#sh ip ospf nei

Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           0   FULL/DROTHER    00:00:07    10.3.1.2        Tunnel0
3.3.3.3           0   FULL/DROTHER    00:00:07    10.3.1.3        Tunnel0
4.4.4.4           0   FULL/DROTHER    00:00:07    10.3.1.4        Tunnel0
2.2.2.2           1   FULL/BDR        00:00:39    172.3.15.252    Vlan15
2.2.2.2           1   FULL/BDR        00:00:39    172.3.14.252    Vlan14
2.2.2.2           1   FULL/BDR        00:00:38    172.3.13.252    Vlan13
2.2.2.2           1   FULL/BDR        00:00:38    172.3.12.252    Vlan12
2.2.2.2           1   FULL/BDR        00:00:36    172.3.11.252    Vlan11
2.2.2.2           1   FULL/BDR        00:00:36    172.3.10.252    Vlan10
Group-3-R1#
```

```
Group-3-R2#sh ip ospf nei

Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1         255   FULL/DR         00:00:07    10.3.1.1        Tunnel0
3.3.3.3           0   2WAY/DROTHER    00:00:06    10.3.1.3        Tunnel0
4.4.4.4           0   2WAY/DROTHER    00:00:06    10.3.1.4        Tunnel0
1.1.1.1           1   FULL/DR         00:00:38    172.3.15.253    Vlan15
1.1.1.1           1   FULL/DR         00:00:39    172.3.14.253    Vlan14
1.1.1.1           1   FULL/DR         00:00:36    172.3.13.253    Vlan13
1.1.1.1           1   FULL/DR         00:00:39    172.3.12.253    Vlan12
1.1.1.1           1   FULL/DR         00:00:37    172.3.11.253    Vlan11
1.1.1.1           1   FULL/DR         00:00:32    172.3.10.253    Vlan10
Group-3-R2#
```

```
Group3-R3#sh ip ospf nei

Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1         255   FULL/DR         00:00:07    10.3.1.1        Tunnel0
2.2.2.2           0   2WAY/DROTHER    00:00:06    10.3.1.2        Tunnel0
Group3-R3#
```

```
Group3-R4#sh ip ospf nei

Neighbor ID     Pri   State           Dead Time   Address         Interface
1.1.1.1         255   FULL/DR         00:00:06    10.3.1.1        Tunnel0
2.2.2.2           0   2WAY/DROTHER    00:00:07    10.3.1.2        Tunnel0
Group3-R4#
```

```
Group-3-R1(config-router)#do sh ip proto
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "nhrp"
  Redistributing: nhrp
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 250)

Routing Protocol is "ospf 3"
  Outgoing update filter list for all interfaces is not set
  Passive Interface(s):
  Incoming update filter list for all interfaces is not set
  Router ID 1.1.1.1
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.0.0.0 0.255.255.255 area 0
    172.3.0.0 0.0.255.255 area 3
  Routing on Interfaces Configured Explicitly (Area 0):
    Tunnel0
  Passive Interface(s):
    Loopback1
  Routing Information Sources:
    Gateway         Distance      Last Update
    4.4.4.4              110      01:09:44
    3.3.3.3              110      00:00:44
    2.2.2.2              110      00:00:56
    172.3.62.254         110      04:26:52
  Distance: (default is 110)

Routing Protocol is "bgp 65001"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Passive Interface(s):
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Unicast Aggregate Generation:
    172.3.0.0/18       summary-only
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    192.168.1.1
  Maximum path: 1
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.1.1           20      03:03:43
  Distance: external 20 internal 200 local 200

Group-3-R1(config-router)#
```

```
Group-3-R2(config-router)#do sh ip proto
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "nhrp"
  Redistributing: nhrp
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 250)

Routing Protocol is "ospf 3"
  Outgoing update filter list for all interfaces is not set
  Passive Interface(s):
  Incoming update filter list for all interfaces is not set
  Router ID 2.2.2.2
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.0.0.0 0.255.255.255 area 0
    172.3.0.0 0.0.255.255 area 3
  Routing on Interfaces Configured Explicitly (Area 0):
    Tunnel0
  Routing on Interfaces Configured Explicitly (Area 3):
    Loopback1
  Passive Interface(s):
    Loopback1
  Routing Information Sources:
    Gateway         Distance      Last Update
    4.4.4.4              110      01:10:05
    3.3.3.3              110      00:01:05
    1.1.1.1              110      00:01:14
    172.3.63.254         110      04:27:04
  Distance: (default is 110)

Routing Protocol is "bgp 65001"
  Passive Interface(s):
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Unicast Aggregate Generation:
    172.3.0.0/18       summary-only
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    192.168.1.5
  Maximum path: 1
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.1.5           20      03:03:05
  Distance: external 20 internal 200 local 200

Group-3-R2(config-router)#
```

```
Group3-R3(config-router)#do sh ip proto
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "nhrp"
  Redistributing: connected
                  nhrp
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 250)

Routing Protocol is "ospf 3"
  Passive Interface(s):
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 3.3.3.3
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.3.0.0 0.0.255.255 area 3
  Routing on Interfaces Configured Explicitly (Area 0):
    Tunnel0
  Routing on Interfaces Configured Explicitly (Area 3):
    Loopback1
  Passive Interface(s):
    Loopback1
  Routing Information Sources:
    Gateway         Distance      Last Update
    4.4.4.4              110      00:01:38
    2.2.2.2              110      00:01:38
    1.1.1.1              110      00:01:38
  Distance: (default is 110)

Group3-R3(config-router)#
```

```
Group3-R4#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Group3-R4(config)#router ospf 3
Group3-R4(config-router)#passive-interface lo1
Group3-R4(config-router)#do sh ip proto
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "nhrp"
  Maximum path: 32
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.3.1.3             250      00:40:24
  Distance: (default is 250)

Routing Protocol is "ospf 3"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 4.4.4.4
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.3.0.0 0.0.255.255 area 3
  Routing on Interfaces Configured Explicitly (Area 0):
    Tunnel0
  Routing on Interfaces Configured Explicitly (Area 3):
    Loopback1
  Passive Interface(s):
    Loopback1
  Routing Information Sources:
    Gateway         Distance      Last Update
    2.2.2.2              110      01:13:51
    1.1.1.1              110      01:33:19
    3.3.3.3              110      00:01:54
  Distance: (default is 110)

Group3-R4(config-router)#
```

```
Group-3-R1(config-router)#do sh ip route ospf
Codes: L - local, C - connected, S - static, 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 192.168.1.1 to network 0.0.0.0

      172.3.0.0/16 is variably subnetted, 20 subnets, 4 masks
O        172.3.0.0/16 is a summary, 00:00:36, Null0
O        172.3.62.254/32 [110/2] via 172.3.14.252, 00:00:36, Vlan14
                         [110/2] via 172.3.13.252, 00:00:36, Vlan13
                         [110/2] via 172.3.11.252, 00:00:36, Vlan11
                         [110/2] via 172.3.10.252, 00:00:36, Vlan10
O IA     172.3.95.254/32 [110/2] via 10.3.1.3, 00:00:36, Tunnel0
O IA     172.3.96.0/24 [110/2] via 10.3.1.4, 00:00:36, Tunnel0
O IA     172.3.111.254/32 [110/2] via 10.3.1.4, 00:00:36, Tunnel0
Group-3-R1(config-router)#
```

```
Group-3-R2(config-router)#do sh ip route ospf
Codes: L - local, C - connected, S - static, 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 192.168.1.5 to network 0.0.0.0

      172.3.0.0/16 is variably subnetted, 20 subnets, 4 masks
O IA     172.3.0.0/16 [110/2] via 10.3.1.1, 00:00:56, Tunnel0
O        172.3.63.254/32 [110/2] via 172.3.13.253, 01:35:38, Vlan13
                         [110/2] via 172.3.12.253, 01:35:38, Vlan12
                         [110/2] via 172.3.11.253, 01:35:38, Vlan11
                         [110/2] via 172.3.10.253, 01:35:38, Vlan10
O IA     172.3.95.254/32 [110/2] via 10.3.1.3, 00:03:47, Tunnel0
O IA     172.3.96.0/24 [110/2] via 10.3.1.4, 01:12:47, Tunnel0
O IA     172.3.111.254/32 [110/2] via 10.3.1.4, 01:35:14, Tunnel0
Group-3-R2(config-router)#
```

```
Group3-R3(config-router)#do sh ip route ospf
Codes: L - local, C - connected, S - static, 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 161.2.3.254 to network 0.0.0.0

      172.3.0.0/16 is variably subnetted, 13 subnets, 3 masks
O IA     172.3.0.0/16 [110/2] via 10.3.1.1, 00:01:13, Tunnel0
O IA     172.3.10.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.11.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.12.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.13.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.14.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.15.0/24 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.62.254/32 [110/2] via 10.3.1.2, 00:04:09, Tunnel0
O IA     172.3.63.254/32 [110/3] via 10.3.1.2, 00:01:13, Tunnel0
O IA     172.3.96.0/24 [110/2] via 10.3.1.4, 00:04:09, Tunnel0
O IA     172.3.111.254/32 [110/2] via 10.3.1.4, 00:04:09, Tunnel0
Group3-R3(config-router)#
```

```
Group3-R4(config-router)#do sh ip route ospf
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR

Gateway of last resort is 161.2.4.254 to network 0.0.0.0

      172.3.0.0/16 is variably subnetted, 14 subnets, 3 masks
O IA     172.3.0.0/16 [110/2] via 10.3.1.1, 00:01:26, Tunnel0
O IA     172.3.10.0/24 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.11.0/24 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.12.0/24 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.13.0/24 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.14.0/24 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.15.0/24 [110/2] via 10.3.1.2, 01:16:14, Tunnel0
O IA     172.3.62.254/32 [110/2] via 10.3.1.2, 01:35:42, Tunnel0
O IA     172.3.63.254/32 [110/3] via 10.3.1.2, 00:01:26, Tunnel0
O IA     172.3.95.254/32 [110/2] via 10.3.1.3, 00:04:17, Tunnel0
Group3-R4(config-router)#
```

TCLSH Verifications

Underlay verification

```
Group-3-R1(config)#end
Group-3-R1#tclsh
*May 16 13:26:58.150: %SYS-5-CONFIG_I: Configured from console by console
Group-3-R1(tcl)#foreach X {
+>161.2.1.1
+>161.2.2.1
+>} {ping $X rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.2.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group-3-R1(tcl)#
```

```
Group-3-R2(tcl)#foreach X {
+>161.2.1.1
+>161.2.2.1
+>} {ping $X rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.2.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group-3-R2(tcl)#
```

```
Group3-R3(tcl)#foreach X {
+>161.2.1.1
+>161.2.2.1
+>} {ping $X rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.2.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group3-R3(tcl)#
```

```
Group3-R4(tcl)#foreach X {
+>161.2.1.1
+>161.2.2.1
+>} {ping $X rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 161.2.2.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Group3-R4(tcl)#
```

Overlay configuration

```
Group-3-R1(tcl)#foreach M {
+>10.3.1.1
+>10.3.1.2
+>10.3.1.3
+>10.3.1.4
+>2001:10:3:1::1
+>2001:10:3:1::2
+>2001:10:3:1::3
+>2001:10:3:1::4
+>} {ping $M rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group-3-R1(tcl)#
```

```
Group-3-R2(tcl)#foreach M {
+>10.3.1.1
+>10.3.1.2
+>10.3.1.3
+>10.3.1.4
+>2001:10:3:1::1
+>2001:10:3:1::2
+>2001:10:3:1::3
+>2001:10:3:1::4
+>} {ping $M rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Group-3-R2(tcl)#
```

```
Group3-R3(tcl)#foreach M {
+>10.3.1.1
+>10.3.1.2
+>10.3.1.3
+>10.3.1.4
+>2001:10:3:1::1
+>2001:10:3:1::2
+>2001:10:3:1::3
+>2001:10:3:1::4
+>} {ping $M rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group3-R3(tcl)#
```

```
Group3-R4(tl)#foreach M {
+>10.3.1.1
+>10.3.1.2
+>10.3.1.3
+>10.3.1.4
+>2001:10:3:1::1
+>2001:10:3:1::2
+>2001:10:3:1::3
+>2001:10:3:1::4
+>} {ping $M rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.3, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 10.3.1.4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::1, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::2, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::3, timeout is 2 seconds:
.!!
Success rate is 66 percent (2/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:10:3:1::4, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group3-R4(tl)#
```

LAN verification

```
Group-3-R2(tcl)#foreach LAN {
+>172.3.63.254
+>172.3.62.254
+>172.3.95.254
+>172.3.111.254
+>2001:172:3:2F::FE
+>2001:172:3:2e::FE
+>2001:172:3:4F::FE
+>2001:172:3:5F::FE
+>} {ping $LAN rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.63.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.62.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.95.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.111.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2E::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:4F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:5F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group-3-R2(tcl)#
```

```
Group-3-R1(tcl)#foreach LAN {
+>172.3.63.254
+>172.3.62.254
+>172.3.95.254
+>172.3.111.254
+>2001:172:3:2F::FE
+>2001:172:3:2e::FE
+>2001:172:3:4F::FE
+>2001:172:3:5F::FE
+>} {ping $LAN rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.63.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.62.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.95.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.111.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2E::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:4F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:5F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group-3-R1(tcl)#
```

```
Group3-R3(tcl)#foreach LAN {
+>172.3.63.254
+>172.3.62.254
+>172.3.95.254
+>172.3.111.254
+>2001:172:3:2F::FE
+>2001:172:3:2e::FE
+>2001:172:3:4F::FE
+>2001:172:3:5F::FE
+>} {ping $LAN rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.63.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.62.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.95.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.111.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2E::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:4F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:5F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/2 ms
Group3-R3(tcl)#
```

```
Group3-R4(tcl)#foreach LAN {
+>172.3.63.254
+>172.3.62.254
+>172.3.95.254
+>172.3.111.254
+>2001:172:3:2F::FE
+>2001:172:3:2e::FE
+>2001:172:3:4F::FE
+>2001:172:3:5F::FE
+>} {ping $LAN rep 3}
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.63.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.62.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.95.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 172.3.111.254, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:2E::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:4F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/2/4 ms
Type escape sequence to abort.
Sending 3, 100-byte ICMP Echos to 2001:172:3:5F::FE, timeout is 2 seconds:
!!!
Success rate is 100 percent (3/3), round-trip min/avg/max = 1/1/1 ms
Group3-R4(tcl)#
```

WAN Configuration

```
WAN2#sh ip int br
Interface              IP-Address      OK? Method Status                Protocol
Vlan1                  unassigned      YES unset  up                    down
GigabitEthernet0/0     unassigned      YES unset  down                  down
GigabitEthernet1/0/1   161.2.1.254     YES manual up                    up
GigabitEthernet1/0/2   161.2.2.254     YES manual up                    up
GigabitEthernet1/0/3   161.2.3.254     YES manual up                    up
GigabitEthernet1/0/4   161.2.4.254     YES manual up                    up
GigabitEthernet1/0/5   unassigned      YES unset  down                  down
GigabitEthernet1/0/6   unassigned      YES unset  down                  down
GigabitEthernet1/0/7   unassigned      YES unset  down                  down
GigabitEthernet1/0/8   unassigned      YES unset  down                  down
GigabitEthernet1/0/9   unassigned      YES unset  down                  down
GigabitEthernet1/0/10  unassigned      YES unset  down                  down
GigabitEthernet1/0/11  unassigned      YES unset  down                  down
GigabitEthernet1/0/12  unassigned      YES unset  down                  down
GigabitEthernet1/0/13  unassigned      YES unset  down                  down
GigabitEthernet1/0/14  unassigned      YES unset  down                  down
GigabitEthernet1/0/15  unassigned      YES unset  down                  down
GigabitEthernet1/0/16  unassigned      YES unset  down                  down
GigabitEthernet1/0/17  unassigned      YES unset  down                  down
GigabitEthernet1/0/18  unassigned      YES unset  down                  down
GigabitEthernet1/0/19  unassigned      YES unset  down                  down
GigabitEthernet1/0/20  unassigned      YES unset  down                  down
GigabitEthernet1/0/21  unassigned      YES unset  down                  down
GigabitEthernet1/0/22  unassigned      YES unset  down                  down
GigabitEthernet1/0/23  unassigned      YES unset  down                  down
GigabitEthernet1/0/24  unassigned      YES unset  down                  down
GigabitEthernet1/1/1   unassigned      YES unset  down                  down
GigabitEthernet1/1/2   unassigned      YES unset  down                  down
GigabitEthernet1/1/3   unassigned      YES unset  down                  down
GigabitEthernet1/1/4   unassigned      YES unset  down                  down
WAN2#
```

DHCP Configuration for WAN

```
WAN2#sh run | s excluded
ip dhcp excluded-address 161.2.1.1 161.2.1.100
ip dhcp excluded-address 161.2.2.1 161.2.2.100
ip dhcp excluded-address 161.2.3.1 161.2.3.100
ip dhcp excluded-address 161.2.4.1 161.2.4.100
WAN2#sh ip dhcp binding
Bindings from all pools not associated with VRF:
IP address      Client-ID/              Lease expiration        Type       State      Interface
                Hardware address/
                User name
161.2.3.101     0063.6973.636f.2d30.    May 17 2026 08:24 AM    Automatic  Active     GigabitEthernet1/0/3
                3034.322e.3638.6537.
                2e31.3861.302d.4769.
                302f.302f.30
161.2.4.101     0063.6973.636f.2d64.    May 17 2026 08:24 AM    Automatic  Active     GigabitEthernet1/0/4
                3836.372e.6439.3834.
                2e30.3136.302d.4769.
                302f.30
WAN2#
```

BGP Configuration

```
Group-3-R1(config-router)#do sh bgp summ
% Command accepted but obsolete, unreleased or unsupported; see documentation.
BGP router identifier 172.3.63.254, local AS number 65001
BGP table version is 16, main routing table version 16
9 network entries using 2232 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1184 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4664 total bytes of memory
BGP activity 9/0 prefixes, 9/0 paths, scan interval 60 secs
9 networks peaked at 10:34:51 May 16 2026 UTC (03:08:57.894 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.1.1     4       777.20     214     212       16    0    0 03:08:57        2
Group-3-R1(config-router)#do sh ip bgp
BGP table version is 16, local router ID is 172.3.63.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          192.168.1.1                            0 777.20 i
 *>   172.3.0.0/18     0.0.0.0                            32768 i
 s>   172.3.10.0/24    0.0.0.0                  0         32768 i
 s>   172.3.11.0/24    0.0.0.0                  0         32768 i
 s>   172.3.12.0/24    0.0.0.0                  0         32768 i
 s>   172.3.13.0/24    0.0.0.0                  0         32768 i
 s>   172.3.14.0/24    0.0.0.0                  0         32768 i
 s>   172.3.15.0/24    0.0.0.0                  0         32768 i
 *>   174.0.0.0/8      192.168.1.1              0             0 777.20 i
Group-3-R1(config-router)#sh ip route bgp
                          ^
```

```
Group-3-R1(config-router)#do sh ip route bgp
Codes: L - local, C - connected, S - static, 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 192.168.1.1 to network 0.0.0.0

B*    0.0.0.0/0 [20/0] via 192.168.1.1, 03:10:14
      172.3.0.0/16 is variably subnetted, 20 subnets, 4 masks
B        172.3.0.0/18 [200/0], 03:10:14, Null0
B     174.0.0.0/8 [20/0] via 192.168.1.1, 03:10:14
Group-3-R1(config-router)#do ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/2/2 ms
Group-3-R1(config-router)#
```

```
Group-3-R1#sh ip bgp
BGP table version is 18, local router ID is 172.3.63.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          192.168.1.1                            0 777.20 i
 *>   172.3.0.0/18     0.0.0.0                            32768 i
 s>   172.3.10.0/24    0.0.0.0                  0         32768 i
 s>   172.3.11.0/24    0.0.0.0                  0         32768 i
 s>   172.3.12.0/24    0.0.0.0                  0         32768 i
 s>   172.3.13.0/24    0.0.0.0                  0         32768 i
 s>   172.3.14.0/24    0.0.0.0                  0         32768 i
 s>   172.3.15.0/24    0.0.0.0                  0         32768 i
 s>   172.3.63.0/24    0.0.0.0                  0         32768 i
 *>   174.0.0.0/8      192.168.1.1              0             0 777.20 i
Group-3-R1#
Group-3-R1#sh ip bgp neigh 192.168.1.1 routes
BGP table version is 18, local router ID is 172.3.63.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          192.168.1.1                            0 777.20 i
 *>   174.0.0.0/8      192.168.1.1                  0         0 777.20 i

Total number of prefixes 2
Group-3-R1#
Group-3-R1#
Group-3-R1#sh ip bgp neigh 192.168.1.1 adv
BGP table version is 18, local router ID is 172.3.63.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   172.3.0.0/18     0.0.0.0                            32768 i

Total number of prefixes 1
Group-3-R1#
```

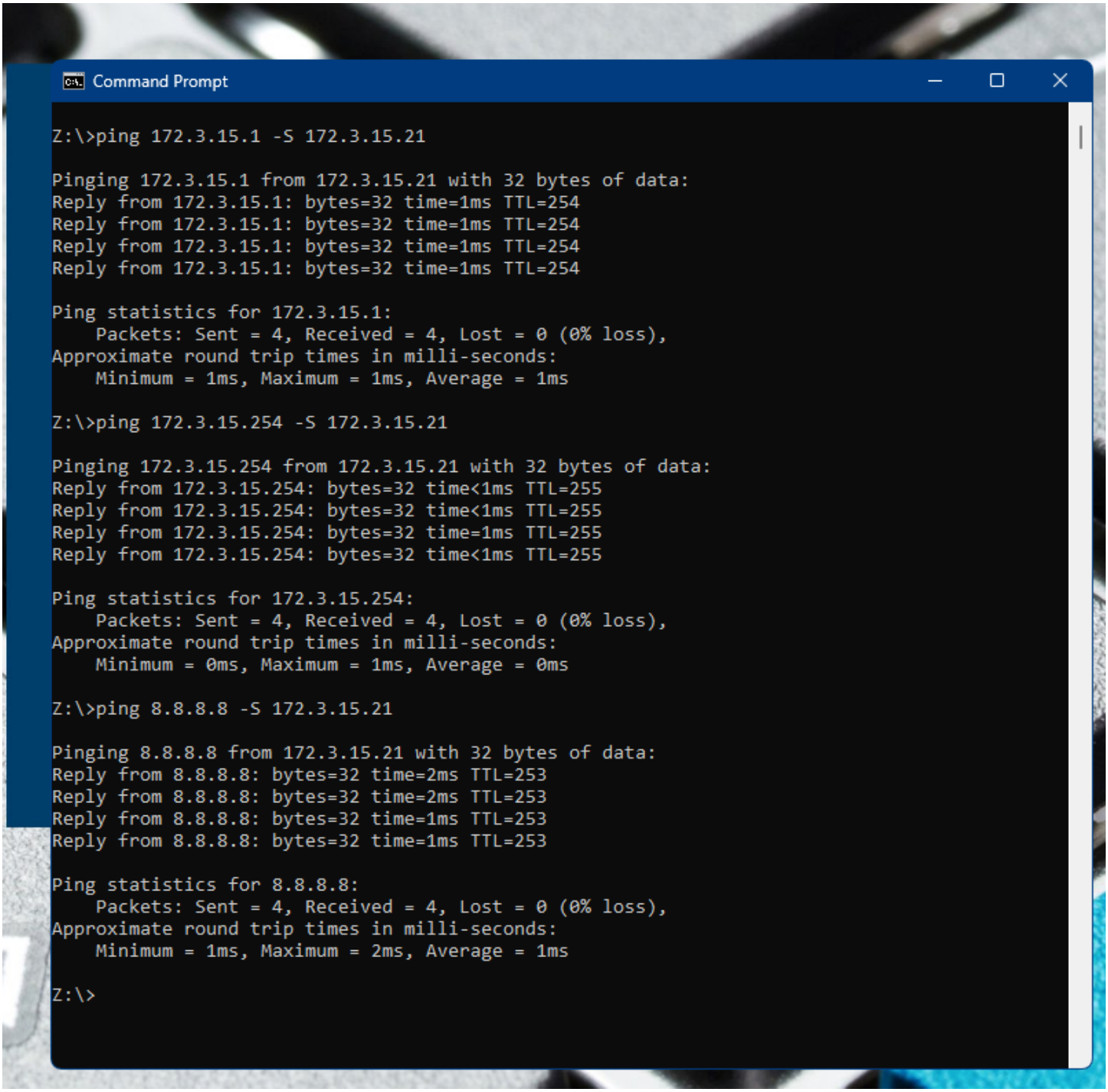
```
Group-3-R2(config-router)#do sh bgp summ
% Command accepted but obsolete, unreleased or unsupported; see documentation.
BGP router identifier 172.3.62.254, local AS number 65001
BGP table version is 16, main routing table version 16
9 network entries using 2232 bytes of memory
9 path entries using 1224 bytes of memory
4/4 BGP path/bestpath attribute entries using 1184 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4664 total bytes of memory
BGP activity 9/0 prefixes, 9/0 paths, scan interval 60 secs
9 networks peaked at 09:50:53 May 16 2026 UTC (03:10:14.228 ago)

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
192.168.1.5     4       777.20     217     212       16    0    0 03:10:13        2
Group-3-R2(config-router)#do sh ip route bgp
Codes: L - local, C - connected, S - static, 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, m - OMP
       n - NAT, Ni - NAT inside, No - NAT outside, Nd - NAT DIA
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       H - NHRP, G - NHRP registered, g - NHRP registration summary
       o - ODR, P - periodic downloaded static route, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from PfR
       & - replicated local route overrides by connected

Gateway of last resort is 192.168.1.5 to network 0.0.0.0

B*    0.0.0.0/0 [20/0] via 192.168.1.5, 03:10:22
      172.3.0.0/16 is variably subnetted, 20 subnets, 4 masks
B        172.3.0.0/18 [200/0], 03:33:32, Null0
B     174.0.0.0/8 [20/0] via 192.168.1.5, 03:10:22
Group-3-R2(config-router)#do ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/3 ms
Group-3-R2(config-router)#
```

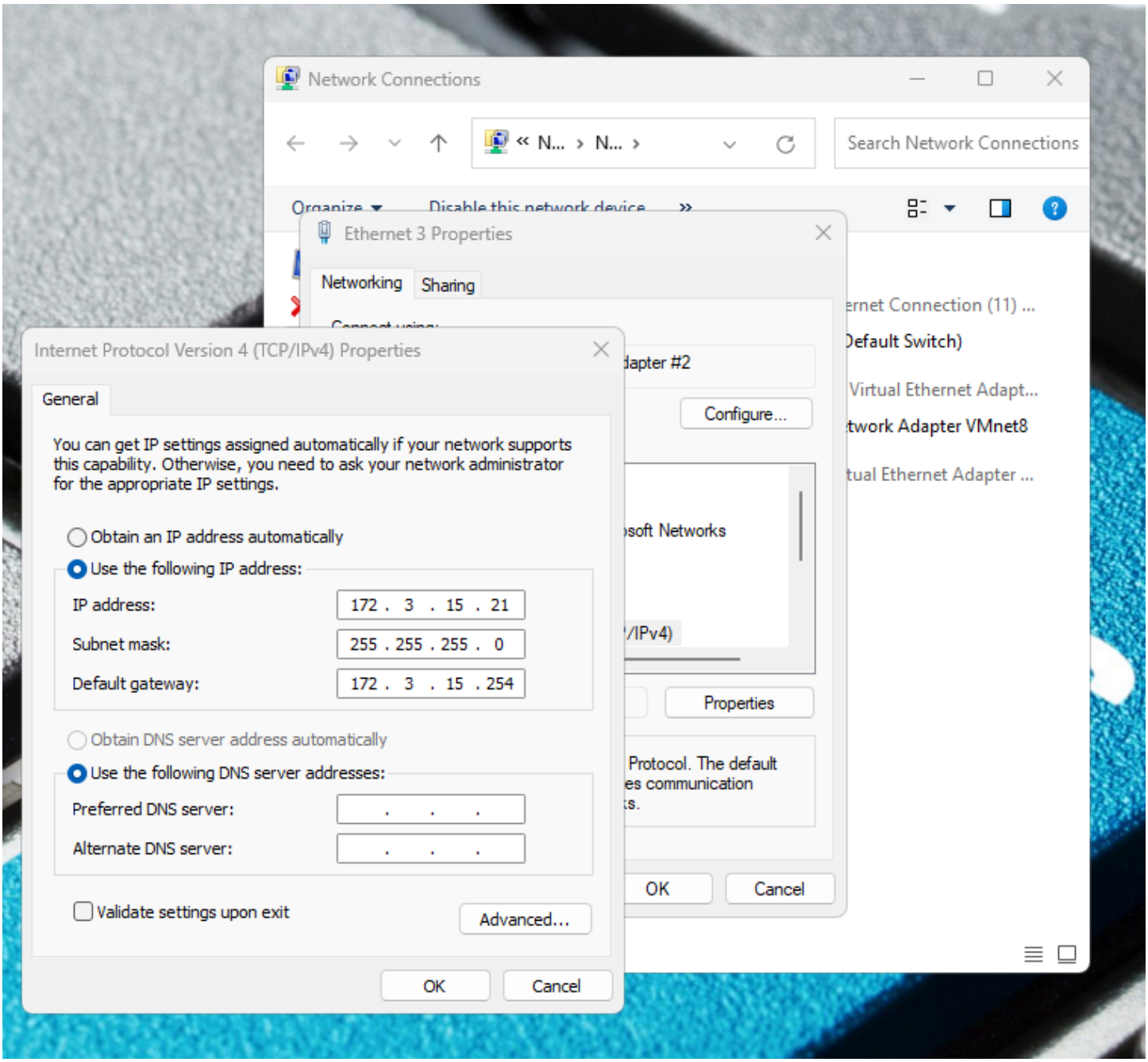
```
Group-3-R2#sh ip bgp
BGP table version is 18, local router ID is 172.3.62.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          192.168.1.5                            0 777.20 i
 *>   172.3.0.0/18     0.0.0.0                            32768 i
 s>   172.3.10.0/24    0.0.0.0                  0         32768 i
 s>   172.3.11.0/24    0.0.0.0                  0         32768 i
 s>   172.3.12.0/24    0.0.0.0                  0         32768 i
 s>   172.3.13.0/24    0.0.0.0                  0         32768 i
 s>   172.3.14.0/24    0.0.0.0                  0         32768 i
 s>   172.3.15.0/24    0.0.0.0                  0         32768 i
 s>   172.3.62.0/24    0.0.0.0                  0         32768 i
 *>   174.0.0.0/8      192.168.1.5              0             0 777.20 i
Group-3-R2#
Group-3-R2#
Group-3-R2#
Group-3-R2#sh ip bgp neigh 192.168.1.5 routes
BGP table version is 18, local router ID is 172.3.62.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   0.0.0.0          192.168.1.5                            0 777.20 i
 *>   174.0.0.0/8      192.168.1.5              0             0 777.20 i

Total number of prefixes 2
Group-3-R2#
Group-3-R2#sh ip bgp neigh 192.168.1.5 adv
BGP table version is 18, local router ID is 172.3.62.254
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
              t secondary path, L long-lived-stale,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>   172.3.0.0/18     0.0.0.0                            32768 i

Total number of prefixes 1
Group-3-R2#
```

```
Group-3-R3#ping
Protocol [ip]:
Target IP address: 8.8.8.8
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]: y
Ingress ping [n]:
Source address or interface: loop 1
DSCP Value [0]:
Type of service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0x0000ABCD]:
Loose, Strict, Record, Timestamp, Verbose[none]: r
Number of hops [ 9 ]:
Loose, Strict, Record, Timestamp, Verbose[RV]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
Packet sent with a source address of 172.3.95.254
Packet has IP options:  Total option bytes= 39, padded length=40
 Record route: <*>
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)

Reply to request 0 (3 ms).  Received packet has options
 Total option bytes= 40, padded length=40
 Record route:
   (10.3.1.3)
   (192.168.1.2)
   (8.8.8.8)
   (10.3.1.1) <*>
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
 End of list

Reply to request 1 (3 ms).  Received packet has options
 Total option bytes= 40, padded length=40
 Record route:
   (10.3.1.3)
   (192.168.1.2)
   (8.8.8.8)
   (10.3.1.1) <*>
   (0.0.0.0)
   (0.0.0.0)
   (0.0.0.0)
```

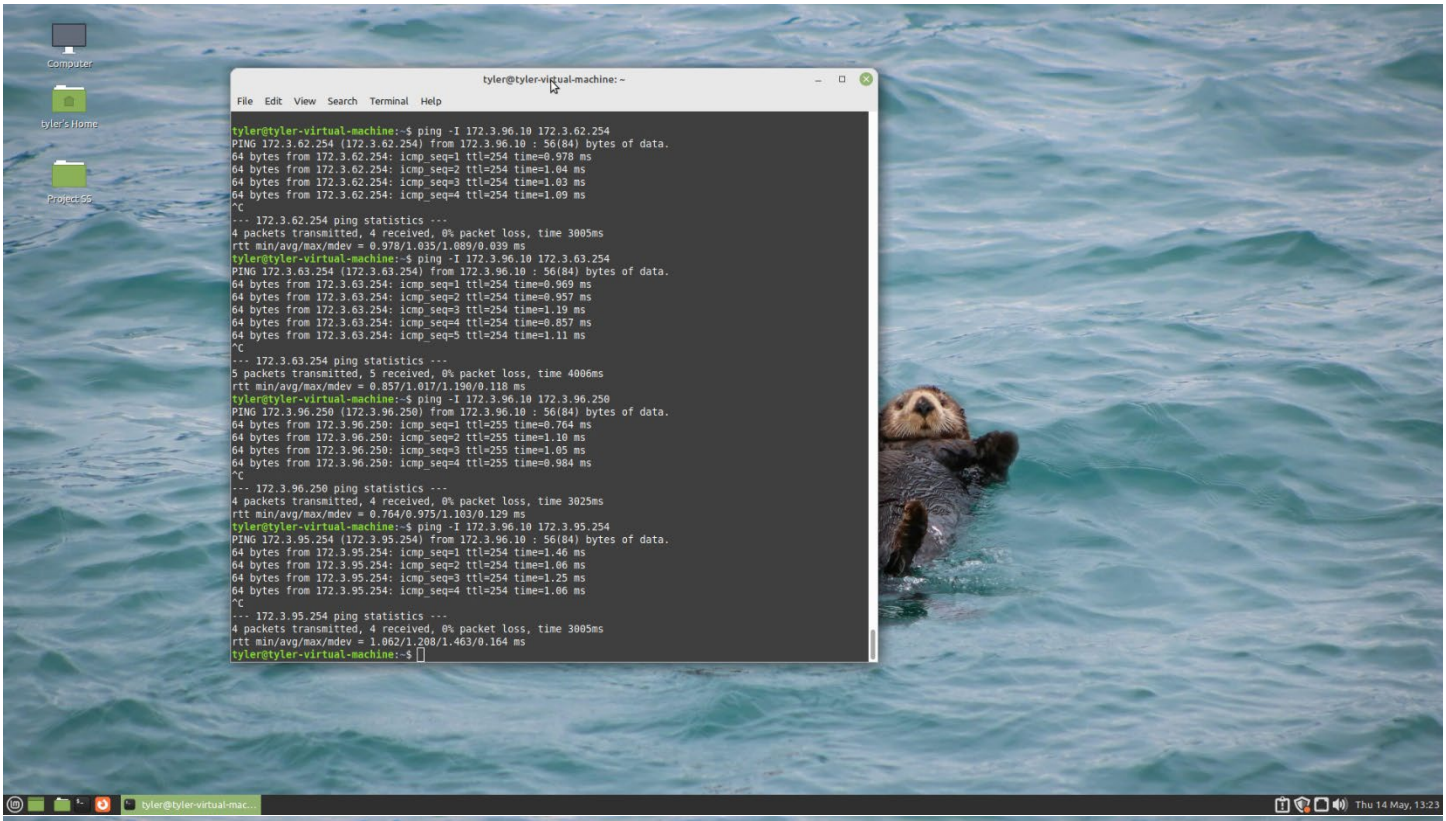
```
Group-3-R3#trace 8.8.8.8 source 172.3.64.254
Type escape sequence to abort.
Tracing the route to 8.8.8.8
VRF info: (vrf in name/id, vrf out name/id)
  1 10.3.1.1 [AS 50921492] 1 msec 1 msec 1 msec
  2 192.168.1.1 [AS 50921492] 2 msec *  3 msec
Group-3-R3#trace 8.8.8.8 source 172.3.95.254
Type escape sequence to abort.
Tracing the route to 8.8.8.8
VRF info: (vrf in name/id, vrf out name/id)
  1 10.3.1.1 [AS 50921492] 1 msec 1 msec 1 msec
  2 192.168.1.1 [AS 50921492] 2 msec *  2 msec
Group-3-R3#
```

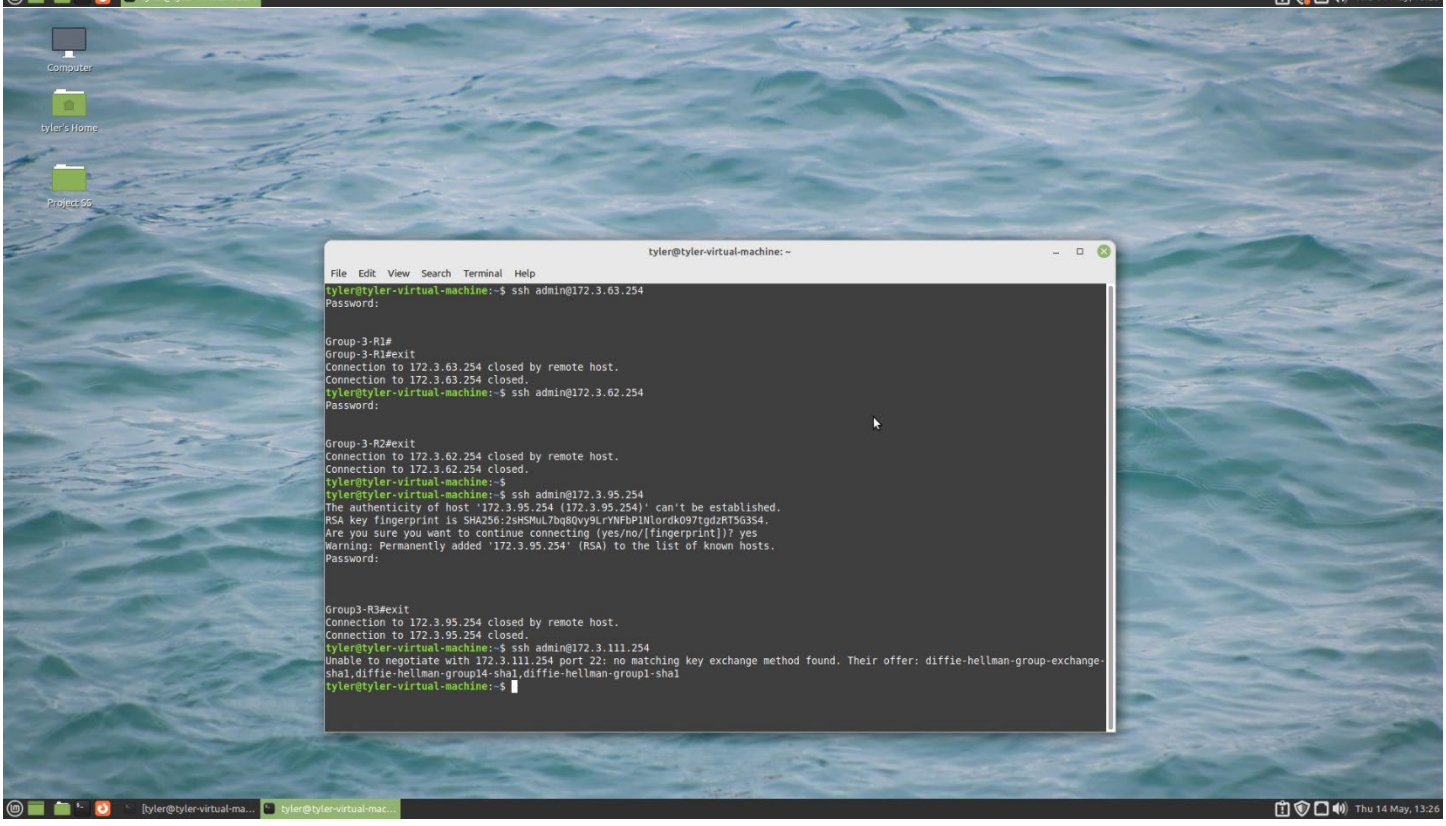
Management VLAN15 PC can ping the network and internet



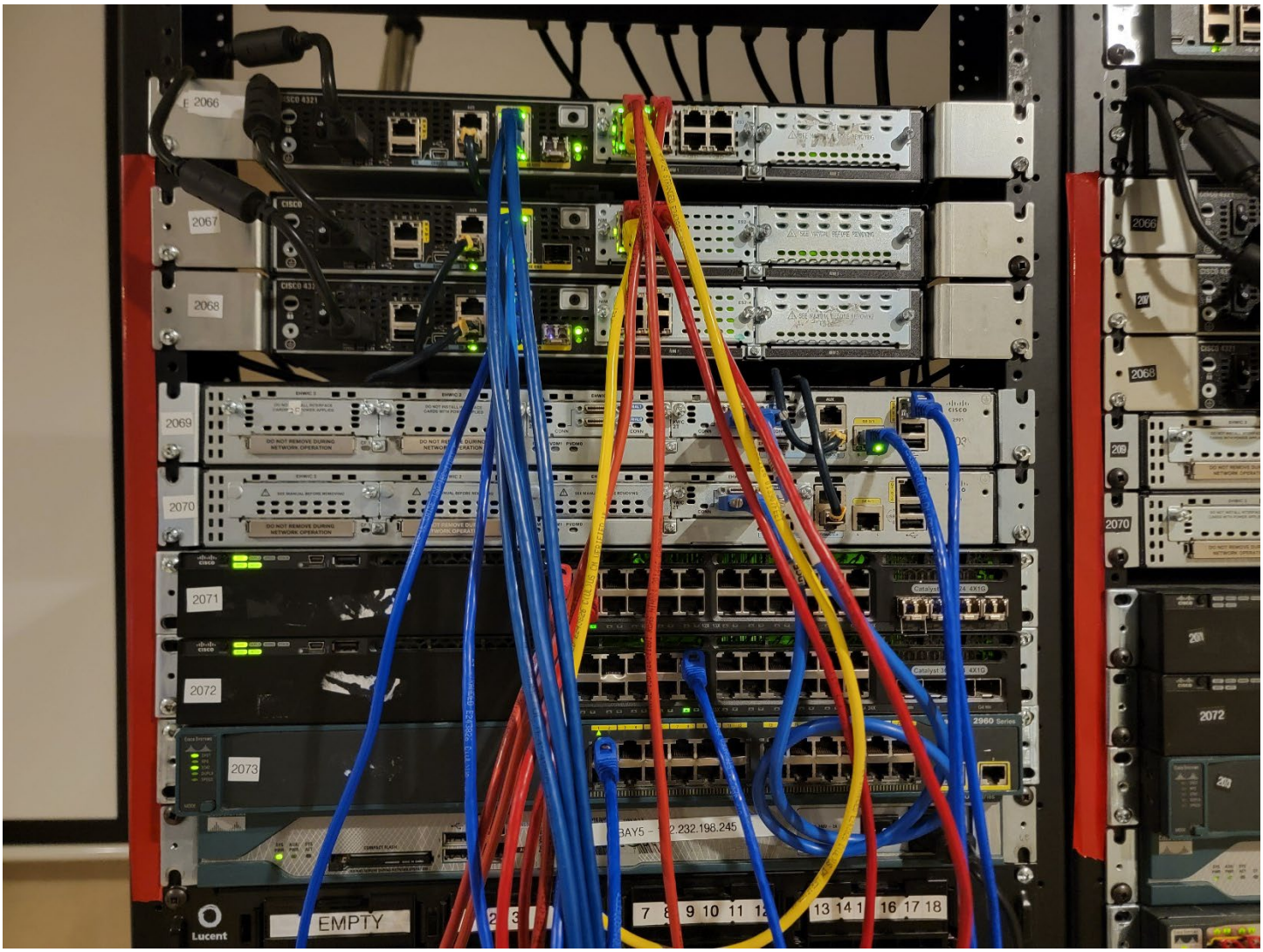

Network Connections
Search Network Connections
Organize
Disable this network device
Ethernet 3 Properties
Networking
Sharing
Configure...
Properties
OK
Cancel
Internet Protocol Version 4 (TCP/IPv4) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 172 . 3 . 15 . 21
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 172 . 3 . 15 . 254
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Validate settings upon exit
Advanced...
OK
Cancel

Linux Pings and SSH to R1, R2, R3. R4

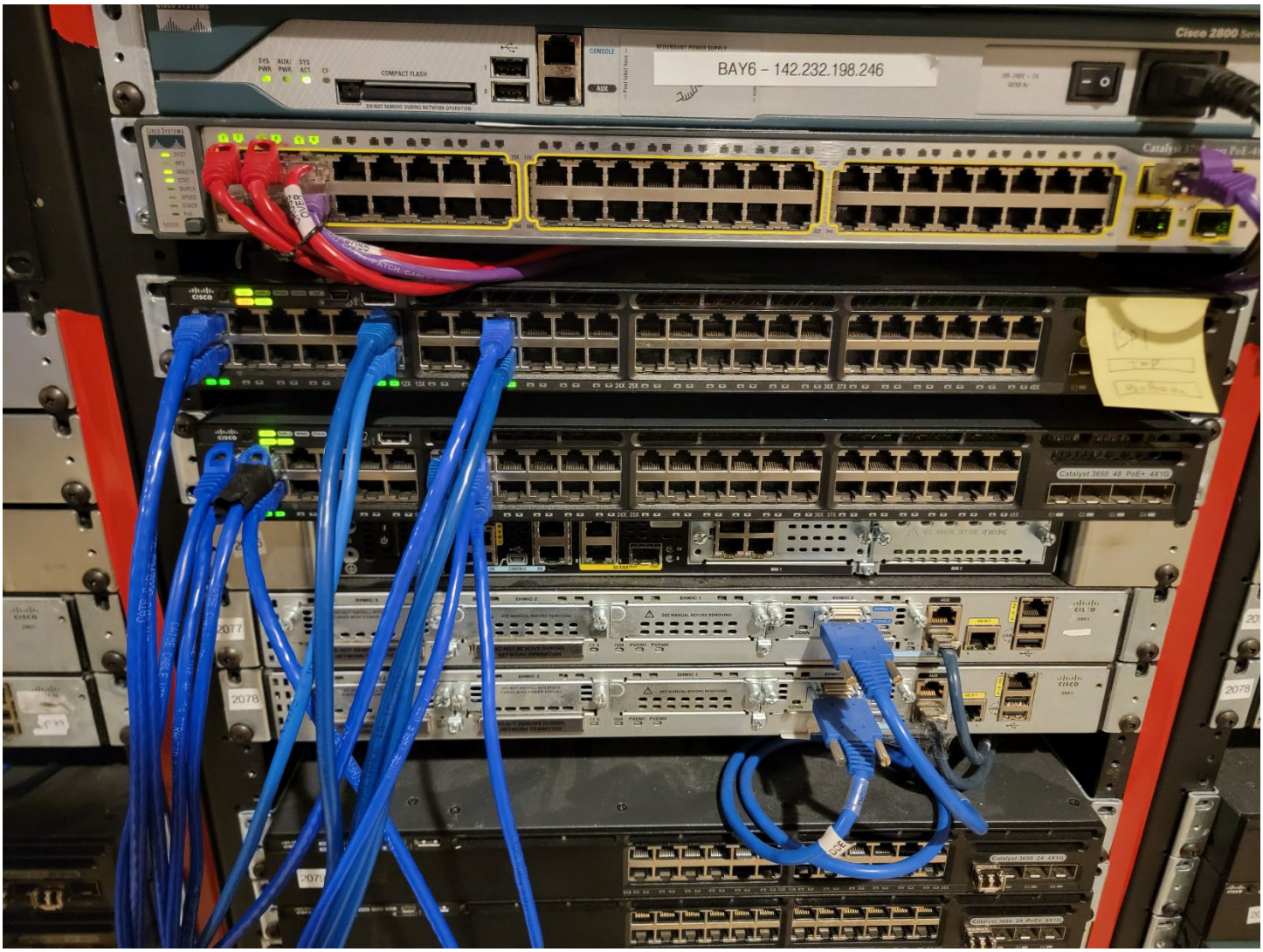




Bay5Pod1



ISP and WAN


BAY6 – 142.232.198.246
Cisco 2800
COMPACT FLASH
CONSOLE
AUX
Catalyst 3650 48 PoE+ 4X1G