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Advanced Cisco CCNP Networking

eBGP Configuration

Lab 4

Purpose

The purpose of this lab was for students to gain experience configuring eBGP. We had to learn how to redistribute different protocols (EIGRP and OSPF) across a BGP network.

Background Information on Lab Concepts

Both OSPF (Open Shortest Path First) and EIGRP (Enhanced Interior Gateway Routing Protocol) are routing protocol used to distribute traffic in a network. BGP (Border Gateway Protocol) is another protocol that functions by using TCP as the transport protocol. Differently from EIGRP and OSPF, BGP does not discover peer routers automatically; they must be set manually. It also uses autonomous systems, or zones of a group of routers, to dictate which routers it "controls". eBGP is used when a router talks to routers running on different autonomous zones. iBGP is used when talking to routers on the same autonomous zone, which is beyond the scope of this lab. In this lab, a significant factor was redistributing traffic from OSPF into BGP, then into EIGRP. This is similar to a language translator. OSPF speaks its own language, perhaps Dutch, and EIGRP speaks Spanish. In order for these two people to talk to each other, a translator must be used. In this case, eBGP is that translator. It redistributes the traffic (or translates the words) between EIGRP and OSPF.

Lab Summary

We began our lab by researching the new topics introduced. Through past labs, my team understood and had experience configuring OSPF and EIGRP, but eBGP was a new topic. After understanding the new protocol, we created a configuration file and started building an addressing scheme for IPv4 and IPv6. We then configured EIGRP and OSPF on packet tracer. Packet tracer cannot be effectively used for testing BGP. Once we correctly setup OSPF and EIGRP on the routers in the lab room, we moved onto configuring eBGP. After configuring eBGP on the routers, we researched what commands were necessary in order to redistribute EIGRP and OSPF over BGP. Once redistribution functioned for IPv4 and IPv6, the lab was complete.

Lab Commands

Router> **enable**
Turns on privileged exec mode which allows changes to be made to the router.

Router# **config t**
Enters the router config file and allows you to make changes to the router configuration file.

Router# **copy run start**
Saves the running-configuration (current config on the router, includes the edits you have made during the session, clears when the router powers off) to the startup-configuration (file that router pulls running-config from on bootup, default config)

Router(config)# **ipv6 unicast-routing**
Enables ipv6 protocol on router. Without this command you cannot route ipv6 traffic through that router or configure any ipv6 related commands.

Router# show **ip route**
Displays information about the various routes that are available to the router, including the protocol by which the route was acquired (OSPF, RIP, EGRIP, static, etc.)

Router(config)# **router eigrp** [instance]
Enables EIGRP of a particular instance on the router and enters router configuration mode.
There can be multiple instances of EIGRP running on a router, however, adjacent routers will only communicate if they are using the same instance.

Router# show **ip[v6] route**

Displays information about the various routes that are available to the router, including the protocol by which the route was acquired (OSPF, RIP, EGRIP, static, etc.)

Router(config)# **interface [*interface*] [*id*]**
Enables configuration on a specific interface.

Router(config-router)# **network [*network address*] [*wildcard mask*] area [*area number*]**
Activates OSPFv3 for a specific subnet.
This command is typed after you enter router OSPF configuration mode. Routers in a particular area share a complete topological database and have route summaries of external areas.

Router(config)# **router bgp [*autonomous system number*]**
Activates a BGP router and enters router configuration mode
The autonomous system number (ASN) is a number that identifies a large collection of routers on the internet. Typically, there are networks run under an ASN by a technical administration. eBGP connects different autonomous systems while iBGP is run within each ASN.

Router(config-router)# **no bgp default ipv4-unicast**
This command is very important for BGPv6, as it enables advertising for IPv6 routes along with IPv4 routes. By default, only IPv4 routes are broadcasted. By default, BGP only runs the IPv4 address-family, so by enabling multiprotocol we can run other address-families such as IPv6 and VPNv4.

Router(config-router)# **address-family [*protocol*]**
Enters configuration mode for a BGP address family
As a basic premise, address families are used to separate certain protocols BGP supports. I find that address-families are more workspaces for the desired protocol. For example, one might enter the "ipv4" or "ipv6" address-families to configure IP routing. This is where redistribution, network statements or activation commands occur.

Router(config-router)# **network [*network address*] mask [*subnet mask*]**
Advertises a directly connected network to the BGP routing table
BGP's network statements are not to be confused with OSPF or EIGRPs; they aren't used to form adjacencies between BGP routers. A BGP network statement is typically configured alongside a neighbor statement, where one advertises the network and the other the neighbor establishment.

Router(config-router)# **neighbor [*IP address*] remote-as [*neighbor's ASN*]**
Used in forming BGP neighbor adjacencies
Unlike a network statement, this command takes the singular *IP* address of the neighbor's connected interface. The second argument is to specify the neighbor's ASN. For a BGP neighborship to be established, each router must have *routes to the neighbor's IP* and *the correct IP and ASN of their neighbor*. Having proper routes to each neighbor's IP is critical to forming adjacencies, but this also means these two BGP neighbors could lie anywhere. For example, routers *A* and *C* are connected via router *B*. Theoretically, you could establish a BGP neighbor relationship between routers *A* and *C* if they both have routes to each other's IPs.

Router(config-router-af)# **network [*IPv6 network address*]**
Specifies a directly connected network on the router that will be broadcasted to other BGP routers similarly to OSPF network statements. However, to form an adjacency with another BGP router, you also need a neighbor statement.

Router(config-router)# **neighbor [*IP address*] remote-as [*neighbor's ASN*]**
Used in forming BGP neighbor adjacencies. Unlike network statements, this command takes a host address (not a network address) of the neighbor's connected interface. The second argument is for the neighbors ASN.

Router(config-router-af)# **neighbor [*IPv6 address*] activate**
Enables the exchange of an address with a BGP neighbor.

Router(config-router)# **redistribute [*routing protocol*] [*protocol instance*] *metric* <value>> subnets**
Redistributes routes from specified routing protocol into the table of a local router
The command is typed in the router where you'd want the routes to redistribute. There are many different additional options when redistributing routes, but I've found the *metric* and *subnets* to be the most useful. Each routing protocol has a different *metric*, so when redistributing be sure to use the right one. *Subnets* usually always refers to redistributing classless networks.

Router(config-if)# **ipv6 ospf [*process id*] area [*number*]**
Activates OSPFv3 under a specific interface.
This command is typed when in interface configuration mode. It is good practice for the process ID to be the same, however isn't necessary for OSPF to form adjacencies; process ID is only locally significant. Each OSPF process retains a different routing table, so depending on the configuration, process ID could determine what routes are redistributed. A router can have multiple OSPF processes but will contain a separate OSPF database per process. Routers in a particular area share a complete topological database and have route summaries of external areas.

Router(config)# **ipv6 router ospf [*process id*]**
Enables configuration for OSPFv3.
It is good practice for the process ID to be the same, however isn't necessary for OSPF to form adjacencies; process ID is only locally significant. Each OSPF process retains a different routing table, so depending on the configuration, process ID could determine what routes are redistributed. A router can have multiple OSPF processes but will contain a separate OSPF database per process.

Router(config)# **router ospf [*process id*]**
Enables the OSPF routing protocol and enters router configuration mode.
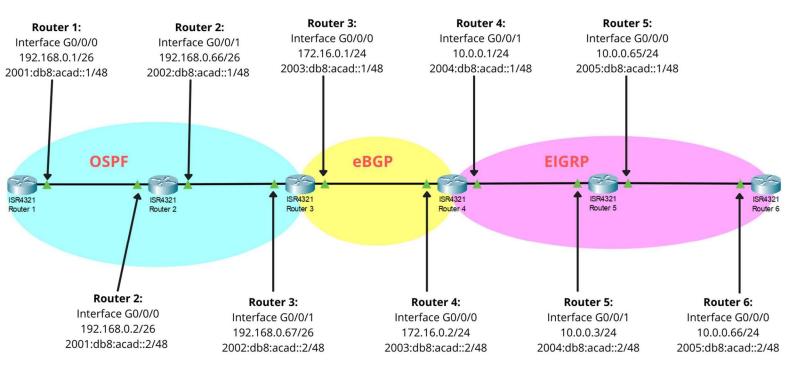It is good practice for the process ID to be the same, however isn't necessary for OSPF to form adjacencies; process ID is only locally significant. Each OSPF process retains a different routing table, so depending on the configuration, process ID could determine what routes are redistributed. A router can have multiple OSPF processes but will contain a separate OSPF database per process.

Router(config)# **router eigrp [*instance*]**
Enables EIGRP of a particular instance on the router and enters router configuration mode.
There can be multiple instances of EIGRP running on a router, however, adjacent routers will only communicate if they are using the same instance.

Network Diagram with IP's

Router 1:
Interface G0/0/0
192.168.0.1/26
2001:db8:acad::1/48

Router 2:
Interface G0/0/1
192.168.0.66/26
2002:db8:acad::1/48

Router 3:
Interface G0/0/0
172.16.0.1/24
2003:db8:acad::1/48

Router 4:
Interface G0/0/1
10.0.0.1/24
2004:db8:acad::1/48

Router 5:
Interface G0/0/0
10.0.0.65/24
2005:db8:acad::1/48

OSPF   **eBGP**   **EIGRP**

ISR4321 Router 1   ISR4321 Router 2   ISR4321 Router 3   ISR4321 Router 4   ISR4321 Router 5   ISR4321 Router 6

Router 2:
Interface G0/0/0
192.168.0.2/26
2001:db8:acad::2/48

Router 3:
Interface G0/0/1
192.168.0.67/26
2002:db8:acad::2/48

Router 4:
Interface G0/0/0
172.16.0.2/24
2003:db8:acad::2/48

Router 5:
Interface G0/0/1
10.0.0.3/24
2004:db8:acad::2/48

Router 6:
Interface G0/0/0
10.0.0.66/24
2005:db8:acad::2/48

Configuration

Router 1:

```
R1#show run
Building configuration...
Current configuration : 3819 bytes
Last configuration change at 18:40:26
UTC Tue Nov 30 2021
version 16.9
service timestamps debug datetime
msec
service timestamps log datetime msec
platform qfp utilization monitor load
80
platform punt-keepalive disable-
kernel-core
hostname R1
boot-start-marker
boot-end-marker
vrf definition Mgmt-intf
 address-family ipv4
 exit-address-family
 address-family ipv6
 exit-address-family
no aaa new-model
login on-success log
subscriber templating
ipv6 unicast-routing
multilink bundle-name authenticated

license udi pid ISR4321/K9 sn FDO21482
DXE
no license smart enable
diagnostic bootup level minimal
spanning-tree extend system-id
redundancy
mode none
interface GigabitEthernet0/0/0
 ip address 192.168.0.1
255.255.255.192
 negotiation auto
 ipv6 address 2001:DB8:ACAD::1/48
 ipv6 ospf 1 area 1
interface GigabitEthernet0/0/1
 no ip address
 shutdown
 negotiation auto
interface Serial0/1/0
interface Serial0/1/1
interface GigabitEthernet0/2/0
 no ip address
 shutdown
 negotiation auto
interface GigabitEthernet0/2/1
 no ip address
 shutdown
 negotiation auto
```

```
interface GigabitEthernet0                    ipv6 router ospf 1
 vrf forwarding Mgmt-intf                       router-id 1.1.1.1
 no ip address                                  control-plane
 shutdown                                       line con 0
 negotiation auto                                transport input none
router ospf 1                                   stopbits 1
network 192.168.0.0 0.0.0.255 area 1            line aux 0
ip forward-protocol nd                          stopbits 1
ip http server                                  line vty 0 4
ip http authentication local                    login
ip http secure-server                           end
ip tftp source-interface
GigabitEthernet0
```

```
R1#show ip route
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 not set
      10.0.0.0/26 is subnetted, 2 subnets
O E2     10.0.0.0 [110/1] via 192.168.0.2, 00:41:16, GigabitEthernet0/0/0
O E2     10.0.0.64 [110/1] via 192.168.0.2, 00:41:16, GigabitEthernet0/0/0
      172.16.0.0/24 is subnetted, 1 subnets
O E2     172.16.0.0 [110/1] via 192.168.0.2, 00:41:16, GigabitEthernet0/0/0
      192.168.0.0/24 is variably subnetted, 3 subnets, 2 masks
C        192.168.0.0/26 is directly connected, GigabitEthernet0/0/0
L        192.168.0.1/32 is directly connected, GigabitEthernet0/0/0
O  192.168.0.64/26
            [110/2] via 192.168.0.2, 00:41:16, GigabitEthernet0/0/0
```

```
R1#show ip ospf neighbor
Neighbor ID     Pri   State          Dead Time   Address         Interface
192.168.0.2      1    FULL/DR        00:00:35    192.168.0.2     GigabitEthernet
0/0/0
```

```
R1#show ip ospf
 Routing Process "ospf 1" with ID 192.168.0.1
 Start time: 00:03:59.063, Time elapsed: 00:42:56.465
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Supports NSSA (compatible with RFC 3101)
 Supports Database Exchange Summary List Optimization (RFC 5243)
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 50 msecs
 Minimum hold time between two consecutive SPFs 200 msecs
```

```
   Maximum wait time between two consecutive SPFs 5000 msecs
   Incremental-SPF disabled
   Initial LSA throttle delay 50 msecs
   Minimum hold time for LSA throttle 200 msecs
   Maximum wait time for LSA throttle 5000 msecs
   Minimum LSA arrival 100 msecs
   LSA group pacing timer 240 secs
   Interface flood pacing timer 33 msecs
   Retransmission pacing timer 66 msecs
   EXCHANGE/LOADING adjacency limit: initial 300, process maximum 300
   Number of external LSA 3. Checksum Sum 0x00DB9F
   Number of opaque AS LSA 0. Checksum Sum 0x000000
   Number of DCbitless external and opaque AS LSA 0
   Number of DoNotAge external and opaque AS LSA 0
   Number of areas in this router is 1. 1 normal 0 stub 0 nssa
   Number of areas transit capable is 0
   External flood list length 0
   IETF NSF helper support enabled
   Cisco NSF helper support enabled
   Reference bandwidth unit is 100 mbps
      Area 1
         Number of interfaces in this area is 1
         Area has no authentication
         SPF algorithm last executed 00:42:00.304 ago
         SPF algorithm executed 5 times
         Area ranges are
         Number of LSA 5. Checksum Sum 0x0211C9
         Number of opaque link LSA 0. Checksum Sum 0x000000
         Number of DCbitless LSA 0
         Number of indication LSA 0
         Number of DoNotAge LSA 0
         Flood list length 0

R1#show ip ospf interface
GigabitEthernet0/0/0 is up, line protocol is up
  Internet Address 192.168.0.1/26, Interface ID 6, Area 1
  Attached via Network Statement
  Process ID 1, Router ID 192.168.0.1, Network Type BROADCAST, Cost: 1
  Topology-MTID    Cost     Disabled     Shutdown      Topology Name
        0           1          no           no              Base
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 192.168.0.2, Interface address 192.168.0.2
  Backup Designated router (ID) 192.168.0.1, Interface address 192.168.0.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:00
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/1/1, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
```

```
     Adjacent with neighbor 192.168.0.2   (Designated Router)
   Suppress hello for 0 neighbor(s)


R1#show ip ospf border-routers
             OSPF Router with ID (192.168.0.1) (Process ID 1)
               Base Topology (MTID 0)
Internal Router Routing Table
Codes: i - Intra-area route, I - Inter-area route
i 192.168.0.67 [2] via 192.168.0.2, GigabitEthernet0/0/0, ASBR, Area 1, SPF 5




R1#show ipv6 route
IPv6 Routing Table - default - 7 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
C   2001:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2001:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/0/0, receive
O   2002:DB8:ACAD::/48 [110/2]
     via FE80::521C:B0FF:FE63:3830, GigabitEthernet0/0/0
O   2003:DB8:ACAD::/48 [110/3]
     via FE80::521C:B0FF:FE63:3830, GigabitEthernet0/0/0
OE2 2004:DB8:ACAD::/48 [110/1]
     via FE80::521C:B0FF:FE63:3830, GigabitEthernet0/0/0
OE2 2005:DB8:ACAD::/48 [110/1]
     via FE80::521C:B0FF:FE63:3830, GigabitEthernet0/0/0
L   FF00::/8 [0/0]
     via Null0, receive


R1#show ipv6 ospf neighbor
           OSPFv3 Router with ID (1.1.1.1) (Process ID 1)
Neighbor ID     Pri   State           Dead Time   Interface ID   Interface
2.2.2.2          1   FULL/DR          00:00:37    6              GigabitEthernet
0/0/0


R1#show ipv6 ospf interface
GigabitEthernet0/0/0 is up, line protocol is up
  Link Local Address FE80::521C:B0FF:FE2C:5100, Interface ID 6
  Area 1, Process ID 1, Instance ID 0, Router ID 1.1.1.1
  Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 2.2.2.2, local address FE80::521C:B0FF:FE63:3830
  Backup Designated router (ID) 1.1.1.1, local address FE80::521C:B0FF:FE2C:5100
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Graceful restart helper support enabled
  Index 1/1/1, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
```

```
   Last flood scan length is 2, maximum is 2
   Last flood scan time is 0 msec, maximum is 1 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 2.2.2.2  (Designated Router)
   Suppress hello for 0 neighbor(s)


R1#show ipv6 ospf border-routers
            OSPFv3 Router with ID (1.1.1.1) (Process ID 1)
Codes: i - Intra-area route, I - Inter-area route

i 3.3.3.3 [2] via FE80::521C:B0FF:FE63:3830, GigabitEthernet0/0/0, ASBR, Area 1,
SPF 6
```

Router 2:

```
R2#show run                               ipv6 address 2001:DB8:ACAD::2/48
Building configuration...                 ipv6 ospf 1 area 1
Current configuration : 3927 bytes       interface GigabitEthernet0/0/1
Last configuration change at 18:22:32     ip address 192.168.0.66
UTC Tue Nov 30 2021                      255.255.255.192
version 16.9                              negotiation auto
service timestamps debug datetime         ipv6 address 2002:DB8:ACAD::1/48
msec                                      ipv6 ospf 1 area 1
service timestamps log datetime msec     interface Serial0/1/0
platform qfp utilization monitor load    interface Serial0/1/1
80                                       interface GigabitEthernet0/2/0
platform punt-keepalive disable-          no ip address
kernel-core                               shutdown
hostname R2                               negotiation auto
boot-start-marker                        interface GigabitEthernet0/2/1
boot-end-marker                           no ip address
vrf definition Mgmt-intf                  shutdown
 address-family ipv4                      negotiation auto
 exit-address-family                     interface GigabitEthernet0
 address-family ipv6                      vrf forwarding Mgmt-intf
 exit-address-family                      no ip address
no aaa new-model                          shutdown
login on-success log                      negotiation auto
subscriber templating                    router ospf 1
vtp domain cisco                          network 192.168.0.0 0.0.0.255 area 1
vtp mode transparent                     ip forward-protocol nd
ipv6 unicast-routing                     ip http server
multilink bundle-name authenticated      ip http authentication local
license udi pid ISR4321/K9 sn FDO21500   ip http secure-server
G1N                                      ip tftp source-interface
no license smart enable                  GigabitEthernet0
diagnostic bootup level minimal          ipv6 router ospf 1
spanning-tree extend system-id            router-id 2.2.2.2
redundancy                               control-plane
 mode none                               line con 0
interface GigabitEthernet0/0/0            transport input none
 ip address 192.168.0.2                   stopbits 1
255.255.255.192                          line aux 0
 negotiation auto                         stopbits 1
```

```
 line vty 0 4                            end
  login


R2#show ip route
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 not set
      10.0.0.0/26 is subnetted, 2 subnets
O E2    10.0.0.0 [110/1] via 192.168.0.67, 00:55:13, GigabitEthernet0/0/1
O E2    10.0.0.64 [110/1] via 192.168.0.67, 00:55:13, GigabitEthernet0/0/1
      172.16.0.0/24 is subnetted, 1 subnets
O E2    172.16.0.0 [110/1] via 192.168.0.67, 00:55:19, GigabitEthernet0/0/1
      192.168.0.0/24 is variably subnetted, 4 subnets, 2 masks
C       192.168.0.0/26 is directly connected, GigabitEthernet0/0/0
L       192.168.0.2/32 is directly connected, GigabitEthernet0/0/0
C       192.168.0.64/26 is directly connected, GigabitEthernet0/0/1
L       192.168.0.66/32 is directly connected, GigabitEthernet0/0/1


R2#show ip ospf neighbor
Neighbor ID     Pri   State          Dead Time   Address         Interface
192.168.0.67     1    FULL/DR        00:00:39    192.168.0.67    GigabitEthernet
0/0/1
192.168.0.1      1    FULL/BDR       00:00:33    192.168.0.1     GigabitEthernet
0/0/0


R2#show ip ospf
 Routing Process "ospf 1" with ID 192.168.0.2
 Start time: 00:04:17.002, Time elapsed: 00:59:34.290
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Supports NSSA (compatible with RFC 3101)
 Supports Database Exchange Summary List Optimization (RFC 5243)
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 50 msecs
 Minimum hold time between two consecutive SPFs 200 msecs
 Maximum wait time between two consecutive SPFs 5000 msecs
 Incremental-SPF disabled
 Initial LSA throttle delay 50 msecs
 Minimum hold time for LSA throttle 200 msecs
 Maximum wait time for LSA throttle 5000 msecs
 Minimum LSA arrival 100 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
```

```
   EXCHANGE/LOADING adjacency limit: initial 300, process maximum 300
   Number of external LSA 3. Checksum Sum 0x00DB9F
   Number of opaque AS LSA 0. Checksum Sum 0x000000
   Number of DCbitless external and opaque AS LSA 0
   Number of DoNotAge external and opaque AS LSA 0
   Number of areas in this router is 1. 1 normal 0 stub 0 nssa
   Number of areas transit capable is 0
   External flood list length 0
   IETF NSF helper support enabled
   Cisco NSF helper support enabled
   Reference bandwidth unit is 100 mbps
      Area 1
          Number of interfaces in this area is 2
          Area has no authentication
          SPF algorithm last executed 00:53:56.571 ago
          SPF algorithm executed 20 times
          Area ranges are
          Number of LSA 5. Checksum Sum 0x0211C9
          Number of opaque link LSA 0. Checksum Sum 0x000000
          Number of DCbitless LSA 0
          Number of indication LSA 0
          Number of DoNotAge LSA 0
          Flood list length 0

R2#show ip ospf interface
GigabitEthernet0/0/1 is up, line protocol is up
   Internet Address 192.168.0.66/26, Interface ID 7, Area 1
   Attached via Network Statement
   Process ID 1, Router ID 192.168.0.2, Network Type BROADCAST, Cost: 1
   Topology-MTID   Cost    Disabled    Shutdown      Topology Name
        0            1        no          no             Base
   Transmit Delay is 1 sec, State BDR, Priority 1
   Designated Router (ID) 192.168.0.67, Interface address 192.168.0.67
   Backup Designated router (ID) 192.168.0.2, Interface address 192.168.0.66
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     oob-resync timeout 40
     Hello due in 00:00:08
   Supports Link-local Signaling (LLS)
   Cisco NSF helper support enabled
   IETF NSF helper support enabled
   Index 1/2/2, flood queue length 0
   Next 0x0(0)/0x0(0)/0x0(0)
   Last flood scan length is 2, maximum is 2
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 192.168.0.67  (Designated Router)
   Suppress hello for 0 neighbor(s)
GigabitEthernet0/0/0 is up, line protocol is up
   Internet Address 192.168.0.2/26, Interface ID 6, Area 1
   Attached via Network Statement
   Process ID 1, Router ID 192.168.0.2, Network Type BROADCAST, Cost: 1
   Topology-MTID   Cost    Disabled    Shutdown      Topology Name
        0            1        no          no             Base
   Transmit Delay is 1 sec, State DR, Priority 1
```

```
   Designated Router (ID) 192.168.0.2, Interface address 192.168.0.2
   Backup Designated router (ID) 192.168.0.1, Interface address 192.168.0.1
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     oob-resync timeout 40
     Hello due in 00:00:08
   Supports Link-local Signaling (LLS)
   Cisco NSF helper support enabled
   IETF NSF helper support enabled
   Index 1/1/1, flood queue length 0
   Next 0x0(0)/0x0(0)/0x0(0)
   Last flood scan length is 2, maximum is 5
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 192.168.0.1  (Backup Designated Router)
   Suppress hello for 0 neighbor(s)

R2#show ip ospf border-routers
            OSPF Router with ID (192.168.0.2) (Process ID 1)
                Base Topology (MTID 0)
Internal Router Routing Table
Codes: i - Intra-area route, I - Inter-area route
i 192.168.0.67 [1] via 192.168.0.67, GigabitEthernet0/0/1, ASBR, Area 1, SPF 20

R2#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
C   2001:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2001:DB8:ACAD::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
C   2002:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2002:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
O   2003:DB8:ACAD::/48 [110/2]
     via FE80::B6A8:B9FF:FE47:9231, GigabitEthernet0/0/1
OE2 2004:DB8:ACAD::/48 [110/1]
     via FE80::B6A8:B9FF:FE47:9231, GigabitEthernet0/0/1
OE2 2005:DB8:ACAD::/48 [110/1]
     via FE80::B6A8:B9FF:FE47:9231, GigabitEthernet0/0/1
L   FF00::/8 [0/0]
     via Null0, receive

R2#show ipv6 ospf neighbor
          OSPFv3 Router with ID (2.2.2.2) (Process ID 1)
Neighbor ID     Pri   State           Dead Time   Interface ID    Interface
3.3.3.3           1   FULL/DR         00:00:34    7               GigabitEthernet
0/0/1
```

```
1.1.1.1            1   FULL/BDR        00:00:39    6                      GigabitEthernet
0/0/0


R2#show ipv6 ospf interface
GigabitEthernet0/0/1 is up, line protocol is up
  Link Local Address FE80::521C:B0FF:FE63:3831, Interface ID 7
  Area 1, Process ID 1, Instance ID 0, Router ID 2.2.2.2
  Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 3.3.3.3, local address FE80::B6A8:B9FF:FE47:9231
  Backup Designated router (ID) 2.2.2.2, local address FE80::521C:B0FF:FE63:3831
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:00
  Graceful restart helper support enabled
  Index 1/2/2, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 4
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 3.3.3.3  (Designated Router)
  Suppress hello for 0 neighbor(s)
GigabitEthernet0/0/0 is up, line protocol is up
  Link Local Address FE80::521C:B0FF:FE63:3830, Interface ID 6
  Area 1, Process ID 1, Instance ID 0, Router ID 2.2.2.2
  Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 2.2.2.2, local address FE80::521C:B0FF:FE63:3830
  Backup Designated router (ID) 1.1.1.1, local address FE80::521C:B0FF:FE2C:5100
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Graceful restart helper support enabled
  Index 1/1/1, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 0, maximum is 6
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 1.1.1.1  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)

R2#show ipv6 ospf border-routers
          OSPFv3 Router with ID (2.2.2.2) (Process ID 1)
Codes: i - Intra-area route, I - Inter-area route
i 3.3.3.3 [1] via FE80::B6A8:B9FF:FE47:9231, GigabitEthernet0/0/1, ASBR, Area 1,
SPF 27
```

Router 3:

```
R3#show run                          service timestamps debug datetime
Building configuration...            msec
Current configuration : 2048 bytes   service timestamps log datetime msec
Last configuration change at 18:49:02  no platform punt-keepalive disable-
UTC Tue Nov 30 2021                  kernel-core
version 15.5                         hostname R3
```

```
boot-start-marker                          no ip address
boot-end-marker                            shutdown
vrf definition Mgmt-intf                 router ospf 1
 address-family ipv4                       redistribute bgp 1 subnets
 exit-address-family                       network 192.168.0.0 0.0.0.255 area 1
 address-family ipv6                     router bgp 1
 exit-address-family                       bgp router-id 3.3.3.3
no aaa new-model                           bgp log-neighbor-changes
ipv6 unicast-routing                       no bgp default ipv4-unicast
subscriber templating                      neighbor 2003:DB8:ACAD::2 remote-as
multilink bundle-name authenticated      2
license udi pid ISR4321/K9 sn FDO21441     neighbor 172.16.0.2 remote-as 2
WDF                                        address-family ipv4
spanning-tree extend system-id              network 172.16.0.0 mask
redundancy                               255.255.255.0
 mode none                                  redistribute ospf 1
vlan internal allocation policy             neighbor 172.16.0.2 activate
ascending                                  exit-address-family
interface GigabitEthernet0/0/0            address-family ipv6
 ip address 172.16.0.1 255.255.255.0        redistribute connected
 negotiation auto                           redistribute ospf 1 match internal
 ipv6 address 2003:DB8:ACAD::1/48        external 1
 ipv6 ospf 1 area 1                          network 2003:DB8:ACAD::/48
interface GigabitEthernet0/0/1              neighbor 2003:DB8:ACAD::2 activate
 ip address 192.168.0.67                   exit-address-family
255.255.255.192                          ip forward-protocol nd
 negotiation auto                        no ip http server
 ipv6 address 2002:DB8:ACAD::2/48        no ip http secure-server
 ipv6 ospf 1 area 1                      ip tftp source-interface
interface Serial0/1/0                    GigabitEthernet0
 no ip address                           ipv6 router ospf 1
 shutdown                                 router-id 3.3.3.3
interface Serial0/1/1                     redistribute bgp 1
 no ip address                           control-plane
 shutdown                                line con 0
interface GigabitEthernet0                stopbits 1
 vrf forwarding Mgmt-intf                line aux 0
 no ip address                            stopbits 1
 shutdown                                line vty 0 4
 negotiation auto                         login
interface Vlan1                          end
```

R3#show ip route
```
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 not set
      10.0.0.0/26 is subnetted, 2 subnets
```

```
B         10.0.0.0 [20/0] via 172.16.0.2, 01:05:03
B         10.0.0.64 [20/3072] via 172.16.0.2, 01:05:03
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C         172.16.0.0/24 is directly connected, GigabitEthernet0/0/0
L         172.16.0.1/32 is directly connected, GigabitEthernet0/0/0
      192.168.0.0/24 is variably subnetted, 3 subnets, 2 masks
O         192.168.0.0/26
             [110/2] via 192.168.0.66, 01:04:14, GigabitEthernet0/0/1
C         192.168.0.64/26 is directly connected, GigabitEthernet0/0/1
L         192.168.0.67/32 is directly connected, GigabitEthernet0/0/1

R3#show ip ospf neighbor
Neighbor ID     Pri   State          Dead Time   Address         Interface
192.168.0.2       1   FULL/BDR       00:00:32    192.168.0.66    GigabitEthernet
0/0/1


R3#show ip ospf
 Routing Process "ospf 1" with ID 192.168.0.67
 Start time: 00:07:26.286, Time elapsed: 01:06:35.940
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 Supports Link-local Signaling (LLS)
 Supports area transit capability
 Supports NSSA (compatible with RFC 3101)
 Supports Database Exchange Summary List Optimization (RFC 5243)
 Event-log enabled, Maximum number of events: 1000, Mode: cyclic
 It is an autonomous system boundary router
 Redistributing External Routes from,
    bgp 1, includes subnets in redistribution
 Router is not originating router-LSAs with maximum metric
 Initial SPF schedule delay 5000 msecs
 Minimum hold time between two consecutive SPFs 10000 msecs
 Maximum wait time between two consecutive SPFs 10000 msecs
 Incremental-SPF disabled
 Minimum LSA interval 5 secs
 Minimum LSA arrival 1000 msecs
 LSA group pacing timer 240 secs
 Interface flood pacing timer 33 msecs
 Retransmission pacing timer 66 msecs
 EXCHANGE/LOADING adjacency limit: initial 300, process maximum 300
 Number of external LSA 3. Checksum Sum 0x00DB9F
 Number of opaque AS LSA 0. Checksum Sum 0x000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 Number of areas transit capable is 0
 External flood list length 0
 IETF NSF helper support enabled
 Cisco NSF helper support enabled
 Reference bandwidth unit is 100 mbps
    Area 1
        Number of interfaces in this area is 1
        Area has no authentication
        SPF algorithm last executed 01:03:53.295 ago
```

```
        SPF algorithm executed 7 times
        Area ranges are
        Number of LSA 5. Checksum Sum 0x0211C9
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0


R3#show ip ospf interface
GigabitEthernet0/0/1 is up, line protocol is up
  Internet Address 192.168.0.67/26, Area 1, Attached via Network Statement
  Process ID 1, Router ID 192.168.0.67, Network Type BROADCAST, Cost: 1
  Topology-MTID    Cost     Disabled    Shutdown      Topology Name
        0           1         no          no             Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 192.168.0.67, Interface address 192.168.0.67
  Backup Designated router (ID) 192.168.0.2, Interface address 192.168.0.66
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:05
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/1/1, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 5, maximum is 5
  Last flood scan time is 0 msec, maximum is 1 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 192.168.0.2  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)


R3#show ip ospf border-routers
           OSPF Router with ID (192.168.0.67) (Process ID 1)
              Base Topology (MTID 0)
Internal Router Routing Table
Codes: i - Intra-area route, I - Inter-area route


R3#show ip bgp all
For address family: IPv4 Unicast
BGP table version is 8, local router ID is 3.3.3.3
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop            Metric LocPrf Weight Path
 *>  10.0.0.0/26      172.16.0.2               0            0 2 ?
 *>  10.0.0.64/26     172.16.0.2            3072            0 2 ?
 *   172.16.0.0/24    172.16.0.2               0            0 2 i
 *>                   0.0.0.0                  0        32768 i
 *>  192.168.0.0/26   192.168.0.66             2        32768 ?
 *>  192.168.0.64/26  0.0.0.0                  0        32768 ?
For address family: IPv6 Unicast
```

```
BGP table version is 17, local router ID is 3.3.3.3
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop           Metric LocPrf Weight Path
 *>  2001:DB8:ACAD::/48
                      FE80::521C:B0FF:FE63:3831
                                              2         32768 ?
 *>  2002:DB8:ACAD::/48
                      ::                      0         32768 ?
 *   2003:DB8:ACAD::/48
                      2003:DB8:ACAD::2
                                              0             0 2 i
 *>                   ::                      0         32768 i
 *>  2004:DB8:ACAD::/48
                      2003:DB8:ACAD::2
                                              0             0 2 ?
 *>  2005:DB8:ACAD::/48
                      2003:DB8:ACAD::2
                                           3072             0 2 ?
For address family: IPv4 Multicast


R3#show ip bgp neighbors
BGP neighbor is 172.16.0.2,  remote AS 2, external link
  BGP version 4, remote router ID 4.4.4.4
  BGP state = Established, up for 01:06:33
  Last read 00:00:41, last write 00:00:29, hold time is 180, keepalive interval
is 60 seconds
  Neighbor sessions:
    1 active, is not multisession capable (disabled)
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Four-octets ASN Capability: advertised and received
    Address family IPv4 Unicast: advertised and received
    Enhanced Refresh Capability: advertised and received
    Multisession Capability:
    Stateful switchover support enabled: NO for session 1
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                6          4
    Keepalives:            73         73
    Route Refresh:          0          0
    Total:                 80         78
  Do log neighbor state changes (via global configuration)
  Default minimum time between advertisement runs is 30 seconds
 For address family: IPv4 Unicast
  Session: 172.16.0.2
  BGP table version 8, neighbor version 8/0
```

```
  Output queue size : 0
  Index 1, Advertise bit 0
  1 update-group member
  Slow-peer detection is disabled
  Slow-peer split-update-group dynamic is disabled
                                  Sent        Rcvd
  Prefix activity:                ----        ----
    Prefixes Current:              3           3 (Consumes 360 bytes)
    Prefixes Total:                4           3
    Implicit Withdraw:             0           0
    Explicit Withdraw:             1           0
    Used as bestpath:            n/a           2
    Used as multipath:           n/a           0
                                Outbound    Inbound
  Local Policy Denied Prefixes:  --------    -------
    Bestpath from this peer:         2         n/a
    Total:                           2           0
  Number of NLRIs in the update sent: max 1, min 0
  Last detected as dynamic slow peer: never
  Dynamic slow peer recovered: never
  Refresh Epoch: 1
  Last Sent Refresh Start-of-rib: never
  Last Sent Refresh End-of-rib: never
  Last Received Refresh Start-of-rib: never
  Last Received Refresh End-of-rib: never
                                  Sent        Rcvd
      Refresh activity:           ----        ----
        Refresh Start-of-RIB        0           0
        Refresh End-of-RIB          0           0
  Address tracking is enabled, the RIB does have a route to 172.16.0.2
  Connections established 1; dropped 0
  Last reset never
  External BGP neighbor configured for connected checks (single-hop no-disable-
connected-check)
  Interface associated: GigabitEthernet0/0/0 (peering address in same link)
  Transport(tcp) path-mtu-discovery is enabled
  Graceful-Restart is disabled
  SSO is disabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.16.0.1, Local port: 179
Foreign host: 172.16.0.2, Foreign port: 44478
Connection tableid (VRF): 0
Maximum output segment queue size: 50
Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)
Event Timers (current time is 0x44B684):
Timer          Starts    Wakeups           Next
Retrans            76         0            0x0
TimeWait            0         0            0x0
AckHold            74        69            0x0
SendWnd             0         0            0x0
KeepAlive           0         0            0x0
GiveUp              0         0            0x0
PmtuAger            0         0            0x0
```

```
DeadWait              0           0             0x0
Linger                0           0             0x0
ProcessQ              0           0             0x0
iss: 1745147664  snduna: 1745149379  sndnxt: 1745149379
irs: 4171009928  rcvnxt: 4171011560
sndwnd:  16137  scale:       0  maxrcvwnd:  16384
rcvwnd:  16213  scale:       0  delrcvwnd:     171
SRTT: 1000 ms, RTTO: 1003 ms, RTV: 3 ms, KRTT: 0 ms
minRTT: 0 ms, maxRTT: 1000 ms, ACK hold: 200 ms
uptime: 3993319 ms, Sent idletime: 29969 ms, Receive idletime: 29769 ms
Status Flags: passive open, gen tcbs
Option Flags: nagle, path mtu capable
IP Precedence value : 6
Datagrams (max data segment is 1460 bytes):
Rcvd: 152 (out of order: 0), with data: 75, total data bytes: 1631
Sent: 150 (retransmit: 0, fastretransmit: 0, partialack: 0, Second Congestion:
0), with data: 77, total data bytes: 1714
 Packets received in fast path: 0, fast processed: 0, slow path: 0
 fast lock acquisition failures: 0, slow path: 0
TCP Semaphore      0x7FF4C8047408  FREE


R3#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
O   2001:DB8:ACAD::/48 [110/2]
     via FE80::521C:B0FF:FE63:3831, GigabitEthernet0/0/1
C   2002:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2002:DB8:ACAD::2/128 [0/0]
     via GigabitEthernet0/0/1, receive
C   2003:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2003:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/0/0, receive
B   2004:DB8:ACAD::/48 [20/0]
     via FE80::CE8E:71FF:FE1E:22E0, GigabitEthernet0/0/0
B   2005:DB8:ACAD::/48 [20/3072]
     via FE80::CE8E:71FF:FE1E:22E0, GigabitEthernet0/0/0
L   FF00::/8 [0/0]
     via Null0, receive


R3#show ipv6 ospf neighbor
         OSPFv3 Router with ID (3.3.3.3) (Process ID 1)
Neighbor ID     Pri   State          Dead Time   Interface ID   Interface
2.2.2.2          1   FULL/BDR        00:00:37    7              GigabitEthernet
0/0/1


R3#show ipv6 ospf interface
GigabitEthernet0/0/1 is up, line protocol is up
```

```
   Link Local Address FE80::B6A8:B9FF:FE47:9231, Interface ID 7
   Area 1, Process ID 1, Instance ID 0, Router ID 3.3.3.3
   Network Type BROADCAST, Cost: 1
   Transmit Delay is 1 sec, State DR, Priority 1
   Designated Router (ID) 3.3.3.3, local address FE80::B6A8:B9FF:FE47:9231
   Backup Designated router (ID) 2.2.2.2, local address FE80::521C:B0FF:FE63:3831
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     Hello due in 00:00:05
   Graceful restart helper support enabled
   Index 1/2/2, flood queue length 0
   Next 0x0(0)/0x0(0)/0x0(0)
   Last flood scan length is 0, maximum is 7
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 2.2.2.2  (Backup Designated Router)
   Suppress hello for 0 neighbor(s)
GigabitEthernet0/0/0 is up, line protocol is up
   Link Local Address FE80::B6A8:B9FF:FE47:9230, Interface ID 6
   Area 1, Process ID 1, Instance ID 0, Router ID 3.3.3.3
   Network Type BROADCAST, Cost: 1
   Transmit Delay is 1 sec, State DR, Priority 1
   Designated Router (ID) 3.3.3.3, local address FE80::B6A8:B9FF:FE47:9230
   No backup designated router on this network
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     Hello due in 00:00:01
   Graceful restart helper support enabled
   Index 1/1/1, flood queue length 0
   Next 0x0(0)/0x0(0)/0x0(0)
   Last flood scan length is 0, maximum is 0
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 0, Adjacent neighbor count is 0
   Suppress hello for 0 neighbor(s)

R3#show ipv6 ospf border-routers
          OSPFv3 Router with ID (3.3.3.3) (Process ID 1)
Codes: i - Intra-area route, I - Inter-area route
```

Router 4:

```
R4#show run                              address-family ipv4
Building configuration...                exit-address-family
Current configuration : 2065 bytes       address-family ipv6
Last configuration change at 18:29:12    exit-address-family
UTC Tue Nov 30 2021                      no aaa new-model
version 15.5                             ipv6 unicast-routing
service timestamps debug datetime        subscriber templating
msec                                     multilink bundle-name authenticated
service timestamps log datetime msec     license udi pid ISR4321/K9 sn FDO21500
no platform punt-keepalive disable-      9QY
kernel-core                              spanning-tree extend system-id
hostname R4                              redundancy
boot-start-marker                        mode none
boot-end-marker                          vlan internal allocation policy
vrf definition Mgmt-intf                 ascending
```

```
interface GigabitEthernet0/0/0
ip address 172.16.0.2 255.255.255.0
negotiation auto
ipv6 address 2003:DB8:ACAD::2/48
ipv6 eigrp 1
interface GigabitEthernet0/0/1
ip address 10.0.0.1 255.255.255.192
negotiation auto
ipv6 address 2004:DB8:ACAD::1/48
ipv6 eigrp 1
interface Serial0/1/0
no ip address
shutdown
interface Serial0/1/1
no ip address
shutdown
interface GigabitEthernet0
vrf forwarding Mgmt-intf
no ip address
shutdown
negotiation auto
interface Vlan1
no ip address
shutdown
router eigrp 1
network 10.0.0.0 0.0.0.255
redistribute bgp 2 metric 1000000 1 1
255 100
router bgp 2
bgp router-id 4.4.4.4
bgp log-neighbor-changes
neighbor 2003:DB8:ACAD::1 remote-as 1

neighbor 172.16.0.1 remote-as 1
address-family ipv4
  network 172.16.0.0 mask
255.255.255.0
  redistribute eigrp 1
  no neighbor 2003:DB8:ACAD::1
activate
  neighbor 172.16.0.1 activate
exit-address-family
address-family ipv6
  redistribute connected
  redistribute eigrp 1
  network 2003:DB8:ACAD::/48
  neighbor 2003:DB8:ACAD::1 activate
exit-address-family
ip forward-protocol nd
no ip http server
no ip http secure-server
ip tftp source-interface
GigabitEthernet0
ipv6 router eigrp 1
eigrp router-id 4.4.4.4
redistribute bgp 2 metric 1000000 1 1
255 100
control-plane
line con 0
stopbits 1
line aux 0
stopbits 1
line vty 0 4
login
end
```

```
R4#show ip route
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 not set
      10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.0.0.0/26 is directly connected, GigabitEthernet0/0/1
L        10.0.0.1/32 is directly connected, GigabitEthernet0/0/1
D        10.0.0.64/26 [90/3072] via 10.0.0.3, 00:49:14, GigabitEthernet0/0/1
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.0.0/24 is directly connected, GigabitEthernet0/0/0
L        172.16.0.2/32 is directly connected, GigabitEthernet0/0/0
      192.168.0.0/26 is subnetted, 2 subnets
B        192.168.0.0 [20/2] via 172.16.0.1, 00:48:11
B        192.168.0.64 [20/0] via 172.16.0.1, 00:49:11
```

```
R4#show eigrp protocols
EIGRP-IPv4 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
  Router-ID: 172.16.0.2
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 4
    Maximum hopcount 100
    Maximum metric variance 1
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
  Router-ID: 4.4.4.4
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1


R4#show ip eigrp interfaces
EIGRP-IPv4 Interfaces for AS(1)
                              Xmit Queue   PeerQ       Mean   Pacing
Time    Multicast    Pending
Interface            Peers  Un/Reliable  Un/Reliable  SRTT   Un/Reliable   Flow
Timer    Routes
Gi0/0/1                 1       0/0         0/0          1        0/0          5
0           0


R4#show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(1)
H   Address                 Interface          Hold
Uptime   SRTT   RTO  Q  Seq
                                               (sec)        (ms)        Cnt N
um
0   10.0.0.3                Gi0/0/1             12
00:49:31   1   100  0  12
R4#show ip bgp all
For address family: IPv4 Unicast
BGP table version is 8, local router ID is 4.4.4.4
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,
```

```
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop            Metric LocPrf Weight Path
*>  10.0.0.0/26       0.0.0.0                  0         32768 ?
*>  10.0.0.64/26      10.0.0.3              3072         32768 ?
*   172.16.0.0/24     172.16.0.1               0             0 1 i
*>                    0.0.0.0                  0         32768 i
*>  192.168.0.0/26    172.16.0.1               2             0 1 ?
*>  192.168.0.64/26   172.16.0.1               0             0 1 ?
For address family: IPv6 Unicast
BGP table version is 11, local router ID is 4.4.4.4
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,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found
     Network          Next Hop            Metric LocPrf Weight Path
*>  2001:DB8:ACAD::/48
                      2003:DB8:ACAD::1
                                               2             0 1 ?
*>  2002:DB8:ACAD::/48
                      2003:DB8:ACAD::1
                                               0             0 1 ?
*   2003:DB8:ACAD::/48
                      2003:DB8:ACAD::1
                                               0             0 1 i
*>                    ::                       0         32768 i
*>  2004:DB8:ACAD::/48
                      ::                       0         32768 ?
*>  2005:DB8:ACAD::/48
                      FE80::B6A8:B9FF:FE47:9351
     Network          Next Hop            Metric LocPrf Weight Path
                                            3072         32768 ?
For address family: IPv4 Multicast


R4#show ip bgp neighbors
BGP neighbor is 172.16.0.1,  remote AS 1, external link
  BGP version 4, remote router ID 3.3.3.3
  BGP state = Established, up for 00:49:38
  Last read 00:00:47, last write 00:00:23, hold time is 180, keepalive interval
is 60 seconds
  Neighbor sessions:
    1 active, is not multisession capable (disabled)
  Neighbor capabilities:
    Route refresh: advertised and received(new)
    Four-octets ASN Capability: advertised and received
    Address family IPv4 Unicast: advertised and received
    Enhanced Refresh Capability: advertised and received
    Multisession Capability:
    Stateful switchover support enabled: NO for session 1
  Message statistics:
    InQ depth is 0
    OutQ depth is 0
                        Sent        Rcvd
```

```
    Opens:                       1             1
    Notifications:               0             0
    Updates:                     4             6
    Keepalives:                 55            54
    Route Refresh:               0             0
    Total:                      60            61
  Do log neighbor state changes (via global configuration)
  Default minimum time between advertisement runs is 30 seconds
For address family: IPv4 Unicast
  Session: 172.16.0.1
  BGP table version 8, neighbor version 8/0
  Output queue size : 0
  Index 1, Advertise bit 0
  1 update-group member
  Slow-peer detection is disabled
  Slow-peer split-update-group dynamic is disabled
                                  Sent         Rcvd
  Prefix activity:                ----         ----
    Prefixes Current:               3            3 (Consumes 360 bytes)
    Prefixes Total:                 3            4
    Implicit Withdraw:              0            0
    Explicit Withdraw:              0            1
    Used as bestpath:             n/a            2
    Used as multipath:            n/a            0

                                Outbound     Inbound
  Local Policy Denied Prefixes:  --------     -------
    Bestpath from this peer:          3          n/a
    Total:                            3            0
  Number of NLRIs in the update sent: max 1, min 0
  Last detected as dynamic slow peer: never
  Dynamic slow peer recovered: never
  Refresh Epoch: 1
  Last Sent Refresh Start-of-rib: never
  Last Sent Refresh End-of-rib: never
  Last Received Refresh Start-of-rib: never
  Last Received Refresh End-of-rib: never
                                  Sent         Rcvd
      Refresh activity:           ----         ----
        Refresh Start-of-RIB        0            0
        Refresh End-of-RIB          0            0
  Address tracking is enabled, the RIB does have a route to 172.16.0.1
  Connections established 1; dropped 0
  Last reset never
  External BGP neighbor configured for connected checks (single-hop no-disable-
connected-check)
  Interface associated: GigabitEthernet0/0/0 (peering address in same link)
  Transport(tcp) path-mtu-discovery is enabled
  Graceful-Restart is disabled
  SSO is disabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Connection is ECN Disabled, Mininum incoming TTL 0, Outgoing TTL 1
Local host: 172.16.0.2, Local port: 44478
Foreign host: 172.16.0.1, Foreign port: 179
```

```
Connection tableid (VRF): 0
Maximum output segment queue size: 50
Enqueued packets for retransmit: 0, input: 0  mis-ordered: 0 (0 bytes)
Event Timers (current time is 0x3537F8):
Timer           Starts      Wakeups            Next
Retrans            58           1              0x0
TimeWait            0           0              0x0
AckHold            57          54              0x0
SendWnd             0           0              0x0
KeepAlive           0           0              0x0
GiveUp              0           0              0x0
PmtuAger         2046        2045         0x353923
DeadWait            0           0              0x0
Linger              0           0              0x0
ProcessQ            0           0              0x0
iss: 4171009928  snduna: 4171011218  sndnxt: 4171011218
irs: 1745147664  rcvnxt: 1745149018
sndwnd:  15095  scale:        0  maxrcvwnd:  16384
rcvwnd:  15031  scale:        0  delrcvwnd:   1353
SRTT: 999 ms, RTTO: 1006 ms, RTV: 7 ms, KRTT: 0 ms
minRTT: 1 ms, maxRTT: 1000 ms, ACK hold: 200 ms
uptime: 2980644 ms, Sent idletime: 23053 ms, Receive idletime: 22852 ms
Status Flags: active open
Option Flags: nagle, path mtu capable
IP Precedence value : 6

Datagrams (max data segment is 1460 bytes):
Rcvd: 113 (out of order: 0), with data: 58, total data bytes: 1353
Sent: 115 (retransmit: 1, fastretransmit: 0, partialack: 0, Second Congestion:
0), with data: 57, total data bytes: 1289


Packets received in fast path: 0, fast processed: 0, slow path: 0
fast lock acquisition failures: 0, slow path: 0
TCP Semaphore       0x7F4350AD1BD0  FREE


R4#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
B   2001:DB8:ACAD::/48 [20/2]
     via FE80::B6A8:B9FF:FE47:9230, GigabitEthernet0/0/0
B   2002:DB8:ACAD::/48 [20/0]
     via FE80::B6A8:B9FF:FE47:9230, GigabitEthernet0/0/0
C   2003:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2003:DB8:ACAD::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
C   2004:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2004:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/0/1, receive
```

```
D   2005:DB8:ACAD::/48 [90/3072]
     via FE80::B6A8:B9FF:FE47:9351, GigabitEthernet0/0/1
L   FF00::/8 [0/0]
     via Null0, receive
```

```
R4#show ipv6 eigrp interfaces
EIGRP-IPv6 Interfaces for AS(1)
                              Xmit Queue   PeerQ        Mean    Pacing
Time   Multicast   Pending
Interface           Peers  Un/Reliable  Un/Reliable  SRTT   Un/Reliable   Flow
Timer   Routes
Gi0/0/0                0       0/0         0/0          0       0/0
0          0
Gi0/0/1                1       0/0         0/0          1278    0/0          639
2          0
```

```
R4#show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(1)
H   Address               Interface          Hold
Uptime   SRTT   RTO  Q  Seq
                                             (sec)        (ms)        Cnt N
um
0   Link-local address:    Gi0/0/1              13
00:50:04 1278  5000  0  11
    FE80::B6A8:B9FF:FE47:9351
```

Router 5:

```
R5#show run
Building configuration...
 Current configuration : 1498 bytes
Last configuration change at 18:43:37
UTC Tue Nov 30 2021
version 15.5
service timestamps debug datetime
msec
service timestamps log datetime msec
no platform punt-keepalive disable-
kernel-core
hostname R5
boot-start-marker
boot-end-marker
vrf definition Mgmt-intf
address-family ipv4
exit-address-family
address-family ipv6
exit-address-family
no aaa new-model
ipv6 unicast-routing
subscriber templating
multilink bundle-name authenticated
license udi pid ISR4321/K9 sn FDO21442
0HM
spanning-tree extend system-id
```

```
redundancy
mode none
vlan internal allocation policy
ascending
interface GigabitEthernet0/0/0
ip address 10.0.0.65 255.255.255.192
negotiation auto
ipv6 address 2005:DB8:ACAD::1/48
ipv6 eigrp 1
interface GigabitEthernet0/0/1
ip address 10.0.0.3 255.255.255.192
negotiation auto
ipv6 address 2004:DB8:ACAD::2/48
ipv6 eigrp 1
interface Serial0/1/0
no ip address
shutdown
interface Serial0/1/1
no ip address
shutdown
interface GigabitEthernet0
vrf forwarding Mgmt-intf
no ip address
shutdown
negotiation auto
interface Vlan1
```

```
no ip address                              eigrp router-id 5.5.5.5
shutdown                                   control-plane
router eigrp 1                             line con 0
network 10.0.0.0 0.0.0.255                 stopbits 1
ip forward-protocol nd                     line aux 0
no ip http server                          stopbits 1
no ip http secure-server                   line vty 0 4
ip tftp source-interface                   login
GigabitEthernet0                           end
ipv6 router eigrp 1
```

R5#show ip route
```
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 not set

      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
C        10.0.0.0/26 is directly connected, GigabitEthernet0/0/1
L        10.0.0.3/32 is directly connected, GigabitEthernet0/0/1
C        10.0.0.64/26 is directly connected, GigabitEthernet0/0/0
L        10.0.0.65/32 is directly connected, GigabitEthernet0/0/0
      172.16.0.0/24 is subnetted, 1 subnets
D EX     172.16.0.0 [170/3072] via 10.0.0.1, 00:44:48, GigabitEthernet0/0/1
      192.168.0.0/26 is subnetted, 2 subnets
D EX     192.168.0.0 [170/3072] via 10.0.0.1, 00:43:48, GigabitEthernet0/0/1
D EX     192.168.0.64 [170/3072] via 10.0.0.1, 00:44:48, GigabitEthernet0/0/1
```

R5#show eigrp protocols
```
EIGRP-IPv4 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
  Router-ID: 10.0.0.65
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 4
    Maximum hopcount 100
    Maximum metric variance 1
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
```

```
  Router-ID: 5.5.5.5
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1


R5#show ip eigrp interfaces
EIGRP-IPv4 Interfaces for AS(1)
                                Xmit Queue   PeerQ        Mean   Pacing
Time    Multicast   Pending
Interface              Peers  Un/Reliable  Un/Reliable  SRTT   Un/Reliable   Flow
Timer   Routes
Gi0/0/0                   1       0/0         0/0          1       0/0          5
0          0
Gi0/0/1                   1       0/0         0/0          1       0/0          5
0          0
R5#show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(1)
H   Address                Interface           Hold
Uptime  SRTT   RTO  Q  Seq
                                                (sec)        (ms)       Cnt N
um
1   10.0.0.1               Gi0/0/1                 12
00:45:17   1   100  0  5
0   10.0.0.66              Gi0/0/0                 11
00:47:04   1   100  0  8


R5#show ipv6 route
IPv6 Routing Table - default - 8 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
EX  2001:DB8:ACAD::/48 [170/3072]
     via FE80::CE8E:71FF:FE1E:22E1, GigabitEthernet0/0/1
EX  2002:DB8:ACAD::/48 [170/3072]
     via FE80::CE8E:71FF:FE1E:22E1, GigabitEthernet0/0/1
D   2003:DB8:ACAD::/48 [90/3072]
     via FE80::CE8E:71FF:FE1E:22E1, GigabitEthernet0/0/1
C   2004:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/1, directly connected
L   2004:DB8:ACAD::2/128 [0/0]
     via GigabitEthernet0/0/1, receive
C   2005:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2005:DB8:ACAD::1/128 [0/0]
     via GigabitEthernet0/0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive
```

```
R5#show ipv6 eigrp interfaces
EIGRP-IPv6 Interfaces for AS(1)
                                Xmit Queue  PeerQ        Mean    Pacing
Time    Multicast    Pending
Interface               Peers  Un/Reliable  Un/Reliable  SRTT   Un/Reliable  Flow
Timer    Routes
Gi0/0/0                   1       0/0        0/0          1       0/0          5
0            0
Gi0/0/1                   1       0/0        0/0          1       0/0          5
0            0

R5#show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(1)
H   Address                 Interface          Hold
Uptime   SRTT   RTO   Q   Seq
                                               (sec)        (ms)         Cnt N
um
1   Link-local address:     Gi0/0/1                12
00:45:29    1    100   0   4
    FE80::CE8E:71FF:FE1E:22E1
0   Link-local address:     Gi0/0/0                11
00:47:17    1    100   0   7
    FE80::227:90FF:FED5:F800
```

Router 6:

```
R6#show run                             vlan internal allocation policy
Building configuration...               ascending
Current configuration : 1438 bytes      interface GigabitEthernet0/0/0
Last configuration change at 18:40:38   ip address 10.0.0.66 255.255.255.192
UTC Tue Nov 30 2021                     negotiation auto
version 15.5                            ipv6 address 2005:DB8:ACAD::2/48
service timestamps debug datetime       ipv6 eigrp 1
msec                                    interface GigabitEthernet0/0/1
service timestamps log datetime msec    no ip address
no platform punt-keepalive disable-     shutdown
kernel-core                             negotiation auto
hostname R6                             interface Serial0/1/0
boot-start-marker                       no ip address
boot-end-marker                         shutdown
vrf definition Mgmt-intf                interface Serial0/1/1
address-family ipv4                     no ip address
exit-address-family                     shutdown
address-family ipv6                     interface GigabitEthernet0
exit-address-family                     vrf forwarding Mgmt-intf
no aaa new-model                        no ip address
ipv6 unicast-routing                    shutdown
subscriber templating                   negotiation auto
multilink bundle-name authenticated     interface Vlan1
license udi pid ISR4321/K9 sn FDO21441  no ip address
4DZ                                     shutdown
spanning-tree extend system-id          router eigrp 1
redundancy                              network 10.0.0.0 0.0.0.255
mode none                               ip forward-protocol nd
```

```
no ip http server                            line con 0
no ip http secure-server                     stopbits 1
ip tftp source-interface                     line aux 0
GigabitEthernet0                             stopbits 1
ipv6 router eigrp 1                          line vty 0 4
eigrp router-id 6.6.6.6                      login
control-plane                                end


R6#show ip route
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 not set
       10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
D         10.0.0.0/26 [90/3072] via 10.0.0.65, 00:40:45, GigabitEthernet0/0/0
C         10.0.0.64/26 is directly connected, GigabitEthernet0/0/0
L         10.0.0.66/32 is directly connected, GigabitEthernet0/0/0
       172.16.0.0/24 is subnetted, 1 subnets
D EX      172.16.0.0 [170/3328] via 10.0.0.65, 00:40:40, GigabitEthernet0/0/0
       192.168.0.0/26 is subnetted, 2 subnets
D EX      192.168.0.0 [170/3328] via 10.0.0.65, 00:39:40, GigabitEthernet0/0/0
D EX      192.168.0.64 [170/3328] via 10.0.0.65, 00:40:40, GigabitEthernet0/0/0


R6#show eigrp protocols
EIGRP-IPv4 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
  Router-ID: 10.0.0.66
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 4
    Maximum hopcount 100
    Maximum metric variance 1
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  Soft SIA disabled
  NSF-aware route hold timer is 240
  EIGRP NSF disabled
     NSF signal timer is 20s
     NSF converge timer is 120s
  Router-ID: 6.6.6.6
  Topology : 0 (base)
    Active Timer: 3 min
```

```
      Distance: internal 90 external 170
      Maximum path: 16
      Maximum hopcount 100
      Maximum metric variance 1


R6#show ip eigrp interfaces
EIGRP-IPv4 Interfaces for AS(1)
                                  Xmit Queue    PeerQ       Mean    Pacing
Time    Multicast    Pending
Interface            Peers  Un/Reliable  Un/Reliable  SRTT  Un/Reliable   Flow
Timer    Routes
Gi0/0/0                 1       0/0         0/0         1       0/0          5
0            0

R6#show ip eigrp neighbors
EIGRP-IPv4 Neighbors for AS(1)
H   Address              Interface          Hold
Uptime   SRTT   RTO  Q  Seq
                                                    (sec)        (ms)      Cnt N
um
0   10.0.0.65            Gi0/0/0                       11
00:42:53   1    100  0  13

R6#show ipv6 route
IPv6 Routing Table - default - 7 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, I1 - ISIS L1, I2 - ISIS L2
       IA - ISIS interarea, IS - ISIS summary, D - EIGRP, EX - EIGRP external
       ND - ND Default, NDp - ND Prefix, DCE - Destination, NDr - Redirect
       O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2, a - Application
EX  2001:DB8:ACAD::/48 [170/3328]
     via FE80::B6A8:B9FF:FE47:9350, GigabitEthernet0/0/0
EX  2002:DB8:ACAD::/48 [170/3328]
     via FE80::B6A8:B9FF:FE47:9350, GigabitEthernet0/0/0
D   2003:DB8:ACAD::/48 [90/3328]
     via FE80::B6A8:B9FF:FE47:9350, GigabitEthernet0/0/0
D   2004:DB8:ACAD::/48 [90/3072]
     via FE80::B6A8:B9FF:FE47:9350, GigabitEthernet0/0/0
C   2005:DB8:ACAD::/48 [0/0]
     via GigabitEthernet0/0/0, directly connected
L   2005:DB8:ACAD::2/128 [0/0]
     via GigabitEthernet0/0/0, receive
L   FF00::/8 [0/0]
     via Null0, receive

R6#show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(1)
H   Address              Interface          Hold
Uptime   SRTT   RTO  Q  Seq
                                                    (sec)        (ms)      Cnt N
um
```

```
0   Link-local
address:     Gi0/0/0                          14 00:43:01  654  3924  0  10
    FE80::B6A8:B9FF:FE47:9350
R6#show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(1)
H   Address                      Interface              Hold
Uptime  SRTT   RTO  Q  Seq
                                              (sec)         (ms)        Cnt N
um
0   Link-local
address:     Gi0/0/0                          13 00:43:07  654  3924  0  10
    FE80::B6A8:B9FF:FE47:9350
```

Pings:

Router 1:
```
R1#ping 192.168.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2001:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 192.168.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2002:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 192.168.0.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.67, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2002:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms
```

```
R1#ping 172.16.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2003:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 172.16.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2003:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 10.0.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2004:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 10.0.0.65
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.65, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2005:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R1#ping 2004:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 10.0.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R1#ping 2005:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Router 2:
```
R2#ping 192.168.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R2#ping 2001:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 192.168.0.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.67, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2002:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 172.16.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2003:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R2#ping 172.16.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2003:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms

R2#ping 10.0.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2004:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 10.0.0.65
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.65, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2005:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 2004:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R2#ping 10.0.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R2#ping 2005:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```

Router 3:

```
R3#ping 192.168.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2001:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 192.168.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2001:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 192.168.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2002:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 172.16.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2003:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 10.0.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2004:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 10.0.0.65
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.65, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2005:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2004:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 10.0.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R3#ping 2005:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Router 4:
```
R4#ping 192.168.0.1
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
R4#ping 2001:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 192.168.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2001:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 192.168.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2002:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 192.168.0.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.67, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2002:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 172.16.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2003:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::1, timeout is 2 seconds:
```

```
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 10.0.0.65
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.65, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2005:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2004:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7 ms

R4#ping 10.0.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R4#ping 2005:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Router 5:

```
R5#ping 192.168.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2001:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/7 ms

R5#ping 192.168.0.2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2001:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 192.168.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2002:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 192.168.0.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.67, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2002:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 172.16.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2003:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 172.16.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2003:db8:acad::2
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 10.0.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2004:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 10.0.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R5#ping 2005:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Router 6:

```
R6#ping 192.168.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R6#ping 2001:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms

R6#ping 192.168.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R6#ping 2001:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R6#ping 192.168.0.66
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.66, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 2002:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 192.168.0.67
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.0.67, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 2002:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2002:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 172.16.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 2003:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 172.16.0.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.0.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms


R6#ping 2003:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2003:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms


R6#ping 10.0.0.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
R6#ping 2004:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/5 ms

R6#ping 10.0.0.65
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.65, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R6#ping 2005:db8:acad::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2005:DB8:ACAD::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/9 ms

R6#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

R6#ping 2004:db8:acad::2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2004:DB8:ACAD::2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Problems

By reviewing the lab documentation, we were able to setup eBGP to function correctly for IPv4 and IPV6. However, we encountered significant problems in redistributing OSPF and EIGRP over BGP. Measures we took to solve these problems included researching online, asking other lab members, and by typing in commands in the router and adding a question mark after the commands (by adding a question mark, the router automatically outputs all possible commands for that container). Our main issue with configuring redistribution was an inability to find the correct combination of commands to use. We found that by mixing the strategies of "question marking" commands and researching online allowed us to solve our redistribution errors. In the future, we will use the "question marking" command strategy more frequently because we found it was an effective method for finding possible commands that were missing.

Conclusions

In this lab, we accomplished using BGP to connect EIGRP and OSPF. First, we read documentation on BGP and modeled OSPF and EIGRP in packet tracer. We then made sure these two protocols functioned correctly on the routers in the lab room. Next, we configured eBGP on the routers in the lab room since Packet Tracer cannot effectively be used for eBGP. Once eBGP was configured correctly and functioned correctly, we worked on troubleshooting how to redistribute EIGRP and OSPF through BPG. Once we solved these problems, we verified IPv4 and IPv6 traffic traveled correctly by pinging all router links.

Instructor Signoff