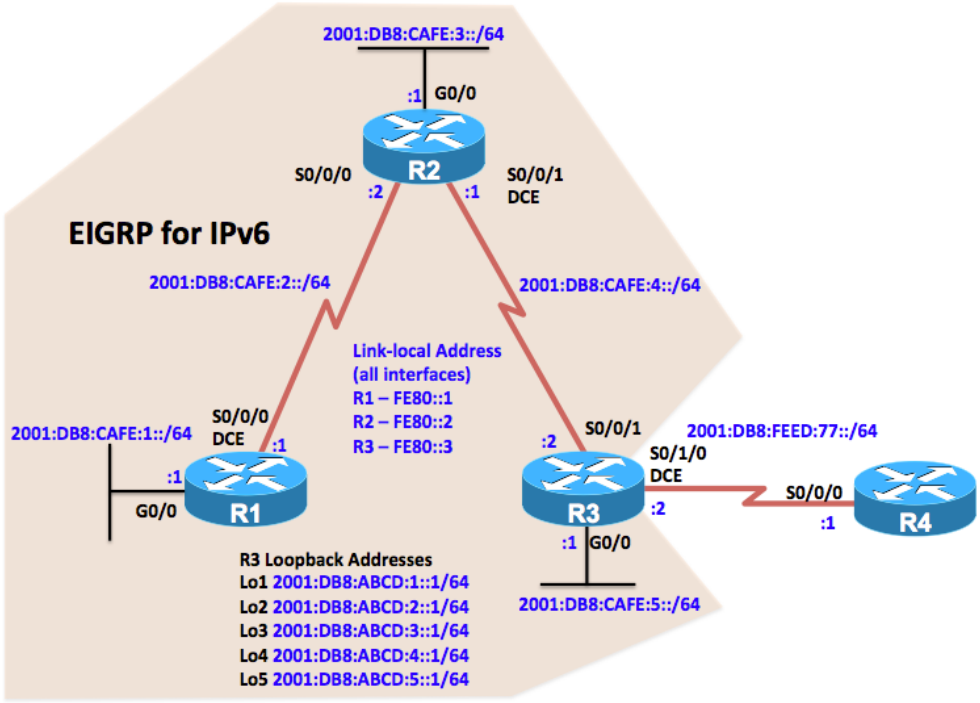
CCNPv7 ROUTE

Chapter 2 Lab 2-3, EIGRP for IPv6

Topology



Objectives

- Configure EIGRP for IPv6.
- Verify EIGRP for IPv6.
- Configure and verify passive routes using EIGRP for IPv6.
- Configure and verify summary routes using EIGRP for IPv6.
- Configure and verify default route using EIGRP for IPv6.

Background

EIGRP for IPv6 has the same overall operation and features as EIGRP for IPv4. However, there are a few major differences between them:

- EIGRP for IPv6 is configured directly on the router interfaces.
- In the absence of the router having any IPv4 addresses, a 32-bit router ID must be configured for the routing process to start.
- IPv6 unicast routing must be enabled before the routing process can be configured.

In this lab, you will configure the network with EIGRP routing for IPv6. You will also assign router IDs, configure passive interfaces, a summary route, and verify the network is fully converged.

Note: This lab uses Cisco 1941 routers with Cisco IOS Release 15.2 with IP Base. The switches are Cisco WS-C2960-24TT-L with Fast Ethernet interfaces, therefore the router will use routing metrics associated with a 100 Mb/s

interface. Depending on the router or switch model and Cisco IOS Software version, the commands available and output produced might vary from what is shown in this lab.

Required Resources

- 4 routers (Cisco IOS Release 15.2 or comparable)
- 3 switches (LAN interfaces)
- Serial and Ethernet cables

Step 0: Suggested starting configurations.

a. Apply the following configuration to each router along with the appropriate **hostname**. The **exec-timeout 0 0** command should only be used in a lab environment.

```
Router(config)# no ip domain-lookup
Router(config)# line con 0
Router(config-line)# logging synchronous
Router(config-line)# exec-timeout 0 0
```

Step 1: Configure the addressing and serial links.

a. Using the topology, configure the IPv6 addresses on the interfaces of each router including the loopback addresses on R3.

```
R1(config)# interface gigabitethernet 0/0
R1(config-if)# ipv6 address 2001:db8:cafe:1::1/64
R1(config-if)# ipv6 address fe80::1 link-local
R1(config-if)# no shutdown
R1(config-if)# exit
R1(config)# interface serial 0/0/0
R1(config-if)# ipv6 address 2001:db8:cafe:2::1/64
R1(config-if)# ipv6 address fe80::1 link-local
R1(config-if)# clock rate 64000
R1(config-if)# no shutdown
R1(config-if)# exit


R2(config)# interface serial 0/0/0
R2(config-if)# ipv6 address 2001:db8:cafe:2::2/64
R2(config-if)# ipv6 address fe80::2 link-local
R2(config-if)# no shutdown
R2(config-if)# exit
R2(config)# interface gigabitethernet 0/0
R2(config-if)# ipv6 address 2001:db8:cafe:3::1/64
R2(config-if)# ipv6 address fe80::2 link-local
R2(config-if)# no shutdown
R2(config)# interface serial 0/0/1
R2(config-if)# ipv6 address 2001:db8:cafe:4::1/64
R2(config-if)# ipv6 address fe80::2 link-local
R2(config-if)# clock rate 64000
R2(config-if)# no shutdown
R2(config-if)# exit


R3(config)# interface serial 0/0/1
R3(config-if)# ipv6 address 2001:db8:cafe:4::2/64
R3(config-if)# ipv6 address fe80::3 link-local
R3(config-if)# no shutdown
```

```
R3(config-if)# exit
R3(config)# interface gigabitethernet 0/0
R3(config-if)# ipv6 address 2001:db8:cafe:5::1/64
R3(config-if)# ipv6 address fe80::3 link-local
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)# interface loopback 1
R3(config-if)# ipv6 address 2001:db8:abcd:1::1/64
R3(config-if)# exit
R3(config)# interface loopback 2
R3(config-if)# ipv6 address 2001:db8:abcd:2::1/64
R3(config-if)# exit
R3(config)# interface loopback 3
R3(config-if)# ipv6 address 2001:db8:abcd:3::1/64
R3(config-if)# exit
R3(config)# interface loopback 4
R3(config-if)# ipv6 address 2001:db8:abcd:4::1/64
R3(config-if)# exit
R3(config)# interface loopback 5
R3(config-if)# ipv6 address 2001:db8:abcd:5::1/64
R3(config-if)# exit
R3(config)# interface serial 0/1/0
R3(config-if)# ipv6 address 2001:db8:feed:77::2/64
R3(config-if)# ipv6 address fe80::3 link-local
R3(config-if)# clock rate 64000
R3(config-if)# no shutdown
R3(config-if)# exit
R3(config)#


R4(config)# interface serial 0/0/0
R4(config-if)# ipv6 address 2001:db8:feed:77::1/64
R4(config-if)# ipv6 address fe80::4 link-local
R4(config-if)# no shutdown
R4(config-if)# exit
R4(config)# ipv6 route 2001:db8:cafe::/48 2001:db8:feed:77::2
R4(config)# ipv6 route 2001:db8:abcd::/48 2001:db8:feed:77::2
```

b. Verify connectivity by pinging across each of the local networks connected to each router.

c. Issue the **show ipv6 interface brief** command on each router. This command displays a brief listing of the interfaces, their status, and their IPv6 addresses. Router R1 is shown as an example.

```
R1# show ipv6 interface brief
Em0/0                  [administratively down/down]
    unassigned
GigabitEthernet0/0     [up/up]
    FE80::1
    2001:DB8:CAFE:1::1
GigabitEthernet0/1     [administratively down/down]
    unassigned
Serial0/0/0            [up/up]
    FE80::1
    2001:DB8:CAFE:2::1
Serial0/0/1            [administratively down/down]
    unassigned
R1#
```

Step 2: Configure EIGRP for IPv6 Routing.

a. Enable IPv6 unicast routing and EIGRP for IPv6 on each router. Since there are no active IPv4 addresses configured, EIGRP for IPv6 requires the configuration of a 32-bit router ID. Use the **router-id** command to configure the router ID in the router configuration mode.

Note: Prior to IOS 15.2 the EIGRP IPv6 routing process is shut down by default and the **no shutdown** router configuration mode command is required to enable the routing process. Although not required with the IOS used in creating this lab, an example of the **no shutdown** command is shown for router R1.

```
R1(config)# ipv6 unicast-routing
R1(config)# ipv6 router eigrp 1
R1(config-rtr)# eigrp router-id 1.1.1.1
R1(config-rtr)# no shutdown

R2(config)# ipv6 unicast-routing
R2(config)# ipv6 router eigrp 1
R2(config-rtr)# router-id 2.2.2.2

R3(config)# ipv6 unicast-routing
R3(config)# ipv6 router eigrp 1
R3(config-rtr)# eigrp router-id 3.3.3.3
```

Step 3: Configure EIGRP for IPv6 on Serial, Gigabit Ethernet and Loopback interfaces on all routers.

a. Issue the **ipv6 eigrp 1** command on the interfaces that participate in the EIGRP routing process. EIGRP for IPv6 does not use the **network** command. IPv6 prefixes are enabled on the interface. Similar to EIGRP for IPv4, the AS number must match the neighbor's configuration for the router to form an adjacency.

```
R1(config)# interface g0/0
R1(config-if)# ipv6 eigrp 1
R1(config-if)# exit
R1(config)# interface s0/0/0
R1(config-if)# ipv6 eigrp 1

R2(config)# interface g0/0
R2(config-if)# ipv6 eigrp 1
R2(config-if)# exit
R2(config)# interface s0/0/0
R2(config-if)# ipv6 eigrp 1
R2(config-if)# exit
R2(config)# interface s0/0/1
R2(config-if)# ipv6 eigrp 1

R3(config)# interface g0/0
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface s0/0/1
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface loop1
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface loop2
```

```
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface loop3
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface loop4
R3(config-if)# ipv6 eigrp 1
R3(config-if)# exit
R3(config)# interface loop5
R3(config-if)# ipv6 eigrp 1
```

b. When you assign EIGRP for IPv6 on R2's serial 0/0/0 interface you will see the neighbor adjacency message as the interface is added to the EIGRP routing process.

```
R1#
*Sep 24 15:28:13.911: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::2 (Serial0/0/0) is up:
new adjacency
R1#
```

What address on R2 is used to form the neighbor adjacency with R1? What type of IPv6 address is used to establish the adjacencies?

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Step 4: Verify EIGRP for IPv6 routing.

a. On R2, issue the **show ipv6 eigrp neighbors** command to verify the adjacency has been established with its neighboring routers. The link-local addresses of the neighboring routers are displayed in the adjacency table.

```
R2# show ipv6 eigrp neighbors
EIGRP-IPv6 Neighbors for AS(1)
H   Address                 Interface              Hold Uptime   SRTT   RTO  Q  Seq
                                                   (sec)         (ms)       Cnt Num
1   Link-local address:     Se0/0/1                  11 00:27:22   31   186  0  8
    FE80::3
0   Link-local address:     Se0/0/0                  14 00:28:17  288  1728  0  10
    FE80::1
R2#
```

b. Verify reachability by pinging the IPv6 addresses on R3 from R1.

```
R1# ping 2001:db8:cafe:5::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:CAFE:5::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/56/56 ms
R1# ping 2001:db8:abcd:1::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/55/56 ms
R1#
```

c. Use the **show ipv6 route eigrp** command to display IPv6 specific EIGRP routes on all the routers. The output of R1's routing table is displayed below.

```
R1# show ipv6 route eigrp
```

```
IPv6 Routing Table - default - 13 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, 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
D   2001:DB8:ABCD:1::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:2::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:3::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:4::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:5::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:3::/64 [90/2172416]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:4::/64 [90/2681856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:5::/64 [90/2684416]
     via FE80::2, Serial0/0/0
R1#
```

d. Examine R1's EIGRP for IPv6 topology table using the **show ipv6 eigrp topology** command.

```
R1# show ipv6 eigrp topology
EIGRP-IPv6 Topology Table for AS(1)/ID(1.1.1.1)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 2001:DB8:CAFE:5::/64, 1 successors, FD is 2684416
        via FE80::2 (2684416/2172416), Serial0/0/0
P 2001:DB8:ABCD:1::/64, 1 successors, FD is 2809856
        via FE80::2 (2809856/2297856), Serial0/0/0
P 2001:DB8:ABCD:2::/64, 1 successors, FD is 2809856
        via FE80::2 (2809856/2297856), Serial0/0/0
P 2001:DB8:CAFE:3::/64, 1 successors, FD is 2172416
        via FE80::2 (2172416/28160), Serial0/0/0
P 2001:DB8:CAFE:4::/64, 1 successors, FD is 2681856
        via FE80::2 (2681856/2169856), Serial0/0/0
P 2001:DB8:CAFE:2::/64, 1 successors, FD is 2169856
        via Connected, Serial0/0/0
P 2001:DB8:ABCD:3::/64, 1 successors, FD is 2809856
        via FE80::2 (2809856/2297856), Serial0/0/0
P 2001:DB8:ABCD:5::/64, 1 successors, FD is 2809856
        via FE80::2 (2809856/2297856), Serial0/0/0
P 2001:DB8:ABCD:4::/64, 1 successors, FD is 2809856
        via FE80::2 (2809856/2297856), Serial0/0/0
P 2001:DB8:CAFE:1::/64, 1 successors, FD is 28160
        via Connected, GigabitEthernet0/0

R1#
```

Why are there no feasible successors?

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Why are there two more entries in R1's EIGRP topology table than there is when displaying R1's EIGRP routes with the **show ipv6 route eigrp** command?

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e. Issue the **show ipv6 protocols** command to verify the configured parameters. Examining the output, EIGRP for IPv6 is the configured IPv6 routing protocol with 1.1.1.1 as the router ID for R1. This routing protocol is associated with autonomous system 1 with two active interfaces: G0/0 and S0/0/0.

```
R1# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "eigrp 1"
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
  Router-ID: 1.1.1.1
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1

  Interfaces:
    GigabitEthernet0/0
    Serial0/0/0
  Redistribution:
    None
R1#
```

Step 5: Configure and verify passive interfaces.

a. A passive interface does not allow outgoing and incoming routing updates over the configured interface. The **passive-interface** *interface* command causes the router to stop sending and receiving Hello packets over an interface but continues to advertise that network in it's routing updates. Configure passive interfaces on each of the three routers' LAN interfaces.

```
R1(config)# ipv6 router eigrp 1
R1(config-rtr)# passive-interface g0/0

R2(config)# ipv6 router eigrp 1
R2(config-rtr)# passive-interface g0/0

R3(config)# ipv6 router eigrp 1
R3(config-rtr)# passive-interface g0/0
```

What would be the result if the **ipv6 eigrp 1** commands were removed from the G0/0 interfaces instead of using the **passive-interface** command?

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b. Issue the **show ipv6 protocols** command on R1 and verify that G0/0 has been configured as passive.

```
R1# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
```

```
IPv6 Routing Protocol is "eigrp 1"
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
  Router-ID: 1.1.1.1
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1

  Interfaces:
    Serial0/0/0
    GigabitEthernet0/0 (passive)
  Redistribution:
    None
R1#
```

c. Issue the **show ipv6 route eigrp** command on R3 to verify it is still receiving EIGRP updates containing the IPv6 prefixes that were configured as passive-interfaces.

```
R3# show ipv6 route eigrp
IPv6 Routing Table - default - 18 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, 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
D   2001:DB8:CAFE:1::/64 [90/2684416]
     via FE80::2, Serial0/0/1
D   2001:DB8:CAFE:2::/64 [90/2681856]
     via FE80::2, Serial0/0/1
D   2001:DB8:CAFE:3::/64 [90/2172416]
     via FE80::2, Serial0/0/1
R3#
```

Step 6: Configure and verify a summary route.

a. Issue the **show ipv6 route eigrp** command on R1 and verify that is has all five of R3's loopback prefixes in its IPv6 routing table.

```
R1# show ipv6 route eigrp
IPv6 Routing Table - default - 13 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, 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
D   2001:DB8:ABCD:1::/64 [90/2809856]
     via FE80::2, Serial0/0/0
```

```
D   2001:DB8:ABCD:2::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:3::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:4::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD:5::/64 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:3::/64 [90/2172416]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:4::/64 [90/2681856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:5::/64 [90/2684416]
     via FE80::2, Serial0/0/0
R1#
```

b. To optimize EIGRP for IPv6, on R3 summarize the loopback addresses as a single route and advertise the summary route in R3's EIGRP updates to R2. Using the same summarization method used for IPv4, The IPv6 loopback addresses can be summarized as 2001:DB8:ABCD::/61. The loopback addresses have the first 61 bits in common. After configuring the summary route on the interface, notice that the neighbor adjacency between R3 and R2 is resynchronized (restarted).

```
R3(config)# interface serial 0/0/1
R3(config-if)# ipv6 summary-address eigrp 1 2001:db8:abcd::/61
*Jun 25 08:35:05.383: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::2
(Serial0/0/1) is resync: summary configured
```

c. Examine R1's routing table and verify that R1 is now only receiving a summary route for R3's loopback prefixes.

```
R1# show ipv6 route eigrp
IPv6 Routing Table - default - 9 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, 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
D   2001:DB8:ABCD::/61 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:3::/64 [90/2172416]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:4::/64 [90/2681856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:5::/64 [90/2684416]
     via FE80::2, Serial0/0/0
R1#
```

d. From R1, ping R3's loopback addresses to verify reachability to each address.

```
R1# ping 2001:db8:abcd:1::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:1::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/55/56 ms
R1# ping 2001:db8:abcd:2::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:2::1, timeout is 2 seconds:
```

```
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/55/56 ms
R1# ping 2001:db8:abcd:3::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:3::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/56/56 ms
R1# ping 2001:db8:abcd:4::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:4::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/56/56 ms
R1#R1# ping 2001:db8:abcd:5::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:ABCD:5::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/56/60 ms
R1#
```

e. Issue the **show ipv6 protocols** command on R3 to verify the configured summary route. From the output, EIGRP for IPv6 is still advertising the loopback addresses and that there is address summarization in effect.

```
R3# show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "application"
IPv6 Routing Protocol is "ND"
IPv6 Routing Protocol is "eigrp 1"
EIGRP-IPv6 Protocol for AS(1)
  Metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  NSF-aware route hold timer is 240
  Router-ID: 3.3.3.3
  Topology : 0 (base)
    Active Timer: 3 min
    Distance: internal 90 external 170
    Maximum path: 16
    Maximum hopcount 100
    Maximum metric variance 1

  Interfaces:
    Serial0/0/1
    Loopback1
    Loopback2
    Loopback3
    Loopback4
    Loopback5
    GigabitEthernet0/0 (passive)
  Redistribution:
    None
  Address Summarization:
    2001:DB8:ABCD::/61 for Se0/0/1
      Summarizing 5 components with metric 128256
R3#
```

Step 7: Configure and verify a default route and CEF.

a. On R3 configure an IPv6 default static route using the next-hop address of R4. Redistribute the static route in EIGRP using the **redistribute static** command.

Note: With the use of CEF (Cisco Express Forwarding) it is recommended practice that a next-hop IP address is used instead of an exit-interface. There is a bug in IOS 15.4 that prevents an IPv6 static route with only a next-hop address from being redistributed. A fully specified static route with both an exit-interface and a next-hop address is used in the example.

```
R3(config)# ipv6 route ::/0 serial0/1/0 2001:db8:feed:77::1
R3(config)# ipv6 router eigrp 1
R3(config-rtr)# redistribute static
```

b. Issue the **show ipv6 route eigrp** command on R1 to verify it has received the default route using EIGRP.

```
R1# show ipv6 route eigrp
IPv6 Routing Table - default - 10 entries
Codes: C - Connected, L - Local, S - Static, U - Per-user Static route
       B - BGP, R - RIP, H - NHRP, 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  ::/0 [170/3193856]
     via FE80::2, Serial0/0/0
D   2001:DB8:ABCD::/61 [90/2809856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:3::/64 [90/2172416]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:4::/64 [90/2681856]
     via FE80::2, Serial0/0/0
D   2001:DB8:CAFE:5::/64 [90/2684416]
     via FE80::2, Serial0/0/0
R1#
```

Why does the default route have a code of “EX”?

_____

c. Verify reachability to R4 by pinging its serial interface.

```
R1# ping 2001:db8:feed:77::1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:FEED:77::1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 80/83/84 ms
R1#
```

d. IPv6 Routing CEF is a forwarding mechanism to optimize the layer 3 and layer 2 lookup processes into a single process. Starting with IOS 15.4 CEF for IPv6 is enabled automatically when ipv6 unicast-routing is configured. The **show ipv6 cef** command can be used to verify the status of CEF for IPv6. If CEF is disabled, it can be enabled with the **ipv6 cef** global configuration command. The output below shows an example of CEF currently disabled and then enabled.

Note: CEF for IPv4 is enabled by default.

```
R1# show ipv6 cef summary
IPv6 CEF is disabled.
VRF Default
```

```
 1 prefix (1/0 fwd/non-fwd)
 Table id 0x1E000000
 Database epoch:        0 (1 entry at this epoch)

R1# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)# ipv6 cef
R1(config)# exit
R1# show ipv6 cef summary
IPv6 CEF is enabled and running centrally.
VRF Default
 14 prefixes (14/0 fwd/non-fwd)
 Table id 0x1E000000
 Database epoch:        0 (14 entries at this epoch)
```