NetSim®
NETWORK SIMULATOR®

Lab ID: 9.9K914A214.SAI2.1

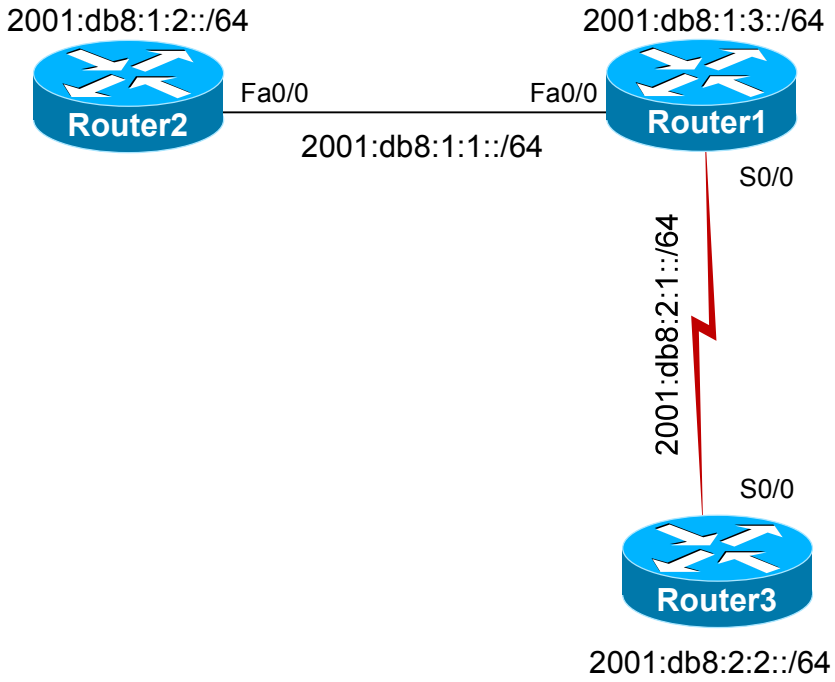
Stand-Alone Lab: EIGRPv6 Configuration

Objective

In this lab, you will learn the commands needed to configure the Enhanced Interior Gateway Routing Protocol (EIGRP) for IP version 6 (IPv6) routing protocol.

Lab Topology

The topology diagram below represents the portion of the network you will be configuring in this lab.



Command Summary

Command	Description
configure terminal	enters global configuration mode from privileged EXEC mode
enable	enters privileged EXEC mode
end	ends and exits configuration mode
exit	exits one level in the menu structure
ipv6 eigrp *as-number*	activates EIGRP for IPv6 (EIGRPv6) on the specified interface
ipv6 router eigrp *as-number*	enters router configuration mode for EIGRPv6
ipv6 unicast-routing	enables IPv6 unicast routing
interface *type number*	changes from global configuration mode to interface configuration mode
no shutdown	enables an interface or routing process

Command	Description
ping ipv6 *ipv6-address*	sends an Internet Control Message Protocol (ICMP) echo request to the specified IPv6 address
router-id *ip-address*	assigns a router ID to an interface
show ipv6 eigrp neighbors	displays information about EIGRPv6 neighbors
show ipv6 eigrp topology [**all-links**]	displays the EIGRPv6 topology table
show ipv6 protocols	displays information about active routing protocols
show ipv6 route	displays the IPv6 routing table
show running-config	displays the active configuration file

The IP addresses, subnet masks, and router IDs used in this lab are shown in the table below:

IP Addresses

Device	Interface	IPv6 Address	Router ID
Router1	Serial 0/0 FastEthernet 0/0 Loopback 0	2001:db8:2:1::1/64 2001:db8:1:1::1/64 2001:db8:1:3::1/64	1.1.1.1
Router2	FastEthernet 0/0 Loopback 0	2001:db8:1:1::2/64 2001:db8:1:2::1/64	2.2.2.2
Router3	Serial 0/0 Loopback 0	2001:db8:2:1::2/64 2001:db8:2:2::1/64	3.3.3.3

Lab Tasks

All passwords in this lab have been set to **cisco**.

Task 1: Enable EIGRP for IPv6

In this task, you will issue the commands necessary to configure EIGRP for IPv6 (EIGRPv6) on Router1, Router2, and Router3.

1. What is an IPv6 unicast address? _____

2. On Router1, enable IPv6 unicast routing.

3. On Router1, enable the EIGRPv6 routing process; use **10** as the autonomous system (AS) number.

4. On Router1, configure the appropriate router ID; refer to the IP Addresses table.

5. On Router1, from EIGRPv6 router configuration mode, enable the EIGRPv6 routing process.

6. On Router1, specify that all interfaces that are configured with an IPv6 address be advertised by EIGRPv6.

7. On Router2, repeat steps 2 through 6. While you are configuring EIGRPv6, you should see output to the console as EIGRP neighbor relationships form.

8. On Router3, repeat steps 2 through 6. While you are configuring EIGRPv6, you should see output to the console as EIGRP neighbor relationships form.

Task 2: Verify the EIGRPv6 Configuration

In this task, you will verify your configuration and observe statistics related to the EIGRPv6 routing protocol configuration you performed.

1. On Router3, display the dynamic routing protocols that are running.

2. On Router1, display the EIGRPv6 neighbor table.

3. On Router1, display the EIGRPv6 topology database.

4. What does the EIGRPv6 topology database contain? _____
   _____

5. On Router1, display all routes, both successor and feasible successor routes, learned by the router.

6. On Router3, display the IPv6 routing table.

7. What is the administrative distance (AD) for EIGRPv6? _____

8. From Router3, ping Router1's Serial 0/0 interface (2001:db8:2:1::1) and Router2's FastEthernet 0/0 interface (2001:db8:1:1::2). Are the pings successful? _____

Lab Solutions

All passwords in this lab have been set to **cisco**.

Task 1: Enable EIGRP for IPv6

1. An IPv6 unicast address is an identifier for a single interface on a single node. You must first enable IPv6 unicast routing before you can enable the EIGRPv6 routing process. By default, IPv6 unicast routing is disabled.

2. On Router1, issue the following command to enable IPv6 unicast routing.

```
Router1(config)#ipv6 unicast-routing
```

3. To enable the EIGRP for IPv6 routing process, you should issue the **ipv6 router eigrp** *as-number* command from global configuration mode, where *as-number* is a number between 1 and 65535 that identifies the AS. The AS identifier must match on neighboring EIGRP routers in order for the routers to establish an adjacency and exchange routes with one another. The following command configures the EIGRPv6 routing process using AS number **10** and places the router into router configuration mode:

```
Router1(config)#ipv6 router eigrp 10
```

4. The EIGRPv6 router ID is used to uniquely identify each router on the network. You can manually configure a router ID for a router by issuing the **router-id** *ip-address* command in router configuration mode, where *ip-address* is the address that you want EIGRPv6 to acknowledge as the new router ID. Issue the following command to configure the appropriate router ID on Router1:

```
Router1(config-rtr)#router-id 1.1.1.1
```

5. You should issue the **no shutdown** command in EIGRPv6 router configuration mode to enable the EIGRPv6 routing process.

```
Router1(config-rtr)#no shutdown
```

6. One difference between configuring EIGRP for IP version 4 (IPv4) and EIGRPv6 is that you cannot add networks to EIGRPv6 by issuing the **network** *ip-address wildcard-mask* command in router configuration mode. Instead, to specify the IPv6 link that should be advertised by EIGRPv6, you should issue the **ipv6 eigrp** *as-number* command, where *as-number* is the number of the EIGRP AS, in interface configuration mode. Issue the following commands on Router1:

```
Router1(config-rtr)#interface serial 0/0
Router1(config-if)#ipv6 eigrp 10
Router1(config-if)#interface fastethernet 0/0
Router1(config-if)#ipv6 eigrp 10
Router1(config-if)#interface loopback 0
Router1(config-if)#ipv6 eigrp 10
```

7. On Router2, issue the following commands to configure EIGRPv6; you should see output to the console as EIGRP neighbor relationships form:

```
Router2(config)#ipv6 unicast-routing
Router2(config)#ipv6 router eigrp 10
Router2(config-rtr)#router-id 2.2.2.2
Router2(config-rtr)#no shutdown
Router2(config-rtr)#interface fastethernet 0/0
Router2(config-if)#ipv6 eigrp 10
Router2(config-if)#interface loopback 0
Router2(config-if)#ipv6 eigrp 10
```

8. On Router3, issue the following commands to configure EIGRPv6; you should see output to the console as EIGRP neighbor relationships form:

```
Router3(config)#ipv6 unicast-routing
Router3(config)#ipv6 router eigrp 10
Router3(config-rtr)#router-id 3.3.3.3
Router3(config-rtr)#no shutdown
Router3(config-rtr)#interface serial 0/0
Router3(config-if)#ipv6 eigrp 10
Router3(config-if)#interface loopback 0
Router3(config-if)#ipv6 eigrp 10
```

Task 2: Verify the EIGRPv6 Configuration

1. On Router3, issue the **show ipv6 protocols** command to display the dynamic routing protocols that are running. Similar to the **show ip protocols** command for IPv4 routing protocols, the **show ipv6 protocols** command lists the IPv6 routing protocols that are running on the router. This command also produces informational output about dynamic IPv6 routing protocols, such as the ASes in which the protocol is configured, the configured maximum hop count, the K values, and the variance. The following is sample output:

```
Router3#show ipv6 protocols
IPv6 Routing Protocol is "connected"
IPv6 Routing Protocol is "static"
Routing Protocol is "eigrp 10"
  EIGRP metric weight K1=1, K2=0, K3=1, K4=0, K5=0
  EIGRP maximum hopcount 100
  EIGRP maximum metric variance 1
  Interfaces:
    Serial0/0
    Loopback0
  Redistribution:
    None
  Maximum path: 16
  Distance: internal 90 external 170
```

2. On Router1, issue the **show ipv6 eigrp neighbors** command to display Router1's EIGRPv6 neighbors. Like EIGRP for IPv4 (EIGRPv4), EIGRPv6 stores neighbor relationships in a neighbor table. The **show ipv6 eigrp neighbors** command displays the contents of this table in a fashion similar to the way the **show ip eigrp neighbors** command displays the EIGRPv4 neighbors table. The following is sample output:

```
Router1#show ipv6 eigrp neighbors
IPv6-EIGRP neighbors for process 10
H   Address                 Interface       Hold Uptime   SRTT   RTO  Q  Seq
                                            (sec)         (ms)       Cnt Num
0   Link-local address:     Fa0/0             11 00:08:58  318  1908  0  5
    FE80::20C:84FF:FE99:1947
1   Link-local address:     Se0/0             11 00:07:19  539  3234  0  6
    FE80::20C:31FF:FE68:8461
```

3. On Router1, issue the following command to display the EIGRPv6 topology database. This command is useful for determining the feasible distance (FD) and advertised distance (AD) of a route. Sample output is below:

```
Router1#show ipv6 eigrp topology
IPv6-EIGRP Topology Table for process 10

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 2001:DB8:2:1::/64, 1 successors, FD is 40512000
        via Connected, Serial0/0
P 2001:DB8:1:1::/64, 1 successors, FD is 28160
        via Connected, FastEthernet0/0
P 2001:DB8:1:3::/64, 1 successors, FD is 128256
        via Connected, Loopback0
P 2001:DB8:1:2::/64, 1 successors, FD is 156160
        via FE80::20C:84FF:FE99:1947 (156160/128256), FastEthernet0/0
P 2001:DB8:2:2::/64, 1 successors, FD is 40640000
        via FE80::20C:31FF:FE68:8461 (40640000/128256), Serial0/0
```

4. The EIGRPv6 topology database contains primary and backup routes to each destination learned from EIGRP neighbors. The best routes (those with the lowest composite metric) are termed *successor routes* and are inserted in the IPv6 routing table on the router; all others are termed *feasible successor* routes.

5. On Router1, issue the following command to display all routes, both successor and feasible successor, learned by the router. Sample output is below:

```
Router1#show ipv6 eigrp topology all-links
IPv6-EIGRP Topology Table for process 10

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status

P 2001:DB8:2:1::/64, 1 successors, FD is 40512000
        via Connected, Serial0/0
        via FE80::20C:84FF:FE99:1947 (40517120/40514560), FastEthernet0/0
        via FE80::20C:31FF:FE68:8461 (41024000/2169856), Serial0/0
P 2001:DB8:1:1::/64, 1 successors, FD is 28160
        via Connected, FastEthernet0/0
        via FE80::20C:84FF:FE99:1947 (30720/28160), FastEthernet0/0
        via FE80::20C:31FF:FE68:8461 (41026560/2172416), Serial0/0
P 2001:DB8:1:3::/64, 1 successors, FD is 128256
        via Connected, Loopback0
        via FE80::20C:84FF:FE99:1947 (158720/156160), FastEthernet0/0
        via FE80::20C:31FF:FE68:8461 (41152000/2297856), Serial0/0
P 2001:DB8:1:2::/64, 1 successors, FD is 156160
        via FE80::20C:84FF:FE99:1947 (156160/128256), FastEthernet0/0
        via FE80::20C:31FF:FE68:8461 (41154560/2300416), Serial0/0
P 2001:DB8:2:2::/64, 1 successors, FD is 40640000
        via FE80::20C:31FF:FE68:8461 (40640000/128256), Serial0/0
        via FE80::20C:84FF:FE99:1947 (40645120/40642560), FastEthernet0/0
```

6. On Router3, issue the following command to display the IPv6 routing table. EIGRP routes are indicated by a `D` code. Sample output is below:

```
Router3#show ipv6 route
IPv6 Routing Table
Codes: C - Connected, L - Local, S - Static, R - RIP, B - BGP
       U - Per-user Static route
       I1 - ISIS L1, I2 - ISIS L2, IA - ISIS interarea, IS - ISIS summary
       O - OSPF intra, OI - OSPF inter, OE1 - OSPF ext 1, OE2 - OSPF ext 2
       ON1 - OSPF NSSA ext 1, ON2 - OSPF NSSA ext 2
       D - EIGRP, EX - EIGRP external
C   2001:DB8:2:2::/64 [0/0]
     via Loopback0, directly connected
L   2001:DB8:2:2::1/128 [0/0]
     via Loopback0, receive
C   2001:DB8:2:1::/64 [0/0]
     via Serial0/0, directly connected
L   2001:DB8:2:1::2/128 [0/0]
     via Serial0/0, receive
D   2001:DB8:1:3::/64 [90/2297856]
     via FE80::20C:39FF:FE62:6232, Serial0/0
D   2001:DB8:1:2::/64 [90/2300416]
     via FE80::20C:39FF:FE62:6232, Serial0/0
D   2001:DB8:1:1::/64 [90/2172416]
     via FE80::20C:39FF:FE62:6232, Serial0/0
L   FF00::/8 [0/0]
     via Null0, receive
```

7. The administrative distance for EIGRPv6 is 90, as indicated by the highlighted portion of the output in the previous step. This is the default administrative distance for EIGRPv6.

8. Pings from Router3 to Router1's Serial 0/0 interface (2001:db8:2:1::1) and Router2's FastEthernet 0/0 interface (2001:db8:1:1::2) should succeed if EIGRPv6 is configured correctly on all routers.

```
Router3#ping ipv6 2001:db8:2:1::1
Router3#ping ipv6 2001:db8:1:1::2
```

Sample Configuration Scripts

Router1

```
Router1#show running-config
Building configuration...
Current configuration : 1113 bytes
!
Version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Router1
!
enable secret 5 $sdf$6978yhg$jnb76sd
enable password boson
!
ip subnet-zero
!
Ip cef
no ip domain-lookup
!
ipv6 unicast-routing
ip host Router2 160.10.1.2
!
interface Loopback0
 ip address 160.10.2.1 255.255.255.0
 ipv6 address 2001:DB8:1:3::1/64
 ipv6 eigrp 10
 no ip directed broadcast
!
interface Serial0/0
 description Serial Link to Router3
 ip address 175.10.1.1 255.255.255.0
 no ip directed-broadcast
 clock rate 64000
 bandwidth 64
 ipv6 address 2001:DB8:2:1::1/64
 ipv6 eigrp 100
!
```

Router1 (continued)

```
interface Serial0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
interface FastEthernet0/0
 ip address 160.10.1.1 255.255.255.0
 no ip directed-broadcast
 ipv6 address 2001:DB8:1:1::1/64
 ipv6 eigrp 10
!
interface FastEthernet0/1
 no ip address
 no ip directed-broadcast
 shutdown
!
ipv6 router eigrp 10
 eigrp router-id 1.1.1.1
 no shutdown
!
ip classless
no ip http server
!
cdp holdtime 20
cdp timer 50
!
banner motd ^C
Unauthorized Access Prohibited^C
line con 0
 login
line aux 0
line vty 0 4
!
no scheduler allocate
end
```