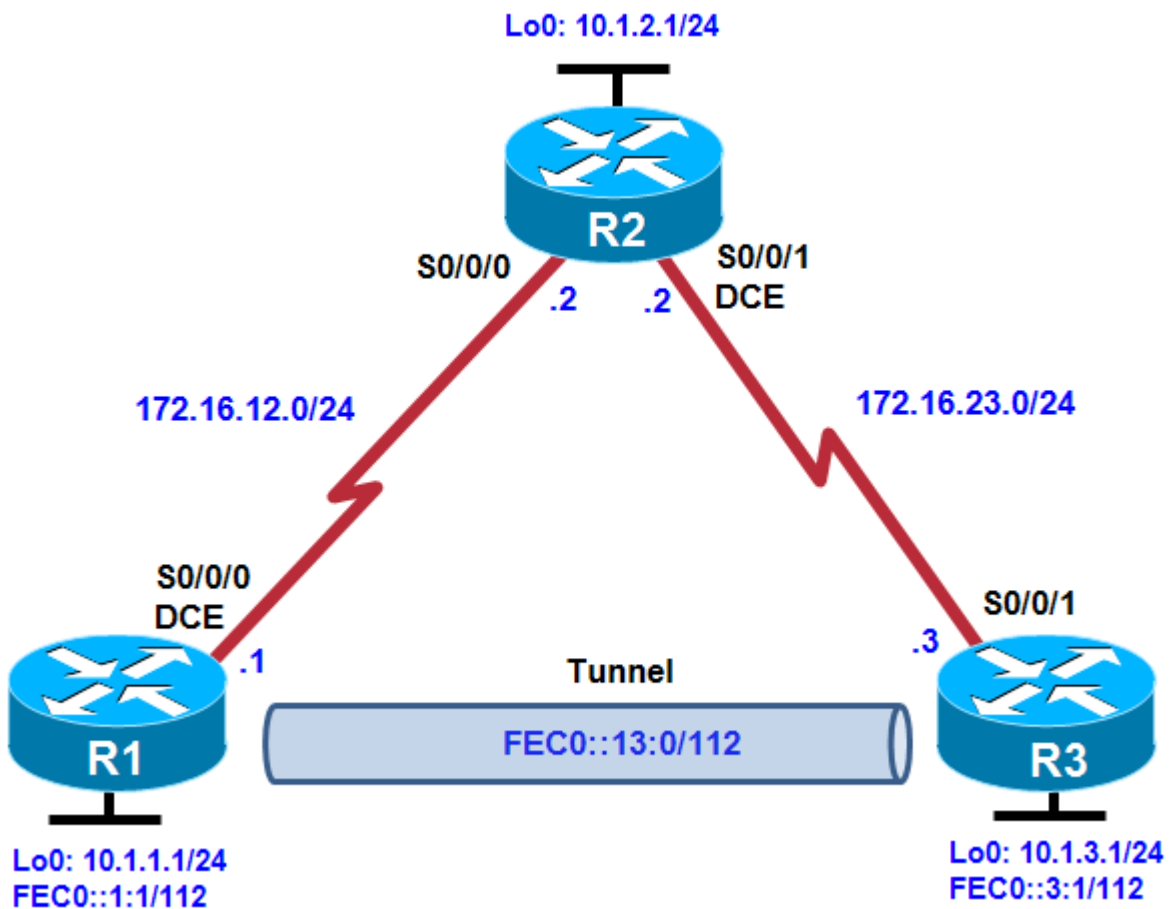# Chapter 8 Lab 8-2, Using Manual IPv6 Tunnels with EIGRP for IPv6

Topology

Objectives

- Configure EIGRP for IPv4.
- Create a manual IPv6 tunnel.
- Configure EIGRP for IPv6 across the tunnel.

Background

In this lab, you configure EIGRP for full connectivity between all IPv4 subnets. Then you create a manual IPv6 tunnel and run EIGRP for IPv6 over it.

Note: This lab uses Cisco 1841 routers with Cisco IOS Release 12.4(24)T1 and the Advanced IP Services image c1841-advipservicesk9-mz.124-24.T1.bin. You can use other routers (such as a 2801 or 2811) and Cisco IOS Software versions if they have comparable capabilities and features. Depending on the router

model and Cisco IOS Software version, the commands available and output produced might vary from what is shown in this lab.

Required Resources

- 3 routers (Cisco 1841 with Cisco IOS Release 12.4(24)T1 Advanced IP Services or comparable)
- Serial and console cables

Step 1: Prepare the routers for the lab.

Cable the network as shown in the topology diagram. Erase the startup configuration, and reload each router to clear the previous configurations. Configure the hostnames as shown.

Step 2: Configure loopbacks and physical interfaces.

Configure the loopback interfaces with IPv4 addresses and IPv6 addresses, where appropriate. Also configure the serial interfaces with the IPv4 addresses shown in the diagram. Set the clock rates on the appropriate interfaces, and issue the **no shutdown** command on all serial connections. Verify that you have local subnet connectivity with **ping**.

```
R1(config)# interface loopback0
R1(config-if)# ip address 10.1.1.1 255.255.255.0
R1(config-if)# ipv6 address FEC0::1:1/112
R1(config-if)# interface serial0/0/0
R1(config-if)# ip address 172.16.12.1 255.255.255.0
R1(config-if)# clockrate 64000
R1(config-if)# bandwidth 64
R1(config-if)# no shutdown

R2(config)# interface loopback0
R2(config-if)# ip address 10.1.2.1 255.255.255.0
R2(config-if)# interface serial0/0/0
R2(config-if)# ip address 172.16.12.2 255.255.255.0
R2(config-if)# bandwidth 64
R2(config-if)# no shutdown
R2(config-if)# interface serial0/0/1
R2(config-if)# ip address 172.16.23.2 255.255.255.0
R2(config-if)# clockrate 64000
R2(config-if)# bandwidth 64
R2(config-if)# no shutdown

R3(config)# interface loopback0
R3(config-if)# ip address 10.1.3.1 255.255.255.0
R3(config-if)# ipv6 address FEC0::3:1/112
R3(config-if)# interface serial0/0/1
R3(config-if)# ip address 172.16.23.3 255.255.255.0
R3(config-if)# bandwidth 64
R3(config-if)# no shutdown
```

Step 3: Configure EIGRP for IPv4.

Configure EIGRP for AS 1 for the major networks 172.16.0.0 and 10.0.0.0 on all three routers. Make sure that you disable auto-summarization. You should have full IPv4 connectivity after this.

```
R1(config)# router eigrp 1
R1(config-router)# no auto-summary
R1(config-router)# network 10.0.0.0
R1(config-router)# network 172.16.0.0
```

```
R2(config)# router eigrp 1
R2(config-router)# no auto-summary
R2(config-router)# network 10.0.0.0
R2(config-router)# network 172.16.0.0

R3(config)# router eigrp 1
R3(config-router)# no auto-summary
R3(config-router)# network 10.0.0.0
R3(config-router)# network 172.16.0.0
```

Step 4: Configure a manual IPv6 tunnel.

A tunnel is a logical interface that acts as a logical connection between two endpoints. It is similar to a loopback interface in that there is no corresponding physical interface, but it is different in that there is more than one router involved. An IPv6 manual tunnel is a type of tunnel that has hard-coded source and destination addresses, with an IPv6 address on the tunnel itself.

a. Use the **interface tunnel** *number* command to create a manual tunnel. For simplicity, use tunnel number 0 on both routers. Configure the tunnel mode for a manual tunnel with the **tunnel mode ipv6ip** command. Then configure an IPv6 address with the **ipv6 address** *address/mask* command. Finally, assign source and destination addresses for the tunnel using the **tunnel source** *address* and **tunnel destination** *address* commands. You can also specify the source by interface.

```
R1(config)# interface tunnel0
R1(config-if)# tunnel mode ipv6ip
R1(config-if)# tunnel source serial0/0/0
R1(config-if)# tunnel destination 172.16.23.3
R1(config-if)# ipv6 address FEC0::13:1/112

R3(config)# interface tunnel0
R3(config-if)# tunnel mode ipv6ip
R3(config-if)# tunnel source serial0/0/1
R3(config-if)# tunnel destination 172.16.12.1
R3(config-if)# ipv6 address FEC0::13:3/112
```

b. Verify that you can ping across the tunnel from one side to the other using the tunnel address of the opposite router.

```
R1# ping FEC0::13:3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FEC0::13:3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/66/68 ms

R3# ping FEC0::13:1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FEC0::13:1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/66/68 ms
```

Note: Although not done in this lab, you can configure the tunnel interfaces using only the **ipv6 enable** command, instead of unicast IPv6 addresses. This command configures the tunnel interfaces for IPv6 operation and assigns automatically generated link-local addresses to them. This allows the tunnel to transport IPv6 packets and an IGP can be run over it. The individual endpoints of the tunnel are not globally addressable, but the tunnel does not require global unicast addresses.

Step 5: Configure EIGRP for IPv6 over a tunnel.

a. Enable IPv6 routing with the **ipv6 unicast-routing** command on R1 and R3. Configure EIGRP for IPv6 on those routers to run over the tunnel and advertise the loopback interfaces into IPv6-EIGRP AS 100.

```
R1(config)# ipv6 unicast-routing
R1(config)# interface loopback0
R1(config-if)# ipv6 eigrp 100
R1(config-if)# interface tunnel0
R1(config-if)# ipv6 eigrp 100

R3(config)# ipv6 unicast-routing
R3(config)# interface loopback0
R3(config-if)# ipv6 eigrp 100
R3(config-if)# interface tunnel0
R3(config-if)# ipv6 eigrp 100
```

b. Verify the configuration using the **show ipv6 eigrp neighbor** command.

```
R1# show ipv6 eigrp neighbor
IPv6-EIGRP neighbors for process 100
% EIGRP 100 is in SHUTDOWN
```

c. IPv6 EIGRP routing is shut down by default. To enable IPv6-EIGRP for process 100, use the following commands on R1 and R3.

```
R1(config-if)# ipv6 router eigrp 100
R1(config-rtr)# no shutdown

*Apr 19 17:27:08.639: %DUAL-5-NBRCHANGE: IPv6-EIGRP(0) 100: Neighbor
FE80::AC10:
1703 (Tunnel0) is up: new adjacency
```

d. Verify the configuration using the **show ipv6 eigrp neighbors** command.

```
R1# show ipv6 eigrp neighbors

IPv6-EIGRP neighbors for process 100
H   Address               Interface     Hold Uptime    SRTT   RTO  Q  Seq
                                        (sec)          (ms)       Cnt Num
0   Link-local address:   Tu0            13 00:01:18  104   5000  0  3
    FE80::AC10:1703
```

Note: The link-local neighbor address is the IPv6 equivalent (AC10:1703) of the R3 serial interface IPv4 address (172.16.23.3).

e. Ping the R3 Lo0 IPv6 address from R1, and ping the R1 Lo0 IPv6 address from R3.

```
R1# ping FEC0::3:1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FEC0::3:1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/64/68 ms

R3# ping FEC0::1:1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to FEC0::1:1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 64/66/68 ms
```

f.   Use the following Tcl script on R1 and R3 to verify connectivity for R1 and R3.

```
R1# tclsh

foreach address {
10.1.1.1
10.1.2.1
10.1.3.1
172.16.12.1
172.16.12.2
172.16.23.2
172.16.23.3
FEC0::1:1
FEC0::3:1
FEC0::13:1
FEC0::13:3
} {
ping $address }
```

Were all pings successful?

g.   Run the Tcl script on R2. Were all IP addresses reachable? Explain.

Router Interface Summary Table

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
1700	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
2800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. Rather than list all combinations of configurations for each router class, this table includes identifiers for the possible combinations of Ethernet and serial interfaces in the device. The table does not include any other type of interface, even though a specific router might contain one. For example, for an ISDN BRI interface, the string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.				