Basic EIGRP for IPv6

Introduction

The Cisco proprietary Enhanced Interior Gateway Protocol (EIGRP) was developed to bridge the gap between the traditional distance vector protocols (IGRP, RIP) and the advanced link-state protocols (OSPF, IS-IS). The large deployed base for EIGRP drove the demand for extending its capabilities to support IPv6. EIGRP for IPv6 works in the same way as EIGRP IPv4 where they can be configured and managed separately. However, configuration for EIGRP for IPv6 is slightly different from IPv4.

Objective(s)

In this lab the student will:

- Configure IPv6 address on Router Interfaces
- Configure EIGRP for IPv6 Routing
- Verify IPv6 EIGRP for IPv6 Routing
- Configure and Verify Passive Interfaces

Equipment/Supplies Needed

If working in a physical environment:

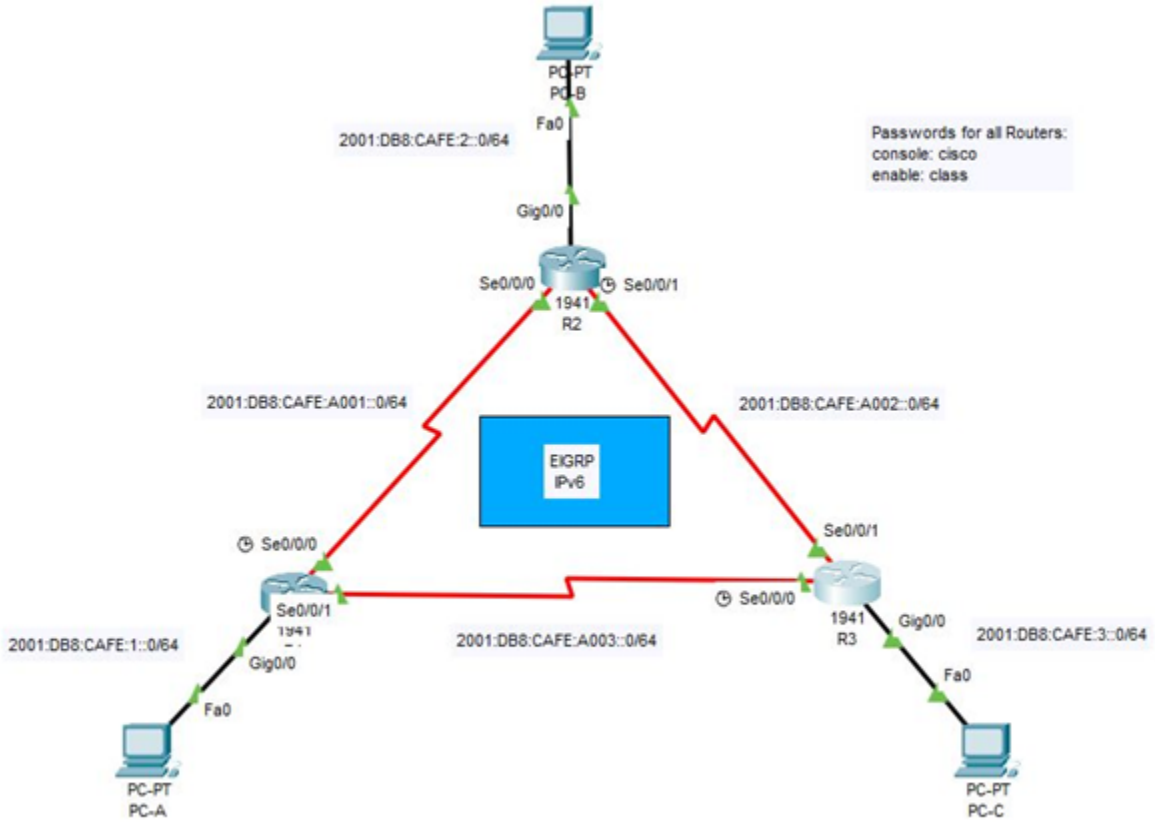
- 3 Computer(s) (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
- 3 Routers (Cisco 1941 with Cisco IOS Release 15.2(4) M3 universal image or comparable)
- Cable(s) [F2F if working in physical environment]
- Terminal Emulation Software (Putty / TeraTerm/ Hyperterm)

If working online:

- Your computer workstation
- Cisco Packet Tracer
- Basic EIGRP for IPv6.pkt file

Note: The routers used with CCNA hands-on labs are Cisco 1941 Integrated Services Routers (ISRs) with Cisco IOS Release 15.2(4)M3 (universalk9 image). Other routers and Cisco IOS versions can be used. Depending on the model and Cisco IOS version, the commands available and output produced might vary from what is shown in the labs. Refer to the Router Interface Summary Table at the end of this lab for the correct interface identifiers.

Topology



Addressing Table

Device	Interface	IPv6 Address	Default Gateway
R1	G0/0	2001:DB8:CAFE:1::1/64	N/A
	S0/0/0	2001:DB8:CAFE:A001::1/64	N/A
	S0/0/1	2001:DB8:CAFE:A003::1/64	N/A
	Link-local	FE80::1 (all router 1 interfaces)	N/A
R2	G0/0	2001:DB8:CAFE:2::1/64	N/A
	S0/0/0	2001:DB8:CAFE:A001::2/64	N/A
	S0/0/1	2001:DB8:CAFE:A002::1/64	N/A
	Link-local	FE80::2 (all router 2 interfaces)	N/A
R3	G0/0	2001:DB8:CAFE:3::1/64	N/A
	S0/0/0	2001:DB8:CAFE:A003::2/64	N/A
	S0/0/1	2001:DB8:CAFE:A002::2/64	N/A
	Link-local	FE80::3 (all router 3 interfaces)	N/A
PC-1	NIC	2001:DB8:CAFE:1::3/64	FE80::1
PC-2	NIC	2001:DB8:CAFE:2::3/64	FE80::2
PC-3	NIC	2001:DB8:CAFE:3::3/64	FE80::3

Procedure

Perform the steps in this lab in the order they are presented to you. Answer all questions and record the requested information in a file.

In this activity, you will configure the network with EIGRP routing for IPv6. You will also assign router IDs, configure passive interfaces, verify the network is fully converged, and display routing information using show commands.

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

- EIGRP for IPv6 is configured directly on the router interfaces.
- With EIGRP for IPv6, a router-id is required on each router or the routing process will not start.
- The EIGRP for IPv6 routing process uses a "shutdown" feature.

Part 1: Configure IPv6 address on router interfaces

Step 1: Configure all router interfaces.

Configure all router interfaces with the appropriate IPv6 addresses according to the addressing scheme listed above.

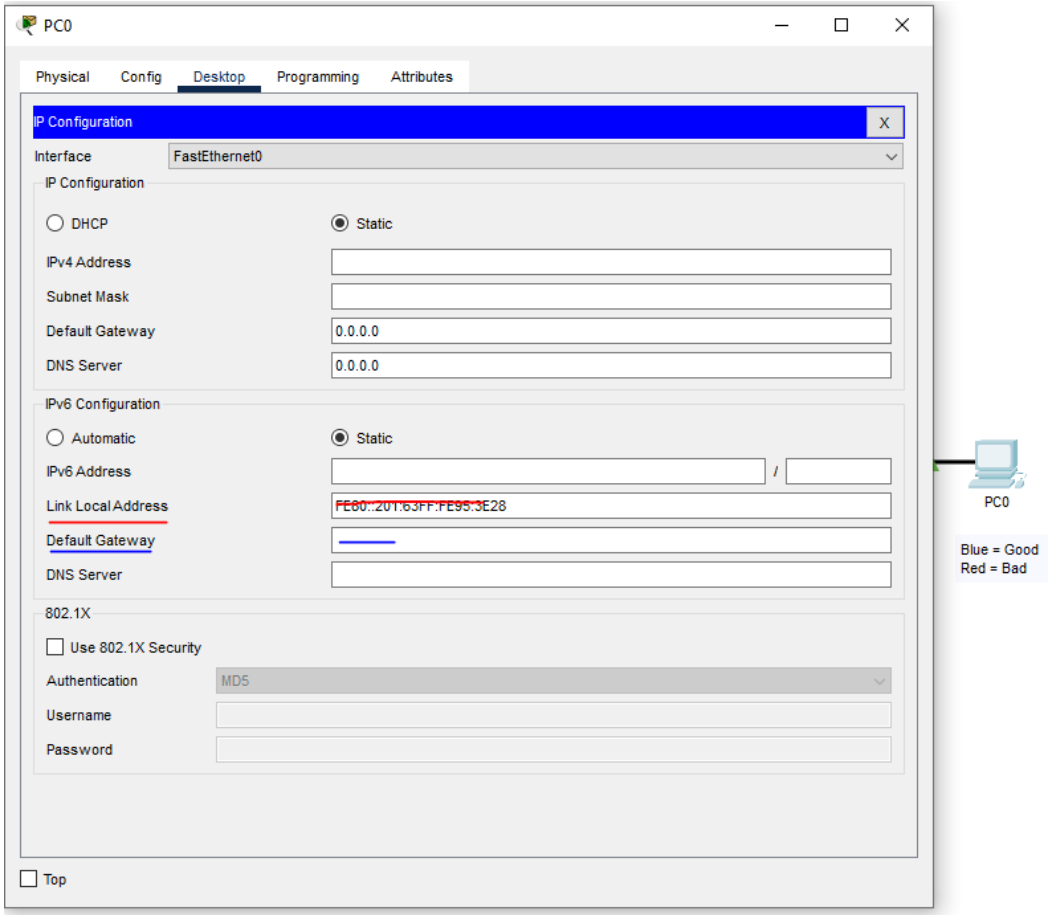
Note: Configure the FE80::x link-local address and the unicast address for each router interface.

Step 2: Configure all PCs with an IPv6 address

Configure all PCs with the appropriate IPv6 addresses and default gateways according to the addressing scheme listed above.

Do **not** configure the IPv6 link local address of the PCs. Only configure the default gateway of the PC with the link local address of the directly connected router interface of the local network segment.

Example below.



Note: If you accidentally statically set the local address on the PC. The PC will no longer auto-generate a link-local address at this point. And you will have to statically assign a link local address not already used on the local network segment.

Ping between directly connected devices to ensure local connectivity. (At this point you will only be able to ping from one device to it's immediate neighbor device since there is no routing protocol configured yet.)

Note: Configure the FE80::x link-local address and the unicast address for each router interface.

Part 2: Configure EIGRP for IPv6 Routing

Step 1: Enable IPv6 routing on each router.

The IPv6 routing process is shutdown by default. Issue a command that will enable EIGRP for IPv6 routing in R1, R2 and R3.

R1(config)# **ipv6 unicast-routing**

Step 2: Assign a router ID to each router.

Enable the EIGRP process on all routers and use 1 as the Autonomous System number.

To begin the EIGRP for IPv6 routing configuration process, issue the **ipv6 router eigrp 1** command, where 1 is the AS number.

R1(config)# **ipv6 router eigrp 1**

EIGRP for IPv6 requires a 32-bit address for the router ID. Use the **eigrp router-id** command to configure the router ID in the router configuration mode.

R1(config)# **ipv6 router eigrp 1**

R1(config-rtr)# **eigrp router-id 1.1.1.1**

R2(config)# **ipv6 router eigrp 1**

R2(config-rtr)# **eigrp router-id 2.2.2.2**

R3(config)# **ipv6 router eigrp 1**

R3(config-rtr)# **eigrp router-id 3.3.3.3**

Step 3: Enable EIGRP for IPv6 routing on each router.

R1(config)# **ipv6 router eigrp 1**

R1(config-rtr)# **no shutdown**

R2(config)# **ipv6 router eigrp 1**

R2(config-rtr)# **no shutdown**

R3(config)# **ipv6 router eigrp 1**

R3(config-rtr)# **no shutdown**

Step: 4 Configure EIGRP for IPv6 using AS 1 on the Serial and Gigabit Ethernet interfaces on the routers.

Issue the **ipv6 eigrp 1** command on the interfaces that participate in the EIGRP routing process. The AS number is 1 as assigned in Step 2. The configuration for R1 is displayed below as an example.

R1(config)# **interface g0/0**

R1(config-if)# **ipv6 eigrp 1**

R1(config-if)# **interface s0/0/0**

R1(config-if)# **ipv6 eigrp 1**

R1(config-if)# **interface s0/0/1**

R1(config-if)# **ipv6 eigrp 1**

Assign EIGRP participating interfaces on R2 and R3. You will see neighbor adjacency messages as interfaces are added to the EIGRP routing process. The messages on R1 are displayed below as an example.

R1(config-if)#

*Apr 12 00:25:49.183: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: **Neighbor FE80::2** (Serial0/0/0) is up: new adjacency

*Apr 12 00:26:15.583: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: **Neighbor FE80::3** (Serial0/0/1) is up: new adjacency

What address is used to indicate the neighbor in the adjacency messages?

Verify end-to-end connectivity before moving on to the next step!

Part 3: Verify EIGRP for IPv6 Routing

On R1, issue the show ipv6 eigrp neighbors command to verify that the adjacency has been established with its neighboring routers. The link-local addresses of the neighboring routers are displayed in the adjacency table.

R1# **show ipv6 eigrp neighbors**

EIGRP-IPv6 Neighbors for AS(1)

H	Address	Interface	Hold	Uptime	SRTT	RTO	Q	Seq	Cnt	Num
1	Link-local address:	Se0/0/1	13	00:02:42	1	100	0	7	**FE80::3**	
0	Link-local address:	Se0/0/0	13	00:03:09	12	100	0	9	**FE80::2**	

Verify the parameters and current state of the active IPv6 routing protocol processes.

Issue the show ipv6 protocols command to verify the configured parameter. From the output, EIGRP 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 three active interfaces: G0/0, S0/0/0, and S0/0/1.

R1# **show ipv6 protocols**

IPv6 Routing Protocol is "connected"

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

GigabitEthernet0/0

Serial0/0/0

Serial0/0/1

Redistribution:

None

Part 4: Configure and Verify Passive Interfaces

A passive interface does not allow outgoing and incoming routing updates over the configured interface. The **passive-interface** command causes the router to stop sending and receiving Hello packets over an interface.

Note: Passive interfaces are usually configured on router interfaces that are not connected to other routers. Passive interfaces limit the amount of unnecessary

protocol traffic in the network because no router devices are receiving the messages on the other side of the link.

Step 1: Configure interface G0/0 as passive on R1 and R2.

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**

Step 2: Verify the passive interface configuration.

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 "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

Serial0/0/1

GigabitEthernet0/0 (passive)

Redistribution:

None

Step 3: Configure the G0/0 passive interface on R3.

If a few interfaces are configured as passive, use the **passive-interface default** command to configure all the interfaces on the router as passive. Use the **no passive-interface interface** command to allow EIGRP Hello messages in and out of the router interface.

a. Configure all interfaces as passive on R3.

R3(config)# **ipv6 router eigrp 1**

R3(config-rtr)# **passive-interface default**

*Apr 13 00:07:03.267: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::1 **(Serial0/0/0) is down: interface passive**

*Apr 13 00:07:03.267: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::2 **(Serial0/0/1) is down: interface passive**

b. After you have issued the **passive-interface default** command, R3 no longer participates in the routing process.

What command can you use to verify it?

Configure the serial interfaces to participate in the routing process.

R3(config)# **ipv6 router eigrp 1**

R3(config-rtr)# **no passive-interface s0/0/0**

R3(config-rtr)# **no passive-interface s0/0/1**

*Apr 13 00:21:23.807: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::1 **(Serial0/0/0) is up: new adjacency**

*Apr 13 00:21:25.567: %DUAL-5-NBRCHANGE: EIGRP-IPv6 1: Neighbor FE80::2 **(Serial0/0/1) is up: new adjacency**

The neighbor relationships have been established again with R1 and R2. Verify that only G0/0 has been configured as passive.

What command do you use to verify the passive interface?

Reflection

1. Where should passive interfaces be configured? Why?

Submit Your Work:

Submit all text files, screenshots, or answers to questions to your instructor Using the most appropriate method below.

Packet Tracer:

Submit Packet Tracer file as well as your text file with your findings and notes.

Rubric

Checklist/Single Point Mastery

Concerns Working Towards Proficiency	Criteria Standards for This Competency	Accomplished Evidence of Mastering Competency
	Criteria #1:Configure IP addresses on Router interfaces and PCs.. (30 pts)	Configure IPv6 address on router interfaces and PCs. Test point to point connectivity between devices. (30 pts) 3 IPs for each router - each router (15 pts) 3 PCs IP address and default gateway. (15 pts)
	Criteria #2: Configure EIGRP protocol needed on all 3 routers for connectivity between networks (30 pts)	Configure EIGRP protocol needed on all 3 routers for connectivity between networks. (30 pts) Each router should have 2 adjacencies. (10pts)
	Criteria #3: Configure Passive interfaces. (10 pts)	Configure Passive interfaces on all LAN interfaces on each router. (10 pts) 3 passive interfaces (3.3 pts)
	Criteria #4: Test connectivity between all remote networks using ping. (15 pts)	Test connectivity between all remote networks using ping. (15 pts) 3 remote networks (5 pts)
	Criteria #5: Submit instructions document with lab questions completed. (15 pts)	Criteria #5: Submit instructions document with lab questions completed. (15 pts)