Lab – Troubleshooting Basic EIGRP for IPv4 and IPv6 (Instructor Version)

**Instructor Note**: Red font color or Gray highlights indicate text that appears in the instructor copy only.

1. Topology

1. Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | EIGRP Router ID | Interface | IP Address | Default Gateway |
| R1 | 1.1.1.1 | G0/0 | 192.168.1.1/242001:DB8:ACAD:A::1/64FE80::1 link-local | N/A |
|  |  | S0/0/0 (DCE) | 192.168.12.1/302001:DB8:ACAD:12::1/64FE80::1 link-local | N/A |
|  |  | S0/0/1 | 192.18.13.1/302001:DB8:ACAD:13::1/64FE80::1 link-local | N/A |
| R2 | 2.2.2.2 | G0/0 | 192.168.2.1/242001:DB8:ACAD:B::2/64FE80::2 link-local | N/A |
|  |  | S0/0/0 | 192.168.12.2/302001:DB8:ACAD:12::2/64FE80::2 link-local | N/A |
|  |  | S0/0/1 (DCE) | 192.168.23.1/302001:DB8:ACAD:23::2/64FE80::2 link-local | N/A |
| R3 | 3.3.3.3 | G0/0 | 192.168.3.1/242001:DB8:ACAD:C::3/64FE80::3 link-local | N/A |
|  |  | S0/0/0 (DCE) | 192.168.13.2/302001:DB8:ACAD:13::3/64FE80::3 link-local | N/A |
|  |  | S0/0/1 | 192.168.23.2/302001:DB8:ACAD:23::3/64FE80::3 link-local | N/A |
| PC-A |  | NIC | 192.168.1.3/242001:DB8:ACAD:A::A/64 | 192.168.1.1FE80::1 |
| PC-B |  | NIC | 192.168.2.3/242001:DB8:ACAD:B::B/64 | 192.168.2.1FE80::2 |
| PC-C |  | NIC | 192.168.3.3/242001:DB8:ACAD:C::C/64 | 192.168.3.1FE80::3 |

1. Objectives

Part 1: Build the Network and Load Device Configurations

Part 2: Troubleshoot Layer 3 Connectivity

Part 3: Troubleshoot EIGRP for IPv4

Part 4: Troubleshoot EIGRP for IPv6

1. Background / Scenario

The Enhanced Interior Gateway Routing Protocol (EIGRP) is an advanced distance vector routing protocol developed by Cisco Systems. EIGRP routers discover neighbors and establish and maintain adjacencies with neighbor routers using Hello packets. An EIGRP router assumes that as long as it is receiving Hello packets from a neighboring router, that neighbor is up and its routes remain viable.

EIGRP for IPv4 runs over the IPv4 network layer, communicating with other EIGRP IPv4 peers, and advertising only IPv4 routes. EIGRP for IPv6 has the same functionality as EIGRP for IPv4 but uses IPv6 as the network layer protocol, communicating with EIGRP for IPv6 peers and advertising IPv6 routes.

In this lab, you will troubleshoot a network that runs EIGRP for IPv4 and EIGRP for IPv6 routing protocols. This network is experiencing problems and you are tasked with finding the problems and correcting them.

**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.

**Note**: Make sure that the routers have been erased and have no startup configurations. If you are unsure, contact your instructor.

**Instructor Note**: Refer to the Instructor Lab Manual for the procedures to initialize and reload devices.

1. Required Resources
* 3 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
* 3 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
* Console cables to configure the Cisco IOS devices via the console ports
* Ethernet and serial cables as shown in the topology
1. Build the Network and Load Device Configurations

In Part 1, you will set up the network topology and configure basic settings on the PC hosts and routers.

* 1. Cable the network as shown in the topology.
	2. Configure PC hosts.
	3. Load router configurations.

Load the following configurations into the appropriate router. All routers have the same passwords. The privileged EXEC password is **class**, and the console and vty password is **cisco**.

Router R1 Configuration:

conf t

service password-encryption

hostname R1

enable secret class

no ip domain lookup

ipv6 unicast-routing

interface GigabitEthernet0/0

 ip address 192.168.1.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:A::1/64

 ipv6 eigrp 1

 no shutdown

interface Serial0/0/0

 bandwidth 128

 ip address 192.168.21.1 255.255.255.252

!ip address 192.168.12.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:12::1/64

 ipv6 eigrp 1

 clock rate 128000

 no shutdown

interface Serial0/0/1

!bandwidth 128

 ip address 192.168.13.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:31::1/64

!ipv6 address 2001:DB8:ACAD:13::1/64

 ipv6 eigrp 1

 no shutdown

router eigrp 1

 network 192.168.1.0

 network 192.168.12.0 0.0.0.3

 network 192.168.13.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 1.1.1.1

ipv6 router eigrp 1

! router-id 1.1.1.1

!passive-interface GigabitEthernet0/0

 no shutdown

banner motd @

 Unauthorized Access is Prohibited! @

line con 0

 password cisco

 logging synchronous

line vty 0 4

 password cisco

login

 transport input all

end

Router R2 Configuration:

conf t

service password-encryption

hostname R2

enable secret class

no ip domain lookup

ipv6 unicast-routing

interface GigabitEthernet0/0

 ip address 192.168.2.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:B::2/64

 ipv6 eigrp 1

! no shutdown

interface Serial0/0/0

! bandwidth 128

 ip address 192.168.12.2 255.255.255.252

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:12::2/64

 ipv6 eigrp 1

 no shutdown

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.23.1 255.255.255.0

!ip address 192.168.23.1 255.255.255.252

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:23::2/64

 ipv6 eigrp 1

 clock rate 128000

 no shutdown

router eigrp 1

! network 192.168.2.0 0.0.0.255

 network 192.168.12.0 0.0.0.3

 network 192.168.23.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 2.2.2.2

ipv6 router eigrp 1

! router-id 2.2.2.2

 no shutdown

 passive-interface GigabitEthernet0/0

banner motd @

 Unauthorized Access is Prohibited! @

line con 0

 password cisco

 login

 logging synchronous

line vty 0 4

 password cisco

 login

 transport input all

end

Router R3 Configuration:

conf t

service password-encryption

hostname R3

enable secret class

no ip domain lookup

! ipv6 unicast-routing

interface GigabitEthernet0/0

 ip address 192.168.3.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:C::3/64

 ipv6 eigrp 1

! no shutdown

interface Serial0/0/0

! bandwidth 128

 ip address 192.168.13.2 255.255.255.252

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:13::3/64

 ipv6 eigrp 1

 no shutdown

! clock rate 128000

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.23.2 255.255.255.252

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:23::3/64

 ipv6 eigrp 1

 no shutdown

router eigrp 1

 network 192.168.3.0

 network 192.168.13.0 0.0.0.3

! network 192.168.23.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 3.3.3.3

!ipv6 router eigrp 1

! router-id 3.3.3.3

! passive-interface GigabitEthernet0/0

! no shutdown

banner motd @

 Unauthorized Access is Prohibited! @

line con 0

 password cisco

 login

 logging synchronous

line vty 0 4

 password cisco

 login

 transport input all

end

* 1. Save the running configuration for all routers.
1. Troubleshoot Layer 3 Connectivity

In Part 2, you will verify that Layer 3 connectivity is established on all interfaces. You will need to test both IPv4 and IPv6 connectivity for all device interfaces.

**Note**: All serial interfaces should be set with a bandwidth of 128 Kb/s. The clock rate on the DCE interface should be set to 128000.

* 1. Verify that the interfaces listed in the Addressing Table are active and configured with correct IP address information.
		1. Issue the **show ip interface brief** command on all routers to verify that the interfaces are in an up/up state. Record your findings.

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R1 - all interfaces are up/up

R2 - G0/0 is administratively down

R3 - G0/0 is administratively down

R1# **show ip interface brief**

Interface IP-Address OK? Method Status Protocol

Embedded-Service-Engine0/0 unassigned YES unset administratively down down

GigabitEthernet0/0 192.168.1.1 YES manual up up

GigabitEthernet0/1 unassigned YES unset administratively down down

Serial0/0/0 192.168.21.1 YES manual up up

Serial0/0/1 192.168.13.1 YES manual up up

R2# **show ip interface brief**

Interface IP-Address OK? Method Status Protocol

Embedded-Service-Engine0/0 unassigned YES unset administratively down down

GigabitEthernet0/0 192.168.2.1 YES manual administratively down down

GigabitEthernet0/1 unassigned YES unset administratively down down

Serial0/0/0 192.168.12.2 YES manual up up

Serial0/0/1 192.168.23.1 YES manual up up

R3# **show ip interface brief**

Interface IP-Address OK? Method Status Protocol

Embedded-Service-Engine0/0 unassigned YES unset administratively down down

GigabitEthernet0/0 192.168.3.1 YES manual administratively down down

GigabitEthernet0/1 unassigned YES unset administratively down down

Serial0/0/0 192.168.13.2 YES manual up up

Serial0/0/1 192.168.23.2 YES manual up up

* + 1. Issue the **show run interface** command to verify IP address assignments on all router interfaces. Compare the interface IP addresses against the Addressing Table and verify the subnet mask assignments. For IPv6, verify that the link-local address has been assigned. Record your findings.

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R1 – S0/0/0 incorrect IPv4 address should be 192.168.12.1, S0/0/1 incorrect IPv6 address should be 2001:DB8:ACAD:13::1/64

R2 – S0/0/1 incorrect subnet mask should be 255.255.255.252

R3 – all IPs configured correctly

R1# **show run interface s0/0/0**

Building configuration...

Current configuration : 188 bytes

!

interface Serial0/0/0

 bandwidth 128

 ip address 192.168.21.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:12::1/64

 ipv6 eigrp 1

 clock rate 128000

end

R1# **show run interface s0/0/1**

Building configuration...

Current configuration : 154 bytes

!

interface Serial0/0/1

 ip address 192.168.13.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:31::1/64

 ipv6 eigrp 1

end

R2# **show run interface s0/0/1**

Building configuration...

Current configuration : 186 bytes

!

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.23.1 255.255.255.0

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:23::2/64

 ipv6 eigrp 1

 clock rate 128000

end

* + 1. Issue the **show interfaces***interface-id* command to verify bandwidth setting on the serial interfaces. Record your findings.

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R1 – S0/0/1 incorrect bandwidth of 1544 should be 128

R2 – S0/0/0 incorrect bandwidth of 1544 should be 128

R3 – S0/0/0 incorrect bandwidth of 1544 should be 128

R1# **show interfaces s0/0/1**

Serial0/0/1 is up, line protocol is up

 Hardware is WIC MBRD Serial

 Internet address is 192.168.13.1/30

 MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,

 reliability 255/255, txload 1/255, rxload 1/255

 Encapsulation HDLC, loopback not set

 Keepalive set (10 sec)

<output omitted>

R2# **show interfaces s0/0/0**

Serial0/0/0 is up, line protocol is up

 Hardware is WIC MBRD Serial

 Internet address is 192.168.12.2/30

 MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,

 reliability 255/255, txload 1/255, rxload 1/255

 Encapsulation HDLC, loopback not set

 Keepalive set (10 sec)

<output omitted>

R3# **show interfaces s0/0/0**

Serial0/0/0 is up, line protocol is up

 Hardware is WIC MBRD Serial

 Internet address is 192.168.13.2/30

 MTU 1500 bytes, BW 1544 Kbit/sec, DLY 20000 usec,

 reliability 255/255, txload 1/255, rxload 1/255

 Encapsulation HDLC, loopback not set

 Keepalive set (10 sec)

<output omitted>

* + 1. Issue the **show controllers** *interface-id*command to verify that clock rates have been set to 128 Kb/s on all DCE serial interfaces. Issue the **show interfaces***interface-id* command to verify bandwidth setting on the serial interfaces. Record your findings.

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R1 – clock rate correctly configured on S0/0/0

R2 – clock rate correctly configured on S0/0/1

R3 – clock rate incorrectly configured 2000000 on S0/0/0 should be 128000

R3# **show controllers s0/0/0**

Interface Serial0/0/0

Hardware is SCC

DCE V.35, clock rate 2000000

idb at 0x30FE4FB4, driver data structure at 0x29E7C30C

wic\_info 0x30FE5EC4

<output omitted>

* + 1. Resolve all problems found. Record the commands used to correct the issues.

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

R1(config-if)# **ip address 192.168.12.1 255.255.255.252**

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

R1(config-if)# **bandwidth 128**

R1(config-if)# **no ipv6 address 2001:db8:acad:31::1/64**

R1(config-if)# **ipv6 address 2001:db8:acad:13::1/64**

R1(config-if)# **end**

R2(config)# **interface g0/0**

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

R2(config-if)# **interface s0/0/0**

R2(config-if)# **bandwidth 128**

R2(config-if)# **interface s0/0/1**

R2(config-if)# **ip address 192.168.23.1 255.255.255.252**

R2(config-if)# **end**

R3(config)# **interface g0/0**

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

R3(config-if)# **interface s0/0/0**

R3(config-if)# **bandwidth 128**

R3(config-if)# **clock rate 128000**

R3(config-if)# **end**

* 1. Verify Layer 3 connectivity.

Use the **ping** command and verify that each router has network connectivity with the serial interfaces on the neighbor routers. Verify that the PCs can ping their default gateways. If problems still exist, continue troubleshooting Layer 3 issues.

1. Troubleshoot EIGRP for IPv4

In Part 3, you will troubleshoot EIGRP for IPv4 problems and make the necessary changes needed to establish EIGRP for IPv4 routes and end-to-end IPv4 connectivity.

**Note**: LAN (G0/0) interfaces should not advertise EIGRP routing information, but routes to these networks should be contained in the routing tables.

* 1. Test IPv4 end-to-end connectivity.

From each PC host, ping the other PC hosts in the topology to verify end-to-end connectivity.

**Note**: It may be necessary to disable the PC firewall before testing, to ping between PCs.

* + 1. Ping from PC-A to PC-B. Were the pings successful? \_\_\_\_\_\_\_\_\_\_\_\_\_ No
		2. Ping from PC-A to PC-C. Were the pings successful? \_\_\_\_\_\_\_\_\_\_\_\_\_ Yes
		3. Ping from PC-B to PC-C. Were the pings successful? \_\_\_\_\_\_\_\_\_\_\_\_\_ No
	1. Verify that all interfaces are assigned to EIGRP for IPv4.
		1. Issue the **show ip protocols** command to verify that EIGRP is running and that all networks are advertised. This command also allows you to verify that the router ID is set correctly, and that the LAN interfaces are set as passive interfaces. Record your findings.

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R1 – router ID, advertised networks, and passive interface are all configure correctly

R2 – router ID is correct, network statement missing for 192.168.2.0 and g0/0 not set to passive

R3 – router ID and passive interface are configured correctly, network statement missing for 192.168.23.0

R1# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "eigrp 1"

 Outgoing update filter list for all interfaces is not set

 Incoming update filter list for all interfaces is not set

 Default networks flagged in outgoing updates

 Default networks accepted from incoming updates

 EIGRP-IPv4 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: 4

 Maximum hopcount 100

 Maximum metric variance 1

 Automatic Summarization: disabled

 Maximum path: 4

 Routing for Networks:

 192.168.1.0

 192.168.12.0/30

 192.168.13.0/30

 Passive Interface(s):

 GigabitEthernet0/0

 Routing Information Sources:

 Gateway Distance Last Update

 192.168.12.2 90 00:19:19

 192.168.13.2 90 00:19:20

 Distance: internal 90 external 170

R2# **show ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "eigrp 1"

 Outgoing update filter list for all interfaces is not set

 Incoming update filter list for all interfaces is not set

 Default networks flagged in outgoing updates

 Default networks accepted from incoming updates

 EIGRP-IPv4 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: 2.2.2.2

 Topology : 0 (base)

 Active Timer: 3 min

 Distance: internal 90 external 170

 Maximum path: 4

 Maximum hopcount 100

 Maximum metric variance 1

 Automatic Summarization: disabled

 Maximum path: 4

 Routing for Networks:

 192.168.12.0/30

 192.168.23.0/30

 Routing Information Sources:

 Gateway Distance Last Update

 192.168.12.1 90 00:13:23

 Distance: internal 90 external 170

R3# **sh ip protocols**

\*\*\* IP Routing is NSF aware \*\*\*

Routing Protocol is "eigrp 1"

 Outgoing update filter list for all interfaces is not set

 Incoming update filter list for all interfaces is not set

 Default networks flagged in outgoing updates

 Default networks accepted from incoming updates

 EIGRP-IPv4 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: 4

 Maximum hopcount 100

 Maximum metric variance 1

 Automatic Summarization: disabled

 Maximum path: 4

 Routing for Networks:

 192.168.3.0

 192.168.13.0/30

 Passive Interface(s):

 GigabitEthernet0/0

 Routing Information Sources:

 Gateway Distance Last Update

 192.168.13.1 90 00:14:25

 Distance: internal 90 external 170

* + 1. Make the necessary changes based on the output from the **show ip protocols** command. Record the commands that were used to correct the issues.

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

R2(config-router)# **network 192.168.2.0 0.0.0.255**

R2(config-router)# **passive-interface g0/0**

R2(config-router)# **end**

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

R3(config-router)# **network 192.168.23.0 0.0.0.3**

R3(config-router)# **end**

* + 1. Re-issue the **show ip protocols** command to verify that your changes had the desired effect.
	1. Verify EIGRP neighbor information.
		1. Issue the **show ip eigrp neighbor** command to verify that EIGRP adjacencies have been established between the neighboring routers.

R1# **show ip eigrp neighbor**

EIGRP-IPv4 Neighbors for AS(1)

H Address Interface Hold Uptime SRTT RTO Q Seq

 (sec) (ms) Cnt Num

1 192.168.12.2 Se0/0/0 10 00:27:21 5 1170 0 12

0 192.168.13.2 Se0/0/1 12 00:47:18 1 1140 0 13

R2# **show ip eigrp neighbor**

EIGRP-IPv4 Neighbors for AS(1)

H Address Interface Hold Uptime SRTT RTO Q Seq

 (sec) (ms) Cnt Num

1 192.168.23.2 Se0/0/1 10 00:06:54 18 1170 0 14

0 192.168.12.1 Se0/0/0 11 00:30:35 6 1200 0 20

R3# **show ip eigrp neighbor**

EIGRP-IPv4 Neighbors for AS(1)

H Address Interface Hold Uptime SRTT RTO Q Seq

 (sec) (ms) Cnt Num

1 192.168.23.1 Se0/0/1 14 00:07:23 16 1170 0 13

0 192.168.13.1 Se0/0/0 13 00:51:01 2 1140 0 21

* + 1. Resolve any outstanding problems that were discovered.

**Instructor Note**: All problems were resolved in Step 2b.

* 1. Verify EIGRP for IPv4 routing information.
		1. Issue the **show ip route eigrp** command to verify that each router has EIGRP for IPv4 routes to all non-adjoining networks.

R1# **show ip route eigrp**

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

 + - replicated route, % - next hop override

Gateway of last resort is not set

D 192.168.2.0/24 [90/20514560] via 192.168.12.2, 01:04:13, Serial0/0/0

D 192.168.3.0/24 [90/20514560] via 192.168.13.2, 01:04:13, Serial0/0/1

 192.168.23.0/30 is subnetted, 1 subnets

D 192.168.23.0 [90/21024000] via 192.168.13.2, 01:04:14, Serial0/0/1

 [90/21024000] via 192.168.12.2, 01:04:14, Serial0/0/0

R2# **show ip route eigrp**

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

 + - replicated route, % - next hop override

Gateway of last resort is not set

D 192.168.1.0/24 [90/20514560] via 192.168.12.1, 01:04:42, Serial0/0/0

D 192.168.3.0/24 [90/20514560] via 192.168.23.2, 01:04:42, Serial0/0/1

 192.168.13.0/30 is subnetted, 1 subnets

D 192.168.13.0 [90/21024000] via 192.168.23.2, 01:04:42, Serial0/0/1

 [90/21024000] via 192.168.12.1, 01:04:42, Serial0/0/0

R3# **show ip route eigrp**

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

 + - replicated route, % - next hop override

Gateway of last resort is not set

D 192.168.1.0/24 [90/20514560] via 192.168.13.1, 01:05:07, Serial0/0/0

D 192.168.2.0/24 [90/20514560] via 192.168.23.1, 01:05:07, Serial0/0/1

 192.168.12.0/30 is subnetted, 1 subnets

D 192.168.12.0 [90/21024000] via 192.168.23.1, 01:05:07, Serial0/0/1

 [90/21024000] via 192.168.13.1, 01:05:07, Serial0/0/0

Are all EIGRP routes available? \_\_\_\_\_\_\_\_ yes

If any EIGRP for IPv4 routes are missing, what is missing?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

All EIGRP routes are present.

* + 1. If any routing information is missing, resolve these issues.

**Instructor Note**: All problems should have been resolved.

* 1. Verify IPv4 end-to-end connectivity.

From each PC, verify that IPv4 end-to-end connectivity exists. PCs should be able to ping the other PC hosts in the topology. If IPv4 end-to-end connectivity does not exist, then continue troubleshooting to resolve remaining issues.

**Note**: It may be necessary to disable the PCs firewall.

1. Troubleshoot EIGRP for IPv6

In Part 3, you will troubleshoot EIGRP for IPv6 problems and make the necessary changes needed to establish EIGRP for IPv6 routes and end-to-end IPv6 connectivity.

**Note**: LAN (G0/0) interfaces should not advertise EIGRP routing information, but routes to these networks should be contained in the routing tables.

* 1. Test IPv6 end-to-end connectivity.

From each PC host, ping the IPv6 addresses of the other PC hosts in the topology to verify end-to-end connectivity.

* 1. Verify that IPv6 unicast routing has been enabled on all routers.
		1. An easy way to verify that IPv6 routing has been enabled on a router is to use the **show run | section ipv6 unicast** command. By adding this pipe to the **show run** command, the **ipv6 unicast-routing** command is displayed if IPv6 routing has been enabled.

**Note**: The **show run** command can also be issued without any pipe, and then a manual search for the **ipv6 unicast-routing** command can be done.

Issue the command on each router. Record your findings.

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R3 does not have IPv6 unicast routing enabled.

* + 1. If IPv6 unicast routing is not enabled on one or more routers, enable it now. Record the commands that were used to correct the issues.

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R3(config)# **ipv6 unicast-routing**

* 1. Verify that all interfaces are assigned to EIGRP for IPv6.
		1. Issue the **show ipv6 protocols** command and verify that the router ID is correct. This command also allows you to verify that the LAN interfaces are set as passive interfaces.

**Note**: If no output is generated from this command, then the EIGRP for IPv6 process has not been configured.

Record your findings.

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R1 – router ID is incorrect.and g0/0 not set to passive interface

R2 – router ID is incorrect

R3 – EIGRP had not been configured on this router

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: 192.168.21.1

 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

 Redistribution:

 None

R2# **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: 192.168.23.1

 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

R3# **show ipv6 protocols**

IPv6 Routing Protocol is "connected"

IPv6 Routing Protocol is "ND"

* + 1. Make the necessary configuration changes. Record the commands used to correct the issues.

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

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

R1(config-rtr)# **passive-interface g0/0**

R2(config-rtr)# **end**

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

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

R2(config-rtr)# **end**

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

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

R3(config-rtr)# **passive-interface g0/0**

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

R3(config-rtr)# **interface g0/0**

R3(config-if)# **ipv6 eigrp 1**

R3(config-if)# **interface s0/0/0**

R3(config-if)# **ipv6 eigrp 1**

R3(config-if)# **interface s0/0/1**

R3(config-if)# **ipv6 eigrp 1**

R3(config-if)# **end**

* + 1. Re-issue the **show ipv6 protocols** command to verify that your changes are correct.
	1. Verify that all routers have correct neighbor adjacency information.
		1. Issue the **show ipv6 eigrp** **neighbor** command to verify that adjacencies have formed between neighboring routers.

R1# **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 13 00:13:38 17 1182 0 7

 FE80::3

0 Link-local address: Se0/0/0 14 00:17:30 16 1182 0 20

 FE80::2

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 13 00:14:36 27 1182 0 8

 FE80::3

0 Link-local address: Se0/0/0 12 00:18:33 17 1182 0 22

 FE80::1

R3# **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 12 00:07:39 24 1182 0 21

 FE80::2

0 Link-local address: Se0/0/0 12 00:07:44 19 1182 0 21

 FE80::1

* + 1. Resolve any EIGRP adjacency issues that still exist.

**Instructor Note**: All adjacency issues should have been resolved in earlier steps.

* 1. Verify EIGRP for IPv6 routing information.
		1. Issue the **show ipv6 route eigrp** command, and verify that EIGRP for IPv6 routes exist to all non-adjoining networks.

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, 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

D 2001:DB8:ACAD:B::/64 [90/20514560]

 via FE80::2, Serial0/0/0

D 2001:DB8:ACAD:C::/64 [90/20514560]

 via FE80::3, Serial0/0/1

D 2001:DB8:ACAD:23::/64 [90/21024000]

 via FE80::2, Serial0/0/0

 via FE80::3, Serial0/0/1

R2# **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, 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

D 2001:DB8:ACAD:A::/64 [90/20514560]

 via FE80::1, Serial0/0/0

D 2001:DB8:ACAD:C::/64 [90/20514560]

 via FE80::3, Serial0/0/1

D 2001:DB8:ACAD:13::/64 [90/21024000]

 via FE80::1, Serial0/0/0

 via FE80::3, Serial0/0/1

R3# **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, 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

D 2001:DB8:ACAD:A::/64 [90/20514560]

 via FE80::1, Serial0/0/0

D 2001:DB8:ACAD:B::/64 [90/20514560]

 via FE80::2, Serial0/0/1

D 2001:DB8:ACAD:12::/64 [90/21024000]

 via FE80::1, Serial0/0/0

 via FE80::2, Serial0/0/1

Are all EIGRP routes available? \_\_\_\_\_\_\_\_ yes

If any EIGRP for IPv6 routes are missing, what is missing?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

All EIGRP for IPv6 routes are present.

* + 1. Resolve any routing issues that still exist.

**Instructor Note**: All EIGRP for IPv6 routes issues should have been resolved.

* 1. Test IPv6 end-to-end connectivity.

From each PC, verify that IPv6 end-to-end connectivity exists. PCs should be able to ping the other PC hosts in the topology. If IPv6 end-to-end connectivity does not exist, then continue troubleshooting to resolve remaining issues.

**Note**: It may be necessary to disable the PCs firewall.

1. Reflection

Why would you troubleshoot EIGRP for IPv4 and EIGRP for IPv6 separately?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

EIGRP for IPv4 and EIGRP for IPv6 do not share routing information and their configuration is completely independent. Troubleshooting these two protocols should be done independently.

1. Router Interface Summary Table

|  |
| --- |
| Router Interface Summary |
| Router Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
| 1800 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 1900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2801 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/1/1) |
| 2811 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | 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. There is no way to effectively list all the 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 may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface. |

1. Device Configs - Final
2. Router R1

R1#show run

Building configuration...

Current configuration : 1937 bytes

!

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname R1

!

boot-start-marker

boot-end-marker

!

enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2

!

no aaa new-model

memory-size iomem 15

!

ip cef

!

no ip domain lookup

ipv6 unicast-routing

ipv6 cef

multilink bundle-name authenticated

!

interface Embedded-Service-Engine0/0

 no ip address

 shutdown

!

interface GigabitEthernet0/0

 ip address 192.168.1.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:A::1/64

 ipv6 eigrp 1

!

interface GigabitEthernet0/1

 no ip address

 shutdown

 duplex auto

 speed auto

!

interface Serial0/0/0

 bandwidth 128

 ip address 192.168.12.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:12::1/64

 ipv6 eigrp 1

 clock rate 128000

!

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.13.1 255.255.255.252

 ipv6 address FE80::1 link-local

 ipv6 address 2001:DB8:ACAD:13::1/64

 ipv6 eigrp 1

!

router eigrp 1

 network 192.168.1.0

 network 192.168.12.0 0.0.0.3

 network 192.168.13.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 1.1.1.1

!

ip forward-protocol nd

!

no ip http server

no ip http secure-server

!

ipv6 router eigrp 1

 passive-interface GigabitEthernet0/0

 eigrp router-id 1.1.1.1

!

control-plane

!

banner motd ^C

 Unauthorized Access is Prohibited! ^C

!

line con 0

 password 7 13061E010803

 login

 logging synchronous

line aux 0

line 2

 no activation-character

 no exec

 transport preferred none

 transport input all

 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

 stopbits 1

line vty 0 4

 password 7 060506324F41

 login

 transport input all

!

scheduler allocate 20000 1000

!

end

1. Router R2

R2# show run

Building configuration...

Current configuration : 1937 bytes

!

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname R2

!

boot-start-marker

boot-end-marker

!

enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2

!

no aaa new-model

memory-size iomem 15

!

ip cef

!

no ip domain lookup

ipv6 unicast-routing

ipv6 cef

multilink bundle-name authenticated

!

interface Embedded-Service-Engine0/0

 no ip address

 shutdown

!

interface GigabitEthernet0/0

 ip address 192.168.2.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:B::2/64

 ipv6 eigrp 1

!

interface GigabitEthernet0/1

 no ip address

 shutdown

 duplex auto

 speed auto

!

interface Serial0/0/0

 bandwidth 128

 ip address 192.168.12.2 255.255.255.252

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:12::2/64

 ipv6 eigrp 1

!

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.23.1 255.255.255.252

 ipv6 address FE80::2 link-local

 ipv6 address 2001:DB8:ACAD:23::2/64

 ipv6 eigrp 1

 clock rate 128000

!

router eigrp 1

 network 192.168.2.0

 network 192.168.12.0 0.0.0.3

 network 192.168.23.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 2.2.2.2

!

ip forward-protocol nd

!

no ip http server

no ip http secure-server

!

ipv6 router eigrp 1

 passive-interface GigabitEthernet0/0

 eigrp router-id 2.2.2.2

!

control-plane

!

banner motd ^C

 Unauthorized Access is Prohibited! ^C

!

line con 0

 password 7 13061E010803

 login

 logging synchronous

line aux 0

line 2

 no activation-character

 no exec

 transport preferred none

 transport input all

 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

 stopbits 1

line vty 0 4

 password 7 070C285F4D06

 login

 transport input all

!

scheduler allocate 20000 1000

!

end

1. Router R3

R3# show run

Building configuration...

Current configuration : 1976 bytes

!

version 15.2

service timestamps debug datetime msec

service timestamps log datetime msec

service password-encryption

!

hostname R3

!

boot-start-marker

boot-end-marker

!

enable secret 4 06YFDUHH61wAE/kLkDq9BGho1QM5EnRtoyr8cHAUg.2

!

no aaa new-model

memory-size iomem 15

!

ip cef

!

no ip domain lookup

ipv6 unicast-routing

ipv6 cef

multilink bundle-name authenticated

!

interface Embedded-Service-Engine0/0

 no ip address

 shutdown

!

interface GigabitEthernet0/0

 ip address 192.168.3.1 255.255.255.0

 duplex auto

 speed auto

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:C::3/64

 ipv6 eigrp 1

!

interface GigabitEthernet0/1

 no ip address

 shutdown

 duplex auto

 speed auto

!

interface Serial0/0/0

 bandwidth 128

 ip address 192.168.13.2 255.255.255.252

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:13::3/64

 ipv6 eigrp 1

 clock rate 128000

!

interface Serial0/0/1

 bandwidth 128

 ip address 192.168.23.2 255.255.255.252

 ipv6 address FE80::3 link-local

 ipv6 address 2001:DB8:ACAD:23::3/64

 ipv6 eigrp 1

!

router eigrp 1

 network 192.168.3.0

 network 192.168.13.0 0.0.0.3

 network 192.168.23.0 0.0.0.3

 passive-interface GigabitEthernet0/0

 eigrp router-id 3.3.3.3

!

ip forward-protocol nd

!

no ip http server

no ip http secure-server

!

ipv6 router eigrp 1

 passive-interface GigabitEthernet0/0

 eigrp router-id 3.3.3.3

!

control-plane

!

banner motd ^C

 Unauthorized Access is Prohibited! ^C

!

line con 0

 password 7 13061E010803

 login

 logging synchronous

line aux 0

line 2

 no activation-character

 no exec

 transport preferred none

 transport input all

 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh

 stopbits 1

line vty 0 4

 password 7 13061E010803

 login

 transport input all

!

scheduler allocate 20000 1000

!

end