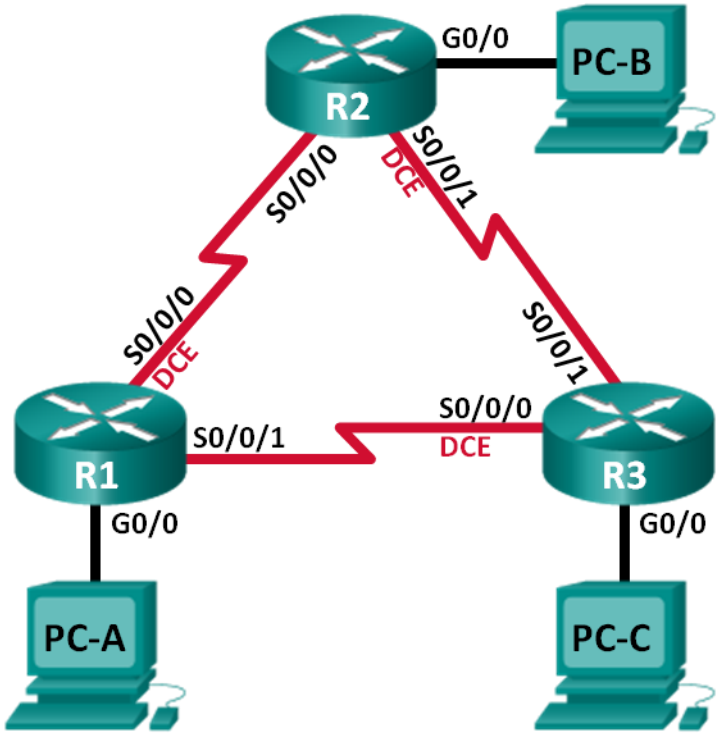
# Lab – Troubleshooting Basic EIGRP for IPv4 and IPv6

## Topology



## Addressing Table

| Device | EIGRP Router ID | Interface | IP Address | Default Gateway |
|---|---|---|---|---|
| R1 | 1.1.1.1 | G0/0 | 192.168.1.1/24<br>2001:DB8:ACAD:A::1/64<br>FE80::1 link-local | N/A |
| | | S0/0/0 (DCE) | 192.168.12.1/30<br>2001:DB8:ACAD:12::1/64<br>FE80::1 link-local | N/A |
| | | S0/0/1 | 192.18.13.1/30<br>2001:DB8:ACAD:13::1/64<br>FE80::1 link-local | N/A |
| R2 | 2.2.2.2 | G0/0 | 192.168.2.1/24<br>2001:DB8:ACAD:B::2/64<br>FE80::2 link-local | N/A |
| | | S0/0/0 | 192.168.12.2/30<br>2001:DB8:ACAD:12::2/64<br>FE80::2 link-local | N/A |
| | | S0/0/1 (DCE) | 192.168.23.1/30<br>2001:DB8:ACAD:23::2/64<br>FE80::2 link-local | N/A |
| R3 | 3.3.3.3 | G0/0 | 192.168.3.1/24<br>2001:DB8:ACAD:C::3/64<br>FE80::3 link-local | N/A |
| | | S0/0/0 (DCE) | 192.168.13.2/30<br>2001:DB8:ACAD:13::3/64<br>FE80::3 link-local | N/A |
| | | S0/0/1 | 192.168.23.2/30<br>2001:DB8:ACAD:23::3/64<br>FE80::3 link-local | N/A |
| PC-A | | NIC | 192.168.1.3/24<br>2001:DB8:ACAD:A::A/64 | 192.168.1.1<br>FE80::1 |
| PC-B | | NIC | 192.168.2.3/24<br>2001:DB8:ACAD:B::B/64 | 192.168.2.1<br>FE80::2 |
| PC-C | | NIC | 192.168.3.3/24<br>2001:DB8:ACAD:C::C/64 | 192.168.3.1<br>FE80::3 |

## 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**

## 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.

## 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

# Part 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.

### Step 1: Cable the network as shown in the topology.

### Step 2: Configure PC hosts.

### Step 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
 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
 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
 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
 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
interface Serial0/0/0
 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
 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 192.168.12.0 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
 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
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 Serial0/0/0
 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
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
 passive-interface GigabitEthernet0/0
 eigrp router-id 3.3.3.3
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
```

### Step 4: Save the running configuration for all routers.

## Part 2: 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.

### Step 1: Verify that the interfaces listed in the Addressing Table are active and configured with correct IP address information.

a. Issue the **show ip interface brief** command on all routers to verify that the interfaces are in an up/up state. Record your findings.

b. 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.

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

d. 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 interface** *interface-id* command to verify bandwidth setting on the serial interfaces. Record your findings.

e. Resolve all problems found. Record the commands used to correct the issues.

### Step 2: 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.

## Part 3: 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.

### Step 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.

a. Ping from PC-A to PC-B. Were the pings successful?

b. Ping from PC-A to PC-C. Were the pings successful?

c. Ping from PC-B to PC-C. Were the pings successful?

### Step 2: Verify that all interfaces are assigned to EIGRP for IPv4.

a. 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.

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

c. Re-issue the **show ip protocols** command to verify that your changes had the desired effect.

### Step 3: Verify EIGRP neighbor information.

a. Issue the **show ip eigrp neighbor** command to verify that EIGRP adjacencies have been established between the neighboring routers.

b. Resolve any outstanding problems that were discovered.

### Step 4: Verify EIGRP for IPv4 routing information.

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

Are all EIGRP routes available?

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

b. If any routing information is missing, resolve these issues.

### Step 5: 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.

## Part 4: 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.

### Step 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.

### Step 2: Verify that IPv6 unicast routing has been enabled on all routers.

a. 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.

b. 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.

### Step 3: Verify that all interfaces are assigned to EIGRP for IPv6.

a. 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.

b. Make the necessary configuration changes. Record the commands used to correct the issues.

c. Re-issue the **show ipv6 protocols** command to verify that your changes are correct.

### Step 4: Verify that all routers have correct neighbor adjacency information.

a. Issue the **show ipv6 eigrp neighbor** command to verify that adjacencies have formed between neighboring routers.

b. Resolve any EIGRP adjacency issues that still exist.

### Step 5: Verify EIGRP for IPv6 routing information.

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

Are all EIGRP routes available?

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

b. Resolve any routing issues that still exist.

### Step 6: 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.

## Reflection

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

## 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.