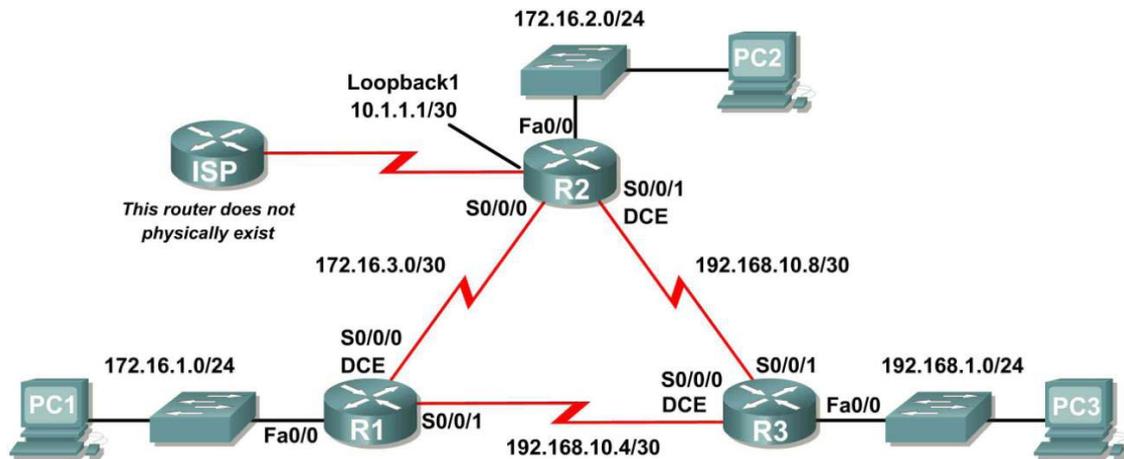


Computer Networks I

Laboratory Exercise 5

This lab focuses on the EIGRP routing protocol. EIGRP will be configured, and the routing table will be investigated to see how EIGRP handles the routing information, and decides the best route to a destination. A default route will be configured, and distributed through the EIGRP network.

5 Basic EIGRP Configuration



Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	172.16.1.1	255.255.255.0	N/A
	S0/0/0	172.16.3.1	255.255.255.252	N/A
	S0/0/1	192.168.10.5	255.255.255.252	N/A
R2	Fa0/0	172.16.2.1	255.255.255.0	N/A
	S0/0/0	172.16.3.2	255.255.255.252	N/A
	S0/0/1	192.168.10.9	255.255.255.252	N/A
	Lo1	10.1.1.1	255.255.255.252	N/A
R3	Fa0/0	192.168.1.1	255.255.255.0	N/A
	S0/0/0	192.168.10.6	255.255.255.252	N/A
	S0/0/1	192.168.10.10	255.255.255.252	N/A
PC1	NIC	172.16.1.10	255.255.255.0	172.16.1.1
PC2	NIC	172.16.2.10	255.255.255.0	172.16.2.1
PC3	NIC	192.168.1.10	255.255.255.0	192.168.1.1

Objective

In this lab you will learn how to configure the routing protocol EIGRP. This is a classless routing protocol that can be used to provide subnet mask information in the routing updates, and this will allow VLSM to be used for the addresses.

A loopback will be used in R2 to simulate a connection to an ISP, where all traffic that is not destined for the local network will be sent.

The following steps are included in this exercise:

- Configure EIGRP routing on all routers
- Verify EIGRP routing using **show** commands.
- Disable automatic summarization
- Configure manual summarization

- Configure a static default route and propagate it with EIGRP
- Configure a loopback interface

Step 1 Basic configuration of the routers

1. To make sure the routers are empty, clear the existing configuration. Setup a network similar to the one in the diagram and start a HyperTerminal session. Configure the hostnames, console, virtual terminal and enable passwords.
2. Configure the interfaces on R1, R2, and R3 with the IP addresses in the table above. Verify the configuration with the command **show ip interface brief**.
3. Configure the hosts with the IP addresses, subnet masks and default gateways in the table.

Step 2 Configure EIGRP

1. Use the **router eigrp** command in global configuration mode to enable EIGRP on the R1 router. Enter a process ID of 1 for the *autonomous-system* parameter.

```
R1(config)#router eigrp 1
R1(config-router)#
```

2. Once you are in the Router EIGRP configuration sub-mode, configure the classful network 172.16.0.0 to be included in the EIGRP updates that are sent out of R1.

```
R1(config-router)#network 172.16.0.0
R1(config-router)#
```

The router will begin to send EIGRP update messages out each interface belonging to the 172.16.0.0 network. EIGRP updates will be sent out of the FastEthernet0/0 and Serial0/0/0 interfaces because they are both on subnets of the 172.16.0.0 network.

3. Configure the router to advertise the 192.168.10.4/30 network attached to the Serial0/0/1 interface. Use the *wildcard-mask* option with the **network** command to advertise only the subnet and not the entire 192.168.10.0 classful network.

Note: Think of a wildcard mask as the inverse of a subnet mask. The inverse of the subnet mask 255.255.255.252 is 0.0.0.3.

To calculate the inverse of the subnet mask, subtract the subnet mask from 255.255.255.255:

```

  255.255.255.255
- 255.255.255.252   Subtract the subnet mask
-----
    0. 0. 0. 3      Wildcard mask
```

```
R1(config-router)# network 192.168.10.4 0.0.0.3
R1(config-router)#
```

When you are finished with the EIGRP configuration for R1, return to privileged EXEC mode and save the current configuration to NVRAM.

```
R1(config-router)#end
%SYS-5-CONFIG_I: Configured from console by console
R1#
```

4. Enable EIGRP routing on the R2 router using the `router eigrp` command. Use a process ID of 1.

```
R2(config)#router eigrp 1
R2(config-router)#
```

Use the classful address 172.16.0.0 to include the network for the FastEthernet0/0 interface.

```
R2(config-router)#network 172.16.0.0
R2(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 172.16.3.1 (Serial0/0/0)
is up: new adjacency
```

Notice that DUAL sends a notification message to the console stating that a neighbor relationship with another EIGRP router has been established.

What is the IP address of the EIGRP neighbor router? _____

What interface on the R2 router is the neighbor adjacent to? _____

5. Configure the R2 router to advertise the 192.168.10.8/30 network attached to the Serial0/0/1 interface. Use the `wildcard-mask` option with the `network` command to advertise only the subnet and not the entire 192.168.10.0 classful network.

When you are finished, return to privileged EXEC mode.

```
R2(config-router)#network 192.168.10.8 0.0.0.3
R2(config-router)#end
%SYS-5-CONFIG_I: Configured from console by console
R2#
```

6. Configure EIGRP on the R3 router using the `router eigrp` and `network` commands. Use a process ID of 1. Use the classful network address for the network attached to the FastEthernet0/0 interface. Include the wildcard masks for the subnets attached to the Serial0/0/0 and Serial 0/0/1 interfaces.

When you are finished, return to privileged EXEC mode.

```
R3(config)#router eigrp 1
R3(config-router)#network 192.168.1.0
R3(config-router)#network 192.168.10.4 0.0.0.3
R3(config-router)# %DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor
192.168.10.5 (Serial0/0/0) is up: new adjacency
R3(config-router)#network 192.168.10.8 0.0.0.3
R3(config-router)# %DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor
192.168.10.9 (Serial0/0/1) is up: new adjacency
R3(config-router)#end %SYS-5-CONFIG_I: Configured from console by
console
R3#
```

Notice that when the networks for the serial links from R3 to R1 and R3 to R2 are added to the EIGRP configuration, DUAL sends a notification message to the console stating that a neighbor relationship with another EIGRP router has been established.

Step 3 Verify EIGRP operation

1. On the R1 router, use the `show ip eigrp neighbors` command to view the neighbor table and verify that EIGRP has established an adjacency with the R2 and R3 routers. You should be able to see the IP address of each adjacent router and the interface that R1 uses to reach that EIGRP neighbor.

```
R1#show ip eigrp neighbors
```

2. View routing protocol information. On the R1 router, use the `show ip protocols` command to view information about the routing protocol operation. Notice that the information that was configured, such as protocol, process ID, and networks, is shown in the output. The IP addresses of the adjacent neighbors are also shown.

```
R1#show ip protocols
```

```
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 metric weight K1=1, K2=0, K3=1, K4=0, K5=0  
  EIGRP maximum hopcount 100  
  EIGRP maximum metric variance 1  
  Redistributing: eigrp 1  
  Automatic network summarization is in effect  
  Automatic address summarization:  
  Maximum path: 4  
  Routing for Networks:  
    172.16.0.0  
    192.168.10.4/30  
  Routing Information Sources:  
    Gateway         Distance      Last Update  
    172.16.3.2       90           4811399  
    192.168.10.6     90           5411677  
  Distance: internal 90 external 170
```

Notice that the output specifies the process ID used by EIGRP. Remember, the process ID must be the same on all routers for EIGRP to establish neighbor adjacencies and share routing information.

Step 4 Examine EIGRP routes in the routing table

1. View the routing table on the R1 router. EIGRP routes are denoted in the routing table with a D, which stands for DUAL (Diffuse Update Algorithm), which is the routing algorithm used by EIGRP.

```

R1#show ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

Gateway of last resort is not set

    172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D    172.16.0.0/16 is a summary, 01:16:19, Null0
C    172.16.1.0/24 is directly connected, FastEthernet0/0
D    172.16.2.0/24 [90/2172416] via 172.16.3.2, 01:16:20, Serial0/0/0
C    172.16.3.0/30 is directly connected, Serial0/0/0
D    192.168.1.0/24 [90/2172416] via 192.168.10.6, 01:06:18, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D    192.168.10.0/24 is a summary, 01:06:07, Null0
C    192.168.10.4/30 is directly connected, Serial0/0/1
D    192.168.10.8/30 [90/2681856] via 192.168.10.6, 01:06:07, Serial0/0/1
R1#

```

Notice that the 172.16.0.0/16 parent network is variable subnetted with three child routes using either a /24 or /30 mask. Also notice that EIGRP has automatically included a summary route to Null0 for the 172.16.0.0/16 network. The 172.16.0.0/16 route does not actually represent a path to reach the parent network. If a packet destined for 172.16.0.0/16 does not match one of the level 2 child routes, it is sent to the Null0 interface.

```

    172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D    172.16.0.0/16 is a summary, 01:16:19, Null0
C    172.16.1.0/24 is directly connected, FastEthernet0/0
D    172.16.2.0/24 [90/2172416] via 172.16.3.2, 01:16:20, Serial0/0/0
C    172.16.3.0/30 is directly connected, Serial0/0/0

```

The 192.168.10.0/24 network is also variable subnetted and includes a Null0 route.

```

    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D    192.168.10.0/24 is a summary, 01:06:07, Null0
C    192.168.10.4/30 is directly connected, Serial0/0/1
D    192.168.10.8/30 [90/2681856] via 192.168.10.6, 01:06:07, Serial0/0/1

```

- View the routing table on the R3 router. The routing table for R3 shows that both R1 and R2 are automatically summarizing the 172.16.0.0/16 network, and sending it as a single routing update. Because of automatic summarization, R1 and R2 are not propagating the individual subnets. Because R3 is getting two equal cost routes for 172.16.0.0/16 from both R1 and R2, both routes are included in the routing table.

```

R3#show ip route
<output omitted>
D    172.16.0.0/16 [90/2172416] via 192.168.10.5, 01:15:35, Serial0/0/0
    [90/2172416] via 192.168.10.9, 01:15:22, Serial0/0/1
C    192.168.1.0/24 is directly connected, FastEthernet0/0
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D    192.168.10.0/24 is a summary, 01:15:22, Null0
C    192.168.10.4/30 is directly connected, Serial0/0/0
C    192.168.10.8/30 is directly connected, Serial0/0/1
R3#

```

Step 5 Configure EIGRP metrics

1. Use the **show interface serial 0/0/0** command to view the EIGRP metric information for the serial 0/0/0 interface on the R1 router. Notice the values that are shown for the bandwidth, delay, reliability, and load.

```
R1#show interface serial0/0/0
Serial0/0/0 is up, line protocol is up (connected)
Hardware is HD64570
Internet address is 172.16.3.1/30
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set, keepalive set (10 sec)

<output omitted>
```

2. Modify the bandwidth of the serial interfaces. On most serial links, the bandwidth metric will default to 1544 Kbits. If this is not the actual bandwidth of the serial link, the bandwidth will need to be changed so that the EIGRP metric can be calculated correctly.

For this lab the link between R1 and R2 will be configured with a bandwidth of 64 kbps, and the link between R2 and R3 will be configured with a bandwidth of 1024 kbps. Use the bandwidth command to modify the bandwidth of the serial interfaces of each router.

R1 router:

```
R1(config)#interface serial0/0/0
R1(config-if)#bandwidth 64
```

R2 router:

```
R2(config)#interface serial0/0/0
R2(config-if)#bandwidth 64
R2(config)#interface serial0/0/1
R2(config-if)#bandwidth 1024
```

R3 router:

```
R3(config)#interface serial0/0/1
R3(config-if)#bandwidth 1024
```

Note: The **bandwidth** command only modifies the bandwidth metric used by routing protocols, not the physical bandwidth of the link.

3. Use the **show ip interfaces** command to verify that the bandwidth value of each link has been changed.

```

R1#show interface serial0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 172.16.3.1/30
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)

<output omitted>

R2#show interface serial0/0/0
Serial0/0/0 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 172.16.3.2/30
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)

<output omitted>

R3#show interface serial0/0/1
Serial0/0/1 is up, line protocol is up (connected)
  Hardware is HD64570
  Internet address is 192.168.10.10/30
  MTU 1500 bytes, BW 1024 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)

<output omitted>

```

Note: Use the interface configuration command `no bandwidth` to return the bandwidth to its default value.

Step 6 Examine successors and feasible distances

1. Examine the successors and feasible distances in the routing table on R2.

```

R2#show ip route

<output omitted>

      10.0.0.0/30 is subnetted, 1 subnets
C       10.1.1.0 is directly connected, Loopback1
      172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D       172.16.0.0/16 is a summary, 00:00:52, Null0
D       172.16.1.0/24 [90/40514560] via 172.16.3.1, 00:00:52, Serial0/0/0
C       172.16.2.0/24 is directly connected, FastEthernet0/0
C       172.16.3.0/30 is directly connected, Serial0/0/0
D       192.168.1.0/24 [90/3014400] via 192.168.10.10, 00:00:11, Serial0/0/1
      192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D       192.168.10.0/24 is a summary, 00:00:11, Null0
D       192.168.10.4/30 [90/3523840] via 192.168.10.10, 00:00:11,
Serial0/0/1
C       192.168.10.8/30 is directly connected, Serial0/0/1
R2#

```

What is the best path to PC1? _____

A successor is a neighboring router that is currently being used for packet forwarding. A successor is the least-cost route to the destination network. The IP address of a successor is shown in the routing table entry right after the word "via".

What is the IP address and name of the successor router in this route? _____

Feasible Distance (FD) is the lowest calculated metric to reach that destination. FD is the metric listed in the routing table entry as the second number inside the brackets.

What is the feasible distance to the network that PC1 is on? _____

2. A feasible successor is a neighbor who has a viable backup path to the same network as the successor. In order to be a feasible successor, R1 must satisfy the feasible condition. The feasible condition (FC) is met when a neighbors reported distance (RD) to a network is less than the local routers feasible distance to the same destination network.

Examine the routing table on R1.

```
R1#show ip route
<output omitted>
    172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D    172.16.0.0/16 is a summary, 00:42:59, Null0
C    172.16.1.0/24 is directly connected, FastEthernet0/0
D    172.16.2.0/24 [90/40514560] via 172.16.3.2, 00:43:00, Serial0/0/0
C    172.16.3.0/30 is directly connected, Serial0/0/0
D    192.168.1.0/24 [90/2172416] via 192.168.10.6, 00:42:26, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D    192.168.10.0/24 is a summary, 00:42:20, Null0
C    192.168.10.4/30 is directly connected, Serial0/0/1
D    192.168.10.8/30 [90/3523840] via 192.168.10.6, 00:42:20,
Serial0/0/1
R1#
```

What is the reported distance to the 192.168.1.0 network? _____

3. Examine the routing table on R2.

```
R2#show ip route
<output omitted>
    10.0.0.0/30 is subnetted, 1 subnets
C    10.1.1.0 is directly connected, Loopback1
    172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D    172.16.0.0/16 is a summary, 00:00:52, Null0
D    172.16.1.0/24 [90/40514560] via 172.16.3.1, 00:00:52, Serial0/0/0
C    172.16.2.0/24 is directly connected, FastEthernet0/0
C    172.16.3.0/30 is directly connected, Serial0/0/0
D    192.168.1.0/24 [90/3014400] via 192.168.10.10, 00:00:11, Serial0/0/1
    192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D    192.168.10.0/24 is a summary, 00:00:11, Null0
D    192.168.10.4/30 [90/3523840] via 192.168.10.10, 00:00:11, Serial0/0/1
C    192.168.10.8/30 is directly connected, Serial0/0/1
R2#
```

What is the feasible distance to the 192.168.1.0 network? _____

Would R2 consider R1 to be a feasible successor to the 192.168.1.0 network? _____

Step 7 Examine the EIGRP topology table

1. View the EIGRP topology table on R2.

```

R2#show ip eigrp topology
IP-EIGRP Topology Table for AS 1

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

P 172.16.2.0/24, 1 successors, FD is 28160
   via Connected, FastEthernet0/0
P 172.16.3.0/30, 1 successors, FD is 40512000
   via Connected, Serial0/0/0
P 192.168.10.8/30, 1 successors, FD is 3011840
   via Connected, Serial0/0/1
P 172.16.0.0/16, 1 successors, FD is 28160
   via Summary (28160/0), Null0
P 192.168.10.0/24, 1 successors, FD is 3011840
   via Summary (3011840/0), Null0
P 172.16.1.0/24, 1 successors, FD is 40514560
   via 172.16.3.1 (40514560/28160), Serial0/0/0
P 192.168.1.0/24, 1 successors, FD is 3014400
   via 192.168.10.10 (3014400/28160), Serial0/0/1
   via 172.16.3.1 (41026560/2172416), Serial0/0/0
P 192.168.10.4/30, 1 successors, FD is 3523840
   via 192.168.10.10 (3523840/2169856), Serial0/0/1

R2#

```

- Use the [network] parameter of the **show ip eigrp topology** command to view detailed EIGRP topology information for the 192.168.1.0 network.

```

R2#show ip eigrp topology 192.168.1.0
IP-EIGRP (AS 1): Topology entry for 192.168.1.0/24
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 3014400
  Routing Descriptor Blocks:
  192.168.10.10 (Serial0/0/1), from 192.168.10.10, Send flag is 0x0
    Composite metric is (3014400/28160), Route is Internal
    Vector metric:
      Minimum bandwidth is 1024 Kbit
      Total delay is 20100 microseconds
      Reliability is 255/255
      Load is 1/255
      Minimum MTU is 1500
      Hop count is 1
  172.16.3.1 (Serial0/0/0), from 172.16.3.1, Send flag is 0x0
    Composite metric is (41026560/2172416), Route is Internal
    Vector metric:
      Minimum bandwidth is 64 Kbit
      Total delay is 40100 microseconds
      Reliability is 255/255
      Load is 1/255
      Minimum MTU is 1500
      Hop count is 2

R2#

```

How many successors are there for this network? _____

What is the feasible distance to this network? _____

What is the IP address of the feasible successor? _____

What is the reported distance for 192.168.1.0 from the feasible successor? _____

What would be the feasible distance to 192.168.1.0 if R1 became the successor? _____

Step 8 Disable EIGRP automatic summarization

1. Notice that R3 is not receiving individual routes for the 172.16.1.0/24, 172.16.2.0/24, and 172.16.3.0/24 subnets. Instead, the routing table only has a summary route to the classful network address of 172.16.0.0/16 through the R1 router. This will cause packets that are destined for the 172.16.2.0/24 network to be sent through the R1 router instead of being sent to the R2 router.

```
R3#show ip route
```

```
<output omitted>
```

```
D 172.16.0.0/16 [90/2172416] via 192.168.10.5, 01:21:54, Serial0/0/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0
  192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
D 192.168.10.0/24 is a summary, 01:21:47, Null0
C 192.168.10.4/30 is directly connected, Serial0/0/0
C 192.168.10.8/30 is directly connected, Serial0/0/1
R3#
```

Why is the R1 router (192.168.10.5) the only successor for the route to the 172.16.0.0/16 network? _____

Notice that the reported distance from R2 is higher than the feasible distance from R1.

```
R3#show ip eigrp topology
IP-EIGRP Topology Table for AS 1
```

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

```
P 192.168.1.0/24, 1 successors, FD is 28160
   via Connected, FastEthernet0/0
P 192.168.10.4/30, 1 successors, FD is 2169856
   via Connected, Serial0/0/0
P 192.168.10.0/24, 1 successors, FD is 2169856
   via Summary (2169856/0), Null0
P 172.16.0.0/16, 1 successors, FD is 2172416
   via 192.168.10.5 (2172416/28160), Serial0/0/0
   via 192.168.10.9 (3014400/28160), Serial0/0/1
P 192.168.10.8/30, 1 successors, FD is 3011840
   via Connected, Serial0/0/1
```

2. Disable automatic summarization on all three routers.

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

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

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

View the routing table again. Notice that the individual routes for the 172.16.1.0/24, 172.16.2.0/24, and 172.16.3.0/24 subnets are now present and the summary Null route is no longer listed.

```
R3#show ip route
```

```
<output omitted>
```

```
172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
D    172.16.1.0/24 [90/2172416] via 192.168.10.5, 00:02:37, Serial0/0/0
D    172.16.2.0/24 [90/3014400] via 192.168.10.9, 00:02:39, Serial0/0/1
D    172.16.3.0/30 [90/41024000] via 192.168.10.9, 00:02:39, Serial0/0/1
      [90/41024000] via 192.168.10.5, 00:02:37, Serial0/0/0
C    192.168.1.0/24 is directly connected, FastEthernet0/0
     192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
C    192.168.10.4/30 is directly connected, Serial0/0/0
C    192.168.10.8/30 is directly connected, Serial0/0/1
R3#
```

Step 9 Configure manual summarization

1. Add two loopback addresses, 192.168.2.1/24 and 192.168.3.1/24 to the R3 router. These virtual interfaces will be used to represent networks to be manually summarized along with the 192.168.1.0/24 LAN.

```
R3(config)#interface loopback1
%LINK-5-CHANGED: Interface Loopback1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1,
changed state to up
R3(config-if)#ip address 192.168.2.1 255.255.255.0

R3(config-if)#interface loopback2
%LINK-5-CHANGED: Interface Loopback2, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback2,
changed state to up
R3(config-if)#ip address 192.168.3.1 255.255.255.0
R3(config-if)#
```

2. Add the 192.168.2.0 and 192.168.3.0 networks to the EIGRP configuration on R3.

```
R3(config)#router eigrp 1
R3(config-router)#network 192.168.2.0
R3(config-router)#network 192.168.3.0
```

Verify that the new routes are being updated in the routing table of all routers.

3. The routes to the 192.168.1.0/24, 192.168.2.0/24, and 192.168.3.0/24 networks can be summarized in the single network 192.168.0.0/22. Configure manual summarization on each of the outbound interfaces connected to EIGRP neighbors.

```
R3(config)#interface serial0/0/0
R3(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.252.0
R3(config-if)#interface serial0/0/1
R3(config-if)#ip summary-address eigrp 1 192.168.0.0 255.255.252.0
R3(config-if)#
```

4. View the routing table on R1 to verify that the summary route is being sent out in the EIGRP updates sent by R3.

```
R1#show ip route
```

```
<output omitted>
```

```
172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
C    172.16.1.0/24 is directly connected, FastEthernet0/0
D    172.16.2.0/24 [90/3526400] via 192.168.10.6, 00:15:07, Serial0/0/1
C    172.16.3.0/30 is directly connected, Serial0/0/0
D    192.168.0.0/22 [90/2172416] via 192.168.10.6, 00:01:11, Serial0/0/1
192.168.10.0/24 is variably subnetted, 3 subnets, 2 masks
C    192.168.10.4/30 is directly connected, Serial0/0/1
D    192.168.10.8/30 [90/3523840] via 192.168.10.6, 00:15:07, Serial0/0/1
R1#
```

5. Configure a static default route on R2. Use the loopback interface that has been configured to simulate a link to an ISP as the exit interface.

```
R2(config)#ip route 0.0.0.0 0.0.0.0 loopback1
R2(config)#
```

6. Include the static route in the EIGRP updates that are sent from the R2 router.

```
R2(config)#router eigrp 1
R2(config-router)#redistribute static
R2(config-router)#
```

7. View the routing table on R1 to verify that the static default route is being redistributed via EIGRP.

Remove all cables, erase the startup configuration, and reload the routers before you leave the equipment.