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Lab 6.1.5 Configuring and Verifying RIP

Straight-through cable ――――――
Serial cable
Console (Rollover) ·····················
Crossover cable ― ― ― ― ― ― ― ·
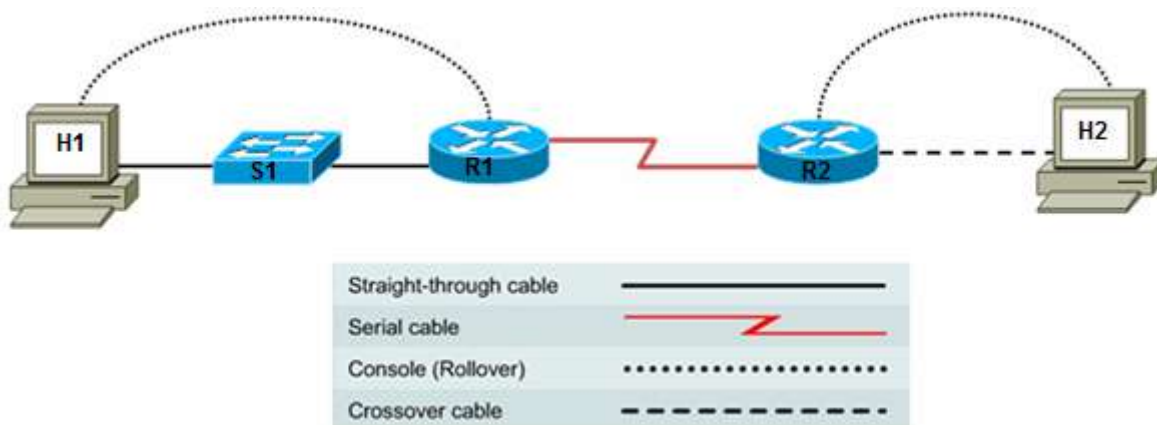
Device	Host Name	Interface	IP Address	Subnet Mask
R1	R1	Serial 0/0/0 (DCE)	172.17.0.1	255.255.255.224
		Fast Ethernet 0/0	172.16.0.1	255.255.255.0
R2	R2	Serial 0/0/0 (DTE)	172.17.0.2	255.255.255.224
		Fast Ethernet 0/0	172.18.0.1	255.255.255.0

Objectives

- Implement RIP routing and verify that network routes are being exchanged dynamically.

Background / Preparation

RIP is one of the most commonly used and widely supported routing protocols in the networking industry. Knowledge of RIP and how to configure it using the Cisco IOS CLI is essential to success as a network technician. In this lab, you build a multi-router network and use RIP to automatically propagate routes, so hosts on remote networks can communicate.

Set up a network similar to the one in the diagram above. You can use any router or combination of routers that meets the interface requirements in the diagram, such as 800, 1600, 1700, 1800, 2500, or 2600 routers. Refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. Depending on the model of router, your output may vary from the output shown in this lab. The lab steps are intended to be executed on each router, unless you are specifically instructed otherwise.

From hosts H1 and H2, start a HyperTerminal session with each router.

Note: Make sure that the routers and the switches have been erased and have no startup configurations. Instructions for erasing are provided in the Lab Manual, located on Academy Connection in the Tools section. Check with the instructor if you are unsure of how to do this.

Required Resources

The following resources are required:

- Two routers, each with an Ethernet and serial interface. These should be non-SDM routers, if possible, because the required SDM startup configuration is deleted when the startup-config is erased.
- Two Windows XP computers
- Two straight-through Category 5 Ethernet cables (H1 to switch and switch to R1)
- Crossover Category 5 Ethernet cable (H2 to router R2)
- Null serial cable
- Console cables (from H1 and H2 to routers R1 and R2)
- Access to the H1 and H2 command prompt
- Access to the H1 and H2 network TCP/IP configuration

Step 1: Build the network and configure the routers.

a. Build a network as shown in the topology diagram

b. In global configuration mode, configure the host names and interfaces according to the chart.

Note: See Lab 5.3.5 if you have difficulty with the basic router configuration. That lab provides instructions for using the Cisco IOS CLI.

Step 2: Configure the hosts.

a. Configure host H1 attached to R1 with an IP address, subnet mask, and default gateway that is compatible with the IP address of the R1 Fast Ethernet interface (172.16.0.1/24).

Host H1 IP configuration:

IP address: 172.16.0.2
Subnet mask: 255.255.0.0
Default gateway: 172.16.0.1

b. Configure host H2 attached to R2 with an IP address, subnet mask, and default gateway that is compatible with the IP address of the R2 Fast Ethernet interface (172.18.0.1/24).

Host H2 IP configuration:

IP address: 172.18.0.2
Subnet mask: 255.255.0.0
Default gateway: 172.18.0.1

Step 3: Check the R1 routing table.

a. View the IP routing table for R1 using the **show ip route** command.

```
R1>show ip route
<output omitted>
Gateway of last resort is not set
C 172.16.0.0/16 is directly connected, FastEthernet0/0
C 172.17.0.0/16 is directly connected, Serial0/0/0
```

b. What is the significance of the "C" to the left of the 172.16.0.0 and 172.17.0.0 network entries in the routing table?

_____

c. Is there a route in the R1 routing table to the R2 Ethernet network 172.18.0.0? _____   Why?
_____

Step 4: Test end-to-end connectivity.

a. From R1, ping the R2 router Fast Ethernet interface.

```
R1#ping 172.18.0.1
```

Are the pings successful? ____

b. From host H1, ping host H2 (from network 172.16.0.2 to network 172.18.0.2).

```
C:\>ping 172.18.0.2
```

Are the pings successful? _____

c. Why are the pings not successful? _____

_____

_____

Step 5: Configure the routing protocol of the routers.

There are two versions of RIP: version 1 and version 2. It is important to specify RIP version 2 (RIPv2) in this configuration, because RIPv2 is the most current version. Some routers default to RIPv2, but it is best to not assume that is the case.

a. In global configuration mode, enter the following on R1.

```
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 172.16.0.0
R1(config-router)#network 172.17.0.0
R1(config-router)#exit
R1(config)#exit
```

b. Save the R1 router configuration.

```
R1#copy running-config startup-config
```

c. In global configuration mode, enter the following on R2.

```
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 172.17.0.0
R2(config-router)#network 172.18.0.0
R2(config-router)#exit
R2(config)#exit
```

d. Save the R2 router configuration.

```
R2#copy running-config startup-config
```

Step 6: View the routing tables for each router.

a. In enable or privileged EXEC mode, examine the routing table entries using the **show ip route** command on router R1.

```
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

         C    172.17.0.0/16 is directly connected, Serial0/0/0
         C    172.16.0.0/16 is directly connected, FastEthernet0/0
         R    172.18.0.0/16 [120/1] via 172.17.0.2, 00:00:17, Serial0/0/0
```

b. Which networks are shown in the R1 routing table?

_____

_____

c. What is the significance of the "R" to the left of the 172.18.0.0 network entry in the routing table?

_____

d. What does "via 172.17.0.2" mean for this network route?

_____

e. What does "Serial0/0/0" mean for this network route?

_____

f. Examine the routing table entries on router R2.

```
R2#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

C    172.17.0.0/16 is directly connected, Serial0/0/0
R    172.16.0.0/16 [120/1] via 172.17.0.1, 00:00:13, Serial0/0/0
C    172.18.0.0/16 is directly connected, FastEthernet0/0
```

g. Which networks are shown in the R2 routing table?

_____

_____

Step 7: Test end-to-end connectivity.

a. From R1, ping the R2 router Fast Ethernet interface.

    R1#**ping 172.18.0.1**

    Are the pings successful? _____

b. From the host H1 command prompt, ping H2 (from network 172.16.0.2 to network 172.18.0.2).

    C:\>**ping 172.18.0.2**

c. Are the pings successful? ____

If the answer is no for either question, troubleshoot the router configurations to find the error. Then do the pings again until the answer to both questions is yes. Be sure to check physical cabling for problems and bad connections, and make sure that you are using the correct cable types.

d. Why are the pings successful this time? _____

_____

Step 8: Use debug to observe RIP communications

Using the **debug ip rip** command, you can see real-time communication and updates passing between routers that are running RIP.

Note: Running debug commands puts a significant load on the CPU of the router. Do not use debug commands on a production network, if possible.

a. On router R1, enter the **debug ip rip** command from privileged EXEC mode. Examine the exchange of routes between the two routers. The output should look similar to that shown here.

```
R1#debug ip rip
RIP protocol debugging is on
R1#
00:51:28: RIP: sending v2 update to 224.0.0.9 via Serial0/0/0 (172.17.0.1)
00:51:28: RIP: build update entries
00:51:28:       172.16.0.0/16 via 0.0.0.0, metric 1, tag 0
00:51:49: RIP: received v2 update from 172.17.0.2 on Serial0/0/0
00:51:49:       172.18.0.0/16 via 0.0.0.0 in 1 hops
00:51:57: RIP: sending v2 update to 224.0.0.9 via FastEthernet0/0
(172.16.0.1)
00:51:57: RIP: build update entries
00:51:57:         172.17.0.0/16 via 0.0.0.0, metric 1, tag 0
00:51:57:         172.18.0.0/16 via 0.0.0.0, metric 2, tag 0
```

b. Enter the command **undebug all** to stop all debugging activity.

```
R1#undebug all
All possible debugging has been turned off
R1#
```

c. What interface does router R1 send and receive updates through? _____

d. Why does the route to 172.17.0.0 have a metric of 1, and the route to 172.18.0.0 have a metric of 2?

_____

e. Log off by typing **exit** and turn off the router.

Step 9: Reflection

a. What would happen to the routing table on router R1 if the Ethernet network on router R2 went down?

_____

_____

b. What would happen if router R1 was configured to run RIPv1, and R2 was configured to run RIPv2?

_____

_____

Router Interface Summary Table

Router Interface Summary				
Router Model	**Ethernet Interface #1**	**Ethernet Interface #2**	**Serial Interface #1**	**Serial Interface #2**
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	Fast Ethernet 0 (FA0)	Fast Ethernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
1800	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	Fast Ethernet 0/0 (FA0/0)	Fast Ethernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)

Note: To find out exactly how the router is configured, look at the interfaces. The interface identifies the type of router and how many interfaces the router has. There is no way to effectively list all combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart 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 information in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.