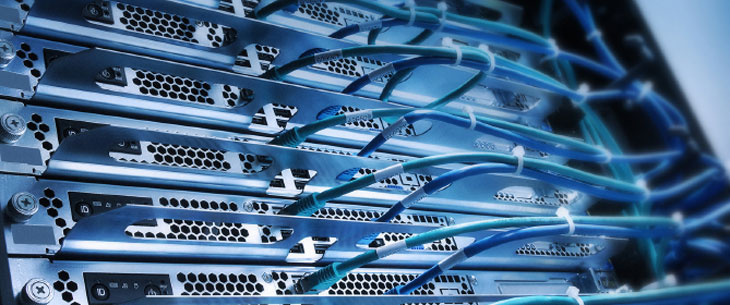
**LAB 11**

Practice and Exercise





Dynamic Routing

RIP

BITS 2343

Computer Network

LAB 11 – Practice 1

Dynamic Routing - RIP

Learning Objectives

Upon completion of this lab, you will be able to:

* Cable a network according to the Topology Diagram.
* Erase the startup configuration and reload a router to the default state.
* Perform basic configuration tasks on a router.
* Configure and activate interfaces.
* Configure RIP routing on all routers.
* Verify RIP routing using **show** and **debug** commands.

Scenario

In this activity, you will create a network that is similar to the one shown in Figure 1. Begin by cabling the network as shown in Table 1. You will then perform the initial router configurations required for connectivity. Use the IP addresses that are provided in the Topology Diagram to apply an addressing scheme to the network devices. When the network configuration is complete, examine the routing tables to verify that the network is operating properly. This lab is a shorter version and assumes you are proficient in basic cabling and configuration file management.



Figure 1: Network Diagram

Topology Diagram and Addressing Table



Figure 2: Topology Diagram

Table 1: Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| R1 | Fa0/0 | 192.168.1.1 | 255.255.255.0 | N/A |
| S0/0/0 | 192.168.2.1 | 255.255.255.0 | N/A |
| R2 | Fa0/0 | 192.168.3.1 | 255.255.255.0 | N/A |
| S0/0/0 | 192.168.2.2 | 255.255.255.0 | N/A |
| S0/0/1 | 192.168.4.2 | 255.255.255.0 | N/A |
| R3 | Fa0/0 | 192.168.5.1 | 255.255.255.0 | N/A |
| S0/0/1 | 192.168.4.1 | 255.255.255.0 | N/A |
| WS1 | NIC | 192.168.1.10 | 255.255.255.0 | 192.168.1.1 |
| WS2 | NIC | 192.168.3.10 | 255.255.255.0 | 192.168.3.1 |
| WS3 | NIC | 192.168.5.10 | 255.255.255.0 | 192.168.5.1 |

Task 1: Prepare the Network.

**Step 1: Cable a network that is similar to the one in the Topology Diagram.**

You can use any current router in your lab as long as it has the required interfaces shown in the topology.

**Note:** If you use a different type of router, the router outputs and interface descriptions will appear different.

Task 2: Perform Basic Router Configurations.

Perform basic configuration of the R1, R2, and R3 routers according to the following guidelines:

1. Configure the router hostname.
2. Disable DNS lookup.

Task 3: Configure and Activate Serial and Ethernet Addresses.

**Step 1: Configure interfaces on R1, R2, and R3.**

Configure the interfaces on the R1, R2, and R3 routers with the IP addresses from the table under the Topology Diagram.

**Step 2: Verify IP addressing and interfaces.**

Use the **show ip interface brief** command to verify that the IP addressing is correct and that the interfaces are active.

When you have finished, be sure to save the running configuration to the NVRAM of the router.

**Step 3: Configure Ethernet interfaces of WS1, WS2, and WS3.**

Configure the Ethernet interfaces of WS1, WS2, and WS3 with the IP addresses and default gateways from the table under the Topology Diagram.

**Step 4: Test the PC configuration by pinging the default gateway from the WS.**

Task 4: Configure RIP.

**Step 1: Enable dynamic routing.**

To enable a dynamic routing protocol, enter global configuration mode and use the **router** command.

Enter **router ?** at the global configuration prompt to a see a list of available routing protocols on your router.

To enable RIP, enter the command **router rip** in global configuration mode.

R1(config)#**router rip**

R1(config-router)#

**Step 2: Enter classful network addresses.**

Once you are in routing configuration mode, enter the classful network address for each directly connected network, using the **network** command.

R1(config-router)#**network 192.168.1.0**

R1(config-router)#**network 192.168.2.0**

R1(config-router)#

The **network** command:

Enables RIP on all interfaces that belong to this network. These interfaces will now both send and receive RIP updates.

Advertises this network in RIP routing updates sent to other routers every 30 seconds.

When you are finished with the RIP configuration, 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#**copy run start**

**Step 3: Configure RIP on the R2 router using the router rip and network commands.**

R2(config)#**router rip**

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

R2(config-router)#**network 192.168.3.0**

R2(config-router)#**network 192.168.4.0**

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

%SYS-5-CONFIG\_I: Configured from console by console

R2#**copy run start**

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

**Step 4: Configure RIP on the R3 router using the router rip and network commands.**

R3(config)#**router rip**

R3(config-router)#**network 192.168.4.0**

R3(config-router)#**network 192.168.5.0**

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

%SYS-5-CONFIG\_I: Configured from console by console

R3# **copy run start**

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

Task 5: Verify RIP Routing.

Step 1: Use the show ip route command to verify that each router has all of the networks in the topology entered in the routing table.

Routes learned through RIP are coded with an **R** in the routing table. If the tables are not converged as shown here, troubleshoot your configuration. Did you verify that the configured interfaces are active? Did you configure RIP correctly? Return to Task 3 and Task 4 to review the steps necessary to achieve convergence.

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 192.168.1.0/24 is directly connected, FastEthernet0/0

C 192.168.2.0/24 is directly connected, Serial0/0/0

R 192.168.3.0/24 [120/1] via 192.168.2.2, 00:00:04, Serial0/0/0

R 192.168.4.0/24 [120/1] via 192.168.2.2, 00:00:04, Serial0/0/0

R 192.168.5.0/24 [120/2] via 192.168.2.2, 00:00:04, Serial0/0/0

R1#

R2#**show ip route**

<Output omitted>

R 192.168.1.0/24 [120/1] via 192.168.2.1, 00:00:22, Serial0/0/0

C 192.168.2.0/24 is directly connected, Serial0/0/0

C 192.168.3.0/24 is directly connected, FastEthernet0/0

C 192.168.4.0/24 is directly connected, Serial0/0/1

R 192.168.5.0/24 [120/1] via 192.168.4.1, 00:00:23, Serial0/0/1

R2#

R3#**show ip route**

<Output omitted>

R 192.168.1.0/24 [120/2] via 192.168.4.2, 00:00:18, Serial0/0/1

R 192.168.2.0/24 [120/1] via 192.168.4.2, 00:00:18, Serial0/0/1

R 192.168.3.0/24 [120/1] via 192.168.4.2, 00:00:18, Serial0/0/1

C 192.168.4.0/24 is directly connected, Serial0/0/1

C 192.168.5.0/24 is directly connected, FastEthernet0/0

R3#

**Step 2: Use the show ip protocols command to view information about the routing processes.**

The **show ip protocols** command can be used to view information about the routing processes that are occurring on the router. This output can be used to verify most RIP parameters to confirm that:

RIP routing is configured

The correct interfaces send and receive RIP updates

The router advertises the correct networks

RIP neighbors are sending updates

R1#**show ip protocols**

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 16 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 1, receive any version

Interface Send Recv Triggered RIP Key-chain

FastEthernet0/0 1 2 1

Serial0/0/0 1 2 1

Automatic network summarization is in effect

Maximum path: 4

Routing for Networks:

192.168.1.0

192.168.2.0

Passive Interface(s):

Routing Information Sources:

Gateway Distance Last Update

192.168.2.2 120

Distance: (default is 120)

R1#

R1 is indeed configured with RIP. R1 is sending and receiving RIP updates on FastEthernet0/0 and Serial0/0/0. R1 is advertising networks 192.168.1.0 and 192.168.2.0. R1 has one routing information source. R2 is sending R1 updates.

**Step 3: Use the debug ip rip command to view the RIP messages being sent and received.**

Rip updates are sent every 30 seconds so you may have to wait for debug information to be displayed.

R1#**debug ip rip**

R1#RIP: received v1 update from 192.168.2.2 on Serial0/0/0

192.168.3.0 in 1 hops

192.168.4.0 in 1 hops

192.168.5.0 in 2 hops

RIP: sending v1 update to 255.255.255.255 via FastEthernet0/0 (192.168.1.1)

RIP: build update entries

network 192.168.2.0 metric 1

network 192.168.3.0 metric 2

network 192.168.4.0 metric 2

network 192.168.5.0 metric 3

RIP: sending v1 update to 255.255.255.255 via Serial0/0/0 (192.168.2.1)

RIP: build update entries

network 192.168.1.0 metric 1

The debug output shows that R1 receives an update from R2. Notice how this update includes all the networks that R1 does not already have in its routing table. Because the FastEthernet0/0 interface belongs to the 192.168.1.0 network configured under RIP, R1 builds an update to send out that interface. The update includes all networks known to R1 except the network of the interface. Finally, R1 builds an update to send to R2. Because of split horizon, R1 only includes the 192.168.1.0 network in the update.

**Step 4: Discontinue the debug output with the undebug all command.**

R1#**undebug all**

All possible debugging has been turned off

LAB 11 – Practice 2

Dynamic Routing – RIP version 2

Learning Objectives

Upon completion of this lab, you will be able to:

* Cable a network according to the Topology Diagram.
* Load provided scripts onto the routers.
* Examine the current status of the network.
* Configure RIPv2 on all routers.
* Examine the automatic summarization of routes.
* Examine routing updates with **debug ip rip**.
* Disable automatic summarization.
* Examine the routing tables.
* Verify network connectivity.
* Document the RIPv2 configuration.

Scenario

The network shown in Figure 1 contains a discontiguous network, 172.30.0.0. This network has been subnetted using VLSM. The 172.30.0.0 subnets are physically and logically divided by at least one other classful or major network, in this case, the two serial networks 209.165.200.228/30 and 209.165.200.232/30. This condition can be an issue when the routing protocol used does not include enough information to distinguish the individual subnets. RIPv2 is a classless routing protocol that can be used to provide subnet mask information in the routing updates. This action will allow VLSM subnet information to be propagated throughout the network.



Figure 1: Topology Diagram

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
| --- | --- | --- | --- | --- |
| R1 | Fa0/0 | 172.30.1.1 | 255.255.255.0 | N/A |
| Fa0/1 | 172.30.2.1 | 255.255.255.0 | N/A |
| S0/0/0 | 209.165.200.230 | 255.255.255.252 | N/A |
| R2 | Fa0/0 | 10.1.0.1 | 255.255.0.0 | N/A |
| S0/0/0 | 209.165.200.229 | 255.255.255.252 | N/A |
| S0/0/1 | 209.165.200.233 | 255.255.255.252 | N/A |
| R3 | Fa0/0 | 172.30.100.1 | 255.255.255.0 | N/A |
| S0/0/1 | 209.165.200.234 | 255.255.255.252 | N/A |
| Lo0 | 172.30.110.1 | 255.255.255.0 | N/A |
| Lo1 | 172.30.200.17 | 255.255.255.240 | N/A |
| Lo2 | 172.30.200.33 | 255.255.255.240 | N/A |
| PC1 | NIC | 172.30.1.10 | 255.255.255.0 | 172.30.1.1 |
| PC2 | NIC | 172.30.2.10 | 255.255.255.0 | 172.30.2.1 |
| PC3 | NIC | 10.1.0.10 | 255.255.0.0 | 10.1.0.1 |
| PC4 | NIC | 172.30.100.10 | 255.255.255.0 | 172.30.100.1 |

Task 1: Download and run \*.pkt file

Step 1: Go to webpage ULearn

Download file L11\_P2.rar and unzip.

Step 2: Run the file

As in Figure 1, all configurations needed have been done, including its routing protocol, RIP.

Task 2: Verify all router configuration.

Step 1:

Use the show running-config command to verify the configuration on R1

!

hostname R1

!

!

interface FastEthernet0/0

ip address 172.30.1.1 255.255.255.0

duplex auto

speed auto

no shutdown

!

interface FastEthernet0/1

ip address 172.30.2.1 255.255.255.0

duplex auto

speed auto

no shutdown

!

interface Serial0/0/0

ip address 209.165.200.230 255.255.255.252

clock rate 64000

no shutdown

!

router rip

passive-interface FastEthernet0/0

passive-interface FastEthernet0/1

network 172.30.0.0

network 209.165.200.0

!

line con 0

line vty 0 4

login

!

end

Step 2:

Use the show running-config command to verify the configuration on R2

hostname R2

!

!

interface FastEthernet0/0

ip address 10.1.0.1 255.255.0.0

duplex auto

speed auto

no shutdown

!

interface Serial0/0/0

ip address 209.165.200.229 255.255.255.252

no shutdown

!

interface Serial0/0/1

ip address 209.165.200.233 255.255.255.252

clock rate 64000

no shutdown

!

router rip

passive-interface FastEthernet0/0

network 10.0.0.0

network 209.165.200.0

!

line con 0

line vty 0 4

login

!

end

Step 3:

Use the show running-config command to verify the configuration on R3

hostname R3

!

!

interface FastEthernet0/0

ip address 172.30.100.1 255.255.255.0

duplex auto

speed auto

no shutdown

!

interface Serial0/0/1

ip address 209.165.200.234 255.255.255.252

no shutdown

!

interface Loopback0

ip address 172.30.110.1 255.255.255.0

!

interface Loopback1

ip address 172.30.200.17 255.255.255.240

!

interface Loopback2

ip address 172.30.200.33 255.255.255.240

!

router rip

passive-interface FastEthernet0/0

network 172.30.0.0

network 209.165.200.0

!

line con 0

line vty 0 4

login

!

end

Task 3: Examine the Current Status of the Network.

Step 1: Verify that both serial links are up.

The two serial links can quickly be verified using the **show ip interface brief** command on R2.

R2#**show ip interface brief**

Interface IP-Address OK? Method Status Protocol

FastEthernet0/0 10.1.0.1 YES manual up up

FastEthernet0/1 unassigned YES manual administratively down down

Serial0/0/0 209.165.200.229 YES manual up up

Serial0/0/1 209.165.200.233 YES manual up up

Vlan1 unassigned YES manual administratively down down

Step 2: Check the connectivity from R2 to the hosts on the R1 and R3 LANs.

Note: For the 1841 router, you will need to disable IP CEF to obtain the correct output from the **ping** command. Although a discussion of IP CEF is beyond the scope of this course, you may disable IP CEF by using the following command in global configuration mode:

R2(config)#**no ip cef**

From the R2 router, how many ICMP messages are successful when pinging PC1?

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

From the R2 router, how many ICMP messages are successful when pinging PC4?

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

Step 3: Check the connectivity between the PCs.

* From the PC1, is it possible to ping PC2? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From the PC1, is it possible to ping PC3? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From the PC1, is it possible to ping PC4? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From the PC4, is it possible to ping PC2? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From the PC4, is it possible to ping PC3? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

Step 4: View the routing table on R2.

Both the R1 and R3 are advertising routes to the 172.30.0.0/16 network; therefore, there are two entries for this network in the R2 routing table. The R2 routing table only shows the major classful network address of 172.30.0.0—it does not show any of the subnets for this network that are used on the LANs attached to R1 and R3. Because the routing metric is the same for both entries, the router alternates the routes that are used when forwarding packets that are destined for the 172.30.0.0/16 network.

R2#**show ip route**

*Output omitted*

10.0.0.0/16 is subnetted, 1 subnets

C 10.1.0.0 is directly connected, FastEthernet0/0

R 172.30.0.0/16 [120/1] via 209.165.200.230, 00:00:24, Serial0/0/0

[120/1] via 209.165.200.234, 00:00:15, Serial0/0/1

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

C 209.165.200.232 is directly connected, Serial0/0/1

Step 5: Examine the routing table on the R1 router.

Both R1 and R3 are configured with interfaces on a discontiguous network, 172.30.0.0. The 172.30.0.0 subnets are physically and logically divided by at least one other classful or major network—in this case, the two serial networks 209.165.200.228/30 and 209.165.200.232/30. Classful routing protocols like RIPv1 summarize networks at major network boundaries. Both R1 and R3 will be summarizing 172.30.0.0/24 subnets to 172.30.0.0/16. Because the route to 172.30.0.0/16 is directly connected, and because R1 does not have any specific routes for the 172.30.0.0 subnets on R3, packets destined for the R3 LANs will not be forwarded properly.

R1#**show ip route**

*Output omitted*

R 10.0.0.0/8 [120/1] via 209.165.200.229, 00:00:02, Serial0/0/0

172.30.0.0/24 is subnetted, 2 subnets

C 172.30.1.0 is directly connected, FastEthernet0/0

C 172.30.2.0 is directly connected, FastEthernet0/1

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

R 209.165.200.232 [120/1] via 209.165.200.229, 00:00:02, Serial0/0/0

Step 6: Examine the routing table on the R3 router.

R3 only shows its own subnets for 172.30.0.0 network: 172.30.100/24, 172.30.110/24, 172.30.200.16/28, and 172.30.200.32/28. R3 does not have any routes for the 172.30.0.0 subnets on R1.

R3#**show ip route**

*Output omitted*

R 10.0.0.0/8 [120/1] via 209.165.200.233, 00:00:19, Serial0/0/1

172.30.0.0/16 is variably subnetted, 4 subnets, 2 masks

C 172.30.100.0/24 is directly connected, FastEthernet0/0

C 172.30.110.0/24 is directly connected, Loopback0

C 172.30.200.16/28 is directly connected, Loopback1

C 172.30.200.32/28 is directly connected, Loopback2

209.165.200.0/30 is subnetted, 2 subnets

R 209.165.200.228 [120/1] via 209.165.200.233, 00:00:19, Serial0/0/1

C 209.165.200.232 is directly connected, Serial0/0/1

Step 7: Examine the RIPv1 packets that are being received by R2.

Use the **debug ip rip** command to display RIP routing updates.

R2 is receiving the route 172.30.0.0, with 1 hop, from both R1 and R3. Because these are equal cost metrics, both routes are added to the R2 routing table. Because RIPv1 is a classful routing protocol, no subnet mask information is sent in the update.

R2#**debug ip rip**

RIP protocol debugging is on

RIP: received v1 update from 209.165.200.234 on Serial0/0/1

172.30.0.0 in 1 hops

RIP: received v1 update from 209.165.200.230 on Serial0/0/0

172.30.0.0 in 1 hops

R2 is sending only the routes for the 10.0.0.0 LAN and the two serial connections to R1 and R3. R1 and R3 are not receiving any information about the 172.30.0.0 subnet routes.

RIP: sending v1 update to 255.255.255.255 via Serial0/0/1 (209.165.200.233)

RIP: build update entries

network 10.0.0.0 metric 1

network 209.165.200.228 metric 1

RIP: sending v1 update to 255.255.255.255 via Serial0/0/0 (209.165.200.229)

RIP: build update entries

network 10.0.0.0 metric 1

network 209.165.200.232 metric 1

When you are finished, turn off the debugging.

R2#**undebug all**

Task 4: Configure RIP Version 2.

Step 1: Use the version 2 command to enable RIP version 2 on each of the routers.

R2(config)#**router rip**

R2(config-router)#**version 2**

R1(config)#**router rip**

R1(config-router)#**version 2**

R3(config)#**router rip**

R3(config-router)#**version 2**

RIPv2 messages include the subnet mask in a field in the routing updates. This allows subnets and their masks to be included in the routing updates. However, by default RIPv2 summarizes networks at major network boundaries, just like RIPv1, except that the subnet mask is included in the update.

Step 2: Verify that RIPv2 is running on the routers.

The **debug** **ip rip**, **show ip protocols**, and **show run** commands can all be used to confirm that RIPv2 is running. The output of the **show ip protocols** command for R1 is shown below.

R1# **show ip protocols**

Routing Protocol is "rip"

Sending updates every 30 seconds, next due in 7 seconds

Invalid after 180 seconds, hold down 180, flushed after 240

Outgoing update filter list for all interfaces is not set

Incoming update filter list for all interfaces is not set

Redistributing: rip

Default version control: send version 2, receive 2

Interface Send Recv Triggered RIP Key-chain

FastEthernet0/0 2 2

FastEthernet0/1 2 2

Serial0/0/0 2 2

Automatic network summarization is in effect

Maximum path: 4

Routing for Networks:

172.30.0.0

209.165.200.0

Passive Interface(s):

FastEthernet0/0

FastEthernet0/1

Routing Information Sources:

Gateway Distance Last Update

209.165.200.229 120

Distance: (default is 120)

Task 5: Examine the Automatic Summarization of Routes.

The LANs connected to R1 and R3 are still composed of discontiguous networks. R2 still shows two equal cost paths to the 172.30.0.0/16 network in the routing table. R2 still shows only the major classful network address of 172.30.0.0 and does not show any of the subnets for this network.

R2#**show ip route**

*Output omitted*

10.0.0.0/16 is subnetted, 1 subnets

C 10.1.0.0 is directly connected, FastEthernet0/0

R 172.30.0.0/16 [120/1] via 209.165.200.230, 00:00:07, Serial0/0/0

[120/1] via 209.165.200.234, 00:00:08, Serial0/0/1

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

C 209.165.200.232 is directly connected, Serial0/0/1

R1 still shows only its own subnets for the 172.30.0.0 network. R1 still does not have any routes for the 172.30.0.0 subnets on R3.

R1#**show ip route**

*Output omitted*

R 10.0.0.0/8 [120/1] via 209.165.200.229, 00:00:09, Serial0/0/0

172.30.0.0/24 is subnetted, 2 subnets

C 172.30.1.0 is directly connected, FastEthernet0/0

C 172.30.2.0 is directly connected, FastEthernet0/1

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

R 209.165.200.232 [120/1] via 209.165.200.229, 00:00:09, Serial0/0/0

R3 still only shows its own subnets for the 172.30.0.0 network. R3 still does not have any routes for the 172.30.0.0 subnets on R1.

R3#**show ip route**

*Output omitted*

R 10.0.0.0/8 [120/1] via 209.165.200.233, 00:00:16, Serial0/0/1

172.30.0.0/16 is variably subnetted, 4 subnets, 2 masks

C 172.30.100.0/24 is directly connected, FastEthernet0/0

C 172.30.110.0/24 is directly connected, Loopback0

C 172.30.200.16/28 is directly connected, Loopback1

C 172.30.200.32/28 is directly connected, Loopback2

209.165.200.0/30 is subnetted, 2 subnets

R 209.165.200.228 [120/1] via 209.165.200.233, 00:00:16, Serial0/0/1

C 209.165.200.232 is directly connected, Serial0/0/1

Use the output of the **debug ip rip** command to answer the following questions:

What entries are included in the RIP updates sent out from R3?

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

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

On R2, what routes are in the RIP updates that are received from R3?

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

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

R3 is not sending any of the 172.30.0.0 subnets—only the summarized route of 172.30.0.0/16, including the subnet mask. This is why R2 and R1 are not seeing the 172.30.0.0 subnets on R3.

Task 6: Disable Automatic Summarization.

The **no auto-summary** command is used to turn off automatic summarization in RIPv2. Disable auto summarization on all routers. The routers will no longer summarize routes at major network boundaries.

R2(config)#**router rip**

R2(config-router)#**no auto-summary**

R1(config)#**router rip**

R1(config-router)#**no auto-summary**

R3(config)#**router rip**

R3(config-router)#**no auto-summary**

The **show ip route** and **ping** commands can be used to verify that automatic summarization is off.

Task 7: Examine the Routing Tables.

The LANs connected to R1 and R3 should now be included in all three routing tables.

R2#**show ip route**

*Output omitted*

10.0.0.0/16 is subnetted, 1 subnets

C 10.1.0.0 is directly connected, FastEthernet0/0

172.30.0.0/16 is variably subnetted, 7 subnets, 3 masks

R 172.30.0.0/16 [120/1] via 209.165.200.230, 00:01:28, Serial0/0/0

[120/1] via 209.165.200.234, 00:01:56, Serial0/0/1

R 172.30.1.0/24 [120/1] via 209.165.200.230, 00:00:08, Serial0/0/0

R 172.30.2.0/24 [120/1] via 209.165.200.230, 00:00:08, Serial0/0/0

R 172.30.100.0/24 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1

R 172.30.110.0/24 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1

R 172.30.200.16/28 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1

R 172.30.200.32/28 [120/1] via 209.165.200.234, 00:00:08, Serial0/0/1

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

C 209.165.200.232 is directly connected, Serial0/0/1

R1#**show ip route**

*Output omitted*

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

R 10.0.0.0/8 [120/1] via 209.165.200.229, 00:02:13, Serial0/0/0

R 10.1.0.0/16 [120/1] via 209.165.200.229, 00:00:21, Serial0/0/0

172.30.0.0/16 is variably subnetted, 6 subnets, 2 masks

C 172.30.1.0/24 is directly connected, FastEthernet0/0

C 172.30.2.0/24 is directly connected, FastEthernet0/1

R 172.30.100.0/24 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0

R 172.30.110.0/24 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0

R 172.30.200.16/28 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0

R 172.30.200.32/28 [120/2] via 209.165.200.229, 00:00:21, Serial0/0/0

209.165.200.0/30 is subnetted, 2 subnets

C 209.165.200.228 is directly connected, Serial0/0/0

R 209.165.200.232 [120/1] via 209.165.200.229, 00:00:21, Serial0/0/0

R3#**show ip route**

*Output omitted*

10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks

R 10.0.0.0/8 [120/1] via 209.165.200.233, 00:02:28, Serial0/0/1

R 10.1.0.0/16 [120/1] via 209.165.200.233, 00:00:08, Serial0/0/1

172.30.0.0/16 is variably subnetted, 6 subnets, 2 masks

R 172.30.1.0/24 [120/2] via 209.165.200.233, 00:00:08, Serial0/0/1

R 172.30.2.0/24 [120/2] via 209.165.200.233, 00:00:08, Serial0/0/1

C 172.30.100.0/24 is directly connected, FastEthernet0/0

C 172.30.110.0/24 is directly connected, Loopback0

C 172.30.200.16/28 is directly connected, Loopback1

C 172.30.200.32/28 is directly connected, Loopback2

209.165.200.0/30 is subnetted, 2 subnets

R 209.165.200.228 [120/1] via 209.165.200.233, 00:00:08, Serial0/0/1

C 209.165.200.232 is directly connected, Serial0/0/1

Use the output of the **debug ip rip** command to answer the following questions:

What entries are included in the RIP updates sent out from R1?

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

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

On R2, what routes are in the RIP updates that are received from R1?

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

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

Are the subnet masks now included in the routing updates? \_\_\_\_\_\_\_\_\_\_

Task 8: Verify Network Connectivity.

Step 1: Check connectivity between R2 router and PCs.

From R2, how many ICMP messages are successful when pinging PC1?

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

From R2, how many ICMP messages are successful when pinging PC4?

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

Step 2: Check the connectivity between the PCs.

* From PC1, is it possible to ping PC2? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From PC1, is it possible to ping PC3? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From PC1, is it possible to ping PC4? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From PC4, is it possible to ping PC2? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

* From PC4, is it possible to ping PC3? \_\_\_\_\_\_\_\_\_\_

What is the success rate? \_\_\_\_\_\_\_\_\_\_

Task 8: Save All Routers Configuration.

R1#**copy run start**

R2#**copy run start**

R3#**copy run start**

LAB 11 - Exercise:

Dynamic Routing Roles in a Scalable Network

Learning Objectives

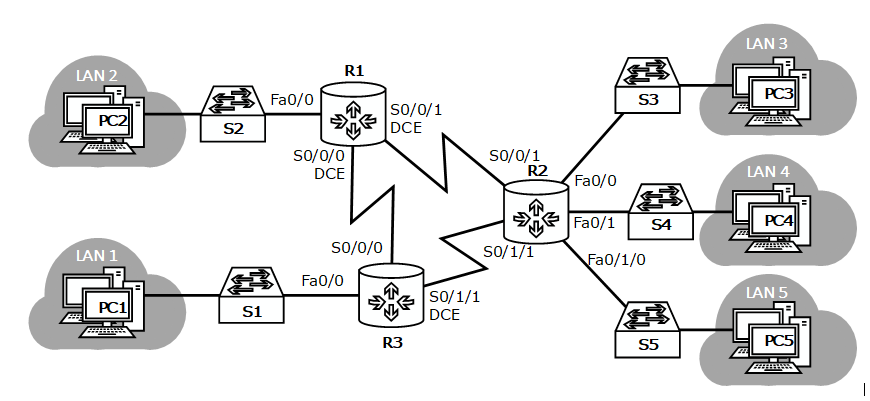
Upon completion of this lab, you will be able to:

* Determine the number of subnets needed using VLSM technique.
* Determine the number of hosts needed.
* Design an appropriate addressing scheme.
* Assign addresses and subnet mask pairs to device interfaces and hosts.
* Examine the use of the available network address space.
* Determine how dynamic routing could be applied to the network.

Scenario

Given the network address 202.1.3.0/24 to subnet and provide the IP addressing for the network shown in Figure 1. The network has the following addressing requirements:

* The LAN 1 require 4 IP addresses.
* The LAN 2 require 7 IP addresses.
* The LAN 3 require 10 IP addresses.
* The LAN 4 require 11 IP addresses.
* The LAN 5 require 30 IP addresses.
* The link between routers require an IP address for each end of the link.



**Figure 1** Topology Diagram

1: Examine the Network Requirements.

Examine the network requirements. Keep in mind that IP addresses will be needed for each of the LAN interfaces.

2: Design an IP Addressing Scheme.

Based on scenario above, determine all usable IP addresses using Variable Length Subnet Masking (VLSM) technique and complete Table 1.

**Table 1** IP Addressing scheme

| **Network** | **Subnet Address** | **First Usable Host Address** | **Last Usable Host Address** | **Broadcast Address** |
| --- | --- | --- | --- | --- |
| LAN1 |  |  |  |  |
| LAN2 |  |  |  |  |
| LAN3 |  |  |  |  |
| LAN4 |  |  |  |  |
| LAN5 |  |  |  |  |
| R1R2 |  |  |  |  |
| R1R3 |  |  |  |  |
| R2R3 |  |  |  |  |

3: Assign IP Addresses to the Network Devices

Use the Packet Tracer to build the topology and assign the appropriate addresses to the device interfaces. Document the addresses to be used in the Addressing Table provided in Table 2.

**Table 2** Addressing Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| R1 | Fa0/0 |  |  | N/A |
| S0/0/0 |  |  | N/A |
| S0/0/1 |  |  | N/A |
| R2 | Fa0/0 |  |  | N/A |
| Fa0/1 |  |  | N/A |
| Fa0/1/0 |  |  | N/A |
| S0/0/1 |  |  | N/A |
| S0/1/1 |  |  | N/A |
| R3 | Fa0/0 |  |  |  |
| S0/0/0 |  |  |  |
| S0/1/1 |  |  |  |
| PC1 | NIC |  |  |  |
| PC2 | NIC |  |  |  |
| PC3 | NIC |  |  |  |
| PC4 | NIC |  |  |  |
| PC5 | NIC |  |  |  |

4: Test the Network Design.

If all routers on the new network are requested to be configured by RIPv2 Routing protocol, use the Packet Tracer and apply your addressing scheme. Check to see that all devices on directly connected and remote networks can communicate (ping) each other. Complete all tasks in **complete network schematic diagram** and **packet tracer file**.