

RIPv2 with Variable Length Subnet Masks (VLSMs)

This chapter will discuss the RIPv2 routing process. This is an important subject to understand as it pertains to all routers and configurations that use IP.

RIPv2 is similar to RIPv1 except that it sends “prefix” routing information with a route update. What this means is the subnet mask used on the network being advertised is also going to be sent with the route update. The “prefix” part is where the /24, /27, /28, etc comes in. By sending an update, for example, 172.16.10.0/24, the router knows that 24 bits of the subnet mask are turned on, which means the mask is 255.255.255.0. By RIPv2 providing the subnet mask information with each update, VLSM networks can be built and used, whereas, in RIPv1, the subnet mask must be the same on all networks for the route updates to work.

The following labs are covered in this chapter:

- 2.1: Configuring the routers with VLSM IP addresses
- 2.2: Verifying your configurations
- 2.3: Configuring RIPv2 Routing
- 2.4: Verifying RIPv2

The following commands are used in this chapter

COMMAND	MEANING
show ip route	Displays the IP routing table
router RIP	Turns on IP RIP routing on a router
Version 2	Enables rip version 2
network	Tells the routing protocol what network to advertise
show protocols	Shows the routed protocols and network addresses configured on each interface
show ip protocols	Shows the routing protocols and timers associated with each routing protocol configured on a router
debug ip rip	Sends console messages displaying information about RIP packets being sent and received on a router interface

This chapter will provide configuration of all routers in the Standard Lab and then you will turn on RIPv2 using VLSM addressing (different subnet masks on each network).

In this section, we will use a /27 (255.255.255.224) for the LANs and /30 (255.255.255.252) for the WANs. Here is the configuration we will use:

Router	Interface	IP Address
2600A	Serial 0/0	192.168.1.5/30 (subnet 4)
2600A	Fastethernet 0/0	192.168.1.33/27 (subnet 32)

```

2600B          Serial 0/0          192.168.1.9/30 (subnet
8)
2600B          FastEthernet 0/0      192.168.1.65/27 (subnet
64)
2600C          Serial 0/0          192.168.1.6/30 (subnet
4)
2600C          FastEthernet 0/0      192.168.1.97/27 (subnet
96)
2600C          Serial 0/1          192.168.1.10/30 (subnet
8)

```

Host	IP Address	Default Gateway
HostA	192.168.1.98	192.168.1.97
HostB	192.168.1.99	192.168.1.97
HostC	192.168.1.100	192.168.1.97
HostD	192.168.1.101	192.168.1.97
HostE	192.168.1.34	192.168.1.33
HostF	192.168.1.66	192.168.1.65

Lab 2.1: Configuring the Routers

This first lab will have you connect to the routers starting at 2600A, finishing with 2600C. After the configurations are complete, we will then build the routing tables.

1. Connect to the 2600A router and set the hostname, passwords, interface descriptions, banners and IP addresses of each interface. For an explanation of each command, please review chapter 4 of the CCNA Standard labs section.

```

Router>enable
Router#config t
Router(config)#hostname 2600A
2600A(config)#enable secret todd
2600A(config)#line console 0
2600A(config-line)#password todd
2600A(config-line)#login
2600A(config-line)#line aux 0
2600A(config-line)#password todd
2600A(config-line)#login
2600A(config-line)#line vty 0 4
2600A(config-line)#password todd
2600A(config-line)#login
2600A(config-line)#interface fastethernet 0/0
2600A(config-if)#ip address 192.168.1.33 255.255.255.224
2600A(config-if)#description connection to LAN 40
2600A(config-if)#no shutdown
2600A(config-line)#interface serial 0/0
2600A(config-if)#ip address 192.168.1.5 255.255.255.252

```

```
2600A(config-if)#description connection to 2600C
2600A(config-if)#no shutdown
2600A(config-if)#exit
2600A(config)#banner motd #
This is the 2600A router
#
2600A(config)#exit
2600A#copy run start
2600A#
```

2. Connect to the 2600B router and set the hostname, passwords, interface descriptions, banners and IP addresses of each interface.

```
Router>enable
Router#config t
Router(config)#hostname 2600B
2600B(config)#enable secret todd
2600B(config)#line console 0
2600B(config-line)#password todd
2600B(config-line)#login
2600B(config-line)#line aux 0
2600B(config-line)#password todd
2600B(config-line)#login
2600B(config-line)#line vty 0 4
2600B(config-line)#password todd
2600B(config-line)#login
2600B(config-line)#interface fastethernet 0/0
2600B(config-if)#ip address 192.168.1.65 255.255.255.224
2600B(config-if)#description connection to LAN 30
2600B(config-if)#no shutdown
2600B(config-line)#interface serial 0/0
2600B(config-if)#ip address 192.168.1.9 255.255.255.252
2600B(config-if)#description connection to 2600C
2600B(config-if)#no shutdown
2600B(config-if)#exit
2600B(config)#banner motd #
This is the 2600B router
#
2600B(config)#exit
2600B#copy run start
```

3. Connect to the 2600C router and set the hostname, passwords, interface descriptions, banners and IP addresses of each interface.

```
Router>enable
Router#config t
Router(config)#hostname 2600C
2600C(config)#enable secret todd
2600C(config)#line console 0
2600C(config-line)#password todd
2600C(config-line)#login
2600C(config-line)#line aux 0
2600C(config-line)#password todd
2600C(config-line)#login
2600C(config-line)#line vty 0 4
2600C(config-line)#password todd
2600C(config-line)#login
2600C(config-line)#interface fastethernet 0/0
2600C(config-if)#ip address 192.168.1.97 255.255.255.224
2600C(config-if)#description connection to LAN 10
2600C(config-if)#no shutdown
2600C(config-line)#interface serial 0/0
2600C(config-if)#ip address 192.168.1.6 255.255.255.252
2600C(config-if)#description connection to 2600A
2600C(config-if)#no shutdown
2600C(config-line)#clock rate 64000
2600C(config-line)#no shut
2600C(config-line)#interface serial 0/1
2600C(config-if)#ip address 192.168.1.10 255.255.255.252
2600C(config-if)#description connection to 2600B
2600C(config-line)#clock rate 64000
2600C(config-if)#no shutdown
2600C(config-if)#exit
2600C(config)#banner motd #
This is the 2600C router
#
2600C(config)#exit
2600C#copy run start
```

Lab 2.2: Verifying the Configurations

Understanding how to configure routers is very important. But just as important as the understanding of configuring routers is the process of verifying your configurations. This lab will provide you with the commands to verify your routers configurations.

1. Starting at the 2600A router and finishing at the 2600C router, run the following two commands:

```
2600A#show running-config
2600A#show ip route
```

2. Notice that the running-config shows the complete configuration your router is running. The **show ip route** command is used to see the routing table on your router. It is important to notice that only the directly connected networks are showing. This means the routers can only route to the directly connected networks. In order to send packets to another network not in the routing table, we must configure the routing table with this network and how to get to the remote network. We'll do this next.

3. Run through the verification commands on the other routers and make sure the configurations are correct, the interfaces are enabled and the directly connected routes show correctly in the routing table..

```
2600B#show running-config
2600B#show ip route
```

```
2600C#show running-config
2600C#show ip route
```

4. Ping your directly connected neighbors. Open the CLI of the 2600A router and ping the 2600C routers directly connected interface. If this doesn't work, troubleshoot the connection.

```
2600A#ping 192.168.1.6
```

5. From the 2600B router, ping the 2600C directly connected interface. If this doesn't work, troubleshoot the connection.

```
2600B#ping 192.168.1.10
```

Lab 2.3: Configuring RIPv2 Routing

1. From the 2600A router, configure RIP routing and tell RIP the network you want to advertise as well as add the **version 2** command which allows VLSM networks to be advertised. Remember, if you don't use the **version 2** command, then this network will not work because RIPv1 does not support VLSM (classless) routing. RIPv1 is considered classful and all subnet masks must be same length in the network.

```
2600A#config t
2600A(config)#router rip
2600A(config-router)#network 192.168.1.0
2600A(config-router)#version 2
2600A(config-router)#^z
```

That's all there is to it! Dynamic routing is easy on small networks. The important thing to notice here is that the network address is a classful address, which means you use the classful

boundary. For example, we use 192.168.1.0 class C address and subnet that network with both 27 and 30 bits of subnetting. RIP is a classful routing protocol, which means that you do not type in any subnet addresses, only the class address. RIPv2, although similar in many aspects, allows RIP to become classless and advertise subnet mask information.

2. From the 2600B router, configure RIP routing and tell RIP the network you want to advertise.

```
2600B#config t
2600B(config)#router rip
2600B(config-router)#network 192.168.1.0
2600B(config-router)#version 2
2600B(config-router)#^z
```

3. From the 2600C router, configure RIP routing and tell RIP the network you want to advertise.

```
2600C#config t
2600C(config)#router rip
2600C(config-router)#network 192.168.1.0
2600C(config-router)#version 2
2600C(config-router)#^z
```

Lab 2.4: Verifying RIP Routing

Configuring RIP is pretty easy, especially in small networks. It is important to be able to verify RIP on Cisco routers. This lab will provide you with the commands to verify RIP.

1. From the 2600A router, use the **show ip route** command to verify the routing table.

```
2600A#show ip route
```

Notice the “R”, which means it is a RIP found route. The “C” is a directly connected network. Unlike RIP version 1 outputs, the RIP version 2 shows the prefix length mask (/27, etc.).

2. From the 2600B router, use the **show ip route** command to verify the routing table.

```
2600B#show ip route
```

3. From the 2600C router, use the **show ip route** command to verify the routing table.

```
2600C#show ip route
```

4. From the 2600A router, use the **debug ip rip** command to see RIP updates being sent and received on the router.

```
2600A#debug ip rip
```

5. To turn off debugging, use the **no debug ip rip** command, or the **undebug all** command.

```
2600A#undebug all
```

6. To see the routing protocol timers, use the **show ip protocols** command.

```
2600A#show ip protocols
```

Notice the timers. RIP is sent out every 30 seconds by default. The administrative distance is 120 by default. Both RIPv1 and RIPv2 use the same timers.

7. Another really good command is the **show protocols** command, which shows you the routed protocol configuration of each interface.

```
2600A#show protocols
```