Topic 4: Basic Routing

Routing is a fundamental function of any extended network topology. No matter what the OSI Layer 3 protocol—Novell IPX, Appletalk, IP—routing provides scalability to the network.

In this topic, you will configure static and RIP routing, both v1 and v2. The lab environment has been partially configured for you for the sake of time. To keep the lab relatively simple, we’ve placed a central router, “Memphis,” that will be configured as both a static router and a RIP router. The blue rectangle represents the static routing “domain.” The green rectangle represents the rip “domain.” Each domain will be configured separately.

Task 1 – Configure Static Routes

Task 2 – Configure RIP Routes

# Static Routes

 Open CLI console for Tupelo.

 Press "enter."

***Note:*** Notice that the CLI prompt automatically enters enable mode (like root).

Make sure that you can see Tupelo's WAN neighbor by using CDP (Cisco Discovery Protocol):

 Type "show cdp neighbor."

 Enter "config t" to enable configuration mode.

Configure a specific route to the ISP Router using the static route syntax," ip route [destination network, destination subnet mask, next hop]."

 Enter "ip route 192.168.1.0 255.255.255.0 192.168.2.1"

After leaving configuration mode, ping the ISP Router.

 "ping 192.168.1.2"

***Note:*** You are able to ping the ISP router with one static route entry because the Memphis router has both subnets attached.

From the ISP router CLI, see if you can ping the Tupelo host. Why can't you ping this host? Why does it respond with "U.U.U.U?"

***Note:*** The U.U.U.U stands for "Unreachable." This means that the ISP router doesn't know where to send the packet.

Let's try another command (traceroute) to troubleshoot. Traceroute is a common tool like ping. It basically does "pings" while decrementing the router hops. This can help you find out where you might be missing a route.

 On the ISP Router, let's use the "traceroute" command to verify where we might be losing a route to the Tupelo PC.

The ping packets can't make it out of the ISP Router. Type Control-Shift-6 to go back to the Enable prompt.

 Now let's enter a route to the Tupelo LAN network. Add an IP route for 192.168.3.0 255.255.255.0 192.168.1.1.

Can you ping 192.168.3.2? Try traceroute. We've got some good news. We can make it to the next hop!

 So, let's check the routes in the Memphis router. Does the Memphis router know how to get to 192.168.3.0?

 Enter a route in Memphis router pointing to the 192.168.3.0 network. Try to ping the Tupelo PC again. Hopefully, we have success. Do a "show ip route" to verify your routes make sense.

 Save your router configs.

Now, let's try a little different variation on the static routes.

 Remove all routes from the ISP, Memphis and Tupelo routers.

 Save the router configurations to NVRAM and reboot the routers.

***Note:*** A static default route can sometimes make routing easier and more stable.

The Tupelo PC already has a default route to the Tupelo Router.

 Put a static default route in the Tupelo router that points to the Memphis router: "ip route 0.0.0.0 0.0.0.0 192.168.2.1."

Now let's do the same default route to the ISP router, 192.168.1.2.

We still need specific routes for the ISP router to find the Tupelo PC.

 Enter the appropriate routes in the ISP Router and the Memphis router so they can find the Tupelo PC.

 Check and make sure that the Tupelo PC can ping the ISP router. You may have to wait for one PING timeout as the Tupelo PC learns about its router.

If you have any problems, use the tools you've learned:

PING

Traceroute

Show IP Route

Again, the static default route makes it easy to configure the remote WAN routers to point at the network core. In turn, this makes the router stable.

# The RIP routing Protocol.

The RIP (Routing Information Protocol) was invented early in the development of routing in general. It is a "Distance Vector" protocol. This means that RIP uses the number of router hops to determine which direction to route a packet.

In this portion of the LAB, we are going to enable the RIP protocol to show that it is easier to use than the

 Go ahead and power on Corinth and Pine Bluff.

 Now, use the graphical tool to enable RIP and add the 10.0.0.0 network for Memphis, Corinth and Pine Bluff.

 Next, see if you can ping from the Memphis server to the Tupelo PC and the Corinth PC.

 Now go to the command line of the Memphis, Tupelo, and Corinth routers. Perform a "show ip route rip."

Notice that the Memphis router doesn't have a route to the Pine Bluff PC network.

*Extra credit study: The network between the Pine Bluff router and its PS is using a /27 or 255.255.255.224 subnet mask. RIP v1 doesn't understand non-Classful subnets. Google Classful Network for more information and check out the Wikipedia entry for more information. In this case, RIPv1 only understands networks with a /8, /16, or /24 subnet mask.*

Let's go back to the task at hand. One of the benefits of RIPv2 is that it will allow us to include variable subnet masks.

Go to the command line of the Memphis, Corinth and Pine Bluff routers.

 In configuration mode, enter:

router rip

version 2

Now, see if you can ping from the Server to both the Corinth and Tupelo routers. If you have any failures, go back and use your tools to find out what might be wrong.

 Do a "show ip route rip."

Notice that the Administrative Distance (AD) are the same for both RIP routes. The RIP routes have an AD of 120, while the static routes have an AD of 1. If we had two identical routes, say one from static and one from RIP, the static would always be chosen first because it has a lower administrative distance.

Dynamic routing protocols will generally advertise their routes out of every interface that matches the "network statement." Routers with a lot of interfaces can generate a lot of unnecessary traffic. Also, advertising your networks onto a host network creates an attractive nuisance that hackers can use to inject routes into your network.

 On the Memphis router, create a new interface by:

interface loopback 0

ip address 10.10.10.10 255.255.255.0

 Now, let's debug the RIP protocol. After leaving config-mode, type:

debug ip rip

Wait around 30 seconds or less for a RIP update. Notice that you are sending routes to interface loopback 0.

So, configure the following:

router rip

passive-interface loopback 0

With the debug still enabled, notice that the router is no longer sending update packets to the loopback interface.