Computer Networks

Lab No.: 6

Dynamic Routing using RIP

Objectives:

- To be familiar with dynamic routing and configuration of dynamic routing using **RIP**
- To observe how the dynamic routing can address changing network topology automatically

Requirements:

- Network simulation tool: Packet Tracer

Configuring RIP

The `router rip` command enables RIP as the routing protocol. The `network` command is then used to tell the router on which interfaces to run RIP.

To enable RIP, use the following commands in global configuration mode as:

- `Router(config)#` **`router rip`**

  Enables the RIP routing process

- `Router(config-router)#` **`network`** *`network-number`*

  Associates a network with the RIP routing process

Example:

- `Router(config)#` **`router rip`**
- `Router(config-router)#` **`network 192.5.5.0`**
- `Router(config-router)#` **`network 205.7.5.0`**

The router interfaces that are connected to networks **192.5.5.0** and **205.7.5.0** send and receive RIP updates. The routing updates allow the router to learn the network topology from a directly connected router that also runs RIP.

The RIP routing protocol supports classful routing only. However the **version 2** of **RIP** is designed to support Classless routing. For networks using VLSM and Classless addressing we need to configure **RIP version 2**. RIP version 2 can be configured as:

- `Router(config)#` **`router rip`**
- `Router(config-router)#` **`version 2`**
- `Router(config-router)#` **`network 12.5.5.0`**
- `Router(config-router)#` **`network 175.7.5.0`**

Configuring the Serial Interface (Review):

If routers are connected via serial interface as following:

Either end of the link is connected as DTE and another is as DCE.

By hovering the mouse over the link you can see the clock symbol for the interface that is connected as a DCE and another end automatically becomes DTE. Refer to the figure below. You can choose a proper cable (DTE or DCE cable) to set either one as DTE and another as DCE.

Configuring Serial interface connected as DCE

```
R1> enable
R1# configure terminal
R1(config)# interface serial 0
R1(config-if)# ip address 201.100.11.2  255.255.255.0
R1(config-if)# clock rate 56000
R1(config-if)# no shutdown
```

Note: Clock rate is necessary when it is connected as DCE

Configuring Serial interface connected as DTE

```
R2> enable
R2# configure terminal
R2(config)# interface serial 1/0
R2(config-if)# ip address 201.100.11.1  255.255.255.0
R2(config-if)# no shutdown
```

Activities:

Configuration of RIP

A. Create the following network topology using Packet Tracer and perform the followings:
   1. Configure the hostname and console password and enable password in each router. The hostname of each router should be your **Firstname_1**, **Firstname_2** and so on. Similarly the console password should be **cisco** and enable password should be **class**.
   2. Enable telnet on each router with the password of **cisco**.
   3. Configure each interface of the router with given IP addresses (refer figure 1).
   4. Configure the given IP address and default gateway on each computer as shown in figure 1 below.

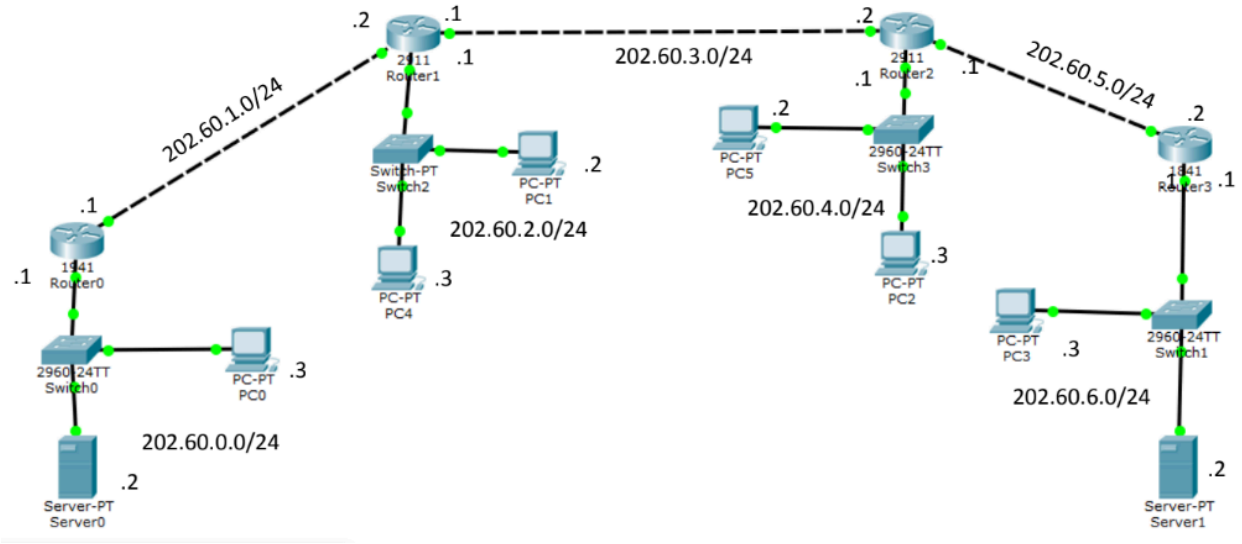

Figure 1: Network Topology 1

   5. Observe and note down the output of the command `show ip route` in each router.
   6. Observe the output while using the ping command from PC0 to Server0, Server1, PC0, PC1, PC2, PC3, Router0, Router1, Router2 and Router3.
   7. Similarly, observe the output while using the ping command from PC1 to all other computers, servers and routers.
   8. Repeat the process from all other computers and routers.
   9. From PC0 enter into Router0 using telnet and configure RIP for each connected network.
   10. From there enter into Router1 using telnet and configure RIP for each connected network.
   11. Repeat the process for Router2 and Router3.
   12. Repeat the step from 5 to 8 and note down the output by observing it.
   13. Use tracert command to observe the output from each PC to all other PCs.

B. To increase the reliability, add a new router to connect Switch0 with Switch1 as shown in figure 2. Assign IP address to both interfaces of router as specified. Configure RIP in this router (for each of the network connected to it) and observe the followings
   1. Observe the output of `show ip route` command in each router, and compare with that of the previous case that is specified in Activity A.

2. Use tracert command from each PC to each other PC and note down the result. Note how the changing network topology is addressed by dynamic routing automatically.

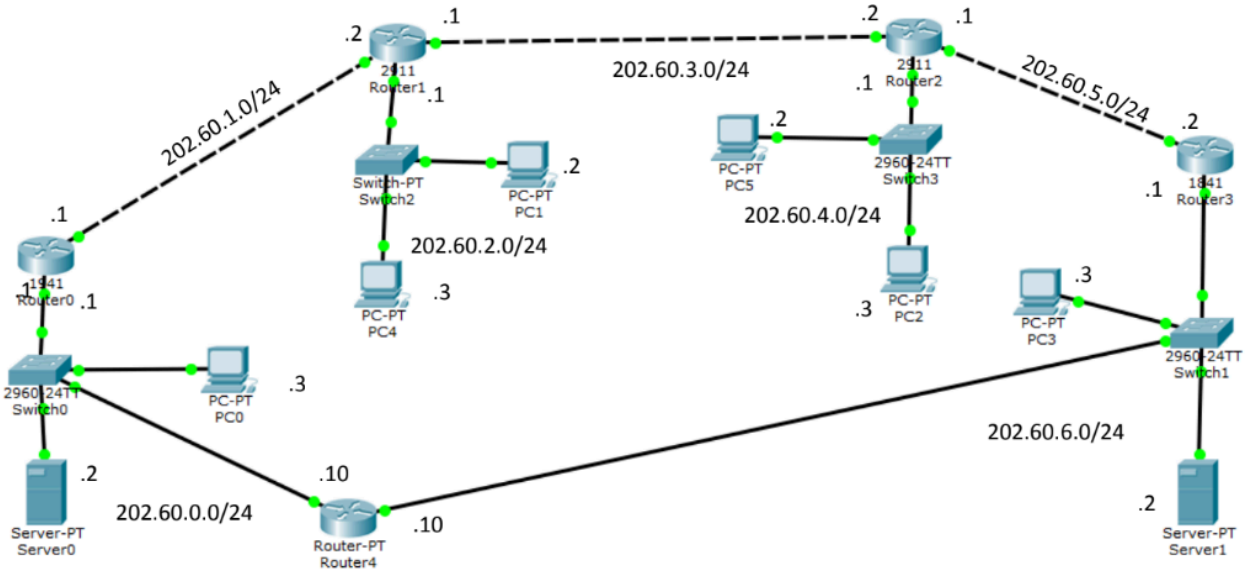

Figure 2: Network Topology 2

3. Now disconnect the link between Router0 and Router1 and observe the output while using tracert command from each PC to each other PC. Now observe the routing table of each router using `show ip route`. Note how changing network topology is addressed in dynamic routing.
4. Similarly observe the routing table of each router and output of traceroute/tracert command by removing different links between routers as well as by connecting the links.
5. Note down how the changing network topology is addressed by dynamic routing protocol automatically to determine the optimal path to reach each of the destination networks.

C. Suppose you have obtained the IP addresses of 222.22.22.0/23 from APNIC. You have to divide this address for different departments A, B, C, D, E and F interconnected as shown in figure 3 below, each department having 60, 70, 50, 10, 40 and 20 numbers of hosts respectively. In addition to this there are three networks G, H and I having only two hosts in each. Allocate the IP address range for each of the sub-networks with their network address, broadcast address and subnet mask. Also list out the remaining range of IP addresses (if any).

Note: You have to use a **serial link** for point-to-point connection between routers as shown in figure 3 below.
Here, each network A, B, C, D, E & F should consist of at least one PC connected to the router via a switch.

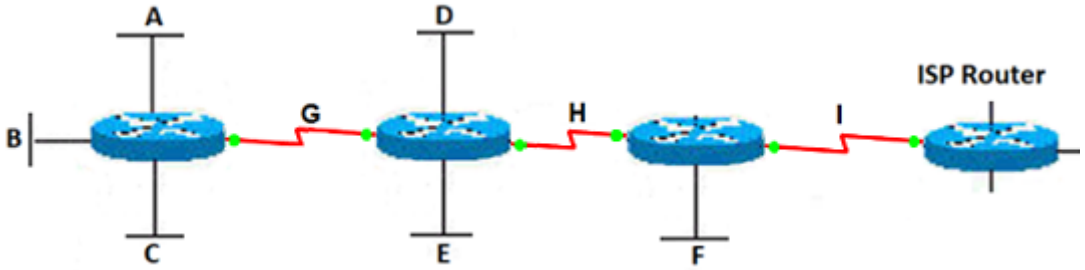

Figure 3: Network Topology 3

1. Configure the network as shown in figure 3, in which for each network use one PC connected to the router via a switch.
2. Configure the hostname and console password and enable password in each router. The hostname of each router should be your **Firstname_1**, **Firstname_2** and so on. Similarly the console password should be **cisco** and enable password should be **class**. Also enable telnet on each router with the password of **cisco**.
3. On the basis of your designed subnet, configure each interface of the router with appropriate IP addresses & subnet mask. Similarly configure the appropriate IP address, subnet mask and default gateway on each computer.
4. Observe and note down the output of the command `show ip route` in each router.
5. Configure the **RIP version 2** in all routers with respective networks.
   Note: Since subnetting is done with VLSM, only version 2 of RIP can be applicable.
6. Observe and note down the output of the command `show ip route` in each router.
7. Test the connectivity from the computer of each network to each other networks.
8. Observe the output of traceroute from a computer of network A to the computer of each other networks and each IP of routers.
9. Observe the output of tracert from the computer of network A to the ip address of 1.1.1.1.
10. Now configure the default route in each router to forward any Internet traffic toward ISP Router.
11. Observe and note down the output of the command `show ip route` in each router.
12. Observe the output of tracert from the computer of network A to 1.1.1.1. Compare the result with that of step 9.

Exercises:

1. What is dynamic routing? How does it differ with static routing? Explain briefly.
2. List out the dynamic routing configuration commands of the router (that you have used in this lab) for RIP as well as RIP version 2 with the syntax and examples.
3. How can dynamic routing address the changing topology of a network automatically? Explain with reference to the observation of your lab exercise.
4. Note down the observation of each step with necessary commands specified in activities A, B and C mentioned above and comment on the result by explaining the reason in detail.

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