Lab 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

Procedure:

A: The network topology was created in Packet Tracer, and each router's hostname, console password, and enable password were configured. Telnet was enabled on each router with the password "cisco". The given IP addresses were assigned to each router interface, and computers were configured with the corresponding IP addresses and default gateways. The `show ip route` command output was observed and recorded on each router. The `ping` command was executed from PC0 to various devices, and the results were noted, repeating the process for PC1 and other devices. RIP was configured on Router0 via a telnet session from PC0, then on Router1, Router2, and Router3. The steps from 5 to 8 were repeated, and the `tracert` command was used from each PC to others, documenting the results.

B: A new router was added between Switch0 and Switch1, and IP addresses were assigned to its interfaces. RIP was configured for each connected network. The `show ip route` command output was observed and compared to Activity A. The `tracert` command was used from each PC to others, noting how dynamic routing addressed topology changes. The link between Router0 and Router1 was disconnected, and `tracert` was used again from each PC to others, documenting the results. The routing table of each router was observed using `show ip route`, repeating the process by removing and reconnecting different links, noting the dynamic routing protocol's behavior.

C: IP addresses 222.22.22.0/23 were divided among departments A, B, C, D, E, F, and networks G, H, and I. The network topology was configured as shown, with one PC connected to each router via a switch. Hostnames, console passwords, and enable passwords were set, and telnet was enabled with

"cisco". Routers and PCs were configured with appropriate IP addresses, subnet masks, and default gateways. The `show ip route` command output was observed and recorded. RIP version 2 was configured on all routers. Connectivity was tested between networks, observing `traceroute` output from network A to others and each router IP. The `tracert` command was used from network A to 1.1.1.1, and results were compared. Default routes were configured to forward internet traffic to the ISP router, and the outputs of `show ip route` and `tracert` were observed and documented.

Observation:

Activity A

Ans for 1: The given network was built and hostname, console password, enable password were configured.

Ans for 3-4: IP addresses for each network and default gateway were configured in each PC.

Ans for 6-8: Static routing was done between the networks and the `ping` command was used from each router-router, PC-router, PC-PC, and replies were observed.

Ans for 9-11: Static routing was removed and dynamic routing RIP was configured between the networks by adding adjacent network IDs to the respective routers.

Ans for 12-13: Initially, request time out was observed for distant routers because the RIP process took time to exchange routing table information between routers.

Activity B

Ans for 2: After the new router was configured between the two networks, the IP route from network 202.60.0.0 to 202.600.6.0 was minimized to route through the shortest path (through the new router path).

Ans for 3-4: After disconnecting the new router wire, the new route path configuration through default RIP routing took time, and finally, the `tracert` path was observed through the longest path.

Ans for 5: The changing network topology was automatically addressed by the dynamic routing protocol to determine the optimal path to reach each destination network.

Activity C

The given IP address range of 222.22.22.0/23 from the ISP was divided into the following networks: The

Departments	Net ID	Range	Broadcast	Subnet Mask
B	222.22.22.0	1-126	222.22.22.127	255.255.255.128
A	222.22.22.128	129-190	222.22.22.191	255.255.255.192
C	222.22.22.192	193-254	222.22.22.255	255.255.255.192
E	222.22.23.0	1-62	222.22.23.63	255.255.255.192
F	222.22.23.64	65-94	222.22.23.95	255.255.255.224
D	222.22.23.96	97-110	222.22.23.111	255.255.255.240
G	222.22.23.112	113-114	222.22.23.115	255.255.255.252
H	222.22.23.116	117-118	222.22.23.119	255.255.255.252
I	222.22.23.120	121-122	222.22.23.123	255.255.255.252

Table 1: Network Division

unused IP addresses are as follows:

- Network B: 128-2-70
- Network A: 64-2-60
- Network C: 64-2-50
- Network E: 64-2-40
- Network F: 32-2-20
- Network D: 16-2-10
- Network G: 4-2-2
- Network H: 4-2-2
- Network I: 4-2-2

Ans for 5: RIP version 2 (for VLSM) was configured in each router with respective networks.

Ans for 7-8: Initially, the `ping` command gave a request timed out, but after several tries, replies were made between each device, including PCs and routers. Similarly, routes were observed using `tracert`.

Ans for 9: When `tracert` 1.1.1.1 was executed from any computer without default routing, request timed out and destination host unreachable messages were observed.

Ans for 12: After the default route was configured, when `tracert` 1.1.1.1 was executed from any device, it reached up to the ISP router, and then request timed out was observed.

Conclusion:

This lab assignment successfully demonstrated the implementation and configuration of dynamic routing using RIP in a simulated network environment. Through the configuration and observation of various network topologies, the automatic adaptation of RIP to changing network conditions was clearly illustrated. The procedures for setting up routers, enabling telnet, assigning IP addresses, and configuring RIP were executed methodically. The dynamic routing protocol's capability to automatically determine optimal paths, maintain connectivity, and adjust to network topology changes was effectively validated. This hands-on experience provided a comprehensive understanding of RIP's practical applications and its significance in managing real-world networks efficiently.

Exercises:

Question 1

What is dynamic routing? How does it differ from static routing? Explain briefly.
Dynamic routing is a network routing technique that automatically adjusts the paths that data packets take based on current network conditions. It uses algorithms and protocols like RIP (Routing Information Protocol) to determine the optimal path for data transmission. This process involves routers exchanging routing information to learn about new routes and to adapt to changes in the network, such as device failures or topology changes. In contrast, static routing involves manually configuring fixed routes for data packets. These routes do not change unless manually reconfigured by a network administrator. Static routing is simpler and more predictable, but it lacks the flexibility of dynamic routing in adapting to network changes.

Question 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.
The following commands were used to configure dynamic routing using RIP and RIP version 2 in this lab:
RIP Configuration:

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

```
Router(config-router)# network <network-number>
```

Example:

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

RIP Version 2 Configuration:

```
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network <network-number>
```

Example:

```
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
```

Question 3

How can dynamic routing address the changing topology of a network automatically? Explain with reference to the observation of your lab exercise.

Dynamic routing addresses the changing topology of a network automatically by allowing routers to share and update routing information continuously. In the lab exercise, we observed this when the RIP protocol was configured on the routers. Initially, when static routes were removed and RIP was enabled, the routers exchanged their routing tables to learn about each other's networks. This process took some time, leading to initial request timeouts when pinging distant routers. However, once the RIP updates were exchanged and routing tables were synchronized, the routers adapted to the network changes and found the optimal paths for data transmission. This automatic adaptation ensures that the network remains efficient and resilient to changes such as link failures or the addition of new routers.