Practical 3: Dynamic Routing with RIP and OSPF

Practical Title: Configure RIP and OSPF; observe routing table changes.

Aim: To configure dynamic routing protocols like RIP and OSPF and observe how routers automatically exchange routing information.

Objective:

- To understand the concepts of RIP and OSPF.
- To configure RIP on a network topology.
- To configure OSPF on the same network topology.
- To observe how the routing table is updated automatically.

Theory: **Dynamic routing protocols** allow routers to automatically learn about network paths from other routers. This is more scalable than static routing. **RIP (Routing Information Protocol)** is a distance-vector protocol that uses hop count as its metric. **OSPF (Open Shortest Path First)** is a link-state protocol that uses a more sophisticated metric and is more scalable.

Steps:

1. **Create the Network Topology:**
    - Use the same two-router topology from Practical 2. Ensure all IP addresses are configured correctly on the interfaces.
2. **Configure RIP Routing:** ○ **On Router0:**
    - ■ Click Router0 > **CLI** tab.

Enter the following commands:

Router(config)#router rip

Router(config-router)#version 2

Router(config-router)#network 192.168.1.0

Router(config-router)#network 10.0.0.0

Router(configrouter)#exit

- **On Router1:**
  - Click Router1 > **CLI** tab.

Enter the following commands:

Router(config)#router rip

Router(config-router)#version 2

Router(config-router)#network 192.168.2.0

Router(config-router)#network 10.0.0.0

Router(config-router)#exit

3. **Verify RIP Configuration:**
   - On either router, use the command show ip route to view the routing table. You should see routes learned via RIP, indicated by an 'R'.
4. **Configure OSPF Routing (alternative configuration):**
   - **Remove RIP configuration first:**
     - On both routers, enter no router rip.
   - **On Router0:**

Enter the following commands:

Router(config)#router ospf 1

Router(config-router)#network 192.168.1.0 0.0.0.255 area 0

Router(configrouter)#network 10.0.0.0 0.0.0.255 area 0

- **On Router1:**

Enter the following commands:

Router(config)#router ospf 1

Router(config-router)#network 192.168.2.0 0.0.0.255 area 0

Router(configrouter)#network 10.0.0.0 0.0.0.255 area 0

5. **Verify OSPF Configuration:**

- On either router, use the command show ip route again. You should now see routes learned via OSPF, indicated by an 'O'.
- Ping from PC0 to PC1 to confirm connectivity.

Conclusion: This practical successfully demonstrated the configuration of two dynamic routing protocols, RIP and OSPF. By observing the routing tables, we saw how these protocols automatically discover and populate network paths, simplifying network management compared to static routing.

Viva / Oral Questions:

1. What is the main difference between RIP and OSPF?
2. What is a "hop count" in the context of RIP?
3. Why is OSPF considered more scalable than RIP?
4. What is the purpose of the "area" in OSPF configuration?
5. How do dynamic routing protocols handle network changes, such as a link going down?

CLI COMMANDS

On Router 0:-

```
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.10.10.0
Router(config-router)#network 40.40.40.1
Router(config-router)#exit
Router(config)#outer ospf 1
^
% Invalid input detected at '^' marker.
Router(config)#router ospf 1
Router(config-router)#network 10.10.10.1 0.0.0.255 area 0
Router(config-router)#network 40.40.40.1 0.0.0.255 area 0
```

On Router 1:-

```
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.10.10.0
Router(config)#router ospf 1
Router(config-router)#network 10.10.10. 0.0.0.255 area 0
Router(config-router)#network 20.20.20.0 0.0.0.255 area 0
```

On Router 2:-

```
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 20.20.20.0
Router(config-router)#network 30.30.30.0
Router(config-router)#exit
Router(config)#router ospf 1
Router(config-router)#network 20.20.20.0 0.0.0.255 area 0
```

Router(config-router)#network 30.30.30.0 0.0.0.255 area 0

VERIFY CONNECTIVITY:

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time=9ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.10.10.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 9ms, Average = 2ms

C:\>ping 20.20.20.1

Pinging 20.20.20.1 with 32 bytes of data:

Reply from 20.20.20.1: bytes=32 time=31ms TTL=254
Reply from 20.20.20.1: bytes=32 time=27ms TTL=254
Reply from 20.20.20.1: bytes=32 time=33ms TTL=254
Reply from 20.20.20.1: bytes=32 time=1ms TTL=254

Ping statistics for 20.20.20.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 33ms, Average = 23ms

C:\>ping 30.30.30.1

Pinging 30.30.30.1 with 32 bytes of data:

Reply from 30.30.30.1: bytes=32 time=44ms TTL=253
Reply from 30.30.30.1: bytes=32 time=43ms TTL=253
Reply from 30.30.30.1: bytes=32 time=46ms TTL=253
Reply from 30.30.30.1: bytes=32 time=51ms TTL=253

Ping statistics for 30.30.30.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 43ms, Maximum = 51ms, Average = 46ms