Experiment 2.2

Student Name: Jeetendra Patel **UID:22BCS12228**
Branch:BE/CSE **Section/Group:702_DC-B**
Semester:5th **Date of Performance:22/09/24**
Subject Name: Computer Networks **Subject Code: 22-CSH-312**

1. **Aim:** To configure a network using RIP (Distance Vector Routing) and OSPF (Link State Routing) protocols in Packet Tracer, ensuring successful data transmission between devices and verifying network connectivity through simulation and ping tests.

2. **Requirements(Hardware/Software):**

S/W Requirement :- Packet Tracer
H/W Requirement :-
• Processor – Any suitable Processor e.g. Celeron
• Main Memory - 128 MB RAM
•Hard Disk – minimum 20 GB IDE Hard Disk
• Removable Drives–1.44 MB Floppy Disk Drive
–52X IDE CD-ROM Drive
•PS/2 HCL Keyboard and Mouse

3. **Theory:**

Routing protocols are essential for directing data packets between routers in a network. They determine the best path for data to travel from a source to its destination. There are two main categories of routing protocols: Distance Vector and Link State. In this experiment, we focus on two widely used protocols—RIP (Distance Vector) and OSPF (Link State).

1. RIP (Routing Information Protocol):

RIP is a Distance Vector Routing Protocol, meaning each router sends a complete copy of its routing table to its immediate neighbors at regular intervals. The key characteristics of RIP are:

- Hop Count: RIP uses the number of hops (routers) between the source and destination as the metric to determine the best route.
- Maximum Hop Count: It has a maximum hop count of 15, meaning networks with more than 15 hops are considered unreachable.
- Version 2: RIP version 2 is the most commonly used version, supporting classless routing and subnet masks, which allows for more flexible addressing.
- Broadcast Updates: RIP routers periodically broadcast routing table updates to neighboring routers.

While RIP is simple and easy to configure, its limitation of a 15-hop maximum and its periodic updates lead to inefficiency in large networks.

2. OSPF (Open Shortest Path First):

OSPF is a Link State Routing Protocol that operates more efficiently than RIP, particularly in large and complex networks. It builds a complete map of the network and uses the Dijkstra algorithm to compute the shortest path between routers. The main features of OSPF are:

- Link State Advertisements (LSAs): Instead of sending entire routing tables, OSPF routers only share information about their own links (called LSAs) with neighboring routers.
- Areas: OSPF divides a large network into smaller areas to reduce the complexity and processing load on routers.
- Cost Metric: OSPF uses a cost metric based on the bandwidth of the links, with higher bandwidth links having a lower cost.
- Convergence: OSPF converges faster than RIP, meaning it adapts more quickly to network changes like link failures.

- Hierarchical Design: OSPF allows for hierarchical network design, with a backbone area (Area 0) connecting all other areas.

Comparison between RIP and OSPF:

- RIP is easier to configure and is suitable for small networks but becomes inefficient in large or dynamic networks due to its hop count limit and slow convergence.
- OSPF is more scalable, flexible, and efficient, making it suitable for large networks. It converges faster, supports VLSM (Variable Length Subnet Masking), and ensures loop-free routing.

By configuring both RIP and OSPF in Packet Tracer, we can observe the differences in how they handle routing information and network changes. Testing network connectivity via ping and using Packet Tracer's simulation mode helps visualize how these protocols operate in a real-world scenario.

4. Procedure:

1. Setup Topology: Add routers, PCs, and a server in Packet Tracer, and connect them with appropriate cables.
2. Assign IP Addresses: Set IP addresses for all devices, including routers, PCs, and the server.
3. Configure RIP: Set up RIP routing on the routers by defining the connected networks.
4. Configure OSPF: Set up OSPF on different routers by specifying networks and areas.
5. Configure Server: Assign an IP address to the server and enable FTP services.
6. Test Connectivity: Ping the server from a PC to check network connectivity.
7. Run Simulation: Use simulation mode to observe how RIP and OSPF handle packet routing.

8. Verify Routing Tables: Check the routing tables on each router to ensure correct protocol configuration.

5. Output:

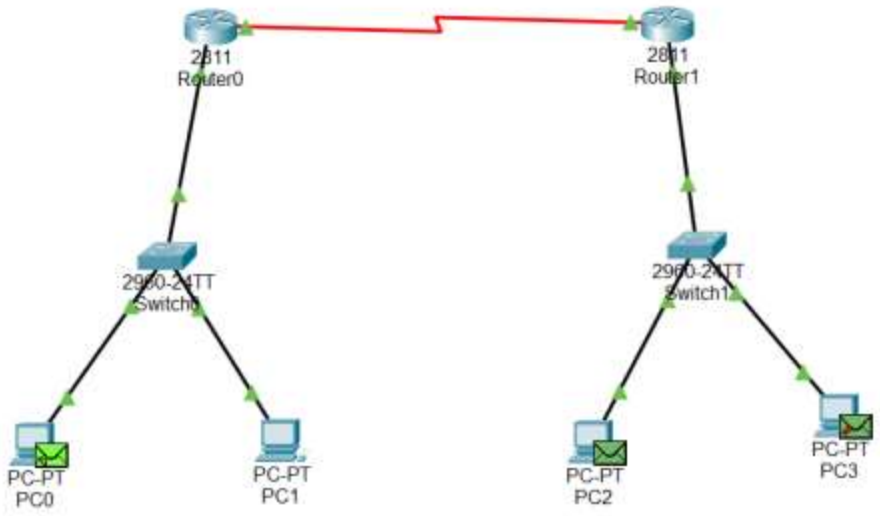

Fig 1. Using distance vector routing protocol

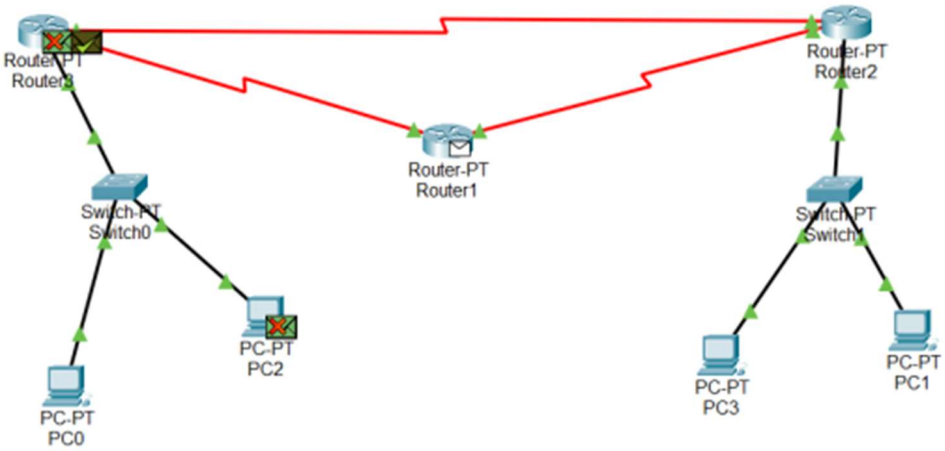

Fig 2. Using OSFP protocol

6. Learning Outcome:

1. Network Setup: Understand how to create a basic network topology using routers, PCs, and servers in Packet Tracer.
2. Routing Protocol Configuration: Gain proficiency in configuring RIP and OSPF routing protocols on routers.
3. Connectivity Testing: Learn to use ping commands to test and verify network connectivity between devices.
4. Protocol Functionality: Observe and compare the operation of Distance Vector and Link State routing protocols in a simulated environment.
5. Troubleshooting Skills: Develop skills to identify and troubleshoot network issues using Packet Tracer's simulation and monitoring features.