Lab Number 7
Aim: Dynamic Routing Implementation using RIP

Theory: Dynamic Routing Implementation using RIP

Introduction to Routing

Routing is a fundamental process in computer networks, responsible for determining the optimal path for data packets to travel from a source to a destination. Routers are devices that manage routing, enabling efficient communication between different networks. There are two primary types of routing: static and dynamic.

- Static Routing: Involves manually configuring routes on routers. While it is simple and suitable for small networks, it lacks scalability and adaptability.
- Dynamic Routing: Utilizes routing protocols to automatically update and determine the best routes based on network topology changes. It is ideal for large and dynamic networks.

What is RIP (Routing Information Protocol)?

The Routing Information Protocol (RIP) is one of the oldest distance-vector routing protocols used in dynamic routing. It enables routers to share information about network topology to maintain up-to-date routing tables. RIP operates in Application Layer (Layer 7) of the OSI model and is suitable for small to medium-sized networks due to its simplicity.

Key Features of RIP

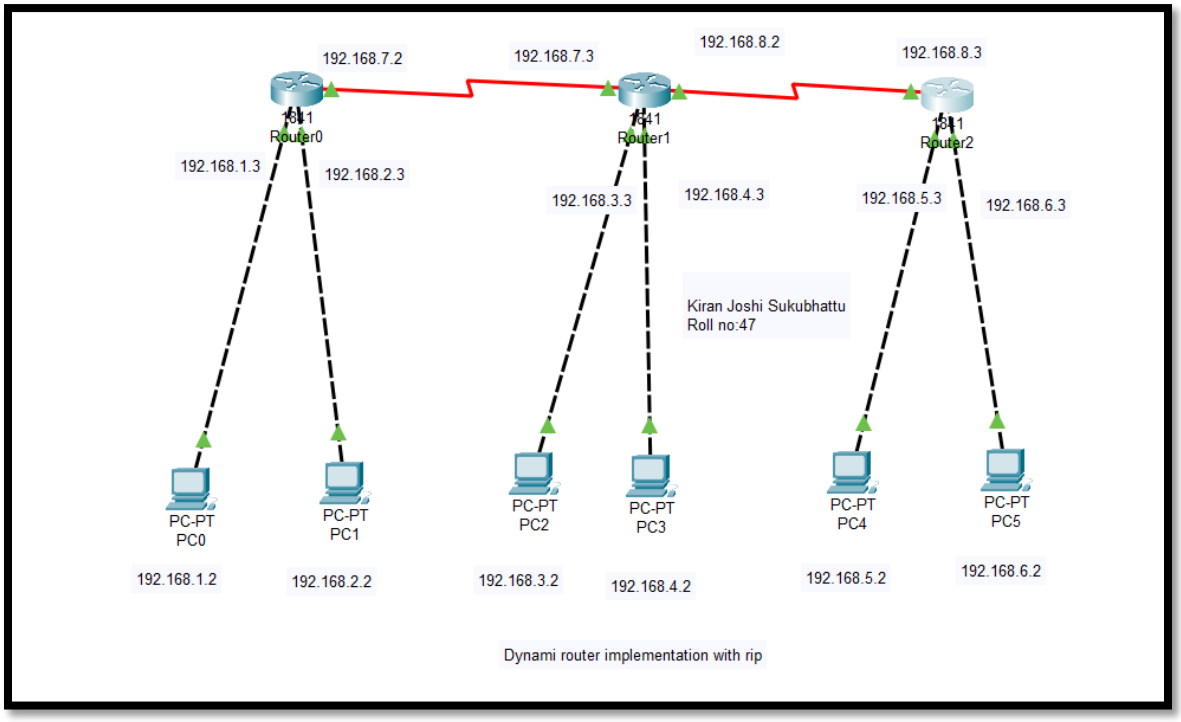
1. Distance-Vector Protocol: RIP uses hop count as a metric to determine the shortest path to a destination.
2. Maximum Hop Count: The maximum number of hops is limited to 15, making it unsuitable for large networks.
3. Periodic Updates: RIP broadcasts routing table updates to neighboring routers every 30 seconds.
4. Routing Table Maintenance: Each router maintains a routing table containing destination networks, hop counts, and the next-hop router.
5. Support for IPv4 and IPv6:
   - RIPv1: Only supports IPv4, does not include subnet information.
   - RIPv2: Supports IPv4, includes subnet masks, and uses multicast for updates.
   - RIPng: Designed for IPv6 networks.

Advantages of RIP

- Simple to configure and implement.
- Supports dynamic adjustments to network topology changes.
- Compatible with both IPv4 and IPv6 (using RIPng).

Limitations of RIP

- Scalability: Limited to networks with 15 hops.
- Convergence Time: Takes longer to adapt to network changes compared to advanced protocols.
- Inefficiency: Broadcast updates can lead to increased network traffic.
- Loop Prevention: Limited mechanisms for preventing routing loops compared to modern protocols.



RIP Operation

1. Initial Exchange: Routers share their routing tables with directly connected neighbors.
2. Route Advertisement: Each router advertises its known routes and their hop counts.
3. Routing Table Update: Upon receiving updates, routers update their tables based on the shortest path (minimum hop count).
4. Periodic Updates: Routing information is shared periodically to ensure consistency.

Comparison with Other Protocols

Feature	RIP	OSPF	EIGRP
Metric	Hop count	Cost (bandwidth)	Composite (bandwidth, delay)
Scalability	Low	High	High
Convergence	Slow	Fast	Fast
Loop Prevention	Limited	Strong	Strong

Applications of RIP

- Small enterprise networks.
- Networks with simple topologies and fewer devices.
- Backup for more advanced routing protocols in specific scenarios.

Conclusion

RIP is a foundational dynamic routing protocol that facilitates automatic route management in small to medium-sized networks. While it has limitations in scalability and efficiency, its simplicity makes it a valuable tool for understanding dynamic routing concepts and implementing basic network designs.