Practical-1

AIM: Study of network devices such as switches, routers, hubs, access points, and firewalls using cisco packet tracer.

➢ REQUIREMENTS

1. Any Computer or Laptop
2. Computer system with minimum 4 GB RAM
3. Cisco Packet Tracer software
4. Windows Operating System

➢ THEORY

Networking devices are used to connect computers and other devices to form a network. Each device has a specific role in managing data transmission, security, and connectivity.

- **Hub:** A basic networking device that broadcasts data to all connected devices.
- **Switch:** Forwards data only to the intended destination device using MAC addresses.
- **Router:** Connects different networks and routes data packets using IP addresses.
- **Access Point:** Allows wireless devices to connect to a wired network.
- **Firewall:** Provides network security by monitoring and controlling incoming and outgoing traffic.

Cisco Packet Tracer is a simulation tool that helps in understanding the working of these devices in a virtual environment.

➢ PROCEDURE

1. Open **Cisco Packet Tracer** on the computer.
2. Create a new project by selecting **File → New**.
3. From the **Network Devices** section, drag and place the following devices into the workspace:
    - Hub
    - Switch
    - Router

- Access Point
- Firewall

4. From the **End Devices** section, add multiple **PCs and Laptops**.
5. Use appropriate cables (Copper Straight-Through / Wireless links) to connect devices:
   - PCs to Hub and Switch
   - Switch to Router
   - Router to Firewall
   - Access Point for wireless devices
6. Assign **IP addresses** to all end devices manually or using DHCP.
7. Configure the router interfaces with proper IP addresses.
8. Enable wireless configuration for the Access Point and connect laptops wirelessly.
9. Configure basic firewall rules to allow or deny traffic.
10. Use **ping command** to test connectivity between devices.
11. Verify successful data transmission between all connected nodes.

➢ OUTPUT

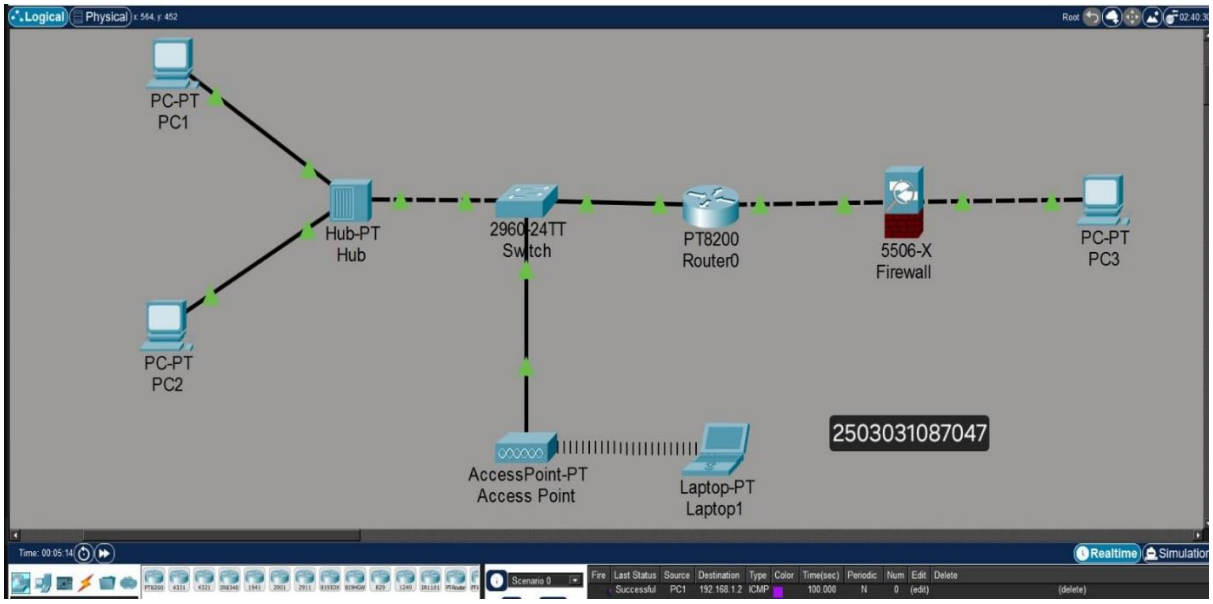

Figure 1: Study of network devices using Cisco Packet Tracer.

➢ OBSERVATION

- Traffic Handling: When a packet is sent through a Hub, it is seen arriving at all connected devices. When sent through a Switch, it is only seen by the intended recipient.
- Network Boundary: A Router successfully stops a broadcast from one network from reaching another, proving it defines a broadcast domain.
- Wireless Connectivity: Laptops equipped with wireless NICs show a signal link to the Access Point without physical cabling.

➢ CONCLUSION

Thus, the study of various network devices such as switches, routers, hubs, access points, and firewalls was successfully performed using Cisco Packet Tracer. This practical helped in understanding the functionality, configuration, and importance of each device in a computer network and how they work together to ensure efficient and secure communication.

Practical-2

AIM: Study and Design of various network topologies using cisco packet tracer.

➢ REQUIREMENTS

1. Any Computer or Laptop
2. Computer system with minimum 4 GB RAM
3. Cisco Packet Tracer software
4. Windows Operating System

➢ THEORY

A **Network topology** refers to the arrangement of different network devices and how they are interconnected. The structure of a network affects its performance, scalability, and reliability.

Common types of network topologies are:

1. **Bus Topology**
   - **Design:** Connect multiple **Hubs** in a linear series using **Copper Cross-Over** cables. Connect one PC to each Hub.
   - **Observation:** Data sent from the first PC travels through every hub in the line. If the "backbone" cable breaks, the entire network fails.

2. **Star Topology**
   - **Design:** Place a central **2960 Switch** and connect 4–5 PCs to it using **Copper Straight-Through** cables.
   - **Observation:** This is the most common LAN setup. Each PC has a dedicated link. If one PC's cable breaks, the rest of the network remains functional.

3. **Ring Topology**
   - **Design:** Connect 4 **Switches** in a closed loop (Switch A to B, B to C, C to D, and D back to A).
   - **Observation:** Packet Tracer will likely turn one link **Orange** (Spanning Tree Protocol) to prevent a broadcast storm. Data travels in a circular fashion.

4. **Mesh Topology**
   - **Design:** Place 4 **Routers** and connect every router to every other router using **Serial** or **Gigabit Ethernet** cables.

- **Observation:** This provides maximum redundancy. If one path is blocked, the router automatically finds another route.

5. **Hybrid Topology**
   - **Design:** Combine a **Star** section and a **Bus** section. For example, connect two Star-configured switches to each other.
   - **Observation:** This offers the scalability of a Star and the reach of a Bus. It is the most realistic representation of a corporate network.

Cisco Packet Tracer allows us to design and simulate these topologies to understand their working practically.

➢ PROCEDURE

1. Open **Cisco Packet Tracer** software.
2. Create a new project by clicking **File → New**.
3. From the **End Devices** section, add multiple PCs.
4. From the **Network Devices** section, select switches and hubs as required.

A. Bus Topology

5. Connect all PCs using a single backbone cable (logical representation using hub).
6. Assign IP addresses to all PCs.

B. Star Topology

7. Place a switch at the centre.
8. Connect all PCs to the switch using straight-through cables.
9. Assign IP addresses to each PC.

C. Ring Topology

10. Connect each PC to two neighbouring PCs to form a ring structure.
11. Assign IP addresses accordingly.

D. Mesh Topology

12. Connect each PC to every other PC.
13. Assign IP addresses to all systems.

E. Hybrid Topology

14. Combine two or more topologies such as star and bus.
15. Assign IP addresses and verify connections.

16. Use the **ping command** to test connectivity in each topology.
17. Observe data transmission between devices.

➢ OUTPUT

A. Bus Topology

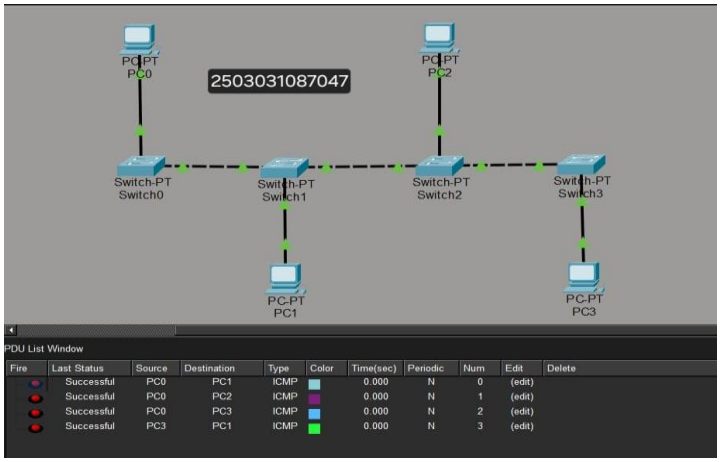

Figure 1: Bus topology implemented using switches showing linear data transmission in Cisco Packet Tracer.

B. Star Topology

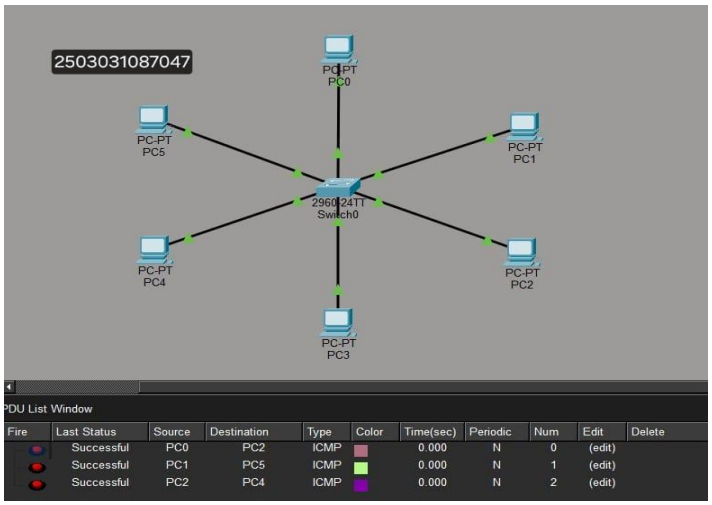

Figure 2: Star topology with a central switch connecting multiple end devices in Cisco Packet Tracer.

C. Ring Topology

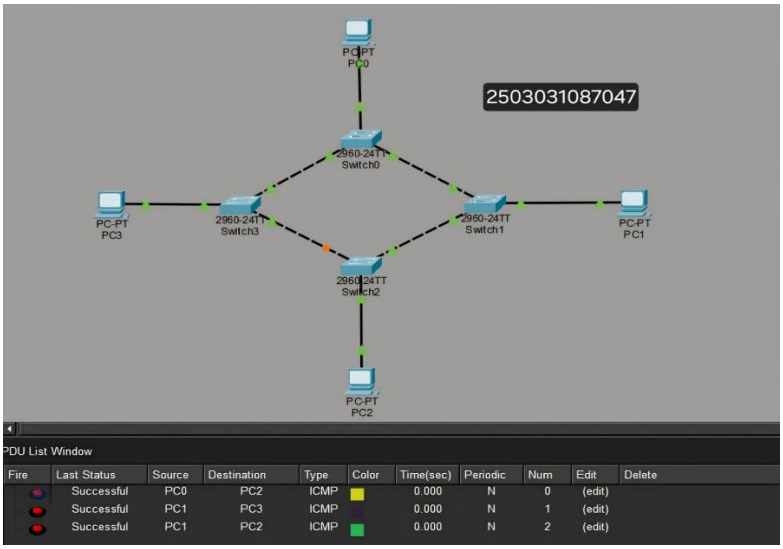

Figure 3: Ring topology showing circular connection of switches and end devices in Cisco Packet Tracer.

D. Mesh Topology

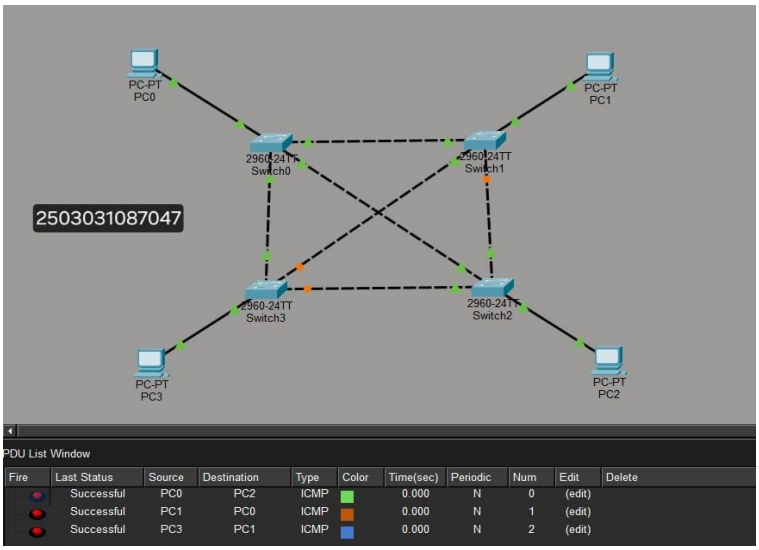

Figure 4: Mesh topology illustrating multiple redundant paths between switches for reliable communication in Cisco Packet Tracer.

E. Hybrid Topology

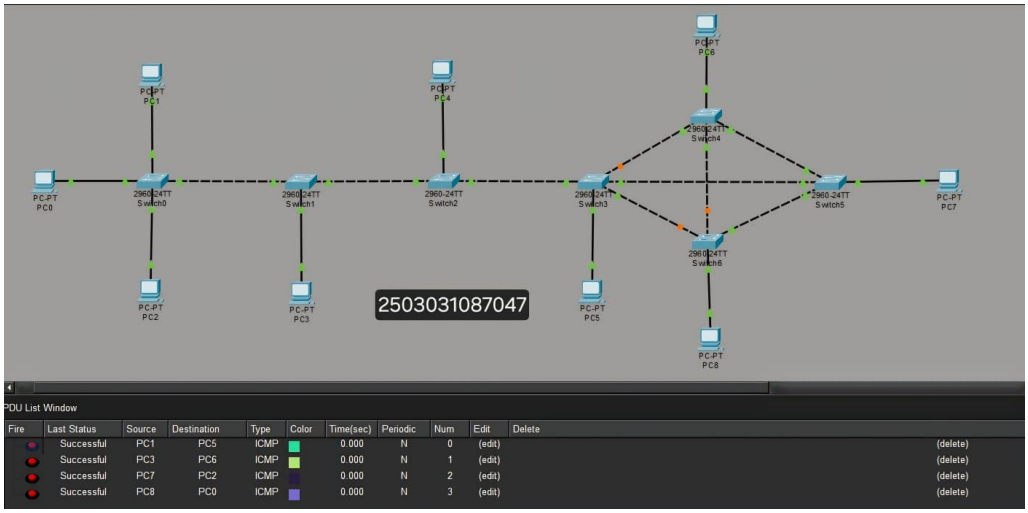

Figure 5: Hybrid topology combining bus and mesh structures designed in Cisco Packet Tracer.

➢ OBSERVATION

- Star topology is easy to manage and troubleshoot.
- Bus topology is simple but failure of backbone affects the entire network.
- Ring topology provides equal access but failure of one node can affect communication.
- Mesh topology offers high reliability but is costly.
- Hybrid topology provides flexibility and scalability.

➢ CONCLUSION

The experiment successfully demonstrates the design and behaviour of various network topologies. While **Bus** and **Ring** are largely legacy systems, **Star** remains the standard for local networks due to its simplicity. **Mesh** is vital for high-availability environments like WANs, and **Hybrid** allows for the creation of large, complex, and scalable networks.

Practical-3

AIM: Study of HUB and Switch behaviour using cisco packet tracer.

➢ REQUIREMENTS

1. Any Computer or Laptop
2. Computer system with minimum 4 GB RAM
3. Cisco Packet Tracer software
4. Windows Operating System

➢ THEORY

A **Hub** and a **Switch** are networking devices used to connect multiple computers within a network, but their working behaviour is different.

- **Hub:**
  A hub is a simple networking device that works at the **physical layer** of the OSI model. It broadcasts data packets to all connected devices, which leads to unnecessary traffic and collisions.
- **Switch:**
  A switch operates at the **data link layer** of the OSI model. It forwards data only to the intended destination using **MAC addresses**, reducing traffic and improving network efficiency.

Cisco Packet Tracer helps in understanding the practical difference between hub and switch behaviour through simulation.

➢ PROCEDURE

A. Study of Hub Behaviour

1. Open **Cisco Packet Tracer**.
2. Create a new project by selecting **File → New**.
3. From **Network Devices**, select **Hub** and place it in the workspace.
4. Add multiple **PCs** from the **End Devices** section.
5. Connect all PCs to the hub using **Copper Straight-Through** cables.
6. Assign IP addresses to all PCs.
7. Use the **ping command** from one PC to another.
8. Observe that the data packet is broadcast to all connected devices.

B. Study of Switch Behaviour

9. Remove the hub and place a **Switch** in the workspace.
10. Connect the same PCs to the switch using straight-through cables.
11. Assign IP addresses to all PCs.
12. Send a ping request from one PC to another.
13. Observe that the data packet is forwarded only to the destination PC.

➢ OUTPUT

A. Hub Behaviour

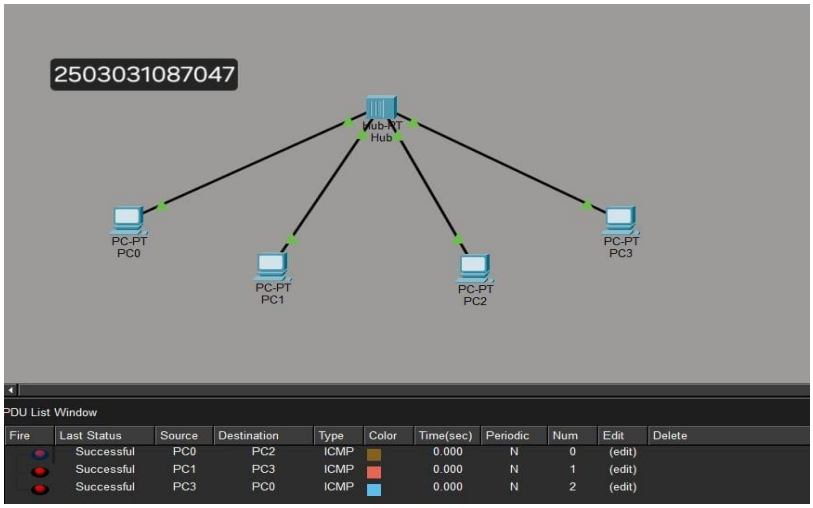

Figure 1: Hub behaviour showing broadcast communication in Cisco Packet Tracer.

B. Switch Behaviour

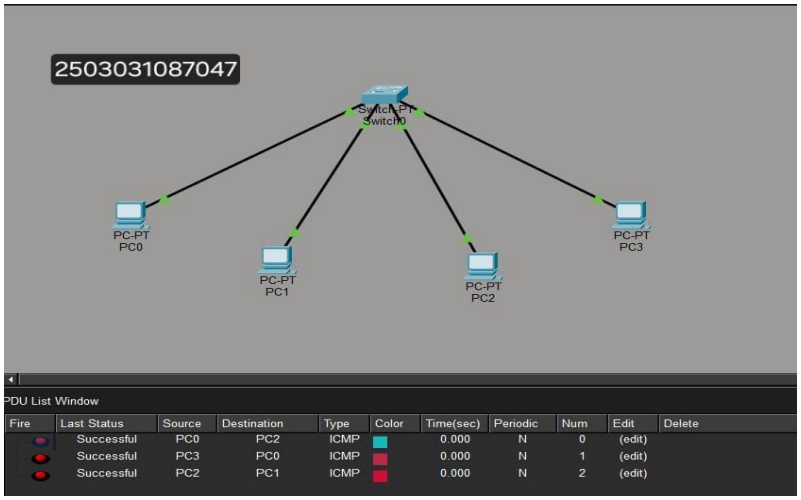

Figure 2: Switch behaviour showing efficient packet forwarding in Cisco Packet Tracer.

➢ OBSERVATION

- Hub sends data to all connected devices.
- Switch sends data only to the target device.
- Hub causes more network traffic and collisions.
- Switch improves network performance and security.

➢ CONCLUSION

Thus, the behaviour of hub and switch was successfully studied using Cisco Packet Tracer. It was observed that a hub broadcasts data to all devices, whereas a switch intelligently forwards data only to the intended destination. Hence, switches are more efficient, secure, and suitable for modern computer networks.