LAB 3:

SIMULATION OF NETWORK DEVICES USING CISCO PACKET TRACER

OBJECTIVE

- To familiarize with Cisco Packet Tracer by exploring its features and simulating devices such as hubs, switches, bridges, routers, and repeaters.
- To observe the movement of Protocol Data Units (PDUs) across the network to understand packet flow.
- To identify differences in data transmission between broadcast and unicast communication methods.
- To analyze how various network devices handle communication to compare their behavior and efficiency

THEORY

Cisco Packet Tracer

Cisco Packet Tracer is a network simulation tool that allows students to create network topologies and imitate modern computer networks. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface. It represents network hardware as software objects, allowing students to visualize the flow of data packets without the need for physical cabling or hardware.

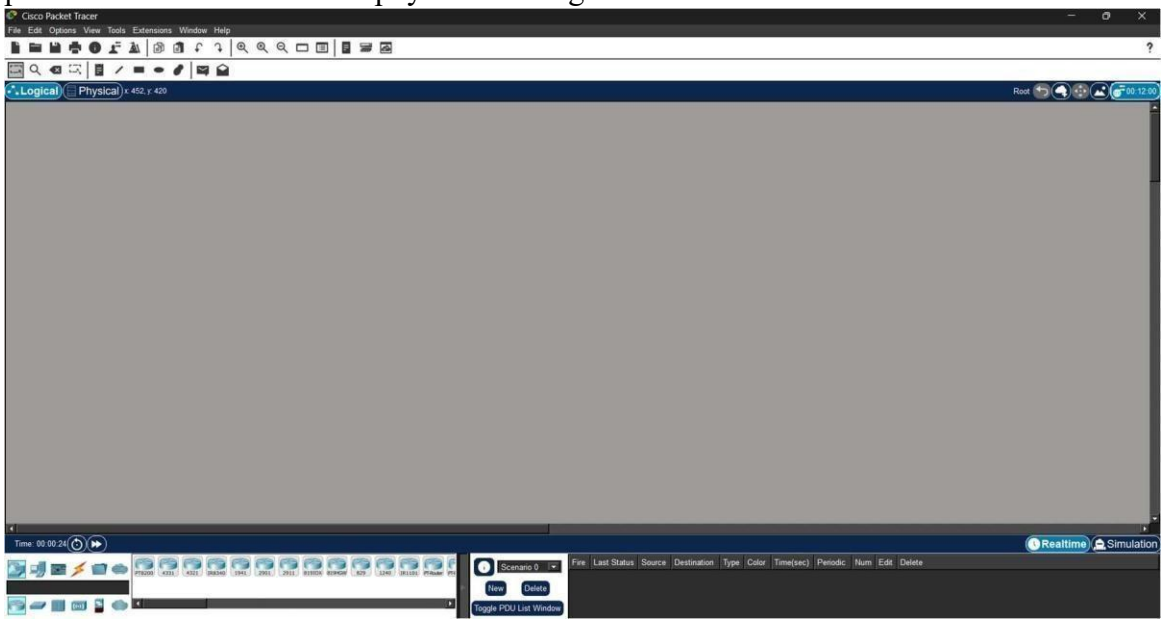


Fig: Cisco Packet Tracker

1. Hub

A Hub is a physical layer (Layer 1) networking device that is used to connect multiple devices in a network. It acts as a multiport repeater. It is considered a non-intelligent device because it does not store any MAC addresses.

Fig: Hub

Operation: When a hub receives a data packet (frame) on one port, it broadcasts that packet to all other ports irrespective of the destination address.

Application: Used in small networks where high traffic and security are not primary concerns.

2. Switch

A Switch is a data link layer (Layer 2) device that connects devices on a computer network by using packet switching to receive, process, and forward data to the destination device. Unlike a hub, a switch is an intelligent device.

Fig : Switch

Operation: It uses a MAC address table to determine which port the data needs to be sent to. It performs unicast transmission after the initial learning phase.

Application: Used in enterprise networks to manage traffic efficiency and reduce collisions.

3. Router

A Router is a network layer (Layer 3) device that connects two or more different networks (e.g., connecting a LAN to a WAN or two different subnets). It uses IP addresses to make routing decisions.

Fig: Router

Operation: It maintains a routing table to determine the best path for a packet to reach its destination. It acts as a gateway between networks.

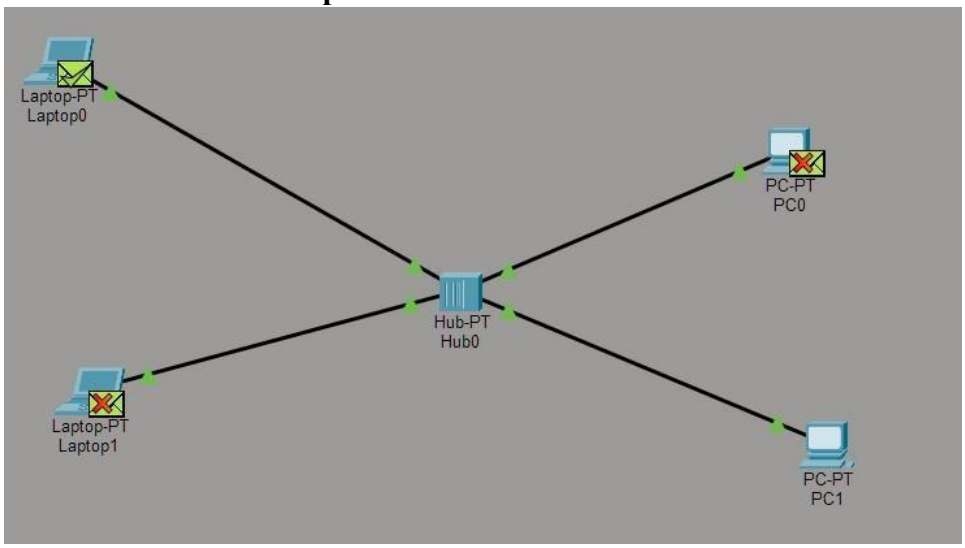
Application: Used to connect home or office networks to the internet and to route traffic between distinct subnets.

Gateway

A Gateway is a network node that serves as an access point to another network. It often involves a router that is configured to pass traffic from a local subnet to outside networks.

Operation: It translates protocols if necessary and routes data directed to IP addresses outside the local network range.

OBSERVATION 1. **Hub implementation**

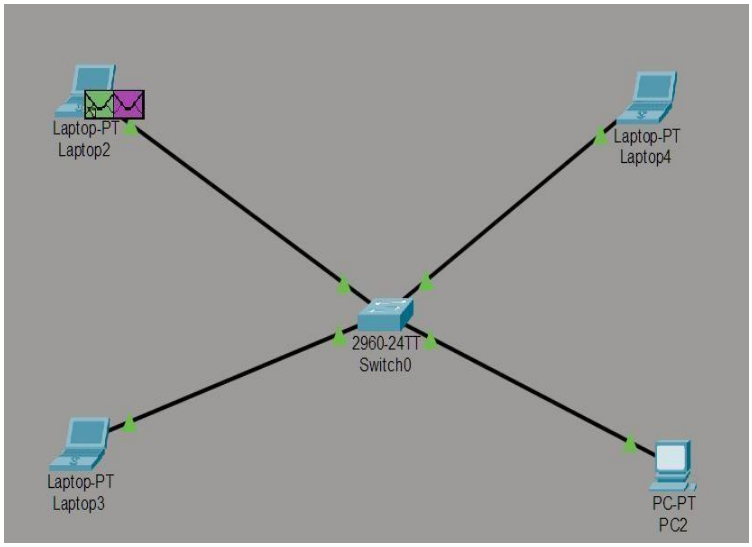


Configuration Table

Device Name	Interface	IP Address	Subnet Mask
PC0	FastEthernet0	192.168.1.1	255.255.255.0
PC1	FastEthernet0	192.168.1.2	255.255.255.0
LAPTOP-PT Laptop0	FastEthernet0	192.168.1.3	255.255.255.0
LAPTOP-PT Laptop1	FastEthernet0	192.168.1.4	255.255.255.0

In this simulation, a Star topology was created using a Hub. PC0 is connected to the HubPT, likewise PC1, PC2, PC3, and PC4 are connected to the remaining ports of the Hub using Copper Straight-Through cables. When a PDU was sent from PC2 to PC0, the Hub received the packet and broadcasted it to all connected devices (PC4, PC3, PC2, PC1, and PC0). The intended recipient accepted it, while others rejected it.

2. **Switch implementation**

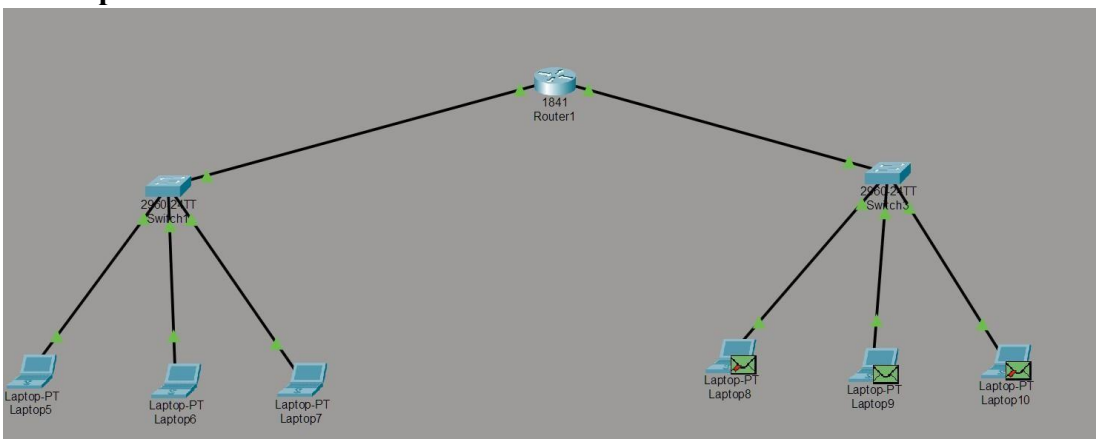


Configuration Table

Device Name	Interface	IP Address	Subnet Mask
Laptop3	FastEthernet0	10.10.10.1	255.0.0.0
PC2	FastEthernet0	10.10.10.2	255.0.0.0
Laptop4 (Sushant)	FastEthernet0	10.10.10.3	255.0.0.0
LAPTOP2	FastEthernet0	10.10.10.4	255.0.0.0

A Switch was used to connect multiple devices. Laptop0, Laptop1, PC43. and PC4 are connected to switch ports. Unlike the Hub, once the Switch learned the MAC addresses, the message flow was observed to be unicast. The packet was sent directly from the source to the destination without disturbing other ports.

4. Router implementation



Configuration Table

Device Name	Interface	IP Address	Subnet Mask	Gateway
Router0	Gig0/0 (LAN 1)	192.168.1.4	255.255.255.0	N/A
Router0	Gig0/1 (LAN 2)	10.10.10.4	255.255.255.0	N/A
Laptop-LAN1	FastEthernet0	192.168.1.1 – 192.168.1.3	255.255.255.0	192.168.1.4
Laptop-LAN2	FastEthernet0	10.10.10.1 – 192.168.1.3	255.255.255.0	10.10.10.4

A Router was configured to connect two different Local Area Networks (LAN 1: 192.168.1.x and LAN 2: 10.10.10.x). The Switch for LAN 1 is connected to Router interface GigabitEthernet0/0, likewise the Switch for LAN 2 is connected to Router interface GigabitEthernet0/1. The Router acted as a Gateway, allowing packets to travel from one network ID to another.

DISCUSSION

In the lab, we explored the practical aspects of network device configuration and traffic management to gain a deeper understanding of how different devices function within a network. Using Cisco Packet Tracer, we successfully configured devices such as routers, hubs, and switches. To verify connectivity, Protocol Data Units (PDUs) were transmitted across the network, allowing us to observe how data flows between devices and how each device handles traffic.

CONCLUSION

In the lab session was successfully completed with practical implementation of hubs, switches, and routers. Through configuration and connectivity testing, we gained valuable insights into how each device operates within a network and contributes to overall traffic management. This hands-on experience strengthened our understanding of fundamental networking concepts and enhanced our ability to design and troubleshoot network topologies effectively.