LAB 3: STUDY AND SIMULATON OF BASIC NETWORKING DEVICE USING CISCO PACKET TRACER

OBJECTIVE:
- To simulate different network devices using Cisco Packet Tracer.
- To understand the function and working of basic networking devices**.**

THOERY:

1. Hub:

A hub is a basic networking device used to connect multiple computers in a network. It works at the Physical Layer of the OSI model. When a hub receives data from one device, it broadcasts the data to all other connected devices without checking the destination. Because of this, unnecessary traffic is created in the network and performance is reduced. Hubs are simple and inexpensive but are rarely used in modern networks.

- Works at Data Link Layer (Layer 2)
- Uses MAC address table
- Reduces network traffic

2. Switch

A switch is an intelligent networking device used in local area networks. It works at the Data Link Layer of the OSI model and uses MAC addresses to forward data. Unlike a hub, a switch sends data only to the destination device, which reduces network traffic and improves speed. Switches are widely used in modern networks due to their efficiency and better performance.

- Works at Layer 2
- Filters traffic using MAC address
- Connects two LAN segments

3. Router

A router is a networking device that connects two or more different networks. It works at the Network Layer of the OSI model and routes data using IP addresses. Routers determine the best path for data using routing tables. They are commonly used to connect local networks to the internet and provide secure and efficient data transmission.
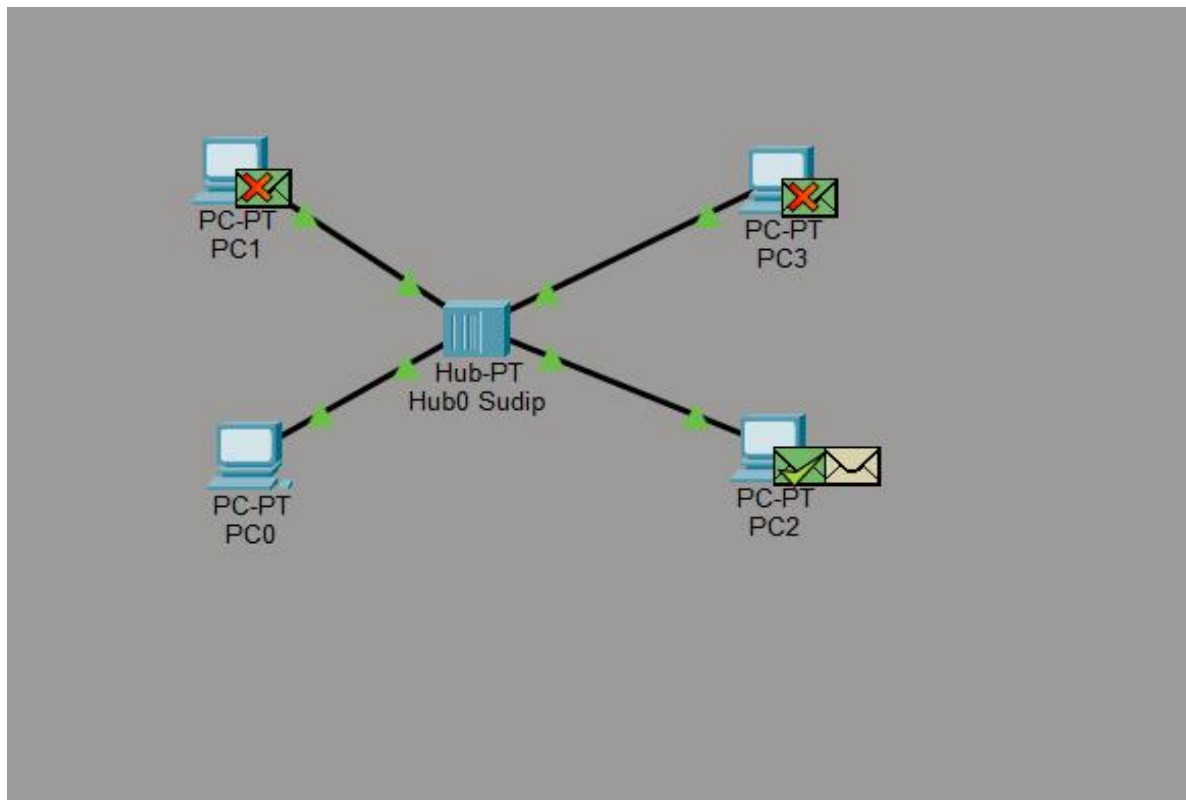
- Works at Network Layer (Layer 3)
- Uses routing table
- Connects LAN to WAN

PROCESS AND OUTPUT:
A.HUB:
Simulation Steps for hub

i. Drag a Hub from Network Devices

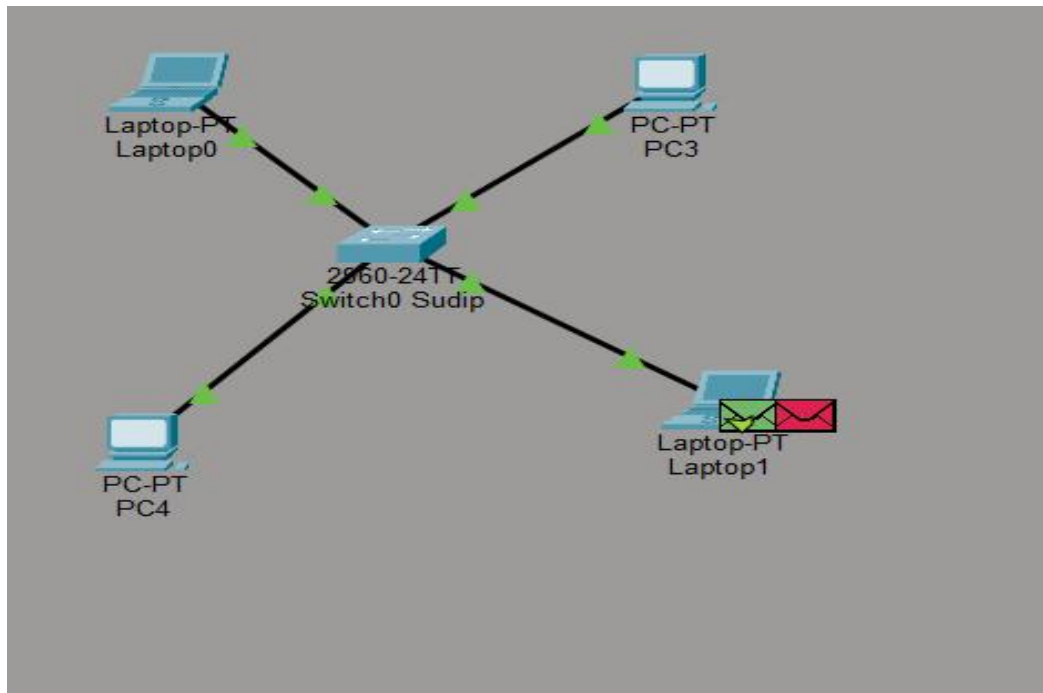ii. Connect multiple PCs using Copper Straight-Through cable

iii. Send data between PCs

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
PC2	FastEthernet0	192.168.1.3	255.255.255.0
PC3	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 and PC3 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 (PC3, PC2, PC1, and PC0). The intended recipient accepted it, while others rejected it.

B.SWITCH:

Simulation Steps for switch

i. Place a Switch

ii. Connect PCs to the switch

iii. Send data between PCs
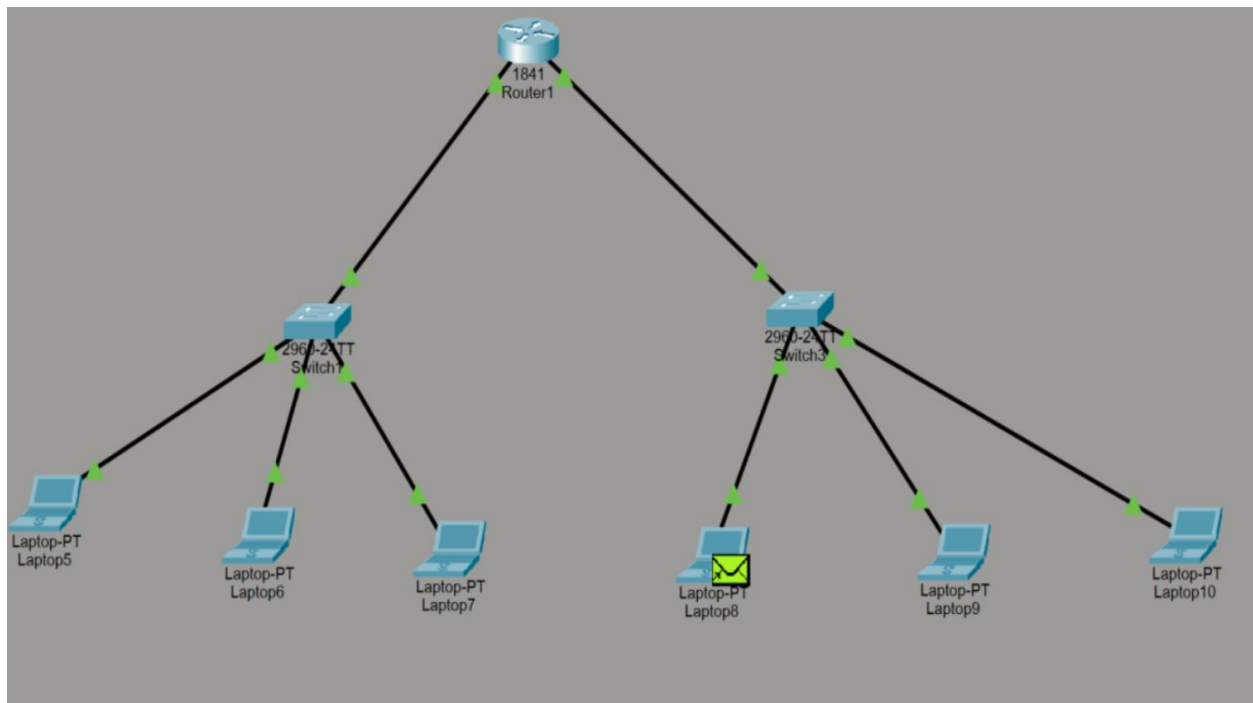
Configuration Table:

Device Name	Interface	IP Address	Subnet Mask
Laptop0	FastEthernet0	10.10.10.1	255.0.0.0
PC3	FastEthernet0	10.10.10.1	255.0.0.0
Laptop1	FastEthernet0	10.10.10.1	255.0.0.0
PC4	FastEthernet0	10.10.10.1	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.

C.ROUTER:
Simulation Steps for router
i. Place a Router

ii. Connect two different networks

iii. Assign IP addressesiv. Send data across networks

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.

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 – 10.10.1.3	255.255.255.0	10.10.10.4

DISCUSSION:

In this experiment, different basic networking devices such as hub, repeater, switch, bridge, and router were studied using Cisco Packet Tracer. The hub and repeater were found to work at the physical layer, where they simply forward or regenerate signals without checking the destination. This can cause unnecessary traffic in the network. The switch and bridge operate at the data link layer and use MAC addresses to send data only to the required device, which helps reduce network traffic and improves performance. The router works at the network layer and is used to connect different IP networks by using correct IP addressing and default gateway settings. Through this experiment, the working and importance of each networking device in data communication were clearly understood.

CONCLUSION:

This experiment provided a clear understanding of the working of basic networking devices such as hubs, switches, bridges, repeaters, and routers. It showed that hubs and repeaters are used to extend the network, switches and bridges control and manage data flow within a network, and routers connect different networks together. Overall, the experiment helped to understand the role of each device and how they operate at different layers of the OSI model in a simple and practical way.