LAB 3:

Simulation of network devices using cisco packet tracer

Objectives:

- To understand the basic concepts of computer networks through simulation.
- To study the working principles of network devices such as hub, switch, router.
- To observe data transmission and packet flow between different network devices.

Theory:

Cisco Packet Tracer is a robust network simulation tool that allows users to create, configure, and test virtual network topologies. It offers a digital environment for working with devices such as routers and switches, removing the need for costly physical hardware. Widely used in education, it helps learners understand networking concepts, visualize how data moves across networks, and develop effective troubleshooting skills.
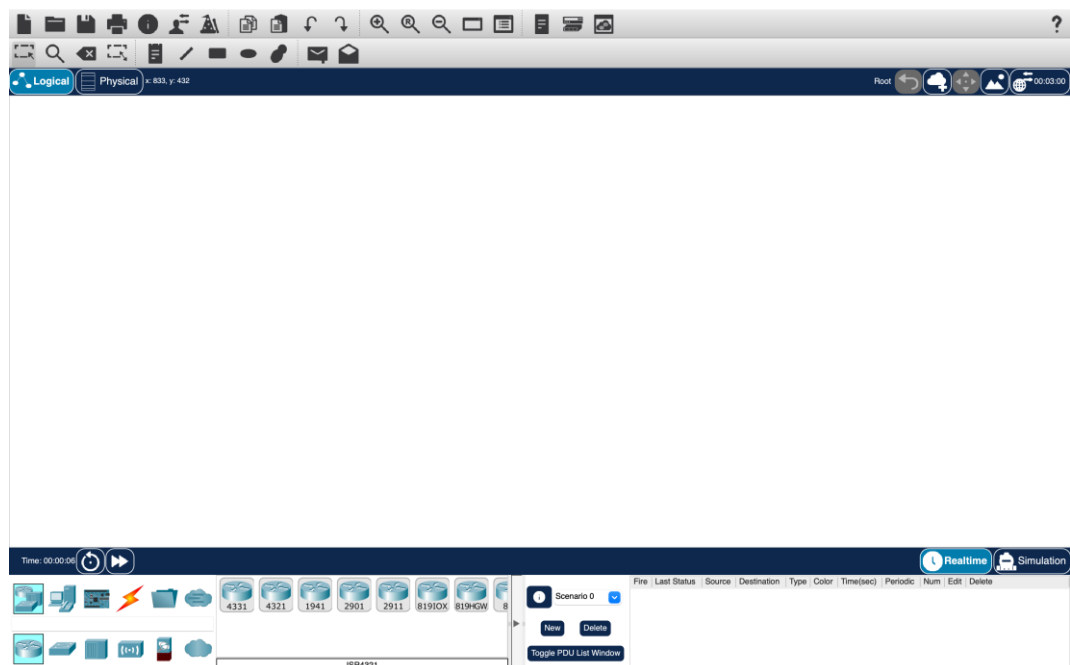
Hub:

A hub is a basic networking device used to connect multiple computers within a local network. It operates at the Physical Layer and sends incoming data packets to all connected ports without considering the intended recipient. This broadcasting, or "flooding," approach frequently causes data collisions and network congestion, which makes hubs far less efficient than modern switches.

Switch:

A switch is an advanced networking device that connects multiple devices within a network. Unlike a hub, it forwards data only to the specific destination device by using MAC addresses. This targeted data transmission minimizes unnecessary traffic and reduces collisions, making switches a preferred choice in local area networks (LANs) due to their improved speed and overall performance.
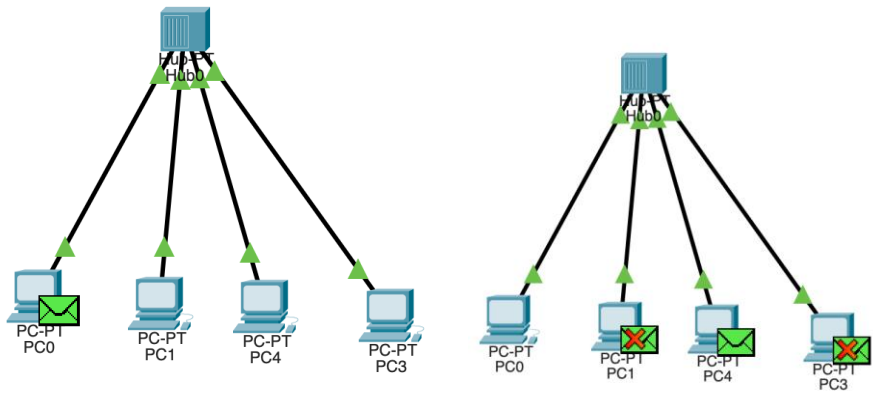
Router:

A router is a networking device that connects multiple networks and directs data packets between them using IP addresses. It determines the most efficient path for data transmission and enables local networks to access the internet. In addition, routers offer enhanced control and security for network communication
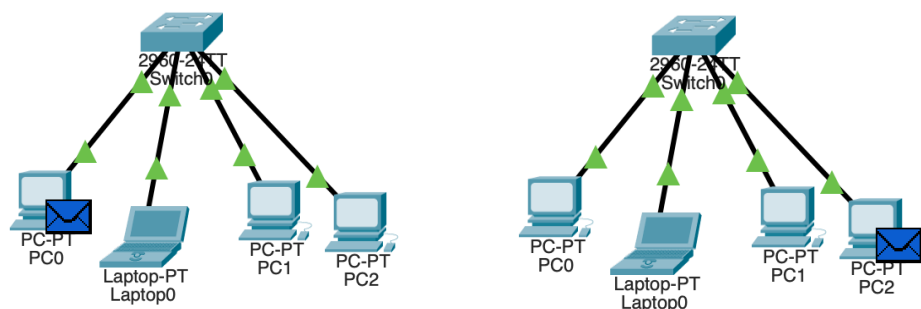

OBSERVATION:

Hub


Event List			
Vis.	Time(sec)	Last Device	At Device
	0.000	--	PC0
	0.001	PC0	Hub0
	0.002	Hub0	PC1
	0.002	Hub0	PC4
	0.002	Hub0	PC3
	0.003	PC4	Hub0
👁	0.004	Hub0	PC0
👁	0.004	Hub0	PC1
👁	0.004	Hub0	PC3

During the simulation, the hub connected multiple devices within a single network. When data was sent from one device, the hub broadcasted the data to all connected devices regardless of the destination. This resulted in unnecessary traffic and increased chances of data collisions, clearly demonstrating why hubs are rarely used in modern network designs.
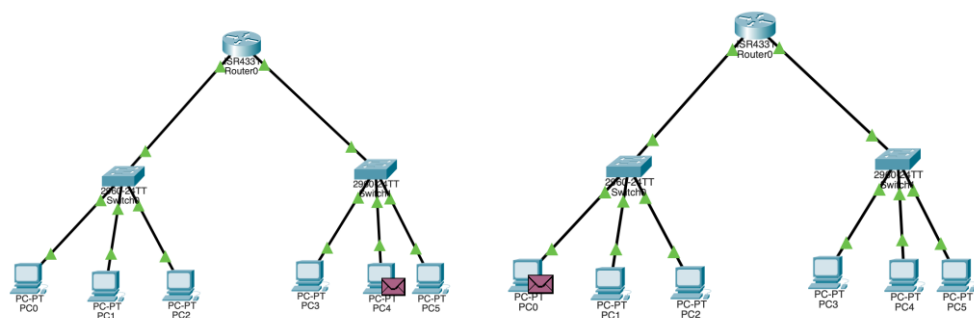
Switch

Event List			
Vis.	Time(sec)	Last Device	At Device
	0.000	--	PC0
	0.001	PC0	Switch0
	0.002	Switch0	PC2
	0.003	PC2	Switch0
	0.004	Switch0	PC0

The switch demonstrated significantly better performance than the hub. Data packets were forwarded only to the intended destination device, reducing network traffic and minimizing collisions. The use of MAC address-based forwarding made communication faster, more efficient, and reliable.

Router

Event List

Vis.	Time(sec)	Last Device	At Device
	0.000	--	PC0
	0.001	PC0	Switch0
	0.002	Switch0	Router0
	0.003	Router0	Switch1
👁	0.004	Switch1	PC4

The router successfully enabled communication between different networks by routing data packets using IP addresses. It selected appropriate paths for data transmission, allowing devices from separate networks to communicate effectively. This highlighted the router's essential role in inter-network communication and internet connectivity.

Discussion and Conclusion:

This laboratory exercise effectively demonstrated the practical functioning of key networking devices using Cisco Packet Tracer. The simulations provided a controlled and risk-free environment to observe how hubs, switches, and routers handle data transmission. The results emphasized the importance of selecting appropriate networking devices based on performance, efficiency, and network requirements. Overall, this experiment successfully bridged theoretical concepts with practical implementation, enhancing understanding of network design and configuration principles.