Report No: 01

Experiment Name: Implementation of different network topologies in Cisco Packet Tracer.

(Star, Ring and Mesh Topologies)

Objectives:

This experiment involves designing and simulating different types of network topologies using Cisco Packet Tracer. Topologies define how devices like computers, laptops, switches, and routers are arranged and connected in a network. Each topology type has its own structure, performance, cost, and fault tolerance. Cisco Packet Tracer allows visualization of network behavior and data flow. Understanding these topologies is crucial for efficient network planning and management.

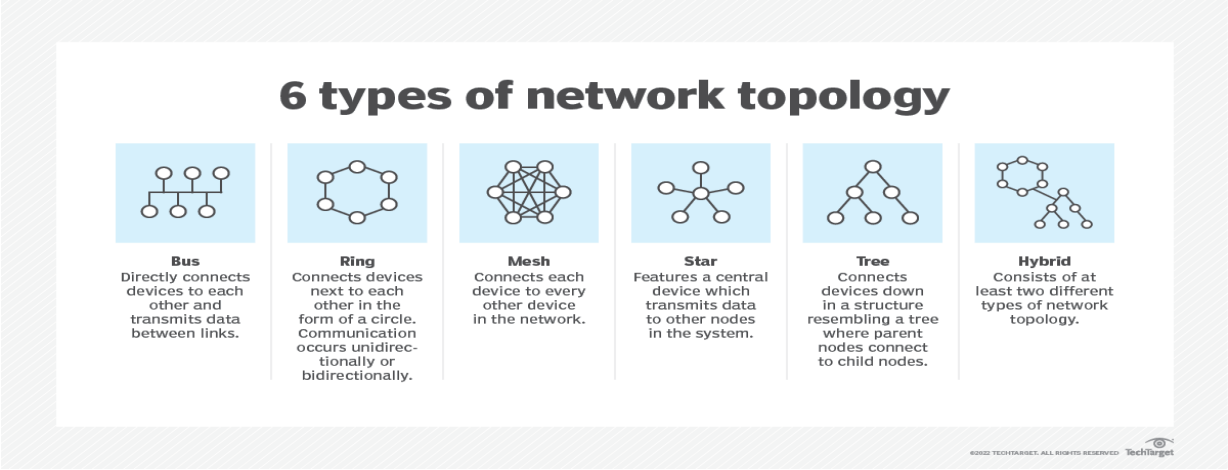
- To understand the structure of different network topologies (star, ring, mesh).
- To implement each topology using Cisco Packet Tracer.
- To assign IP addresses and configure basic connectivity.
- To verify successful communication between devices.
- To compare the advantages and limitations of each topology.

Components:

- Software: Cisco Packet Tracer.
- Devices: Hub, Switch, PC, Laptop.
- Wires:
    - Ethernet Cables: Straight-Through: To connect PCs to switches or routers**.**
    - Ethernet Cables (Copper Crossover): To connect similar devices, like PC to PC or router to router.

Theory:

A network topology is the physical and logical arrangement of nodes and connections in a network. Nodes usually include switches, routers and software with switch and router features. Network topologies are often represented as graphs showing node connections. There are many types of topology in computer network:



Star Topology:

In a star topology, all network devices are connected individually to a central device such as a switch or hub. This central node manages and controls all data transmission across the network. The structure allows for easy management and troubleshooting, as each device has its own dedicated connection. One of the main advantages is that failure in a single device does not impact the rest of the network. However, if the central hub or switch fails, the entire network is disrupted. Star topology is commonly used in home, school, and office networks due to its reliability and performance.

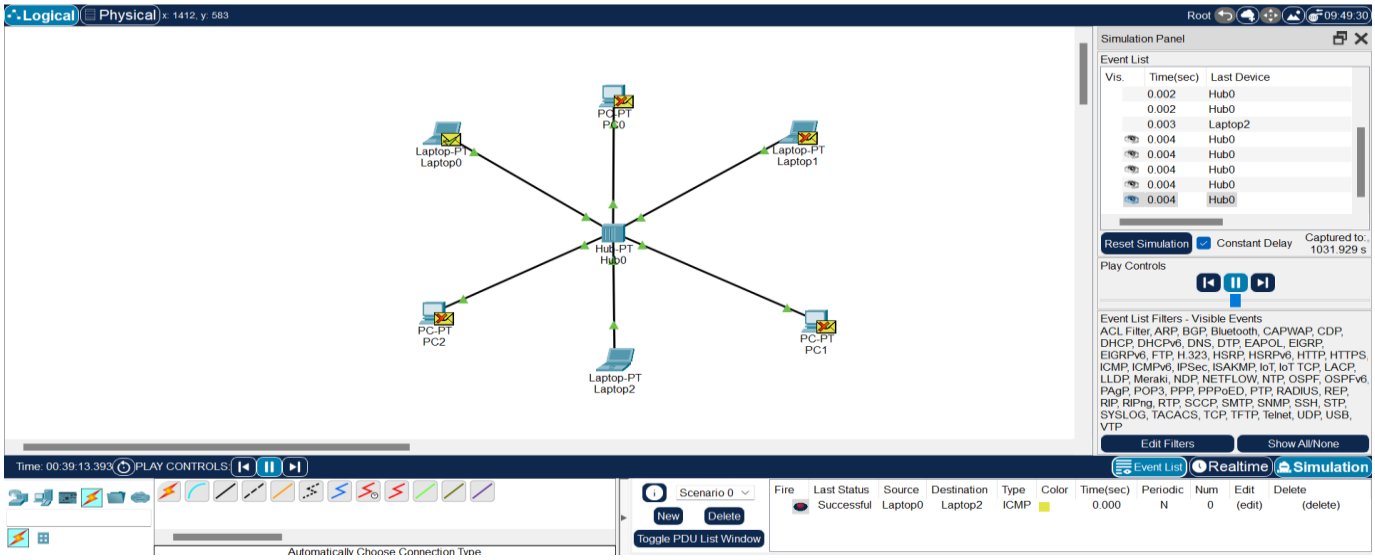


Figure Name: Implementation of Star Topology.

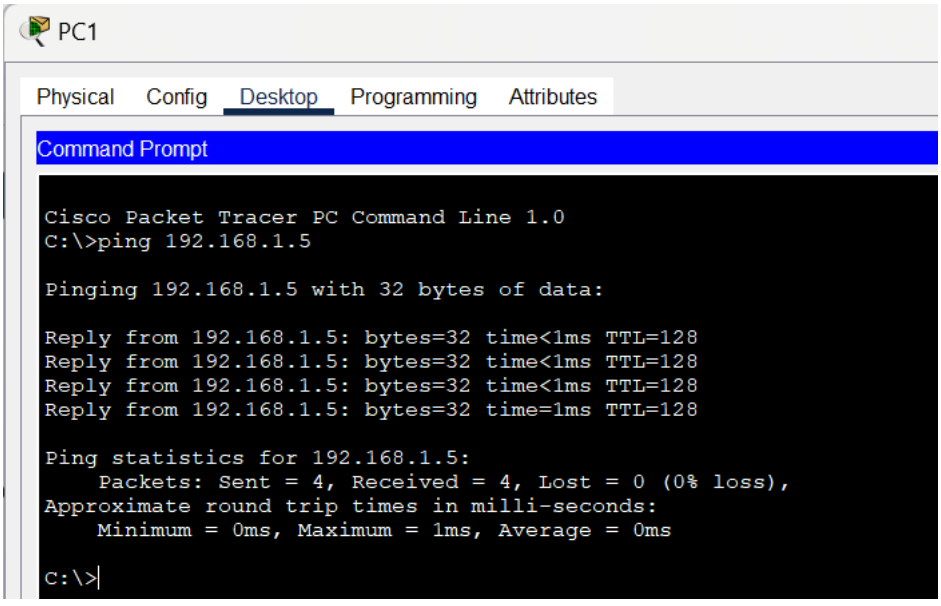


Figure Name: Ping command of Star Topology.

Ring Topology:

In a ring topology, each device is connected to exactly two other devices, forming a circular or ring-like structure. Data travels in one direction (or sometimes both, in a dual ring) through each device until it reaches its destination. This setup reduces the chance of data collisions and ensures a predictable path for data transmission. However, if any single device or connection in the ring fails, it can disrupt the entire network unless there's a built-in redundancy. Ring topology is less common today but was widely used in earlier networking systems like Token Ring.

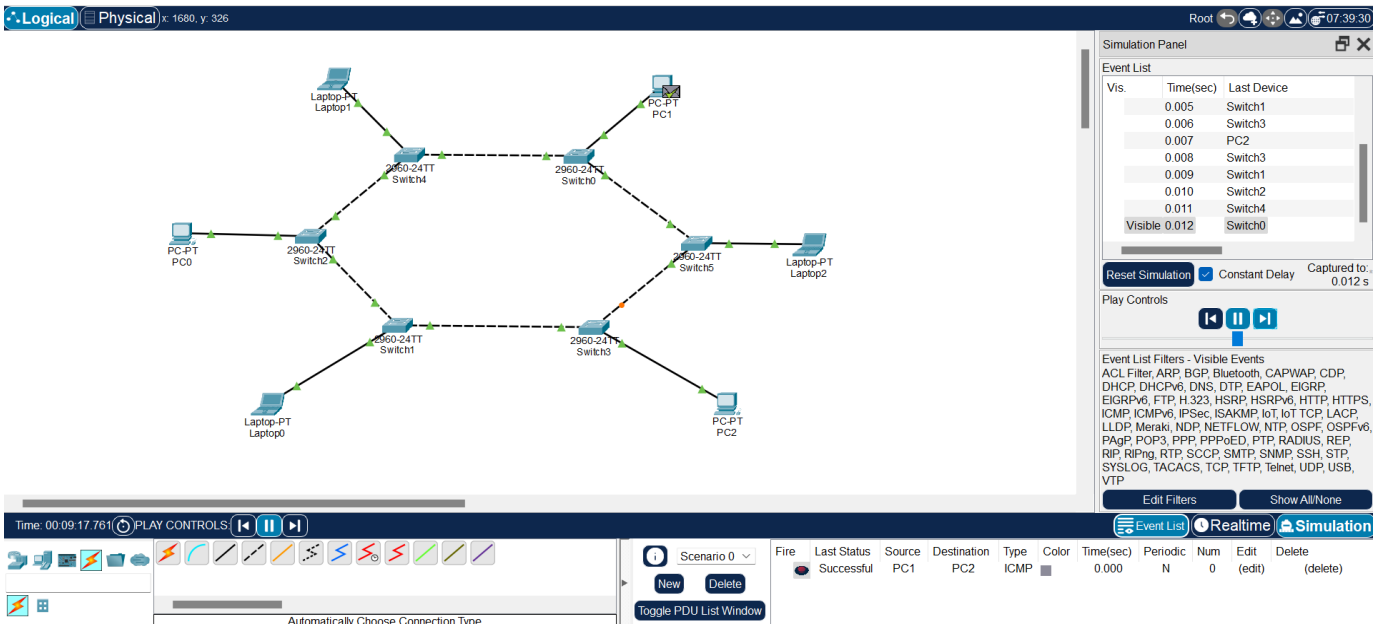


Figure Name: Implementation of Ring Topology.

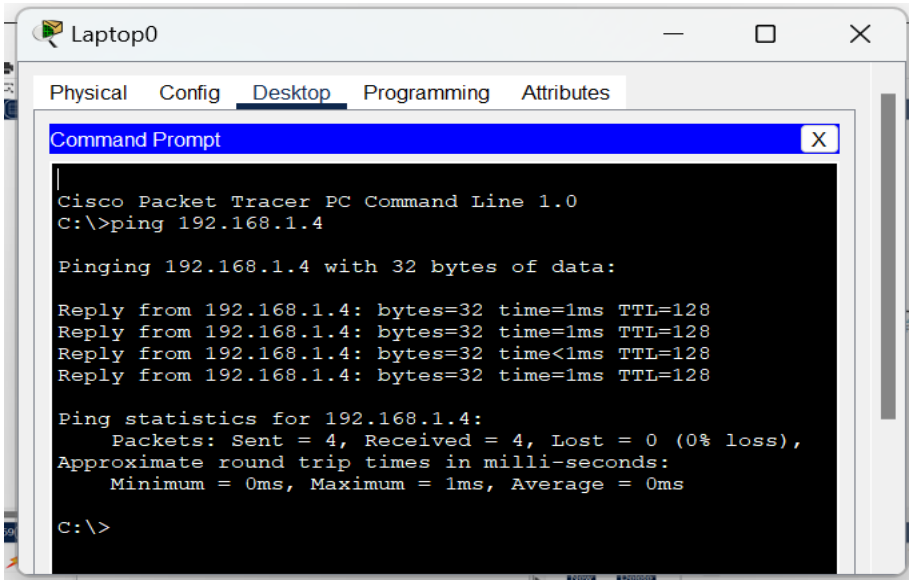


Figure Name: Ping command of Ring Topology.

Mesh Topology:

In a mesh topology, every device is directly connected to every other device in the network, creating a fully interconnected system. This provides high reliability and fault tolerance, as data can take multiple paths to reach its destination. If one link fails, traffic can be rerouted through alternative paths, ensuring continuous network operation. However, this topology requires a large number of connections, making it complex and costly to implement, especially as the network grows. Mesh topology is typically used in critical applications where reliability is paramount, such as in large data centers or high-security environments.

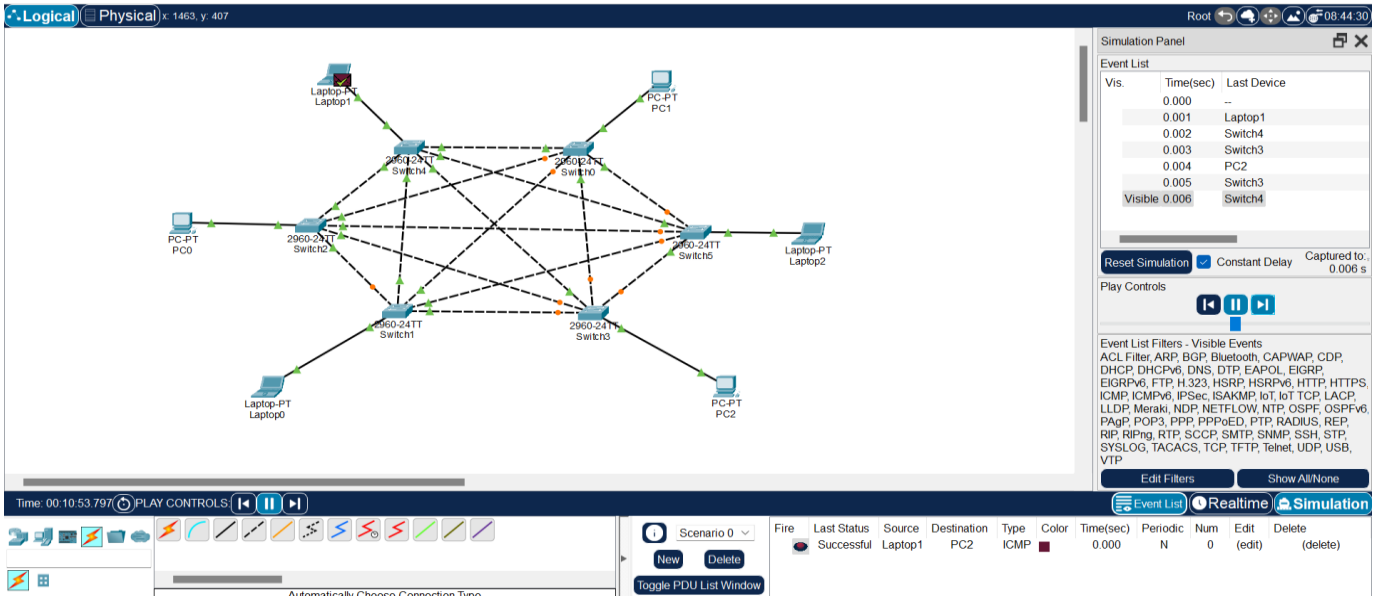


Figure Name: Implementation of Mesh Topology.

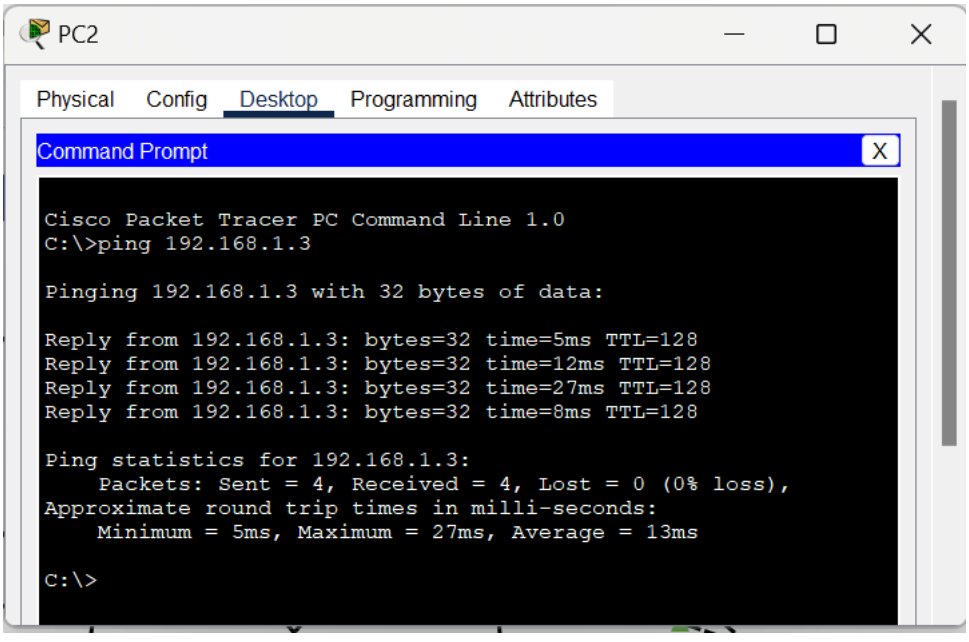


Figure Name: Ping command of Mesh Topology.

Description:

In this experiment, we implemented different network topologies using Cisco Packet Tracer. We created bus, star, ring, mesh, and hybrid topologies by connecting devices like PCs, switches, and routers. Each topology was tested by assigning IP addresses and using the ping command. The simulation helped us understand data flow and device connectivity. This improved our knowledge of network structure, design, and troubleshooting.

Conclusion:

In conclusion, the choice of network topology is pivotal in shaping the efficiency and resilience of a network. Each topology star, ring, and mesh offers distinct benefits and challenges, making it essential to align the network structure with specific organizational needs. While star topology excels in simplicity and centralized management, ring topology provides orderly data flow with minimal interference. On the other hand, mesh topology stands out for its robustness and fault tolerance, offering multiple pathways for data. Ultimately, selecting the right topology ensures not only optimal performance but also the long-term sustainability of a network, balancing reliability, cost, and scalability.