Network Topologies

Chapter Objectives

- *Explain the different topologies*
- *Explain the structure of various topologies*

Questions Time Limit – 5 Mins

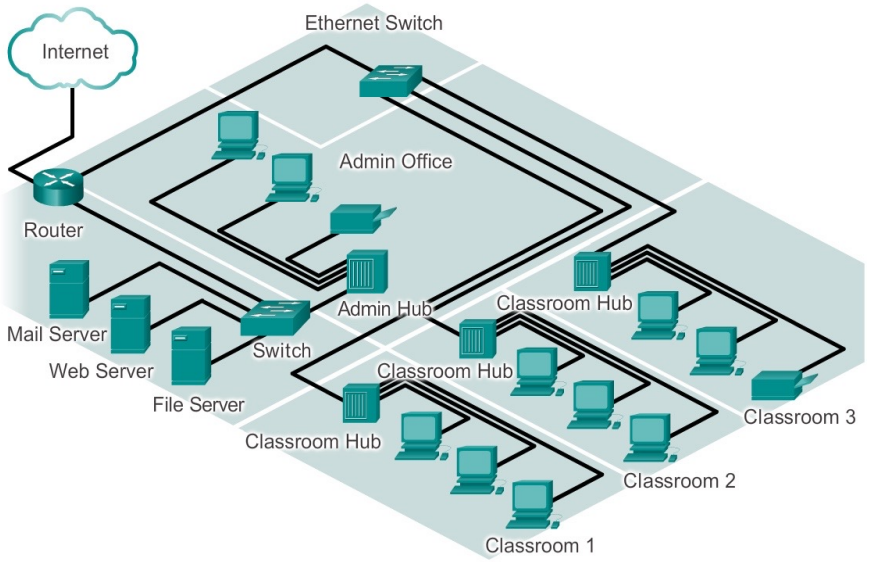
- What is a switch and explain the working of switch in a network?
- What is a gateway? Is firewall a gateway device?
- What is a router?

Topology

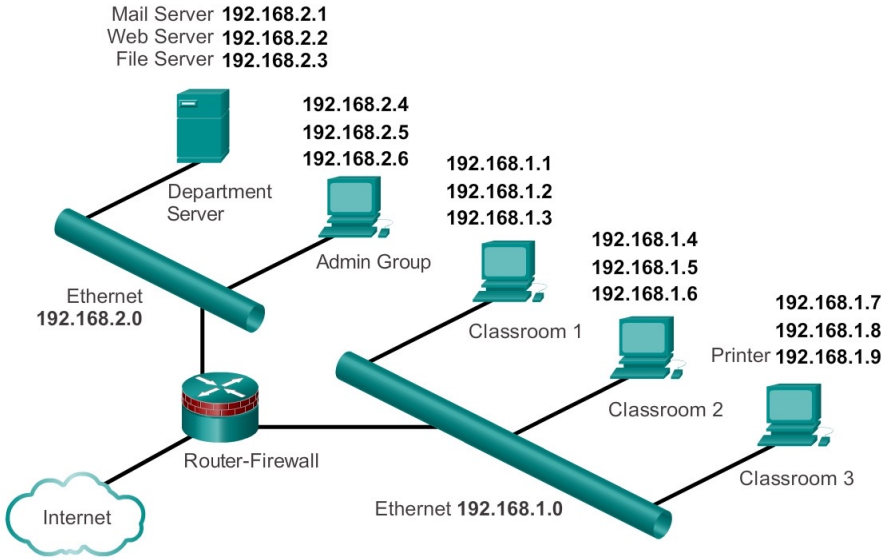
- Provides different configurations that are used to create a network
- Is a pattern of network devices and describes the way in which these devices are connected.
- Topologies can be physical or logical.
- Physical topology refers to the actual physical structure of the network, while a logical topology determines the way in which the data actually passes through the network from one device to other.

Topology Diagrams

Physical Topology



Logical Topology

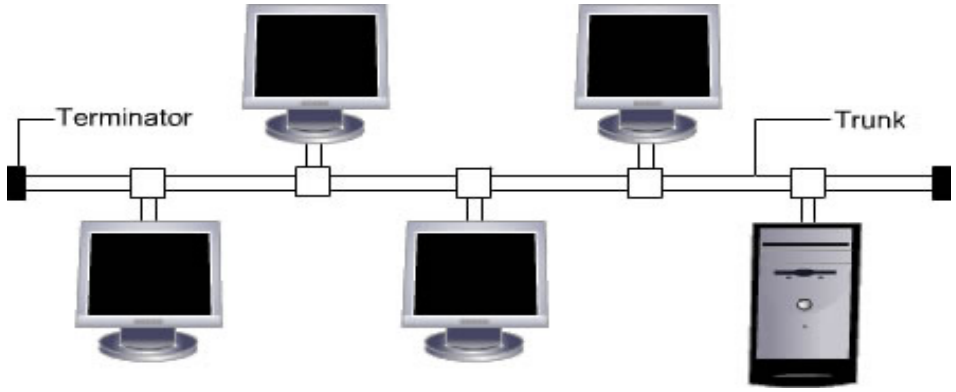


Types of Topologies

- Bus
- Star
- Ring
- Mesh
- Tree
- Hybrid

Bus topology - I

- All devices are connected to a common cable called backbone/trunk
- Operates in daisy chain fashion
- Medium is shared that’s why creates collision

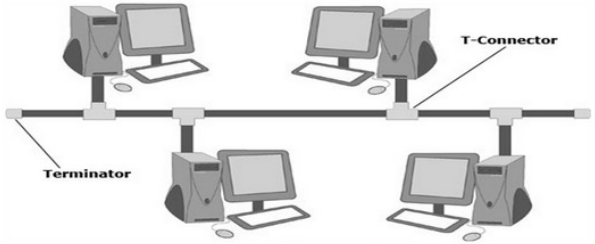


Question Time Limit – 3 Mins

- List the different types of topology.

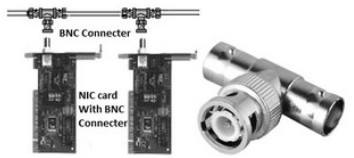
Bus topology - II

- Server is at one end and devices are at different positions
- 50 ohm terminators are used
- Devices are not responsible for data transmission
- 10BASE5
- 10BASE2



Bus Topology

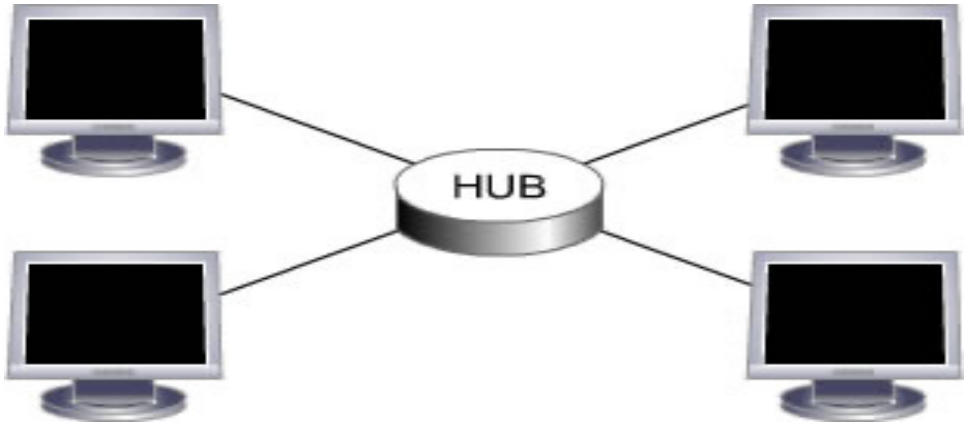
Terminator



T Connecter

Star Topology - I

- Each device is connected to a central device called hub through cable
- Data passes through hub before reaching destination

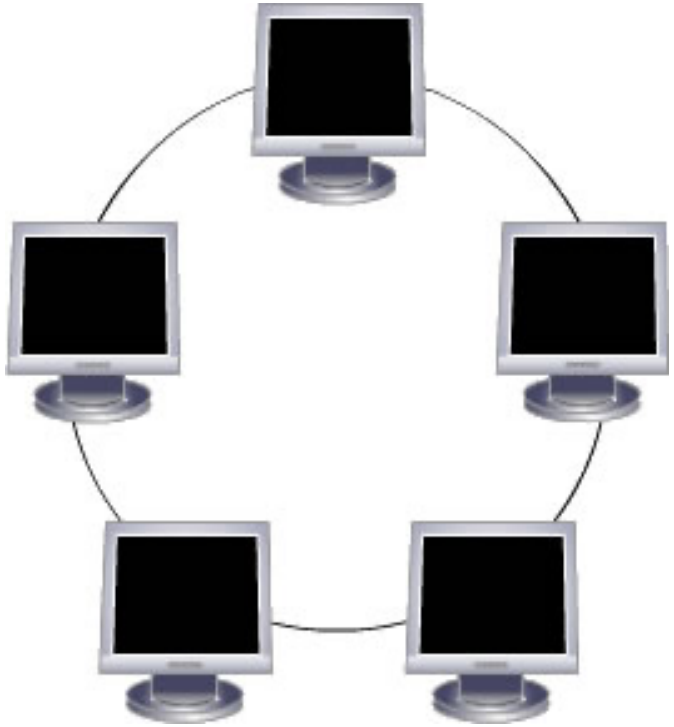


Star Topology - II

- Advantages:
  - Easy to install, configure, manage and expand
  - Centralized management
  - Addition or removal of device does not affect the whole network
- Disadvantages:
  - Requires more cable
  - Failure of hub affects entire network
  - More Expensive

Ring Topology - I

- Devices are connected in a closed loop
- All devices have equal access to media
- Device waits for its turn to transmit
- Most common type is Token Ring network

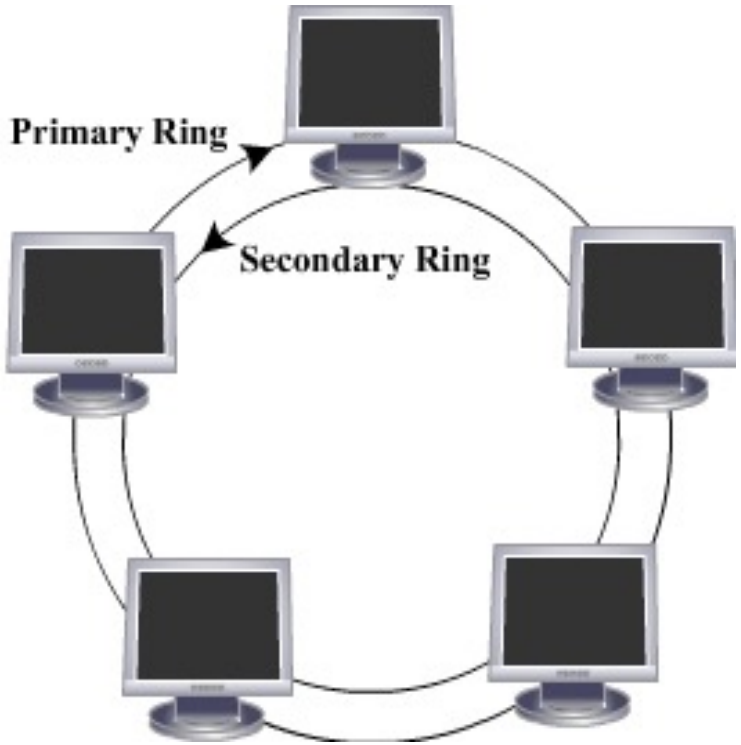


Ring Topology - II

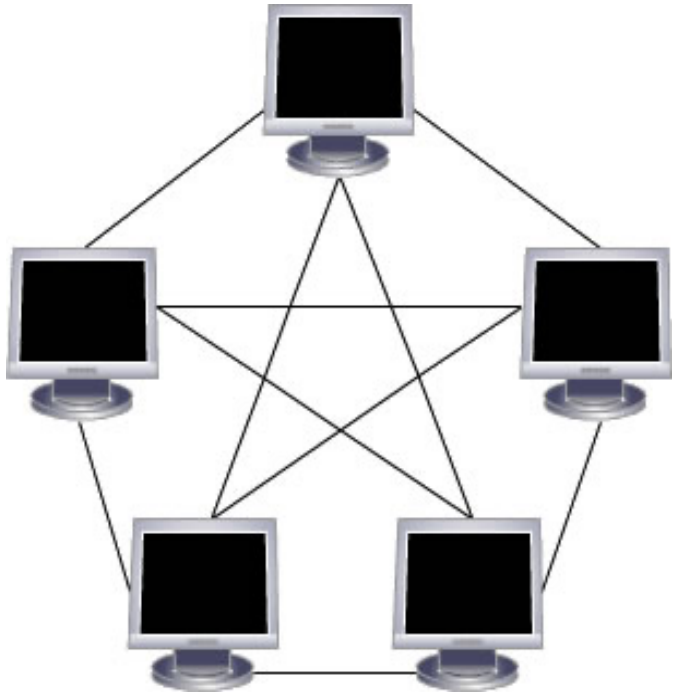
- Advantages:
  - Reliable and offers greater speed
  - No collisions
  - Handles large volume of traffic
- Disadvantages:
  - More cabling is required compared to bus topology
  - One faulty device affects the entire network
  - Addition of devices affect network

Dual Ring Topology

- Consists of two independent primary and secondary rings
- Secondary ring is redundant, used only when primary stops functioning

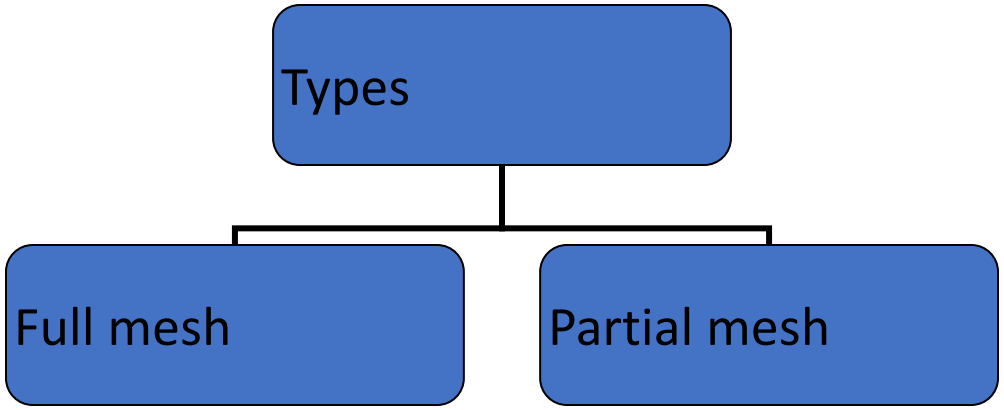


Mesh Topology - I



- Used in WANs to interconnect LANs
- Every device is connected to every other device
- Use routers to determine the best path of communication

Mesh Topology - II

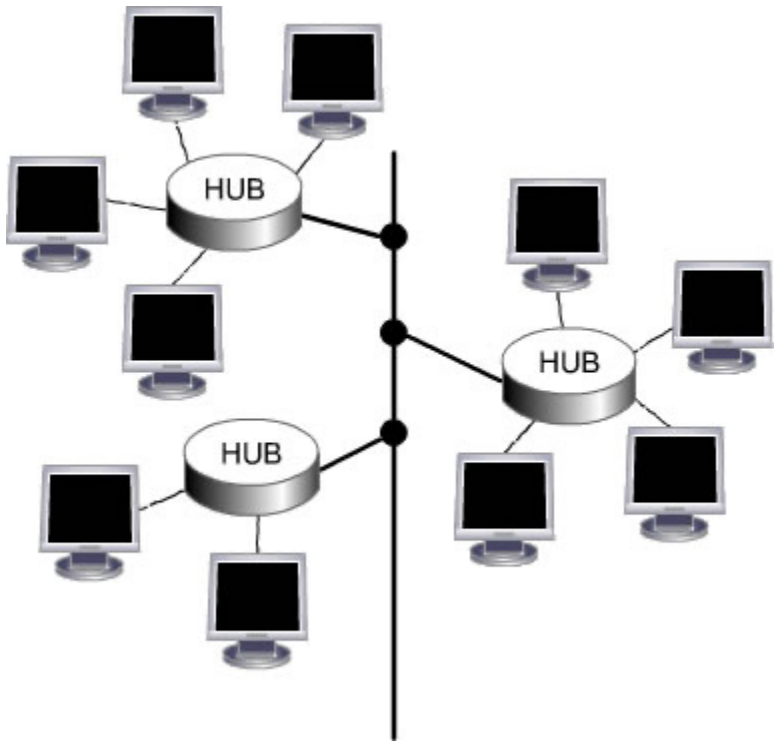


- Full mesh topology – All devices are connected to each other
- Partial mesh topology - Some devices are connected to only those with whom they exchange most of the data

Mesh Topology - III

- Advantages:
  - Improves fault tolerance
  - Failure of one link does not affect entire network
  - Centralized management is not required
- Disadvantages:
  - Difficult to install and manage
  - Each link from one device to other requires individual NIC
  - Expensive

Tree Topology - I



- Combines the characteristic of linear bus and star topology
- Devices are wired to root hub
- Twisted pair cable is commonly used
- Lowest level devices are smaller computers

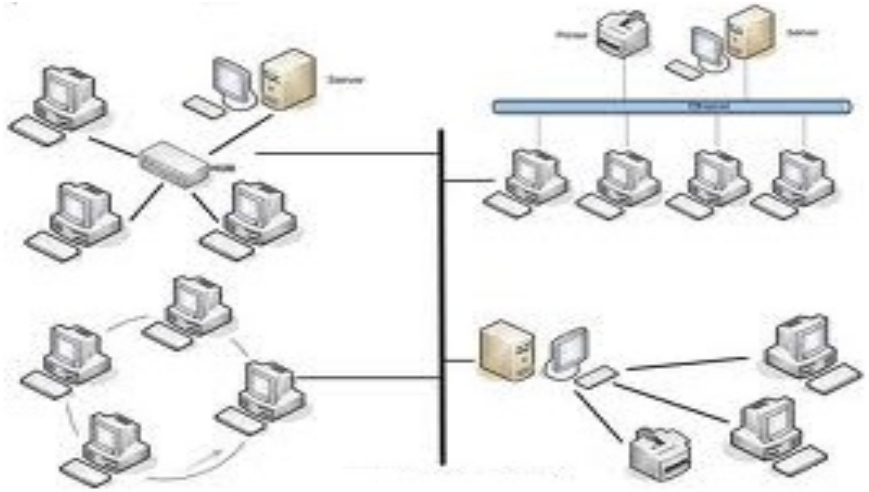
Question Time Limit – 3 Mins

- Explain the difference between ring and mesh topology.

Tree Topology - II

- Advantages:
  - Easy to expand the network
  - Point-to-point wiring for each device
  - Fault detection is easy
- Disadvantages:
  - Difficult to configure
  - If backbone breaks, entire network goes down
  - More expensive

Hybrid Topology - I



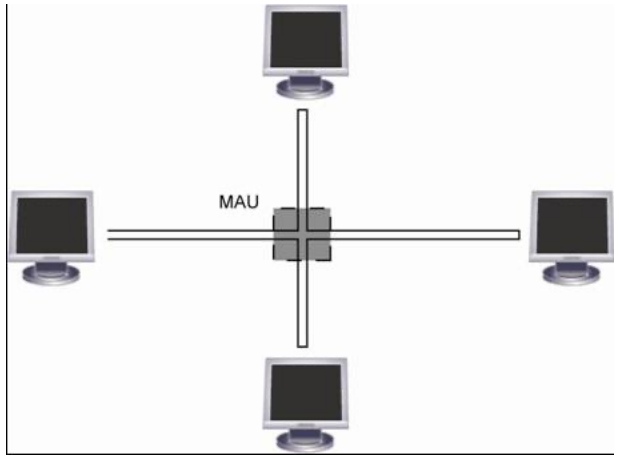
- Hybrid topology is a network where two or more topologies are connected in such a way that the resulting network does not have one of the standard forms.

Hybrid Topology - II

- Advantages:
  - Used for creating larger networks
  - Handles large volume of traffic
  - Fault detection is easy
- Disadvantages:
  - Installation and configuration is difficult
  - More expensive than other topologies
  - More cabling is required

Logical Vs Physical Configuration

- Physical topology - Defines how the systems are physically connected
- Logical topology - Defines how the systems communicate across the physical topologies



Summary - I

- Topology is a pattern of network devices and describes the way in which these devices are connected.
- Physical topology refers to the actual physical structure of the network, while a logical topology determines the way in which the data actually passes through the network from one device to other.
- Different types of topologies are Star, Bus, Ring, Mesh, Tree and Hybrid
- Bus topology connects each device to a single cable and at either end of the cable terminator is used to remove unsent data from the cable

mmary - II

- In star topology, multiple devices are connected to a central connection point known as hub or switch
- In a ring topology, data travels around the loop in one direction and passes through each device
- In a mesh topology, every device is connected to each and every node in the network with many redundant interconnections and at least two paths to and from every node
- Tree topology connects multiple star networks to other star networks using bus topology.
- Hybrid topology is a combination of two or more different topologies.