

Q.1) What is the propagation delay if the distance between the two points is 12000 km? Assume the propagation speed to be $2.4 * 10^8$ m/s in cable.

$$\begin{aligned}d_{\text{prop}} &= d/s \\ &= (12000 * 1000) / (2.4 * 10^8) = .05 \text{ sec} = 50 \text{ ms}\end{aligned}$$

Q.2) What are the propagation delay and the transmission delay for 2.5 KB message If the bandwidth of the network is 1 Gbps ? Assume that the distance between the sender and the receiver is 12000 km and that light travels at $2.4 * 10^8$ m/s.

$$\begin{aligned}d_{\text{prop}} &= d/s \\ &= (12000 * 1000) / (2.4 * 10^8) = .05 \text{ sec} = 50 \text{ ms}\end{aligned}$$

$$\begin{aligned}d_{\text{trans}} &= L/R \\ &= (2.5 * 10^3 * 8) / (1 * 10^9) = 0.02 \text{ ms}\end{aligned}$$

$$(A+B)' = A' \cdot B'$$

Q.3) What are the propagation delay and the transmission delay for a 5 MB message if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 12000 km and that light travels at 2.4×10^8 m/s.

$$\begin{aligned}d_{\text{prop}} &= d/s \\&= (12000 \times 1000) / (2.4 \times 10^8) = .05 \text{ sec} = 50 \text{ ms} \\d_{\text{trans}} &= L/R \\&= (5 \times 10^6 \times 8) / 10^6 \\&= 40 \text{ s}\end{aligned}$$

Q.4) If the message size is 1 kilobyte and bandwidth is 10 Mbps calculate transmission delay.

$$\begin{aligned}d_{\text{trans}} &= L/R \\&= (1 \times 10^3 \times 8) / (10 \times 10^6) \\&= 8 \times 10^{-4} \\&= 800 \times 10^{-6} = 800 \mu\text{s}\end{aligned}$$

$$(A+B)' = A'B'$$

What is Network Topology?

A computer network is a collection of two or more computers which are connected together to share information and resources.



Desktop PC



Desktop PC



Desktop PC



Desktop PC

$$(A+B)' = A' \cdot B'$$

Types Of Topology

Based on geographical area covered

Local Area Network (LAN)

Metropolitan Area Network (MAN)

Wide Area Network (WAN)

Based on Architecture

Bus Topology

Star Topology

Ring Topology

Tree Topology

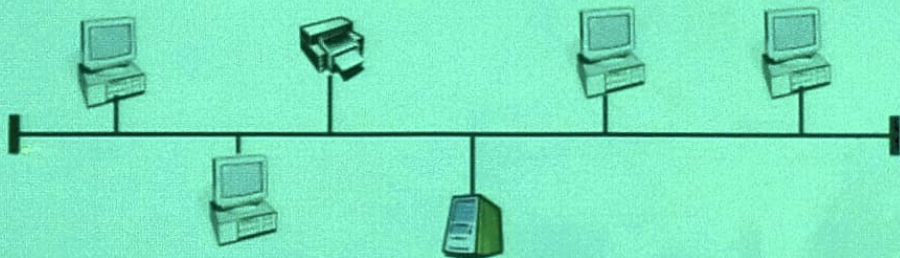
Mesh Topology

Hybrid Topology

$$(A+B)' = r' \cdot u''$$

Bus Topology

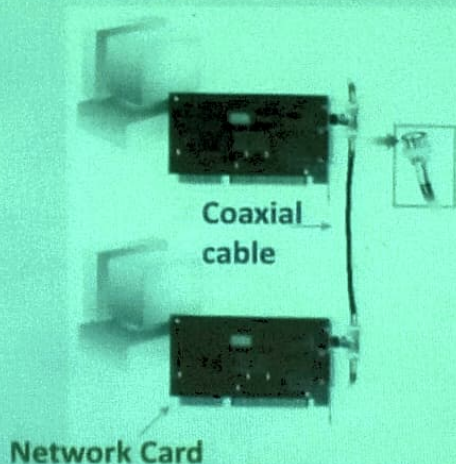
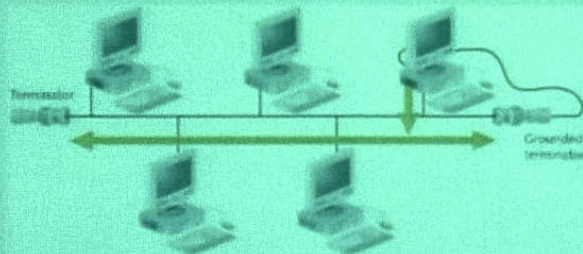
A **Bus topology** consists of a single cable—called a **bus**—connecting all nodes on a network without intervening connectivity devices



$$(A+B)' = A' \cdot B'$$

Advantages of Bus Topology

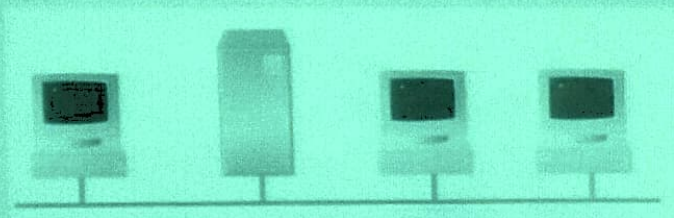
- Works well for small networks.
- Relatively inexpensive to implement.
- Easy to expand joining two cables together.
- Used in small network.



$$(A+B)' = A' \cdot B'$$

Disadvantages of Bus Topology

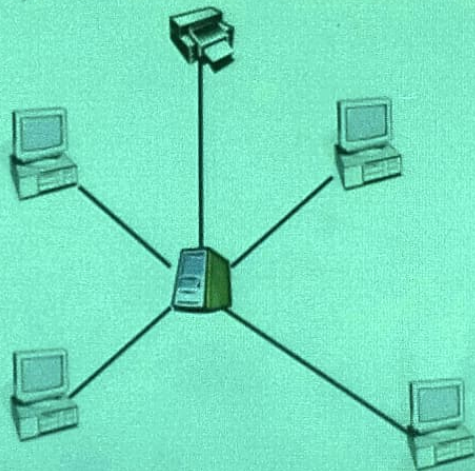
- Management costs can be high
- Cables fails then whole network fails.
- Cables has a limited length.



$$(A+B)' = A' \cdot B'$$

Star Topology

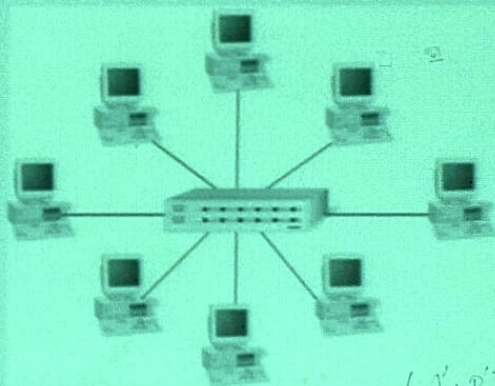
A star network is designed with each node (file server, workstation, peripheral) connected directly to a central network hub or server.



$$(A+B)' = A'B$$

Advantages of Star Topology

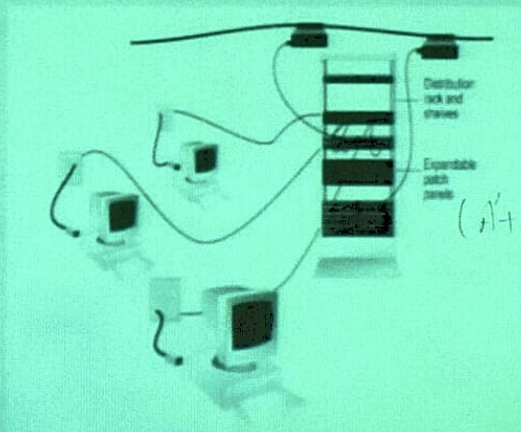
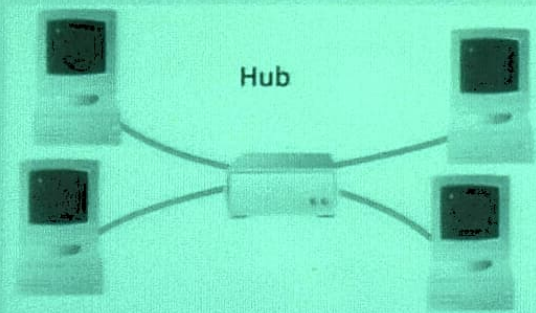
- Good option for modern networks
- Low startup costs
- Easy to manage
- Offers opportunities for expansion
- Most popular topology in use wide variety of equipment available



$$(A+B)' = A'B$$

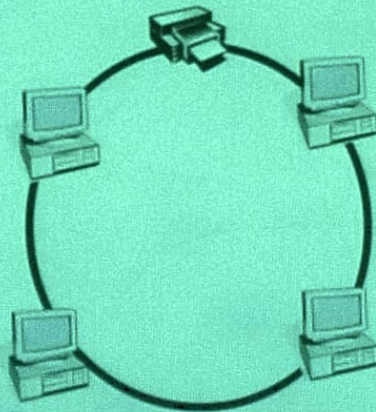
Disadvantages of Star Topology

- Hub is a single point of failure
- Requires more cable than the bus
- Cost of installation is high.



Ring topology

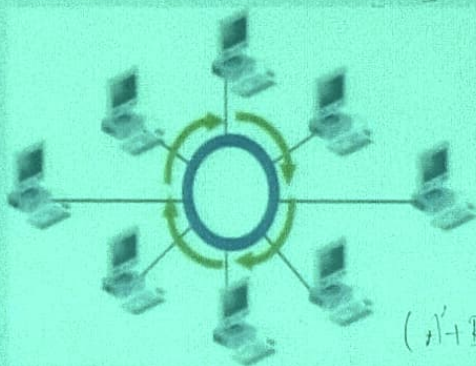
A ring network is one where all workstations and other devices are connected in a continuous loop. There is no central server.



$$(A+B)' = r' \cdot e''$$

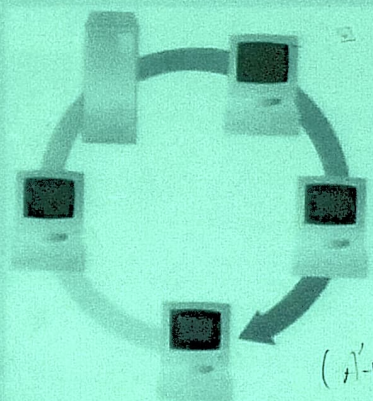
Advantages of Ring Topology

- Easier to manage; easier to locate a defective node or cable problem
- Well-suited for transmitting signals over long distances on a LAN
- Handles high-volume network traffic



Disadvantages of Ring Topology

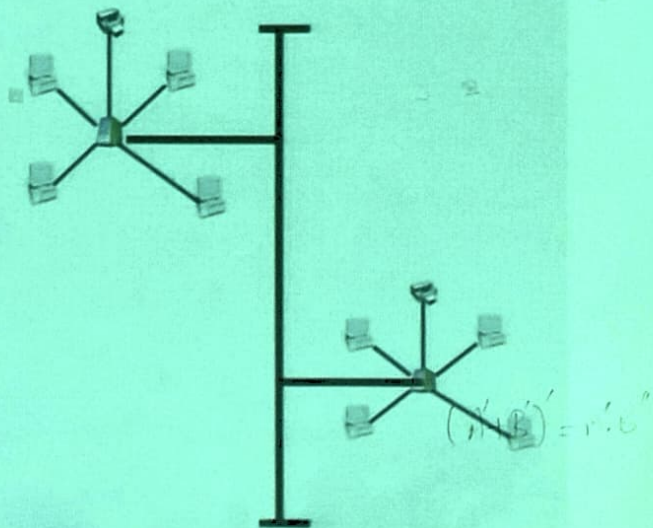
- Expensive
- Requires more cable and network equipment at the start
- Not used as widely as bus topology
 - Fewer equipment options
 - Fewer options for expansion to high-speed communication



$$(A+B)' = r' \cdot e''$$

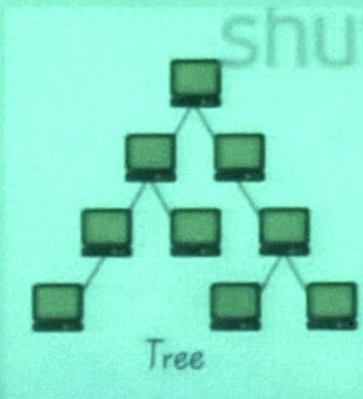
Tree topology

- It has a root node and all other nodes are connected to it forming a hierarchy. It is also called Hierarchical Topology.



Advantages Of Tree Topology

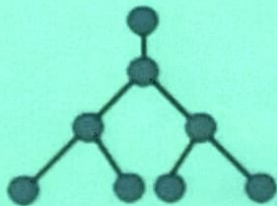
- Extension of Bus and Star Topology.
- Expansion of nodes is possible and easy.
- Easily managed and maintained.



$$(A+B)' = A' \cdot B'$$

Disadvantages Of Tree Topology

- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, network fails.



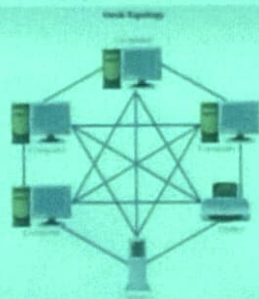
Hierarchical

$$(A+B)' = A' \cup B'$$

Mesh Topology

It is a point-to-point connection to other nodes or devices. Traffic is carried only between two devices or nodes to which it is connected. Mesh has $n(n-2)/2$ physical channels to link n devices.

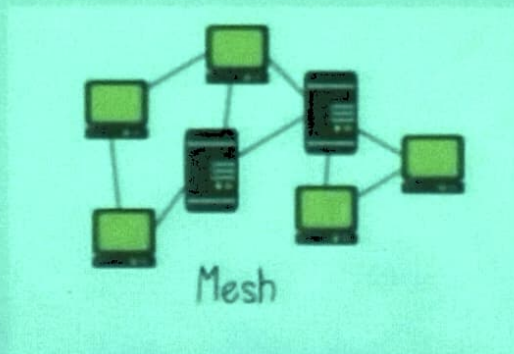
Figure 5.5d Network Topologies



$$(A+B)' = r' \cdot B''$$

Advantages Of Mesh Topology

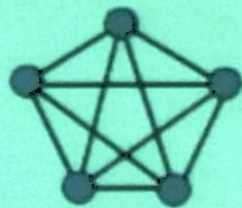
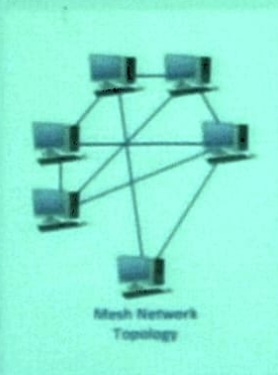
- Each connection can carry its own data load.
- Fault is diagnosed easily.
- Provide security and privacy.



$$(A+B)' = A' \cdot B'$$

Disadvantage of mesh topology

- Installation and configuration is difficult.
- Cabling cost is more.
- Bulk wiring is required.



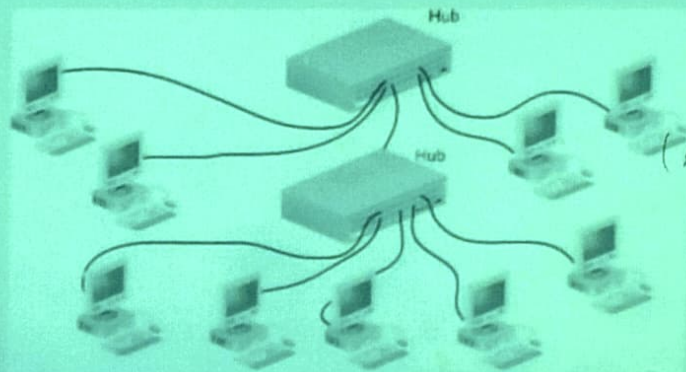
Mesh

$$(A+B)' = A' \cdot B'$$

Hybrid Topology

It is the mixture of two or more topologies. Therefore it is called Hybrid topology. A hybrid topology combines characteristics of linear bus and star and/or ring topologies.

Star-Wired Bus

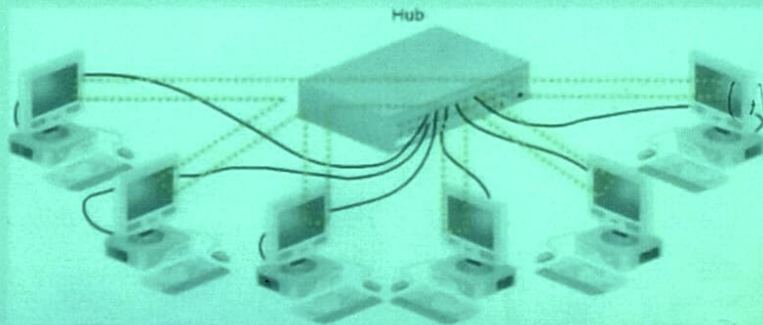


$$(A+B)' = A' \cup B'$$

Advantages of hybrid topology

- Reliable as error detecting and trouble shooting is easy.
- Effective.
- Scalable as size can be increased easily.
- Flexible.

Star-Wired Ring



Disadvantages Of Hybrid Topology

- Complex in design.
- Costly.

