Network Topologies
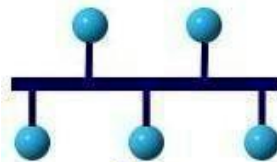
- Network topology is the arrangement of the various components(links, nodes, etc.) of a computer network.

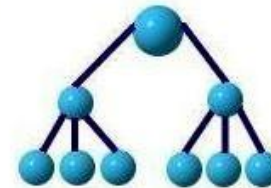- Types of network topologies :

  1. Bus
  2. Ring
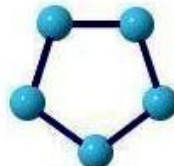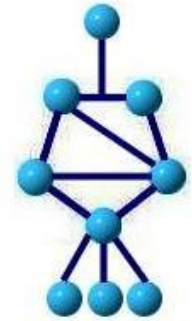 3. Star
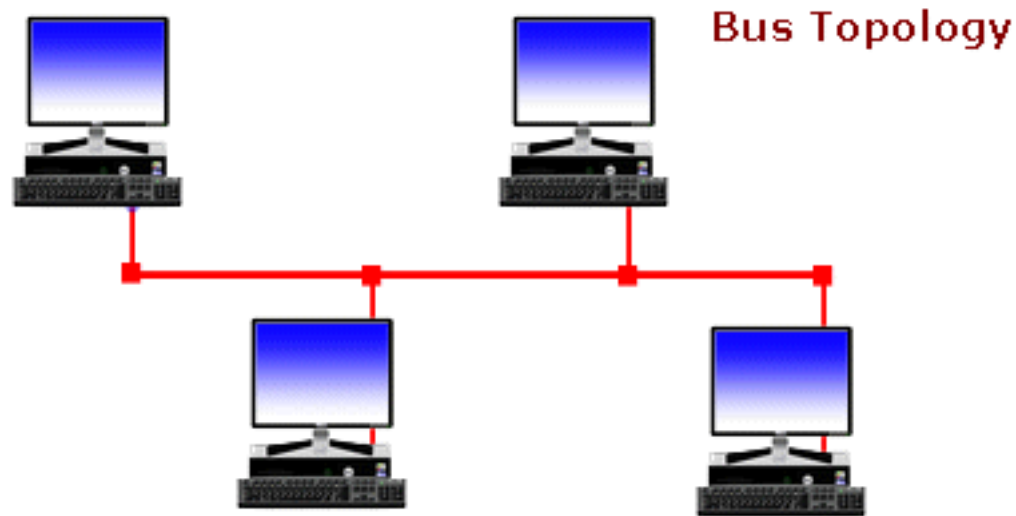 4. Mesh
  5. Tree
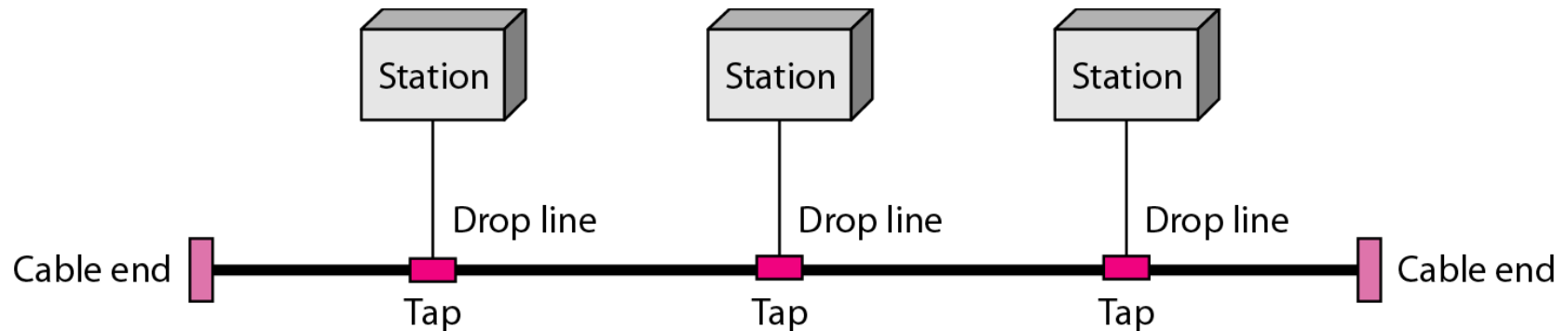 6. Hybrid

Bus   Star   Tree   Hybrid

Ring   Mesh

Bus Topology

- Every computer and network device is connected to single cable

- It transmits data only in one direction

- Cost effective

- Used in small networks

- Easy to expand joining two cables together

- It is used in early LAN connection

Bus Topology

- **Early Ethernet**

Advantages:

- If N devices are connected to each other in bus topology, then the number of cables required to connect them is 1 which is known as backbone cable and N drop lines are required.
- Cost of the cable is less as compared to other topology, but it is used to built small networks.

Disadvantages:

- If the common cable fails, then the whole system will crash down.
- If the network traffic is heavy, it increases collisions in the network.

Ring Topology
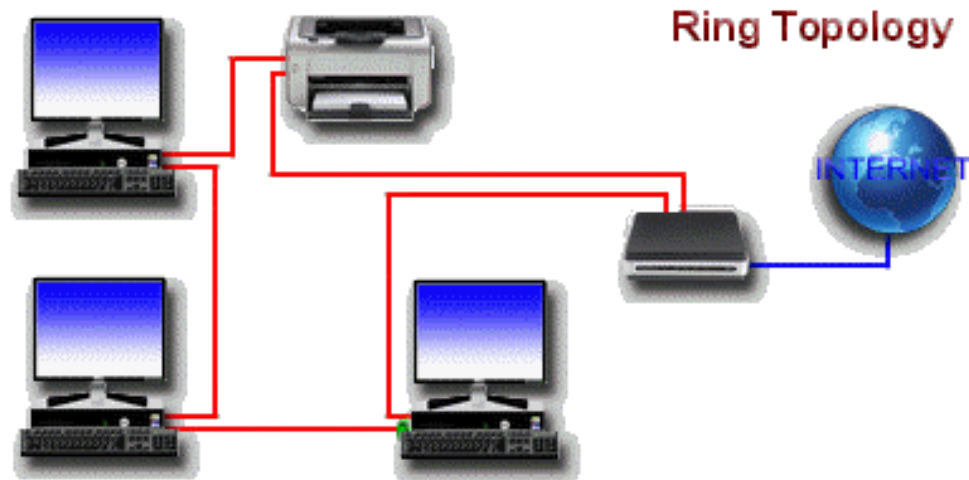
- It forms a ring as each computer is connected to another computer, with the last one connected to the first.

- Transmission is unidirectional & sequential way that is bit by bit.

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.

- Cheap to install and expand.

Advantages:

- The possibility of collision is minimum in this type of topology.
- Cheap to install and expand.

Disadvantages:

- Troubleshooting is difficult in this topology.
- Addition of stations in between or removal of stations can disturb the whole topology.

Star Topology

- Computers are connected to a single central hub through a cable.

- Fast performance with few nodes and low network traffic.

- Easy to troubleshoot & Easy to setup and modify.

- Only that node is affected which has failed rest of the nodes can work smoothly.

- Hub can be upgraded easily.

Advantages:
- If N devices are connected to each other in star topology, then the number of cables required to connect them is N. So, it is easy to set up.
- Each device require only 1 port i.e. to connect to the hub.

Disadvantages:
- If the concentrator (hub) on which the whole topology relies fails, the whole system will crash down.
- Cost of installation is high.
- Performance is based on the single concentrator i.e. hub.

Mesh Topology
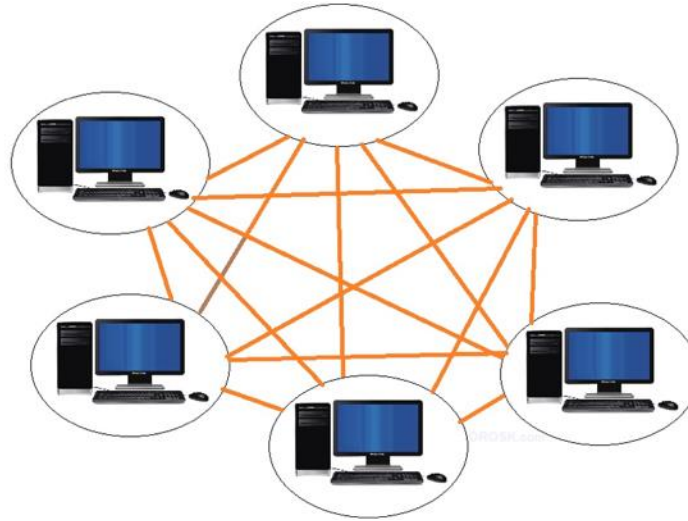
- Point-to-point connection to other devices or fully connected.

- Traffic is carried only between two connected devices.

- Robust, costly but not flexible.

- Fault is diagnosed easily.

- More cable resource used in setup.

Advantages:
- It is robust.
- Fault is diagnosed easily. Data is reliable because data is transferred among the devices through dedicated channels or links.
- Provides security and privacy.

Disadvantages:
- Installation and configuration is difficult.
- Cost of cables are high as bulk wiring is required, hence suitable for less number of devices.
- Cost of maintenance is high.

Tree Topology
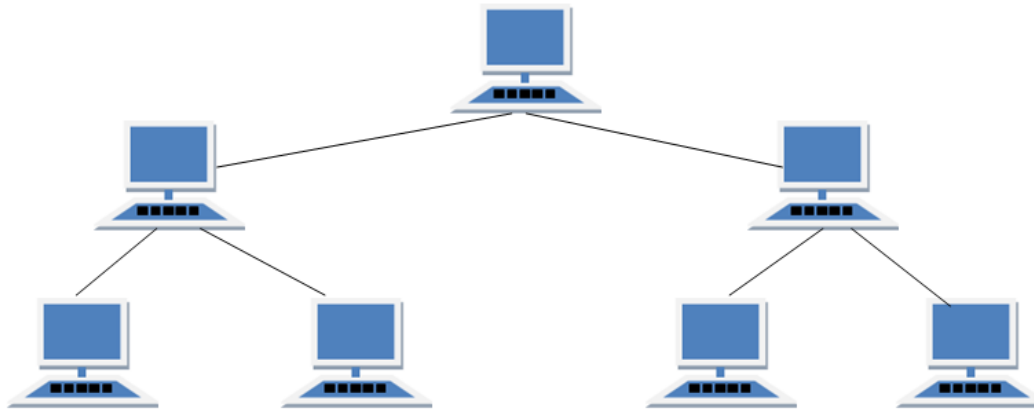
- It has a root node and all other nodes are connected to it forming a hierarchy.

- Also called hierarchical topology.

- Mostly used in Wide Area Network – WAN.

- Expansion of nodes is possible and easy.

- Easily managed and maintained.

Hybrid Topology
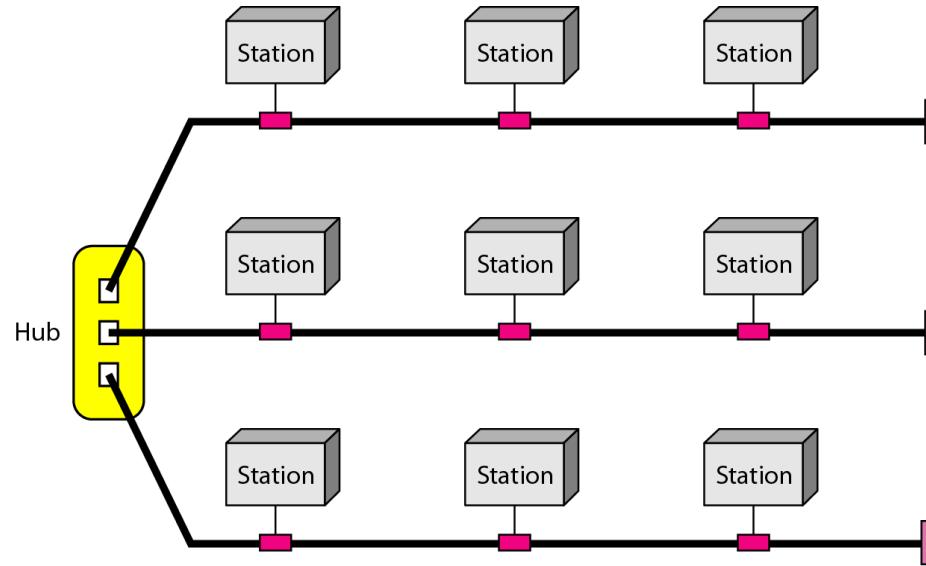
- A network structure whose design contains more than one topology is said to be hybrid topology.

- It is a combination of two or more topologies.

- Flexible & reliable as error detection and easy to troubleshoot.

- Scalable as size can be increased easily.

Comparison of Topologies

	Bus	Ring	Star	Mesh	Tree
Means	every computer and network device is connected to single cable.	Each computer is connected to another, with the last one connected to the first.	All the computers are connected to a single hub through a cable.	All the network nodes are connected to each other.	It has a root node and all other nodes are connected to it forming a hierarchy.
Cost	Average	Cheap	High	High	High
Used in	Small Network	Expand Network	Small Network	Expand Network	Expand Network
Troubleshoot	Easy, But Cables fail then whole network fails.	Difficult; Failure of one computer disturbs the whole network.	Easy; If the hub fails then the whole network is down.	Easy; Installation and configuration is difficult.	Easy; Central root hub fails, network fails.