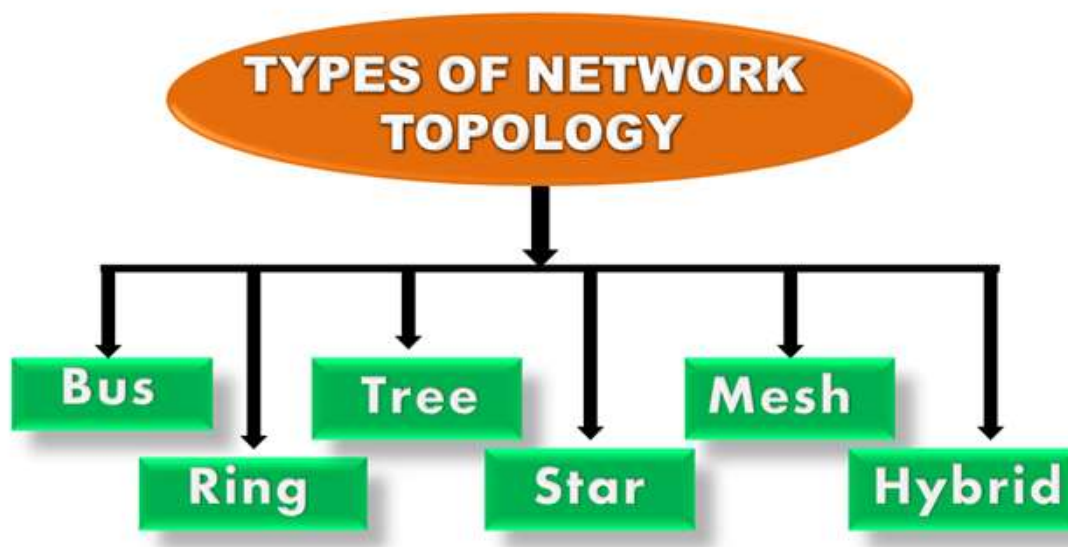


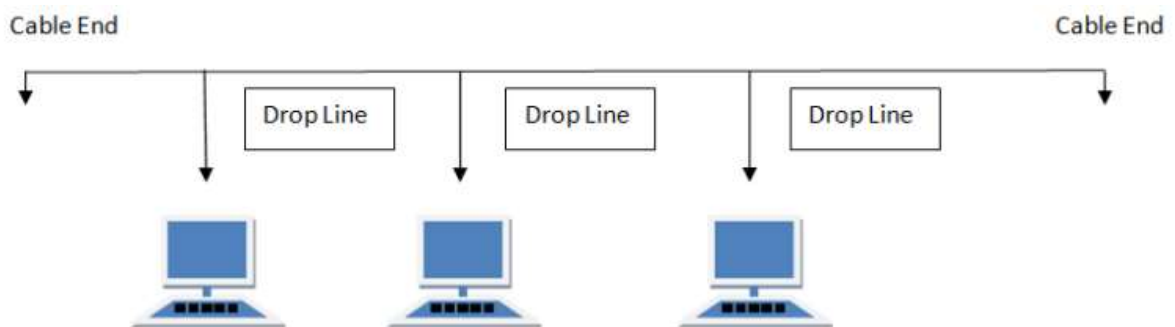
Computer Network Topology

Geometric representation of how the computers are connected to each other is known as topology.



BUS TOPOLOGY:

Bus topology is a network type in which every computer and network device is connected to single cable. It transmits the data from one end to another in single direction. No bi-directional feature is in bus topology.



Features of Bus Topology

1. It transmits data only in one direction.
2. Every device is connected to a single cable

Advantages of Bus Topology

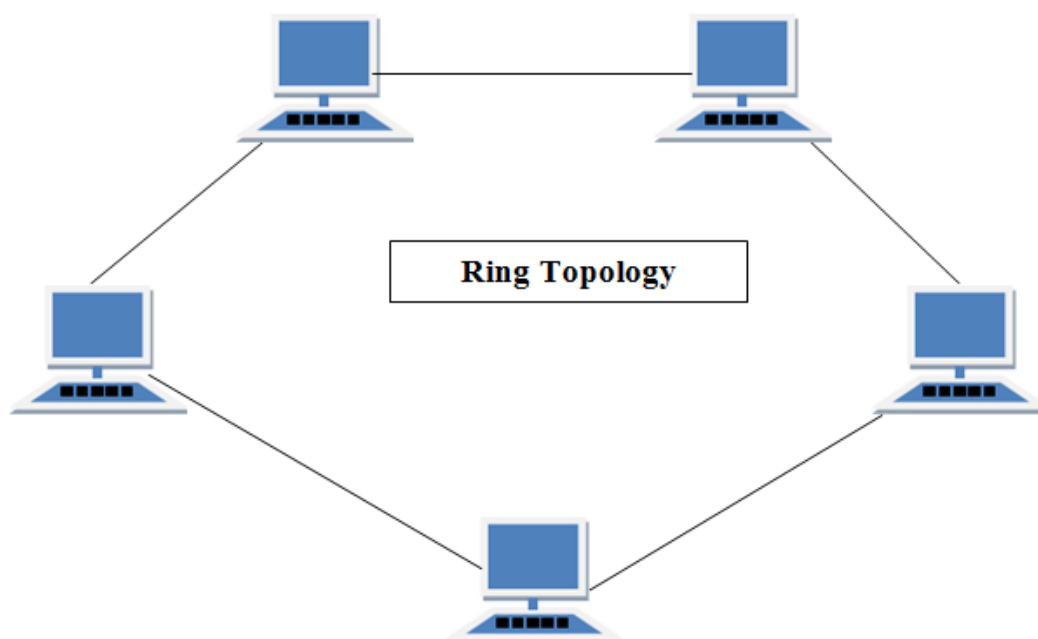
1. It is cost effective.
2. Cable required is least compared to other network topology.
3. Used in small networks.
4. It is easy to understand.
5. Easy to expand joining two cables together.

Disadvantages of Bus Topology

1. Cables fails then whole network fails.
2. If network traffic is heavy or nodes are more the performance of the network decreases.
3. Cable has a limited length.
4. It is slower than the ring topology.

RING TOPOLOGY

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.



Features of Ring Topology

1. A number of repeaters are used for Ring topology with large number of nodes, because if someone wants to send some data to the last node in the ring topology with 100 nodes, then the data will have to pass through 99 nodes to reach the 100th node. Hence to prevent data loss repeaters are used in the network.
2. The transmission is unidirectional, but it can be made bidirectional by having 2 connections between each Network Node, it is called **Dual Ring Topology**.
3. In Dual Ring Topology, two ring networks are formed, and data flow is in opposite direction in them. Also, if one ring fails, the second ring can act as a backup, to keep the network up.
4. Data is transferred in a sequential manner that is bit by bit. Data transmitted, has to pass through each node of the network, till the destination node.

Advantages of Ring Topology

1. Easy to install.
2. Managing is easier as to add or remove a device from the topology only two links are required to be changed.

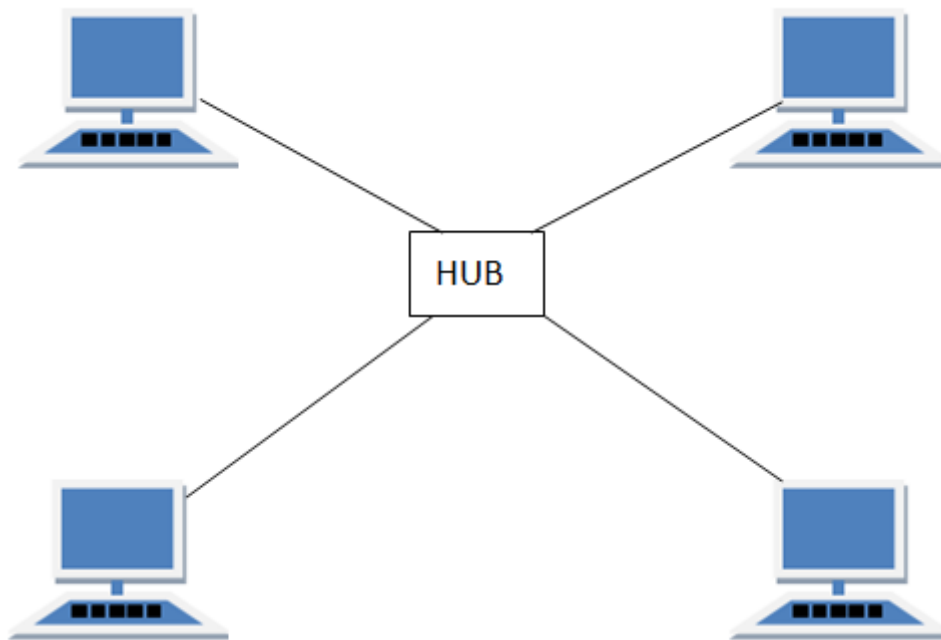
Disadvantages of Ring Topology

- ❖ A link failure can fail the entire network as the signal will not travel forward due to failure.
- ❖ **Reconfiguration difficult:** Adding new devices to the network would slow down the network.
- ❖ **Delay:** Communication delay is directly proportional to the number of nodes. Adding new devices increases the communication delay.

STAR TOPOLOGY

In star topology each device in the network is connected to a central device called hub. Unlike Mesh topology, star topology doesn't allow direct

communication between devices, a device must have to communicate through hub. If one device wants to send data to other device, it has to first send the data to hub and then the hub transmit that data to the designated device.



Advantages of Star topology

1. Less expensive because each device only needs one I/O port and needs to be connected with hub with one link.
2. Easier to install
3. Less number of cables required because each device needs to be connected with the hub only.
4. Robust, if one link fails, other links will work just fine.
5. Easy fault detection because the link can be easily identified.

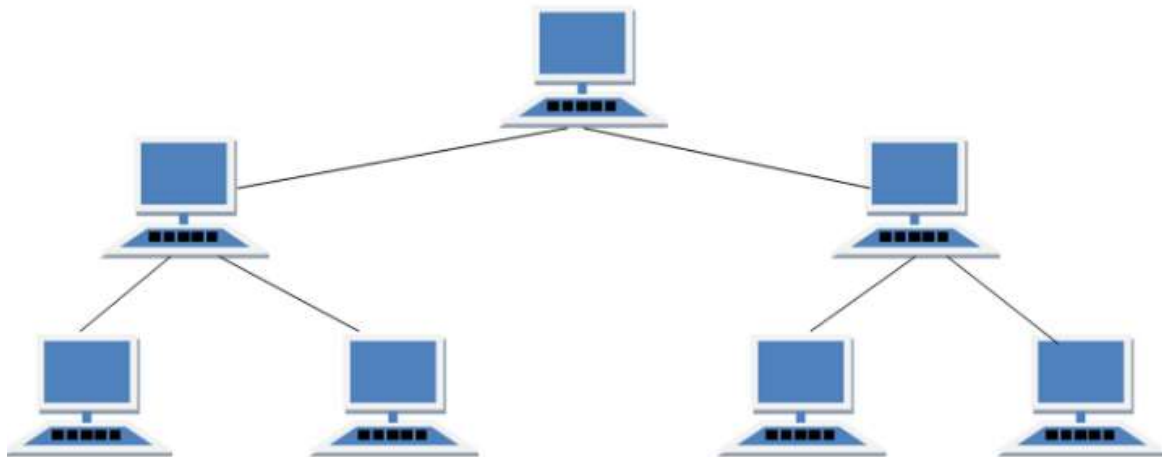
Disadvantages of Star topology

1. If hub goes down everything goes down, none of the devices can work without hub.
2. Hub requires more resources and regular maintenance because it is the central system of star topology.

Tree topology

- Tree topology combines the characteristics of bus topology and star topology.

- A tree topology is a type of structure in which all the computers are connected with each other in hierarchical fashion.
- The top-most node in tree topology is known as a root node, and all other nodes are the descendants of the root node.
- There is only one path exists between two nodes for the data transmission. Thus, it forms a parent-child hierarchy.



Advantages of Tree topology

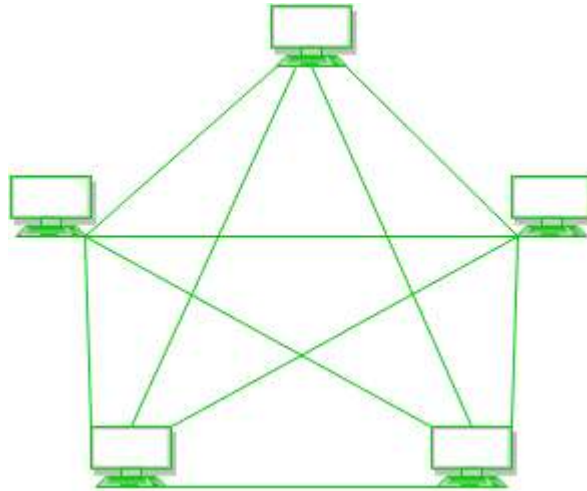
- **Easily expandable:** We can add the new device to the existing network. Therefore, we can say that tree topology is easily expandable.
- **Easily manageable:** In tree topology, the whole network is divided into segments known as star networks which can be easily managed and maintained.
- **Error detection:** Error detection and error correction are very easy in a tree topology.
- **Limited failure:** The breakdown in one station does not affect the entire network.

Disadvantages of Tree topology

- **High cost:** Devices required for broadband transmission are very costly.
- Heavily cabled.
- Costly.
- If more nodes are added maintenance is difficult.
- Central hub fails, network fails.

Mesh Topology :

In mesh topology, every device is connected to another device via particular channel.



- If suppose, N number of devices are connected with each other in mesh topology, then total number of ports that is required by each device is ? N-1. In the Figure 1, there are 5 devices connected to each other, hence total number of ports required is 4.
- If suppose, N number of devices are connected with each other in mesh topology, then total number of dedicated links required to connect them is ${}^N C_2$ i.e. $N(N-1)/2$. In the Figure 1, there are 5 devices connected to each other, hence total number of links required is $5*4/2 = 10$.

Advantages of this topology :

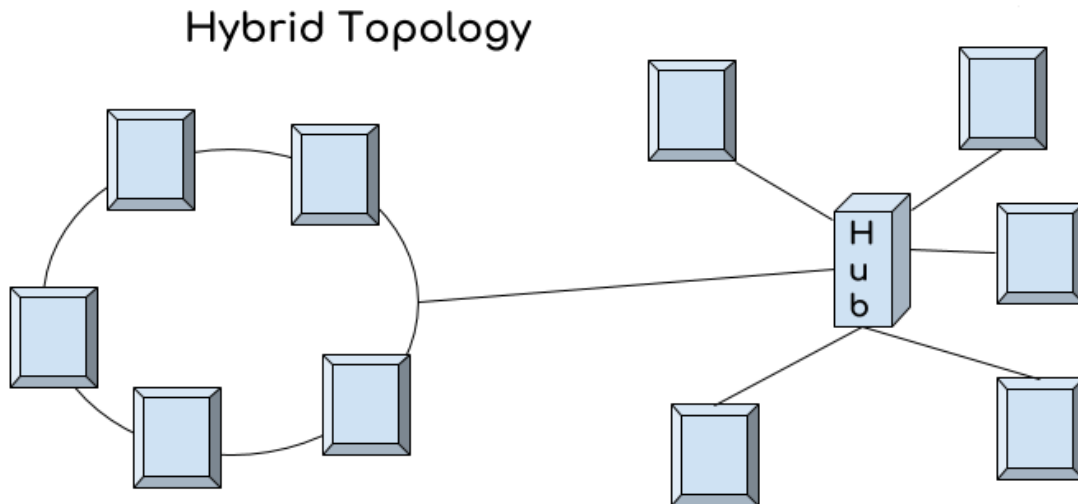
- It is robust.
- Fault is diagnosed easily. Data is reliable because data is transferred among the devices through dedicated channels or links.
- Provides security and privacy.

Problems with this topology :

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

HYBRID Topology

It is two different types of topologies which is a mixture of two or more topologies.



A combination of two or more topology is known as hybrid topology. For example a combination of star and mesh topology is known as hybrid topology.

Advantages of Hybrid topology

1. We can choose the topology based on the requirement for example, scalability is our concern then we can use star topology instead of bus technology.
2. Scalable as we can further connect other computer networks with the existing networks with different topologies.

Disadvantages of Hybrid topology

1. Fault detection is difficult.
2. Installation is difficult.
3. Design is complex so maintenance is high thus expensive.