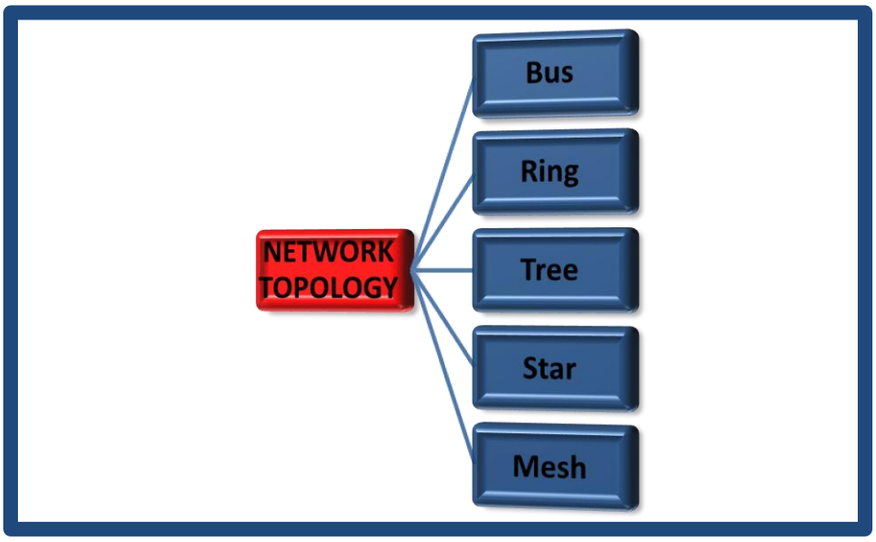
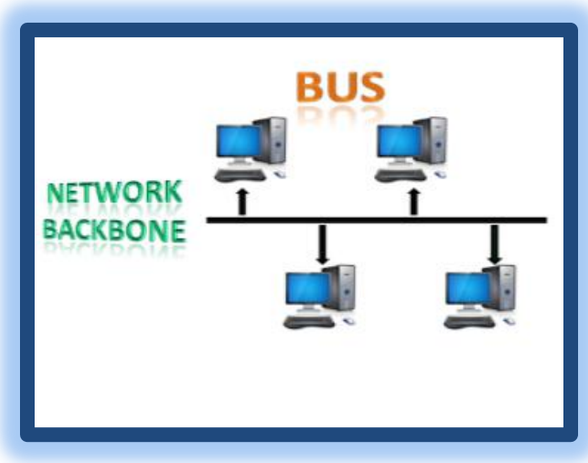
Network Topology

Network Topology refers to the layout of a network and describes how links and nodes are set up to relate to each other.

There are five types of topology – Bus, Ring, Tree, Star, and Mesh.



Bus Topology



A bus topology connects all the devices on a network along a single cable running in a single direction from one end of the network to the other. It is sometimes called a line topology or backbone topology. Data flow on the network follows the route of the cable, moving in one direction.

Advantages of Bus Topology

Bus topologies are a good, cost-effective choice for smaller networks because the layout is simple, allowing all devices to be connected via a single coaxial cable. If needed, more nodes can be easily added to the network by joining additional cables.

Disadvantages of Bus Topology

However, because bus topologies use a single cable to transmit data, they are somewhat vulnerable. If the cable experience a failure, the whole network goes down, which can be time-consuming and expensive to restore, which can be less of an issue with smaller networks?

Ring Topology

In ring topology the nodes are arranged in a circle (or ring). The data can travel through the ring network in either one direction or both directions, with each device having exactly two neighbours.

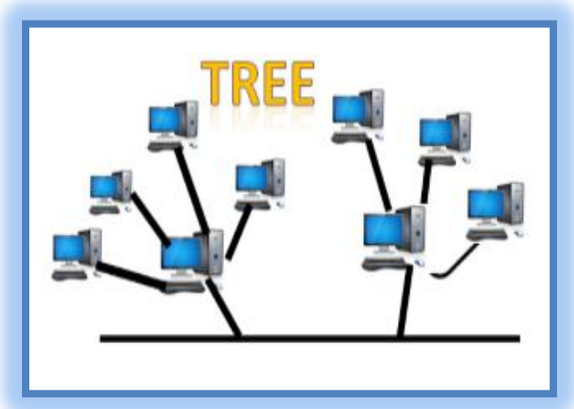
Advantages of Ring Topology

Since each device is only connected on either side, when data is transmitted, the packets also travel along the circle, moving through each of the intermediate nodes until they arrive at their destination. If a large network is arranged in a ring topology, repeaters can be used to ensure packets arrive correctly and without data loss.

Disadvantages of Ring Topology

Even though it's popular, a ring topology is still vulnerable to failure without proper network management. Since the flow of data transmission moves unidirectionally between nodes along each ring, if one node goes down, it can take the entire network with it. Moreover, the entire network must be taken offline to reconfigure, add, or remove nodes.

Tree Topology



The tree topology structure gets its name from how the central node functions as a sort of trunk for the network, with nodes extending outward in a branch-like fashion. A tree topology has a parent-child hierarchy to connect the nodes. Those connected to the central hub are connected linearly to other nodes, so two connected nodes only share one mutual connection. Because the tree topology structure is both extremely flexible and scalable, it's often used for wide area networks to support many spread-out devices.

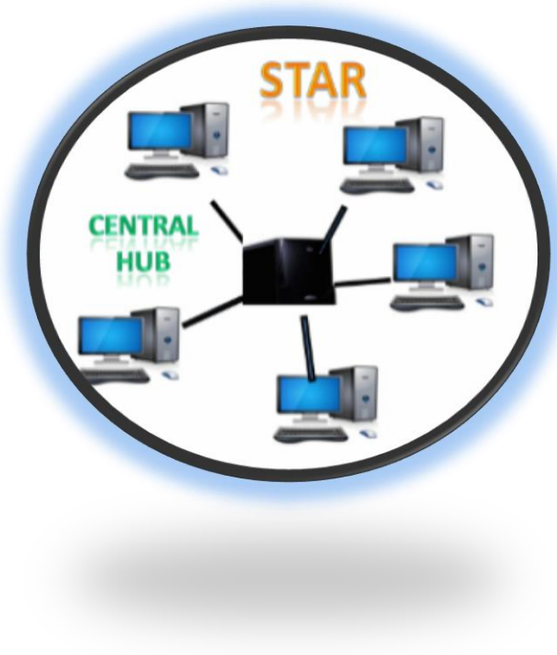
Advantages of Tree Topology

Combining elements of the star and bus topologies allows for the easy addition of nodes and network expansion. Troubleshooting errors on the network is also a straightforward process, as each of the branches can be individually assessed for performance issues.

Disadvantages of Tree Topology

If the central hub fails, the various node branches will become disconnected, though connectivity within, but not between, branch systems will remain. Because of the hierarchical complexity and linear structure of the network layout, adding more nodes to a tree topology can quickly make proper management an unwieldy, not to mention costly, experience. Tree topologies are expensive because of the sheer amount of cabling required to connect each device to the next within the hierarchical layout.

Star Topology



A star topology, the most common network topology, is laid out so every node in the network is directly connected to one central hub via coaxial, twisted-pair, or fiber-optic cable. Acting as a server, this central node manages data transmission—as information sent from any node on the network has to pass through the central one to reach its destination—and functions as a repeater, which helps prevent data loss.

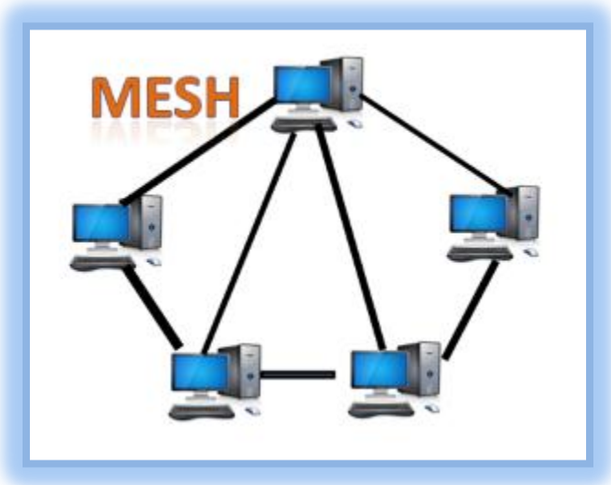
Advantages of Star Topology

Star topologies are common since they allow to conveniently managing the entire network from a single location. Because each of the nodes is independently connected to the central hub, should one go down, the rest of the network will continue functioning unaffected, making the star topology a stable and secure layout. The devices can be added, removed, and modified without taking the entire network offline. The simplicity of the network design makes life easier for administrators, too, because it's easy to identify where errors or performance issues are occurring.

Disadvantages of Star Topology

On the other hand , if the central hub goes down, the rest of the network can't function. But if the central hub is properly managed and kept in good health, administrators shouldn't have too many issues. The overall bandwidth and performance of the network are also limited by the central node's configurations and technical specifications, making star topologies expensive to set up and operate.

Mesh Topology



A mesh topology is a structure of point-to-point connections where the nodes are interconnected. Mesh networks can be full or partial mesh. Partial mesh topologies are mostly interconnected, with a few nodes with only two or three connections, while full-mesh topologies are fully interconnected. The web-like structure of mesh topologies offers two different methods of data transmission: routing and flooding.

Advantages of Mesh Topology

Mesh topologies are reliable and stable, and the complex degree of interconnectivity between nodes makes the network resistant to failure. For instance, no single device going down can bring the network offline.

Disadvantages of Mesh Topology

Mesh topologies are incredibly labour intensive. Each interconnection between nodes requires a cable and configuration once deployed, so it can also be time consuming to set up. As with other topology structures, the cost of cabling adds up fast, and mesh networks require a lot of cabling.