UNIT-V

TOPIC NAME: NETWORK TOPOLOGIES

Network Topology refers to layout of a network and how different nodes in a network are connected to each other and how they communicate. Topologies are either physical (the physical layout of devices on a network) or logical (the way that the signals act on the network media, or the way that the data passes through the network from one device to the next).

A network consists of two or more computers that are linked together in order to share resources (such as printers, emails and CDs), exchange files, or allow electronic communications. The computers on a network may be linked through cables, telephone lines, radio waves, satellites, or infrared light beams.

The network topologies are divided into two:

- Physical topology

- Logical topology

Benefits of Topology

➢ Fewer peripherals needed – By sharing printers and scanners etc. the total cost of ownership of these devices may be lowered

➢ Increased communication capabilities - via e-mail, chat, blogs etc

➢ Increased consistency of data by avoiding duplication of data.

➢ Centralized administration of data and devices

➢ Lower cost licensing

> ➢ Shared processing power

Types of Networks Topologies

BUS TOPOLOGY:

Bus Topology is the simplest of network topologies. In this type of topology, all the nodes are connected to the single cable called bus, by the help of interface connectors. This central cable is the backbone of the network and is known as Bus. Every workstation communicates with the other device through this Bus.

Advantages of Bus Topology

1) It is easy to set-up and extend bus network.

2) Cable length required for this topology is the least compared to other networks.

3) Bus topology costs very less.

4) Linear Bus network is mostly used in small networks. Good for LAN.

Disadvantages of Bus Topology

1) There is a limit on central cable length and number of nodes that can be connected.

2) Dependency on central cable in this topology has its disadvantages. If the main cable (i.e. bus) encounters   some problem, whole network breaks down.

3) Proper termination is required to dump signals. Use of terminators is must.

4) It is difficult to detect and troubleshoot fault at individual station.

5) Maintenance costs can get higher with time.

6) Efficiency of Bus network reduces, as the number of devices connected to it increases.

7) It is not suitable for networks with heavy traffic.

8) Security is very low because all the computers receive the sent signal from the source.
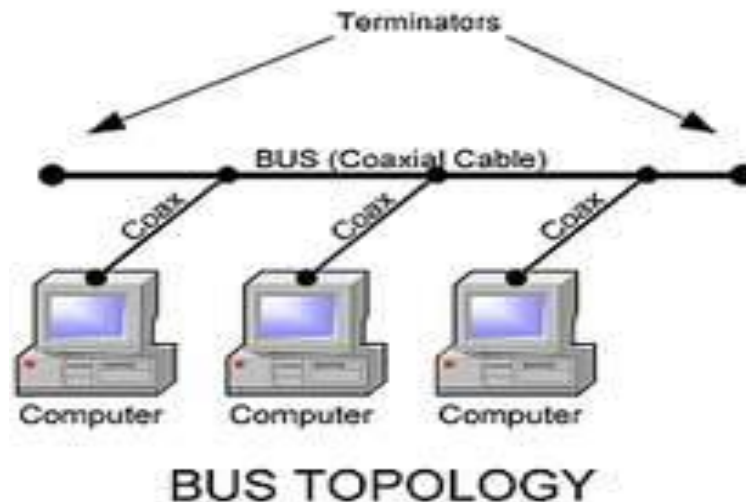
BUS TOPOLOGY

RING TOPOLOGY:

In Ring Topology, all the nodes are connected to each-other in such a way that they make a closed loop. Each workstation is connected to two other components on either side, and it communicates with these two adjacent neighbors. Data travels around the network, in one direction. Sending and receiving of data takes place by the help of TOKEN.

Advantages of Ring Topology

1) This type of network topology is very organized. Each node gets to send the data when it receives an empty token. This helps to reduces chances of collision. Also in ring topology all the traffic flows in only one direction at very high speed.

2) Even when the load on the network increases, its performance is better than that of Bus topology

3) There is no need for network server to control the connectivity between workstations.

4) Additional components do not affect the performance of network.

5) Each computer has equal access to resources.

Disadvantages of Ring Topology

1) Each packet of data must pass through all the computers between source and destination. This makes it slower than Star topology.

2) If one workstation or port goes down, the entire network gets affected.

3) Network is highly dependent on the wire which connects different components.

4) MAU's and network cards are expensive as compared to Ethernet cards and hubs.
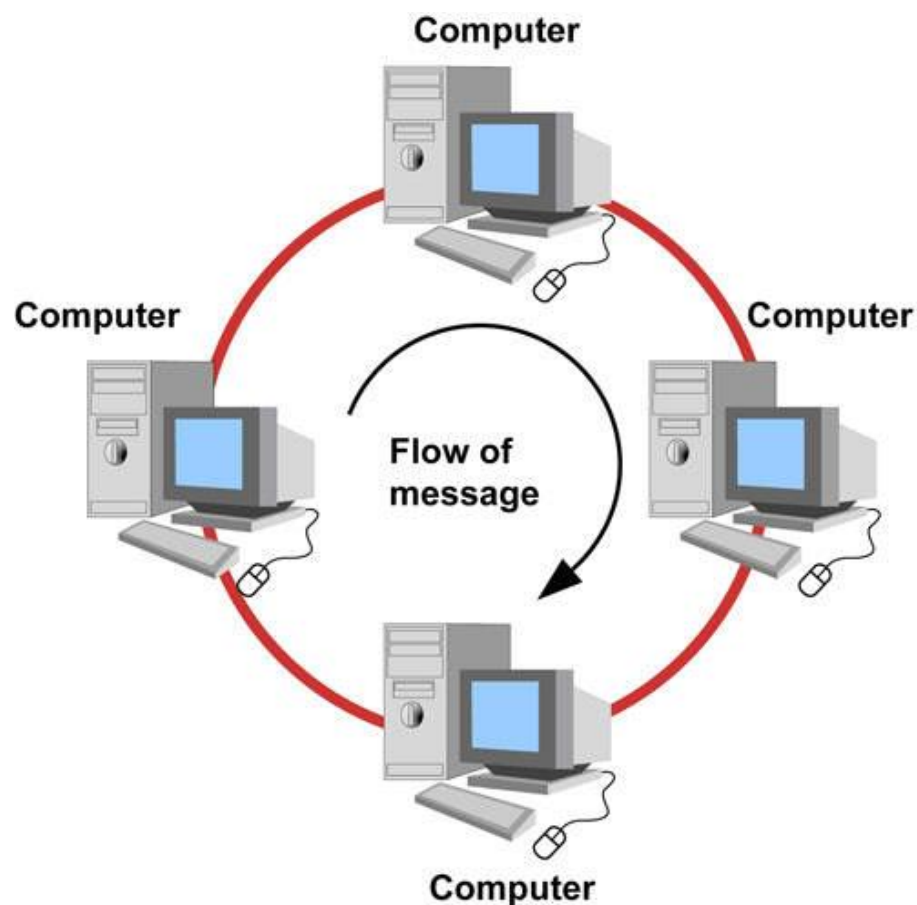
STAR TOPOLOGY:

In Star topology, all the components of network are connected to the central device called a "hub" which may be a hub, a router or a switch. All the workstations are connected to central device with a point-to-point connection. So it can be said that every computer is indirectly connected to every other node by the help of "hub".

Advantages of Star Topology

1) As compared to Bus topology it gives far much better performance, signals don't necessarily get transmitted to all the workstations. A sent signal reaches the intended destination after passing through no more than 3-4 devices and 2-3 links. Performance of the network is dependent on the capacity of central hub.

2) Easy to connect new nodes or devices. In star topology new nodes can be added easily without affecting rest of the network. Similarly components can also be removed easily.

3) Centralized management. It helps in monitoring the network.

4) Failure of one node or link doesn't affect the rest of network. At the same time it's easy to detect the failure and troubleshoot it.

Disadvantages of Star Topology

1) Too much dependency on central device has its own drawbacks. If it fails whole network goes down.

2) The use of hub, a router or a switch as central device increases the overall cost of the network.

3) Performance and as well number of nodes which can be added in such topology is depended on capacity of central device.

Star Topology

MESH TOPOLOGY

A mesh network topology is a decentralized design in which each node on the network connects to at least two other nodes. Unlike nodes in a star topology, which require a router to deliver Internet service, network nodes can "talk" directly to each other without requiring the assistance of an Internet connection.

Advantages

▸ The arrangement of the network nodes is such that it is possible to transmit data from one node to many other nodes at the same time.

▸ The failure of a single node does not cause the entire network to fail as there are alternate paths for data transmission.

▸ It can handle heavy traffic, as there are dedicated paths between any two network nodes.

‣ Point-to-point contact between every pair of nodes, makes it easy to identify faults.

Disadvantages

‣ The arrangement wherein every network node is connected to every other node of the network, many connections serve no major purpose. This leads to redundancy of many network connections.

‣ A lot of cabling is required. Thus, the costs incurred in setup and maintenance are high.

‣ Owing to its complexity, the administration of a mesh network is difficult.
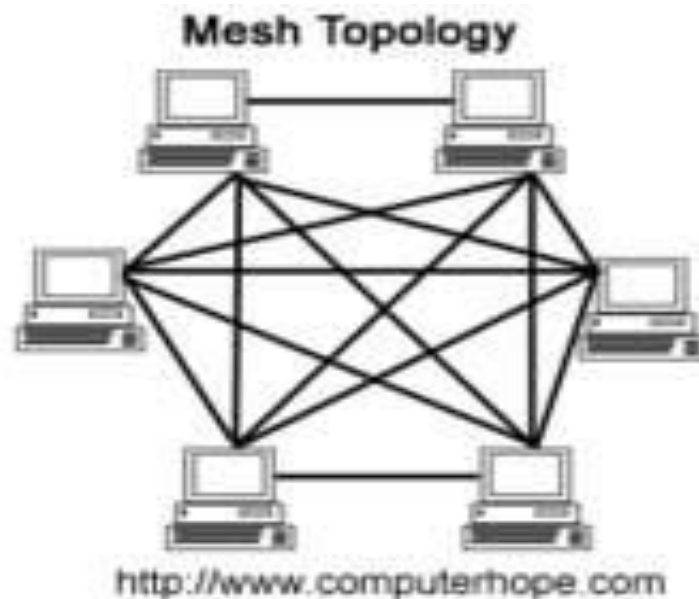
HYBRID TOPOLOGY

Hybrid networks use a combination of any two or more topologies, in such a way that the resulting network does not exhibit one of the standard topologies (e.g., bus, star, ring, etc.). For example, a tree network connected to a tree network is still a tree network topology.

A hybrid topology is always produced when two different basic network topologies are connected. Two common examples for Hybrid network are: star ring network and star bus network

Advantages and Disadvantages

A hybrid topology combines two or more topologies. This means that this type of topology inherits their advantages and disadvantages. Obviously, the advantages and disadvantages of a hybrid topology are a combination of the merits and demerits of the topologies used to structure it example: One of its main advantages is that this type of topology is very useful in larger environments like businesses, industries, etc. It also divides certain aspects of the network in a business for better management. It is also very unlikely for the whole network to malfunction if a single node in one of the combined topologies malfunctions.

Different problems vary depending on the combinations. Example: Redundancy and complexity as well as it being difficult to troubleshoot as some of its major disadvantages.