

## Networks

**networking** is the practice of linking two or more computing devices together for the purpose of sharing data. Networks are built with a mix of computer hardware and computer software.

## Distributed Processing

**Distributed computing** is a field of computer science that studies distributed systems. A **distributed system** consists of multiple autonomous computers that communicate through a computer network. The computers interact with each other in order to achieve a common goal. A computer program that runs in a distributed system is called a **distributed program**, and **distributed programming** is the process of writing such programs.

Distributed computing also refers to the use of distributed systems to solve computational problems. In distributed computing, a problem is divided into many tasks, each of which is solved by one or more computers.

Distributed programming typically falls into one of several basic architectures or categories: client-server, 3-tier architecture, *n*-tier architecture, distributed objects, loose coupling, or tight coupling.

- **Client-server:** Smart client code contacts the server for data then formats and displays it to the user. Input at the client is committed back to the server when it represents a permanent change.
- **3-tier architecture:** Three tier systems move the client intelligence to a middle tier so that stateless clients can be used. This simplifies application deployment. Most web applications are 3-Tier.
- ***n*-tier architecture:** *n*-tier refers typically to web applications which further forward their requests to other enterprise services. This type of application is the one most responsible for the success of application servers.
- **Tightly coupled (clustered):** refers typically to a cluster of machines that closely work together, running a shared process in parallel. The task is subdivided in parts that are made individually by each one and then put back together to make the final result.
- **Peer-to-peer:** an architecture where there is no special machine or machines that provide a service or manage the network resources. Instead all responsibilities are uniformly divided among all machines, known as peers. Peers can serve both as clients and servers.
- **Space based:** refers to an infrastructure that creates the illusion (virtualization) of one single address-space. Data are transparently replicated according to application needs. Decoupling in time, space and reference is achieved.

## Line Configuration

Line configuration refers to the way two or more communication devices attached to a link. Line configuration is also referred to as connection. A Link is the physical communication pathway that transfers data from one device to another. For communication to occur, two devices must be connected in same way to the same link at the same time.

There are two possible line configurations.

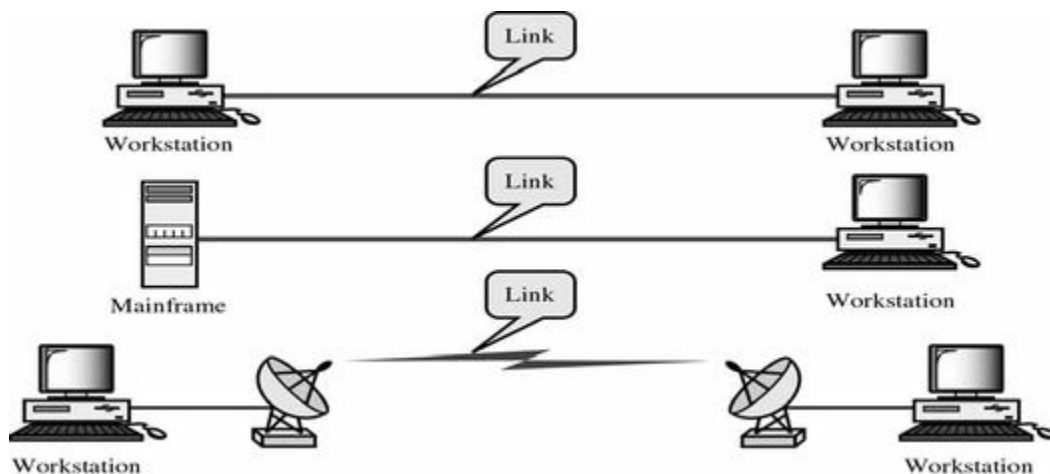
1. Point-to-Point.
2. Multipoint.

## Point-to-Point

**A Point to Point Line Configuration** Provide dedicated link between two devices use actual length of wire or cable to connect the two end including microwave & satellite link. Infrared remote control & tvs remote control.

The entire capacity of the channel is reserved for transmission between those two devices. Most point-to-point line configurations use an actual length of wire or cable to connect the two ends, but other options, such as microwave or satellite links, are also possible.

**Point to point** network topology is considered to be one of the easiest and most conventional network topologies. It is also the simplest to establish and understand. To visualize, one can consider point to point network topology as two phones connected end to end for a two way communication

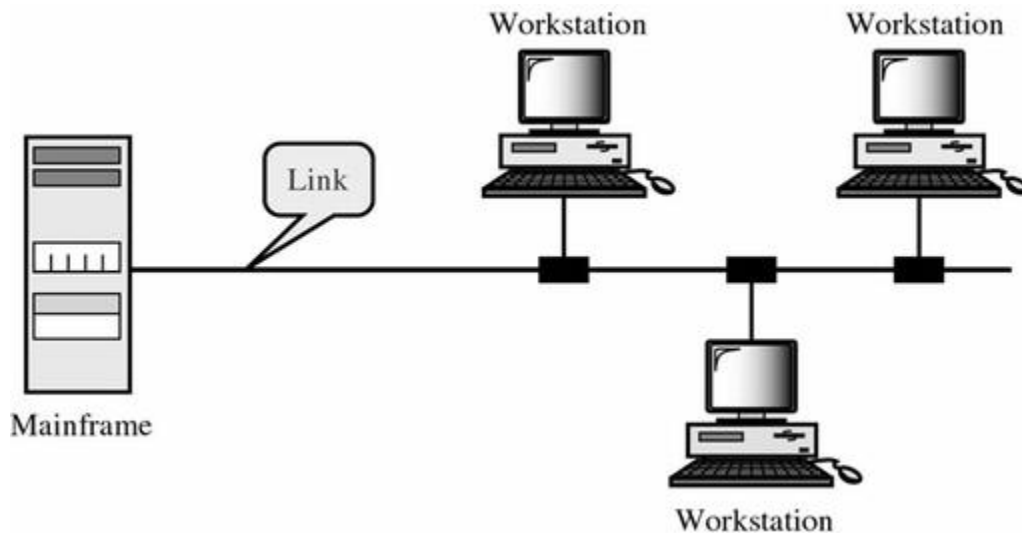


## Multipoint Configuration

**Multipoint Configuration** also known as **Multidrop line configuration** one or more than two specific devices share a single link capacity of the channel is shared.

More than two devices share the Link that is the capacity of the channel is shared now. With shared capacity, there can be two possibilities in a Multipoint Line Config:

- **Spatial Sharing:** If several devices can share the link simultaneously, its called Spatially shared line configuration
- **Temporal (Time) Sharing:** If users must take turns using the link , then its called Temporally shared or Time Shared Line Configuration



## Topology

The term "**Topology**" refers to the way in which the end points or stations/computer systems, attached to the networks, are interconnected. We have seen that a topology is essentially a stable geometric arrangement of computers in a network. If you want to select a topology for doing networking. You have attention to the following points.

- Application S/W and protocols.
- Types of data communicating devices.
- Geographic scope of the network.
- Cost.
- Reliability.

Depending on the requirement there are different Topologies to construct a network.

- (1) Mesh topology.
- (2) Star topology.
- (3) Tree (Hierarchical) topology.
- (4) Bus topology.

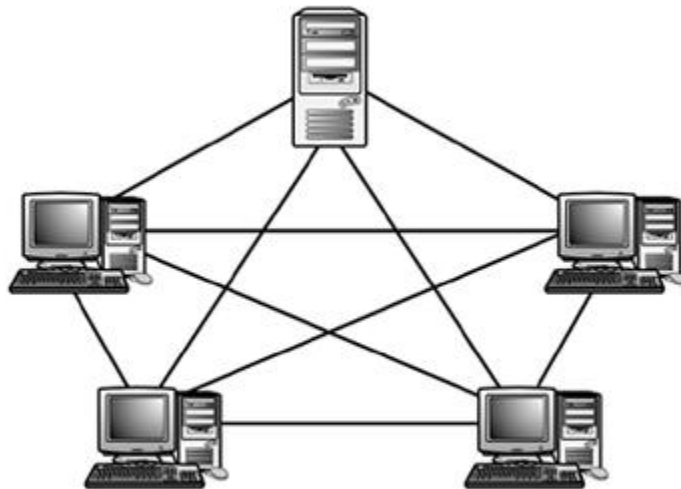
- (5) Ring topology.
- (6) Cellular topology.

- Ring and mesh topologies are felt convenient for peer to peer transmission.
- Star and tree are more convenient for client server.
- Bus topology is equally convenient for either of them.

## Mesh Topology

The value of fully meshed networks is proportional to the exponent of the number of subscribers, assuming that communicating groups of any two endpoints, up to and including all the endpoints, is approximated by **Reed's Law**.

The number of connections in a full mesh =  $n(n - 1) / 2$



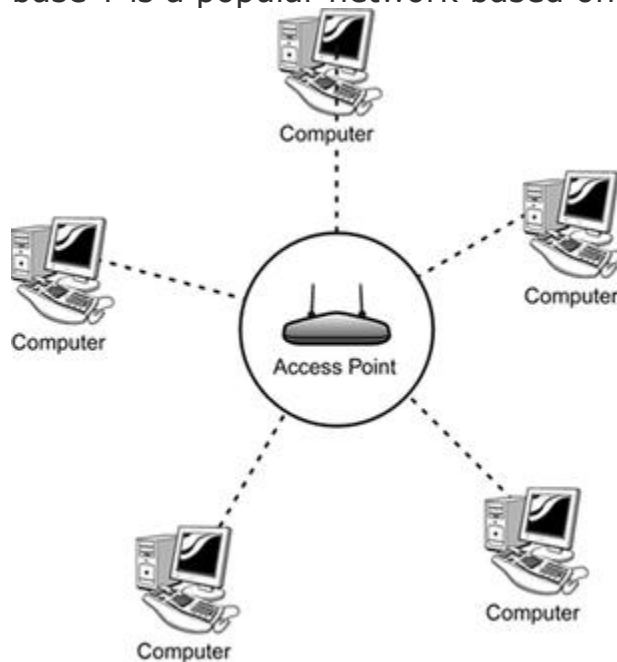
## Star Topology

In a star topology, cables run from every computer to a centrally located device called a HUB. Star topology networks require a central point of connection between media segment. These central points are referred to as Hubs.

Hubs are special repeaters that overcome the electromechanical limitations of a media. Each computer on a star network communicates with a central

hub that resends the message either to all the computers. (In a broadcast network) or only the destination computer. (In a switched network).

Ethernet 10 base T is a popular network based on the star topology.



### Tree (Hierarchical) topology

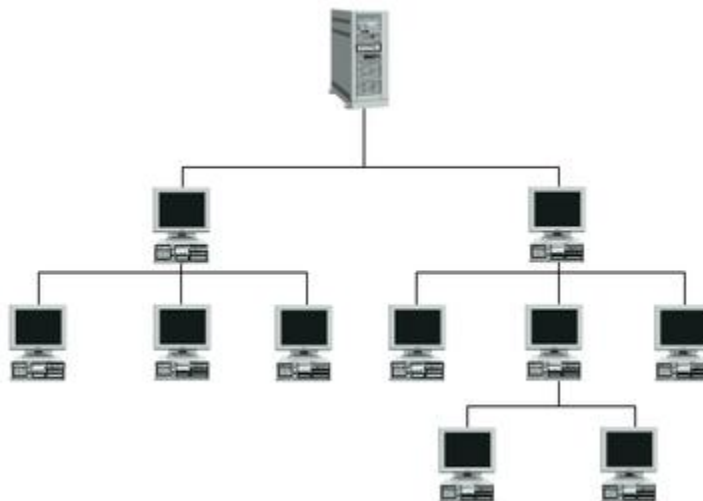
It is similar to the star network, but the nodes are connected to the secondary hub that in turn is connected to the central hub.

The central hub is the active hub.

The active hub contains the repeater, which regenerates the bits pattern it receives before sending them out.

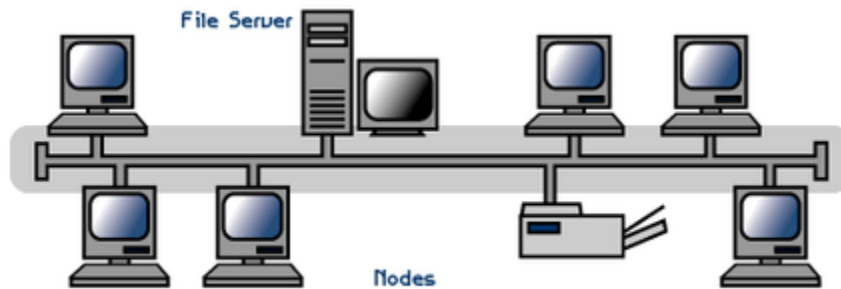
The secondary hub can be either active or passive.

A passive hub provides a simple physical connection between the attached devices.



## Bus topology

A bus topology connects computers along a single or more cable to connect linearly. A network that uses a bus topology is referred to as a "bus network" which was the original form of Ethernet networks. Ethernet 10Base2 (also known as thinnet) is used for bus topology.



## Ring topology

In ring topology, each device has a dedicated point-to-point line configuration only with two devices on either side of it.

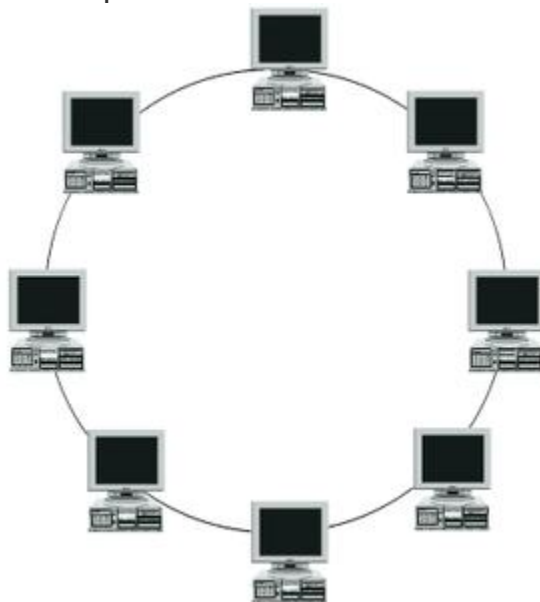
A signal is passed along the ring in one direction, from device to device until it reaches its destination.

Each device in the ring has a repeater. When the devices receive the signal intended for the other node, it just regenerates the bits and passes them along.

Ring network passes a token.

A token is a short message with the electronic address of the receiver.

Each network interface card is given a unique electronic address, which is used to identify the computer on the network.



## Cellular topology

The cellular topology is applicable only in case of wireless media that does not require cable connection.

In wireless media, each point transmits in a certain geographical area called a cell.

Each cell represents a portion of the total network area.

Devices that are in the cell communicate through a central hub. Hubs in different cells are interconnected. They route data across the network and provide a complete network infrastructure.

The data is transmitted in the cellular digital packet data (CDPD) format.

