

## COMPUTER NETWORK :-



A computer network is a set of devices connected through links. A node can be computer, printer, or any other device capable of sending or receiving the data. The links connecting the nodes are known as communication channels.

Computer Network uses distributed processing in which task is divided among several computers. Instead, a single computer handles an entire task, each separate computer handles a subset.

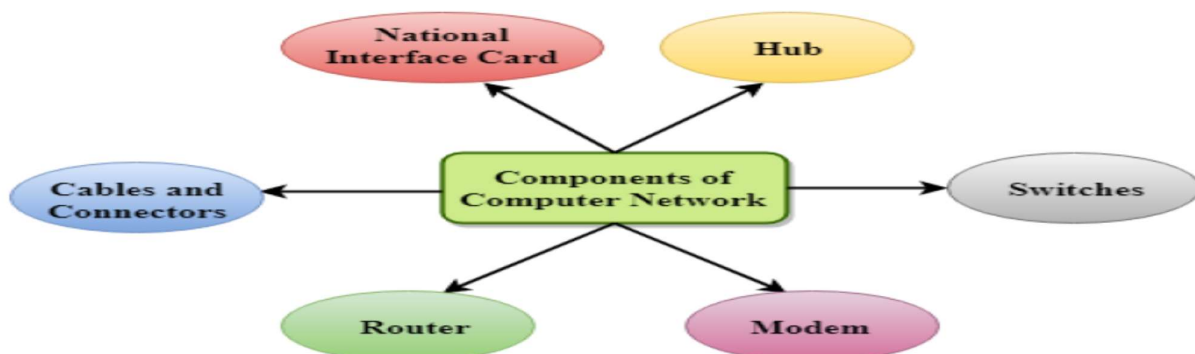
## Advantages of Distributed processing:

- **Security:** It provides limited interaction that a user can have with the entire system. For example, a bank allows the users to access their own accounts through an ATM without allowing them to access the bank's entire database.
- **Faster problem solving:** Multiple computers can solve the problem faster than a single machine working alone.
- **Security through redundancy:** Multiple computers running the same program at the same time can provide the security through redundancy. For example, if four computers run the same program and any computer has a hardware error, then other computers can override it.

## What is a Computer Network?

- **Computer Network** is a group of computers connected with each other through wires, optical fibres or optical links so that various devices can interact with each other through a network.
- The aim of the computer network is the sharing of resources among various devices.

## Components Of Computer Network:



## a) NIC (National interface card)

NIC is a device that helps the computer to communicate with another device. The network interface card contains the hardware addresses, the data-link layer protocol use this address to identify the system on the network so that it transfers the data to the correct destination.

There are two types of NIC: wireless NIC and wired NIC.

**Wired NIC:** Cables use the **wired NIC** to transfer the data over the medium.

**Wireless NIC:** All the modern laptops use the wireless NIC. In Wireless NIC, a connection is made using the antenna that employs the **radio wave technology**.

## b) Hub

Hub is a central device that splits the network connection into multiple devices. When computer requests for information from a computer, it sends the request to the Hub. Hub distributes this request to all the interconnected computers.

## c) Switches

Switch is a networking device that groups all the devices over the network to transfer the data to another device.

A switch is better than Hub as it does not broadcast the message over the network, i.e., it sends the message to the device for which it belongs to. Therefore, we can say that switch sends the message directly from source to the destination.

## d) Cables and connectors

Cable is a transmission media that transmits the communication signals. **There are three types of cables:**

- **Twisted pair cable:** It is a high-speed cable that transmits the data over **1Gbps** or more.
- **Coaxial cable:** Coaxial cable resembles like a TV installation cable. Coaxial cable is more expensive than twisted pair cable, but it provides the high data transmission speed.
- **Fibre optic cable:** Fibre optic cable is a high-speed cable that transmits the data using light beams. It provides high data transmission speed as compared to other cables. It is more expensive as compared to other cables.

## e) Router

Router is a device that connects the LAN to the internet. The router is mainly used to connect the distinct networks or connect the internet to multiple computers.

## f) Modem

Modem connects the computer to the internet over the existing telephone line. A modem is not integrated with the computer motherboard. A modem is a separate part on the PC slot found on the motherboard.

## Uses Of Computer Network

- **Server-Client model:** Computer networking is used in the **server-client model**. A server is a central computer used to store the information and maintained by the system administrator. Clients are the machines used to access the information stored in the server remotely.
- **Resource sharing:** Resource sharing is the sharing of resources such as programs, printers, and data among the users on the network without the requirement of the physical location of the resource and user.
- **Communication medium:** Computer network behaves as a communication medium among the users. For example, a company contains more than one computer has an email system which the employees use for daily communication.
- **E-commerce:** Computer network is also important in businesses. We can do the business over the internet. For example, Flipkart.com is doing their business over the internet, i.e., they are doing their business over the internet.

## Features Of Computer network

- Performance
- Reliability
- File sharing
- Back up and Roll back is easy
- Software and Hardware sharing
- Security
- Scalability
- Communication speed

### Performance

Performance can be measured in many ways, including transit time and response time. Transit time is the amount of time required for a message to travel from one device to another. Response time is the elapsed time between an inquiry and a response.

### Reliability

In addition to accuracy of delivery, network reliability is measured by the frequency of failure, the time it takes a link to recover from a failure, and the network's robustness in a catastrophe.

### File sharing

File sharing is one of the major advantage of the computer network. Computer network provides us to share the files with each other.

### Back up and Roll back is easy

Since the files are stored in the main server which is centrally located. Therefore, it is easy to take the back up from the main server.

## Software and Hardware sharing

We can install the applications on the main server, therefore, the user can access the applications centrally. So, we do not need to install the software on every machine. Similarly, hardware can also be shared.

## Security

Network security issues include protecting data from unauthorized access, protecting data from damage and development, and implementing policies and procedures for recovery from breaches and data losses.

## Scalability

Scalability means that we can add the new components on the network. Network must be scalable so that we can extend the network by adding new devices. But, it decreases the speed of the connection and data of the transmission speed also decreases, this increases the chances of error occurring. This problem can be overcome by using the routing or switching devices.

## Communication speed

Network provides us to communicate over the network in a fast and efficient manner. For example, we can do video conferencing, email messaging, etc. over the internet. Therefore, the computer network is a great way to share our knowledge and ideas.

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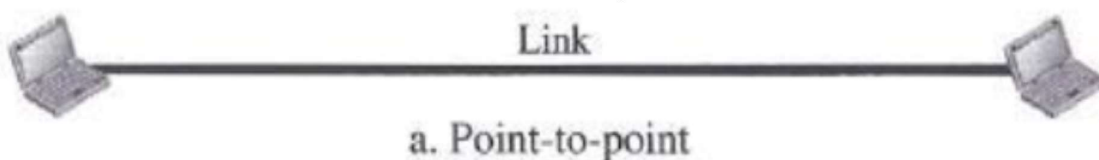
## Physical Structures

### Type of Connection

A network is two or more devices connected through links. A link is a communications pathway that transfers data from one device to another. For communication to occur, two devices must be connected in some way to the same link at the same time. There are two possible types of connections: **point-to-point** and **multipoint**.

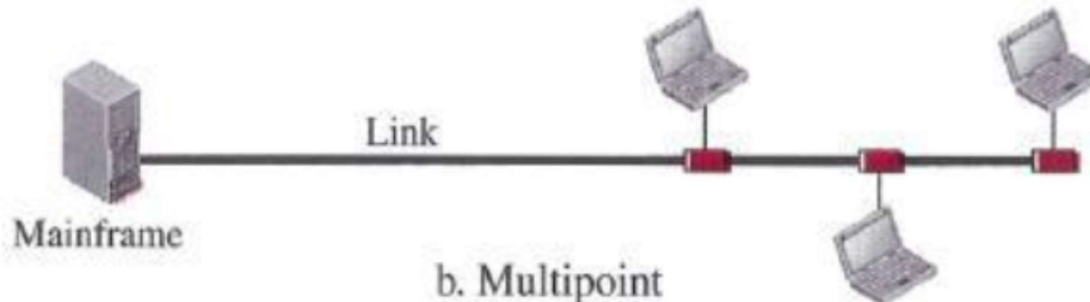
### Point-to-Point

A point-to-point connection provides a dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices. Most point-to-point connections 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. When we change television channels by infrared remote control, we are establishing a point-to-point connection between the remote control and the television's control system.



## Multipoint

A multipoint (also called multidrop) connection is one in which more than two specific devices share a single link. In a multipoint environment, the capacity of the channel is shared, either spatially or temporally. If several devices can use the link simultaneously, it is a *spatially shared* connection. If users must take turns, it is a *timeshared* connection.



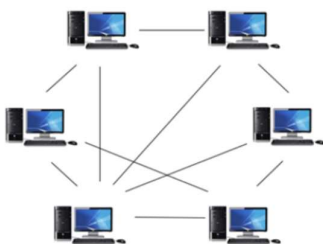
## Computer Network Architecture

Computer Network Architecture is defined as the physical and logical design of the software, hardware, protocols, and media of the transmission of data. Simply we can say that how computers are organized and how tasks are allocated to the computer.

**The two types of network architectures are used:**

- Peer-To-Peer network
- Client/Server network

### I. Peer-To-Peer network



- Peer-To-Peer network is a network in which all the computers are linked together with equal privilege and responsibilities for processing the data.
- Peer-To-Peer network is useful for small environments, usually up to 10 computers.
- Special permissions are assigned to each computer for sharing their resources, but this can lead to a problem if the computer with the resource is down.
- Peer-To-Peer network has no dedicated server.

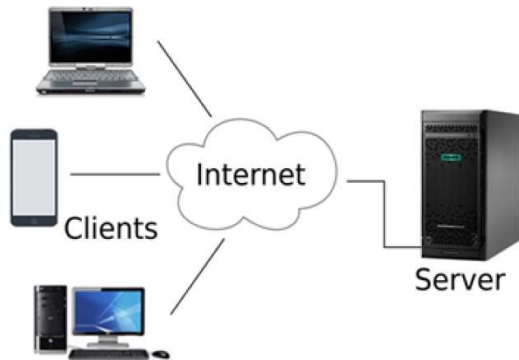
**Advantages Of Peer-To-Peer Network:**

- It is less costly as it does not contain any dedicated server.
- If one computer stops working but, other computers will not stop working.
- It is easy to set up and maintain as each computer manages itself.

**Disadvantages Of Peer-To-Peer Network:**

- In the case of Peer-To-Peer network, it does not contain the centralized system. Therefore, it cannot back up the data as the data is different in different locations.
- It has a security issue as the device is managed itself.

## II. Client/Server Network



- Client/Server network is a network model designed for the end users called clients, to access the resources such as songs, video, etc. from a central computer known as Server.
  - The central controller is known as a **server** while all other computers in the network are called **clients**.
  - A server performs all the major operations such as security and network management.
  - A server is responsible for managing all the resources such as files, directories, printer, etc.
- All the clients communicate with each other through a server. For example, if client1 wants to send some data to client 2, then it first sends the request to the server for the permission. The server sends the response to the client 1 to initiate its communication with the client 2.

### Advantages Of Client/Server network:

- A Client/Server network contains the centralized system. Therefore we can back up the data easily.
- A Client/Server network has a dedicated server that improves the overall performance of the whole system.
- Security is better in Client/Server network as a single server administers the shared resources.
- It also increases the speed of the sharing resources.

### Disadvantages Of Client/Server network:

- Client/Server network is expensive as it requires the server with large memory.
  - A server has a Network Operating System(NOS) to provide the resources to the clients, but the cost of NOS is very high.
  - It requires a dedicated network administrator to manage all the resources.
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