

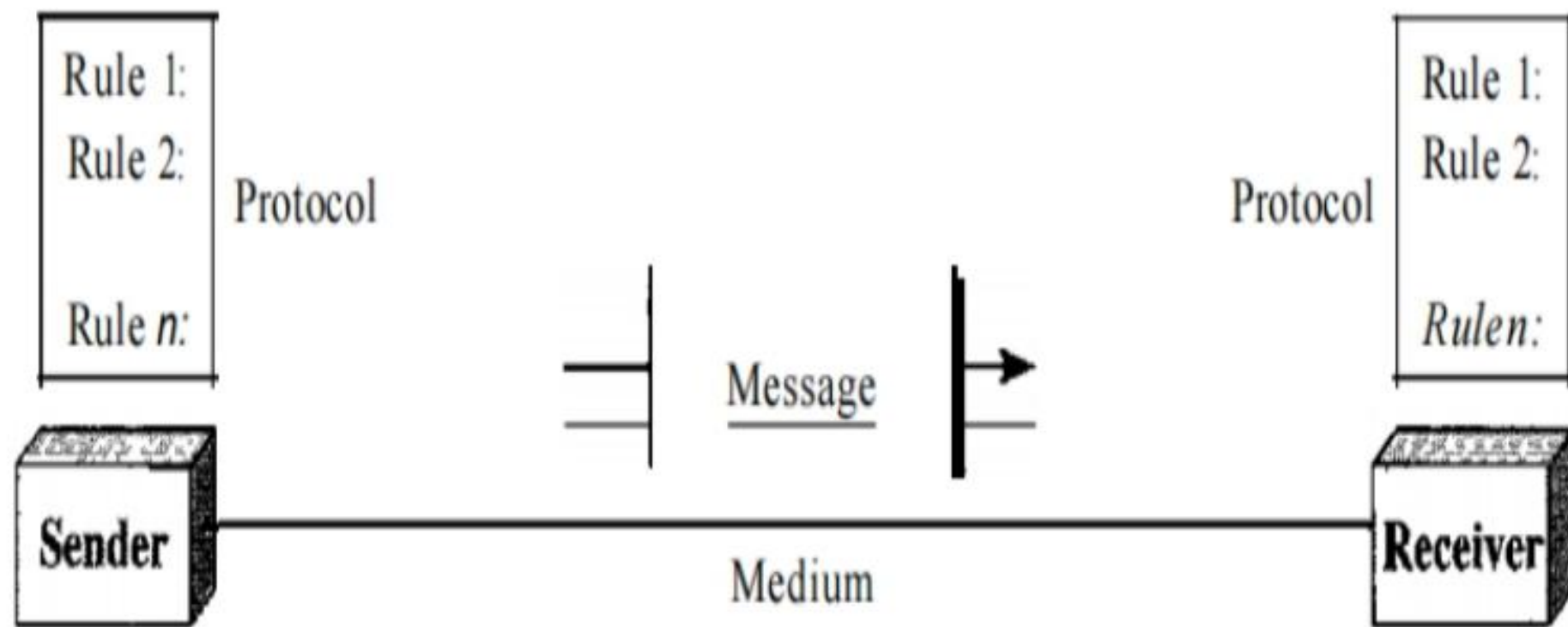
CN: WEEK 1

Data Communications:

- When we communicate, we are sharing information. This sharing can be local or remote.
- Between individuals, local communication usually occurs face to face, while remote communication takes place over distance.
- The word data refers to information presented in whatever form is agreed upon by the parties creating and using the data.

- *Data communications are the exchange of data between two devices via some form of transmission medium such as a wire cable.*
- *Transmission of digital data between two or more computers.*
- *Effectiveness of a data communications system depends on four fundamental characteristics:*
 - *Delivery*
 - *Accuracy*
 - *Timelines*
 - *Jitter.*

- **Delivery.** The system must deliver data to the correct destination. Data must be received by the intended device or user and only by that device or user.
- **Accuracy.** The system must deliver the data accurately. Data that have been altered in transmission and left uncorrected are unusable.
- **Timeliness.** The system must deliver data in a timely manner. Data delivered late are useless. In the case of video and audio, timely delivery means delivering data as they are produced, in the same order that they are produced, and without significant delay. This kind of delivery is called real-time transmission.
- **Jitter.** Jitter refers to the variation in the packet arrival time. It is the uneven delay in the delivery of audio or video packets. For example, let us assume that video packets are sent every 5 ms. If some of the packets arrive with 3-ms delay and others with 4-ms delay, an uneven quality in the video is the result.

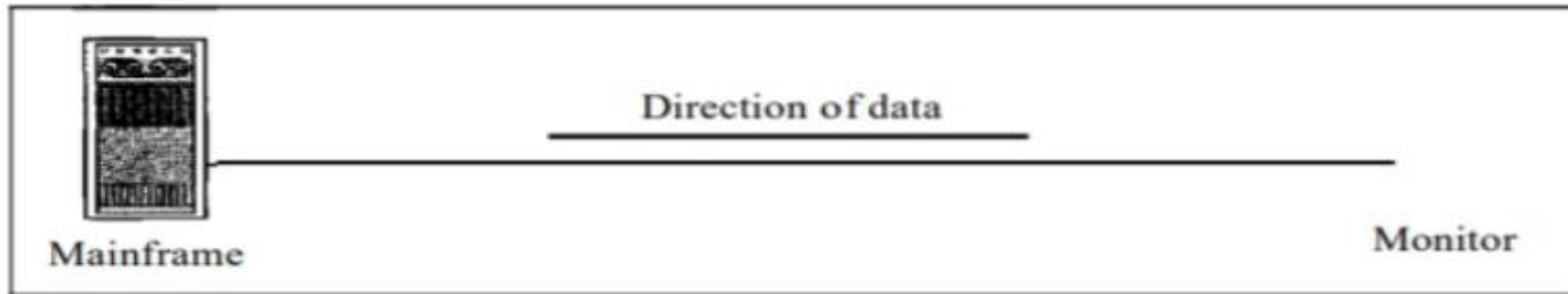


Five components of data communication

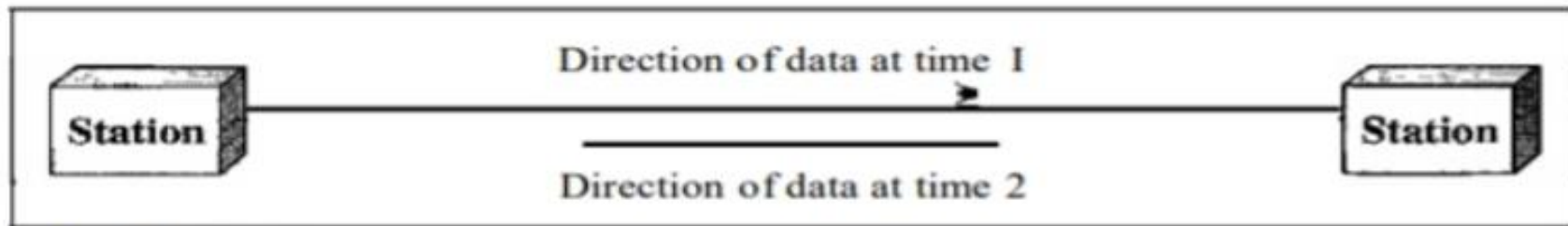
Information today comes in different forms such as text, numbers, images, audio, and video. A data communications system has five components:

- **Message.** The message is the information (data) to be communicated. Popular forms of information include text, numbers, pictures, audio, and video.
- **Sender.** The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.
- **Receiver.** The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.
- **Transmission medium.** The transmission medium is the physical path by which a message travels from sender to receiver. Some examples of transmission media include twisted-pair wire, coaxial cable, fiber-optic cable, and radio waves.
- **Protocol.** A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating, just as a person speaking French cannot be understood by a person who speaks only Japanese.

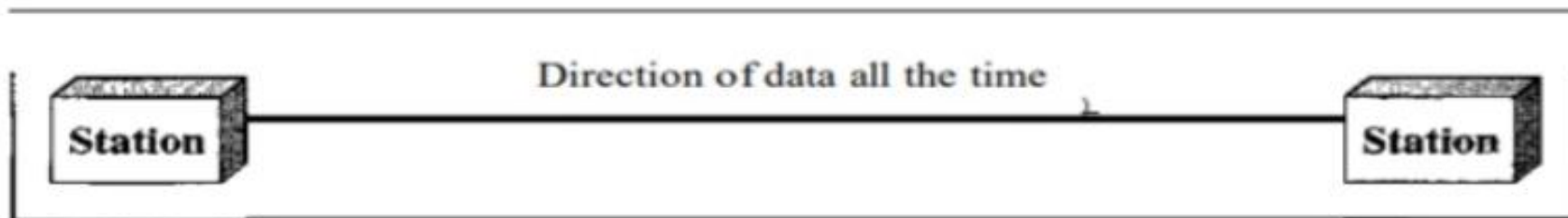
Communication between two devices can be simplex, half-duplex, or full-duplex.



a. Simplex



b. Half-duplex



c. Full-duplex

- **Simplex:** In simplex mode, the communication is unidirectional, as on a one-way street. Only one of the two devices on a link can transmit; the other can only receive. Keyboards and traditional monitors are examples of simplex devices. The keyboard can only introduce input; the monitor can only accept output.
- **Half-Duplex:** In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive, and vice versa. Walkie-talkie and CB (citizens band) radios are both half-duplex systems.
- **Full-Duplex:** In full-duplex mode, both stations can transmit and receive simultaneously. One common example of full-duplex communication is the telephone network. When two people are communicating by a telephone line, both can talk and listen at the same time.

NETWORKS

- A network is a set of devices (often referred to as nodes) connected by communication links so that various devices can interact with each other through a network.
- A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network.
- The aim of the computer network is the sharing of data & resources among various devices.
- Most networks use distributed processing, in which a task is divided among multiple computers. Instead of one single large machine being responsible for all aspects of a process, separate computers handle a subset.

A network must be able to meet certain criterias, these are mentioned below

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. Performance is often evaluated by two networking metrics: throughput and delay.

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.

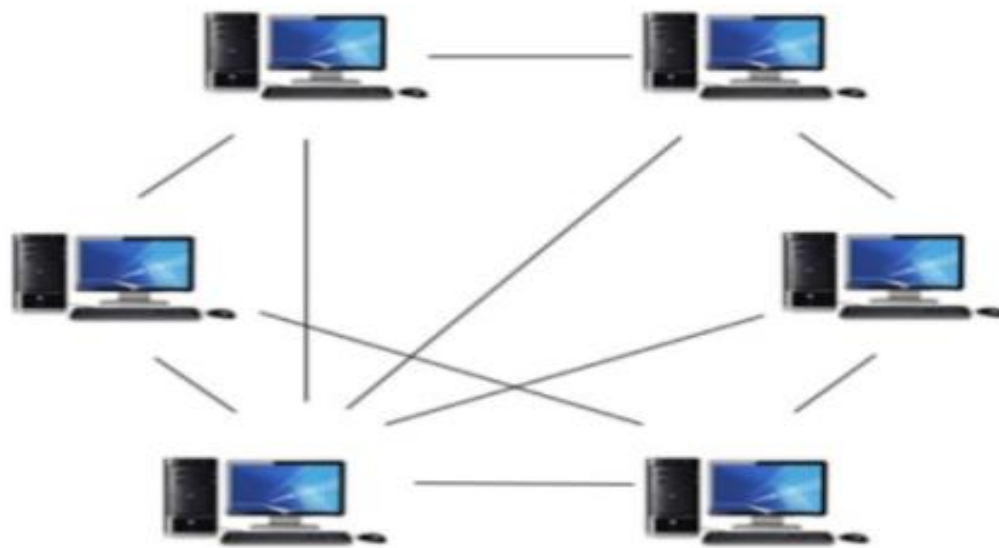
Security Network security issues include protecting data from unauthorized access, protecting data from damage and development, and implementing policies and procedures for recovery from breaches and data losses.

Important uses Of Computer Network are:

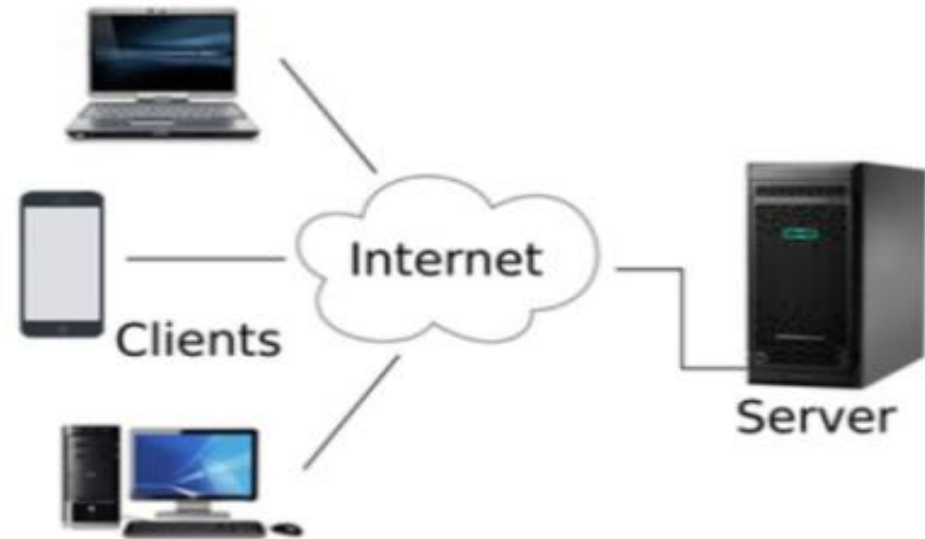
- **Resource sharing:** Resource sharing is the sharing of resources such as programs, printers, and data among the users on the network without the requirement of the physical location of the resource and user.
- **Server-Client model:** Computer networking is used in the server-client model. A server 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.
- **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, amazon.com is doing their business over the internet, i.e., they are doing their business over the internet.

Computer Network Architecture

It defines how tasks are allocated to the computer. The two types of network architectures are Peer-To-Peer network and Client/Server network.



Peer-To-Peer



Client/Server

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.
- Peer-To-Peer network has no dedicated server.
- Special permissions are assigned to each computer for sharing the resources, but this can lead to a problem if the computer with the resource is down.

Client/Server Network

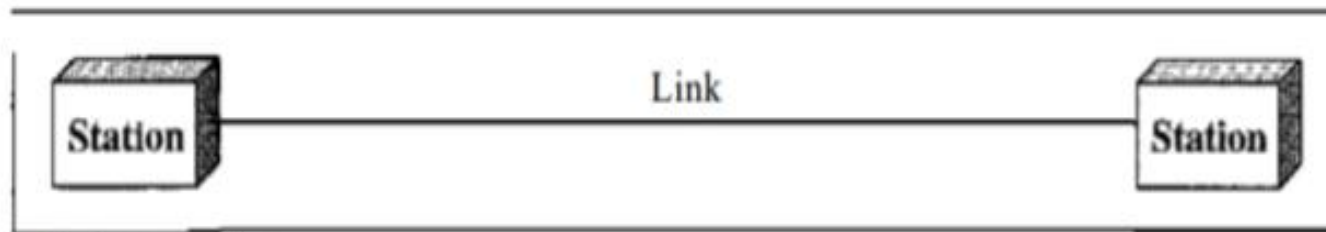
- Client/Server network is a network model designed for the end users called clients, to access the resources such as songs, video, etc. from a central computer known as Server.
- The central controller is known as a server while all other computers in the network are called clients.
- A server performs 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.

S.NO	Client-Server Network	Peer-to-Peer Network
1.	In a Client-Server Network, clients and servers are differentiated due to the existence of distinct servers and clients.	In a Peer-to-Peer Network, there is no clear distinction between clients and servers.
2.	It primarily focuses on the dissemination of information.	It chiefly emphasizes on connectivity.
3.	Data is typically stored in a centralized server.	Every peer holds its own data.
4.	In a Client-Server network, the server responds to the service requests made by the client.	In a Peer-to-Peer network, each node can both request and provide services.
5.	A Client-Server network is more expensive than a Peer-to-Peer network.	A Peer-to-Peer network is more cost-effective than a Client-Server network.
6.	They provide a more stable network configuration.	They offer less stability in comparison.
7.	They can be employed in both small and large networks.	They are mainly used for smaller networks.

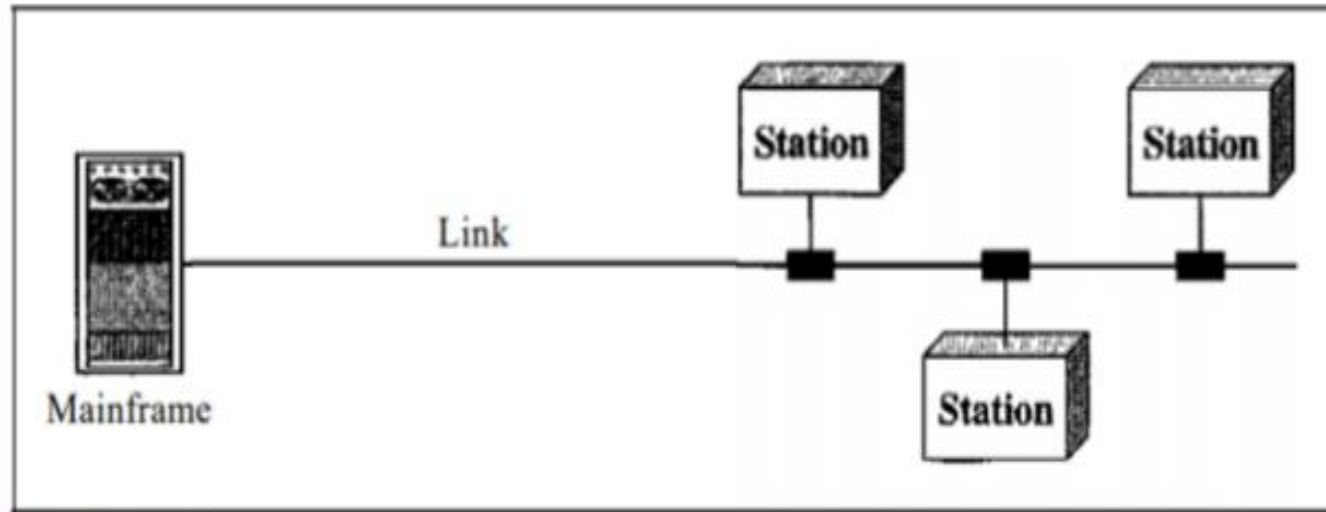
A link is a communications pathway that transfers data from one device to another.

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 multi-point.



a. Point-to-point



b. Multipoint

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.

➤ ***Multipoint*** A multipoint 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.

END