

CAP275: Data Communication and Networking

Unit-I: Data Communications

Dr. Manmohan Sharma

School of Computer Applications

Lovely Professional University

Computer Networks

A **computer network**, often simply referred to as a network, is a collection of computers and devices interconnected by communications channels that facilitate communications and allows sharing of resources and information among interconnected devices.

Data Communication

- Data Communications is the transfer of data or information between a source and a receiver. The source transmits the data and the receiver receives it.
- The actual generation of the information is not part of Data Communications nor is the resulting action of the information at the receiver.
- Actual Data Communication is referred to the transfer of data, the method of transfer and the preservation of the data during the transfer process.

Effectiveness of Data Communication

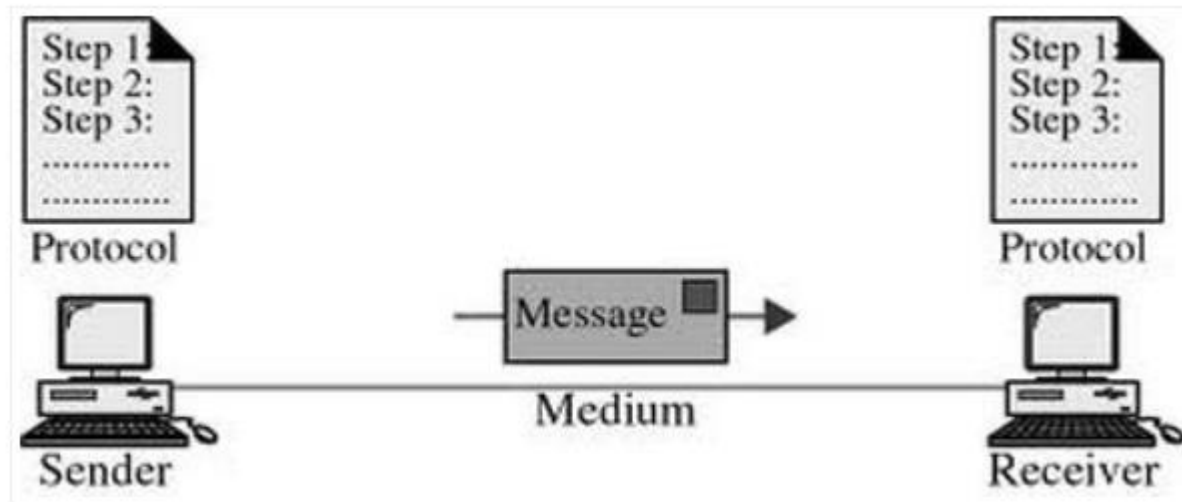
The effectiveness of a data communication system depends on the three fundamental characteristics:

1. **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
2. **Accuracy:** The system must deliver data accurately. Data that have been altered in transmission and left uncorrected are rustles
3. **Timeliness:** The system must deliver data in a timely manner. Data delivered late are useless. In the case of video, audio, and voice data, 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 id called real-time transmission.

Components of Data Communication System

The following are the basic requirements for working of a communication system.

1. The sender (source) who creates the message to be transmitted
2. A medium that carries the message
3. The receiver (sink) who receives the message



1. **Message:** A **message** in its most general meaning is an object of communication. It is a vessel which provides information. Yet, it can also be this information.

Therefore, its meaning is dependent upon the context in which it is used; the term may apply to both the information and its form.

2. **Sender:** The sender will have some kind of meaning she wishes to convey to the receiver. It might not be conscious knowledge, it might be a sub-conscious wish for communication.

What is desired to be communicated would be some kind of idea, perception, feeling, or datum. It will be a part of her reality that she wishes to send to somebody else.

3. **Receiver:** These messages are delivered to another party.

Keep in mind, the other party also enters into the communication process with ideas and feelings that will undoubtedly influence their understanding of your message and their response. To be a successful communicator, you should consider these before delivering your message, then acting appropriately.

4. **Medium:** Medium is a means used to exchange/transmit the message.

The sender must choose an appropriate medium for transmitting the message else the message might not be conveyed to the desired recipients. The choice of appropriate medium of communication is essential for making the message effective and correctly interpreted by the recipient. This choice of communication medium varies depending upon the features of communication.

5. **Protocol:** A **protocol** is a formal description of digital message formats and the rules for exchanging those messages in or between computing systems and in telecommunications.

Protocols may include signalling, authentication and error detection and correction syntax, semantics, and synchronization of communication and may be implemented in hardware or software, or both.

6. **Feedback:** Feedback is the main component of communication process as it permits the sender to analyse the efficacy of the message.

It helps the sender in confirming the correct interpretation of message by the decoder. Feedback may be verbal (through words) or non-verbal (in form of smiles, sighs, etc.). It may take written form also in form of memos, reports, etc.

Data Representation

Information shared on the networks are of different forms represented by various codes such as ASCII, EBCDIC, BCD etc.

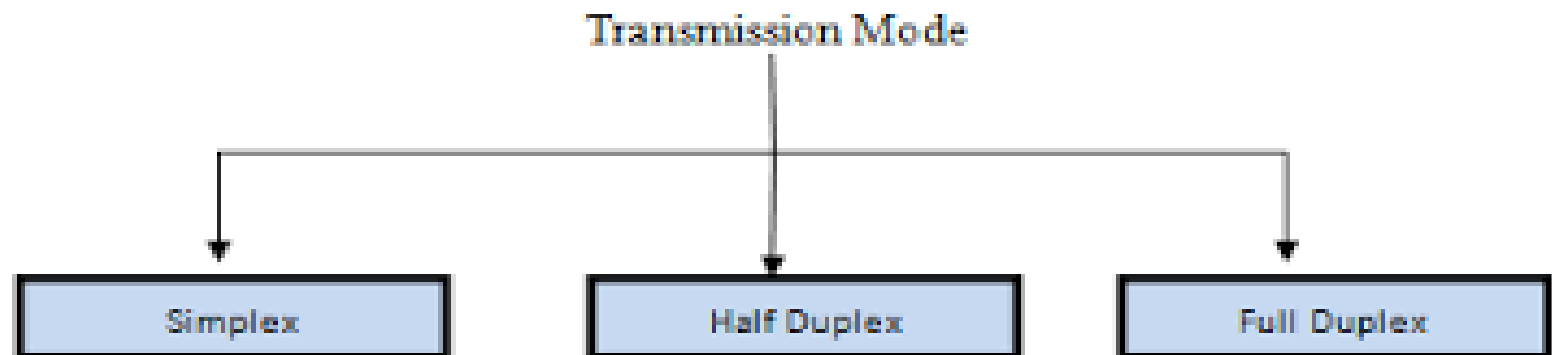
- **Text:** In data communications, text is represented as a bit pattern, a sequence of bits (0s or 1s). Different sets of bit patterns have been designed to represent text symbols. Each set is called a code, and the process of representing symbols is called coding.
- **Numbers:** Numbers are also represented by bit patterns. However, a code such as ASCII is not used to represent numbers; the number is directly converted to a binary number to simplify mathematical operations.

- **Images:** Images are also represented by bit patterns. In its simplest form, an image is composed of a matrix of pixels (picture elements), where each pixel is a small dot. The size of the pixel depends on the resolution.
- **Audio:** Audio refers to the recording or broadcasting of sound or music. Audio is by nature different from text, numbers, or images. It is continuous, not discrete.
- **Video:** Video refers to the recording or broadcasting of a picture or movie. Video can either be produced as a continuous entity (e.g., by a TV camera), or it can be a combination of images, each a discrete entity, arranged to convey the idea of motion.

Data Flow

The flow of data on a communications channel between two machines can occur in several different ways known as transmission modes. The data flow or transmission is characterized by following characteristics:

- Direction of the exchanges
- Transmission: the number of bits sent simultaneously
- Synchronization between the transmitter and receiver



Simplex

- A **simplex connection** is a connection in which the data flows in only one direction, from the transmitter to the receiver. This type of connection is useful if the data do not need to flow in both directions
 - for example, from your computer to the printer or from the mouse to your computer.
- There is no mechanism in for information to be transmitted back from receiver to sender.
- The entire capacity of the channel is used to send data in one direction



Half Duplex

- A **half-duplex connection** (sometimes called an *alternating connection* or *semi-duplex*) is a connection in which the data flows in one direction or the other, but not both at the same time.
 - for example walkie talkie
- With this type of connection, each end of the connection transmits in turn.
- This type of connection makes it possible to have bidirectional communications using the full capacity of the line.



Full Duplex

- A **full-duplex connection** is a connection in which the data flow in both directions simultaneously.
 - For example communication between two interconnected computers, your mobile phones
- Each end of the line can thus transmit and receive at the same time, which means that the bandwidth is divided in two for each direction of data transmission if the same transmission medium is used for both directions of transmission.

