CAP275: Data Communiction and Networking
Unit-I: Basic Concepts

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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

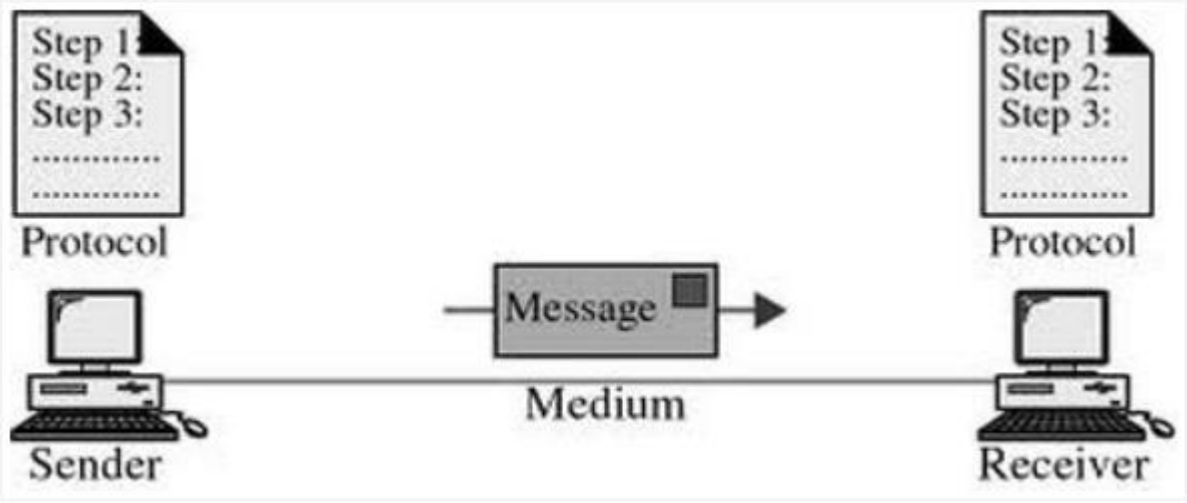
The effectiveness of a data communication system depends on the three fundamental characteristics:

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.

Protocol and its Components

Protocol is a set of rules that governs data communication. It represents an agreement between the communicating devices. Without protocol two devices may be connected but cannot communicate.

The key elements of protocol are:

1. **Syntax:** The term *syntax* refers to the structure or format of the data, meaning the order in which they are presented.
2. **Semantics:** The word *semantics* refers how a particular pattern to be interpreted and what action is to be taken based on that interpretation.
3. **Timing:** Timing refers to when the data should be sent and how fast it should be sent?

The key functions that a protocol performs are:

- **Protocol Data Unit:** It refers to the breaking of data in manageable units called Protocol Data Unit e.g. Segment, Packet, Frame etc.
- **Format of packet:** Format of the packet like which group of bits in the packet constitute data, address, or control bits.
- **Sequencing:** It refers to the breaking long message into smaller units. Sequencing is responsibility protocol.
- **Routing of packets:** Finding the most efficient path between source and destination is responsibility of protocol.
- **Flow control:** It is responsibility of the protocol to prevent fast sender to overwhelm slow receiver. It ensures resource sharing and protection against traffic congestion by regulating the flow of data through the shared medium.

- **Error control:** Protocol is responsible to provide method for error detection and correction.
- **Log related information:** Some communication software has features to provide log of usage of network resources.
- **Defining priority:** Different types of packets needs to have different priority while moving on the shared network e.g. network management packets needs to be given higher priority if some congestion occurs.
- **Creating and terminating a connection:** Protocol defines the rules to create and terminate a connection between sender and receiver to communicate among each other.
- **Security of data:** Several communication software has features to prevent data from unauthorized access.

Next Class will be based on

- Standards and Organizations
- Classification of Networks