ENTRI

DATA COMMUNICATION

SESSION 1

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OUTLINE

- Data Communication
- Components
- Modes of Communication
- Transmission Media

Data Communication

- Data Communication is defined as exchange of data between two devices via some form of transmission media such as a cable, wire or it can be air or vacuum also.

- For occurrence of data communication, communicating devices must be a part of communication system made up of a combination of hardware or software devices and programs.

Simple Data Communication System

Data Communication System Components :

1. Message
2. Sender
3. Receiver
4. Transmission Medium
5. Set of rules (Protocol)

1. **Message**: It is the information or data to be communicated. It can consist of text, numbers, pictures, sound or video or any combination of these.

2. **Sender**: It is the device/computer that generates and sends that message.

3. **Receiver**: It is the device or computer that receives the message. The distance between sender and receiver depends upon the types of network used in between.

4. **Medium**: It is the channel or physical path through which the message is carried from sender to the receiver. The medium can be wired like twisted pair wire, coaxial cable, fiber-optic cable or wireless like laser, radio waves, and microwaves.

5. **Protocol**: It is a set of rules that govern the communication between the devices. Both sender and receiver follow same protocols to communicate with each other.

The effectiveness depends on four fundamental characteristics of data communications

1. Delivery: The data must be deliver in correct order with correct destination.

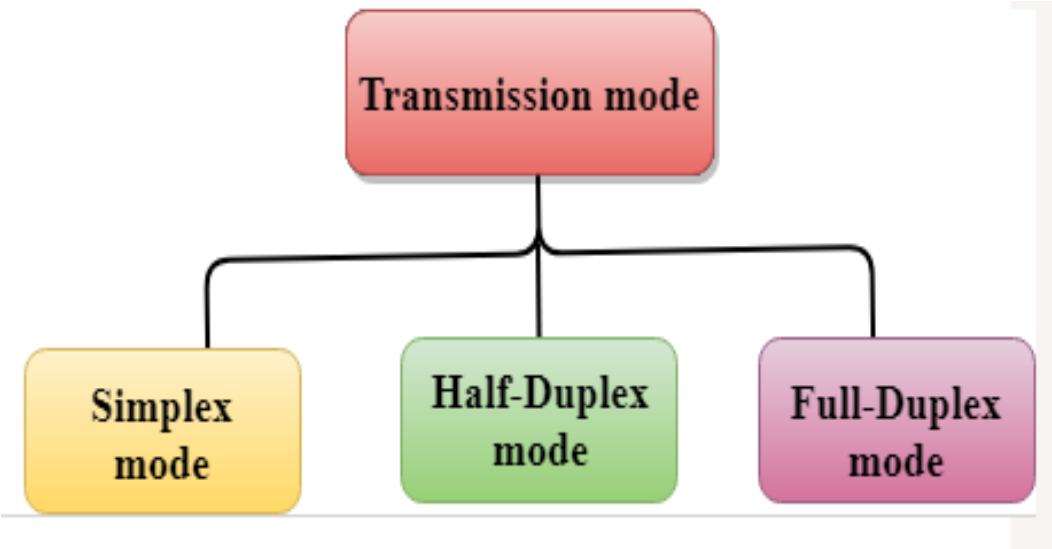
2. Accuracy: The data must be deliver accurately.

3. Timeliness: The data must be deliver in a timely manner.

4. Jitter: It is the uneven delay in the packet arrival time that cause uneven quality

Modes of Data Communication

- The way in which data is transmitted from one device to another device is known as **transmission mode**.
- The transmission mode is also known as the communication mode.
- Each communication channel has a direction associated with it, and transmission media provide the direction. Therefore, the transmission mode is also known as a directional mode.
- The transmission mode is defined in the physical layer.


Transmission mode
Simplex mode
Half-Duplex mode
Full-Duplex mode

Simplex Mode

- 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.

- The simplex mode can use the entire capacity of the channel to send data in one direction.

- **Example: Keyboard and traditional monitors**. The keyboard can only introduce input, the monitor can only give the output.

Half-Duplex Mode

- 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.

- The half-duplex mode is used in cases where there is no need for communication in both direction at the same time.

- Example: Walkie- talkie

Full duplex

- In Full duplex mode, the **communication is bi-directional**, i.e., the data flow in both the directions.
- Both the stations can send and receive the message simultaneously.
- Full-duplex mode has two simplex channels. One channel has traffic moving in one direction, and another channel has traffic flowing in the opposite direction.

Transmission media

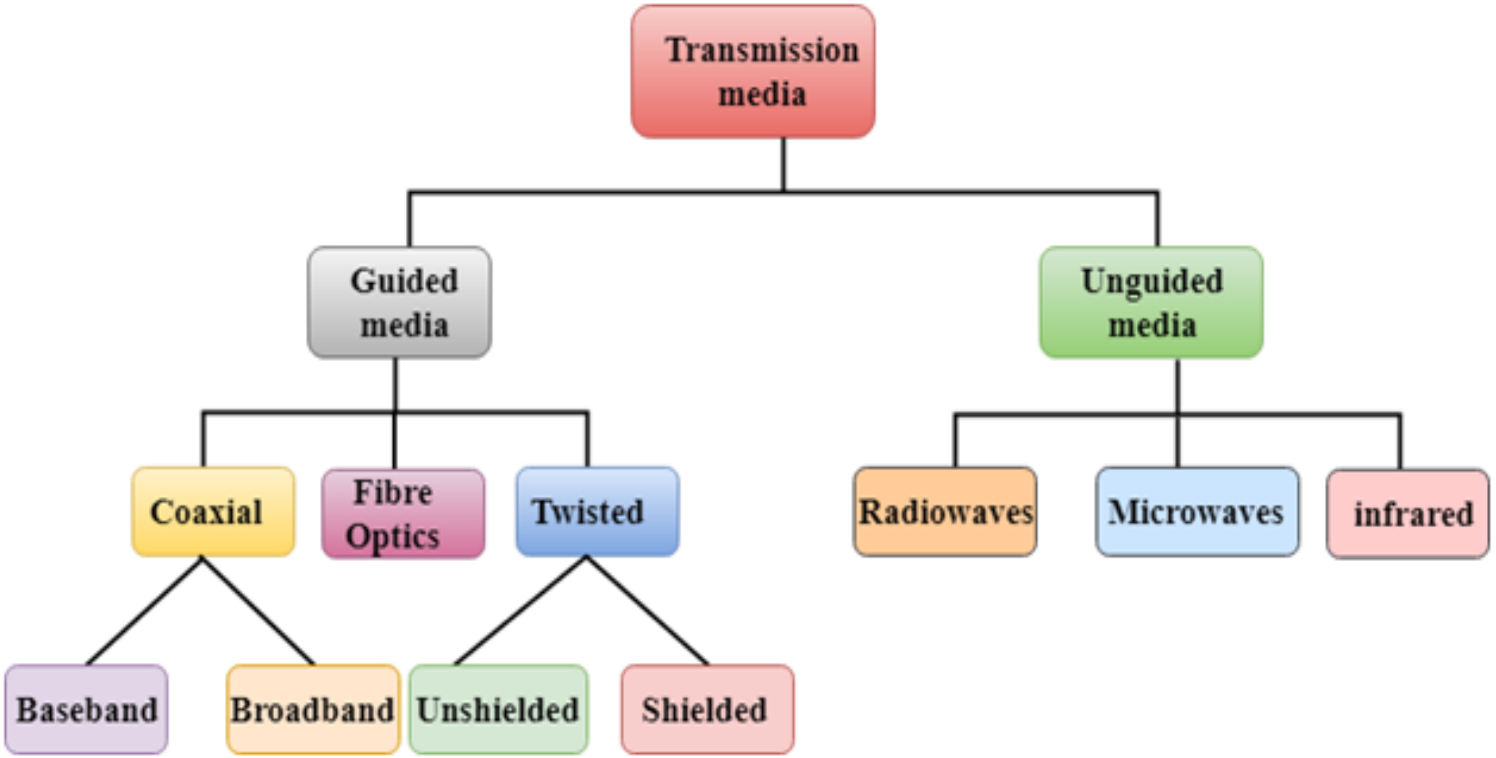
Transmission media is a communication channel that carries the information from the sender to the receiver. Data is transmitted through the electromagnetic signals.

It is a physical path between transmitter and receiver in data communication.

In **OSI**(Open System Interconnection) phase, transmission media supports the Layer 1. Therefore, it is considered to be as a Layer 1 component.

Transmission media is of two types are **wired media and wireless media** In wired media, medium characteristics are more important whereas, in wireless media, signal characteristics are more important.

Different transmission media have different properties such as bandwidth, delay, cost and ease of installation and maintenance.


Transmission media
Guided media
Unguided media
Coaxial
Fibre Optics
Twisted
Radiowaves
Microwaves
infrared
Baseband
Broadband
Unshielded
Shielded

Twisted pair:

- Twisted pair is a physical media made up of a pair of cables twisted with each other.

- A twisted pair cable is cheap as compared to other transmission media. Installation of the twisted pair cable is easy, and it is a lightweight cable.

- The frequency range for twisted pair cable is from 0 to 3.5KHz

- A twisted pair consists of two insulated copper wires arranged in a regular spiral pattern.

- The degree of reduction in noise interference is determined by the number of turns per foot. Increasing the number of turns per foot decreases noise interference.

Unshielded Twisted Pair (UTP):

- This type of cable has the ability to block interference and does not depend on a physical shield for this purpose. It is used for telephonic applications.
- Least expensive
- Easy to install
- High-speed capacity
- Lower capacity and performance in comparison to STP

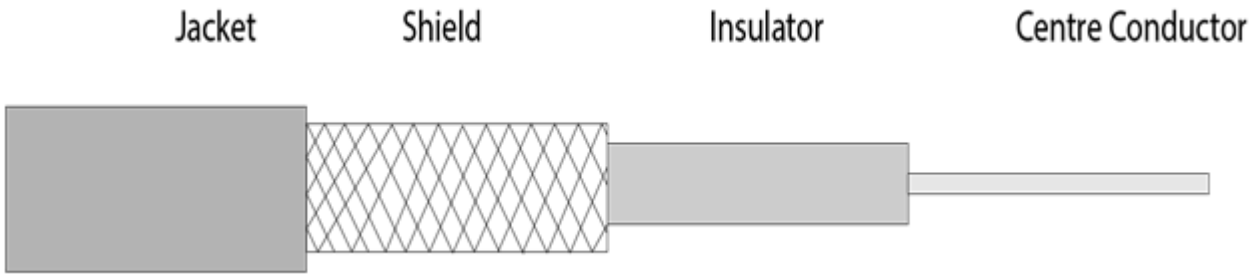
Shielded Twisted Pair (STP):

- This type of cable consists of a special jacket to block external interference. It is used in fast-data-rate Ethernet and in voice and data channels of telephone lines.

- Better performance at a higher data rate in comparison to UTP
- Comparatively faster
- Comparatively difficult to install and manufacture
- More expensive

Coaxial Cable

- Coaxial cable is very commonly used transmission media, for example, TV wire is usually a coaxial cable.
- It has a higher frequency as compared to Twisted pair cable.



- The inner conductor of the coaxial cable is made up of copper, and the outer conductor is made up of copper mesh. The middle core is made up of non-conductive cover that separates the inner conductor from the outer conductor.

- The middle core is responsible for the data transferring whereas the copper mesh prevents from the **EMI**(Electromagnetic interference).

Coaxial cable is of two types

- **Baseband transmission:** It is defined as the process of transmitting a single signal at high speed.

- **Broadband transmission:** It is defined as the process of transmitting multiple signals simultaneously

Fiber Optic

- Fiber optic cable is a cable that uses electrical signals for communication.

- Fiber optic is a cable that holds the optical fibers coated in plastic that are used to send the data by pulses of light.

- The plastic coating protects the optical fibers from heat, cold, electromagnetic interference from other types of wiring.
- Fibre optics provide faster data transmission than copper wires.

- **Greater Bandwidth:** The fibre optic cable provides more bandwidth as compared copper. Therefore, the fibre optic carries more data as compared to copper cable.

- **Faster speed:** Fibre optic cable carries the data in the form of light. This allows the fibre optic cable to carry the signals at a higher speed.

- **Longer distances:** The fibre optic cable carries the data at a longer distance as compared to copper cable.

Unguided Transmission

- An unguided transmission transmits the electromagnetic waves without using any physical medium. Therefore it is also known as **wireless transmission**.

- In unguided media, air is the media through which the electromagnetic energy can flow easily.

Radio waves

- Radio waves are the electromagnetic waves that are transmitted in all the directions of free space.

- Radio waves are omnidirectional, i.e., the signals are propagated in all the directions.

- The range in frequencies of radio waves is from 3Khz to 1 khz.
- An example of the radio wave is **FM radio**.

Microwaves

- Microwaves are of two types:
  - Terrestrial microwave
  - Satellite microwave communication.

Terrestrial Microwave Transmission

- Terrestrial Microwave transmission is a technology that transmits the focused beam of a radio signal from one ground-based microwave transmission antenna to another.

- Microwaves are the electromagnetic waves having the frequency in the range from 1GHz to 1000 GHz.

- Microwaves are unidirectional as the sending and receiving antenna is to be aligned, i.e., the waves sent by the sending antenna are narrowly focused.

- In this case, antennas are mounted on the towers to send a beam to another antenna which is km away.

- It works on the line of sight transmission, i.e., the antennas mounted on the towers are the direct sight of each other.

Satellite Microwave Communication

- The satellite accepts the signal that is transmitted from the earth station, and it amplifies the signal. The amplified signal is retransmitted to another earth station.

- A satellite is a physical object that revolves around the earth at a known height.

- Satellite communication is more reliable nowadays as it offers more flexibility than cable and fiber optic systems.

- We can communicate with any point on the globe by using satellite communication.

Infrared

- An infrared transmission is a wireless technology used for communication over short ranges.
- The frequency of the infrared in the range from 300 GHz to 400 THz.
- It is used for short-range communication such as data transfer between two cell phones, TV remote operation, data transfer between a computer and cell phone resides in the same closed area.

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THANK YOU