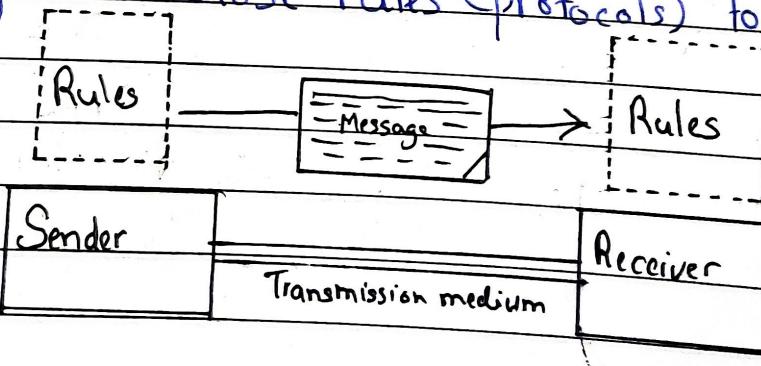


Data Comm.

Ch. 1

• Component of DC

- Message: The data to be communicated is called the message. It may include text, images, audio and video.
- Sender: The device which sends the message is called the sender; It could be a computer, router, sensor, etc
- Receiver: The device for whom the message is intended and which receives the message is called receiver.
- Transmission Medium: It is the path between the sender and receiver which carries message. It could be wired medium like coaxial cable, twisted cable or wireless medium like radio waves.
- Protocol: It is the set of rules which governs data communication. Two communicating devices must be agree on those rules (protocols) to communicate effectively.



• Transmission Media

• Guided: In guided media, transmitted data travels through cabling system that has a fixed path.

1. Twisted pair cables

• It is a common type of wiring used to connect homes and businesses to the telephone company.

• The twisted pair cable is suitable for transferring balanced differential signals.

• The advantages of improved SNR ratio, crosstalk, and ground bounce that balanced signal transmission brings are particularly valuable in wide bandwidth and high fidelity system.

★ 2 Types

1. STP (Shielded) → has extra metal covering to stop noise. Used in old Token Ring Networks

2. UTP (Unshielded) → do not have any material for covering. Used in Ethernet cables

2. Coaxial Cable

- In this cable, an inner copper core (conductor) is covered by an insulating material on which there is another layer of conducting layers, followed by outer sheath / jacket.
- This unique design allows coaxial cable to be installed near metal objects without losing the strength of signal.
- Mainly used for connecting radio transmitter and receivers with their antennas and DTH / TV cable services.
- Costlier than Twisted pairs.

3. Fibre optic cables / optical fibre cable

- Fibre optic cable consist of a center glass core surrounded by several layers of protective material.
- It transmits light rather than electronic signal eliminating the problem of electrical interference.
- Ideal for environment with high electrical interference and also immune to lightning and moisture.
- Costlier than both twisted pair and coaxial cable.

- Can transfer data over much longer distance at vastly great speed.
- This cable is difficult to install and modify
- 10BaseF → std. name for ethernet over fibre optic

• RJ-45

- ↳ RJ-45 is a connector used for twisted pair
- ↳ The pairs first untangled then its layer is trimmed about an inch and then that wires are placed into RJ-45 connector and then crimped using crimping tool.
- ↳ RJ → Registered Jack; 45 → IDK, Find out yourself.

• BNC connector

- ↳ Used for coaxial cable to connect those wires.
- ↳ BNC - Bayone - Neill - Connelman
- ↳ 3 Types of adapters
 - ↳ 1. T-connector : Splits into 3
 - ↳ 2. Barrel connector : Joins two wires
 - ↳ 3. Terminator

• Unguided Media

1. Radio Waves

- Radio waves are electromagnetic waves with frequency betⁿ 3KHz to 1GHz.

• This wave spread in ~~all~~ directions and because of that, signals can interfere with other signals on same frequency.

• These waves are used for broadcasting for long-distance (unlike your gf/bf), can pass through walls (just like your neighbours).

• Because of lower frequency band, data speed is low and government gives special permissions to use radio waves.

• Used in walkie-Talkie, pager device, AM/PM Radio.

2. Microwaves

• Microwaves are also EM waves with frequency 1GHz to 300GHz and it is unidirectional, means wave can be focused in one direction.

• The sending & Receiving antennas must be aligned with each other, can work in same area without interference since beam is focused.

- These antennas are parabolic or funnel shaped kept on high place (like on a building) facing each other.
- These waves cannot penetrate walls, but its data rate is higher (almost 500 Gbps).
- Needs Government permissions to use it.
- Used in cell phones, wi-fi, satellite comm, etc.

3. Infrared (IR) waves)

- IR waves have frequency ranging between 300 GHz to 400 THz, typically used in short-ranged communication.
 - IR waves cannot penetrate walls and receiving and transmitting device should point at each other.
 - Used in TV remotes, wireless keyboard, mice, etc.
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- Data Representation

i. Text: It represents information in form of characters. In binary, characters are represented in bits called code. ASCII and UNICODE are the std. coding system.

ii. Numbers: Numbers are directly converted into binary and sent in msg.

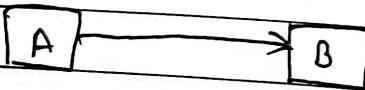
iii. Images: Images are represented as a matrix of pixels. Each pixel represents specific bits which depend on the type of image. Commonly used std. are JPEG, PNG, etc.

iv. Audio: Audio is a continuous signal which represents a sound. Audio has been converted from analog to digital in order to store and send it. Common std. are MP3, WAV, etc.

v. Video: Video represents moving pictures, or images. It requires maximum storage since several images form a video (typically 12 or 24 images per second). Common std. are MP4, MPEG, MOV, etc.

• Data Flow.

1. Simplex: Data flows in only one direction i.e., sender to receiver only. For e.g., TV broadcast, Radio broadcast.

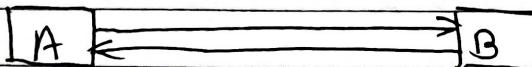


2. Duplex (half): Data can flow in both directions i.e., sender to receiver and vice-versa but not simultaneously. One has to wait until the complete data is received.



for e.g., walkie-talkie.

3. Full-Duplex: Data can flow both direction, i.e., from transmitter to receiver and vice-versa simultaneously. For e.g., Telephone network, calls.



• Types of Communication

1. Baseband & Broadband:

Baseband: • In baseband comm, the digital signal is transmitted over communication channel without converting it into analog signal.

• Only one signal can occupy a channel at a time.

• Baseband transmission requires low pass channel, a channel with bandwidth starts from zero.

• It is simpler to implement, cost effective, with high signal integrity and low latency making it efficient for shorter distance, but also has scalability issues, interference issue and signal lost.

2.

Broadband: In broadband comm, signal is converted from digital to analog using modulation. A high freq. carrier signal is modulated according to digital signal.

- Signals can be transmitted over different frequency band.
- At receiving end, signals are reconverted into Analog to digital.
- In broadband, long distances are covered with higher data transfer rate and efficient bandwidth use.
- But it is complex, costly and require more bandwidth and latency.

2. Serial & Parallel Transmission.

- In Serial Transmission, one bit of data is transferred at a time, consecutively, via a communication channel or computer bus.
- 8-bits are conveyed at a time with start & stop bit.
- All long distance and majority comm. system uses serial transmission.

- In Parallel transmission, multiple binary digits (bits) are transmitted simultaneously.
- A parallel interface comprises parallel wiring that individually contains data and other cable.
- A large amount of data is delivered across connection lines at high speed.
- Synchronous & Asynchronous Transmission.
 - In Sync. transmission, data is transferred in form of block or frames.
 - This is full-duplex type transmission.
 - There is no time gap present in data.
 - The sender and receiver MUST be synced with a common clock signal.
 - E.g., Chat rooms, VCs, etc.
- In Async. transmission, data is transferred in form of byte or character.
 - This is half-duplex type transmission.
 - The data is sent with a start and stop bits. and no time gap.
 - The send and receiver does not need to be synced, the data is sent without knowing exactly when the receiver will receive, that's make it more efficient.
 - E.g., Email, forums, APT calling, etc.

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11