

* Switching Techniques

- Data communication takes place between 2 devices that are directly connected by some form of transmission medium.

* There are 3 common switching techniques.

1. Circuit Switching:

- CS is a method of communicating in which a dedicated communication path is established between 2 devices through 1 or more intermediate switching nodes.
- This link is allocated for the duration of the communication & no other processes can use that link during this period.
- This scheme is similar to that used in telephone systems.

2. Message Switching:

- If 2 processes want to communicate a temporary link is established for the duration of 1 message transfer.
- Physical links are allocated for only short period.
- Each message is a block of data with system information (The source, destination & error correction nodes) allows the communication network to deliver the message to the destination correctly.
e.g. email

* 3. Packet Switching.

- PS is a method of transmitting messages through a communication network in which long messages are subdivided into short packets.
- The packets are then transmitted as in Message Switching.
- It is a form of store & forward switching system in which messages are stored at the switch nodes & then transmitted onwards to their destination.
- This system deletes the message from memory as soon as it's correct except at the next node is acknowledged.
- The packets must be reassembled into messages as they arrive.

* Difference between

1. Circuit Switching & Packet Switching.
 - CS reserves the required bandwidth in advance whereas the PS acquires and releases it as needed.
 - CS is completely transparent while in PS the carrier determines the basic parameters of switching.
 - PS usually base their charge on both the no. of bytes carried & the connect time while in CS the charge is based on the distance & time & not the traffic.

2. Packet Switching & Message Switching.

- S - In PS, a fixed size of data packets can be transmitted across the network &

then the data packets are sent to switching statⁿ to the final destination. All the packets are stored in the main memory & hence the time required to access the packets is reduced.

MS - The source computer sends message to the switching statⁿ which stores data in a buffer. It then looks for a free link to another switching station & sends data to that statⁿ. This process continues until data is delivered to the destination computer.

- Both are called stored forward switching

* Advantages of circuit Switching.

- (1) - It is simple & requires no special facilities. Hence suitable for long continuous transmissions, having a dedicated circuit continuously available.
- (2) - Once the circuit is established, data is transmitted with no delay.
 - full capacity of the circuit is available for exclusive use by a connected pair of nodes, transmission time required to send a message can be known and guaranteed)

* Disadvantages of CS.

- (1) - Before actual data transfer, a circuit b/w the 2 nodes has to be established

- (2) - Network resources may be underutilised
 :: the circuit is dedicated to a pair of nodes, entire channel capacity is dedicated to them for entire duration of connection.
- (3) - It is uneconomical when connected with expensive high speed transmission lines.

* Advantages of Message Switching.

- 1) - Unlike CS, no physical connection between the source & destination is required.
- 2) - It uses channels very effectively because they are used only when messages are transmitted.

* Disadvantages of MS.

- 1) - Each node must have sufficient storage to buffer messages.
- 2) - A message is delayed at each node hence time taken to transmit the message is long.

* Advantages of Packet Switching.

- 1) - Packets are small & fixed size hence storage required during buffering is minimum.
- 2) - Throughput is fast :: routing is done on packet basis.



Disadvantages

- Due to the need to split the message in packets at source node, the time required to buffer each packet is long) also it requires reassembling of the packets at destination node. Hence overhead per packet is large.
- (3) - There is no guarantee of how long it takes a message to travel from source to destination). each packet is sent independently, depending upon the path available.

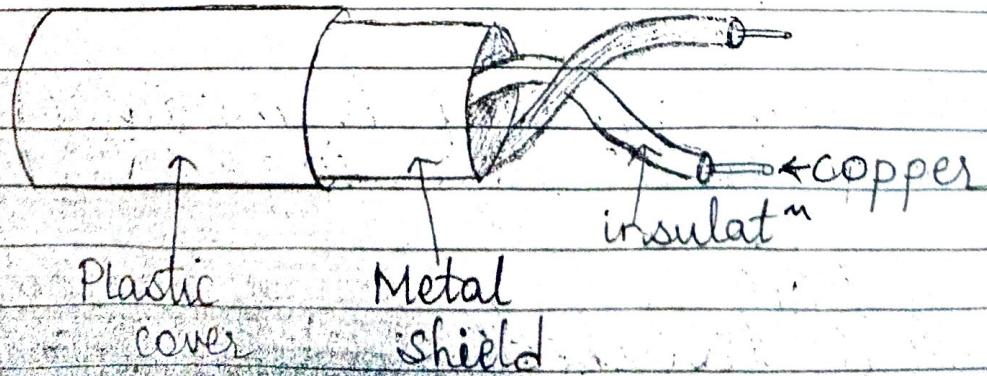
* Communication Channels (Transmissⁿ Media)

- There are 2 main types of cables used as a transmissⁿ media.
- They are :-
 1. Wired Communicatⁿ (Guided Media)
 2. Wireless " (Unguided Media)

①. Wired Communicatⁿ. (GUIDED MEDIA)

- This media provides a channel from 1 device to another.

eg 1) * Twisted Pair Cable.



- It is a transversal medium consisting of insulated wires arranged in a regular spiral pattern.
- These characteristics helps to lower the cables susceptibility to noise from neighbouring cables / external sources called crosstalk.
- It supports 10 to 1000 mbps speed.

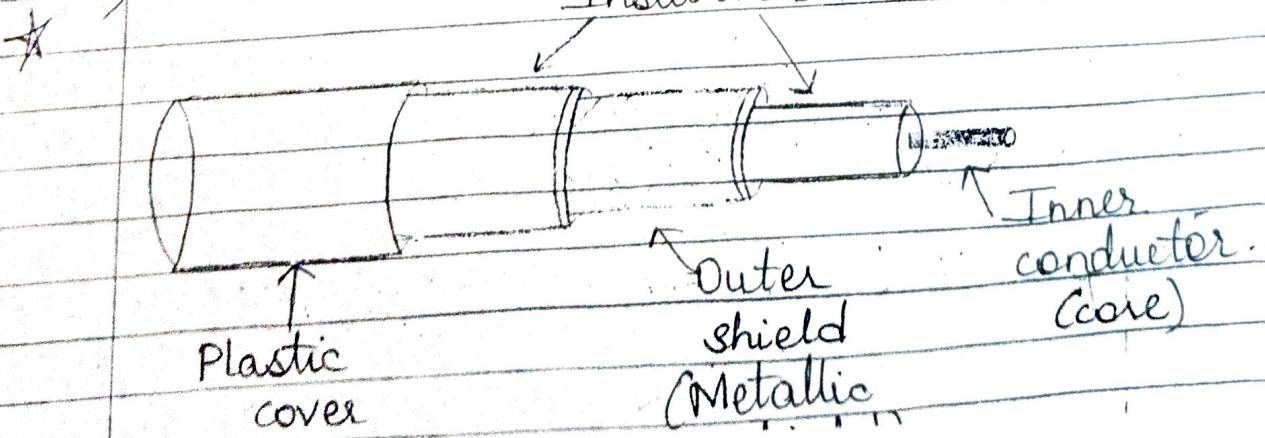
* Advantages.

- reasonable cost
- easy to add extra network devices
- high speed
- easy to install because of low weight & easy connectivity

* Disadvantages.

- signals lose energy due to attenuation so repeaters are required
- bandwidth is low.
- high attenuation limits individual's 1000 metres.

2) Coaxial cable. (Co-ax cable).



- Coaxial cable consists of a hollow outer cylindrical conductor that surrounds a single inner wire made of 2 conducting elements.

- One of these elements located in the center of the cable is a copper conductor. Surrounding the copper conductor is a layer of flexible insulation. Over this insulating material is a copper braid or metallic foil that acts both as the 2nd wire in the circuit & as a shield for the inner conductor.

- This 2nd layer helps to reduce the amount of outside interference & finally covering this shield is the plastic jacket.

- It supports 10-100 mbps & is relatively inexpensive.

* Advantages:

- Lower error rates ✓ ④ Inexpensive

- Greater channel capacity ✓ ⑤ Easy to wire

- Has a sufficient frequency range to support multiple channels which allows it to use in broadband systems. ✓ ⑥ " expand

* Disadvantages:

- high installation costs.

- Susceptible to damage from lightning strikes.

- problems with the deployment architecture.

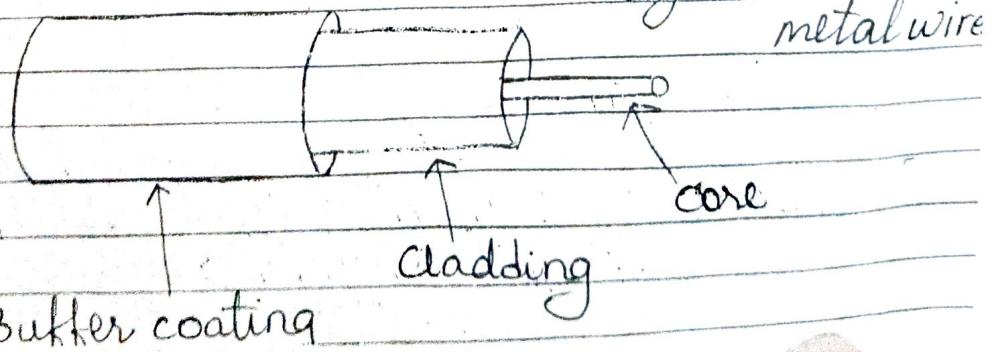
3) *

Fibre Optic Cable.

- Fibre Optics are long thin strands of pure glass fibres arranged in the form of bundles called Optical cables & used to transmit light signals over long distances.
- It consists of 1) core - This glass centre of the fibre where the light travels.
2) cladding - Outer optical material suspending the core that reflects the light back into the core.
3) Buffer coating - Plastic coating that protects the fibre from damage & moisture.
- It is capable of transmitting data at over 100 gbps.

* Advantages:

- ① - ✓ bandwidth is potentially very high.
- ② - ✓ data transmission rate is high, multiple frequencies like signals can be used to carry massive amt of data.
- ✓ very good transmission technology with no loss rates & no interference.
- ④ - ✓ fibre optic cables are much thinner & lighter than metal wire.



* Disadvantages

- ① - (most expensive) type of cable, network hardware is also very expensive
- ② - (difficulty to install) these cables due to stiffness of the outer jacket & hardness to bend around corners.
- ③ - (special skilled trained ppl are required to install these cables)

② Wireless Communication (Unguided Media)

- WC transport electromagnetic waves without using a physical conductor.

eg 1) * Microwaves.

Microwave is an electromagnetic wave in the frequency range of abt 2-40 GHz.

The receivers for MW signals are usually disc-shaped antennas & usually installed in business locations.

* Advantage:

- ① - The main advantage is that building towers is cheaper than laying coax cable or fibre, low maintenance cost, low management cost.

* Disadvantage:

- ① - The signals from antenna may split up transmit in different ways to different antenna which leads to reduce signal strength.

2) * Radio Waves.

RW transmit music, conversations, pictures & data invisibly through the air often over few miles.

- RW like visible light, infrared, UV, X rays & gamma rays are electromagnetic waves that do travel through a vacuum.

* Advantages:

- (1) - easy to generate,
- (2) - travel over long distances.
- (3) - used for communication both indoors & outdoors.
- (4) - relatively inexpensive than wired mediums.

* Disadvantages:

- (1) - subject to interference
- (2) - less secure mode of transmission

3) * Satellite Links.

- It is simply the communication of the satellite in space with large no. of Earth stations on the ground.

- Users are the ones to generate signals which is processed at the Earth's stat & then transmitted to the satellite to through disc antennas.

* Advantages:

- ① - The coverage area of the satellite exceeds that of the terrestrial system.
- ② - ✓ Higher bandwidths are available for use.
- ③ - Transmission cost of a satellite is independent of the distance from the centre of coverage area.

* Disadvantages:

- ① - Launching satellites into orbit is costly.
- ② - There is a larger investment in satellite communication than in terrestrial communication.

* Definitions:-

* Protocol

- A protocol is a set of rules that governs the communication between the computers on a network.

→ * FTP (File transfer protocol)

- FTP enables file sharing between the computers. It is used widely on the internet, for transferring files to & fro from a remote host.

→ * HTTP (Hyper text transfer Protocol)

- HTTP is a set of rules/protocols that governs the transfer of hypertext between 2 or more computers.

→ * TCP/IP (Transmission Control Protocol/Internet Protocol)

- An internet connection is usually accomplished using international standards called TCP/IP.
- It is actually a collection of protocols that governs the way data travels from one machine to another across networks.

* WWW uses for transmission of protocols.

* TCP

1. Responsible for breaking data into IP packets before they are sent
2. Also responsible for reassembling the packets when they arrive.
3. Verifies that all the packets arrive at their destination

* IP

1. Envelopes & addresses the data.
2. Enables the network to read the envelope & forward the data to its destination
3. Defines how much data can fit in a single packet

* Basic Functions

1. Reading email
 2. Deleting / Removing email.
 3. Handling email headers
- It defines a no. of operations for how to access & store email on your server.

* Remote Login / Telnet

- 1. Telnet is a protocol for remote computing on the internet.
- 2. It allows a computer to act as a remote terminal on another machine anywhere across the network.
- ④ Remote Login means to connect the network at a remote station.
- ⑤ A telnet session is established by using a telnet client software. The user requests a session to be established with a remote host by providing its host name / ip address. The telnet client software locates the host over the network & establishes a remote login sess. to that host.