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Guided Media :-

Guided Media, which are those that provides a conduit from one device to another which include :-

(1) Twisted Pair Cable
(2) Coaxial Cable
(3) Fibre Optic Cable.

(1) Twisted Pair Cable :

- It is light weight, cheap, can be installed easily, and they support many different types of network.
- Frequency range is 0 to 3.5 kHz.
- Twisted Pair is of two types :
  (a) Unshielded Twisted Pair (UTP)
  (b) Sheilded Twisted Pair (STP)

- **Advantages of UTP :**
  (a) Installation is easy
  (b) Flexible
  (c) Cheap
  (d) High Speed Capacity
  (e) 100 meter limit.

- **Disadvantages of UTP :**
  (a) Bandwidth is low
  (b) Provides less protection from interference

- **Advantages of STP :**
  (a) Easy to install
  (b) Performance is adequate
  (c) Can be used for Analog and Digital Transmission
  (d) Increases the signalling rate
  (e) Higher capacity

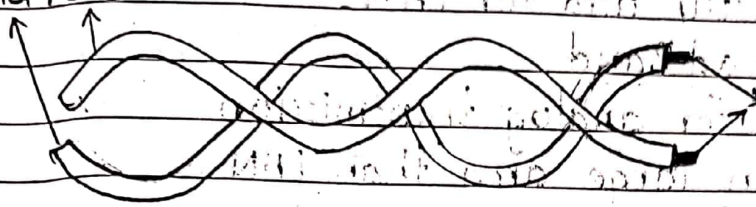
(f) Eliminates crosstalk

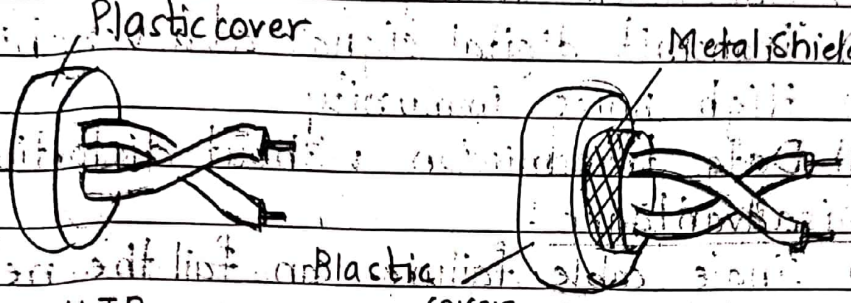
- Disadvantages of UTP:

(a) Difficult to manufacture

(b) Heavy

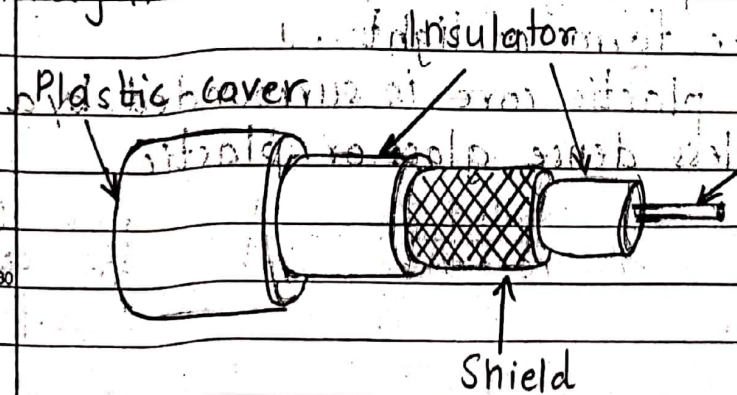
Insulators





(2) Coaxial cable :-

- This cable contains two conductors that are parallel to each other.
- Copper is used as centre conductor which is surrounded by Pvc installation
- Outer metallic wrapping is used as shield against noise.



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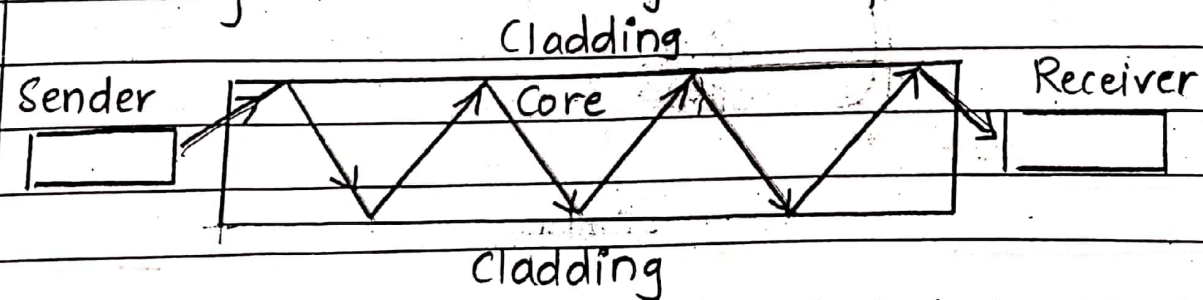
- There are two types of coaxial cable :
(1) Base Band
- used for digital transmission
- 50 Ω coaxial cable
- mostly used for LAN's
(2) Broad Band
- used for analog transmission
- covers large area than LAN.
- Advantages :
(a) Bandwidth is high
(b) Transmit digital signals at a very high rate
(c) High noise immunity
(d) Data transmission without distortion.
- Disadvantages :
(a) Single cable failure can fail the network
(b) Difficult to install
(c) Expensive
(d) If shield is imperfect, it can lead to grounded loop.
- Applications :-
(a) Used in analog telephone networks
(b) Cable TV networks.

(3) Fibre Optic Cable :-
- It is made up of glass or plastic and transmit signals in the form of light.
- A glass or plastic core is surrounded by a cladding of less dense glass or plastic.



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Propogation Mode of Fibre optic Cable

Mode

- Multimode
  - Step Index
  - Graded Index
- Single mode

- Advantages :-
  (a) Higher bandwidth
  (b) Less signal attenuation
  (c) Immunity to electromagnetic interference
  (d) Light weight
- Disadvantages :-
  (a) Installation and maintenance is difficult
  (b) High cost
  (c) Unidirectional light propogation
- Applications :-
  (a) Used in local Area Network
  (b) Some cable TV companies

Unguided Media :- (Wireless)

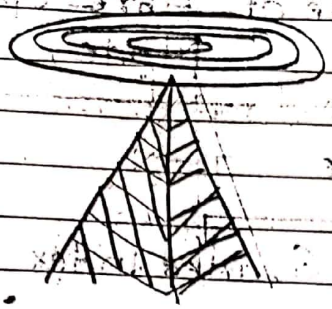
Unguided medium transport electromagnetic waves without using a physical conductor. Wireless transmission can be divided into 3 broad groups :-

(a) Radio waves
(b) Micro waves
(c) Infrared Waves

(1) Radio Waves :-

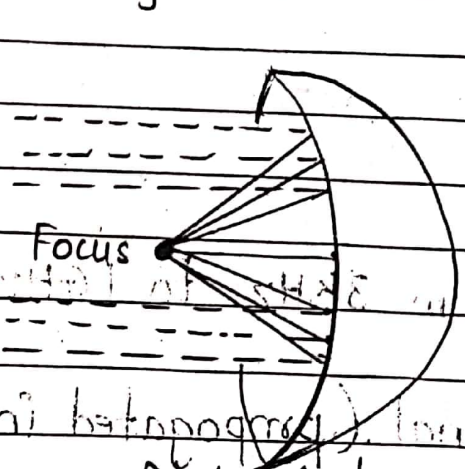
These waves range from 3KHz to 1GHz of frequency.

- They are omnidirectional (propogated in all directions)

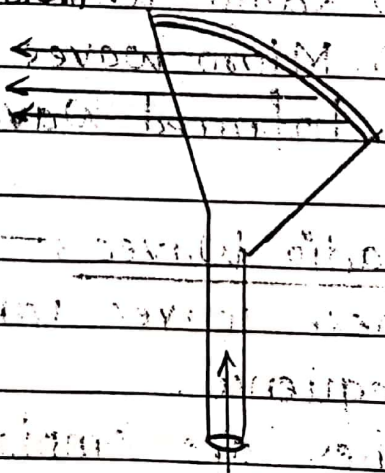


- Advantages:
(a) Offers Mobility
(b) Cheap
(c) Offers ease of communication
- Disadvantages:
(a) A insecure communication
(b) The waves are susceptible to weather effects
- Applications:-
(a) Used for multicasting
(b) AM and FM Radio
(c) Television
(d) Cordless Phones

(2) Micro Waves:-
- These waves range from 1 to 300 GHz of frequency
- They are unidirectional
- They need unidirectional antennas that send out signals in one direction



Dish Antenna



Horn Antenna

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Advantages :-
(a) No cables needed
(b) Multiple channel available
(c) Wide bandwidth

Disadvantages :-
(a) Towers are expensive to build
(b) Suffer from attenuation due to atmospheric conditions.
(c) Line of sight will be disrupted if any obstacle such as building is in the way.

There are 2 types of Microwave Transmission :
(1) Terrestial Microwave
(2) Satellite Microwave

Applications :-
(a) cellular phones
(b) satellite networks
(c) wireless LAN's.

Infrared Waves :-
These waves range from 300 GHz to 400 THz of frequency.
Used for short range communication.
Covers distance of 10 to 30 meters.
Data Rate upto 4 Mbps can be achieved.

- Advantages:-
(a) Cheap
(b) Devices are compact, lightweight
(c) More secure that radio waves transmission
(d) Consume low power
- Dicadvantages:-
(a) Very short distance applications
(b) Requires both transmitter and receiver to be in line of sight
(c) Devices cannot move around while the transmission is in progress
- Applications:-
(a) transmit digital data
(b) Remote control

Packet Switching :-

- It is a method of transferring the data to a network in form of packets
- The data is broken into small pieces of variable length called packets
- At the destination all the packets are reassembled
- It uses Store and forward technique while switching the packets.
- Each packet contains source and destination address using which they independently travel through the network.
- If there is congestion at some path, packets are allowed to choose different path possible over existing pat network.

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- Modes of Packet switching :

(1) Connection oriented packet switching :-
- Data packets are sent sequentially over a predefined route.
- Also called virtual circuit switching
- Address informatn not required.
- Packets are given a sequence number and transported to the destination in sequential manner.

(2) Connection less Packet switching :-
- Each packet has complete addressing or routing informatn
- They are transported out-of-order and have different path of transmission.
- At the destination, the packets are rearranged to form original message
- Also known datagram switching.

- Advantages :-
(a) Efficient use of network
(b) High Data Transmission is easy.
(c) More efficient in terms of bandwidth
(d) Cheaper to implement
(e) More reliable as destination can detect the missing packet

- Disadvantages :-
(a) More transmission delay
(b) Require large amount of RAM
(c) Packets may be lost on their route, so sequence numbers are required to identify those missing packets.

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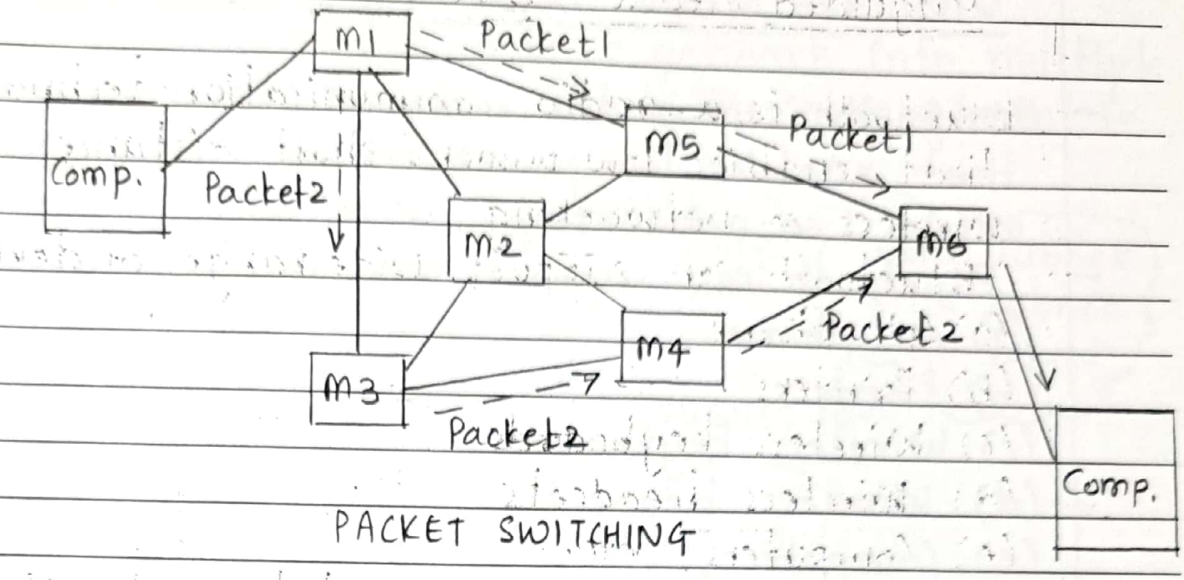
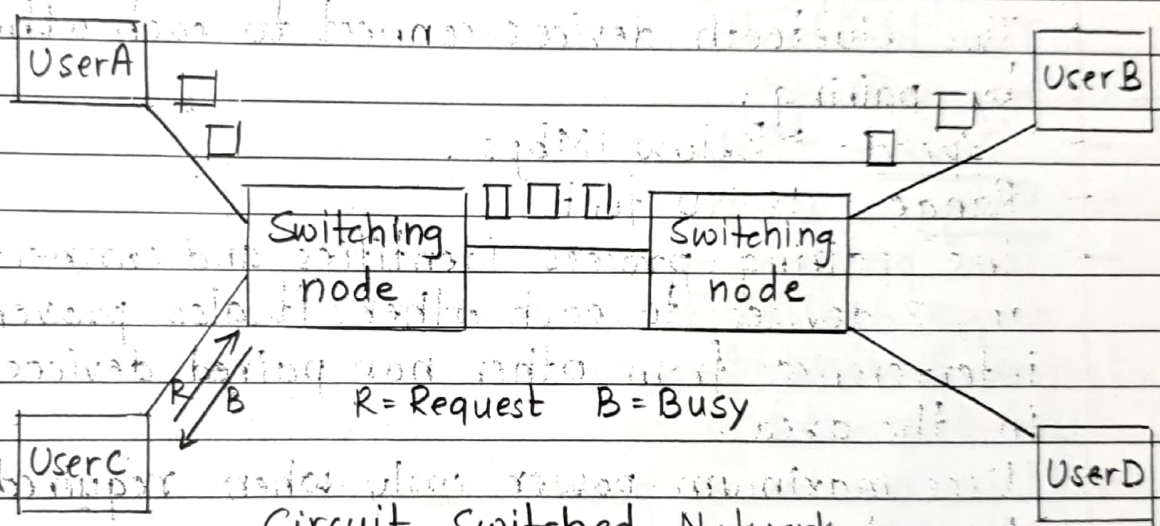
Circuit Switching :-

- In this there is a dedicated communication path between two stations.
- It involves three phases:
  (a) circuit establishment
  (b) data transfer
  (c) circuit disconnect.
- The path is decided upon before the data transmission starts.
- Once the connection is made the only delay is propogation time.
- The data may be analog or digital
- It uses entire capacity of the link
- Eg:- PSTN, Telephone System Network.
- Have fixed bandwidth
- Advantages :-
  (a) provides guaranteed data rate
  (b) data is transmitted without any delay
  (c) suitable for long continuous transmission
- Disadvantages :-
  (a) As the connection is dedicated it cannot be used to transmit any other data even if channel is free
  (b) Inefficient in terms of system resource utilisation.
  (c) Require more bandwidth
  (d) Time Required to ~~ea~~ establish a physical link betⁿ two stations is too long.



PACKET SWITCHING



Circuit Switched Network

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Unguided Media (Bluetooth) :-

- Bluetooth is a radio communication technology that enables low power, short distance wireless networking.
- Bluetooth can support wide range of devices :
  (a) Cell phone
  (b) Printers
  (c) Wireless keyboards
  (d) Wireless headsets
  (e) Computers, etc.
- Two bluetooth devices connect to each other by pairing.
- Speed - Below 1Mbps.
- Range - 15-50 feet
- The pairing process identifies and connects any 2 devices to each other, it also prevents interference from other non paired devices in the area.
- Uses maximum power only when required.
- Advantages :-
  (a) Wireless transmission
  (b) Extensive Availability and Accessibility
  (c) Easy to use (d) Energy efficiency
- Disadvantages
  (a) Limited Operational Range
  (b) Can be energy inefficient
  (c) Slow Transmission
  (d) Possible Security Vulnerabilities
  (e) Compatibility Issues.