Unit 3

- Transmission Media Magnetic Media
- Twisted pair
- Co-axial cable
- Fibre optics
- Radio transmission
- Wireless transmission
- Bluetooth.

Transmission Media:

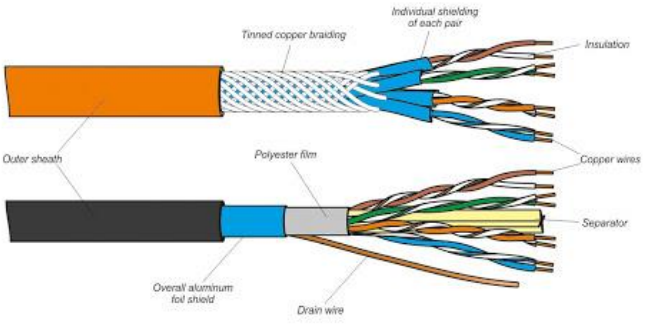
- The purpose of the physical layer is to transport bits from one machine to another.
- Various physical media can be used for the actual transmission.
- Media are roughly grouped into guided media, such as **copper wire and fiber optics**, and **unguided media**, such as **terrestrial wireless, satellite, and lasers** through the air.

Magnetic Media

- One of the most convenient way to transfer data from one computer to another, even before the birth of networking, was to save it on some storage media and transfer physical from one station to another. Though it may seem old-fashion way in today's world of high speed internet, but when the size of data is huge, the magnetic media comes into play.
- For example, a bank has to handle and transfer huge data of its customer, which stores a backup of it at some geographically far-away place for security reasons and to keep it from uncertain calamities. If the bank needs to store its huge backup data then its, transfer through internet is not feasible. The WAN links may not support such high speed. Even if they do; the cost too high to afford.
- In these cases, data backup is stored onto magnetic tapes or magnetic discs, and then shifted physically at remote places.

Twisted pair:

- A twisted pair cable is made of two plastic insulated copper wires twisted together to form a single media. It consists of 2 separately insulated conductor wires wound about each other. Generally, several such pairs are bundled together in a protective sheath. They are the most widely used Transmission Media.



Twisted Pair is of two types:

- **Unshielded Twisted Pair (UTP):**
- **Shielded Twisted Pair (STP):**

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.

Advantages:

- Least expensive
- Easy to install
- High speed capacity

Disadvantages:

- Easily affected to external interference
- Lower capacity and performance in comparison to STP
- Short distance transmission

Shielded Twisted Pair (STP):

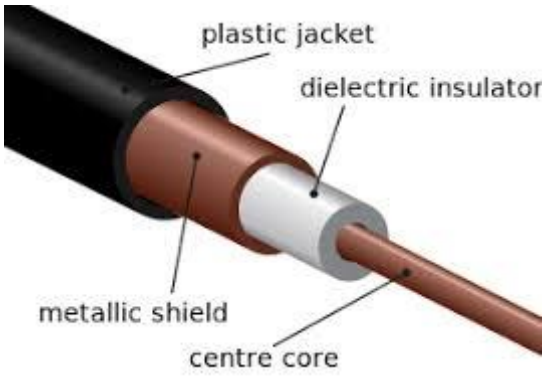
- This type of cable consists of a special jacket to block external interference. It is used in fast-data-rate Ethernet and in voice and data channels of telephone lines.
- **Advantages**:

- Better performance at a higher data rate in comparison to UTP
- Eliminates crosstalk
- Comparitively faster

- **Disadvantages**:
  - Comparitively difficult to install and manufacture
  - More expensive
  - Bulky

Co-axial cable:

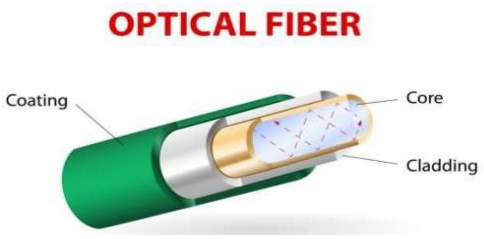
- Coaxial cable has two wires of copper. The core wire lies in the center and it is made of solid conductor. The core is enclosed in an insulating sheath. The second wire is wrapped around over the sheath and that too in turn encased by insulator sheath. This all is covered by plastic cover.
- **Coaxial cables** are copper cables with better **shielding** than twisted pair cables, so that transmitted signals may travel longer distances at higher speeds.
- Coaxial cables are widely used for **cable TV** connections and **LANs**.
- Because of its structure, the coax cable is capable of carrying high frequency signals than that of twisted pair cable. The wrapped structure provides it a good shield against noise and cross talk.



- **Advantages of Coaxial Cables**
- Excellent noise immunity
- Signals can travel longer distances at higher speeds,
- Can be used for both analog and digital signals
- Inexpensive as compared to fibre optic cables
- Easy to install and maintain
- **Disadvantages of Coaxial CableS**
- Expensive as compared to twisted pair cables
- Not compatible with twisted pair cables

Fibre optics

- Fiber optic cable is ideal cable for fast data transmission. Fiber optic cable transmits light signals rather than electrical signals. These cables have high bandwidth.
- It uses the concept of reflection of light through a core made up of glass or plastic. The core is surrounded by a less dense glass or plastic covering called the cladding. It is used for transmission of large volumes of data.



- Optical fiber is rapidly replacing copper wires in telephone lines, internet communication and even cable TV connections because transmitted data can travel very long distances without weakening.
- **Advantages of Optical Fiber**
- High bandwidth
- Immune to electromagnetic interference
- Suitable for industrial and noisy areas
- Signals carrying data can travel long distances without weakening
- **Disadvantages of Optical Fiber**
- Optical fiber cables are expensive
- Sophisticated technology required for manufacturing, installing and maintaining optical fiber cables

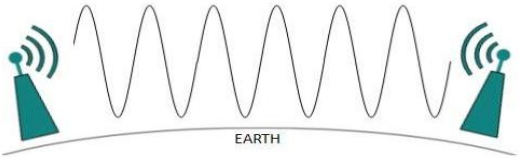
- Light waves are unidirectional, so two frequencies are required for full duplex transmission.

Radio transmission

- Electromagnetic waves ranging in frequencies between **3 KHz and 1 GHz** are normally called **radio waves**. They are widely used for communications since they are **easy to generate**, can **travel long distances** and can **penetrate** buildings. Radio waves have **omnidirectional antennas**, i.e. antennas that can send signals in all directions.
- The properties of radios waves vary according to their frequencies. However, radio waves at all frequencies are prone to interference from electrical equipment's like motors etc.

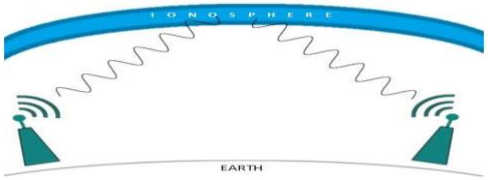
Low and Medium Frequency Radio Waves

- Low and medium frequency radio waves can pass through obstacles and have **ground propagation**. However, the power reduces rapidly depending upon the distance from the source. This reduction in power is called the path loss. AM radio uses LF and MF bands.



High Frequency Radio Waves

- High frequency radio waves travel in straight lines and have **sky propagation**. However, they are affected by **interferences and are affected by rains**. The military communicates in the HF and VHF bands. They are also used for long distance broadcasting and FM radio.



Applications:

- Some of the areas of applications of radio waves are −
- Broadcasting and multicasting
- Fixed and mobile radio communications
- AM and FM radio
- Television
- Marine communication
- Wireless computer networks
- Cordless phones

Wireless transmission:

It is referred to as Wireless or Unbounded transmission media. No physical medium is required for the transmission of electromagnetic signals.

Features:

- Signal is broadcasted through air
- Less Secure
- Used for larger distances

There are 3 major types of wireless Media:

Radio waves:

- These are **easy to generate** and can **penetrate** through **buildings**. The sending and receiving antennas need not be aligned.
- Frequency Range:**3KHz – 1GHz. AM and FM radios** and **cordless phones** use Radio waves for transmission.

Microwaves:

It is a line of sight transmission i.e. the **sending and receiving antennas** need to be **properly aligned** with each other. The distance covered by the signal is directly proportional to the height of the antenna.

Frequency Range:1GHz – 300GHz. These are majorly used for **mobile phone** communication and **television distribution**.

Infrared:

Infrared waves are used for **very short distance communication**. They **cannot penetrate through obstacles**. This prevents interference between systems. Frequency Range:**300GHz – 400THz**. It is used in **TV remotes, wireless mouse, keyboard, printer**, etc.

BLUETOOTH:

Bluetooth is a **wireless technology** used to transfer data between different electronic devices. The **distance of data transmission is small** in comparison to other modes of wireless communication. This technology **eradicates the use of cords, cables, adapters** and permits the electronic devices to communicate wirelessly among each other.

The key features of Bluetooth technology:

- Less complication
- Less power consumption
- Available at cheaper rates
- Robustness

Advantages of Bluetooth Technology

- It is cheap
- Easy to install
- It makes connecting to different devices convenient
- It is wireless
- It is free to use if the device is installed with it.

Disadvantages of Bluetooth Technology

- It can be hacked into
- If installed on a cellphone it is prone to receiving cell phone viruses
- It only allows short range communication between devices
- It can only connect two devices at once
- It can lose connection in certain conditions