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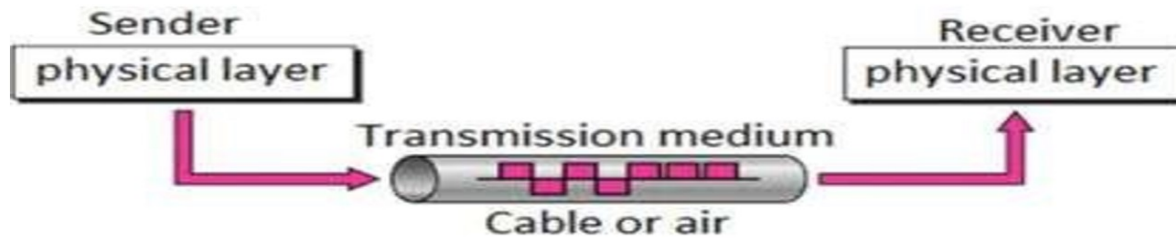
**Semester : 5**

**Course Title:** Data Communication

## Unit 2: Transmission Media and Modes

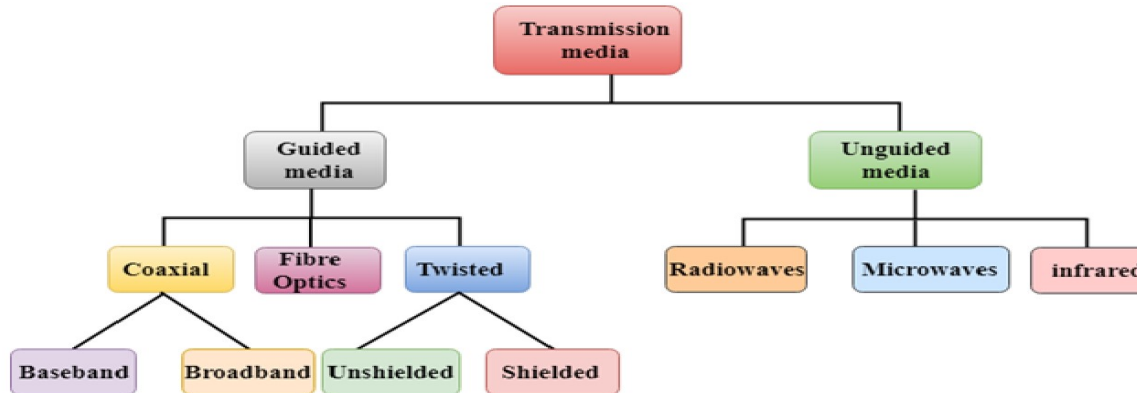
### Transmission Media

- Sending of data from one device to another is called transmission of data.
- Medium used to transmit the data is called media.
- Transmission of data through medium is called **transmission media**. So, it is a **pathway** that carries the information from sender to receiver.
- We use different types of cables or waves to transmit data.
- Data is transmitted normally in electrical or electromagnetic signals.
- Transmission media are located below the physical layer.
- Computers use signals to represent data.
- Signals are transmitted in the form of electromagnetic energy.



### TYPES OF TRANSMISSION MEDIA:

Transmission media is classified as:



## 1. Wired or Guided Media or Bound Transmission Media:

Guided transmission media are the cables that are tangible or have physical existence and are limited by the physical geography.

**Examples of guided transmission media are:**

### 1. Twisted pair cable

- Shielded twisted pair cable
- Unshielded twisted pair cable

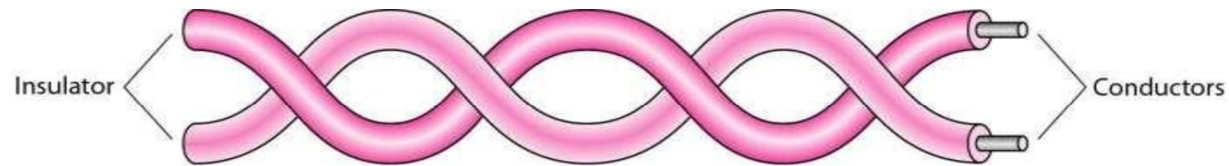
### 2. Co-axial cable

- (a) Baseband co-axial cable
- (b) Broadband co-axial cable

### 3. Fiber optical cable.

Each of them has its own characteristics like transmission speed, effect of noise, physical appearance, cost etc.

### 1. Twisted-pair Cable



**Fig. Twisted Pair Cable**

- 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 3.5 KHz.
- 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.

### Types of Twisted pair:

1. Unshielded Twisted Pair:
2. Shielded Twisted Pair:

## 1. Unshielded Twisted Pair:

An unshielded twisted pair is widely used in telecommunication. Following are the categories of the unshielded twisted pair cable:

- **Category 1 (CAT 1):** Category 1 is used for telephone lines that have low-speed data.
- **Category 2 (CAT 2):** It can support upto 4Mbps and used in T-lines.
- **Category 3 (CAT 3):** It can support upto 16Mbps and used in LANs.
- **Category 4 (CAT 4):** It can support upto 20Mbps. Therefore, it can be used for long-distance communication (e.g. in Token Ring networks).
- **Category 5 (CAT 5):** It can support upto 200Mbps and used in Ethernet.

### Advantages of Unshielded Twisted Pair:

- It is cheap.
- Installation of the unshielded twisted pair is easy.
- It can be used for high-speed LAN.

### Disadvantage:

- This cable can only be used for shorter distances because of attenuation.

## 2. Shielded Twisted Pair

A shielded twisted pair is a cable that contains the mesh surrounding the wire that allows the higher transmission rate.

### Characteristics of Shielded Twisted Pair:

- The cost of the shielded twisted pair cable is not very high and not very low.
- An installation of STP is easy.
- It has higher capacity as compared to unshielded twisted pair cable.
- It has a higher attenuation.
- It is shielded that provides the higher data transmission rate.

### Advantages:

- Shielded
- Faster than UTP

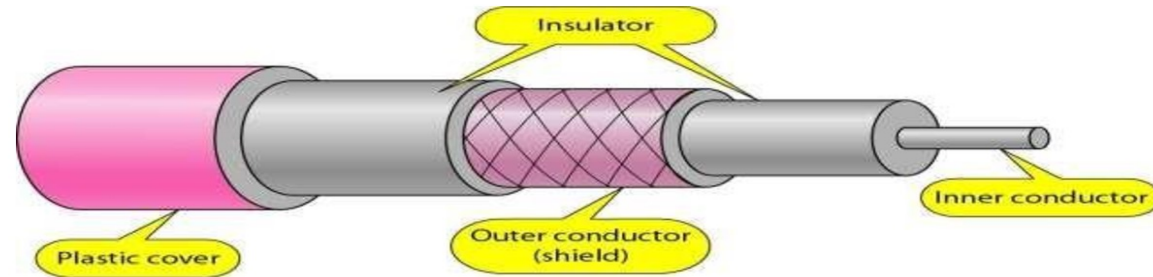
### Disadvantages

- It is more expensive as compared to UTP and coaxial cable.
- It has a higher attenuation rate.

## Comparison of UTP and STP

| Parameter               | UTP  | STP  |
|-------------------------|--|--|
| Data Range              | 10-100 Mbps                                    | 150 Mbps                                       |
| Cable length            | 100 meters max.                                | 500 meters max.                                |
| Electrical Interference | Most susceptible to interference or cross talk | Less susceptible to interference or cross talk |
| Installation            | Easy to install                                | Very easy to install                           |
| Cost                    | Lowest   | Little costly                                  |

## 2. Co-axial Cable



- Coaxial cable is very commonly used transmission media, for example, TV wire is usually a coaxial cable.
- The name of the cable is coaxial as it contains two conductors parallel to each other.
- 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).

### Types of Coaxial cable:

#### 1. Baseband transmission:

It is defined as the process of transmitting a single signal at high speed. This is 50 Ohm coaxial cable which is used for digital transmission. It is mostly used for LANs. It transmits a single signal at a time with very high speed. The major drawback is that it needs amplification after every 1000 feet.

#### 2. Broadband transmission:

It is defined as the process of transmitting multiple signals simultaneously. This uses analog transmission on standard television cabling. It transmits simultaneous signal using different frequencies. It covers large area when compared with Baseband coaxial cable.

### Applications

- Analog telephone networks
- Digital telephone networks
- Cable TV.
- Traditional Ethernet LANS
- Digital transmission
- Thick Ethernet

### Advantages of Coaxial cable:

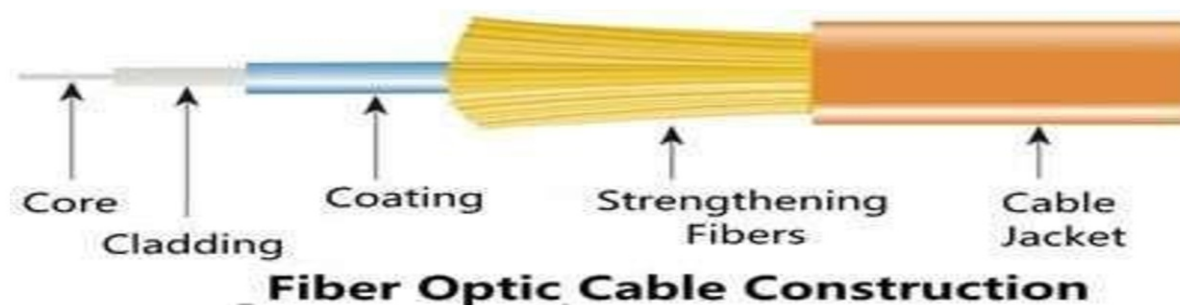
- The data can be transmitted at high speed.
- It has better shielding as compared to twisted pair cable.
- It provides higher bandwidth.

### Disadvantages of Coaxial cable:

- It is more expensive as compared to twisted pair cable.
- If any fault occurs in the cable causes the failure in the entire network.

- **Fiber Optic or Optical Fiber Cable**

- A fiber optic cable is made of glass or plastic and transmit signals in the form of light.
- It has fibers which are long, thin strands made with pure glass about the diameter of human hair.
- Optical fibers are faster, lighter, and suitable for transferring large amount of data.
- Uses reflection to guide light through a channel
- Core is of glass or plastic surrounded by Cladding
- Cladding is of less dense glass or plastic
- An optical fiber cable has a cylindrical shape and consists of three concentric sections: the core, the cladding, and the jacket (outer part of the cable).



Fiber Optic cable consists of:

1. Core
2. Cladding
3. Coating
4. Strengthening Fibers
5. Cable Jacket

- **Core:** The optical fibre consists of a narrow strand of glass or plastic known as a core. A core is a light transmission area of the fibre. The more the area of the core, the more light will be transmitted into the fibre.
- **Cladding:** The concentric layer of glass is known as cladding. The main functionality of the cladding is to provide the lower refractive index at the core interface as to cause the reflection within the core so that the light waves are transmitted through the fibre.
- **Coating:** This is the layer of plastic that surrounds the core and cladding to reinforce the fiber core .It helps to absorb shocks and provide extra protection against excessive cable bends.
- **Strengthening Fibers:** It helps to protect the core against crushing forces and excessive tension during installation.
- **Jacket:** The protective coating consisting of plastic is known as a jacket. The main purpose of a jacket is to preserve the fibre strength, absorb shock and extra fibre protection.

### **Advantages of Fiber Optic Cable**

1. **Greater Bandwidth:** The fibre optic cable provides more bandwidth as compared copper. Therefore, the fibre optic carries more data as compared to copper cable.
2. **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.
3. **Longer distances:** The fibre optic cable carries the data at a longer distance as compared to copper cable.
4. **Better reliability:** The fibre optic cable is more reliable than the copper cable as it is immune to any temperature changes while it can cause obstruct in the connectivity of copper cable.

### **Disadvantages of Fiber Optic Cable**

1. It is expensive
2. Difficult to install.
3. Maintenance is expensive and difficult.

***THANK YOU...***