



SRI AKILANDESWARI WOMEN'S COLLEGE, WANDIWASH

DATA COMMUNICATION & NETWORKS

Class : UG Computer Science

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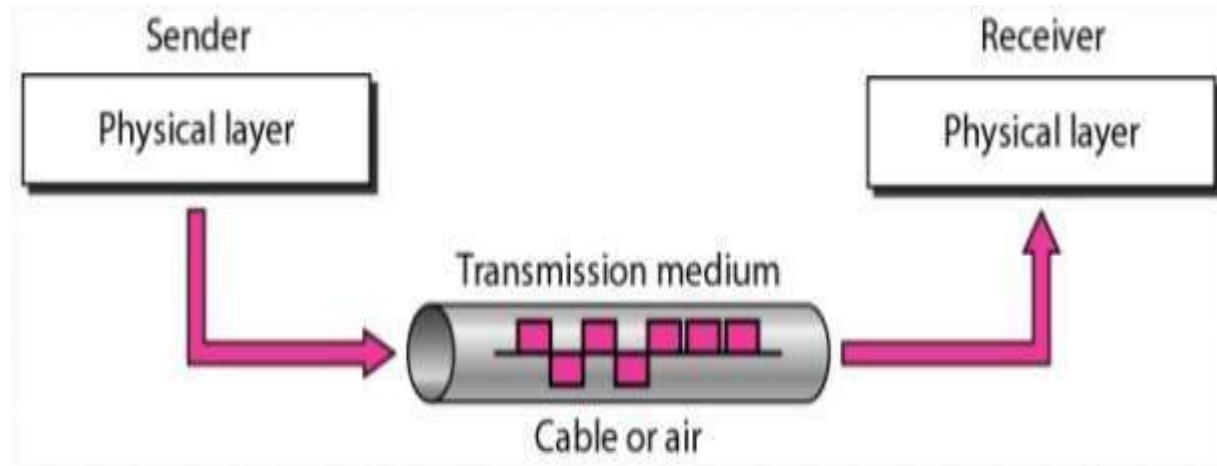
Department of Computer Science

SWAMY ABEDHANADHA EDUCATIONAL TRUST, WANDIWASH

Transmission Media

- 📁 The transmission medium is the **physical path** by which a **message travels from sender to receiver**.
- 📁 These signals are transmitted from one machine to another in the form of **electromagnetic waves**.
- 📁 For the transmission of bit stream from one machine to another, various physical media can be used.
- 📁 They differ in terms of:
 - 📁 Bandwidth
 - 📁 Delay
 - 📁 Cost
 - 📁 Ease of installation and maintenance.

Transmission Media

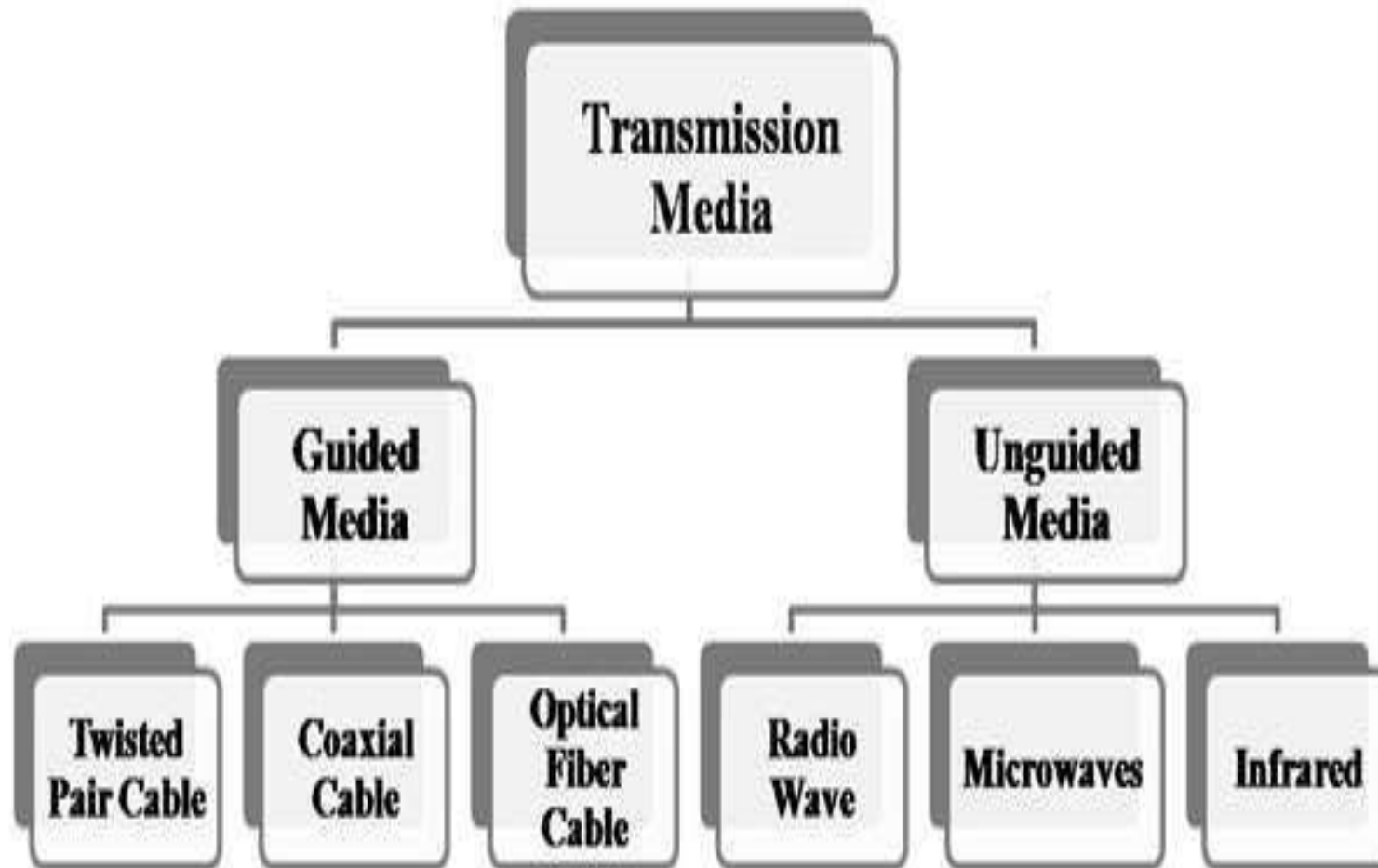


Transmission Media

Factors to be considered while selecting a Transmission Medium:

- 📡 Transmission Rate
- 📡 Cost and Ease of Installation
- 📡 Resistance to Environmental Conditions
- 📡 Distances

Transmission Media



Transmission Media

Guided Media:

 Which are those provide a **physical conductor** from one device to another.


Examples:

 Twisted-pair,

 Coaxial cable,

 Fiber optics.

Unguided Media:

 Transport electromagnetic waves **without using a physical conductor.**

Examples:

 Radio waves,

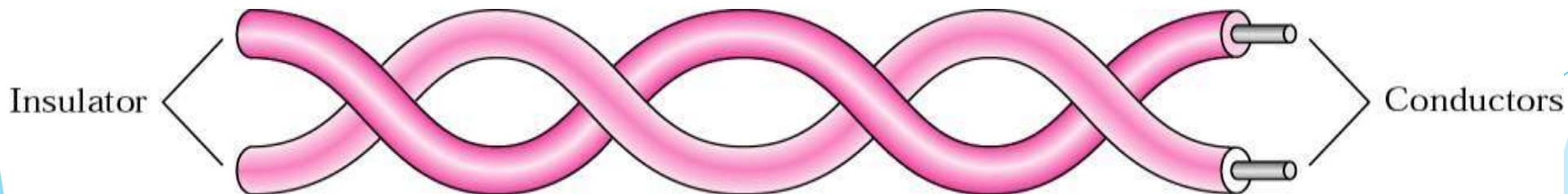
 Micro waves,

 Infrared waves.

Guided Media

Twisted pair:

- ❏ Twisted pair is the oldest and still most common transmission medium.
- ❏ It consists of **two conductors (normally copper)**, each with its own plastic insulation, typically about 1mm thick.
- ❏ The wires are twisted together to **reduce electrical interference (noise) and crosstalk**.



Guided Media

Twisted-pair cable comes in two forms:

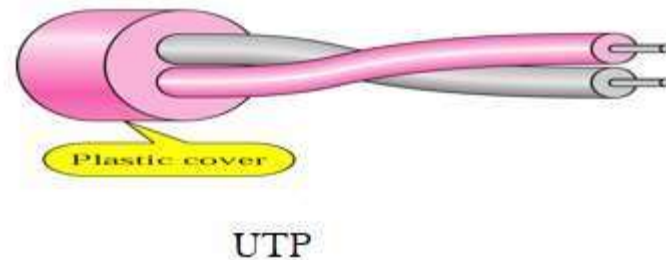
- ❏ Unshielded (UTP)
- ❏ Shielded (STP)

UTP: Unshielded Twisted Pair

- ❏ UTP cable is the most common type of **telecommunication medium** in use today.
- ❏ The range is suitable for transmitting both **data and video**.

Advantages:

- ❏ Cost and ease of use.
- ❏ UTP is cheap, flexible.
- ❏ Easy to install.



Guided Media

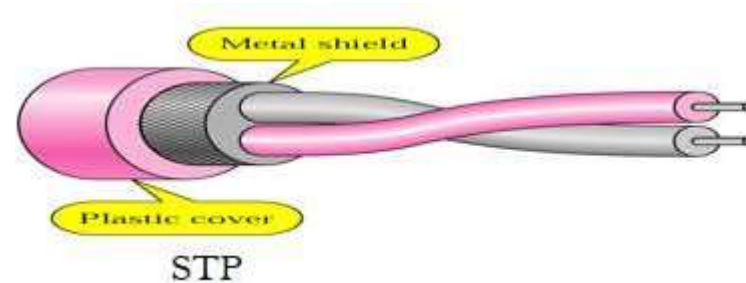
Twisted pair cabling comes in several varieties,

- 📄 Category 1: used in telephone systems for voice.
- 📄 Category 2: used for voice and data of up to 2Mbps.
- 📄 Category 3: used for data transmission up to 10 Mbps.
- 📄 Category 4: used for data transmission 20 Mbps.
- 📄 Category 5: used for data transmission up to 100 Mbps

Guided Media

STP: Shielded Twisted Pair

- STP cable has a metal foil or braided-mesh covering that enhances each pair of insulated conductors.
- It prevents the **penetration of electromagnetic noise**.



Applications:

- The most common application of the twisted pair is the telephone system.
- Used in Local Area Networks.

Guided Media

Twisted pair:

Advantages

- 📁 Inexpensive and readily available
- 📁 Flexible and light weight
- 📁 Easy to work with and install

Disadvantages

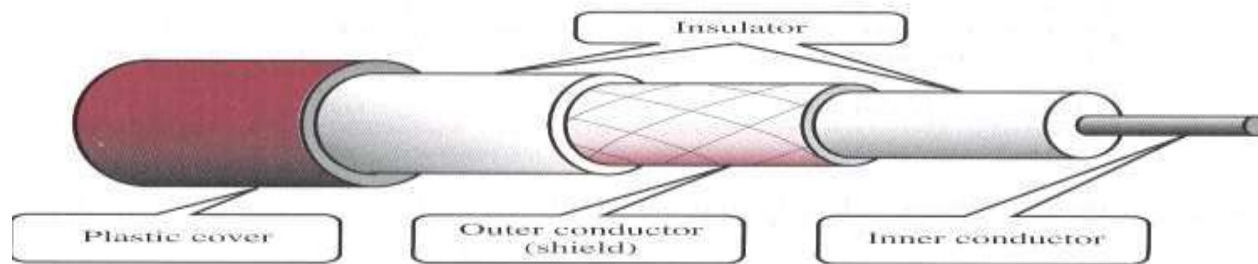
- 📁 Affected by interference and noise
- 📁 Attenuation problem exists
- 📁 Relatively low bandwidth

Guided Media

Coaxial cable

Base band Coaxial cable

- ❏ Coaxial cable (frequently called “coax”) is another common transmission medium.
- ❏ It carries signals of **higher frequency range than twisted-pair cable**. So, it **span longer distance** at higher speeds.



Guided Media

Two kinds of coaxial cables are widely used:

- 📁 **50-ohms** – Used for digital transmission.
- 📁 **75-ohms** - Used for analog transmission.
- 📁 For 1 km cables, a data rate 1-2 Gbps is feasible. Longer cables enable only lower data rates or require periodic amplifiers.
- 📁 The bandwidth depends on the cable length.
- 📁 Coaxial cable used to be widely used within the telephone system now they are largely replaced by fiber optics on long-haul routes.

Guided Media

Coaxial Cable standards:

- 📡 RG-8, RG-9, RG-11 are used in thick Ethernet.
- 📡 RG-58 Used in thin Ethernet
- 📡 RG-59 Used for thinnet.

Applications:

- 📡 Television distribution: Aerial to TV, Cable TV
- 📡 Long distance telephone transmission.
- 📡 Short distance computer systems links- LAN

Guided Media

Coaxial Cable

Advantages

- 📡 Higher bandwidth 400 to 600 Mhz
- 📡 Much less interference than twisted pair.

Disadvantages

- 📡 Relatively low bandwidth
- 📡 Can be tapped easily
- 📡 Affected by interference and noise

Guided Media

Fiber optics:

- 📖 Optical fiber is made of **glass or plastic** and transmits signals in the form of lights. Light, a form of electromagnetic energy, travels at 3×10^8 meters/second in a vacuum.
- 📖 The speed of the light depends on the density of the medium through which it is traveling (the higher density, the slower the speed).

An optical transmission system has three components:

- 📖 **The light source:** A pulse of light indicates a 1 bit and the absence of light indicates a 0 bit.
- 📖 **The transmission medium:** ultra-thin fiber of glass.
- 📖 **The detector:** Generates an electrical pulse when light falls on it.

Guided Media

Fiber optics:

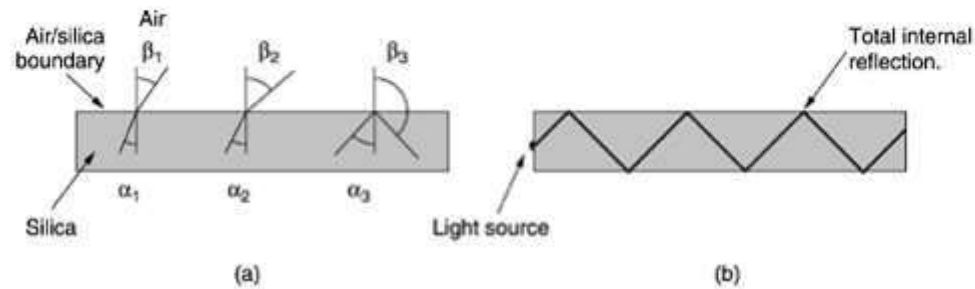
- 📖 By attaching a light source to one end of an optical fiber and a detector to the other, we get a unidirectional data transmission system.
- 📖 The work of this transmission system is based on the refraction of the light ray at the silica/air boundary.
- 📖 Since any light ray incident on the boundary above the critical angle will be reflected internally, many different rays will be bouncing around at different angles.
- 📖 Each ray is said to have a different mode, so a fiber having this property is called a multimode fiber.

Guided Media

Fiber optics:

- ☞ If the fiber diameter is reduced to a few wavelength of light, the fiber acts like a wave guide and the light can only propagate in a straight line, without bouncing, yielding a single mode fiber.
- ☞ Single mode fibers are more expensive but can be used for longer distances (typically several Gbps for 30 Km).

Figure 2-5. (a) Three examples of a light ray from inside a silica fiber impinging on the air/silica boundary at different angles. (b) Light trapped by total internal reflection.



Guided Media

Fiber optics:

Advantages

- 📁 Much higher bandwidth
- 📁 Low attenuation
- 📁 Noise resistance
- 📁 Difficult to tap- higher security

Disadvantages

- 📁 More expensive over short distance
- 📁 Unidirectional communication
- 📁 Unfamiliar technology
- 📁 Installation and maintenance cost more