Networking Essentials
ITC 2243

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1) Network Devices

- Devices that are used to connect computers, printers, fax machines and other electronic devices to a network are called network devices. These devices transfer data (fast/secure) in a correct way over the same or different networks.
- Network devices may be inter-network or intra-network.

Repeater

- A repeater is an electronic device that amplifies the signal it receives. You can think of repeater as a device which receives a signal and retransmits it at a higher level or higher power so that the signal can cover longer distances, more than 100 meters for standard LAN cables.
- Repeaters work at the Physical layer.

Hub

- Hubs connect multiple computers together. A hub also acts as a repeater in that it amplifies signals that passing through it.
- Hubs do not perform packet filtering or addressing functions; they just send the data to all connected devices.
- Hubs operate at the Physical layer.
- 1 Collision Domain, 1 Broadcast Domain

Switch

- Switches generally have a more intelligent role than hubs. A switch is a multiport device that connects PCs and improves network efficiency.
- Switches can read the hardware addresses of incoming data frames and transmit them to the appropriate destination.
- In general switches are L2 (Can also be L3)

❑ <u>Two types available.</u>

1. Manageable Switches
2. Unmanageable Switches

Network Interface Card (NIC)

- NIC is a computer hardware component that connects a computer to a computer network.
- This works in Physical layer.

Router

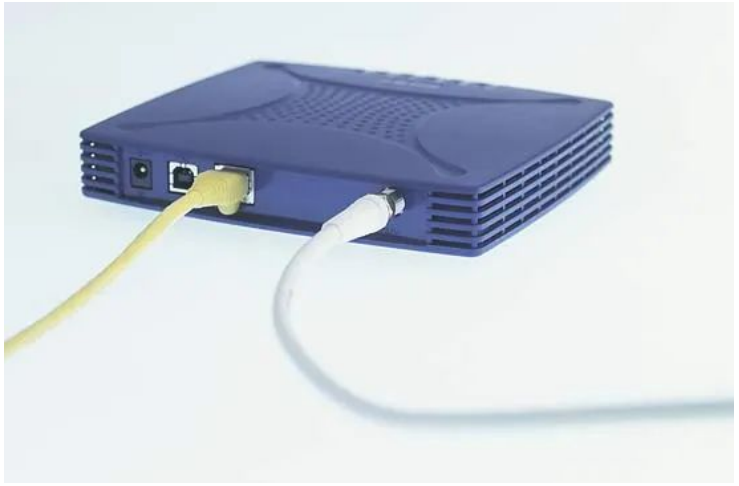
- A router is a device that forwards data packets along networks.
- A router is used to connect at least two networks, commonly two LANs or WANs or a LAN and its ISP's network.
- Routers are located at gateways, the places where two or more networks connect.
- Routers are the critical devices that keeps data flowing between networks and keeps the networks connected to the Internet.

Access Point (AP)

- In computer networking, a wireless access point (WAP), or more generally just access point (AP), is a networking hardware device that allows other Wi-Fi devices to connect to a wired network.
- The AP connects to a switch / router (via a wirec network), but it can also be an integral component of the router itself.

Modem

- It converts or "modulates" an analog signal from a telephone or cable wire to digital data (1s and 0s) that a computer can recognize.
- Similarly, it converts digital data from a computer or other device into an analog signal that can be sent over standard telephone lines.
- ▪Modem stand for "Modulator-Demodulator."



Firewall

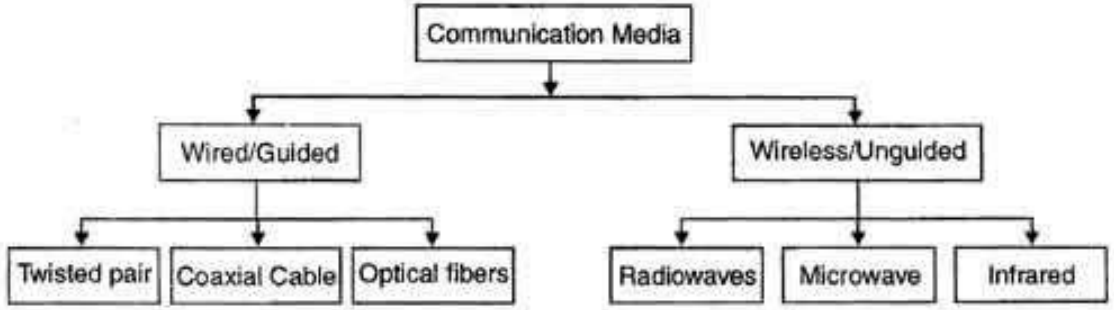
- System or group of systems that enforces an access control policy between two networks
- Monitors and controls traffic into and out of secure networks
- Normally located at the gateway to a network.

2) Transmission Media

- Transmission media is the data signal carrier with in computer networks.
- In data communication, the transmitter sends the signals, and the receiver receives them.
- The transmission media is the path between the transmitter and the receiver.
- There are two types of transmission media.

1) Wired Media (Guided)

2) Wireless Media (Unguided)



Basic Types of Physical Media

- Twisted Pair – 10 Base T
  - ✔ Unshielded Twisted Pair (UTP) cable
  - ✔ Shielded Twisted Pair (STP) cable
- Coaxial cable
  - ✔ Thin Coaxial Cable – 10 Base 2
  - ✔ Thick Coaxial Cable – 10 Base 5
- Optical Fiber.

Twisted Pair Cable

- Inexpensive
- Susceptible to electrical interference (noise)
- Used in telephone systems

Physical characteristics

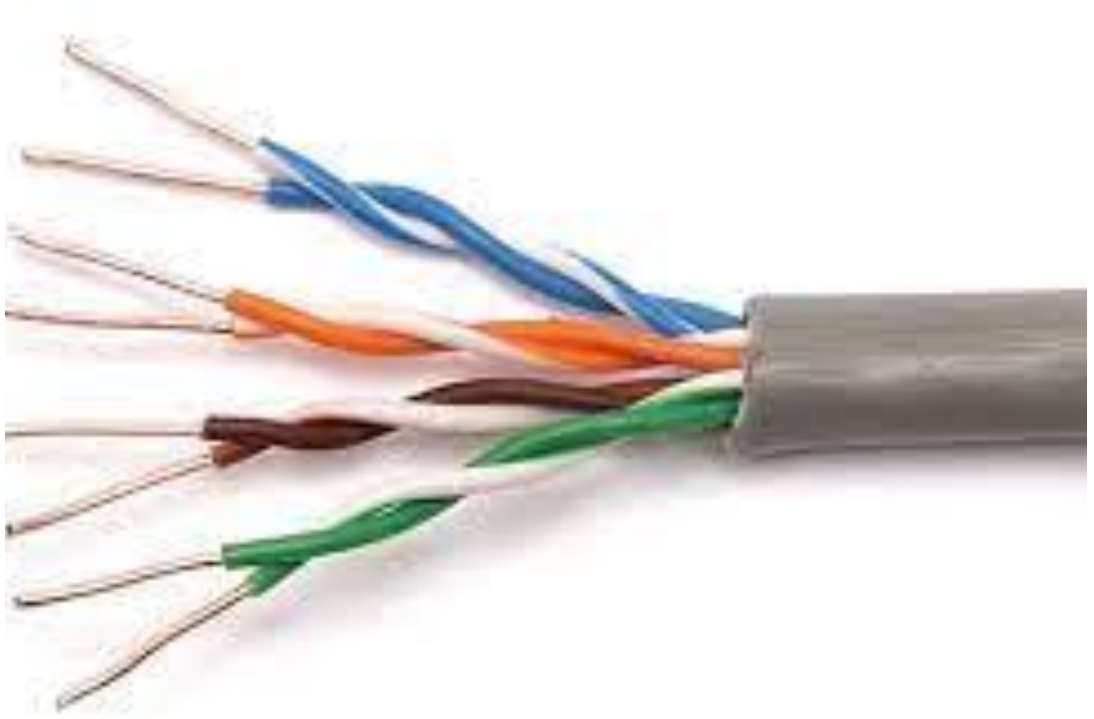
✔ Requires two conductors

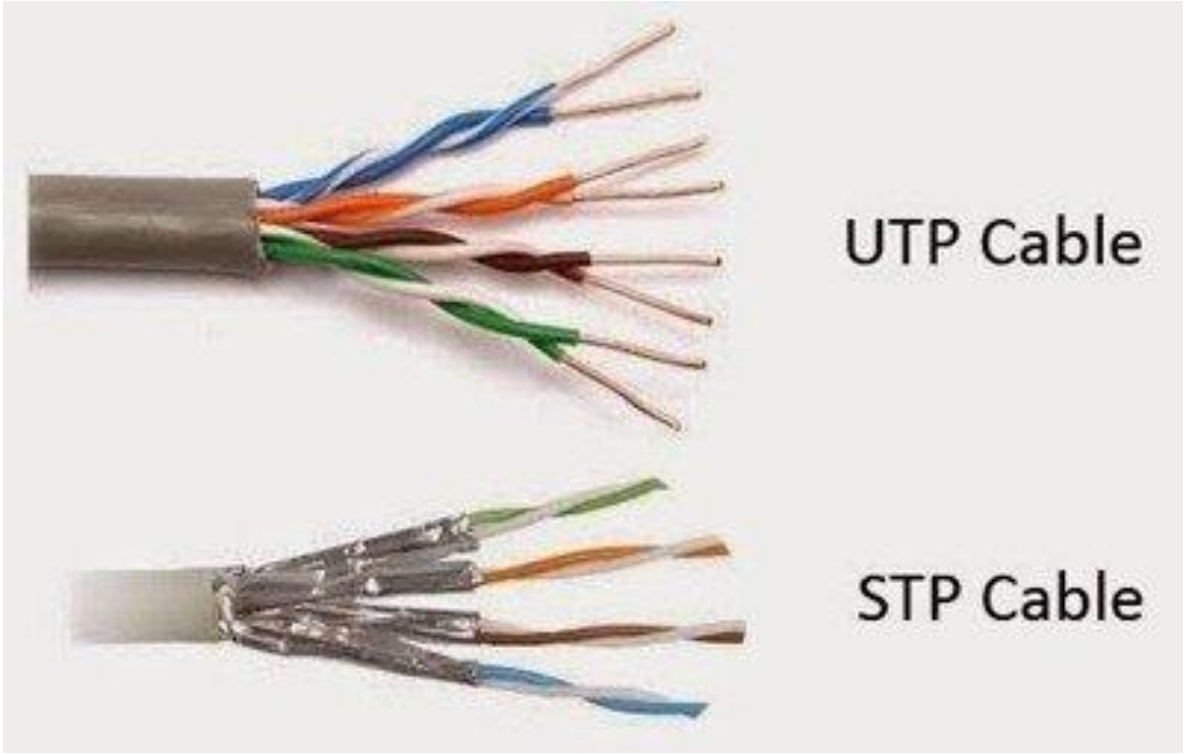
✔ Twisted around each other to reduce electrical interference ▪Plastic sheath

Two Types

✔ Unshielded Twisted Pair (UTP)

✔ Shielded Twisted Pair (STP)





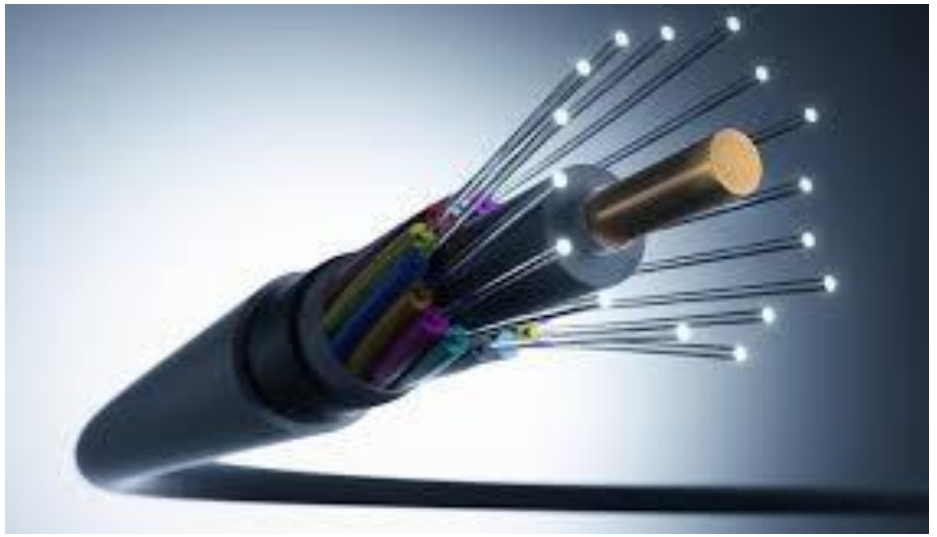
RJ 45 Connector & UTP vs STP

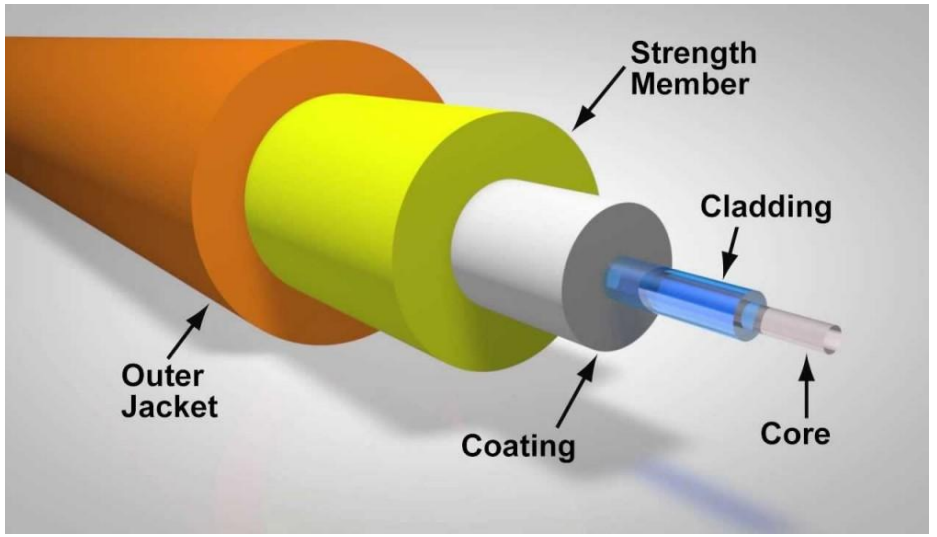
Coaxial Cable

- At one time, coaxial cable was the most widely used network cabling
- Coaxial was relatively inexpensive, and it was light, flexible, and easy to work with
- It was so popular that it became a safe, easily supported installation

Fiber Optic Cable

- Fiber optic cabling consists of a center glass core surrounded by several layers of protective materials
- Transmit light rather than electronic signals which eliminating the problem of electrical interference.
- Ability to transmit signals over much longer distance.
- Data transmission at vastly greater speeds





Basic Types of Wireless Media

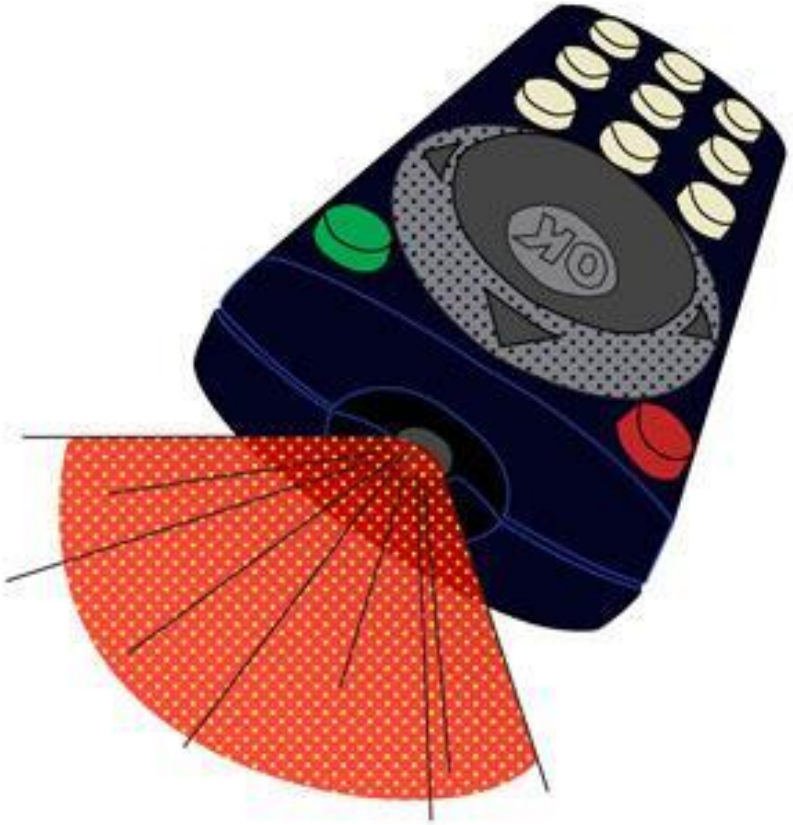
- Infrared
- Radio waves
- Bluetooth
- Microwave
- Satellite

Infrared

- Infrared Is limited for a small area.

  ✔ Eg: a room

- Walls/barriers will block the signals.
- Mainly used for TV remote control, IRD port.
- Transmits data as infrared light waves from one device to another, providing wireless links between PCs and peripherals



Bluetooth

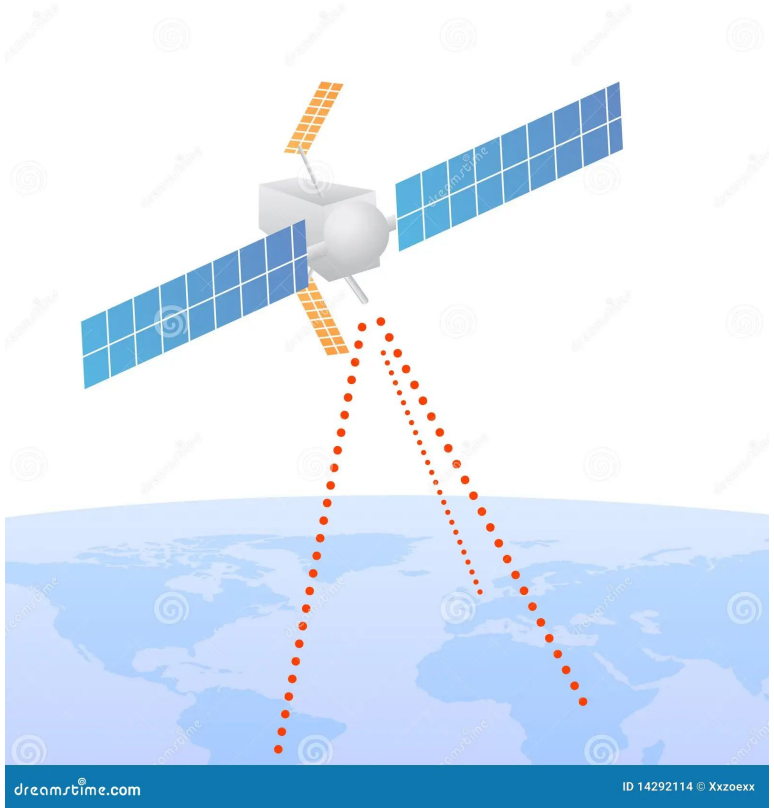
- Bluetooth is a similar radio-wave technology, but it's mainly designed for communicating over short distances less than about 10m or 30ft.

Microwave

- Microwares travels nearly in a straight line.
- Tall building is a barrier
- This Is widely used for mobile phone, television etc.

Satellite

- Used for long distance telephone Television.
- Private business networks.
- Receive transmitted signals, amplify them, and then transmit the signals to the appropriate locations



Radio Waves

- Omni directional
- Suffers from interference
- These waves are omni directional in nature which means that they can travel in all the directions.
- They are widely used for the communication between both indoor and outdoor because they have the property that they can penetrate through the walls very easily.

3) Transmission Impairments

- Transmission impairment is a property of a transmission medium which causes the signal to be degraded, reduced in amplitude, distorted or contaminated. Impairment can introduce errors into digital signals. Examples of transmission impairments are attenuation, delay distortion, and several sources of noise including, thermal noise, impulse noise, and inter-modulation noise.

Transmission Impairments Types

- **Attenuation -** Signal becomes weaker over distance. Amplifiers (analog) and repeaters (digital) used to strengthen and recover.
- **Delay Distortion -** Propagation through a cable in different speeds for different frequencies. Various components of a signal arrive at the receiver at different times.
- **Limited Bandwidth -** Every medium has a limit on its bandwidth. Bandwidth is the range of frequencies that the equipment or channel is capable of processing. If there is not enough bandwidth, some of the frequencies will be lost, and the signal will be distorted.

Transmission Impairments Types

- **Noise** is unwanted sound or an unwanted electrical interference on the signal wires. There are several types of noises.

✔ Thermal
– Present in all electronic devices
– Happens due to temperature change

✔ Intermodulation Noise
– Signals of different frequencies share a medium and can produce a new frequency that is the sum or the difference of the original frequency

✔ Crosstalk
– Unwanted coupling of signal paths. (Ex Hear someone else's conversation on phone)

✔ Impulse
– Irregular pulses, high amplitude, non-continuous (Ex. Lightning or faults in communication system)

Thank you!!!