UNIT 5: NETWORKING CONCEPT

Application of Synchronous transmission

• Synchronous transmission is used for high speed communication between computers.

Advantage of Synchronous transmission

1. This method is faster as compared to asynchronous as there are no extra bits (start bit & stop bit) and also there is no gap between the individual data bytes.

Disadvantages of Synchronous transmission

1. It is costly as compared to asynchronous method. It requires local buffer storage at the two ends of line to assemble blocks and it also requires accurately synchronized clocks at both ends. This lead to increase in the cost.

2. The sender and receiver have to operate at the same clock frequency. This requires proper synchronization which makes the system complicated.

Comparison between Serial and Parallel transmission

| Sr. No.	Factor	Serial	Parallel
1.	Number of bits transmitted at one clock pulse	One bit	n bits
2.	No. of lines required to transmit n bits	One line	n lines
3.	Speed of data transfer	Slow	Fast
4.	Cost of transmission	Low as one line is required	Higher as n lines are required.
5.	Application	Long distance communication between two computers	Short distance communication. like computer to printer.

Comparison between Asynchronous and Synchronous.

Sr. No.	Factor	Asynchronous	Synchronus
1.	Data send at one time	Usually 1 byte	Multiple bytes
2.	Start and Stop bit	Used	Not used
3.	Gap between Data units	Present	Not present
4.	Data transmission speed	Slow	Fast
5.	Cost	Low	High

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Transmission Modes in Computer Networks (Simplex, Half-Duplex and Full-Duplex)

Transmission mode means transferring of data between two devices. It is also known as communication mode. Buses and networks are designed to allow communication to occur between individual devices that are interconnected. There are three types of transmission mode: -
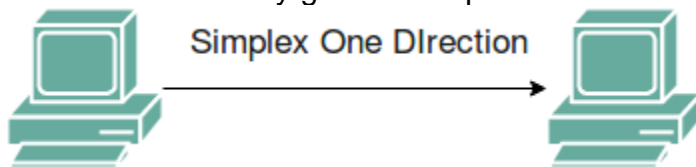
• Simplex **Mode**

• Half-**Duplex Mode**

• Full-**Duplex Mode**
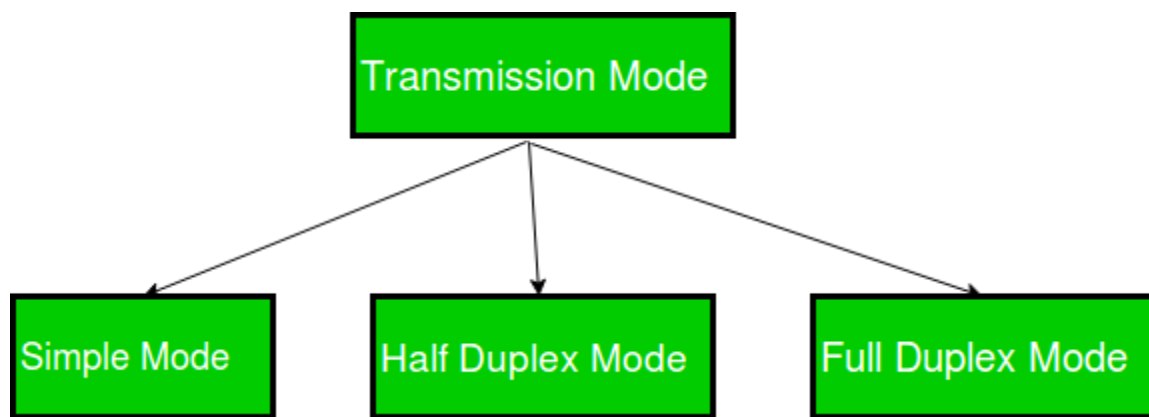
Simplex Mode
In Simplex mode, the communication is unidirectional, as on a one-way street. Only one of the two devices on a link can transmit, the other can only receive. The simplex mode can use the entire capacity of the channel to send data in one direction.
Example: Keyboard and traditional monitors. The keyboard can only introduce input, the monitor can only give the output.
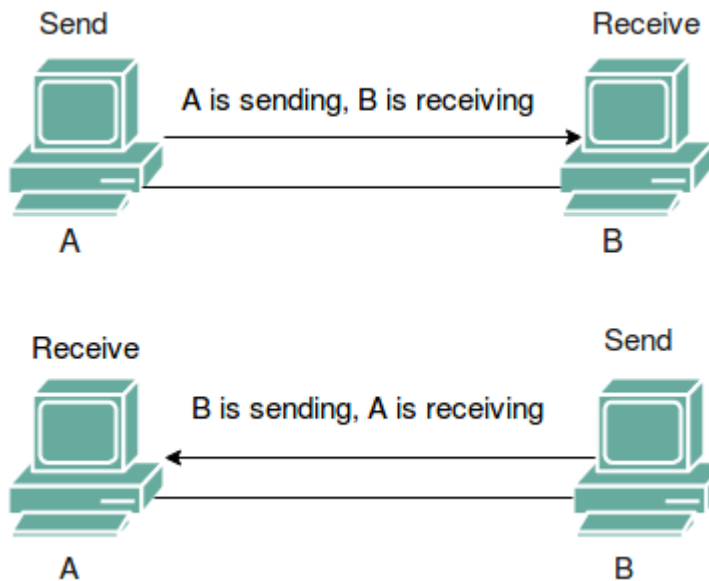

Half-Duplex Mode
In half-duplex mode, each station can both transmit and receive, but not at the same time. When one device is sending, the other can only receive, and vice versa. The half-duplex mode is used in cases where there is no need for communication in both direction at the same time. The entire capacity of the channel can be utilized for each direction.
Example: Walkie- talkie in which message is sent one at a time and messages are sent in both the directions.

Send   Receive

A is sending, B is receiving

A   B

Receive   Send

B is sending, A is receiving

A   B

Full-Duplex Mode
In full-duplex mode, both stations can transmit and receive simultaneously. In fullduplex mode, signals going in one direction share the capacity of the link with signals going in other direction, this sharing can occur in two ways:

• Either the link must contain two physically separate transmission paths, one for sending and other for receiving.

• Or the capacity is divided between signals travelling in both directions.

Full-duplex mode is used when communication in both direction is required all the time. The capacity of the channel, however must be divided between the two directions.
Example: Telephone Network in which there is communication between two persons by a telephone line, through which both can talk and listen at the same time.

Both Directions

PC   Terminal
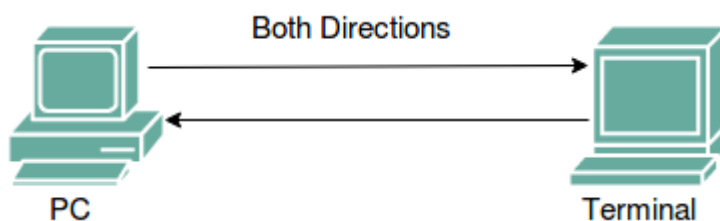
COMMUNICATION MEDIA

Communication medium refers to the physical channel through which data is sent and received. Data is sent in the form of voltage levels which make up the digital signal. A digital signal consists of 0s and 1s; essentially, a 1 corresponds to a high voltage, while a 0 corresponds to a low voltage.

The speed of data transmission or data rate depends upon the type of medium being used in the network. There are basically two types of networks:

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- Wired network
- Wireless network

Wired Network

In a wired network, data is transmitted over a physical medium. There are three types of physical cables used in a wired network.

1.   Twisted Pair

It consists of a pair of copper wires twisted around each other; the wires are around 1 to 2 mm thick and they are twisted to reduce the interference from the surrounding wires. Remember that a current carrying wire has a magnetic field around it that can interfere with that of another wire when in close proximity. Invented by Alexander Graham Bell, this form of wire has been in use since the 19th century and is currently the cheapest mediums available. Twisted pairs are also used in telephone wires, but they only consist of four wires or two pairs. In computer networks, eight wires or four pairs are utilized. This is also known as the Ethernet cable or RJ-45 cable. The pairs of wires are bundled together and covered by a protective shield.

2.   Coaxial Cable

Offering better data rates and less signal attenuation, a coaxial cable consist of a central copper conductor that is surrounded by a foil shield. The foil is covered by yet another shield known as a braided shield. Unlike twisted pairs, coaxial cables only have a single copper conductor. The conductor and the foil shield are separated by a dielectric.

3.   Fibre Optic

It is the most expensive of wired mediums and offers the highest rates of data transmission. They are often used in long distance communications and are never affected by any electromagnetic fields. This is because it involves light.
A fibre optic cable is a thin, flexible, transparent medium made of very fine glass or plastic fibres. It utilizes the principle of total internal reflection. Unlike twisted pairs or coaxial cables, a fibre optic uses light pulses generated by laser or an injection diode to transmit data. Each pulse of light represents a single bit of data.

Wireless Network

A wireless network uses radio waves as the sole medium for transmitting and receiving data. There are no wires involved. An example is the wireless router in your home. Radio waves are electromagnetic waves which are transverse in nature and they have the longest wavelength on the electromagnetic spectrum. They travel at the speed of light and have frequencies ranging from 3 kHz to 3 GHz. Radio waves can easily be absorbed by most materials and can bend around objects as well. However, they are susceptible to nearby electromagnetic fields which can cause losses in the data rate.