TRANSMISSION MODES

Data is transmitted between two digital devices on the network in the form of bits. Transmission mode refers to the mode used for transmitting the data. The transmission medium may be capable of sending only a single bit in unit time or multiple bits in unit time.

When a single bit is transmitted in unit time the transmission mode used is Serial Transmission and when multiple bits are sent in unit time the transmission mode used is called Parallel transmission.

Types of Transmission Modes:

There are two basic types of transmission modes Serial and Parallel as shown in the figure below.

Serial transmission is further categorized into Synchronous and Asynchronous Serial transmission.

Fig. Types of Transmission Modes 9.2.1 Parallel Transmission

It involves simultaneous transmission of *N* bits over *N* different channels

Parallel Transmission increases transmission speed by a factor of *N* over serial transmission

Disadvantage of parallel transmission is the cost involved, N channels have to be used, hence, it can be used for short distance communication only

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Example of Parallel Transmission is the communication between CPU and the Projector.

9.2.2 Serial Transmission

In Serial Transmission, as the name suggests data is transmitted serially, i.e. bit by bit, one bit at a time.

Since only one bit has to be sent in unit time only a single channel is required.

Fig. Serial Transmission of Data over N = 8 channels Types of Serial Transmission:

Depending upon the timing of transmission of data there are two types of serial transmission as described below

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9.2.2.1 ASynchronous Transmission

In asynchronous serial transmission the sender and receiver are not synchronized.

The data is sent in group of 8 bits i.e. in bytes.

The sender can start data transmission at any time instant without informing the receiver.

To avoid confusing the receiver while receiving the data, —startǁ and —stopǁ bits are inserted before and after every group of 8 bits as shown below

The start bit is indicated by —0‖ and stop bit is indicated by —1‖.

The sender and receiver may not be synchronized as seen above but at the bit level they have to be synchronized i.e. the duration of one bit needs to be same for both sender and receiver for accurate data transmission.

There may be gaps in between the data transmission indication that there is no data being transmitted from sender. Ex. Assume a user typing at uneven speeds, at times there is no data being transmitted from Keyboard to the CPU.

Following is the Diagram for Asynchronous Serial Transmission.

Advantages

1. Cheap and Effective implementation 2. Can be used for low speed communication

Disadvantages

Insertion of start bits, stop bits and gaps make asynchronous transmission slow.

Application

Keyboard **9.2.2.2 Synchronous Transmission**

In Synchronous Serial Transmission, the sender and receiver are highly synchronized.

No start, stop bits are used.

Instead a common master clock is used for reference.

The sender simply send stream of data bits in group of 8 bits to the receiver without any start or stop bit.

It is the responsibility of the receiver to regroup the bits into units of 8 bits once they are received.

When no data is being transmitted a sequence of 0‘s and 1‘s indicating IDLE is put on the transmission medium by the sender.

Fig: Asynchronous Serial Transmission

Advantage

1. There are no start bits, stop bits or gaps between data units
2. Since the above are absent data transmission is faster.
3. Due to synchronization there are no timing errors.

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9.2.2.3 Comparison of serial and parallel transmission

Sr.no	Parameter	Parallel transmission	Serial transmission
1	Number of wire required to transmit N bits	N wire	1 wire
2	Number of bits transmitted simultaneously	N bits	1 bit

3	Speed of data transfer	False	Slow
4	Cost	Higher due to more number of conductor	Low, since only one wire is used
5	Application	Short distance communication such as computer to printer communication	Long distance computer to computer communication.

9.3 Transmission Impairments & Types

Data is transmitted through transmission medium which are not perfect.

The imperfection causes signal impairment.

Due to the imperfection error is introduced in the transmitted data i.e. the original signal at the beginning of the transmission is not the same as the signal at the Receiver.

There are three causes of impairment: attenuation, distortion, and noise as shown below:

Fig: Transmission Impairment Types

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9.3.1 Attenuation

• Attenuation results in loss of energy. When a signal travels through a medium, it loses some of its energy in overcoming the resistance of the medium.

• The electrical energy in the signal may converted to heat.

• To compensate for this loss, amplifiers are used to amplify the signal. Figure below shows the effect of attenuation and amplification.

Fig. Attenuation 9.3.2 Distortion

Distortion changes the shape of the signal as shown below

Fig. Distortion 9.3.3 Noise

Noise is any unwanted signal that is mixed or combined with the original signal during transmission.

Due to noise the original signal is altered and signal received is not same as the one sent.