CHAPTER SIX

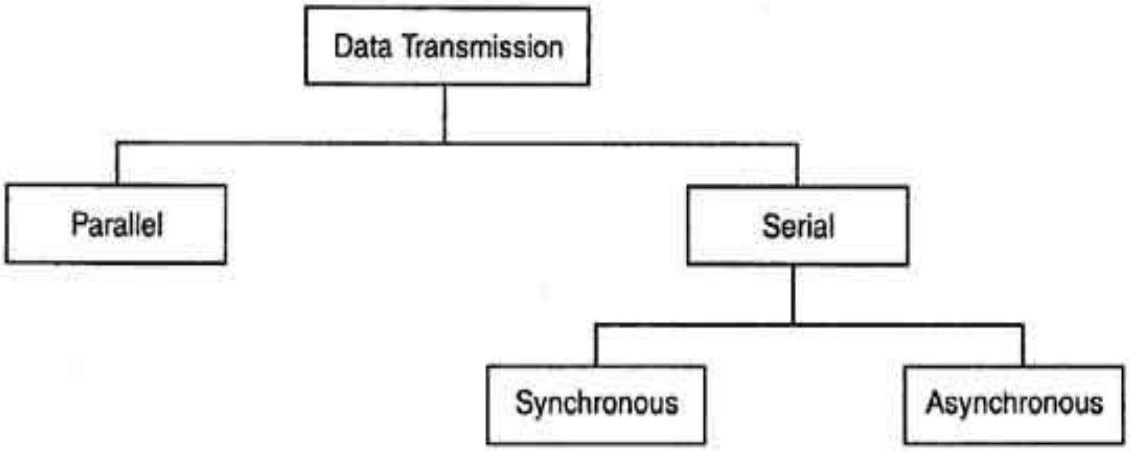
Data transmission

Definition Data transmission:

Data transmission is the transfer of data from point-to-point often represented as an electro-magnetic signal over a physical point-to-point or point-to-multipoint communication channel. Examples of such channels are copper wires, optical fibers, wireless communication channels, and storage media.

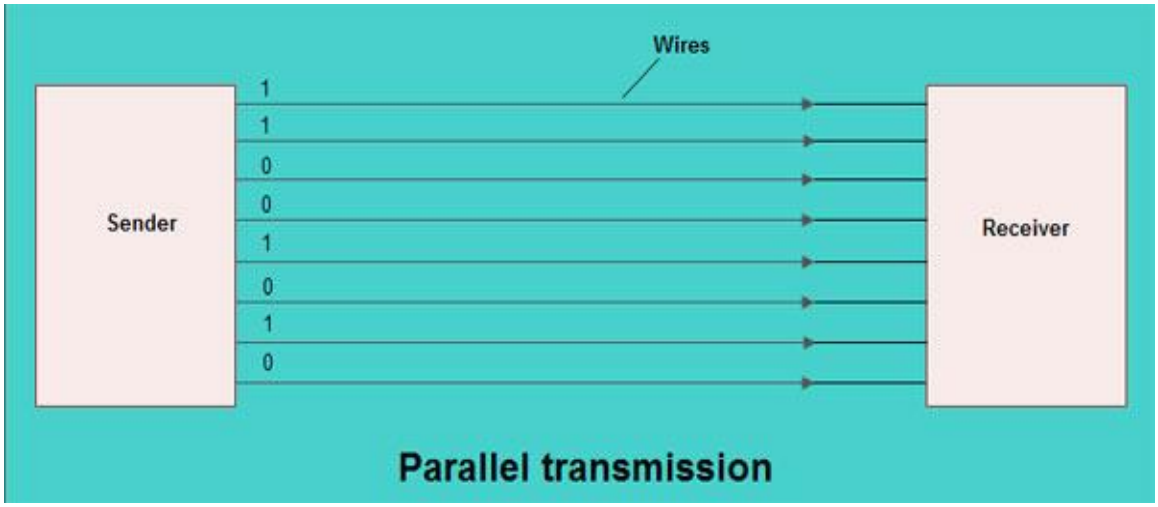
Data transmission is a subset of the field of data communication, which also includes computer networking or computer communication applications and networking protocols, for example routing. The term input refer, to data or software or instruction that you enter into the computer memory.

Types of data transmission:



1. Parallel transmission:

Within a computing or communication device, the distances between different subunits are too short. Thus, it is normal practice to transfer data between subunits using a separate wire to carry each bit of data. And data is exchanged using a parallel transfer mode. This mode of operation results in minimal delays in transferring each word. As shown in the fig. eight separate wires are used to transmit 8 bit data from sender to receiver.

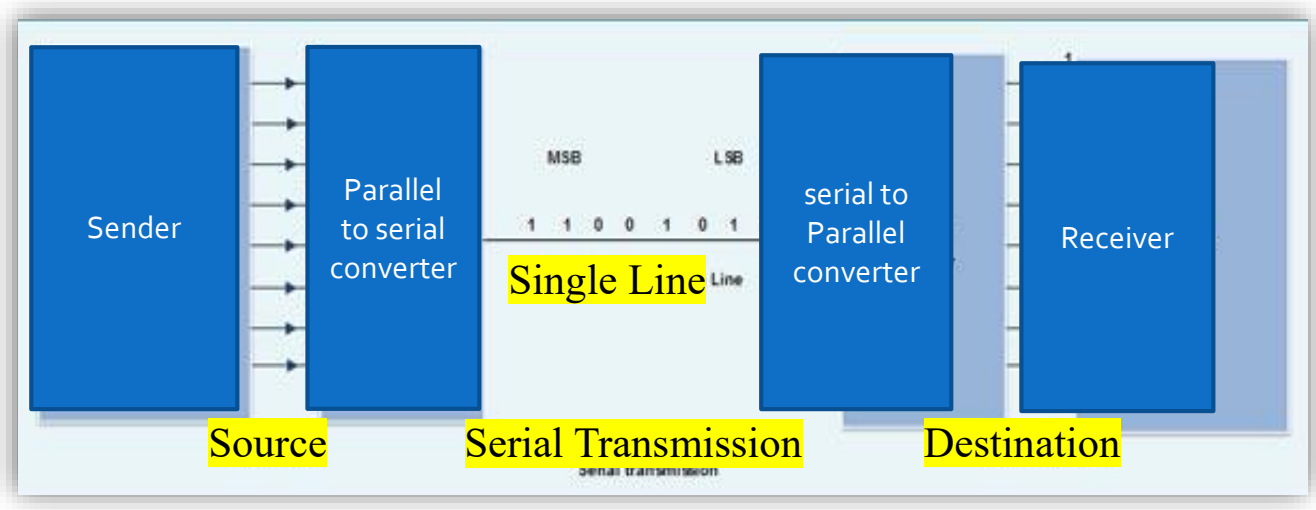


Parallel transmission is speedy way of transmitting data as multiple bits are transmitted simultaneously with a single clock pulse. But it is costly method of data transmission as it requires n lines to transmit n bits at the same time.

2. Serial Transmission:

When transferring data between two physically separate devices, especially if the separation is more than a few kilometers, for reasons of cost, it is more economical to use a single pair of lines. Data is transmitted as a single bit at a time using a fixed time interval for each bit. This mode of transmission is known as bit-serial transmission. The internal circuitry of computer transmits data in parallel fashion. So in order to change this parallel data into serial data, conversion devices are used.

These conversion devices convert the parallel data into serial data at the sender side so that it can be transmitted over single line. On receiver side, serial data received is again converted to parallel form so that the internal circuitry of computer can accept it.



Serial transmission is use a single communication line reduces the transmission line cost as compared to parallel transmission. But it use conversion devices at source and destination end may lead to increase in overall transmission cost. And this method is slower as compared to parallel transmission.

Types of Serial Transmission:

There are two types of serial transmission-synchronous and asynchronous both these transmissions use 'Bit Synchronization'

Bit Synchronization is a function that is required to determine when the beginning and end of the data transmission occurs. Therefore bit synchronization provides timing control.

1 – Asynchronous:

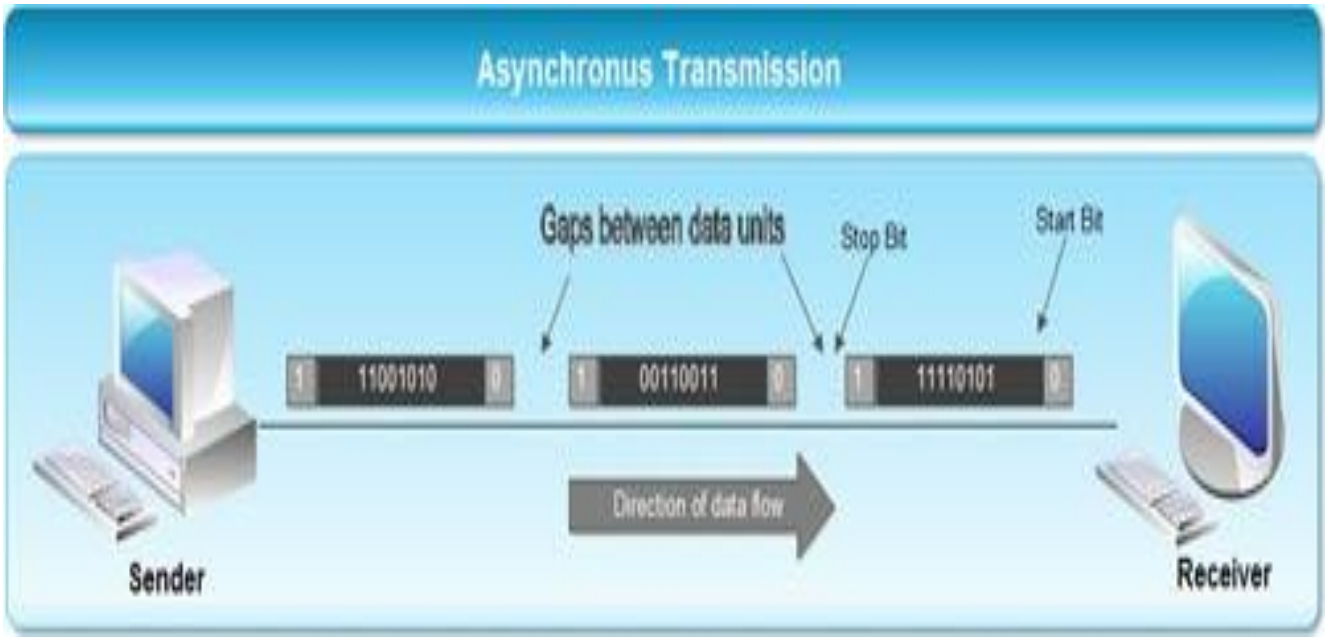
It sends only one character at a time where a character is either a letter of the alphabet or number or control character i.e. it sends one byte of data at a time.

Bit Synchronization between two devices is made possible using start bit and stop bit.

Start bit indicates the beginning of data i.e. alerts the receiver to the arrival of new group of bits.

A start bit usually 0 is added to the beginning of each byte. Stop bit indicates the end of data i.e. to let the receiver know that byte is finished, one or more additional bits are appended to the end of the byte. These bits, usually 1s are called stop bits.

The gap or idle time can be of varying intervals. This mechanism is called Asynchronous, because at byte level sender and receiver need not to be synchronized. But within each byte, receiver must be synchronized with the incoming bit stream.



2 – Synchronous:

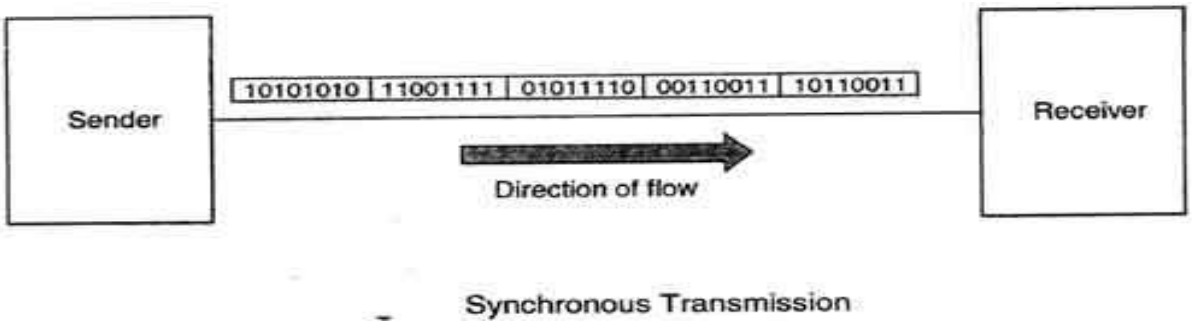
Synchronous transmission does not use start and stop bits. In this method bit stream is combined into longer frames that may contain multiple bytes.

There is no gap between the various bytes in the data stream.

In the absence of start & stop bits, bit synchronization is established between sender & receiver by 'timing' the transmission of each bit.

Since the various bytes are placed on the link without any gap, it is the responsibility of receiver to separate the bit stream into bytes so as to reconstruct the original information.

In order to receive the data error free, the receiver and sender operates at the same clock frequency.



Synchronous Transmission

Synchronous transmission is used for high speed communication between computers.

Compared between Synchronous and Asynchronous transmission:

1- Synchronous transmission 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.
2- But 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.
3- And the sender and receiver have to operate at the same clock frequency. This requires proper synchronization which makes the system complicated.

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