

DATA COMMUNICATION

Part TWO Data Transmission

This Chapter intends to create basic concepts of Data communication. We will be covering some basic definitions and details

Q: What are the basics Communication model :

There are basic three **Communication model** These are

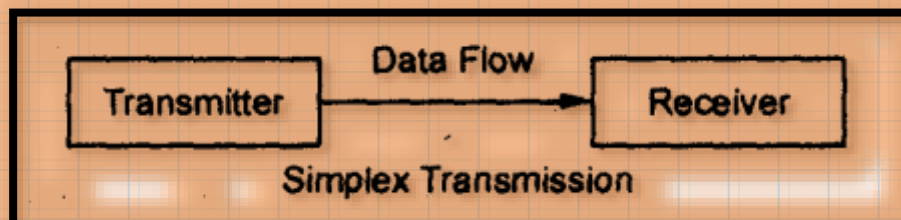
- Simplex
- Half-duplex
- Full-duplex

Simplex-In this mode, the data flows in only one direction i.e. sender always remain a sender and receiver always remains a receiver.

Disadvantage As it is one way communication. So, receiver can't intimate the sender that data was being received properly or not. In this mode, the main transmitter broadcasts a signal but it does not expects any reply from the receiver.

Advantage- Less Sources Required

Example: Television and Radio broadcasts.



Half Duplex-In this mode, the data flow in both direction but not simultaneously i.e. sender can send data to receiver and receiver can send acknowledgement as well but not together as line is common. Hence it is a two way alternate communication.

Advantages of Half Duplex

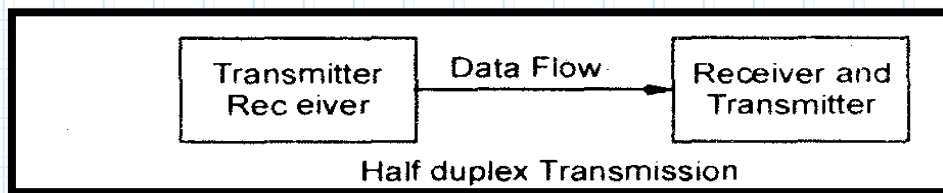
- Costs less than full duplex.
- Enables for two way communications.

Disadvantages of Half Duplex

- Costs more than simplex.
- Only one device can transmit at a time.

Example

- Walkie Talkie



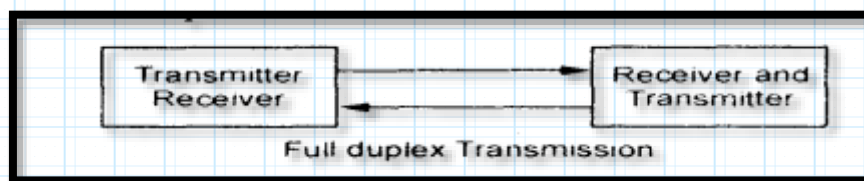
Full Duplex— To overcome the limitations of the half duplex i.e. to reduce the turned around time, here different paths are being allocated because of which two way simultaneous communication can take place here.

Advantage of Full Duplex.

- Enables two-way communication simultaneously.

Disadvantage of Full Duplex.

- The most expensive method in terms of equipment because of two bandwidth channels is required.



Techniques of Data Communication

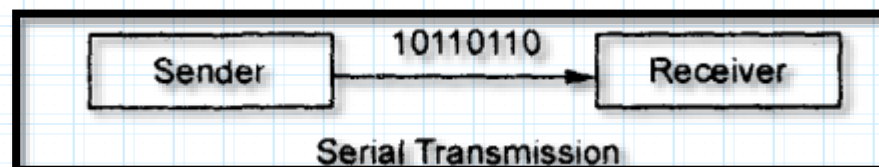


What are the techniques in which data can be transferred from one end to another, using data?

There are two techniques

1. Serial Transmission:
2. Parallel Transmission:

Serial Transmission: In this transmission the data is transmitted serially over the line. As signal wire pair carry the signal so generally it is preferred for long distance communication. The problem of crosstalk, interference is negligible but the speed is slow. Hence due to its low cost in implementation, optimum data rate for longer distance it is considered efficient transmission e.g. keyboard to computer system.



Advantages of serial transmission—Communication.

1. Only one wire is required
2. Reduction in cost due to less number of conductors.

Disadvantages

1. The speed of data transfer is low.
2. To increase the speed of data transfer, it is necessary to increase the clock frequency

Parallel Transmission: Here the multiple data lines are laid out to carry multiple signals at a time. The lines are laid in **multiple of 8**.

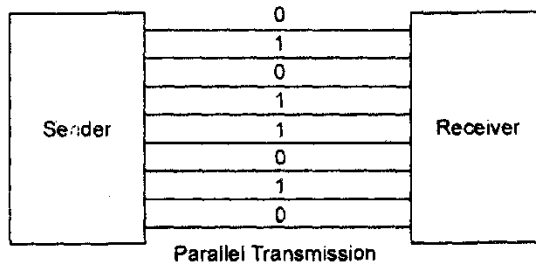
With the distance cost gets increased as more number of cables are to be drawn, hence **seeing its cost factor** this transmission is generally preferred for short distances communication. The multiple paths also introduced the **concept of cross talking and interference** leading to the generation of errors. But it is fast as multiple bits are transmitted simultaneously on different paths to the receiver. e.g. data transmission between computer system and printer.

Advantages:

1. The advantage of parallel transmission is that all the data bits will be transmitted simultaneously. Therefore the time required for the transmission of an N bit words are only one clock cycle.
2. The serial transmission will require N number of clock cycles for the transmission of same word. Due to this the clock frequency can be kept low without affecting the speed of operation. For serial transmission the clock frequency cannot be low.

Disadvantages :

To transmit an N-bit word, we need N number of wires. With increase in the number of users, these wires will be too many to handle. The serial transmission used only one wire, for connecting the transmitter to the receiver. Hence, practically the serial transmission is always preferred.



| Parameter | Parallel Transmission | Serial Transmission |
|---|-----------------------|---------------------|
| 1. Number of wires required to transmit N bits. | N wires | 1 Wire |
| 2. Number of bits transmitted simultaneously. | N bits | 1 bit. |

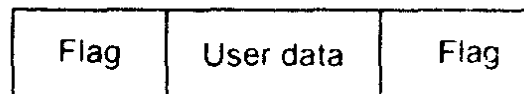
| Parameter | Parallel Transmission | Serial Transmission |
|---------------------------|--|---|
| 3. Speed of data transfer | Fast | Slow. |
| 4. Cost | Higher due to more Number of conductors | Low, since only one wire is used. |
| 5. Application | Short distance communication such as computer to printer communication | Long distance computer to computer communication. |



Hmmm!!!... So while sending digital data, how does receiver knows that, where one character ends and the next begins.

This is a very important issue. As receiver exactly needs to know that where to takes the decision regarding, where a character or bit is starting or ending. If receiver fails to distinguish it. All data received will be decrypted falsely

Synchronous Transmission When data is being send at periodic intervals with constant arrival rate then data is said to be synchronized. A synchronous systems will synchronize the signal clocks on both sides before transmission begin. In this method a clock signal is used for this purpose It doesn't use start and stop bits but the character are sent in character groups called block. Each data block is being surrounded by control bits called flags which delimits the data block boundaries



Synchronous data frame

Advantages of Synchronous Transmission

- It is very fast as compared to Asynchronous Series Transmission.

Disadvantage of Synchronous Transmission

- It uses more expensive and complex equipment.
- Clock Signal also need special care

Asynchronous Transmission: When a data character is sent at any time i.e. no fixed interval this can lead to loss of synchronizations as it is then difficult to know that when next character is arriving, hence in this approach, each character is being preceded by a bit called start bit while succeeded by a stop bit. The arrival of these bits will tell the receiver about the corresponding character.

This type of communication is generally found in machines or terminals such as teletypes or teleprinters and low speed computer terminals. It is very simple to implement.



Asynchronous Transmission

Advantages of Asynchronous Transmission

- This type of transmission is very simple.
- This type of transmission is cheaper.

Disadvantages of Asynchronous Serial Transmission

- This type of transmission is slow.



Which is faster in terms
of Data Communication.
Synchronous or
Asynchronous
Transmission

A start bit and a stop bit are added to each data segment for asynchronous communications. For synchronous communication, but the start bit and stop bit are eliminated. So a faster transmission speed is achieved.