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Topic: Transmission modes

A given transmission on a communications channel between two machines can occur in several different ways. The transmission is characterised by:

- the direction of the exchanges
- the transmission mode: the number of bits sent simultaneously
- synchronization between the transmitter and receiver

There are 3 different transmission modes characterised according to the direction of the exchanges:

- Simplex Mode
- Half duplex Mode
- Full duplex Mode

SIMPLEX Mode:

In this type of transmission mode data can be sent only through one direction i.e. communication is unidirectional. We cannot send a message back to the sender. Unidirectional communication is done in Simplex Systems.

Examples of simplex Mode is loudspeaker, television broadcasting, television and remote, keyboard and monitor etc.
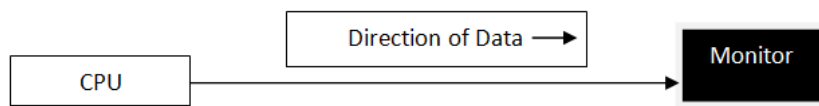
HALF DUPLEX Mode:

In half duplex system we can send data in both directions but it is done one at a time that is when the sender is sending the data then at that time we can't send the sender our message. The data is sent in one direction.

Example of half duplex is a walkie- talkie in which message is sent one at a time and messages are sent in both the directions.

Direction of data 1 ⟶

Direction of data 2 ⟵
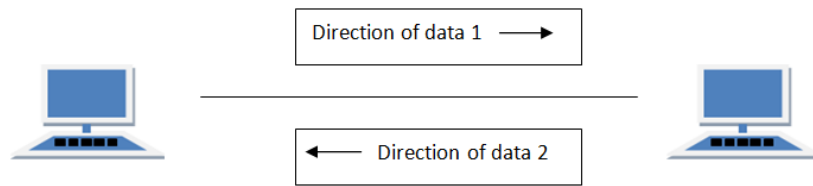
FULL DUPLEX Mode

In full duplex system we can send data in both directions as it is bidirectional. Data can be sent in both directions simultaneously. We can send as well as we receive the data.

Example of Full Duplex is a 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.

Direction of Data ⟷
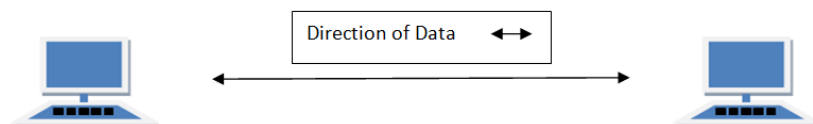
In full duplex system there can be two lines one for sending the data and the other for receiving data.

The **transmission mode** can also refers to the number of elementary units of information (bits) that can be simultaneously translated by the communications channel. In fact, processors (and therefore computers in general) never process (in the case of recent processors) a single bit at a time; generally they are able to process several (most of the time it is 8: one byte), and for this reason the basic connections on a computer are parallel connections.

There are 2 different transmission modes characterised according to the number of bits sent simultaneously:

- **Parallel transmission**
- **Serial transmission**

Parallel:

Parallel connection means simultaneous transmission of N bits. These bits are sent simultaneously over N different channels (a channel being, for example, a *wire*, a cable or any other physical medium). The parallel connection on PC-type computers generally requires 10 wires.

Parallel connection
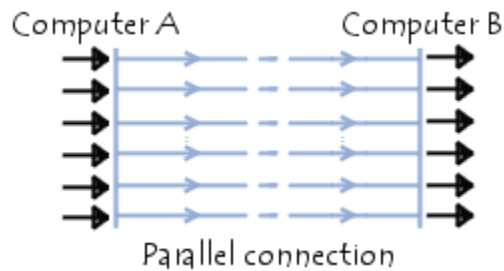
- In parallel transmission of data, all the bits of a byte are transmitted simultaneously on separate wires.
- This type requires multiple circuits for interconnecting the two devices.
- It is practically possible only if two devices are close to each other.
- E.g. Data transmission between computer and printer.

The 8 bits are sent together

We need eight lines.
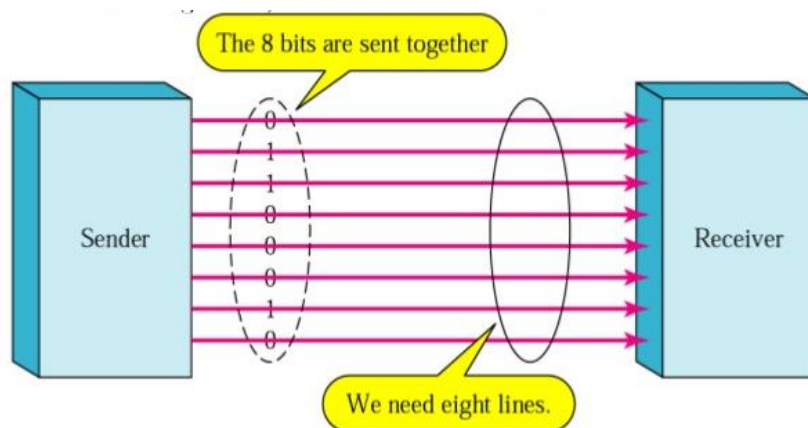
Advantage of Parallel Transmission:

1. All the data bits will be transmitted simultaneously, so time required for transmission of N number of bits will be only one clock cycle.
2. Due to transmission in only one clock cycle, clock frequency can be kept low without affecting speed of operation.
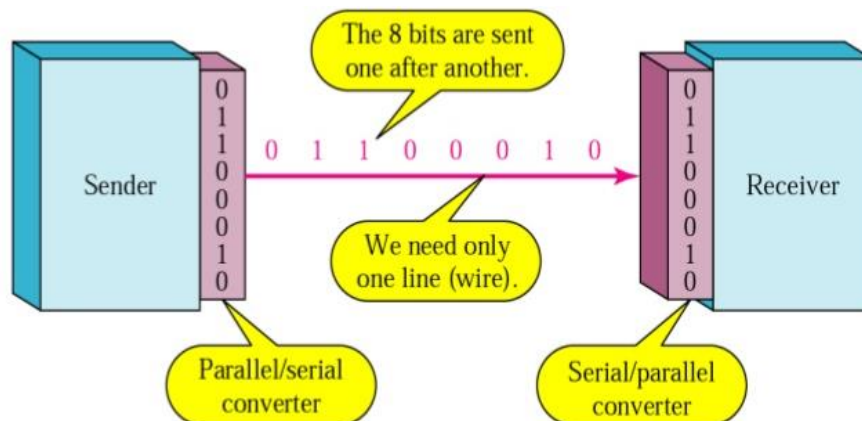
Disadvantage of Parallel Transmission:

1. Transmission of N bits will require N number of wires.
2. With increase of users these wires will be too many to handle.

Serial:

In a serial connection, the data are sent one bit at a time over the transmission channel. However, since most processors process data in parallel, the transmitter needs to transform incoming parallel data into serial data and the receiver needs to do the opposite.

1. In serial transmission of data, all the bits of a byte are transmitted serially one after the other on same wire.
2. This type doesn't require multiple circuits for interconnecting the two devices, indeed it just requires 1 wire to connect.
3. It is practically possible in all sorts of situations close or far.
4. E.g. Data transmission between computer and computer.

Advantage of Serial Transmission:

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

Disadvantage of Serial Transmission:

1. Speed of data transfer is low.
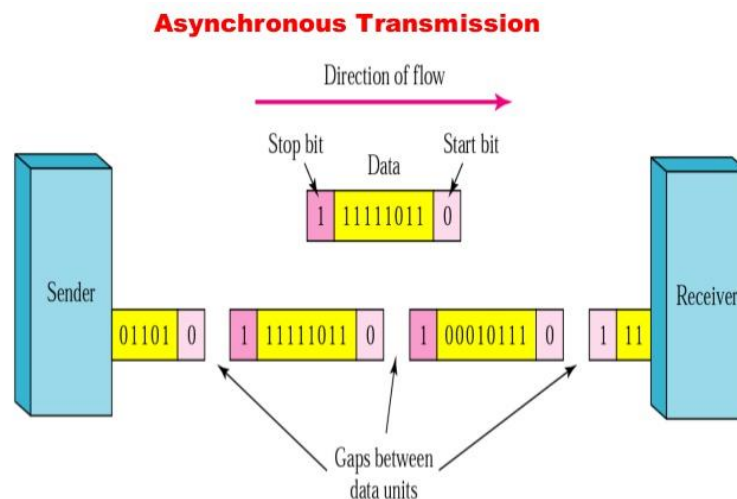2. To increase speed of data transfer, clock frequency needs to be increased.

Types of Serial Transmission:

1. **Asynchronous**

    2. Synchronous

1. Asynchronous data transmission:

1. In asynchronous transmission, the transmitter transmits data bytes at any instant of time.
2. Only one byte is sent at a time. There is ideal time between two data bytes.
3. Transmitter and Receiver operate at different clock frequencies.
4. To help receiver 'start' and 'stop' bits are used along with data in middle.
5. Ideal time between byte is not constant. They are also known as gaps.
6. In asynchronous transmission timing of signal is not important.

Asynchronous Transmission

Direction of flow →

Stop bit   Start bit

Data

| 1 | 11111011 | 0 |

Sender   Receiver

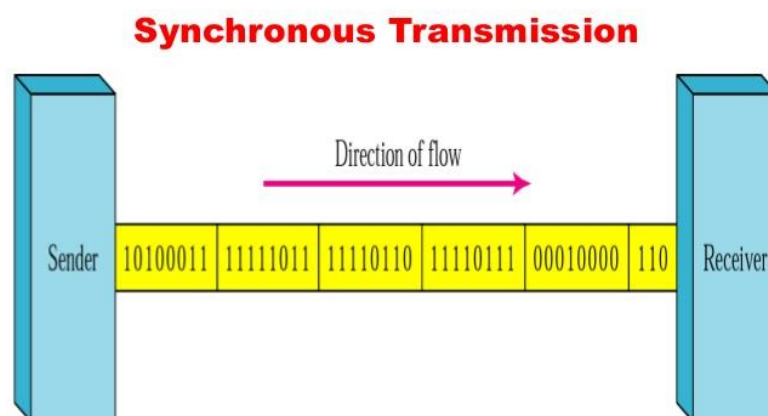| 01101 | 0 | | 1 | 11111011 | 0 | | 1 | 00010111 | 0 | | 1 | 11 |

Gaps between data units

Advantage:

1. Synch between devices is not necessary.
2. It is cheap scheme.

Disadvantage:

1. Use of 'start' and 'stop' bits and gaps between data makes transmission slow.
2. Timing error can take place.

2. Synchronous data transmission:

1. In synchronous transmission, data transmission is carried out under the control of a common master clock.
2. Bytes are transmitted as a block in a continuous stream of bits.
3. Transmitter and Receiver operate at synchronised clock frequencies.
4. No 'start' and 'stop' bits are used.
5. No need of ideal time between data bytes.
6. In synchronous transmission timing of signal is important.

Synchronous Transmission

| Sender | 10100011 | 11111011 | 11110110 | 11110111 | 00010000 | 110 | Receiver |

Direction of flow

Advantage:

1. Speed of data is much higher because of no 'start' and 'stop' bits and continuity.
2. Timing errors are reduced due to synch.

Disadvantage:

1. Accuracy of data is entirely dependent on timing.
2. Transmitter and Receiver needs to be properly synchronized.