Data Transmission Mode

– Parallel vs Serial

What is data transmission?

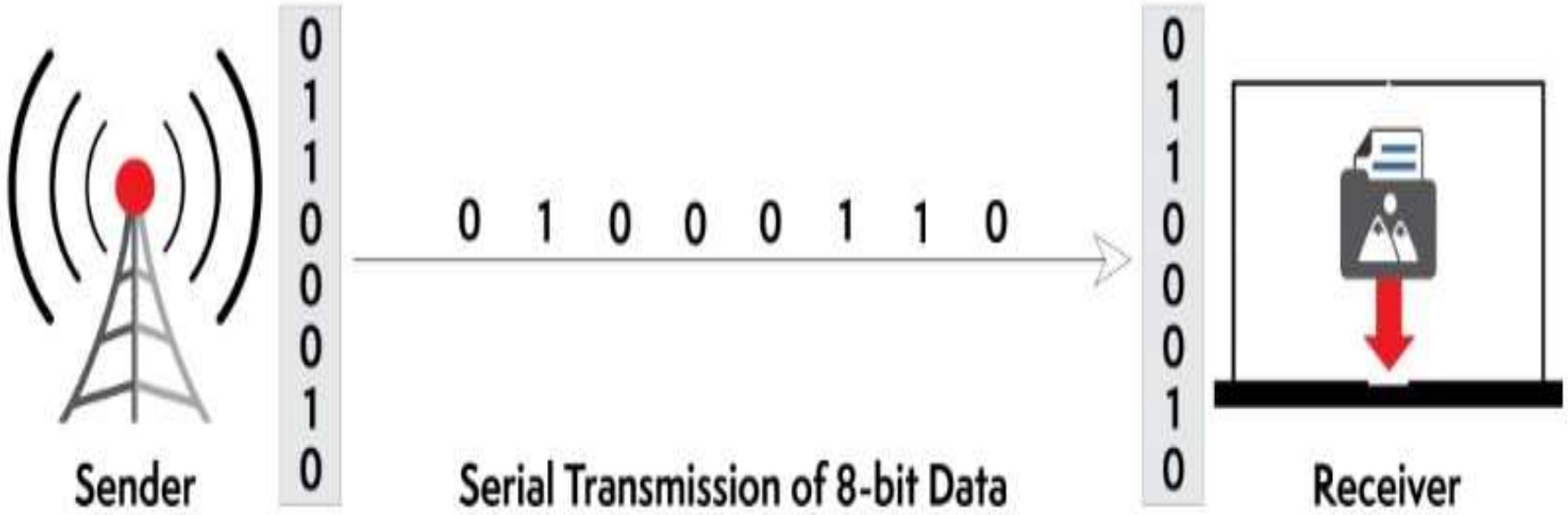
- Data transmission refers to the process of transferring data between two or more digital devices. Data is transmitted from one device to another in analog or digital format. Basically, data transmission enables devices or components within devices to speak to each other.

How does data transmission work between digital devices?

- Data is transferred in the form of bits between two or more digital devices. There are two methods used to transmit data between digital devices: serial transmission and parallel transmission. Serial data transmission sends data bits one after another over a single channel. Parallel data transmission sends multiple data bits at the same time over multiple channels.

What is serial transmission?

- When data is sent or received using serial data transmission, the data bits are organized in a specific order, since they can only be sent one after another. The order of the data bits is important as it dictates how the transmission is organized when it is received. It is viewed as a reliable data transmission method because a data bit is only sent if the previous data bit has already been received.



Example of Serial Data Transmission

Asynchronous Serial Transmission

- Data bits can be sent at any point in time. Stop bits and start bits are used between data bytes to synchronize the transmitter and receiver and to ensure that the data is transmitted correctly. The time between sending and receiving data bits is not constant, so gaps are used to provide time between transmissions.
- The advantage of using the asynchronous method is that no synchronization is required between the transmitter and receiver devices. It is also a more cost effective method. A disadvantage is that data transmission can be slower, but this is not always the case.

Synchronous Serial Transmission

- Data bits are transmitted as a continuous stream in time with a master clock. The data transmitter and receiver both operate using a synchronized clock frequency; therefore, start bits, stop bits, and gaps are not used. This means that data moves faster and timing errors are less frequent because the transmitter and receiver time is synced. However, data accuracy is highly dependent on timing being synced correctly between devices. In comparison with asynchronous serial transmission, this method is usually more expensive.

- When is serial transmission used to send data?
- Serial transmission is normally used for long-distance data transfer. It is also used in cases where the amount of data being sent is relatively small. It ensures that data integrity is maintained as it transmits the data bits in a specific order, one after another. In this way, data bits are received in-sync with one another.

What is parallel transmission?

- When data is sent using parallel data transmission, multiple data bits are transmitted over multiple channels at the same time. This means that data can be sent much faster than using serial transmission methods.
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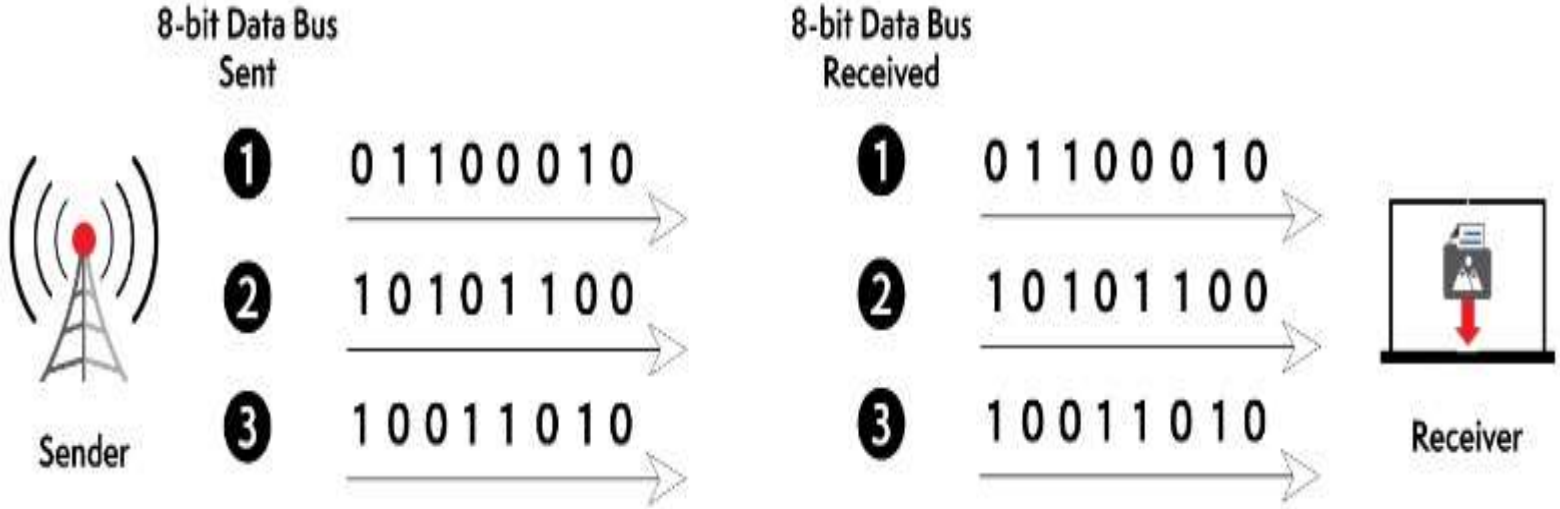
Example of Parallel Data Transmission

- Given that multiple bits are sent over multiple channels at the same time, the order in which a bit string is received can depend on various conditions, such as proximity to the data source, user location, and bandwidth availability.
- Two examples of parallel interfaces can be seen below. In the first parallel interface, the data is sent and received in the correct order. In the second parallel interface, the data is sent in the correct order, but some bits were received faster than others.



Example of Parallel Transmission – Data Received Correctly

Example of Parallel Transmission – Data Received Incorrectly

S.NO	Serial Transmission	Parallel Transmission
1.	In this type, a single communication link is used to transfer data from one end to another	In this type, multiple parallels links used to transmit the data
2.	In serial transmission, data(bit) flows in bi-direction.	In Parallel Transmission, data flows in multiple lines.
3.	Serial Transmission is cost-efficient.	Parallel Transmission is not cost-efficient.
4.	In serial transmission, one bit transferred at one clock pulse.	In Parallel Transmission, eight bits transferred at one clock pulse.
5.	Serial Transmission is slow in comparison of Parallel Transmission.	Parallel Transmission is fast in comparison of Serial Transmission.

6.	Generally, Serial Transmission is used for long-distance.	Generally, Parallel Transmission is used for short distance.
7.	The circuit used in Serial Transmission is simple.	The circuit used in Parallel Transmission is relatively complex.
8.	Serial Transmission is full duplex as sender can send as well as receive the data	Parallel Transmission is half-duplex since the data is either send or receive
9.	Converters are required in a serial transmission to convert the data between internal and parallel form	No converters are required in Parallel Transmission
10.	Serial transmission is reliable and straightforward.	Parallel transmission is unreliable and complicated.