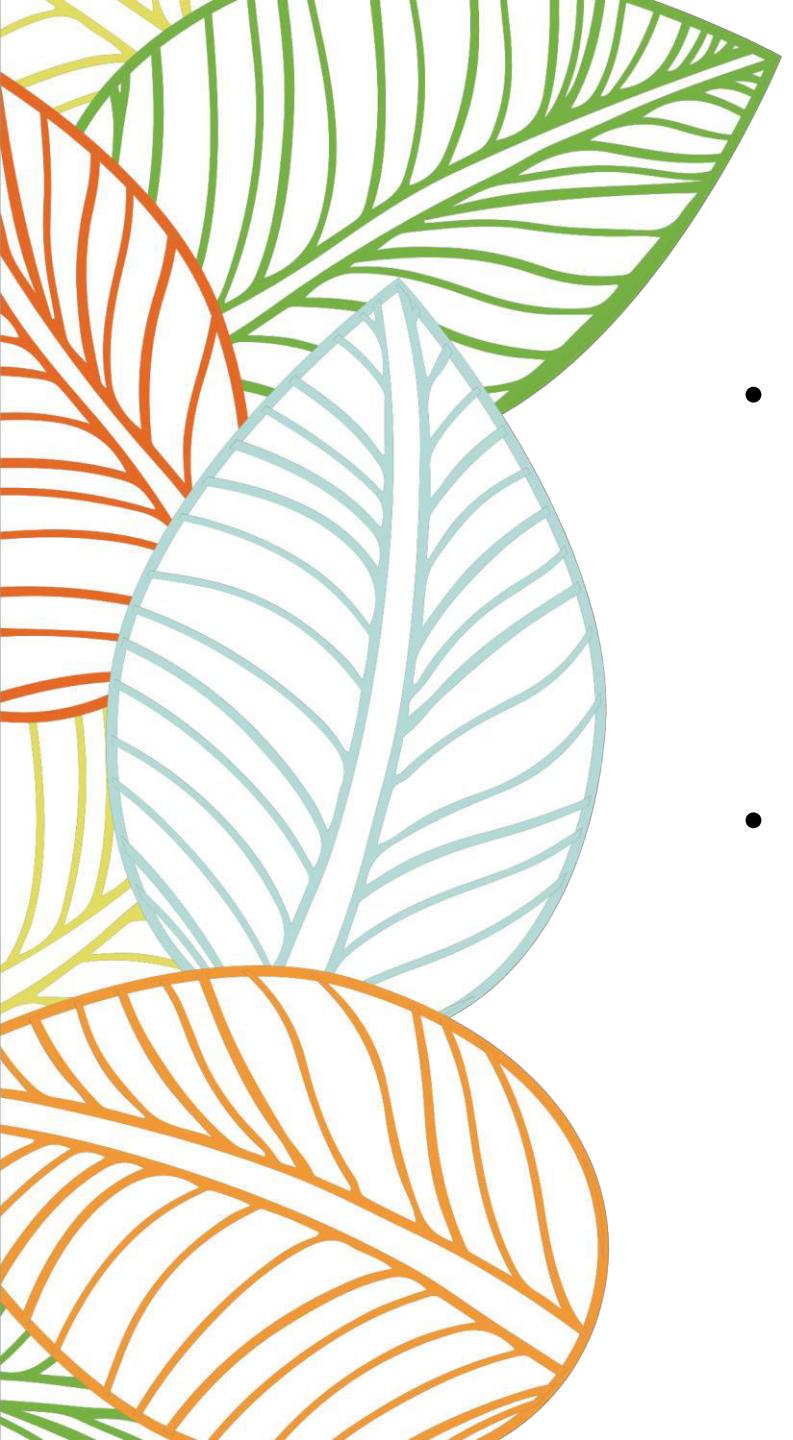
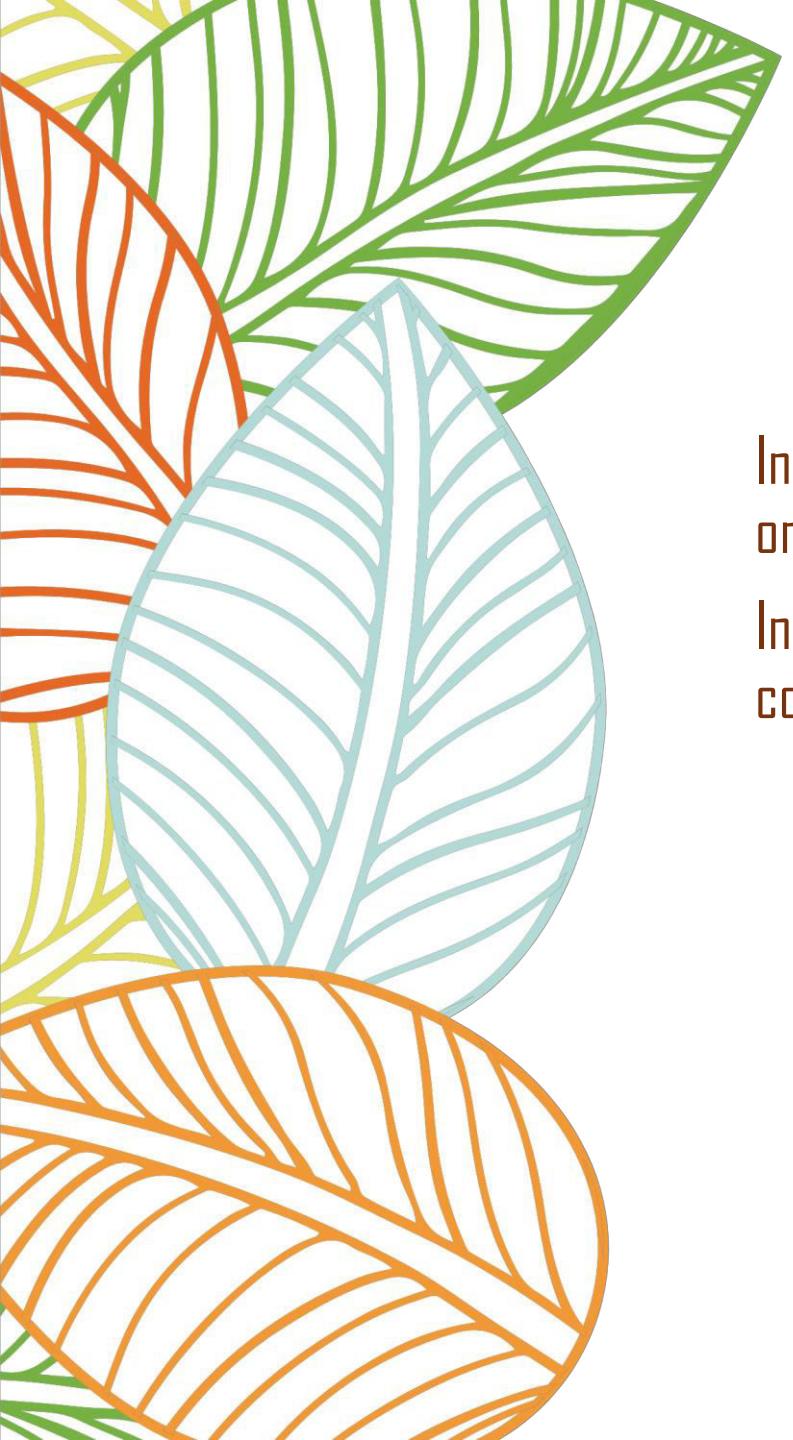




Synchronous & Asynchronous Data Transfer Schemes

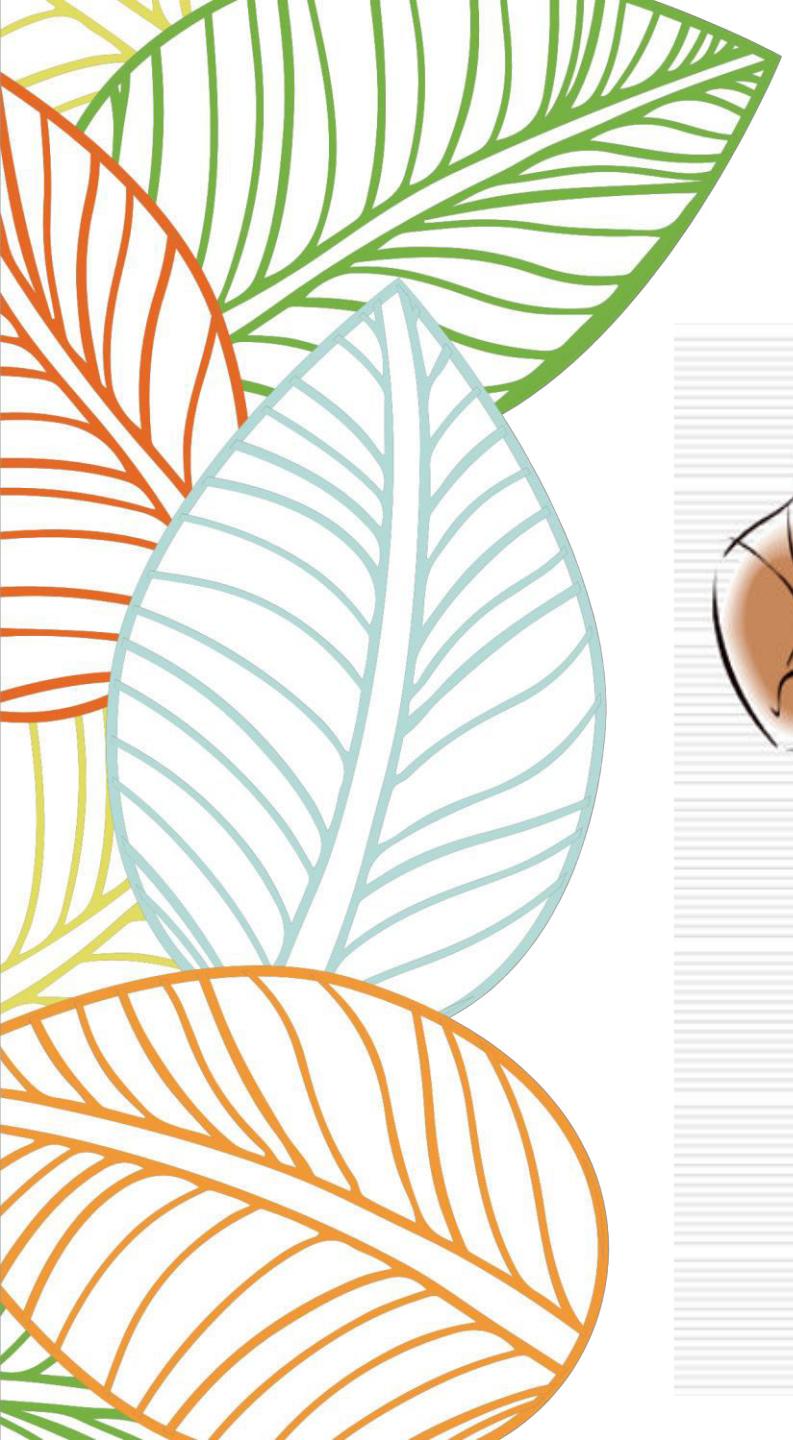
- 
- What is Transmission?
 - It is a mechanism of transferring data between two devices connected using a network
 - Serial Data Transmission
 - Parallel Data Transmission
 - Both Synchronous and Asynchronous Transmission are the type of serial data transmission in which data is transmitted between sender and receiver based on the clock pulse used for synchronization.



Serial & Parallel Data Transmission

In serial data transmission – transmitting the data/information bit after bit (only one bit goes through in a particular moment)

In parallel data transmission – transmitting a number of bits at once from one computer to the second computer



Example for Serial Data Transmission

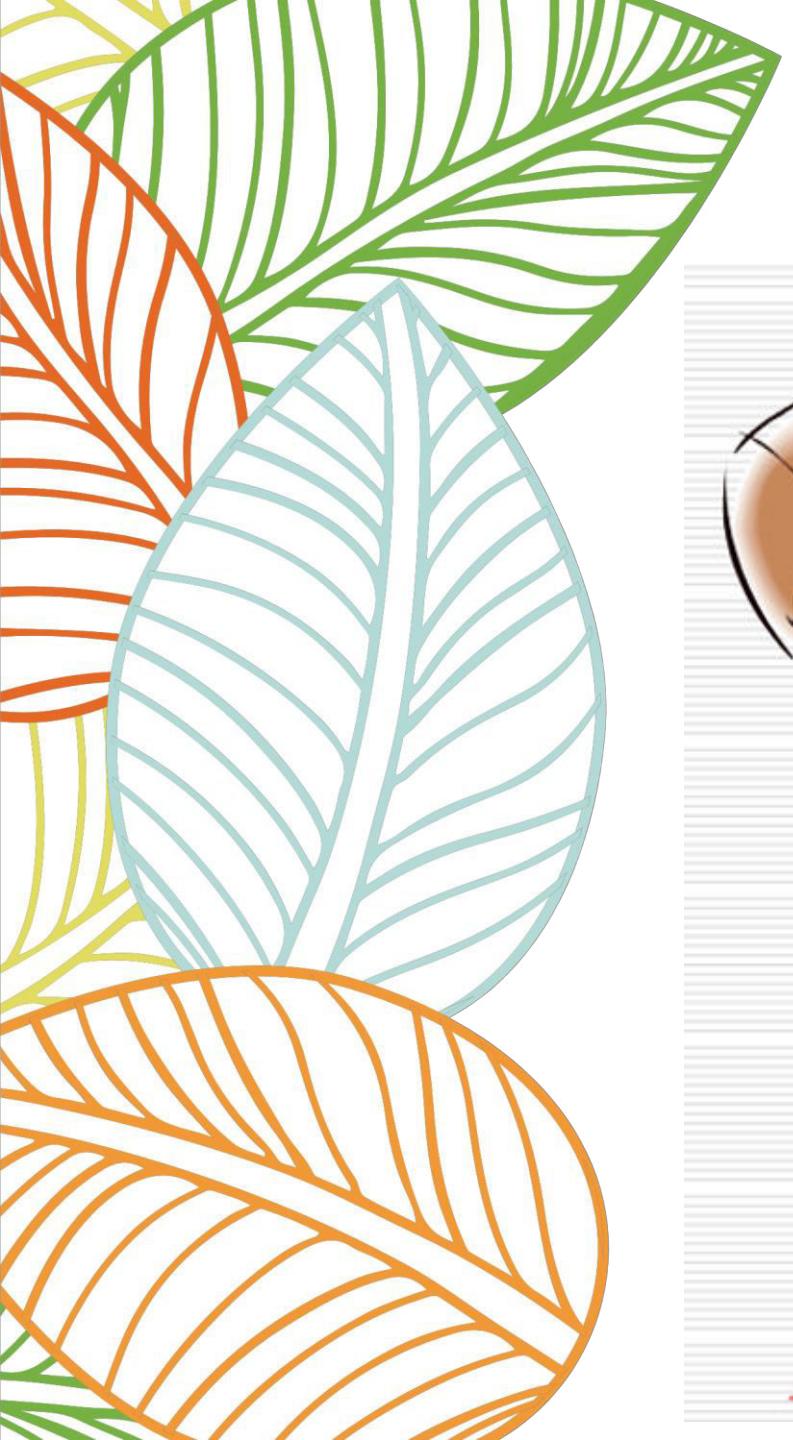


For example: We want to transmit a word 10011101 using serial communication between two computers.

1 → 0 → 0 → 1 → 1 → 1 → 0 → 1

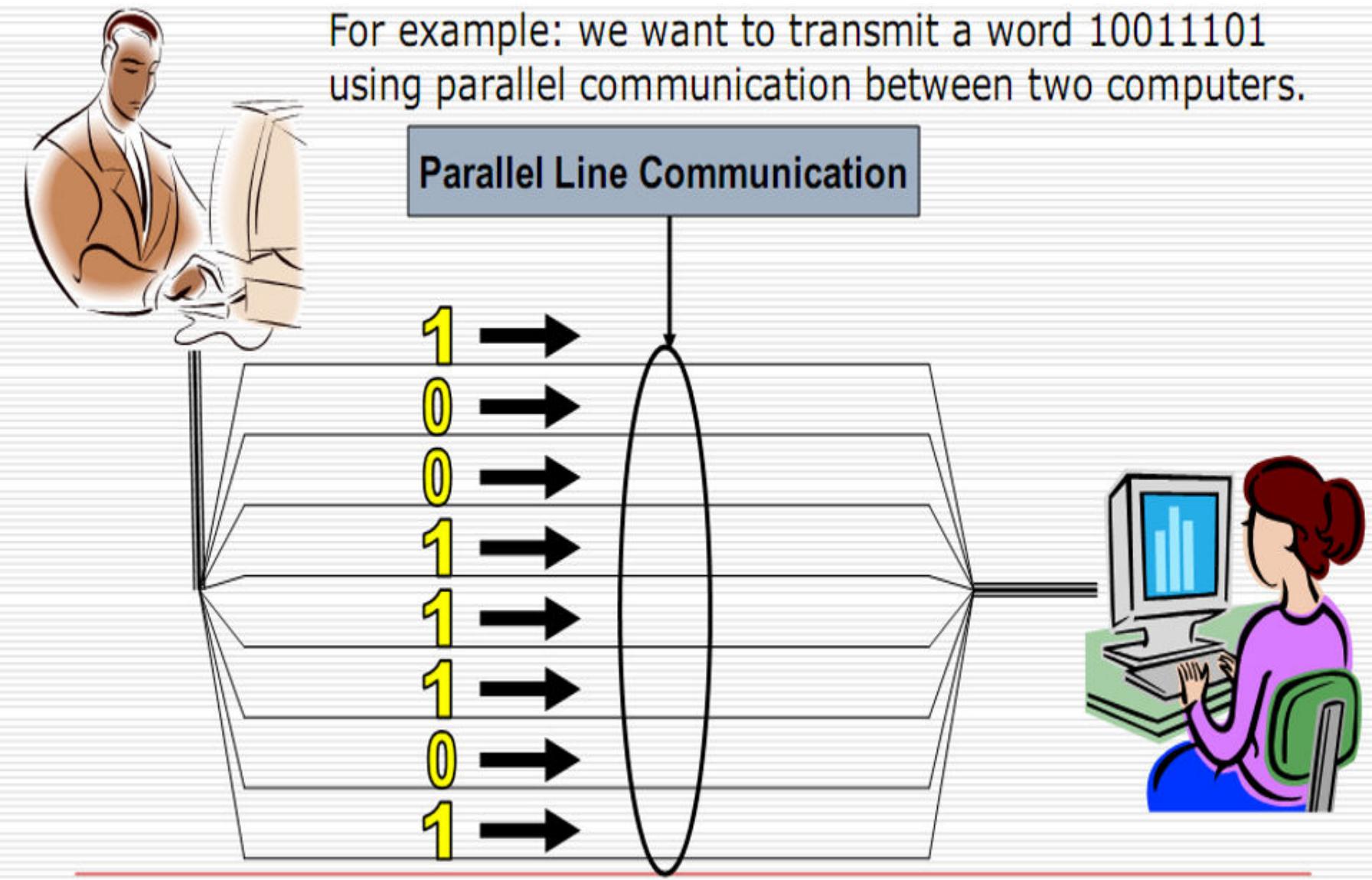
Serial line communication





Example for Parallel Data Transmission

For example: we want to transmit a word 10011101 using parallel communication between two computers.

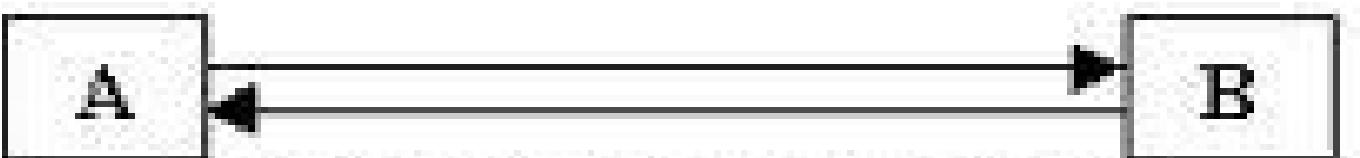


Sr. No.	Key	Serial Transmission	Parallel Transmission
1	Definition	Serial Transmission is the type of transmission in which a single communication link is used to transfer the data from an end to another.	On other hand Parallel Transmission is the transmission in which multiple parallel links are used that transmit each bit of data simultaneously.
2	Bit transmission	In case of Serial Transmission only one bit is transferred at one clock pulse.	On other hand in case of Parallel Transmission, eight bits transferred at one clock pulse.
3	Cost Efficient	As single link is used in Serial Transmission, comparatively low cost is required for its implementation hence it is cost efficient.	On other hand multiple links need to be implemented in case of Parallel Transmission hence more cost is required and hence it is not cost efficient.
4	Performance	As single bit gets transmitted per clock in case of Serial Transmission, its performance is comparatively lower as compared to Parallel Transmission.	However on other hand as already mentioned that 8 bits get transferred per clock in case of Parallel transmission hence it is more efficient in performance.

5	Preference	<p>As single bit gets transmitted per clock and only single link is implemented in Serial Transmission, it is more preferred for long distance transmission.</p>	<p>However on other hand as multiple bits get transferred and multiple links need to be implemented in case of Parallel Transmission, it is preferred only for short distance.</p>
6	Complexity	<p>Already mentioned due to single link implementation circuit having Serial Transmission is less complex as compared to that of Parallel Transmission.</p>	<p>However on other hand due to multiple link implementation circuit having Parallel Transmission is more complex as compared to that of Serial Transmission.</p>



Simplex A to B only



Half-Duplex A to B or B to A

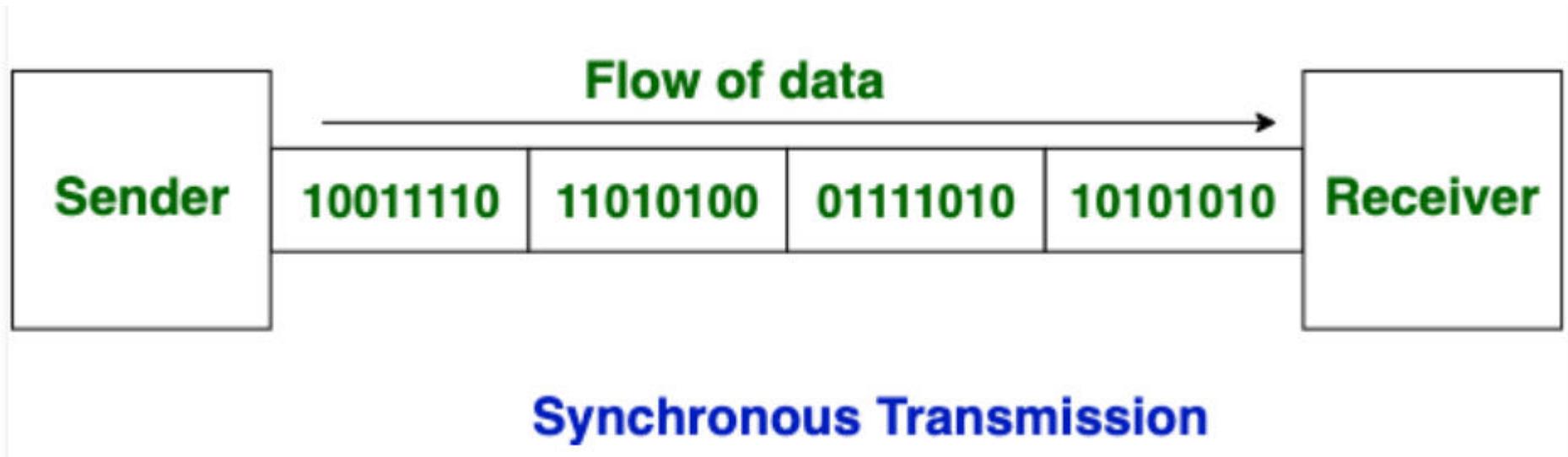


Full-Duplex A to B and B to A



Synchronous Data Transfer

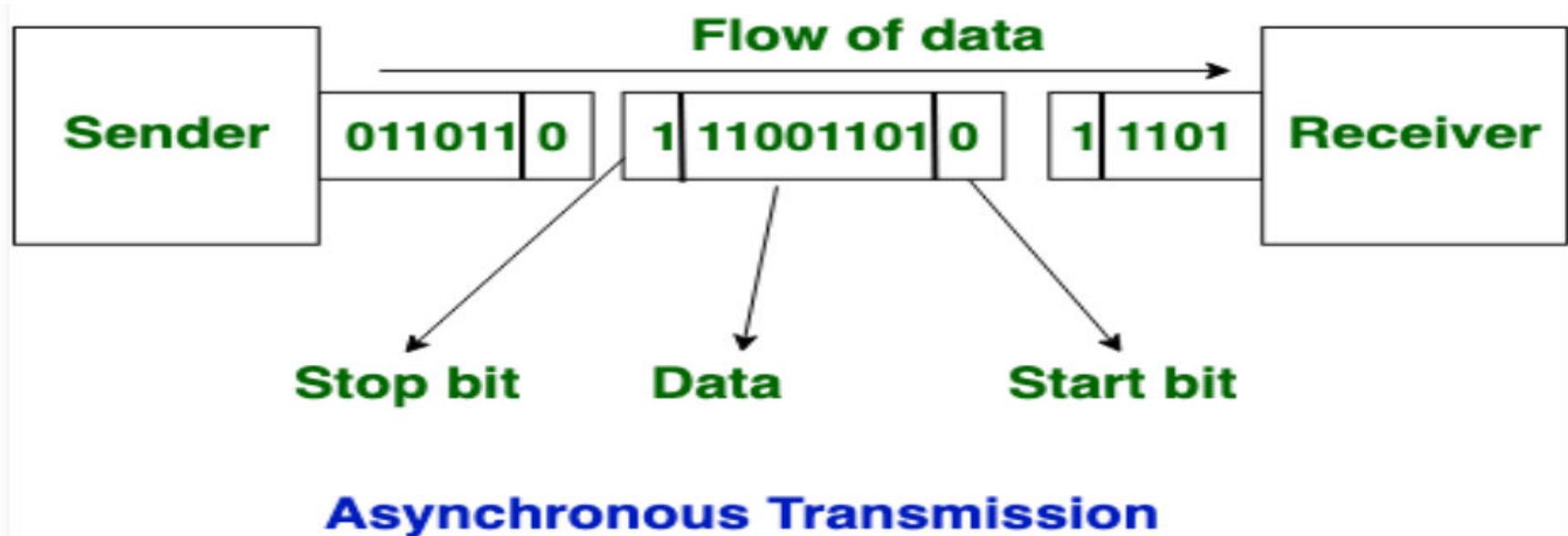
- In Synchronous Transmission,
 - Data is sent in form of blocks or frames
 - This transmission is the full duplex type
 - Between sender and receiver the synchronization is compulsory
 - There is no gap present between data
 - More efficient and more reliable than asynchronous transmission to transfer the large amount of data.





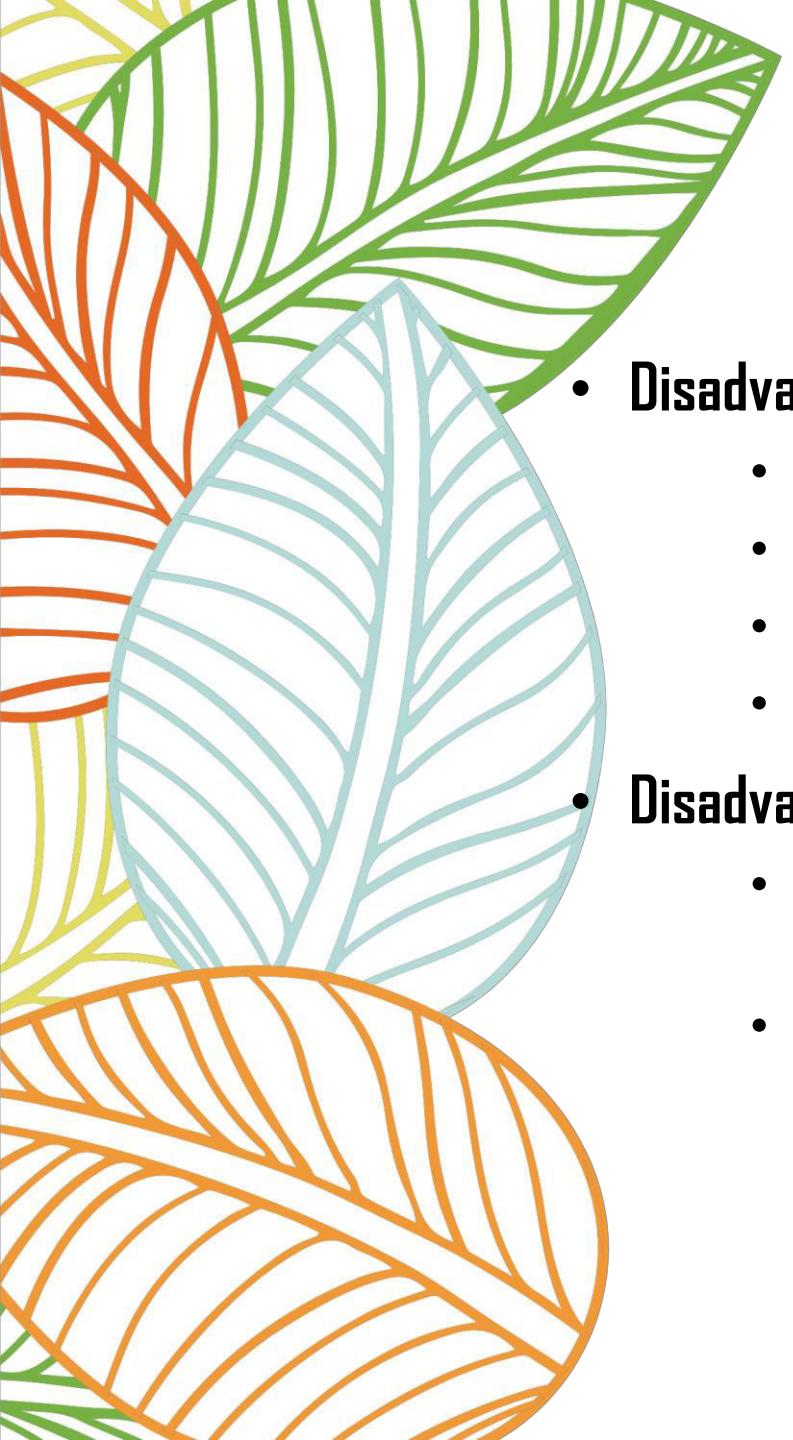
Asynchronous Data Transfer

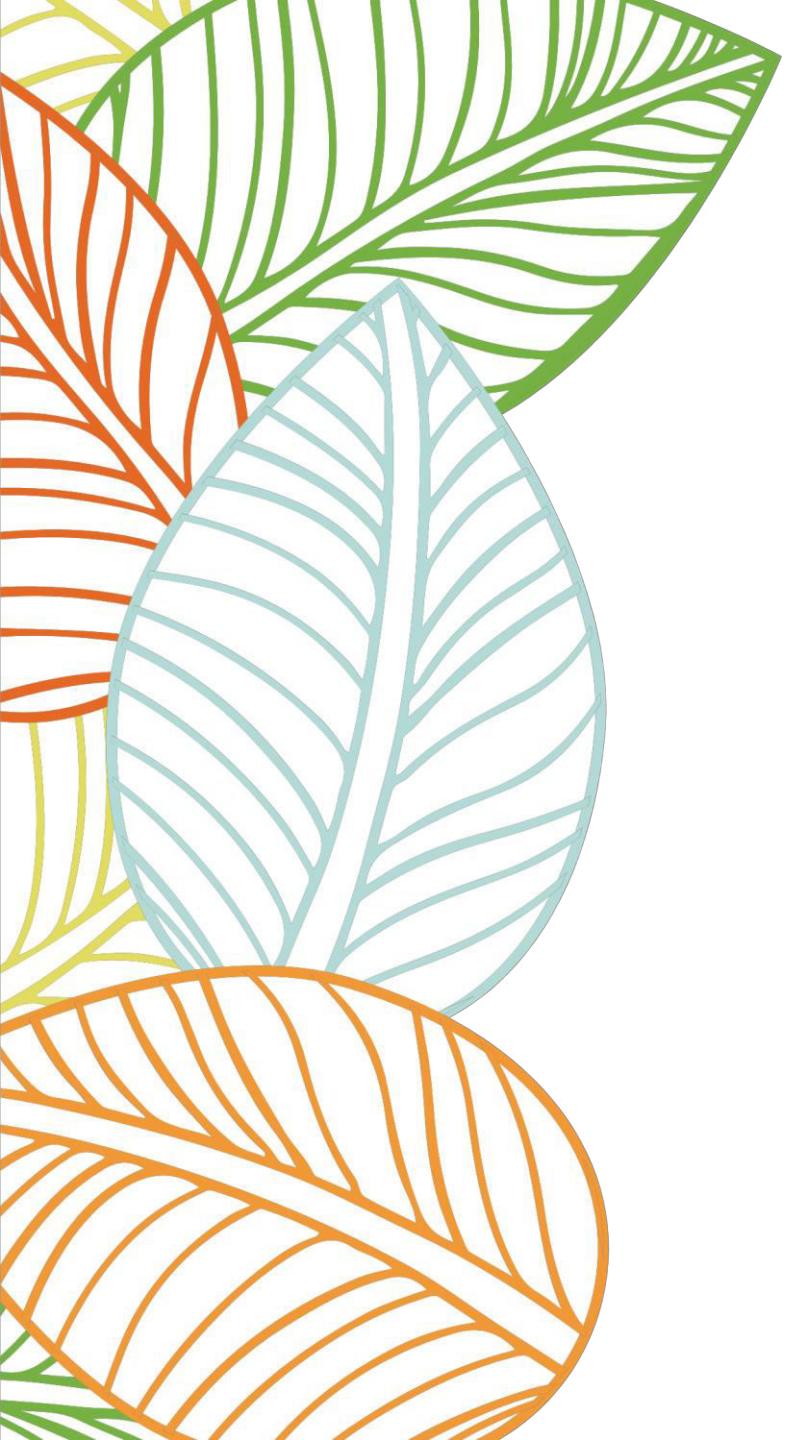
- In Asynchronous Transmission,
 - Data is sent in form of byte or character.
 - This transmission is the half duplex type transmission.
 - Start bits and Stop bits are added with data.
 - Does not require synchronization.



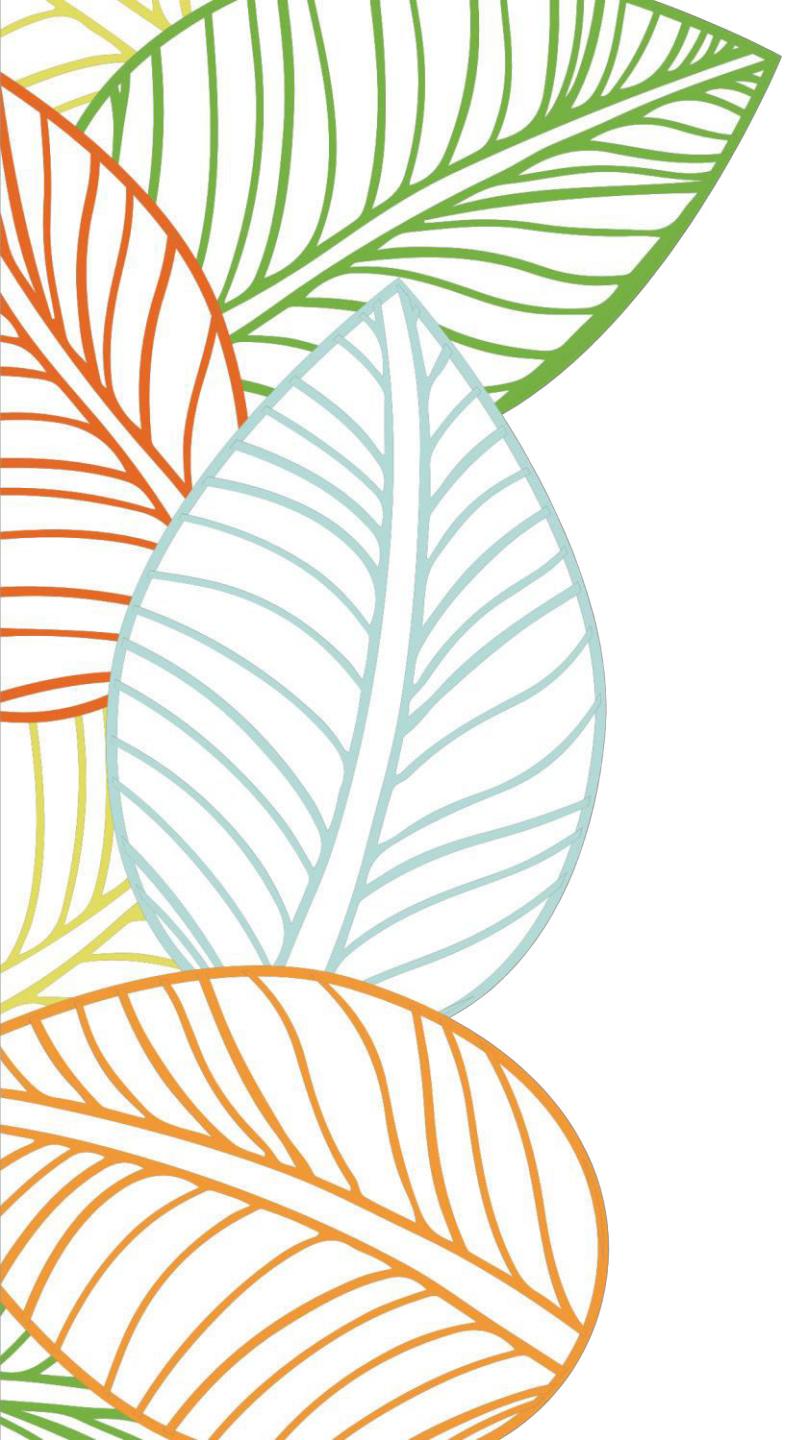
Sr. No.	Key	Synchronous Transmission	Asynchronous Transmission
1	Definition	Synchronous transmission is the type of transmission in which a common clock pulse is shared between transmitter and receiver in order to permit synchronized communication.	On other hand Asynchronous transmission is the type of transmission in which the sender and receiver have their own internal clocks thus do not need an external common clock pulse.
2	Data Unit	In Synchronous transmission data is sent in the form of frames or blocks so the data unit is Frame/block.	On other hand in Asynchronous transmission data is transmitted in the form of byte or character so the data unit is byte/character.
3	Performance and Cost efficient	Due to implementation of common clock pulse in Synchronous transmission, the transmission of data is faster as compared to that in Asynchronous transmission but this makes this transmission costlier.	On other hand each sender and receiver has their own input clocks in Asynchronous hence the transmission depends on its synchronization so is slower as compared to that in Synchronous transmission but this makes this transmission cheaper.
4	Complexity	It is easy to design Synchronous transmission.	However on other hand the Asynchronous transmission is complex in nature and design.
5	Data Gap	Due to the common clock pulse in Synchronous transmission there is no gap present between data.	On other hand the Asynchronous transmission there is gap present between the data and consists of start bit and end bit in middle of which actual data is present.

- 
- **Advantages of Synchronous Transmission**
 - It helps you to transfer a large amount of data.
 - It offers real-time communication between connected devices.
 - Each byte is transmitted without a gap between the next byte.
 - It also reduces time timing errors.
 - **Advantages of Asynchronous Transmission**
 - This is a highly flexible method of data transmission.
 - Synchronization between the receiver and transmitter is unnecessary.
 - It helps you to transmit signals from the sources which have different bit rates.
 - The Transmission can resume as soon as the data byte transmission is available.
 - This mode of Transmission is easy for implementation.

- 
- **Disadvantages of Asynchronous Transmission**
 - Additional bits called start and stop bits are required to be used.
 - Timing error may take place as it is difficult to determine synchronicity.
 - Slower transmission rate.
 - May create false recognition of these bits because of noise on the channel.
 - **Disadvantages of Synchronous Transmission**
 - The accuracy of the received data depends on the receiver's ability to count the received bits accurately.
 - The transmitter and receiver need to operate simultaneously with the same clock frequency.

A decorative illustration of several tropical leaves on the left side of the image. The leaves are outlined in thin black lines and filled with various colors: a large green leaf at the top, an orange-red fan-shaped leaf below it, a large light blue leaf with prominent veins in the center, and a large orange-yellow leaf at the bottom. The arrangement is asymmetrical, with the leaves overlapping each other.

Thank You



How Synchronous Transmission works?

- Separate clocking lines used when the distance between the data terminal equipment (DTE) and data communications equipment (DCE) is short.
- This method uses a clocking electrical system at both transmitting and receiving stations. This ensures that the communication process is synchronized.
- Devices that communicate with each other Synchronously use either separate clocking channels.

How Asynchronous Transmission works?

- Asynchronous communication is eased by two bits, which is known as start bit as '0' and stop bit as '1.'
- You need to send '0' bit to start the communication & '1' bit to stop the Transmission.
- There is a time delay between the communication of two bytes.
- The transmitter and receiver may be function at different clock frequencies.



S.NO	Synchronous Transmission	Asynchronous Transmission
1.	In Synchronous transmission, Data is sent in form of blocks or frames.	In asynchronous transmission, Data is sent in form of byte or character.
2.	Synchronous transmission is fast.	Asynchronous transmission is slow.
3.	Synchronous transmission is costly.	Asynchronous transmission is economical.
4.	In Synchronous transmission, time interval of transmission is constant.	In asynchronous transmission, time interval of transmission is not constant, it is random.
5.	In Synchronous transmission, There is no gap present between data.	In asynchronous transmission, There is present gap between data.
6.	Efficient use of transmission line is done in synchronous transmission.	While in asynchronous transmission, transmission line remains empty during gap in character transmission.
7.	Synchronous transmission needs precisely synchronized clocks for the information of new bytes.	Asynchronous transmission have no need of synchronized clocks as parity bit is used in this transmission for information of new bytes.