**Introduction to Serial Communication**

1. **Introduction:**

In Embedded Systems, Communication means the exchange of data in the form of bits by some set of defined rules between two micro - controller.

Serial Communication in embedded systems is the way of exchanging data using different methods in the form of serial digital binary pulses where binary one represents logic High or 5 volts and binary zero represents logic Low or 0 volts.

Serial communication sends data bit by bit at one clock pulse which makes the communication speed slow as compared to parallel communication. Since serial communication sends data bit by bit, therefore it requires one wire to transmit the data and fewer input-output lines. It is preferred for long distance communication.

Serial Communication is popular because most computers have one or more serial ports , so no extra hardware is needed other than a cable to connect the instruments to the computer or two computers together.

1. **Transmission modes:**

Serial communication has many forms based on types of modes which are as follow:-

1. **Simplex mode**

It is a one-way communication technique. Only one client either receiver or sender is active at a time. Ex-radio, TV.

1. **Half Duplex mode**

In this mode, both the clients receiver and the sender are active but not at a time. Ex- Internet.

**C. Full Duplex mode**

Here, both the clients, sender and the receiver can transmit and receive

At the same time. Ex-smartphone.

1. **Serial Communication classification on the basis of Clock Synchronization**
2. **Synchronous serial communication**

In this type of communication both transmitter and receiver share a common clock to remain in sync with each other.

1. **Asynchronous serial communication**

This type of serial communication does not require any common clock source between the transmitter and receiver. Both sides work according to their independent clock.

1. **How does serial Data Transfer work?**

It requires mainly four rules.

**a.** Baud rate control

**b.** Framing

**c.** synchronization and asynchronization

**d.** Error control

**e.** full or half –duplex operation

1. **Baud rate control**

It is the speed of transferring data from the transmitter to a receiver in the form of bits per second. Same baud rate should be there on both client sides. Higher a baud rate, more data can be transferred in less amount of time.

1. **Framing**

Framing shows how many bits we want to send from the sender device to the receiver device. Mostly 8 bits are preferred.

1. **Synchronization and Asynchronization**

Bits are transferred based on preferred mode, I.e. synchronization which requires common clock and asynchronization which does not require any common clock.

1. **Error Control**

Data corruption may happen due to external noise at the receiver end. The only solution to get the stable output is to check the parity.

Even no. of 1’s known as even parity and the parity bit is set to 1. Odd no. Of 1’s is called odd parity and parity bit is set to 0.

1. **full or half–duplex operation**

Half duplex includes both the client receiver and the sender are active

But not at the same time.

Full duplex includes sender and the receiver can transmit and receive

at the same time.

1. **Uses of serial communication in embedded systems**
2. Enabling communication between different parts of the device.
3. Downloading firmware updates to maintain peak performance.
4. Supplying an interface for a debugging or testing console.
5. Establishing communication with external devices.

**By Kavita Yadav**