

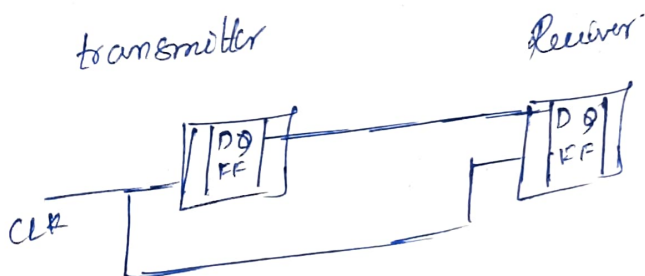
## Communication protocols

- Speed of both data transmission & reception must be similar, there will be proper handshake & no loss of data
- There must be proper synchronization. When the receiver must be known that the data is being forwarded to it & after completion to guarantee it's reception an acknowledgement is needed.

2 types of Communication protocol.

- Synchronous  $\rightarrow$  Similar clock.
- Asynchronous  $\rightarrow$  does not have similar clock.

$\rightarrow$  Synchronous :-



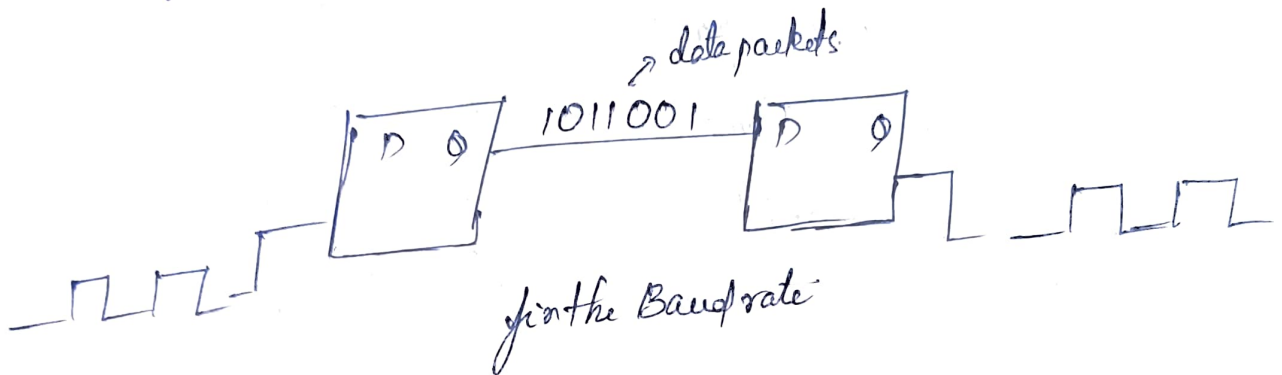
Eg: SPI  
I2C

- Common clk for synchronization
- After the transmitter sending all data it sends a stop bit to inform all data is sent, then it sends Ack.

If not received the Ack it sends the data again.

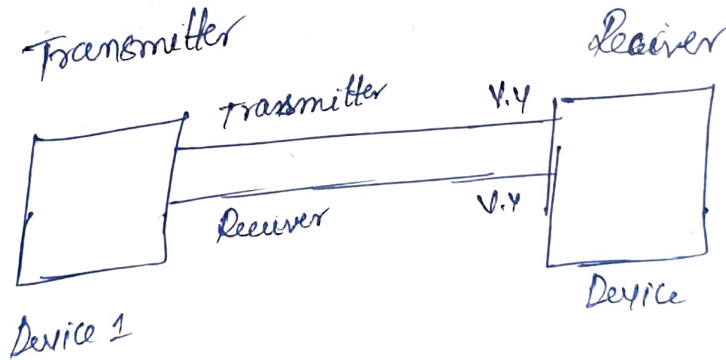
## 2. Asynchronisation:

We fix the time interval of the transmission of packets. (Eg: 2s between transfers) No Ack.



Eg: UART  
CAN.

## UART (Universal Asynchronous Receiver Transmitter)



sends by 1 byte (8 bits). (chunk of bytes 1 by 1)

## topology

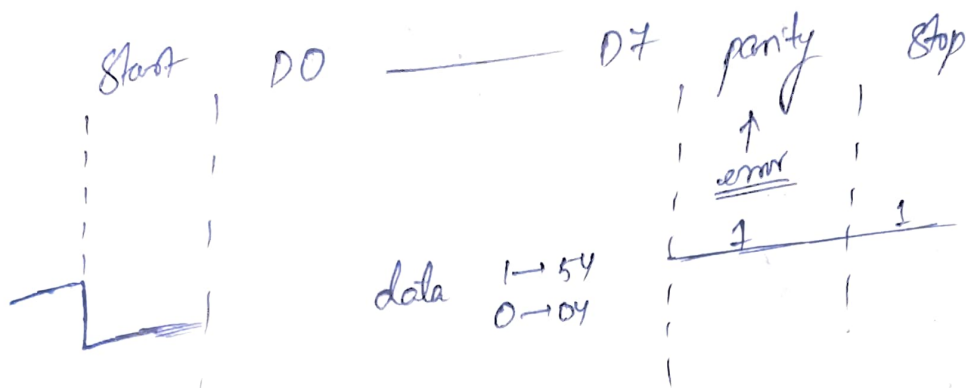
• Bus (CAN mostly used).

• Star (Master, Slave).

• Ad-Hoc / peer-to-peer topology

(2 devices),  
just  
UART

Bit frame  $\rightarrow$  sequence of bits inform Start & Stop.



⊛ 10 bit data frame + parity

There use to be 2 stop bits to have some delay & get ready for the next data frame.

\* This is used for short distance communication only because for long distance there might be electromagnetic interference & all.

• Hence for long distance we need for RS232 Comm protocol.

Req, 9 pin for diff Handshake req.



TX & RX communicate req their status

- Ready to transmit
- Ready to transmit.

Voltage levels

1's  $\rightarrow$  -3V to -25V } diff 26V  
0's  $\rightarrow$  3V to 25V.

even the interference of noise the system can easily communicate with 1's & 0's

Hence we use level shifter.

High to low (LS)

• printer

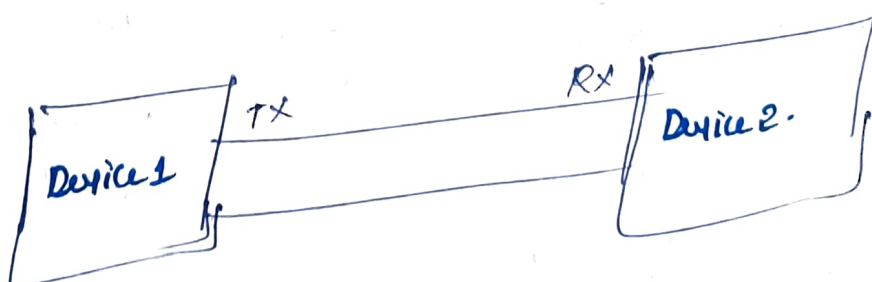
Low to High (HS)  
• Computer

## Programming of UART

- Baud Rate
- Programming methods
- UART peripheral
- PROS, CONS And App. of UART

9600  
115200 } Both transmitter & receiver must  
configure the same Baud rate

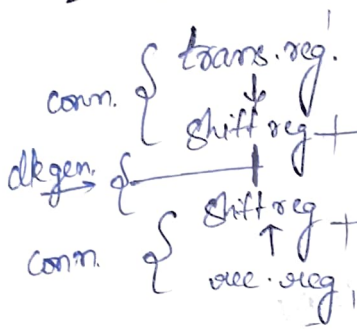
• Bit Banging: to be transferred  
A - 010000001  
Baud rate  $\rightarrow$  1 bit/sec.



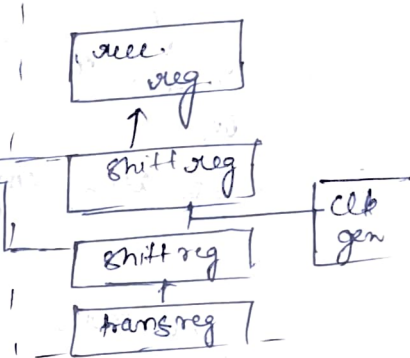
Start bit 0  
Then data 1 bit / 1 clock cycle.  
The stop  $\rightarrow$  1.

# UART peripherals

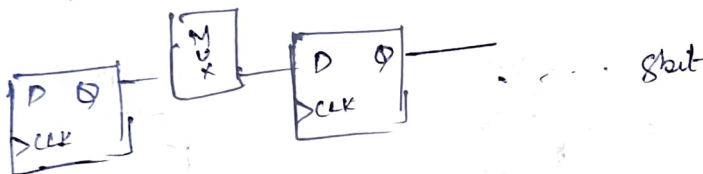
Parallel in serial out



serial in parallel out



## Shift reg



## Configuration for UART

- Clock configuration (Acc. to Band rate).
- Data Loading
- Data Transmission
- Monitoring data
  - looping method
  - Interrupt method (Adv.).

## Adv. of UART

- Easy to interface
- Less Hardware
- Less software complications

## disadv.

- Synchro. of Band Rate
- NO Ack
- only 2 devices can be connected.
- Usage
  - GSM, bluetooth, Arduino