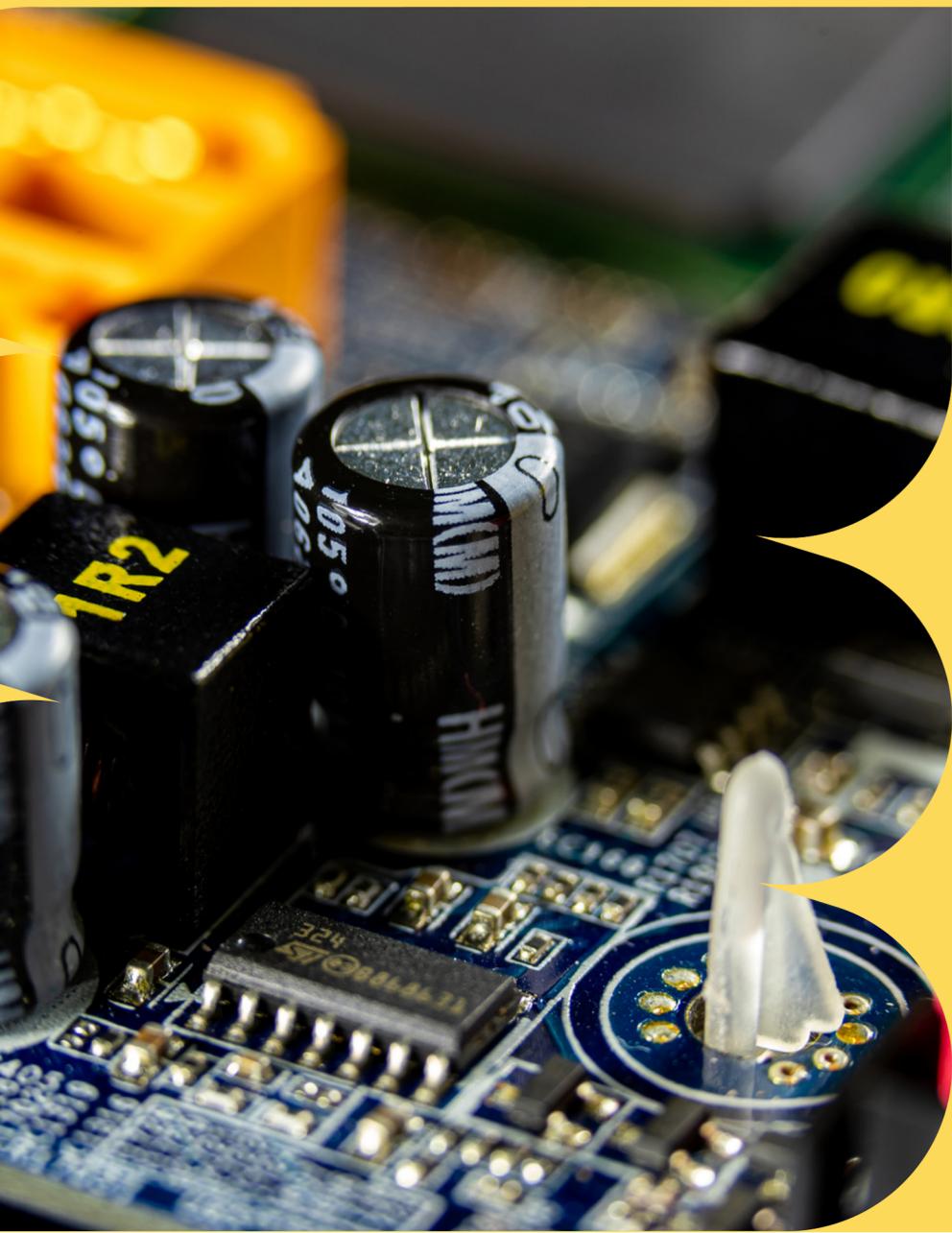


Protocols in VLSI

Basic understanding you should know about protocols



PRESENTED BY
Harshit Gupta

Protocols :

- Theses are the set of rules that need to follow for the communication to be happened between a master & slave or set of components.
- The way software engineer implements algorithms using C/C++, VLSI engineers uses Verilog/SV/UVM to implement various components based on standard protocols.

Examples :

- **I2C** - Inter IC bus protocol by *Phillips*.
- **SPI** - Serial Peripheral Interface bus by *Motorola*.
- **UART** - Universal Asynchronous Receiver-Transmitter by *Gordon Bell*
- **CAN** - Controller Area Network automobile protocol by *Robert Bosch*.
- **USB** - Universal Serial Bus protocol to connect external devices to PCs was developed by seven companies like *Compaq, Dell, IBM, Intel, Microsoft, NEC and Nortel*.

- **USART** - Universal Synchronous Asynchronous Receiver-Transmitter which supports synchronous clock and used by *IBM*.
- **AMBA** -(Advanced Micro controller Bus Architecture) which uses its own protocols developed by *ARM community* for many ASIC and SoC.
- **APB** - Advanced Peripheral Bus protocol for low-power peripherals.
- **AHB** - Advanced High-performance Bus for high performance system modules.
- **AXI** - Advanced eXtensible Interface for higher Bandwidth and low-latency designs. Latency is the Delay before transfer of a data.
- **CHI** - Coherent Hub Interface used in high performance Networks and Servers.

Classification of Protocols :

1.ON-CHIP Communication Protocols :

These are used for communication between various IP blocks of a chip.

Examples : AXI, AHB, ASB, APB, OCP

2.Peripheral Communication Protocols :

These are used for communication between some logic on the chip to an external agent or peripheral.

Examples : I2C, SPI, UART, PCIE, USB, Ethernet

Classification based on way of data transfer :

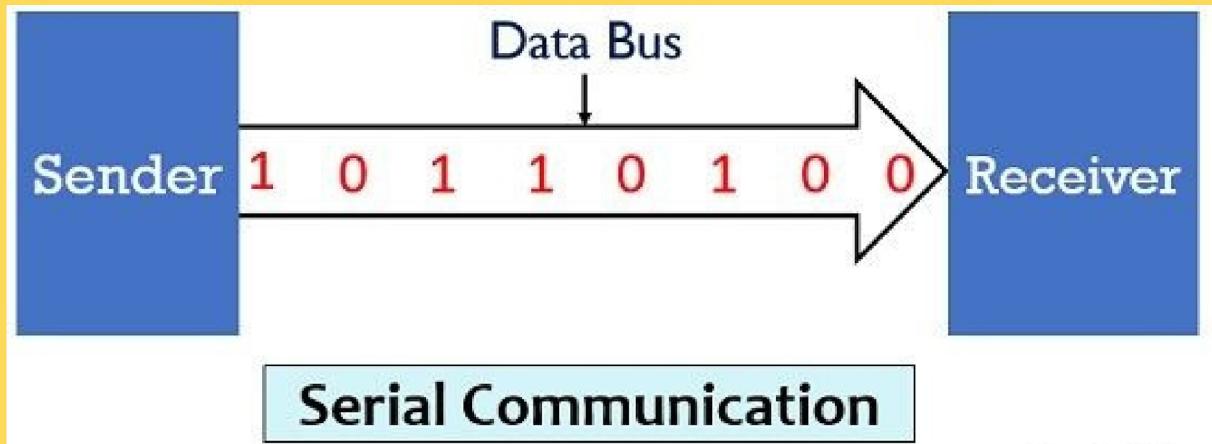
1.Serial Communication Protocols : A serial transmission transfers data one bit at a time, consecutively, via a communication channel or computer bus in telecommunication and data transmission..

Examples : SPI,I2C, UART, SMBUS,CAN, USB, Ethernet, SATA

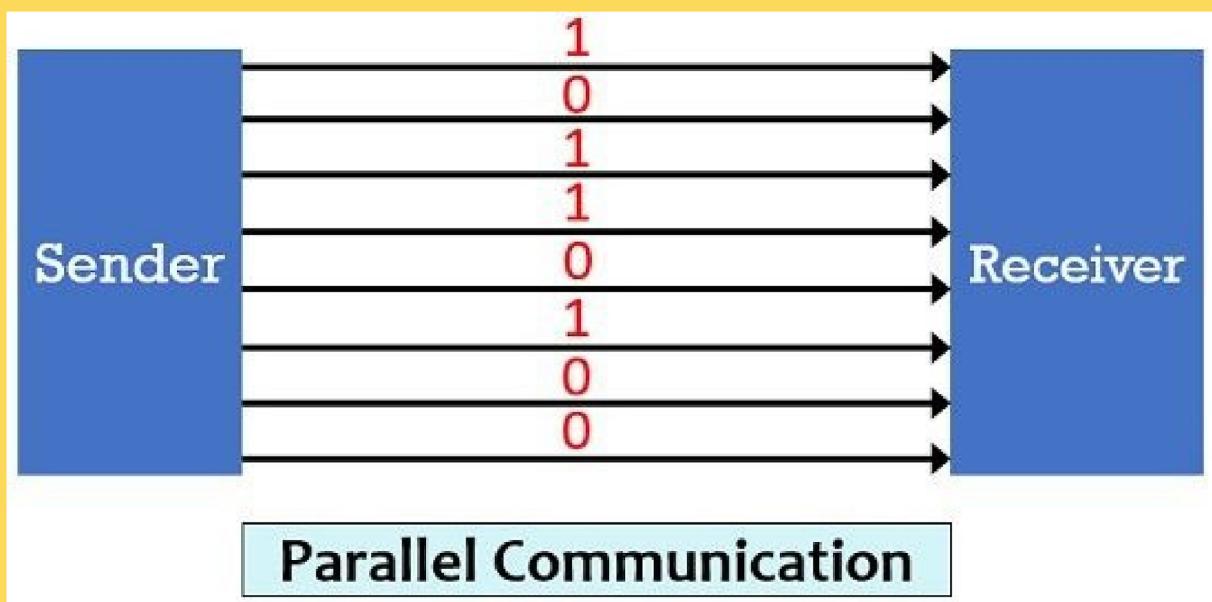
2.parallel Communication Protocols : parallel communication delivers multiple bits as a single unit through a network with many similar channels.

Examples : PCI, SCSI, ATA, ISA

1.Serial Communication :



2.parallel Communication :



Classification based on Synchronization:

1.Synchronization Communication :

Any Communication protocol where devices share a clock signal is known as synchronous.

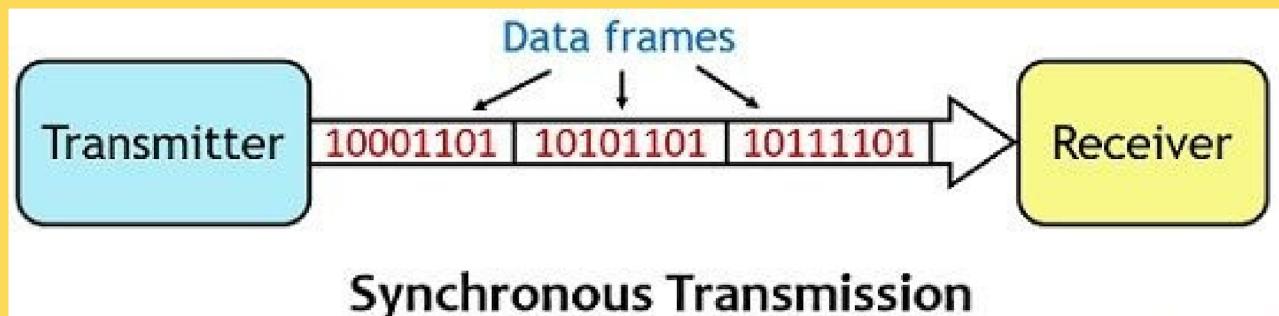
Examples : I2C, SPI, AMBA Protocols etc.

2.Asynchronization Communication :

follows a non-synchronized form of communication(don't use a CLK signal). Thus start and stop bits are required in order to intimate the receiver about the beginning and end of the data stream.

Examples : UART

1. Synchronous Transmission:



2. Asynchronous Transmission:

