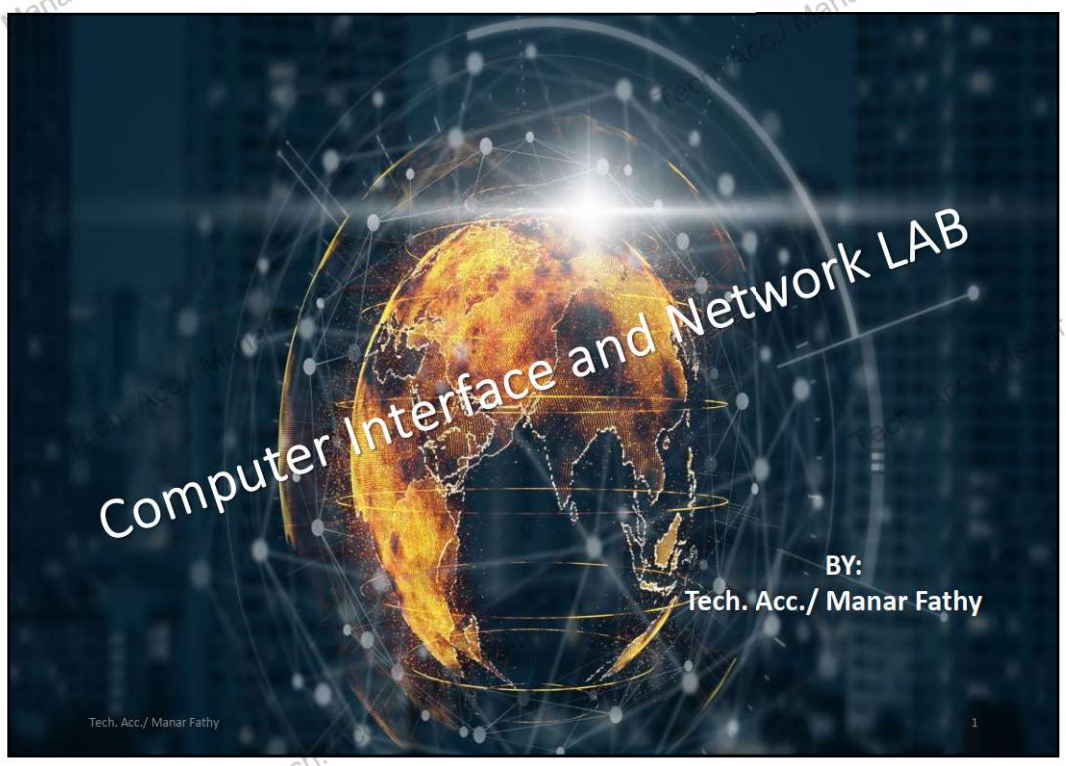
Computer Interface and Network LAB
BY:
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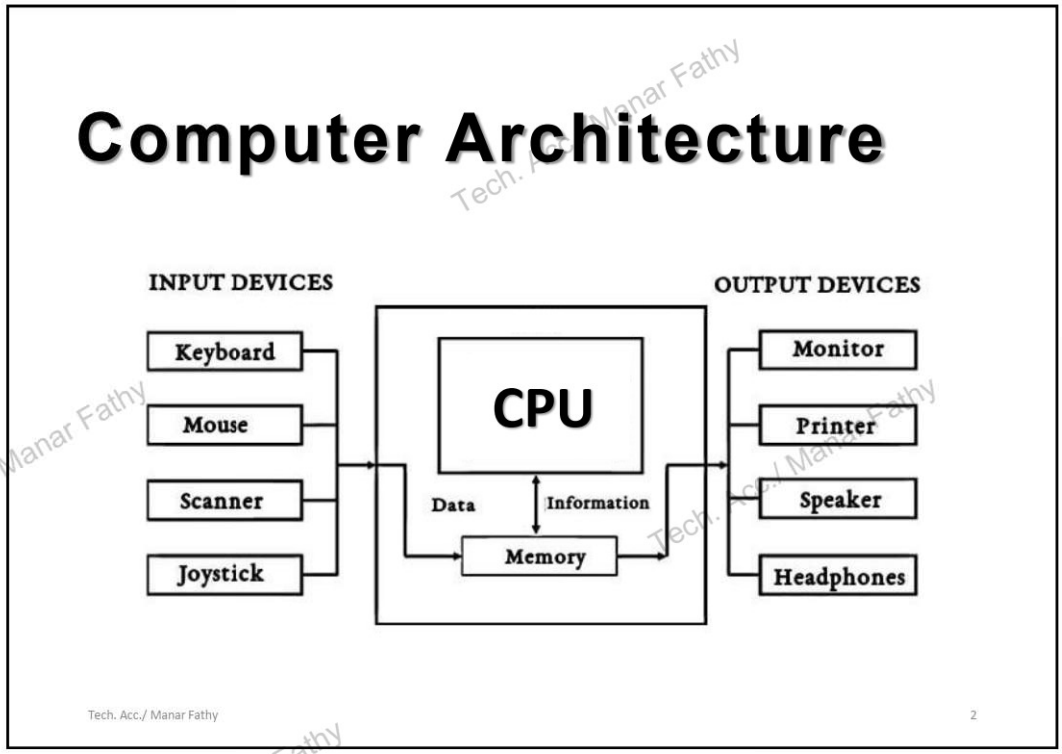
1

1


Computer Architecture
INPUT DEVICES
Keyboard
Mouse
Scanner
Joystick
CPU
Data
Information
Memory
OUTPUT DEVICES
Monitor
Printer
Speaker
Headphones
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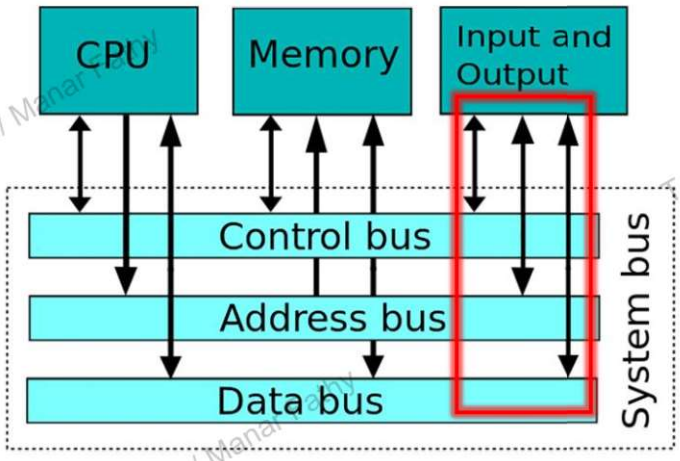
2

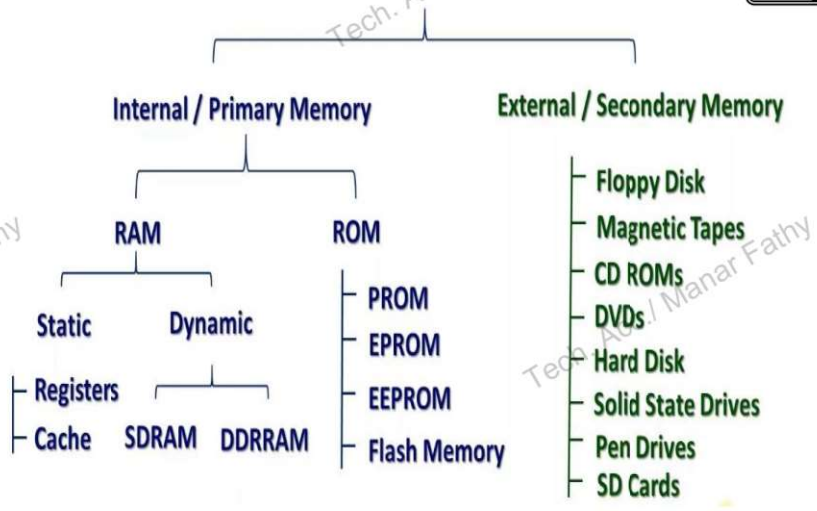
2

CPU-Memory-I/O Architecture



3

Type of Memory



4

Input / Output Ports


PS/2


Parallel Port

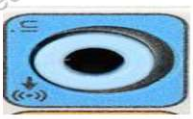

Digital Video Interface


Serial Port


Mini-DVI


HDMI


USB


Audio Ports


Micro-DVI


Mini DisplayPort


VGA Port


USB Type C

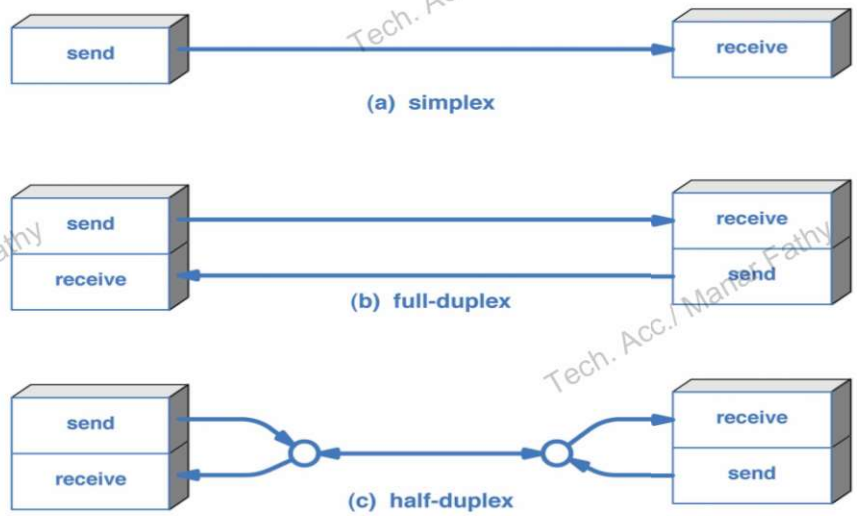

S/PDIF


RJ-45


e-SATA

5

Transmission Modes



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Data Transfer Mechanism

- Polling
- Interrupt
- DMA
- Threading

Polling is a technique in which there is a status bit which is checked periodically
By the processor

Adv)
So Simple

DisAdv)
Checking the device even it is idle

- Polling
- Interrupt
- DMA
- Threading

Interrupt occurs when the device required to be serviced, it will be serviced

Adv)
Save the time when the device is idle

DisAdv)
Each device requires interrupt cycle.
ISR may take long time

7

Difference between Interrupt and Polling:

Interrupt	Polling
When it comes to an interrupt, the device informs the CPU that it needs its attention.	When it comes to polling, the CPU keeps on checking if the device needs attention.
It is a hardware mechanism, not a protocol.	It is a protocol and not a hardware mechanism.
Here the system is functioned by an interrupt handler.	Here the system is serviced by a CPU.
It can occur at any time and moment.	Here the CPU polls the system at some intervals.
In the case of an interrupt, the Interrupt-request line indicates that the device requires assistance.	In the case of polling, the command ready bit suggests the device requires service.

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Data Transfer Mechanism

- Polling
- Interrupt
- DMA
- Threading

DMA is a technique required for high speed processing like Graphic cards interface, in this case the DMA take the control form the CPU and generate the address, data, control signals

Adv)
High speed processing

DisAdv)
High cost as required new hardware

- Polling
- Interrupt
- DMA
- Threading

Threading Is a new technique established after manufacturing multi-core systems.

Adv)
High speed processing
No waste time

DisAdv)
Limited no of threading

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Bit Rate and Baud Rate

Bit rate = Baud rate x the number of bits per baud

Bit Rate	Baud Rate
Transmission of number of bits per second.	Number of signal units per second.
Emphasized on computer efficiency.	Emphasized on data transmission.

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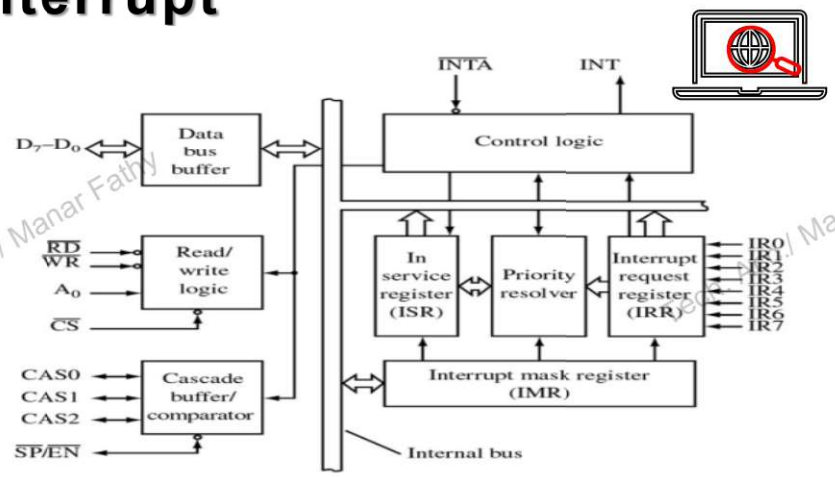
PC Interrupt



https://www.techtarget.com/whatis/definition/interrupt
https://www.geeksforgeeks.org/interrupts/
https://www.geeksforgeeks.org/computer-organization-hardwired-vs-micro-programmed-control-unit/?ref=ml_lbp

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Pc interrupt

- An interrupt is a signal emitted by a device attached to a computer or from a program within the computer.
- It requires the operating system (OS) to stop and figure out what to do next.
- An interrupt temporarily stops or terminates a service or a current process.
- Most I/O devices have a bus control line called **Interrupt Service Routine (ISR)** for this purpose.

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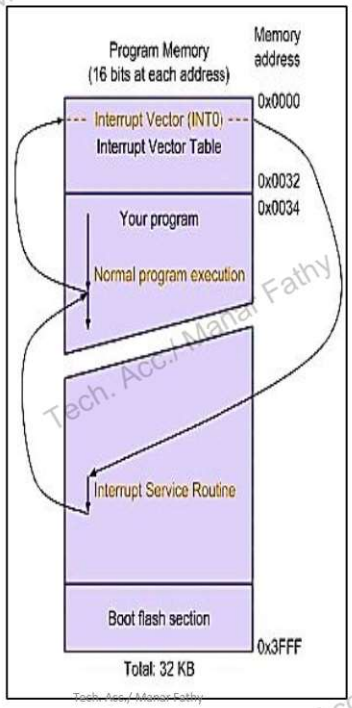

Interrupt Service Routine (ISR) or Interrupt Handler

- Piece of code that should be execute when an interrupt is triggered. Usually, each interrupt has its own ISR. Its address in ROM is usually save in **interrupt vector table.**
- should be deterministic and short as possible, as it usually set a flag to a specific task indicating a certain event is happened or save small data in buffer.

Handler = ISR = Code

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Types of interrupt

Hardware interrupt

- A hardware interrupt is an electronic signal from an external hardware device that indicates it needs attention from the OS.
- One example of this is moving a mouse or pressing a keyboard key. In these examples of interrupts, the processor must stop to read the mouse position or keystroke at that instant.

Software interrupts

- A software interrupt occurs when an application program terminates or requests certain services from the OS.
- Software interrupts are commonly used when the system interacts with device drivers or when a program requests OS services.

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Characters Per Seconed

A useful unit for describing throughput is characters per second (cps)

A standard character is one byte of data

- cps is not the same as bytes per second
- bytes per second is ambiguous on whether overhead is subtracted out or not.

$$cps = bit\ rate \times \frac{character\ bits}{total\ bits}$$

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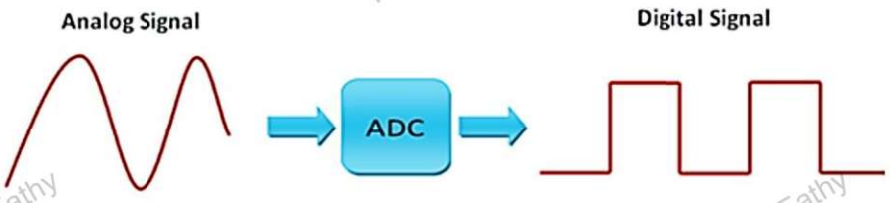
Analogue Input



$$Voltage = \frac{DigitalValue * Vref}{2^n}$$

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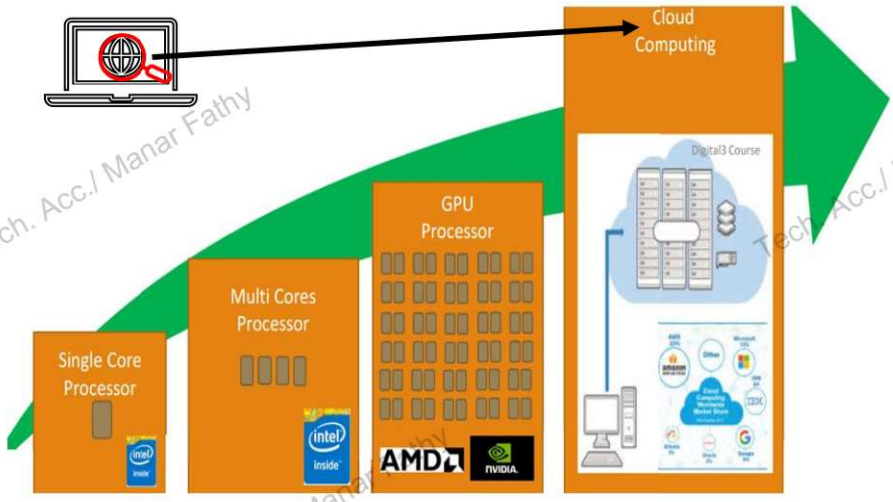
HARDWARE BECOME POWERFUL



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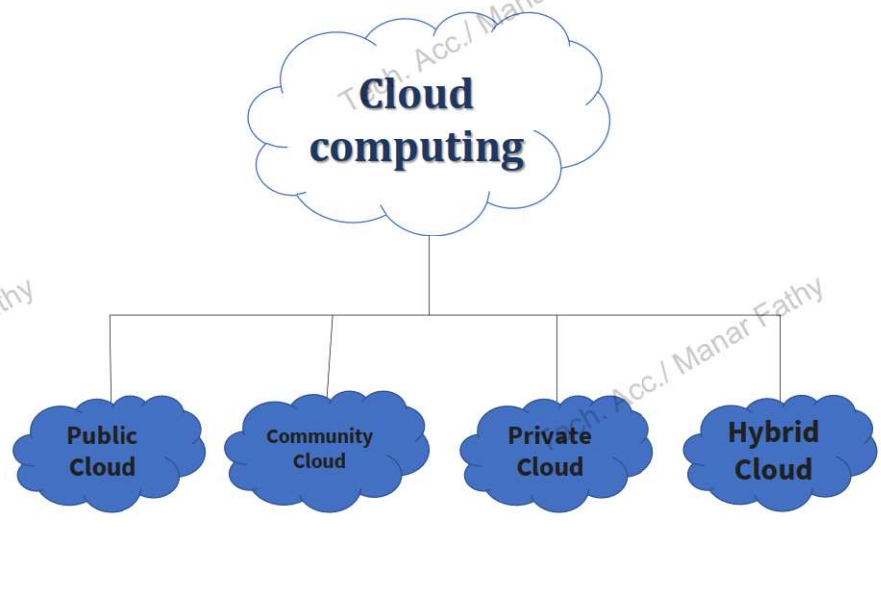

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Types of clouds

1. **Public Cloud:** This type of cloud is used usually for B2C (Business to Consumer) type interactions. Here the computing resource is owned, governed and operated by government, an academic or business organization.
2. **Community Cloud:** Here, computing resources are provided for a community and organizations.
3. **Private Cloud:** computing resources are deployed for one particular organization. This method is more used for intra-business interactions. Where the computing resources can be governed, owned and operated by the same organization.
4. **Hybrid Cloud:** This type of cloud can be used for both type of interactions – B2B (Business to Business) or B2C (Business to Consumer). This deployment method is called hybrid cloud as the computing resources are bound together by different clouds.

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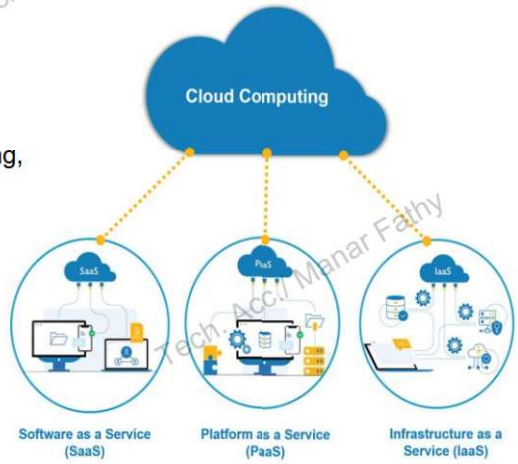
Cloud Computing

cloud computing is the delivery of computing services including (servers, storage, databases, networking, software, analytics, and intelligence) over the Internet to offer

1. faster innovation
2. flexible resources
3. economies of scale



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Advantages of Cloud Computing

Lower the Infrastructure Price

Expand IT Resources

Easy Management

Reliability

Data Backup & Recovery

Nearly Unlimited Storage Space

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Disadvantages of Cloud Computing

Operating from Cloud to On-Premises

Cloud specialized skills

Downtime

Restricted Control

Rigid Contracts

Security

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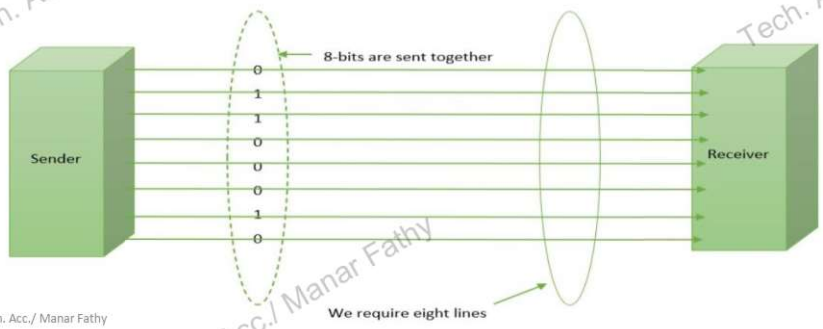
Parallel Transmission

- In Parallel Transmission, **many bits are flow together simultaneously** from one computer to another computer.
- Parallel Transmission is **faster** than serial transmission to transmit the bits.
- Parallel transmission is used for **short** distance.



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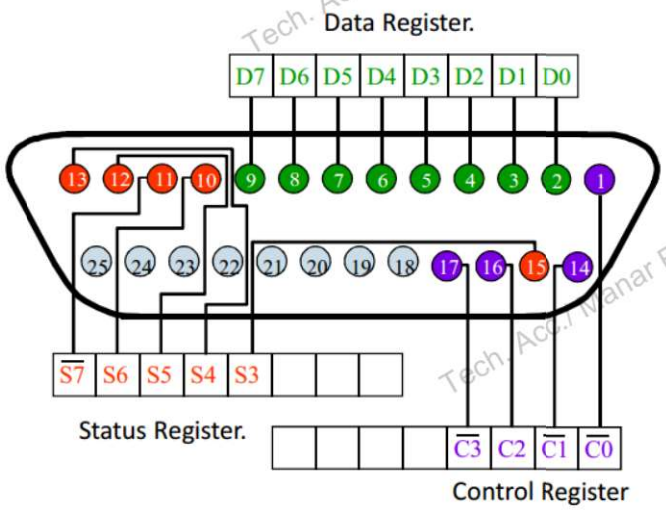
Parallel Port Pins



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Parallel Modes

1. Standard Parallel Port (SPP)

A) Centronics [CPU send 8 bits data in one direction]

B) Nipple [CPU receive bits data in one direction]

C) Byte "Burst" [CPU can Send or Receive 8 bits in bi-directional]

Data rate 150 Kbyte/sec

2. Enhanced Parallel Port (EPP)

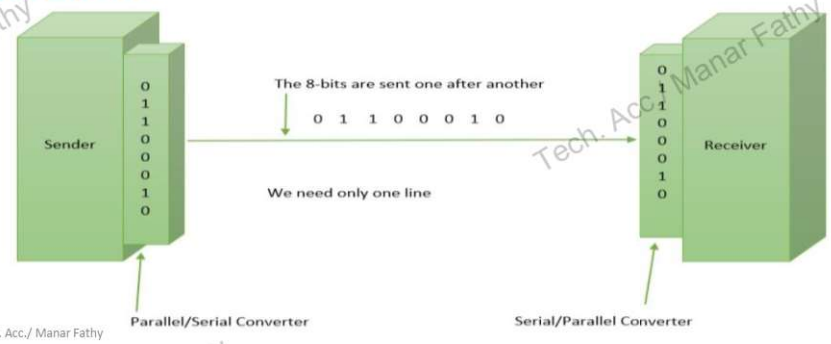
3. Extended capability Port (ECP)

Use additional hardware

Data rate 2 MBytes/sec

Serial Transmission

- In Serial Transmission, **data-bit flows** from one computer to another computer in **bi-direction.**
- In this transmission, **one-bit flows at one clock pulse.**
- In Serial Transmission, 8 bits are transferred at a time having **a start and stop bit.**

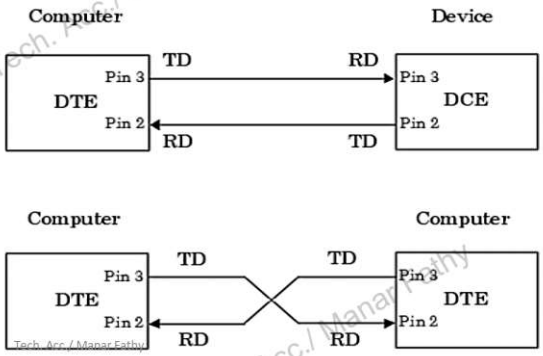


Serial Terminals

The RS-232 cable has two terminal devices to Define

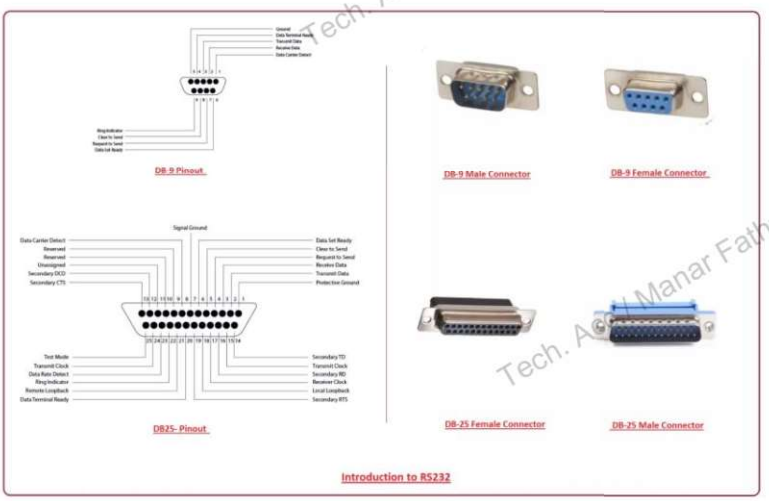
DTE = Data Terminal Equipment (computer)

DCE = Data Communications Equipment (modem)



1.DTE - DCE is called a 'Straight Cable'
2.DTE - DTE is called a 'Null-Modem Cable'
3.DCE - DCE is called a 'Tail Circuit Cable

Serial Interfaces: RS-232



Serial Interfaces: RS-232

DB-25 Female Connector

DB-25 Male Connector

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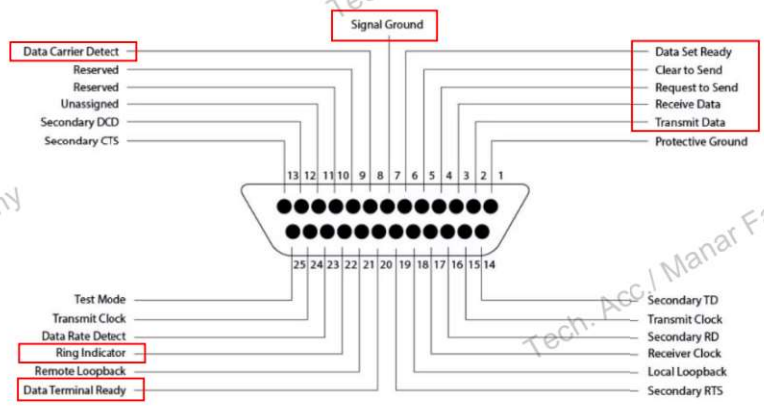
Serial Interfaces: RS-232



DB25- Pinout

30

Serial Interfaces: RS-232

DB-9 Male Connector

DB-9 Female Connector

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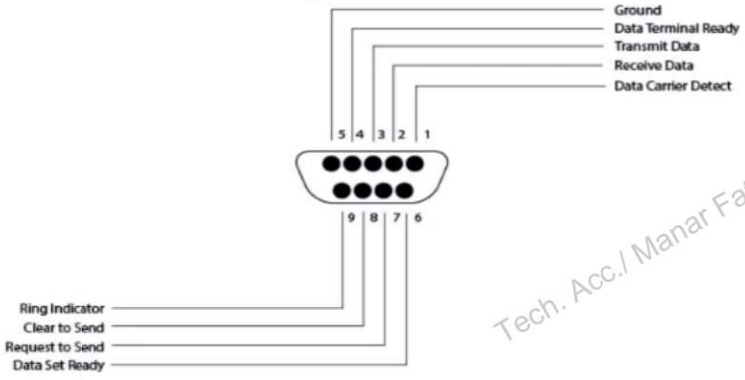
Serial Interfaces: RS-232



DB-9 Pinout

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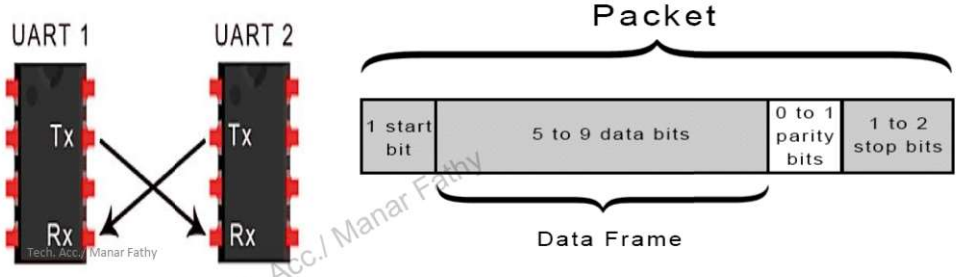
Serial Interfaces: UART

- UART stands for **Universal Asynchronous Receiver/Transmitter.**
- A UART's main purpose is to **transmit and receive serial data** .
- It's not a communication protocol like SPI and I2C, but a **physical circuit in a microcontroller**, or **a stand-alone IC**.



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UART Data Frame Format

START BIT

from high to low for **one clock** cycle.

DATA FRAME

5 bits up to 8 bits long if **a parity bit is used**, 9 bits long If **no parity bit is used**.

In most cases, the data is sent with **the least significant bit first**.

PARITY

Bits can be changed by

- electromagnetic radiation
- mismatched baud rates
- long-distance data transfers.

STOP BITS

from **low voltage to a high** voltage for **at least two-bit durations**.

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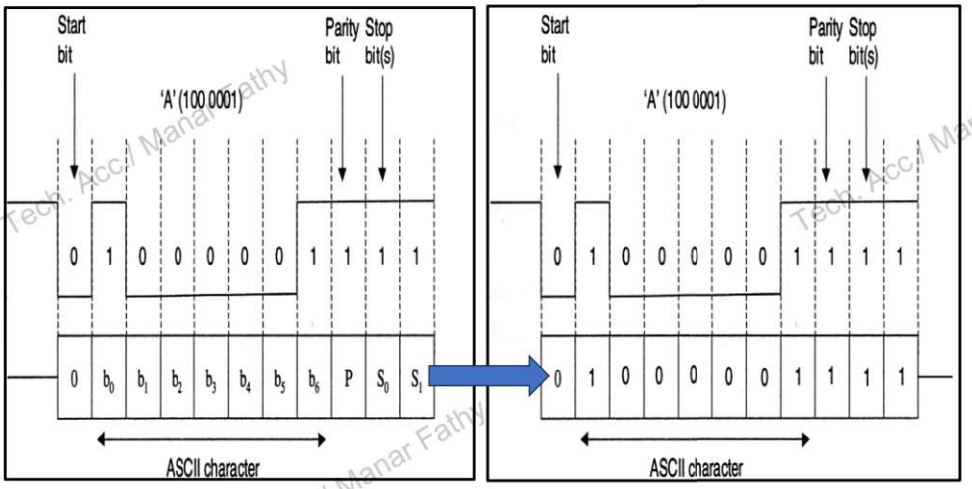
UART Data Frame Format CONT.



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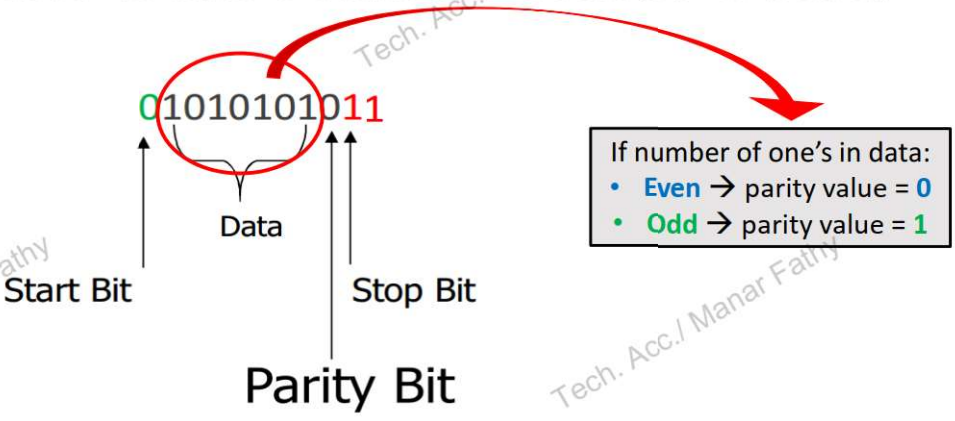
UART Data Frame Format CONT.



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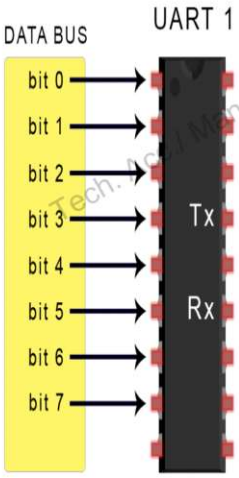
HOW UART WORKS?

1) **The UART1** (that is going to transmit data) receives the data from a **data bus**.
2) The data bus is used to send data to the UART1 by another device like **a CPU, memory, or microcontroller**.
3) Data is transferred from the data bus to the transmitting UAR1 in **parallel form**.
4) After the transmitting UART1 gets the parallel data from the data bus, it adds a start bit, a parity bit, and a stop bit, **creating the data packet**.



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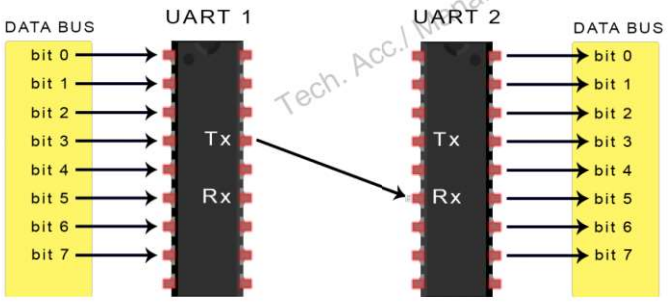
HOW UART WORKS? CONT.

5) Next, the data packet is output serially, bit by bit **at the Tx pin**.
6) The receiving UART2 reads the data packet bit by bit **at its Rx pin**.
7) The receiving UART2 then converts the data back into parallel form and **removes the start bit, parity bit, and stop bits.**
8) Finally, the receiving UART2 transfers the data packet in parallel to **the data bus** on the receiving end



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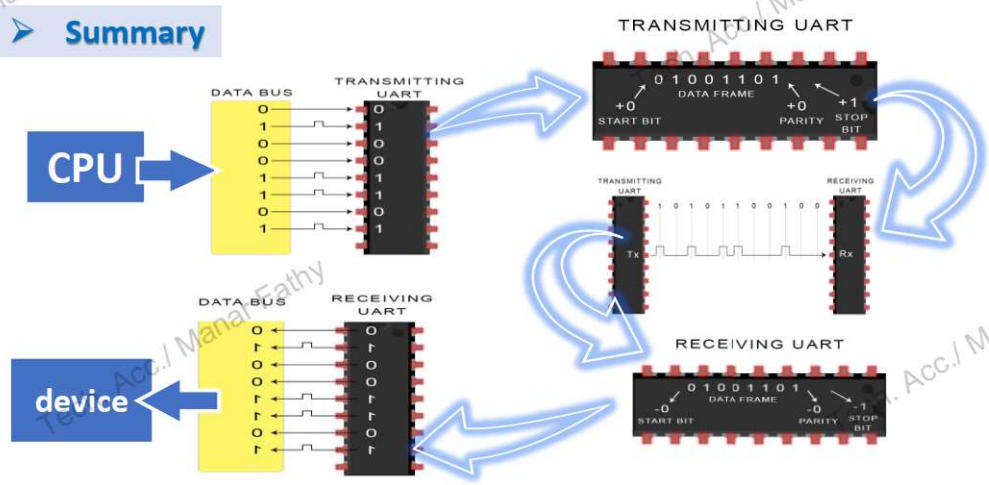
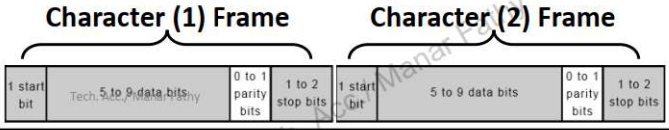
Summary



Frame of Sending 2 characters in UART



- **Character bits**
  (5 to 9)
- **Total Character**
  Total Frame bits * number of Frames

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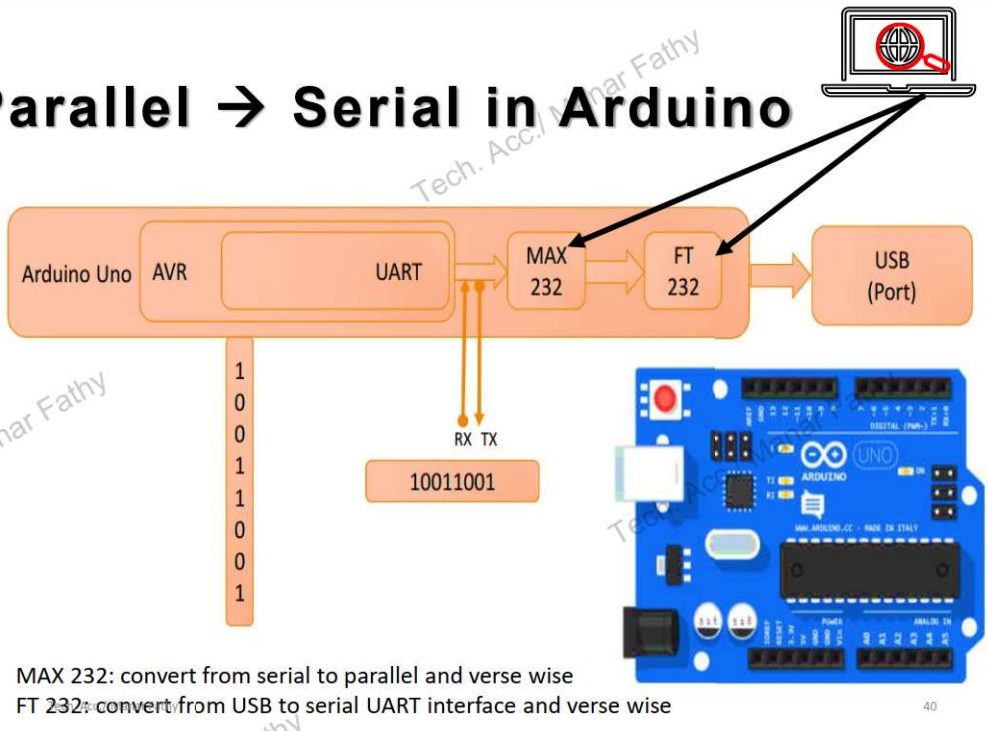
Parallel → Serial in Arduino



- MAX 232: convert from serial to parallel and verse wise
- FT 232: convert from USB to serial UART interface and verse wise

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Serial VS Parallel

No	Serial transmission	Parallel transmission
1.	A single communication link is used to transfer data from one end to another	Multiple parallels links used to transmit the data
2.	Data (bit) flows in bi-direction.	Data flows in multiple lines.
3.	Cost-efficient.	Not cost-efficient.
4.	One bit transferred at one clock pulse.	Eight bits transferred at one clock pulse.
5.	Slow in comparison of parallel transmission.	Fast in comparison of serial transmission.

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Serial VS Parallel Cont.

No	Serial transmission	Parallel transmission
6.	Long-distance.	Short distance.
7.	The circuit used in serial transmission is simple.	The circuit used in parallel transmission is relatively complex.
8.	Full duplex as sender can send as well as receive the data	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.	Reliable and straightforward.	Unreliable and complicated.

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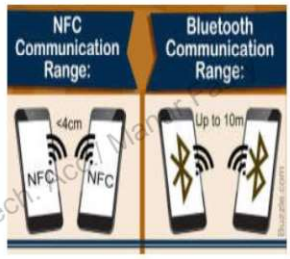
Wireless Technologies



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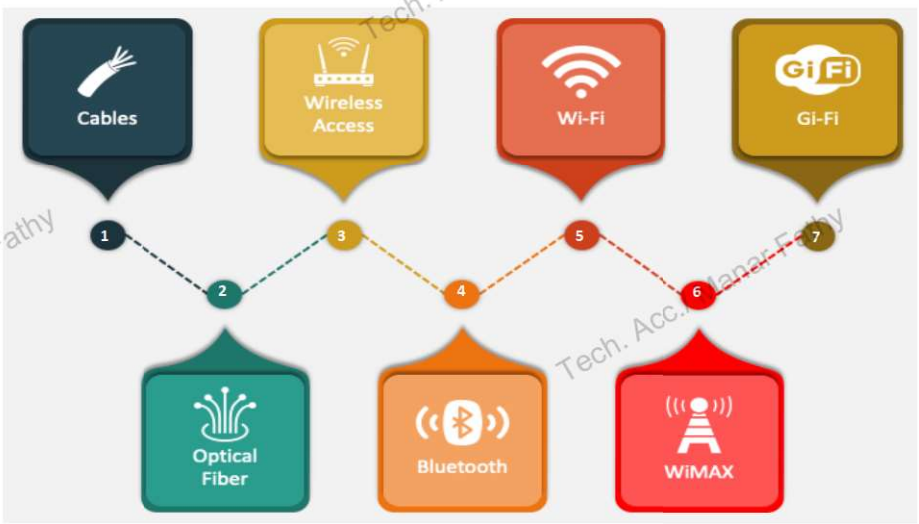
Wireless Technologies



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GI-Fi

A wireless connection with a data rate of more than one billion bits (Gigabits) per second

Technical characteristics

1. The absolute production cost per chip is no more than $10 and costs just under 2 watts.
2. It operates on a frequency range of 57 to 64 GHz, which is not a widely spread frequency range
3. The technology is more efficient in performance and does not interfere with other wireless technologies, providing speeds of up to 5 Gigabits
4. HD rates per second and provide coverage over 10 meters.

Comparison between Gi-Fi and Wi-Fi:

Feature	GiFi	WiFi
Transport medium	It uses millimeter waves to transmit/receive data.	It uses radio frequency waves to transmit/receive data.
Frequency range	57to 64 GHz	2.4GHz and/or 5 GHz
Data rate or speed	5Gbps and more	upto 250 Mbps
Coverage range or distance	About 10 meters	About 300 meters
Data density	very high	very low
Cost	low	high

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