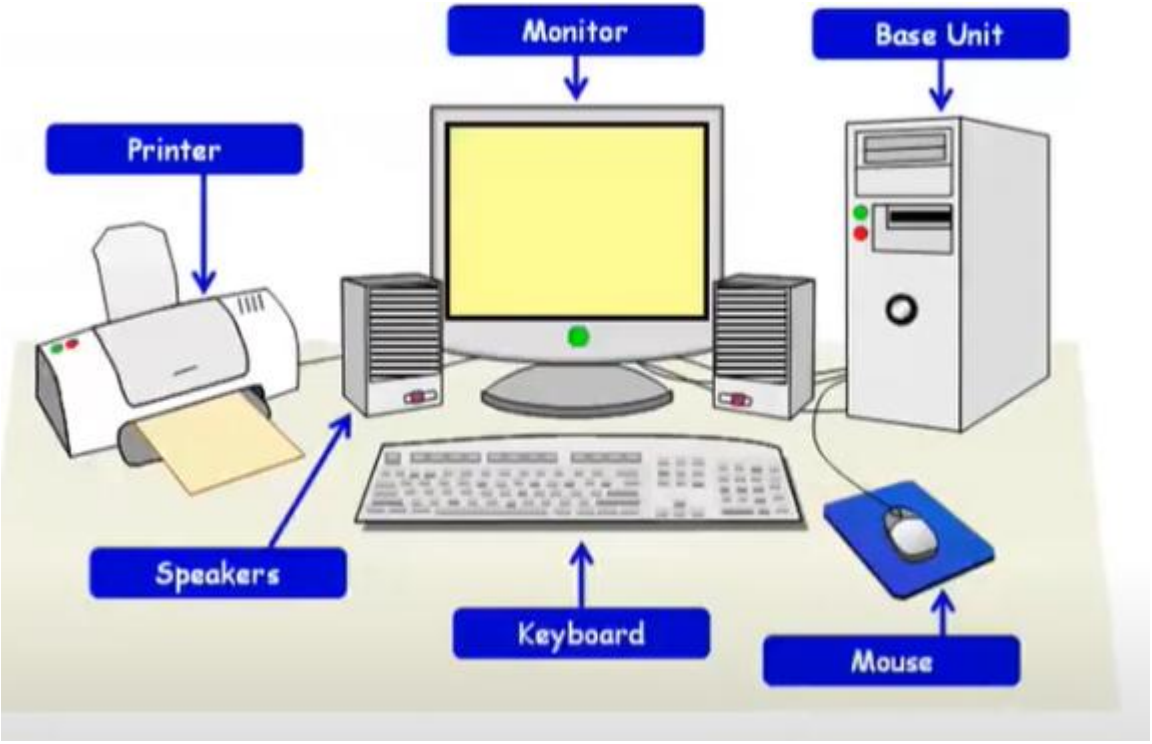
Computer System: Computer system is a combination of all input, output and processing devices.



A computer is an electronic device that accepts a set of instructions in the form of a program that executes it and displays the output to the user.

Input Process Output Cycle (IPO Cycle):

Computers take input in the form of data and generate output in the form of information.

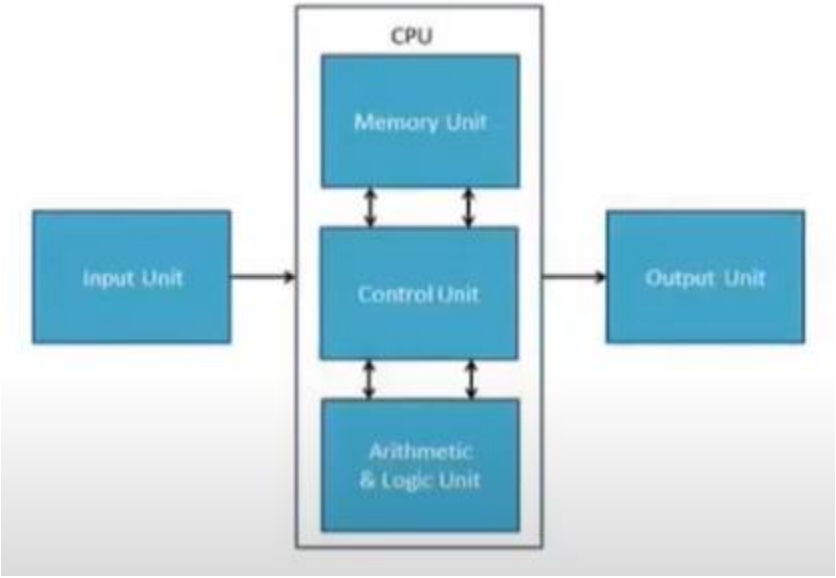
This process of converting data into some meaningful information is called the Information processing cycle.

Basic Components of computer System:

1. **Input Unit**: This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer. Ex: keyboard, Mouse, Smart card reader, Barcode reader, Biometric, web camera etc.

2. **CPU (Central Processing Unit):** CPU is considered as the brain of the computer. CPU performs all types of data processing operations. It controls the operation of all parts of the computer.

CPU itself has the following three components



→ **ALU (Arithmetic Logic Unit):** All calculations and comparisons are made in this unit.

→ **Control Unit:** It controls all the functions like input, output, storage and process. It Instructs ALU which operation is to be carried out.

→ **Memory Unit**: It is also known as internal memory or primary memory, used to save data and instructions so that they are available for processing as and when required.

✓ **RAM (Random Access Memory):** It is volatile memory as it loses its contents when power is switched off. It is also called temporary memory

✓ **ROM (Read only Memory):** It is non-volatile memory, the data and instructions are placed in the ROM at the time of its manufacturing and can't be changed, its is also called permanent memory

3. **Output Unit:** Output unit is formed by the output devices attached to the computer. Output devices produce the output generated by the CPU in human readable form. Ex: Monitor LCD, Printer, and Speaker etc.
4. **Secondary Memory:** These devices are used to store a large amount of data permanently, which is not possible by using the primary or main memory. Some common secondary storage devices are as follows: Hard disk, CD, DVD, Blu-ray disc, memory cards and pen drive etc.

Units of Memory: Units of memory are used to measure and represent data. Data is used to store in the form of binary numbers like 0 or 1. A bit stands for binary digits either 1 or 0. Eight bits together form 1 Byte and a group of four bits is called Nibble.

S.No.	Unit	Description
1.	Binary Digit	1 Bit
2.	Byte	1 Byte = 8 Bits
3.	KiloByte (KB)	1 KB = 1024 Bytes
4.	Mega Byte (MB)	1 MB = 1024 KB
5.	Giga Byte (GB)	1 GB = 1024 MB
6.	Tera Byte (TB)	1 TB = 1024 GB
7.	Peta Byte (PB)	1 PB = 1024 TB
8.	ExaByte (EB)	1 EB = 1024 PB
9.	Zetta Byte (ZB)	1 ZB = 1024 EB
10.	YottaByte (YB)	1 YB = 1024 ZB
11.	BrontoByte (Brontobyte)	1 Bronto Byte = 1024 YB

Communication Bus/System Bus:

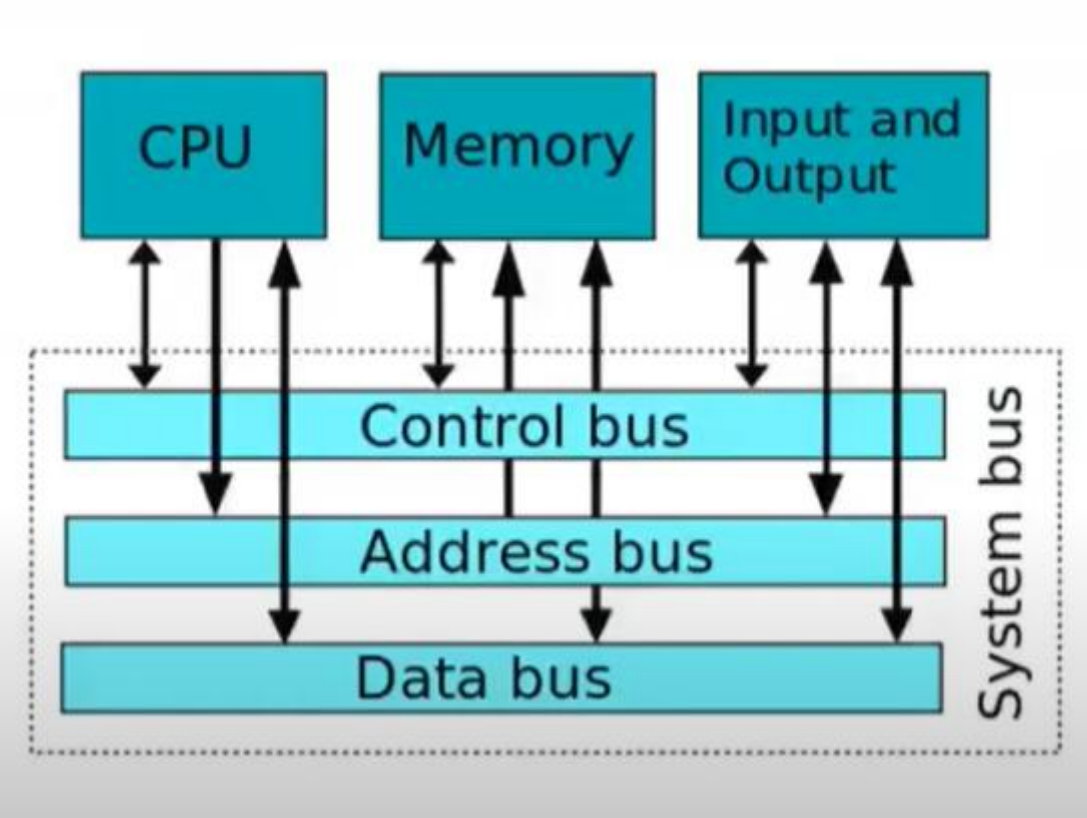
A bus can be defined as a set of wires/ cables to carry binary information between components of a computer like Input/output device, CPU and Memory. It usually transmits binary numbers, one bit per wire.

The bus system in computer is made up of three types of buses:

1. Address Bus

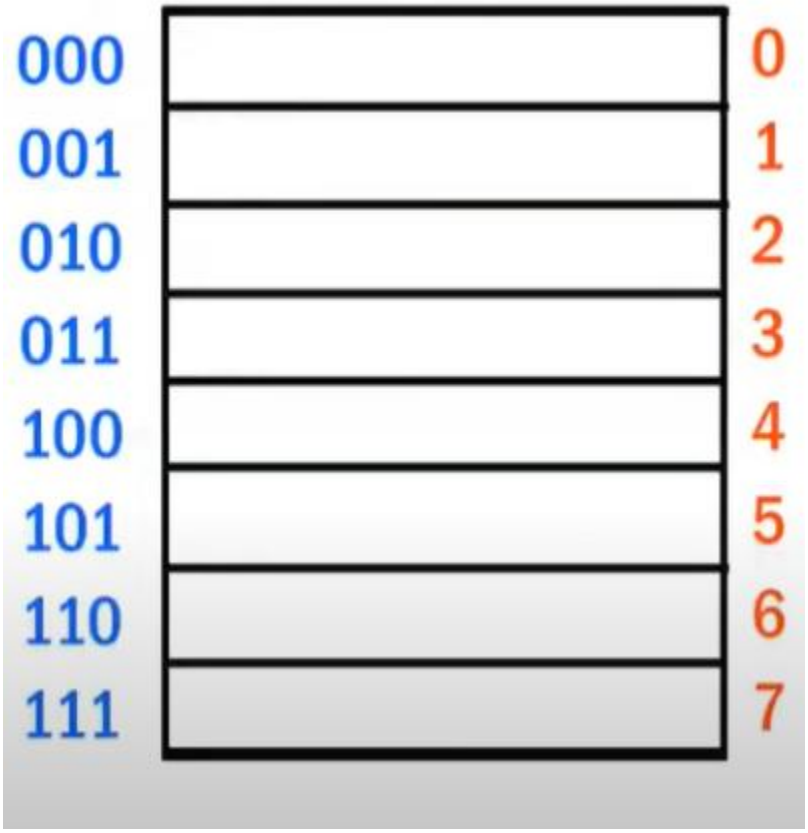
2. Data Bus

3. Control Bus



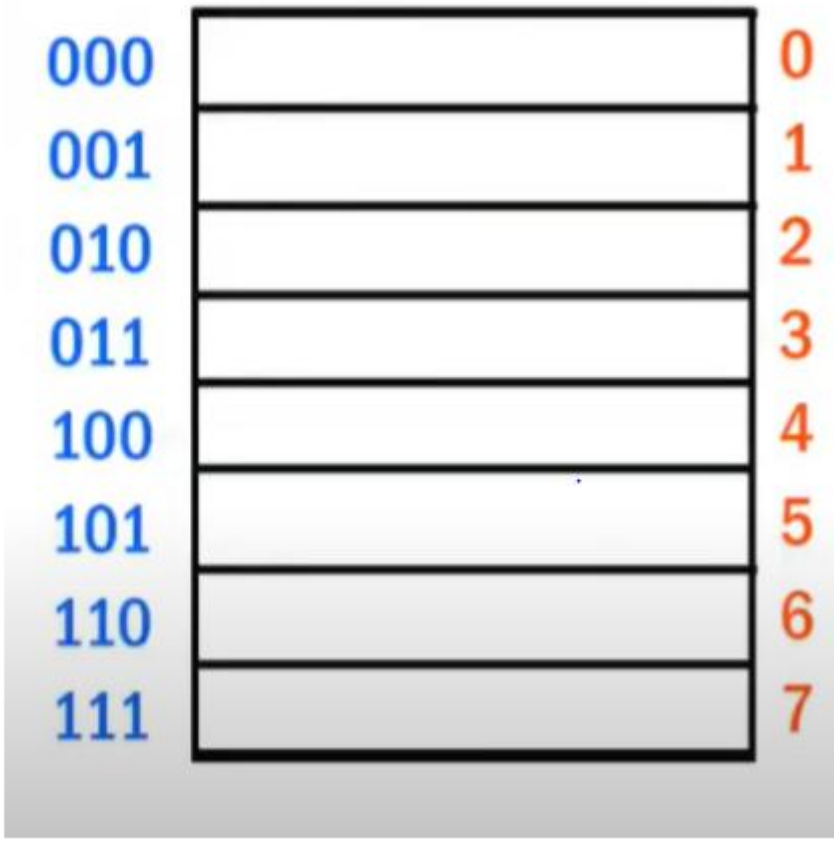
Address Bus:

- Address bus system is used to specify the address of a data/memory location. CPU is connected to main memory by a set of parallel wires which is the Address bus, which carries address to the Memory Address Register (MAR).
- The width of a bus determines the number of memory locations
- Address bus consists of 16 wires; thus, it consumes 16 bits, i.e., its width is 16 bits.
- For example, a 16-bit address bus can transfer 216(65,536)memory locations/addresses.



Data Bus:

- It is an electrical path that connects the CPU, memory, Input/output Devices and secondary storage devices. Data bus carries data in binary form.
- Data bus contains a set of parallel wires which is used to transmit data.
- The number of lines in a bus affects the speed at which the data travels between different components. Ex: Speed of a 16 bit data bus is more than 8 bit data bus.
- Data bus is bi-directional bus because same bus is used for data transmission from microprocessor to memory location or input/output device and vice versa.



Control Bus:

- The Control Bus carries control information from the control unit to the other units.
- The control information is used for directing the activities of all units.
- The control unit controls the functioning of other units like: Input/Output Devices, Secondary storage.

Apart from the above described important bus systems, a separate type of bus called 1/0 (Input-Output) bus connects the input, output and other external devices to the system.

Register Memory / Registers in Computer:

- Register memory can also be called as Register; Register memory is the smallest and fastest temporary memory in a computer.
- Each Register inside the CPU has a specific function like storing data, storing an instruction, storing address of memory location for immediate requirement to performing any operation.
- Registers can be of different sizes 16 bit, 32 bit, 64 bit, and so on.

Functions of Registers:

Fetch: The Fetch Operation is used for taking the instructions that are given by the user and the Instructions that are stored into the Main Memory will be fetched by using Registers.

Decode: The Decode Operation is used for interpreting the Instructions means, The CPU will find out which Operation is to be performed on the Instructions.
Execute: The Execute Operation is performed by the CPU. And Results those are produced by the CPU are then Stored into the Memory and after that they are displayed on the user Screen.

Cache Memory:

The Cache Memory (Pronounced as "cash") is very near to the CPU so also called CPU memory, all the Recent Instructions are Stored into the Cache Memory. It is the fastest memory that provides high-speed data access to a computer microprocessor.

- When the CPU requires data, it first sends a request to cache, which stores recently-used values.

- Computer processors generally take about 180 nanoseconds (1 second = 1 billion nanoseconds) to read data from RAM but only 45 nano seconds when this data is received from cache memory (Cache Memory). That's why Cache memory is faster than the primary memory or RAM.
- The cache memory data application is created during use and will create temporary files related to the application that is used by your CPU but the data is not automatically deleted from the cache memory. The cache memory size is very small. Because it fills up quickly and hangs on your computer and mobile. But we can avoid this problem by clearing cache memory from time to time and we regenerate it again as per your requirement.

Mobile Processor or CPU:

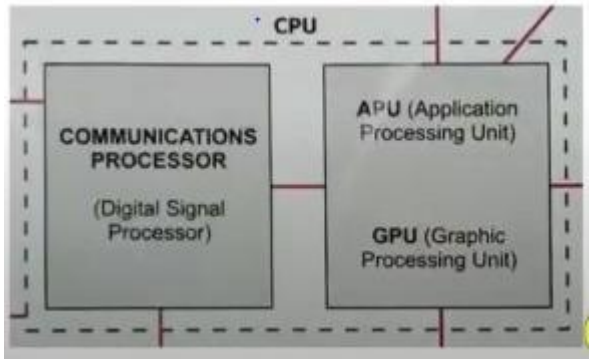
Just like the CPU is the brain of a computer system, a mobile processor is the brain of a Smartphone. It receives and executes every command, performing billions of calculations per second. The effectiveness of the processor directly affects every application you run, whether it's the camera, the music player, or just a simple email program.

A mobile processor further divided into three units:

(a) Applications Processing Unit (APU)

(b) Graphics Processing Unit (GPU)

(c) Communications Processing Unit



`Applications Processing Unit (APU)

- The Applications Processing Unit of a mobile processor works the same way as the Control Unit (CU) of a computer system. It is responsible for controlling and governing the entire set of tasks and execution that takes place inside a mobile system.
- Application processor executes the user applications and the related OS services which include audio/video codec and players, games, connecting to other devices, playing music, saving data, image processing, speech processing, internet browsing, text editing etc.

Graphics Processing Unit (GPU)

- The GPU assists the APU by handling graphics and visuals. In other words, GPU handles all graphics-related processing of a mobile CPU.
- The better the GPU, The better the visualization of complex websites and 3D video games.

Communications Processing Unit or Digital Signal Processor

The Communications Processing Unit is the unit that controls the call-making and receiving mechanism on a Smartphone.

It is further divided into two parts:

- **Radio Signal Management Unit:** This unit is responsible for connecting SIM (Subscriber Identity Module) to the base stations through radio signals like in Cellular networks such as 3G/LTE/4G-based cellular networks.
- **Audio Subsystem:** This sub-unit converts the voice signals (analog type) into digital signals and vice versa. The voice signals receive an input through a built-in mic and convert the generated audio output and send it to the in-built speaker. The audio system divided into two sub-parts:
- **DAC (Digital-to-Analog Converter)** converts digital signal into analog audio signal.
- **ADC (Analog-to-Digital Converter)** converts analog audio signals received from the person who is making the call into digital form so that the mobile processor can work on it.

System-on-a-Chip: All components of CPU are fabricated on a single chip and, hence, the entire integration is described as System-on-a-Chip (SoC). Thus, SoC can be described in the expression as:

SOC = CPU + GPU + Display Processor + Radio signal processor + Video processor

The major advantage of SoC architecture for mobile processors is that SoC chips consume less power as compared to their counterparts.

Camera ISP (Image Signal Processor)

It is designed to deliver a tightly bound image processing package and enable an improved overall picture and video experience. It provides a complete set of image processing operations like instant image capture, high-resolution support, image stabilization and other image enhancements.

Display Unit

This unit is responsible for providing display facilities, touch sensitive interface and touch sensitive keyboards.

Memory Unit

Like a computer system, a Smartphone can be effectively used for carrying out various tasks and running several applications which require memory to work. A mobile system's memory is classified into two types: a) RAM b) ROM

Power Management/Battery Management

A mobile phone battery is the main source of power supply for this device. Almost all mobile phones are equipped with lithium-ion batteries. The lithium ion batteries allow for a high charge capacity based on the size and weight of the battery. For smart phones battery capacity is a measure in milliampere-hours (MAH).

Storage

The external storage of a mobile system is also called expandable storage. It comes in the form of SD cards, or micro SD cards etc. It is the storage which can be removed easily by you and can be used for storing pictures, music, videos etc.

Software & Types of Software:

What is Software?

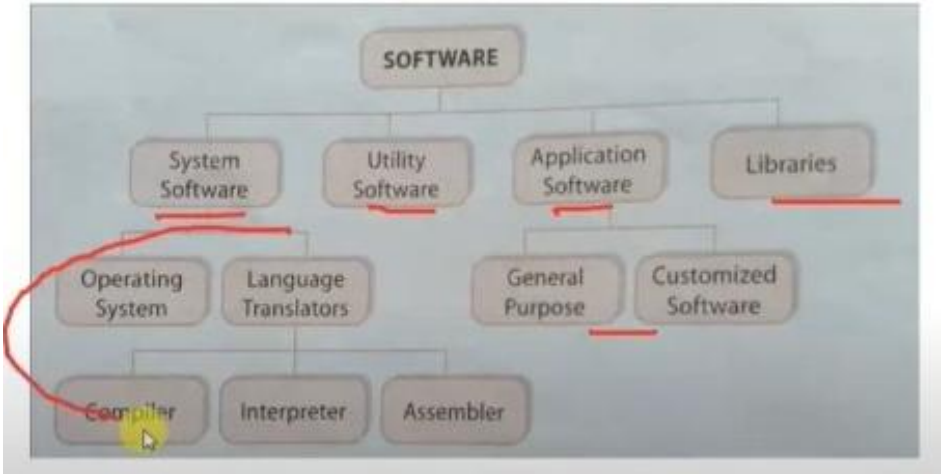
Software is a collection of program or computer instructions that tell the computer how to work.

A program is a sequence of instructions written to solve a particular problem and to make the hardware run.

Types of Software:

There are mainly three types of software given below:

- System software
- Application Software
- Utility Software
- Libraries



System Software:

These programs provide the environment for running application programs and are designed to control the operation of a computer system. System software comprises programs which interact with the hardware at the core or basic level. It directs the computer what to do, when to do and how to do it. Thus, system software serves as the interface between hardware and the user.

In Short: The software that controls internal computer operations is called System Software.

The different functions of system software are:

1. Reading data and receiving information
2. Translating data and instructions
3. Controlling all the peripheral devices
4. Processing and generating output

Application Software:

Application software is bought by the user to perform specific applications or tasks, for example, making a document or making a presentation or handling inventory or managing the employee database.

Application software are classified into two types:

- **General Purpose Application Software**
- **Customized Application Software.**

General Purpose Application Software

Application software is made for the common users for day-to-day applications and uses. These are also referred to as Office Tools. The users may use them in the manner they want. **Example:** MS office,Photoshop etc.

Customized Application Software.

Customized Software is one which is tailor-made as per the user's requirement. Such type of software is customer-specific. It is made keeping in mind the individual needs of the user and so is also referred to as Domain Specific Tool.

Example: Banking System, Payroll Management System, Financial Accounting, Management Software, Billing System, etc.

Utility Software:

Utility software are those application programs that help in proper maintenance of the computer. So that computer system runs smoothly. It is used to performing housekeeping functions like scanning, data backup, removing viruses, etc

Example:

Antivirus: Anti-virus software is a software utility that detects, prevents, and removes viruses, worms, and other malware from a computer.

Disk Defragmenter: It is used to rearrange the fragments or discontiguous parts of each file stored on a computer hard disk so that the small, empty storage spaces adjacent to fragments can be used, effectively creating new storage space and possibly making file access faster.

Backup Utility: This utility helps in taking backup of the data, i.e., duplicating the disk.