COMPUTER ORGANIZATION

UNIT-1
BASIC STRUCTURE OF COMPUTERS

What is computer Organization?

Computer organization refers to the arrangement and interconnection of hardware components within a computer system to perform tasks efficiently and reliably. It encompasses the design and configuration of the central processing unit (CPU), memory, input/output (I/O) devices, and other hardware components.

Computer Architecture VS Computer Organization:

Computer Architecture:

- Focus: Computer architecture primarily deals with the high-level design principles and structure of computer systems as perceived by software developers and users.

- Scope: It encompasses both hardware and software aspects of computer systems.

- Design Goals: Computer architecture aims to define the structure and behavior of a computer system to meet specific performance, cost, power consumption, and scalability requirements.

- Examples: Designing instruction sets, defining the organization of the memory hierarchy, specifying the system's bus architecture, and optimizing performance through techniques like pipelining and parallel processing are all part of computer architecture.

Computer Organization:

- Focus: Computer organization focuses on the physical components and operational characteristics of computer systems.

- Scope: It deals with the arrangement, interconnection, and operation of hardware components within a computer system.

- Design Goals: Computer organization aims to design and configure the CPU, memory, I/O devices, and other hardware components to perform tasks efficiently and reliably.

- Examples: Designing the internal structure of the CPU, specifying memory addressing modes, configuring I/O interfaces, and managing interrupts and DMA (Direct Memory Access) controllers are all part of computer organization.

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Computer types: -

A computer can be defined as a fast electronic calculating machine that accepts the (data) digitized input information process it as per the list of internally stored instructions and produces the resulting information.

Many types of computers exist that differ widely in size, cost, computational power and intended use.

The different types of computers are
1. **Personal computers: -** This is the most common type found in homes, schools, Business offices etc., It is the most common type of desk top computers with processing and storage units along with various input and output devices.
2. **Note book computers: -** These are compact and portable versions of PC
3. **Work stations: -** These have high resolution input/output (I/O) graphics capability, but with same dimensions as that of desktop computer. These are used in engineering applications of interactive design work.
4. **Enterprise systems: -** These are used for business data processing in medium to large corporations that require much more computing power and storage capacity than work stations. Internet associated with servers have become a dominant worldwide source of all types of information.
5. **Super computers: -** These are used for large scale numerical calculations required in the applications like weather forecasting etc.,

Functional unit: -

A computer consists of five functionally independent main parts input, memory, arithmetic logic unit (ALU), output and control unit.
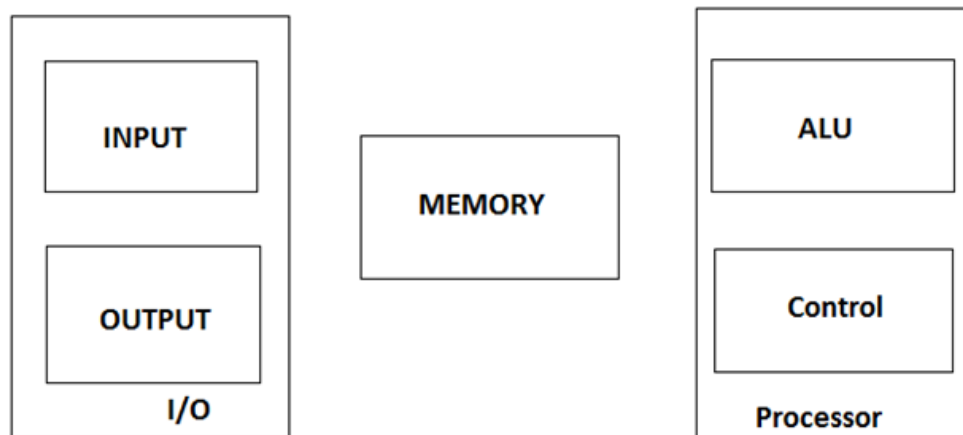
Basic functional units of a computer

Input device accepts the coded information as source program i.e. high level language. This is either stored in the memory or immediately used by the processor to perform the desired operations. The program stored in the memory determines the processing steps. Basically the computer converts one source program to an object program. i.e. into machine language.

Finally the results are sent to the outside world through output device. All of these actions are coordinated by the control unit.

Input unit: -
The source program/high level language program/coded information/simply data is fed to a computer through input devices keyboard is a most common type. Whenever a key is pressed, one corresponding word or number is translated into its equivalent binary code over a cable & fed either to memory or processor.

Joysticks, trackballs, mouse, scanners etc are other input devices.

Memory unit: -
Its function into store programs and data. It is basically to two types

- **Primary memory**
- **Secondary memory**

1. Primary memory: - Is the one exclusively associated with the processor and operates at the electronics speed's programs must be stored in this memory while they are being executed. The memory contains a large number of semiconductors storage cells. Each capable of storing one bit of information. These are processed in a group of fixed site called word.

To provide easy access to a word in memory, a distinct address is associated with each word location. **Addresses are** numbers that identify memory location.

Number of bits in each word is called word length of the computer. Programs must reside in the memory during execution. Instructions and data can be written into the memory or read out under the control of processor.

Memory in which any location can be reached in a short and fixed amount of time after specifying its address is called random-access memory (RAM).

The time required to access one word in called memory access time. Memory which is only readable by the user and contents of which can't be altered is called read only memory (ROM) it contains operating system.

Caches are the small fast RAM units, which are coupled with the processor and are aften contained on the same IC chip to achieve high performance. Although primary storage is essential it tends to be expensive.

2 Secondary memory: - Is used where large amounts of data & programs have to be stored, particularly information that is accessed infrequently.

Examples: - Magnetic disks & tapes, optical disks (ie CD-ROM's), floppies etc.,

Arithmetic logic unit (ALU):-

Most of the computer operators are executed in ALU of the processor likeaddition, subtraction, division, multiplication, etc. the operands are brought into the ALU from memory and stored in high speed storage elements called register. Then according to the instructions the operation is performed in the required sequence.

The control and the ALU are may times faster than other devices connected to a computer system. This enables a single processor to control a number of external devices such as key boards, displays, magnetic and optical disks, sensors and other mechanical controllers.

Output unit:-

These actually are the counterparts of input unit. Its basic function is to send the processed results to the outside world.

Examples:- Printer, speakers, monitor etc.

Control unit:-

It effectively is the nerve center that sends signals to other units and senses their states. The actual timing signals that govern the transfer of data between input unit, processor, memory and output unit are generated by the control unit.