UNIT 1

INTRODUCTION OF COMPUTER

Definition of Computer:

It is a programmable electronic device designed for storing and processing data, based on sequence of instruction.

Evolution:

The evolution of digital computing is often divided into generations. Each generation is characterized by dramatic improvements over the previous generation in the technology used to build computers, in terms of the internal organization of computer and programming languages.

Five Generations of Computers:

First Generation
Second Generation
Third Generation
Fourth Generation
Fifth Generation

First Generation: Vacuum Tubes (1940-1956):
The first computer systems used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up entire rooms. These computers were very expensive to operate and in addition to using a great deal of electricity, the first computers generated a lot of heat, which was often the cause of malfunctions.
First generation computers relied on machine language, the lowest-level programming language understood by computers, to perform operations, and they could only solve one problem at a time. It would take operators days or even weeks to set-up a new problem. Input was based on punched cards and paper tape, and output was displayed on printouts.
The UNIVAC (Universal Automatic Computer) and ENIAC (Electronic Numerical Integrator and Computer) computers are examples of first-generation computing devices. The UNIVAC was the first commercial computer delivered to a business client, the U.S. Census Bureau in 1951

Second Generation: Transistors (1956-1963):
The world would see transistors replace vacuum tubes in the second generation of computers. The transistor was invented at Bell Labs in 1947 but did not see widespread use in computers until the late 1950s.
The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation predecessors. Though the transistor still generated a great deal of heat that subjected the computer to damage,

it was a vast improvement over the vacuum tube. Second-generation computers still relied on punched cards for input and printouts for output. Second-generation computers moved from cryptic binary machine language to symbolic, or assembly, language.

Third Generation: Integrated Circuits (1964-1971)
The development of the integrated circuit was the hallmark of the third generation of computers. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers.

Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating system, which allowed the device to run many different applications at one time with a central program that monitored the memory. Computers for the first time became accessible to a mass audience because they were smaller and cheaper than their predecessors.

Fourth Generation: Microprocessors *(1971-Present):*
The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. What in the first generation filled an entire room could now fit in the palm of the hand. The Intel 4004 chip, developed in 1971, located all the components of the computer—from the unit and memory to input/output controls—on a single chip.

In 1981 IBM introduced its first computer for the home user, and in 1984 Apple introduced the Macintosh. Microprocessors also moved out of the realm of desktop computers and into many areas of life as more and more everyday products began to use microprocessors.

As these small computers became more powerful, they could be linked together to form networks, which eventually led to the development of the Internet. Fourth generation computers also saw the development of GUIs, the mouse and handheld devices.

Fifth Generation: Artificial Intelligence (Present and Beyond):
Fifth generation computing devices, based on artificial intelligence, are still in development, though there are some applications, such as voice recognition, that are being used today. The use of parallel processing and superconductors is helping to make artificial intelligence a reality.

Quantum computation and molecular and nanotechnology will radically change the face of computers in years to come. The goal of fifth-generation computing is to develop devices that respond to natural language input and are capable of learning and self-organization.
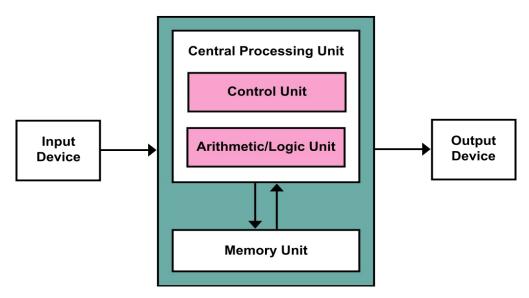
Characteristics of Computer

- **Speed**: In general, no human being can compete to solving the complex computation, faster than computer.
- **Accuracy**: Since Computer is programmed, so whatever input we give it gives result with accurately.
- **Storage**: Computer can store mass storage of data with appropriate format.

- **Diligence**: Computer can work for hours without any break and creating error.
- **Versatility**: We can use computer to perform completely different type of work at the same time.
- **Power of Remembering**: It can remember data for us.
- **No Intelligence Quotient (IQ)**: Computer does not work without instruction
- **No Feeling**: Computer does not have emotions, knowledge, experience and feeling

Organization of a Computer

A computer is a fast system that is organized to accept, store, and process data and produce output results under the direction of a stored program of instructions. This section explains how a computer system is organized.

Basic organization of computer system includes input, processing unit, Memory Unit and output devices.

Input Devices: Computer systems use many devices for input purpose. Input devices include the mouse, input pen, touch screen, and microphone. Regardless of the type of device used, all are components for interpretation and communication between people and computer systems.

Central Processing Unit (CPU) : It is the brain of the computer without this unit computer unable to process.

Output device: Output device is used to show the result of the instructions. Example Monitor, printer, Headphones etc

Memory unit: A memory unit is the collection of storage **units** or devices together.

The memory unit stores the binary information in the form of bits.

Classification of Computers

Based on size and capacity, computers are classified as follows:
- ➢ Super Computers
- ➢ Mainframe Computer,
- ➢ Mini Computers
- ➢ Micro Computers
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Super Computers: Supercomputers are the most powerful and physically the largest by size. These are systems designed to process huge amounts of data and the fastest supercomputers can perform over one trillion calculations in a second. Supercomputers have thousands of processors. Because of their extraordinary speed, accuracy and processing power, supercomputers are well suited for solving highly complex problems and performing tasks that demand huge amounts of calculations.

Mainframe Computer: Mainframe computers are very large often filling an entire room and can process thousands of millions of instructions per second. In a mainframe environment, users connect to the mainframe through the many terminals wired to the mainframe. Mainframes are capable of supporting hundreds to thousands of users simultaneously. Some of the functions performed by a mainframe include: flight scheduling, reservations and ticketing for an airline etc
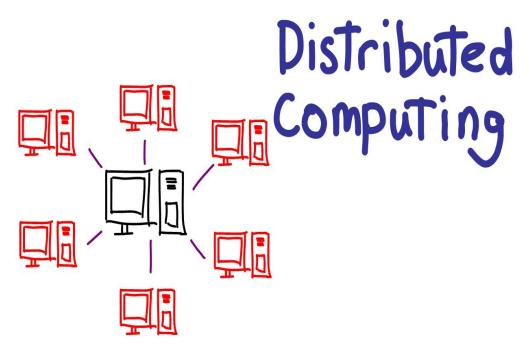
Minicomputers: Minicomputers are much smaller than mainframes .These computers are also less expensive. Sometimes referred to as Midrange Server or Midrange Computer, they are typically larger, more powerful and more expensive than desktop computers. Midrange computers are usually used by small and medium-sized businesses as their servers. Users connect to the server through a network by using desktop computers.

Microcomputers

Microcomputers are the most frequently used type of computer. Also, known as Personal Computer (PC), a microcomputer is a small computer system designed to be used by one person at a time.

Distributed computers: It is a model in which components of a software system are shared among multiple computers to improve efficiency and performance. According to the narrowest of definitions, distributed computing is limited to programs with components shared among computers within a limited geographic area.

In distributed computing, each processor has its own private memory (distributed memory). Information is exchanged by passing messages between the processors. It is shown in the diagram below:

Parallel Computation: It is a type of computation in which many calculations or the execution of processes are carried out simultaneously. Large problems can often be divided into smaller ones, which can then be solved at the same time.

In parallel computing, all processors may have access to a shared memory to exchange information between processors.

Computer Memory:

Computer memory is any physical device capable of storing information temporarily like RAM (random access memory), or permanently, like ROM (read-only memory). Memory devices utilize integrated circuits

Random Access Memory (RAM):
- It is also called as read write memory or the main memory or the primary memory.
- The programs and data that the CPU requires during execution of a program are stored in this memory.
- It is a volatile memory as the data loses when the power is turned off.
- RAM is further classified into two types- SRAM (Static Random Access Memory) and DRAM (Dynamic Random Access Memory).

Read Only Memory (ROM) –
- Stores crucial information essential to operate the system, like the program essential to boot the computer.
- It is not volatile.
- Always retains its data.
- Used in embedded systems or where the programming needs no change.
- Used in calculators and peripheral devices.
- ROM is further classified into 4 types- *ROM*, *PROM*, *EPROM*, and *EEPROM*

Types of Read Only Memory (ROM):

1. **PROM (Programmable read-only memory)** – It can be programmed by user. Once programmed, the data and instructions in it cannot be changed.
2. **EPROM (Erasable Programmable read only memory)** – It can be reprogrammed. To erase data from it, expose it to ultra violet light. To reprogram it, erase all the previous data.
3. **EEPROM (Electrically erasable programmable read only memory)** – The data can be erased by applying electric field, no need of ultra violet light. We can erase only portions of the chip.

S.No	RAM	ROM
1	Temporary Storage	Permanent Storage
2	Store data in MBs	Store data in GBs
3	Volatile	Non-Volatile
4	Used in normal operations	Used for startup process of computer
5	Writing data is faster	Writing data is slower

Secondary Memory: Consists of all permanent or persistent **storage** devices, such as read-only memory (ROM), flash drives, hard disk drives (HDD), magnetic tapes etc.
Primary memory has limited storage capacity and is volatile. Secondary memory overcomes this limitation by providing permanent storage of data and in bulk quantity. Secondary memory is also termed as external memory and refers to the various storage media on which a computer can store data and programs. The Secondary storage media can be fixed or removable. Fixed Storage media is an internal storage medium like hard disk that is fixed inside the computer. Storage medium that are portable and can be taken outside the computer are termed as removable storage media.
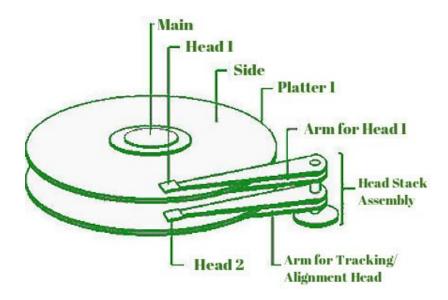
Compact Disc Read-Only Memory: A CD-ROM is a CD that can be read by a computer with an optical drive. The "ROM" part of the term means the data on the disc is "read-only," or cannot be altered or erased. Because of this feature and their large capacity, CD-ROMs are a great media format for retail software.

Magnetic Storage Drives: Magnetic storage is one of the most affordable ways to store large amounts of data. Magnetic storage uses the two types of magnetic polarities to represent the

binary information consisting of zeros and ones. Commonly used devices that use magnetic storage include magnetic tape, floppy disks and hard-disk drives.

Magnetic media is coated with a magnetic layer which is magnetized in clockwise or anticlockwise directions. When the disk moves, the head interprets the data stored at a specific location in binary 1s and 0s at reading.

- **Floppy Disk:** A floppy disk is a flexible disk with a magnetic coating on it. It is packaged inside a protective plastic envelope. These are one of the oldest types of portable storage devices that could store up to 1.44 MB of data but now they are not used due to very less memory storage.

- **Hard disk:** A hard disk consists of one or more circular disks called platters which are mounted on a common spindle. Each surface of a platter is coated with a magnetic material. Both surfaces of each disk are capable of storing data except the top and bottom disk where only the inner surface is used. The information is recorded on the surface of the rotating disk by magnetic read/write heads. These heads are joined to a common arm known as access arm.

USB: A Universal Serial Bus (**USB**) is a common interface that enables communication between devices and a host controller such as a personal computer (PC). It connects peripheral devices such as digital cameras, mice, keyboards, printers, scanners, media devices, external hard drives and flash drives.
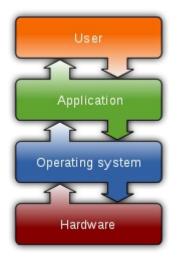
USB view

Software:

Software is a set of instructions used to operate computers and execute specific tasks.

Types of S/W: The software is used extensively for different purpose in several domains. It can be categorized into different types:

System Software: It is a type of software that is designed to run a computer's hardware and application programs. Software like operating systems, compilers, editors and drivers etc., come under this category. A computer cannot function without the presence of these. If we think of the computer system as a layered model, the system software is the interface between the hardware and user applications.

Operating System (OS): Operating system acts as manager of all the resources of computer, i.e. resource manager. It is system software that manages computer hardware and software resources and provides services. Thus operating system becomes an interface between user and machine.

Operating System Representation

Utility Programs: These programs analyze and maintain a computer. These programs are focused on how OS works on that basis it perform task to enable smooth functioning of computer. This program may come along with OS like windows defender, windows disk cleanup tool, Antivirus, backup software, files manager, disk compression tool all are utility software.

Application software: It is software created for a specific purpose, used by end users. It can be called an application or simply an app. Examples: word processor, accounting application, a web browser, an email client, media player etc

Proprietary Software: It is software that is owned by an individual or a company (generally the one that developed it). There are almost always major restrictions on its use, and its source code is almost always kept secret. The proprietary Software is a non-free computer software for which the software's publisher or another person retains intellectual property rights—usually copyright of the source code. It is also known as 'closed-source software'.

Overview of open source technology: Open source technology is defined as the development of software for allowing end users and developers to not only see the source code of software, but modify it as well.

Open-source software (OSS) is a type of computer software in which **source** code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose. The Linux operating system(OS) is the best-known examples of open source software technology

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