

Unit 1: Introduction to computers

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Computer

- Nowadays, computers are an integral part of our lives.
- They are used for :
 - the reservation of tickets for airplanes and railways,
 - payment of telephone and electricity bills,
 - deposit and withdrawal of money from banks,
 - processing of business data,
 - forecasting of weather conditions,
 - diagnosis of diseases,
 - searching for information on the Internet, etc.

Computers are also used extensively in schools, universities, organizations, music industry, movie industry, scientific research, law firms, fashion industry, etc.

Computer

- The term computer is derived from the word compute.
- The word compute means to calculate.
- A computer is an electronic machine that accepts data from the user, processes the data by performing calculations and operations on it, and generates the desired output results.
- Computer performs both simple and complex operations, with speed and accuracy.

DIGITAL AND ANALOG COMPUTERS

- A digital computer uses distinct values to represent the data internally.
- All information are represented using the digits 0s and 1s. The computers that we use at our homes and offices are digital computers.



Analog Computer

Vs.



Digital Computer

- Analog computer is another kind of a computer that represents data as variable across a continuous range of values.
- The earliest computers were analog computers.
- Analog computers are used for measuring of parameters that vary continuously in real time, such as temperature, pressure and voltage.
- Analog computers may be more flexible but generally less precise than digital computers.

CHARACTERISTICS OF COMPUTER

Speed

- The computer can process data very fast, at the rate of millions of instructions per second.
- Some calculations that would have taken hours and days to complete otherwise, can be completed in a few seconds using the computer.
- For example, calculation and generation of salary slips of thousands of employees of an organization, weather forecasting that requires analysis of a large amount of data related to temperature, pressure and humidity of various places, etc.

Accuracy

- Computer provides a high degree of accuracy.
- For example, the computer can accurately give the result of division of any two numbers up to 10 decimal places.

- **Diligence**

When used for a longer period of time, the computer does not get tired or fatigued.

- It can perform long and complex calculations with the same speed and accuracy from the start till the end.

- **Storage**

Capability Large volumes of data and information can be stored in the computer and also retrieved whenever required.

- A limited amount of data can be stored, temporarily, in the primary memory.
- Secondary storage devices like floppy disk and compact disk can store a large amount of data permanently

- **Versatility**


- Computer is versatile in nature. It can perform different types of tasks with the same ease. At one moment you can use the computer to prepare a letter document and in the next moment you may play music or print a document.


- Computers have several limitations too.
- Computer can only perform tasks that it has been programmed to do. Computer cannot do any work without instructions from the user.
- It executes instructions as specified by the user and does not take its own decisions.


History of Computers


- Prepare a report on history of computers.


Generations of Computers


SN	Generation	Period	Main Component used	Merits/Demerits
1	First Generation	1942-1955	 Vacuum tubes	<ul style="list-style-type: none">• Big in size• Consumed more power• Malfunction due to overheat• Machine Language was used
First Generation Computers - ENIAC , EDVAC , UNIVAC 1 ENIAC weighed about 27 tons, size 8 feet × 100 feet × 3 feet and consumed around 150 watts of power				

2	Second Generation	1955-1964	 <p>Transistors</p>	<ul style="list-style-type: none"> • Smaller compared to First Generation • Generated Less Heat • Consumed less power compared to first generation • Punched cards were used • First operating system was developed - Batch Processing and Multiprogramming Operating System • Machine language as well as Assembly language was used.
Second Generation Computers IBM 1401, IBM 1620, UNIVAC 1108				

3	Third Generation	1964 -1975	 <p>Integrated Circuits (IC)</p>	<ul style="list-style-type: none"> • Computers were smaller, faster and more reliable • Consumed less power • High Level Languages were used
<p>Third Generation Computers IBM 360 series, Honeywell 6000 series</p>				

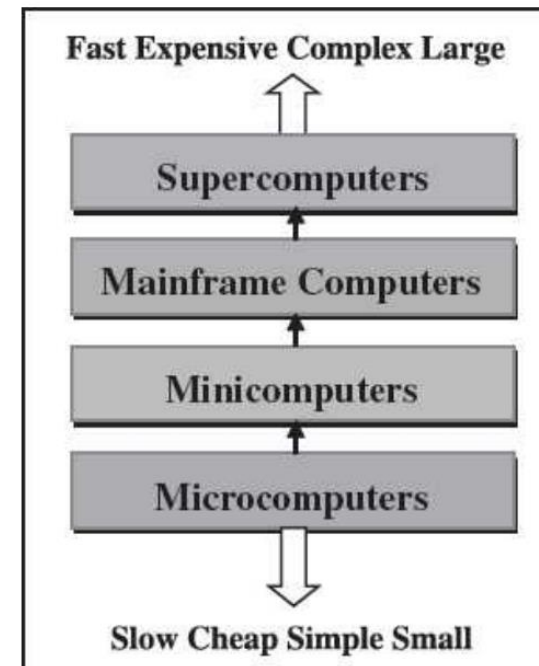
4	Fourth Generation	1975-1980	 <p>Microprocessor Very Large Scale Integrated Circuits (VLSI)</p>	<ul style="list-style-type: none">• Smaller and Faster• Microcomputer series such as IBM and APPLE were developed• Portable Computers were introduced.
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5	Fifth Generation	1980 - till date	 <p>Ultra Large Scale Integration (ULSI)</p>	<ul style="list-style-type: none">• Parallel Processing• Super conductors• Computers size was drastically reduced.• Can recognize Images and Graphics• Introduction of Artificial Intelligence and Expert Systems• Able to solve high complex problems including decision making and logical reasoning
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6	Sixth Generation	In future		<ul style="list-style-type: none">• Parallel and Distributed computing• Computers have become smarter, faster and smaller• Development of robotics• Natural Language Processing• Development of Voice Recognition Software
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Classification of Computers

- The digital computers that are available nowadays vary in their sizes and types. The computers are broadly classified into four categories based on their size and type—
 - (1) Microcomputers,
 - (2) Minicomputers,
 - (3) Mainframe computers, and
 - (4) Supercomputer.



Microcomputers

- small, low-cost and single-user digital computer.
- consist of CPU, input unit, output unit, storage unit and the software.
- stand-alone machines, but can be connected together to create a network of computers that can serve more than one user.
- *Eg. IBM PC based on Pentium microprocessor and Apple Macintosh.*
Microcomputers include desktop computers, notebook computers or laptop, tablet computer, handheld computer, smart phones and netbook

Type of Micro Computer



Minicomputers

- digital computers, generally used in multi-user systems.
- have high processing speed and high storage capacity than the microcomputers.
- can support 4–200 users simultaneously. The users can access the minicomputer through their PCs or terminal.
- used for real-time applications in industries, research centers, etc.
- *Eg. PDP 11, IBM (8000 series) are some of the widely used minicomputers*



Mainframe computers

- multi-user, multi-programming and high performance computers.
- operate at a very high speed, have very large storage capacity and can handle the workload of many users.
- large and powerful systems generally used in centralized databases.
- The user accesses the mainframe computer via a terminal that may be a dumb terminal, an intelligent terminal or a PC.
 - A dumb terminal cannot store data or do processing of its own. It has the input and output device only.
 - An intelligent terminal has the input and output device, can do processing, but, cannot store data of its own.
 - The dumb and the intelligent terminal use the processing power and the storage facility of the mainframe computer.
- used in organizations like banks or companies, where many people require frequent access to the same data.
- Some examples of mainframes are CDC 6600 and IBM ES000 series.



Supercomputers

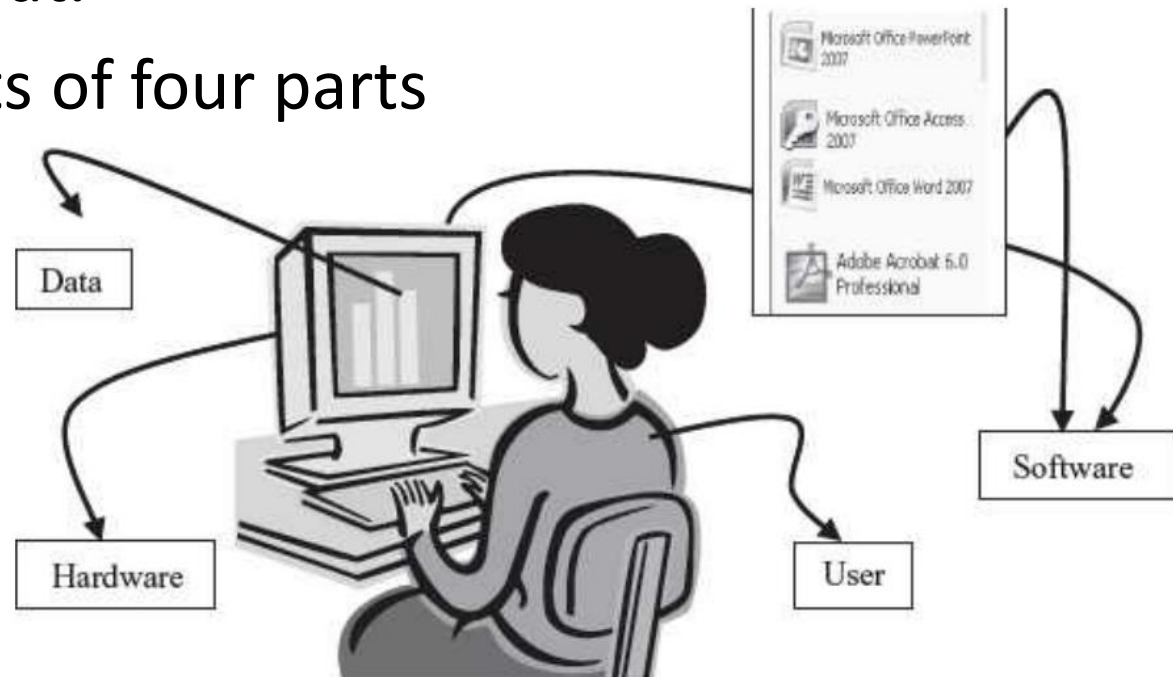
- fastest and the most expensive machines.
- have high processing speed compared to other computers.
- The speed of a supercomputer is generally measured in FLOPS (Floating point Operations Per Second).
- Some of the faster supercomputers can perform trillions of calculations per second.
- Supercomputers are built by interconnecting thousands of processors that can work in parallel.

- used for highly calculation-intensive tasks, such as, weather forecasting, climate research (global warming), molecular research, biological research, nuclear research and aircraft design.
- They are also used in major universities, military agencies and scientific research laboratories.
- Some examples of supercomputers are IBM Roadrunner, IBM Blue gene and Intel ASCI red.



THE COMPUTER SYSTEM

- Computer is an electronic device that accepts data as input, processes the input data by performing mathematical and logical operations on it, and gives the desired output.
- The computer system consists of four parts
 - (1) Hardware,
 - (2) Software,
 - (3) Data, and
 - (4) Users



Hardware

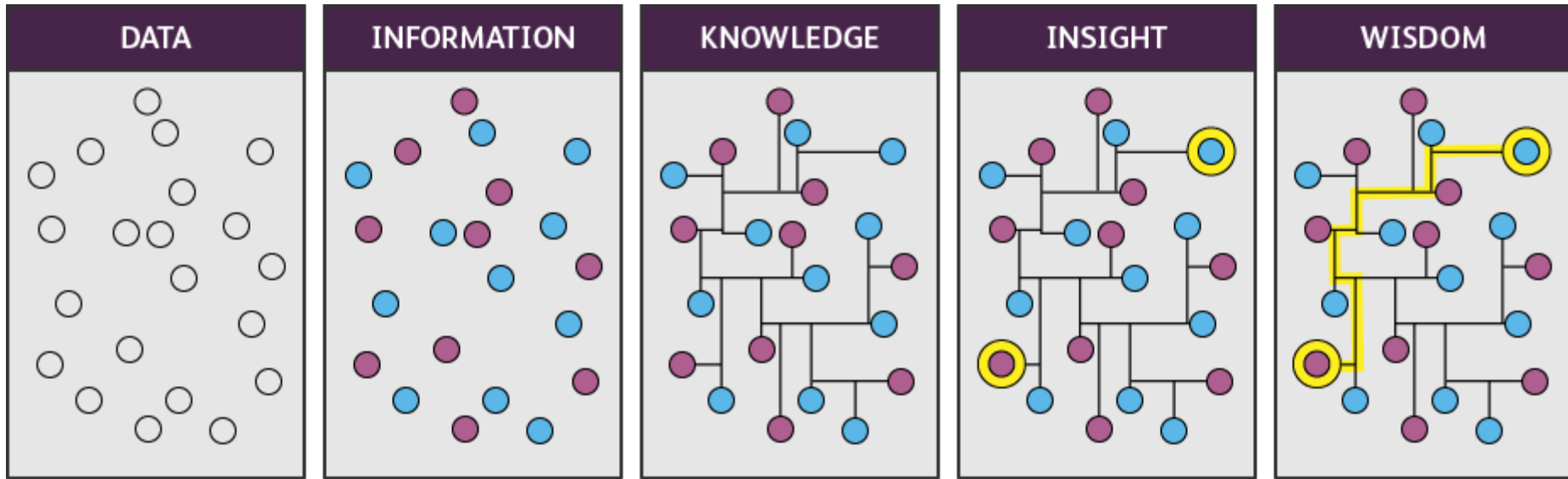
- Hardware consists of the mechanical parts that make up the computer as a machine.
- The hardware consists of physical devices of the computer.
- The devices are required for input, output, storage and processing of the data.
- Keyboard, monitor, hard disk drive, printer, processor and motherboard are some of the hardware devices.

Software

- Software is a set of instructions that tells the computer about the tasks to be performed and how these tasks are to be performed. Program is a set of instructions, written in a language understood by the computer, to perform a specific task.
- A set of programs and documents are collectively called software.
- The hardware of the computer system cannot perform any task on its own.
- The hardware needs to be instructed about the task to be performed. Software instructs the computer about the task to be performed.
- The hardware carries out these tasks.
- Different software can be loaded on the same hardware to perform different kinds of tasks.

Data

- Data are isolated values or raw facts, which by themselves have no much significance.
- For example, the data like 29, January, and 1994 just represent values.
- The data is provided as input to the computer, which is processed to generate some meaningful information.
- For example, 29, January and 1994 are processed by the computer to give the date of birth of a person.

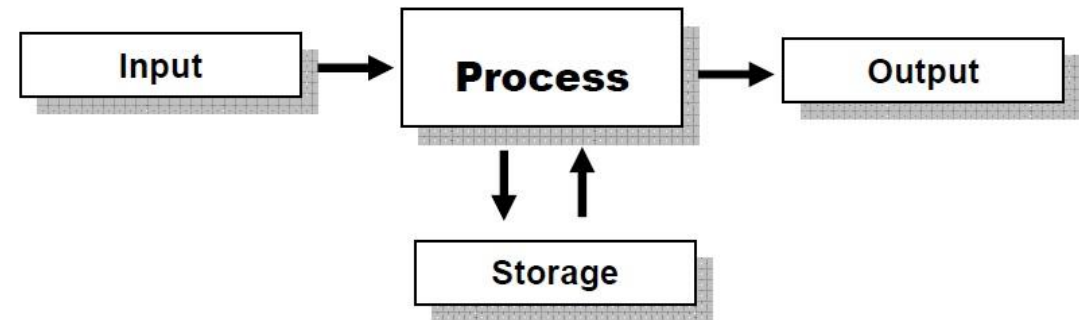


User

- Users are people who write computer programs or interact with the computer.
- They are also known as skinware, liveware, humanware or peopleware.
- Programmers, data entry operators, system analyst and computer hardware engineers fall into this category.

Input-Process-Output Concept

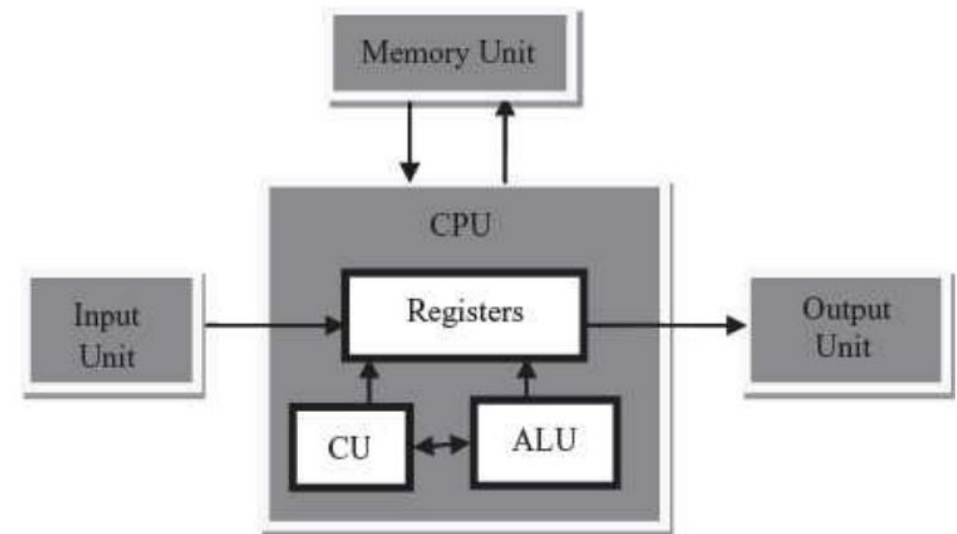
- A computer is an electronic device that
 - (1) accepts data,
 - (2) processes data,
 - (3) generates output, and
 - (4) stores data.



The concept of generating output information from the input data is also referred to as input-process-output concept.

Components of Computer Hardware

- The computer system hardware comprises of three main components:
 - 1. Input/Output (I/O) Unit,
 - 2. Central Processing Unit (CPU), and
 - 3. Memory Unit.



Input/Output Unit

- The user interacts with the computer via the I/O unit.
- The Input unit accepts data from the user and the Output unit provides the processed data i.e. the information to the user.
- The Input unit converts the data that it accepts from the user, into a form that is understandable by the computer.
- Similarly, the Output unit provides the output in a form that is understandable by the user.
- The input is provided to the computer using input devices like keyboard, trackball and mouse.
- Some of the commonly used output devices are monitor and printer.

Central Processing Unit

- CPU controls, coordinates and supervises the operations of the computer. It is responsible for processing of the input data.
- CPU consists of Arithmetic Logic Unit (ALU) and Control Unit (CU).
 - ALU performs all the arithmetic and logic operations on the input data.
 - CU controls the overall operations of the computer i.e. it checks the sequence of execution of instructions, and, controls and coordinates the overall functioning of the units of computer.
- Additionally, CPU also has a set of registers for temporary storage of data, instructions, addresses and intermediate results of calculation.

Memory Unit

- Memory unit stores the data, instructions, intermediate results and output, temporarily, during the processing of data.
- This memory is also called the main memory or primary memory of the computer.
- The input data that is to be processed is brought into the main memory before processing.
- The instructions required for processing of data and any intermediate results are also stored in the main memory.
- The output is stored in memory before being transferred to the output device. CPU can work with the information stored in the main memory.
- Another kind of storage unit is also referred to as the secondary memory of the computer.
- The data, the programs and the output are stored permanently in the storage unit of the computer. Magnetic disks, optical disks and magnetic tapes are examples of secondary memory.

APPLICATION OF COMPUTERS

