Chapter 1.Overview of Computer

Computer is an electronic device which accepts the input, processing on them and produces the output.

Data: Data is a collection of unprocessed items, which can include text, numbers, audio or video.

Information: Processed data is called information (Output).

Software: A Set or collection of programs or instructions is known as software.

Hardware: The physical components or parts of a computer system called as hardware.

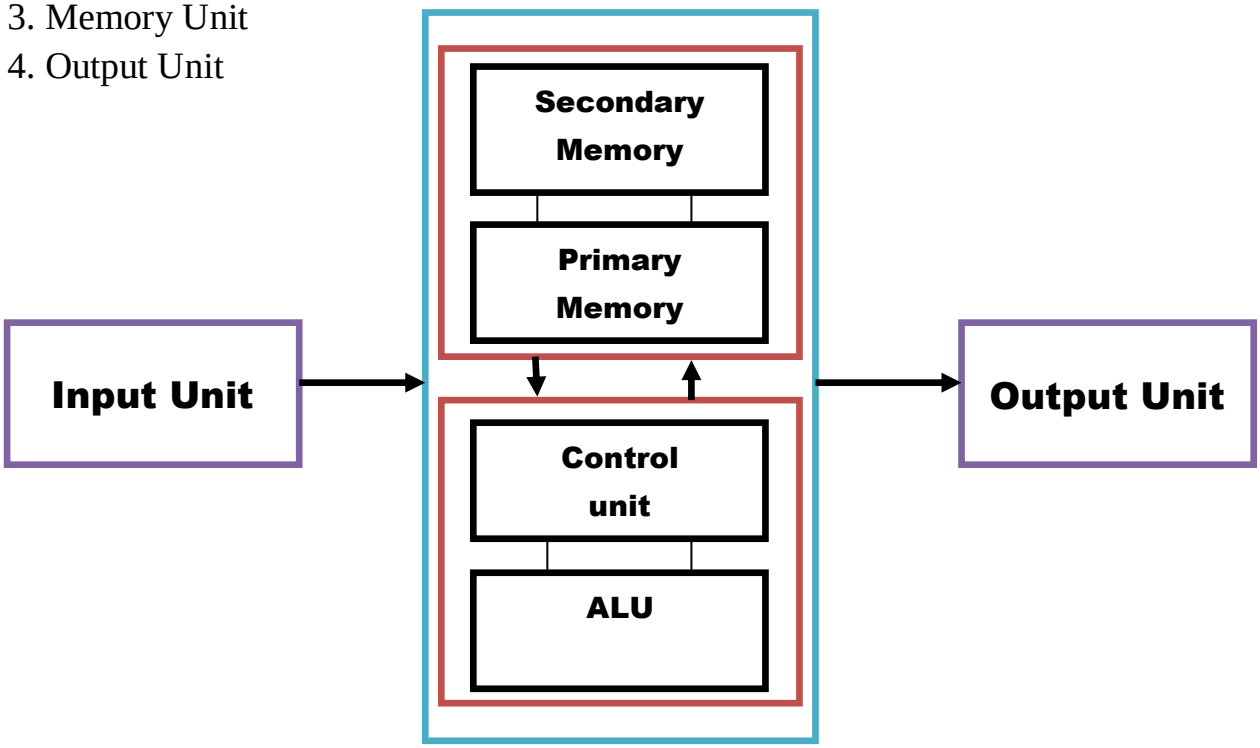
Characteristics of Computer:

1. **Speed:** The computer works very fast.
2. **Storage:** The computer can store a large volume of data and information.
3. **Accuracy:** The computer generated results are exact and without any mistakes
4. **Diligence:** Computer does not suffer from limitations like tiredness and lack of concentration.
5. **Versatility:** Computers are capable of performing any task.
6. **Cost effectiveness:** Computers reduce the amount of paper work and human effort, thereby reducing costs.

Functional components of a computer (Block diagram of a computer):

A computer is contains four basic units:

1. Input Unit
2. Central Processing Unit (CPU)
   - Arithmetic and Logic Unit (ALU)
   - Control Unit
3. Memory Unit
4. Output Unit



Input Unit: This unit accept the input from user and converts it into machine readable language. The input unit may consist of one or more input devices. Widely used input devices are keyboard, Mouse, scanner, microphone etc.

Central Processing Unit (CPU): CPU is the main part of the computer it carries out the instructions.CPU reads and executes the program instructions. Hence it is known as the brain of the computer. It consists of ALU, control unit and memory unit.

Arithmetic and Logic Unit (ALU): Arithmetic and logic unit performs both arithmetic operations (Addition, Subtraction, Multiplication, Divison, Modulus) and logical operations (AND,OR,NOT).

Control unit: Control unit acts as central nervous system and ensures that information is stored correctly. It also coordinates all input and output devices of a system. Also controls hardware operations.

Memory unit: The data and the instructions required for processing have to be stored in the memory unit before the actual processing. There are two types: Primary memory and secondary memory.

Output unit: Output unit receives the information from CPU and convert it into human readable language. Commonly used output devices are monitor, printer, speakers etc.

Evolution or History of computer:

Abacus: Approximately 4,000 years ago, the Chinese invented the Abacus. It was the first machine used for counting and calculating. This is the earliest computing machine. Abacus was mainly used for addition, subtraction and later for division and multiplication.

Napier's bones: John Napier invented another calculating tool "Napier's bones". A set of bones consisted of nine rods, one for each digit 1 through 9 and constant rod for digit 0.A rod is similar to one column of a multiplication table.

The slide Rule: The slide Rule was invented by William Oughtred. It is based on the principle that actual distance from the starting point of the rule is directly proportional to the logarithm of the numbers printed on the rule.

Adding Machine (Pascaline): Blaise Pascal invented the Pascaline. The Pascaline is known as first mechanical calculator. Pascaline could add,subtract,multiply and divide the numbers.

Leibniz Calculator: Gottfried Leibniz built a calculator that could add, substract, multiply and divide the numbers. Leibniz Calculator add,subtract,multiply and divide the numbers.

Jacquard loom: Joseph Mary Jacquard invented the Jacquard loom. A powered loom that used punched wooden cards to automatically weave incredibly detailed patterns including pictures and text. This can be taken as the first "Read only Memory" device.

Difference and Analytical Engine: Charles Babbage designed an automatic calculating machine called the Difference Engine. Later he developed mechanical-digital computer called Analytical Engine. This analytical machine consisted five units, which became the basic principle for the development of modern computer. Hence Charles Babbage is known as the "Father of Computers".

First Programmer: Lady Ada Lovelace is the first programmer, who designed program for Babbage's Analytical Engine.

Hollerith Tabulating Machine: Herman Hollerith invented a counting machine to count the population of USA. It was one of the main electronic counting devices. It was based on punched cards. Herman Hollerith was the founder of the company that became famous as IBM.

Generations of Computer:

Depending on the development of the technology the generation of computer is classified into five generations.

First Generation of Computer:

1. Vacuum tubes are used for internal operations.
2. Input was based on punched card and paper tapes an output was obtained as printout.
3. Magnetic drum is used for memory.
4. This generation computers operated only on machine language.
5. The speed of these computers was very slow, storage capacity was very less and these computers are large in size.
6. These computers were very expensive to operate and consumed large amount of electricity.

During first generation, few computers were developed such as Mark-I,ENIAC,EDVAC AND UNIVAC.

Mark-I: Harvard Mark-I as the first major American development in computing race developed by Aiken.

ENIAC: It stands for Electronic Numerical Integrator and Computer. ENIAC is developed by John W Mauchly and Eckert. It used a word of 10 decimal digits instead of binary ones like previous automated calculators or computers. ENIAC contains more than 2000 vacuum tubes and 18000kms of wires.

EDVAC: It stands for **Electronic Discrete Variable Automatic Computer.** It was to be a vast improvement upon ENIAC. Mauchly and Eckert started working on it two years before ENIAC even went into operation. This idea was to have the program for the computer stored inside the computer. EDVAC us e binary rather than decimal numbers and simplifying the construction of arithmetic units.

UNIAC: It stands for **Universal Automatic Computer .It** was the first commercial computer produced in the United States

Second Generation of Computer:

1. In this generation transistors were used for switching circuits and internal operations.
2. Second Generation computers used punched cards for input and printout for output.
3. Magnetic core is used for memory.
4. This generation computers operated on assembly language.

5. High level languages were developed during this generation such as COBOL and FORTRAN.
6. This generation computers become smaller, faster, economical and more reliable than first generation computers.

Third Generation of Computer :

1. Integrated Circuits (IC's) were used for switching circuits and internal operations.
2. In this generation, Keyboard and monitors were used instead of punched cards and printout.
3. Magnetic disk is used for memory.
4. Third generation computers were interfaced with an operating system which allowed to solve a many problems at a time.
5. These computers were faster and with increased efficiency.
6. LSIC and VLSIC are used in this computer.

Fourth Generation of Computer :

1. Microprocessors were used for switching circuits and internal operations.
2. In this generation, Keyboard and monitors were used instead of punched cards and printout.
3. Magnetic disk is used for memory.
4. In this generation networking concept is introduced.
5. This computers is smaller in size and more powerful.

Fifth Generation of Computer :

1. Fifth generation computer based on Artificial Intelligence (AI) which made the computer think like human beings.
2. These computers are more intelligent and faster comparing to other generation computers.

Classification of Computer: Classification of computers based on either principles of operation or configurations (size,cost,capacity and performance).

Classification of Computer based on principles of operation:

Based on principles of operation, computers are classified into three types

1. Analog Computers
2. Digital Computers
3. Hybrid Computers

Analog Computers: Analog computer work on the principle of measuring, in which measurements obtained are converted into data rather than counting. In analog computer all calculations take place in parallel hence it is faster. Modern analog computers usually employ electrical parameters, such as voltages, resistances or currents, to represent the quantities being manipulated. Analog computer generally deals with the physical variables such as voltages, length, current, temperature, speed etc.

Digital Computer: Digital computer work on digital data such as information and numerical data. Digital computer process data into a digital value (0's and 1's). It uses binary number system in which there are only two digits 0 and 1. Each one is called a bit.Digital computers are unique. The digital computer is made for both general purpose and special purpose.

Hybrid Computer: A combination of analog and digital computer is called hybrid computer. Hybrid computer is accept both the analog and digital signals for processing. Now a day's analog-to-digital and digital-to-analog used for transforming data into suitable form. In these computers, some calculations take place in analog manner and rest of them takes place in a digital manner. Hybrid computers are best used in the hospital where the analog part is responsible for measurement of patient's heart beat, blood pressure, temperature and other vital signs.

Classification based on Configuration (performance, size, cost, capacity):

Based on configuration, computers are classified into four types:

1. Micro Computers
2. Mini Computers
3. Mainframe Computers
4. Super Computers

Micro Computers: Micro computer is also called personal computer. The number of processors in microcomputers will be one or two processors. It contains input devices, output devices, storage device and processor. It is used by one person at a time.

Example: Desktop (PC), Laptop, Notebook, Tablet, Palmtop, Smart Phone.

Uses of Micro computers:

- Used in office and home.
- Used for business and engineering application.

Mini Computers: Minicomputer is larger and more powerful than personal computer. It generally consists of two or more processors. It can execute five million instructions per second. Minicomputer can serve up to 4000 connected users simultaneously. It is normally accessed by users via personal computer or terminal. A device with a monitor and keyboard is called terminal. It has no processing power and cannot work as stand-alone computer.

Example: VAX-800, AS 400.

Uses of Mini computers:

- Mini computers are often used by small and medium sized companies to provide centralized store of information.

Mainframe Computers: Mainframe computer is very large computer in size. It is more powerful than mini computers. It consists of multiple processors. It is designed to perform multiple tasks for multiple users at the same time. Mainframe computers can serve up to 50000 users at the same time. A typical mainframe computer can execute 16 million instructions per second.

Example: NEC 610, DEC 10.

Uses of Mainframe Computers:

- Mainframe computers are used in large organizations.
- Mainframe computers are used to maintain the information of population(NADRA).

Super computers: Super computer is the fastest computer. Super computer is the biggest in size and the most expensive in price than any other computers. Supercomputer is the most sophisticated, complex and advance computer. It has a very large storage capacity. It can process trillions of instructions in one second. Supercomputers are used for highly calculations intensive task. Supercomputers are used for specialized applications.

Example: Eka, PARAM,Yuva ,Cray XP,Eta-10 etc.

Uses of Super computers:

- Weather Forecasting
- Nuclear energy research
- Space Science
- Weapons and Missile design
- Animated Graphics like Hollywood Movies
- Fluid dynamic calculations
- Petroleum Exploration etc.

Applications of computers:

- ❖ Schools and colleges
- ❖ Banks & Office
- ❖ Stock control in business firms
- ❖ Research and developments
- ❖ Entertainment and news
- ❖ Government office
- ❖ Satellite communication
- ❖ Hospital
- ❖ E-Commerce