

## CLASSIFICATION OF COMPUTERS

Computers can be classified in the following methods:

- I. Computational Method
- I. Size and Capability

I. Classification based on Computational method: Based on the way a system performs the computations, a computer can be classified as follows:

- Digital
- Analog
- Hybrid

**Digital computer:** A digital computer can count and accept numbers and letters through various input devices. The input devices convert the data into electronic pulses, and perform arithmetical operations on numbers in discrete form. In addition to performing arithmetical operations, they are also capable of:-

1. Storing data for processing
2. Performing logical operations
3. Editing or deleting the input data.

One of the main advantages in the use of digital computers is that any desired level of accuracy can be achieved by considering as many places of decimal as are necessary and hence are most suitable for business application. The main disadvantage is their high cost, even after regular reductions in price and the complexity in programming.

Example: To calculate the distance travelled by a car in a particular time interval, you might take the diameter of the tyre to calculate the periphery,

take into consideration the number of revolutions of the wheel per minute, take the time in minutes and multiply them all to get the distance moved. This is called digital calculation. A computer using the principle of digital calculations can be called a digital computer.

**Analog Computer:** Analog computers process data input in a continuous form. Data such as voltage, resistance or temperature are represented in the computer as a continuous, unbroken flow of information, as in engineering and scientific applications, where quantities to be processed exist as waveforms or continually rising and falling voltages, pressure and so on. As the measurements in analog computer are carried out by a few single-purpose devices, the analog computer offers low cost and ease in programming.

The main disadvantage of an analog computer is the accuracy factor, and the limited storage capacity. Hence it is not suitable for processing business data.

**Example:** If you see the principle of a milometer in a car it does not work with the same principle as explained in digital calculation. The rotation of the car wheels move some gears, the movement is transmitted to the meter by a flexible shaft. The meter itself contains some gears/wheels marked with numbers and is calibrated to give exact distance travelled in meter/kilometers. There is no calculation involved by numbers and the result is obtained by physical phenomenon. This method of calculation is called Analog method. A computer using analog method of calculation will be termed an analog computer.

**Hybrid Computer:** Computer can also be built using some parts employing digital computations, and some parts based on Analog principles. Such computers are called Hybrid computer.

Example: In Process Control Computer Systems, the input comes from devices like pressure, gauge, thermometers, motors etc. These pressure control uses analog methods in the relevant areas. The inputs from analog devices are sent to a digital computation unit that runs the mathematical model for controlling

the process. These types of computers are called Hybrid because they use analog methodology in some parts and digital methodology in some others.

II. **Classification based on Size and Capability:** On the basis of size and capability, digital computers can be classified as:

- Super Computer
- Mainframe Computer
- Mini Computer
- Micro Computer

Super computers are the largest and most powerful; microcomputers are the smallest. Mainframe computers are large, expensive computers designed to meet a large organization's computing needs. Minicomputers are smaller than mainframes but still large enough to meet the computing needs of a medium-sized or small organization. Personal computers, or microcomputers, meet the computing needs of a medium-sized or small organisation. Notebook computers provide a personal computer's capabilities in a small lightweight portable package. All around us are embedded computers, special purpose computers that perform control functions in such devices as microwave ovens, fuel-injected systems and wristwatches.

### **Super Computer**

Supercomputers are the largest, fastest, most powerful, and most expensive computers made. Like other large systems, many individuals can access supercomputers at the same time. Super computers are used primarily for scientific applications that are mathematically intensive. The aerospace, automotive, chemical, electronics and petroleum industries use supercomputers extensively. Supercomputers are used in weather forecasting and seismic analysis. They are found in many public and private research centers, such as universities and government laboratories.

The first supercomputer was built in the 1960s for the United States

Department of defense. This computer was designed to be the world's fastest and most powerful computer of that time. The commitment to create the fastest, most powerful computer in the world is still the driving force behind the development of supercomputers. Manufacturers produce relatively few of any one model of supercomputer, and they spend irallions of dollars on research and development of new machines.

Supercomputers derive much of their speed from the use of multiple processors. Multiprocessing enables the computers to perform tasks simultaneously—either assigning different tasks to each processing unit or dividing a complex task among several processing units. The first supercomputer had four central processing units; the massively parallel processors of today contain hundreds of processors.

Supercomputers are rarely used for input/output-intensive processing, such as accounting or record-keeping operations.

The first super computer was the ILLIAC IV made by Bur Roughts. Other suppliers of supercomputer are CRAY, CDC, FUJITSU, NEC etc. A supercomputer CRAY-1 is considered the most powerful computer today. The supercomputers CRAY-2 and CRAY-3 developed by Seymore Cray are wonderful. Supercomputers can process

64 bits or more at a time. Their processing speed ranges from 10,000 million instructions per sec (MIKPS) to 1.2 billion instructions per sec. They can support 10,000 terminals at a time. They have huge numbers of storage and other devices connected to them. A supercomputer was used to alert scientists to the impending collision of a comet with Jupiter in 1994, giving them time to prepare to observe and record the event. Leaders in the development of supercomputers include Cray Research Company, Silicon Graphics, Thinking Machines Corporation. Fujitsu, IBM, and Intel. Cray Research Company, founded by Seymour Cray in 1972, has been the undisputed leader in this segment of the computer industry ever since. Silicon Graphics challenged that lead in 1995. Then, in 1996, it merged with Cray, which became a subsidiary of Silicon Graphics. Cray research recently delivered a 256 processor system

to the, Swiss Federal Institute of Technology And Silicon Graphics opened a technology center, directly connected to Silicon Graphics headquarters in California, to develop supercomputer applications in China. Thinking Machines has produced a super4computer called the Connection Machine, which has over 64,000 processors. The Connection Machine is reasonably priced at \$5 million. Silicon Graphics is mass-marketing the Cray T90 and Cray J90 (several hundred have been sold to date) with price tags of \$500,000 to \$2,500,000 Supercomputers have traditionally ranged in price from \$2 million to \$20 million.

## **Mainframe**

Mainframes are less powerful and cheaper than Super computers. However, they are big general purpose computers capable of handling all kinds of scientific and business applications. Mainframes, are used for applications as payroll computations, accounting, business transactions, information retrieval, and airline seat reservations. Mainframes can process several million instructions per second. More than 1,000 remote terminals can be supported by a Mainframe. Mainframes have large on-line secondary storage capacity. A number of different types of peripheral devices like magnetic tape drivers, hard disk drive, visual display units, plotters, printers and telecommunication terminals can be attached with Mainframe computers.

Since the first UNIVAC I was sold in 1951, the mainframe computer has been the cornerstone of the computer industry. IBM. The giant of the computer industry, captured the mainframe market in the late 1950s and made its name and fortune manufacturing mainframe computer systems.

The typical mainframe computer occupies much of a large room. Like supercomputers, mainframes require an environment with closely monitored humidity and temperature. For input/output-intensive operations,

mainframe computers are much more suitable than supercomputers. Many modern mainframes have multiprocessing capabilities, however, they are generally limited to fewer processors.

A mainframe computer system is usually composed of several computers in addition to mainframe, or host processor. The host processor is responsible for controlling the other processors, all the peripheral devices, operations. A front end processor is responsible for handling communications to and from all the remote connected to the computer system. Sometimes a backend processor is used to handle data retrieval operations. Although the host computer could perform all these operations, it can be used more efficiently if relieved of time consuming chores that do not require processing speed.

Mainframe computer systems are powerful enough to support several hundred users simultaneously at remote terminals. Terminals can be located near the computer or miles away. The capability to process many programs concurrently for multiple users is known as multiprogramming.

### **Mini**

This type of computer performs data processing activities in the same way as the Mainframe but on a smaller scale. The cost of minis is lower. As the name, a minicomputer is small compared with a Mainframe and may be called a scaled down. The creation of integrated circuits suitable for computers enabled designers to shrink the size of the computer. Before Digital Equipment Corporation (DEC) released the first DEC PDP-8 minicomputer in 1968, most medium sized organizations were priced out of the computer market because they couldn't afford mainframe computers. The DEC computer cost around \$50,000 a considerable savings compared with \$200,000 mainframe of that time.

Like mainframes, most minicomputers are multiuser systems. Many of today's minicomputers can accommodate as many as 200 users working from individual terminals. The major difference between mainframe and

minicomputers is in scale. Minicomputers can perform the same types of tasks as mainframes, but minicomputers are a little slower. Like mainframes, minicomputers can accommodate remote users but not as many.

The most popular Minicomputers or minis, are Nova, Dec, PDP\_II and IBM series.

### **Micro**

This is the smallest category of computers, consisting of a microprocessor and associated storage and input/output devices. These are also called Personal Computer systems. Microcomputers were first available for widespread use in the 1970's, when it became possible to put the entire circuitry of computers (CPU) into a small silicon chip.

Personal computers is so named because it is designed for personal use. IBM, the foremost computer manufacturing firm in the world, introduced the first PC named as IBM-PC. Personal computers are classified on the basis of size and portability. There are different types of microcomputer platforms with varying capabilities. The most common type of microcomputer is a desktop computer, which is a nonportable personal computer.

Portable computers are those personal computers that are light enough to be easily transported. Portable personal computers that are small enough to be set on the lap of a user are called laptop computers, notebook computers are approximately the size of a book. Portable personal computers that can be put in a pocket are called pocket or palm-sized computers.

The boundary between workstations and personal computers is becoming less distinct. Today's best normal personal computers are more powerful and offer more precise displays than the workstations of the recent past. The new Pentium pro microcomputers have multiprocessing capabilities. In addition, the distinction between workstation and microcomputers is becoming blurred because of the most powerful workstations. These workstations can be equipped so that more than one person can use the workstation at once, in

effect making the work station a minicomputer.

Most microcomputers enable the user to switch between tasks. This capability is known as **multitasking**, a single user variation on multiprogramming. Multitasking can be a great timesaver.

## **Hardware and Software**

We come across two terms quite frequently in relation to computers. These are Hardware and Software. Let us define these terms. We will discuss about them in more details later.

Hardware – Hardware refers to the physical components of a computer. The devices that physically ensure intake of data, storing them, processing them and displaying them are called Hardware.

Software – Software consists of sequence of instructions, in the form of a program to perform a particular task on a computer.

