



# Fundamentals of Computer

## **PART-I**

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**JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR**

UGC Approved Under 2(f) & 12(b) | NAAC Accredited | Recognized by Statutory Councils

Printed by :  
JAYOTI PUBLICATION DESK

Published by :  
*Women University Press*  
Jayoti Vidyapeeth Women's University, Jaipur

**Faculty of Education & Methodology**

**Title:** Fundamentals of Computer

**Author Name**Dr. Anamika Ahirwar

**Published By:** Women University Press

**Publisher's Address:** Jayoti Vidyapeeth Women's University, Jaipur  
Vedaant Gyan Valley,  
Village-Jharna, Mahala Jobner Link Road, NH-8  
Jaipur Ajmer Express Way,  
Jaipur-303122, Rajasthan (INDIA)

**Printer's Detail:** Jayoti Publication Desk

**Edition Detail:** I

**ISBN:** 978-93-90892-78-5

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# **FUNDAMENTALS OF COMPUTERS- Part I**

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# Chapter I: Introduction of Computer

## 1.1. DEFINITION OF COMPUTER

The word **computer** comes from the word “compute”. “Compute” means that to calculate.

A computer could be a programmable machine that manipulates data or information to store, retrieve and method information. A computer is largely a general purpose machine that processes the input file in keeping with a collection of directions keep internally to grant the output. To process information into data, a computer uses hardware and software system. The equipment connected to the computer referred to as “hardware”. The directions that tell the computer what to do are “software”. Figure 1 shows the diagram of modern computer.

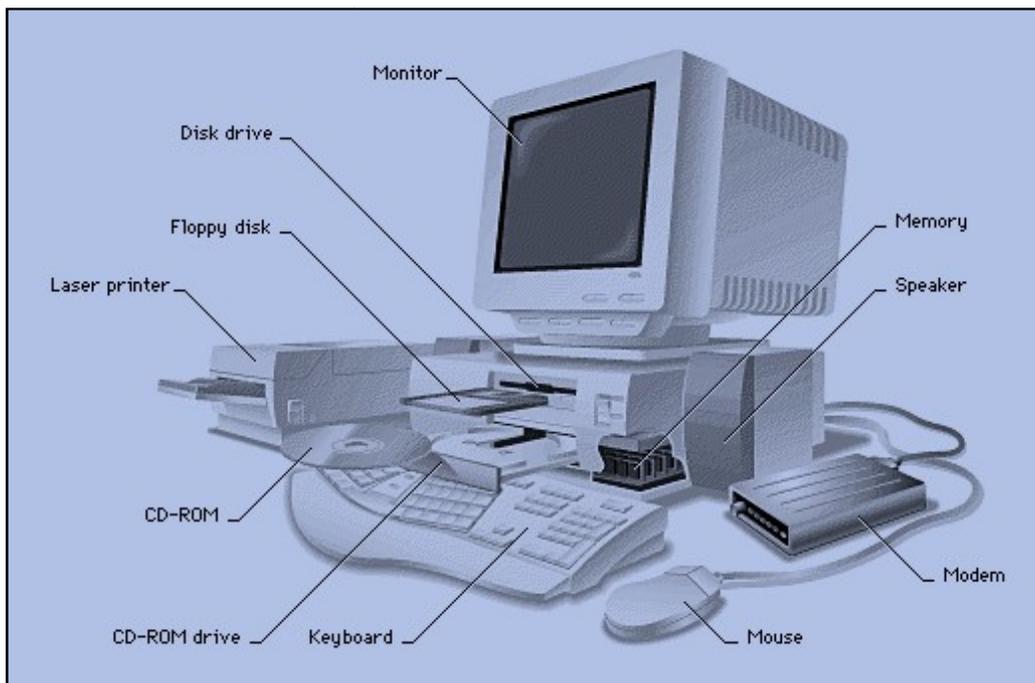


Figure 1: Modern Computer

### 1.1.1. Characteristics of Computer

The two principal characteristics of a computer are:

1. It responds to a particular set of directions during a well-defined manner.
2. It will execute a pre-recorded list of directions (a program).

### 1.1.2. Applications of Computers in varied Fields

Computers play a significant role in our trendy human life. Computer now-a-days are being employed virtually in each department to try and do the work on a larger speed and accuracy. In our standard of living computers are utilized in numerous fields. Engineers, doctors, students, teachers, architects, jewelers, and filmmakers all use computers to easy their work with larger preciseness and accuracy and fewer time taken.

Some of the outstanding areas of computer applications are shown in Figure 2:

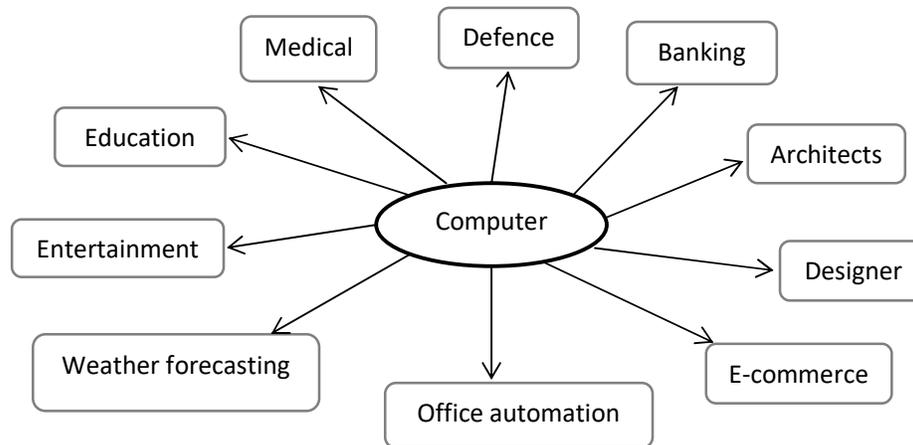


Figure 2: Area of computer applications.

### 1.1.3. Basic Computer Operation

- Input accepts knowledge and directions through the input devices like keyboard, mouse, scanner, microphone, joystick etc.
- Process and management performs the actions per the instruction issued and method the given computer file. The process might embrace ALU operations. It conjointly controls the general operations like ALU operations within the pc.
- Storage stores the information and therefore the directions for future execution.
- Output generates the specified output once executing the directions and therefore the process the computer file.

## 1.2. HISTORY OF COMPUTER

Classification	Properties	Generation				
		First (1942-1955)	Second (1955-1964)	Third (1964-1975)	Fourth (1975-1990)	Fifth (1990-till date)
Features	Major Innovation	Vacuum tubes	Transistors	Integrated circuit (ICs) as basic electronic component	LSIC, VLSIC (Micro Processor)	ULSIC (Ultra large scale integrated circuit)
	Main memory	Punched cards	RAM, ROM	PROM, DRAM	EPROM, SRAM	EEPROM, SIMM, DIMM
	External storage	---	Magnetic tapes & Magnetic disk	Improve disk (Floppy disk)	Floppy disk, hard disk	Modified magnetic, optical disks, flesh drive
	Input Output devices	Punched cards & papers	Magnetic tapes & Magnetic disk	Keyboard for input, monitor for output	Monitor for output	Keyboard, pointing device, scanner as input or monitor as main output
	Languages	Low level machine language	Assembly language, some high level languages for example Basic, COBOL, FORTRAN	More high level languages	Languages and application software's	AI (Artificial Intelligence) Expert system
	Operating system	No operating system, human operators to set switches	Human handles punched card	Complete operating systems were introduced	MS-DOS, PC-DOS	GUI based e.g. Windows XP, 7, NT

	Example	ENIAC, EDVAC, UNIVAC	IBM-1401, NCR-300, IBM-600 etc.	IBM SYSTEM/360, ICH- 360, HONEY WELL-316 etc.	IBM-PC, Apple Macintosh etc.	Laptop, note book, digital diary, palm top and pocket PC
<b>Advantages</b>		Vacuum tubes were the only electronic components available during those days	Similar in size as compared to first generation computers	Smaller in size as compared to previous generation computers	Low cost machine	Very large storage capacity
		Vacuum tube technology made possible the advent of electronic digital computers	More reliable	Even more reliable than second generation computers	High speed.	Long bit processor builds
		These computers were the fastest calculating devices of their time	Less heat generated	Even lower heat generated than second generation computers	Large memory	Artificial Intelligence Language developed
		They could perform computations in milliseconds	These computers were able to reduce computational times from milliseconds to	Able to reduce computational times from microseconds to nanoseconds	Small size	

			microseconds			
		<b>Generation</b>				
<b>Classification</b>	<b>Properties</b>	<b>First (1942-1955)</b>	<b>Second (1955-1964)</b>	<b>Third (1964-1975)</b>	<b>Fourth (1975-1990)</b>	<b>Fifth (1990-till date)</b>
<b>Advantages</b>			Less possibility to hardware failures	Maintenance cost is low because hardware failures are rare	Less power consumption	
			Better portability	Easily portable	Floppy disk is used as storage device. Semiconductor internal memory	
			Wider commercial use	Less power requirements than previous generation computers	Improve in software (spread sheet)	
					Hardware failure is negligible	
					Heat generated is negligible	
					Cheapest among all generations	
<b>Disadvantages</b>		Too heavy in size	Air conditioning still required	Air conditioning required in many cases	Highly sophisticated technology required for manufacture of ISI	Very large storage capacity

					chips	
		Unreliable	Frequent maintenance required	Highly sophisticated technology required for manufacture of IC chips		Long bit processor builds
		Produced large amount of heat	Manual assembly of individual components into a functioning unit was required			Artificial Intelligence Language developed
		Air conditioning required	Commercial production was difficult and costly			
		Possibility to frequent hardware failures				
		Constant maintenance required				
		Not portable				
		Commercial production was difficult and costly				

### 1.3. HARDWARE ELEMENTS OF A COMPUTER SYSTEM

1. **The central processing unit (Central process Unit)**- this carries out all the directions the computer should do. It's created up of:
  - a. A control unit that controls every of the steps the central processing unit makes because it works.
  - b. An ALU (Arithmetic and Logic Unit) that carries out the stepwise calculations and process.
2. **Main/internal memory** - RAM (Random Access Memory) is employed to store the software system, code and files knowledge used whereas the computer is running. ROM (Read Only Memory) is employed to store the software used to begin the hardware and load the software system code into RAM.
3. **Input devices** - these permit the input of knowledge into the computer (i.e. a keyboard or mouse).
4. **Output devices** - these permit the output of data from the computer (i.e. a monitor or printer).
5. **Secondary/Backing Storage** - these store knowledge once the computer is turned off (i.e. a tough disk).

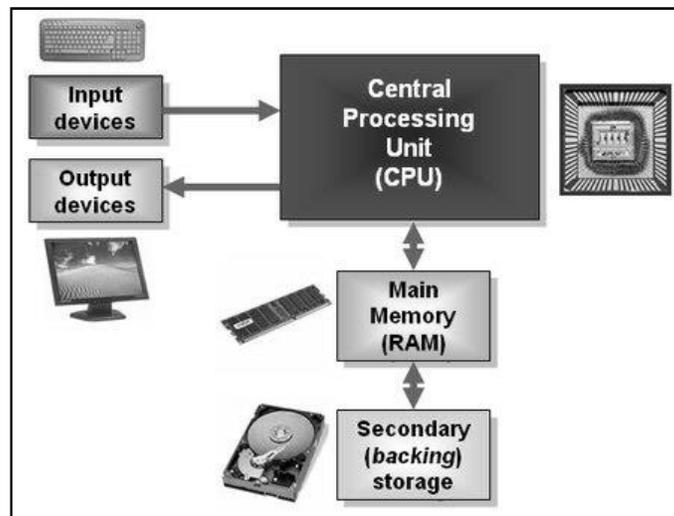


Figure 3: Hardware elements of computer systems

### 1.4. Information in Bytes

<b>Bit</b>	either a 1 or 0 (on or off)								
<b>Nibble</b>	4 bits								
<b>Byte</b>	8 bits								
<b>Kilobyte (KB)</b>	1,024 bytes								
<b>Megabyte (MB)</b>	1,048,576 bytes or 1,024 Kilobytes	873 pages of plaintext (1,200 characters)	4 books (200 pages or 240,000 characters)						
<b>Gigabyte (GB)</b>	1,073,741,824 (2 <sup>30</sup> ) bytes. 1,024 Megabytes, or 1,048,576 Kilobytes	894,784 pages of plaintext (1,200 characters)	4,473 books (200 pages or 240,000 characters)	640 web pages (with 1.6MB average file size)	341 digital pictures (with 3MB average file size)	256 MP3 audio files (with 4MB average file size)	1 650MB CD		
<b>Tera byte (TB)</b>	1,099,511,627,776 (2 <sup>40</sup> ) bytes, 1,024 Gigabytes, or 1,048,576 Megabytes	916,259,689 pages of plaintext (1,200 characters)	4,581,298 books (200 pages or 240,000 characters)	671,088,640 web pages (with 1.6MB average file size)	357,913,941 digital pictures (with 3MB average file size)	262,144 MP3 audio files (with 4MB average file size)	1,613 650 MB CD's	233 4.3 GB DVD's	40 25 GB Blu-ray discs

					size)				
<b>Peta byte (PB)</b>	1,125,899,906,842,624 (2 <sup>50</sup> ) bytes, 1,024 Terabytes, 1,048,576 Gigabytes, or 1,073,741,824 Megabytes	938,249,922,368 pages of plaintext (1,200 characters)	671,088,640 web pages (with 1.6MB average file size)	357,913,941 digital pictures (with 3MB average file size)	268,435,456 MP3 audio files (with 4MB average file size)	1,651,910 650MB CD's	239,400 4.38GB DVD's	41,943 25GB Blu-ray discs	
<b>Exabyte (EB)</b>	1,152,921,504,606,846,976 (2 <sup>60</sup> ) bytes, 1,024 Petabytes, 1,048,576 Terabytes, 1,073,741,824 Gigabytes, or 1,099,511,627,776 Megabytes	960,767,920,505,705 pages of plaintext (1,200 characters)	4,803,839,602,528 books (200 pages or 240,000 characters)	687,194,767,360 web pages (with 1.6MB average file size)	366,503,875,925 digital pictures (with 3MB average file size)	274,877,906,944 MP3 audio files (with 4MB average file size)	1,691,556,350 650MB CD's	245,146,535 4.38GB DVD's	42,949,672 5GB Blu-ray discs
<b>Zetta byte (ZB)</b>	1,180,591,620,717,411,303,424 (2 <sup>70</sup> ) bytes, 1,024	983,826,350,597,842,752 pages of plaintext	4,919,131,752,989,213 books (200 pages	703,687,443,750,000 web pages (with	375,299,970,000,000 digital pictures	281,474,977,500,000 MP3 audio files	1,732,153,707,691 650MB CD's	251,030,052,000 4.38GB	43,980,465,111 25

	Exabytes, 1,048,576 Petabytes, 1,073,741,824 Terabytes, 1,099,511,627,776 Gigabytes, or 1,125,899,910,000, 000 Megabytes	(1,200 characters)	or 240,000 characters)	1.6MB average file size)	(with 3MB average file size)	(with 4MB average file size)		B DVD's	GB Blu- ray discs
<b>Yotta byte (YB)</b>	1,208,925,819,614, 629,174,706,176 (2 <sup>80</sup> ) bytes, 1,024 Zettabytes, 1,048,576 Exabytes, 1,073,741,824 Petabytes, 1,099,511,627,776 Terabytes, 1,125,899,910,000, 000 Gigabytes, or 1,152,921,500,000, 000,000 Megabytes	1,007,438,183,0 12,190,978,921 pages of plaintext (1,200 characters)	5,037,190,915 ,060,954,894 books (200 pages or 240,000 characters)	720,575,937,5 00,000,000 we b pages (with 1.6MB average file size)	384,307,166, 666,666,666 digital pictures (with 3MB average file size)	288,230,375, 000,000,000 MP3 audio files (with 4MB average file size)	1,773,725, 384,615,38 4 650MB CD's	257,054 ,773,25 1,740 4. 38GB DVD's	45,035 ,996,2 73,704 25GB Blu- ray discs

## 1.5. CLASSIFICATION OF COMPUTER

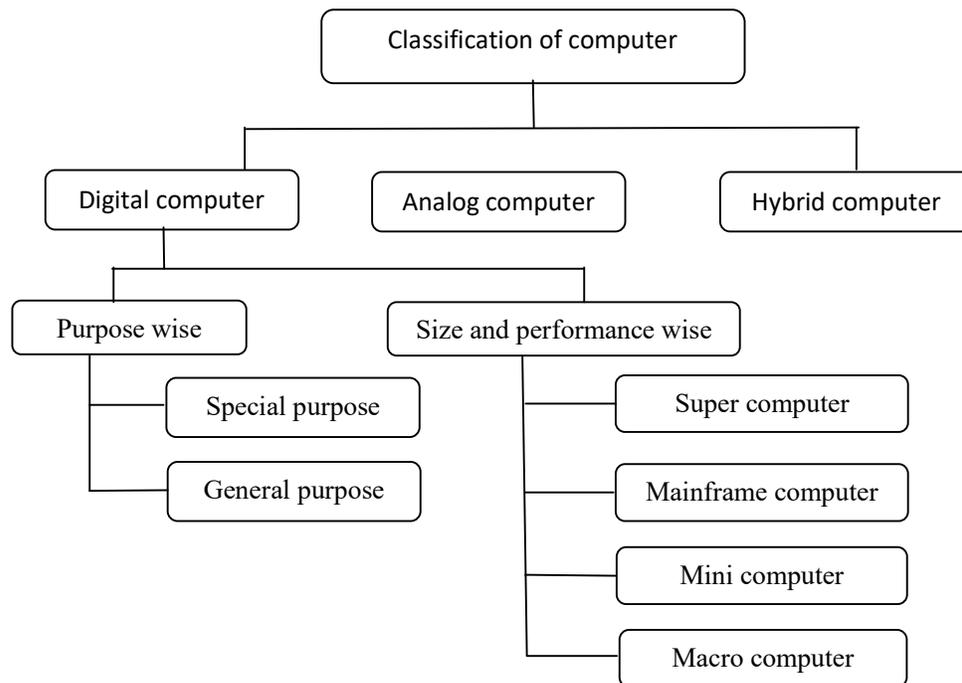


Figure 4: Classification of computer

### 1.5.1. Digital Computer

A digital computer is an electronic put together framework that works with respect to irregular information. Computerized PCs convert the information into twofold digits for example 0 or 1. All activities are completed on these digits at very quick rates. These computers realize how to tally the digits and add the digits. Digital computers are a lot quicker than analog computer and more precise.

The instances of digital computers are microcomputers, PCs, network workers, super PCs and multi-processor PCs.

#### 1.5.1.1. Classification of Digital Computers

Digital computers can be further classified in two ways:

##### (1) Purpose wise

- a. **Special-purpose computer:** Special-reason computer is intended to play out a particular undertaking. The guidelines to complete the assignment are for all time put away in the machine. They are otherwise called committed PCs, since they are devoted to play out a solitary undertaking. The speed of these computers is high and acceptable effectiveness, however they are not flexible. Models are carrier reservations, airport regulation, satellite tracking and so on.

- b. **General-purpose computer:** General sort of computer is a typical computer which is intended to play out an assortment of assignments. This kind of computer can deal with various sorts of projects contribution to it. The projects are not for all time put away however are contribution at the hour of execution. These computers are exceptionally flexible however are low in speed and effectiveness. These kinds of computers are utilized for logical, business purposes, in schools, universities and homes.

(2) **Size and performance wise**

- a. **Microcomputers:** Microcomputers were introduced in the early 70's. These microcomputers have less storing space and processing speed. Microcomputers are very smallest computers which contain only one CPU. These are mainly used in offices, homes, schools, shops, stores etc. Examples are IBM PCs, Apple, Mac, IBM, PS/2.
- b. **Minicomputers:** Minicomputers are more powerful computers than microcomputers as far as preparing force and capacities. These are more modest than centralized computers regarding size and different offices, (for example, speed, stockpiling limit and different administrations). Their adaptable nature they can be fitted any place they are required. Their velocities are appraised somewhere in the range of one and fifty million instructions per second (MIPS). They have essential stockpiling in hundred to 300 megabytes range with direct access storage device.
- c. **Mainframe computers:** Mainframe computer is extremely enormous and costly computer equipped for supporting hundreds, or even thousands, of clients simultaneously. Thus we state that these are multiuser, multiprocessor frameworks. They can deal with a few million guidelines for every second. Its putting away limit and information move rate is high. It has enormous on-line optional capacity limit. They are utilized in WAN. Models are ICL 39, CDC 6600, VAX 8842, IBM 3090/600, and IBM4381.
- d. **Super computers:** Super PCs are the most impressive computers. These comprise of a few processors running together accordingly making them extremely quicker and incredible. Its preparing speed goes from 10,000 million guidelines for each second to 1.2 billion directions per sec. They can uphold 10,000 terminals all at once. They have immense quantities of capacity and different gadgets associated with them. Models are CRAY-1, CRAY-2, CRAY-3, CDC-205 and ETA GF-10. PARAM and ANURAG are created by India and are sent out to numerous European nations.

### 1.5.2. Analog Computer

Analog computer is characterized as a PC that utilizes *continuous* physical phenomena, for example, electrical, mechanical, or pressure driven amounts to show the issue being settled. A thermometer is a basic simple PC. As the temperature shifts, the mercury moves correspondingly. Different models are climate anticipating, in petroleum siphon and so forth

Simple PCs work by estimating as opposed to computing. Analog computers are a lot of quicker in light of the fact that all calculations happens in equal yet their precision is poor when contrasted with advanced PCs.

### 1.5.3. Hybrid Computer (Analog + Digital)

Hybrid computers are characterized as the blend of Analog and Digital computer. A hybrid computer arrangement offers a practical strategy for performing complex simulations. Analog to Digital and Digital to Analog converters are fundamental in half breed computer to utilize forces of both Analog and advanced methods. Hybrid computer systems are utilized for logical applications, designing and in mechanical control measures.

Hybrid computers are best utilized in clinic where Analog part is liable for estimation of patient's heart beat, pulse, temperature and other essential signs and afterward the activity are done in computerized style to screen patient's imperative signs. Illustration of crossover framework is modem. It gives the great exactness that can be achieved with simple PCs and the more noteworthy control that is conceivable with computerized PCs, in addition to the capacity to acknowledge the info information in one or the other structure.

## 1.6. DIFFERENCE BETWEEN COMPUTER AND DIGITAL COMPUTER:

Following are the fundamental contrasts between analog computer and digital computer.

	<b>Digital</b>	<b>Analog</b>
Technology	digital technology is advanced and modern	Analog technology is still shows more precise and accurate output
Result (input/output)	Digital computer shows result of input in form of computer display screen, monitor, CD or other peripheral devices	Analog computer shows output in form of voltage signals and reading on connected meters
Use	If talk about electronic circuits, digital computer uses two switches on and off	Analog computer uses signals generators, op amps (operational amplifiers) and many resistors for flow of continuous signals
Work	Digital computer performs work discretely	Analog computer produces continuous voltage signals to perform continuously
Adoption	Today with invention of latest technology many digital computers are performing the	Analog computers are not able to perform the same for digital computers

	functions of analog computers	
Area	Digital computers are widely acceptable and useable around the world. They are being used more than analog computers	Analog computers are not
Storage	digital computers obviously requires memory in shape of hard disk, flash storage or memory chip to perform	There is no concept of memory disc, drive or chip in analog computer
Effect from noise	noise has no such effect on digital computers	Due to noise or disturbance in environment accuracy can be manipulate in analog computer

- Although computerized innovation is progressed and current yet simple innovation is still shows more exact and precise yield in contrast with simple
- Digital computer shows after effect of contribution to type of PC show screen, screen, CD or other fringe gadgets while simple PC shows yield in type of voltage signals and perusing on associated meters.
- If talk about electronic circuits, digital computer utilizes two switches on and off. While simple PC utilizes signals generators, operation amps (operational enhancers) and numerous resistors for stream of nonstop signals.
- Digital computer performs work discretely. However, simple PC produces consistent voltage signs to perform ceaselessly.
- Today with invention of latest technology many digital computers are performing the functions of analog computers. While analog computers are not able to perform the same for digital computers.
- Digital computers are widely acceptable and useable around the world. They are being used more than analog computers.
- There is no understanding of memory disc, drive or chip in simple PC. While computerized computers clearly requires memory fit as a fiddle of hard circle, streak stockpiling or memory chip to perform.
- Due to noise or disturbance in environment accuracy can be manipulate in analog computer while noise has no such effect on digital computers.

**Workstations** - A terminal or personal computer in an organization. In this unique circumstance, workstation is only a conventional term for a client's machine (customer machine) as opposed to a "worker" or "centralized computer."

## 1.7. COMPUTER ORGANIZATIONS

A computer fundamentally executes five significant capacities for example input, control and output.

**Input:** Input is the way toward entering information and projects into the computer system. The information takes information from the client to the PC in a coordinated way for handling.

**Storage:** Storage is the way toward saving information and guidelines for all time is known as capacity.

**Processing:** Processing is the task of carrying out arithmetic and logical operations on data that converts them into useful information.

**Control:** Control mean show directions are executed and the above activities are performed.

**Output:** Output produce results from the information for getting helpful data.

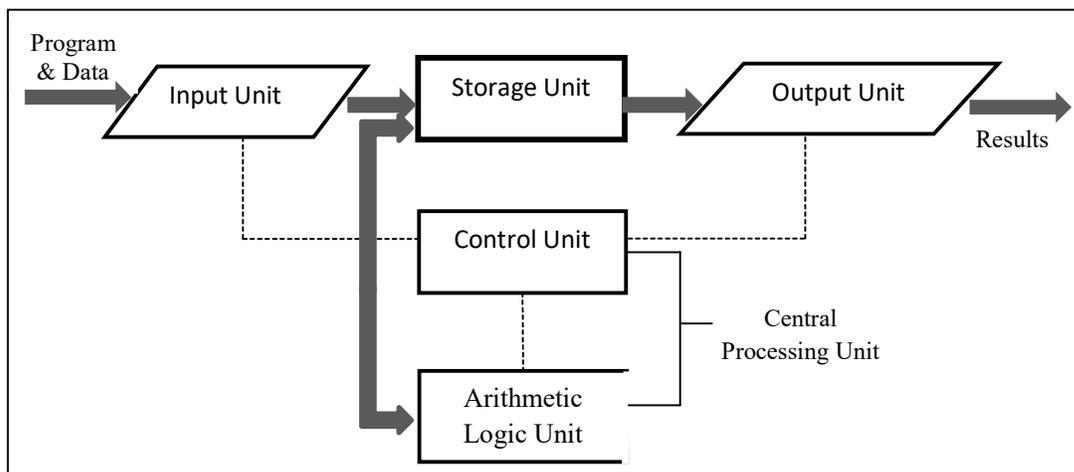


Figure 5: Basic computer operations

## 1.8. FUNCTIONAL UNITS

The computer allocates the task between its numerous useful units to hold out the operations mentioned higher than. The computer system is split into three distinct units for its operation. These units are Arithmetic Logical Unit (ALU), Control Unit (CU) and Central Process Unit (CPU).

### Arithmetic Logical Unit (ALU)

The ALU performs all the four arithmetical (add, subtract, multiply and divide) operations and a few logical operations like but, adequate to or larger than. Once two numbers are needed to be additional, these numbers are sent from memory to ALU where addition takes place and also the result's change within the memory. An equivalent manner different

arithmetic operations are performed. The Arithmetic Logical Unit takes information from memory unit and returns information to memory unit. It uses variety of registers and short term storage of characters whereas doing calculations or computations. It will do advanced calculations with quick speed.

### **Control Unit (CU)**

The next element of computer is that the management Unit. The management Unit determines the order during which computer programs and instruction are performed. The management unit sends management signals till the desired operations are complete properly by ALU and memory. Management unit execute programs by completing all the directions keep within the program. The metallic element gets program directions from memory and executes them one when the opposite. When obtaining the directions from memory in cu, the instruction is decoded and taken i.e. that operations. Then the asked operation is allotted. When the work of this instruction is completed, management unit sends signal to memory to send subsequent instruction in sequence to metallic element. The management unit even controls the flow of information from input devices to memory and from memory to output devices.

### **Central processing Unit (CPU)**

Central processing Unit (CPU) was 1st developed at Intel with the assistance of ted Hoff in the early 1970's. Computer hardware is that the kernel of the pc. Therefore computer hardware is accountable for handling all directions it receives from hardware and software running on the computer. The computer hardware has basically two primary parts, Control Unit (CU) and Arithmetic Logic Unit (ALU).

### **Register**

Registers are temporary storage units among the computer hardware. A register could hold a computer instruction, a storage address, or any reasonably information (like a touch sequence or individual characters). Some directions specify registers as a part of the instruction. Registers are commonly measured by the quantity of bits they will hold. For example, an eight-bit register suggests that it will store 8 bits of data or a 32-bit register suggests that it will store 32 bit of data Registers are accustomed store information quickly throughout the execution of a program. A number of the registers are measure accessible to the user through directions. Data and instructions should be place into the system. Therefore we'd like registers for this.

The basic computer registers with their names, size and functions are listed below

Register Symbol	Register Name	Number of Bits	Description
AC	Accumulator	16	Processor Register
DR	Data Register	16	Hold memory data
TR	Temporary Register	16	Holds temporary Data
IR	Instruction Register	16	Holds Instruction Code
AR	Address Register	12	Holds memory address
PC	Program Counter	12	Holds address of next instruction
INPR	Input Register	8	Holds Input data
OUTR	Output Register	8	Holds Output data

## 1.9. BUS ARCHITECTURE

A bus is defined as a group of physical connections (like cables, written circuits, etc.) which may be shared by multiple hardware elements so as to speak with each other.

**Purpose:** to reduce the quantity of "paths" needed for communication between the elements, by carrying out all communications over one knowledge channel. This can be why the figure of a "data highway" is typically used.

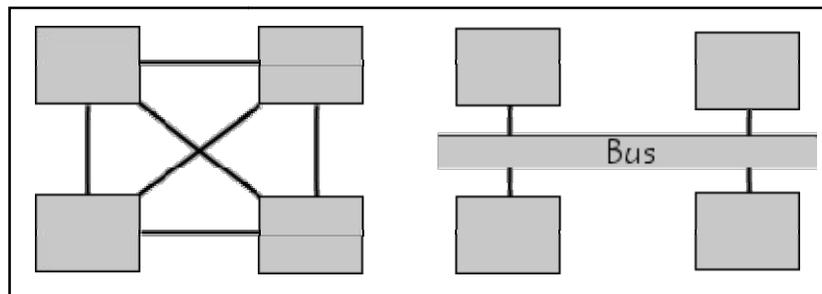


Figure 6: Example of Bus

If solely 2 hardware elements communicate over the line, it's known as a hardware port (such as interface or parallel port).

### Characteristics

A bus is characterized by the number of knowledge which will be transmitted directly. This quantity, expressed in bits, corresponds to the quantity of physical lines over that knowledge

is sent at the same time. A 32-wire ribbon cable will transmit 32 bits in parallel. The term "width" is used to check with the quantity of bits that a bus will transmit directly.

Additionally, the bus speed is additionally outlined by its frequency (expressed in Hertz), the quantity of information packets sent or received per second. Every time that knowledge is sent or received is named a cycle.

This way, it's attainable to search out the most transfer speed of the bus, the number of information that it will transport per unit of time, by multiplying its width by its frequency. A bus with a breadth of sixteen bits and a frequency of 133 megahertz, therefore, includes a transfer speed equal to:

$$16 * 133.106 = 2128 * 106 \text{ bit/s,}$$

$$\text{or } 2128 * 106 / 8 = 266 * 106 \text{ bytes/s}$$

$$\text{or } 266 * 106 / 1000 = 266 * 103 \text{ KB/s}$$

$$\text{or } 259.7 * 103 / 1000 = 266 \text{ MB/s}$$

### Architecture

There are three types of data bus, address bus and management bus that is set by the kind of signal it's carrying or the strategy of operation.

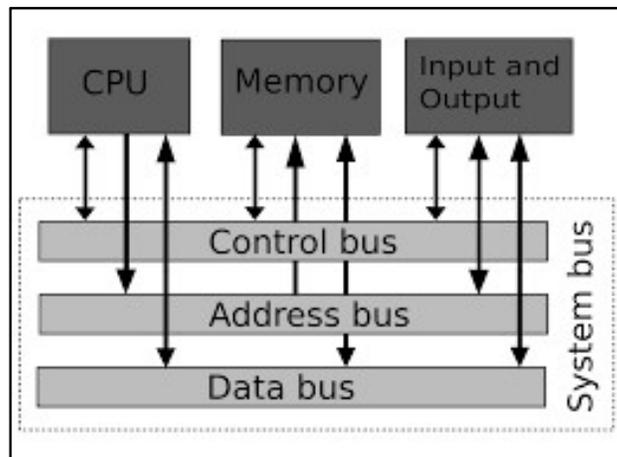


Figure 7: Bus Architecture

Usually every bus is recognized of fifty to a hundred distinct physical lines that are divided into three subassemblies:

- The address bus transports memory addresses that the processor needs to access so as to browse or write knowledge. It's a one-way bus. Address bus is typically known as the memory bus.

- The data bus transfers directions coming back from or aiming to the processor. It's a bifacial bus.
- The control bus transports orders and synchronisation signals coming back from the management unit and motion to any or all alternative hardware elements. It's a bidirectional bus, because it conjointly transmits response signals from the hardware. Control bus is additionally known as command bus.

### Primary Buses

There are typically two buses among a computer:

**1. Internal bus (sometimes known as the front-side bus or FSB):** the internal bus permits the processor to communicate with the system's central memory i.e. RAM.

**2. Expansion bus (sometimes known as the input/output bus):** expansion bus permits varied motherboard elements (like USB, serial, and parallel ports, cards inserted in PCI connectors, hard drives, CD-ROM and CD-RW drives, etc.) to communicate with each other. However, it's mainly used to add new devices using what are known as growth slots connected to the input/output bus.

### Chip Set

In an integrated circuit a chipset could be a set of electronic elements that manages the data flow between the processor, memory and peripherals. Typically a chip set is found on the motherboard. We can conjointly outline chipset because the element that routes knowledge between the computer's buses, in order that all the elements that structure the computer will communicate with one another.

Initially the chipset was created from a large range of electronic chips. There are typically two elements of chipset i.e. North Bridge and South Bridge:

1. **The North Bridge:** it's conjointly known as the memory controller, is in charge of dominant transfers between the processor and therefore the RAM that is much its set physically close to the processor. It's generally known as the Graphic and Memory Controller Hub(GMCH).
2. **The South Bridge:** it's conjointly known as the input/output controller or growth controller which handles communications between the peripheral devices. it's conjointly known as the I/O Controller Hub(ICH). The term bridge is mostly wont to be an element that connects two buses.

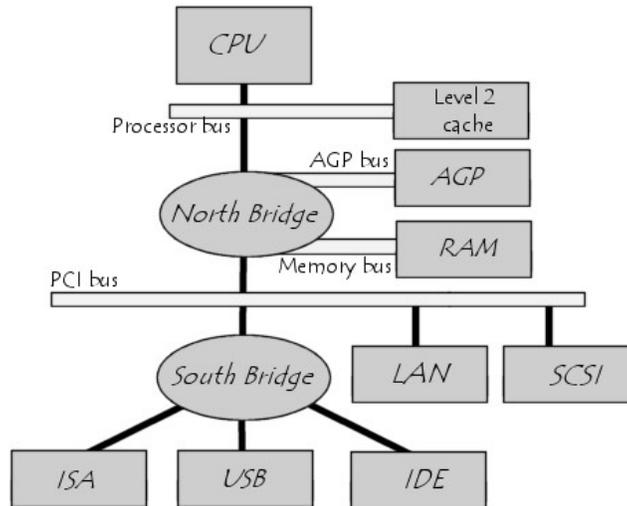


Figure 8: How Buses are connected

### 1.10. INSTRUCTION SET

CPU processes instructions and information. It receives orders from the software. It is the complete set of all the directions in machine language which will be recognized and executed by a central processing unit. These directions may be known as program code. They include the commands that you perpetually (via user programs) send to your computer using your keyboard and mouse. Commands to print, save, open, etc. Data is usually user information. as an example, have faith in that email users are writing. The particular contents (the text, the letters) are user information. However after you and your software package say “send”, users are causation program code (instructions) to the processor:

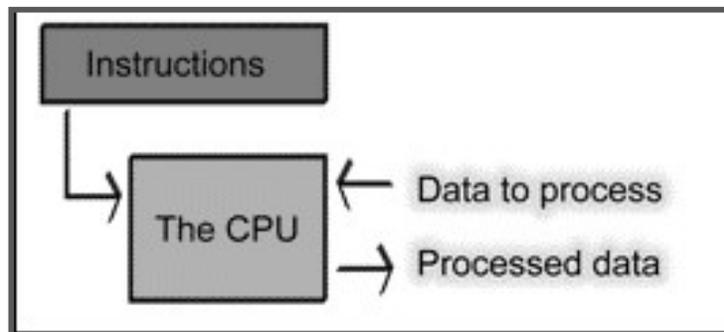


Figure 9: The instructions process the user data.

# Chapter II: Memory and Storage Device

## 2.1. INTRODUCTION OF MEMORY AND STORAGE DEVICE

A location wherever one thing is kept is memory. In computer memory; information, data and programs are kept. Typically memory is additionally called physical memory that refers to the particular chips capable of holding information. Some computers additionally use virtual storage that expands physical memory onto a hard disk.

Every computer comes with an explicit quantity of physical memory, typically observed as main memory or RAM (Read solely Memory). We are able to perceive main memory as associate degree array of boxes, each of which may hold one computer memory unit of knowledge. A computer that has one MB of memory, therefore, will hold concerning one million bytes (or characters) of knowledge.

### 2.1.1. Types of Memory

Computer uses two varieties of storage or memory:

1. Primary memory
2. Secondary memory

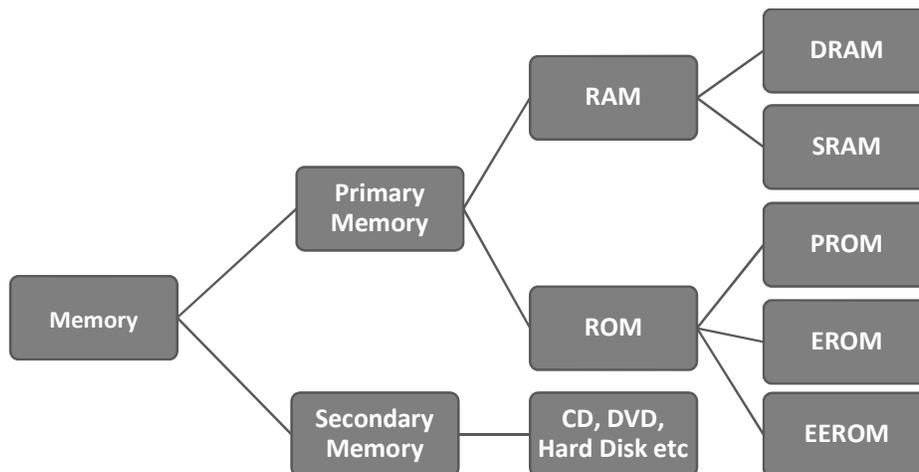


Figure10: Hierarchical of Memory

### 2.1.1.1. Primary Memory

Primary memory may be a part of computer that holds solely those information and directions on which pc is presently operating. It's additionally called main memory or internal memory of laptop. Primary Memory is volatile memory as a result of the memory can't store information for good. It has restricted area and information is lost once power is converted. It usually created of conductor and is placed on the motherboard within the sort of chips. These recollections don't seem to be as quick as registers. The info and instruction needed to be processed reside in main memory. It is divided into two subcategories RAM and memory board.

**A. RAM (Random Access Memory):** RAM is that the same as main memory. It performs read/write operations on memory. It's a volatile memory means that if power failures happened in systems throughout operation then data will lose permanently. RAM is subcategorized into Static RAM and Dynamic RAM.

**i. Static RAMs (SRAM):** Static RAMs retain keep data as long as power supply is on. They costlier and consume a lot of power. They are doing not would like refreshing circuits. They need higher speed than Dynamic RAMs.

**ii. Dynamic RAM (DRAM):** Dynamic RAM loses its keep data in a } very short time even supposing the power supply is on. Therefore, Dynamic RAMs got to be refreshed periodically, usually each a pair of msec. The Dynamic RAMs are cheaper and have high packing density and moderate speed. They consume less power. They are used wherever large capability capacities are required.

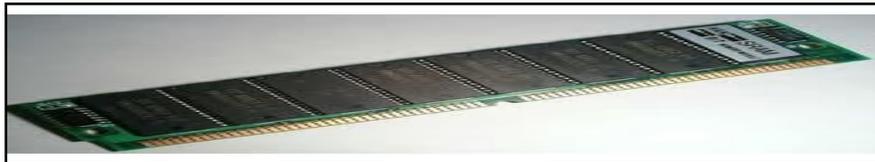


Figure 11: Example of SRAM

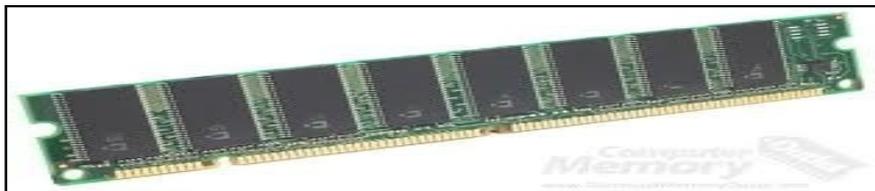


Figure 12: Example of DRAM

**B. ROM (Read Only Memory):** Read-Only Memory may be a permanent memory means that its contents aren't lost once power supply of computer is switched off. Thus read-only memory may be a non-volatile memory. The user cannot write into a read-only memory as its contents are written at producing time. ROMs store permanent programs and alternative kinds of data that are required by the computer to execute user programs. ROMs store operate like sine, cosine, logarithm, square root, exponential and code conversion tables, etc. an

example of a read-only memory is Toshiba Mask read-only memory, TCS 534000, 512 KX8 bits once more.

ROM can be further subcategorized into PROM, EPROM, and EEPROM.

- i. **PROM** (programmable read-only memory): A prom may be a chip on that a program is store. Once the knowledge is written by the user in prom it cannot be modified. Such data is needed whereas executing user programs. Like ROMs, PROMs are non-volatile.
- ii. **EPROM** (erasable programmable read-only memory): Once data is keep during a read-only memory or a prom chip it cannot be modified. However, there's another sort of chip referred to as erasable programmable scan only memory that overcomes this downside. An EPROM may be a special sort of prom that may be erased by exposing it to ultraviolet.
- iii. **EEPROM** (electrically erasable programmable read-only memory):It is additionally referred to as flash BIOS(basic input/output system).In this sort of memory high voltage electrical pulses are accustomed erase data content within the read-only memory. New data are often recorded in read-only memory by special software system program though there's a limit to the quantity of times that may be programmed. EEPROM chip permits user to upgrade their BIOS.

### **2.1.1.2. Secondary Memory**

This sort of memory is additionally called external memory or non-volatile memory. This memory is intended for user to copy their knowledge. it's the slowest and least expensive style of memory. It store vast quantity of knowledge and knowledge in permanent kind which will be transferred to be used once needed. It cannot be accessed directly by the central processing unit. It should initial be transferred into primary storage (also called RAM), then central processing unit will access it. These devices embody magnetic disks (like exhausting drives and floppy), optical disks (such as CDs and CDROMs), and magnetic tapes (which were the primary styles of secondary memory).

## **2.2. INTRODUCTION OF STORAGE DEVICES**

Storage device may be a device capable of storing knowledge. The term typically refers to mass storage devices, like disk and tape drives. In modern-day computers, storage devices are often found in several forms. Storage devices are often classified supported several criterions.

The following list provides some classifications of memory devices.

- Primary and Secondary and Tertiary Storage
- Volatile and non-volatile storage
- Read only and Writable storage
- Random Access and Sequential Access storage
- Magnetic storage
- Optical storage
- Semiconductor storage

**1. Magnetic tape:** Magnetic tapes square measure used wherever the massive volume of knowledge is keep for an extended time. The value of storing knowledge in tapes is cheap. Tapes accommodate magnetic materials that store knowledge for good. It are often twelve.5 metric linear unit to twenty five metric linear unit wide sheet kind and five00 metric linear unit to 1200 meter long that is coated with magnetic material. The deck is connected to the electronic equipment. It's like magnetic tape recorder.

**2. Hard Disk:** A hard drive is usually abbreviated as disc drive, HD, or HDD. It's a non-volatile memory hardware device that stores and retrieves data for good. It consists of a stiff disc created with non-magnetic material that is coated with a skinny layer of magnetic material. Knowledge is keep by magnetizing this skinny film. The disk rotates at a high speed and an electromagnet mounted on a moving arm is employed to scan and write knowledge. Its storing capability is highest and is quicker than floppy.

On a tough disk, knowledge is kept in skinny bands. A drive head will scan or write a circular ring or band referred to as a track. There are often quite one thousand tracks on a three.5 in. hard disc. Sections of every track square measure referred to as sectors. A sector is that the smallest physical storage unit on a disk that store 512 bytes in size.

A cylinder is created whereas all drive heads square measure within the same position on the disk. The tracks stacked on high of every alternative kind a cylinder. The system control reads this knowledge to position the drive heads within the correct sector position.

### **Hard Disk Structure**

In hard disk every platter is split into thin concentric bands like floppy disks called tracks. On a 3.5 inch hard disk there are often over 1000 tracks. Further, tracks are often divided into sectors. These are the smallest physical storage unit on a disk and that they are nearly always 512 bytes long. A bunch of tracks that have constant track number, are area unit on are platters is stated as a cylinder. Tracks are created once the disk is at the start formatted. Sometimes there are 1024 tracks on a hard disk, numbered from 0 (at the edge of the disk) to 1023 (near the centre).

The problem with this structure is that the tracks close to the centre are shorter than those close to the edge of the disk. to beat this downside, they're a lot of densely inhabited with knowledge, suggests that constant quantity of information are often written or scan over constant amount of your time, no matter the drive head position.

One aspect of the primary platter has house reserved for hardware-based track-positioning info that isn't offered to the package. This knowledge is written to the disk throughout assembly and is employed by the control to position the drive heads properly.

A sector is that the smallest physical storage unit on the disk and is typically 512 bytes long. Files ought to ideally be keeping in a very single contiguous area of disk space. Since most files are longer than 512 bytes, the filing system should allocate the amount of sectors needed to store the file, e.g.: a 640 computer memory unit file would need two sectors. If further

knowledge is appended to the file later, any sectors are often allotted. Below the Figure 13 shows the structure of hard disc.

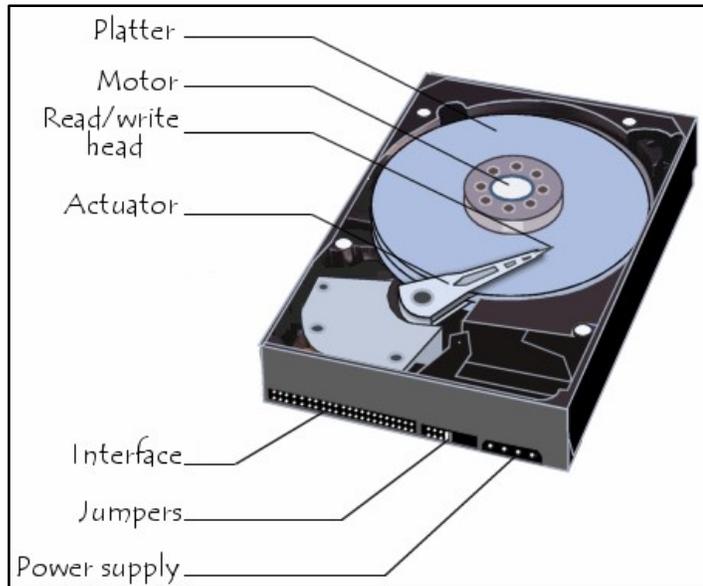


Figure 13: Structure of hard disk

### Hard drive components

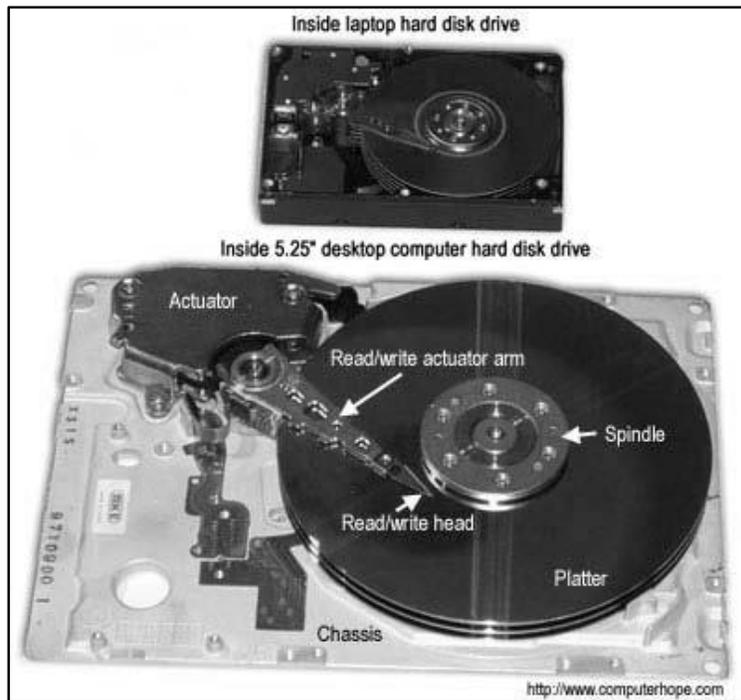


Figure 14: Hard drive components

As is seen within the image on top of, the desktop drive consists of the subsequent components: the pinnacle actuator, read/write mechanism arm, read/write head, spindle, and platter. On the rear of a tough drive may be a circuit card referred to as the control.

**3. Floppy Disk:** A floppy disk, diskette or just referred to as a disk, may be a magnetic storage medium for computers. It's composed of a thin, versatile magnetic disc sealed square sq. plastic carrier. Floppy disks are read and write by a disc drive (FDD) or just floppy. It a removable magnetic storage medium and is used for moving data between computers, laptops or different devices.

Today floppies are accessible in 3.5 in. and 5.25 in. sizes. 3.5 in. disc is extremely small. This can be coated with hard plastic. It's dust free and its storing capability is 1.44 MB. It's write protected notch. Whereas the dimensions of 5.25 in. floppy is bigger than 3.5 in. floppy. The cover of its body is extremely soft. The capability of a 5.25 in. floppy is 1.2 MB. It's simply broken by dirt. It's write protected notch. If button is down, we can scan data only. We have a tendency to can't change, write or copy any data, virus conjointly cannot shift. If button is up, we can do scan, write, copy and virus is shifted conjointly.

A number of various styles of floppy disks are developed, the dimensions of the floppy got smaller, and also the storage capability increased; but, within the 1990s, different media, as well as hard disc drives, ZIP drives, optical drives, and USB flash drives, began to replace floppy disks because the primary storage medium.

### **Types of Floppy Disks**

The first floppy disks that came on the market were 8 inches (200 mm) in diameter. The disk was protected by a versatile plastic jacket. an 8-inch disk back within the late 1970s may store concerning one MB of information. This was quickly followed by a smaller version of a similar style, the 5.25-inch (133 mm) floppy that may store concerning a similar quantity of data exploitation higher-density media and recording techniques.

In the early 1980s, the 3.5-inch (90 mm) floppy, or small floppy, came on the market, and this kind became the dominant storage medium dust computers for several years. Each of those discs needed a unique form of floppy disk drive. These were generally designed into the computer case itself.

Floppy disks were quite vulnerable. The disk medium was terribly sensitive to dirt, moisture, and heat. The versatile plastic carrier was conjointly not terribly durable. The hard plastic case of the 3.5-inch floppy presented a considerable improvement during this respect. the foremost common format of this floppy became the double-sided, high-density 1.44 MB disk drive.

**4. Optical Disk:** Optical disk is an electronic knowledge medium which will store over a floppy disk however but a tough disk. The primary optical was developed by James T. Russell within the late 1960s. They're a lot of reliable as compare to disc. Optical disc is

written to and read employing a weak laser beam. An optical device scans the dots, and also the knowledge was born-again to an electrical signal, and eventually to audio or visual output.

Optical disks are divided into the subsequent categories:

**A. Compact Disk:** CD-ROM stands for CD read only Memory. A CD-ROM is just referred to as a CD which will be read by a computer with an optical drive. Memory board means that the data on the disk is read-only as data cannot be altered or erased. as a result of their massive storage capability and also the read-only feature, CD-ROMs are an excellent media format for retail code. The primary CD-ROMs may hold concerning 600 MB of information, however currently they'll hold up to 700 MB. CD-ROMs share a similar technology as audio CDs, however they're formatted otherwise, permitting them to store many varieties of information.

**B. WORM:** WORM stands for Write Once scan several. WORM permits the user to put in writing knowledge for good on the disk. Once the info is written, it will never be erased while not physically damaging the disk. Here knowledge is recorded from keyboard, video scanner, OCR instrumentation and different devices. The advantage of this can be that, it will store vast quantity of information, amounting in gigabytes. Any document during a WORM is accessed in no time, say but thirty seconds.

**C. Erasable optical disk:** Erasable optical disk may be a read/write optical disk memory. Data is written to and read from the disk. The disk contents is erased and new knowledge is rewritten. Thus it will function a secondary memory of a computer. It rotates as a constant speed. Its tracks are concentric circles. Every track is split into variety of sectors. Its benefits over magnetic disc are:

- i. Terribly high storage capability.
- ii. An optical disc is far away from the drive.
- iii. Its long life.
- iv. It's a lot of reliable.

**D. Digital Video Disk (DVD):** DVD stands for Digital Versatile Disk or Digital Video Disk. It's associate degree storage device technology capable of storing giant amounts of knowledge on one disk the scale of a customary optical disc. The storage capability of a single-sided, one bedded disk is 4.7 gigabytes. There are many capacities one DVD disc is capable of holding. Below is a listing of the various kinds of DVD's and every of their total capability.

- i. One in all the foremost common DVD's is that the single-sided, single-layer disc, capable of holding 4.7 GB.
- ii. The single-sided, double-layer disc is capable of holding between 8.5-8.7 GB.
- iii. The double-sided, single-layer disc is capable of holding nine.4 GB.

iv. Though rare, the double-sided, double-layer disc is capable of holding up to 17.08 GB.

**E. Zip drive:** A zip drive may be a small, removable magnetic disc storage system used for backing up and archiving personal computer files. PC drive is introduced within the mid-1990s. It provides far more storage capability than floppy disks. Its storing capability is concerning one hundred MB. By the first 2000s zip drives became for the most part obsolete with the advance of USB flash drives, recordable CDs and external exhausting disks. Zipdrive is mounted in CPU and zip floppy is inserting only in it. These are used for lacking up hard disks and transferring large files. It's wont to produce zip disks.

**5. USB Flash Drive:** USB (Universal Serial Bus) flash drive is additionally called a flash drive, pen drive or keychain drive. It's a plug-and-play portable device that uses non-volatile storage and is light-weight enough to connect to a keychain. USB may be a small, portable device that plugs into a computer's USB port. A USB flash drive stores info like magnetic disc, however with a flash drive you'll simply transfer that info from one computer to a different. A USB drive is employed in place of a disk, zip drive disk or CD. Once the user plugs the device into the USB port, the computer's software package acknowledges the device as a removable drive and assigns it a drive letter. In contrast to most removable drives, a USB drive doesn't need rebooting once it's connected, doesn't need a battery or an external power offer, and is platform freelance. Many makers supply extra options like word protection, and downloadable drivers that enable the device to be compatible with older systems that don't have USB ports. USB drives are offered in capacities move up to close to 65 gigabytes (GB), depending on manufacturer, in an exceedingly corresponding vary of costs. A number of the foremost popular brand drives are Lear, Sandisk, Kingston, PNY, and Iomega.

## Chapter III: Input and Output devices

### 3.1. INTRODUCTION OF INPUT DEVICES

A data input device could be hardware or electronic equipment won't to send information to a computer. An input device permits users to speak and feed directions and information to computers for process, display, storage and/or transmission.

#### 3.3.1. Functions of Input devices

1. Settle for information from outside world.
2. Converts information into American Standard Code for Information Interchange code or binary type.
3. Sends information in binary type to the computer for more process.

#### 3.3.2. Types of Input Devices

There are many sorts of input devices that are employed by the computers. Some of them are general purpose, that is, they'll be employed by any computer. Keyboard is that the most typically used data input device. Apart from keyboard there area unit different input devices like mouse, joystick, touchpad, trackball, trackball, light pen, joystick, scanner etc.

##### 1. KEYBOARDS:

Keyboard is incredibly fashionable and therefore the most typical data input device that helps in inputting information to the computer. Within the period of time of computing, it absolutely was usually the sole data input device. The layout of the keyboard is like ancient character printer, though there are some extra keys (like Enter, Delete, etc.) provided for playacting extra functions.

##### 2. MOUSE:

Mouse was invented by Douglas Engelbart in 1963 whereas performing at Xerox PARC. It is a pointing still as positioning device that matches under palm of a hand. A typical mouse has two buttons. Because the user rolls it on a flat surface, the mouse controls pointer movement on the screen. Once the user presses one amongst the buttons, the mouse either marks an area on the screen or makes choices from information on the screen. It will be used for several applications, starting from games to coming up with products with graphics. It will be used as an alternate to keyboard or it will be employed in combination with a keyboard to boost input operations.

##### Functions of a Mouse:

A computer mouse has several functions that facilitate a user use their computer. The foremost common functions of a mouse are:

- Move the mouse pointer - the first use of an electronic device is to move the mouse pointer on the screen.
- Open or execute a program - Once you have moved the mouse to associate degree icon, folder, or different object clicking or double clicking that object opens the document or executes the program.
- Select - A mouse additionally permits you to pick a file or highlight and choose multiple files quickly.
- Scroll - once operating with an extended document or viewing an extended online page you will have to be compelled to scroll up or down thereon page. Employing a mouse wheel or clicking and dragging the scroll bar are another performing of the mouse.

**Types of computer mouse:** Cordless, Footmouse, IntelliMouse (Wheel mouse), J mouse, Mechanical mouse, Optical mouse.

1. **Cordless (Wireless):** A cordless mouse is known as a wireless mouse. It connects to a computer with none wires. Instead, the mouse uses some manner of wireless technology, like Bluetooth, RF, or infrared radio waves. Usually, a USB receiver is blocked into the computer and receives signals from the cordless mouse.



Figure 15: Logitech M705 Cordless (Wireless) mouse

2. **Footmouse:** Footmouse may be a variety of electronic device that enables a user to regulate the mouse indicator with their feet. The concept behind this technology is to permit a user to stay their hands on their keyboard and still be ready to use a mouse. An example of an organization that develops this can be Hunter Digital.

**3. IntelliMouse (Wheel mouse):** IntelliMouse is an optical mouse whole 1st developed by Microsoft in 1996. Thus it's also called Microsoft mouse, wheel mouse or scroll mouse. It's a wheel between the left and right buttons that enable the user to scroll up and down a web page; as critical exploitation the vertical scroll bar. Figure 16 shows an example of the first Microsoft IntelliMouse.



Figure 16: IntelliMouse (Wheel mouse)

The mouse wheel additionally acts as a push button once depressed. For instance, if you hover over a link and press down on the mouse wheel, it opens that link in a very new tab. Due to the wide quality of this mouse; it's become the quality mouse model used with most computers. Though "IntelliMouse" could be a Microsoft trademark, wheel mice are developed by each mouse manufacturer these days.

**4. J mouse:** Alternatively noted as a J Mouse or J Mouse, a J-Mouse was used with older transportable computers that utilized the "J" key on the keyboard to perform the functions of a computer mouse. It unremarkably had two separate buttons for the left and right-click below the spacebar. As may be seen within the image, the zenith or ZDS Z-Star EX keyboard the J-mouse is unambiguously known within a mouse associated an indented circle. It may be known visually and physically from the opposite keys on the keyboard. The following image is an example of the left and right mouse buttons found on the laptop computer.



Figure 17: J mouse

Because of its problem to use and higher technologies that were later introduced, this mouse isn't any longer utilized. We'd wish to give thanks Chris from ZDSParts for provision U.S.A. with a clear image of the Z-Star EX portable computer.

**5. Mechanical mouse:** A mechanical mouse could be an electronic device that contains a metal or rubber ball on its side. Once the ball is rolled in any direction, sensors within the mouse observe this motion and move the on-screen mouse pointer within the same direction. The image is an example of very cheap of a mechanical mouse with the ball removed. Today, this mouse has been replaced by the optical mouse.



Figure 18: Mechanical Mouse

**6. Optical mouse:** The optical mouse initial introduced by Microsoft on 19 April 1999 that uses light-emitting diodes (LED) or optical device to assist track movement. These mice are known by examining very cheap of the mouse. As seen within the figure below the optical-mechanical mouse incorporates a ball, and also the optical mouse incorporates a lightweight emitting from very cheap.

Drawbacks of some optical mice are that it works properly in rooms with bright lights and a few surfaces like a glass table. However, as compared to optical-mechanical mice, optical mice are a far higher resolution.



### **How will an optical mouse work?**

An optical mouse also encompasses a small low-resolution camera that takes a thousand or more photos each second. Within the camera, the complementary metal-oxide semiconductor (CMOS) sensor sends a proof to a Digital Signal Processor (DSP). The DSP will analyze every image for pattern and lightweight changes then primarily based off those changes moves the mouse indicator on your screen.

### **Why is the mouse light red?**

Although not all optical mouse use red, it is the most common semiconductor diode used as a result of it's usually the cheaper diode and since the photo detectors are more sensitive to red light.

### **3. JOYSTICK:**

Joystick is an input device that permits the user move an object on the screen. It consists of a small, vertical lever (called the stick) mounted on a base that's used to direct the screen indicator around. Children's use joystick easily led play games. A joystick may be a stick set in two crossed grooves and might be moved left or right, forward or backward. Potentiometer mounted at the bottom of the joystick measure the number of movement, and is derived come the stick back to the center position once it's free.

The primary joystick was invented in 1926 at the U.S. naval work by C. B. Mirick and patented. It was a two-axis electronic joystick, kind of like the joysticks in use these days, and was original designed for remotely piloting aircraft. The picture shows the Logitech Freedom two.4, an example of a joystick.



Figure 20: Joystick

### **4. TOUCHPAD (GLIDEPOINT):**

A touchpad is an input device located on laptops and some keyboards to move a cursor with your figure. It is often utilized in place of an external mouse. It's additionally observed as a glide pad, glide point, pressure sensitive tablet, or trackpad. A touchpad is operated by using

your finger and dragging it across the flat surface of the touchpad. As you move your finger on the surface, the mouse indicator moves in this same direction. Like most computer mice, the touchpad additionally has two buttons below the touch surface that allows you to left-click or right-click.



Figure 21: Touchpad

## 5. TRACKBALL:

A data input device that appears like an upside-down mouse. The onscreen pointer is moved by the electronic device with a thumb or finger. An electronic device needs arm and gliding joint motion that an everyday mouse takes and thus is commonly less trying for the user to use, serving to forestall RSI. The image of the Logitech cordless electronic device mouse is an example of an electronic device mouse that uses the thumb for movement.



Figure 22: Trackball

## 6. TRACKPOINT:

IBM initially introduced TrackPoint in 1992. It's a mouse alternative used with moveable computers. TrackPoint may be a little, isometric joystick that resembles a pencil's implement head, settled between the "G," "H," and "B" keys on the keyboard. This technology allows the user to stay their hands on the keyboard and still be able to management the mouse. The left and right buttons for this mouse are ordinarily settled underneath the spacebar. The image shows an example of the TrackPoint.



Figure 23: TrackPoint

## 7. LIGHT PEN:

An electronic stylus may be a inform device. It's wont to choose a displayed menu choice on the cathode-ray tube. It's a sensitive pen like device. It's capable of sensing a footing on the CRT screen, once its tip touches the screen. Once its tip is moved over the screen surface, its photoconductive cell device detects the sunshine coming back from the screen and therefore the corresponding signals are sent to the processor. The menu may be a set of programmed decisions offered to the user. A lightweight pen can even be used for graphics work. A user will draw directly on the CRT screen with the sunshine pen.

## 8. JOYSTICK:

A joystick may be a inform device. It's wont to move the indicator position on a CRT screen. It performs an analogous to it of a mouse. A joystick may be a stick that has spherical ball at its lower finish yet as its higher finish. The lower spherical ball move in an exceedingly socket. The joystick is often moved right to left, forward, or backward. The electronic equipment within the joystick detects and measures the displacement of the joystick from its central position. The data is shipped to the processor.

## 9. SCANNER:

Scanners are a sort of input devices. The keyboard will input only text by using keys. If we wish to input an image the keyboard cannot do this. Thus by using scanners we can input any

graphical matter directly into the computer and show it back on the computer screen. Necessary kinds of scanners are optical scanners and magnetic ink character readers.

**a. Optical scanners:** The optical scanners are capable of reading information recorded on paper, using and light and lightweight sensors. The data to be scanned is typed information, information coded as ink or pencil marks, or info coded as bars. The following are the unremarkably used optical scanners-

**i. Optical Character Reader (OCR):** An optical character reader detects alphanumeric characters, written or typed on paper. It's going to be a hand-held scanner or a page scanner to observe lightweight reflected from a line or from a page of the text. The amendment within the mirrored lightweight is converted to binary information that is distributed to the processor

**ii. Optical Mark Reader (OMR):** Special marks such as bubble are ready on examination answer sheets or questionnaires'. The user fill in these squares or bubbles with soft pencil or ink to point their alternative. These marks are detected by an optical mark reader and therefore the corresponding signals are sent to the processor.

**iii. Optical Bar-code Readers:** This methodology uses variety of bars or lines of varying thickness and spacing between them, to point the specified information. Bar-code is employed on most grocery things. An optical-bar scanner will read such bars and convert them into electrical pulses to be processed by a computer. the foremost unremarkably used bar-code is Universal Product Code (UPC). The UPC code uses a series of vertical bars of varied widths. These bars square measure detected as 10 digits. The primary 5 digits determine the provider or manufacturer of the item. The second 5 digits determine individual product. The code additionally contains a check digit, to make sure that the data scan is correct or not.

**b. Magnetic Ink Character Reader (MICR):** MICR is wide employed by banks to process large volumes of cheques and deposit forms, written daily. A special ink referred to as ink is employed to put in writing characters on the cheques and drafts that are to be processed by MICR.

## **10. TOUCH SCREEN:**

Touch screen may be a type of display screen that includes a touch-sensitive clear panel covering the screen. in touch screens, a grid of sunshine beams or fine wires crisscrosses the compiler screen. When you touch the screen along with your finger, the rays are blocked and therefore the computer senses wherever you've got pressed and thereby identifies the object that you would like to settle on. Principally it's accustomed select choices that are displayed on screen. are screen square measure terribly straightforward to use hence they're usually used as input devices in public places like ATM, Airports, Travel Agencies etc.

### 3.2. INTRODUCTION OF OUTPUT DEVICES

An output device may be a peripheral that enables a computer to communicate info to humans or another machine, by accepted information from the pc and remodeling them into an acceptable kind.

Output that may be understood by humans is within the kind of:

- (1) **Hard copy:** hard copy is an output on paper and might be scan instantly or keep and browse later. This can be a comparatively stable and permanent kind of output. Examples are printer and plotter.
- (2) **Soft copy:** Soft copy is typically a screen displayed output. It a transient kind of output and is lost once the computer is turned off. Examples are visual display terminal or visual show unit (monitor).

#### 1. PRINTERS:

Printers are commonly used output devices. They supply info in a very permanent readable kind.

There are two kinds of printer that depends on the technology utilized in their manufacture.

- 1. Impact printers
- 2. Non-impact printers

There is one more classification in step with however they print-

- 1. Character printers
- 2. Line printers
- 3. Page printers

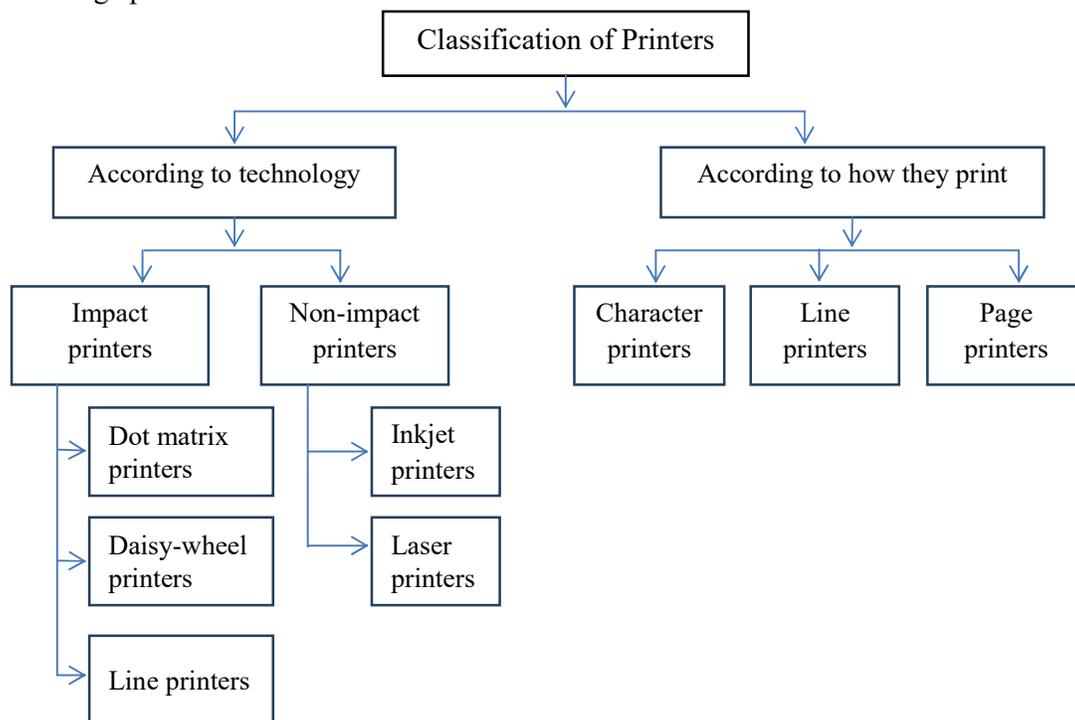


Figure 24: Classification of printers

## A. According to technology

(1) **Impact printers:** The printer that prints the information with the help of collision of print head on the inked ribbon and paper are named as impact printers. Some samples of impact printers are dot-matrix printers, daisy-wheel printers, and line printers.

### Benefits:

1. They work with multipart forms that either have leaves of carbon or use carbon-imprinted paper as they use pressure to get a picture.
2. Their device mechanisms are designed to allow them to use continuous forms as they print one line at a time rather than one page at a time.

(2) **Non-Impact Printers:** Non-impact printers use ink spraying, static magnetization or a heating methodology to produce the required image on the paper or the other output media. Two common types of non-impact printers embody inkjet and laser printers. Inkjet printers spray very little drops of ink onto each page, whereas laser printers roll ink onto the paper using a cylindrical drum.

### Benefits:

1. Non-impact printers have advanced to a degree that they're higher than impact printers at as regards to everything apart from feeding continuous paper and dealing with multi-part forms.
2. They need abundant higher resolutions since, rather than using metal pins, they'll use drops of ink measured in picoliters or toner particles measured in micrometers.
3. Non-impact printers are typically quieter and need less maintenance than impact printers, since they do not physically strike a ribbon against the paper.

*Usually a non-impact printer are quicker than printer, however the disadvantage of non-impact printer is that it turn outs single copy of text whereas impact printers produce multiple copies of the text.*

## B. According to how they print

### (1) CHARACTER PRINTERS:

Character printers print one character at a time. Three of the foremost usually used character printers are:

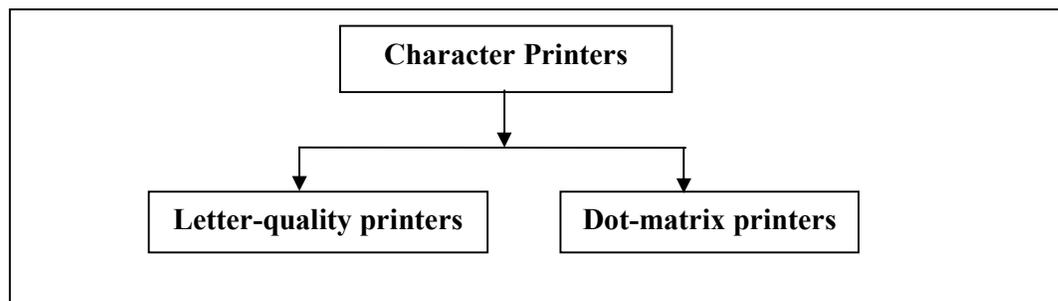


Figure 25: Classification of Character printers

**a. Letter-quality printers:** These printers use printwheel font known as daisy print wheel. Each petal of the wheel contains a character embossed on it. A motor spins the wheel at a fast rate. A print hammer strikes it to produce the output. Wheel printers are impact printers. Their output resembles a typed output which they're noted for their print quality. The speed of these letter-quality printers typically ranges from ten to fifty characters per second.

**b. Dot-matrix printers:** These printers print each character as a pattern of dots. The print head includes a matrix of very little needles, typically seven rows with nine needles in each (9 x seven matrix), that hammers out characters at intervals the sort of patterns of very little dots. The shape of each character, i.e. the dot pattern, is obtained from info management electronically at intervals the printer. The print quality of a dot-matrix printer is inferior to that of a wheel printer. But dot-matrix printers are faster than letter-quality printers at intervals the vary of forty to 250 characters per second.

## (2) LINE PRINTERS:

In business where large amount of material are written, the character-at-a-time printers are too slow; therefore, these users would really like line-at-a-time printers. Line printers, or line-at-a-time printers, use special mechanism which is able to print a full line at once; they will typically print the range of 1,200 to 6,000 lines per minute. Drum, chain, and band printers are line-at-a-time printers.

There are three types of line printers–

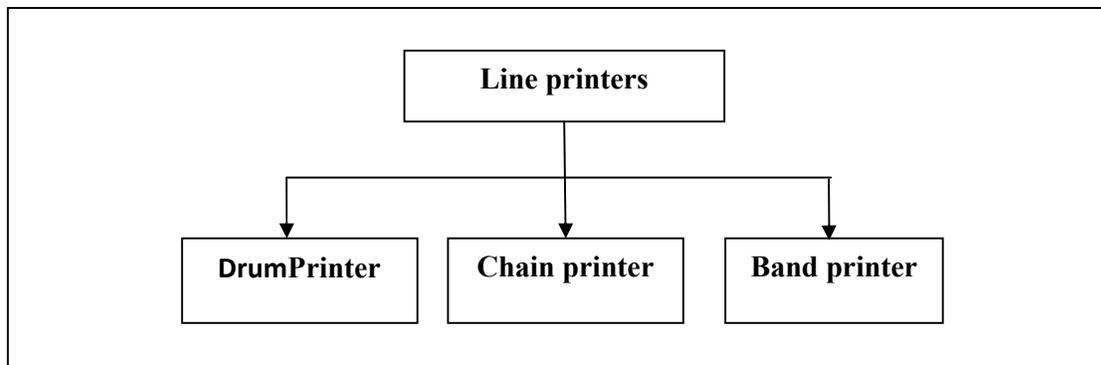


Figure 26: Types of Line printers

**(i) Drum printer:** A printing machine consists of a solid, cylindrical drum that has raised characters in bands on its surface. There are as many bands as there are printing positions. Each band contains all the potential characters. The drum rotates at a fast speed. For each potential print position, that is, opposite to each band of the drum, there is a print hammer settled behind the paper. These hammers strike the paper, together with the connected ribbon, behind the paper. Typically speed of drum printers is within the vary of 300 to 2000 lines per minute.

**(ii) Chain printer:** Chain printers are speedily rotating chain that's named print chain. The print chain contains characters. every link of the chain is character font. The printers receive

all the characters to be written in one line from the processor. a sequence might contain over one listing. Once the required character comes within the print position, the hammer strikes the ribbon and paper against the character. Its speed lies within the vary of 400-2400 lines per minute.

**(iii) Band printer:** Band printers are rather like chain printers except it uses a band instead of a sequence and has fewer hammers. Band printer contains a band divided into five sections of forty eight characters each. The hammers on a band printer are mounted on a cartridge that moves across the paper to the acceptable positions. Characters are turned into place and affected by the hammers. Font styles can merely be changed by substitution a band or chain. Some printers can print up to 3000 lines/min.

### **(3) PAGE PRINTERS:**

These are really high speed nonimpact printers, which can prove documents at speed of over 20,000 lines per minute. Electronics, xerography, lasers, and completely different technologies have created these high-volume systems potential. These techniques, named as electro photographic techniques, have developed from the paper apparatus technology.

Advantages of optical laser printers are-

- 1) Really high speed
- 2) Really high image quality
- 3) Low background level
- 4) Glorious graphics capabilities
- 5) Low maintenance demand.

## **2. PLOTTERS:**

Plotters are output devices. They are accustomed prove precise and smart quality graphics and drawings at a lower place computer's management. A plotter reproduces drawings exploitation pens that are connected to movable arms. The pen is directed across the surface of a stationary piece of paper. High quality bar graph, pie charts, created with a plotter provides an excellent quality output. Plotters are really valuable but they are in a very position in providing pictures footage. Plotters are in a very position in characteristic voluminous colors. The pen plotters might even be classified into the following types-

- Drum plotters
- Micro grip plotters
- Flat-bed plotters
- Inkjet plotters

### 3. SPEAKERS:

A speaker may be a device that converts analog audio signals into the equivalent air vibrations so as to create audible sound. A system's speaker is that the part that takes the signaling keep on things like CDs, tapes, and DVDs and turns it into actual sound that we will hear. The speakers that are connected to the computer are kind of like those that are connected to a stereo. The sole distinction is that the computer system's speakers are typically littler and that they contain their own small electronic equipment. Speakers receive perpetually dynamical electrical phenomenon from sound card. This current is transferred to a magnet that pushes the speaker core back and forth. This manner pressure vibration is generated that makes sound.

### 4. SOUND CARDS:

A sound card may be a peripheral device that attaches to the ISA (Industry standard Architecture) or PCI (Peripheral component Interconnect) slot on a motherboard to enable the computer to input, process, and deliver sound.

The four main functions of sound card are:

- (1) As a synthesizer (generating sounds)
- (2) As a MIDI interface
- (3) Analog to Digital conversion (for example, in recording sound from a microphone)
- (4) Digital to Analog conversion (for example, to breed sound for a speaker).

We can use three strategies for sound synthesis namely; frequency modulation (FM) technology, wavetable and physical modelling.

**Frequency Modulation (FM) technology:** this is often the smallest amount costly and least effective technique. Sounds area unit simulated by using algorithms to form circular function waves that area unit as shut as attainable to the sound. as an example, the sound of a stringed instrument will be simulated, though the result doesn't extremely sound noticeably sort of a stringed instrument.

**Wavetable:** Wavetable uses actual, digitally recorded sound samples keep on the card for the very best performance.

**Physical modelling:** during this synthesizing technique sounds are simulated through a complex programming procedure. Some sound cards may also have sounds downloaded to them.

### 3.3. SOFTWARE AND ITS TYPES

Software may be an assortment of computer programs and connected information that gives the directions for telling a computer what to do and the way to try and do it. Code refers to one or additional computer programs and data command within the storage of the computer for a few functions.

In other words, we will say that code may be a set of programs, procedures, algorithms and its documentation involved with the operation of a data process system. In brief, we will say that a group of directions that performs a selected task is named the program or code program. The directions within the program direct the computer to perform input operations, method the data, and output the results.

The software is assessed into the following-

-System software and application software

-Assemblers, Compilers, and interpreters

-System utility software

### **3.3.1. System Software**

A group of one or additional programs designed to manage the operation of a computing system. These are general programs written to help humans within the use of computing system and for creating the operations of the computer system more practical and economical.

System software is responsible for managing a range of independent hardware elements, in order that they will work along harmoniously. Its purpose is to unburden the applying code software engineer from the usually advanced details of the actual computer getting used, as well as such accessories as communications devices, printers, device readers, displays and keyboards, and conjointly to partition the computer's resources like memory and processor time in a safe and stable manner.

### **3.3.2. Application Software**

Application software is that the interface between the user and also the system software to permit the user to perform specific tasks.

Application software is developed from two main sources-

**1. User written application packages:** User written application packages are people who are designed and coded by the users of the package for their own use.

**2. Pre-written application packages:** Pre-written application packages are those packages that are written by another person or group and made out there to computer users like-

1. Word processor
2. Data manager
3. Electronic program

Traditionally, application packages square measure restricted to the final purpose functions of production schedule, ledger, and general accounting packages. Since, there's an excellent

demand for general purpose package. Special purpose packages have conjointly been developed for such areas as banking, hospital administration, insurance, video editing software, package, medical software etc.

### **3.4. ASSEMBLERS, COMPILERS, AND INTERPRETERS**

**Assemblers:** A program that translates a programming language program into a machine language program is termed an assembler. An assembler translates the programs written within the method codes (assembly language) into executable kind. A compiler will identical issue for programs written in a very problem-oriented language.

**Compilers:** A program that interprets a problem-oriented language program into a machine language program is termed a compiler. A compiler is a lot of intelligent than a programme. It checks every kind of limits, ranges, errors, etc.

**Interpreters:** an interpreter may be a program that interprets one statement of a problem-oriented language program into machine codes and executes it. During this approach it payoff additional, until all the statements of the program are translated and executed. A compiler is almost five to twenty five times quicker than an interpreter. an interpreter may be a tiny program as compared to the compiler. It occupies less memory space.

### **3.5. SYSTEM UTILITY SOFTWARE**

System utility software may be a program designed to perform maintenance work on the system or on system parts. For instance, a storage backup program, a disk and file recovery program, or a resource editor.

Utility programs conjointly referred to as service programs are routines that perform services like writing texts or programs, debugging programs to correct logical mistakes, sorting records into a specific sequence for process. a couple of samples of utility programs normally out there in a very automatic data processing system are: Text editor, Memory dump program, Debugging tool, type and merge, Trace routine, File manager, Loader, Linker and locator.

### **3.6. INTRODUCTION OF COMPUTER APPLICATION**

Now a day's computer plays an important role in our lifestyle. Everyone is connected either directly or indirectly with computers. From Engineers to Doctors, Students, Teachers, Government Organization all of them use computers to perform specific tasks, for recreation or simply to end work. Computers have created our life easier. When we work manually the time to finish the task is a lot of whereas through computer we are able to complete the task a lot of with efficiency in very less time and is a lot of correct. A number of the common applications are shown in Figure 27.

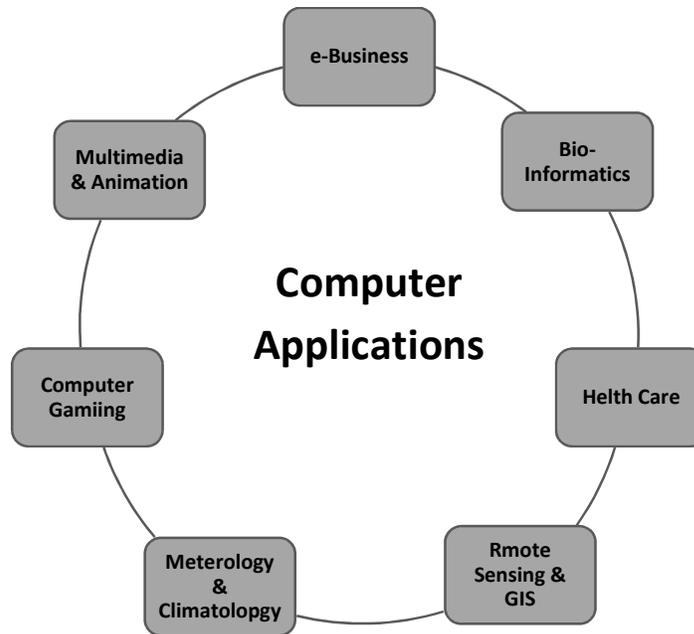


Figure 27: Computer Applications

(1) **E-Business:** E-businesses any system or application that empowers business processes. E-business is additionally called Electronic business or E-commerce. Nowadays this is often principally finished internet technologies. Applications of E-business is divided into three categories:

a. **Internal business systems:** This includes; client relationship management, Enterprise resource designing, worker data portals, data management, progress management, Document management systems, Human resource management, method management and Internal dealings process.

b. **Enterprise communication and collaboration:** This includes; E-mail, Voice mail, Discussion forums, Chat systems, knowledge conferencing and cooperative work systems.

c. **Electronic commerce:** Electronic commerce is Business-to-business electronic commerce or business-to-consumer electronic commerce. This includes; Electronic funds transfer, offer chain management, E-marketing and on-line dealings process.

(2) **Bio-Informatics:** Bio-informatics term originate from the term computers and biology. It derives data from computer analysis of biological knowledge. A serious activity in bioinformatics is to develop computer code tools to come up with helpful biological data. These will accommodates the data hold on within the order, however conjointly experimental results from varied sources, patient statistics, and scientific literature. Analysis in bioinformatics includes technique development for storage, retrieval, and analysis of the data. Bioinformatics could be a speedily developing branch of biology and is very knowledge domain, using techniques and ideas from scientific discipline, statistics, arithmetic,

chemistry, organic chemistry, physics, and linguistics. It's several sensible applications in numerous areas of biology and medication.

Computers play several roles in modern biology:

- Collecting and process signals detected by laboratory equipment: deoxyribonucleic acid sequences, CCD devices, spectrophotometers, and on the subject of the other device which will be connected to a computer via an analog to digital convertor.
- Tracking samples and managing experiments in industrial-style laboratories (e.g., in factor sequencing centers). Smaller labs haven't got the resources to invest in machine-controlled laboratory management; however using computer code to manually maintain lab-notebook-style electronic records is speedily turning into additional common.
- Storing knowledge publically databases, and additional significantly, public access to the info via refined internet searches and deposition mechanisms. NCBI, home of Genbank, PubMed, and alternative public databases, is that the premier example of the sort of knowledge services which will be designed onto a public biological database.
- Extracting patterns and rules from large knowledge collections and using these determined patterns to characterize and predict options in new knowledge. This is often the core of bioinformatics: developing tools which might acknowledge pattern matches and have signatures among an otherwise inexplicable knowledge set.
- Annotation: using automatic process ways to assign useful meaning to uncharacterized knowledge and to form informative links between totally different knowledge collections. As an example, several annotation systems use machine-controlled sequence comparison searches to identify potential genes in new genome knowledge.
- Simulation: victimization known data a couple of system, together with a mathematical or chemical science model, to simulate properties of the system. This class is unbelievably various, from simulating the motions of interacting protein molecules to modeling the flow of chemicals through organic chemistry pathways.

**(3) Healthcare:** Within the previous few decades incredible advances are created in health care. Computing technology has become very important in several areas of the health care business. Several of those have relied upon technology by applying applied science skills to medical issues. Mapping the human ordination was solely attainable as a result of algorithms developed by computer scientists. Image process and pattern recognition technology used to assess radiology scans and electronic medical records and physician ordering systems are currently returning on-line, reducing medical errors and rising the standard of care.

Robots are used for Microscopic surgery to enhance the correctness of the procedure. This improves the outcomes and reduces recovery time.

For example, data retrieval and data processing ought to give improved ways for early detection of illness outbreaks and unsuspected drug reactions. Personalized medication can give treatment plans, not supported applied math outcomes for big populations, however on the individual's polymer. Telemedicine can support medical examinations in remote areas of the globe and supply up so far diagnostic support. Computer helpful devices will permit the disabled or senior to steer fuller, additional independent lives.

**(4) Remote Sensing and GIS:** Remote sensing is that the art and science of constructing measurements of the planet exploitation sensors on airplanes or satellites. These sensors collect knowledge within the style of pictures and supply specialized capabilities for manipulating, analysing, and visualizing those pictures. Remote detected mental imagery is integrated at intervals a GIS.

A geographic data system (GIS) may be a computer-based tool for mapping and analyzing feature events on earth. GIS technology integrates common database operations, like question and applied math analysis, with maps. GIS manages location-based data and provides tools for show and analysis of various statistics, as well as population characteristics, economic development opportunities, and vegetation varieties. GIS permits you to link databases and maps to make dynamic displays. Additionally, it provides tools to envision, query, and overlay those databases in ways that inconceivable with ancient spreadsheets. These skills distinguish GIS from different data systems, and build it valuable to a large varies of public and personal enterprises for explaining events, predicting outcomes, and designing methods.

**(5) Metrology and Climatology:** Meteorology is that the science of weather. It's primarily an inter-disciplinary science as a result of the atmosphere, land and ocean represent an integrated system. The three basic aspects of meteorology are observation, understanding and prediction of weather. There are several kinds of routine meteorological observations. A number of them are created with easy instruments just like the measuring device for measure temperature or the wind gage for recording wind speed. The observant techniques became more and more advanced in recent years and satellites have currently created it attainable to watch the weather globally. Countries round the world exchange the weather observations through quick telecommunications channels. These are aforethought on weather charts and analysed by skilled meteorologists at forecasting centers. Weather forecasts are then created with the assistance of contemporary computers and supercomputers. Weather data and forecasts are of significant importance to several activities like agriculture, aviation, shipping, fisheries, tourism, defence, industrial comes, water management and disaster mitigation. Recent advances in satellite and technology have led to vital progress in meteorology.

Climatology may be a study of the climate of an area or region on the premise of weather records accumulated over long periods of your time. The typical values of earth science parameters derived from a knowledge base that extends over many decades are known as climatologically traditional. Totally different regions of the globe have different characteristic climates. However, it's currently recognized that climate isn't static and problems like temperature change and warming are receiving increasing attention.

(6) **Computer Game:** A video game may be a computer-controlled game wherever players act with objects displayed on a screen for the sake of diversion. A computer game is actually an equivalent style of diversion, however refers not solely to games played on a private laptop, however conjointly to games pass by a console or arcade machine.

The term "computer game" conjointly includes games that show solely text or that use different ways, like sound or vibration, as their primary feedback device, or a controller (console games), or a mixture of any of the higher than.

There are many varieties of Computer Games:

- a. **Action and skills games:** The game comes in this category are Sports games, Combat games, Platform games, Labyrinth games and Interactive movies.
- b. **Strategy and role games:** In this category Adventure games, Role playing games (single user or small groups) like (Neverwinter Nights), Roguelike games, MMORPGs, War games, Strategy and construction games, and Simulations are there.
- c. **Hybrid play:** Real time strategy games, Real time adventure and role playing games with combat come in this category.

(7) **Multimedia System and Animation:** Multimedia uses computers to present text, audio, video, animation, interactive options, and still pictures in varied ways in which and mixtures created possible through the advancement of technology. By combining media and content, those interested in multimedia system will take on and work with a range of media forms to get their content across. This can be an exciting new field for those interested in computers, technology, and artistic career choices. Multimedia system will be accessed through computers or electronic devices and integrates the various forms along. One example of multimedia system would be combining an internet site with video, audio, or text pictures.

Animation is that the method of displaying still pictures during a speedy sequence to make the illusion of movement. These pictures will be hand drawn, computer generated, or pictures of 3D objects. Though' most of the people associate animation with cartoons, it additionally has applications in industrial and research project. Despite the sort, the viewer's body plays a main role in why people see continuous movement rather than a series of quickly dynamical pictures.

### **Types**

There are three main types of animation: traditional, stop motion, and computer generated. Every will be wont to build each second and 3D pictures. There are also alternative less common forms, several of that targets using an uncommon medium like sand or glass to make the photographs, moreover as mixtures of live action and drawings or computer created pictures.

## **Traditional**

Traditional animation involves drawing each frame of a movie by hand. In any case the drawings are completed and color, they'll be photographed or scanned into a computer and so combined with sound on film. The method is extraordinarily long, since it needs the creation of around twenty four drawings per second of film. It is also effortful, that is why most historically animated films are created by large corporations.

# Chapter IV: Introduction of Operating System

## 4.1. INTRODUCTION OF OPERATING SYSTEM

An operating system is an integrated set of computer programs that controls the general operations of the computer. It conjointly manages and controls the obtainable resources (like processor, memory, I/O devices etc.) to supply most productivity in terms of potency and utilization. Its primary objective is to boost the performance and potency of a computer system and increase facility. Operating system is directly interact with hardware element and build an interface between user and application software as shown in Figure 28. Some standard in operation systems are MS-DOS, OS/2, Windows, and Unix.

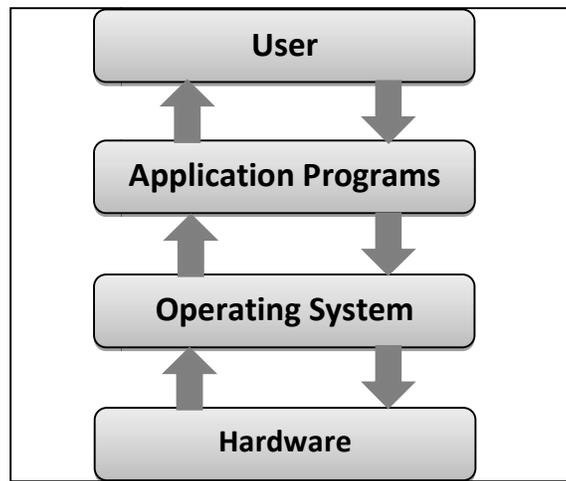


Figure 28: Operating System

## 4.2. FUNCTIONS OF OPERATING SYSTEM

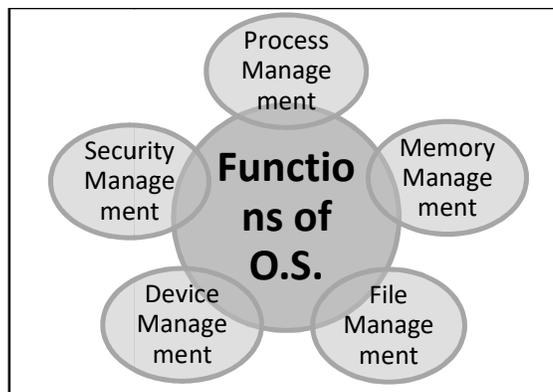


Figure 29: Functions of O.S.

**1. Process Management:** Process could be a program in execution, i.e. a way is that the unit of work throughout a system. Multiprogramming systems expressly permit multiple processes to exist at any given time, where only one is using the C.P.U. at any given moment, whereas the remaining processes are taking part in I/O or are waiting.

The software package is answerable for the following activities in relation to methodology management -

- a. The creation and deletion of every user and system methodology.
- b. The suspension and commencement of processes.
- c. The supply of mechanisms for methodology synchronization.
- d. The supply of mechanisms for dead end handling.

The state of a way is made public by that process's current activity. Each methodology may even be in one in each of the following states; new, ready, running, waiting or halted. Each methodology is delineate inside the software package by its own methodology management block (PCB).

**2. Memory management:** Memory management is that the act of managing constituent. It involves allocation and deallocation of memory resources (i.e. primary and secondary memory) to various programs that desires them.

Operating System can be the following activities for memory management.

- (1) Keeps tracks of primary memory i.e. what a part of it area unit in use by whom, what half are not in use.
- (2) In multiprogramming, package decides that methodology will get memory once and therefore the approach a great deal of.
- (3) Allocates the memory once the tactic requests it to do to thus.
- (4) De-allocates the memory once the tactic now not needs it or has been terminated.

**3. File Management:** A file could also be a set of connected information made public by its creator. Commonly, files represent programs (both provide and object forms) and information. Information files may even be numeric, alphabetic or alphabetical. Files may even be free-form, like text files, or may even be bolt formatted. In general, a file could also be a sequence of bits, bytes, lines or records whose meaning is made public by its creator and user.

File management is one in each of the foremost visible services of an OS. Computers can store information in several whole totally different physical forms among that tape, disk, and drum are the foremost common forms. each of these devices has their own characteristics and physical organization.

Normally files area unit organized into directories to ease their use. once multiple users have access to files, it's aiming to be fascinating to manage by whom and in what ways in which

files may even be accessed. The OS is answerable for the following activities in relation to file management:

- a. Keeps track of information, location, uses, status etc. The collective facilities are typically mentioned as organization.
- b. Decides WHO gets the resources.
- c. Allocates the resources.
- d. De-allocates the resources.

**4. Device management:** Device management, activating and dominant the peripheral devices in a computer. The OS is mostly responsible for device management that is embodied within the device drivers. Generally the routines of device management are run while not an OS (such as in tiny embedded systems or outside of the OS as in early DOS systems).

Operating System will be the subsequent activities for device management.

- a. Keeps tracks of all devices. Program responsible for this task because the I/O controller.
- b. Decides that method gets the device once and for the way abundant time.
- c. Allocates the device within the economical approach.
- d. De-allocates devices.

**5. Security Management:** Security involves protection of varied resources and data against destruction or unauthorized access. It includes each internal and external security. External security involves security from external factors like fireplace, floods, thefts etc., whereas internal security involves varied processes as routine backup of knowledge, data replications at over one place etc.

### 4.3. TYPES OF OPERATING SYSTEM

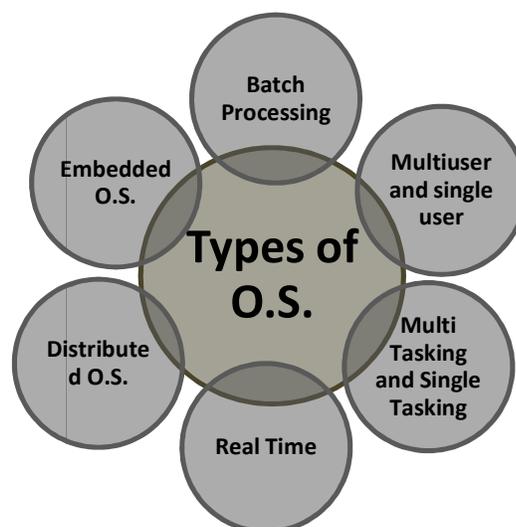


Figure 30: Types of O.S.

### 4.3.1. Batch processing operating System

In batch processing software every user prepares his program off-line and submits it to the computer center. Computer operator collects the programs that are punched on card and stacks one program or job on prime of another. once a batch of programs has been collected, the operator loads this batch of programs into the computer at just once wherever they're executed one when another. Finally the operator retrieves the written outputs of all these jobs and returns them to the connected users.

Batch processing is also referred to as serial, sequential, off line, or stacked job process. It reduces the best time of a automatic data processing system as a result of transition from one job to a different doesn't need operator intervention. It's the foremost acceptable methodology of process for several kinds of applications like payroll or preparation of client statements wherever it's not necessary to update information (records) on each day.

Batch processing in operation systems are ideal in things where:

- There are large amounts of data to be processed.
- Similar data must be processed.
- Similar process is concerned once execution the info.

The system is capable of distinctive times once the processor is idle at which period 'batches' perhaps processed. Process is all performed automatically with none user intervention.

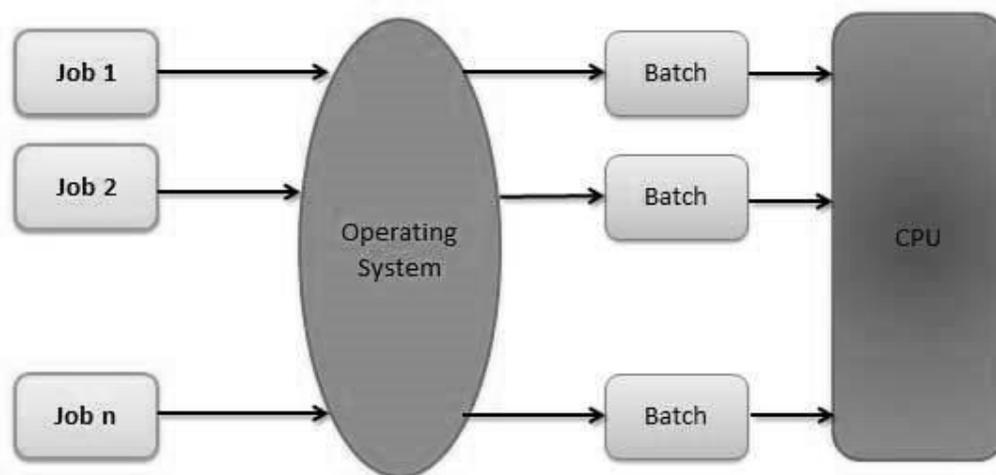


Figure 31: Batch processing O.S.

## Advantages:

- a. The processing time on machine is increased.
- b. CPU utilization is improved.

## Disadvantages:

- a. Troublesome to debug program.
- b. A job could enter an infinite loop.
- c. Due to lack of protection scheme, one batch job will have an effect on unfinished jobs.

### 4.3.2. Multi-programming operating system

The conception of execution was introduced to beat the matter of underutilization of the mainframe and main memory.

In multiprogramming the concept is carried by placing two or more user's program in main memory and execution them at the same time. The CPU jumps from one program to another virtually oftentimes. Since the operational speed of CPU is way faster than that of I/O operations, the mainframe will provide time to varied programs despite of sitting idle once one is busy with I/O operations. In execution system, varied users share the time of CPU. Once one user program looking ahead to I/O transfer; there's another user program that is prepared to create use of the CPU time. In execution all the programs residing within the main memory are going to be in one among the subsequent three states; running, blocked, ready. a simple method of execution is shown in Figure 32.

As shown in Figure 32 at the particular situation, job 'A' isn't utilizing the mainframe time because it's busy in I/O operations. Therefore the mainframe becomes busy to execute the task 'B'. Another job C is waiting for the mainframe for obtaining its execution time. so during this state the mainframe can never be idle and utilizes most of its time.

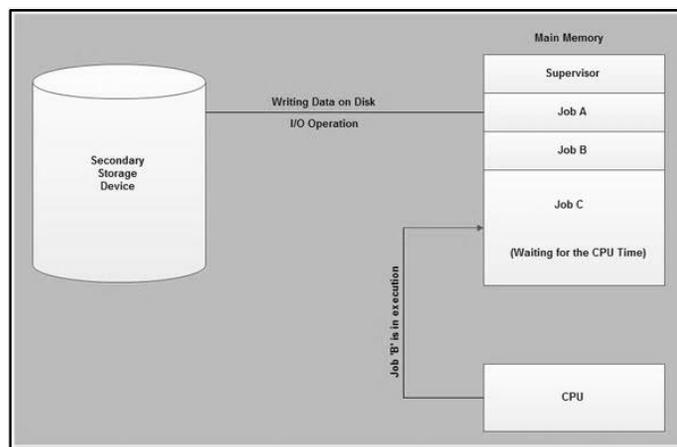


Figure 32: Multi-programming O.S.

## Advantages

1. High and efficient CPU utilization.
2. User feels that many programs are allotted CPU almost simultaneously.

## Disadvantages

1. CPU scheduling is required.
2. To accommodate many jobs in memory, memory management is required.

### 4.3.3. Multi-processing operating system

The term multiprocessing is defined as collection of computer connected with one another or computers with two or more independent CPUs all having the capability to execute many programs at same time. In such a system, directions from different and independent programs will be processed at the same instant of time by different CPUs or the CPUs might simultaneously execute different directions from an equivalent program. The fundamental organization of a typical multiprocessing system is shown in figure.

There are nearly limitless numbers of possible data processing systems. In some systems, various small CPUs are connected together to perform the main process. If one amongst the small CPUs fails, the opposite CPUs can automatically begin executing its job. In different systems, CPUs are connected as a computer networks. for instance – distributed processing. In these networks, small CPUs, referred to as face processors are used for planning and dominant all jobs getting into the system from distant terminals and different input devices. The CPUs, referred to as computer or back-end processors are used just for main process jobs and not for knowledge communications. In some data processing systems, every hardware performs solely explicit quite work and if one hardware fails then different hardware performs complete work till error is debugged.

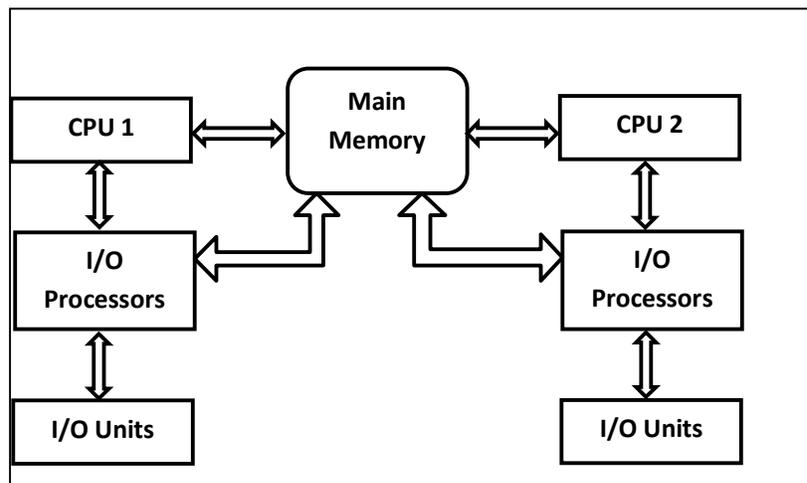


Figure 33: Basic organization of multiprocessing system

Multi-processing operating systems have multiple processor that shares there bus, clock, memory and I/O devices. By using I/O processors enhances the potency of the computer system by creating doable the concurrent execution of input, processing, and output operations. The hardware will perform some operations on elements of varied totally different user programs whereas acting I/O operations are carried out at the same time by I/O processors on different elements of programs. the computer design having I/O processors is shown in figure. the aim of use of I/O processors is to enhance the performance of a computer system. this idea helps us to move one step more by planning systems that build use of over one hardware. Such systems are referred to as multiprocessing systems.

### **Advantage**

1. Increase throughput
2. Economy of scale
3. Increased reliability

### **Disadvantage**

1. If one processor fails then it'll have an effect on within the speed
2. Multiprocessor systems are expensive
3. Complex OS is required
4. Large main memory required.

### **4.3.4. Multi-Tasking operating System**

Concurrent execution of over one task at identical time is named multitasking. just one central processing unit is employed in multitasking however it switches from one program to a different thus quickly that it provides the looks of executing all of the programs at identical time. In multitasking OS many tasks are loaded at the same time and employed in the memory. Windows OS is an example of this sort of OS and it will be seen all over.

### **4.3.5. Timesharing operating system**

Allocation of computer resources in time slots to many programs at the same time is timesharing. It provides numerous numbers of user's direct access to the computer for problem solving. This method is completed by providing a separate machine to every user. Of these machines are hooked up to the main computer system. In time sharing OS several users to share the resources at the same time.

The main distinction between Multiprogrammed Batch Systems and Time-Sharing Systems is that just in case of Multiprogrammed batch systems, objective is to maximize processor use, whereas in Time-Sharing Systems objective is to reduce latency.

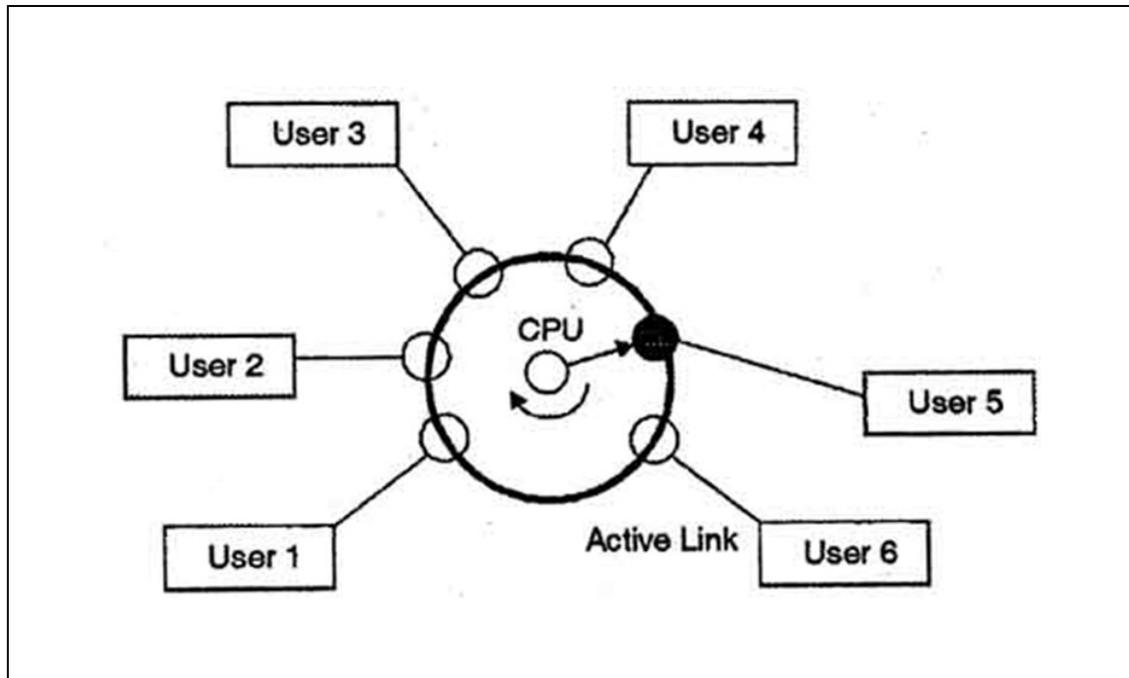


Figure 34: Timesharing O.S.

In Figure 34 the user 5 is active however user 1, user 2, user 3, and user four are in waiting state whereas user 6 is in ready status.

As soon as the time slice of user 5 is completed, the control moves on to the next prepared user i.e. user 6. During this state user 2, user 3, user 4, and user 5 are in waiting state and user one is in prepared state. The method continues within the same means so on.

**Note:** The term 'Time Sharing' isn't any longer usually used, it's been replaced by 'Multitasking System'.

### Advantages

1. Provide advantage of fast response.
2. Avoids duplication of software.
3. Reduces central processing unit idle time.

### Disadvantages

1. Problem of reliability.
2. Question of security and integrity of user programs and data.
3. Problem of data communication.

### 4.3.6. Real-time Operating System

There are several applications during which immediate response is needed from computer. Time is that the key think about real time software system. Real-time software system has well-defined, fixed time constraints otherwise system can fail. For instance Scientific experiments, medical imaging systems, industrial management systems, weapon systems, robots, and home-appliance controllers, traffic system etc. There are two types of real-time operating systems.

**a. Hard real-time operating system:** Hard real-time OS guarantee that critical tasks complete on time. In hard real-time systems secondary storage is proscribed or missing with knowledge keep in store. In these systems memory board is nearly never found.

**b. Soft time period operating system:** Soft real-time OS are less restrictive. Critical real-time task gets priority over different tasks and retains the priority till it completes. Soft real-time systems have limited utility than hard real time systems. For instance, Multimedia, video game, Advanced Scientific projects like subsurface exploration and planetary rovers etc.

### 4.3.7. Distributed operating system

Distributed systems use multiple central processors to serve multiple real time application and multiple users. in this type of system, processor don't share memory or clock. Instead, every processor has its own memory. Processing jobs are distributed among the processors consequently to that one will perform every job most with efficiency. The processor communicates with one another through numerous communication lines. These are referred as loosely coupled systems or distributed systems. Processors in a distributed system might vary in size and performance. These processors are referred as sites, nodes, and computers and so on.

#### Advantages

1. With resource sharing facility user at one web site is also able to use the resources accessible at another.
2. Speedup the exchange of data with each other via email correspondence.
3. If one web site fails in a distributed system, the remaining sites will probably continue in operation.
4. Better service to the customers.
5. Reduction of the load on the host pc.
6. Reduction of delays in data processing

### 4.3.8. Network operating system

Network operating system is that the combination of software system and protocols utilized by totally different computers connected with one another within the network. It runs on a server and provides server the potential to manage data, users, groups, security, applications,

and different networking functions. Its primary purpose is to permit shared file and printer access among multiple computers in a very network, usually space area network (LAN), a private network or to other networks. examples of network operating systems are Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

### **Advantages:**

1. Centralized servers are extremely stable.
2. Security is server managed.
3. Upgrades to new technologies and hardware may be simply integrated into the system.
4. Remote access to servers is feasible from totally different locations and types of systems.

### **Disadvantages:**

1. High value of buying and running a server.
2. Dependency on a central location for many operations.
3. Regular maintenance and updates are needed.

#### **4.3.9. Embedded in operation System**

An embedded system could be a pc that's a part of a distinct kind of machine. Embedded software system could be specialized operating systems that are designed to control small machines (like PDAs with less autonomy) with a restricted number of resources. They're terribly compact efficient economical purposely. Samples of embedded in operation systems are Windows cerium and Minix 3.

#### **4.3.10. Multi-User operating System**

An operating system that allows coincident access by multiple users of a pc is termed as multi user. Multiuser operating system allows multiple users to at the same time use the system. the computer resources are time-shared among the user and each user having exclusive use of the resources at anyone time. The slice throughout that anyone user has access to the computer may be as small on milliseconds. this is often an extended time for several of the computer operations and since all operators are offered a time slice successively, each user has the impression that they have exclusive use of computer all the time. a number of the examples of this type of software system are; UNIX operating system, Windows NT, LINUX, XENIX.

#### **4.3.11. Single User in operation System**

One user software system is intended for one user to effectively use a pc at a time. It'll allow each real time process, wherever the user is interacting with the pc throughout the execution of the program and batch processing, wherever a series of programs are run in sequence. a number of the examples are; Disk operating system, Windows 95/98, Windows NT.

## References

### Text / Reference Books:

1. Introduction to Information Technology: Rajaraman, PHI
2. Fundamentals of Computers 4/E: Rajaraman, PHI
3. Fundamentals of Computers: P. Mohan, Himalaya
4. Information Technology: Dennis P. Curtin, McGraw Hill International
5. Fundamentals of Information Technology: Sahaetal, Himalaya
6. Microsoft Office Excel 2003 step by step: Frye, PHI
7. Fundamentals of Computers: Atul Kahate, Tata McGraw Hill

## Questions for Practice

1. Define computer. What does a computer do?
2. Explain the types of computer.
3. Explain different types of computer
4. Write short on the system bus.
5. What is the classification of computer memory?
6. What is hardware and software? Explain different types of software.
7. Differentiate between application software and system software.
8. Explain the characteristics of computers.
9. What is primary memory and its types?
10. What is RAM and ROM with example?
11. Why is RAM so important?
12. What is ROM and its types?
13. What is primary memory give example?
14. Why is primary memory called so?
15. Explain the capabilities and limitations of Computers.
16. What do you mean by computer memory? Explain its classification.
17. What is RAM? Explain its types.
18. What are the two types of secondary memory?
19. What are the 3 types of memory in a computer?
20. Explain different types of keyboards.
21. What are the types of memory?
22. What is secondary memory and types?
23. Differentiate between impact printer and non- impact printer.
24. Explain the working of laser printer.
25. What is software? Explain its types.
26. Write the difference between system software and application software.
27. What is assembly language?
28. What are inputs and outputs devices?
29. What are the 10 input devices?
30. What are the 3 types of ROM?

31. What is the main function of ROM?
32. What is ROM and its application?
33. What are the five types of ROM?
34. Describe in full the working structure of a device driver.
35. What is operating system? Describe the goals of OS.
36. Describe the major functions of Operating System.
37. What are the types of file management?
38. What are the types of RAM and ROM?
39. What are the different types of file organization?
40. What is EPROM in computer?
41. What is the function of EPROM?
42. Where EPROM is used?
43. What is difference between EPROM and EEPROM?
44. What is the difference between RAM and EPROM?
45. What is the function of EEPROM?
46. What are the 2 types of primary memory?
47. What are primary and secondary memory?
48. What is the main purpose of an operating system?
49. What are the different operating systems?
50. What is an operating system explain with an example?



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(Only Speed Post is Received at University Campus Address, No. any Courier Facility is available at Campus Address)

Pages : 64  
Book Price : ₹ 150/-



Year & Month of Publication- 3/4/2021