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PG DEPARTMENT OF COMPUTER APPLICATIONS

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UNIT -I

Introduction to Computers-Generations of Computer-Data and Information – Components of Computer – Software – Hardware – Input Devices Output Devices—Types of Operating System.

Introduction of Computer

The modern computer took its shape with the arrival of your time. It had been around the 16th century when the evolution of the computer started. The initial computer faced many changes, obviously for the betterment. It continuously improved itself in terms of speed, accuracy, size, and price to urge the form of the fashionable day computer.

Basic Terms Related to Computers

The basic terms related to generations of computers are listed below.

- **Vacuum Tube:** Vacuum tubes have the functionality of controlling the flow of electronics in a vacuum. Generally, it is used in switches, amplifiers, radios, televisions, etc.
- **Transistor:** A transistor helps in controlling the flow of electricity in devices, it works as an amplifier or a switch.
- **Integrated Circuit (IC):** Integrated circuits are silicon chips that contain their circuit elements like transistors, resistors, etc.
- **Microprocessors:** Microprocessors are the components that contain the CPU and its circuits and are present in the Integrated Circuit.
- **Central Processing Unit (CPU):** The CPU is called the brain of the computer. CPU performs processing and operations work.
- **Magnetic Drum:** Magnetic Drum is like a cylinder that stores data and cylinder.
- **Magnetic Core:** Magnetic cores are used to store information. These are arrays of small rings.
- **Machine Language:** Machine Language is the language that a computer accepts (in the form of binary digits). It is also called low-level programming language.
- **Memory:** Memory is used to store data, information, and program in a computer.
- **Artificial Intelligence:** Artificial Intelligence deals with creating intelligent machines and behaviors.

Generation of computer:

This long period is often conveniently divided into the subsequent phases called computer generations.

- First Generation Computers (1940-1956)

- Second Generation Computers (1956-1963)
- Third Generation Computers (1964-1971)
- Fourth Generation Computers (1971-Present)
- Fifth Generation Computers (Present and Beyond)

Generations of Computer	Time-Period	Evolving Hardware
First Generation	1940s – 1950s	Vacuum Tube Based
Second Generation	1950s – 1960s	Transistor Based
Third Generation	1960s – 1970s	Integrated Circuit Based
Fourth Generation	1970s – Present	Microprocessor Based
Fifth Generation	Present – Future	Artificial Intelligence Based

Before the generation of computers, we used calculators, spreadsheets, and computer algebra systems, mathematicians and inventors searched for solutions to ease the burden of calculation. Below are the 8 **Mechanical Calculators** before modern computers were invented.

1. Abacus (ca. 2700 BC)

2. Pascal's Calculator (1652)
3. Stepped Reckoner (1694)
4. Arithmometer (1820)
5. Comptometer (1887) and Comptograph (1889)
6. The Difference Engine (1822)
7. Analytical Engine (1834)
8. The Millionaire (1893)

First Generation Computers:

The technology behind the primary generation computers was a fragile glass device, which was called a vacuum tube. These computers were very heavy and really large. These weren't very reliable and programming on them was a tedious task as they used low-level programming language and used no OS. First-generation computers were used for calculation, storage, and control purpose. They were too bulky and large that they needed a full room and consume a lot of electricity.

Examples of some main first-generation computers are mentioned below

- **ENIAC:** Electronic Numerical Integrator and Computer, built by J. Presper Eckert and John V. Mauchly was a general-purpose computer. It had been cumbersome, and large, and contained 18,000 vacuum tubes.
- **EDVAC:** Electronic Discrete Variable Automatic Computer was designed by von Neumann. It could store data also as instruction and thus the speed was enhanced.
- **UNIVAC:** Universal Automatic Computer was developed in 1952 by Eckert and Mauchly.

Characteristics of First-Generation Computers

Characteristics	Components
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Main electronic component	Vacuum tube.
Programming language	Machine language.
Main memory	Magnetic tapes and magnetic drums.
Input/output devices	Paper tape and punched cards.
Speed and size	Very slow and very large (often taking up an entire room).

Second Generation Computers

Second-generation computers used the technology of transistors rather than bulky vacuum tubes. Another feature was the core storage. A transistor may be a device composed of semiconductor material that amplifies a sign or opens or closes a circuit.

Transistors were invented in Bell Labs. The use of transistors made it possible to perform powerfully and with due speed. It reduced the dimensions and price and thankfully the warmth too, which was generated by vacuum tubes. Central Processing Unit (CPU), memory, programming language, and input, and output units also came into the force within the second generation.

The programming language was shifted from high level to programming language and made programming comparatively a simple task for programmers. Languages used for programming during this era were FORTRAN (1956), ALGOL (1958), and COBOL (1959).

Characteristics of Second-Generation Computers

Characteristics	Components
Main electronic component	Transistor.
Programming language	Machine language and assembly language.
Memory	Magnetic core and magnetic tape/disk.
Input/output devices	Magnetic tape and punched cards.
Power and size	Smaller in size, had low power consumption, and generated less heat (in comparison with the first-generation computers).
Examples of the second generation	PDP-8, IBM1400 series, IBM 7090 and 7094, UNIVAC 1107, CDC 3600, etc.

Third Generation Computers

During the third generation, technology envisaged a shift from huge transistors to integrated circuits, also referred to as IC. Here a variety of transistors were placed on silicon chips, called semiconductors. The most feature of this era's computer was speed and reliability. IC was made from silicon and also called silicon chips.

A single IC has many transistors, registers, and capacitors built on one thin slice of silicon.

The value size was reduced and memory space and dealing efficiency were increased during this generation. Programming was now wiped out Higher level languages like BASIC (Beginners All-purpose Symbolic Instruction Code). Minicomputers find their shape during this era.

Characteristics of Third-Generation Computers

Characteristics	Components
Main electronic component	Integrated circuits (ICs).
Programming language	High-level language.
Memory	Large magnetic core, magnetic tape/disk.
Input/output devices	Magnetic tape, monitor, keyboard, printer, etc.
Examples of the third generation	IBM 360, IBM 370, PDP-11, NCR 395, B6500, UNIVAC 1108, etc.

Fourth Generation Computers

In 1971 First microprocessors were used, the large-scale of integration LSI circuits built on one chip called microprocessors. The advantage of this technology is that one microprocessor can contain all the circuits required to perform arithmetic, logic, and control functions on one chip.

computers, with larger capacities. That's not enough, then Very Large Scale Integrated (VLSI) circuits replaced LSI circuits. The Intel 4004 chip, developed in 1971, located all the components of the pc from the central processing unit and memory to input/ output controls on one chip and allowed the dimensions to reduce drastically.

Technologies like multiprocessing, multiprogramming, time-sharing, operating speed, and virtual memory made it a more user-friendly and customary device. The concept of private computers and computer networks came into being within the fourth generation.

Characteristics of Fourth-Generation Computers

Characteristics	Components
Main electronic component	Very-large-scale integration (VLSI) and the microprocessor (VLSI has thousands of transistors on a single microchip).
Memory	semiconductor memory (such as RAM , ROM , etc.).
Input/output devices	pointing devices, optical scanning, keyboard, monitor, printer, etc.
Examples of the fourth generation	IBM PC, STAR 1000, APPLE II, Apple Macintosh, Alter 8800, etc.

Fifth Generation Computers

The technology behind the fifth generation of computers is AI. It allows computers to behave like humans. It is often seen in programs like voice recognition, area of medicine, and entertainment. Within the field of game playing also it's shown remarkable performance where computers are capable of beating human competitors.

The speed is the highest, size is the smallest and area of use has remarkably increased within the fifth generation computers. Though not a hundred percent AI has been achieved to date but keeping in sight the present developments, it is often said that this dream also will become a reality very soon.

To summarize the features of varied generations of computers, it is often said that a big improvement has been seen so far because of the speed and accuracy of functioning care, but if we mention the dimensions, it's been small over the years. The value is additionally diminishing and reliability is increasing.

Characteristics of Fifth-Generation Computers

Characteristics	Components
Main electronic component	Based on artificial intelligence, uses the Ultra Large-Scale Integration (ULSI) technology and parallel processing method (ULSI has millions of transistors on a single microchip and the Parallel processing method use two or more microprocessors to run tasks simultaneously).
Language	Understand natural language (human language).

Size	Portable and small in size.
Input/output device	Trackpad (or touchpad), touchscreen, pen, speech input (recognize voice/speech), light scanner, printer, keyboard, monitor, mouse, etc.
Example of the fifth generation	Desktops, laptops, tablets, smartphones, etc.

Data and Information:

Usually, the terms “data” and “information” are used interchangeably. However, there is a subtle difference between the two.

- In a nutshell, data can be a number, symbol, character, word, codes, graphs, etc. On the other hand, information is data put into context. Information is utilised by humans in some significant way (such as to make decisions, forecasts etc).
- A basic example of information would be a computer. A computer uses programming scripts, formulas, or software applications to turn data into information.

Difference Between Data and Information:

Data	Information
Data is unorganised and unrefined facts	Information comprises processed, organised data presented in a meaningful context
Data is an individual unit that contains raw materials which do not carry any specific meaning.	Information is a group of data that collectively carries a logical meaning.
Data doesn't depend on information.	Information depends on data.

Raw data alone is insufficient for decision making

Information is sufficient for decision making

What is Data?

Data is a collection of raw, unorganised facts and details like text, observations, figures, symbols and descriptions of things etc. In other words, data does not carry any specific purpose and has no significance by itself. Moreover, data is measured in terms of bits and bytes – which are basic units of information in the context of computer storage and processing.

What is Information?

Information is processed, organised and structured data. It provides context for data and enables decision making. For example, a single customer's sale at a restaurant is data – this becomes information when the business is able to identify the most popular or least popular dish.

Component of computer:

Motherboard: The motherboard is the main board that is screwed into the computer case directly. Its function is to connect all of the components so that they may communicate and work together.

Input Unit: The main function of the input unit is to send commands and transfer data into computers. Later, the data gets processed by the computer's CPU which generates output. For example, a laptop's keyboard is an input device.

Output Unit: The computer's response is relayed through output devices in the form of a visual response (monitor), sound (speakers), or media devices (CD or DVD drives). The function of these devices is to convert the machine's response into a format that the computer user can understand.

Central Processing Unit (CPU): The CPU can be regarded as a computer's brain. On a computational level, it processes all of the data. It reads data from the RAM and processes it in order for the computer to do the tasks it is programmed

Graphics Processing Unit (GPU): GPU is a specialized processor that is created to accelerate graphics processing. It can render many pieces of data making them ideal for machine learning, video editing, and gaming.

Random Access Memory (RAM): RAM is a form of data storage that allows for faster read and write operations. RAM is also volatile, which means that if the power goes out, it loses all of the data it has stored.

Storage Unit: This device stores all the data and the instructions required for processing. It keeps intermediate results of processing.

SOFTWARE:

"Software is a set of programs (sequence of instructions) that allows the users to perform a well-defined function or some specified task." Software is responsible for directing all computer-related devices and instructing them regarding what and how the task is to be performed.

However, the software is made up of binary language (composed of ones and zeros), and for a programmer writing the binary code would be a slow and tedious task. Therefore, software programmers write the software program in various human-readable languages such as Java, Python, C#, etc.

Types of Software

Software's are broadly classified into two types, i.e., System Software and Application Software.

1. System Software

System software is a computer program that helps the user to run computer hardware or software and manages the interaction between them. Essentially, it is software that constantly runs in the computer background, maintaining the computer hardware and computer's basic functionalities, including the operating system, utility software, and interface

System software is not limited to the operating system. They also include the basic I/O system procedures, the boot program, assembler, computer device driver, etc. This software supports a high-speed platform to provide effective software for the other applications to work in effortlessly.

System software is also known as "low-level software" because the end-users do not operate them. Companies usually employ the best software development programmers who can deploy efficient system software.

The further classifications of system software are as follows:

1. Operating System

The operating system is the most prominent example of system software that acts as an interface between the user and system hardware. It is a group of software that handles the execution of programs and offers general services for the application that runs over the computer. There are various types of operating systems available in the market, such as embedded operating systems, real-time OS, distributed OS, single or multi-user operating system, mobile, Internet, and various others.

Some of the commonly used examples of operating systems are given below.

Microsoft Windows

Apple's iOS

Apple's MacOS

Android

CentOS

Linus

Ubuntu

Unix

2. Device Drivers:

In computing, the device driver is a type of software that operates or controls some specific hardware devices linked to your system. They provide a software interface to hardware devices allowing computer operating systems and other applications to fetch hardware functions without knowing the exact specifications of the hardware. Some common examples of such device drivers that connect hardware devices (printers, sound cards, network cards, hard disks, floppy disk, keyboard, mouse, etc.) to a system easily are as follows:

BIOS (Basic Input/Output System) Device Driver

USB (Universal Serial Bus) Drivers

Motherboard Drivers

Display Drivers

Printer Drivers

Sound Card Driver

ROM (Read-only memory) Drivers

VGA (Video Graphic Array) Drivers

3. Firmware

In electronic systems and computing, firmware is a type of permanent software embedded in the system's ROM (read-only memory) to provide low-level control for some particular system device hardware. It is a set of instructions that are stored permanently on your computer's hardware device.

Common examples of devices utilizing firmware are given below:

Computer Peripherals

Consumer Appliances

Embedded Systems

UEFI (United Extensible Firmware Interface)

BIOS (Basic Input/Output System)

4. Utility

Utility software is developed to provide support in analyzing, optimizing, along configuring and maintaining a computer. The job of the utility program is to offer support to the system infrastructure. Though the system will work even if it doesn't have any utility software, the right kind of utility software enhances its performance and makes it more reliable.

Some of the common examples of utility software are as follows:

Norton and McAfee Antivirus

WinRAR

Directory Opus

Disk defragmenter

WinZip

Windows File Explorer

Razer Cortex

Application Software

Application programs or software applications are end-user computer programs developed primarily to provide specific functionality to the user. The applications programs assist the user in accomplishing numerous tasks such as doing online research, completing notes, designing graphics, managing the finances, watching a movie, writing documents, playing games, and many more.

Word Processors

Word processor applications are globally used for documentation, making notes, and typing data. It also helps the end-users store and format data. They also enable the users to print their documents.

Some examples of Word Processor software's are as follows:

MS Word (Microsoft)

iWork-Pages (Apple)

Corel WordPerfect

Google Docs

b. Database Software

Database software is used to create, manage, modify and organize a massive amount of data quickly retrieved. Another name for database software is Database Management System (DBMS). Such software helps companies in their data organization. Common examples of Database Software's are:

Oracle

MS Access

SQLite

Microsoft SQL Server

FileMaker

dBase

MariaDB

MySQL

c. Multimedia Software

This software enables the users to play, create or record images, music, and video files. Different graphic designing companies widely use multimedia software to make animation, images, posts, packaging, marketing creative, gif, or even video editing. Due to their popularity and increasing demand, every software product development corporation has massive avenues in creating and upgrading them.

Common examples of Database Software's are given below:

Adobe Photoshop

Windows Movie Maker

Adobe Illustrator

Picasa

Windows Media Player

Corel Draw

d. Web Browsers

These are a type of software that is globally used to browse the Internet. Web browsers help the users in positioning as well as fetching data across the web. Common examples of web browsers are given below:

Chrome

Mozilla Firefox

Microsoft Internet Explorer

Opera

Microsoft Edge

UC Browser

Apple Safari

However, there also occurs another classification of the software that exists on the basis of their availability and shareability. The classification is given below:

1. Freeware

As the name suggests, Freeware software is available free of cost for an unlimited time. Any user can easily download their respective software from the Internet and start using them instantly without paying any charges or fees. Software development companies mostly design and develop freeware software as a strategy to reach out to more people. Typical examples of Freeware Software are as follows:

Adobe Reader

Zoom

Skype

ImgBurn

Audacity

Whatsapp

Anydesk

2. Shareware

Shareware software is readily available on the Internet to download on a fixed trial basis. It is distributed freely with a set time limit, and at the end of the trial period, the user is asked either to pay the fee or uninstall the software. Some shareware, mainly including the gaming softwares, have a fixed trial based on the counts an application is opened rather than the number of days it has been installed on the system.

Give below are some of the popular examples for Shareware Software:

Adobe Acrobat

Adobe Photoshop

AnyDVD

PHP Debugger

WinZip

3. Open-source

People usually get confused with freeware and open-source, but both are different. Though both the software are available on the Internet free of cost with the only difference that open source software is available online along with their source code. It means the user can change, transform, and even can add additional features to them. Based on their services, they can be chargeable as well free of cost.

Give below are some of the popular examples for open-source Software:

Mozilla Firefox

MySQL

Thunderbird

OpenOffice

ClamWinantivirus

Apache Web Server

What is Computer Hardware?

Hardware, which is abbreviated as HW, refers to all physical components of a computer system, including the devices connected to it. You cannot create a computer or use software without using hardware. The screen on which you are reading this information is also a hardware.

What is a hardware upgrade?

A hardware upgrade refers to a new hardware, or a replacement for the old one, or additional hardware developed to improve the performance of the existing hardware. A common example of a hardware upgrade is a RAM upgrade that increases the computer's total memory, and video card upgrade, where the old video card is removed and replaced with the new one.

Computer Hardware Parts

Some of the commonly used hardware in Syour computer are described below:

1. Motherboard
2. Monitor
3. Keyboard
4. Mouse

1) Motherboard:

The motherboard is generally a thin circuit board that holds together almost all parts of a computer except input and output devices. All crucial hardware like CPU, memory, hard drive, and ports for input and output devices are located on the motherboard. It is the biggest circuit board in a computer chassis.

It allocates power to all hardware located on it and enables them to communicate with each other. It is meant to hold the computer's microprocessor chip and let other components connect to it. Each component that runs the computer or improves its performance is a part of the motherboard or connected to it through a slot or port.

There can be different types of motherboards based on the type and size of the computers. So, a specific motherboard can work only with specific types of processors and memory.

Components of a Motherboard:

CPU Slot: It is provided to install the CPU. It is a link between a microprocessor and a motherboard. It facilitates the use of CPU and prevents the damage when it is installed or removed. Furthermore, it is provided with a lock to prevent CPU movement and a heat sink to dissipate the extra heat.

RAM Slot: It is a memory slot or socket provided in the motherboard to insert or install the RAM (Random Access Memory). There can be two or more memory slots in a computer.

Expansion Slot: It is also called the bus slot or expansion port. It is a connection or port on the motherboard, which provides an installation point to connect a hardware expansion card, for example, you can purchase a video expansion card and install it into the expansion slot and then can install a new video card in the computer. Some of the common expansion slots in a computer are AGP, AMR, CNR, PCI, etc.

Capacitor: It is made of two conductive plates, and a thin insulator sandwiched between them. These parts are wrapped in a plastic container.

Inductor (Coil): It is an electromagnetic coil made of a conducting wire wrapped around an iron core. It acts as an inductor or electromagnet to store magnetic energy.

Northbridge: It is an integrated circuit that allows communications between the CPU interface, AGP, and memory. Furthermore, it also allows the southbridge chip to communicate with the RAM, CPU, and graphics controller.

USB Port: It allows you to connect hardware devices like mouse, keyboard to your computer.

PCI Slot: It stands for Peripheral Component Interconnect slot. It allows you to connect the PCI devices like modems, network hardware, sound, and video cards.

AGP Slot: It stands for Accelerated Graphics Port. It provides the slot to connect graphics cards.

Heat Sink: It absorbs and disperses the heat generated in the computer processor.

Power Connector: It is designed to supply power to the motherboard

CMOS battery: It stands for complementary metal-oxide-semiconductor. It is a memory that stores the BIOS settings such as time, date, and hardware settings.

2) Monitor:

A monitor is the display unit of a computer on which the processed data, such as text, images, etc., is displayed. It comprises a screen circuitry and the case which encloses this circuitry. The monitor is also known as a visual display unit (VDU).

Types of Monitors:

1. CRT Monitor: It has cathode ray tubes which produce images in the form of video signals. Its main components are electron gun assembly, deflection plate assembly, glass envelope, fluorescent screen, and base.
2. LCD Monitor: It is a flat panel screen. It uses liquid crystal display technology to produce images on the screen. Advanced LEDs have thin-film transistors with capacitors and use active-matrix technology, which allows pixels to retain their charge.
3. LED Monitor: It is an advanced version of an LCD monitor. Unlike an LCD monitor, which uses cold cathode fluorescent light to backlight the display, it has LED panels, each of which has lots of LEDs to display the backlight.
4. Plasma Monitor: It uses plasma display technology that allows it to produce high resolutions of up to 1920 X 1080, wide viewing angle, a high refresh rate, outstanding contrast ration, and more.

3) Keyboard:

It is the most important input device of a computer. It is designed to allow you input text, characters, and other commands into a computer, desktop, tablet, etc. It comes with different sets of keys to enter numbers, characters, and perform various other functions like copy, paste, delete, enter, etc.

A [keyboard](#) is an input device through which users can input text, numbers, and special characters. It is an input device with a typical QWERTY keyset. It is an external hardware device that is connected to the computer. It serves as the user's most fundamental interface with a system. It has numerous buttons that can be used to generate letters, numbers, and symbols as well as unique keys like the Windows and Alt keys that can also accomplish other tasks.

Types of Keyboards:

1. QWERTY Keyboards
2. AZERTY Keyboards
3. DVORAK Keyboards

4) Mouse:

It is a small handheld device designed to control or move the pointer (computer screen's cursor) in a GUI (graphical user interface). It allows you to point to or select objects on a computer's display screen. It is generally placed on a flat surface as we need to move it smoothly to control the pointer. Types of Mouse: Trackball mouse, Mechanical Mouse, Optical Mouse, Wireless Mouse, etc.

A [mouse](#) can be wireless or wired. It is a portable pointing device that is used to interact with objects on computer screens with the help of moving the cursor around the screen. On the display screen, the cursor moves in the same direction as the users' mouse movements. The term "mouse" refers to a compact, wired, elliptical-shaped gadget that somewhat resembles a mouse.



Main functions of a mouse:

- Move the cursor: It is the main function of the mouse; to move the cursor on the screen.
- Open or execute a program: It allows you to open a folder or document and execute a program. You are required to take the cursor on the folder and double click it to open it.
- Select: It allows you to select text, file, or any other object.
- Hovering: Hovering is an act of moving the mouse cursor over a clickable object. During hovering over an object, it displays information about the object without pressing any button of the mouse.
- Scroll: It allows you to scroll up or down while viewing a long webpage or document.

Parts of a mouse:

- Two buttons: A mouse is provided with two buttons for right click and left click.
- Scroll Wheel: A wheel located between the right and left buttons, which is used to scroll up and down and Zoom in and Zoom out in some applications like AutoCAD.
- Battery: A battery is required in a wireless mouse.
- Motion Detection Assembly: A mouse can have a trackball or an optical sensor to provide signals to the computer about the motion and location of the mouse.

Input Devices

Input device enables the user to send data, information, or control signals to a computer. The Central Processing Unit (CPU) of a computer receives the input and processes it to produce the output.

Some of the popular input devices are:

1. Keyboard
2. Mouse
3. Scanner
4. Joystick
5. Light Pen
6. Digitizer
7. Microphone
8. Magnetic Ink Character Recognition (MICR)
9. Optical Character Reader (OCR)
10. Digital Camera

Output Devices

The output device displays the result of the processing of raw data that is entered in the computer through an input device. There are a number of output devices that display output in different ways such as text, images, hard copies, and audio or video.

Some of the popular output devices are:

1. Monitor
 - CRT Monitor
 - LCD Monitor
 - LED Monitor
 - Plasma Monitor
2. Printer
 - Impact Printers
 1. Character Printers
 1. Dot Matrix printers
 2. Daisy Wheel printers
 2. Line printers
 1. Drum printers

2. Chain printers

- Non-impact printers
 - 1. Laser printers
 - 2. Inkjet printers

3. Projector

1) Monitor

The monitor is the display unit or screen of the computer. It is the main output device that displays the processed data or information as text, images, audio or video.

2) Printer

A printer produces hard copies of the processed data. It enables the user, to print images, text or any other information onto the paper.

3) Projector



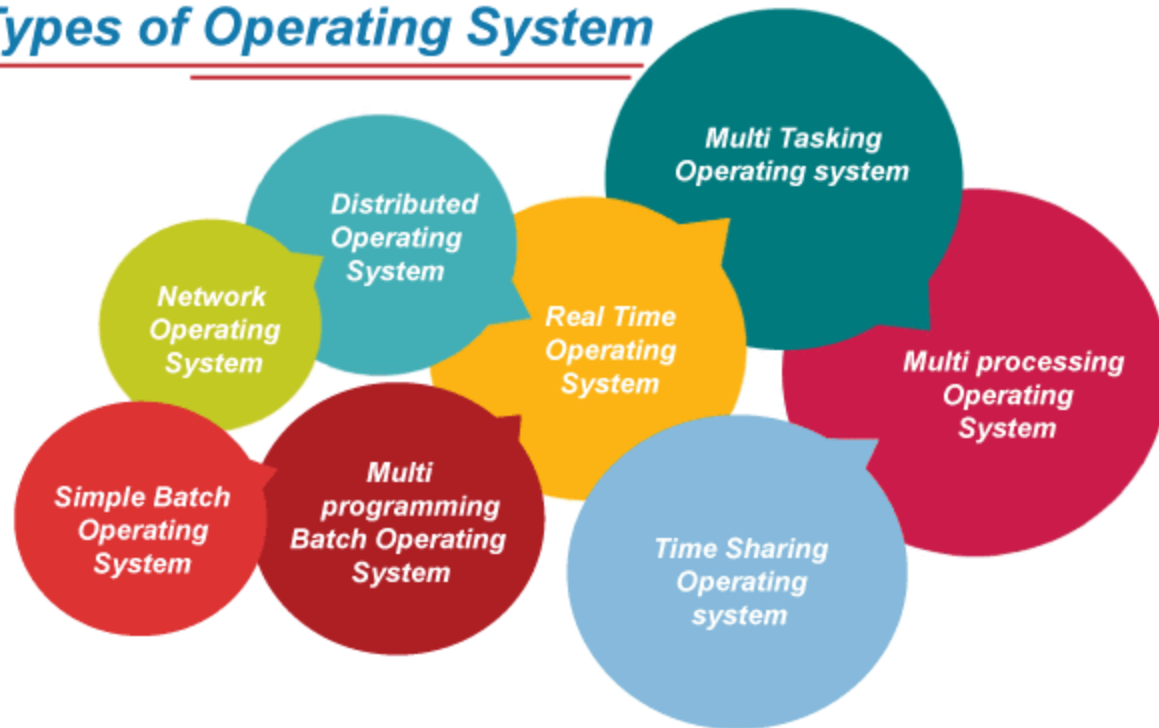
A projector is an output device that enables the user to project the output onto a large surface such as a big screen or wall. It can be connected to a computer and similar devices to project their output onto a screen. It uses light and lenses to produce magnified texts, images, and videos. So, it is an ideal output device to give presentations or to teach a large number of people.

Modern projects (digital projectors) come with multiple input sources such as HDMI ports for newer equipment and VGA ports that support older devices. Some projectors are designed to support Wi-Fi and Bluetooth as well. They can be fixed onto the ceiling, placed on a stand, and more and are frequently used for classroom teaching, giving presentations, home cinemas, etc.

Types of Operating Systems (OS)

An operating system is a well-organized collection of programs that manages the computer hardware. It is a type of system software that is responsible for the smooth functioning of the computer system.

Types of Operating System

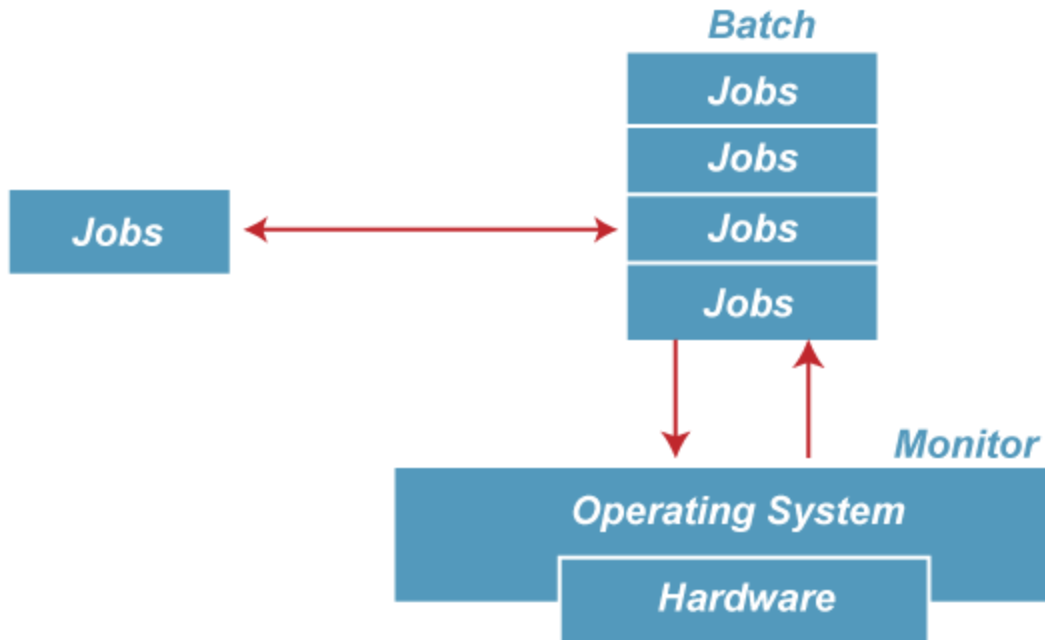


Batch Operating System

In the 1970s, Batch processing was very popular. In this technique, similar types of jobs were batched together and executed in time. People were used to having a single computer which was called a mainframe.

In Batch operating system, access is given to more than one person; they submit their respective jobs to the system for the execution.

The system put all of the jobs in a queue on the basis of first come first serve and then executes the jobs one by one. The users collect their respective output when all the jobs get executed.



The purpose of this operating system was mainly to transfer control from one job to another as soon as the job was completed. It contained a small set of programs called the resident monitor that always resided in one part of the main memory. The remaining part is used for servicing jobs.

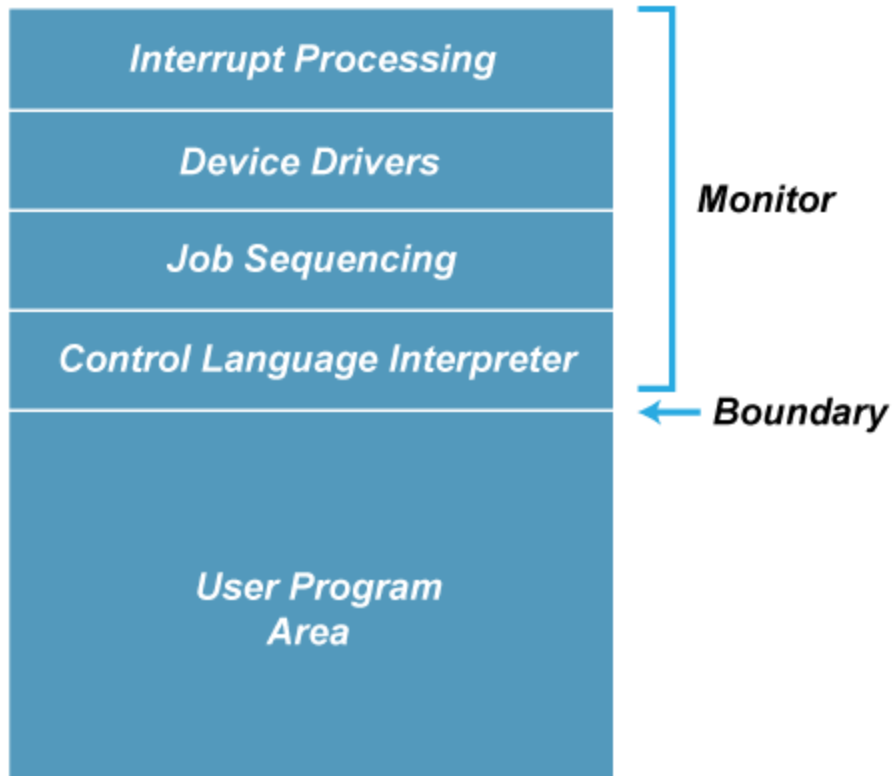
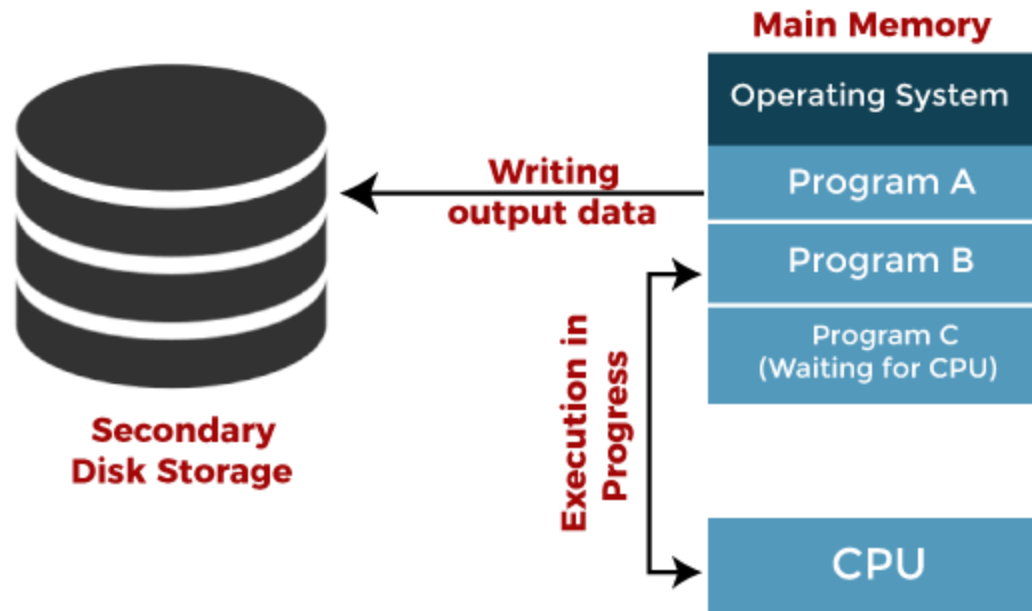


Figure: Memory Layout of the resident monitor

Multiprogramming Operating System

Multiprogramming is an extension to batch processing where the CPU is always kept busy. Each process needs two types of system time: CPU time and IO time.

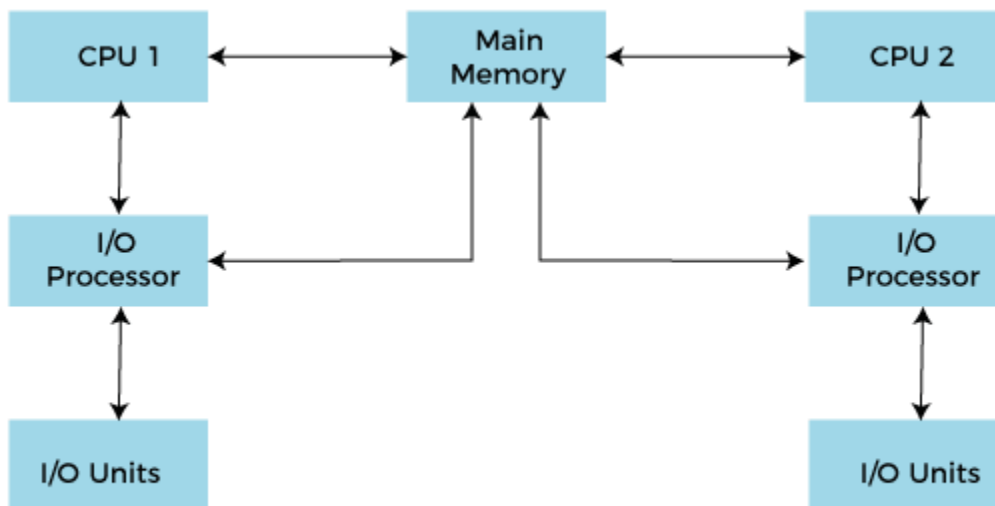
In a multiprogramming environment, when a process does its I/O, The CPU can start the execution of other processes. Therefore, multiprogramming improves the efficiency of the system.



Jobs in multiprogramming system

Multiprocessing Operating System

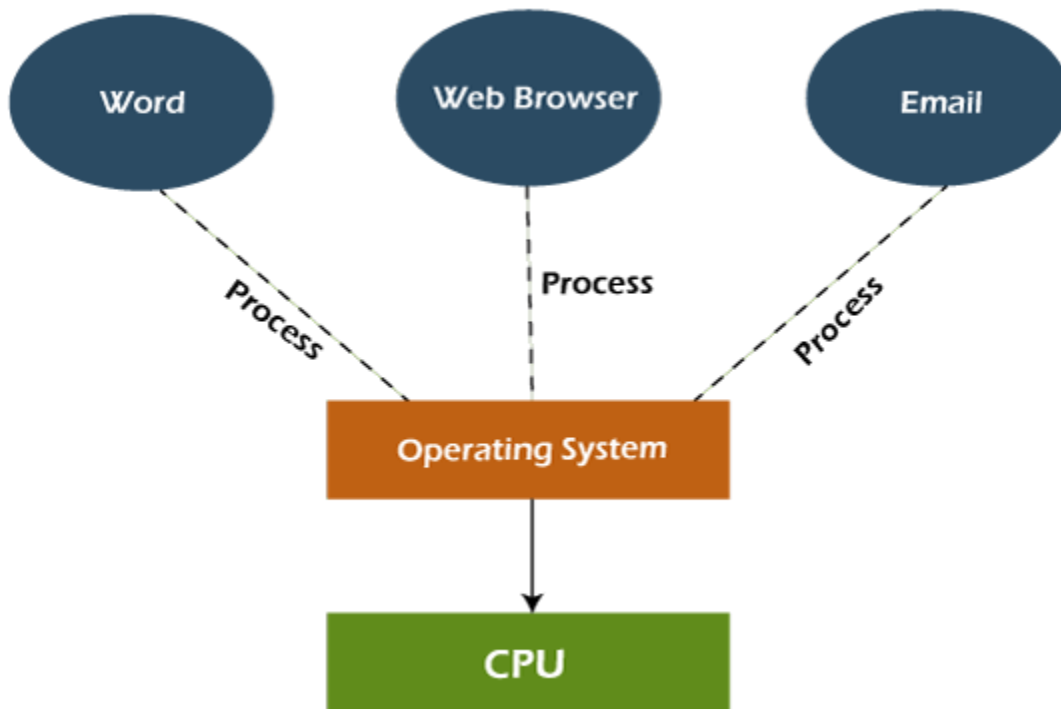
In Multiprocessing, Parallel computing is achieved. There are more than one processors present in the system which can execute more than one process at the same time. This will increase the throughput of the system.



Working of Multiprocessor System

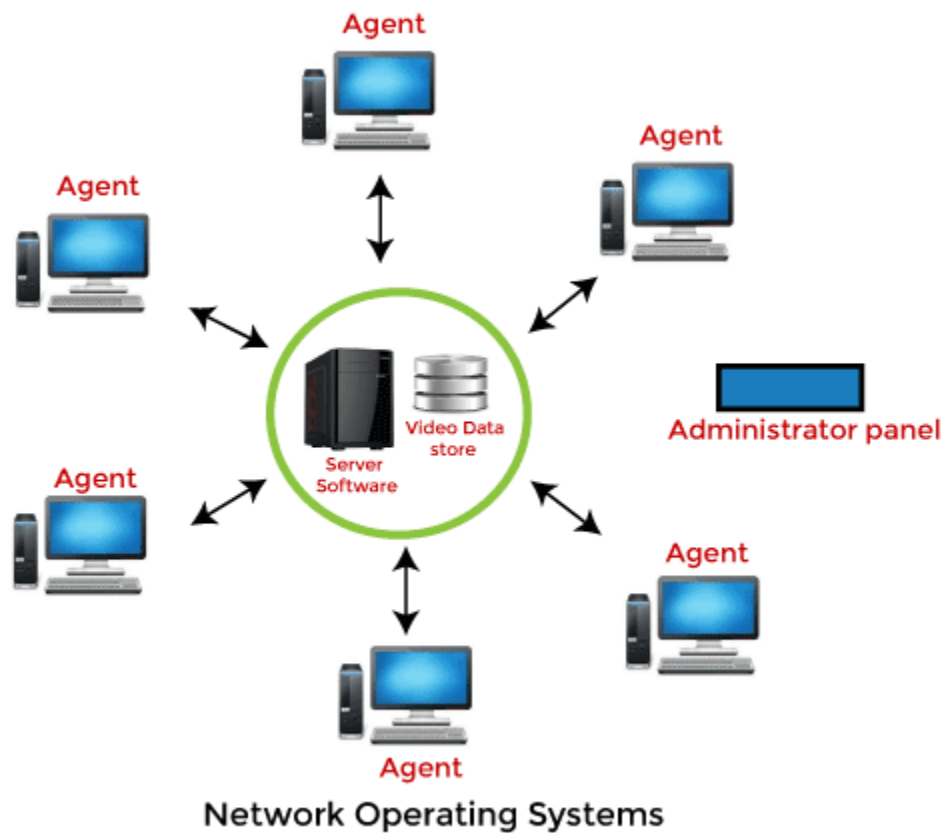
In Multiprocessing, Parallel computing is achieved. More than one processor present in the system can execute more than one process simultaneously, which will increase the throughput of the system.

Multitasking Operating System



The multitasking operating system is a logical extension of a multiprogramming system that enables multiple programs simultaneously. It allows a user to perform more than one computer task at the same time.

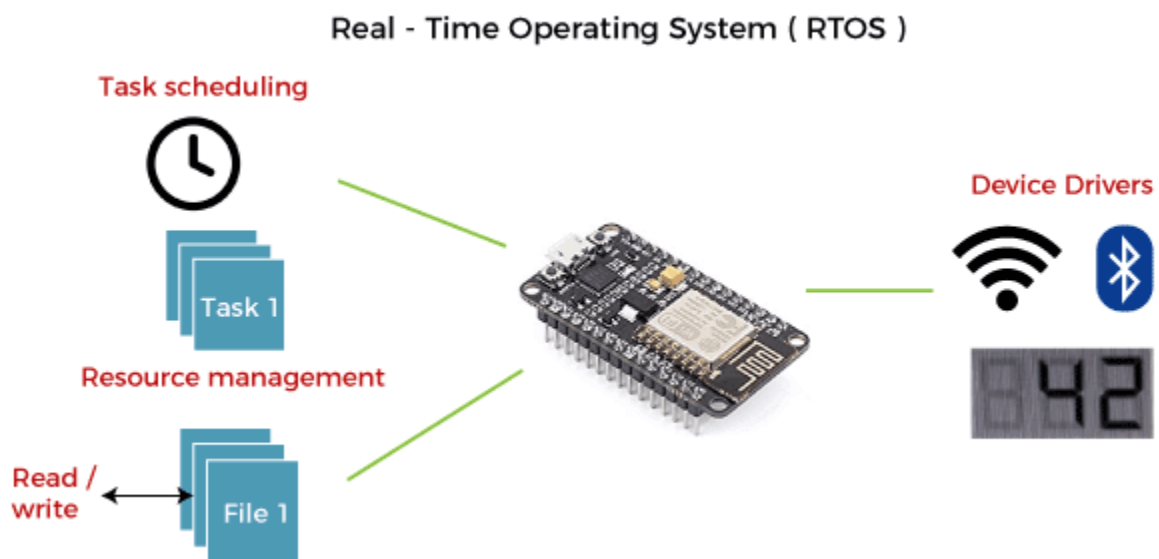
Network Operating System



An Operating system, which includes software and associated protocols to communicate with other computers via a network conveniently and cost-effectively, is called Network Operating System.

Real Time Operating System

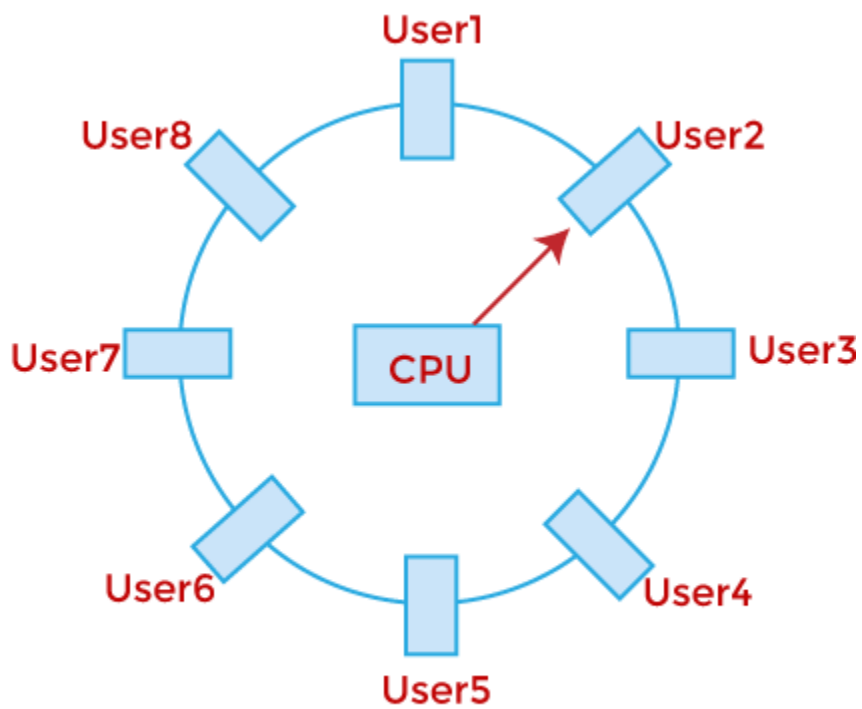
In Real-Time Systems, each job carries a certain deadline within which the job is supposed to be completed, otherwise, the huge loss will be there, or even if the result is produced, it will be completely useless.



The Application of a Real-Time system exists in the case of military applications, if you want to drop a missile, then the missile is supposed to be dropped with a certain precision.

Time-Sharing Operating System

In the Time Sharing operating system, computer resources are allocated in a time-dependent fashion to several programs simultaneously. Thus it helps to provide a large number of user's direct access to the main computer. It is a logical extension of multiprogramming. In time-sharing, the CPU is switched among multiple programs given by different users on a scheduled basis.

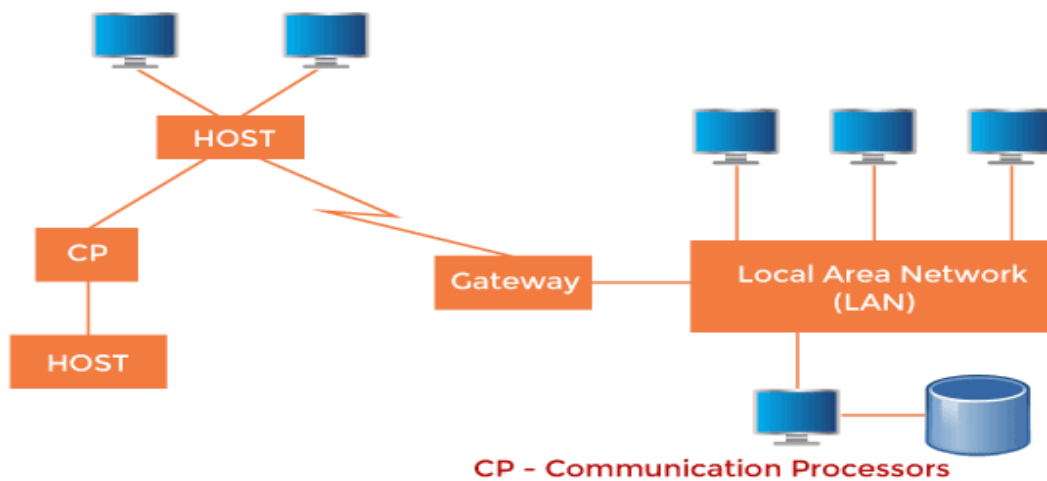


Timesharing in case of 8 users



Distributed Operating System

The Distributed Operating system is not installed on a single machine, it is divided into parts, and these parts are loaded on different machines. A part of the distributed Operating system is installed on each machine to make their communication possible. Distributed Operating systems are much more complex, large, and sophisticated than Network operating systems because they also have to take care of varying networking protocols.



A Typical View of a Distributed System