

GUI Operating System

An operating system is software that provides an interface between the user and the hardware. The computer cannot perform any task without an operating system. The operating system controls and manages the operation of computer hardware.

Some popular, modern graphical user interfaces include Microsoft Windows, macOS, Ubuntu, Android, Apple's iOS, BlackBerry OS, Windows 10 Mobile,

Some operating systems are graphical user interfaces (GUI), and some are command-line interfaces (CLI)

What is GUI OS?

GUI stands for Graphical User Interface. It is a visual representation of communication presented to the user for easy interaction with the machine. The actions in a GUI are usually performed through direct manipulation of graphical elements like buttons and icons. Communication can be performed by interacting with these icons rather than the usual text-based or command-based communication.

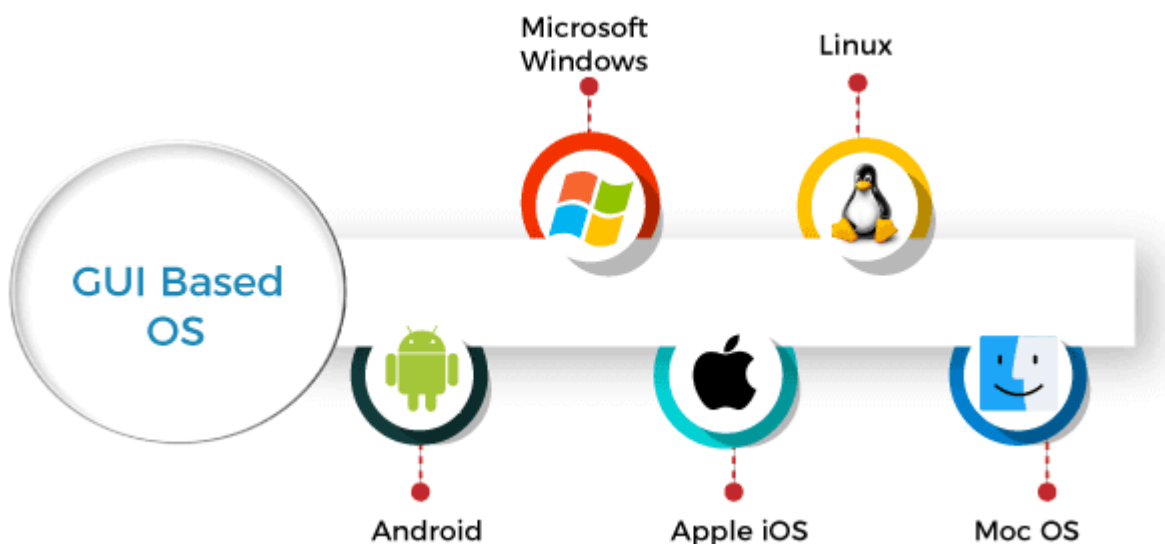


There are different elements and objects that the user use to interact with the software to make a user friendly GUI.

- **Button:** A graphical representation of a button that acts as a program when pressed.

- **Dialogue box:** A type of window that displays additional information and asks a user for input.
- **Icon:** Small graphical representation of a program, features, or file.
- **Menu:** List of commands or choices offered to the user through the menu bar.
- **Ribbon:** Replacement for the file menu and toolbar that groups programs activities together.
- **Tab:** Clickable area at the top of a window that shows another page or area.
- **Toolbar:** Row of buttons, often near the top of an application window, that controls software functions.
- **Window:** Rectangular section of the computer's display that shows the program currently being used.

Types of GUI based Operating System



1. Microsoft Windows

Microsoft Windows is one of the most common GUI based operating systems. It is developed and marketed by Microsoft. The current version of Microsoft Windows is Windows 10. Moreover, it has several earlier versions like Windows XP, Windows 8, Windows 7, etc. Besides, the most common editions for home computers are Windows Home (Win Home) and Windows Professional (Win Pro or Windows Pro).

2. Linux

Linux is a popular operating system. It is not a part of any particular firm or organization. Rather, it was developed by a programmer **Linus Torvalds** in 1991. It is

an open-source operating system. Today, LINUX is run in many organizations, private offices, on mobiles, supercomputers, over the internet, etc.

3. Android

It is one of the most common versions of the operating system today. It is used on mobile phones and tablets. Most versions of it are the open-source operating system.

4. Apple iOS

After android, it is one of the most popular OS. It is designed to run on Apple devices such as iPhones, iPad tablets, etc.

5. MacOS

It is the operating system used in Apple laptops and Apple desktops. Moreover, Its most popular features are **Siri** and **FaceTime**.

Difference between GUI and CUI Operating System

The interface can be understood as the medium we communicate with each other. In the same way, to communicate with the computer, we have interfaces. There are two types of interface one is the graphical user interface, and the other one is the command-line interface.



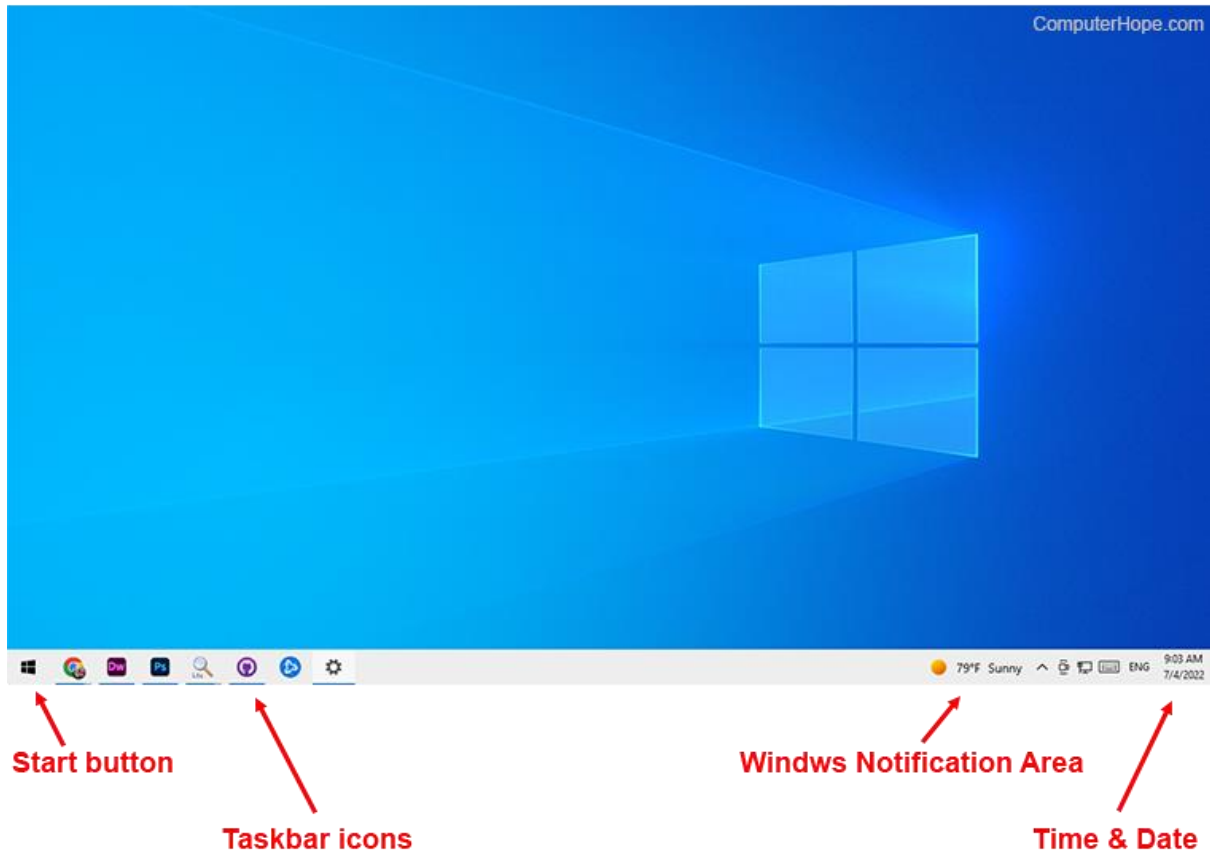
A command user interface (CUI) processes commands to a computer program in the form of lines of text. The program which handles the interface is called a command-line interpreter or command-line processor. Operating systems implement a command-line interface in a shell for interactive access to operating system functions or services.

The graphical user interface (GUI) allows users to interact with electronic devices through graphical icons and audio indicators such as primary notation instead of

text-based user interfaces, typed command labels, or text navigation. Below are some more differences between GUI and CUI Operating System, such as:

Terms	GUI	CUI
Interaction	A user interacts with the computer using Graphics like images, icons.	A user interacts with a computer using commands like text.
Navigation	Navigation is easy.	Navigation is difficult.
Usage	GUI is easy to use.	CUI is difficult to use and requires expertise.
Peripherals used	GUI operating system requires a keyboard, mouse or any other pointing device.	CUI operating system requires only keyboard.
Memory requirement	It required high memory.	It required low memory.
Flexibility	Highly flexible user interface.	Less flexible user interface.
Customize	GUI is highly customizable.	CUI appearance is not easily changeable.

Windows 10 Desktop



What are the benefits of GUI?

A GUI is considered to be more [user-friendly](#) than a text-based [command-line interface](#), such as [MS-DOS](#) or the [shell](#) of [Unix-like](#) operating systems.

Unlike a [command-line operating system](#) or [CUI](#) (command-line user interface), like [Unix](#) or [MS-DOS](#), GUI operating systems are easier to learn and use because commands do not need to be memorized. Additionally, users do not need to know any [programming languages](#). Because of their ease of use and more modern appearance, GUI operating systems are the primary type of operating systems used today.

What are examples of a GUI operating system?

- [Microsoft Windows](#)

- Apple [System 7](#) and [macOS](#)
- [Chrome OS](#)
- [Linux](#) variants like [Ubuntu](#) use a GUI interface.

How does the user interact with a GUI?

A [pointing device](#), such as the [mouse](#), interacts with nearly all aspects of the GUI. More modern (and mobile) devices also utilize a [touch screen](#).

GUI KEY Benefits

- It allows you to place more information within a program.
- The graphics allow users to use complex programs with greater ease.
- It saves time as you do not need to edit configurations manually.
- You can easily memorize the tasks (point-and-click).
- Helps create user-friendly software with a point-and-click interface.

Operating System

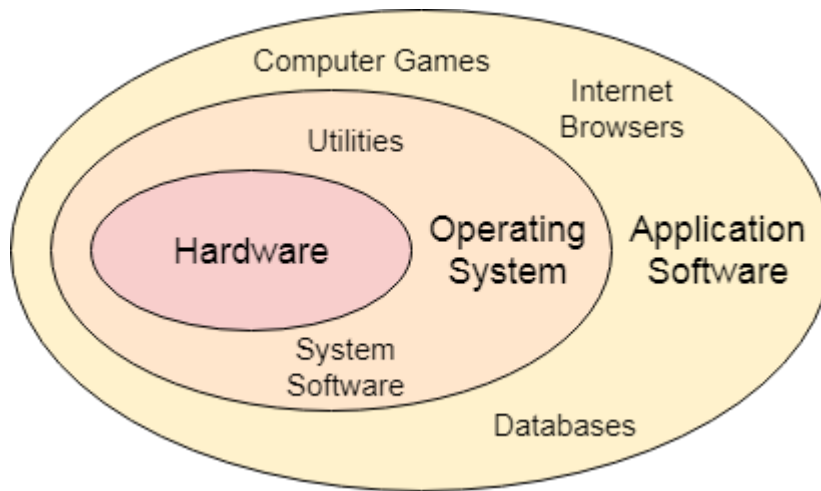
Operating System can be defined as an interface between user and the hardware. It provides an environment to the user so that, the user can perform its task in convenient and efficient way.

The Operating System Tutorial is divided into various parts based on its functions such as Process Management, Process Synchronization, Deadlocks and File Management.

Operating System Definition and Function

In the Computer System (comprises of Hardware and software), Hardware can only understand machine code (in the form of 0 and 1) which doesn't make any sense to a naive user.

We need a system which can act as an intermediary and manage all the processes and resources present in the system.



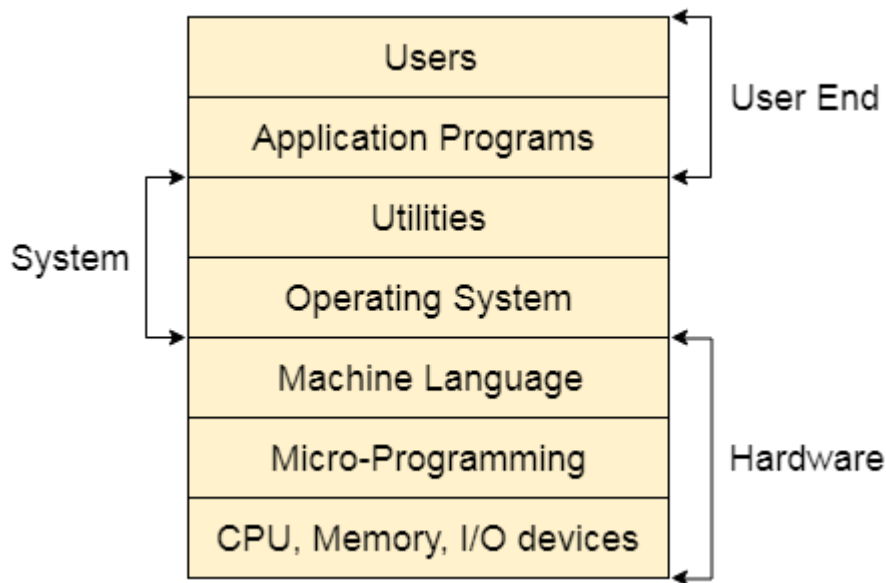
An **Operating System** can be defined as an **interface between user and hardware**. It is responsible for the execution of all the processes, Resource Allocation, CPU management, File Management and many other tasks.

The purpose of an operating system is to provide an environment in which a user can execute programs in convenient and efficient manner.

Structure of a Computer System

A Computer System consists of:

- Users (people who are using the computer)
- Application Programs (Games, Video player, Browsers, etc.)
- System Programs (Shells, Editors, Compilers, etc.)
- Operating System (A special program which acts as an interface between user and hardware)
- Hardware (CPU, Disks, Memory, etc)



What does an Operating system do?

1. Process Management
2. Storage management
3. Memory Management
4. Device management
5. CPU Scheduling
6. File Management
7. Security

Functions of Operating System

1. Memory Management

It is the management of the main or primary memory. Whatever program is executed, it has to be present in the main memory. Main memory is a quick storage area that may be accessed directly by the CPU. When the program is completed, the memory region is released and can be used by other programs. Therefore, there can be more than one program present at a time. Hence, it is required to manage the memory.

The operating system:

- Allocates and deallocates the memory.
- Keeps a record of which part of primary memory is used by whom and how much.
- Distributes the memory while multiprocessing.
- In multiprogramming, the operating system selects which processes acquire memory when and how much memory they get.

2. Processor Management/Scheduling

- Every software that runs on a computer, whether in the background or in the frontend, is a process. Processor management is an execution unit in which a program operates. The operating system determines the status of the processor and processes, selects a job and its processor, allocates the processor to the process, and de-allocates the processor after the process is completed.

When more than one process runs on the system the OS decides how and when a process will use the CPU. Hence, the name is also **CPU Scheduling**. The OS:

- Allocates and deallocates processor to the processes.
- Keeps record of CPU status.

Certain algorithms used for CPU scheduling are as follows:

- First Come First Serve (FCFS)
- Shortest Job First (SJF)
- Round-Robin Scheduling
- Priority-based scheduling etc.

Purpose of CPU scheduling

The purpose of CPU scheduling is as follows:

- Proper utilization of CPU. Since the proper utilization of the CPU is necessary. Therefore, the OS makes sure that the CPU should be as busy as possible.
- Since every device should get a chance to use the processor. Hence, the OS makes sure that the devices get fair processor time.
- Increasing the efficiency of the system.

3. Device Management

An operating system regulates device connection using drivers. The processes may require devices for their use. This management is done by the OS. The OS:

- Allocates and deallocates devices to different processes.
- Keeps records of the devices.
- Decides which process can use which device for how much time.

4. File Management

The operating system manages resource allocation and de-allocation. It specifies which process receives the file and for how long. It also keeps track of information, location, uses, status, and so on. These groupings of resources are referred to as file systems. The files on a system are stored in different directories. The OS:

- Keeps records of the status and locations of files.
- Allocates and deallocates resources.
- Decides who gets the resources.

5. Storage Management

Storage management is a procedure that allows users to maximize the utilization of storage devices while also protecting data integrity on whatever media on which it lives. Network virtualization, replication, mirroring, security, compression, deduplication, traffic analysis, process automation, storage provisioning, and memory management are some of the features that may be included. The operating system is in charge of storing and accessing files. The creation of files, the creation of directories, the reading and writing of data from files and directories, as well as the copying of the contents of files and directories from one location to another are all included in storage management.

The OS uses storage management for:

- Improving the performance of the data storage resources.
- It optimizes the use of various storage devices.
- Assists businesses in storing more data on existing hardware, speeding up the data retrieval process, preventing data loss, meeting data retention regulations, and lowering IT costs

What are the functions of Operating System

- **Security** – For security, modern operating systems employ a firewall. A firewall is a type of security system that monitors all computer activity and blocks it if it detects a threat.
- **Job Accounting** – As the operating system keeps track of all the functions of a computer system. Hence, it makes a record of all the activities taking place on the system. It has an account of all the information about the memory, resources, errors, etc. Therefore, this information can be used as and when required.

- **Control over system performance** – The operating system will collect consumption statistics for various resources and monitor performance indicators such as reaction time, which is the time between requesting a service and receiving a response from the system.
- **Error detecting aids** – While a computer system is running, a variety of errors might occur. Error detection guarantees that data is delivered reliably across susceptible networks. The operating system continuously monitors the system to locate or recognize problems and protects the system from them.
- **Coordination between other software and users** – The operating system (OS) allows hardware components to be coordinated and directs and allocates assemblers, interpreters, compilers, and other software to different users of the computer system.
- **Booting process** – The process of starting or restarting a computer is referred to as Booting. Cold booting occurs when a computer is totally turned off and then turned back on. Warm booting occurs when the computer is restarted. The operating system (OS) is in charge of booting the computer.

Types of Operating Systems (OS)

- Batch Operating System

- Multi-Programming System
- Multi-Processing System
- Multi-Tasking Operating System
- Time-Sharing Operating System
- Distributed Operating System
- Network Operating System
- Real-Time Operating System

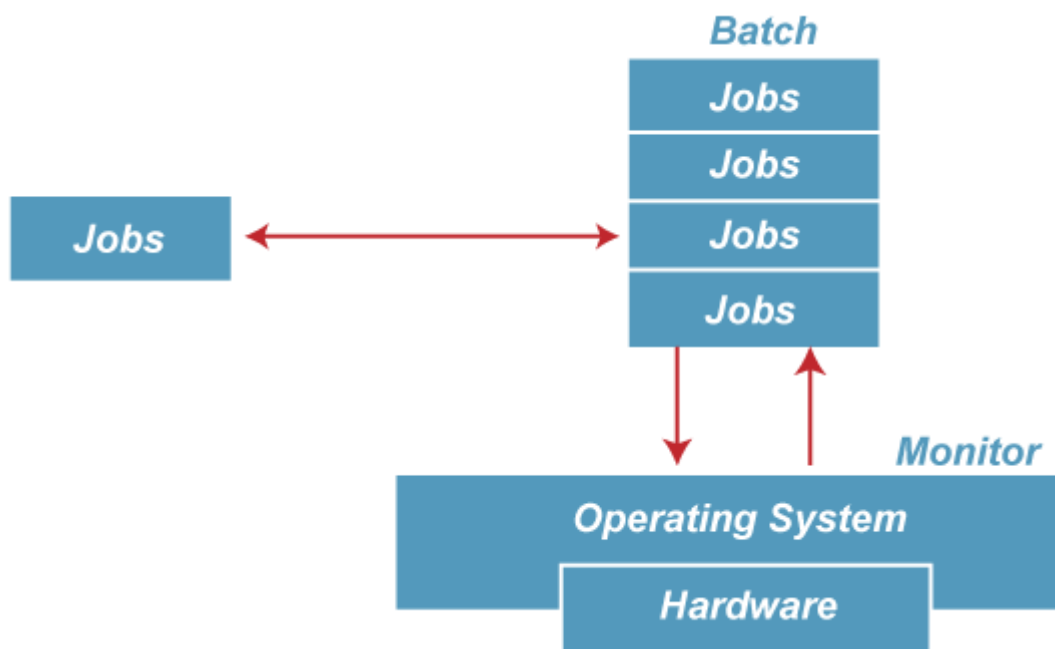
An operating system is a well-organized collection of programs that manages the computer hardware. It is a type of system software that is responsible for the smooth functioning of the computer system.

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 this os user can not directly interact with computer system.

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.

In this os user prepare similar types of jobs and submit to the oprator and wait for output.



Advantage:

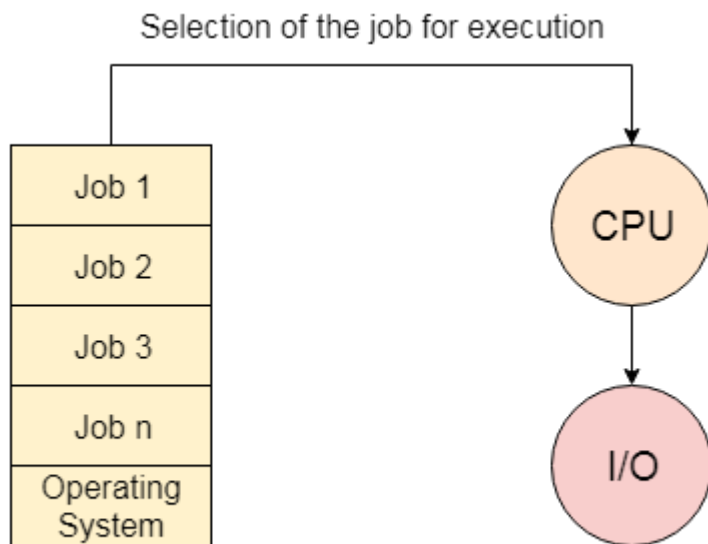
It is suitable for execute similar types of job.

Disadvantages of Batch OS

1. Starvation

Batch processing suffers from starvation.

For Example:



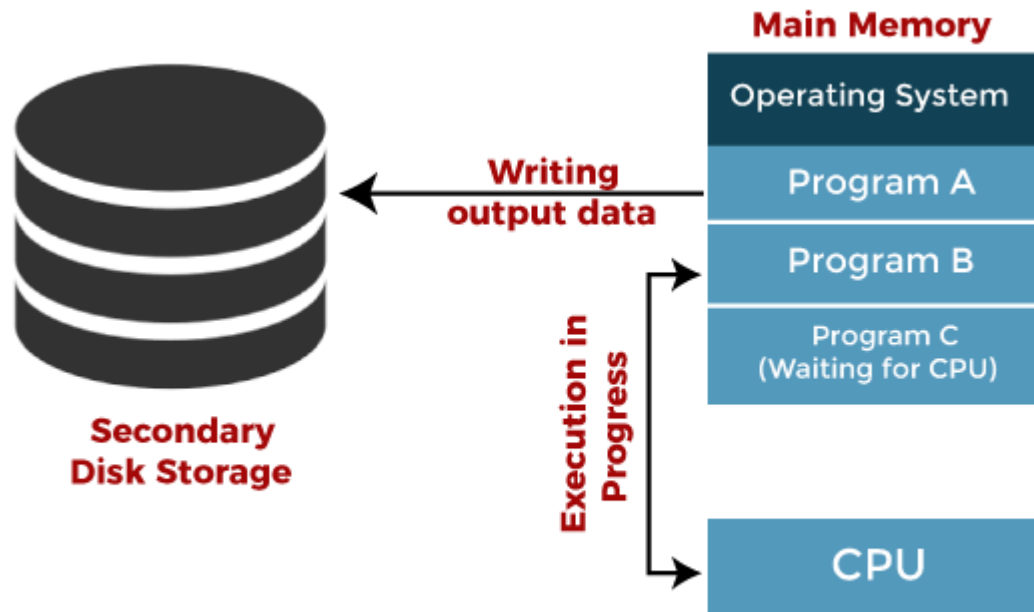
Job Queue

There are five jobs J1, J2, J3, J4, and J5, present in the batch. If the execution time of J1 is very high, then the other four jobs will never be executed, or they will have to wait for a very long time. Hence the other processes get starved.

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

Advantages of Multiprogramming OS

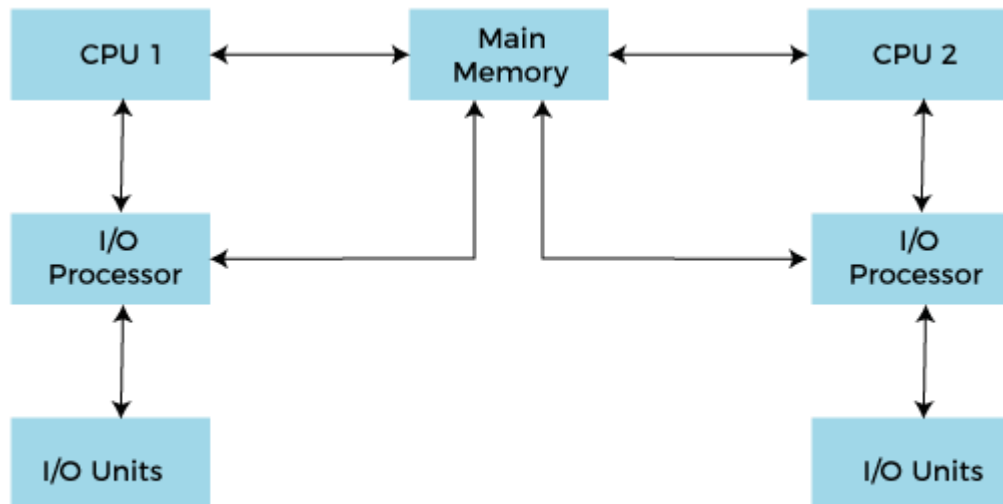
- Throughout the system, it increased as the CPU always had one program to execute.
- Response time can also be reduced.

Disadvantages of Multiprogramming OS

- Multiprogramming systems provide an environment in which various systems
- resources are used efficiently, but they do not provide any user interaction with the computer 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.

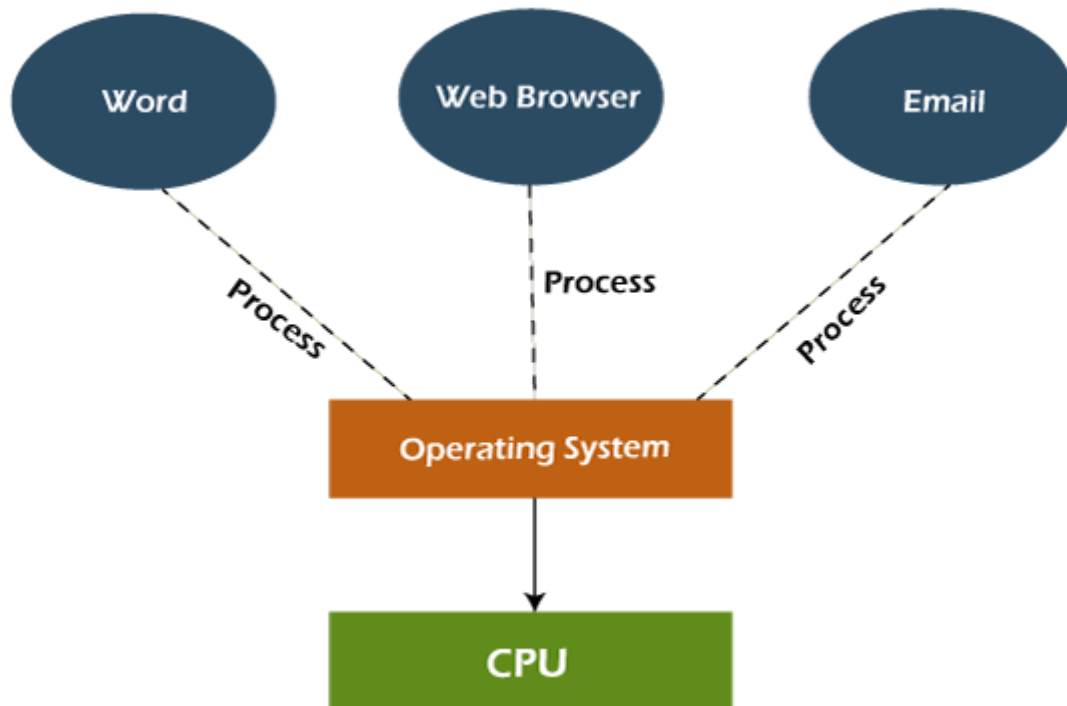
Advantages of Multiprocessing operating system:

- **Increased reliability:** Due to the multiprocessing system, processing tasks can be distributed among several processors. This increases reliability as if one processor fails, the task can be given to another processor for completion.
- **Increased throughput:** As several processors increase, more work can be done in less.

Disadvantages of Multiprocessing operating System

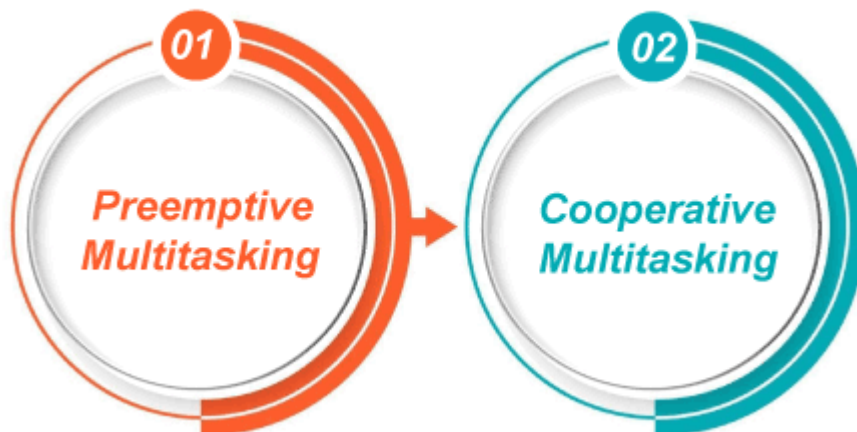
- Multiprocessing operating system is more complex and sophisticated as it takes care of multiple CPUs simultaneously.

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.

Types of Multitasking



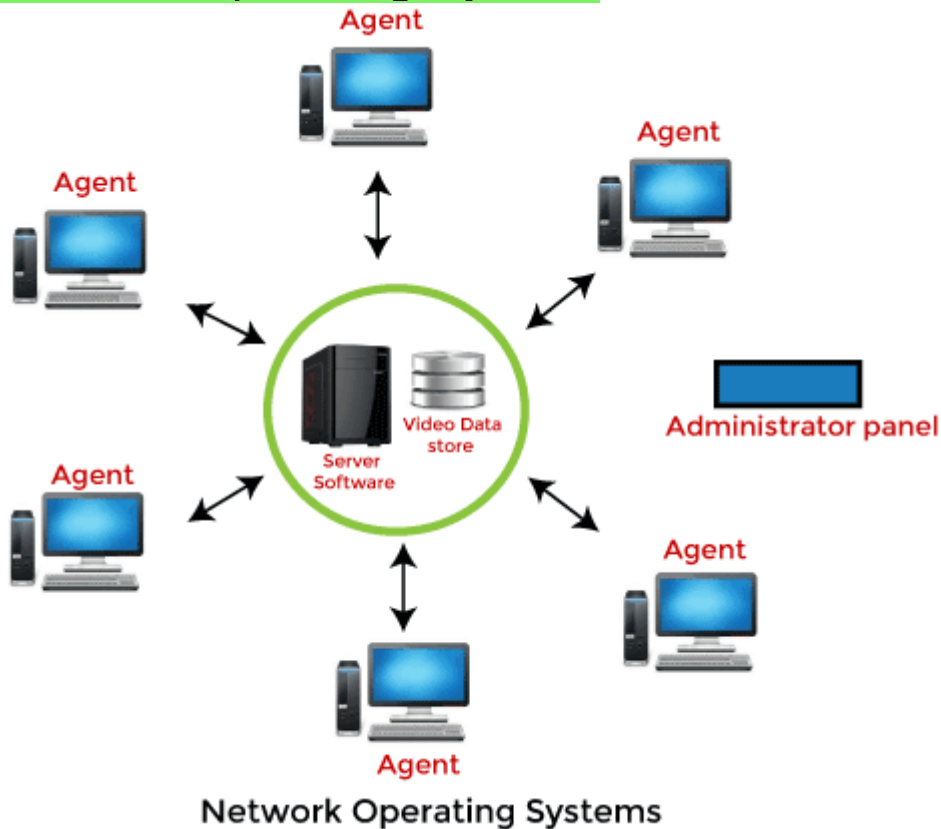
Advantages of Multitasking operating system

- This operating system is more suited to supporting multiple users simultaneously.
- The multitasking operating systems have well-defined memory management.

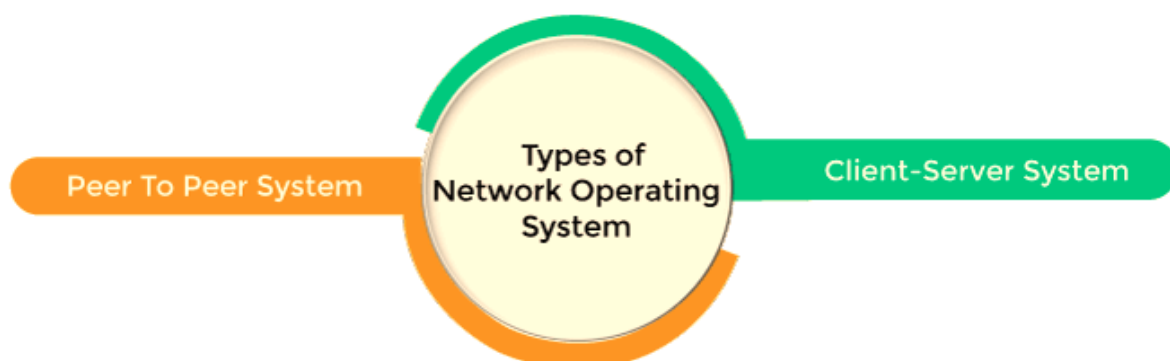
Disadvantages of Multitasking operating system

- The multiple processors are busier at the same time to complete any task in a multitasking environment, so the CPU generates more heat.

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.



Advantages of Network Operating System

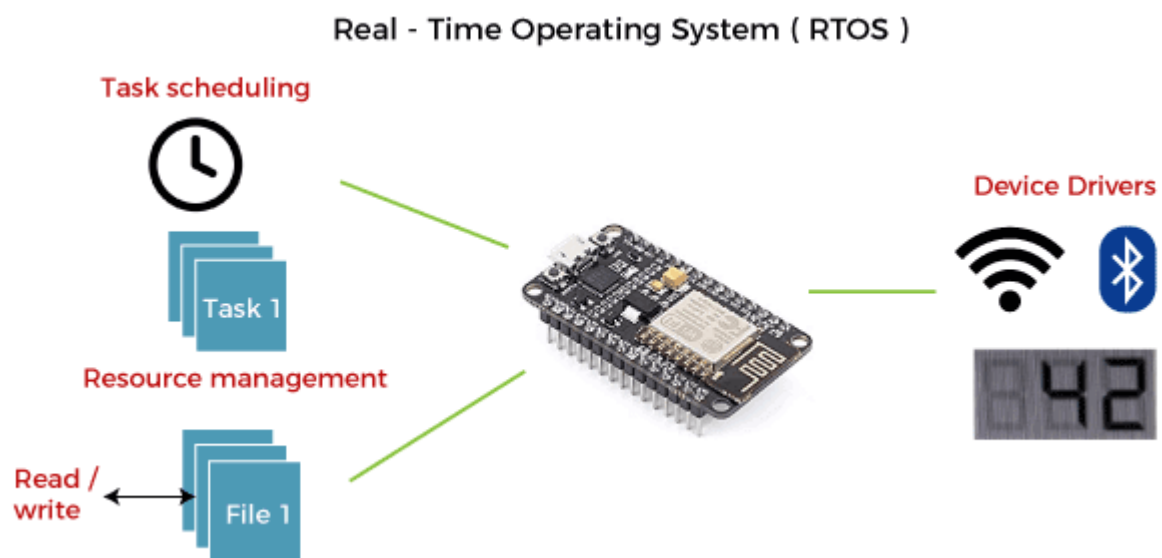
- In this type of operating system, network traffic reduces due to the division between clients and the server.
- This type of system is less expensive to set up and maintain.

Disadvantages of Network Operating System

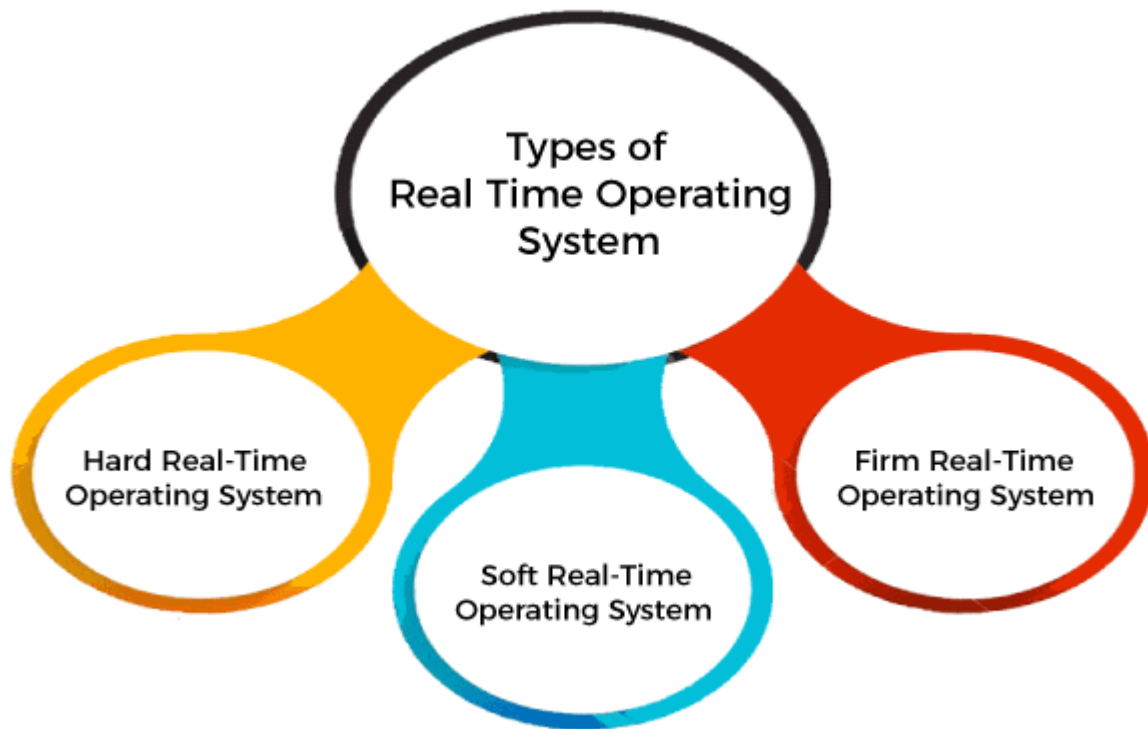
- In this type of operating system, the failure of any node in a system affects the whole system.
- Security and performance are important issues. So trained network administrators are required for network administration.

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.



Advantages of Real-time operating system:

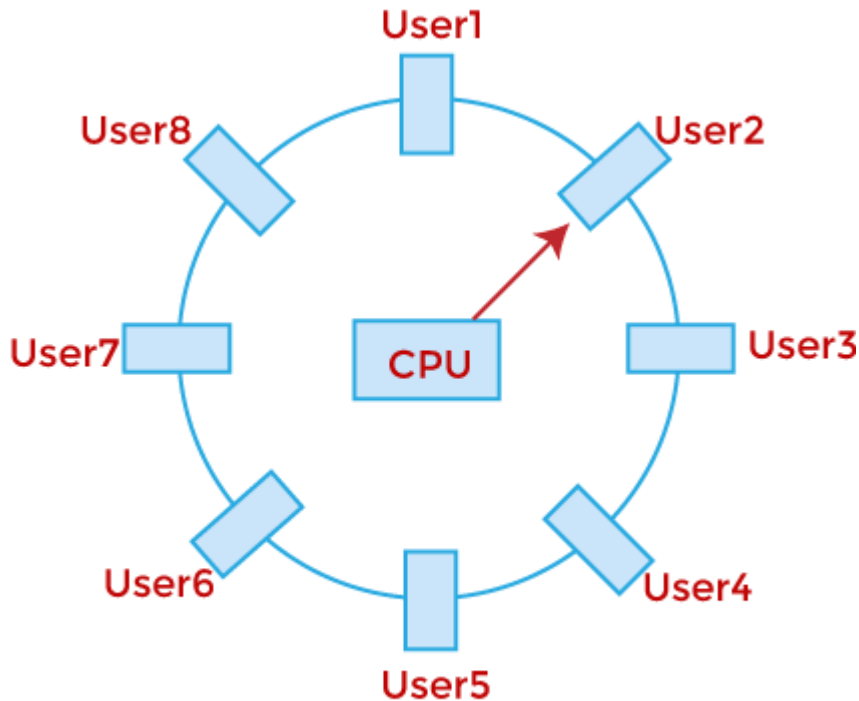
- Easy to layout, develop and execute real-time applications under the real-time operating system.
- In a Real-time operating system, the maximum utilization of devices and systems.

Disadvantages of Real-time operating system:

- Real-time operating systems are very costly to develop.
- Real-time operating systems are very complex and can consume critical CPU cycles.

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

A time-sharing operating system allows many users to be served simultaneously, so sophisticated CPU scheduling schemes and Input/output management are required.

Time-sharing operating systems are very difficult and expensive to build.

Advantages of Time Sharing Operating System

- The time-sharing operating system provides effective utilization and sharing of resources.
- This system reduces CPU idle and response time.

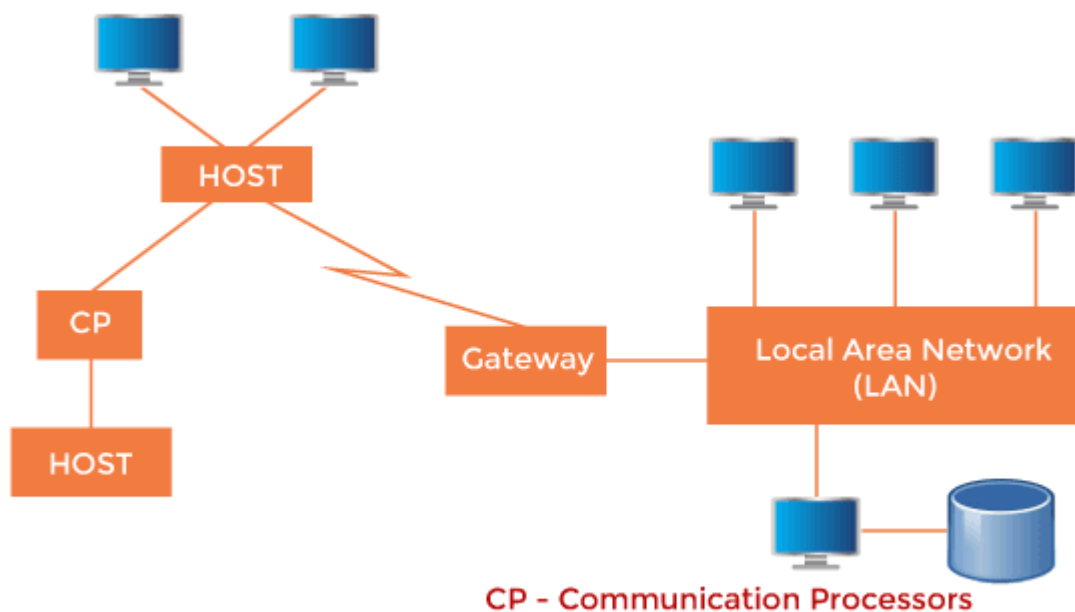
Disadvantages of Time Sharing Operating System

- Data transmission rates are very high in comparison to other methods.
- Security and integrity of user programs loaded in memory and data need to be maintained as many users access the system at the same time.

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

Advantages of Distributed Operating System

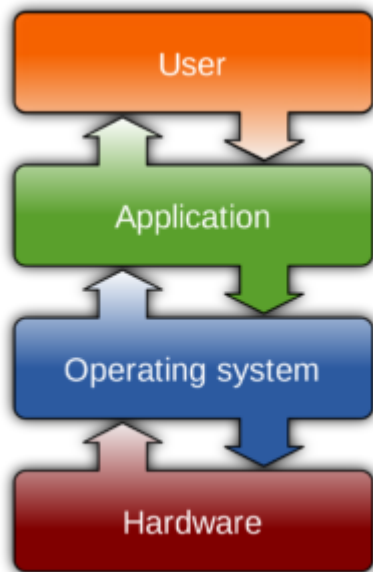
- The distributed operating system provides sharing of resources.
- This type of system is fault-tolerant.

Disadvantages of Distributed Operating System

- Protocol overhead can dominate computation cost.

Operating System

An operating system (OS) is a program that acts as an interface between the system hardware and the user. Moreover, it handles all the interactions between the software and the hardware. All the working of a computer system depends on the OS at the base level. Further, it performs all the functions like handling memory, processes, the interaction between hardware and software, etc. Now, let us look at the functions of operating system.



Operating System

Objectives of OS

The primary goals of an operating system are as follows:

- **Convenience** – An operating system improves the use of a machine. Operating systems enable users to get started on the things they wish to complete quickly without having to cope with the stress of first configuring the system.
- **Efficiency** – An operating system enables the efficient use of resources. This is due to less time spent configuring the system.
- **Ability to evolve** – An operating system should be designed in such a way that it allows for the effective development, testing, and introduction of new features without interfering with service.
- **Management of system resources** – It guarantees that resources are shared fairly among various processes and users.

Windows Operating system

It is a GUI-based operating system that is developed and marketed by Microsoft Corporation. The main objective of Microsoft company regarding this operating system is to make it an all-rounder and easy-to-use OS that has everything So that any normal user who doesn't have knowledge about coding can easily use this operating without any issue.

It comes up with a clean desktop environment that looks minimal and easy to use. It also comes up with a pre-loaded application like Microsoft Excel, PowerPoint, Microsoft Edge browser, Microsoft store, some basic games, and many other applications come. It allows the user to do multitask, play games, watch videos, browse the internet, chats with friends/family, and even you can install any software without any issue.

Now, let see what are the features in the window OS

Features in Windows Operating System

As such there are many features in the windows are :

- Desktop
- Taskbar
- Task Manager
- Control Panel
- Command Prompt
- Recycle Bin
- Setting
- Registry Editor
- Cortana
- System Information
- Start Menu

1. Desktop

Desktop is a by-default GUI-based Screen provided by the Microsoft in windows OS. It is a place where all the software applications icons are available on a screen, so the users can do their work by clicking on these applications. You can also customize it according to your preferences like you can change the background, you can delete your application's icons, you can create a folder, and also you can customize your taskbar.



2. Taskbar

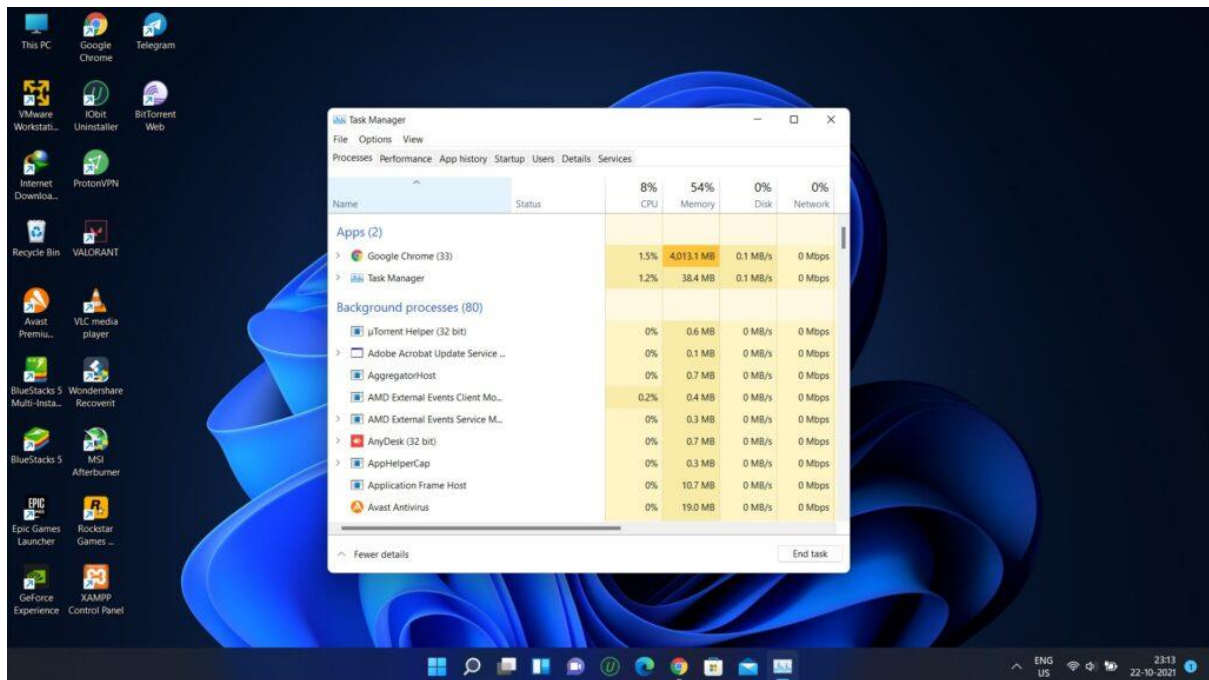
Taskbar is an area where you can check which application in your PC/laptop is currently open or which is not. Like in the given image, you can see that the only chrome application is currently open.



Taskbar

3. Task Manager

Task manager is a “system monitoring program” where you can monitor your system what’s currently running on your computer. It shows your system resource information, what amount of resources can be used by each application.



4. Control Panel

It is a management tool where you can manage all the resources on your system like you can make some changes on Hardware resources(Printer, Mouse, keyboard, etc), networks, programs, personalization, etc.

5. Command Prompt

Command Prompt is a terminal where you can operate your computer by writing Some commands like `cd`, `cls`, `dir`, `exit`, `find`, `hostname`, `shutdown`, etc, and many others. It is mostly known for “`cmd`”.



6) Recycle Bin

It is a place where all the deleted files and applications are stored. It provides a facility of restore point where we can restore any deleted files or applications of our system. If you delete any files or applications from the recycle bin then you will no longer restore them, they will be permanently deleted. In a given image you can see that my Linux command PDF file has been deleted and is now showing in the recycle bin folder.

Recycle Bin

7) Setting

The word “setting” you better know, this is available in all the devices smartphones, tablets, PC, etc. setting allows us to make some changes like we can customize our window desktop by adding different types of wallpapers, pictures to the background, we can adjust the icon size and also we can change the time and date of your system.

If we talked about an important thing then we can check the windows updates, update drivers, secure system, etc.

Setting



8) Registry Editor

It is the place where we can fix any error which will be happening in windows OS and for any applications.

Registry Editor



9) Cortana

Cortana is an assistant which helps us to execute our program by hearing our voice, it saves our time and focuses attention on what matters most.

Cortana

10) System Information

System information shows our PC information of hardware resources, components, and of the software environment.



System Information

11) Start Menu

Start Menu shows all the applications and programs of our system. It also shows the history of what application was currently open.

Start Menu

History of Windows Operating System

1983 was the year where the first window operating system was developed which is done by the multi-technology software company “**Microsoft**” and it was founded by the two popular electronics magazines friends “**Bill Gates**” and “**Paul Allen**” in 1975. After some years Paul Allen left the Microsoft company (In 1983) and right now the Bill Gates was the only person who owns Microsoft and there are many shareholders who invest in Microsoft.

Versions of Windows Operating System

There are too many versions were released by Microsoft are:

a) Windows 1

It was the first Windows from Microsoft which is released on 20 November 1985. This was the first step from the Microsoft to produce a GUI-based operating system. After that, they sold it in the market at \$100.

b) Window 2

After two years, Microsoft released the second version of the window which is released on 9 December 1987. It was sold for \$100.

c) Window 386

The release date of window 2, “**Window 386**” was released on the same day (on 9 Dec 1987). And, it was also sold at \$100.

d) Window 286

In June 1988 the window 286 were released and also sold for \$100.

e) Window 3

It was released on 22 May 1990 and this was the first version of windows that required an HDD (Hard Drive Disk). It was initially sold at a price of \$149.95 and the upgraded version was sold for \$79.95.

e) Window 3.1

It was released on 6 April 1992. It was the most loved version in the market, Within 2 months the millions of copies of this version were sold in the market.



f) Windows 95

Windows 95 was released on 24 August 1995. This was the time where the windows craze started, within a few days the millions of copies were sold.

g) Windows 98

Windows 98 was released in 1998. This was the updated version of windows 95 where the Microsoft added some new feature which was not available in windows 95

h) Windows 2000

Windows 2000 was launched on 17 Feb 2000. This version was based on a business-oriented system.

i) Windows XP

Windows XP was released on 25 October 2001 and this was the best version of Windows OS because it is a stable OS which is built on a Windows 2000 kernel.

j) Windows Vista

In January 2006 this version was released and it is the updated version of Windows XP where the vista added some additional features with its looks and feel.

k) Window 7

Window 7 is a successor to window vista which was released on 22 July 2009. This version of windows aims to fix all those bugs which was faced in windows vista and make it user-friendly OS.

l) Window 8

Window 8 was released on 26 October 2012 and this version of windows comes with some news features like faster booting speed, web store, improved search function, USB 3.0 supported device, etc., and many others.

m) Window 8.1

Window 8.1 was released on 23 august 2013 and it is the little upgrade of window 8.

n) Window 10

Window 10 was released on 29 July 2015. This version comes up with some improvements and with news features.



o) Window 11

Well, we all know window 11 is recently released by microsoft. It is released on 5 Oct 2021. It is also comes up with some improvements and with some features like

Apple mac-like interface, Integrated android apps, splitting the screen, Better virtual desktop support, etc. and many other things.