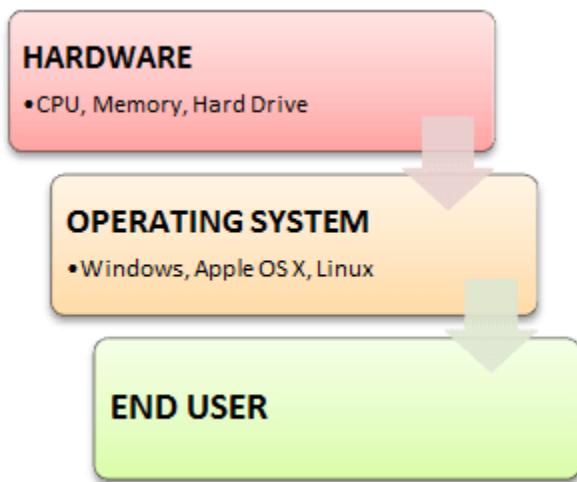


What is an Operating System?

An **Operating System (OS)** is a software that acts as an interface between computer hardware components and the user. Every computer system must have at least one operating system to run other programs. Applications like Browsers, MS Office, Notepad Games, etc., need some environment to run and perform its tasks.

The OS helps you to communicate with the computer without knowing how to speak the computer's language. It is not possible for the user to use any computer or mobile device without having an operating system.



Introduction to Operating System

Following are the Operating System examples with the latest Market Share

OS Name	Share
Windows	40.34
Android	37.95
iOS	15.44
Mac OS	4.34
Linux	0.95
Chrome OS	0.14
Windows Phone OS	0.06

Types of Operating System (OS)

Following are the popular types of OS (Operating System):

- Batch Operating System
- Multitasking/Time Sharing OS
- Multiprocessing OS
- Real Time OS
- Distributed OS
- Network OS
- Mobile OS

Batch Operating System

Some computer processes are very lengthy and time-consuming. To speed the same process, a job with a similar type of needs are batched together and run as a group.

The user of a batch operating system never directly interacts with the computer. In this type of OS, every user prepares his or her job on an offline device like a punch card and submit it to the computer operator.

Multi-Tasking/Time-sharing Operating systems

Time-sharing operating system enables people located at a different terminal(shell) to use a single computer system at the same time. The processor time (CPU) which is shared among multiple users is termed as time sharing.

Real time OS

A real time operating system time interval to process and respond to inputs is very small. Examples: Military Software Systems, Space Software Systems are the Real time OS example.

Distributed Operating System

Distributed systems use many processors located in different machines to provide very fast computation to its users.

Network Operating System

Network Operating System runs on a server. It provides the capability to serve to manage data, user, groups, security, application, and other networking functions.

Mobile OS

Mobile operating systems are those OS which is especially designed to power smartphones, tablets, and wearables devices.

Some most famous mobile operating systems are Android and iOS, but others include BlackBerry, Web, and watchOS.

Functions of Operating System

Some typical operating system functions may include managing memory, files, processes, I/O system & devices, security, etc.

1. **Process management:** Process management helps OS to create and delete processes. It also provides mechanisms for synchronization and communication among processes.
2. **Memory management:** Memory management module performs the task of allocation and de-allocation of memory space to programs in need of this resources.
3. **File management:** It manages all the file-related activities such as organization storage, retrieval, naming, sharing, and protection of files.
4. **Device Management:** Device management keeps tracks of all devices. This module also responsible for this task is known as the I/O controller. It also performs the task of allocation and de-allocation of the devices.
5. **I/O System Management:** One of the main objects of any OS is to hide the peculiarities of that hardware devices from the user.
6. **Secondary-Storage Management:** Systems have several levels of storage which includes primary storage, secondary storage, and cache storage. Instructions and data must be stored in primary storage or cache so that a running program can reference it.
7. **Security:** Security module protects the [data and information](#) of a computer system against malware threat and authorized access.

8. **Command interpretation:** This module is interpreting commands given by the user and acting system resources to process those commands.
9. **Networking:** A distributed system is a group of processors which do not share memory, hardware devices, or a clock. The processors communicate with one another through the network.
10. **Job accounting:** Keeping track of time & resource used by various job and users.
11. **Communication management:** Coordination and assignment of compilers, interpreters, and another software resource of the various users of the computer systems.

Features of Operating System (OS)

Here is a list of important features of OS:

- Protected and supervisor mode
- Allows disk access and file systems Device drivers Networking Security
- Program Execution
- Memory management Virtual Memory Multitasking
- Handling I/O operations
- Manipulation of the file system
- Error Detection and handling
- Resource allocation
- Information and Resource Protection

Advantage of Operating System

- Allows you to hide details of hardware by creating an abstraction
- Easy to use with a GUI
- Offers an environment in which a user may execute programs/applications
- The operating system must make sure that the computer system convenient to use
- Operating System acts as an intermediary among applications and the hardware components
- It provides the computer system resources with easy to use format

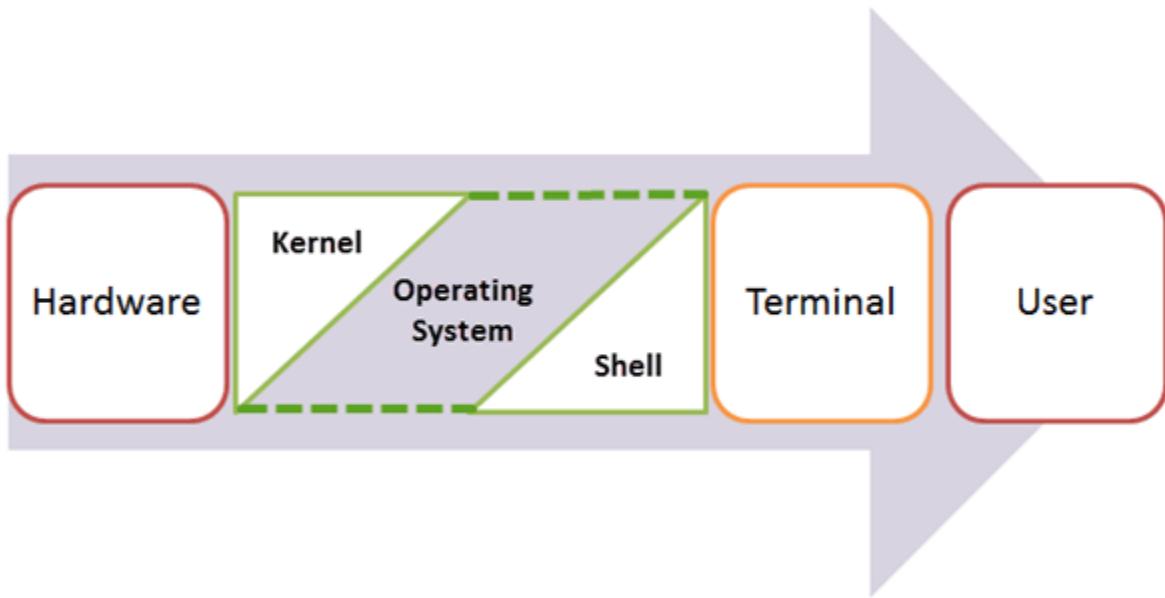
- Acts as an intermediary between all hardware's and software's of the system

Disadvantages of Operating System

- If any issue occurs in OS, you may lose all the contents which have been stored in your system
- Operating system's software is quite expensive for small size organization which adds burden on them. Example Windows
- It is never entirely secure as a threat can occur at any time

What is Kernel in Operating System?

The kernel is the central component of a computer operating systems. The only job performed by the kernel is to manage the communication between the software and the hardware. A Kernel is at the nucleus of a computer. It makes the communication between the hardware and software possible. While the Kernel is the innermost part of an operating system, a shell is the outermost one.



Introduction to Kernel

Features of Kernel

- Low-level scheduling of processes

- Inter-process communication
- Process synchronization
- Context switching

Types of Kernel

There are many types of kernels that exists, but among them, the two most popular kernels are:

1. Monolithic

A monolithic kernel is a single code or block of the program. It provides all the required services offered by the operating system. It is a simplistic design which creates a distinct communication layer between the hardware and software.

2. Microkernels

Microkernel manages all system resources. In this type of kernel, services are implemented in different address space. The user services are stored in user address space, and kernel services are stored under kernel address space. So, it helps to reduce the size of both the kernel and operating system.

Open source operating system

Open source refers to the computer software or applications where the owners or copyright holders allow the users or third party to see, use and provide the right to modify the source code of the product.

Some features of open source software

1. Free Redistribution

The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programs from several different sources. The license shall not require a royalty or other fee for such sale.

2. Source Code

The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost, preferably downloading via the Internet without charge. The source code must be the

preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.

3. Derived Works

The license must allow modifications and derived works, and must allow them to be distributed under the same terms as the license of the original software.

4. Integrity of The Author's Source Code

The license may restrict source-code from being distributed in modified form *only* if the license allows the distribution of "patch files" with the source code for the purpose of modifying the program at build time. The license must explicitly permit distribution of software built from modified source code. The license may require derived works to carry a different name or version number from the original software.

5. No Discrimination Against Persons or Groups

The license must not discriminate against any person or group of persons.

6. No Discrimination Against Fields of Endeavor

The license must not restrict anyone from making use of the program in a specific field of endeavor. For example, it may not restrict the program from being used in a business, or from being used for genetic research.

7. Distribution of License

The rights attached to the program must apply to all to whom the program is redistributed without the need for execution of an additional license by those parties.

8. License Must Not Be Specific to a Product

The rights attached to the program must not depend on the program's being part of a particular software distribution. If the program is extracted from that distribution and used or distributed within the terms of the program's license, all parties to whom the program is redistributed should have the same rights as those that are granted in conjunction with the original software distribution.

9. License Must Not Restrict Other Software

The license must not place restrictions on other software that is distributed along with the licensed software. For example, the license must not insist that all other programs distributed on the same medium must be open-source software.

10. License Must Be Technology-Neutral

No provision of the license may be predicated on any individual technology or style of interface.

Closed Operating Systems are built with numerous codes and complex programming and that is called source code. This source code is kept secret by the respective companies (owners) and inaccessible to third parties. By doing so, they ensure the safety and secure the Operating System and computer from any threats.

Pros and Cons of Open Source Operating Systems:

Pros:

- **Cost-efficient** – Most of the Open Source OS is free. And some of them are available at a very cheap rate than the commercial closed products.
- **Reliable and efficient** – Most of them are monitored by thousands of eyes since the source code is public. So if there is any vulnerability or bugs, they are fixed by the best developers around the world
- **Flexibility**- The great advantage is you can customize it as per your need. And there is creative freedom.

Cons:

- **Security risk** – Though the bugs are identified, there is a risk of attacks as the source code is available to the attackers.
- **Complicated** – It is not user-friendly as the closed ones. You need to have the minimum technical knowledge to use this software
- **No support** – If you meet with the problem, then there is no customer support to help you out.

Open Source operating systems are released under a license where the copyright holder allows others to study, change as well as distribute the software to other people. This can be done for any reason. The different open-source operating system available in the market are –

Cosmos

This is an open source operating system written mostly in programming language C#. Its full form is C# Open Source Managed Operating System. Till 2016, Cosmos did not intend to be a fully fledged operating system but a system that allowed other developers to easily build their own operating systems. It also hid the inner workings of the hardware from the developers thus providing data abstraction.

FreeDOS

This was a free operating system developed for systems compatible with IBM PC computers. FreeDOS provides a complete environment to run legacy software and other embedded systems. It can be booted from a floppy disk or USB flash drive as required. FreeDOS is licensed under the GNU General Public License and contains free and open source software. So there is no license fees required for its distribution and changes to the system are permitted.

Genode

Genode is free as well as open source. It contains a microkernel layer and different user components. It is one of the few open source operating systems not derived from a licensed operating system such as Unix. Genode can be used as an operating system for computers, tablets etc. as required. It is also used as a base for virtualisation, interprocess communication, software development etc. as it has a small code system.

Ghost OS

This is a free, open source operating system developed for personal computers. It started as a research project and developed to contain various advanced features like graphical user interface, C library etc. The Ghost operating system features multiprocessing and multitasking and is based on the Ghost Kernel. Most of the programming in Ghost OS is done in C++.

ITS

The incompatible time-sharing system was developed by the MIT Artificial Intelligence Library. It is principally a time sharing system. There is a remote login facility which allowed guest users to informally try out the operating system and its features using ARPAnet. ITS also gave out many new features that were unique at that time such as

device independent graphics terminal, virtual devices, inter machine file system access etc.

OSv

This was an operating system released in 2013. It was mainly focused on cloud computing and was built to run on top of a virtual machine as a guest. This is the reason it doesn't include drivers for bare hardware. In the OSv operating system, everything runs in the kernel address space and there is no concept of a multi-user system.

Phantom OS

This is an operating system that is based on the concepts on persistent virtual memory and is code oriented. It was mostly developed by Russian developers. Phantom OS is not based on concepts of famous operating systems such as Unix. Its main goal is simplicity and effectiveness in process management.

Linux Kernel

Linux kernel was developed by Linus Torvalds. It offers the essential functions required for an operating system, such as data cancellation, memory processing, and interactions with computer hardware. It is open-source software, and many developers researched the source code and produced a plethora of helpful plug-ins and operating systems to meet their requirements.

Linux Lite

Linux Lite is another free and open-source operating system that can run on lower-end hardware. It is a lightweight operating system designed to help users who are unfamiliar with Linux-based operating systems. The operating system includes all of the required programs, capabilities, tools, and desktops. It has a minimal interface and is entirely based on the Ubuntu system. In the last five years, the operating system has been stable and has received regular updates. It is efficiently functional soon after installation. After installation, users are not required to install any further drivers. If you want a lightweight open-source operating system on your PC, go with Linux Lite.

Linux mint

Linux Mint is a powerful Linux-based operating system that exudes modernity and power. It is simple to use and includes complete multimedia capabilities, making it a user-friendly open-source operating system. It is an Ubuntu-based distribution that is popular among both beginners and experts. It is built on the Debian platform and includes one of the most powerful software managers. It is more stable and has better visual aesthetics than Ubuntu.

Fedora

Fedora is another popular Linux-based operating system, and it is widely considered the best open-source operating system after Ubuntu. It is an RPM-based general-purpose operating system that is supported by Red Hat and built by the Fedora Project community. Its purpose is to develop and share cutting-edge open-source technology for free. As a result, Fedora developers prefer to make upstream improvements rather than create fixes specifically for Fedora. Fedora developers' updates are available to all Linux distributions.

It has a GNOME-based desktop that may be customized. Fedora comes with a customizable GNOME-based desktop. Its Fedora Spins feature allows you to customize and run several user interfaces and desktop environments.

React OS

ReactOS is another free and open-source operating system that has nearly 1 million downloads in over **100** countries. This community-based OS may run Windows apps, making it an excellent alternative to the Windows operating system. Although ReactOS is still growing, users, who love highly customizable operating systems, can select ReactOS. However, the operating system is developer-focused.

Solus

Solus is a free and open-source operating system for your desktop computer. It's a new operating system from the Linux family, released in **2012**. More than **6000** registered users are currently using the software. VLC, XChat, Transmission, Thunderbird, OpenShot Video Editor, Firefox, Budgie desktop environment, and LibreOffice Suite are all included with Solus. The most recent version of Solus, **Solus 3**, was released in **August 2017**.

Chrome OS

Chrome OS is a partly open-source operating system with various attractive features. It's a part of the Chromium and Linux families, with features including better security, compatibility for supported Android and Chrome apps, Aura windows manager, Google cloud print, integrated media player, virtual desktop access, and cloud-based management. The only issue with the operating system is that it only supports Nexus devices or its hardware. As a result, if you're a Google fan, you'll love Chrome OS on a Chromebook.