

## Types of Operating System

### OS as per Computer Classification

- Personal Computer
- Mobile operating systems
- Operating Systems in Video Games And Consoles

### Personal Computers Operating System:

- Operating systems usually come **pre-loaded** on any computer you buy. Most people use the operating system that comes with their computer, but it's possible to upgrade or even change operating systems. The three most common operating systems for personal computers are **Microsoft Windows**, **macOS**, and **Linux**.
- Modern operating systems use a **graphical user interface**, or **GUI** (pronounced **gooey**). A GUI lets you use your mouse to click **icons**, **buttons**, and **menus**, and everything is clearly displayed on the screen using a combination of **graphics** and **text**.

### Microsoft Windows

- Microsoft created the **Windows** operating system in the mid-1980s. There have been many different versions of Windows, but the most recent ones are **Windows 10** (released in 2015), **Windows 8** (2012), **Windows 7** (2009), and **Windows Vista** (2007). Windows comes **pre-loaded** on most new PCs, which helps to make it the **most popular operating system** in the world.

### macOS

- **macOS** (previously called **OS X**) is a line of operating systems created by Apple. It comes preloaded on all Macintosh computers, or Macs. Some of the specific versions include **Mojave** (released in 2018), **High Sierra** (2017), and **Sierra** (2016).

## Linux

- **Linux** (pronounced **LINN-ux**) is a family of **open-source** operating systems, which means they can be modified and distributed by anyone around the world. This is different from **proprietary software** like Windows, which can only be modified by the company that owns it. The advantages of Linux are that it is **free**, and there are many different **distributions**—or versions—you can choose from.

## Mobile operating systems :

- A mobile operating system is an operating system that helps to run other application software on mobile devices. It is the same kind of software as the famous computer operating systems like Linux and Windows, but now they are light and simple to some extent.
- The operating systems found on smartphones include Symbian OS, iPhone OS, RIM's BlackBerry, Windows Mobile, Palm WebOS, Android, and Maemo. Android, WebOS, and Maemo are all derived from Linux. The iPhone OS originated from BSD and NeXTSTEP, which are related to Unix.
- It combines the beauty of computer and hand use devices. It typically contains a cellular built-in modem and SIM tray for telephony and internet connections. If you buy a mobile, the manufacturer company chooses the OS for that specific device.

- **Examples of operating systems(os)**

**1. Android OS:** The [Android operating system](#) is the most popular [operating system](#) today. It is a mobile OS based on the Linux Kernel and open-source software. The android operating system was developed by Google. The first Android device was launched in 2008

**2. Bada (Samsung Electronics):** Bada is a Samsung mobile operating system that was launched in 2010. The Samsung wave was the first mobile to use the bada operating system. The bada operating system offers many mobile features, such as 3-D graphics, application installation, and multipoint-touch.

**3. BlackBerry OS:** The BlackBerry [operating system](#) is a mobile operating system developed by Research In Motion (RIM). This operating system was designed specifically for BlackBerry

handheld devices. This operating system is beneficial for the corporate users because it provides synchronization with Microsoft Exchange, Novell GroupWise email, Lotus Domino, and other business software when used with the BlackBerry Enterprise Server.

**4. iPhone OS / iOS:** The iOS was developed by the Apple inc for the use on its device. The iOS operating system is the most popular operating system today. It is a very secure operating system. The iOS operating system is not available for any other mobiles.

**5. Symbian OS:** Symbian operating system is a mobile operating system that provides a high-level of integration with communication. The Symbian operating system is based on the java language. It combines middleware of wireless communications and personal information management (PIM) functionality. The Symbian operating system was developed by Symbian Ltd in 1998 for the use of mobile phones. Nokia was the first company to release Symbian OS on its mobile phone at that time.

**6. Windows Mobile OS:** The window mobile OS is a mobile operating system that was developed by Microsoft. It was designed for the pocket PCs and smart mobiles.

**7. Harmony OS:** The harmony operating system is the latest mobile operating system that was developed by Huawei for the use of its devices. It is designed primarily for IoT devices.

**8. Palm OS:** The palm operating system is a mobile operating system that was developed by Palm Ltd for use on personal digital assistants (PADs). It was introduced in 1996. Palm OS is also known as the Garnet OS.

**9. WebOS (Palm/HP):** The WebOS is a mobile operating system that was developed by Palm. It based on the Linux Kernel. The HP uses this operating system in its mobile and touchpads.

## OS as per Function Type

- Early time-sharing and virtual machine systems
- Single processor systems
- Multiprocessor systems
- Batch Processing
- Multitasking
- Parallel systems
- Distributed systems
- Embedded Systems
- Mobile OS
- Cloud OS
- Network OS

### Early time-sharing and virtual machine systems:

- In [computing](#), **time-sharing** is the sharing of a computing resource among many users at the same time by means of [multiprogramming](#) and [multi-tasking](#).
- Its emergence as the prominent model of computing in the 1970s represented a major technological shift in the history of computing.
- By allowing many users to interact [concurrently](#) with a single computer, time-sharing dramatically lowered the cost of providing computing capability, made it possible for individuals and organizations to use a computer without owning one, and promoted the interactive use of computers and the development of new interactive [applications](#).
- In computing, a system virtual machine is a virtual machine that provides a complete system platform and supports the execution of a complete operating system (OS).

- These usually emulate an existing architecture, and are built with the purpose of either providing a platform to run programs where the real hardware is not available for use (for example, executing on otherwise obsolete platforms), or of having multiple instances of virtual machines leading to more efficient use of computing resources, both in terms of energy consumption and cost effectiveness (known as hardware virtualization, the key to a cloud computing environment), or both.
- A VM is an efficient, isolated duplicate of a real machine.

**System virtual machine advantages:**

- Multiple OS environments can co-exist on the same primary hard drive, with a virtual partition that allows sharing of files generated in either the "host" operating system or "guest" virtual environment. Adjunct software installations, wireless connectivity, and remote replication, such as printing and faxing, can be generated in any of the guest or host operating systems. Regardless of the system, all files are stored on the hard drive of the host OS.
- Application provisioning, maintenance, high availability and disaster recovery are inherent in the virtual machine software selected.
- Can provide emulated hardware environments different from the host's instruction set architecture (ISA), through emulation or by using just-in-time compilation.

**The main disadvantages of VMs are:**

- A virtual machine is less efficient than an actual machine when it accesses the host hard drive indirectly.
- When multiple VMs are concurrently running on the hard drive of the actual host, adjunct virtual machines may exhibit a varying and/or unstable performance (speed of execution and malware protection). This depends on the data load imposed on the system by other VMs, unless the selected VM software provides temporal isolation among virtual machines.

- Malware protections for VMs are not necessarily compatible with the "host", and may require separate software.

## **Single processor systems:**

- It is a processor that has only one core, so it can only start one operation at a time.
- In the early 1970's the first Single-core processor was developed by Intel.
- It was a 4 bit machine that was named the 4004.
- The techniques used to increase single core performance was:
  - Pipelining: beginning other waiting instructions before the first finishes .
  - Multithreading : involves execution of two separate threads. Time is divided and interlaced between the two threads in order to simulate simultaneous execution

## **Advantages:**

- Processing speed is faster.
- Multithreading enables better performance
- High Performance can be achieved

## **Disadvantages:**

- To execute the tasks faster you must increase the clock time.
- Increasing clock times too high drastically increases power consumption and heat dissipation to extremely high levels, making the processor inefficient.

## **Multiprocessor systems:**

- A Multicore Processor is a single computing component with two or more independent actual processing unit
- In the early 2000's the first Multi-coreprocessor was developed by Intel.
- Creating two cores or more on the same Die increases processing power while keeping clock speeds at an efficient level.
- A processor with 2 cores running at efficient clock speeds can: process instructions with similar speed to a single core processor running at twice the clock speed, yet the dual core processor would still consume less energy.

### **Advantages**

High performance than single core Multi-core processors allows the CPU to perform complex task at low energy

Cache sharing Multi-core processors share the cache memory of the CPU hence reducing separate use of cache.

### **Disadvantages**

- Heat radiation: The higher the number of cores, the higher is the heat radiated from the processor

## **Batch Processing:**

- Batch processing is a technique in which operating system collects programs and data in a batch before processing starts .
- It is the execution of series of programs called jobs on a computer without manual intervention.
- Where is Batch processing used?
  - ◦ Payroll Processing
  - ◦ Processing Bank Cheques
  - ◦ Printing of Bank Statements
  - ◦ Updating of a stock Data base

## **Advantages:**

- Repeated jobs are done fast in batch systems without user interaction.
- Best for large organisation but small organisation can also benefit from it.
- No special hardware and system support is required to input data in batch systems.
- Batch system can work offline so it makes less stress on processor.
- The idle time of batch system is very less.

## **Disadvantages:**

- Computer operators must be trained for using batch system.
- It is difficult to debug batch systems.
- Batch systems are sometime costly.
- If some job gets too much time (for eg. if error occurs in job )then other jobs will wait for unknown time.



## **Multitasking OS:**

- In Multitasking, only one cpu is involved, but it switchies from one program to another so, quickly that it gives the appearance of executing all the program at the same time.
- Multitasking, in an oprating system is allowing a user to perform more than one computer task at a time.
- The operating system is able to keep track of where you are in these tasks and go from one to the other without losing information.

### **Advantages:**

- It increases CPU utilisation ability.
- It saves times
- Very efficient virtual memory access controls and security.

### **Disadvantages:**

- The processing speed may slow down.
- It requires more battery.
- If we are performing multiple tasks at a single time, then sometimes there may be chances that a computer can hang.

## **Parallel systems:**

- Parallel operating system are a type of computer processing platform that breaks large tasks into smaller pieces that are done at the same time in different places and by different mechanisms.
- It works by dividing sets of calculations into smaller parts and distributing them between the machines on a network.
- Parallel processing makes a program run faster because there are more than one CPUs running.

## **Advantages:**

- faster execution of data
- faster data sharing
- the larger task can be accomplished more quickly.

## **Disadvantages:**

- The cost of implementation is very expensive
- It is a great expense in terms of electricity and operation costs.
- Parallel running implementation requires frequent maintenance.
- More hardware is required

## **Distributed systems:**

A distributed system is a software system in which components located on networked computers communicate and coordinate their actions by passing messages.

The collection of independent computers that appears to its users as a single coherent system. Features:

- No shared memory.
- message-based communication.
- Each runs its own local OS Heterogeneity
- Ideal: to present a single-system image.
- The distributed system “looks like” a single computer rather than a collection of separate computers.

### **ADVANTAGES:**

- Economics: Better price performance rate for networked computers than central.
- Reliability: If one machine crashes the system as a whole can still survive.
- Device Sharing: Allow many users to share expensive devices.
- Data Sharing: Allow many users access to a common database.
- Communication: Make human to human communication easier.
- Flexibility: Spread the workload over available machines in the most cost effective way.

### **DISADVANTAGES:**

- Software: Complexity of programming distributed system.
- Networking: The network can saturate or cause other problem.
- Security: Easy access also applies to secret data.

## **Embedded Systems:**

- An Embedded system is a computer that has been built to solve only a few very specific problems and is not easily changed.
- An Embedded system usually doesn't look like a computer, often there is no keyboard or monitor or mouse. But like any computer it has a processor and software, input and output.
- Embedded it into the system & it is a permanent part in a bigger system.
- For eg: Elevator, Satellite television , etc.
- These are basically not stand alone systems.

### **Common Features Of Embedded System:**

- User Interfaces
- CPUs Ready Made Computer Boards
- ASIC and FPGA solutions
- Peripherals
- Operating system
- Safety and Reliability

### **Advantages:**

- enables communications between systems
- helps digitize the system and monitoring
- enables monetary benefits
- enables easy file sharing

### **Disadvantages:**

- threat of human becoming lazier and addictive
- threat of frauds
- explicit content
- violation in privacy

## **Mobile OS:**

- Operating System is a piece of software responsible for management of operations, control, coordinate the use of the hardware among the various application programs, and sharing the resources of a device.
- Different types of operating systems are needed depending on the capabilities they support. e.g. a PDA OS is different from a Smartphone OS.
- Design and capabilities of a Mobile OS (Operating System) is very different than a general purpose OS running on desktop machines:
- Mobile devices have constraints and restrictions on their physical characteristic such as - screen size, memory, processing power and etc.
- Examples of operating systems(os)
  - Android OS
  - Symbian OS
  - iPhone OS (iOS )
  - Black Berry OS

## **Android OS:**

- Android is a software platform and Operating System for mobile devices. The founder of Android were Andy Rubin and Chris White.
- Android Inc. acquired by Google on August 17, 2005.
- Android is based on the Linux kernel Version 2.6.
- Developed by Google and later the Open Handset Alliance .
- Android phone has a inbuilt 3<sup>rd</sup> party apps known Google play store.
- Android phone support applications of extension .APK format.
- Application of Android was developed in java language using.
- Google play has more than 700,000 applications.
- Android is the most popular and most used and installed Mobile OS in the world.
- Its the most popular Monile OS in the world.

## **Symbian OS:**

- The Symbian OS is produced by the software development and licensing company OF Symbian Ltd.
- Symbian Ltd was established in June 1998 and is headquartered in Southwark in the UK.

- Compatible with all kinds of devices. mostly removable media file systems.
- The Symbian applications like the Themes, games, wallpapers and software's are all SIS files which can also be easily transferred by using Bluetooth, or through the internet or through transfer using cables.
- Symbian was the most popular smartphone OS in the market back in 2010 with 37.6% of the sector's total sales and 111.6m handsets sold in 2010. But now with the strong presence of the Android and iOS, the share of Symbian OS has been reduced to an all time low of 6.8%.

### **iPhone OS:**

- iOS (known as iPhone OS prior to June 2010) is Apple's mobile operating system.
- Apple is the company who developed iPhone Operating System (iOS).
- This OS is released on June 29, 2007.
- The latest mobile of Apple is iOS 9.0
- In this mobile phone iOS 9.0 operating system is used.
- It supports wireless communications using:
- GSM mobile-phone technology
- 3G/4G
- Wi-Fi networks
- This operating system is used in Apple's products such as iPhone, iPad, iPod Touch.

## **Cloud OS:**

- A cloud operating system is a type of operating system designed to operate within cloud computing and virtualization environments. A cloud operating system manages the operation, execution and processes of virtual machines, virtual servers and virtual infrastructure, as well as the back-end hardware and software resources
- A cloud operating system may also be called a virtual operating system.
- A cloud operating system primarily manages the operation of one or more virtual machines within a virtualized environment. Depending on the virtual environment and cloud services in use, the functionality of cloud operating systems varies.
- For example, a cloud operating system developed to be used within a computing-specific environment will manage the processes and threads of a single or cluster of virtual machines and servers. Similarly, a light-end cloud OS might provide end users with pre-installed applications and services, accessed through an Internet browser.
- Microsoft Windows Azure and Google Chrome OS are among current examples of cloud operating systems.

### **Advantages:**

Back-up and restore data

Improved collaboration

Excellent accessibility

Low maintenance cost

Mobility

IServices in the pay-per-use model

Unlimited storage capacity

Data security

**Disadvantages:**

Internet Connectivity

Vendor lock-in

Limited Control

Security



## Network OS:

- An operating system (OS) is basically a collection of software that manages computer hardware resources and provides common services for computer programs. Operating system is a crucial component of the system software in a computer system.
- **Network Operating System** is one of the important type of operating system.
- Network Operating System runs on a server and gives the server the capability to manage data, users, groups, security, applications, and other networking functions. The basic purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks.
- Some examples of network operating systems include Microsoft Windows Server 2003, Microsoft Windows Server 2008, UNIX, Linux, Mac OS X, Novell NetWare, and BSD.

## Advantages

- Centralized servers are highly stable.
- Security is server managed.
- Upgradation of new technologies and hardware can be easily integrated into the system.
- It is possible to remote access to servers from different locations and types of systems.

## Disadvantages

- High cost of buying and running a server.
- Dependency on a central location for most operations.
- Regular maintenance and updates are required.

## **Introduction to Open Source Operating Systems**

- 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.
- An **Open-source Operating System** is the Operating System in which source code is visible publically and editable. The generally known Operating Systems like **Microsoft's Windows**, [Apple's iOS](#) and **Mac OS**, are **closed Operating system**.
- 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.
- In the case of an Open Source Operating system, everyone can access and edit the source code.

## **How Open Source Operating System Works?**

- Open Source Operating System works the same as the closed ones; the only difference is that the source code or the whole application is modifiable by the user. There is no difference in performance, but there can be a difference in functioning.
- For example, in a proprietary (closed) Operating system, the information is packed and stored. The same happens in the Open Source. But since the source code is visible to you (user) you can understand the process and alter the way information is processed.
- While the former is secure and hassle-free, the latter needs some technical knowledge, but you can customize and increase performance. The difference and Pros & Cons are discussed later in the article.
- There is no defined way or framework for the Open Source Operating System working; it can be customized based on the user needs.

## Types of Open Source Operating System

Most of the Open Source Operating Systems are Linux based.

- **Linux Kernel** is created by **Linus Torvalds**. It provides the core functions needed for an Operating System like Parcelling of data, processing of memory, and interactions with the computer hardware. Linux is open-source many developers studied the source code and created many supportive plug-ins and operating systems for their needs. Though Linux is the heart of the operating systems, there are also some Open Source
- Operating Systems that are **not based on Linux**.
  - There are many types of Operating systems that differ between them based on their goal and purpose. While some of them, like – **Ubuntu, Linux Mint, and Elementary OS** focus on simplicity, some like **Tails** focus on security.

## How many Open Source Operating systems are there?

The answer is infinite. If you have enough technical and programming knowledge to understand the code of an Open Source Operating System, then you can also create one as per your or your company's needs and sell it.

## 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.