



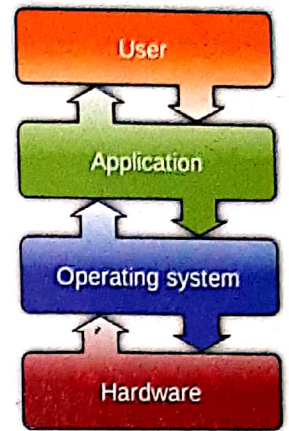
PUBLIC SCHOOL DARBHANGA

OPERATING SYSTEM

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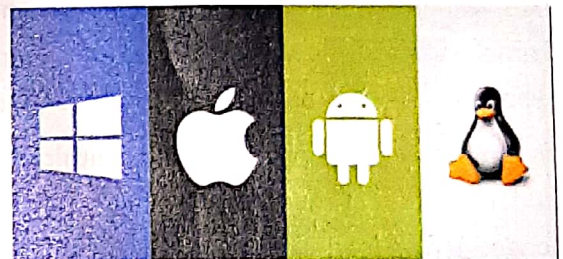
An operating system (OS) is the most important program that is first loaded on a computer when you switch on the system. It is a program that acts as an interface between the software and the computer hardware. It is a specialized set of programs to manage the overall functioning of a computer and its resources. An operating system controls and monitors the execution of other programs and applications. It performs basic tasks, such as recognizing input from the keyboard, sending output to the monitor, managing files and directories on the storage devices, and controlling peripheral devices.

Some common examples of operating system are Windows, Macintosh (Mac), Linux, and Unix.



OBJECTIVES OF OPERATING SYSTEM

- ◆ To manage and share the hardware/software resources of a computer system.
- ◆ To provide an interface for the users to communicate with the computer system.
- ◆ To send messages to each application or interactive user (or to a system operator) about the status of operation and any errors that may have occurred.
- ◆ To be responsible for security, ensuring that unauthorized users do not access the system.



COMPONENTS OF OPERATING SYSTEM

To perform the above-mentioned tasks, the operating system has two components:

- ◆ Shell (handles the interaction with users)
- ◆ Kernel (handles the interaction with hardware)

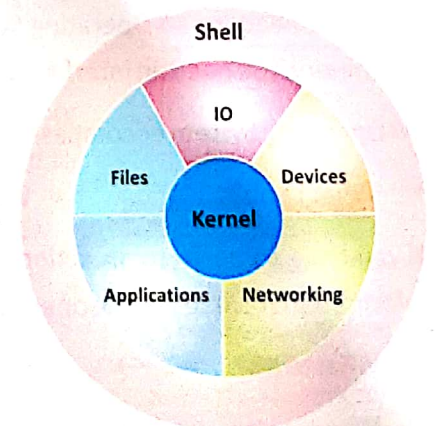
SHELL

An interface to the operating system is called a shell.

It is the outermost layer of the operating system and manages the interaction between you and the operating system by:

- ◆ prompting you for the input
- ◆ interpreting that input for the operating system
- ◆ handling the resulting output from the operating system

A Shell provides a way for you to communicate with the operating system, either interactively (input from the keyboard is acted upon immediately) or as a shell script. A shell script is a sequence of system commands that are stored in a file.



KERNEL

Kernel is the core component of an operating system which acts as an interface between applications and the data processing being performed at the hardware level.

When an operating system is loaded into memory, the kernel loads first and remains in memory until the operating system is shut down. The kernel provides and manages the computer resources, and allows other programs to run and use these resources. The kernel also sets up the memory address space for applications, loads the files with application code into memory, and sets up the execution stack for programs.

The kernel is responsible for performing the following tasks:

- ◆ I/O management
- ◆ Memory management
- ◆ Process management for application execution
- ◆ Device management (through the use of device drivers)
- ◆ System calls control

Earlier, all the basic system services like process and memory management, interrupt handling etc., were packaged into a single module in the kernel space. This type of kernel was called as **Monolithic Kernel**. The problem with this approach was that the whole kernel had to be recompiled for even a small change.

In a modern day approach to **monolithic architecture**, we have **microkernel**, which contains different modules (Device Management, File System, Network Protocol, etc.) and which can be dynamically loaded and un-loaded. With this approach, the kernel code size was reduced while the stability increased.

NEED FOR AN OPERATING SYSTEM

How many of you have played real-time strategy games on a computer, Sony Play Station, or X-Box? I guess almost everyone of you have tried hands on these fancy gadgets. The game board, joystick, remotes, monitor, and disk holder, all fall in the category of hardware. The game, its characteristics, the sound and animation effects fall in the category of software.

Have you ever wondered how do the hardware components interact with the software components? At this point of time, the need for an Operating System is realized. Hardware is nothing but a well-crafted and beautifully engineered machinery. You need an interface which fills the communication gap between a hardware and a user.

An Operating System encompasses all the operations like:

- What to do?
- When to do?
- How to do?

If you have to perform an action-based stunt during the game, you simply press the required buttons in order. This information is passed to the operating system, which takes care of the final outcome by handling:

- ◆ What to do? → To perform a set of moves for the game character.
- ◆ When to do? → When the required buttons are pressed in a correct sequence.
- ◆ How to do? → Through proper communication with the Application Software, and instructing it about the correct motion of the player as seen on the screen.

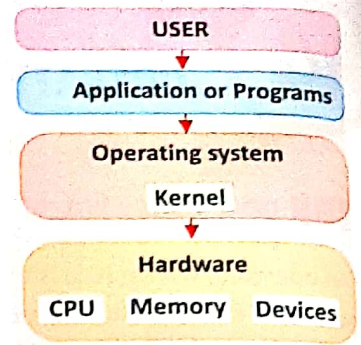


Figure 4.1: Functioning of Kernel

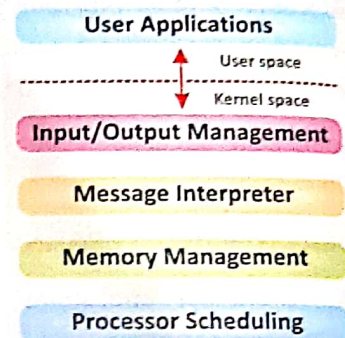


Figure 4.2: Tasks Performed by Kernel

FUNCTIONS OF AN OPERATING SYSTEM

PROCESSOR MANAGEMENT: An operating system manages the working of the processor by allocating various jobs to it. It also ensures that each process and application receives enough time by the processor to function properly. It also tries to utilize as many processor cycles as possible for the real time work. It is these processes rather than applications which are controlled, managed, and executed by the operating system.

MEMORY MANAGEMENT: An operating system manages the sharing of internal memory among multiple applications. It also takes care of the fact that one process should not consume the memory allocated to another process. An OS has to make efficient utilization of different types of memory (RAM, Cache, etc.) within the system to ensure the proper execution of every process.

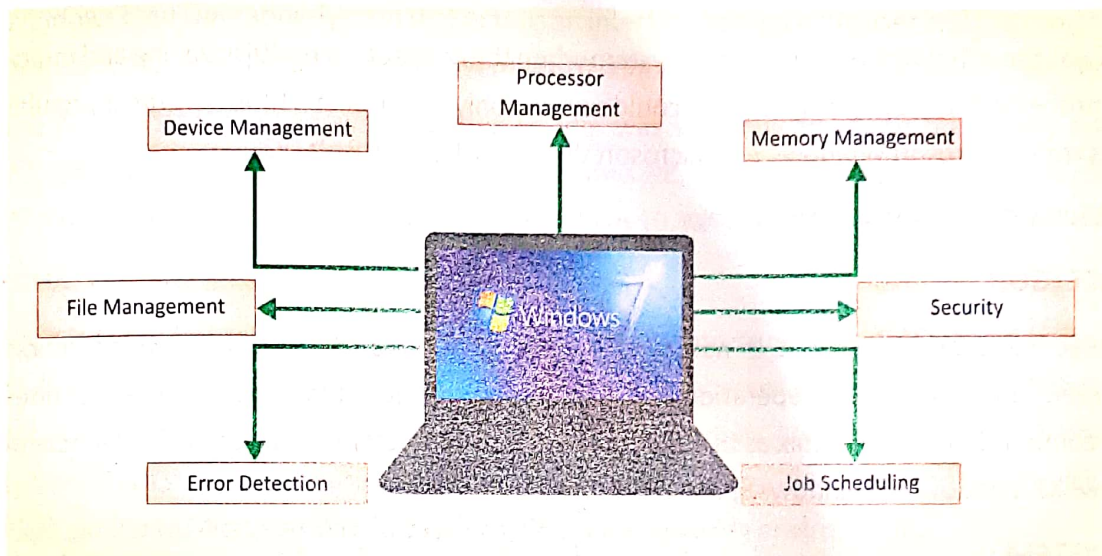


Figure 4.3. Functions of Operating System

DEVICE MANAGEMENT: An operating system controls the working of all input and output (I/O) devices. It receives the requests from these devices, performs a specific task, and communicates back to the requesting process.

FILE MANAGEMENT: An operating system keeps track of information regarding creation, deletion, transfer, copy, and storage of files in an organized way. It also maintains the integrity of data stored in these files including the file directory structure.

SECURITY: The operating system provides various techniques which assures the integrity and confidentiality of user's data. Following are the security measures which are used to protect the user's data from threats and intrusion:

1. Protection against unauthorized access through login and password.
2. Protection against intrusion by keeping the firewall active.
3. Protecting against malicious access to system memory.
4. Displaying messages related to system vulnerabilities.

ERROR DETECTION: From time to time, the operating system checks the system for any kind of external threat or malicious software activity. It also checks the hardware for any

type of damage. In this process, it displays a number of alerts to the user so that appropriate action can be taken against any flaw or damage caused to the system.

JOB SCHEDULING: In a multitasking operating system where multiple programs run at the same time, operating system determines which applications should run in which order and how much time should be allocated for each application in turn.

II TYPES OF OPERATING SYSTEM

In the past three decades, computers have taken a giant stride towards excellence and high performance. From bulky physical configurations, computers have miraculously transformed into one of the most powerful, yet completely portable devices. In a similar way, operating systems have also been developed at a rapid pace to serve the needs of users. Let us learn the different types of operating systems:

SINGLE USER OPERATING SYSTEM

Single User Operating System was the initial version of operating system when the concepts of multithreading and multi-user were yet to be exploited properly. These operating systems could support only one user at a time. The most popular Single User Operating Systems were: Microsoft Windows 3.1, Microsoft Windows 95, Microsoft DOS.

Due to their limited features, they are no longer in use nowadays.

GRAPHICAL USER INTERFACE (GUI)

This operating system is graphic based and interactive in nature. The commands were replaced by graphic symbols displayed on the computer screen. The user can do all operations by clicking at these graphical symbols. Now a user does not need to cram the lengthy commands or their syntax as they had to do in CUI (Character User Interface). Example of GUI are: Windows 98, Windows XP, Windows 7, Windows 8, Windows 8.1, etc.

MULTI-USER OPERATING SYSTEM

Multi-user Operating Systems allow more than one user to use the same computer at the same time or different times. Some of the Operating Systems which fall in this category are: Linux, Unix, Microsoft Windows 2000. Windows 2000 was the first version of Windows which allowed us to create several User Accounts on a single machine.

MULTITASKING OPERATING SYSTEM

The ability to perform more than one task at a single instant of time is called **Multitasking**. An operating system which is capable of doing multiple tasks or executing processes while using common processing resources like a CPU, is called a Multitasking Operating System. Today, most of the operating systems fall under this category. Examples are: Unix, Windows XP, Windows 7, Windows 8, Windows 8.1, Windows 10.

MULTITHREADING OPERATING SYSTEM

These are the operating systems, which allow different parts of an application or program to run simultaneously. The feature of multithreading can delay the execution response of certain processes. For example, if you host a Game server on LAN, your friends will utilize different parts of the same game by connecting to your machine at the same time. All resources will be utilized from your machine, which can be a performance degrading factor. The common examples of such operating systems are: Windows XP, Unix, Linux.

RTOS (REAL TIME OPERATING SYSTEM)

RTOS is designed to handle real life scenarios and problems. Such operating systems have the capability to prioritize the processes, minimize execution time, and work independently with no interdependencies. Whenever you book an air

ticket online, you are actually communicating with a real time machine which is handling your data independently, giving you instant response and securing your information while maintaining the same features for every customer who is online at that moment.

DISTRIBUTED OS

Distributed Operating System runs on computers, which are located in different geographical areas, interconnected through a network. It controls these interconnected systems and makes them appear to be a single computer. It allows all the linked machines to access data, software, and process tasks over the common network from different computers irrespective of their location on the globe.

COMMONLY USED OPERATING SYSTEMS

WINDOWS

Windows is an Operating System that acts as an interface between the user and the computer. It has been developed by 'Microsoft' and was introduced on **November 20, 1985**. Windows uses a Graphical User Interface (GUI).

The first version of Windows Operating System was Windows 95, since then many new and advanced versions of Windows have been developed such as Windows 98, Windows 2000, Windows ME, Windows XP, Windows Vista, Windows 7, Windows 8, Windows 8.1, and Windows 10, which is the latest version of Windows released on 29th July 2015.

UNIX

UNIX is a very powerful operating system with a wide spectrum of powerful features. It was developed in 1969 by a group of AT&T employees at Bell Labs and since then it is under constant development. High level of security and regulated access to data are the main features of this operating system. Most of the high-level organizations use this operating system. It is a stable, multi-user, multi-tasking operating system. This operating system also has a graphical user interface (GUI) similar to Microsoft Windows which offers an easy to use environment.

UNIX operating system was initially developed in Assembly language. In the year 1973, the whole program was re-coded in C language. The main objective behind this shift was to make UNIX move to many different computers. Today, UNIX is available on devices such as PCs, workstations, mainframes, and super computers.

LINUX

Linux is a high performance, yet completely free, Unix-like operating system, which is suitable for use on a wide range of computers and other products. Most of its versions like **Fedora Core**, **Ubuntu** etc. consist of a kernel accompanied by hundreds of free utilities and application programs in a coordinated package. The kernel's responsibilities include managing the system's resources i.e, the communication between hardware and software components. Unlike the Windows by Microsoft, Linux is developed and maintained collaboratively, which means that no single organization is fully responsible for its development and support. Various companies work together on its Research & Development and share a common economic platform with each other. Companies such as **RedHat**, **SuSE**, and **Mandriva** are now providing packaged distribution of Linux, meant for mass utilization. Linux is slowly growing as a tough competitor against Windows. Linux is very stable as compared to Windows. In Linux, every single application is independent of each other and is free of cost. Hardly 1% of the applications, which are exclusively for business purpose, cost something. Linux is very safe as compared to Windows.

SOLARIS

Solaris operating system is a part of UNIX OS family. This operating system was originally developed by **Sun Microsystems** in 1992. Presently it's known as **Oracle Solaris** since Oracle corporation overtook Sun in January 2010. It is a combination of both open source and closed source.

BOSS

BOSS (Bharat Operating System Solutions) is a GNU/Linux distribution developed by C-DAC, Chennai, in order to benefit the usage of Free/Open Source Software throughout India. BOSS GNU/Linux is a key deliverable of NRCFOSS (National Resource Centre for Free Open Source Software). It has enhanced desktop environment integrating Indian language support and other packages that are relevant for use in the Indian government domain. BOSS makes it easier for Microsoft Windows user to migrate to GNU/Linux platform, by providing outstanding features like bulk document converter, presentation tools, and features like plug and play. BOSS is customized for the ease of use in educational domains (schools & colleges) and variants are available to suit Enterprise users (Server Edition).

MOBILE OPERATING SYSTEM

Mobile Operating System is also known as Mobile OS. It is particularly designed to operate smartphones, PDAs, tablets and other mobile devices. Mobile Operating System is a software, which provides platform on which other programs or applications can run on mobile devices.

With the advent of Mobile OS, the technology savvy people are no more confined to a particular geographical location. It has empowered the users to check their mails, files, and to work on the data from anywhere and anytime.

There are various kind of Mobile Operating System used in smartphones such as, BlackBerry (**RIM**), Android (**Google**), iOS (**Apple**), Symbian (**Nokia**), and Windows Mobile (**Microsoft**).

ANDROID OPERATING SYSTEM (OS)

Android is the world's most popular Mobile Operating System. It is an open source (Linux based) platform initially developed by **Android Inc.** in October 2003, and later on purchased by **Google Inc.** in 2005. The green robot is the logo for the Android operating system. Android OS turns your phone into a powerful web browser, game console, and personal assistant all in one.



It was primarily designed for touchscreen portable devices such as smartphones and tablet computer. With Android, you can use all the Google apps and many other applications for free, which empowers the phone.

Android powers some of the best handset and tablet manufacturers in the world like Samsung, HTC, Motorola, Sony, Asus, and many more.

SYMBIAN OPERATING SYSTEM (OS)

Symbian is a mobile operating system which is specifically created for smartphones. Symbian was originally developed by **Symbian Ltd** and is currently maintained by **Accenture**.



Symbian was primarily used by **Nokia** and was also used by many major mobile phone brands like Samsung, Motorola, and Sony Ericsson. Android overtook it in the end of 2010 until then it was the most popular OS for smartphones.

iOS

iOS is a mobile operating system developed by **Apple**. It is the world's most advanced mobile operating system. It was originally released in 2007 and is used to run the iPhone, iPad, and iPod Touch. Formerly it was known as iPhone OS.



Apple makes both the hardware and the operating system for its devices which run on iOS. Everything is designed to work together, which makes it safe and unique. iOS 11.4.1 is its latest version, which was released on 9th July, 2018.

iOS offers multitasking features that allow the applications on iPhone to perform tasks in the background which in turn preserves battery life, and moreover, increases performance. With iOS, searching any geographical location (Mapping) has become very convenient.

Unlike other Mobile OS such as Android (Google) and Windows (Microsoft), Apple does not authorize iOS for installation on any non-Apple hardware. Therefore, iOS devices are created exclusively for its hardware.

Apple designs the iOS devices to maintain a high level of security without compromising the user's experience. iOS prevents the chances of piracy by not allowing illegal downloads into any iOS device be it a movie, music, games, etc.

Due to their exceptional quality of apps, games, and features, iOS devices cost more than any other mobile OS gadgets available in the market.



WINDOWS MOBILE OPERATING SYSTEM

It is a mobile operating system developed by Microsoft for smartphones and mobile devices based on the **Windows CE Kernel**. It is designed to look and operate similar to desktop versions of Microsoft Windows. It has given a whole new dimension to e-mailing and documentation.

Some of the Windows Mobile OS are: Nokia Lumia 920, Samsung ATIV S, and Windows Phone 8C by HTC.

Windows Mobile OS is mainly classified into three main versions for various hardware devices:

Smartphones with touchscreen are supported with **Windows Mobile Professional Version**, mobile phones without touchscreen run on **Windows Mobile Standard**, and the last version of Windows Mobile OS is **Windows 10 mobile** which runs on mobile phones and tablets. Microsoft will stop providing support and updates for Windows 10 mobile by the end of 2019.

