## Experiment: 1

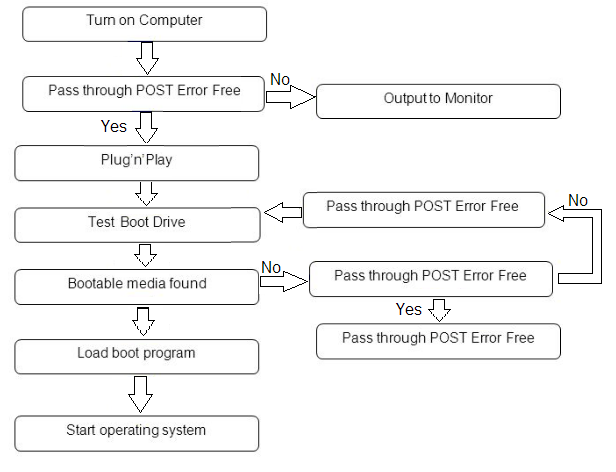
## Aim: To study about BIOS and layers of an operating system.

## BIOS

BIOS stand for Basic Input Output System. It is built-in software. It is the first software run by the computer when you turned on your computer system. This software is usually stored in Read Only Memory (ROM) and located on the motherboard. In modern computer systems, the BIOS contents are stored in a flash memory. It is not possible for an operating system to continue without BIOS as it is the BIOS that loads the drivers of the hard disk and primary portions of the operating system like MBR, FAT, GPT etc, into the memory to enable the operating system to continue loading itself.

When you turn on the computer, BIOS instructions are initiated. These instructions make it check the RAM and the Processor (for faults) on your computer.

**Flow chart of BIOS functions:**

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**Key points:**

1. It enumerates the RAM by checking each compartment to see if all of them are working.
2. After checking out RAM and Processor, it checks for other devices attached to the computer
3. It detects all the peripherals, including the keyboard and mouse and then checks for the boot options
4. Boot options are checked in the sequence configured in your BIOS: Boot from CD-ROM, Boot from Hard Drive, Boot from LAN, etc.
5. It checks for bootstraps on the devices in the order you or the machine vendor configured the BIOS.
6. It passes reigns of the computer to the operating system by loading the essential parts of the OS into the random-access memory (RAM) reserved for the OS, after bootstrap is located.

**The four main functions of a PC BIOS**

* **POST** - Test the computer [hardware](https://www.computerhope.com/jargon/h/hardware.htm) and make sure no errors exist before loading the operating system. Additional information on the POST is available on our [POST and beep codes](https://www.computerhope.com/beep.htm) page.
* **Bootstrap Loader** - Locate the [operating system](https://www.computerhope.com/jargon/o/os.htm). If a capable operating system is located, the BIOS will pass control to it.
* **BIOS drivers** - Low-level drivers that give the computer basic operational control over your computer's hardware.
* **BIOS setup** or **CMOS setup** - Configuration program that allows you to configure hardware settings including system settings such as computer passwords, time, and date.

## Experiment: 2

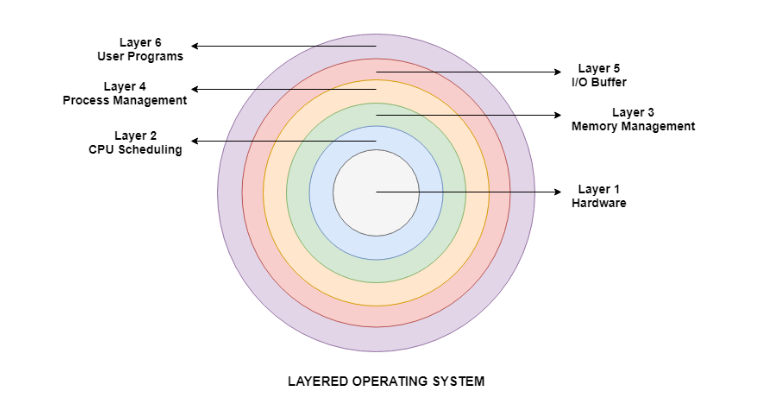
**Aim**: Case study on layered architecture of operating system.

# Layered Operating System

The operating system is split into various layers in the layered operating system and each of the layers has different functionalities. This type of operating system was created as an improvement over the early monolithic systems.

**Layers in Layered Operating System**

There are six layers in the layered operating system. A diagram demonstrating these layers is as follows:



\*Details about the six layers are:

Hardware

This layer interacts with the system hardware and coordinates with all the peripheral devices used such as printer, mouse, keyboard, scanner etc. The hardware layer is the lowest layer in the layered operating system architecture.

CPU Scheduling

This layer deals with scheduling the processes for the CPU. There are many scheduling queues that are used to handle processes. When the processes enter the system, they are put into the job queue. The processes that are ready to execute in the main memory are kept in the ready queue.

Memory Management

Memory management deals with memory and the moving of processes from disk to primary memory for execution and back again. This is handled by the third layer of the operating system.

Process Management

This layer is responsible for managing the processes i.e. assigning the processor to a process at a time. This is known as process scheduling. The different algorithms used for process scheduling are FCFS (first come first served), SJF (shortest job first), priority scheduling, round-robin scheduling etc.

I/O Buffer

I/O devices are very important in the computer systems. They provide users with the means of interacting with the system. This layer handles the buffers for the I/O devices and makes sure that they work correctly.

User Programs

This is the highest layer in the layered operating system. This layer deals with the many user programs and applications that run in an operating system such as word processors, games, browsers etc.

## Experiment: 3

**Aim**: Case study on any one OS (Operating System).

# Introduction to Mac OS

# Mac OS is the computer operating system for Apple Computer's Macintosh line of personal computers and workstations. A popular feature of its latest version, Mac OS X, is a desktop interface with some 3-D appearance characteristics. OS X has a modular design intended to make it easier to add new features. It runs UNIX applications as well as older Mac applications.

# Mac OS is considered the pioneer of GUI based operating systems, as it was launched when MS-DOS was the industry standard. Mac OS is a completely capable OS that provides functionality and services similar to Windows or Linux OS.

# History of macOS

# Mac OS, operating system (OS) developed by the American computer company Apple Inc. The OS was introduced in 1984 to run the company’s Macintosh line of personal computers (PCs). The Macintosh heralded the era of graphical user interface (GUI) systems, and it inspired Microsoft Corporation to develop its own GUI, the Windows OS.

# Layers of macOS

# The structure of the Mac OS X includes multiple layers. The base layer is Darwin which is the Unix core of the system. Next layer is the graphics system which contains Quartz, OpenGL and QuickTime. Then is the application layer which has four components, namely Classic, Carbon, Cocoa and Java.

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**Features of macOS**

# 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.

# Compare macOS with other operating systems

|  |  |  |
| --- | --- | --- |
| Basis | Mac OS | Others OS |
| Define | Short form for “Macintosh” and refers to any computer produced by Apple, Inc | Refers to any computer running IBM-Based (Windows, Linux, Solaris, FreeBSD) operating systems. stands for "Personal Computer" |
| Cost | Computers start at $499 for the Mac Mini desktop, $899 for the Macbook Air notebook, and $1099 for the iMac all-in-one. Other models are more expensive. For desktop or home use Macs are generally expensive than a PC. | Compared to a Mac, Windows and Windows-associated hardware is cheaper, and you can build your own for even less money. Comparable computers running Windows can be found around 40% cheaper than a Mac. |
| Manufacturer | Apple Inc. | Several companies: HP, Toshiba, Dell, Lenovo, Samsung, Acer, Gateway etc. |
| Development and Distribution | Macs are developed and distributed by Apple Inc. | PCs are manufactured and distributed by hundreds of manufacturers. |
| Developer | Apple, Inc. | Microsoft (Windows), Ubuntu (Linux), Sun (Solaris), etc. |
| Gaming | Not as many games are made natively for the Mac, although in recent years, many more applications are released for them. The App Store is a hub for users to download games from. | The library of games available for the PC is exhaustive, and hardware specifically tweaked for gaming performance is much more readily available for Windows. The array of graphics cards and upgradability also favour Windows-based computers. |
| User | Home users and businesses (mainly in the creative department) | Home users and businesses. |
| Available language(s) | Multilingual | Must purchase a different OS Version, but has multiple languages available. |
| OS Family | Unix-like (BSD>Darwin>Mac) | Windows, Linux, Solaris, FreeBSD, etc. |
| Popular Applications | Photos, iMovie, GarageBand, Pages, Numbers, Keynote, Safari, Mail, Messages, FaceTime, Calendar, Contacts, App Store, iTunes, iBooks, Maps, Photo Booth, Time Machine. | MS Office, Internet Explorer, Media Player, Media Center, Windows Defender, SkyDrive, VLC media player, Chrome browser. |
| Latest Operating System | OS X Yosemite (version 10.10); OS X El Capitan (version 10.11) announced. | Windows 8/8.1, Windows 10 announced. |
| Compatibility | Can open almost all PC files and can coexist on local networks with PCs. Can open .doc, .exe (as a compressed bundle), .xls, and others. Software exists for other file types. Can also run Windows on a Mac for 100% compatibility. | Mac-based files (.DMG) cannot be opened on PCs natively, but you can install software that can read, and possibly write Mac-based files on a PC. |
| Virus Attacks | Since Macs are not as popular as PCs, there are fewer malware written to target Macs, although the threat of malicious software is growing, like from Java. | Being the popular desktop choice, most virus writers target Windows systems, however, Linux often has less malware. |
| Performance | Since Apple have controlled the hardware & software bundles and model updates, so every Mac operates smoothly without worry on lagging, incompatibles, and have stable and expected performance. | Different OEMs and even custom build PCs might not have the suitable drivers released for every components in each OS version, incompatibles, lagging may occur. Maybe cannot reach expected performance. |
| Piracy Prevention | Activation is not required, can reinstall as many times as needed. | Windows has a unique activation key for each package distribution, and lots of custom and OEM PC appears, so genuine checking become important. Linux, Solaris, FreeBSD is free and no need for those keys. |

# Versions of macOS:

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