CL2006- Operating Systems Lab

Lab Manual 1

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How PC turns on

When you press the power button of your PC, the first thing which starts is called Firmware. A firmware is low level software which provides an interface between hardware and Operating System. The firmware is responsible for initializing the hardware, loading OS and transferring hardware control to OS. Firmware is stored permanently in ROM (Read Only Memory).

Famous Computer firmwares:

- BIOS (Basic Input Output System) (legacy mode)
- UEFI (Unified Extensible Firmware Interface)

Booting an OS (Reading Material)

Firmware: BIOS and UEFI

Firmware is the piece of software that acts as an interface between the hardware (motherboard) and the operating system (OS). The difference between Unified Extensible Firmware Interface (UEFI) boot and legacy boot is the process that the firmware uses to find the boot target.

Legacy boot is the boot process used by basic input/output system (BIOS) firmware. BIOS was the first popular firmware for desktop PCs introduced in 1975 by IBM for its Control Program for Microcomputers (CP/M) OS. Even though it is still widely present, computers have evolved tremendously and BIOS is unable to provide advanced features of modern hardware. The firmware maintains a list of installed storage devices that may be bootable (floppy disk drives, hard disk drives, optical disk drives, tape drives, etc.) and enumerates them in a configurable order of priority. Once the power-on self-test (POST) procedure has completed, the firmware loads the first sector of each of the storage targets into memory and scans it for a valid master boot record (MBR). If a valid MBR is found, the firmware passes execution to the boot loader code found in the MBR, which allows the user to select a partition to boot from. If one is not found, it proceeds to the next device in the boot order. If no MBR is found at all, the user is presented with the famous, “Please insert system disk yadda yadda yadda,” message.

UEFI boot is the successor to BIOS. UEFI uses the globally unique identifier (GUID) partition table (GPT) whereas BIOS uses the master boot record (MBR) partitioning scheme. GPT and MBR are both formats specifying physical partitioning information on the hard disk. The firmware

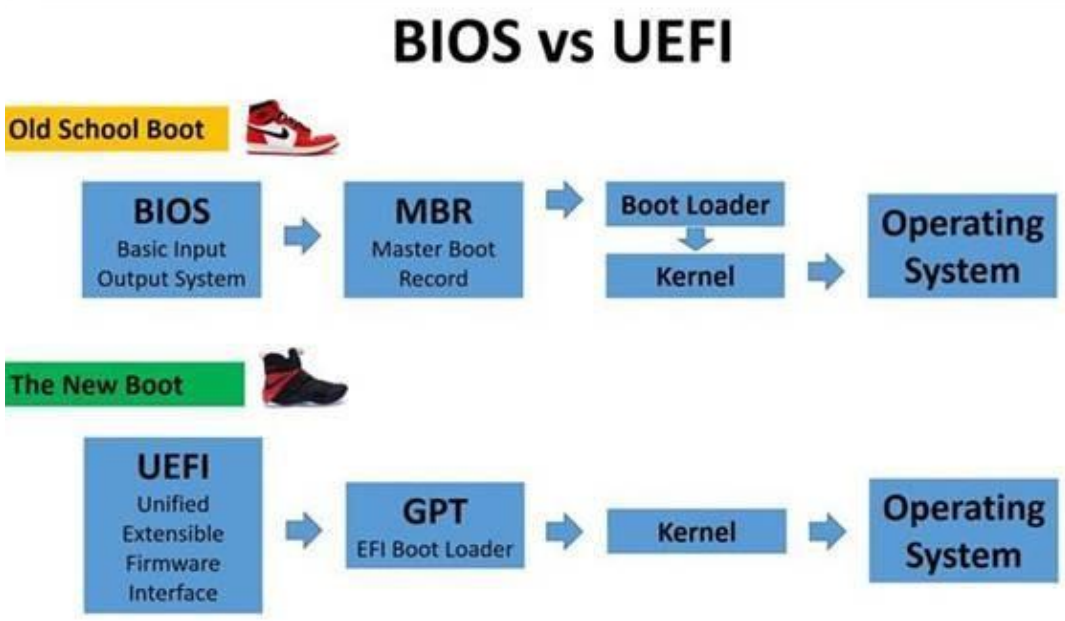
maintains a list of valid boot volumes called EFI Service Partitions. During the POST procedure, UEFI firmware scans the bootable storage devices that are connected to the system for a valid GPT. Unlike a MBR, a GPT does not contain a boot loader. The firmware itself scans the GPTs to find an EFI Service Partition to boot from. If no EFI bootable partition is found, the firmware can fall back on the Legacy Boot method. If both UEFI boot and Legacy boot fail, the user is presented with the famous, “Please insert system disk yadda yadda yadda,” message.

Below is the primary difference between both boot processes:

- Max partition size in MBR is ~2 TB, whereas in UEFI it is ~9 ZB
- MBR can have, at max, 4 primary partitions, whereas GPT can have 128.
- MBR can store only one bootloader, whereas GPT has a separate dedicated EFI system partition (ESP) for storing multiple bootloaders. This is very helpful if you have two or more operating systems which require different bootloaders.
- UEFI offers secure boot, which can prevent boot-time viruses from loading.

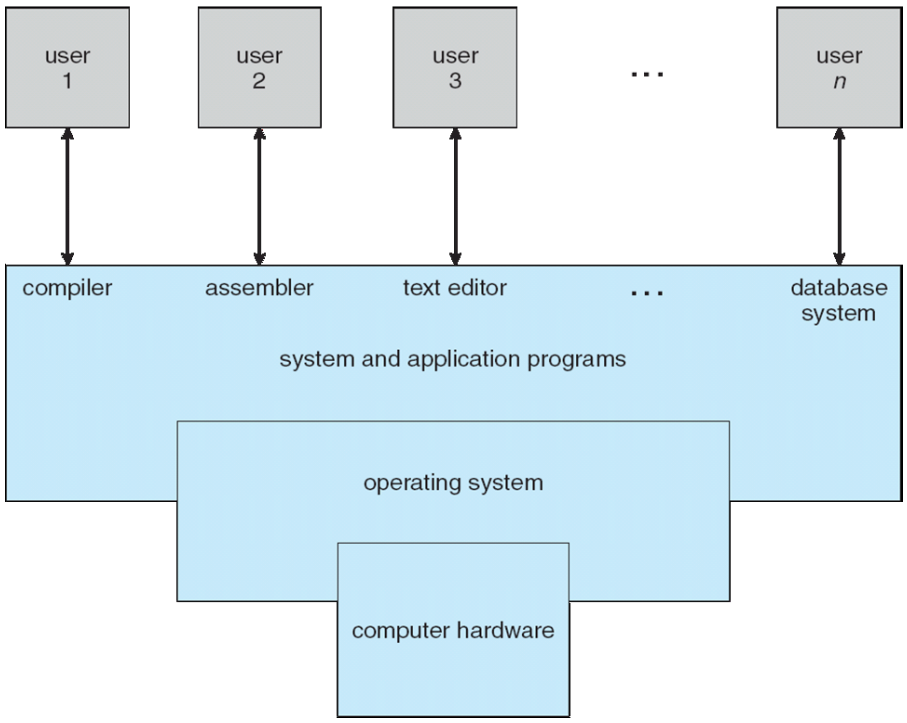
The material under the above heading is from the following article.

Useful video link
Useful video link



What is an Operating System (OS)

OS is a Program which helps the users to utilize the hardware resources.



Introduction to Linux

What is linux? (must read)

Linux is an open source operating system (for detailed information follow the above given link).

If you are interested in history, below you can find useful resources:

- GNU Project Official Website
- Linux Distribution Introduction and Overview (Blog) (Must Read)

Which Linux Distribution to install

Reading Material
Well it's up to you, each distribution comes with a different flavor, Choose what you like.

Recommendations

- Ubuntu
- Linux Mint (Cinnamon)
- Do have a look on linux code