NETWORKING & SYSTEM ADMINISTRATION LAB

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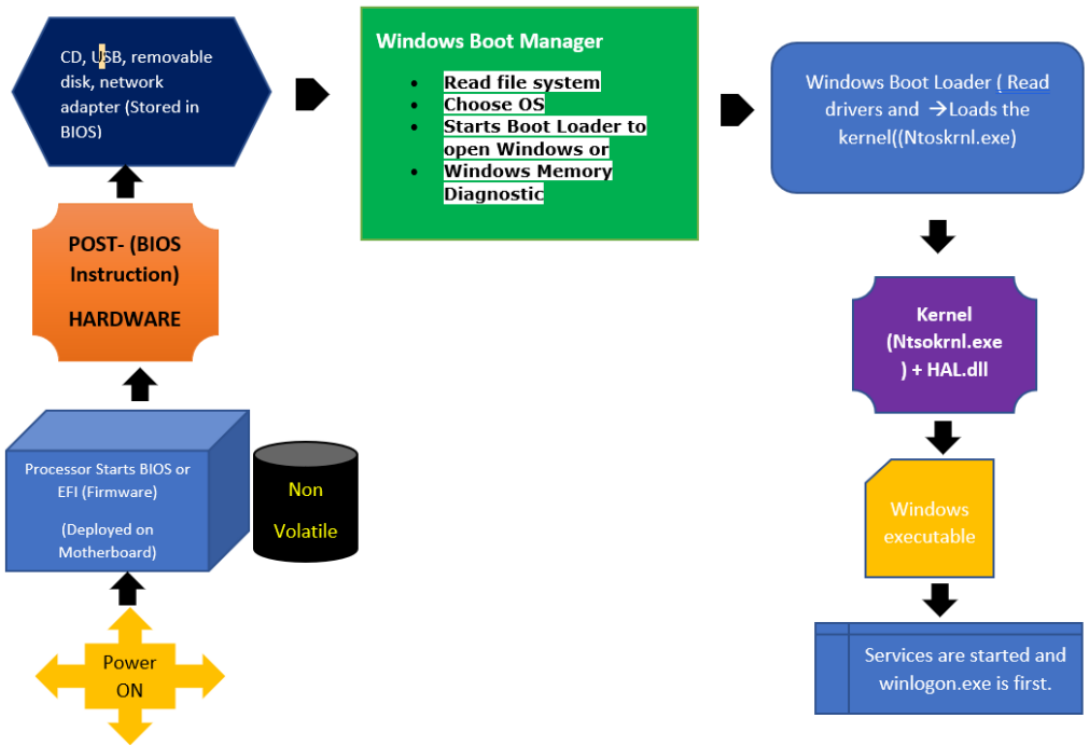
Windows boot Processing

Step by Step Windows boot Processing

Now that you have a basic idea about a few components used in booting the windows machine. Let's discuss in detail each step of how to perform window booting.



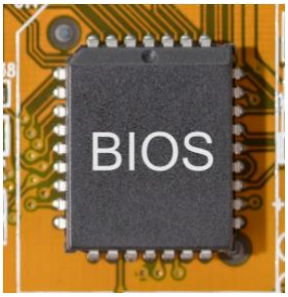
Step by Step Windows boot Processing

What bios stands for and what is Bios ?

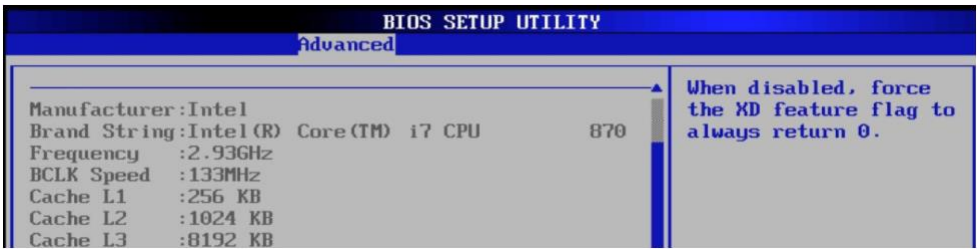
Bios stands for Basic Input Output System and is the first software to run when a computer is started and is stored on a small memory chip on the motherboard. BIOS provides steps to the computer to perform basic functions such as booting.

(BIOS) is a program that's stored in nonvolatile memory such as read-only memory (ROM) or flash memory, making it firmware.

- BIOS is also used to identify and configure the hardware in a computer such as the hard drive, floppy drive, optical drive, CPU, memory, and related equipment.
- BIOS performs a POST (Power On Self Test) that checks all the hardware devices connected to a computer like RAM, hard disk, etc, and makes sure that the system can run smoothly with those hardware devices. If the POST is a failure the system halts with a beep sound.
- The other task of the BIOS is to read the MBR. MBR stands for Master Boot Record and it's the first sector on a hard disk. MBR contains the partition table and boot loader.



BIOS



BIOS Configuration

What is Power On Self Test (POST)

Power On Self Test (POST) checks all the hardware devices connected to a computer like RAM, hard disk, etc., and makes sure that the system can run smoothly with those hardware devices. If the POST fails, the system halts with a beep sound.

The first set of startup instructions in BIOS is the POST, which is responsible for the following system and diagnostic functions:

- Performs initial hardware checks, such as determining the amount of memory present

- Verifies that the devices needed to start an operating system, such as a hard disk, are present
- Retrieves system configuration settings from nonvolatile memory, which is located on the motherboard
- If a single beep is sounded from the PC, then there are no hardware issues present in the system. However, an alternative beep sequence indicates that the PC has detected a hardware issue that needs to be resolved before moving on to the next stages of the process

Master Boot Record (MBR)

After POST performs the testing, the BIOS reads the Master Boot Record (MBR). MBR is stored on the hard disk's first sector and contains the boot loader.

Windows Boot Manager

Windows Boot Manager enables you to choose from multiple operating systems or select the kernels or helps to start Windows Memory Diagnostics. Windows Boot Manager starts the Windows Boot Loader. Located at %SystemDrive%\bootmgr.

Windows Boot Loader

The boot loader is a small program that loads the kernel to the computer's memory that is in the RAM. There are three boot files in a Windows operating system: NTLDR, NTDETECT.COM, and Boot.ini.

- The path of NTLDR (NT Loader) is C:\Windows\i386\NTLDR.
- C:\boot.ini contains the configuration files of NTLDR
- This file detect hardware's and passes information to NTLDR

Loading the Windows kernel

The Windows Boot Loader is responsible for loading the Windows kernel (Ntoskrnl.exe), Hardware Abstraction Layer (HAL), Hal.dll file that helps the kernel to interact with hardware. Next, Windows executes the configuration information stored in the registry in HKLM\SYSTEM\CurrentControlSet and starts services and drivers. Winlogon.exe starts the login procedures of the windows machine.

High Level Summary of Windows Boot Process

1. The computer loads the basic input/output system (BIOS) from ROM. The BIOS provides the most basic information about

storage devices, boot sequence, security, Plug and Play (auto device recognition) capability and a few other items.

2. The BIOS triggers a test called a power-on self-test (POST) to make sure all the major components are functioning properly. You may hear your drives spin and see some LEDs flash, but the screen, at first, remains black.
3. The BIOS has the CPU send signals over the system bus to be sure all of the basic components are functioning. The bus includes the electrical circuits printed on and into the motherboard, connecting all the components with each other.
4. The POST tests the memory contained on the display adapter and the video signals that control the display. This is the first point you'll see something appear on your PC's monitor.
5. During a cold boot the memory controller checks all of the memory addresses with a quick read/write operation to ensure that there are no errors in the memory chips. Read/write means that data is written to a bit and then read back from that bit. You should see some output to your screen – on some PCs you may see a running account of the amount of memory being checked.
6. The computer loads the operating system (OS) from the hard drive into the system's RAM. That ends the POST and the BIOS transfers control to the operating system. Generally, the critical parts of the operating system – the kernel – are maintained in RAM as long as the computer is on. This allows the CPU to have immediate access to the operating system, which enhances the performance and functionality of the overall system