who are responsible for the booting process.

1.BIOS(**B**asic **I**nput/**O**utput **S**ystem)

2.**MBR**(**M**aster **B**oot **R**ecord)

3.**LILO** or **GRUB**

LILO:-**LI**nux **LO**ader

GRUB:-**GR**and **U**nified **B**ootloader

4.**Kernel**

5.**init**

6.**Run Levels**

1.BIOS:

i.When we power on BIOS performs a **P**ower-**O**n **S**elf-**T**est (**POST**) for all of the different hardware components in the system to make sure everything is working properly

ii.Also it checks for whether the computer is being started from an off position (cold boot) or from a restart (warm boot) is
stored at this location.

iii.Retrieves information from **CMOS** (**C**omplementary **M**etal-**O**xide **S**emiconductor) a battery operated memory chip on the motherboard that stores time, date, and critical system information.

iv.Once BIOS sees everything is fine it will begin searching for an operating system Boot Sector on a valid master boot sector
on all available drives like hard disks,CD-ROM drive etc.

v.Once BIOS finds a valid MBR it will give the instructions to boot and executes the first 512-byte boot sector that is the first
sector (“Sector 0”) of a partitioned data storage device such as hard disk or CD-ROM etc .

2.MBR

i. Normally we use multi-level boot loader.Here MBR means I am referencing to DOS MBR.

ii.Afer BIOS executes a valid DOS MBR,the DOS MBR will search for a valid primary partition marked as bootable on the hard disk.

iii.If MBR finds a valid bootable primary partition then it executes the first 512-bytes of that partition which is second level MBR.

iv. In linux we have two types of the above mentioned second level MBR known as LILO and GRUB

3.LILO

i.LILO is a linux boot loader which is too big to fit into single sector of 512-bytes.

ii.So it is divided into two parts :an installer and a runtime module.

iii.The installer module places the runtime module on MBR.The runtime module has the info about all operating systems installed.

iv.When the runtime module is executed it selects the operating system to load and transfers the control to kernel.

v.LILO does not understand filesystems and boot images to be loaded and treats them as raw disk offsets

GRUB

i.GRUB MBR consists of 446 bytes of primary bootloader code and 64 bytes of the partition table.

ii.GRUB locates all the operating systems installed and gives a GUI to select the operating system need to be loaded.

iii.Once user selects the operating system GRUB will pass control to the karnel of that operating system.
see below what is the difference between LILO and GRUB

4.Kernel

i.Once GRUB or LILO transfers the control to Kernel,the Kernels does the following tasks

- Intitialises devices and loads initrd module
- mounts root filesystem

5.Init

i.The kernel, once it is loaded, finds init in sbin(/sbin/init) and executes it.

ii.Hence the first process which is started in linux is init process.

iii.This init process reads /etc/inittab file and sets the path, starts swapping, checks the file systems, and so on.

iv.It runs all the boot scripts(/etc/rc.d/*,/etc/rc.boot/*)

v.starts the system on specified run level in the file /etc/inittab

6.Runlevel

i.There are 7 run levels in which the linux OS runs and different run levels serves for different purpose.The descriptions are
given below.

- 0 – halt
- 1 – Single user mode
- 2 – Multiuser, without NFS (The same as 3, if you don’t have networking)
- 3 – Full multiuser mode
- 4 – unused
- 5 – X11

- 6 – Reboot

ii.We can set in which runlevel we want to run our operating system by defining it on /etc/inittab file.

Now as per our setting in /etc/inittab the Operating System the operating system boots up and finishes the bootup process.

Below are given some few important differences about LILO and GRUB

LILO	GRUB
LILO has no interactive command interface	GRUB has interactive command interface
LILO does not support booting from a network	GRUB does support booting from a network
If you change your LILO config file, you have to rewrite the LILO stage one boot loader to the MBR	GRUB automatically detects any change in config file and auto loads the OS
LILO supports only linux operating system	GRUB supports large number of OS