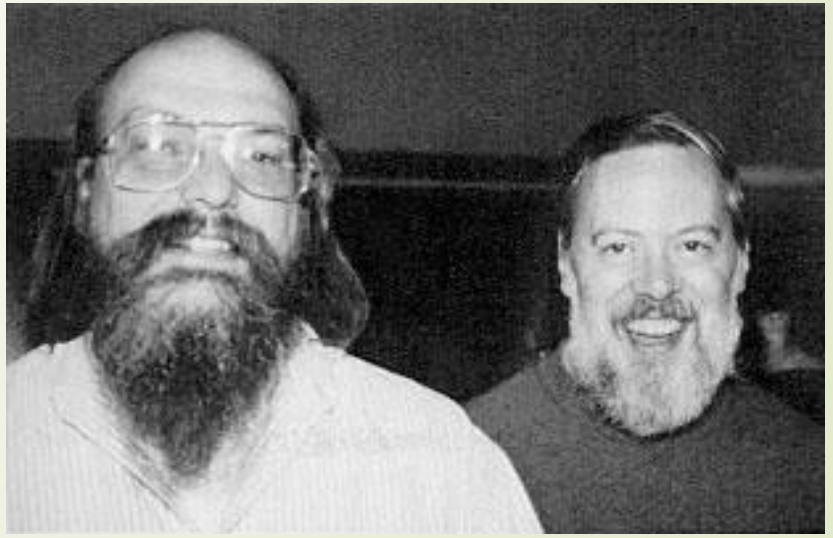
UNIX (History)

- Originated as a research project at A T & T Bell Labs in 1969 by Ken Thompson and Dennis Ritchie.



- Developed in several different versions for various hardware platforms (Sun Sparc, Power PC, Motorola, HP RISC Processors).

UNIX (History)

- In 1991, Linus Torvalds created a UNIX-like system to run on the Intel 386 processor.
- While still a student at the University of Helsinki, Torvalds started developing **Linux** to create a system similar to MINIX, a UNIX operating system.

UNIX (History)

- Intel had already started dominating the PC market, but UNIX was nearly absent from the initial Intel market.

- In January 2000, Apple announced MAC OS X, a UNIX/Mach hybrid that provides UNIX command line features.

Is Linux Same as UNIX?

YES, Because:

- It has essentially the same look and feel like any UNIX operating System.
- It offers the ability to run nearly any program that runs on UNIX systems (through API conventions such as POSIX, etc..).

NO, Because:

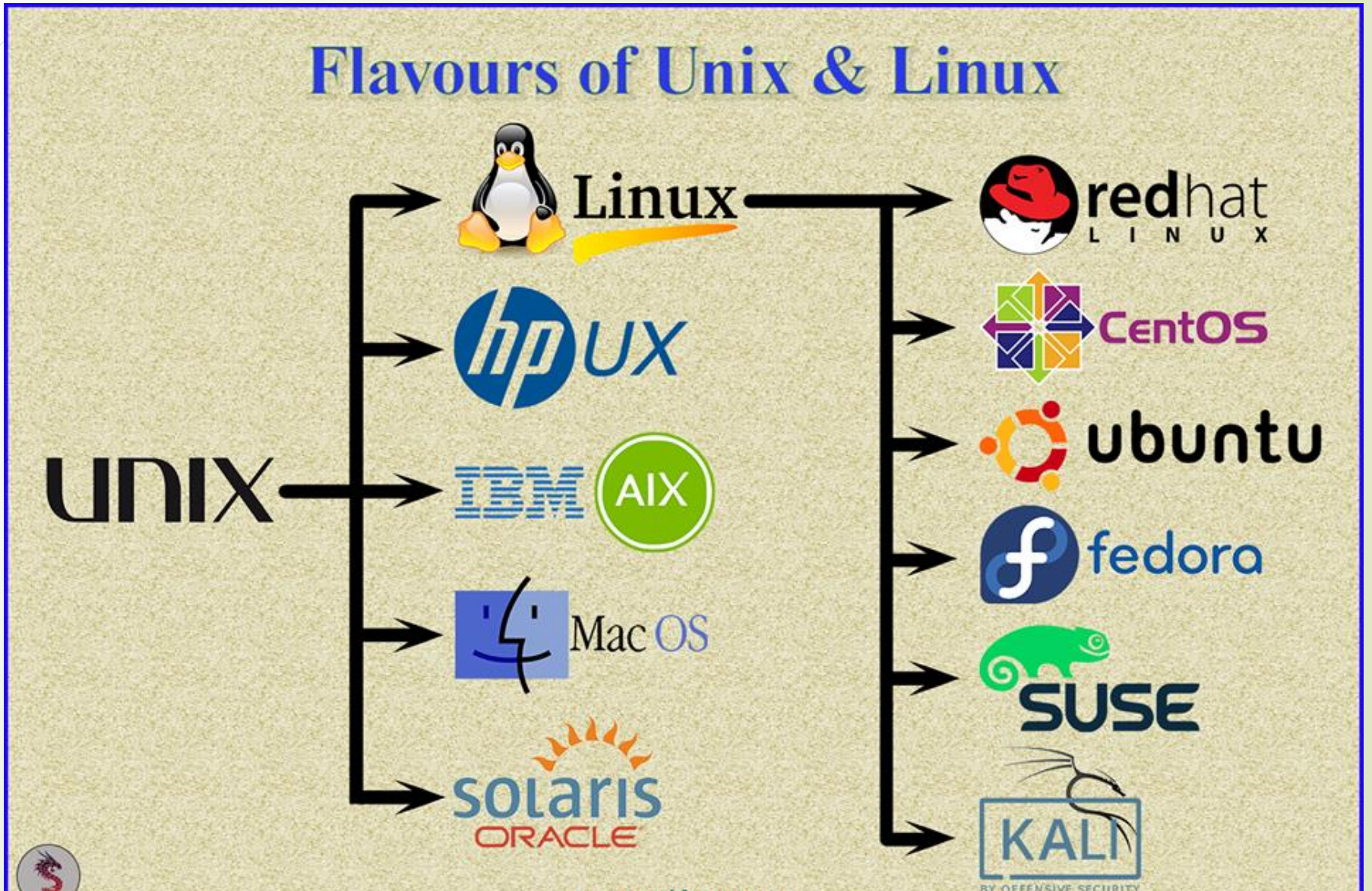
- The heart of the system (kernel) has a lot of new features that go beyond the classical design philosophy of UNIX kernels.

Therefore Linux is UNIX Like Operating System, but not UNIX.

What is GNU?

- GNU stands for “GNU's Not Unix”. GNU emphasizes a major project of the Free Software Foundation (FSF) that really created the LINUX operating system with many of its popular tools.
- Richard Stallman created FSF, in order to encourage the development and use of freely redistributable code.
- Freely means the freedom of redistributing your code under certain conditions. It does NOT mean zero financial cost!
- The GNU Public License (GPL) defines the terms and conditions of redistributing the LINUX kernel and other tools that make it usable, forming a LINUX distribution.

Flavours of UNIX



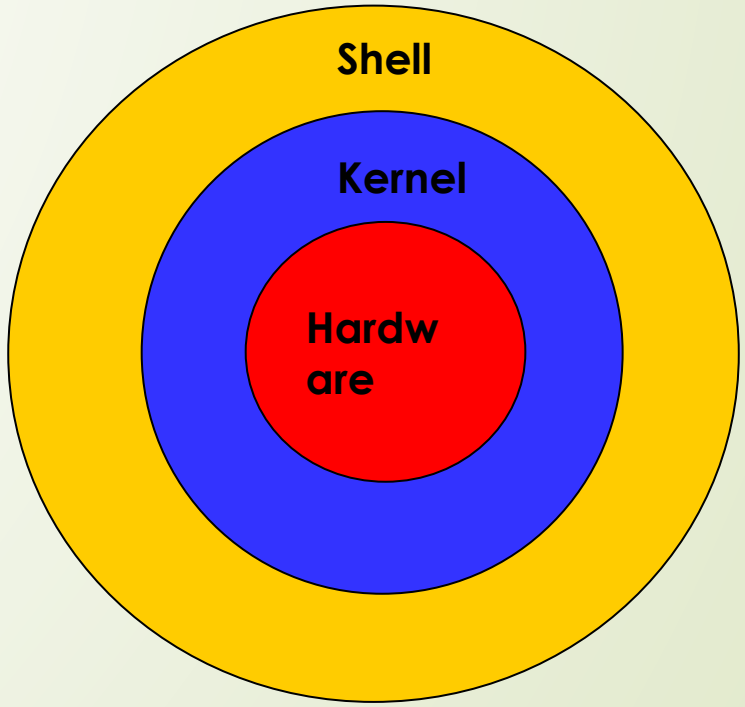
Features of Linux

- High Security (Virus Free)
- High Stability
- Ease of Maintenance
- Hardware Independent
- Freely Available
- Distributed OS
- Supports All File Systems
- Multiuser, Multitasking OS
- Open Source
- Ease of Use
- Customization
- Education
- Support
- Better Process Handling

Linux is Used in:

- Super Computers
- Servers, Cloud Computing
- The Large Hadron Collider
- NASA
- Space Robots
- Game Consoles
- Smart TVs
- US Defence
- Nuclear Submarines
- Space Station
- Smart Watches
- In-Car Entertainment
- Flights
- Smart Cars & Bikes
- Air Traffic Control (ATC)
- Stock Exchanges
- Mobile Phones
- Laptop, Desktops & PCs

Linux Kernel



- The operating system is broken into three pieces: the kernel, the shell, and the built-in utilities. The kernel is responsible for low level hardware communication, the shell provides human users with a user-friendly interface, and the built-in utilities provide basic tools for doing work.

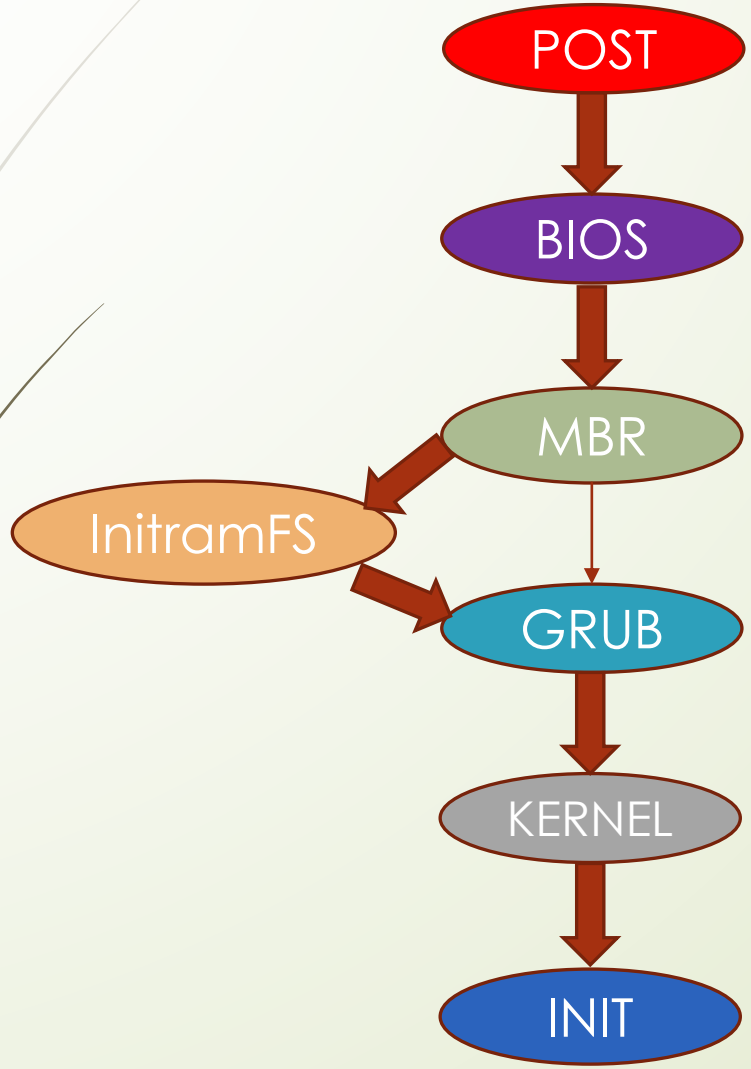
UNIX/Linux Shell

- Provides a *powerful* interface to the UNIX Operating System, so you can manipulate data and execute several applications under certain conditions.
- Also known as the '*command-line*' interface, a bit like the old “Command Prompt” in Windows/DOS systems, but it is not the same.
- Comes under different flavours, but all of them do the same thing in slightly different ways.
- Knowing the shell well is the ONLY WAY to make the most out of a UNIX system. It can be a bit difficult at the beginning, but since you get used to it, you have made a good friend that will help you address every computational problem!

Logging Into The Shell

- to use the UNIX shell, you will have to authenticate yourself (tell the system who you are). This process is commonly called the 'login' process, and it involves two steps.
  - Know your **username** and a **password**.
  - Have a means of communicating with the UNIX shell, so you can provide this kind of information.
- The first step is quite easy. You contact your system administrator or relevant authority and you obtain a login name and a password for the system. The second step requires a little bit more attention.

Linux Booting Process

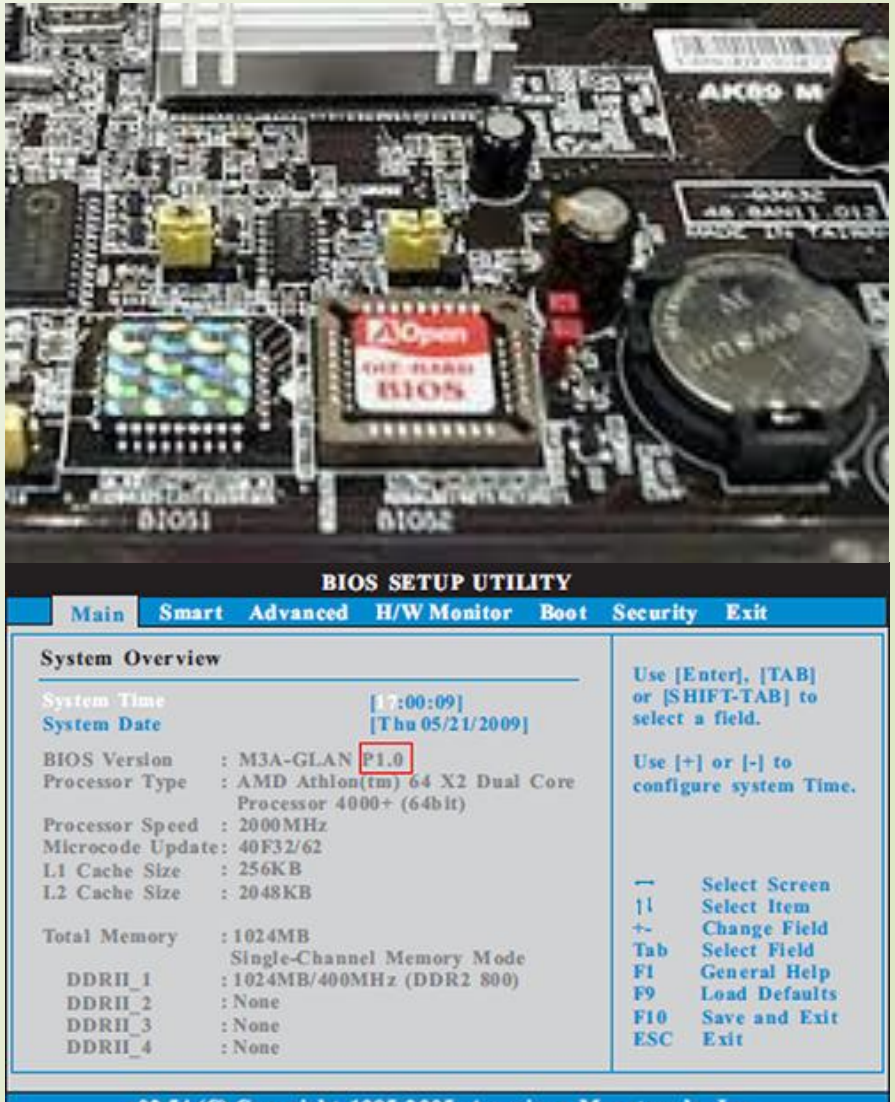


- Power On Self Test
- Basic Input Output System
- Master Boot Record
- Initram File System
- Grand Unified Boot Loader
- Kernel
- Initialization

Linux Booting Process

Basic Input Output System (BIOS)

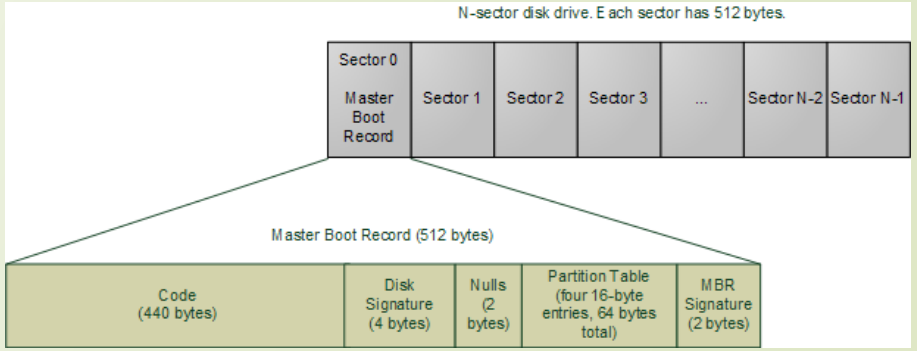
- BIOS is a combination of both hardware as well as software.
- BIOS provides us option to choose a boot device.
- Then it gives the control to MBR (Master Boot Record).



Linux Booting Process

Master Boot Record (MBR)

- Provides us a boot selection menu to choose a particular Operating System (OS) with which we want to boot our machine.



- It contains the information about the boot loader.

- Then it handovers the control to the boot loader.

Linux Booting Process

GRUB (Grand Unified Bootloader)

- GRUB is a file located in the address /boot/grub/grub.conf
- The Older version of Linux Bootloader is LiLo (Linux Loader).
- The latest version of Linux Bootloader is GRUB2.
- It contains information about Linux Kernel & initial (basic) Ram Disk.
- It also contains information about the particular partition in which the root file system is loaded.
- Then it gives control to the Kernel.

Linux Booting Process

KERNEL

- The name of the Linux Kernel is VM-Linuz.
- It interacts between machine hardware and shell.
- After getting control from the GRUB, KERNEL loads its splash image first with the help of initramfs, files which are accessed even without mounting the HDD.
- Then it transfers the control to the INIT.

Linux Booting Process

INIT (Initialization)

- INIT is the first process of Linux OS.
- INIT is also known as the parent of all processes.
- The process ID of INIT process is 1.
- After loading itself then it loads the whole Operating System (OS).
- There are several run levels in Linux which works on INIT values.

Linux Booting Process

Linux Run Levels

- Run Level 0 = INIT 0 □ Shut Down
- Run Level 1 = INIT 1 □ Single User Mode Without GUI & NFS
- Run Level 2 = INIT 2 □ Multi User Mode Without Network FS
- Run Level 3 = INIT 3 □ Multi User Mode with NFS
- Run Level 4 = INIT 4 □ Research Purpose
- Run Level 5 = INIT 5 □ X11 (Linux Graphics)
- Run Level 6 = INIT 6 □ Reboot

Linux File System Structure