Linux Introduction

In short

Basics of UNIX

- UNIX is an operating system which was first developed in the 1970s, and has been under constant development ever since.

- It is a *stable, multi-user, multi-tasking* system for servers, desktops and laptops.

- UNIX systems also have a graphical user interface (GUI) similar to Microsoft Windows which provides an easy to use environment.

- There are many different versions of UNIX, although they share common similarities.

The UNIX Distributions / Distros

- AIX by IBM

- BSD/OS (BSDi) by Wind River

- HP-UX by Hewlett-Packard Company

- OpenBSD by OpenBSD Group

- Solaris by Sun Microsystems (Oracle)

- IRIX by Silicon Graphics, Inc.

- Tru64 UNIX

- FreeBSD

- NetBSD

- Mac OS

Beginning of LINUX

- The history of Linux began in 1991 with the commencement of a personal project by Finnish student **Linus B. Torvalds** to create a new free operating system kernel.

- The initial release of its source code in September 17, 1991, which is still getting improved day by day.

- Linus Torvalds had wanted to call his invention Freax, ("free", "freak", and "x").

- Linus wrote the program specifically for the hardware he was using and independent of an operating system because he wanted to use the functions of his new PC with an 80386 processor.

Why to choose LINUX ?

- Easy to install applications

- Secure

- Easy to change options

- Community

- Free

- Portable

- Open Source

- Multi-User Hierarchical File System (FHS)

I AM TUX !!!

- Torvalds announced in 1996 that there would be a mascot for Linux, a **Penguin**.

- This was due to the fact when they were about to select the mascot, Torvalds did mention he was bitten by a little penguin

- It is also known as TUX (Torwalds UniX)
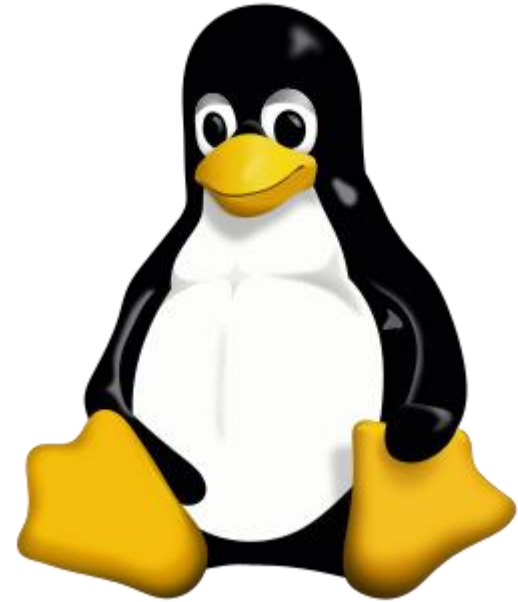
The Kernel

- All operating systems have kernels.

- The Linux kernel is unique and flexible because it is also modular in nature.

- The kernel of the Window operating system is a solidly connected piece of code, unable to be easily broken up into pieces.

- This modularity is significant to the success of Linux. The ability to scale down (or up) to meet the needs of a specific platform is a big advantage over other operating systems constrained to just a few possible platforms

- Latest stable kernel version is **4.7.3**

The Shell

- The shell provides you with an interface to the UNIX system.

- It gathers input from you and executes programs based on that input. When a program finishes executing, it displays that program's output.

- A shell is an environment in which we can run our commands, programs, and shell scripts.

- In UNIX there are two major types of shells:

- The Bourne shell. If you are using a Bourne-type shell, the default prompt is the $ character.

- The C shell. If you are using a C-type shell, the default prompt is the % character.

- There are again various subcategories for Bourne Shell which are listed as follows −

    - Bourne shell (sh)

    - Korn shell (ksh)

    - Bourne Again shell (bash)

- The different C-type shells follow −

    - C shell (csh)

    - Turbo C shell (tcsh)

Linux Environments

- The windows, menus, and dialog boxes known as the **windowing system** and the **desktop environment.**

- These layers provide the human-oriented graphical user interface (GUI).

- In Linux, there a lot of choices for which windowing system and desktop environment can be used, something that Linux allows **users to decide.**

  - **Unity**
  - **GNOME**
  - **KDE**
  - **XFCE**
  - **Cinnamon**
  - **MATE**
  - **LXDE**
  - **XMONAD**

Linux Distributions

- Ubuntu

- Linux Mint

- Debian

- Fedora

- OpenSUSE / SUSE Linux Enterprise

- Mandriva

- Puppy Linux

- Slackware Linux

- Arch Linux

- **Red Hat Enterprise Linux** / CentOS

  - CentOS is a community, that uses RedHat code.

Linux Architecture
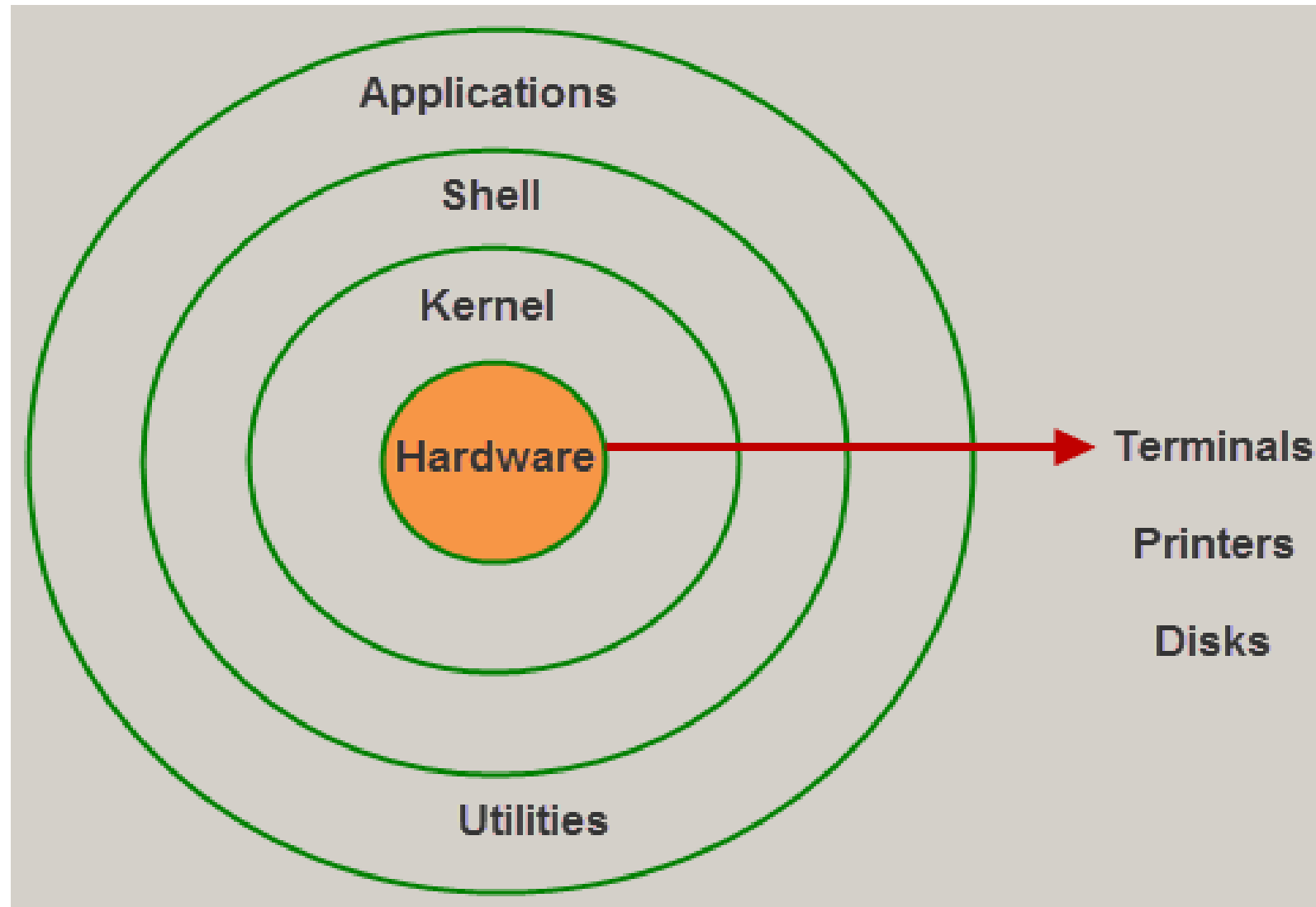
Linux Principle

- **Everything is a file. (Including hardware)**

  - The UNIX security model is based around the security of files.

  - By treating everything as a file, a consistency emerges.

  - You can secure access to hardware in the same way as you secure access to a document.

- **Small, single-purpose programs.**

  - UNIX provides many small utilities that perform one task very well.

  - When new functionality is required, the general philosophy is to create a separate program – rather than to extend an existing utility with new features.

Linux Principle *(conti.)*

- **Ability to chain programs together to perform complex tasks.**

  - A core design feature of UNIX is that the output of one program can be the input for another.

  - This gives the user the flexibility to combine many small programs together to perform a larger, more complex task.

- **Avoid captive user interfaces.**

  - Interactive commands are rare in UNIX.

  - Most commands expect their options and arguments to be typed on the command line when the command is launched.

- **Configuration data stored in text**

  - Text is a universal interface, and many UNIX utilities exist to manipulate text.

  - Storing configuration in text allows an administrator to move a configuration from one machine to another easily.

Booting process in LINUX
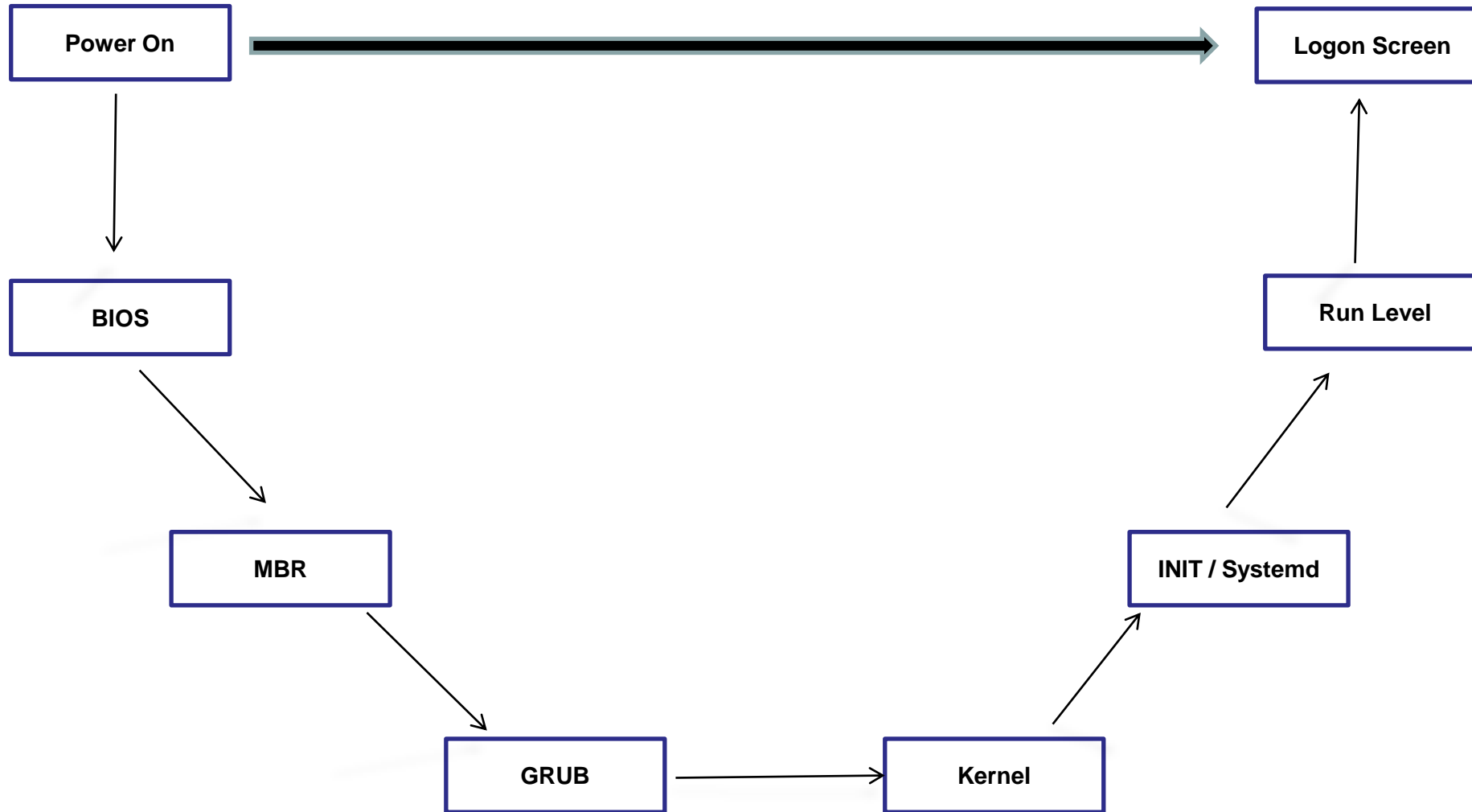
BIOS (Basic Input Output System)

- Responsible for searching, loading & executing the boot loader program.

- Searches boot loader in HDD, SD card, CD/DVD.

- Once loaded into memory, it gives the control to MBR.

- BIOS loads & executes the MBR

MBR (Master Boot Record)

- Located in the 1st sector of the HDD.

- Size is equal to 512 byte

  - 446 byte = Primary boot loader info

  - 64 byte = partition table info.

  - 2 byte = MBR validation checks

- It contains info about GRUB

- It loads & executes boot loader.

GRUB *(Grand Unified Boot loader)*

- Used for selecting the operating system at the time of boot up.

- Has the knowledge of the file system in "/boot/grub/grub.conf".

- Grub loads & executes the 'Kernel' & INITRD (INITial Ram Disk image).

- INITRD is used by kernel as temp root file system until kernel is booted & real root is mounted.

Kernel

- Mounts root file system.

- Executes the INIT program located in "/sbin/init"

- INIT becomes the very 1st process which get executes and got PID as 1.

- Loads the file systems & runs the initial (init) program.

INIT

- It decides the run level.

- System executes the program depending upon Run Level

- Run Level decides which initial program be loaded at startup.

  - INIT 0 = Halt

  - INIT 1 = Single User mode / maintenance

  - INIT 2 = Multiuser, without NFS

  - INIT 3 = Full multiuser mode (CLI)

  - INIT 4 = unused

  - INIT 5 = init 3 + GUI

  - INIT 6 = Reboot

File system Hierarchy Standard (FHS)

/	/kernel
/bin	/dev
/etc	/lib
/boot	/home
/mnt	/proc
/tmp	/usr
/var	/sbin

RHEL 7 vs RHEL 6

Features	RHEL 7	RHEL 6
Default File System	XFS	EXT4
Kernel Version	3.10.xx kernel	2.6.xx kernel
Kernel Code Name	Maipo	Santiago
First Process	systemd (process ID 1)	init (process ID 1)
Change In UID Allocation	Root → 0 to 999 Normal → 1000 & so on	Root → 0 to 499 Normal → 500 & so on
Boot Loader	GRUB 2	GRUB 0.97
Default Database	MariaDB	MySQL

Difference between different file systems

	Ext2	Ext3	Ext4	XFS
Full form	2nd extended file system	3rd extended file system	4th extended file system	extent file system
intro in	1993	2001	2008	1994 with IRIX 5.3
Journaling feature	No	Yes - dedicated area	yes - but can be turned off	Yes
Individusal File size	16 GB to 2 TB	16 GB to 2 TB	16 GB to 16 TB	16 TB to 16 Exabyte
Overall File size	2 TB to 32 TB	2 TB to 32 TB	1 ExaByte to 1 PetaByte	16 TB to 18 Exabyte

What's new in RHEL 7

- No 32 Bit ISO Image

- New Ruby and Python Versions

- OpenJDK7 Made Default

- More Powerful Network Manager

- Support for 40 Gigabit NICs

- Implementation of tmpfs file system

- Minimum Disk Space for Installation of RHEL7

  - At least 1 GB of disk space, but 5 GB is recommended for all architecture.

Red Hat Certification Path

ADMINISTRATOR NEW TO LINUX	EXPERIENCED LINUX ADMINISTRATOR / SENIOR UNIX ADMINISTRATOR	SENIOR LINUX ADMINISTRATOR	RED HAT CERTIFIED ENGINEER (RHCE) RECERTIFY
RH124 **RED HAT SYSTEM ADMINISTRATION I**			
RH 134/135* **RED HAT SYSTEM ADMINISTRATION II**	**RH 199/200*** **RHCSA RAPID TRACK COURSE**		
RED HAT CERTIFIED SYSTEM ADMINISTRATOR (RHCSA)	**RED HAT CERTIFIED SYSTEM ADMINISTRATOR (RHCSA)**	**RH 254/255*** **RED HAT SYSTEM ADMINISTRATION III**	**RH 299/300*** **RHCE CERTIFICATION LAB**
RH 254/255* **RED HAT SYSTEM ADMINISTRATION III**	**RH 254/255*** **RED HAT SYSTEM ADMINISTRATION III**	**RED HAT CERTIFIED SYSTEM ADMINISTRATOR (RHCSA)**	**RED HAT CERTIFIED SYSTEM ADMINISTRATOR (RHCSA)**
RED HAT CERTIFIED ENGINEER (RHCE)	**RED HAT CERTIFIED ENGINEER (RHCE)**	**RED HAT CERTIFIED ENGINEER (RHCE)**	**RED HAT CERTIFIED ENGINEER (RHCE)**