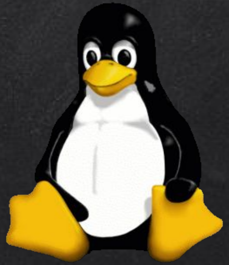


Tux Wars

Class - 1

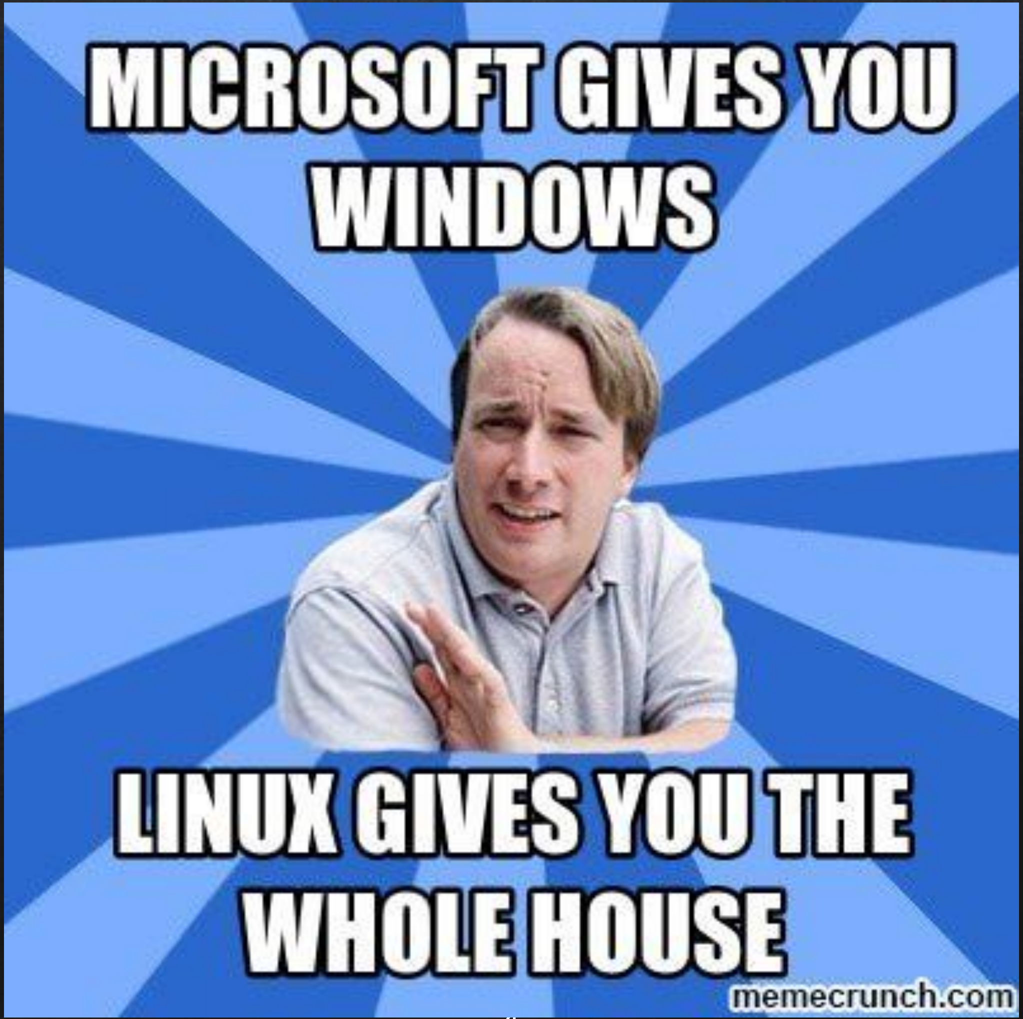
Table of Contents

1) Introduction to Linux and its history
2) Booting process of a linux system
3) Linux Kernel
4) What is a shell
5) Bash Shell
6) Anatomy of command
7) Let's make our own command
8) WildCards in Bash
9) Man
10) General directory structure in UNIX
11) Mounting a device
12) > IO Redirection >>
13) Permissions, Users & groups
14) Super User

1.

Introduction

Let’s start with the first set of slides



MICROSOFT GIVES YOU WINDOWS
LINUX GIVES YOU THE WHOLE HOUSE
memecrunch.com

History Of linux

1991. Just a hobby, won't be big and professional like GNU – Linus Torvalds
1992. Linux became open source
1996. Tux becomes the logo of linux
1997. GNOME project is born
2000. Steve jobs made an offer to Linus Torvalds to work on OS X.
2004. Ubuntu is released
2005. Linus torvalds created git
2008. Android v1.0 released

And today

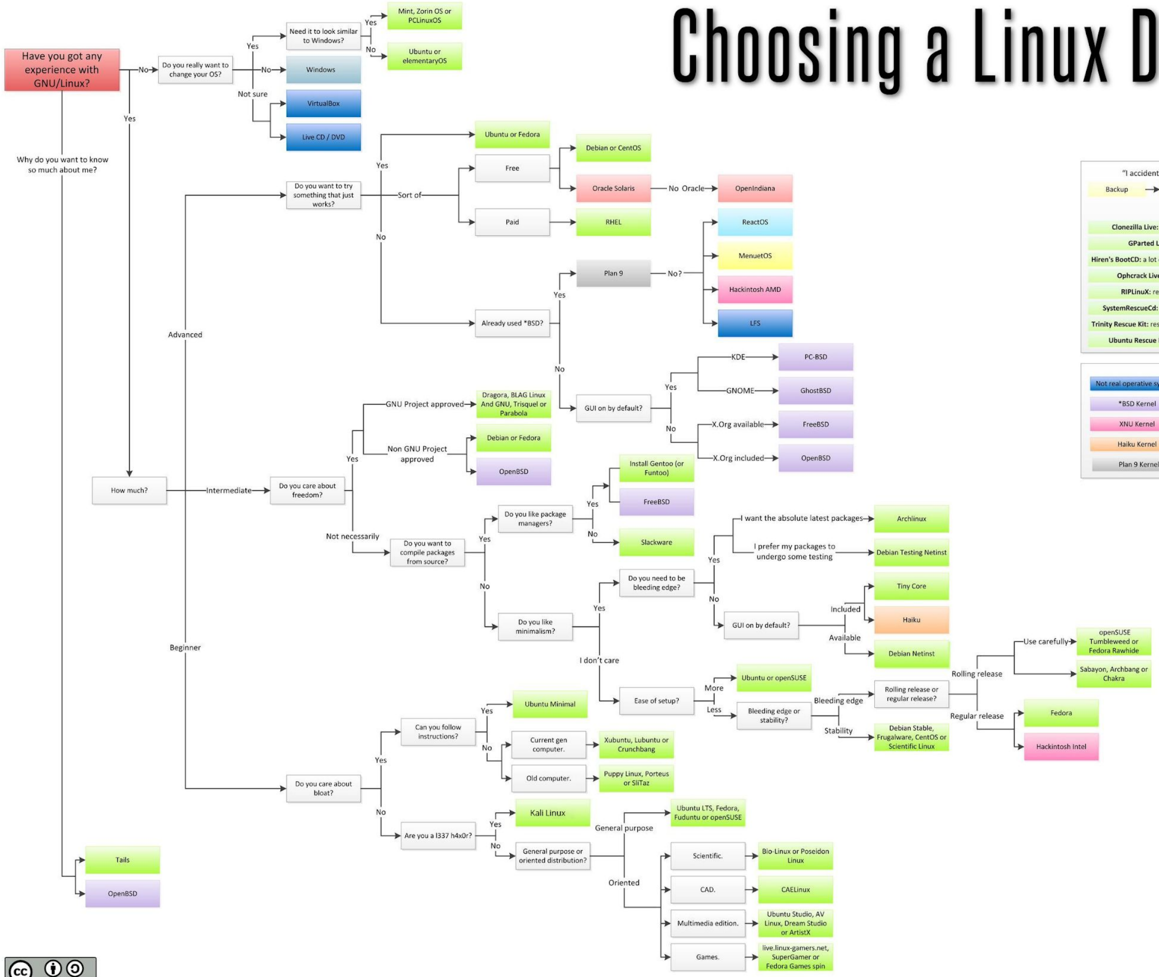
All 500 of the world's fastest supercomputers are running Linux.

Flavors of Linux

Let’s see which linux flavor to use.

CRux Linux
CDlinux
CensorNet
CentOS
CHAKRA
clearOS
Clonezilla
Comfusion
Connochaet
Coyote
#!
CRUNCHBANG
CRUX
CTKarchLinux
dragora
dreamlinux
DVL
easy peasy
edubuntu
EKAATY
elastix
ELEMENT
Elive
Endian
EnGarde
Estrella Roja
Frenzy
Frugalware
Fuguita
Fusion
GeeBox
gentoo linux
Gentoox
GhostBSD
GIBRALTAR
GnackTrack
gNewSense
GNOBSD
GNUstep
iMagic OS
INQUISITOR
Insigne
IPCop
IPFire
Jibbed
JL
JoLinux
Joli OS
K12
K12Linux
kubuntu
Kwort
LEGACY OS
Legacy OS
linux from scratch
LinEx
LinHES
LINPUS
Linux-EduCD
LinuxTLE
Linux XP
Litrix
MAX Madrid_Linux
M
MCNLive
MeeGo
MEPIS
MidnightBSD
MilaX
MiniNo
MINIX
Linux Mint
MIRACLE LINUX
MirOS
moblin
NL
Neoshine
NepaLinux
NetBSD
netrunner
NetSecL
Nexenta
nexentastor
NimbleX
NOVA
N
Novell
NST
Openwall
OS
ophcrack
ORACLE
PAIPIX
paldo
Papug
PARDUS
Parsix
parted magic
PC-BSD
PCLinuxOS
PC/OS
PelicanHPC
Poseidon
Privatix
Puppy
puredyne
PureOS
Qimo
Qomo
Quirky
redhat
redwall

Choosing a Linux Distro



Have you got any experience with GNU/Linux?

No → Do you really want to change your OS?

- Yes → Need it to look similar to Windows?
  - Yes → Mint, Zorin OS or PCLinuxOS
  - No → Ubuntu or elementaryOS
- No → Windows
- Not sure → VirtualBox; Live CD / DVD

Why do you want to know so much about me? → Tails; OpenBSD

Yes → How much?

Advanced → Do you want to try something that just works?

- Yes → Ubuntu or Fedora
- Sort of → Free → Debian or CentOS; Oracle Solaris —No Oracle→ OpenIndiana
- Sort of → Paid → RHEL
- No → Already used *BSD?
  - Yes → Plan 9 —No?→ ReactOS; MenuetOS; Hackintosh AMD; LFS
  - No → GUI on by default?
    - Yes → KDE → PC-BSD; GNOME → GhostBSD
    - No → X.Org available → FreeBSD; X.Org included → OpenBSD

Intermediate → Do you care about freedom?

- Yes → GNU Project approved → Dragora, BLAG Linux And GNU, Trisquel or Parabola
- Yes → Non GNU Project approved → Debian or Fedora; OpenBSD
- Not necessarily → Do you want to compile packages from source?
  - Yes → Do you like package managers?
    - Yes → Install Gentoo (or Funtoo); FreeBSD
    - No → Slackware
  - No → Do you like minimalism?
    - Yes → Do you need to be bleeding edge?
      - Yes → I want the absolute latest packages → Archlinux
      - Yes → I prefer my packages to undergo some testing → Debian Testing Netinst
      - No → GUI on by default?
        - Included → Tiny Core; Haiku
        - Available → Debian Netinst
    - I don't care → Ease of setup?
      - More → Ubuntu or openSUSE
      - Less → Bleeding edge or stability?
        - Bleeding edge → Rolling release or regular release?
          - Rolling release → Use carefully → openSUSE Tumbleweed or Fedora Rawhide; Sabayon, Archbang or Chakra
          - Regular release → Fedora; Hackintosh Intel
        - Stability → Debian Stable, Frugalware, CentOS or Scientific Linux

Beginner → Do you care about bloat?

- Yes → Can you follow instructions?
  - Yes → Ubuntu Minimal
  - No → Current gen computer. → Xubuntu, Lubuntu or Crunchbang
  - No → Old computer. → Puppy Linux, Porteus or SliTaz
- No → Are you a l337 h4x0r?
  - Yes → Kali Linux
  - No → General purpose or oriented distribution?
    - General purpose → Ubuntu LTS, Fedora, Fuduntu or openSUSE
    - Oriented → Scientific. → Bio-Linux or Poseidon Linux
    - Oriented → CAD. → CAELinux
    - Oriented → Multimedia edition. → Ubuntu Studio, AV Linux, Dream Studio or ArtistX
    - Oriented → Games. → live.linux-gamers.net, SuperGamer or Fedora Games spin

"I accidentally my computer, wat do?"

Backup → Reformat → Reinstall

Tools

Clonezilla Live: hard disk partitioning and cloning.

GParted LiveCD: hard disk partitioning.

Hiren's BootCD: a lot of problem solving and diagnosis utilities.

Ophcrack LiveCD: Windows password cracker.

RIPLinuX: rescue, backup and maintenance.

SystemRescueCd: repair and recover data after a crash.

Trinity Rescue Kit: rescue, repair, password resets and cloning.

Ubuntu Rescue Remix: data recovery and forensics.

References

Not real operative systems	Linux Kernel
*BSD Kernel	Solaris/Illumos Kernel
XNU Kernel	Windows NT Kernel
Haiku Kernel	ReactOS Kernel
Plan 9 Kernel	MenuetOS Kernel

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https://distrowatch.com/dwres.php?resource=popularity

2.

Linux Kernel

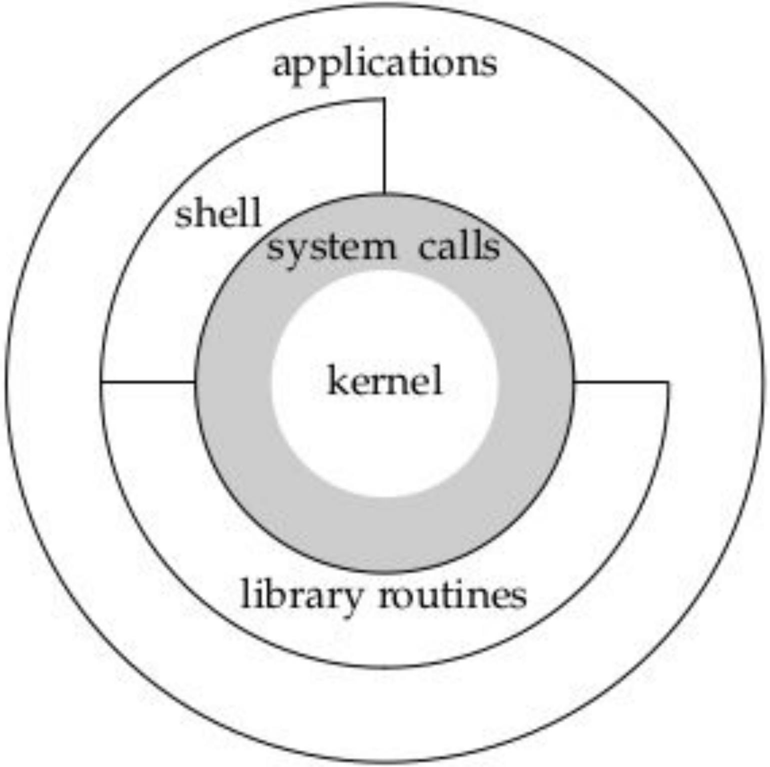


Figure 1.1 Architecture of the UNIX operating system

3.

Shells

What is a Shell ?

- ✘ The shell is the command interpreter in an operating system such as Unix or GNU/Linux.
- ✘ It is **a program** that executes other programs.
- ✘ It provides user an interface to the Unix/GNU-Linux system so that the user can run different commands.

Types of Linux Shells

- The Bourne Shell ($)
  - Bourne Shell (sh)
  - Korn Shell (ksh)
  - Bourne Again Shell (bash)
  - POSIX Shell (sh)
- The C Shell (%)
  - C shell (csh)
  - TENEX/TOPS C shell (tsch)

4.

Bash

Interacting with Bash

1. Bash Built-ins
   - cd
   - echo
   - alias
   - exit

2. Bash Commands (executables/binaries)
   - ls
   - mkdir
   - cp
   - chmod

And lot more.....

- https://courses.cs.washington.edu/courses/cse390a/14au/bash.html

5.

Anatomy of a Command

UTILITY [ARGS] . . .

Also called options, switches or flags

6.

Let's make our own command

7.

WildCards

WildCards in Bash

What are wildcards ?

- A wildcard is a character that can be used as a substitute for any of a **class of characters** in a search, thereby greatly increasing the flexibility and efficiency of searches.

Example please ??

- ls *.txt

Okay, what other wildcards are available ?

Standard Wildcards (globbing patterns)

- ✘ ? (question mark)
- ✘ { } (curly brackets)
  - ○ touch file{1 . . 10}
  - ○ cp { *.txt,*.pdf } ~
- ✘ [ ] (square brackets)
  - ○ ls file[1-3]
- ✘ * (asterisk)
  - ○ rm file*

8.

Sir, ये सब तो ठीक..... याद कैसे होगा ????

Take the chill pill !!

Linux got your back :

- man
- help
- Info
- apropos (similar to man –f)

7.

Everything is a file(descriptor)

Everything is a File

"Everything is a file" – a wide range of input/output resources such as

- ✘ Documents
- ✘ Directories
- ✘ Hard-drives
- ✘ Modems
- ✘ Keyboards, printers and even some inter-process and network communications

are simple streams of bytes exposed through the filesystem name space.

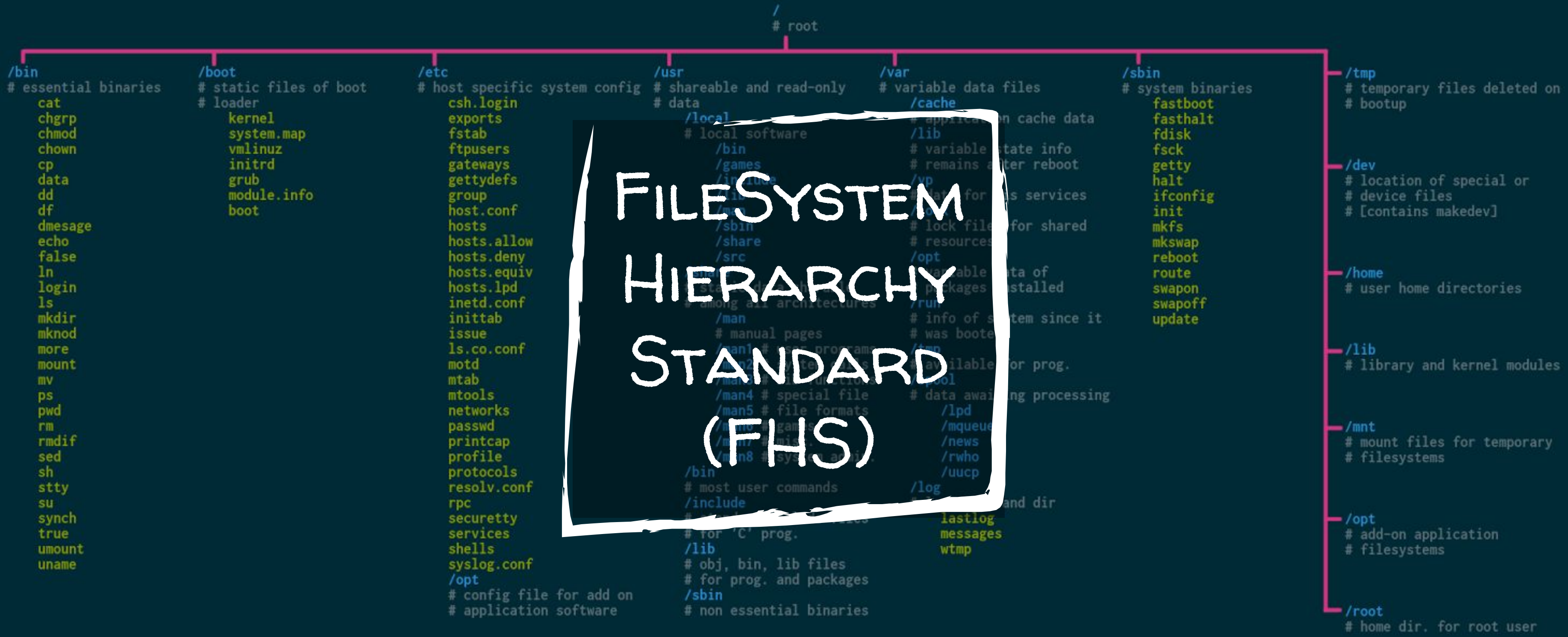
Different types of files in linux

1. Regular
    - Readable
    - Binary
    - So on…..
2. Directories
3. Special Files
    - Block
    - Character
    - Symbolic Link files
    - Named Pipe
    - socket

Why file “Descriptor” ?

- When a file is opened, a file descriptor is created.
- File descriptors are also created for things like pipes and network sockets via different methods.

FileSystem Hierarchy Standard (FHS)



/
# root

/bin
# essential binaries
cat
chgrp
chmod
chown
cp
data
dd
df
dmesage
echo
false
ln
login
ls
mkdir
mknod
more
mount
mv
ps
pwd
rm
rmdif
sed
sh
stty
su
synch
true
umount
uname

/boot
# static files of boot
# loader
kernel
system.map
vmlinuz
initrd
grub
module.info
boot

/etc
# host specific system config
csh.login
exports
fstab
ftpusers
gateways
gettydefs
group
host.conf
hosts
hosts.allow
hosts.deny
hosts.equiv
hosts.lpd
inetd.conf
inittab
issue
ls.co.conf
motd
mtab
mtools
networks
passwd
printcap
profile
protocols
resolv.conf
rpc
securetty
services
shells
syslog.conf
/opt
# config file for add on
# application software

/usr
# shareable and read-only
# data
/local
# local software
/bin
/games
/include
/lib
/man
/sbin
/share
/src
/share
# static data shareable
# among all architectures
/man
# manual pages
/man1 # user programs
/man2 # system calls
/man3 # lib functions
/man4 # special file
/man5 # file formats
/man6 # games
/man7 # misc.
/man8 # system admin.
/bin
# most user commands
/include
# standard include files
# for 'C' prog.
/lib
# obj, bin, lib files
# for prog. and packages
/sbin
# non essential binaries

/var
# variable data files
/cache
# application cache data
/lib
# variable state info
# remains after reboot
/yp
# data for nis services
/lock
# lock files for shared
# resources
/opt
# variable data of
# packages installed
/run
# info of system since it
# was booted
/tmp
# available for prog.
/spool
# data awaiting processing
/lpd
/mqueue
/news
/rwho
/uucp
/log
# log files and dir
lastlog
messages
wtmp

/sbin
# system binaries
fastboot
fasthalt
fdisk
fsck
getty
halt
ifconfig
init
mkfs
mkswap
reboot
route
swapon
swapoff
update

/tmp
# temporary files deleted on
# bootup

/dev
# location of special or
# device files
[contains makedev]

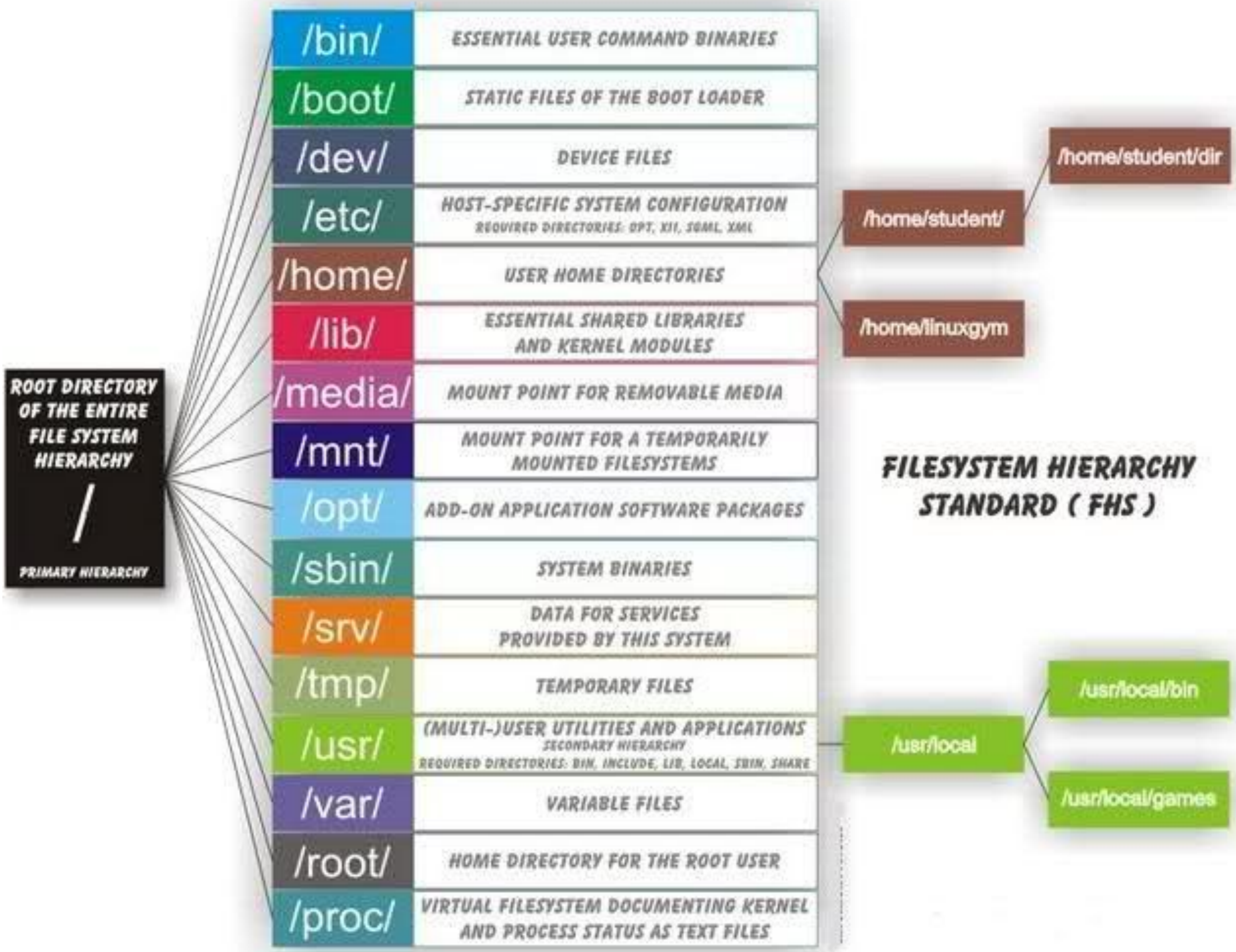
/home
# user home directories

/lib
# library and kernel modules

/mnt
# mount files for temporary
# filesystems

/opt
# add-on application
# filesystems

/root
# home dir. for root user



FILESYSTEM HIERARCHY STANDARD (FHS)

ROOT DIRECTORY OF THE ENTIRE FILE SYSTEM HIERARCHY

/

PRIMARY HIERARCHY

/bin/	ESSENTIAL USER COMMAND BINARIES
/boot/	STATIC FILES OF THE BOOT LOADER
/dev/	DEVICE FILES
/etc/	HOST-SPECIFIC SYSTEM CONFIGURATION REQUIRED DIRECTORIES: OPT, X11, SGML, XML
/home/	USER HOME DIRECTORIES
/lib/	ESSENTIAL SHARED LIBRARIES AND KERNEL MODULES
/media/	MOUNT POINT FOR REMOVABLE MEDIA
/mnt/	MOUNT POINT FOR A TEMPORARILY MOUNTED FILESYSTEMS
/opt/	ADD-ON APPLICATION SOFTWARE PACKAGES
/sbin/	SYSTEM BINARIES
/srv/	DATA FOR SERVICES PROVIDED BY THIS SYSTEM
/tmp/	TEMPORARY FILES
/usr/	(MULTI-)USER UTILITIES AND APPLICATIONS SECONDARY HIERARCHY REQUIRED DIRECTORIES: BIN, INCLUDE, LIB, LOCAL, SBIN, SHARE
/var/	VARIABLE FILES
/root/	HOME DIRECTORY FOR THE ROOT USER
/proc/	VIRTUAL FILESYSTEM DOCUMENTING KERNEL AND PROCESS STATUS AS TEXT FILES

/home/student/

/home/student/dir

/home/linuxgym

/usr/local

/usr/local/bin

/usr/local/games

To read about FHS 3.0 refer :

- https://refspecs.linuxfoundation.org/FHS_3.0/fhs-3.0.pdf
- https://www.tecmint.com/linux-directory-structure-and-important-files-paths-explained/

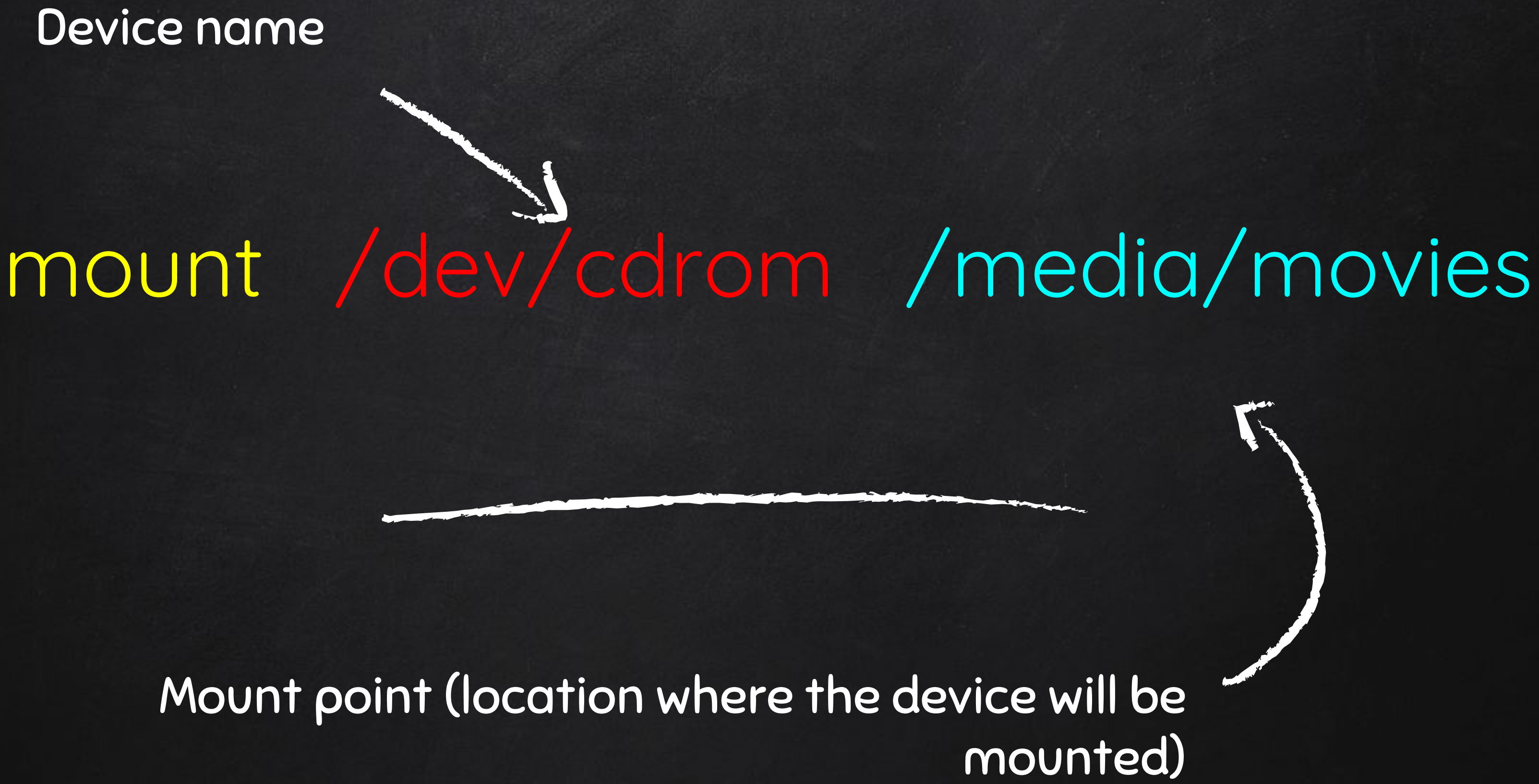
10.

Mounting

Mounting a device

- ✘ All accessible storage/devices must have an associated location in **the directory tree defined by FHS.**
- ✘ This is unlike Windows where (in the most common syntax for file paths) there is one directory tree per storage component (drive).

"Mounting is the act of associating a storage device to a particular location in the directory tree. For example, when the system boots, a particular storage device."



Device name

```
mount   /dev/cdrom   /media/movies
```

Mount point (location where the device will be mounted)

11.

IO Redirection, Pipes

Redirecting output to a file

`./a.out > output.txt` : redirects output of a.out to output.txt

`./a.out >> output.txt` : appends output of a.out to output.txt

PIPES

ls /etc/ | sort | less : lists /etc directory sorts it and passes it to less pager.

12.

User And Groups

Users in Linux

A user or account of a system is uniquely identified by a numerical number called the UID (unique identification number).

There are two types of users:

- ✘ Normal user – limited access to files
- ✘ Root / Superuser – can access all the files.

Groups in Linux

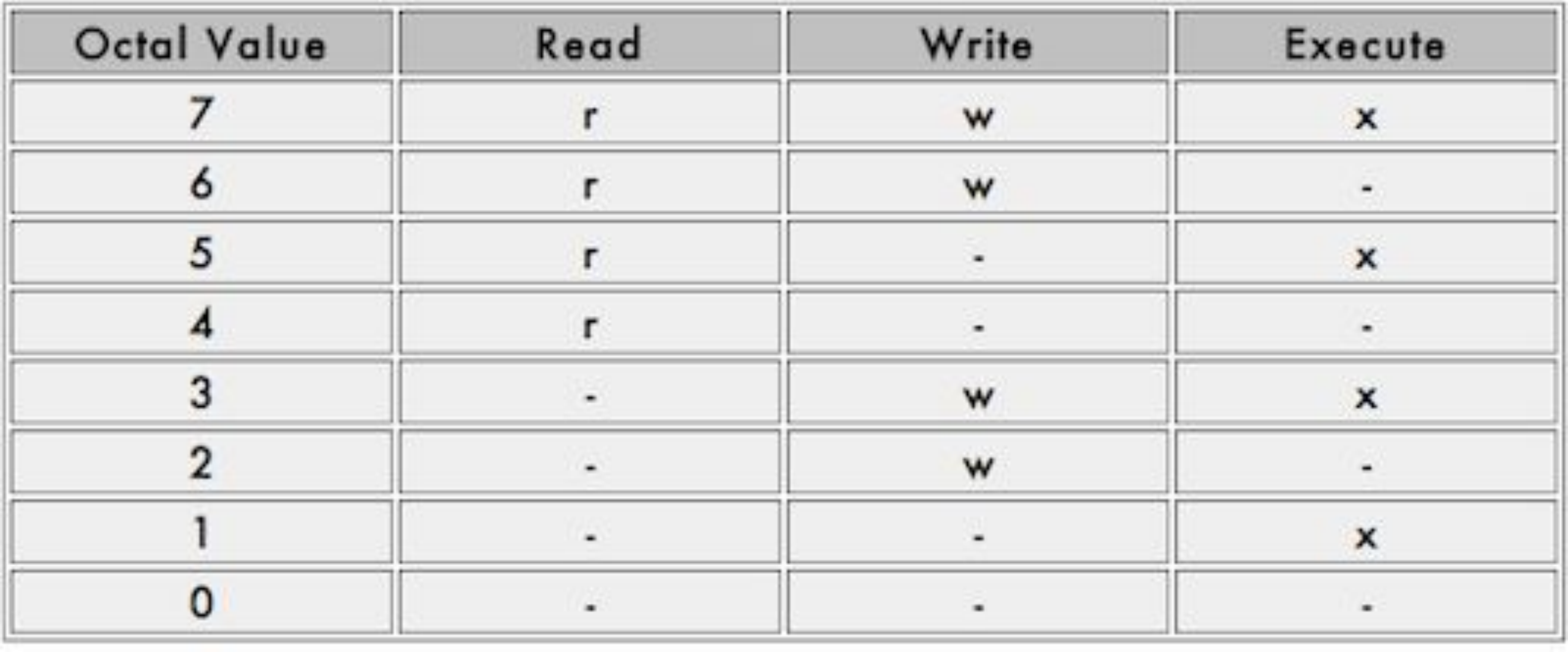
Linux group is a mechanism to organise a collection of users. Like the user ID, each group is also associated with a unique ID called the GID (group ID).

There are two types of groups:

- ✘ Primary group
- ✘ Supplementary group

Each user is a member of exactly one primary group and zero or more supplementary groups.

CHMOD PERMISSION IN OCTAL



Octal Value	Read	Write	Execute
7	r	w	x
6	r	w	-
5	r	-	x
4	r	-	-
3	-	w	x
2	-	w	-
1	-	-	x
0	-	-	-

13.

SUDO

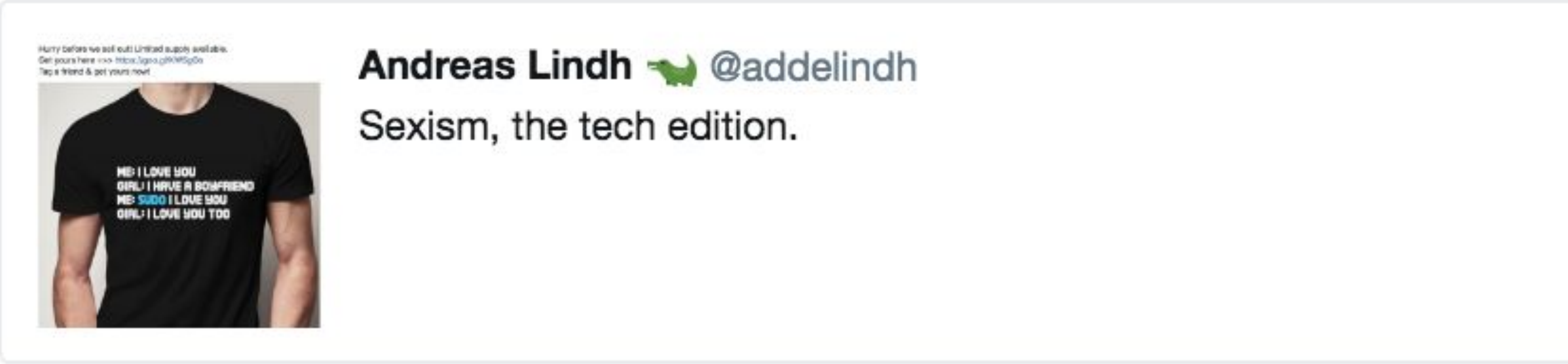
ME : I LOVE YOU

GIRL : I HAVE A BOYFRIEND

ME : SUDO I LOVE YOU

GIRL : I LOVE YOU TOO

Boy: I LOVE YOU
Girl: I HAVE A BOYFRIEND
Boy: SUDO I LOVE YOU
Girl: BOY IS NOT IN THE SUDOERS FILE. THIS INCIDENT WILL BE REPORTED.



Hurry before we sell out! Limited supply available.
Get yours here >>> [illegible]
Tag a friend & get yours now!

Andreas Lindh @addelindh

Sexism, the tech edition.

SUDO

- ✘ Root is the super user and has the ability to do anything on a system. Therefore, in order to have protection against potential damage sudo is used in place of root.
- ✘ Sudo allows users and groups access to commands they normally would not be able to use.
- ✘ Sudo will allow a user to have **administrative privileges** without logging in as root.

Before using sudo, it may need to be installed if it is not part of your distro

SU vs. SU –

SU : will land in the current directory

SU – : will land in the root’s home directory (/root)

THANKS!

Any questions?

*The content in the slides was designed by Dipunj Gupta