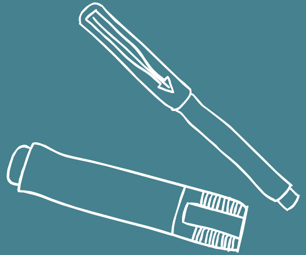
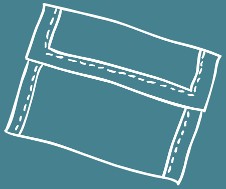
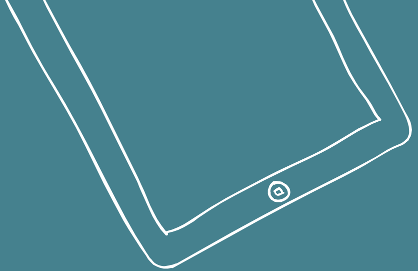
TuxWars

Topics For The Day

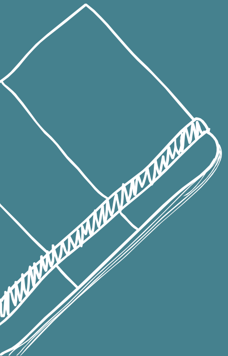
1. What is Linux and why use it?
2. History of Linux
3. Flavours and Distros
4. Linux Architecture
5. How Linux boots up?
6. The File System
7. Shells
8. Exploring Commands
9. Files, files everywhere!
10. Wildcards
10. Shell Scripting
11. Make your own command
12. Redirection and Pipes
13. To permit, or not to permit
14. Sudo and su -
15. Mount and Unmounting
16. How to Kill?
18. System Calls

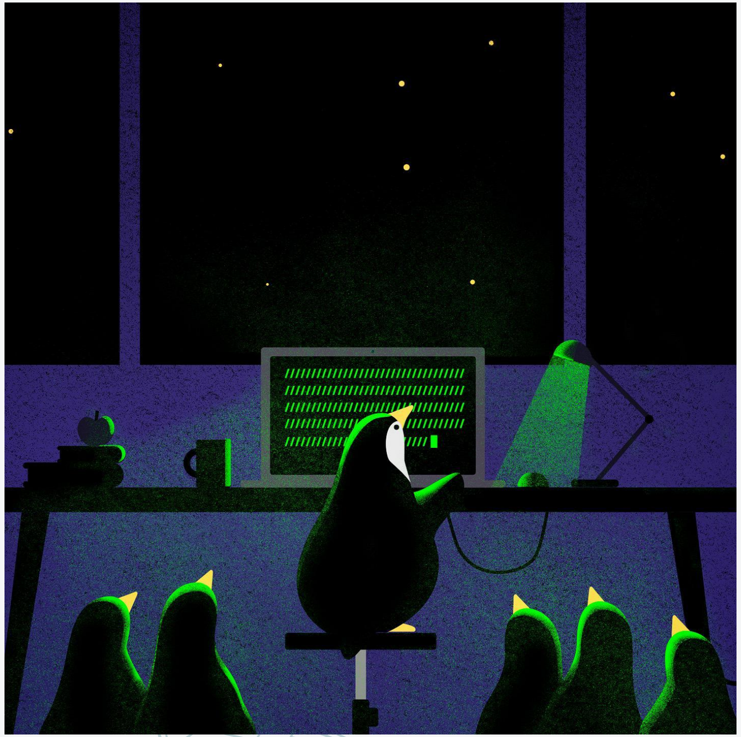
1.

What Is Linux And Why Use It?

...Because it's the best OS in the world!!

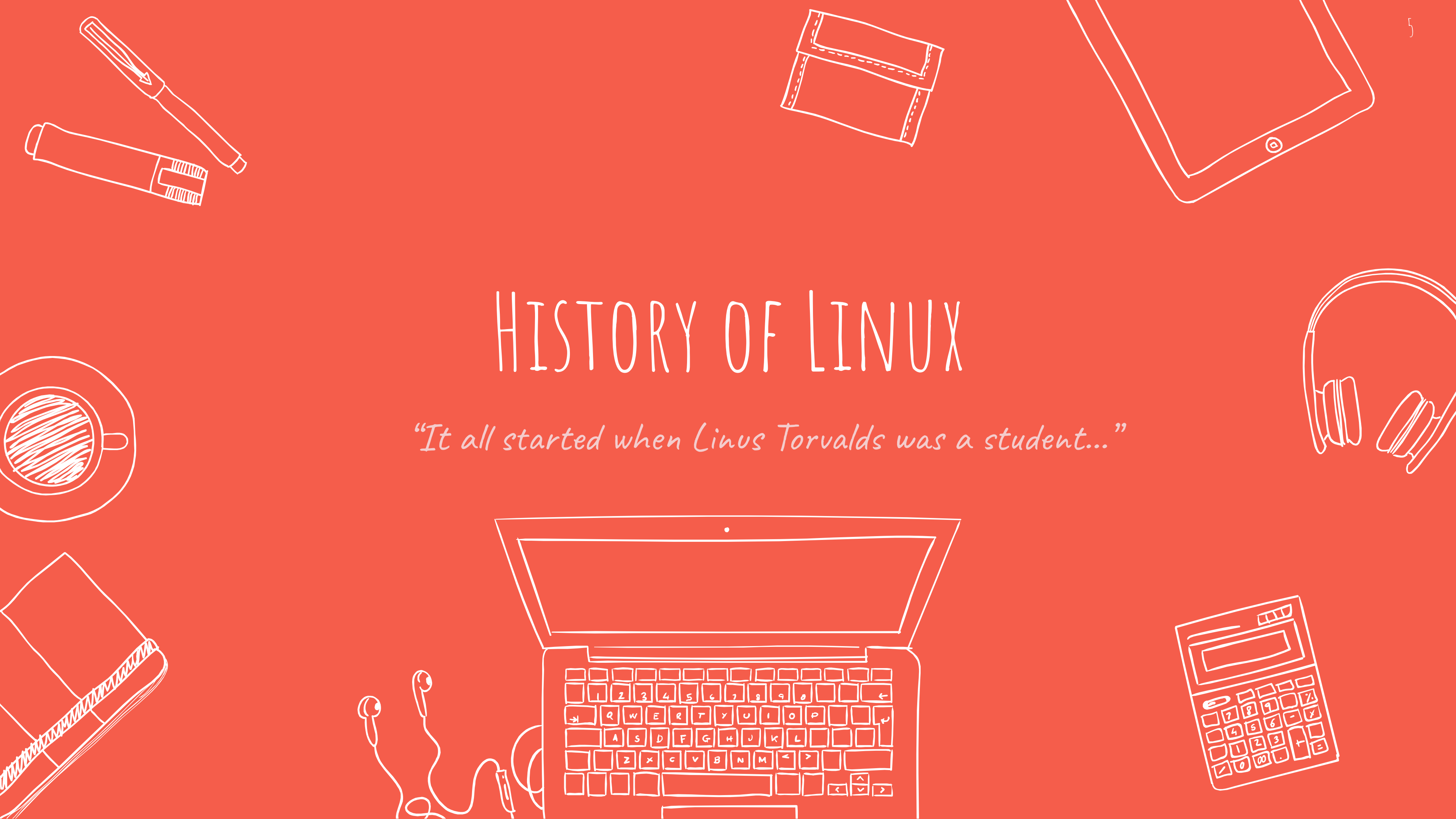


What Makes Linux So Special?



Features of Linux

1. Open-source OS
2. Compatible with every computer
3. Customizable
4. Security
5. Networking
6. Stable release



History of Linux

"It all started when Linus Torvalds was a student…"

MEMORABLE LINUX EVENTS

CELEBRATING 30 YEARS OF GNU LINUX

1985

THE FREE SOFTWARE FOUNDATION IS CREATED BY RICHARD STALLMAN TO PROMOTE SOFTWARE FREEDOM AND FUND THE GNU PROJECT

1989

GNU GPL VERSION 1 IS PUBLISHED TO ENSURE ELECTRONIC RIGHTS AND ALLOW COLLABORATION

1991

LINUS TORVALDS POSTS HIS FAMOUS MESSAGE - "HELLO EVERYBODY OUT THERE USING MINIX..." AND RELEASES THE FIRST VERSION OF THE LINUX KERNEL

1992

LINUS LICENSES VERSION 0.99 OF LINUX UNDER THE GNU GPL. "DEFINITLY THE BEST THING I EVER DID"

1993

LINUX DISTRIBUTIONS ARE CREATED IN THIS YEAR WE SEE SLACKWARE AND DEBIAN BEING LAUNCHED

1996

THE 'TUX' LINUX MASCOT WAS CREATED BY LARRY EWING

1998

JASPER NUYENS STARTS DELIVERING THE FIRST 24 BY 7 LINUX SUPPORT IN EUROPE. ENTERPRISE LINUX USE KICKS OFF AND FUELS THE INTERNET BOOM

1999

RED HAT GOES PUBLIC ON THE NASDAQ STOCK MARKET

2000

LINUX BELGIUM IS CREATED AS THE BUSINESS INTERFACE TO THE LINUX COMMUNITY

2004

UBUNTU LINUX DISTRIBUTION IS FOUNDED WITH AN INITIAL INVESTEMNENT OF 10M USD BY MARK SHUTTLEWORTH

2005

PUPPET LABS IS FOUNDED TO SUPPORT THE MOST POPULAR CONFIGURATION MANAGEMENT SOFTWARE EVER

2007

THE GPLv3 IS CREATED TO ADDRESS ISSUES LIKE SOFTWARE PATENTS AND THE 'MICROSOFT PACT'

2008

THE FIRST ANDROID BASED SMARTPHONE IS LAUNCHED. AFTER 2 YEARS, MOST SMARTPHONES ARE ANDROID BASED

2012

THE RASPBERRY PI IS INTRODUCED TO MAKE EMBEDDED LINUX MORE ACCESSABLE TO THE GENERAL PUBLIC. IN 3 YEARS 5 MILLION UNITS ARE SOLD

2013

8 YEARS AFTER LINUS CREATED GIT, IT HAS BECOME THE MOST POPULAR VERSION CONTROL SYSTEM IN THE WORLD

2014

THE DEDICATED LINUX EDUCATION CENTER IS OPENED IN DIEGEM.

2015

30 YEARS OF GNU HAVE BEEN VERY EXCITING AND CHANGED THE FACE OF THE PLANET. FROM SUPER COMPUTERS TILL EMBEDDED DEVICES. LINUX IS EVERYWHERE

Flavors and Distros

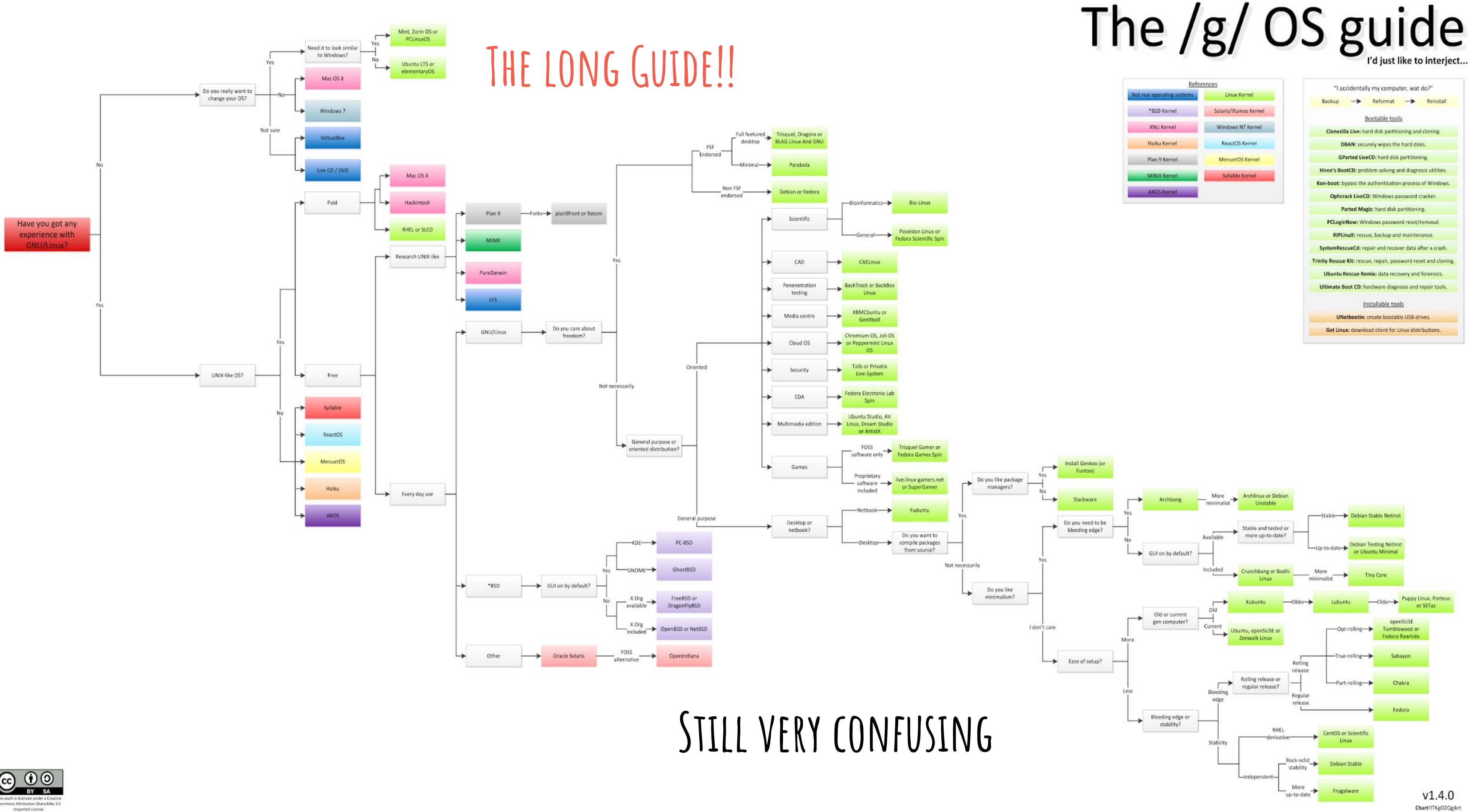
Not your average ice cream flavors!

There is a huge Diversity.

redhat
MEPIS
turbolinux
LUNAR
EvilEntity
debian
Vine Linux
cAos/CentOS
MiniKazit
UTUTO
archlinux
m0n0wall
Jamd
Knoppix STD
gentoo linux
DeLi Linux
Hiweed
amlug
slackware
yellow dog
Fedora
PLD
SLAX
COREL LINUX
Progeny
GEEXBOX
BIGLINUX
FREEDUC
Lycoris
EnGarde
Mandrakelinux
BeatrIX
Linspire
SuSE
YOPER
BearOps
ASPLINUX
kalango
Slackintosh
Frugalware
Foresight
Mint
PCLinuxOS
Haydar Linux
sabayon
ubuntu
JULEX
blag

Sir, I'm lost. How will I choose ??

The long Guide!!


The /g/ OS guide
I'd just like to interject...
Have you got any experience with GNU/Linux?
No
Yes
Do you really want to change your OS?
Yes
No
Not sure
Need it to look similar to Windows?
Mint, Zorin OS or PCLinuxOS
Ubuntu LTS or elementaryOS
Mac OS X
Windows 7
VirtualBox
Live CD / DVD
UNIX-like OS?
Paid
Free
Mac OS X
Hackintosh
RHEL or SLED
Research UNIX-like
Every day use
Plan 9
Forks
plan9front or 9atom
MINIX
PureDarwin
LFS
Syllable
ReactOS
MenuetOS
Haiku
AROS
GNU/Linux
Do you care about freedom?
Not necessarily
FSF Endorsed
Full featured desktop
Trisquel, Dragora or BLAG Linux And GNU
Minimal
Parabola
Non FSF endorsed
Debian or Fedora
General purpose or oriented distribution?
Oriented
General purpose
Scientific
Bioinformatics
Bio-Linux
General
Poseidon Linux or Fedora Scientific Spin
CAD
CAELinux
Penenetration testing
BackTrack or BackBox Linux
Media centre
XBMCbuntu or GeeXboX
Cloud OS
Chromium OS, Joli OS or Peppermint Linux OS
Security
Tails or Privatix Live-System
EDA
Fedora Electronic Lab Spin
Multimedia edition
Ubuntu Studio, AV Linux, Dream Studio or ArtistX
Games
FOSS software only
Trisquel Gamer or Fedora Games Spin
Proprietary software included
live.linux-gamers.net or SuperGamer
Desktop or netbook?
Netbook
Fudantu
Desktop
Do you want to compile packages from source?
Yes
Do you like package managers?
Install Gentoo (or Funtoo)
Slackware
Not necessarily
Do you like minimalism?
Do you need to be bleeding edge?
Archbang
More minimalist
Archlinux or Debian Unstable
GUI on by default?
Available
Stable and tested or more up-to-date?
Stable
Debian Stable Netinst
Up-to-date
Debian Testing Netinst or Ubuntu Minimal
Included
Crunchbang or Bodhi Linux
Tiny Core
I don't care
Ease of setup?
More
Old or current gen computer?
Old
Xubuntu
Older
Lubuntu
Puppy Linux, Porteus or SliTaz
Current
Ubuntu, openSUSE or Zenwalk Linux
Less
Bleeding edge or stability?
Bleeding edge
Rolling release or regular release?
Rolling release
Opt-rolling
openSUSE Tumbleweed or Fedora Rawhide
True-rolling
Sabayon
Part-rolling
Chakra
Regular release
Fedora
Stability
RHEL derivative
CentOS or Scientific Linux
Independent
Rock-solid stability
Debian Stable
More up-to-date
Frugalware
*BSD
GUI on by default?
KDE
PC-BSD
GNOME
GhostBSD
X.Org available
FreeBSD or DragonFlyBSD
X.Org included
OpenBSD or NetBSD
Other
Oracle Solaris
FOSS alternative
OpenIndiana
References
Not real operating systems
Linux Kernel
*BSD Kernel
Solaris/Illumos Kernel
XNU Kernel
Windows NT Kernel
Haiku Kernel
ReactOS Kernel
Plan 9 Kernel
MenuetOS Kernel
MINIX Kernel
Syllable Kernel
AROS Kernel
"I accidentally my computer, wat do?"
Backup
Reformat
Reinstall
Bootable tools
Clonezilla Live: hard disk partitioning and cloning.
DBAN: securely wipes the hard disks.
GParted LiveCD: hard disk partitioning.
Hiren's BootCD: problem solving and diagnosis utilities.
Kon-boot: bypass the authentication process of Windows.
Ophcrack LiveCD: Windows password cracker.
Parted Magic: hard disk partitioning.
PCLoginNow: Windows password reset/removal.
RIPLinuX: rescue, backup and maintenance.
SystemRescueCd: repair and recover data after a crash.
Trinity Rescue Kit: rescue, repair, password reset and cloning.
Ubuntu Rescue Remix: data recovery and forensics.
Ultimate Boot CD: hardware diagnosis and repair tools.
Installable tools
UNetbootin: create bootable USB drives.
Get Linux: download client for Linux distributions.
This work is licensed under a Creative Commons Attribution-ShareAlike 3.0 Unported License.
v1.4.0
Chart!!TKgO2Qgkrt

Still very confusing

The short one!

- Community and forums
- User -friendly
- Stable release every 6 month

- Bug-free
- Stable versions
- Completely open-source
- For experienced users

- Free version of RHEL
- Enterprise features
- Not bug-free, but fast updates

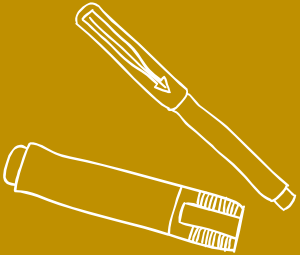
- Ubuntu with better graphics
- Ease of use
- Windows-like experience

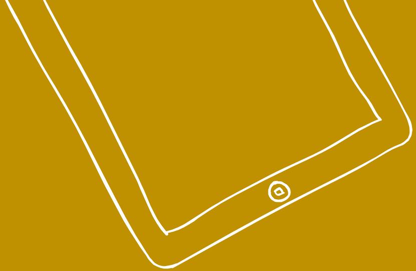
The short guide to choose the distro-contd…

- For experienced users
- Great hardware support
- Tweaks, customizations and optimisations

- Inbuilt or pre-installed security tools and features

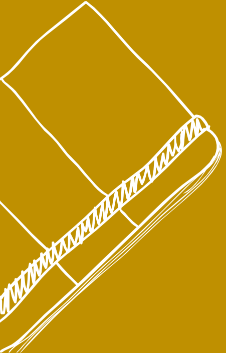
- Community EnterPrise
- Drivers and media-codecs pre-installed

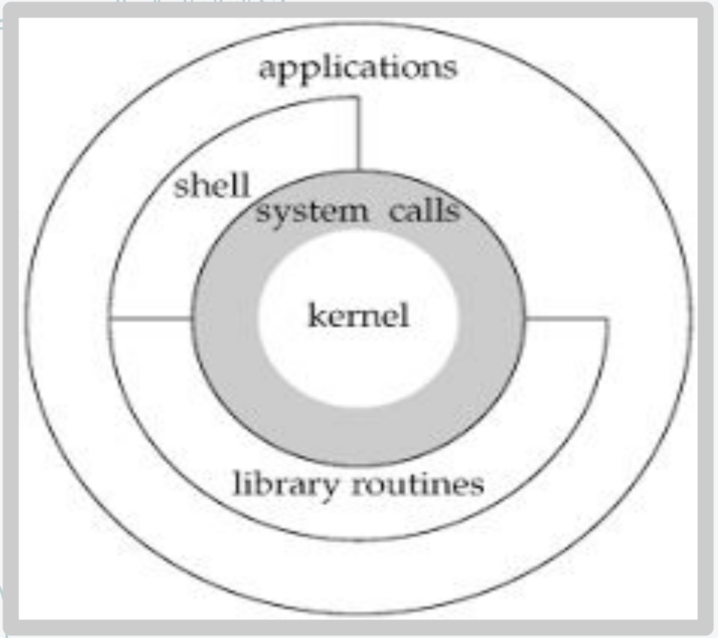


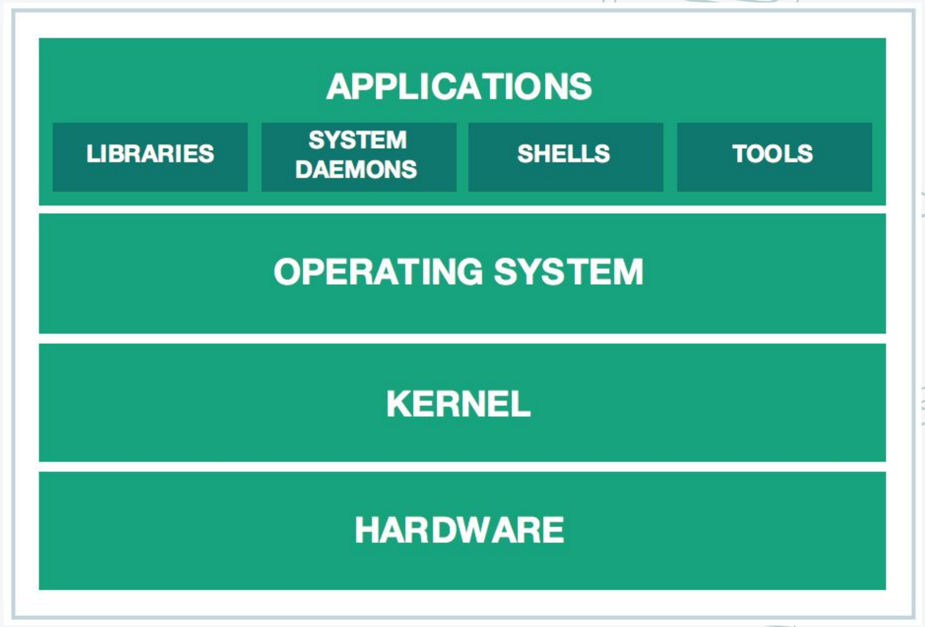


Linux Architecture

- *Let's move towards the monolithic period*



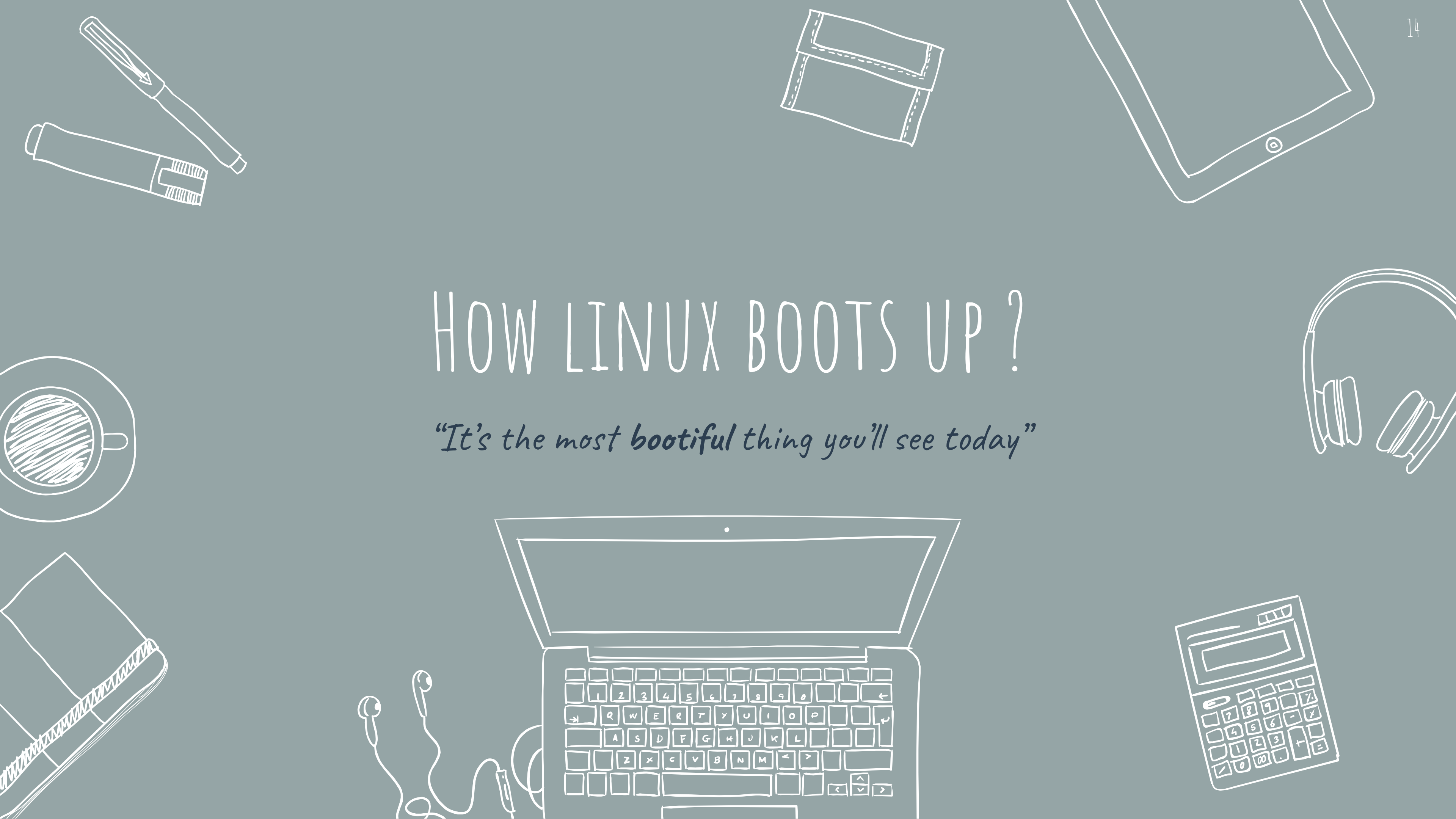




Architecture of unix operating system

How linux boots up ?

*“It’s the most **bootiful** thing you’ll see today”*



Our process is easy

BIOS (Basic I/O system)

- **System Startup/Hardware checks**
- POST
- System integrity checks
- Disk Drives/SD card reader/ CD|DVD/HDD
- Boot sequence/ BIOS configuration change
- Searching, loading and executing Boot Loader

MBR (Master Boot Record)

- **BootLoader Stage 1**
- Present in first sector of the bootable disk
- 512 B

Bootloader info	Partiotion table/ Filesystem	MBR validation/ GRUB info
446 B	64 B	2 B

GRUB (Grand Unified BootLoader)

- **BootLoader Stage 2**
- Loads among various Kernel Images
- Loads the initrd
- Either the choice or default
- Has the knowledge of filesystem(still not loaded) /boot/grub/grub.conf

Boot-up Contd...

initrd(initial Ram Disk)
- Acts as the temporary kernel uitl the kernel is loaded
- Temporary root filesystem loaded

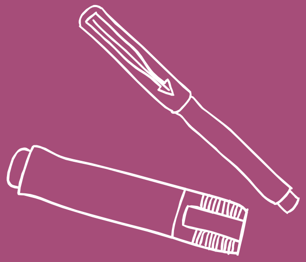
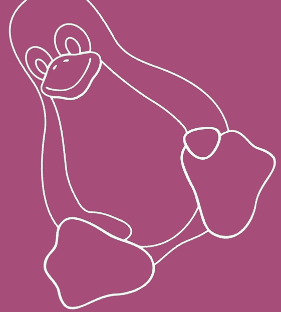
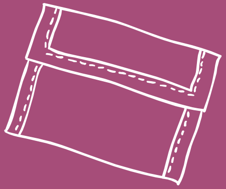
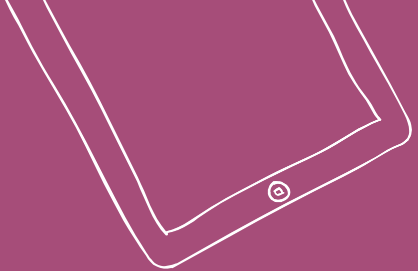
KERNEL(the OS)
- Mounts the root filesystem as specified in grub.conf
- Initiates the first process
- /sbin/init ps -ef | grep init

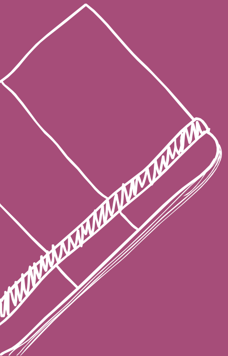
Init
- Decides the runlevel
- /etc/inittab

Runlevels:
0. Halt
1. Single User
2. Multiuser w/o NFS
3. Full multiuser
4. Unused
5. Graphics (X11)
6. reboot

Runlevels
- /etc/rc.d/rc[0-6].d/
- Sequence
- S-> start
- K-> shudown

User login prompt

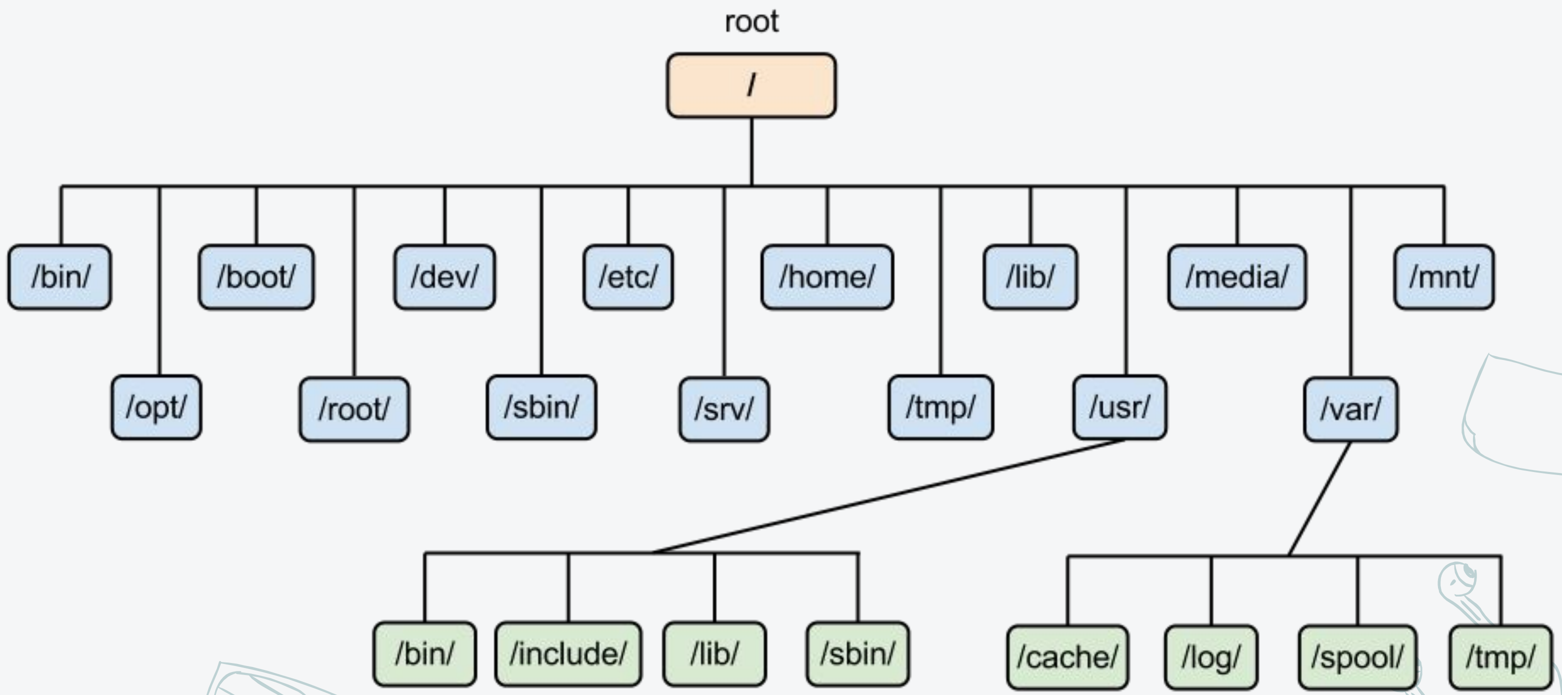





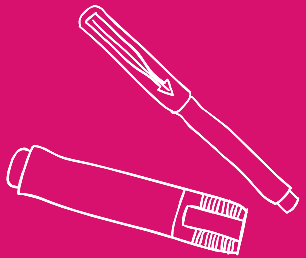


The File System

/usr/bin/learnin

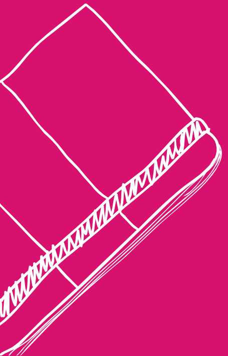
What's beyond the Root





Shells

You shell #ping me!

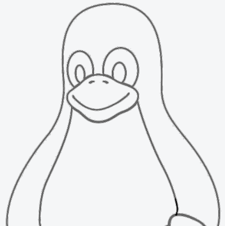


What is a Shell?

A Shell is a command interpreter.

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.

Shell is an environment in which we can run our commands, programs, and shell scripts. There are different flavors of a shell, just as there are different flavors of operating systems. Each flavor of shell has its own set of recognized commands and functions.



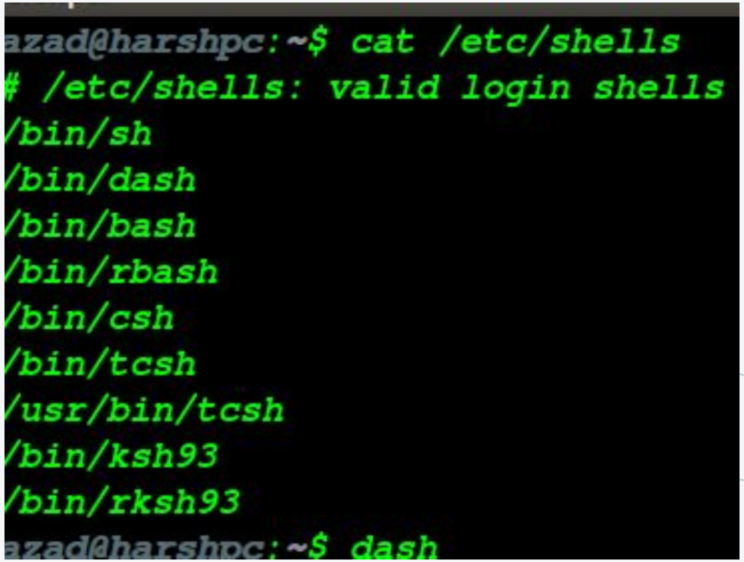
Types of Shells

Linux Shells:

1. sh(Bourne) : $, #, /bin/sh,/sbin/sh
2. Korne Shell- c, tc, bash, efficient
3. Bash- arrow keys,sh,csh
4. C Shell- %, #, /bin/csh
5. tcsh- emacs

	Bourne	C	TC	Korn	BASH
command history	No	Yes	Yes	Yes	Yes
command alias	No	Yes	Yes	Yes	Yes
shell scripts	Yes	Yes	Yes	Yes	Yes
filename completion	No	Yes*	Yes	Yes*	Yes
command line editing	No	No	Yes	Yes*	Yes
job control	No	Yes	Yes	Yes	Yes

* means not the default setting



```
azad@harshpc:~$ cat /etc/shells
# /etc/shells: valid login shells
/bin/sh
/bin/dash
/bin/bash
/bin/rbash
/bin/csh
/bin/tcsh
/usr/bin/tcsh
/bin/ksh93
/bin/rksh93
azad@harshpc:~$ dash
```

Exploring Commands

Fedora the explorer

Command [Options] [Arguments]

- ls -l /home/user/Desktop
- cd ../web
- pwd
- chown
- chgrp
- grep
- cat
- sed
- awk
- which
- touch

But what you really need are

- man
- info
- apropos
- find
- whatis

Files, files everywhere

Everything is a file

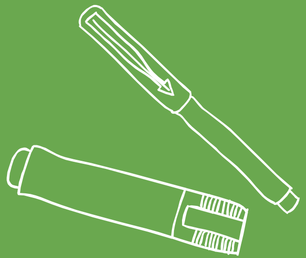
"Everything is a file" - a wide range of input/output resources such as

- ❌ 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.

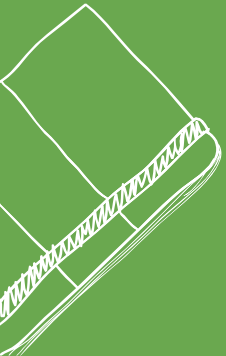
Different types of files in linux

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



WILDCARDS

More than just an UNO trick!



Wildcards in bash

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

Example:

```
ls *.cpp
ls l?st.*
```

Standard Wildcards

- ❌ ? (question mark)
- ❌ * (asterisk)

  rm file*

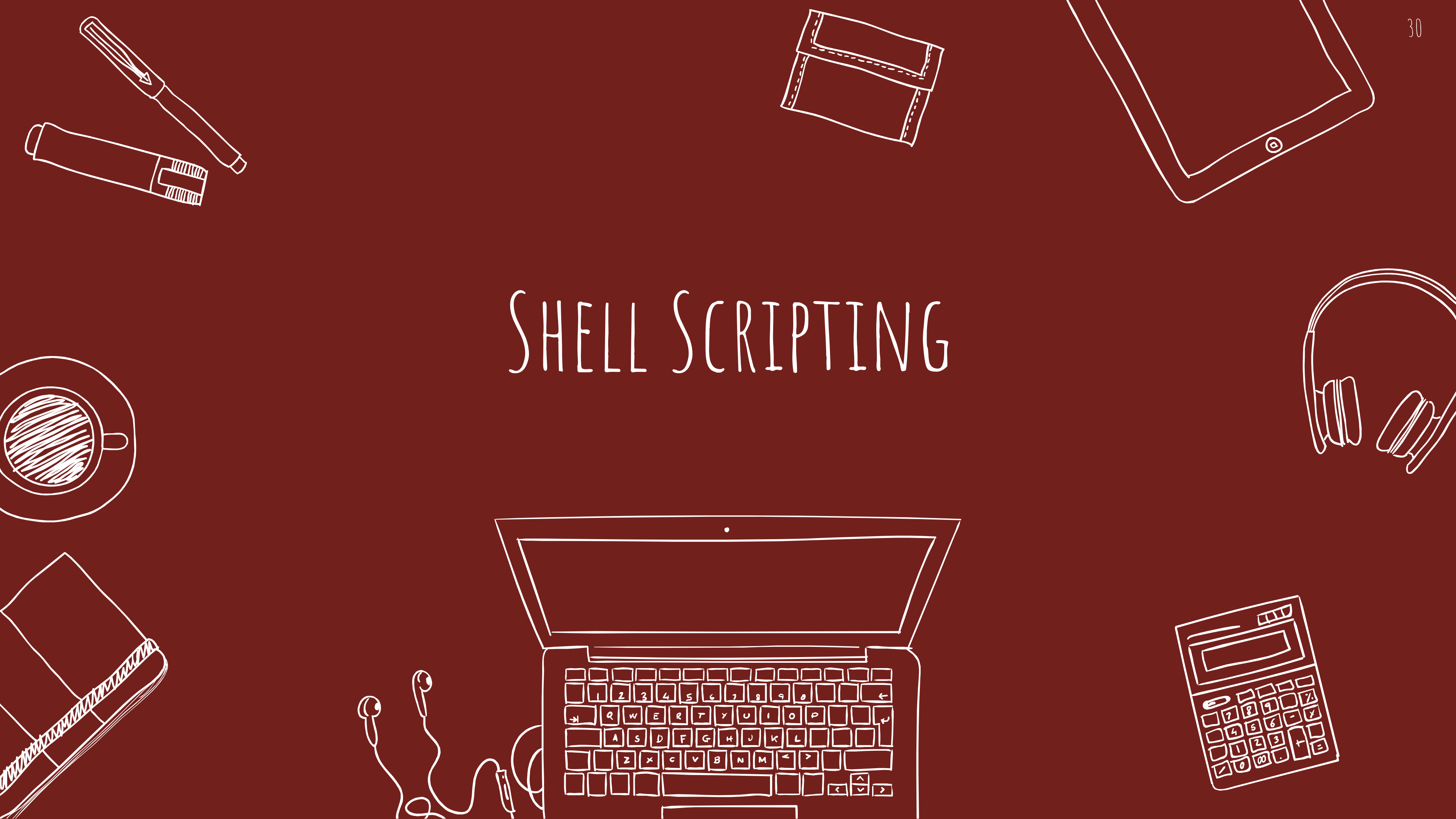
- ❌ { } (curly brackets)

  touch file{1 . . 10}

  cp { *.txt,*.pdf } ~

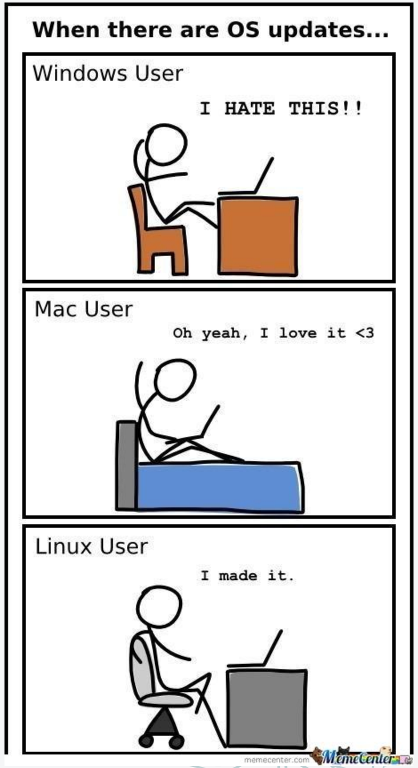
- ❌ [ ] (square brackets)

  ls file[1-3]



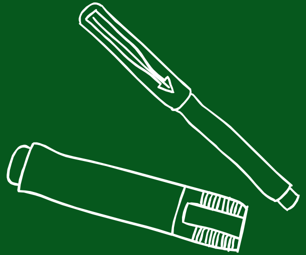
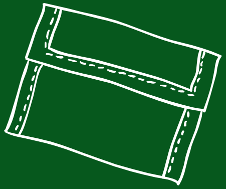
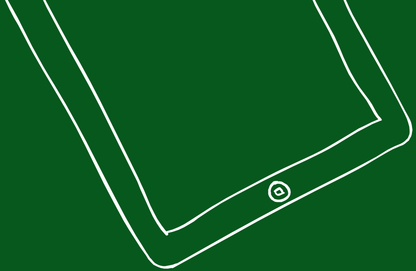
Shell Scripting

How to perform Shell Scripting?



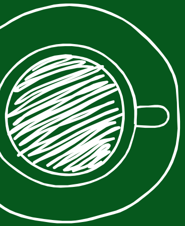
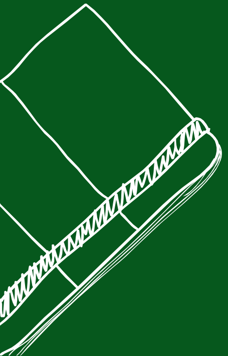
#!/bin/sh
echo
bc
$0 - $9, $#, $*, $?, $@, $!, $$
cp `pwd` /home

./script.sh

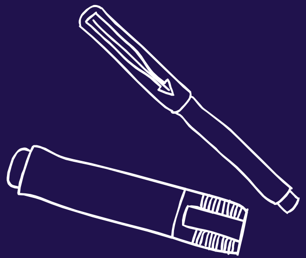
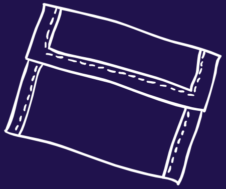




Making your own Command

Your journey as a developer begins in 3.. 2.. 1..

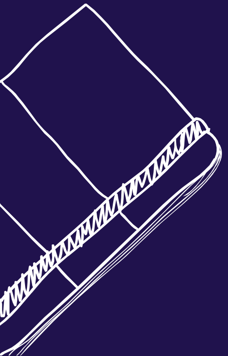



alias, .bashrc, .bash_profile, /bin, /sbin,$PATH

Redirection and Pipes

...Like what plumbers do!



Redirection vs. Pipes: What's the difference?

Input/Output

- ./a.out > output.txt

Redirects the output of ./a.out to output.txt

- cat < file.txt

Redirects file.txt as the input for the cat command

Appending

- ./a.out >> output.txt

Appends the output of ./a.out to output.txt

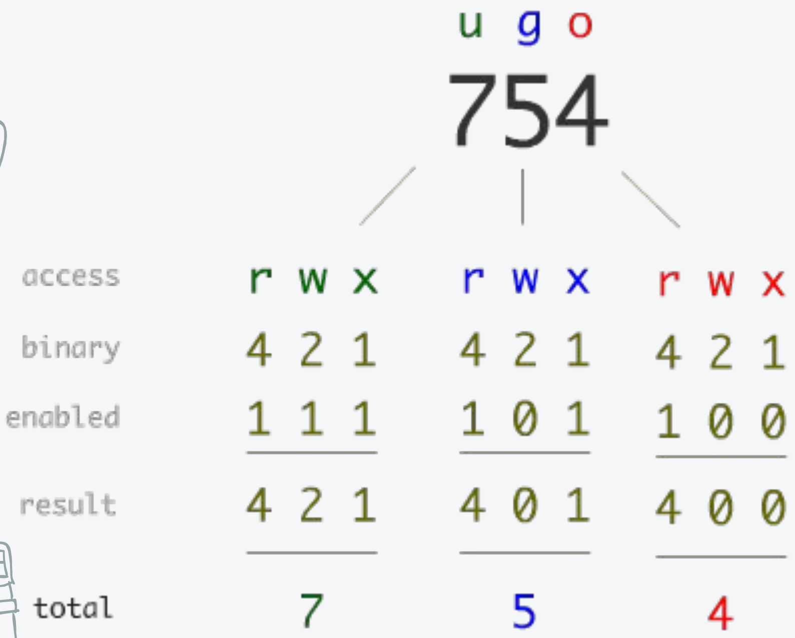
Pipes

- ls /etc/|sort|less

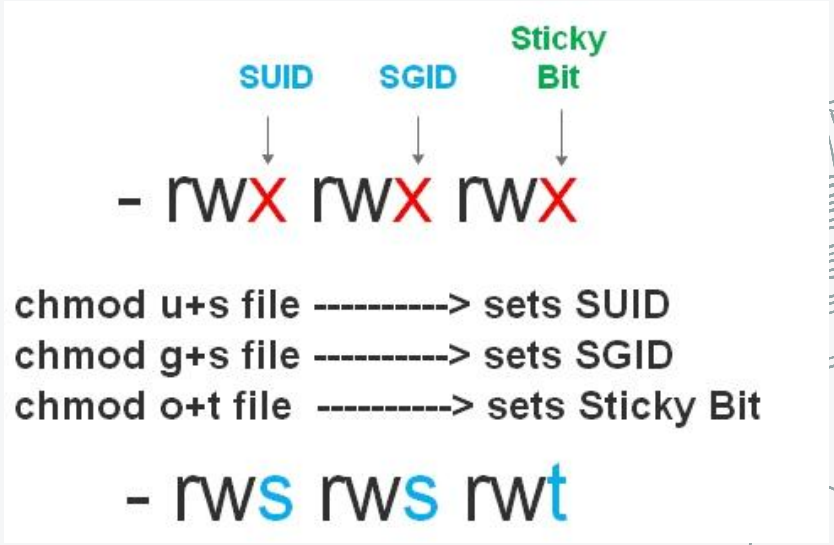
Lists the contents of /etc directory, sorts it and passes it to less pager.

To permit, or not to permit

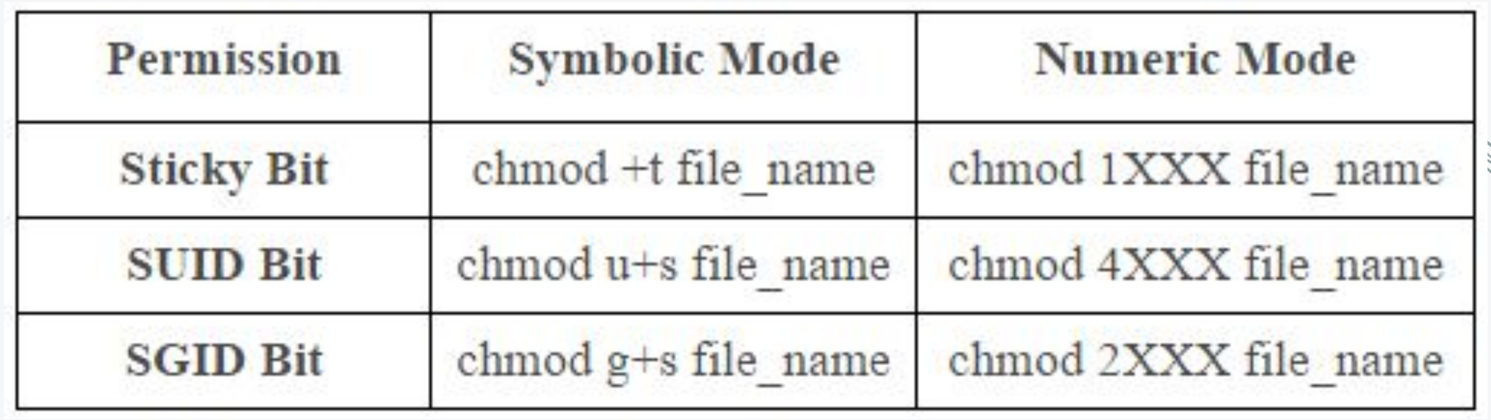
That is the question



	u			g			o		
access	r	w	x	r	w	x	r	w	x
binary	4	2	1	4	2	1	4	2	1
enabled	1	1	1	1	0	1	1	0	0
result	4	2	1	4	0	1	4	0	0
total		7			5			4	



```
chmod u+s file ----------> sets SUID
chmod g+s file ----------> sets SGID
chmod o+t file  ----------> sets Sticky Bit
```



Permission	Symbolic Mode	Numeric Mode
Sticky Bit	chmod +t file_name	chmod 1XXX file_name
SUID Bit	chmod u+s file_name	chmod 4XXX file_name
SGID Bit	chmod g+s file_name	chmod 2XXX file_name

SUDO AND SU -

I am root

Difference between sudo and su -

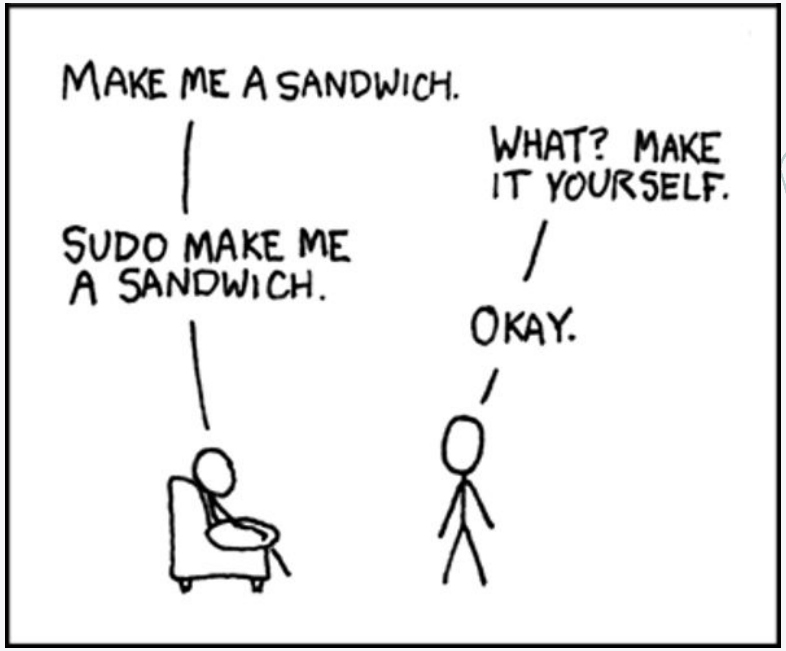
- sudo <command>

Allows the user to run the command as root if the user is mentioned in the /etc/sudoers file

- su -

Switches the user to root and places them in /root directory

- su <---> ???



Mounting and unmounting

Mount 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 attaching of an additional *filesystem* to the *currently accessible filesystem* of a computer.”

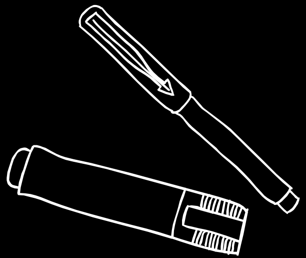
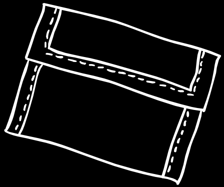
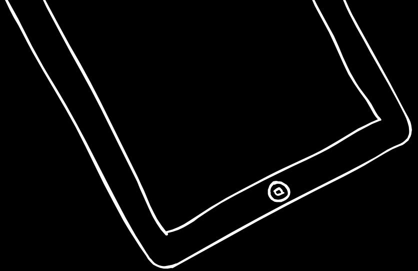
Mount point
(location in file system)

```
mount /dev/sda5 /mnt/linux
```

Device name

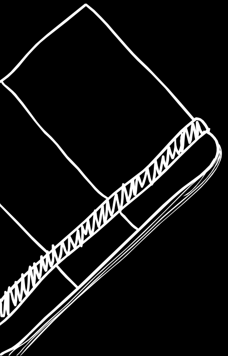
Unmounting a device

```
umount /dev/sda5
```

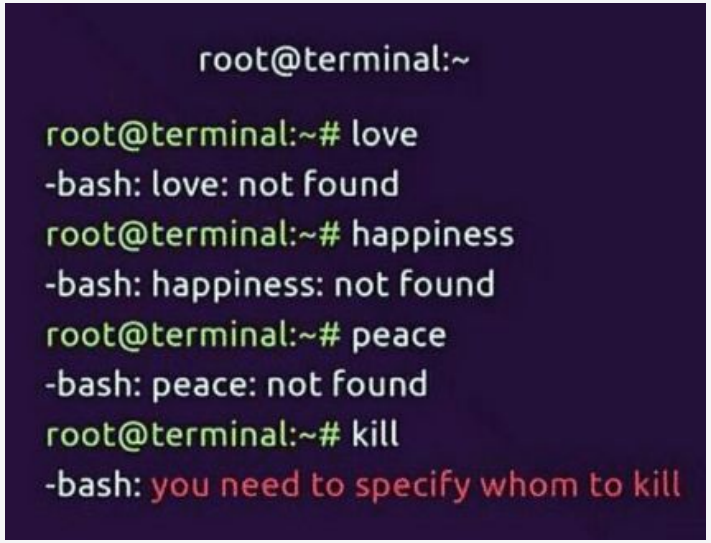




How to Kill?

System calls for --help



Kill and other necessary commands



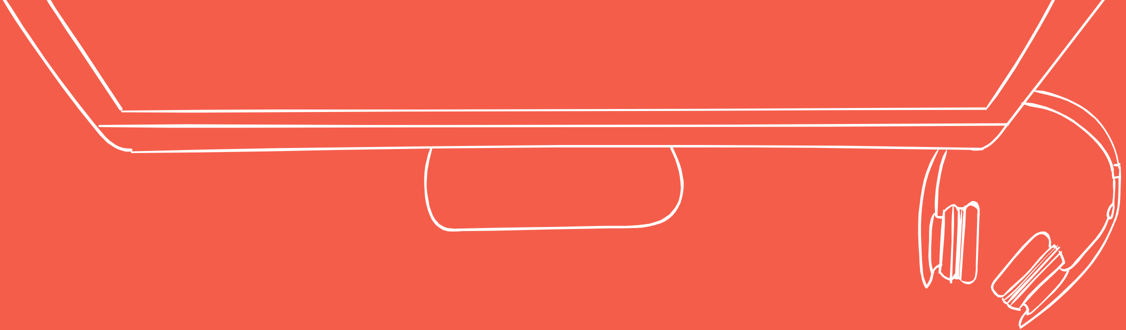
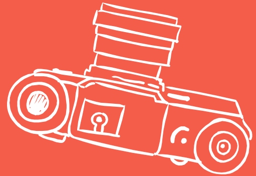
```
root@terminal:~

root@terminal:~# love
-bash: love: not found
root@terminal:~# happiness
-bash: happiness: not found
root@terminal:~# peace
-bash: peace: not found
root@terminal:~# kill
-bash: you need to specify whom to kill
```

kill command can be used to

- Terminate a process
- Send signals to processes

top command displays processes like task manager

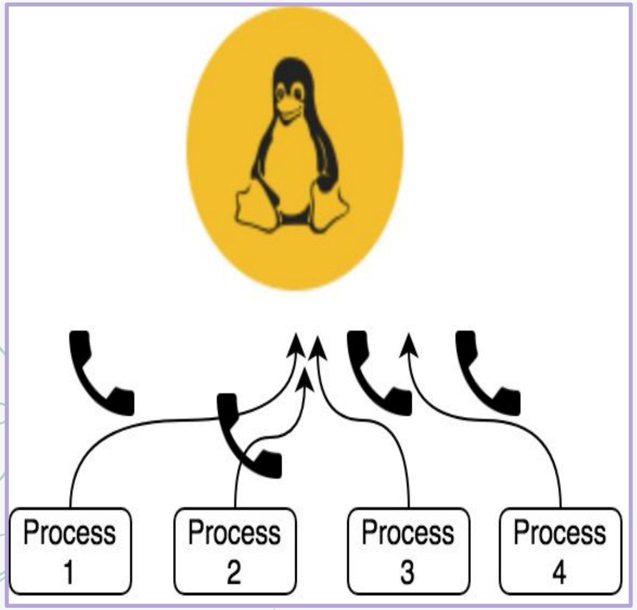
ps provides the process status of various processes.

System Calls

Switch from user to kernel

Call the kernel utilities

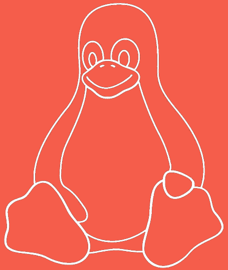


- System call **provides** the services of the operating system to the user programs via Application Program Interface(API).
- It provides an interface between a process and operating system to allow user-level processes to request services of the operating system
- System calls are the only entry points into the kernel system.

The call recipients are...

- fork()
- exec()
- wait()
- kill()
- open()
- close()
- read()
- write()
- alarm()
- getpid()
- getppid()

Thanks!



Any questions?

You can find us at:

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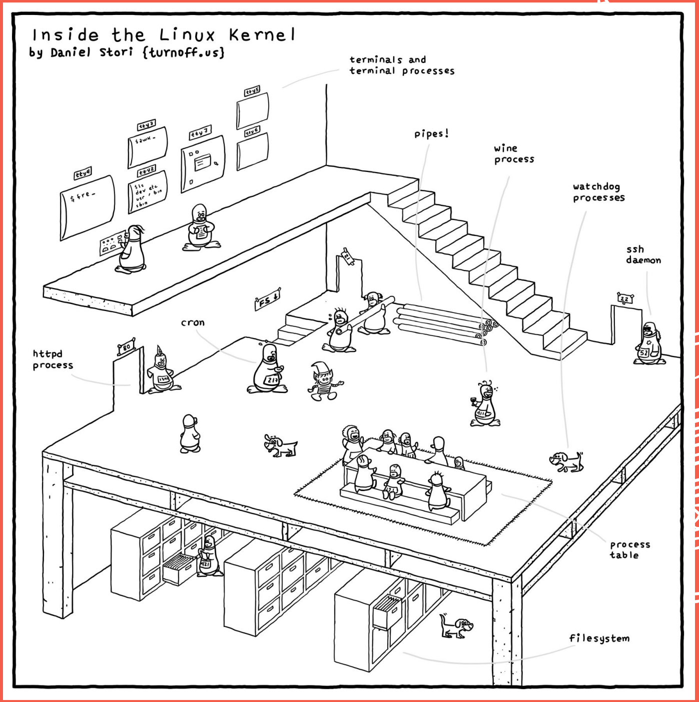
Krithika Venkatanath: G-51, KNGH

Penguin Hunt

Let us know if you found all the penguins!



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