

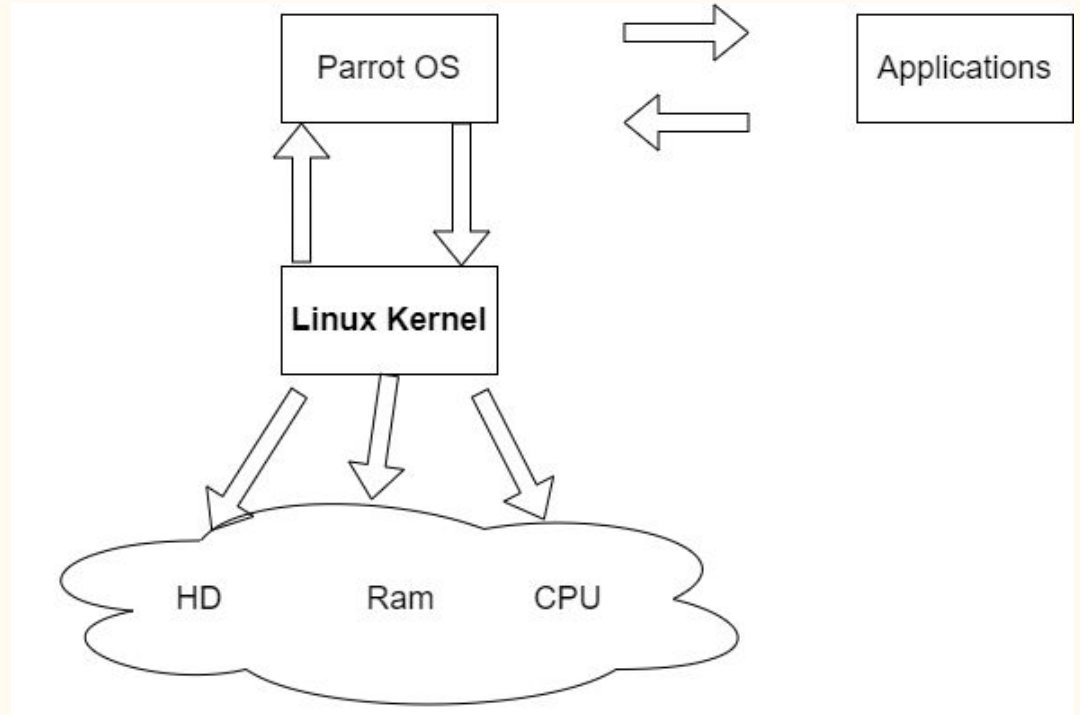
Linux Fundamentals

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Linux

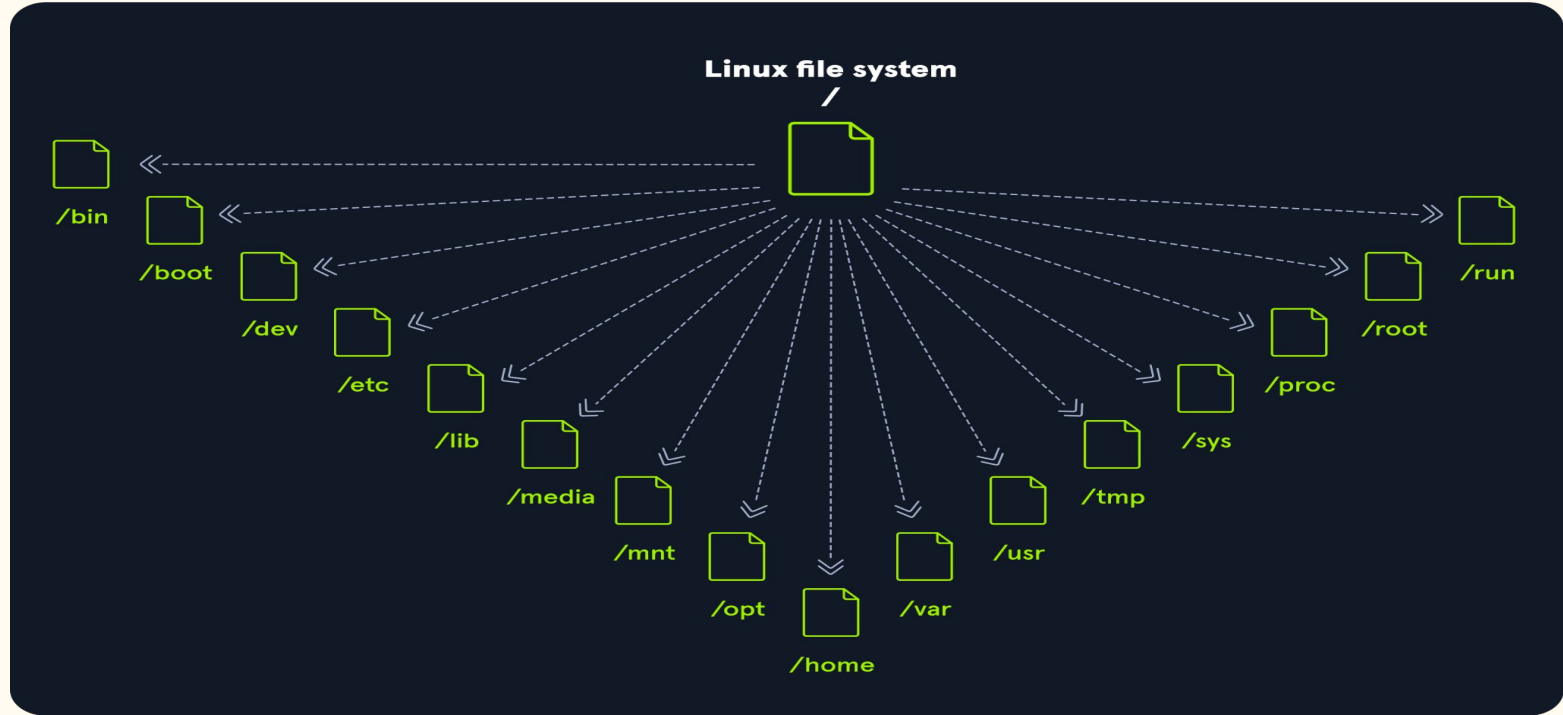
- Hardware
- Kernel
- OS
- Applications



Linux Terminal & First Commands

- `pwd`: print working directory
- `ls` : list contents of current directory
- `cd`: change directory
- `cd ..` : go back a directory
- `cd directory/../../`: go forward in current directory
- `cd/directory/../../`: go to a specific location in your system
- `whoami`: prints the user account that is logged in

Linux File System



Linux File System

- Everything in Linux is a file
 - Network Settings
 - Devices
 - Hard-drives
 - Cd-rom
 - Printer
 - **Commands**

Binaries

bin folder: command binaries

- Go to the root folder and use `cd bin`
- `Ls` to view contents

New Command to see the contents of the file

cat: concatenate

example : bin directory

Since commands are files you can delete them:

1. Backup the ls command

- a. `cp ls christos-----` > Permission Denied
- b. Use `sudo`: by using `sudo` we can pretend to be the root or the admin user for just that one command
- c. Try the new command
- d. `sudo rm ls`: delete ls
- e. Try `ls`, then new command
- f. `sudo mv christos ls`

sbin

sbin

- From the root folder cd to sbin
- Try out adduser command
 - **sudo adduser nameofuser**
 - Fill in additional info
- Go back to the root folder

usr

usr

- cd to usr directory
- We notice that there are bin and/sbin folders here too
- **Which command binary are we using when executing a command in the terminal?**
- **Try out: `which ls`**

Essentially:

- `/usr/bin = /bin`
- `/usr/sbin = /sbin`

Typically `/usr/bin` and `/usr/sbin` have more commands installed by the user, the core commands are inherited from `/bin` and `/sbin`

`/usr/local` is used to store the command binaries of the user

Key directories

- boot:boot contains the files your system needs to boot
- var:log files and also web application related files
- tmp: temporary files
- lib: libraries
- home: home is where users live
 - cd home
 - You will notice that the user you created earlier has a directory there
 - Every linux system has a home for the root user but we didn't see it at home
 - Go to root directory
 - cd root
- mnt & media: They mount drives, if for example you plug a usb flash drive into your linux box it will be mounted in the media directory as a file

dev

As we mentioned earlier devices are also files in linux

- Go to root directory
- `cd dev`
- Example
 - `Vda & vda1`: Hard drives
 - Try to cat your drive
 - `sudo cat rda`
 - Stop it with `ctrl+c`

etc

The settings of your linux server or your linux computer are files

- Go to the etc directory and try ls
- cd network
- ls
- cat interfaces: interfaces and assigned IP addresses

For the rest of the directories you can check the htb academy linux fundamentals course.

What we learned so far

1. Everything in linux is a file
2. We explored the file system
3. We learned the commands below:
 - a. `cd`
 - b. `ls`
 - c. `pwd`
 - d. `adduser`
 - e. `sudo`
 - f. `which`
 - g. `cp`
 - h. `rm`
 - i. `mv`

Terminal

We used the terminal but how much do we know about it?

What we are using is not the terminal, it is a terminal emulator!

This is a terminal----->

So a terminal is the hardware used to communicate with your computer, your keyboard your screen etc.



Terminal emulator: gui window that pretends to be the physical keyboard and monitor

Terminal's purpose: To give us access to things like this our commands which are used to interact with our operating system

The commands are used to interact with our operating system. **That is not the terminal! That is the shell!**

The shell is used to interact with our operating system, the terminal or the terminal emulator is what we use to interact with the shell.

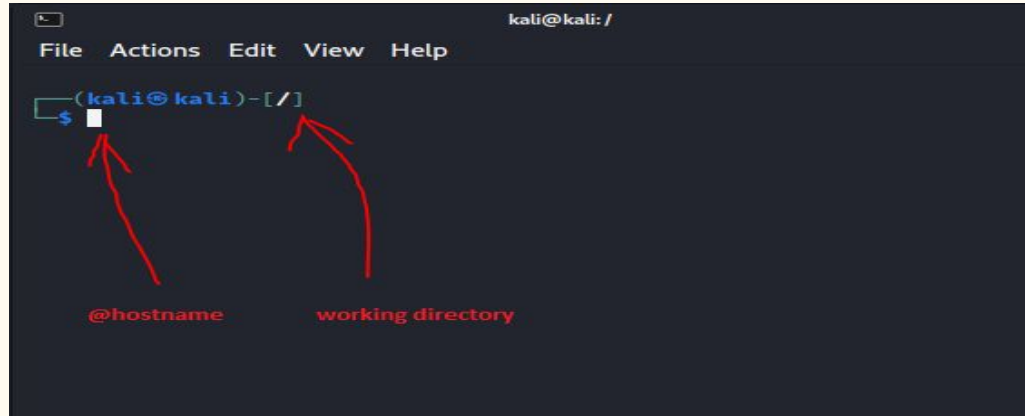
Picture the terminal as a physical keyboard and screen and the shell as the UI!

We use bash or Bourne-Again Shell

New command time

Lets find out what shell we are using:

- ps: list of processes running on your box
- You will see bash
- If you open the powershell (blue box) and run ps you will see pwsh.



```
kali@kali: /
File Actions Edit View Help
(kali@kali)-[ / ]
└─$
```

The screenshot shows a terminal window with a dark background. At the top, there is a title bar with a window icon and the text "kali@kali: /". Below the title bar is a menu bar with "File", "Actions", "Edit", "View", and "Help". The main content of the terminal shows a shell prompt in blue text: "(kali@kali)-[/]". Below this prompt is a dollar sign "\$" followed by a white cursor. Two red arrows point from the text "@hostname" and "working directory" at the bottom of the terminal to the "@" symbol and the "[/]" part of the prompt, respectively.

Root user & User info commands

su root: switch user to root

Instead of \$ you will notice a # before your cursor

Commands:

- Id
- hostname
- Uname -r -a

Commands

- Ifconfig
- Ip
- Netstat
- Ss -sessions
- Ps process
- Who: who else is logged in
- Env: environment variables
- Lsusb
- Lsof: open files

I NEED SOME HELP

Linux is amazing but sometimes it's a bit complex especially if you're just starting to use it.

- All these commands you have to know
- All the different switches and ways you can use them
- A new File System

HELP!!!!!!

All the help you need is in your linux terminal!

Call the man!

man & apropos: how to get help

Detailed manual of the command you search:

Try out:

- man ls
- man ip
- Man uname

Also try:

- uname -h or --help

What do you do if you dont know what command you want to use?

There is a command for that! Try: apropos compress

Managing users in Linux

You are user, so who are you?

`whoami`

How to add users:

`sudo adduser username:` Adds user,group, initializes home directory, sets password

`sudo useradd username:` Adds user,group

We can see the users in the passwd file, try:

- `cat /etc/passwd`

Passwd and shadow file

Next to the usernames enumerated in the passwd file we see an x, that means a password is stored for this user in the shadow file.

The numbers next to it are the user and group id.

The intermediate field represent name and other information and finally we have the home directory of the user. Try:

- `sudo cat /etc/shadow` : we see the username and the corresponding hashed password
- Try `useradd`: `sudo useradd username`

Useradd

- Cat passwd and look at the new user
- The x is there but we didn't set a password, there is an entry in the shadow file but it is an initialization. To set password try:
 - `sudo passwd username`
- Also if you go to `/home` you will see there is no home directory for this user.
- Finally the default shell for this user is `sh` not `bash`!
- To change this:
 - Options: `usermod -h`
 - `Sudo usermod username --shell /bin/bash`
- Check passwd file
- Also try:
 - `Sudo usermod -l newusername oldusername`

The sudo command: super user do

Not all users can use the sudo command. Try:

- `sudo su -` : switch to root user
- `exit` to return to user
- `su - username`

Try sudo command, it will not work! You are not in the sudoers file!

- `ctrl -d` to return to normal user
- `sudo visudo`
- Under user privilege specification add
 - `username ALL = /sbin/userdel`
- Try the command out

Group

`sudo groupadd groupname`

`Cat /etc/group`

Try:

- Groups
- `sudo visudo` under allow members of a group
- `%groupname ALL = NOPASSWD:ALL`
- `sudo usermod -aG groupname username`: append group to user. If you use `-G` instead it will eliminate the other groups from this user
- `sudo gpasswd -d username groupname`: remove user from group

Linux Package Management

So how do i install stuff in linux?

Anything you want to install is contained in something called packages.

How do you install those packages?

Through Package Managers!

dpkg

dpkg: d package, low level package manager

- Let's say you want to download discord
 - <https://discord.com/download>
 - Click download for linux
 - It says deb, who is deb?
 - File extension for packages in linux Debian distributions, like exe files for windows
 - Go to downloads and ls
 - `sudo dpkg -i discord..`
 - Errors... Dependency problems...
 - See dependencies
 - You can go and download them or you can use apt!

apt

Apt: advanced package tool

Try:

- `sudo apt update`
- `Sudo apt install pidgin: chat client`
- Depends on.. dPackage's fault
- `sudo apt --fix-broken install`
- `sudo apt install pidgin`
- `pidgin`

apt: Sources

We used apt-update:

Apt asks the repository for everything it has!

Lets see our sources:

- `sudo apt edit-sources`
- `cat enumerated file`
- Check out link

apt: browse through packages

- `sudo apt -h`
- `sudo apt list`: lists all available packages
- `sudo apt list --installed`
- `sudo apt list --installed | grep nmap`

What is nmap?

- `sudo apt show nmap`
- `sudo apt search nmap`

Apt: Remove packages

- `sudo apt remove pidgin`
- `sudo apt purge pidgin`
- `sudo apt list --installed | grep pidgin`
- `sudo apt purge pidgin-data`
- `sudo apt list --installed | grep pidgin`

Apt : updates

Sudo apt update && sudo apt upgrade

Sudo apt update && sudo apt full-upgrade: removes previous versions of programs