

Linux — A project started in 1964 by Bell Laboratory in New Jersey.

Purpose: Multi-user | Multi-task type of OS

1969 → withdrawn



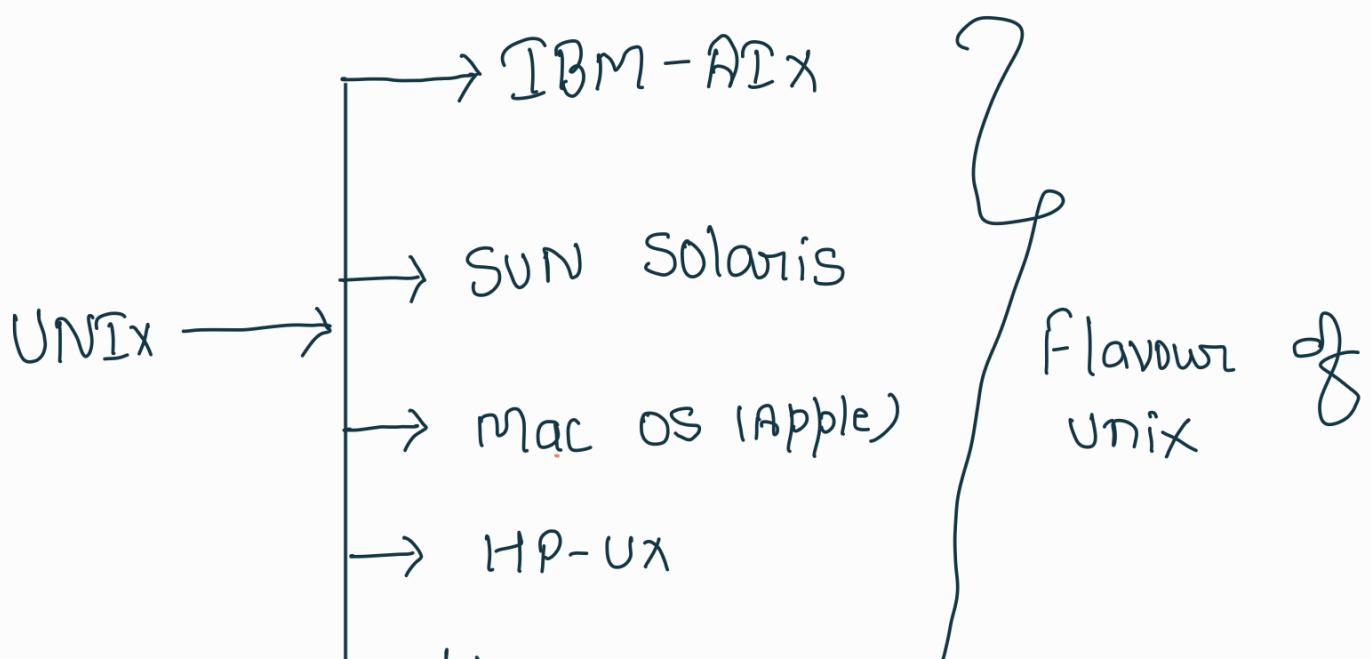
Dennis Ritchie + Ken Thompson

→ UNICS → uniplexed Information

↓ and computing Services.

Made free — Open Source

Now private company started to come with their own Unix version.



→ Linux

↓

Linus Torvald (1991) → All the new version of unix were highly expensive.

→ That's why he created new o.s Linux and made it free.

↓  
Kernel

There was a movement going on for free Software b/w 1991 - 1995 known as GNU.

Linux + GNU → O.S

↓  
Kernel (collection of free Software)

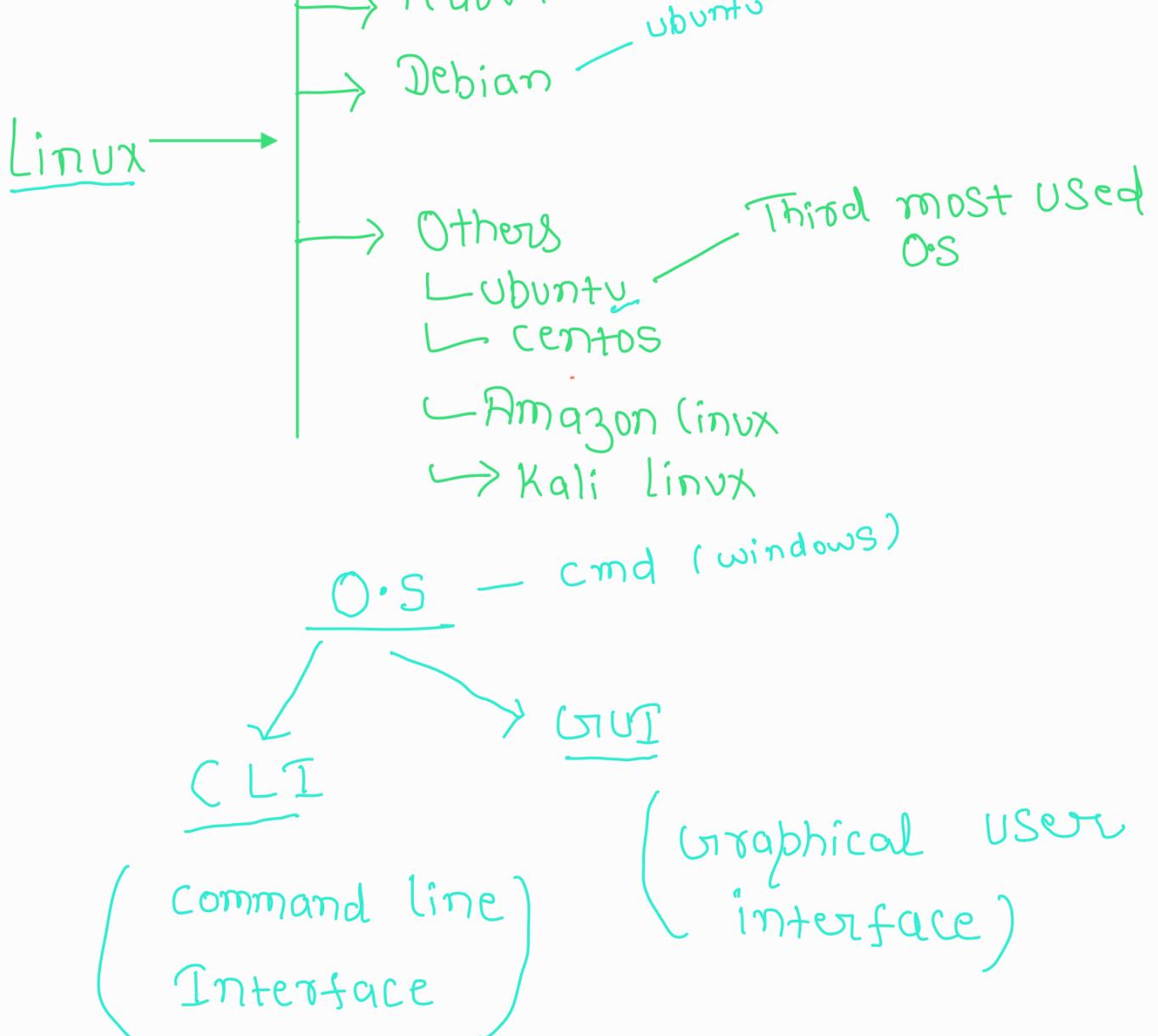
↓

Kernel → It is a part of O.S not full O.S

Now again from Linux many new version of Linux are launched in market. Some were paid and some were free.

→ RHEL - Red Hat Enterprise Linux

→ Fedora



CLI → you have to write commands to perform any action like creating folder

e.g → `mkdir folder`

→ To create a directory with name `folder`.

GUI → you can directly visualize what you are doing. By clicking right click, then click on new, create new folder.

e.g. → windows O.S (simplest GUI) That's why more in market.

- In windows O.S GUI is popular, similarly in linux O.S, it's CLI is popular.
- In some linux they provide GUI, but it's CLI is more popular.

### Points to remember

- Linux is Kernel not O.S  
(But in daily day to day talk you can say Linux is an O.S, not an issue)
- Linux is not Unix derivative. It was written from scratch.
- A Linux distribution is the Linux Kernel and a collection of software that together

## Create an O.S

Linux O.S  $\rightarrow$  Linux Kernel + GNU

### Feature of linux

- (i) Open Source { freely available, source code is public}
- (ii) Secure
- (iii) Simplified updates for all installed Software.
- (iv) Light weight
- (v) Multiuser - Multi task
- (vi) Multiple distribution - Redhat, Debian, Fedora



### \* why linux over windows ?

$\rightarrow$  If you downloaded a file having virus in linux and you kept it inside a folder, then that virus will infect that folder only not full O.S.

$\rightarrow$  But in case of windows it infects full O.S

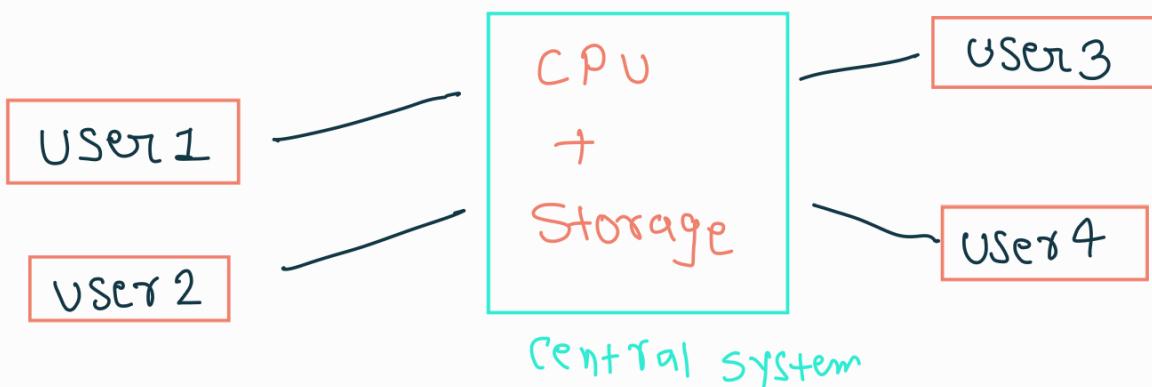
$\rightarrow$  Even antivirus cost on enterprise level

for windows is very high

→ Linux don't require antivirus  
↓ firewall

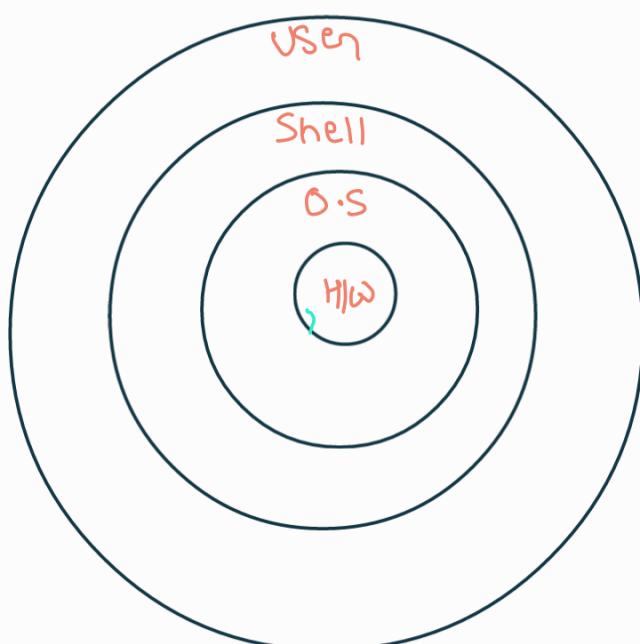
→ Attacks are less on linux system as compare to windows.

→

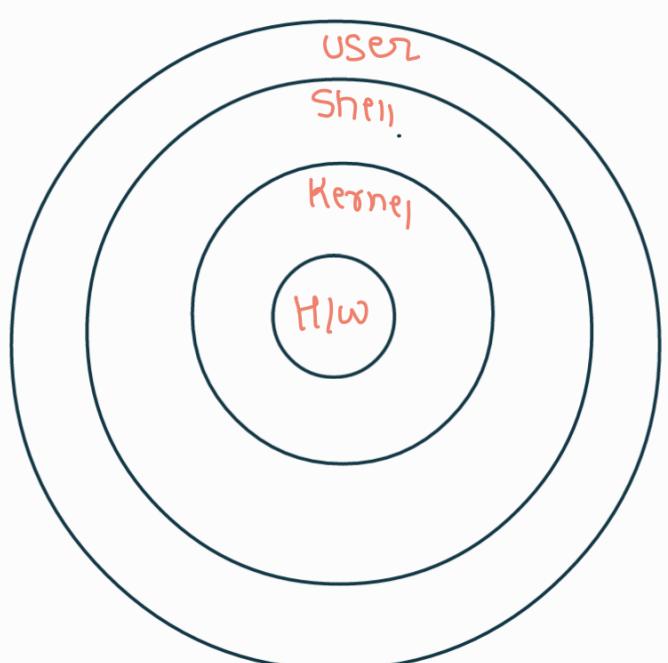


→ unlimited user can connect to same linux server and can use it differently.

Windows



Linux Kernel + UN  
=linux O.S



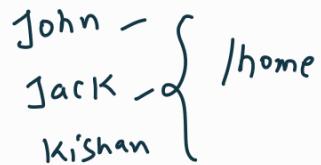
→ cmd mode → output

Shell → Black screen (cmd in windows),  
(terminal in linux) / Mac OS

linux is faster because in linux we directly write command, But in windows we use GUI to do work. windows converts that GUI to command in backend that's why it is heavy as well as slower.

| Windows       | Terms | linux     |
|---------------|-------|-----------|
| Folder        |       | Directory |
| Administrator |       | root user |
| File          |       | file      |
| Software      |       | Package   |

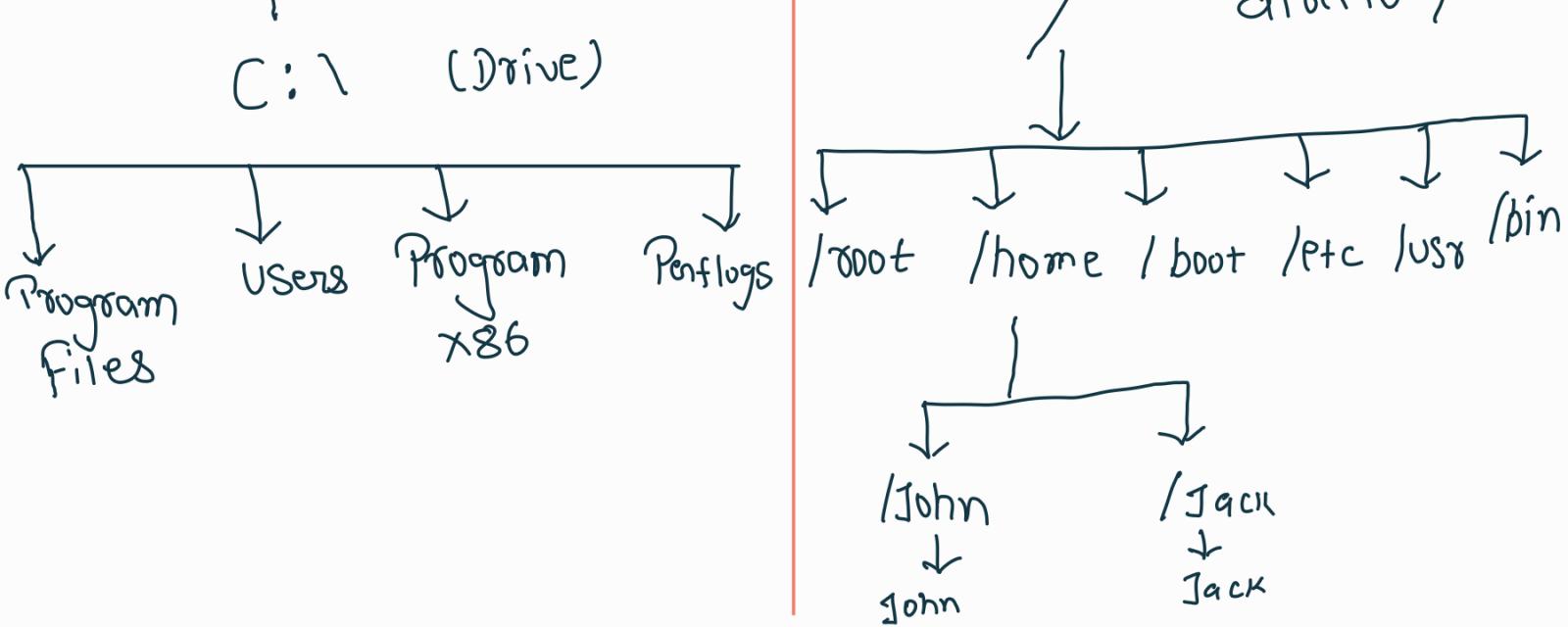
## File System Hierarchy



Windows

Linux

Top level root directory



## Details of file System Hierarchy (Linux)

/home → Home directory for other user

/root → Home directory for root user

→ As a administrator you will be working

\* Root user logged in linux → /root

\* Other user logged in linux → /home/username

→ Entire O.S

/boot → It contains bootable file for linux.

→ bootable files required when our machine starts. With the help of bootable file only our hardware are able to communicate with O.S.

→ Never delete /boot folder.

→ Power on Self test is done by this folder which checks everything like RAM is Available / Storage is available etc.

/etc → It contains all configuration files.

↳ All hardware related configuration file found here.

/usr → by default software are installed in this directory.

/opt → optional application software packages.

/bin → It contains commands used by all users. (including root user)

/sbin → It contains commands used by only root user.

/dev → Essential device files. This include terminal devices, USB or any device

Attached to the System.

How to create a file in linux?

→ cat      { command  
→ touch  
→ vi | vim      { editor  
→ nano

cat > a.txt

\_\_\_\_\_ {

touch

↓

empty file

→ touch file1 file2 file3

Ctrl+d / Ctrl+c

vi | vim      { editor  
nano

→ will seen practically

→ Connect to ec2-instance

↳ login as ec2-user [ec2-user@ip]\$

↳ Then login as root — Sudo su root  
↳ Super user do  
Switch user root

[root@ip]#

↳ root (Privileged power)

[root@ip]# cat > file1

— -- Hi  
— -- Hello  
— --  
ctrl+d

} Case Sensitive

cat > file1

— -- Hello  
— -- Mi  
— --  
ctrl+d

## Cat command

↳ Create file — Create Single file

↳ Concatenate file — To add more than one file into a Single file.

↳ Copy files → To copy the content of

file.

↪ tac → To see content from bottom to top:

ls command → To show file / folder list  
↳ list in current working directory.

[root@ip] cat > file1 ↲

what is this

How are you

ctrl + d

[root@ip] ls

- file1

[root@ip] cat file1

what is this {

How are you {

[root@ip] cat > file 2

Hello !!

ctrl + d

[root@ip] ls

> file1 file2

→ file1 file2

[root@ip] cat >> file2  
THANK you  
ctrl+d

➤ append lines  
in file

[root@ip] cat file2  
Hello!!  
THANK YOU

[root@ip] cat file1 file2 > all

➤ new file  
all

[root@ip] ls  
file1 file2 all

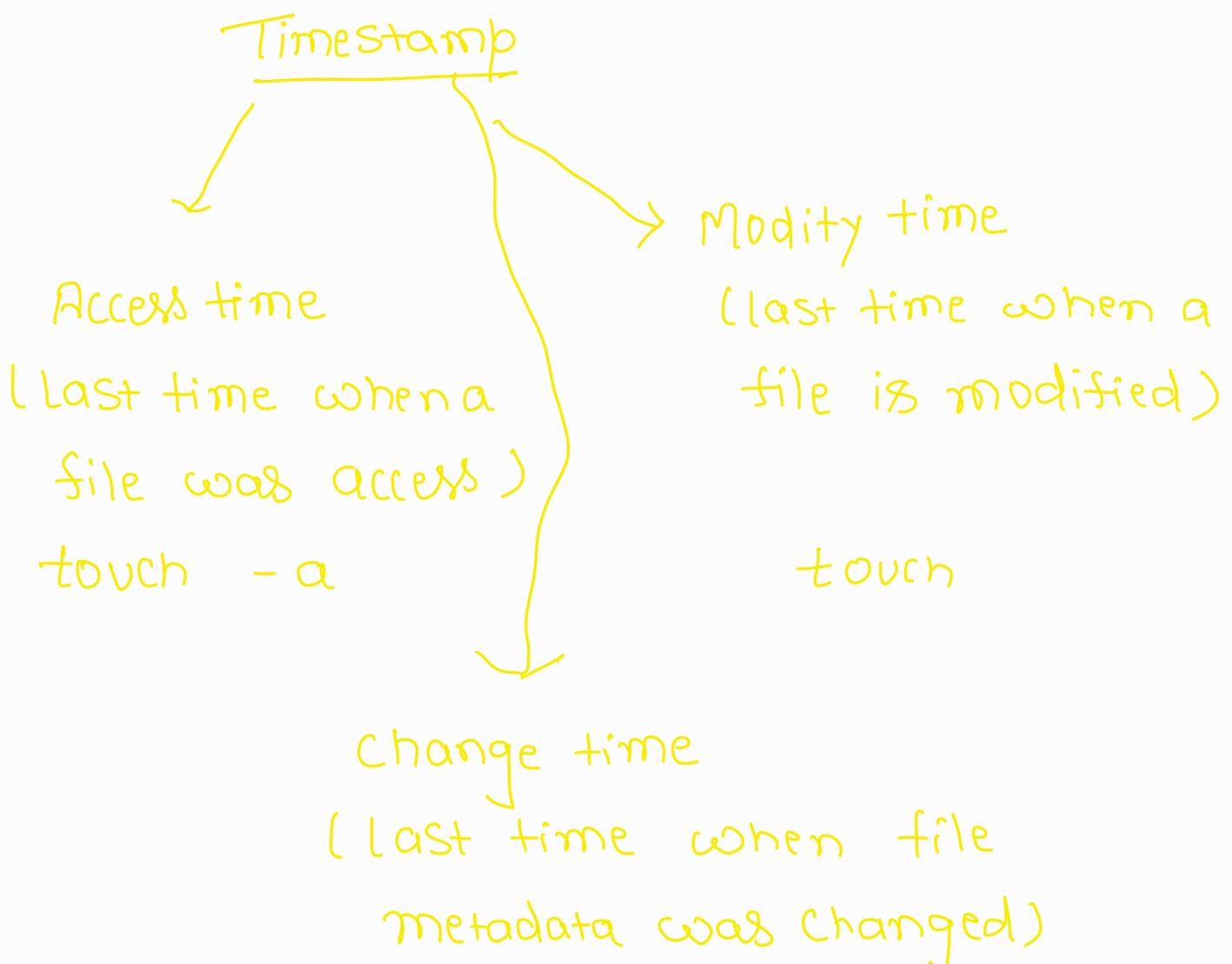
[root@ip] cat all

what is this  
How are you  
Hello!!  
THANK YOU

➤ file1  
➤ file2  
➤ all

Touch command ⇒

- Four commands :-
- (i) Create an empty file
  - (ii) Create multiple empty file
  - (iii) Change all timestamp of a file
  - (iv) Update only access time of file, modify time of file.



file 1

— Access time

— Modify time

date      time

Stat file 1  
command  
to see

- change time

timestamp

metadata → details of data of data =

[root@ip] touch file1 ← empty file created

[root@ip] ls

file1

[root@ip] touch file2 file3 file4 ←

[root@ip] ls

file1 file2 file3 file4

[root@ip] touch file2 ←

[root@ip] stat file2 ←

====

[root@ip] touch -a file3 ←  
└ access time

[root@ip] touch -m file4 ←  
└ modify time

Vi editor

Notepad in windows

→ A programmer text editor

→ gt can be used to edit all kinds of plain text, it is specially use for editing programs.

[root@ip]# vi field ↵

```
Hello  
Bye Bye  
  
insert
```

Press i

Now for coming out → esc escape

```
Hello  
Bye Bye  
  
:wq ↵
```

Navigate

```
H I K L
```

Press :wq  
↓ Save → quit

:wq  
↓ save ↓ quit

[root@ip] ls

file a

[root@ip] cat filea ↪

Hello

Bye Bye

Note

:w → To Save

:wq or :x → To save and quit

:q → quit (without Saving)

:q! → Force Quit, no save

↓ for forcefully (Mark of Explanation)

Nano Command

[root@ip] # nano fileb ↪

— —  
— —

Ctrl+X  
Esc  
vi

Y ↪ ↪

Save

{ add some more line  
--- Ctrl+D  
--- Ctrl+X  
Y

[root@ip] ls

fileb

[root@ip] cat fileb  
=====  
=====  
=====

ls -l / ll command to see file details.

ls -a → To show hidden files also.

history → command to see all previous used command.

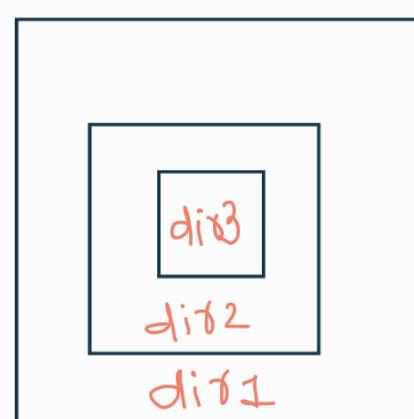
====

How to create a directory in linux?

[root@ip]# mkdir dir1  
[root@ip]# ls  
dir1

\* Now create a directory inside dir1

↑ you can create a directory inside directory  
but not file inside file.  
file is a basic building block of OS



```
[root@ip]# mkdir -p dir2)dir3|dir4  
[root@ip]# ls      └ Parent  
    dir1  dir2
```

```
[root@ip]# cd  dir2  
      └ Change directory
```

```
[root@ip]# ls
```

```
    dir3
```

```
[root@ip]# cd  dir3
```

```
[root@ip]# ls
```

```
    dir4
```

```
[root@ip]# cd  ..
```

```
[root@ip] ls
```

dir 3

[root@ip]# cd ..

[root@ip]# ls

dir1 dir2

[root@ip]# pwd

↳ Print working directory

→ /home/ec2-user/dir1/dir2/dir3

[root@ip]# cd ..|..|.. ↳

[root@ip]# pwd

↳ /home/ec2-user

[root@ip]# mkdir dir4 dir5 dir6

↳ will create multiple directory through a command

Some more commands

How to copy a file?

How to cut & paste file ?  
How to rename file or directory ?  
How to create hidden file or directory ?  
How to remove file or directory ?

Other command → less, more, Head and  
Tail:

[root@ip]# touch .file1  
→ will create a  
hidden empty file

[root@ip]# ls  
dir file2  
[root@ip]# ls -a → show hidden  
file & folder:  
dir .file1 file2

[root@ip]# mkdir .dira  
→ will create a  
hidden directory.

[root@ip]# ls -a

To copy files

|           | source   | destination |
|-----------|----------|-------------|
| [root@ip] | cp file1 | file2       |
|           | ↳ copy   |             |

To cut and paste files

↳ move

|           |          |                      |
|-----------|----------|----------------------|
| [root@ip] | mv file1 | /home/ec2-user/dir1  |
|           | ↓        | ↓                    |
|           | source   | destination location |
|           | (cut)    | (paste)              |

[root@ip] cd dir1

[root@ip] ls  
file1

To Rename

|           |          |         |
|-----------|----------|---------|
| [root@ip] | mv file1 | myfile  |
|           | Oldname  | newname |

To Remove file or directory (rm)

rm -dir → This command is used to remove the specified directory. (empty)

~~rm~~ ~~rm~~ -r → Remove both the parents and child directory.

~~rm~~ ~~rm~~ -rv → Removes all the parents and Subdirectories along with the verbose.

~~rm~~ -rf → Removes even non-empty file \$ directory.

~~rm~~ -rP → Removes non-empty directories including parent \$ subdirectory.

~~rm~~ -r → Removes empty directories

[root@ip]# rm -rf file1  
dir1 { both can be removed }

[root@ip]# less file

First page content

→ head file

↳ first 10 line

→ tail file

↳ last 10 line

→ more file

↳ full content

## Advance Command

[ ] \$ sudo su

[root@ip] # touch file1 file2 file3

[root@ip] # hostname

↳ Name of the machine  
on which you are  
running the command.

[root@ip] # ifconfig → ip address of machine  
+ more details

[root@ip] # hostname = i

[root@ip]# hostname

→ will show only IP address

[root@ip]# cat /etc/os-release

Absolute path

root directory

will show the version of OS

Yum → yellowdog Updater Modified

→ yum is an automatic updater and package installer/remover for rpm systems.

→ used in RPM distros like Red hat linux, centos, Amazon AMI linux etc.

for debian/ubuntu we use - apt / apt-get command.

→ yum update -y

↳ tree

→ yum install httpd -y

→ Install apache web server in our system

- `yum remove httpd`  
    ↳ To remove apache web server.
- `yum update httpd`  
    ↳ To update the apache server.
- `yum list installed`  
    ↳ To install software/packages.
- `service httpd start` — To start apache web server
- `service httpd status` — active
- `service httpd enable`  
    ↳ To start the service
- `chkconfig httpd on`

→ To automatically Start the httpd service when we restart the system.

→ chkconfig httpd off

Similar to service enable / service disable.

which httpd ? - To check whether package is present or not.

whoami ? → root

```
[root@ip]# echo "Hello world"  
Hello world
```

```
[root@ip]# echo "Welcome!!" > filez  
[root@ip]# cat filez  
[root@ip]# echo " Kishan " >> filez  
[root@ip]# cat filez
```

Welcome !!

Kishan

[root@ip]# echo >filez

[root@ip]# cat filez

? empty.

[root@ip]# grep root /etc/passwd

→ All lines having root will be shown.

[root@ip]# sort filez

Apple

Ball

cat

Dog

}

will sort line

Alphabetically

## Advance commands

Useradd → To create user

groupadd → To create group

gpasswd -a/-M → To add user into group,  
to add multiple user.

ln → hardlink → backup

ln -s → softlink → Shortcut

tar → Tar is an archiver used to  
combine multiple files into one.

gzip → gzip is a compression tool used  
to reduce the size of file.

wget → wget is the non-interactive network  
downloader.

[root@ip]# useradd kishan

[ ]# cat /etc/passwd

[ ]# groupadd devops

[ ]# cat /etc/group

\* If you create a user but don't specify it in any group then a new group will be created with exactly same name as user, and user will be added in that group.

To add user in already created group.

```
[ ]# gpasswd -a Kishan devops
```

```
[ ]# gpasswd -M John,Roy,Kishan devops
```



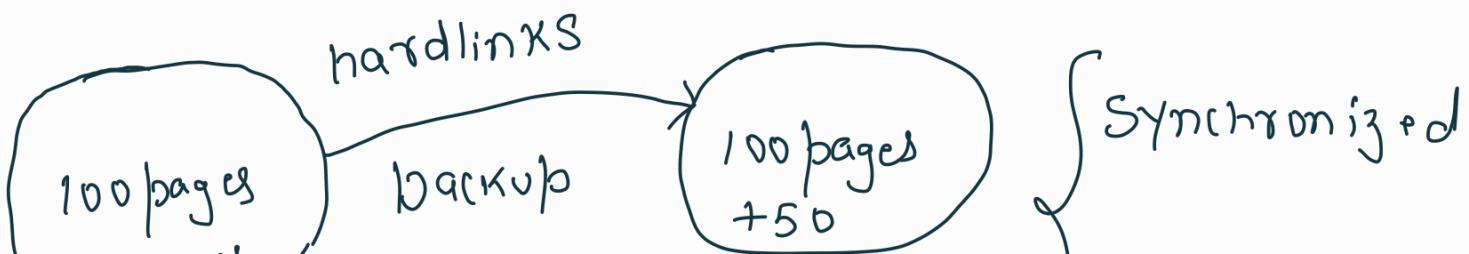
multiple user to add in group

```
[ ]# ln -s file1 Softfile1
```

↳ softlink

```
[ ]# ls -l
```

Softfile > file1



+50pages

→ Automatically

why hardlink over copy?

→ Both file get synchronized so if you even more lines, that line will be automatically added in hardlink file also.

[ ]# ln file2 backupfile2

[ ]# ls

file2 backupfile2

tar

create  
| verbose  
| forcefully

[ ]# tar -cvf dirx.tar dirx

dirx  
↓  
diry  
↓  
dirz

[ ]# ls

dirx.tar dirx

gzip

[ ]# gzip dirx.tar

>To compress tar

```
[ ]# ls
```

file

```
- dirx.tar.gz
```

Reiever end To unzip

```
[ ]# gunzip dirx.tar.gz
```

```
[ ]# ls
```

```
[ ]# dirx.tar
```

```
[ ]# tar -xvf dirx.tar
```

Extract

```
[ ]# ls
```

dirx  
  ↳ dir1  
  ↳ dir2

wget (To download files from internet)

```
[ ]# wget <URL>
```

```
[ ]# rm -rf rm  
  ↳ rm  
-rf rm  
  ↳ rm  
recursive forcefully
```

## Access mode / Permission

read write execute  
d  $\begin{smallmatrix} r \\ - \\ - \end{smallmatrix}$   $\begin{smallmatrix} r \\ w \\ - \end{smallmatrix}$   $\begin{smallmatrix} r \\ - \\ x \end{smallmatrix}$   $\begin{smallmatrix} r \\ - \\ - \end{smallmatrix}$   
— User Group Other

d  $\rightarrow$  directory

—  $\rightarrow$  file

l  $\rightarrow$  Softlink

f  $\begin{smallmatrix} r \\ - \\ - \end{smallmatrix}$   $\begin{smallmatrix} w \\ - \\ - \end{smallmatrix}$   $\begin{smallmatrix} x \\ - \\ - \end{smallmatrix}$   
—  $\begin{smallmatrix} r \\ w \\ - \end{smallmatrix}$   $\begin{smallmatrix} - \\ 2 \\ - \end{smallmatrix}$   $\begin{smallmatrix} x \\ - \\ 1 \end{smallmatrix}$

| Access mode |   | file                   | Directory               |
|-------------|---|------------------------|-------------------------|
| r           | 4 | To display the content | To list the content     |
| w           | 2 | To modify              | To create or remove     |
| x           | 1 | To execute the file    | To enter into directory |

## Commands

chmod  $\rightarrow$  Used to change the access mode of a file.

chown  $\rightarrow$  Change the owner of file or directory.

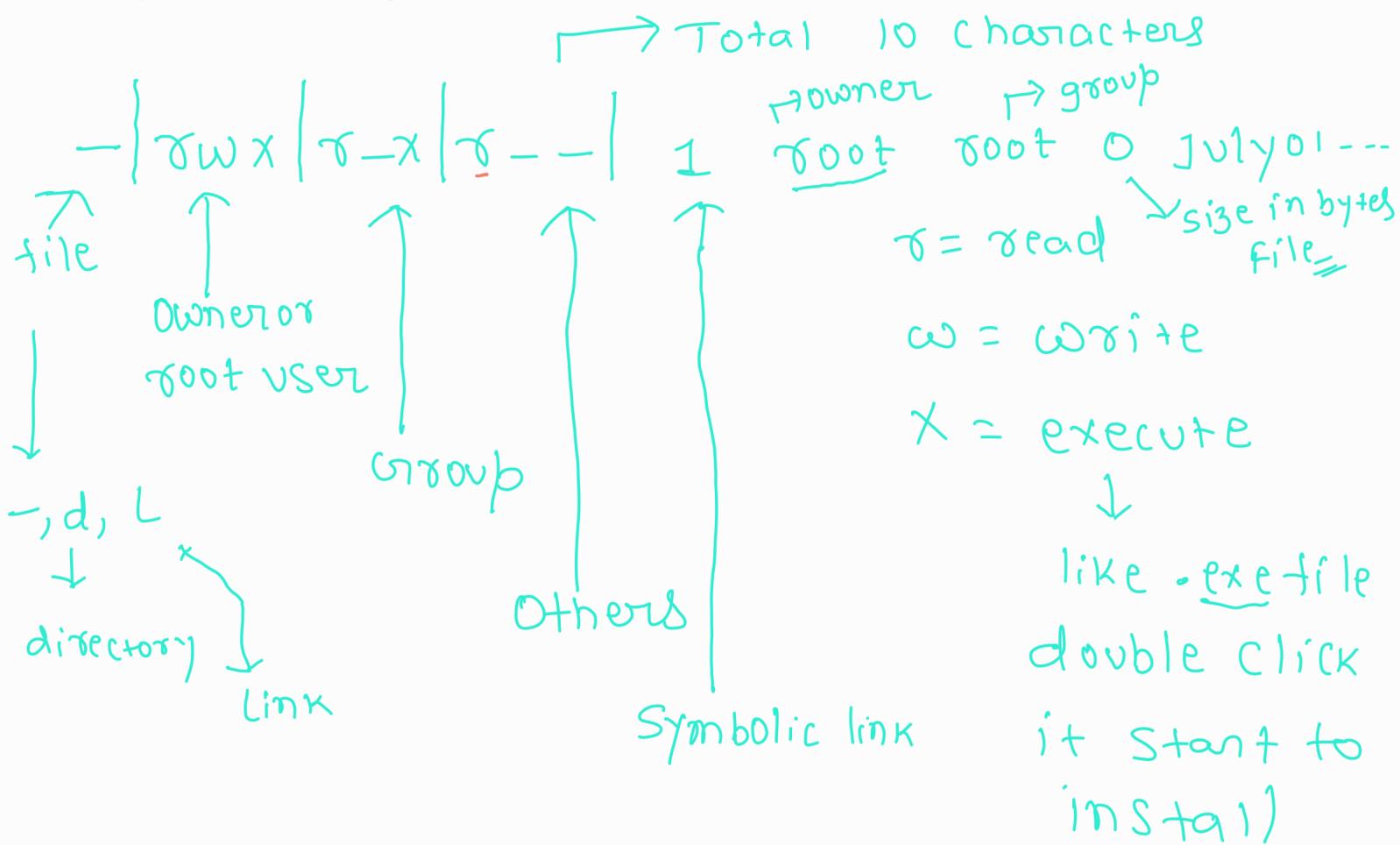
chgrp  $\rightarrow$  Change the group of file or

# directory.

[ ]# touch file1

[ ]# mkdir dirx

[ ]# ls -l



Chmod       $\begin{matrix} 7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 \\ x & x & x & x & x & x & x & x \end{matrix}$       P Q S T U V W X Y Z

$\begin{matrix} r & - & 4 \\ w & - & 2 \\ x & - & 1 \end{matrix}$       half

owner group others  
`d | rwx | r-x | r--`

421 401 400  
 ↓ ↓ ↓  
 7 5 4

[ ]# chmod 754 dir

d | rwx | rwx | rwx [ ]# chmod 777 dir  
 ↓ ↓ ↓  
 421 421 421  
 ↓ ↓ ↓  
 7 7 7

- | r-x | -wx | r-- [ ]# chmod 534 dir  
 ↓ ↓ ↓  
 401 021 400  
 ↓ ↓ ↓  
 5 3 4

[ ]# chmod 700

| owner | group | others |
|-------|-------|--------|
| 7     | 0     | 0      |
| 421   | 000   | 000    |
| rwx   | ---   | ---    |

7 0 0  
 ↓ ↓ ↓  
 4+2+1 0+0+0 0+0+0

rwx --- ---

- | rwx | --- | ---

- | rwx | --- | ---

```
[ ]# chmod 536
```

| Owner | group | Others |
|-------|-------|--------|
| 5     | 3     | 6      |

| Owner | group | Others |
|-------|-------|--------|
| 401   | 021   | 420    |

| Owner | group | Others |
|-------|-------|--------|
| -     | -     | -      |

| 5   | 3   | 6   |
|-----|-----|-----|
| 401 | 021 | 420 |

$\delta - x$

$- w x$

$\delta w -$

$- | \delta - x | - w x | \delta w -$

## Other way

| Owner                                      | group | Others |
|--|-------|--------|
| $d   \delta w x   \delta - x   \delta - -$ | $u$   | $g$    |

chmod 754



chmod  $u = \delta w x, g = \delta x, o = \delta -$

U = user / owner

g = group

O = Others

```
[ ]# chmod u=\delta w x, g=\delta x, o=\delta - file
```

```
[ ]# chown kishan file1
```

```
[ ]# chgrp devops file1
```



