



WALCHAND COLLEGE OF ENGINEERING
WALCHAND LINUX USERS' GROUP



LINUXDIARY 4.0

LIMITED
SEATS

19

Explore the Linux Realm

August

COMPETITIVE
WARGAMES

20

EXCITING
PRIZES

REGISTER AT



- ▶ Session 01:
Open Source 101
- ▶ Session 02:
Echo Linux

- ▶ Session 03:
The File Maze
- ▶ Session 04:
NetVerse

• CONNECT WITH US •



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LinuxDiary 4.0

2023



Introduction to
Linux and
Fundamentals

Applications and
distributions

Basic Linux
Commands

Booting
Processes

Summarising



Day 2 | Session 1

The File Maze

File systems

Linux directory structure

User and group management

File permissions and commands

xxxx

Files and Directories +



xxxx

Recipe Cards

|||

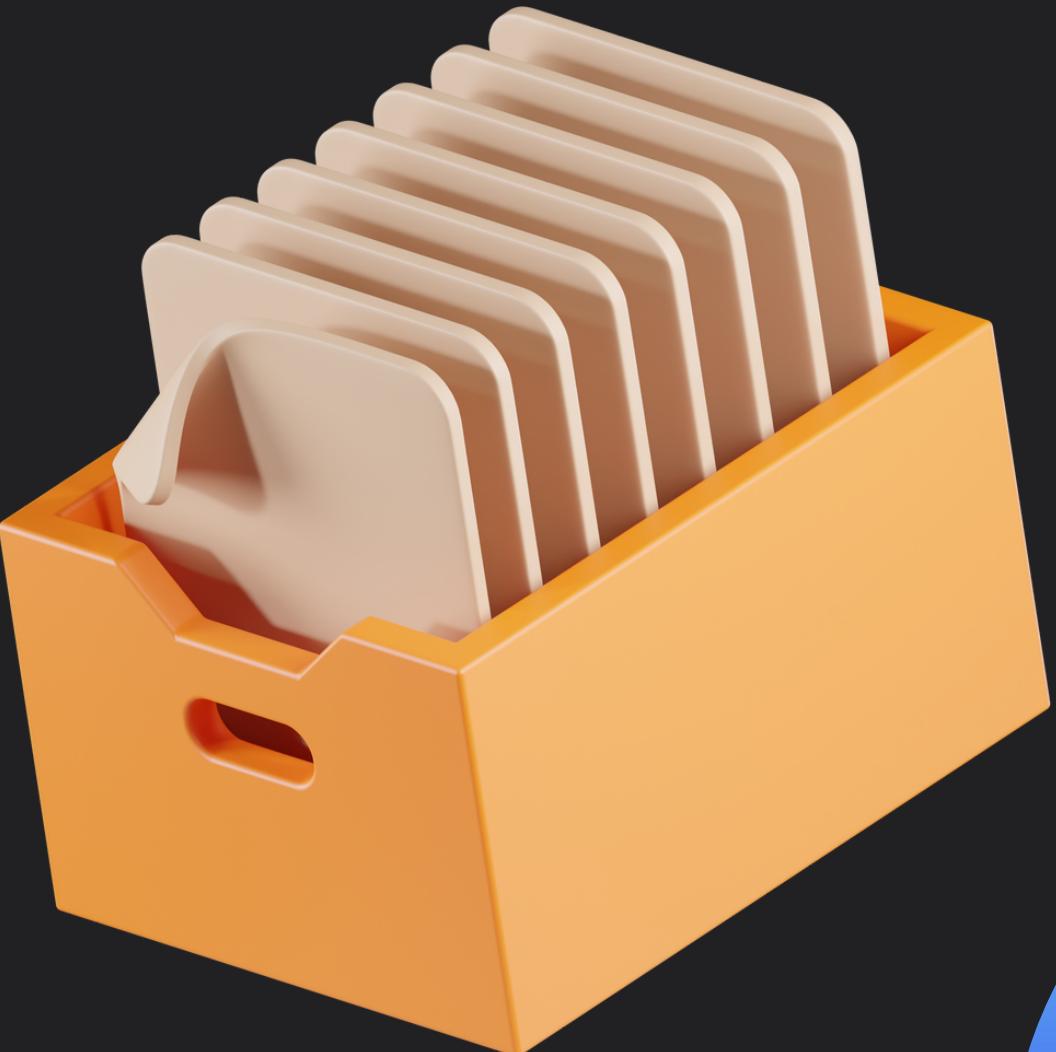
Files



Directories

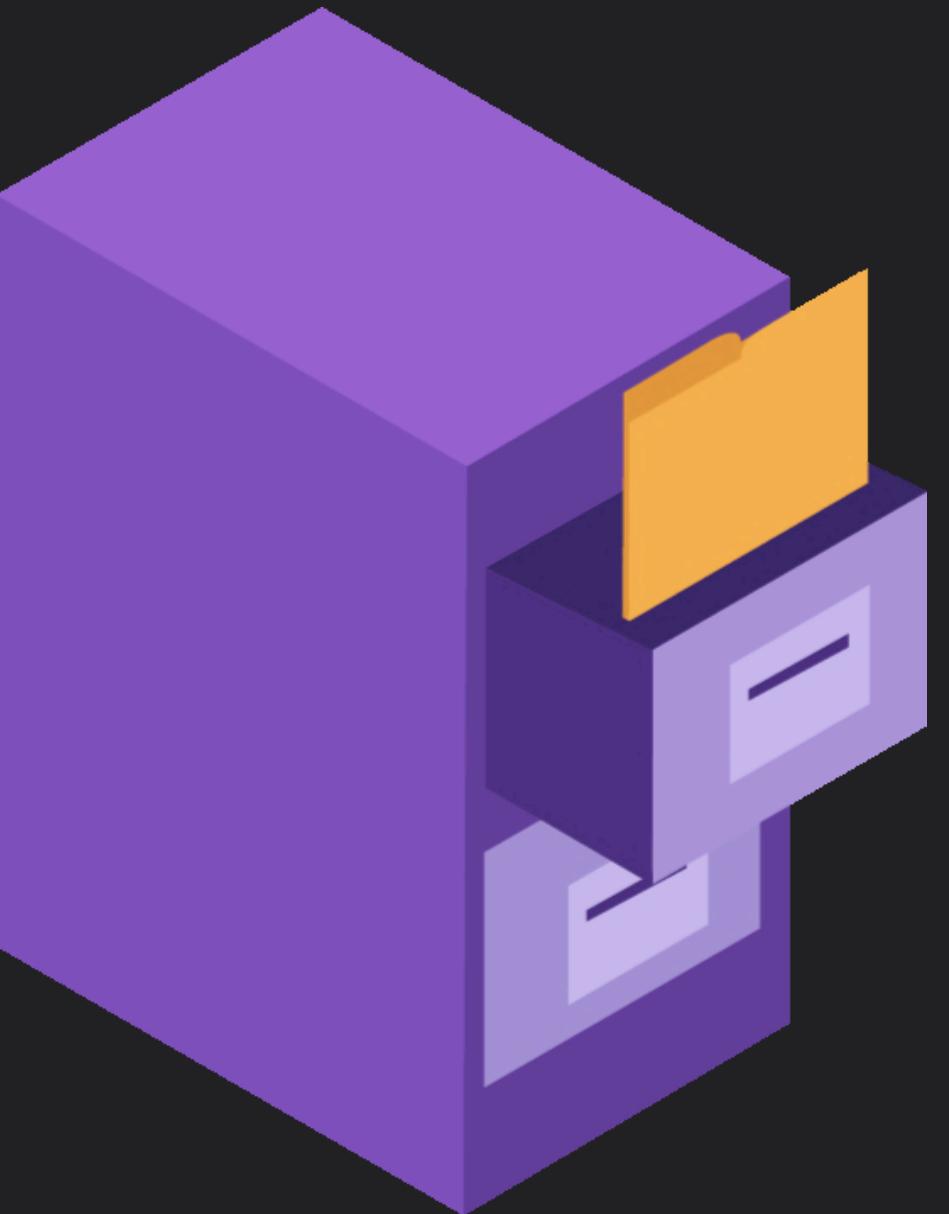
- ▶▶▶ A virtual container used to organize and manage files

- ▶▶▶ A folder for grouping related files and subdirectories



Mounting

- ▶▶▶ Mounting is a process by which a computer's operating system makes files and directories on a storage device available for users to access

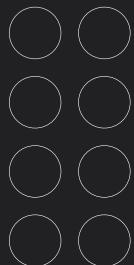


Inodes

Index Nodes

Size

Permissions

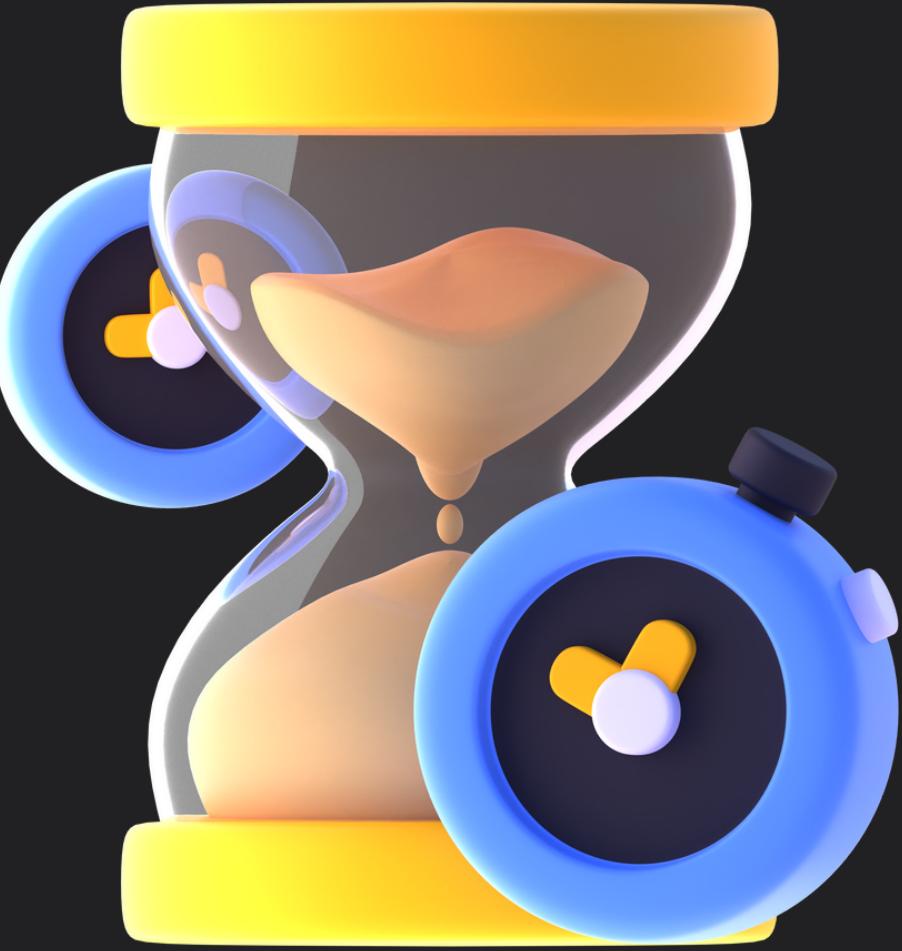


Date modified
& created

Location

Inode Limitations

- ▶▶ Type `df -i` in terminal
- ▶▶ All the inodes allocated to existing files
- ▶▶ No more files can be created even if space is remaining



File Systems

- ▶▶▶ Naming and placement of Files
- ▶▶▶ Process of managing data on storage disk



Can You Guess The Game ?



Why can't we install APKs on iPhones?



APFS

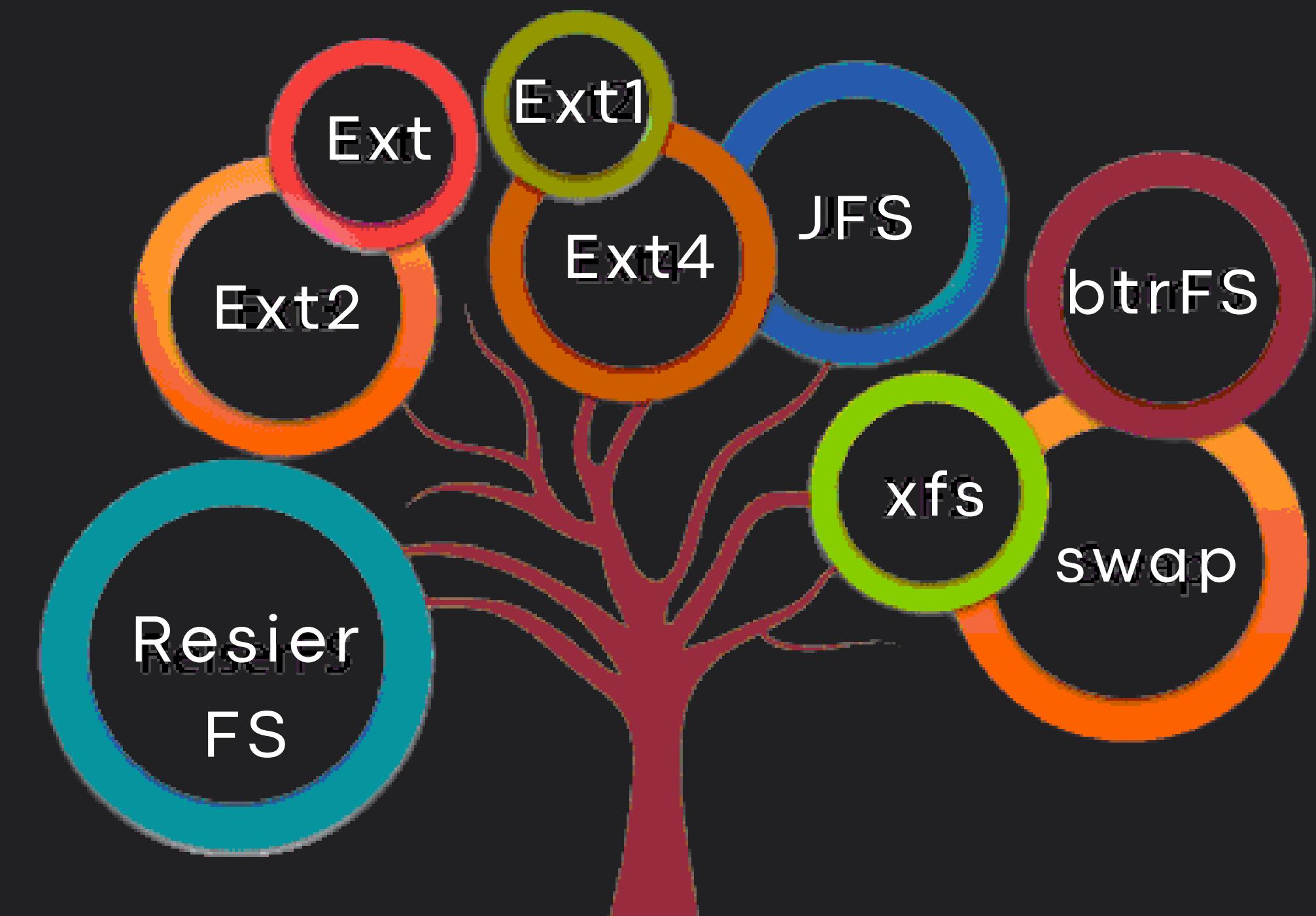


EXT4



Linux File Systems

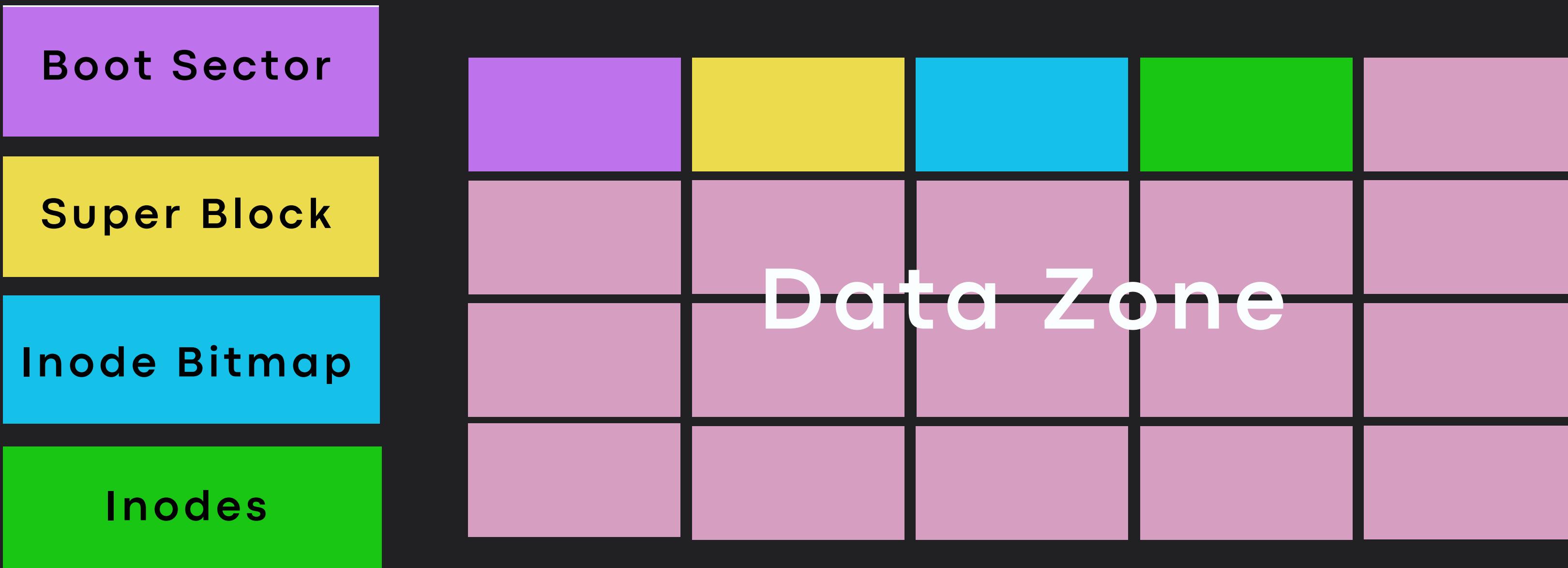
- ▶▶ Ext4
- ▶▶ XFS
- ▶▶ ZFS
- ▶▶ btrfs



EXT4

- » 32-Bit Journaling file system
- » Successor of ext3 developed between 2003 to 2006



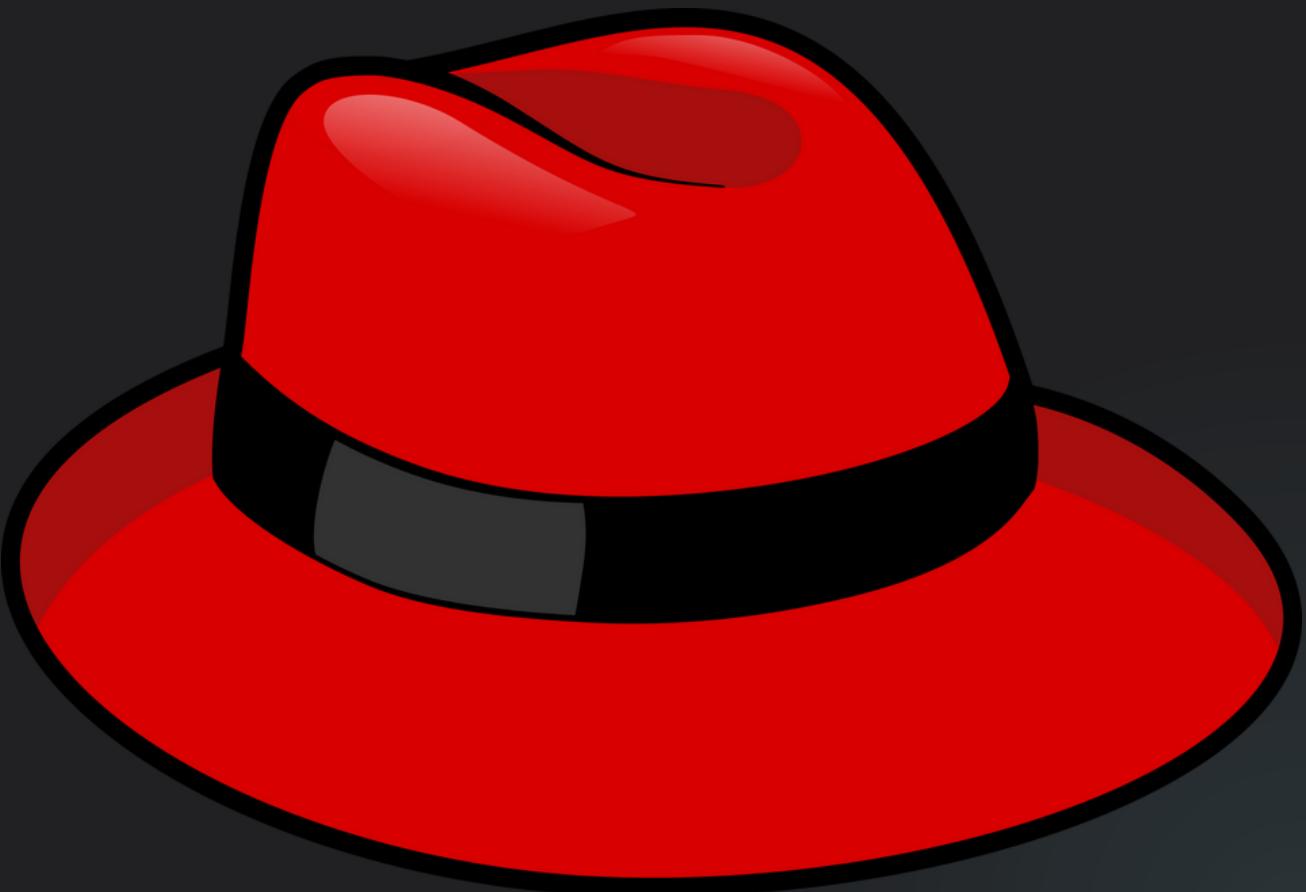


Features:-

- ▶▶▶ Its a Journaling System
- ▶▶▶ Delayed Allocation

XFS

- ▶▶▶ Used in Fermilab & CERN
- ▶▶▶ For systems having large no. of CPUs and huge disk arrays
- ▶▶▶ 64 Bit Journaling File System



But what do 32 and 64 even mean?

- »» 32 bit = $2^{32} \times \text{Size Allocated}$
- »» 64 bit = $2^{64} \times \text{Size Allocated}$

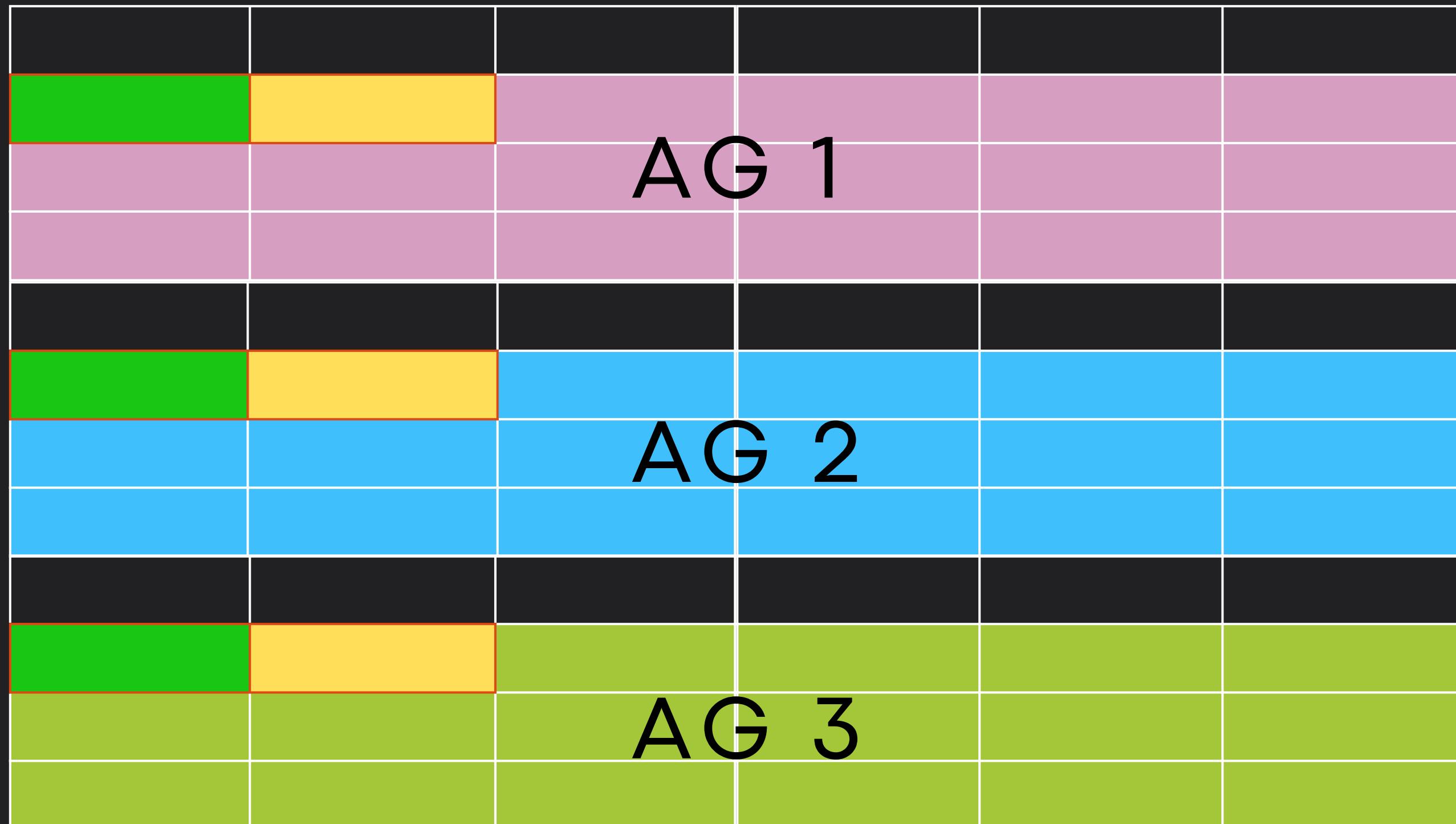


Limit	ext4	XFS
max file system size	16 Tb	16Eb
max file size	16Tb	8Eb
max extent size	4kb	64kb

»» 1Eb = 100,000 Tb

Formatting Structure

- ▶▶ Allocation Groups
- ▶▶ Larger than Block Groups
- ▶▶ Max Size 1TB



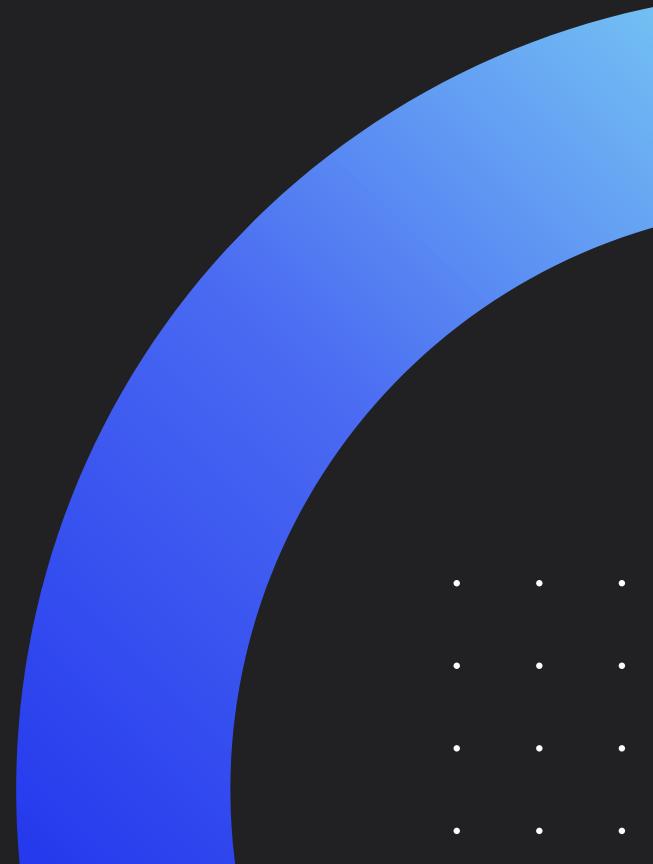
ZFS

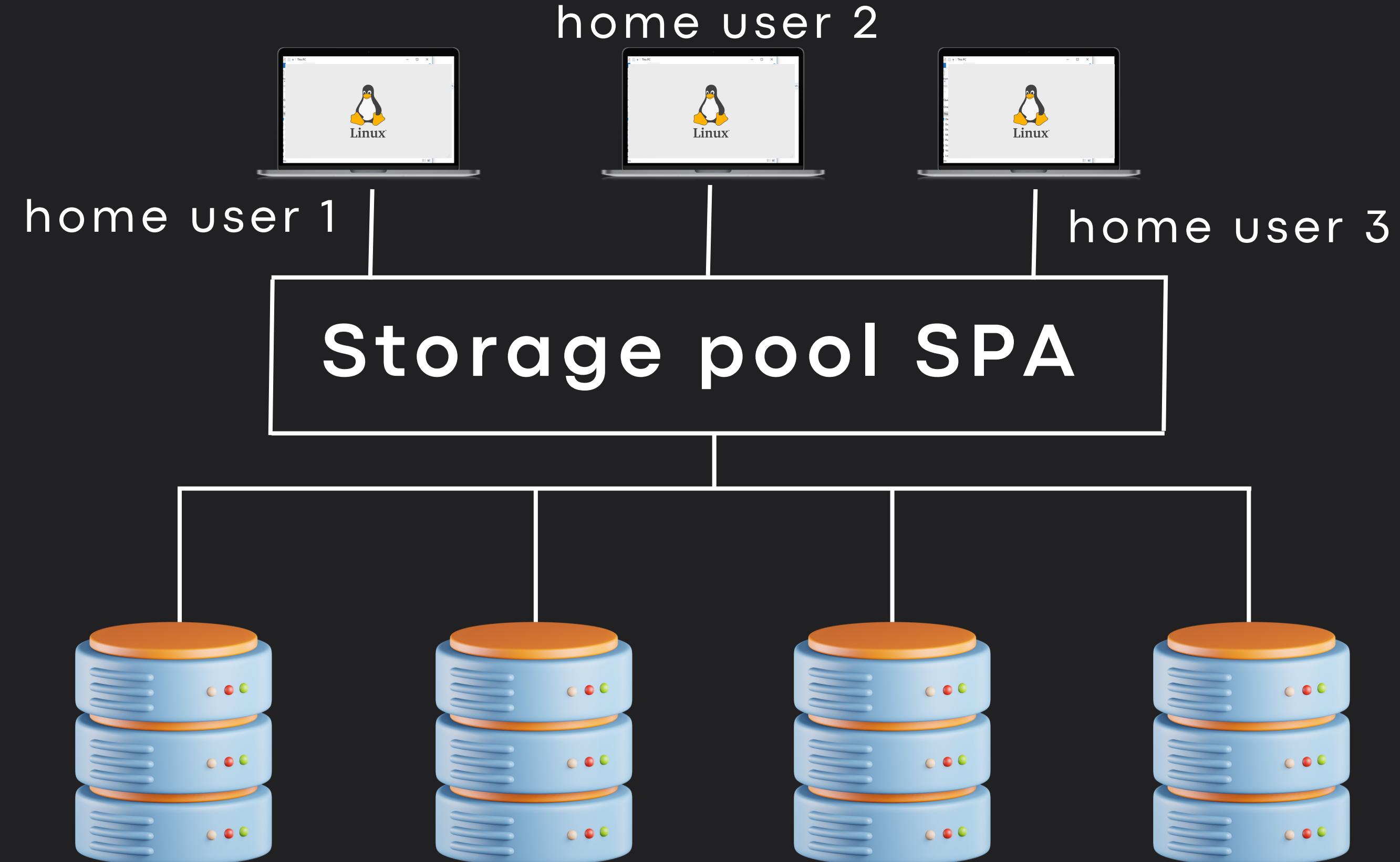
- ▶▶ Zettabyte File System
- ▶▶ It acts as both volume manager and a file system
- ▶▶ Used in server OS

Bytes	8 Bits
KiloBytes	1024 Bytes
MegaBytes	1024 Kb
GigaBytes	1024 MB
TeraByte	1024 Gb
Petabyte	1024 TB
ExaByte	1024 PB
ZettaByte	1024 EB

Formatting Structure

- »»» 128 Bit File System
- »»» Max File Size - 16 Eb
- »»» Max Vol Size - 256 trillion Yb





Features

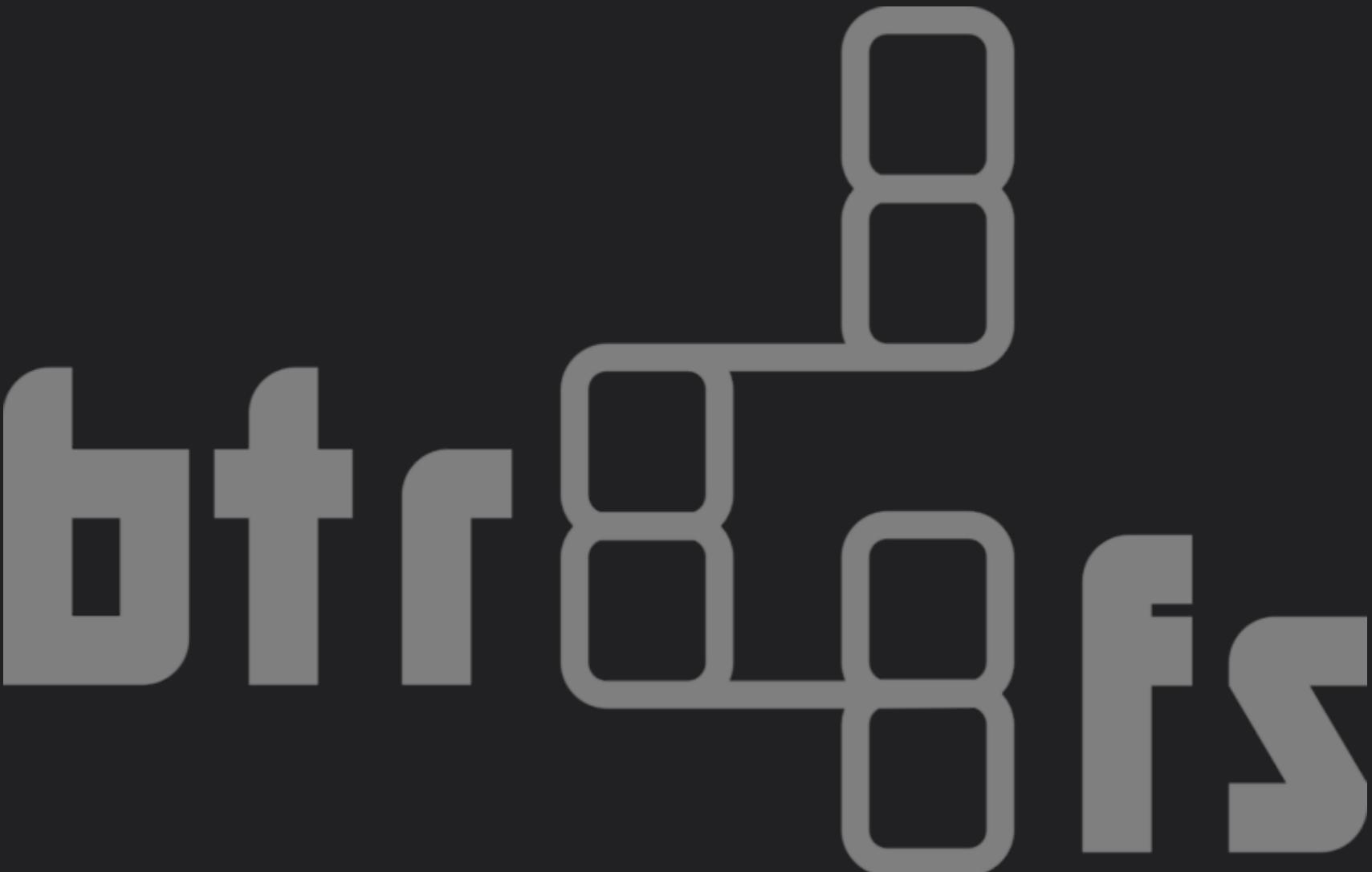


- ▶▶ Single FS Snapshots
- ▶▶ Checksums
- ▶▶ RAID - Z
- ▶▶ Built-in Scrub



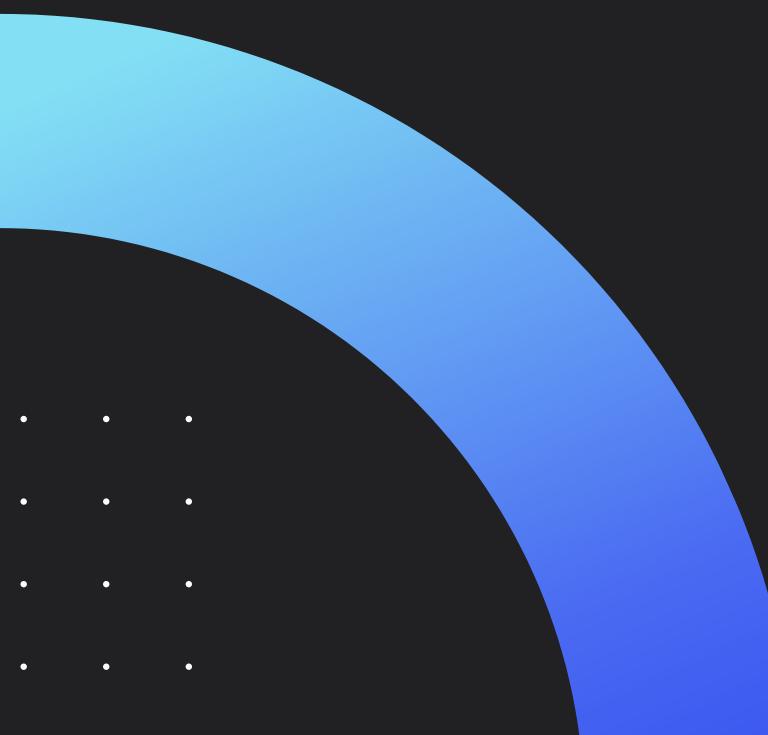
BTrFS

- »» B-Tree File System
 - »» Single Volume Snapshots
 - »» Transparent file compression
 - »» Built-in RAID support
 - »» Faster read and write speeds
- ...
- ...
- ...
- ...
- ...



Companies Using BTrFS

ORACLE®



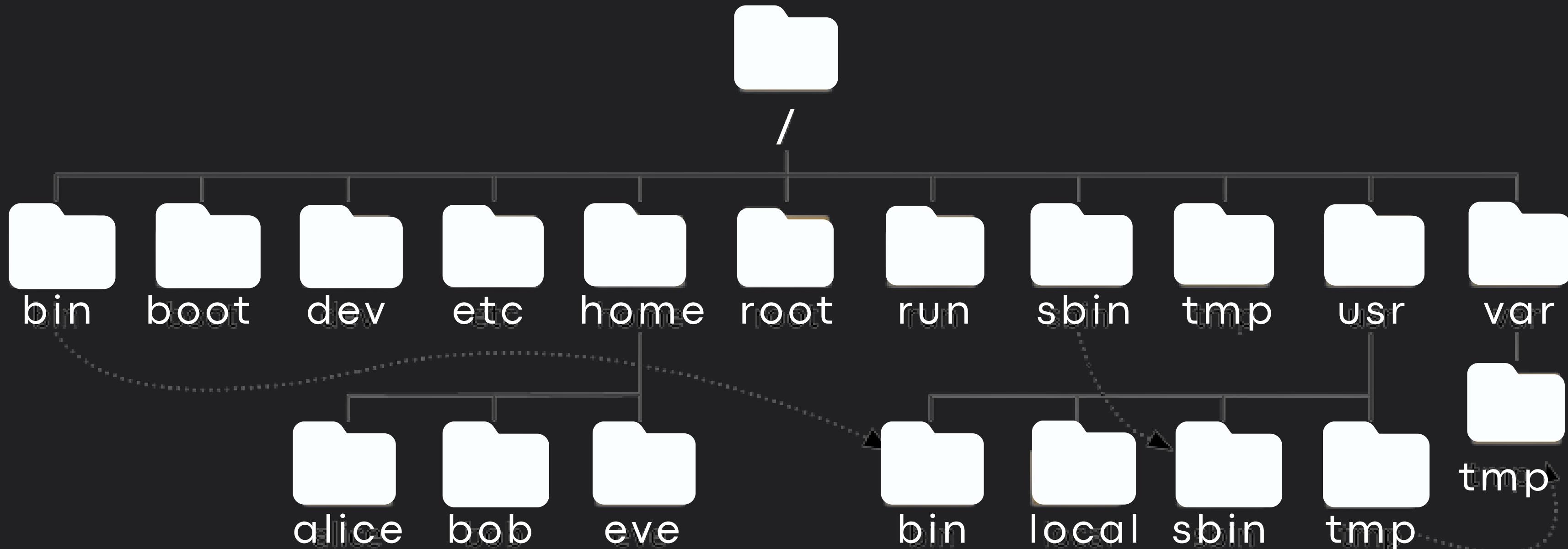
Linux Directory⁺ Structure

xxxx



x x x x

The FHS Tree



x x x x

x x x x

Basic Commands



LS

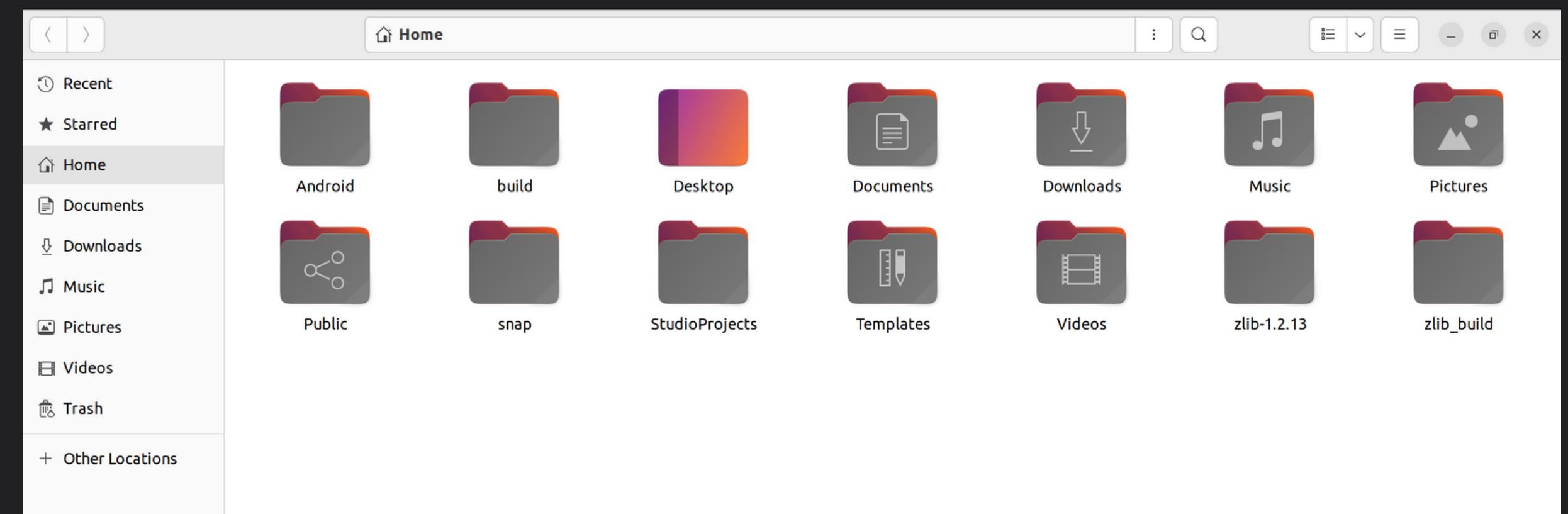
CD

x x x x



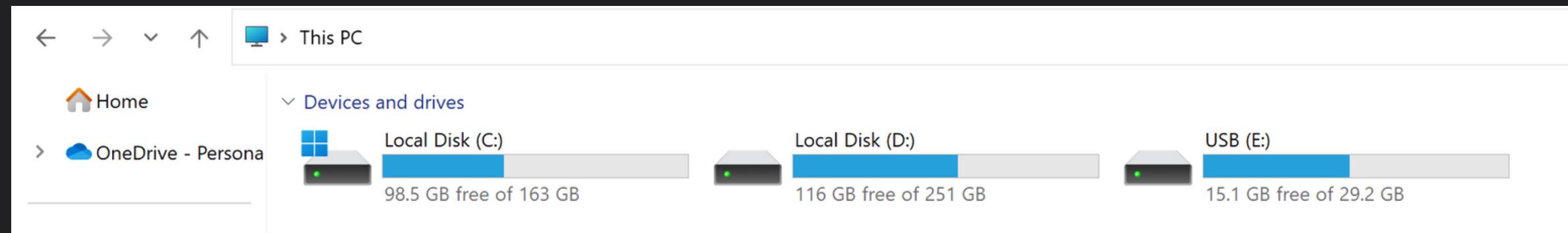
/home \$ l

Home

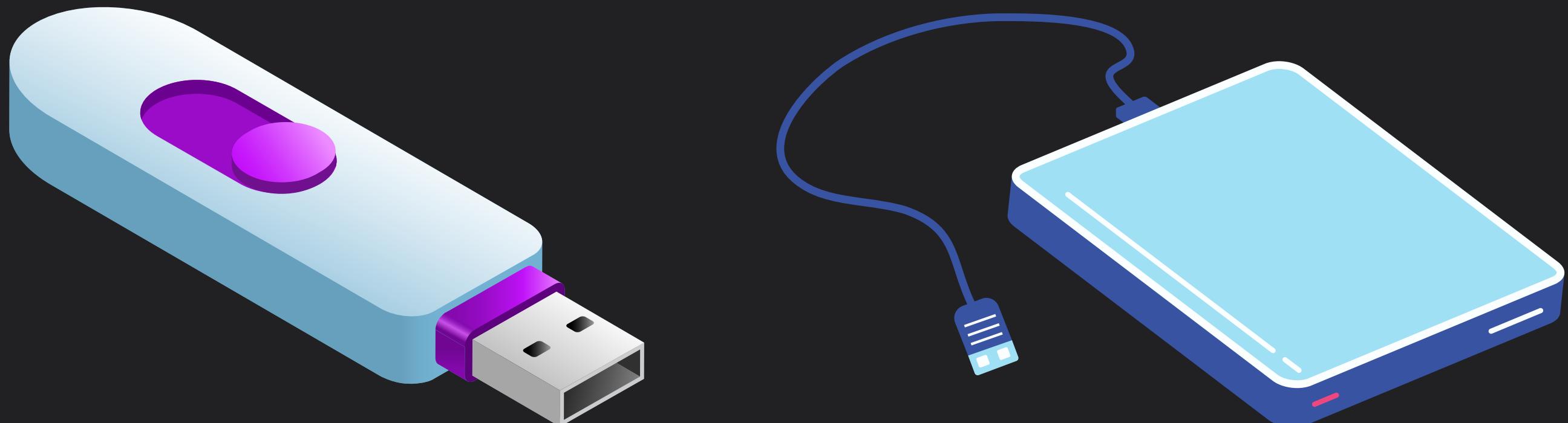


Home directories for all users to store their personal files

Media & Mnt

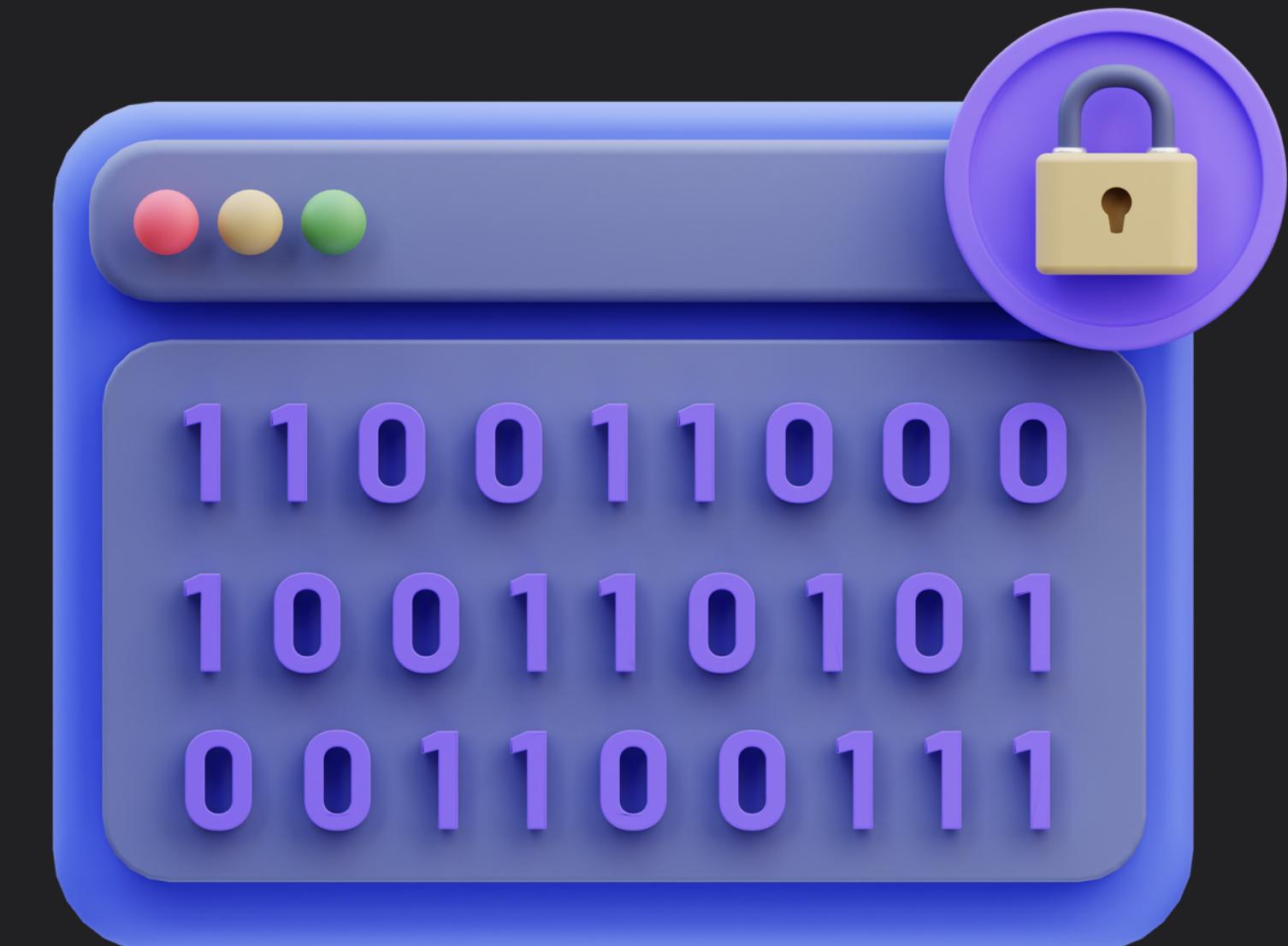


▶▶▶ Temporary mount directory for removable devices



Bin & Sbin

- ▶▶ Bin -> Binaries
- ▶▶ Sbin -> System Binaries



Boot

- ▶▶▶ This directory contains everything required for the boot process



Dev

- ▶▶▶ Contains special device files for all the devices

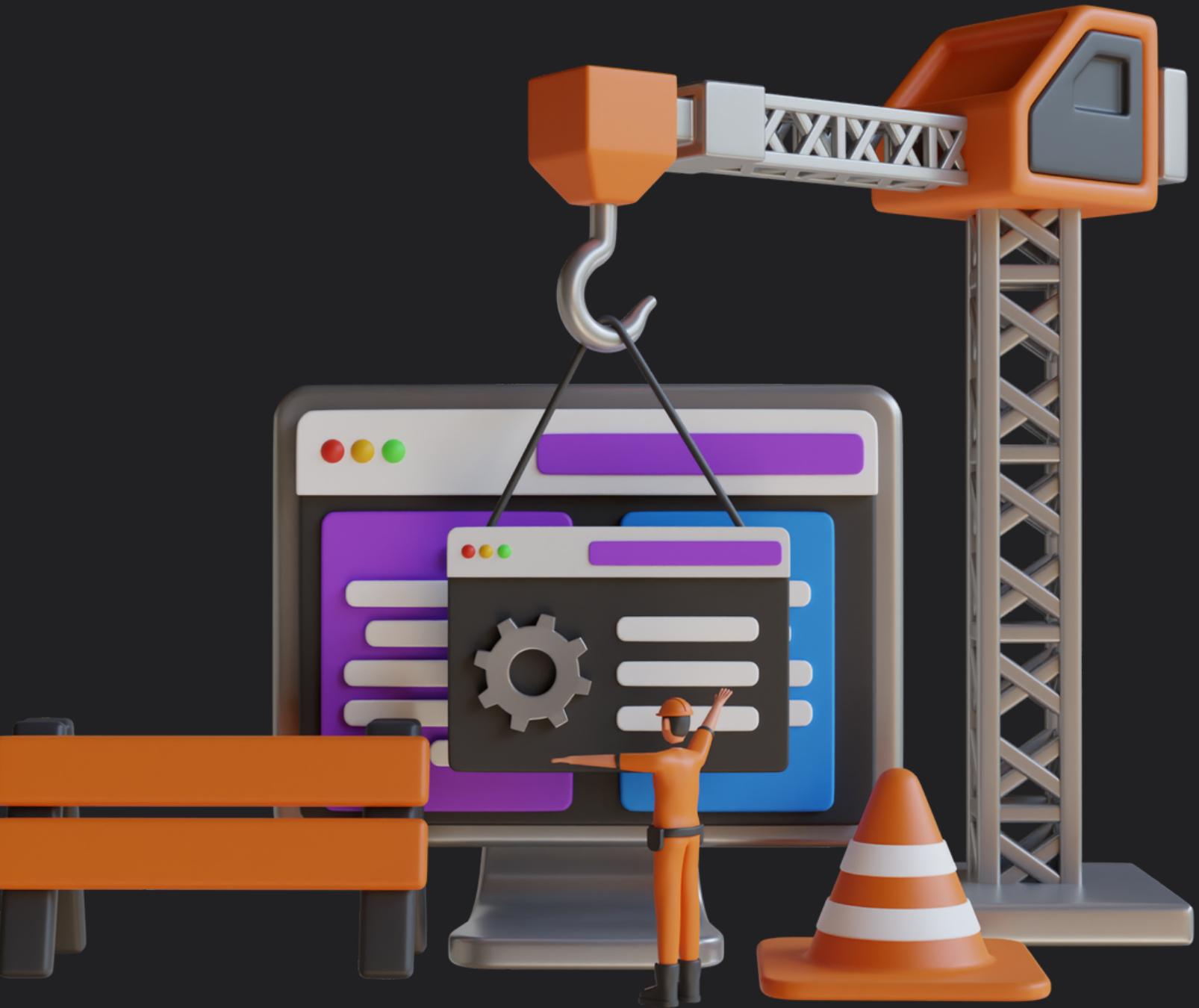




Name	Status	4%	37%	1%	0%
		CPU	Memory	Disk	Network
>  Brave Browser (13)		1.1%	1,207.7 MB	0.1 MB/s	0.1 Mbps
>  Antimalware Service Executable		0%	166.6 MB	0 MB/s	0 Mbps
>  Desktop Window Manager		0.8%	145.5 MB	0 MB/s	0 Mbps
>  Windows Explorer		0.4%	86.1 MB	0 MB/s	0 Mbps
>  McAfee Framework Host Servi...		0%	76.1 MB	0 MB/s	0 Mbps
>  Task Manager		1.0%	60.2 MB	0 MB/s	0 Mbps
>  Start (2)		0%	45.9 MB	0 MB/s	0 Mbps
>  Runtime Broker (2)		0%	33.0 MB	0 MB/s	0 Mbps
>  DAX API		0%	25.4 MB	0 MB/s	0 Mbps
>  Lenovo.Modern.ImController (...)		0%	24.9 MB	0 MB/s	0 Mbps
>  Windows Input Experience (3)	!(II)	0%	22.9 MB	0 MB/s	0 Mbps
>  IntelAudioService		0%	21.5 MB	0 MB/s	0 Mbps
>  Service Host: Windows Event ...		0%	17.1 MB	0 MB/s	0 Mbps
>  wsappx		0%	16.4 MB	0 MB/s	0 Mbps
>  Service Host: UtcSvc		0%	16.2 MB	0 MB/s	0 Mbps
>  Widgets.exe (7)	!(S)	0%	15.9 MB	0 MB/s	0 Mbps
>  Intel® Graphics Command Ce...		0%	15.5 MB	0 MB/s	0 Mbps
>  Service Host: Windows Update		0%	13.7 MB	0 MB/s	0 Mbps
>  McAfee WebAdvisor(service)		0%	13.0 MB	0 MB/s	0 Mbps
>  Microsoft Windows Search In...		0%	12.7 MB	0 MB/s	0 Mbps
>  Vanguard user-mode service.		0%	12.6 MB	0 MB/s	0 Mbps
>  Lenovo.Modern.ImController....		0%	11.7 MB	0 MB/s	0 Mbps
>  Microsoft Office Click-to-Run ...		0%	10.0 MB	0 MB/s	0 Mbps
>  LocalServiceNoNetworkFirewa...		0%	9.8 MB	0 MB/s	0 Mbps
>  Registry		0%	9.1 MB	0.1 MB/s	0 Mbps
>  Container Host		0%	8.8 MB	0 MB/s	0 Mbps

Proc

- »» htop
- »» Contains one subdirectory for each process running on the system, which is named after the process ID (PID).



Run

- ▶▶ Files loaded onto to the RAM when OS is booted
- ▶▶ Files deleted when PC shuts down

Tmp

- ▶▶ Binaries of unsaved files and browsing history

Etc

- » It stores storage system configuration files, executables required to boot the system, and some log files.



Users in Linux

Q1

What is a User?

Q2

What is a
Multi-user OS?

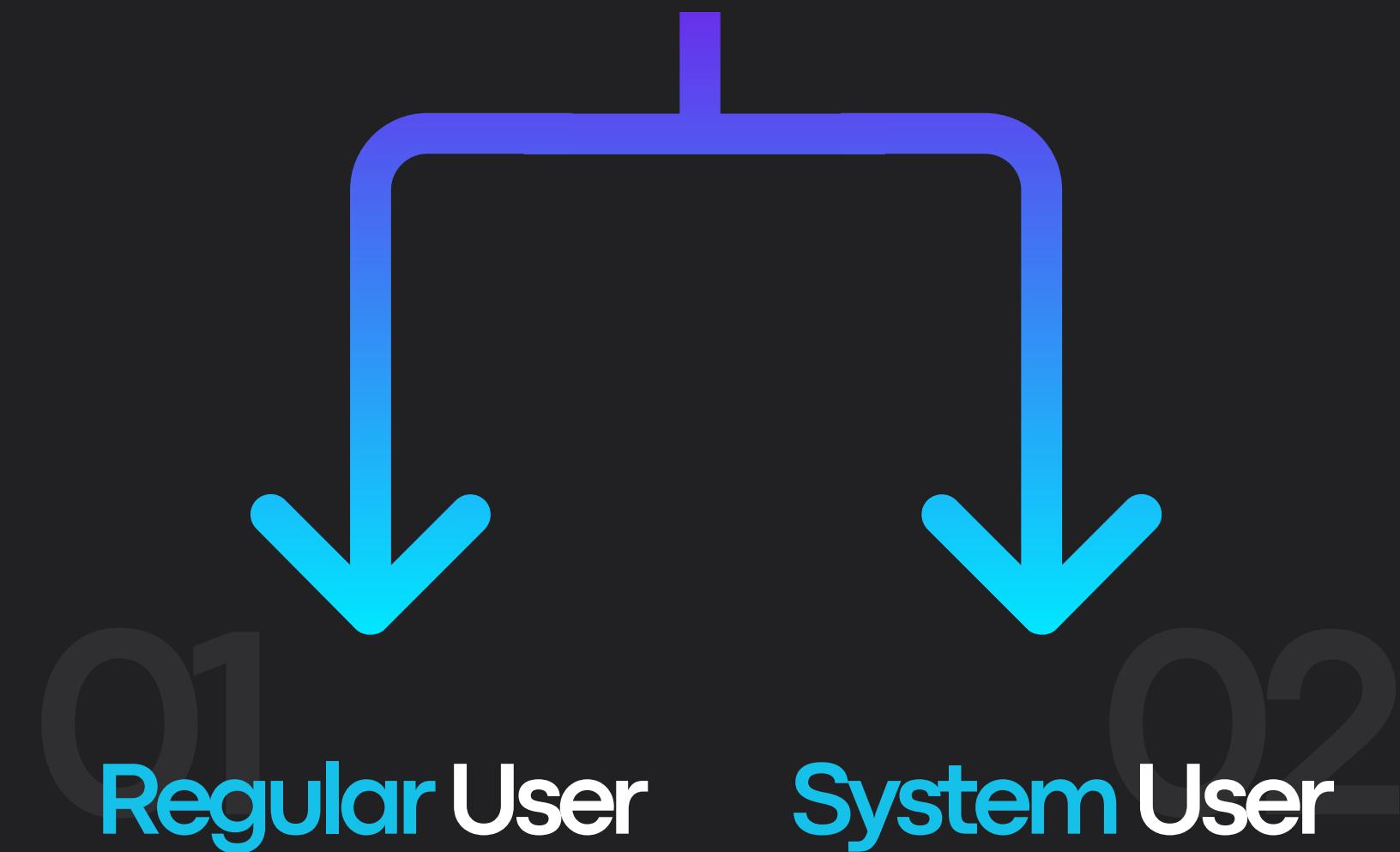
Q3

Why do we need
user management?



Users in Linux

Types of Users



Regular User



- Regular users are standard user account.



Regular Users can perform tasks like :

- Run programs
- Store personal files
- Use applications

System User



- System users are specialized user accounts.



They can perform:

- Handle background tasks
- System operations
- Automation process

Super User



- The super user is also known as the root user.



The root user can perform :

- Administrative task
- Modify system files
- Change system configuration

Groups in Linux

01

What is a Group?

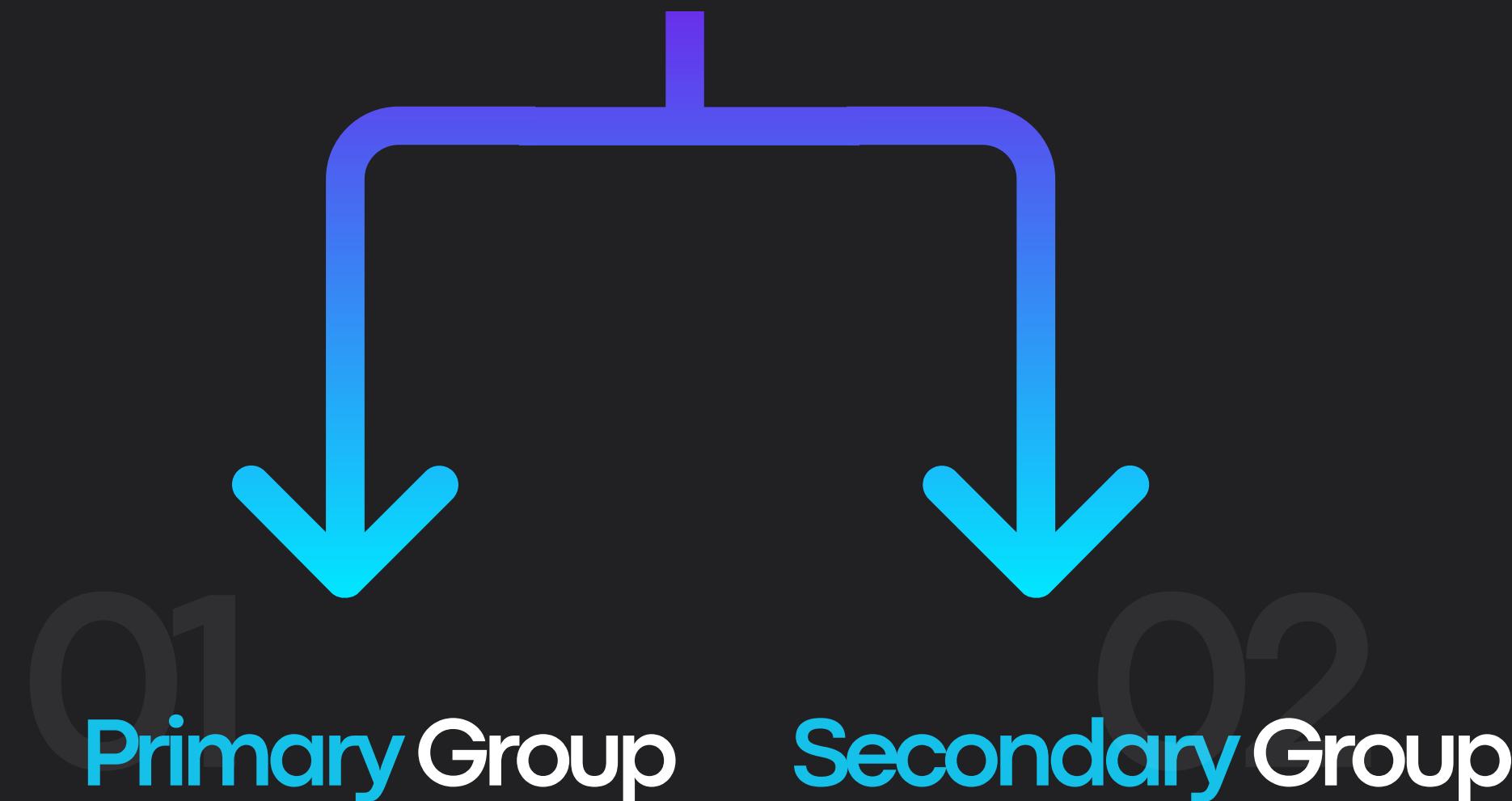
02

Why do we need Groups?

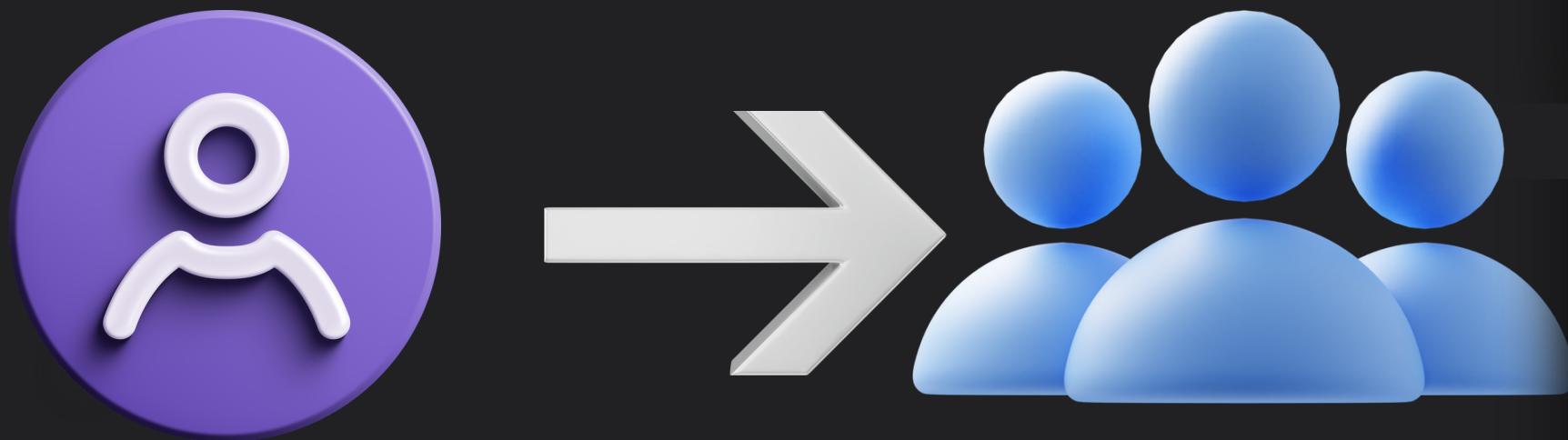


Groups in Linux

Types of Groups



Primary Group

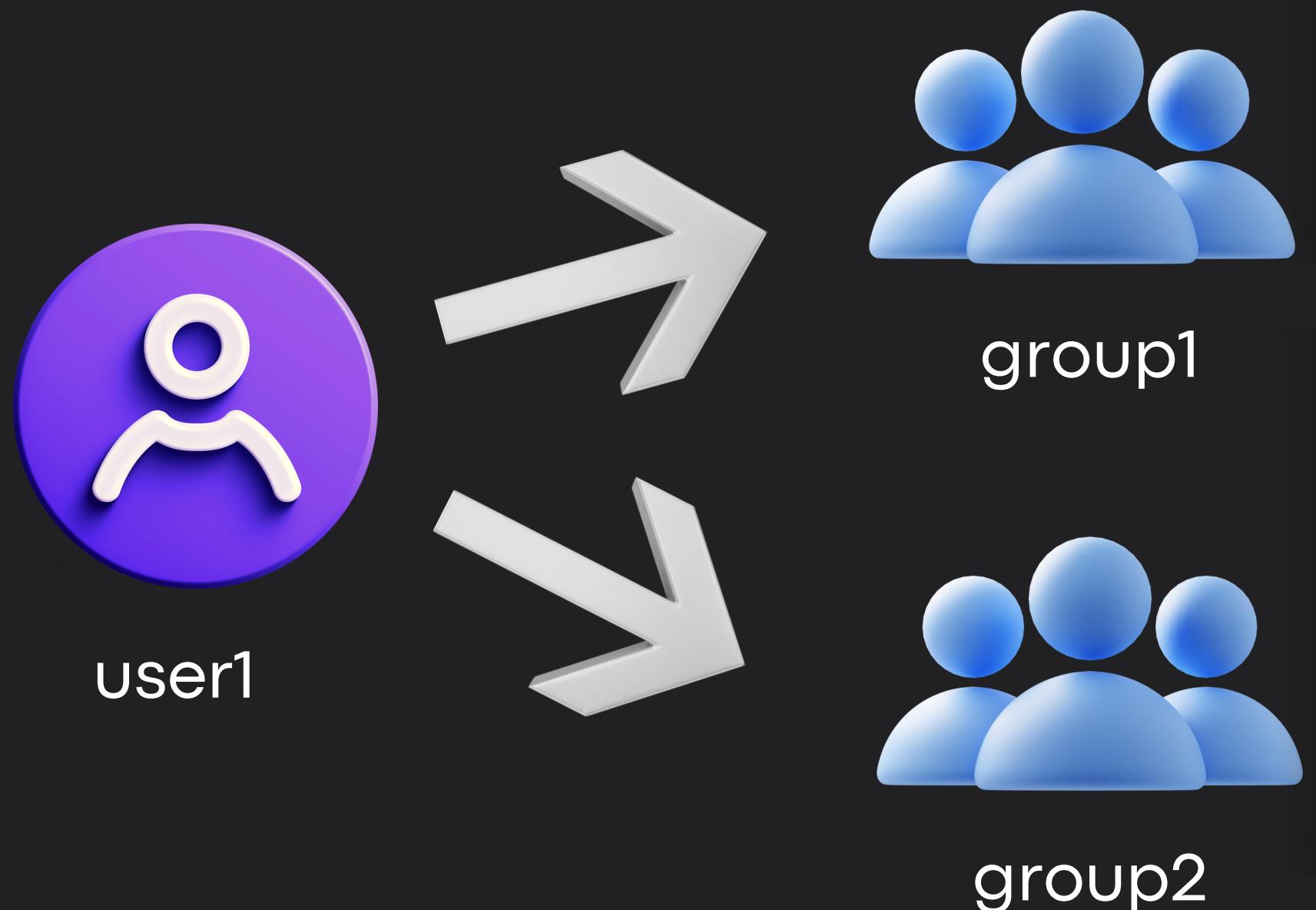


- The primary group is the default group associated with a user account.



- It determines the group ownership of files and directories created by the user.

Secondary Group



- Users can also belong to one or more secondary groups.



- It provides additional permissions and access to resources beyond the primary group.

How to view users and groups?



```
$ cat /etc/passwd
```

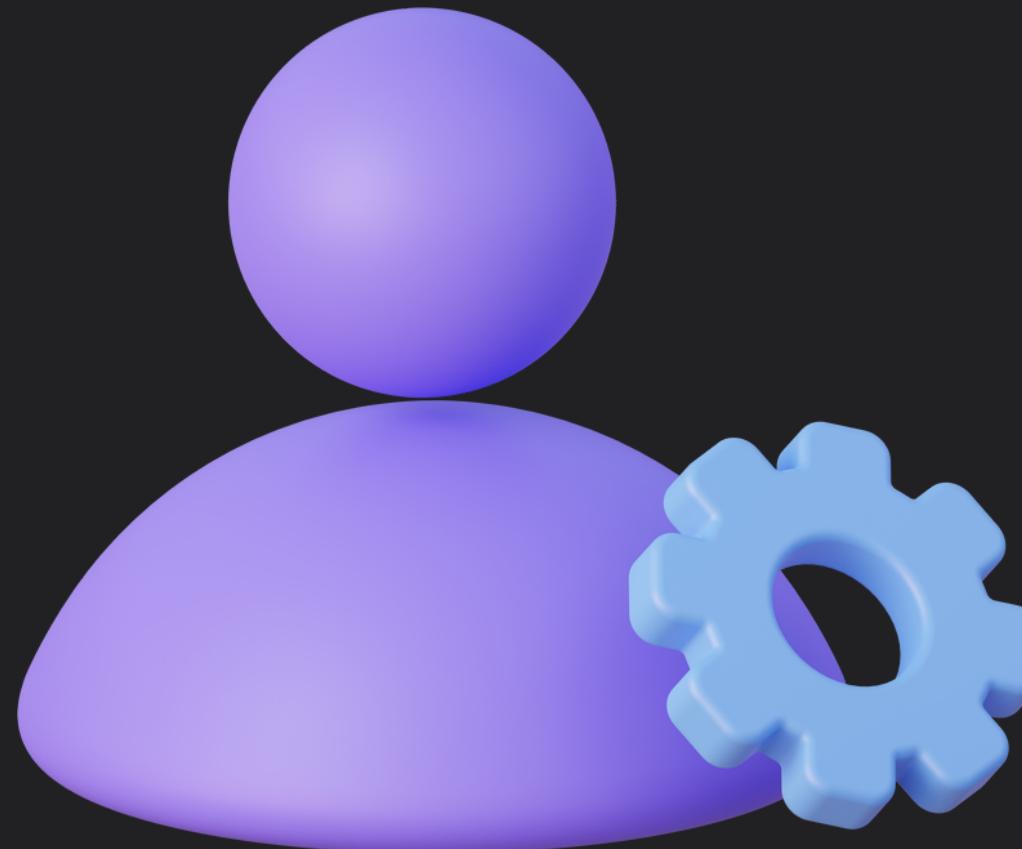
Lists all users



```
$ cat /etc/group
```

Lists all groups

Adding, deleting & modifying a user



```
$ sudo adduser USER_NAME
```

Adds a user



```
$ sudo usermod -l NEW_USERNAME  
OLD_USERNAME
```

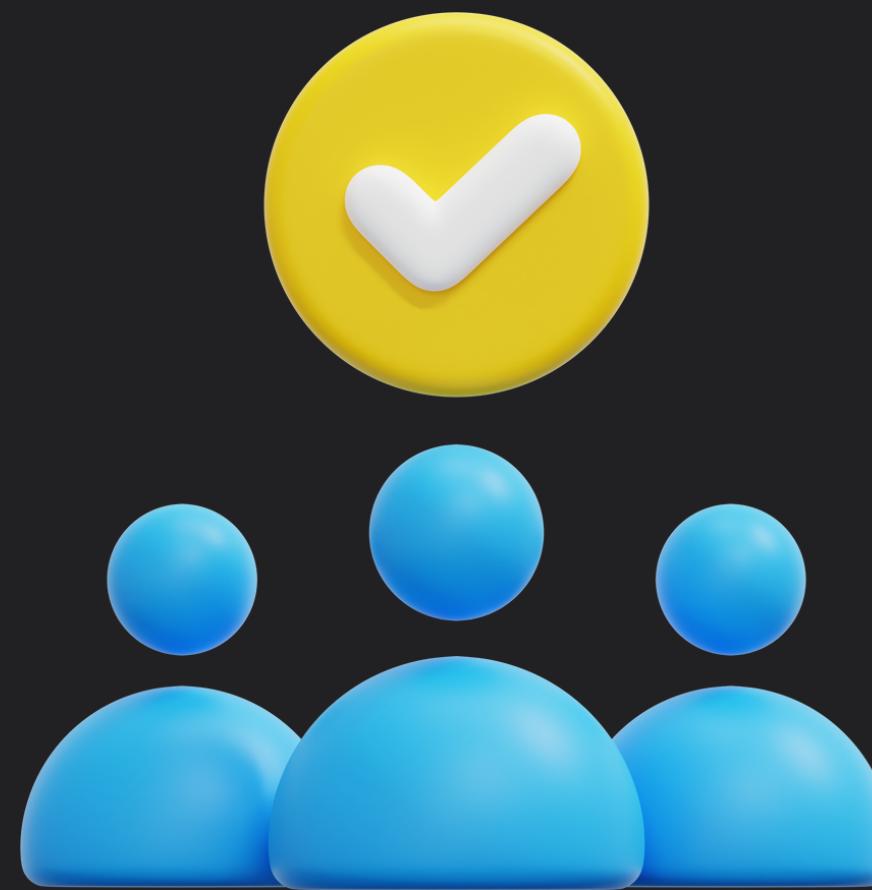
Renames a user



```
$ sudo userdel -r USER_NAME
```

Removes user with directory

Adding, deleting & modifying a group



```
$ sudo groupadd GROUP_NAME  
Adds a group
```

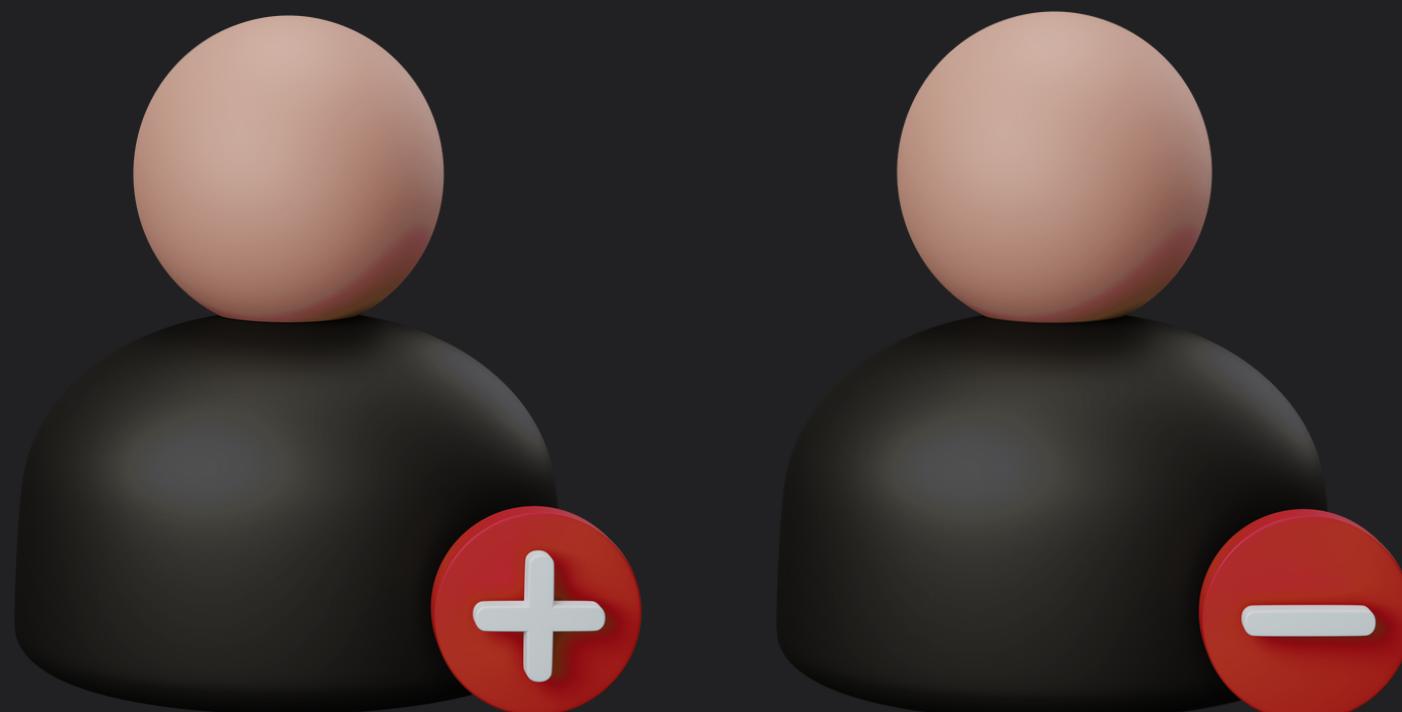


```
$ sudo groupmod -n NEW_GROUP  
OLD_GROUP  
Renames a group
```



```
$ sudo groupdel GROUP_NAME  
Deletes a group
```

Adding /deleting users from groups?



```
$ sudo gpasswd -a USER_NAME GROUP_NAME  
Adds a user to a group
```

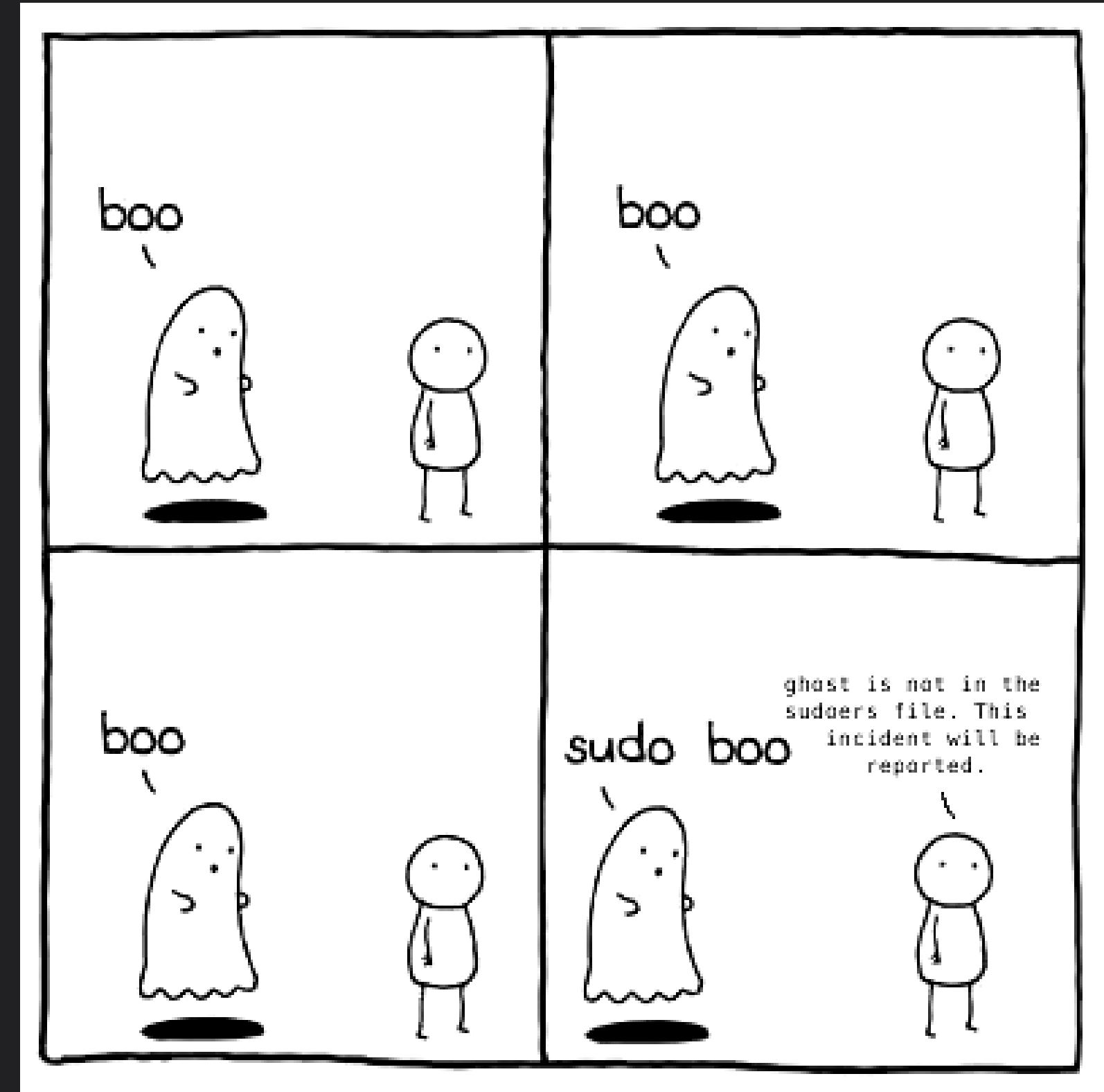


```
$ sudo gpasswd -d USER_NAME GROUP_NAME  
Removes a user from a group
```



```
$ sudo usermod -g NEW_GROUP USER_NAME  
Changes primary group of a user
```

Meme Time!!



File Permissions

Q1

What is
Permission?



Q2

Why do we need
Permissions?



Q3

Which
Permissions?

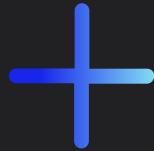


File Permissions



04 How to view
Permission?

05 How to change
Permissions?



What are Permissions?

- Set of rules
- Action we can perform



Why do we need Permission?



- Security
- Privacy and Confidentiality
- System Stability

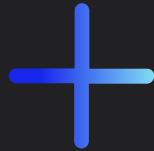
File Permissions

Types of Permissions

READ

WRITE

EXECUTE



Read Permission



▶▶▶▶▶▶▶ Read

- Read the contents of a file



- List the files in a directory
- Read permission is essential for viewing the content of a file



Write Permission



►►►►►►► Write

- Update the contents of a file

- Allowed to open, read and manipulate
- Write Permission is essential to change, write data

Execute Permission



▶▶▶▶▶ Execute

- Process of running or execution of a file

- Whether a file can be executed as a program
- It is essential permission to run the files

How to view the permissions?



▷▷▷▷▷▷▷▷▷▷ ls -l

- List files, directories
 - Flag?
-
- In a detailed or "long" format
 - First 10 characters use to check the permission

How to change the permission?



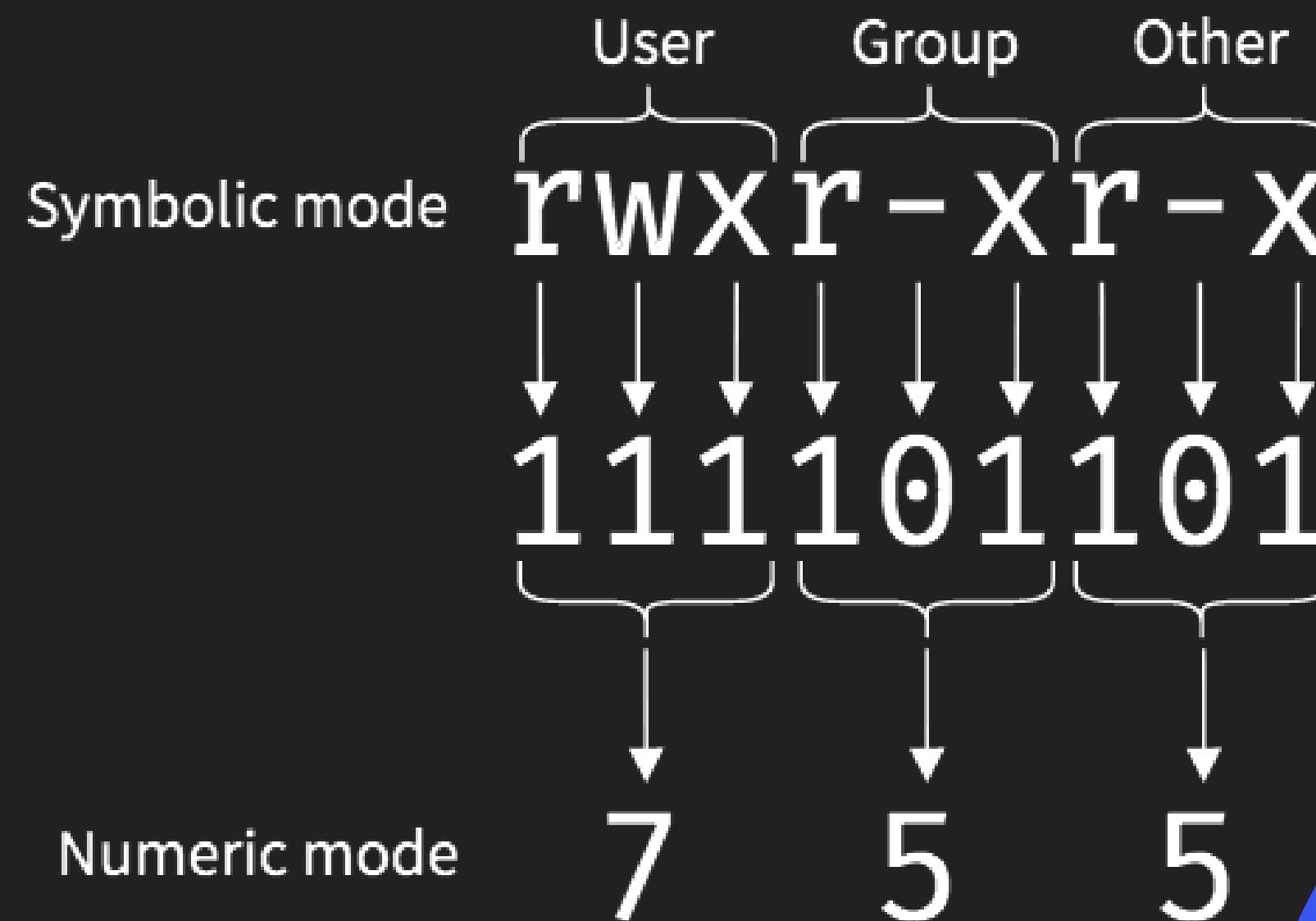
▷▷▷▷▷▷▷▷ **chmod**

- Change mode
- Use to update the permission

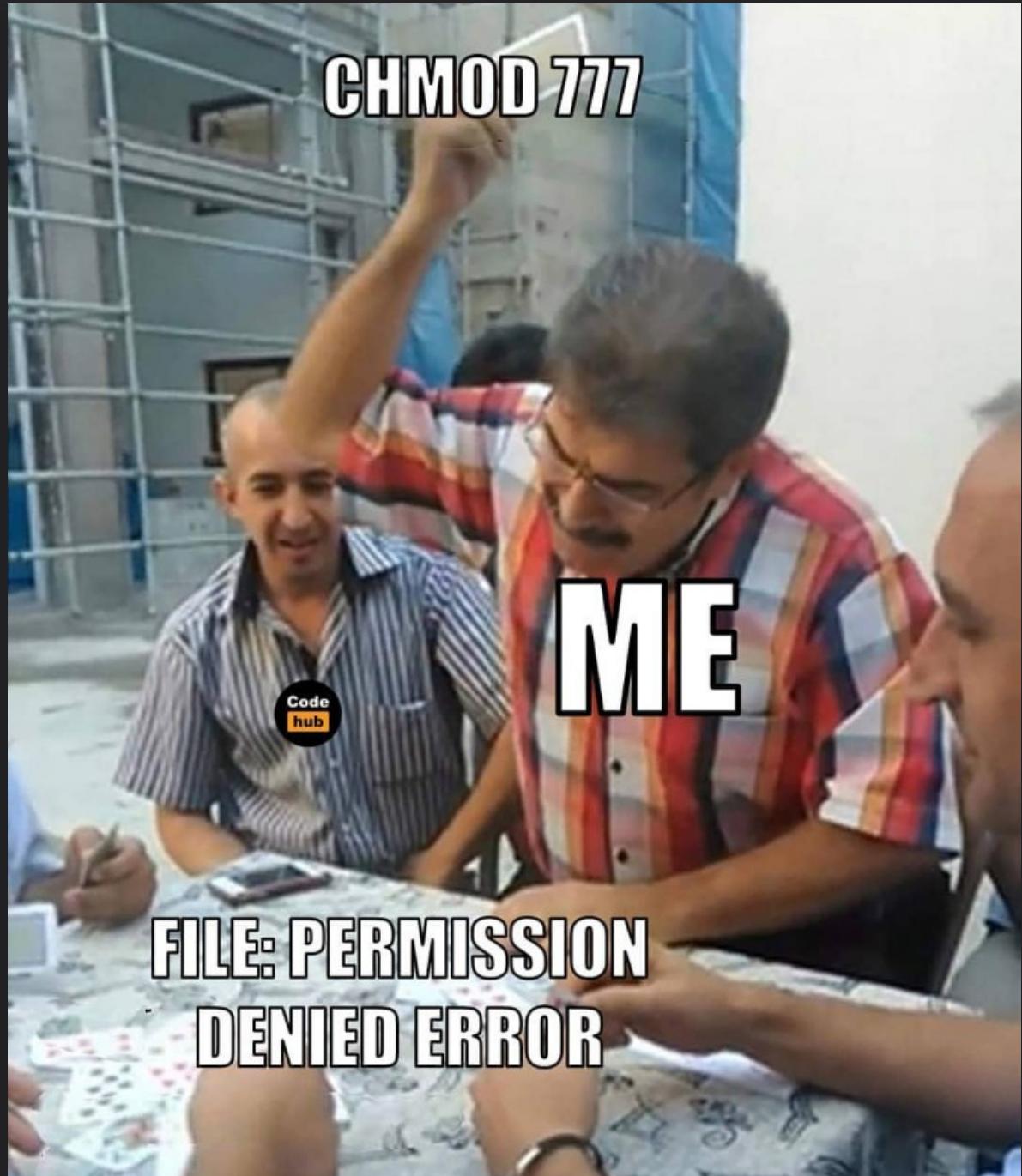


- chmod [options] mode file(s)
- 2 Types of Mode
 - Symbolic Mode
 - Absolute Mode(Numeric)

Permission Structure



Meme Time!!



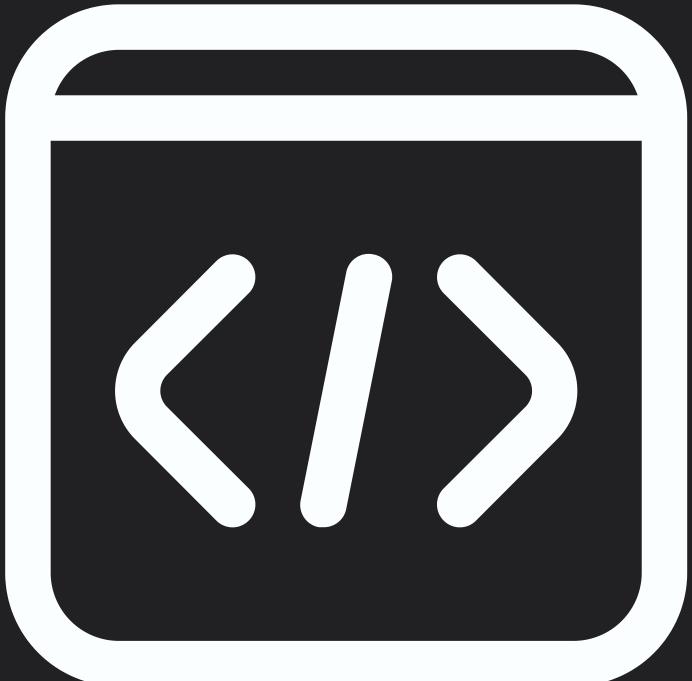
Customisation



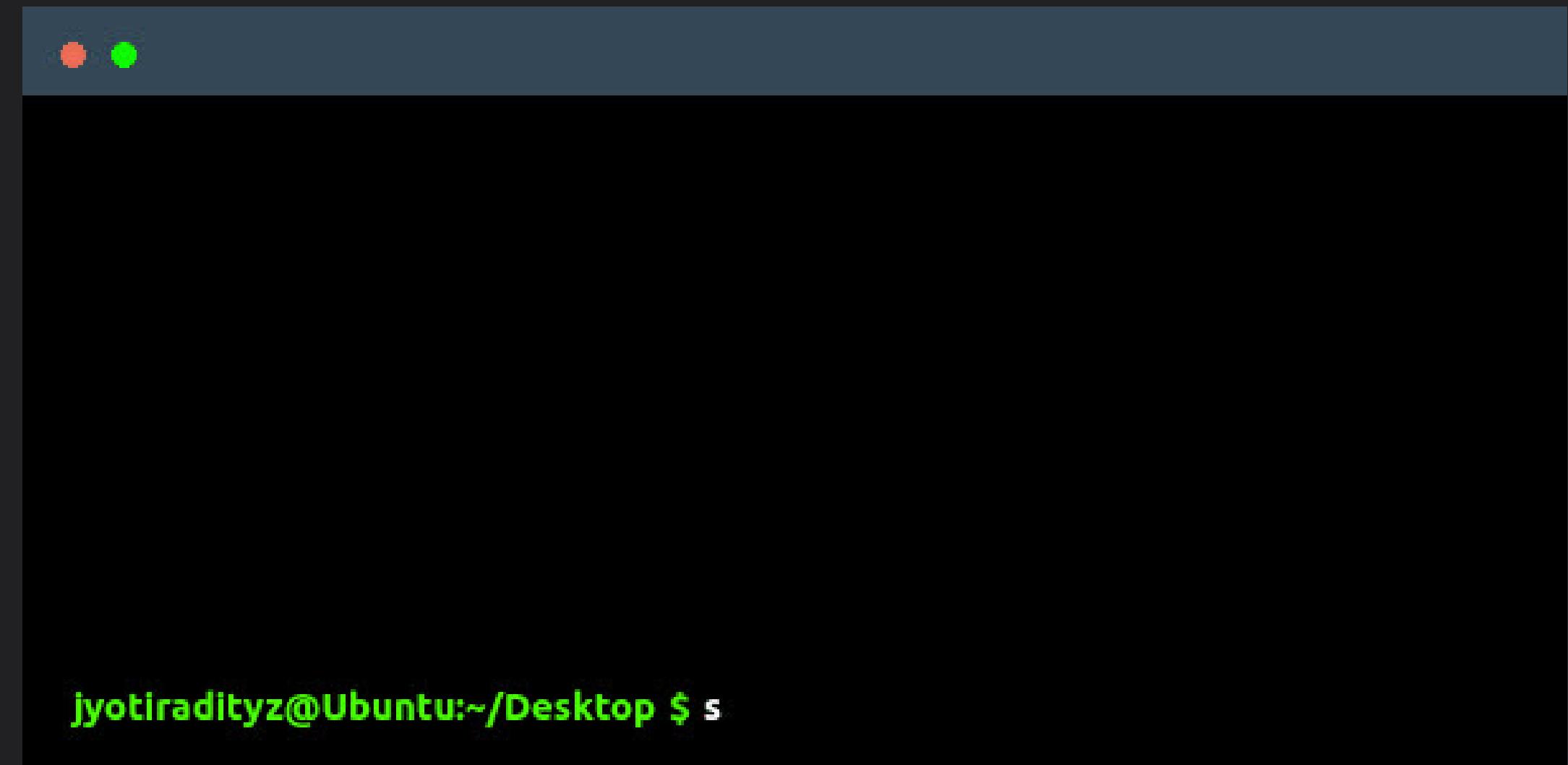
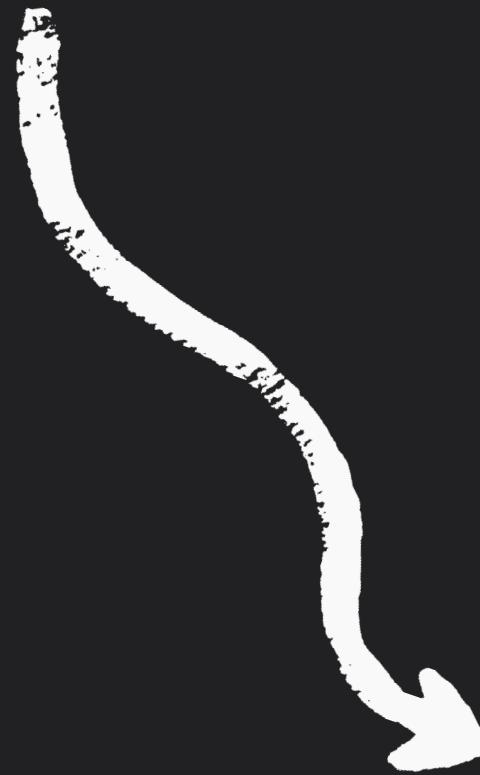
Lets Customize our terminal

Install 2 Commands

- figlet
- lolcat



Install the Commands



```
jyotiradityz@Ubuntu:~/Desktop $
```

.bashrc File

Important Instructions

- Important file of terminal
- Do not change any other content



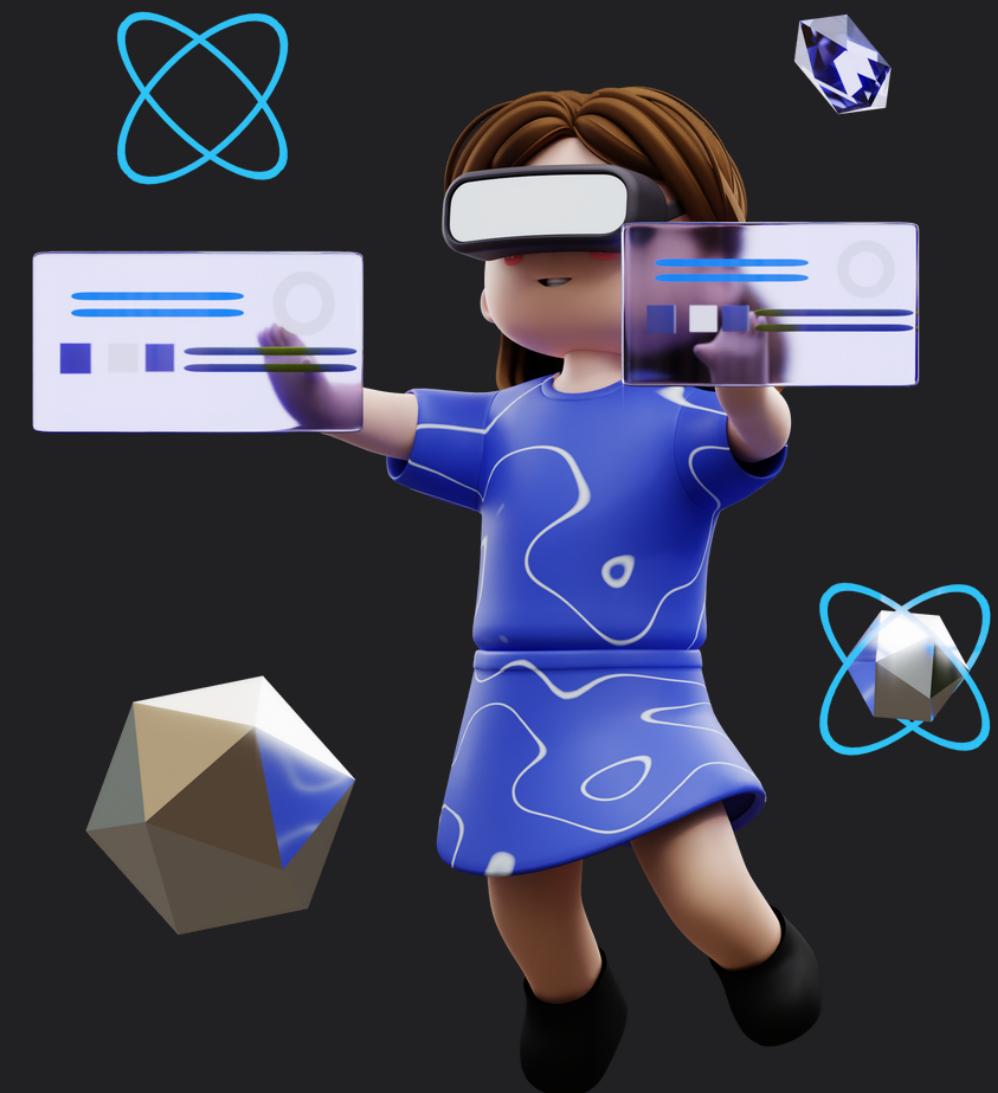
Lets Burn the Windows

- That doesn't mean that we are Deleting Windows
- Linux Gnome Extension
- **BURN MY WINDOWS**
- Cool animation
- On closing and opening



Many more things to checkout

- GRUB Customization
- Themes/fonts
- Komorebi (Live Wallpaper)
- Dock-to-dash



Thank You!!!