WLUG PRESENTS

LinuxDiary 3.0

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DAY 2

Session 1

File System & Management

Tushar Rathod
Chetana Patil
Abhishek Deokar

Summarising

- Basic Linux Commands.
- Keyboard shortcuts
- Booting Process.
- Text Editors
- Process Management
- Pipelining on Linux.

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- Introduction to File system
- Inode
- File permissions
- Advanced file management commands
- User & group management commands

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LINUX FILE SYSTEM

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What is a File ?

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What is a Directory?

File System is often specified in two terms:

- A specific type of data storage format
- The Linux Directory sturcture

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Data Storage format/File System

Why we need a File System?

Formatting –

Process of writing a file system to the disk and preparing it for file operations.

File System –

That which structures data and controls how data is written to and retrieved from the underlying disk.

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Basic Parameters Of Formatted Disk :

- Max File System size
- Max File size (16 TIB i.e 2^32)
- Max Inode number (32 bit)

Types of File Systems:

- Ext4
- Fat32
- NTFS
- BtrFS
- XFS
- ZFS

Ext4:

- Journaling file system or fourth extended file system for linux.
- Successor of ext3 developed between 2003 to 2006.

Ext4 Formatting structure:

Memory Block Size - 1 KiB to 64 KiB
Default Block Size - 4 KiB
Extent Attribute - upto 128 MiB

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Ext4 Disk Parameters:

Max File Size - 16 TiB

Max Volume Size - 1 EiB

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Features of Ext4:

- It is Journaling File System.
- Delayed Data Allocation.
- Online Defragmentation.

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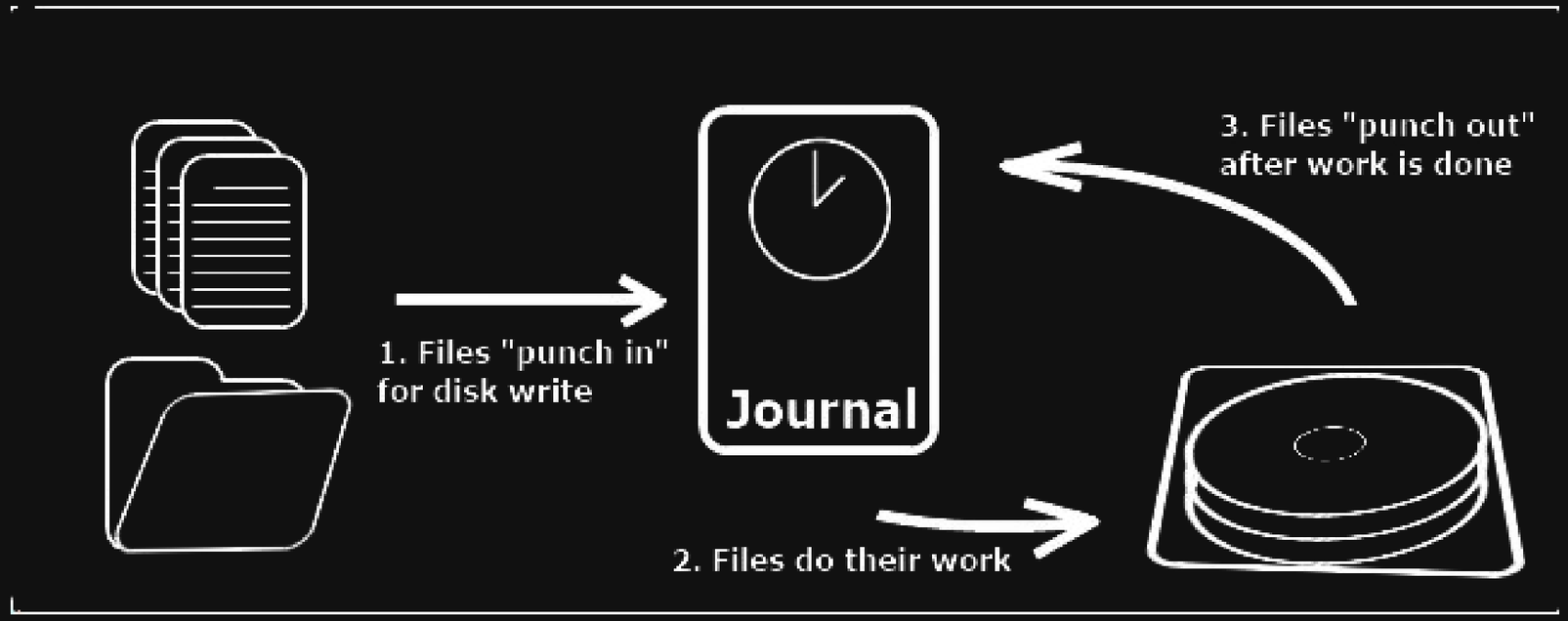
Journaling:

- Cataloging the memory write process



XFS :

- Widely used in Enterprise Environment.
- Is a default file system in RHEL.
- Manages huge chunk of data.
- Also used by Scientific Orgs. such as NASA, Cern .corp, etc.

XFS Formatting structure:

Memory Block Size - 1 KiB to 64 KiB
Default Block Size - 4 KiB
Extent Attribute - upto 8 GiB
Max Allocation Group Size - 1 TiB

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XFS Disk Parametes :

Max File Size - 8 TiB

Max Volume Size - 16 EiB

Features of XFS:

- Online Defragmentation. (Using [xfs_fsr])
- Online Resizing. (Using [xfs_growfs] tool)
- Guaranteed I/O.

ZFS (ZettaByte File System):

- 1 ZiB = 1000 EiB or 256 Quadrillion bits.
- Acts as volume manager and File System.
- Mainly used in Servers.
- Developed by Sun Microsystems.

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ZFS Disk Parametes :

Max File Size - 16 EiB

Max Storage - 256 Quadrillion Zettabytes

Features of ZFS:

- Transactional Semantics
- CheckSums
- Single F.S snapshot
- Built-in Scrub

BtrFS:

- Known as "Better FS" or "B tree File System".
- Same as ZFS but offers a lot of advanced features.
- Open Source.
- Would replace Ext4 as default system for linux.

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BtrFS Disk Parametes :

Max File Size - 16 EiB

Max Storage - 16 EiB

Features of BtrFS:

- Snapshot of volume can be taken. (-r,-w,-r/w)
- Transparent file compression
  Uses Three types of algorithms -
    ZLIB, LZO, LSTD
- Can convert Ext FS to BtrFs.
- Online defragmentation and SSD Optimization.

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The Linux Directory Structure

File System Hierarchy Standard:

Unix Standard that defines the directory structure and directory contents in Unix/Linux OS as maintained by Linux foundation.

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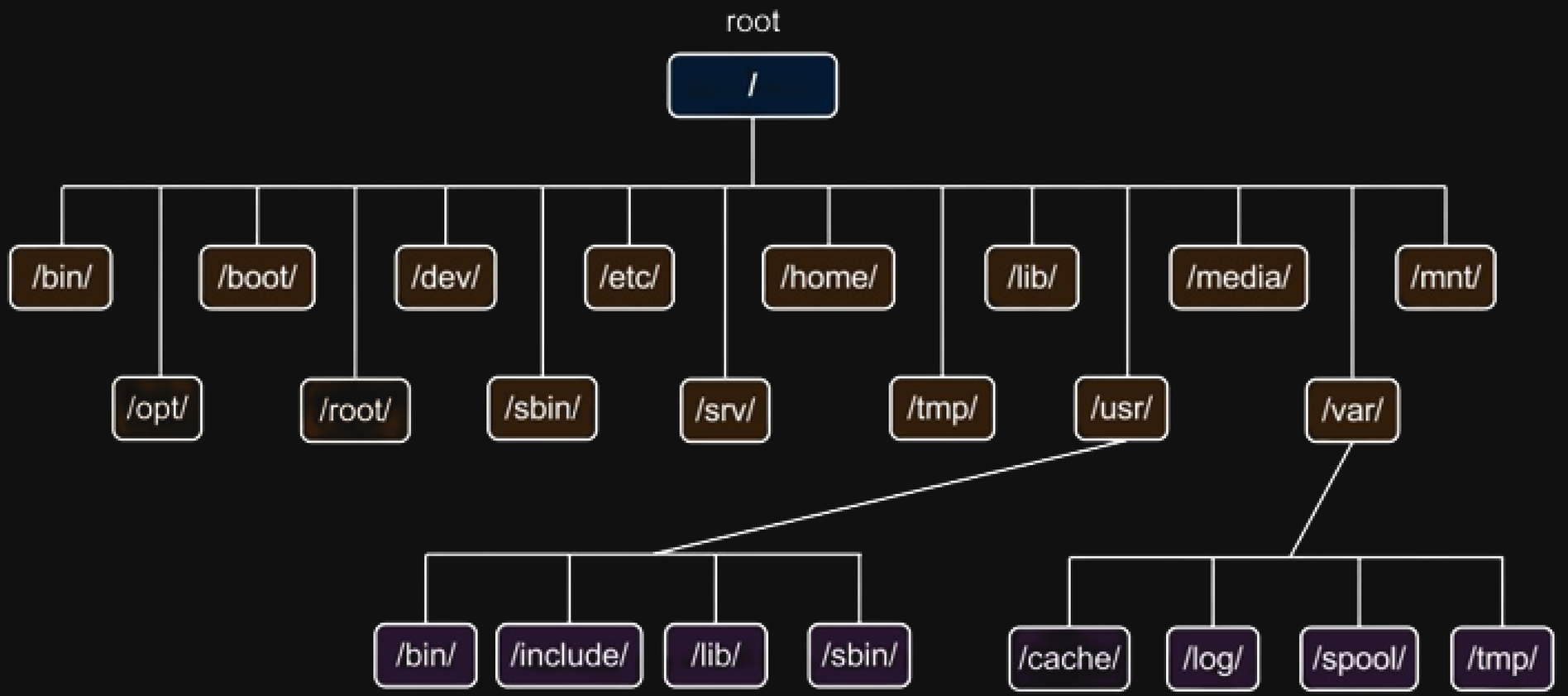
The FHS Tree :



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USERS IN LINUX

Linux is a Multi-user Operating System

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TYPES OF USERS IN LINUX

- Regular Users
- System Users

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USER ACCOUNTS IN LINUX

REGULAR USER

- Has moderate Privilege
- Whenever a user is created, it owns a Home directory
- Each user has unique UID(User ID) and GID(Group ID)

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SYSTEM USERS

- Runs non-interactive or background processes on a system
- Has the highest privilege in system
- All the created users details can be found in /etc/passwd file
- Command: cat /etc/passwd

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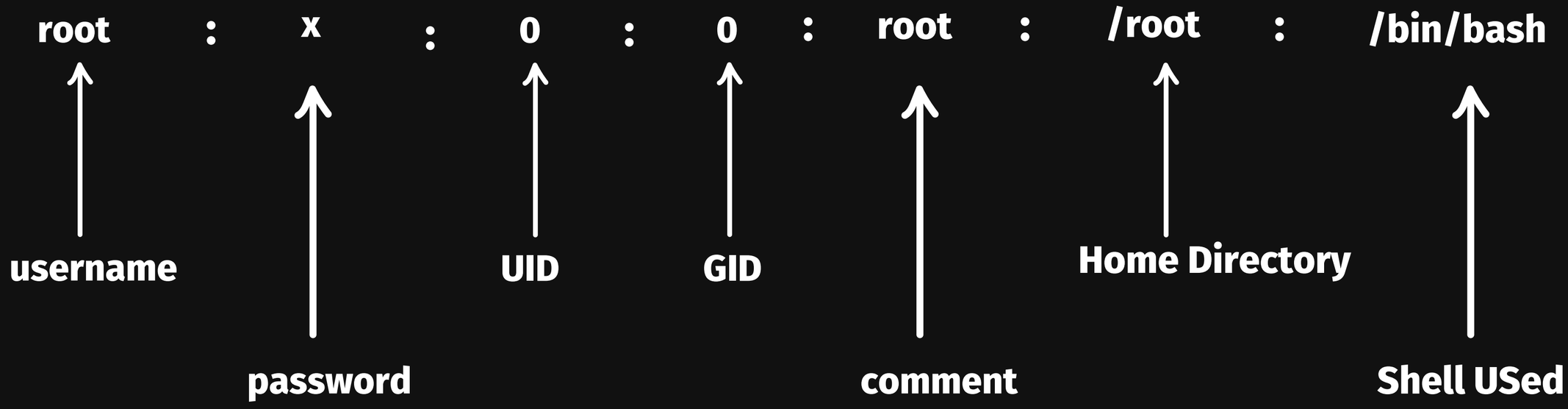
ANALYSING OUTPUT



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SUPER USER IN LINUX

- Also known as root user
- Has right to access anything on its own server
- Unrestricted access to the whole system; all commands and all files regardless of their permissions

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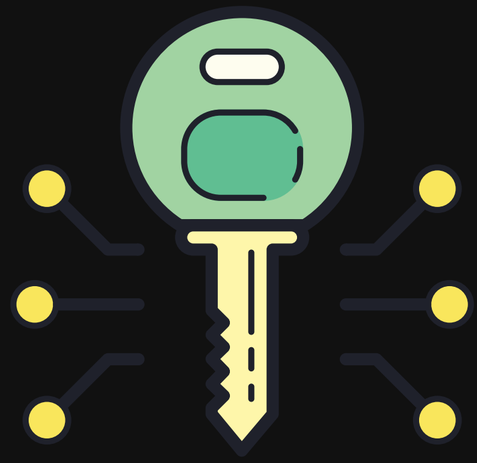
WHAT IS SUDO?

- The Master-Key to your high-privilege admin tasks
- Unrestricted access to the whole system; all commands and all files regardless of their permissions



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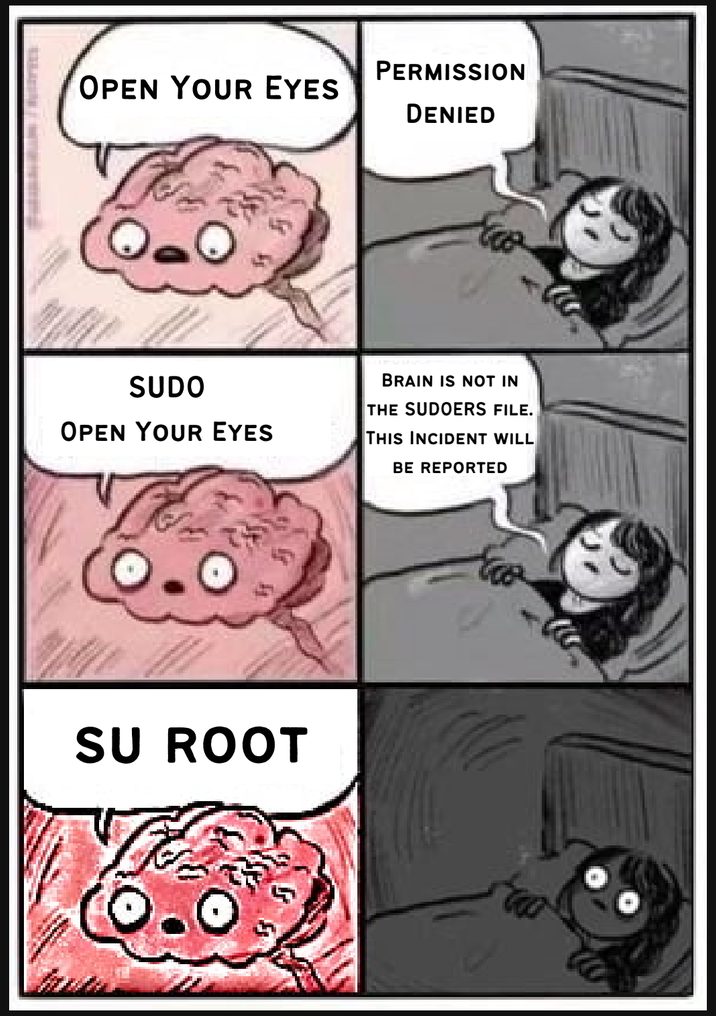
SUDO



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GROUPS IN LINUX

- Collections of zero or more users
- Easy to Manage users with the same security and access privileges
- A user can be part of different groups

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TYPES OF GROUPS

- **Primary group** : Name of the primary group is the same as the name of the user. Each user must belong to exactly one primary group.
- **Secondary group** : A user can be a member of zero or more secondary groups.

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happy birthday

BOB

ALICE

PAUL

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FILE PERMISSIONS

- File ownership can be changed using the chown and chgrp commands.
- To view the file permissions, use the ls command:
  ls -l file_name

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TYPES OF FILE PERMISSIONS

- The READ Permission
- The WRITE Permission
- The EXECUTE Permission

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Output

```
-rw-r--r-- 12 linuxize users 12.0K Apr  28 10:10 file_name
|[-][-][-]-   [------] [---]
| |  |  | |      |       |
| |  |  | |      |       +-----------> 7. Group
| |  |  | |      +-------------------> 6. Owner
| |  |  | +--------------------------> 5. Alternate Access Method
| |  |  +----------------------------> 4. Others Permissions
| |  +-------------------------------> 3. Group Permissions
| +----------------------------------> 2. Owner Permissions
+------------------------------------> 1. File Type
```

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FUN FACT

- Linus Torvalds wanted to name the project Freax (combination of free and Unix) but his colleague had created an FTP server named Linux (combination of Linus and Unix) for the project already.

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COMMANDS	DESCRIPTION	SYNTAX
touch	Creating simple files on a Linux system	touch file_name
cat >	Creating simple files and adding content	cat > file_name
>	Creating simple files	> file_name

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COMMANDS	DESCRIPTION	SYNTAX
cat >>	Appends text into the file	cat >> file_name
cat	Displays file content	cat file_name

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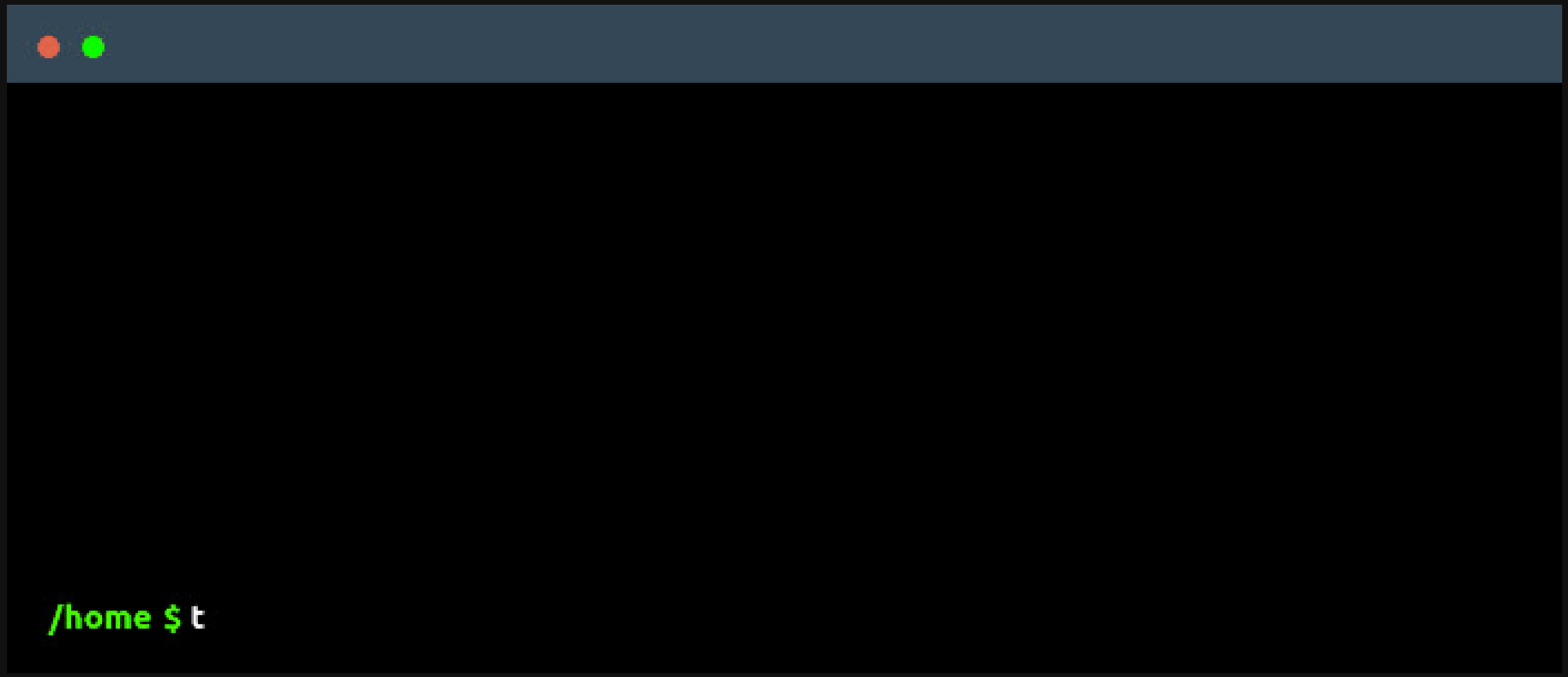

COMMANDS	DESCRIPTION	SYNTAX
mv	Rename or move a file	mv filename1 filename2
cp	Copy file	cp filename1 filename2
rm	Removes a file	rm file_name

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```
/home $ m
```

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COMMANDS	DESCRIPTION	SYNTAX
mkdir	To create a directory	mkdir directory_name
cd	Change current working directory	cd directory_name

COMMANDS	DESCRIPTION	SYNTAX
mv	Rename or move a directory	mv filename /path/to/destination/
rmdir	Deletes an Empty Directory	rmdir Directory_name

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COMMANDS	DESCRIPTION	SYNTAX
grep flags = -i, -n	Find phrase within file	grep [phrase] [filename]
gio trash flag = --empty	Move file to trash	gio trash [filename]

COMMANDS	DESCRIPTION	SYNTAX
wc flags = -l,-w,-c	To count the lines, words, and characters in a file	wc [filename]
comm flags = – nocheck-order	To compare two files	comm [filename1] [filename2]

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COMMANDS	DESCRIPTION	SYNTAX
groupadd	To create a group	groupadd [groupname]
groupdel	To delete a group	groupdel [groupname]

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COMMANDS	DESCRIPTION	SYNTAX
useradd flags =-m	To create a user	useradd [username]
userdel	To delete a user	userdel [username]

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COMMANDS	DESCRIPTION	SYNTAX
/etc/group	To list all groups	cat /etc/group
/etc/passwd	To list all users	cat /etc/passwd

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COMMANDS	DESCRIPTION	SYNTAX
id	To display user and group id	id [username]
groups	To display user's groups	groups [username]

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COMMANDS	DESCRIPTION	SYNTAX
groupmod	To rename a group	groupmod -n [newgroup] [oldgroup]
usermod	To rename a user	usermod -l [newuser] [olduser]

COMMANDS	DESCRIPTION	SYNTAX
gpasswd -a	To add existing user to the group	gpasswd -a [username] [groupname]
gpasswd -d	To remove a user from a group	gpasswd -d [username] [groupname]

COMMANDS	DESCRIPTION	SYNTAX
usermod -g	To change a user primary group	usermod -g [groupname] [username]
usermod -a -G	To change a user secondary group	usermod -a -G [groupname] [username]

COMMANDS	DESCRIPTION	SYNTAX
chown	changes the user and/or group ownership of for given file.	chown user:group [filename]
chmod	To set or remove file permission	chmod a+r [filename]

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drwxrwxrwx

d = Directory
r = Read
w = Write
x = Execute

7	rwx	111
6	rw-	110
5	r-x	101
4	r--	100
3	-wx	011
2	-w-	010
1	--x	001
0	---	000

chmod 777

rwx | rwx | rwx
Owner | Group | Others

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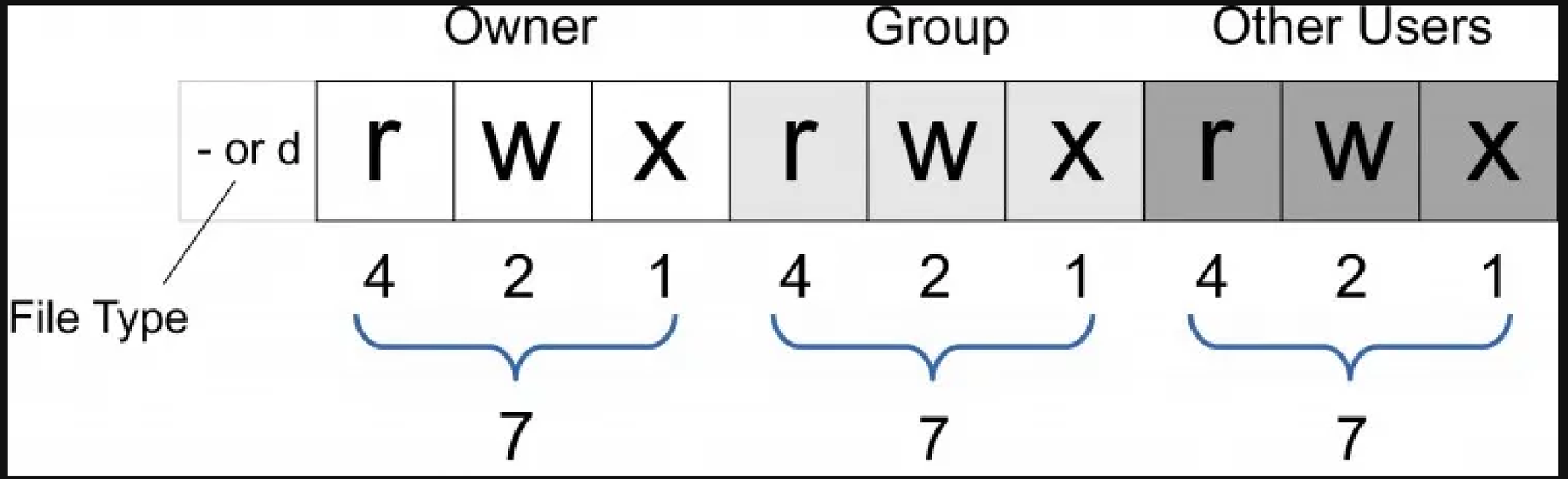

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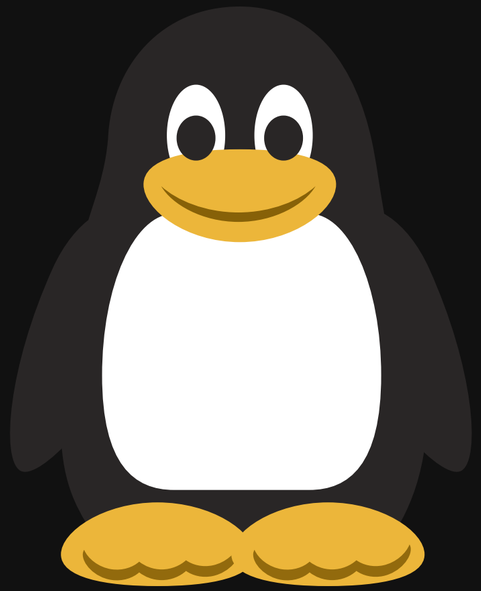
Thank You !!