LINUX & COMMAND LINE CRASH COURSE

PART 1: What is Linux?

Linux is an open-source, Unix-like operating system that powers:

- Servers
- Desktops
- Embedded systems
- Android devices

It is known for stability, security, and flexibility.

Common distributions (distros): Ubuntu, Debian, Fedora, Arch, CentOS, Kali, Mint.

PART 2: The Command Line Interface (CLI)

The **command line** is a text-based interface for interacting with the system. You type commands into a **terminal**, and the system executes them.

Common **shells**:

- bash (default on many systems)
- zsh
- fish

PART 3: Linux Filesystem Structure

Linux uses a single-root hierarchy starting at `/`.

Directory	Purpose
`/`	Root directory
`/home`	User home directories
`/etc`	System and service configuration files
`/var`	Logs and variable data
`/usr`	Applications and libraries
`/bin`, `/sbin`	Essential system binaries
`/tmp`	Temporary files
`/dev`	Device files

PART 4: Navigation and File Management

Navigation

Command	Example	Description
`pwd`	`pwd`	Print working directory
`ls`	`ls -l`	List files and directories
`cd`	`cd /home/user`	Change directory
`tree`	`tree`	Show directory structure (requires installation)

Files and Directories

Command	Example	Description
`mkdir`	`mkdir myfolder`	Create directory
`rmdir`	`rmdir myfolder`	Remove empty directory
`rm`	`rm file.txt`	Delete file
`rm -r`	`rm -r folder`	Delete folder recursively
`cp`	`cp file1.txt file2.txt`	Copy files
`mv`	`mv old.txt new.txt`	Move or rename file
`touch`	`touch file.txt`	Create empty file
`cat`	`cat file.txt`	Show file contents
`less`	`less file.txt`	View file page by page
`head` / `tail`	`head -n 10 file.txt`	View beginning or end of file

PART 5: System and Process Management

Command	Example	Description
`whoami`		Show current user
`uname -a`		Show system information
`top`		Show running processes
`htop`		Interactive process viewer (install with `sudo apt install htop`)
`ps aux`		List all running processes
`kill`	`kill 1234`	Kill process by PID
`df -h`		Show disk usage
`du -sh folder`		Show folder size
`free -h`		Show memory usage

Command	Example	Description
`uptime`		Show system uptime
`history`		Show command history

PART 6: Permissions and Ownership

Each file and directory has permissions for **user**, **group**, and **others**. Permissions: **r** (read), **w** (write), **x** (execute)

Command	Example	Description
`ls -l`		Show permissions
`chmod`	`chmod 755 script.sh`	Change permissions
`chown`	`chown user:group file`	Change owner and group
`sudo`	`sudo apt update`	Run command as superuser

PART 7: Networking Commands

Command	Example	Description
`ping`	`ping google.com`	Test connectivity
`ip a`		Show network interfaces
`curl`	`curl https://example.com`	Fetch data from URL
`wget`	`wget file_url`	Download file
`ssh`	`ssh user@host`	Connect to remote host
`scp`	`scp file.txt user@host:/path`	Copy files securely
`netstat -tuln`		Show open ports

PART 8: Package Management

Debian/Ubuntu (APT)

```
sudo apt update
sudo apt install package
sudo apt remove package
sudo apt upgrade
```

Fedora/RHEL (DNF)

```
sudo dnf install package
sudo dnf update
sudo dnf remove package
```

Arch (pacman)

```
sudo pacman -S package
sudo pacman -R package
sudo pacman -Syu
```

PART 9: Searching and Filtering

Command	Example	Description
`grep`	`grep "error" logfile.log`	Search text in file
`find`	`find / -name file.txt`	Find files
`locate`	`locate config.json`	Search file database
`wc`	`wc -l file.txt`	Count lines, words, characters
`sort`	`sort data.txt`	Sort text
`uniq`	`uniq file.txt`	Remove duplicate lines
`cut`	`cut -d ":" -f1 /etc/passwd`	Extract specific fields
`awk`	`awk '{print $1}' file.txt`	Pattern scanning and processing
`sed`	`sed 's/old/new/g' file.txt`	Stream editor for text substitution

PART 10: Shell Shortcuts and Tricks

Shortcut	Description
`Tab`	Autocomplete command or filename
`Ctrl + C`	Cancel running command
`Ctrl + L`	Clear terminal screen
`Ctrl + R`	Search through command history
`!!`	Repeat last command
`>`	Redirect output to file (`ls > files.txt`)
`>>`	Append output to file (`echo "text" >> file.txt`)
`|`	Pipe output to another command (`ps aux | grep python`)

PART 11: File Compression and Archiving

Command	Example	Description
`tar -cvf`	`tar -cvf archive.tar folder/`	Create tar archive
`tar -xvf`	`tar -xvf archive.tar`	Extract tar archive
`gzip`	`gzip file.txt`	Compress file
`gunzip`	`gunzip file.txt.gz`	Decompress gzip file
`zip`	`zip archive.zip file1 file2`	Create zip archive
`unzip`	`unzip archive.zip`	Extract zip archive

PART 12: Daily Useful Commands

Command	Description
`man command`	Display manual for a command
`alias ll='ls -lah'`	Create shortcut for a command
`date`	Show date and time
`cal`	Display calendar
`echo $PATH`	Show environment variable
`nano file.txt`	Edit file with nano
`vim file.txt`	Edit file with Vim
`shutdown now`	Shut down system
`reboot`	Restart system

PRACTICE MINI-PROJECT

```
cd /tmp
mkdir linux_practice
cd linux_practice
touch test.txt
echo "Hello Linux" > test.txt
cat test.txt
cp test.txt copy.txt
mv copy.txt renamed.txt
tar -cvf myfiles.tar ./
ls -l
```

RECOMMENDED LEARNING RESOURCES

- Online terminal practice: https://linuxcommand.org/lc3_learning_the_shell.php
- Book: *The Linux Command Line* by William Shotts
- Cheat sheet: https://cheat.sh