# DAY 2 – LINUX FUNAMENTALS

What is an Operating System ?

- Operating System is a system software that controls the execution of other application programs and also acts as an interface between application programs and computer hardware.
- Its key Functions are :
    - Resource management
    - File System Management
    - Process Management
    - User Interface
    - Security and Access Control
- Examples → Windows , macOS , Linux , iOS etc.

What is Linux ?

1. It is an open -source operating system that is based on Unix architecture.
2. Open Source means that is is free to use and modify, with a large community contributing to its improvement.
3. It was founded by Linus Torvalds in 1991.
4. It is widely used for its robustness, security, and versatility. Unlike proprietary operating systems like Windows or macOS, Linux is freely available to anyone, and its source code can be modified and distributed.
5. This flexibility has led to the creation of various distributions (distros), such as Ubuntu, CentOS, Fedora, and Debian, each tailored for different uses and user preferences.
6. It is a command based operating system.
7. It consists of Kernel which is also called heart of Linux , commands in Linux are typed in Shell (Terminal).It act as a Bridge between computers hardware and software applications that you run.
    1. It provides Stability ensures that the system runs smoothly and efficiently.
    2. Performance
    3. Security
8. Whenever a user types a command in Shell , it requests the kernel to run the command , the kernel finds the executable file (program) in the system for the command provided by the user and executes it. For example → mkdir creates a New Folder.
9. In Linux everything is represented as a file including a hardware program , the files are stored in a directory , and every directory contains a file with a tree structure. That is called File System Hierarchy.
10. Root Directory is a top level directory and is represented with / (fwd slash) in Linux.

Basic structure of Linux
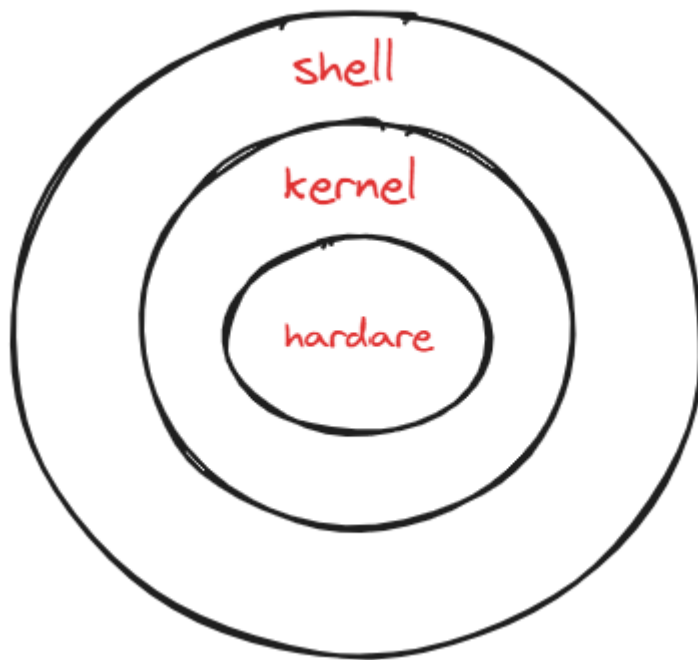
Advantages of using Linux

1. **Open Source**: Free to use, modify, and distribute.
2. **Multi-User**: Linux allows multiple users to log in and use the system simultaneously, each with their own isolated environment.
3. **Multi-Tasking**: Linux enables a single user to run multiple applications at the same time, efficiently managing system resources to keep everything running smoothly.
4. **High Security**: Strong security features with low susceptibility to malware.
5. **Stability and Reliability**: Robust performance and consistent uptime.

Difference b/w Unix and Linux

1. **Origin**:
   - **Unix**: Made in the 1960s by AT&T.
   - **Linux**: Created in 1991 by Linus Torvalds.
2. **Licensing**:
   - **Unix**: Costs money and has restrictions.

- **Linux**: Free to use and open-source.
3. **Distributions**:
    - **Unix**: Has few commercial versions like AIX and Solaris.
    - **Linux**: Has many free versions like Ubuntu and Fedora.

Linux Commands

1] This command is used to check the information regarding operating system.

`$lsb_release -a`

> ##output##
> No LSB modules are available.
> Distributor ID: Ubuntu
> Description: Ubuntu 22.04.4 LTS
> Release: 22.04
> Codename: jammy

2] The `clear` command in Linux is used to clear the terminal screen. When you type `clear` and press Enter, it removes all the previous output from the terminal, giving you a clean screen to work with.
`$clear`
After running this command, the terminal screen will be cleared of all previous commands and outputs, leaving you with a blank screen.

3] The `ls` command in Linux is used to list the contents of a directory. It shows files and directories within the specified directory. By default, if no directory is specified, it lists the contents of the current directory.

```
$ ls
```

Common Options:

- `-l` : Long listing format, shows detailed information.
- `-a` : Includes hidden files (those starting with a dot).
- `-h` : Human-readable sizes (used with `-l`).
- `-R` : Recursively lists subdirectories.

```
$ ls # Lists files and directories in the current directory
$ ls -l # Lists files with detailed information (permissions, owner,
size, etc.)
$ ls -a # Includes hidden files in the listing
```

4] `whoami` command gives the name of the current user
ex → `$whoami`

5] The `pwd` command stands for "print working directory." It displays the full path of the current directory you are in.
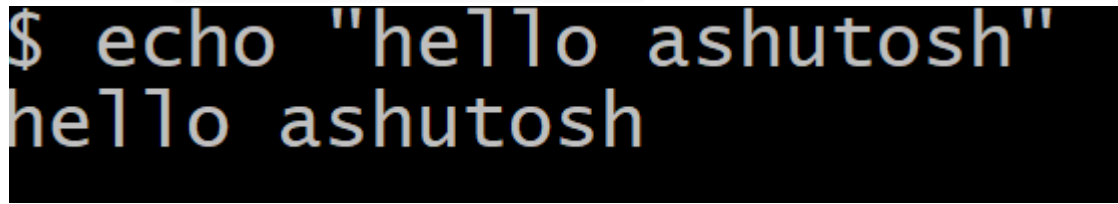Syntax→ `$ pwd`
⇒ Output
`/home/username/projects`

6] The `cd` command stands for "change directory." It is used to change the current working directory to another directory.
example → `` `$ cd directory_name ``

- Change to a specific directory: `$ cd /path/to/directory`
- Move up one directory level : `$ cd ..`
- Move to the home directory: `$cd`
- Move to the previous directory: `$cd -`

7] `$echo` is a command used to print string in terminal

Syntax → `$ echo [options] [string]`

```
$ echo "hello ashutosh"
hello ashutosh
```

8] The `touch` command in Linux is used to create empty files or update the access and modification timestamps of existing files.

`$ touch filename`

example → `$touch hello.txt`

- Create a file in a specific directory → `$ touch /path/to/directory/newfile.txt`
- Now to create multiple files at once we use → `$ touch file{1..10}.txt` (This creates 10 empty files in the current directory).

9] The `df` command in Linux is used to display the amount of disk space available on the file system. It shows the total, used, and available disk space for each mounted file system.

`$df [options]`

Common Options:

- `-h` : Human-readable format (shows sizes in KB, MB, GB).
- `-T` : Shows the file system type.
- `-i` : Shows inode usage instead of block usage.

Output

```
$ df -h
Filesystem              Size  Used Avail
Use% Mounted on
C:/Program Files/Git  476G  356G  120G
 75% /
G:                    100G   12G   89G
 12% /g
```

10] The `cp` command in Linux is used to copy files and directories from one location to another.

`$ cp [options] source destination`

Common Options:

- `-r` : Recursively copy directories and their contents.

⇒ example → `$ cp file1.txt /path/to/destination/`

11] The `ping` command in Linux is used to test the network connectivity between your computer and another computer by sending ICMP echo requests and receiving echo replies.

`$ ping google.com`

> [Output]
> Pinging www.google.com [142.250.182.196] with 32 bytes of data:
> Reply from 142.250.182.196: bytes=32 time=7ms TTL=117
> Reply from 142.250.182.196: bytes=32 time=6ms TTL=117
> Reply from 142.250.182.196: bytes=32 time=5ms TTL=117
> Reply from 142.250.182.196: bytes=32 time=5ms TTL=117
>
> Ping statistics for 142.250.182.196:
> Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
> Approximate round trip times in milli-seconds:
> Minimum = 5ms, Maximum = 7ms, Average = 5ms

12] The `rm` command in Linux is used to remove files and directories. Be cautious when using this command, as it permanently deletes the specified files or directories without sending them to a trash or recycle bin.

Syntax → `$ rm [options] filename`

Common Options:

- `-r` : Recursively remove directories and their contents.
- `-f` : Force removal without prompting for confirmation.
- `-i` : Prompt for confirmation before each removal.
  Examples →

1. `$ rm file1.txt` → this removes single file.
2. `$ rm -r new*` → This deletes all the files that start with name new recursively.
3. Be very careful when using `rm -rf`, as it will forcefully and recursively remove files and directories without any prompts, which can lead to accidental data loss.

13] You can create a file and write content into it using various commands in Linux. Here are a few common methods:

- **Using `echo` and Redirection:**

  `$ echo "Hello, World!" > myfile.txt`
  This creates a file named `myfile.txt` and writes "Hello, World!" into it. If `myfile.txt` already exists, it will be overwritten.
- **Using `cat` Command:**
  `$ cat > myfile.txt Hello, World! This is a new file. Press Ctrl+D (or Ctrl+Z on Windows) to save and exit.`
  This creates `myfile.txt` and allows you to type multiple lines. Press `Ctrl+D` to save and exit.
- If the file is already created and you want to add text in that file then we can use the vim editor to do that.
  - example → `vim myfile.txt`

- After this a vim editor will open to insert and start typing the text press "i" button on keyboard it will go to insert mode.
- After completing the typing to exit the insert mode press "esc" (escape) button on keyboard
- To save and quit the file we type ":wq" on keyboard.

NOW TO DISPLAY THE CONTENT OF FILE ON TERMINAL

- `$ cat myfile.txt` → This displays the entire contents of `myfile.txt`.
- `$ less myfile.txt` → This allows you to scroll through the contents of `myfile.txt`. Use `q` to quit.

14] The `sudo` command in Linux stands for "superuser do" and is used to execute commands with elevated (superuser or root) privileges. This allows users to perform administrative tasks that require higher permissions than those granted to regular users.
`apt` is a package manager for Debian-based Linux distributions like Ubuntu. It helps you install, update, and manage software packages on your system.

- `$ sudo command`
  To update ubuntu
- `$ sudo apt update` → This downloads the index files, If a new version of a package has been released, `apt update` will retrieve this information so you can upgrade to the new version later.
- `$sudo apt upgrade` → It downloads the latest version packages of the installed packages ,Upgrades installed packages to their latest versions.
- If you have an outdated version of a package, `apt upgrade` will replace it with the latest version available from the repositories.
  To Add new user to Ubuntu
- `$ sudo useradd -m username` → Add new user and `-m` option ensures that a home directory is created for the new user.
- `$ sudo passwd username` → setting the password for the new created user.
- `$ su username` → used to switch to another user.
  To Install and Uninstall applications from Ubuntu

- `$ sudo apt-get install docker.io` → this command installs docker from the internet. (get is used to get the latest packages from the internet).
- `$ sudo apt purge docker` → this command is used to permanently remove/uninstall all the application and configuration files from ubuntu.
- `$ sudo apt remove docker` → this command is used to delete all the application files but it leaves behind the configuration files so that the application can be reinstalled with the settings intact.

15] `head` command is used to view the lines of text inside a file from the top we use `head` command , by default it shows 10 lines from the top.
Syntax → `$ head filename.txt`
Now to view specific number of line/lines we can use `-n`
`$ head -n 5 filename.txt` or `$ head filename.txt -n 5`
this shows the first 5 lines from the specified file.
⇒ Same goes for `tail` command , it is used to display the last lines of code inside a file, default value is 10 but we can also specify the number of lines to show.
example → `$ tail -n 5 filename.txt`

16] The `find` command searches for files and directories within a directory hierarchy based on various criteria.
Syntax → `$ find /path/to/search -type f -name "filename"`

- `/path/to/search` : Directory where the search begins.
- `-type f` : Finds files (use `-type d` for directories).
- `-name "filename"` : Matches files with the specified name.

Examples:

1. **Find a File by Name**:
   `$ find /home/user -name "file.txt"`
   Searches for `file.txt` starting from `/home/user`.
2. **Find All `.txt` Files**:
   `$ find /path/to/search -type f -name "*.txt"` Finds all `.txt` files in the

specified directory and subdirectories.

17] The `grep` command searches for specific patterns within files or input provided to it.
Syntax → `$ grep "pattern" filename`

- `"pattern"` : The text or regular expression to search for.
- `filename` : The file in which to search.
  Examples
- **Search for a Pattern in a File**: `$ grep "search_term" file.txt`
  Finds and displays lines containing `search_term` in `file.txt`.
- **Search for a Pattern Recursively in a Directory**: `$ grep -r "search_term" /path/to/search`
  Searches for `search_term` in all files within `/path/to/search`.