[01].Understanding Linux file system in depth:

The Linux file system is a hierarchical structure that organizes files and directories in a tree-like manner. At the top of this hierarchy is the root directory (/), from which all other directories branch out. This structure allows for efficient organization, access control, and management of files on the system. Here's a detailed breakdown:

1. The Root Directory (/)

The root directory is the base of the entire Linux file system. All other directories and files stem from this point. It is denoted by a single forward slash (/). Unlike in some other operating systems, there's no concept of drive letters (like C: in Windows); everything in Linux is under this single root directory.

2. Key Directories under the Root (/)

- /bin (Binary):
  Contains essential user command binaries (executables) required for system operation. Commands like ls, cp, mv, and cat are stored here. These are crucial for both the system and users.
- /boot:
  Contains the files necessary to boot the system, including the Linux kernel (vmlinuz), boot loader configuration files, and initial RAM disk image (initrd). It is critical for the system startup process.
- /dev (Device Files):
  Contains device files that represent hardware devices (e.g., hard drives, terminals, USB devices). Linux treats devices as files, allowing them to be accessed and managed like regular files.
- /etc (Configuration Files):
  Holds system-wide configuration files and shell scripts used to boot and initialize the system. Files like /etc/passwd (user account information) and /etc/fstab (disk partitions) reside here.
- /home:
  Contains the home directories of all users. Each user has a directory under /home (e.g., /home/username), where personal files, configurations, and data are stored. This separation helps in managing user data and permissions.
- /lib (Libraries):
  Contains shared libraries needed by the binaries in /bin and /sbin. These libraries are similar to DLL files in Windows. The /lib/modules directory contains kernel modules.
- /media and /mnt (Mount Points):
  These directories are used as mount points for removable media like USB drives, CDs, and other file systems. While /media is typically used for automatically mounted devices, /mnt is often used for manual mounts.
- /opt (Optional Packages):
  Contains optional software packages that are not part of the default installation. It's often used

for large third-party software packages that can be added or removed without affecting the base system.

- /proc (Process Information):
  A virtual file system that provides an interface to kernel data structures. It contains information about system processes and kernel information, accessible via files like /proc/cpuinfo (CPU details) and /proc/meminfo (memory usage).
- /root:
  The home directory for the root user (the system administrator). It is separate from the /home directory to ensure that the root's files are isolated from those of regular users.
- /sbin (System Binaries):
  Contains essential system binaries that are typically only accessible to the root user. These include administrative commands like ifconfig, reboot, and fdisk.
- /srv (Service Data):
  Contains data for services provided by the system, such as web servers or FTP servers. For example, a web server might serve files from /srv/www.
- /tmp (Temporary Files):
  Used for temporary files created by the system and users. The contents of /tmp are usually deleted upon reboot, making it ideal for short-term storage.
- /usr (User Binaries and Data):
  A secondary hierarchy containing user programs and data. It is often the largest directory on a system. Key subdirectories include:
  - /usr/bin: Non-essential command binaries for all users.
  - /usr/sbin: Non-essential system binaries, typically for administrative tasks.
  - /usr/lib: Libraries for /usr/bin and /usr/sbin.
  - /usr/local: Locally compiled and installed software, usually from source.
- /var (Variable Files):
  Contains files that are expected to grow in size, such as logs (/var/log), mail (/var/mail), and temporary files created by applications (/var/tmp). It also contains directories like /var/www (web server files) and /var/lib (state information).

[02].Basic commands including:

1. vim (Vi Improved)

- **Description:** A powerful text editor used for creating and editing files.
- **Usage:**
  - vim file_name: Open a file in vim.

    - Basic commands:
        - i: Insert mode (for editing text).
        - Esc: Exit insert mode.
        - :w: Save changes.
        - :q: Quit vim.
        - :wq: Save and quit.

2. grep (Global Regular Expression Print)

- **Description:** Searches for patterns within files.
- **Usage:**
    - grep 'pattern' file_name: Search for a pattern in a file.
    - grep -r 'pattern' directory: Recursively search in a directory.
    - grep -i 'pattern' file_name: Case-insensitive search.

3. more and less

- **Description:** View the content of files one screen at a time.
- **Usage:**
    - more file_name: View the file with basic navigation.
    - less file_name: View the file with more advanced navigation (backward/forward).

4. tail

- **Description:** Displays the last few lines of a file.
- **Usage:**
    - tail -n 10 file_name: Show the last 10 lines of a file.
    - tail -f file_name: Continuously monitor a file for new lines (commonly used for log files).

5. head

- **Description:** Displays the first few lines of a file.
- **Usage:**
    - head -n 10 file_name: Show the first 10 lines of a file.

6. wc (Word Count)

- **Description:** Counts lines, words, and characters in a file.
- **Usage:**

- wc file_name: Display line, word, and character count.
- wc -l file_name: Count lines.
- wc -w file_name: Count words.
- wc -c file_name: Count bytes/characters.

7. sort

- **Description:** Sorts lines of text files.
- **Usage:**
  - sort file_name: Sort lines alphabetically.
  - sort -n file_name: Sort lines numerically.
  - sort -r file_name: Sort lines in reverse order.

8. uniq

- **Description:** Removes duplicate lines from a sorted file.
- **Usage:**
  - uniq file_name: Remove duplicate lines.
  - sort file_name | uniq: Combine with sort to remove duplicates.

9. tee

- **Description:** Reads from standard input and writes to standard output and files.
- **Usage:**
  - command | tee file_name: Save the output of a command to a file and display it on the terminal.

10. cat (Concatenate)

- **Description:** Concatenates and displays the content of files.
- **Usage:**
  - cat file_name: Display the content of a file.
  - cat file1 file2 > file3: Concatenate two files into a new file.

11. cut

- **Description:** Removes sections from each line of files.
- **Usage:**
  - cut -d 'delimiter' -f field_number file_name: Extract specific fields from a file.

- Example: cut -d ',' -f 1 file_name.csv extracts the first column of a CSV file.

12. sed (Stream Editor)

- **Description:** Performs basic text transformations on an input stream.
- **Usage:**
  - sed 's/old/new/g' file_name: Replace all occurrences of 'old' with 'new' in a file.
  - sed -n 'p' file_name: Print specific lines.

13. tr (Translate)

- **Description:** Translates or deletes characters.
- **Usage:**
  - tr 'a-z' 'A-Z' < file_name: Convert lowercase letters to uppercase.
  - tr -d '[:space:]' < file_name: Delete all spaces from the input.

14. paste

- **Description:** Merges lines of files horizontally.
- **Usage:**
  - paste file1 file2: Combine corresponding lines from two files into one.

[03].Commands to File/Folder management, File transfer:

File/Folder Management Commands

1. **ls (List Directory Contents)**
   - **Description:** Lists files and directories in the current directory.
   - **Usage:**
     - ls: Basic listing.
     - ls -l: Long format listing with details.
     - ls -a: Include hidden files.
     - ls -h: Human-readable file sizes.
2. **cd (Change Directory)**
   - **Description:** Changes the current working directory.
   - **Usage:**

        - cd directory_name: Move to the specified directory.
        - cd ..: Move up one level in the directory tree.
        - cd ~: Move to the home directory.
3. **pwd (Print Working Directory)**
    - **Description:** Displays the current directory path.
    - **Usage:**
        - pwd: Print the full path of the current directory.
4. **mkdir (Make Directory)**
    - **Description:** Creates a new directory.
    - **Usage:**
        - mkdir directory_name: Create a new directory.
        - mkdir -p /path/to/directory: Create nested directories.
5. **rmdir (Remove Directory)**
    - **Description:** Removes empty directories.
    - **Usage:**
        - rmdir directory_name: Remove an empty directory.
6. **rm (Remove Files or Directories)**
    - **Description:** Deletes files or directories.
    - **Usage:**
        - rm file_name: Remove a file.
        - rm -r directory_name: Remove a directory and its contents recursively.
        - rm -f file_name: Force removal without confirmation.
7. **cp (Copy Files and Directories)**
    - **Description:** Copies files and directories.
    - **Usage:**
        - cp source_file destination: Copy a file.
        - cp -r source_directory destination: Copy a directory recursively.
8. **mv (Move/Rename Files and Directories)**
    - **Description:** Moves or renames files and directories.

- **Usage:**
  - mv old_name new_name: Rename a file or directory.
  - mv file_name /path/to/destination: Move a file to a new location.

9. **find (Search for Files and Directories)**
   - **Description:** Searches for files and directories in a directory hierarchy.
   - **Usage:**
     - find /path -name file_name: Search for a file by name.
     - find /path -type d -name directory_name: Search for directories by name.
     - find /path -size +10M: Find files larger than 10 MB.
10. **chmod (Change File Mode/Permissions)**
    - **Description:** Changes file permissions.
    - **Usage:**
      - chmod 755 file_name: Set specific permissions.
      - chmod u+x file_name: Add execute permission for the owner.
11. **chown (Change File Owner)**
    - **Description:** Changes the ownership of files and directories.
    - **Usage:**
      - chown user_name file_name: Change the owner of a file.
      - chown user_name:group_name file_name: Change the owner and group.
12. **ln (Create Links)**
    - **Description:** Creates hard and symbolic links.
    - **Usage:**
      - ln source_file link_name: Create a hard link.
      - ln -s source_file link_name: Create a symbolic (soft) link.

File Transfer Commands

1. **scp (Secure Copy)**
   - **Description:** Copies files between hosts on a network using SSH.
   - **Usage:**

        - scp file_name user@remote_host:/path/to/destination: Copy a file to a remote host.
        - scp user@remote_host:/path/to/file_name /local/path: Copy a file from a remote host.

2. **rsync (Remote Sync)**
    - **Description:** Efficiently transfers and synchronizes files between locations.
    - **Usage:**
        - rsync -avz file_name user@remote_host:/path/to/destination: Sync files to a remote host.
        - rsync -avz user@remote_host:/path/to/file_name /local/path: Sync files from a remote host.
3. **ftp (File Transfer Protocol)**
    - **Description:** Transfers files to and from a remote host via FTP.
    - **Usage:**
        - ftp remote_host: Connect to a remote FTP server.
        - put file_name: Upload a file.
        - get file_name: Download a file.
4. **sftp (Secure File Transfer Protocol)**
    - **Description:** Transfers files securely over SSH.
    - **Usage:**
        - sftp user@remote_host: Connect to a remote host.
        - put file_name: Upload a file.
        - get file_name: Download a file.
5. **wget**
    - **Description:** Downloads files from the web.
    - **Usage:**
        - wget http://example.com/file_name: Download a file from a URL.

[04]. System information:

uname

- **Description:** Displays system information.
- **Usage:**
    - uname -a: Show all system information (kernel name, version, etc.).

top

- **Description:** Displays real-time system information and process usage.
- **Usage:**
    - top: Monitor system processes and resource usage.

htop

- **Description:** A more user-friendly version of top.
- **Usage:**
    - htop: Monitor system processes and resource usage interactively.

df (Disk Free)

- **Description:** Reports file system disk space usage.
- **Usage:**
    - df -h: Show disk space usage in a human-readable format.

du (Disk Usage)

- **Description:** Estimates file and directory space usage.
- **Usage:**
    - du -sh directory_name: Show total size of a directory in a human-readable format.

free

- **Description:** Displays the amount of free and used memory in the system.
- **Usage:**
    - free -h: Show memory usage in a human-readable format.

uptime

- **Description:** Shows how long the system has been running.
- **Usage:**
    - uptime: Display system uptime and load average.

ps (Process Status)

- **Description:** Reports a snapshot of current processes.
- **Usage:**
    - ps aux: Show all running processes.
    - ps -ef: Show detailed information about running processes.

lscpu

- **Description:** Displays CPU architecture information.
- **Usage:**
    - lscpu: Show detailed CPU information.

lsblk

- **Description:** Lists information about all available block devices.
- **Usage:**
    - lsblk: Show details of all block devices (e.g., hard drives, partitions).

dmesg

- **Description:** Prints the kernel ring buffer messages (system boot and hardware-related messages).
- **Usage:**
    - dmesg: View the kernel's messages.
    - dmesg | grep pattern: Search for specific messages.

hostnamectl

- **Description:** Shows or set the system hostname and related information.
- **Usage:**
    - hostnamectl: Show system hostname and related information.
    - hostnamectl set-hostname new_hostname: Change the system hostname.