2. Explore directory structure of Linux File System. Understand and represent file system of LINUX with brief details.

The Linux file system is a hierarchical directory structure that starts with the **root directory** (/) and expands into subdirectories. Each directory serves a specific purpose and organizes files logically for efficient management.

Hierarchy and Root Directory

- The file system begins with the **root directory** (/), which is the top-level directory.
- All files and directories in Linux are part of this hierarchy.
- Devices, processes, configuration files, and user data are organized within this structure.

Key Directories in the Linux File System

Directory	Description
/	The root directory . The base of the Linux file system, containing all other directories.
/bin	Binary files: Contains essential user commands (e.g., 1s, cat, cp, mv, etc.).
/boot	Boot loader files : Contains the Linux kernel, boot configuration files, and boot loader programs.
/dev	Device files : Contains device nodes for hardware devices (e.g., /dev/sda for a hard drive).
/etc	Configuration files: Stores system-wide configuration files (e.g., /etc/passwd, /etc/fstab).
/home	User home directories : Each user gets a subdirectory to store personal files (e.g., /home/user).
/lib	Libraries : Contains shared libraries needed by system programs and utilities.
/media	Removable media: Mount points for removable devices (e.g., USB drives, CDs).
/mnt	Mount points : Temporary mount points for filesystems (e.g., network shares or extra partitions).
/opt	Optional software: Used for third-party or additional software installations.
/proc	Process information : Virtual filesystem containing information about running processes.
/root	Root user directory: The home directory for the root (administrator) user.
/run	Runtime files : Contains runtime data like PID files and sockets for running processes.
/sbin	System binaries : Contains system administration commands (e.g., ifconfig, shutdown).
/srv	Service data: Contains data for services such as web servers (e.g., /srv/www).
/sys	System information: Virtual filesystem providing information about hardware

Directory

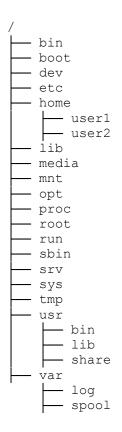
Description

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	and devices.
/tmp	Temporary files: Used to store temporary data; files are often cleared on reboot.
/usr	User programs and data : Contains user-installed software, libraries, and documentation.
/var	Variable data: Stores log files, caches, and temporary files for running applications.

Representation of the Linux File System

Below is a basic representation of the Linux file system:



1. Root Directory (/)

- The topmost directory in the Linux file system.
- Every file and directory starts here and branches out into a hierarchical structure.

2. /bin

- **Purpose**: Contains essential **binary executable files** required for basic system functionality.
- Examples: Common commands like 1s, cat, cp, mv, and grep.

3. /boot

- **Purpose**: Contains **boot loader files** necessary for starting the system.
- Examples:
 - o vmlinuz: Compressed Linux kernel file.
 - o grub/: Directory for GRUB bootloader configuration.

4. /dev

- **Purpose**: Contains **device files** representing hardware devices (e.g., disks, terminals, USB drives).
- Examples:
 - o /dev/sda: Represents the first hard disk.
 - o /dev/null: A special device that discards all data written to it.

5. /etc

- **Purpose**: Stores **configuration files** and directories for system-wide settings.
- Examples:
 - o /etc/passwd: User account information.
 - o /etc/fstab: File system mount configuration.

6. /home

- **Purpose**: Contains **user directories** where individual users store their personal files and settings.
- Examples:
 - o /home/user1: Files and data for user1.
 - o /home/user2: Files and data for user2.

7. /lib

- **Purpose**: Stores **shared libraries** and kernel modules needed by programs in /bin and /sbin.
- Examples:

o . so files (shared objects), which are the equivalent of DLLs in Windows.

8. /media

- **Purpose**: Contains **mount points** for removable media (e.g., USB drives, CDs).
- Examples:
 - o /media/usb: Mount point for a USB drive.
 - o /media/cdrom: Mount point for a CD-ROM.

9. /mnt

- **Purpose**: Temporarily **mount file systems** (e.g., external storage or network drives).
- Examples:
 - o Mount a remote file system using commands like mount /mnt/remote.

10. /opt

- **Purpose**: Contains **optional software** or third-party applications installed on the system.
- Examples:
 - A third-party application like a database or proprietary software might reside here.

11. /proc

- **Purpose**: A **virtual file system** that contains runtime system information, such as processes and kernel data.
- Examples:
 - o /proc/cpuinfo: Information about the CPU.
 - o /proc/meminfo: Information about system memory usage.

12. /root

- **Purpose**: The **home directory for the root user** (system administrator).
- Examples:
 - o Configuration files and scripts specific to the root user are stored here.

13. /run

- Purpose: Stores runtime data for processes since the last system boot.
- Examples:
 - o PID files (/run/foo.pid), sockets, and temporary system files.

14. /sbin

- **Purpose**: Contains **system binaries** for administrative tasks.
- Examples:
 - o ifconfig: Configure network interfaces.
 - o reboot: Restart the system.

15. /srv

- **Purpose**: Stores **data for services** offered by the system, such as web servers or file servers.
- Examples:
 - o /srv/www: Web server data.
 - o /srv/ftp: FTP server data.

16. /sys

- **Purpose**: Another **virtual file system** that provides system information, especially about hardware.
- Examples:
 - o /sys/class/net: Contains information about network interfaces.

17. /tmp

- **Purpose**: Stores **temporary files** created by applications or the system.
 - o Files in /tmp are often cleared on system reboot.

18. /usr

- Purpose: Contains user utilities and applications.
- Structure:
 - o /usr/bin: User-installed binaries and programs (e.g., gcc, python).

- o /usr/lib: Libraries for /usr/bin programs.
- o /usr/share: Architecture-independent files (e.g., documentation, icons).

19. /var

- **Purpose**: Contains **variable data** that changes frequently, like logs, caches, and spool files.
- Structure:
 - o /var/log: System log files (e.g., /var/log/syslog, /var/log/auth.log).
 - o /var/spool: Spool files for tasks like print jobs or mail queues.

Brief Explanation of the Linux File System

- 1. Root Directory (/):
 - o The single starting point of the file system tree.
- 2. User Directories:
 - o Files and configurations related to individual users are stored in /home.
- 3. System Files:
 - o System-critical files reside in /etc, /bin, /sbin, and /lib.
- 4. **Dynamic Information**:
 - o Directories like /proc and /sys provide a dynamic view of system processes and hardware.
- 5. Temporary Data:
 - o /tmp is used for temporary storage, while /var stores logs and frequently changing files.
- 6. **Mount Points**:
 - o External devices and filesystems are mounted under /mnt or /media.

Conclusion

The Linux file system is structured for flexibility, efficiency, and modularity. By understanding its directory hierarchy and purpose, users can effectively navigate, manage files, and troubleshoot issues in a Linux environment.