Session - 8

Linux File System – Explained

The **Linux File System** is a **hierarchical structure** used to organize files and directories on a Linux operating system. It starts from the **root directory (/)** and branches into various subdirectories.

🌳 1. Hierarchical Structure

- The **root (/)** is the top-level directory.
- Everything (files, devices, partitions) is under /.

arduino

/

├── bin/

├── boot/

├── dev/

├── etc/

├── home/

├── lib/

├── media/

├── mnt/

├── opt/

├── proc/

├── root/

├── run/

├── sbin/

├── tmp/

├── usr/

└── var/

📁 2. Key Directories and Their Purpose

Directory	Description
/	Root directory of the file system
/bin	Essential user **binary executables** (e.g., ls, cat)
/boot	Bootloader files, **kernel image** (vmlinuz)
/dev	Device files (e.g., /dev/sda, /dev/tty)
/etc	Configuration files
/home	User directories (e.g., /home/user1)
/lib	Shared libraries needed by system programs
/media	Mount points for external media (USB/CD-ROM)
/mnt	Temporary mount directory (for manual mounts)
/opt	Optional/additional software packages
/proc	Virtual file system for **process info**
/root	Home directory of the **root** user

Directory	Description
/run	Runtime data (PID files, sockets)
/sbin	System binaries (e.g., shutdown, mount)
/tmp	Temporary files (cleared on reboot)
/usr	Secondary hierarchy for user applications and libraries
/var	Variable data like logs, mail, and spool files

🔍 3. File System Types in Linux

Type	Description
ext4	Most common Linux file system (used by Ubuntu, etc.)
xfs	High-performance journaling file system
btrfs	Advanced file system with snapshot and RAID features
vfat	Used for USB drives (Windows-compatible)
ntfs	Microsoft file system, supported with drivers

🧰 4. Useful Commands

```
bash
df -h        # Show mounted file systems and usage
du -sh *     # Show disk usage of files/directories
mount        # Show or mount file systems
umount       # Unmount a mounted file system
lsblk        # List block devices
```

file <name> # Identify file type

stat <file> # Show detailed file info

🔐 5. Permissions and Ownership

- Every file/directory has:
    - Owner (user)
    - Group
    - Permissions (rwx)

bash

chmod, chown, ls -l

Example:

bash

-rwxr-xr-- 1 user1 users 1234 Jul 30 example.sh

🧠 Summary

- Linux uses a **unified** file system structure starting at /.
- All devices and files are treated as **files**.
- Understanding the purpose of each directory helps in **administration and troubleshooting**.