Linux File System

The Linux File System is the way Linux organizes and manages data on storage devices. It defines how files are stored, accessed, and managed. Unlike Windows (which uses drives like C:, D:), Linux has a single hierarchical directory structure that starts from the root (/) directory.

1. Key Features of Linux File System

1. Hierarchical structure: Everything starts from / (root).
2. Everything is a file: Devices, directories, and processes are treated as files.
3. Case-sensitive: File.txt and file.txt are different.
4. Supports permissions & security: User, group, others with r, w, x.
5. Supports multiple file systems: ext2, ext3, ext4, XFS, Btrfs, etc.

2. Filesystem Types

1. **ext4:** Default in many Linux distributions, stable and fast.
2. **XFS:** High performance for large files.
3. **Btrfs:** Advanced features like snapshots, compression.
4. **Swap:** Special partition used as virtual memory.

3. Linux Directory Structure

Directory	Purpose
/	Root directory (everything starts here).
/bin	Essential binary executables (commands like ls, cp).
/boot	Boot loader files (Linux kernel, GRUB).
/dev	Device files (disks, printers, USB, etc.).
/etc	Configuration files.
/home	User home directories.
/lib	Shared libraries needed for binaries.
/media	Mounted removable devices (USB, DVD).
/mnt	Temporary mount points.
/opt	Optional software packages.
/proc	Virtual filesystem with system/process info.
/root	Home directory of root user.
/sbin	System binaries (administrative commands).
/tmp	Temporary files.
/usr	User programs, libraries, documentation.
/var	Variable data (logs, mail, cache).

4. Special Files

1. **Regular Files (-):** Normal data (text, scripts, binaries).
2. **Directories (d):** Contain files & other directories.
3. **Links (l):** Shortcuts to files (hard link, soft link).
4. **Device Files (b, c):** Represent devices (block/character).
5. **Sockets (s):** Communication between processes.
6. **Pipes (p):** Data flow between processes.

5. Mounting in Linux

Linux doesn't use drive letters like Windows. Instead, storage devices are mounted into the directory tree.

Example: /dev/sda1 may be mounted at /home.

Commands:

1. mount → See mounted devices.
2. umount /mnt → Unmount a device.
3. lsblk → View block devices.
4. df -h → Check disk usage of filesystems.