Linux File System Hierarchy – Detailed Documentation

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1. Introduction

Linux uses a **hierarchical file system structure**, starting from a single root directory (/).
All files and directories are organized in a tree-like structure.
Each directory has a **specific purpose** defined by the *Filesystem Hierarchy Standard (FHS)*.

Understanding this structure is essential for:

- System administration
- Troubleshooting
- DevOps and Cloud operations
- Automation and scripting

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2. Core Directories

2.1 Root Directory (/)

Description:
The root directory is the top-level directory in the Linux file system. All other directories originate from this location.

Contents:
System-critical directories such as /bin, /etc, /home, /usr, /var, and /tmp.

Example files/directories (ls -l /):
bin, boot, dev, etc, home, lib, usr, var

Usage:
I would use this when navigating the overall structure of the Linux system.

2.2 /home – User Home Directories

Description:
This directory contains personal home folders for each normal user on the system.

Contents:
User files such as documents, downloads, and user-specific configuration files.

Example files/directories (ls -l /home):
akash, ubuntu

Important hidden files:
.bashrc, .profile, .config/

Usage:
I would use this when accessing or managing user files and personal data.

2.3 /root – Root User Home Directory

Description:
This is the home directory for the root (administrator) user.

Contents:
Administrative scripts and root user configuration files.

Example files (ls -l /root):
.bashrc, .profile

Usage:
I would use this when performing system administration tasks as the root user.

2.4 /etc – Configuration Files

Description:
This directory stores system-wide configuration files required by the operating system and services.

Contents:
Configuration files for networking, users, and system services.

Example files/directories (ls -l /etc):
passwd, group, ssh/, hostname, fstab

Important files:

- /etc/passwd → User account information
- /etc/ssh/sshd_config → SSH server configuration
- /etc/fstab → Disk mount configuration

Usage:
I would use this when configuring system services or modifying system settings.

2.5 /var/log – Log Files

Description:
This directory stores log files generated by the system and applications.

Contents:
System logs, authentication logs, and service logs.

Example files (ls -l /var/log):
syslog, auth.log, kern.log, journal/

Importance:
Logs are essential for monitoring and troubleshooting system issues.

Usage:
I would use this when investigating errors or analyzing system activity.

2.6 /tmp – Temporary Files

Description:
This directory holds temporary files created by applications and users.

Contents:
Short-lived working files and sockets.

Example files (ls -l /tmp):
systemd-private-*, tmp123

Special behavior:
Files in this directory are usually deleted automatically on system reboot.

Usage:
I would use this when storing short-term or non-critical files.

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3. Additional Directories (Good to Know)

3.1 /bin – Essential Binaries

Description:
Contains essential command binaries required for system boot and repair.

Contents:
Core Linux commands.

Example files (ls -l /bin):
ls, cp, mv, cat, bash

Usage:
I would use this when running basic Linux commands required for system operation.

3.2 /usr/bin – User Command Binaries

Description:
Contains most user-level application binaries and utilities.

Contents:
Editors, compilers, and command-line tools.

Example files (ls -l /usr/bin):
vim, nano, python3, git

Difference from /bin:

- /bin → essential system commands
- /usr/bin → additional user applications

Usage:
I would use this when executing installed programs and utilities.

3.3 /opt – Optional / Third-Party Applications

Description:
Stores optional or third-party software installed manually.

Contents:
Vendor or custom application directories.

Example directories (ls -l /opt):
google/, oracle/, custom_app/

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4. Summary Table

Directory	Purpose
/	Root of the filesystem
/home	User home directories
/root	Root user’s home directory
/etc	System configuration files
/var/log	Log files
/tmp	Temporary files
/bin	Essential command binaries
/usr/bin	User application binaries
/opt	Optional and third-party software

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5. Conclusion

The Linux file system is organized based on functionality rather than randomness.
Each directory has a clearly defined role:

- Configuration → /etc
- Logs → /var/log
- User data → /home
- Commands → /bin, /usr/bin
- Temporary data → /tmp

Understanding this structure is fundamental for Linux administration, DevOps operations, and cloud environments.