Introduction to Linux

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What is Linux ?

Linux is an open-source, Unix-like operating system that is widely used for servers, desktops, and embedded systems. It was created by Linus Torvalds in 1991 and has since evolved into one of the most popular operating systems, especially for server environments and software development.

Key Features of Linux:

- Open Source and Free
- Multi-user and Multitasking
- Stability and Security
- Portability and Customizability
- Rich Ecosystem of Tools and Utilities

Common Linux Distributions (Distros):

1. **Ubuntu**: User-friendly, popular for beginners.
2. **CentOS/Red Hat**: Enterprise-level stability.
3. **Debian**: Stable and versatile.
4. **Fedora**: Cutting-edge and developer-friendly.
5. **Arch Linux**: Minimal and customizable.

Key Directories

- **root**: This is the superuser or administrative user in a Unix-like system. The root user has unrestricted access to all commands and files. Commands like sudo, su, and sudo -i are used to gain root privileges or switch to the root user.

- **etc**: This directory contains system-wide configuration files. These files control the operation of programs and services running on the system.

- **bin**: Short for "binary," this directory contains executable programs (commands) that are essential for system operation. These are programs that are ready to run and are available to all users.

- **usr**: This directory contains user-related programs, libraries, and documentation. It is a secondary hierarchy for user data and applications.

- **tmp**: This is the temporary files directory. Files stored here are typically deleted upon system reboot. It is used for storing short-lived files.

- **dev**: This directory contains device files, which are special files that represent hardware devices or virtual devices. These files allow programs to interact with hardware.

- **var**: Variable data files (logs, databases).

Essential & Advanced Linux Commands

Linux commands are categorized based on their functionality. Here’s an overview:

Essential Linux Commands:

1. **File Management:**
    - **ls**: List directory contents.
    - **cd**: Change directory.
    - **pwd**: Print working directory.
    - **cp**: Copy files.
    - **mv**: Move/rename files.
    - **rm**: Remove files or directories.
    - **mkdir**: Create directories.
    - **touch**: Create empty files.

2. **File Viewing:**
    - **cat**: Display file contents.
    - **less**: View file contents one screen at a time.
    - **head/tail**: Display the first/last lines of a file.

3. **File Permissions:**
    - **chmod**: Change file permissions.
    - **chown**: Change file ownership.

1. **Networking:**
    - **ping**: Test network connectivity.
    - **ifconfig/iptables**: Network configurations (deprecated; now ip).

1. **Process Management:**
    - **ps**: View active processes.
    - **kill**: Terminate processes by PID.
    - **top/htop**: Monitor system processes.

Advanced Linux Commands:

1. **Disk and File Systems:**
    - **df/df -T**: Check disk space usage.
    - **du**: Disk usage for files and directories.
    - mount/umount: Mount or unmount file systems.
    - **fsck**: Check and repair file systems.

1. **Scripting & Automation:**
    - **bash**: Command-line interpreter.
    - **cron**: Schedule tasks.
    - **awk/sed**: Text processing.

1. **User Management:**
    - **useradd/userdel**: Add or remove users.
    - **passwd**: Change user passwords.

1. **Package Management:**
    - **apt/yum/dnf**: Install or update software packages.

2. **Performance Monitoring:**
    - **iotop**: Monitor disk I/O.
    - **vmstat**: View memory usage.
    - **uptime**: Check system uptime.

6. **Service Management**
    - **systemctl start** : Service Management
    - **systemctl start <service>** – Start a service.
    - **systemctl stop <service>** – Stop a service.
    - **systemctl restart <service>** – Restart a service.

7. **File Compression & Archiving**
    - **tar** – Archive files.
    - **gzip/gunzip** – Compress and decompress files.
    - **zip/unzip** – Work with ZIP archives.