



School Of Engineering

Linux Programming Assignment-1

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Q1. What is Linux Operating System (OS)? List three pros and cons of it.

Ans: Linux is a computer operating system. An operating system consists of the software that manages your computer and lets you run applications on it. Linux is an open-source, Unix-like operating system . It powers many distributions like Ubuntu, Fedora, Red Hat etc.

Pros:

- The source code is freely available for anyone to view, modify, and distribute. This leads to high transparency, community-driven innovation, and zero licensing costs..
- Linux's robust architecture allows it to run for years without requiring a reboot for patches or maintenance, ensuring maximum uptime..
- The multi-user architecture, strict file permissions, and rapid patching of vulnerabilities by the global community make Linux inherently more secure.

Cons:

- Steeper Learning Curve: The command-line interface (CLI) is central to system administration. For new users accustomed to graphical interfaces, Linux can be less intuitive.
- Fragmentation: The existence of hundreds of different distributions can be overwhelming for new users who may struggle to choose the right one.
- Limited Desktop Software Support: Some industry-standard desktop applications and many popular games are not natively supported on Linux.

Q2. Differentiate between Linux, Mac, Android, and Windows OS with at least six unique features.

Ans: Linux OS:

- It's an Open-source.
- Used for Servers, desktops, embedded.
- Monolithic Linux.
- Highly customizable.
- Security is Very strong.
- It's Free.

Mac OS:

- It's a Closed-source.
- Used for Professional creative work.
- Hybrid XNU.
- Very limited customization.
- Strong Security.
- It's Expensive.

Android OS:

- It's an Open-source.
- Used for Mobile devices, tablets.
- Modified Linux.
- Moderate customization
- Moderate security.
- Free with devices.

Windows OS:

- Closed-source proprietary.
- Used for Desktops, gaming, enterprise.
- Windows NT.
- Limited customization.
- Vulnerable to malware/ransomware.
- Paid license.

Q3. Why is Linux preferred for Mainframe Servers for legacy application? Give three out-of-the-box technical reasons.

Ans:

• **Extreme Stability and Uptime:** Mainframes are designed for mission-critical, high-availability workloads. Linux's robust architecture allows it to run for years without requiring a reboot for patches or maintenance, ensuring maximum uptime for legacy systems.

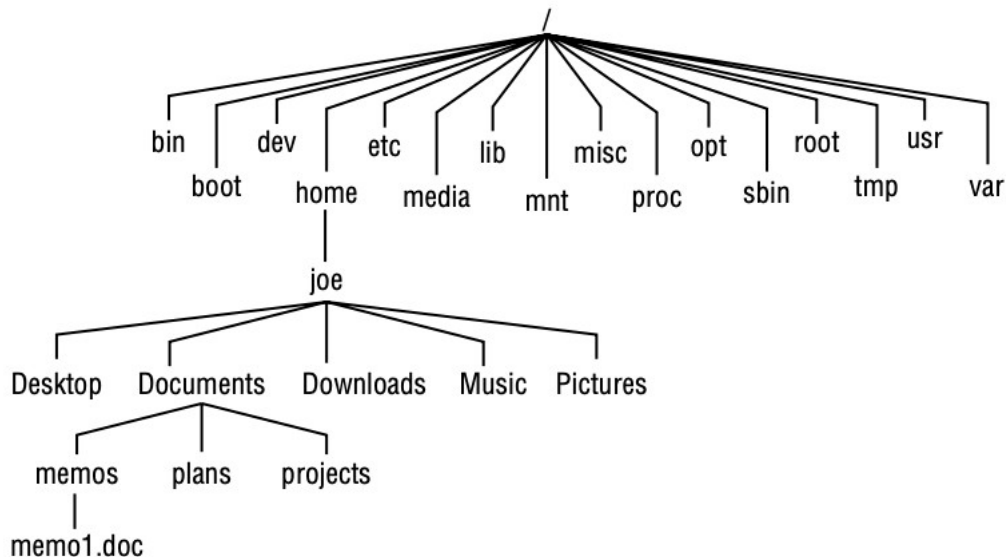
• **Superior Performance Efficiency:** The Linux kernel is highly efficient at handling a massive number of concurrent processes and I/O operations. On powerful mainframe hardware, it can run thousands of virtualised instances of a legacy application with minimal overhead.

• **Native Legacy Support:** Linux has excellent support for the specific instruction sets and architectures of modern mainframes. Furthermore, it natively supports crucial legacy protocols and standards that are often required to interact with older applications.

Q4. Explain the structure of the Linux File System with proper diagram. Note: you can use the tree command to find it out.

Ans:

The Linux filesystem is organized as a hierarchy of directories.



bin: Essential user command binaries.

boot: Boot loader files, kernel, initrd.

dev: Device files.

etc: System-wide configuration files.

home: User home directories.

lib: Essential shared libraries.

media: Mount point for removable media.

mnt: Temporary filesystem mounts.

opt: Optional application software.

proc: Virtual filesystem for process/kernel info.

root: Root user's home directory.

sbin: System administration binaries.

tmp: Temporary files.

usr: User utilities and applications.

var: Variable data.

sys: System parameters and cgroups.

The /proc directory provides detailed information about system processes.

Q5. If Linux OS is open-source, how do companies like Red Hat still making money from it? Do a market study and answer properly?

Ans: Red Hat makes money through services and value-added products, not by selling the software itself.

1.Enterprise Subscriptions: Red Hat Enterprise Linux (RHEL) subscriptions include:

- Binary distributions.
- Guaranteed technical support.
- Security patches and updates.
- Hardware/software certification.

2.Training and Certification: RHCE (Red Hat Certified Engineer) and RHCSA (Red Hat Certified System Administrator) programs.

3.Consulting Services: Professional services for deployment and management.

4.Additional Products: JBoss middleware, Red Hat Virtualisation, OpenShift, OpenStack.

5.Software Bounties: Paid feature development for specific client needs.

Q6. Write the command to display today's date and time (i.e., current System time).

Ans: The command is **date**.

Ex: Mon Oct 28 14:30:15 UTC 2023

Q7. Which command is used to check how long the system has been running?

Ans: The primary command is **uptime**.

Ex:14:30:20 up 10 days, 2:15, 3 users, load average: 0.05, 0.10, 0.15

Q8. What is the difference between shutdown -h now and halt?

Ans: shutdown -h now: It is a Graceful shutdown which notifies users and stops services properly, unmounts filesystems, then finally halts it.

halt: Its More abrupt shutdown, it may not properly stop services or unmount filesystems, simply stops the CPU from running.

Q9. Compare init 0 and shutdown -h. Which is safer? Why?

Ans: init 0: Changes to runlevel 0 which is halt state that executes shutdown scripts in /etc/rc.d/rc0.d/ directory.

shutdown -h: Specifically designed for controlled system shutdown with warnings.

Safer: shutdown -h - It is a Graceful shutdown which notifies users and stops services properly, unmounts filesystems, then finally halts it. init 0 is more direct and may not provide the same level of graceful service shutdown.

Q10. A system administrator accidentally powers off a Server machine without shutting it down properly. What problems can occur to the said Server?

Ans:

- **File System Corruption:** Data in memory cache not written to disk, leaving filesystems inconsistent.
- **Data Loss:** Application data (especially databases) cached in memory never committed to storage.
- **Hardware Damage:** Potential physical damage to storage devices during read/write operations.
- **Boot Failures:** System may not restart properly until filesystem check completes.
- **Database Corruption:** Transactional data loss leading to database integrity issues.
- **Service Interruption:** Running services terminated abruptly without proper cleanup.

Brainstorming

a) As Linux Kernel is open-source, can we build our own operating system?

Ans: Yes. Because the source code is freely available for anyone to view, modify, and distribute, you can build your own operating system. This is what Ubuntu which is a Linux Distro have done, they have taken Linux kernel and built complete Operating Systems.

b) In order to do that, what are the stoppers, hurdles, and challenges?

Ans:

Hardware Detection and Preparation :

- Detecting and preparing hardware: Loading the software needed to access particular hardware devices.

2. System Component Integration :

- Managing processes, memory, filesystems, user access, and services.

c) Is anyone in India working on this field? Find at-least three to four engineers

Ans: Dr. Dinesh Kulkarni - Lead engineer at Red Hat India, working on RHEL development.

2. Kushal Das - Python Software Foundation fellow, contributor to Fedora Linux.

3. Ankita Mukherjee - Kernel engineer working on Linux storage subsystems.

4. Sankarshan Mukhopadhyay - OpenStack contributor and Linux system architect.

THANK YOU