Linux Programming: Assignment-1

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SECTION-3A

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1.What is Linux Operating System (OS)? List three pros and cons of it. (CO1)

Linux is an open-source operating system based on UNIX. It is responsible for managing the hardware of a computer, running the users' applications, and supporting multi-user and multitasking environments.

Pros: It is a free product and its source code is available to only view, very secure and is extremely stable which is the reason why servers are running on it.

Cons: There isn't a full range of commercial apps that support Linux, command-based work is hard for beginners, and additionally, in some cases, there may be no hardware drivers available.

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

Linux is an open source operating system mainly used in servers. It is also possible to use it on desktops, but its use is mostly limited to environments jnvolving technology. Linux is completely customizable, offers high security, and software installation is carried out via package managers such as apt or yum.

MacOS is a proprietary operating system built only for Apple devices. Its primary features are good UI, tight security, and excellent integration with the rest of the Apple ecosystem. The advantage of customization is limited because Apple is controlling both hardware and software.

Same goes for Android. Despite this, it is mainly utilized in smartphones and other touchscreen gadgets. The operating system is open but Google is the maintainer. To install apps, one has to use Play Store or APK files.

On the other hand, Windows is a proprietary operating system tailored for typical desktop usage. It is compatible with a plethora of software, games, and drivers. Also, for installation purposes, it uses EXE/MSI files. Additionally, this platform is the most commonly found in offices and homes.

In simple words: Linux = most customizable, Mac = polished but restricted, Android = mobile Linux, Windows = user-friendly and widely supported.

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

One of the reasons that explains why Linux is preferred is that it allows changes at the kernel level to be done which is how the system can be adjusted for heavy mainframe workloads. Another good point is very robust process isolation which is due to use of tools like cgroups, namespaces, and SELinux. Also, the reason for the longest uptime is another one - Linux is able to operate non-stop for several years without rebooting, which is a must for old enterprise applications.

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

Linux has a tree-like file system that goes all the way back to the root /.

/bin is the folder that has the basic commands, /sbin is the folder with system commands, /etc is the folder that has the configuration files, /home is the folder for user files, /var is the folder that holds log files, /boot is the folder for kernel and bootloader files, /lib is the folder for libraries, and /tmp is the folder for temporary data.

Small diagram:

```
/
├── bin
├── boot
├── dev
├── etc
├── home
├── lib
├── sbin
├── tmp
└── var
```

5. How Red Hat earns money if Linux is open-source

Red Hat's main source of revenue is enterprise subscriptions where the companies pay for the official updates, security patches, long-term support, and certifications. They also offer paid training (like RHCE), cloud platforms such as OpenShift, and automation tools such as Ansible. In a nutshell, what they do is not selling Linux but selling the support, the reliability, and the enterprise services.

6. Command for today's date/time

date

7. Command to check system uptime

uptime

8. Difference between shutdown -h now and halt

The command **shutdown -h** now shuts the system down in a safe manner by stopping the various running services and unmounting the disks.

Halt on the other hand is the command that stops the system right away and thus may not unmount discs properly. Therefore, **shutdown -h** now is the safer option.

9. init 0 vs shutdown -h (which is safer)

The command **init 0** changes the system to runlevel 0 and shuts down the system very quickly. The command **shutdown -h** does a clean and a graceful shut down by warning the users and closing the services. Therefore, **shutdown -h** is safer.

10. Problems if a server is powered off without proper shutdown

Corruption of file systems is one of the consequences that might occur after such an event, open transactions in databases could be lost, logs may be in an inconsistent state, and some hardware components such as hard drives can get damaged due to the abrupt removal of power.

Brainstorming

a) Can we build our own OS using Linux kernel?

Yes, the Linux kernel is an open-source project and hence anyone is free to compile it and create their own operating system.

b) Challenges in building your own OS

Deep knowledge of kernel internals is required, hardware drivers are not that easy to figure out because they are often not documented, keeping the security updates coming is not an easy task, and creating a complete package ecosystem takes a lot of time.

c) Engineers in India working in this field

Among the Indian contributors are Balasubramaniam Mani (IBM Linux performance), Siddhesh Poyarekar (Red Hat, glibc), Srivatsa S. Bhat (Linux memory management), and Anil Venkatesh (kernel debugging & file systems)