**Linux Programming: Assignment-1**

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

Answer:

Open-source operating system.

Pros:

* Free and open-source: Freely available and Customizable.
* Highly secure: Less vulnerable to malware and viruses.
* Flexible: It can run on various hardware platforms.

Cons:

* Steep learning curve: It can be challenging for beginners.
* Limited software compatibility: Some software applications may not be available for Linux.
* Hardware support issues: It may not support all hardware devices.

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

Answer:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Windows OS** | **Linux** | **Mac** | **Android** |
| **Manufacture** | Microsoft Inc. | Developed as open source OS under the GNU project by the originator, Linus Torvalds and many others. | Apple Inc. for their Macintosh line of computer systems. | Open source OS designed and developed by Android Inc. Google is now the current owner |
| **Development and Distribution** | Developed and Distributed by Microsoft. | Linux is open sourced and distributed by various vendors | Mac OS was designed only to be deployed by Apple Computers | OHA (open Handset Alliance) |
| **Computer Architecture Supported** | X86, x86-64 | X86,x86-64, PowerPC, SPARC, Alpha, others | 68k, PowerPC | Android-x86 powered by AMD and Intelx86 processors |
| **Target System Type** | Workstation, Personal Computer, Media Centre, Tablet PC, Embedded. | Desktop/Server Depends on Distribution | Work station, Personal Computer, embedded | Consumer, Enterprise, education |
| **File System Supported** | NTFS, FAT & exFAT with ISO 9660; UDF, 3rd Party driver that supports file system ext2, and ext3, ReiserFS, and HFS | ext2, ext3, ex4, ReiserFS, FAT, ISO 9660, UDF, NFS, and others. | HFS+, HFS, MFS(Mac OS 8.0 and before) AFP, with ISO 9660, FAT, UDF | Ext4 |
| **User Friendly for Lay Users** | Very User Friendly | Depends on Distribution. More friendlier to users | Very User Friendly | Very User Friendly |

**Windows Operating System**

* It is designed to run on any standard x86 Intel and**AMD** hence most of the hardware vendors make drivers for windows like Dell, HP, etc.
* It supports enhanced performance by utilizing multi-core processors.
* It comes preloaded with many productivity tools which helps to complete all types of everyday tasks on your computer.
* Windows has a very large user base so there is a much larger selection of available software programs, utilities.
* Windows is backward compatible meaning old programs can run on newer versions.
* Hardware is automatically detected eliminating need of manually installing any device drivers.

**LINUX Operating System**

* Linux is free can be downloaded from the Internet or redistribute it under GNU licenses and has the best community support.
* Linux OS is easily portable which means it can be installed on various types of devices like mobile, tablet computers.
* It is a multi-user, multitasking operating system.
* BASH is the Linux interpreter program which can be used to execute commands.
* Linux provides multiple levels of file structures i.e. hierarchical structure in which all the files required by the system and those that are created by the user are arranged.
* Linux provides user security using authentication features and also threat detection and solution is very fast because Linux is mainly community driven.

**MS-DOS**

* It is a single-user operating system meaning only one user can operate at a time.
* It is a lightweight operating system allowing users to have direct access to the BIOS and its underlying hardware.
* Loads data and programs from external sources and brings them into the internal memory so they can be used on the computer.
* Enables the computer to perform input and output operations such as taking commands from the keyboard, and printing information on the screen.
* It is very helpful in making file management like creating, editing, deleting files, etc.
* It also controls and manages other external devices such as the printer, keyboard or external hard drive using various drive utilities.

**Android Operating System**

* The android operating system is an open source operating system means that it’s free and any one can use it.
* Android offers optimized 2D and 3D graphics, multimedia, GSM connectivity, multi-tasking.
* Android OS is known for its friendly user interface and exceptional customizable according to the user's taste.
* Huge choice of applications for its users since Play store offer over one million apps.
* Software developers who want to create applications for the Android OS can download the Android Software Development Kit (SDK) to easily develop apps for android.
* Android would consume very little power but deliver extreme performance since its hardware is based on ARM architecture.

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

Answer:

Linux is preferred for mainframe servers due to:

* Stability and reliability: Highly stable and reliable.
* Scalability: Handle high workloads and scale efficiently.
* Cost-effectiveness: It is open-source, reducing licensing costs.

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

Answer:

The Linux file system structure can be visualized using the tree command:

/

├── bin

├── boot

├── dev

├── etc

├── home

├── lib

├── lost+found

├── media

├── mnt

├── opt

├── proc

├── root

├── run

├── sbin

├── srv

├── sys

├── tmp

├── usr

└── var

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

Answer:

Red Hat makes money from Linux through:

* Support and services: Offering paid support, consulting, and training.
* Enterprise solutions: Providing customized solutions for enterprises.
* Certifications and training: Offering certifications and training programs.

1. **Write the command to display today’s date and time (i.e., current System time).**

Answer:

Command: date

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

Answer:

Command: uptime

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

Answer:

shutdown -h now and halt both shut down the system, but:

- shutdown -h now sends a signal to all processes to terminate.

- halt immediately stops the system without sending signals.

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

Answer:

|  |  |
| --- | --- |
| **Init 0** | **Shutdown -h** |
| * Direct init system command | * User-level command |
| * No built-in user | * Can send messages to logged-in users before shutdown |
| * No built-in scheduling | * Built-in scheduling |
| * Less flexible, primarily for immediate halt | * More versatile, with options for reboot, halt, and scheduling |

Shut down -h is more safer because:

* It sends messages to all logged-in users
* Cleanly closes all running applications
* Preventing data corruption from incomplete writes.
* Flexibility

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

Answer:

Improper shutdown can cause:

* Data corruption: Files may become corrupted or damaged.
* File system damage: The file system may become damaged, requiring repair.
* System instability: The system may become unstable or unresponsive.
* Brainstorming

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

Answer:

Yes, we can build our own operating system using the open-source Linux kernel as its core

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

Answer:

"**Stoppers**" ,"**Hurdles**," and "**Challenges**" refer to difficulties that impede the design, stability, and performance of the kernel

Some potential challenges and hurdles are:

* Massive Complexity
* Hardware Abstraction
* Memory and Process Management
* Security
* Stability and Reliability

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

Answer:

Yes, numerous engineers in India work on the Linux kernel.

Some Engineers are:

Linus Torvalds

Greg Kroah-Hartman

Dennis Ritchie

Ken Thompson