**Linux**

1.What is Linux and how is it different from other operating systems?

* Linux is a free and open-source operating system.
* It was developed by Linus Torvalds in 1991.
* Linux is considered one of the most stable, secure and reliable operating system widely used in servers and supercomputers.
* Linux is a type of operating system that is similar to Unix it is build upon the Linux kernel.
* It is a multi-user based operating system. It means multiple users can access this operating system at a time.
* High security, it is a distributed operating system and community-based operating system.
* It is a user friendly.
* Linux is compatible with large number of files.
* Kernel is the brain of the operating system because it is going to manages a hardware resource and provides essential services for all other parts of the operating system.
* Some distributions of Linux such as ubuntu, fedora, Debian, centos, SUSE.

Different from other operating systems:

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| Features | Linux | Other operating systems |
| Source code access | Open source, allowing users to view, modify, and distribute the code. | Proprietary, source code is not accessible to users. |
| Cost | It is free to use and distribute. | Costlier compare with Linux. |
| User interface | Highly customizable. | Less customization. |
| security | Security is high. | Security is less. |
| File system | Supports various file systems .example: ext4, btrfs. | Primarily uses NTFS, APFS. |
| System resource usage | Typically, more lightweight and efficient, making it suitable for older hardware. | Generally, requires more system resources. |

2. Explain the Linux file system hierarchy.

* The Linux file system hierarchy is structured in a way that organizes files and directories logically. This structured are defined by the filesystem hierarchy standard.

1. /Root

The top-level directory of the file system.

All other directories are subdirectories of this root directory.

1. /bin

Contains essential binary executables(commands) required for system operation.

Programs here are available to all users, such as ls,cp and mv.

1. /boot

Contains files necessary for booting the system, including the Linux kernel and initial RAM disk image.

1. /dev

Contains device files that represent hardware devices

Examples include /dev /sda for hard drives and /dev/tty for terminal devices.

1. /etc

Contains system- wide configuration files and scripts.

Examples include network configurations, user account information, and service settings.

1. /home

The default directory for user home directories.

Each user has a subdirectory here like /home/username.

1. /lib

Contains shared libraries and kernel modules needed by programs in /bin and /sbin.

1. /media

A mount point for removable media example: USB, DRIVES, AND CDs.

Automatically created by the system when media is inserted.

1. /mnt

A temporary mount point for mounting file systems manually.

1. /opt

It contains optional software packages that are not part of the default installation.

1. /proc

A virtual filesystem that provides information about the system processes and hardware.

Files here are not actual files but interfaces to kernel data structures.

1. /Root

The home directory for the root user(superuser)

Different from /home, which is for regular users.

1. /run

Contains runtime data for processes, including PID files and sockets.

Data here is cleared on reboot.

1. /srv

Data for services provided by the system.

Example: web server files.

1. /Sys

A virtual filesystem that exposes information and configuration options for devices and kernel subsystems.

1. /tmp

A temporary directory for storing transient files created by applications.

Cleared on reboot.

1. /usr

Contains user-related programs and data.

/usr/bin: non-essential user binaries

/usr/lib: non-essential shared libraries.

/usr/share: architecture-independent data

Example: documentation.

1. /Var

Contains variable data files, such as logs, databases and spool files.

The contents can grow in size, hence the name “variable”.

3.What are the basic Linux commands for file operations?

* Touch:

Creates an empty file.

Syntax: Touch [filename]

* Ls:

It shows total files what we created.

Syntax: ls

* Cp: copy

Copies files or directories

Syntax: Cp [file name] [file name]

* Mv: Moving/renaming

Moves or renames files and directories.

Syntax: mv [old filename] [new filename]

* Rm: remove

Removes files.

Syntax: rm [filename]

* Cat:

Displays the content of a file.

Syntax: cat [filename]

* Head:

Displays the first few lines of a file.

Syntax: head [filename]

* Tail:

Displays the last few lines of a file.

Syntax: tail [filename]

* Grep: global regular expression print

Searches for a specific pattern in files.

Syntax: grep “word” [filename]

* Find:

Searches for files in a directory hierarchy.

4.How do you change file permissions in Linux?

* Chmod command: it means change mode
* By using numerical values, we will change the permissions (777)
* Read=4 (it defines ‘r’)
* Write=2 (it defines ‘w’)
* Execute=1 (it defines ‘x’)
* Chmod +rwx filename to add permissions.
* Chmod +x filename to allow executable permissions.
* Chmod –wx filename to take out write and executable permissions

5.What is the difference between chmod and chown?

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| --- | --- | --- |
| feature | Ch mod | Chown |
| purpose | Change file permissions. Chmod allows you to set read, write, execute permissions. | Change file ownership. Chown enables you to change who the owner of the file is. |
| syntax | Ch mod [mode] [file] | Chown [new\_owner:new\_group] [file] |
| parameters | Permissions(numeric/symbolic) | New owner and optional group. |
| Affects | Access rights | Ownership. |
| Use case | Granting/denying permissions. | Changing the file’s owner. |

6.Explain the use of grep command.

* Grep means global regular expression print.
* The grep command in Linux is powerful tool used for searching and manipulating text patters within files.
* Grep is widely used by programmers, system administrators, and users alike for its efficiency and versatility in handling text data.
* Syntax: grep “word” filename.
* Grep –c: this prints only a count of the lines that match a pattern.
* -h: display the matched lines, but do not display the filenames.
* -i: ignores, case for matching
* -l: displays list of a filenames only.
* -n: display the matched lines and their line numbers.
* -v: displays lines that do not matches the pattern.

7.How do you check disk usage in Linux?

* Df: disk free
* The df command displays information about the total and available disk space on all mounted filesystems.
* Syntax: df or df –h.

8.What is the difference between soft link and hard link?

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| Comparision parameters | Hard link | SoftLink |
| Inode number | Files that are hard linked take the same inode number. | Files that are soft linked take different inode number. |
| File system limitations | Cannot span filesystems. | Can span filesystems. |
| Speed | Hard links are comparatively faster. | Softlink's are comparatively slower. |
| Use cases | Multiple references to the same file. | Shortcuts or references to files. |
| Deletion behavior | If the original file is removed, the link will still work as it accesses the data the original was having access to. | If the original file is removed, the link will not work as it doesn’t access the original files data. |
| Creation command | ln original file hard link. | ln –s original file SoftLink. |
| Directories | Hard links are not allowed for directories. | Soft links can be used for linking directories. |

9.How do you schedule a cron job in Linux?

* The cron daemon is a built in Linux utility that reads the crontab file and executes commands and scripts at predefined times and intervals.
* Cron is a time-based job scheduler in Linux operating system, allowing users to run scripts or commands at specified intervals.
* Scheduling a job for a specific time.
* To view the crontab entries.
* To edit crontab entries edit the current logged-ln users crontab entries.
* To schedule a job for every minute using cron.
* To schedule a job for more than one time.
* To schedule a job for a within certain range of time.
* To schedule a background cron job for every 10 minutes.
* To schedule a job for the first minute of every year using@yearly.
* To schedule a cron job beginning of every month using@monthly.
* To schedule a background job every day using@daily.
* To execute a command after every reboot using @reboot.

10.What is the purpose of the /etc/passwd file?

* The /etc/passwd file is the most important file in Linux operating system.
* This file stores essential information about the users on the system.
* This file is owned by the root user and to edit this file we must have root privileges.
* This file contains one entry per line. That means it stores one user's information on one line. The user information contains seven fields and each field is separated by the colon (:) symbol.

1. Username
2. Password
3. User ID
4. Group ID
5. User ID info
6. Home directory
7. Login shell.

11.Explain the basic features of the Linux OS.

* Free and open source: it is free of cost and the source code of Linux is freely available to the public.
* Multiuser capacity: Linux supports multiple users accessing the system simultaneously.
* Multitasking: Linux can run multiple processes at the same time.
* Security: Linux has built in security features, including user permissions and access controls.
* Portability: it is run on various hardware platforms.
* File system: Linux supports various file systems, including ext4, btrfs, xfs and more.
* Customization: it is highly customizable, allowing users to modify the OS according to their preferences.
* Networking capabilities: Linux has robust networking features, supporting various protocols and services.
* Command-line interface: it provides powerful command line interface for system management and automation.

12.What are the major differences between Linux and Windows?

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| Linux | windows |
| Linux is a free and open source. | It is not open-source operating system |
| It is free of cost. | Windows is paid and requires a license. |
| File names are case sensitive | File names are case insensitive. |
| Uses a monolithic kernel. | Uses hybrid kernel. |
| More secured and stable | Less secured. |
| Single user-based operating system. | Multi user based operating system. |
| In Linux three types of user accounts: regular, root and service account. | In windows four types of user accounts: administrator, standard, child and guest. |

13. Define the basic components of Linux.

* Linux is a powerful and versatile operating system that consists of several key components.

1. Kernel:

kernel is the core component of the Linux operating system.it manages system resources and facilitates communication between hardware and software. It is responsible for all major activities of this operating system.

It manages CPU, memory, and device drivers.

Handles system calls and process management.

Provides security and access control.

1. Shell:

The shell is a command line interface that allows users interact with the operating system. It interprets user commands and communicates with the kernel. Command execution and scripting. File manipulation and system administration tasks.

Bash: bourne again shell the most common shell in Linux.

Zsh, ksh, fish.

1. System library:

System libraries provides standard function and routines that applications can use to perform tasks without needing to access the kernel directly.

Example: libc-the standard C library.

Libm-the math library.

1. File system:

The file system organizes and manages data on storage devices. Linux uses a hierarchical file system structure.

Example:ext4,xfs,btrfs, and zfs.

Ext4 most widely used file system for linux.

1. User space:

It is the memory area where your applications and processes run, separate from kernel space.

1. System utilities:

System utilities are programs that perform system-related tasks, such as file management, process management, and system monitoring.

Example: ls, cp and top.

14. What is the chmod command in Linux, and how do you use it?

* Linux chmod command is used to change the access permissions of files and directories.
* It stands for change mode.
* It cannot change the permissions of symbolic links.
* In the Linux system each file is associated with a particular owner and have permission access for different users.
* User classes are:

1. Owner
2. Group member
3. Others.

* The file permissions in Linux are the following three types:

1. Read (‘r’)
2. Write (‘w’)
3. Execute (‘x’)

Example: chmod u+x filename

chmod g-w filename

chmod 644 filename

chmod 755 filename

15. What are the most important Linux commands?

* Ls : it is showed list of files and directories.
* Cd: it is changed the directory
* Pwd: it prints the current working directory.
* Mkdir: it creates the new directory.
* Rmdir: it removes the empty directory.
* Rm: it removes the files.
* Rm –r : it removes the directory.
* Cp: copy files or directories.
* Mv: it is used to moves or renames files or directories.
* Cat: it displays the file content.
* More: views file content page by page.
* Less: similar to more but allows backward navigation.
* Vim: a powerful text editor with advanced features.
* Top: displays running processes and system resource usage.
* Df: displays disk space usage.
* Du: displays disk usage of files and directories.
* Free: displays memory usage.
* Uname:it displays operating system name.
* Ping: tests network connectivity to a host.
* Ifcongif: displays network interface configuration.
* Whoami: displays the current logged-in-user.
* Adduser: add a new user.
* Passwd:changes a user's password.
* Man: displays the system interface.
* History: it shows the commands history.
* Clear: it clears the console or terminal.
* Grep: it searches the particular word.
* Cal: it displays the present month calendar.
* Date: it displays the todays date.
* Head: it gives top 10 lines in the file.
* Tail: it gives bottom 10 lines in the file.
* Wc: it s used to count the lines, words, and characters in the file.