Linux

Operating System - Linux

What:

Linux is one of popular version of UNIX operating System. It is open source as its source code is freely available. It is free to use. Linux was designed considering UNIX compatibility. Its functionality list is quite similar to that of UNIX.

use:

Linux is an open source operating system (OS). An operating system is the software that directly manages a system's hardware and resources, like CPU, memory, and storage. The OS sits between applications and hardware and makes the connections between all of your software and the physical resources that do the work.

How many types of distributions:

Today, there are over 600 active Linux distros.
Some of the most commonly used are Debian, Gentoo, Ubuntu, Linux Mint, Red Hat Enterprise Linux, CentOS, Fedora, Kali Linux

Components of Linux System

Linux Operating System has primarily three components:

1.Kernel – Kernel is the core part of Linux. It is responsible for all major activities of this operating system. It consists of various modules and it interacts directly with the underlying hardware.

2.System Library – System libraries are special functions or programs using which application programs or system utilities accesses Kernel's features.

3.System Utility – System Utility programs are responsible to do specialized, individual level tasks.

Architecture:

The following illustration shows the architecture of a Linux system –

- **Hardware layer** − Hardware consists of all peripheral devices (RAM/ HDD/ CPU etc).
- **Kernel** − It is the core component of Operating System, interacts directly with hardware, provides low level services to upper layer components.
- **Shell** − An interface to kernel, hiding complexity of kernel's functions from users. The shell takes commands from the user and executes kernel's functions.
- **Utilities** − Utility programs that provide the user most of the functionalities of an operating systems.
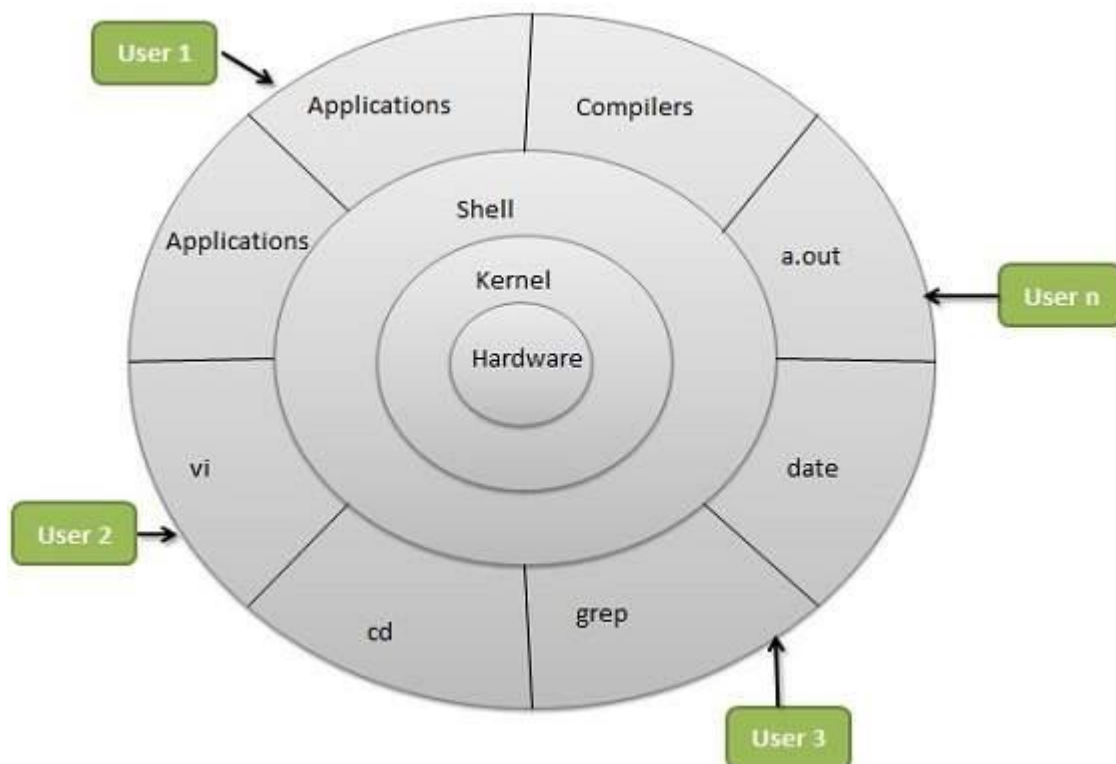
Basic Features

Following are some of the important features of Linux Operating System.

- **Portable** − Portability means software can works on different types of hardware in same way. Linux kernel and application programs supports their installation on any kind of hardware platform.
- **Open Source** − Linux source code is freely available and it is community based development project. Multiple teams work in collaboration to enhance the capability of Linux operating system and it is continuously evolving.
- **Multi-User** − Linux is a multiuser system means multiple users can access system resources like memory/ ram/ application programs at same time.
- **Multiprogramming** − Linux is a multiprogramming system means multiple applications can run at same time.
- **Hierarchical File System** − Linux provides a standard file structure in which system files/ user files are arranged.

- **Shell** − Linux provides a special interpreter program which can be used to execute commands of the operating system. It can be used to do various types of operations, call application programs. etc.
- **Security** − Linux provides user security using authentication features like password protection/ controlled access to specific files/ encryption of data.

LINUX DIRECTORY STRUCTURE :

1. / – Root

- Every single file and directory starts from the root directory.
- Only root user has write privilege under this directory.
- Please note that /root is root user's home directory, which is not same as /.

2. /bin – User Binaries

- Contains binary executables.
- Common linux commands you need to use in single-user modes are located under this directory.
- Commands used by all the users of the system are located here.
- For example: ps, ls, ping, grep, cp.

3. /sbin – System Binaries

- Just like /bin, /sbin also contains binary executables.
- But, the linux commands located under this directory are used typically by system aministrator, for system maintenance purpose.
- For example: iptables, reboot, fdisk, ifconfig, swapon

4. /etc – Configuration Files

- Contains configuration files required by all programs.
- This also contains startup and shutdown shell scripts used to start/stop individual programs.
- For example: /etc/resolv.conf, /etc/logrotate.conf

5. /dev – Device Files

- Contains device files.
- These include terminal devices, usb, or any device attached to the system.
- For example: /dev/tty1, /dev/usbmon0

6. /proc – Process Information
- Contains information about system process.

- This is a pseudo filesystem contains information about running process. For example: /proc/{pid} directory contains information about the process with that particular pid.
- This is a virtual filesystem with text information about system resources. For example: /proc/uptime

7. /var – Variable Files

- var stands for variable files.
- Content of the files that are expected to grow can be found under this directory.
- This includes — system log files (/var/log); packages and database files (/var/lib); emails (/var/mail); print queues (/var/spool); lock files (/var/lock); temp files needed across reboots (/var/tmp);

8. /tmp – Temporary Files

- Directory that contains temporary files created by system and users.
- Files under this directory are deleted when system is rebooted.

9. /usr – User Programs

- Contains binaries, libraries, documentation, and source-code for second level programs.
- /usr/bin contains binary files for user programs. If you can't find a user binary under /bin, look under /usr/bin. For example: at, awk, cc, less, scp
- /usr/sbin contains binary files for system administrators. If you can't find a system binary under /sbin, look under /usr/sbin. For example: atd, cron, sshd, useradd, userdel
- /usr/lib contains libraries for /usr/bin and /usr/sbin
- /usr/local contains users programs that you install from source. For example, when you install apache from source, it goes under /usr/local/apache2

10. /home – Home Directories

- Home directories for all users to store their personal files.
- For example: /home/john, /home/nikita

11. /boot – Boot Loader Files

- Contains boot loader related files.
- Kernel initrd, vmlinux, grub files are located under /boot
- For example: initrd.img-2.6.32-24-generic, vmlinuz-2.6.32-24-generic

12. /lib – System Libraries

- Contains library files that supports the binaries located under /bin and /sbin
- Library filenames are either ld* or lib*.so.*
- For example: ld-2.11.1.so, libncurses.so.5.7

13. /opt – Optional add-on Applications

- opt stands for optional.
- Contains add-on applications from individual vendors.
- add-on applications should be installed under either /opt/ or /opt/ sub-directory.

14. /mnt – Mount Directory

- Temporary mount directory where sysadmins can mount filesystems.

15. /media – Removable Media Devices

- Temporary mount directory for removable devices.
- For examples, /media/cdrom for CD-ROM; /media/floppy for floppy drives; /media/cdrecorder for CD writer

16. /srv – Service Data

- srv stands for service.
- Contains server specific services related data.
- For example, /srv/cvs contains CVS related data

Linux commands and types:

1.touch Command

The touch command is used to create empty files. We can create multiple empty files by executing it once.

Syntax: touch **<file** name**>**

       touch **<file1> <file2>** ....

output:

2. cat Command

The cat command is a multi-purpose utility in the Linux system. It can be used to create a file, display content of the file, copy the content of one file to another file, and more.

Syntax: cat [OPTION]... [FILE]..

To create a file, execute it as follows:

   # cat **>** **<file** name**>** // Enter file content

Press "CTRL+ D" keys to save the file. To display the content of the file, execute it as follows:

cat **<file** name**>**

Output:

3.rm Command

   -- The rm command is used to remove a file.

Syntax: rm <file name>

Output:

4. cp Command

The cp command is used to copy a file or directory.

Syntax: cp **<existing** file name**>** **<new** file name**>**

Output:

5.mv Command

The mv command is used to move a file or a directory form one location to another location.

Syntax: mv <file name> <directory path>

Output:

6.rename Command

The rename command is used to rename files. It is useful for renaming a large group of files.

Syntax: rename 's/old-name/new-name/' files

Output :

2 Linux Directory Commands

1.pwd Command

--The **pwd** command is used to display the location of the current working directory.

Syntax: pwd
Output:

2.mkdir Command

-- The **mkdir** command is used to create a new directory under any directory.

Syntax: mkdir **<**directory name**>**
Output:

3. rmdir Command

--The rmdir command is used to delete a directory.

Syntax: rmdir **<directory** name**>**
Output:

4. ls Command

-- The ls command is used to display a list of content of a directory.

Syntax: ls
Output:

5. cd Command

--The **cd** command is used to change the current directory.

    Syntax: cd **<directory** name**>**
    Output:

3 Linux File content Commands

1.head Command

--The **head** command is used to display the content of a file. It displays the first 10 lines of a file.

    Syntax: head **<file** name**>**

2. tail Command

The **tail** command is similar to the head command. The difference between both commands is that it displays the last ten lines of the file content. It is useful for reading the error message.

    Syntax: tail **<file** name**>**

3.tac Command

The **tac** command is the reverse of cat command.It displays the file content in reverse order (from the last line).

    Syntax: tac **<file** name**>**

4.Linux User Commands

1.su Command

The **su** command provides administrative access to another user. In other words, it allows access of the Linux shell to another user.

    Syntax: su **<user** name**>**

2.id Command

The **id** command is used to display the user ID (UID) and group ID (GID).

Syntax: id

3. useradd Command

The useradd command is used to add or remove a user on a Linux server.

Syntax: useradd username

4. passwd Command

The passwd command is used to create and change the password for a user.

Syntax: passwd **<username>**

5. groupadd Command

The groupadd command is used to create a user group.

Syntax: groupadd **<group** name**>**

5.Linux Filter Commands

1. cat Command

The cat command is also used as a filter. To filter a file, it is used inside pipes.

Syntax: cat **<fileName>** | cat or tac | cat or tac |. . .

2. cut Command

The cut command is used to select a specific column of a file. The '-d' option is used as a delimiter, and it can be a space (' '), a slash (/), a hyphen (-), or anything else. And, the '-f' option is used to specify a column number.

Syntax: cut -d(delimiter) -f(columnNumber) <fileName>

3. grep Command

The grep is the most powerful and used filter in a Linux system. The 'grep' stands for "global regular expression print." It is useful for searching the content from a file. Generally, it is used with the pipe.

Syntax: command | grep **<searchWord>**

4. comm Command

The 'comm' command is used to compare two files or streams. By default, it displays three columns, first displays non-matching items of the first file, second indicates the non-matching item of the second file, and the third column displays the matching items of both files.

Syntax: comm <file1> <file2>

6.Linux Utility Commands

1. find Command

The find command is used to find a particular file within a directory. It also supports various options to find a file such as byname, by type, by date, and more.

Syntax: find . -name "*.pdf"

2.mount Command

The mount command is used to connect an external device file system to the system's file system.

Syntax: mount -t type <device> <directory>

3.clear Command

Linux clear command is used to clear the terminal screen. **Syntax:** clear

7.Linux Admin Command

1.PS command

Linux ps command is used to see the Process related things.

Syntax: ps

2.Kill command

It is a built-in command which is used to terminate processes manually. *kill* command sends a signal to a process which terminates the process.

Sysntax: kill

3.visudo command

visudo edits the sudoers file in a safe fashion.

Syntax: visudo

Use the visudo command to edit the configuration file: sudo visudo.

1. This will open /etc/sudoers for editing. To add a user and grant full sudo privileges, add the following line: [username] ALL=(ALL:ALL) ALL.
2.Save and exit the file.

4.sudo command

Stands for "super user do". it will run that command with elevated privileges. Elevated privileges are required to perform certain administrative tasks

Syntax: sudo

8.Linux Networking Command

1.ip Command

Linux **ip** command is an updated version of the ipconfig command. It is used to assign an IP address, initialize an interface, disable an interface.

Syntax: ip a   or   ip addr

2.ssh Command

Linux **ssh** command is used to create a remote connection through the ssh protocol.

Syntax: ssh user_name@host(IP/Domain_name)**</**p**>**

9.Linux file or directory or users permission Commands

There are four categories: **system, owner, group, and world**

Four types of access permissions : **Read, Write, Execute and Delete**.

Read(r)	4
Write(w)	2
Execute(x)	1
	7 =4+2+1

- for when a particular permission is not granted

Syntax: The syntax for using numerical notation is:

```
#   chmod [numeric permissions] [file]
```

Access classes are indicated using initials, as follows:

- **u** for user
- **g** for group
- **o** for other
- **a** for all three: user and group and other

syntax: `chmod <alpha indicates> <file name>`

The operators are the following:

- **+** to add a permission
- **-** to remove a permission
- **=** to set a permission

The categories are not mutually disjoint: World includes Group, which in turn includes Owner

1.chmod command

The chmod command enables you to change the permissions on a file. You must be superuser or the owner of a file or directory to change its permissions.

Syntax: chmod [numeric permissions] [file]

2.chgrp command

Chgrp command in Linux is used to change the group ownership of a file or directory.

Syntax: `chgrp [OPTION]… GROUP FILE…`

`chgrp [OPTION]… –reference=RFILE FILE…`

3.chown command

chown command is used to change the file Owner or group. Whenever you want to change ownership you can use chown command.
Syntax:

`chown [OPTION]… [OWNER][:[GROUP]] FILE…`

`chown [OPTION]… –reference=RFILE FILE…`

Example: To change owner of the file:

```
#chown owner_name file_name
```

Yum software Repositories

yum is the primary tool for getting, installing, deleting, querying, and managing Red Hat Enterprise Linux RPM software packages from official Red Hat software repositories

syntax: yum <action>

yum update: update the server

syntax: yum update -y

yum install: install packages in the server

syntax: yum install <package name>

yum remove: Remove packages in the server

syntax: yum remove <existing or installed package name>

Note: Same Ubuntu ,debian we use APT REPO

Systemctl:

The systemctl command manages both system and service configurations, enabling administrators to manage the OS and control the status of services. Further, systemctl is useful for troubleshooting and basic performance tuning.

Syntax: systemctl <run,stop,etc..,>

1.**systemctl enable:**   enable the particular package in server

2.**systemctl start:**   start the particular package in the server

3.**systemctl status:** to see the status of the running package or s/w