



**Vital Tech
Myanmar**

LINUX ESSENTIALS COURSE

PRESENT BY VITAL TECH MYANMAR



What is Linux?

- ❑ Linux is a free and open source operating system.
- ❑ At its core, the linux operating system is derived from the Unix OS.
- ❑ Unix was created in the 1960s by Dennis Ritchie and Ken Thompson, both of them also invented the C Programming Language.
- ❑ Linux was initially named GNU and was developed by Richard Stallman
- ❑ Linux was the name of the kernel created in 1991 by Linus Torvalds, a student at the University of Helsinki
- ❑ Linus Torvalds had wanted to call his invention "Freax" i.e., Free, Freak + x as an allusion to Unix. In this project his partner Mr. A.L. Torvalds did not think it's a good name, So they finally decided named their project name as "Linux".



The father of Linux: [Linus Torvalds](#)



The father of GNU: [Richard Stallman](#)



Linux Distribution

- ❑ Linux OS has multiple distributions (called distros) that are derived from it's initial development.
- ❑ Most of the are FREE and offer full functionality:
 - ❑ Debian
 - ❑ Ubuntu
 - ❑ RedHat
 - ❑ Rocky Linux (Released April 30, 2021)
 - ❑ CentOS
 - ❑ OpenSUSE



For more info about various types of Linux:

<https://distrowatch.com/>



Architecture of Linux

Kernel:

- Linux is not a operating system, Linux is kernel.
- The kernel is the heart of the operating system.
- It interacts with hardware and most of the tasks like memory management, task scheduling and the file management

Shell:

- The shell is the utility that processes your requests
- When you type in a command at your terminal, the shell interprets the command and calls the program that you want.
- The shell uses standard syntax for all commands.
- C Shell (csh), Bourne Again Shell(Bash) are most famous shells which available with most of the Unix variants.
- Bash is the default for Linux



Advantages and Disadvantages of Linux

Advantages

- It's free and open source
- Linux is portable hardware platform
- Requires minimal hardware configuration
- Linux continue work well even when the hard disk is almost full

Disadvantages

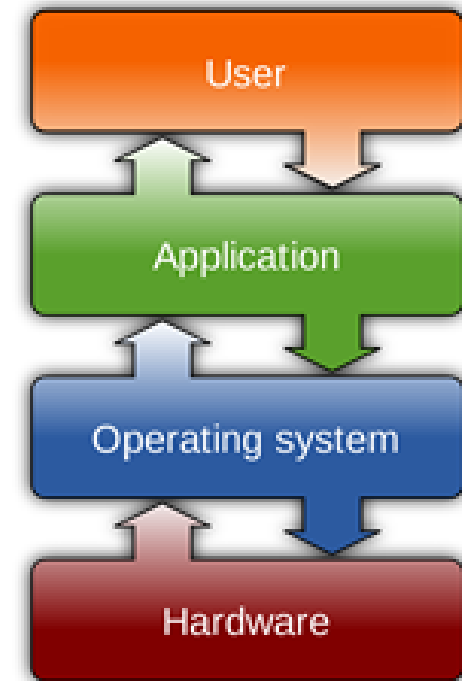
- Text Interface is not as user-friendly as windows
- Less Commercial software available
- More difficult to setup
- There are far too many distro



What is Operating System?

An **Operating System** is a system software that manage computer hardware and software resources and provides common services for computer programs.

- Manage **processor** resources to handle input, output and processing tasks.
- Manage **memory** by allocating space for all the programs and data that are in use during a computing session
- Keep track of **storage resources** so that files and programs can be found and manipulated.
- Ensure that **input and output** proceed in an orderly manner by communicating with peripheral devices.
- Establish basic elements of the **user interfaces** such as the appearance of the desktop, menus, and toolbars.





Rocky Linux Installation

Prerequisites

HDD minimum: 20GB

RAM minimum: 2GB (Recommended 4GB)

System Type: 64-bit x86 System

Installation kit: Bootable DVD/USB/.iso

Download Rocky Linux

Rocky Linux's official site provides a direct download link for the iso file.

<https://rockylinux.org/download/>

Download Rocky

Download the official release of Rocky from one of our trusted mirrors.

Rocky 9

Enterprise Linux v9 Compatible

Planned EOL: May 31 2032

ARCHITECTURE	ISOS	PACKAGES
x86_64	Minimal DVD Boot Torrent Checksum	BaseOS
ARM64 (aarch64)	Minimal DVD Boot Torrent Checksum	BaseOS
ppc64le	Minimal DVD Boot Torrent Checksum	BaseOS
s390x	Minimal DVD Boot Torrent Checksum	BaseOS



Partition File System

Certified and [maximum] individual file size

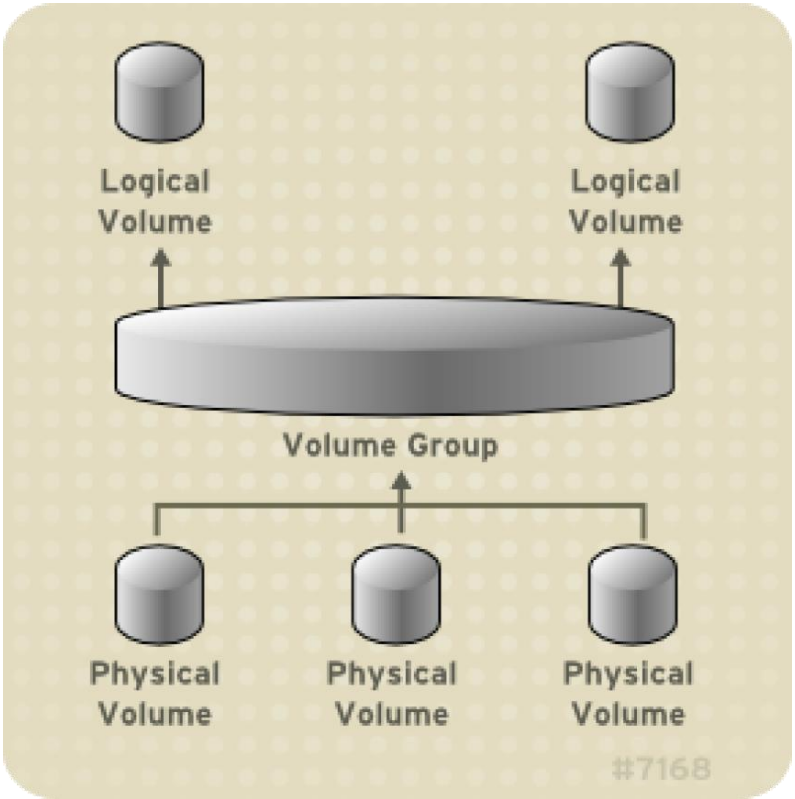
File system	RHEL 3	RHEL 4	RHEL 5	RHEL 6	RHEL 7	RHEL 8
Ext2/3	1TiB (3.0) 2TiB (3.5+)	2TiB	2TiB	2TiB	2TiB	2TiB
Ext4	n/a	n/a	16TiB (5.6+) ²	16TiB	16TiB	16TiB
GFS1	2TiB	16TiB [8EiB]	16TiB [8EiB]	n/a	n/a	n/a
GFS2 ¹	n/a	n/a	100TiB (5.3+) [8EiB]	100TiB [8EiB]	100TiB [8EiB]	100TiB [8EiB]
XFS ³	n/a	n/a	100TiB [8EiB]	100TiB [8EiB]	500TiB [8EiB]	8EiB

Certified and [maximum] file system size

File system	RHEL 3	RHEL 4	RHEL 5	RHEL 6	RHEL 7	RHEL 8
Ext2/3	1TiB (3.0) 2TiB (3.5+) [8TiB]	8TiB	8TiB (5.0), 16TiB (5.1+) ⁴	16TiB	16TiB	16TiB
Ext4	n/a	n/a	16TiB [1EiB] (5.6+) ²	16TiB [1EiB]	50TiB [1EiB]	50TiB [1EiB]
GFS	2TiB	16TiB [8EiB]	16TiB [8EiB]	n/a	n/a	n/a
GFS2 ¹	n/a	n/a	100TiB (5.3+) [8EiB]	100TiB [8EiB]	100TiB [8EiB]	100TiB [8EiB]
XFS ³	n/a	n/a	100TiB [16EiB]	300TiB [16EiB] ⁵	500TiB [16EiB]	1PiB



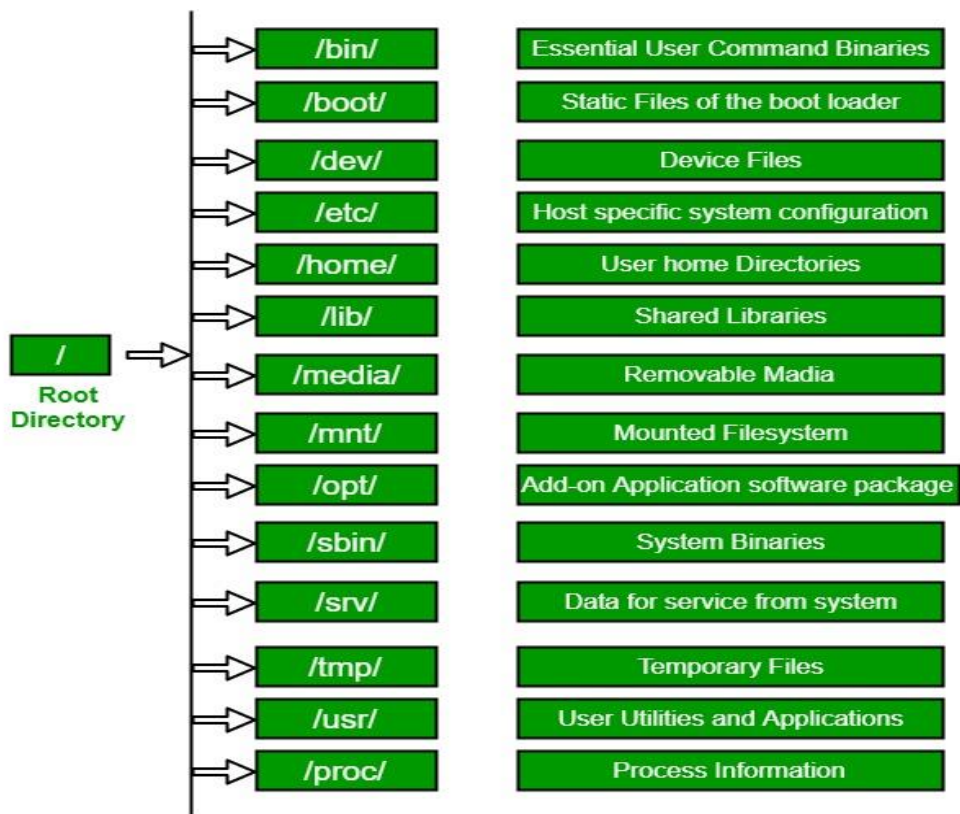
Logical Volume Manager (LVM)





Linux File System Hierarchy

In Windows we call them folders, in Linux the term used is directory/directories.





Linux File System Hierarchy

- The equivalent of the “C:\” partition in Windows is referred in Linux as “/” – also called “root” directory, or “slash”.
- The Linux file system has the root directory at the top of the directory tree.
- The Following list of directories are subdirectories of the root directory. This directory is denoted by the / (pronounced “slash”) symbol.
- **/bin**
Contain executable program such as ls (“dir” in Windows) and cp (“copy” in Windows). These programs are designed to make the system usable.
- **/etc**
Contains system configuration files which are local to the machine. Programs store configuration files in the directory and these files are referenced when programs are run.
- **/home**
Contains user account directories. Each user created by the system administrator will have a subdirectory under /home with the name of the accounts. This is default behaviour of Linux System. E.g. User account for **Carter** is created, her home directory will be located in **/home/carter**.



Linux File System Hierarchy

/mnt

Used for mounting temporary filesystems. When mounting a CD-ROM for instance, the standard mount point location is `/mnt/cdrom`.

/opt

Used for storing random data that has no other logical destination.

/proc

Provides information about running process and the kernel. A directory is provided for each running process. Useful system information such as the amount of Random Access Memory (RAM) available on the system as well as Central Processing Unit(CPU) speed in Megahertz (MHz) can be found within the **/proc** directory.

/root

This is home directory for the super user (root). This directory is not viewable from user accounts. The `/root` directory usually contains system administration files.

/sbin

Similar to `/bin`, this directory contains executable programs needed to boot the system, however the programs within `/sbin` are executed by the root user.



Linux File System Hierarchy

/tmp

This directory is used for temporary storages spaces. Files within this directory are often cleaned out either at boot time or by a regular process

/usr

Used to store applications. When installing an application on a Debian GNU/Linux machine, the typical path to install would be /usr/local. You will notice the directory structure within /usr appears similar to the root directory structure.

/var

This directory contains files of variable file storage. File in /var are dynamic and are constantly being written to or changed. This the directory where websites are usually stored in.

/boot

The files necessary for the system to boot.

/dev

All device drivers are the files that your there's a file in the /dev directory for your particular make and model of monitor, and all of your Linux computer's communication with the monitor go through that file.

/lib

System libraries. Libraries are just bunches of programming code that the programs on your system use to get things done.



File System

- Windows uses letters of the alphabet to represent different devices and different hard disk partitions. Under Windows, you need to know what volume (C:, D:, ...) a file resides on to select it, the file's physical location is part of its name.
- In Linux all directories are attached to the root directory, which is identified by a forward-slash, "/". – root.
- For example, below are some second-level directories:

- shell command.

fdisk -l /*list partitions*/

#/dev/sda1

 /dev device

 /sda1 or /hda1

 sd – SATA /*SATA – tech to read/write data*/

 hd – IDE

 a



File System

- Sd ..a/b/c/d...1/2/3...
 - a – primary master
 - b - primary slave
 - c - secondary master
 - d - secondary slave
 - 1/2/3 ... - first/second/third partition

- # fdisk /dev/sda /* 'm' for help*/
- (if type “l” it will list all available file sys with their Id e.g. Windows - 7 and Linux – 83)
- /dev/sda1 – sys reserve
- /dev/sda2 – is C:\
- (Windows makes 2 partition: 100MB (From 100GB) for sys reserve and remaining C:\(100GB))



Linux Help (Man)

- You can keyword search for commands
- For instance, what commands show a calendar?

- `$ man -k calendar`

`cal (1)` - displays a calendar

`cal (1p)` – print a calendar

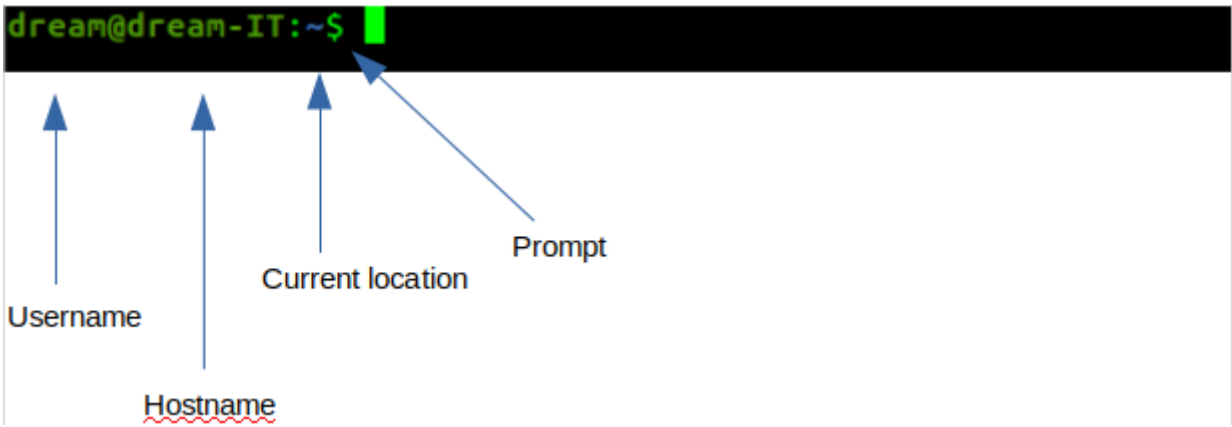
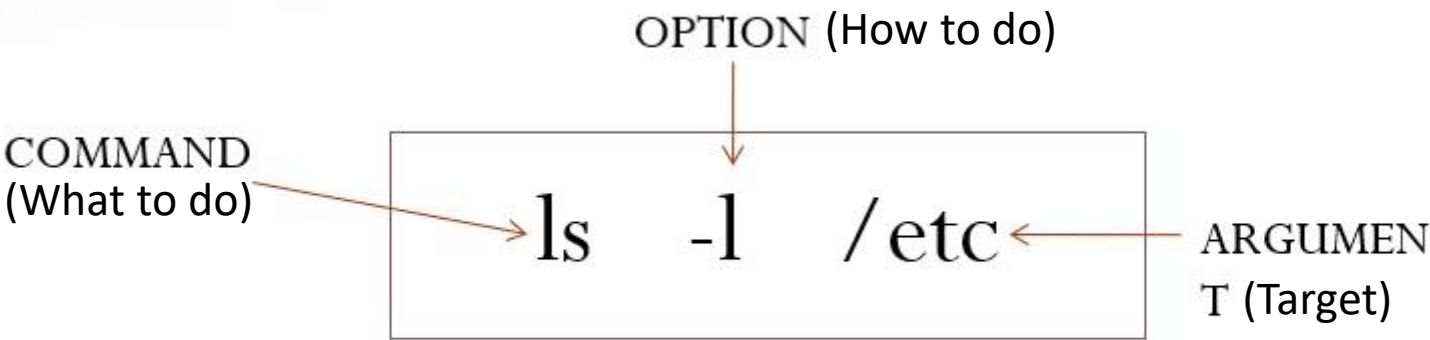
`Difftime (3p)` – compute the difference

Linux Help (Info)

- A program for reading documentation, sometimes a replacement for manual pages
- Example : `info ls`



Terminal Overview





Linux File Paths

- Two type of file paths – Absolute file path and Relative file path.

Absolute file path

- An absolute path is defined as the specifying the location of a file or directory from the root directory (/).
- Start at the root directory (/) and work down.
- Write a slash (/) after every directory name (last one is optional)

Eg. `cat /etc/passwd`

`vim /etc/sysconfig/network-scripts/ifcfg-eth0`

`ls /home/carter/Desktop/`



Linux File Paths

Relative file path

Relative path is defined as the path related to the present working directory(pwd). It start at your current directory and never starts with a / .

A shortcut in the relative pathname – that uses either the current or parent directory as reference and specifies the path relative to it . A relative path-name uses one of these cryptic symbols:

- . (a single dot) – this represents the current directory.
- .. (two dots) – this represents the parent directory.



Linux File/Directory Properties

- Type `ls -l` in Terminal

drwxr-xr-x	4	devr	net	devnet	4096	2009-09-28	05:13	Desktop
drwxr-xr-x	6	devnet	devnet	devnet	4096	2009-09-25	07:23	Documents
drwxr-xr-x	49	devnet	devnet	devnet	4096	2009-09-25	07:23	Music
drwxr-xr-x	2	devnet	devnet	devnet	4096	2009-09-25	07:11	Network
drwxr-xr-x	2	devnet	devnet	devnet	4096	2009-09-25	07:04	Pictures
drwxr-xr-x	2	devnet	devnet	devnet	4096	2009-09-25	07:11	Public
drwxr-xr-x	2	devnet	devnet	devnet	4096	2009-09-25	07:11	Templates
drwxr-xr-x	2	devnet	devnet	devnet	4096	2009-09-25	07:11	Videos

File Type

User Permissions

Group Permissions

Other Permissions

of Hard Links

User / Owner

Group

Size

Date

File or Directory Name

Legend:

- d - directory
- r - readable
- w - writeable
- x - executable



Linux Basic Command Part-1

- cd (change the shell working directory)
- ls (list of file/directories)
- pwd (Print Working Directory)
- mkdir
- touch
- date (date and time)
- cal (calendar)
- cp
- mv
- echo
- head (first 10 lines of each file)
- tail (last 10 lines of each file)
- cat (read standard input)
- more (scroll up and down)
- less (up and down)
- uname
- df (Hard Disk Information)



Linux Basic Command Part-2

- rmdir(delete an empty directory), rm(delete a file or directory)
- top
- ps
- kill -9 process id
- Ifconfig, ping, traceroute, dig (like nslookup)
- whatis, whereis
- free
- lsblk
- du -h
- su
- which (like locate)
- uptime (check uptime of machine)
- lastlog (check the last logging user and time)
- history (display last commands in history)
- nano, vi



Text Editor (VI)

Editors are used for adding, modifying and / or deleting text.

The different editors used

- Windows (Notepad)
- Linux
 - 1.CLI Based (vi, nano)
 - 2.GUI Based (gedit)
- Vi editors is a screen oriented text editors written by Bill Joy in 1976.
- This is the most commonly used editor for editing files in linux.

Vi Editor Modes

- Command mode
- Insert Mode
- Ex Mode



Insert mode

- i - Inserts the text at the current cursor position.
- I - Inserts the text in beginning of line.
- a - Adds the text after the current cursor position.
- A - Adds the text at the end of the line.
- o - Insert the text one line below current cursor point.
- O - Insert the text one line above current cursor point.



Command mode

- dd - Delete a line.
- 3dd - Delete '3' lines.
- yy - Copies a lines.
- 3yy - Copies "3" lines.
- p - Put (Paste the deleted or copied text.)
- u - Undo (you can undo 1000 times)



Ex mode

- `:q` - Quit without saving.
- `:w` - Write (save).
- `:wq` - Save and quit.
- `:se nu` - Set line numbers.
- `:se nonu` - remove line numbers.
- `:88` - This cursor goes to line 84.



Tar Command

- ❑ The Linux 'tar' stands for tape archive, is used to create archive and extract the archive files. Tar command in Linux is one of the important command which provides archiving functionality in Linux. We can use Linux tar command to create compressed or uncompressed archives files and also maintain and modify them.

- ❑ `# tar <option> <archive name> <source file or dir>`

Options

- c = create an archive
- t = display or lists files in archived file
- x = extract an archive
- f = creates archive with given filename
- v = display Verbose Information
- z = zip, tells tar command that creates tar file using gzip
- r = update or add file or directory in already existed .tar file
- j = filter archive tar file using tbzip

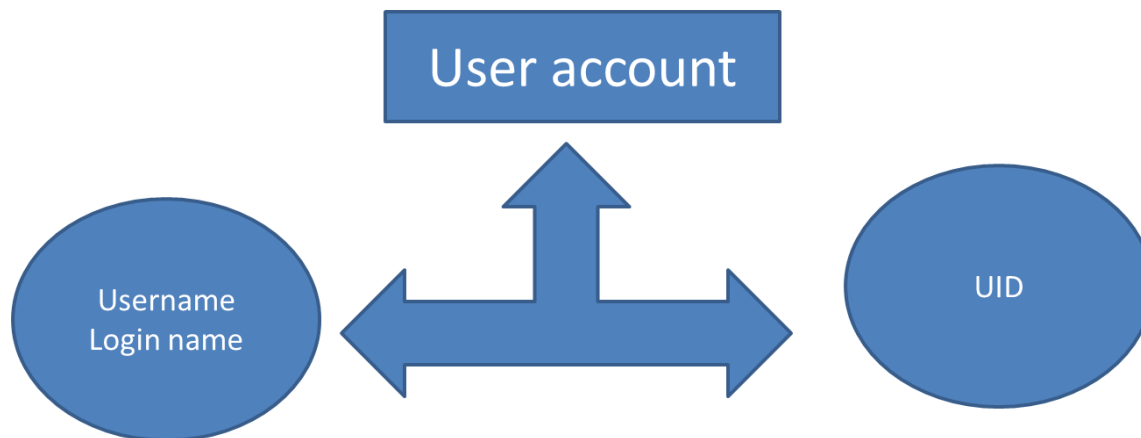


Local User and Group Management



User Accounts

- ❑ A user account is a systematic approach to track and monitor the usage of system resources.
Each user account contains two unique identifiers; username and UID.
- ❑ When a user account is created, its username is mapped to a unique UID.





Types of user accounts

- ❑ There are three types of user in linux –
 - ❑ Super User (root)
 - ❑ Normal User
 - ❑ System User (service user account)

Super User (UID 0)

Super User is the main user account in Linux System. It is automatically created during the installation. It has the highest privilege in system. It can do any administrative work and can access any service.

Normal User (1001 – 60000)

Normal User is the one of the user account is created automatically. After the installation, we can create as many normal user accounts as we need. This account has moderate privilege.

System User (1 – 999)

System User are created by installation packages when they are installed. These accounts are used by services to run processes and execute functions.



User and Group Management Command

- `#id`

The id command is used to show information about current logged-in user.

- `#id <username>`

Basic information about another user can also be requested by passing in the username of that user as the first argument to the id command.

- `#useradd <username>`

- `#userdel -r <username>`

The “r” option is important for user delete

- `#usermod <option> <username>`

Usermod command is used to for user modify. You can check option with this command “usermod --help”



User and Group Management Command

- `#passwd`
Current user password change
- `#passwd <username>`
Other user password change but root user only can change other user password.
- `#groupadd <group name>`
- `#groupdel <group name>`
- `#usermod -aG <group> <username>`
User Account add in group.
- `#gpasswd -d <username> <group>`
User Account remove from group



User and Group Management Command

- `#getent <group> <groupname>`
Check Group UID
- `#cat /etc/passwd`
User Information and config file
- `#cat /etc/group`
Group Information and config file
- `#cat /etc/shadow`
User Password Information and config file



File Permission in Linux



File Permissions

- There are three defined categories of users.
- The categories are:
 - Owner - the owner of the file or application.
 - Others - All users with access to the system.
 - Group - The group that own the file or application.
- There are three permissions for any file, directory or application program.
 - read - indicate that a given category of user can read a file.
 - write - indicates that a given category of user can write to a file.
 - execute – indicates that a given category of user can execute the file.

```
# ls -l file
-rw-r--r-- 1 root root 0 Nov 19 23:49 file
```

Other (r - -)
Group (r - -)
Owner (rw-)

File type

r = Readable
w = Writeable
x = Executable
- = Denied