Understanding Linux

In 1991
by Linus Torvalds,
Computer science student
in Finland
as personal project

He wanted to develop the kernel for operating system.

kernel is the core component of an operating system that manages hardware resources, facilitates communication between software and hardware, and ensures the stability and security of the overall system.

Open source philosophy

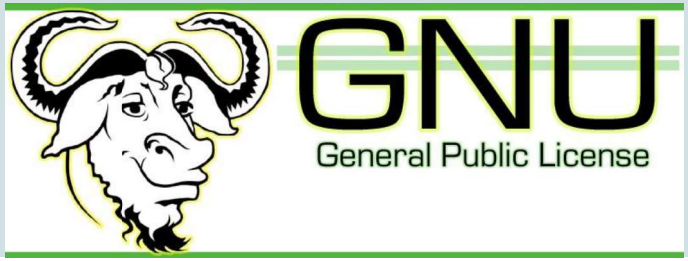
GNU:

GNU stands for "GNU's Not Unix," is a project initiated by Richard Stallman in 1983 with the goal of creating a free and open-source Unix-like operating system

GNU General Public License :

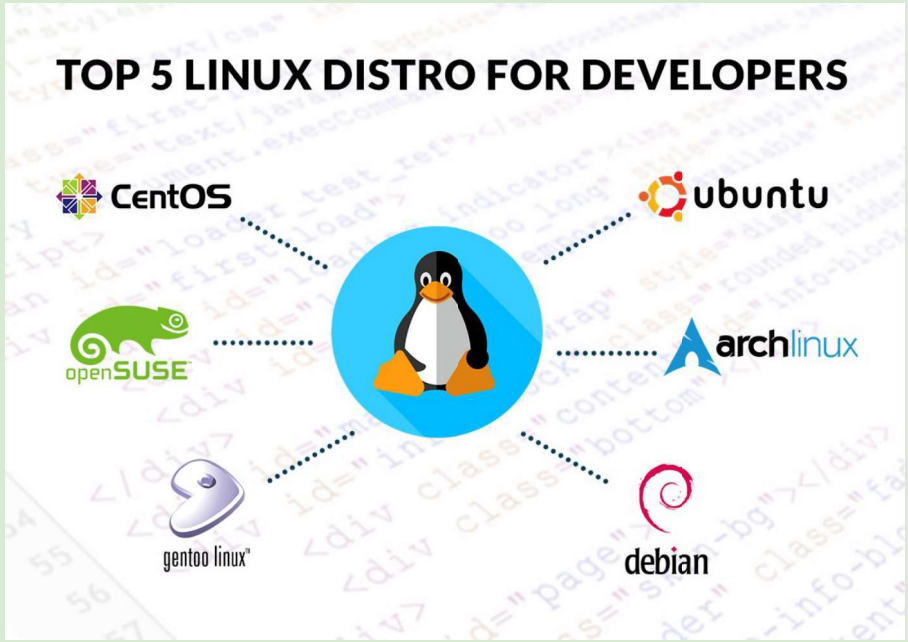
A software license that ensures that software released under it remains free and open source. The GPL is a cornerstone of the GNU Project.

Linus Torvalds decided to release Linux under the GNU General Public License (GPL). This license ensured that Linux would remain open source, allowing anyone to access, modify, and distribute its source code freely.



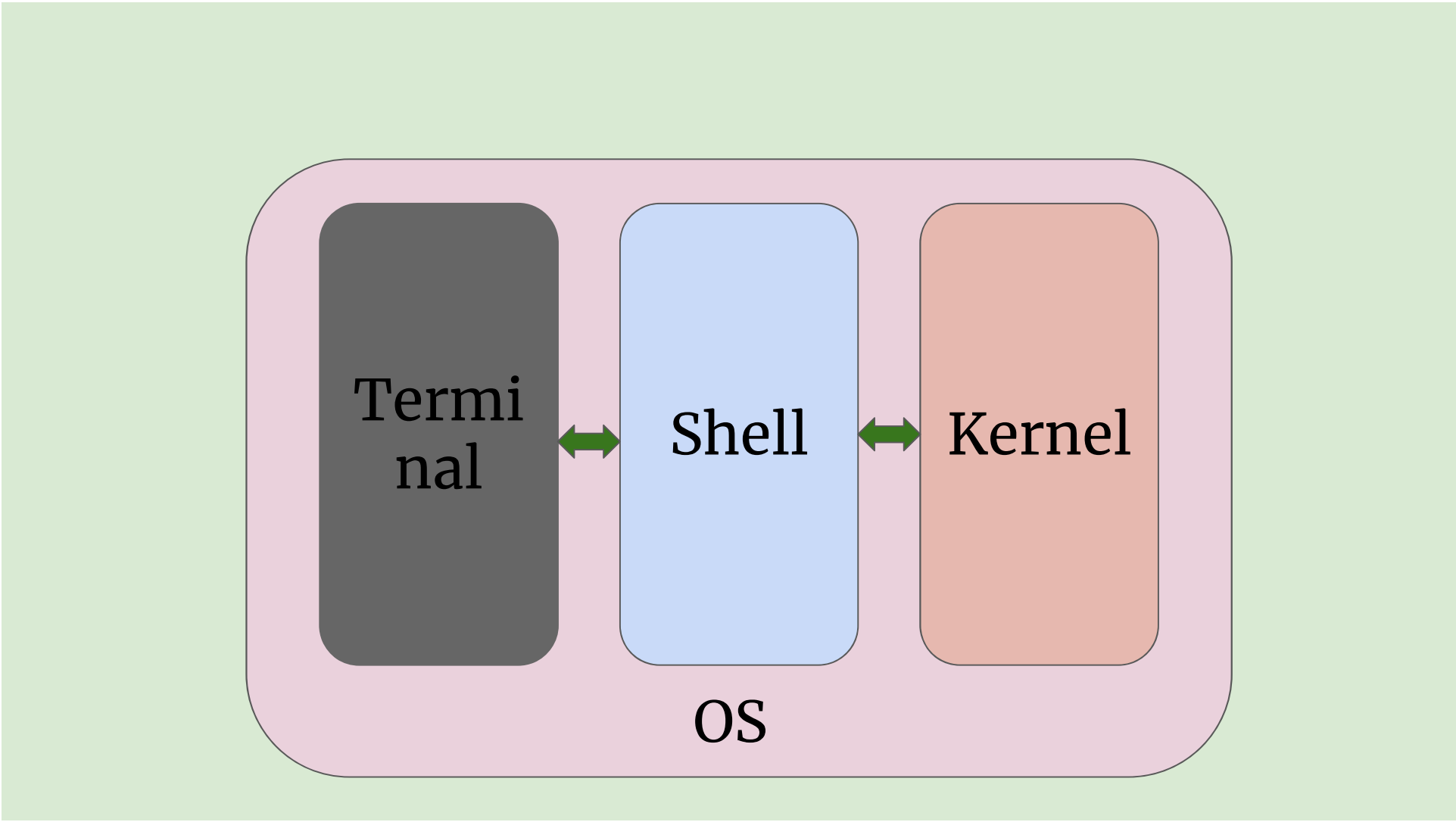
Distributions (Distros):

To create a complete, usable operating system, Linux needed more than just the kernel. Various groups and organizations started creating Linux distributions by combining the Linux kernel with software packages and utilities. Some early distributions include Slackware, Debian, and Red Hat.



CLI vs GUI

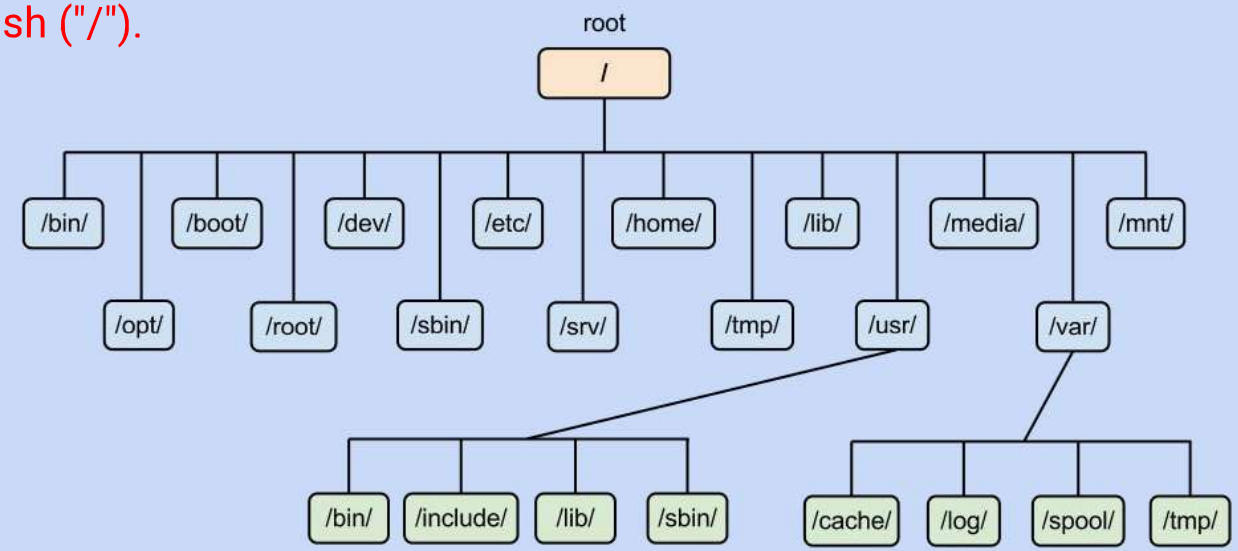
CLI (Command Line Interface)	GUI (Graphical User Interface)
Text-based interface where users interact with the system by typing commands into a terminal or command prompt.	Visual interface that uses graphical elements like windows, icons, buttons, and menus to interact with the system.
Well-suited for automation, scripting, and remote server management.	Well-suited for applications that require rich graphics, multimedia, and complex user interactions.
Typically uses fewer system resources compared to GUI.	Typically uses more system resources compared to CLI due to graphical rendering.
Provides fine-grained control over the system and access to a wide range of tools and utilities.	Limited to the features and functionality exposed by the graphical interface.
Efficient for experienced users who are comfortable with text commands	More user-friendly and intuitive for beginners and casual users.


Termi
nal
Shell
Kernel
OS

Linux file system

- In Linux, the file system is the structure and methodology used to organize and manage files and directories on storage devices
  like hard drives,
  solid-state drives,
  network-mounted storage.

- The Linux file system is hierarchical, and it starts with the root directory, denoted by a forward slash ("/").



omkar@omkar -VirtualBox :~$ ⇒ username@hostname normal user

User can be of two types

1. Normal user (less privileges)
2. Root user (High privileges)

ls (list): It is used to list files and directories in a current directory.

ls directory : It is used to list files and directories in a that particular directory.

ls -a : It is used to list the hidden files from directory.

ls -l: To get a more detailed listing with information such as file permissions, owner, group, file size, modification date, and filename

drwxr Permission

d : Directory

r : Read

w : Write

x : Execute

ls -S : To sort the directories on basis of file size.

ls *.txt : To list files which has specific extensions.

ls -lS > out.txt : Export or save the content of command into out.txt

clear : to clear the terminal

cd : Change directory

cd	Change location to home directory
cd /	Change file system location to root
cd ~	Change file system location to Home
cd ..	Change location to previous directory
cd path	Change location to specified path or directory
cd firstpart\ secondpart name cd “Directory name” cd ‘Directory name’	Change location to directory which having space in name.

Relative path vs absolute path

cat (concatenate) Used to display content of text files.

cat	Echo the input from user to exit cat command (Ctr+D)
cat filename.txt	Show the content of text file
cat filename.txt filename.txt	Show the content of two text file
cat -b filename.txt	Add number to non blank line
cat -n filename.txt	Add number to every line even if it is blank line
cat -s filename.txt	Reduce the blank space into one line
cat -E filename.txt	Indicate end of line by adding $ sign

> (Recapture) Used to manage input and output

cat > filename.txt	Input content is saved into filename.txt (Content is overwritten)
cat >> filename.txt	Append the input content into text file
cat filename.txt filename.txt > out.txt	Add the content of two text file into one single file
ls -l > filename.txt	Save the content of ls into filename.txt

mkdir (make directory) Used to create directory in linux.

mkdir directory	Create new directory
mkdir directory/directory	Create directory inside directory
mkdir -p directory/directory	Create directory structure
mkdir -p directory/{directory ,directory,directory}	Create multiple directory inside directory

rmdir (remove directory) Used to remove directory in linux.
rm (remove) used to remove file.

rmdir directory	Delete existing directory
rmdir directory/directory	Remove top level directory
rmdir -p directory/directory	Remove directory structure
rmdir -pv directory/directory	Show details about how internal thing works
rm file.txt	Delete the file.txt
rm -r directory	Delete total directory structure

rmdir (remove) only delete empty directory.

cp (copy) Used to copy files and directory in linux.

cp [options] source destination

cp file_1 file_2	Copy file_1 content to file_2
cp file_1 directory	Copy file_1 to directory
cp file_1 file_2 directory	Copy file_1 and file_2 to directory
cp dir_1 dir_2	Copy dir_1 to dir_2 if directory dir_1 is empty
cp -r dir_1 dir_2	Copy dir_1 to dir_2
cp -rv dir_1 dir_2	Copy dir_1 to dir_2

If destination does not exist already then cp create the destination.

mv(move) Used to rename and move directory in linux.

mv [options] source destination

mv oldfile newfile	Rename file from oldfile to newfile
mv file dir	move file to destination directory
mv file dir	Overwritten if file already exits
mv dir1 dir2	Move dir1 to dir2

less Used to read or view content conveniently in linux.
Used for file containing very big data

less file.txt	Show the content of file.txt △ Down scrolling ▽ Up scrolling spacebar : Next page B : Previous page G : Last page g : First page / word : Show word in content (n) next word Up to down search ? word : Show word in content (n) next word down to up search Q : Quit the window

touch : Used to create empty file and update timestamp of existing files linux.

touch [options] filename

touch newfile	Create new empty file
touch newfile.txt	Create new empty newfile.txt
touch oldfile	Update the timestamp of existing file

Using touch we can create the files with different extensions (.c, .cpp, .py)

nano Simple, straightforward text editor in linux.

nano filename

nano filename.txt	Create new file and open text editor
nano filename.txt	Open text editor for exiting filename.txt
nano file.c	Open editor for programming language

rmdir (remove) only delete empty directory.

sudo(Super user do) It allows special (root) privilege as an administrator and power user in linux.

Sudo option command

Try to create a directory or file in “/etc”.

Sudo mkdir newfiledir

Ask for password (password will not print)

Used in installing new third party software or library.

top Provide dynamic realtime information about performance and resources used in OS linux.

top [options]

PID	Process ID
i	Do not show idel process
k	Kill the process with PID
m	Sort process by memory usage
p	Sort process by CPU usage
q	Quit the top view

top command refreshes in every 3 second

kill used to end or kill the process in OS linux.

kill [options] pid

kill PID	End the process having PID
pidof process-name	Get the pid of process
kill KILL PID	Powerful command to Kill the process with PID
ps -ux	To get the PID

Unity control centre

echo print anythings in linux.

echo

echo text	Repeat the text
echo “Text”	Write the text in double
var_name = value	To store the value in var_name
var_name= “string”	To store the string in var_name
echo $var_name	print the value of var_name
echo “value of var is $var_name”	Printing values of variable with text
echo -e “text \n \t \b....”	To use escape sequence

File permission -rw-rw-r- - 1 omkar omkar 40 18 oct 23 10:30 filename

- d c b	Normal File type Directory file type Character file type Binary file type
rw-	Owner has these permissions
rw-	Group has these permission
r--	Permission for every one
1	Symbolic link
omkar	Owner name of file
omkar	Group name of file
40	file size
18 oct 23 10:30	Date and Time stamp

chmod : Change the file permission in linux.

chmod u/g/o/a +/- r/w/x filename
chmod ug = rw filename

u g o a	Owner Group Other All three
+ -	Add permission Remove permission
r w x	read Write Execute

chmod : Change the directory permission in linux.

chmod u/g/o/a +/- r/w/x dirname

Remove permission one by one from owner and perform task like reading content , changing content and accessing files

Octal Representation

0	000	- - -	No permissions
1	001	- - x	Only Execute
2	010	- w -	Only Write
3	011	- w x	Write and Execute
4	100	r - -	Only Read
5	101	r - x	Read and Execute
6	110	r w -	Read and Write
7	111	r w x	Read, Write and Execute

chmod 000 filename
chmod 111 filename

Scripting

Script are program written in scripting language.
It contain the command for linux os.
They are used to perform task or automate the task.
Script are interpet by shell and translate to os.
There are various type of shell available

- sh
- bash
- dash

We are using bash shell for scripting
Location of bash shell is “/bin/bash”.
You can check it by using command which bash
Script contain function,loop, if-else it is pretty advance topic

How to create script

- nano scriptfile.sh
- Write type of shell #! /bin/bash
- Write commands
- Save and exit
- Change file permission
- Execute the file by ./scriptfile.sh

which : It provide the path of program or command stored in system

which command

which ls => /bin/ls

whatis : It provide the short description about command

whatis command

whatis => list the directory and file

useradd: To create new user in system

useradd username options

useradd username -m	Create home directory for new user
useradd username -s /bin/bash	All user to use shell (bash)
useradd username -g usergroup	To make newuser a part of the usergroup Defult user group is user
sudo useradd username	To make user as root user

sudo useradd username -m -s /bin/bash

When create new user in system to login with that user we need add password to it.

sudo passwd username

To switch the user use **su** su username

To delete the user we use **userdel**

sudo userdel username : it will not delete the home directory
To remove it use -r option

sudo userdel -r username

Resources management

df -h	To see the total, fill and available disk space of system
du -h file/dir	To see how much space is taken by particular file or directory
free -m/k/g/tera	To see total, used and free memory space

Group management

groups	To see how many how many groups the user is connected
cat /etc/groups	To see how much groups are there in system
sudo groupadd groupname	to add new group in system
sudo groupdel groupname	To delete the group
sudo gpassswd -a username groupname	Add user to the group
sudo gpassswd -d username groupname	Remove user from the group

.bashrc file present in home/omkar/
It is executed when terminal is opened
You can add your own things to this script file and see the output on terminal

watch :

watch execute the command after every fixed time interval

Watch command	Execute command after every 2 s
watch -n sec command	To change the time interval

find:

To find the file in particular directory

find dir -name filename	Search filename in dir
find dir -mtime +-day	Show all the file - before day or + after day

wc :

Gives the word, line and character count

cal :

To show conventional calendar

cal year	Show 12 month calendar of year
cal month year	Show calender of month of year

date:

To show current date

Combining multiple command (;)

ls ; pwd	list file and get PWD
ls && pwd	list file and get PWD
ls || pwd	list file and get PWD

apt-get

It is used to install, upgrade, configure, and manage software packages on your system.

sudo apt-get update	update package list
sudo apt-get update install packagename	Install specific package
sudo apt-get update remove packagename	Remove package

Ifconfig

(Interface configuration) Configuring network

sudo ifconfig wan0 down	Disconnect from network
sudo ifconfig wan0 up	Connect or start with network

grep

(grab) To search pattern from txt file

grep “word” file.txt	Find word in file.txt