Computer Engineering Department & Information Technology Engineering Department

Academic Year: 2021-2022

Class: S.Y.B.Tech **Sem.:** 4 **Course:** OS

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Experiment No.	1		

AIM:	To understand Linux and its commands
EXPERIMENT 1	
Linux Theory:	**What is Linux OS?** 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 does Linux work?** Think about an OS like a car engine. An engine can run on its own, but it becomes a functional car when it's connected with a transmission, axles, and wheels. Without the engine running properly, the rest of the car won't work. Linux was designed to be similar to UNIX, but has evolved to run on a wide variety of hardware from phones to supercomputers. Every Linux-based OS involves the Linux kernel—which manages hardware resources—and a set of software packages that make up the rest of the operating system. The OS includes some common core components, like the GNU tools, among others. These tools give the user a way to manage the resources provided by the kernel, install additional software, configure performance and security

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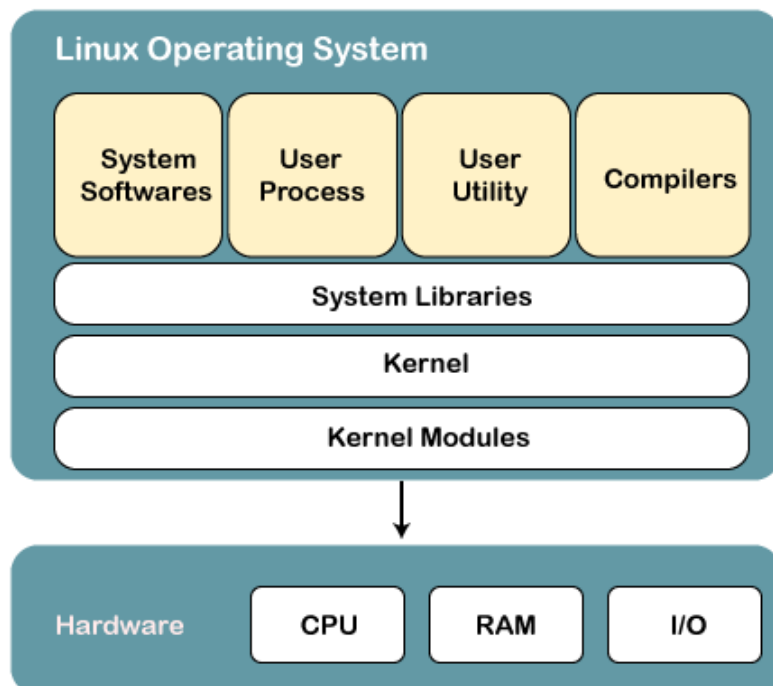
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settings, and more. All of these tools bundled together make up the functional operating system. Because Linux is an open source OS, combinations of software can vary between Linux distributions.

What's a command line?

The command line is your direct access to a computer. It's where you ask software to perform hardware actions that point-and-click graphical user interfaces (GUIs) simply can't ask.

Command lines are available on many operating systems—proprietary or open source. But it's usually associated with Linux, because both command lines and open source software, together, give users unrestricted access to their computer.

What does Linux include?

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	Kernel The base component of the OS. Without it, the OS doesn't work. The kernel manages the system's resources and communicates with the hardware. It's responsible for memory, process, and file management. **System user space** The administrative layer for system-level tasks like configuration and software install. This includes the shell, or command line, daemons, processes that run in the background, and the desktop environment. **Applications** A type of software that lets you perform a task. Apps include everything from desktop tools and programming languages to multiuser business suites. Most Linux distributions offer a central database to search for and download additional apps.
History:	# HISTORY OF LINUX Linux began in 1991 as a personal project by Finnish student Linus Torvalds: to create a new free operating system kernel. The resulting Linux kernel has been marked by constant growth throughout its history. Since the initial release of its source code in 1991, it has grown from a small number of C files under a license prohibiting commercial distribution to the 4.15 version in 2018 with more than 23.3 million lines of source code, not counting comments, under the GNU General Public License v2 ## Evolution of Unix In 1969, a team of developers of Bell Labs started a project to make a common software for all the computers and named it as 'Unix'. It was simple and elegant, used 'C' language instead of assembly language and its code was recyclable. As it was recyclable, a part of its code now

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commonly called 'kernel' was used to develop the operating system and other functions and could be used on different systems. Also its source code was open source.

Initially, Unix was only found in large organizations like government, university, or larger financial corporations with mainframes and minicomputers (PC is a microcomputer).
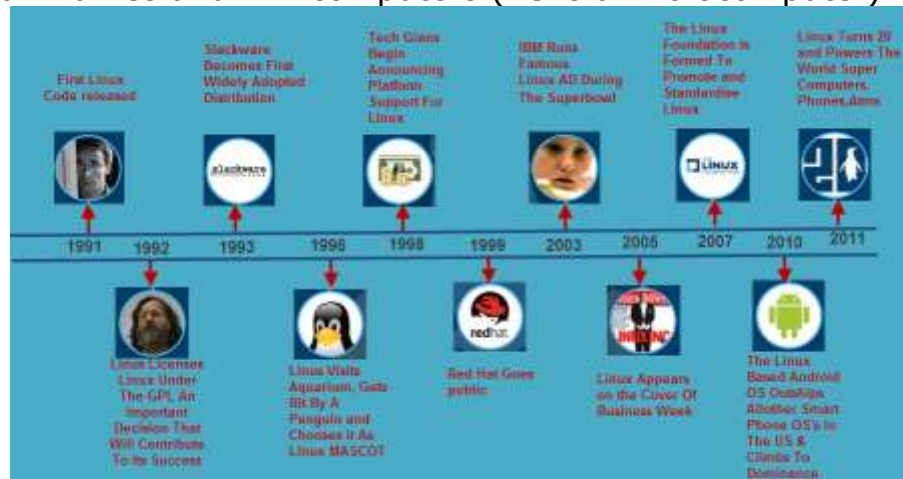
Evolution of Linux

In 1991, Linus Torvalds a student at the university of Helsinki, Finland, thought to have a freely available academic version of Unix started writing its own code. Later this project became the Linux kernel. He wrote this program specially for his own PC as he wanted to use Unix 386 Intel computer but couldn't afford it. He did it on MINIX using GNU C compiler. GNU C compiler is still the main choice to compile Linux code but other compilers are also used like Intel C compiler.

He started it just for fun but ended up with such a large project. Firstly he wanted to name it as 'Freax' but later it became 'Linux'.

He published the Linux kernel under his own license and was restricted to use as commercially. Linux uses most of its tools from GNU software and are under GNU copyright.

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Basic Commands:	**Basic Commands**
	1. pwd — When you first open the terminal, you are in the home directory of your user. To know which directory you are in, you can use the "pwd" command. It gives us the absolute path, which means the path that starts from the root.
	2. ls — Use the "ls" command to know what files are in the directory you are in. You can see all the hidden files by using the command "ls -a".
	3. cd — Use the "cd" command to go to a directory. For example, if you are in the home folder, and you want to go to the downloads folder, then you can type in "cd Downloads". Remember, this command is case sensitive, and you have to type in the name of the folder exactly as it is. But there is a problem with these commands. Imagine you have a folder named "Raspberry Pi".
	4. mkdir & rmdir — Use the mkdir command when you need to create a folder or a directory. For example, if you want to make a directory called "DIY", then you can type "mkdir DIY". Remember, as told before, if you want to create a directory named "DIY Hacking", then you can type "mkdir DIY\ Hacking". Use rmdir to delete a directory.
	5. rm - Use the rm command to delete files and directories. Use "rm -r" to delete just the directory. It deletes both the folder and the files it contains when using only the rm command.
	6. touch — The touch command is used to create a file. It can be anything, from an empty txt file to an empty zip file. For example, "touch new.txt".
	7. man & --help — To know more about a command and how to use it, use the man command. It shows the manual pages of the command. For example, "man cd" shows the

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manual pages of the cd command. Typing in the command name and the argument helps it show which ways the command can be used (e.g., cd –help).

8. cp — Use the cp command to copy files through the command line. It takes two arguments: The first is the location of the file to be copied, the second is where to copy.

9. mv — Use the mv command to move files through the command line. We can also use the mv command to rename a file. For example, if we want to rename the file "text" to "new", we can use "mv text new". It takes the two arguments, just like the cp command.

10. locate — The locate command is used to locate a file in a Linux system, just like the search command in Windows. This command is useful when you don't know where a file is saved or the actual name of the file. Using the -i argument with the command helps to ignore the case

Tips and Tricks for Using Linux Command Line

- You can use the **clear** command to clear the terminal if it gets filled up with too many commands.
- **TAB** can be used to fill up in terminal. For example, You just need to type "**cd Doc**" and then **TAB** and the terminal fills the rest up and makes it "**cd Documents**".
- **Ctrl+C** can be used to stop any command in terminal safely. If it doesn't stop with that, then **Ctrl+Z** can be used to force stop it.
- You can exit from the terminal by using the **exit** command.
- You can power off or reboot the computer by using the command **sudo halt** and **sudo reboot**.

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File Structure:	**Linux File Hierarchy Structure**

The Linux File Hierarchy Structure or the Filesystem Hierarchy Standard (FHS) defines the directory structure and directory contents in Unix-like operating systems. It is maintained by the Linux Foundation.

- In the FHS, all files and directories appear under the root directory /, even if they are stored on different physical or virtual devices.
- Some of these directories only exist on a particular system if certain subsystems, such as the X Window System, are installed.
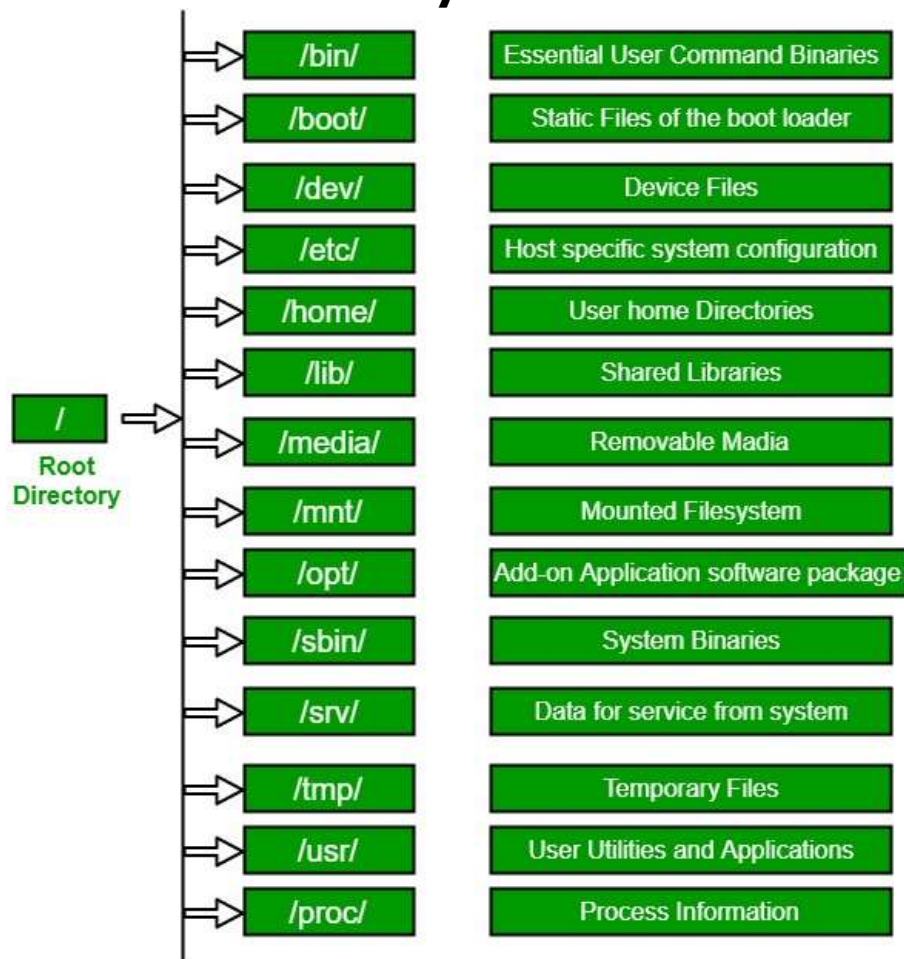
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- Most of these directories exist in all UNIX operating systems and are generally used in much the same way; however, the descriptions here are those used specifically for the FHS and are not considered authoritative for platforms other than Linux.
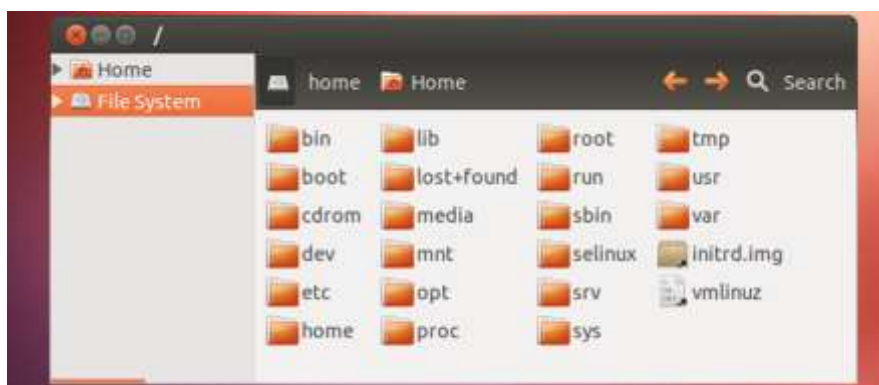
1. / (Root): Primary hierarchy root and root directory of the entire file system hierarchy.

- Every single file and directory starts from the root directory
- The only root user has the right to write under this directory
- /root is the root user's home directory, which is not the same as /

2. /bin : Essential command binaries that need to be available in single-user mode; for all users, e.g., cat, ls, cp.

- 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 e.g. ps, ls, ping, grep, cp

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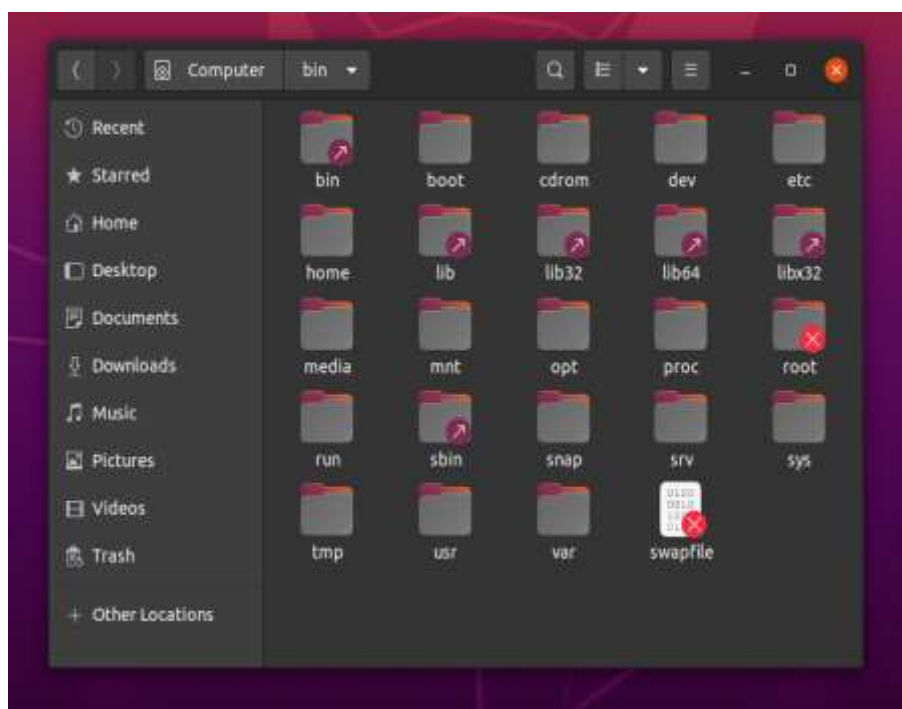
3. /boot : Boot loader files, e.g., kernels, initrd.

- Kernel initrd, vmlinux, grub files are located under /boot
- Example: initrd.img-2.6.32-24-generic, vmlinuz-2.6.32-24-generic

4. /dev : Essential device files, e.g., /dev/null.

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

5. /home : Users' home directories, containing saved files, personal settings, etc.
- Home directories for all users to store their personal files.
- example: /home/pratik, /home/p

**6. /sbin :** Essential system binaries, e.g., fsck, init, route.

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- Just like /bin, /sbin also contains binary executables.
- The linux commands located under this directory are used typically by system administrator, for system maintenance purpose.
- Example: iptables, reboot, fdisk, ifconfig, swapon
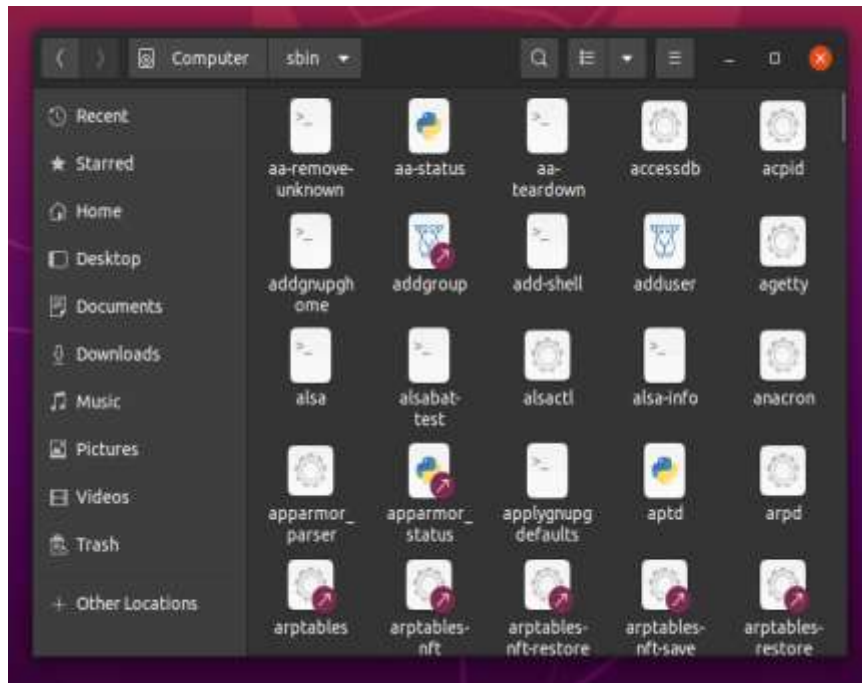
7. /tmp : Temporary files. Often not preserved between system reboots, and may be severely size restricted.
- Directory that contains temporary files created by system and users.
- Files under this directory are deleted when system is rebooted.

8. /proc : Virtual filesystem providing process and kernel information as files. In Linux, corresponds to a procfs mount. Generally automatically generated and populated by the system, on the fly.
- Contains information about system process.

This is a pseudo filesystem contains information about running process. For example: /proc/{pid}

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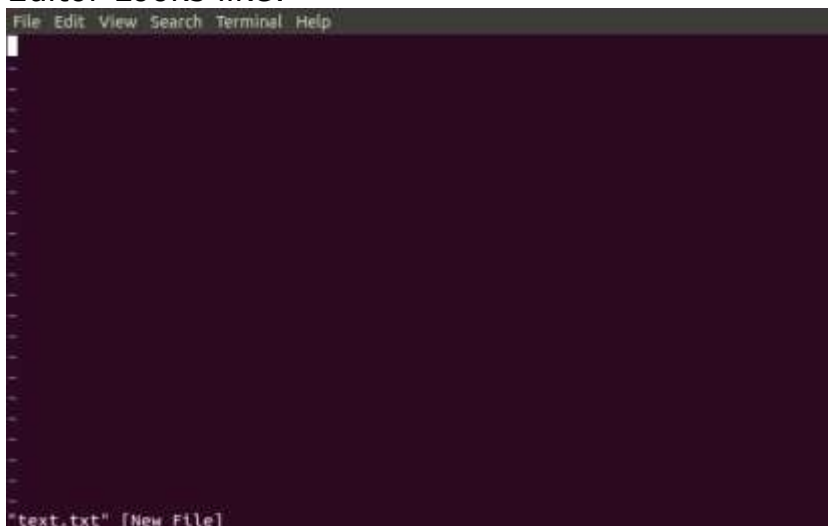|	
EDITORS:	# Linux Text Editors Linux text editors can be used for editing text files, writing codes, updating user instruction files, and more. A Linux system supports multiple text editors. There are two types of text editors in Linux, which are given below: ## 1.Vi/VIM editor Vim editor is one of the most used and powerful command-line based editor of the Linux system. **Command Mode:** The command mode allows us to perform actions on files. By default, it starts in command mode. In this mode, all types of words are considered as commands. We can execute commands in this mode. **Insert Mode:** The insert mode allows to insert text on files. To switch from command mode to insert mode, press the **Esc** key to exit from active mode and **'i'** key. To learn more about Vi editor, visit the Vi editor with commands. To invoke the vi editor, execute the vi command with the file name as follows: 1. vi <file name> Vim Editor Looks like:

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2. Nano editor

Nano is a straight forward editor. It is designed for both beginners and advanced users. It has many customization features.

Some advanced features of a nano text editor are as following:

- It has highly customizable key bindings
- It supports syntax highlighting
- It has undo and redo options
- It provides full line display on the standard output
- It has pager support to read from standard input

To open file with nano editor, execute the command as follows:

1. nano <file name>

3. Gedit editor

Gedit editor is the default editor for the GNOME desktop environment. When we open a file, it will open with the Gedit editor. It provides straightforward functionalities like any basic text editor. It is a lightweight editor with a straight forward user interface. It was publicly released in the year 2000 with a GNOME desktop environment. It is

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developed using the C programming language and supports all font family.

Some key features of the gedit text editor are as following:

- It provides syntax highlighting.
- It supports internationalized text.
- It supports several programming languages.

To invoke the gedit editor from the terminal, execute the below command:

1. gedit <file name>

It looks like:

Conclusion: At last, I learnt what is linux Operating system and some of its basic commands to open/create files.

I learnt how to create C files and write programs in it using VIM, NANO and GEDIT applications.

I learnt about the file structure of linux and installed the tree plugin which shows all the directories in tree format