Practical No. 1

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Aim :- study of linux's kernel-shell → user relationship and Linux file system and directory structure.

Theory :

Linux operating system :

Operating system is a program that acts as an intermediary between a user of a computer and the computer hardware.

- Linux is one of the popular version of unix operating system.
- Linux is multi-threading multiuser operating system that has been ported to several different platforms & processor architecture.

- Linux is a free (open source) operating system originally developed by Linux torvalds and other programmers in 1991
- Linux was designed considering unix compatibility. Its functionality list is quite similar to that of unix.
- Linux operating system (os) has primarily three components as shown in fig 1.1 & explained below:

1. Kernel :
   - The kernel is the heart of a linux operating system. The kernel acts as an intermediary between the computer hardware & various applications.
   - It is responsible for all major activities of this operating system. It consists of various modules & it intract directly with the underlying hardware

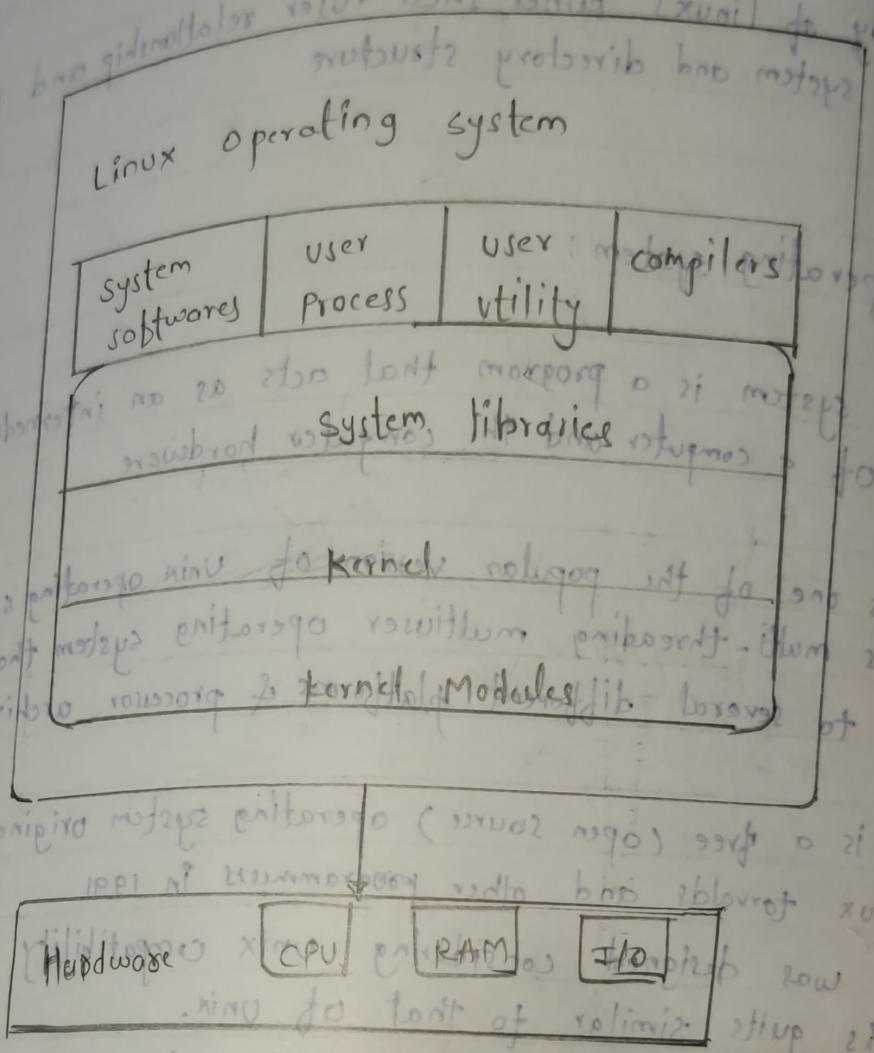

fig. 1.1 components of linux operating system

Kernel provides the required abstraction to hide low level hardware details to system or application programs.

2. System Library:
- system library are special functions or programs using with application program or system utilities accesses kernel's features
- These libraries implements most of the functionalities of the operating system & do not requires kernel module code access rights.

3. system utility:
System utility programs are responsible to do specialized individual level tasks

* History of Linux:
- In 1969 unix was developed at AT & T Bell Labs. At that time unix operating system was a private system owned by AT & t
- In 1983 Richard stallman created at AT & T Bell labs. At that time "GNU" is a recursive acronym for "GNU's not unix!" It was an attempt of creating a unix type operating system but composed of entirely free software.
- In 1991 Linux Travalds developed first kernel software when he was studying in university of helsinki.
- The commercial version of Linux was released by Redhat in the early 1990's known as Red Hat commercial linux.

* Features of Linux:

1. Open source : Linux source code is freely available & it is community based development project. Multiple teams works in collabration to enhance the capability of linux works in operating system & it is continously envolving.
2. portable : portability means software can works on different types of hardware in same way. Linux kernel & application programs supports their installation on any kind of hardware platform.
3. Multiprogramming : Linux is a multiprogramming system means multiple applications can run at same time.
4. Multi-user : Linux is a multiuser system means multiple user can access system resources like memory / ram / application programs at same time.
5. Hierachical File system : Linux provides a standard file structure in which system files / user files are arranged.
6. security : Linux provides user security using authentication feature like password protection / encryption of data.
7. shell : Linux provides special interpreter program which can be used to execute commands of operating system.
8. Graphical user interface (x window system) : people think that Linux is a command line os, somewhere its true also but not necessarily, It has pakages which can be installed to make os graphics based window.
9. Application support : Linux has its own software repository from where users can download and install thowards of applications by issuing shell. Linux can run windows applications if needed.

* Architecture of Linux:

- Linux is basically a kernel around which applications are added & form an operating system.
- Like every other OS, Linux helps applications and operators to interact with the devices on the computer & perform desired functions.
- Linux system architecture is consists of following layers:

1. Hardware layer:
   - Hardware consists of all peripherals devices like RAM/HDD/CPU etc

2. Kernel:
   - The core of the Linux system is the kernel. The heart of Linux system is a program called kernel.
   - The kernel controls all of the hardware & software on the computer systems, allocating hardware when necessary, & executing software when required.
   - The kernel is primarily responsible for main function as given below: i) system memory management
     ii) software program management
     iii) Hardware management, and
     iv) File system management

3. Shell:
   - The shell is a command interpreter that provides a line-oriented interactive & non-interactive interface between the user & the operating system.
   - shell act as an interface between user & the operating system The shell provides services for a user. A user interacts with computer by using the shell.
   - A shell is an environment in which we can run our commands, programs, & shell scripts. It provides a way for user to start

programs, manage file on the file system, & manage processes running on Linux.

- The core of the shell is command prompt • The command prompt is interface • part of the shell.
- It allows you to interact with it by entering certain commands from the keyboards; the shell will execute the commands & display its output on monitor.
- The environment of interaction is text based & since it is command oriented type of interface termed command line interface or CLI.
- The shell contains a set of internal commands that you use to control thing such as copying files, moving files, renaming files, displaying the programs currently running on the system.
- You can also group shell commands into files to execute as program. Those files are called shell scripts.

4. GNU utilities:

- Kernel control hardware devices, along with operating system needs utilities to perform standard function, such as controlling files & programs, text utilities, red reation. & piping etc.

* Linux file system (Hierachical file system)

- Linux uses a hierachical file system structure, much like an upside-down tree, with root (/) at the base of the file system & all other directories spreading from there
- A linux file system is a collection of files & directories that has following properties

1. It has a root directory (/) that contains other files & directories

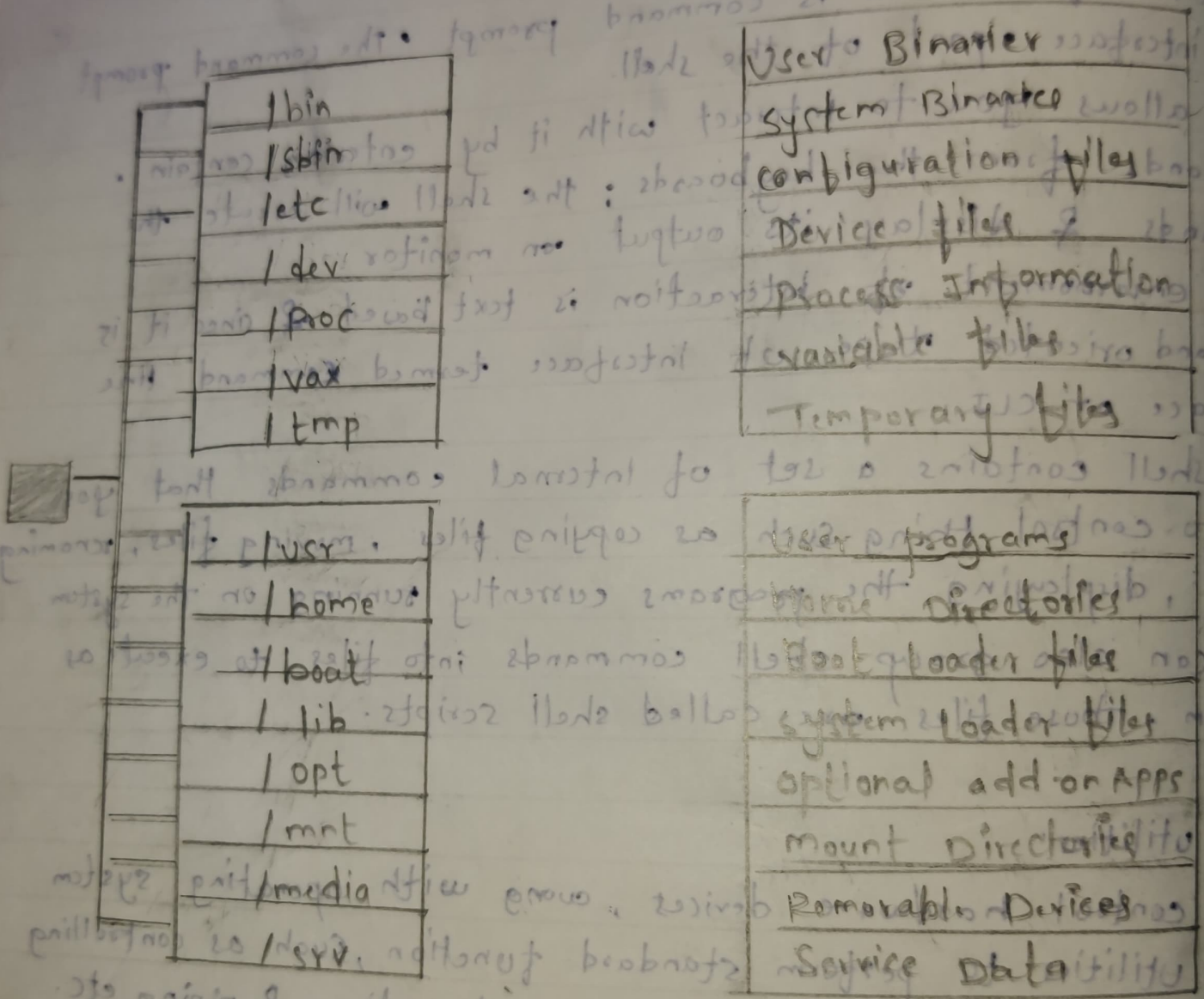

fig · Linux file system

2. It is a self contained. There are no dependencies between one filesystem and any other.
3. Each file or directory is uniquely identified by its name, the directory in which it resides, & a unique identifier, typically called an inode.
4. By convention, the root directory has an inode number of 3 & the lost + found directory has an inode number of 3. Inode numbers 0 & 1 are not used. File inode numbers can be seen By specifying the -i option to ls command.
5. The directories have specific purposes & it generally hold the same types of information for easily locating files.
- The fig shows the linux file system.

* following are directories on linux os:
1. /bin : This is where executable files are located. They are available to all users.
2. /home : contains home directory for users & other accounts.
3. /boot : contains files for boosting the system.
4. /lib : contains shared library files & sometimes other kernel related files
5. /tmp : holds temporary files used between system boot.
6. /media : Used to mount directory for removing devices temporary

Conclusion : Thus, we had studied the linux's kernel. shell user relationship & linux file system & the directory structure

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