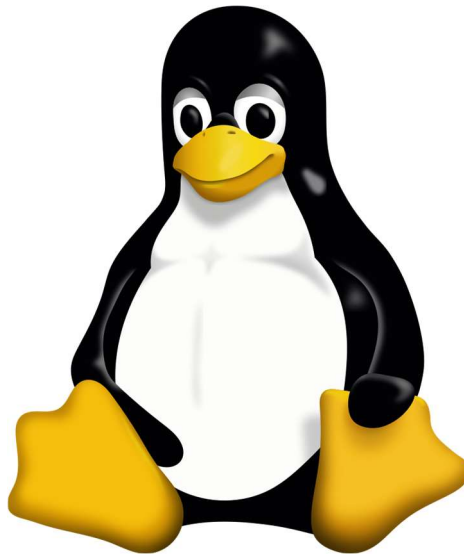


## **CHAPTER 3**

### **LINUX**

#### **3.1 LINUX OPERATING SYSTEM**

- ✚ A University of Helsinki student named Linus Torvalds began coding his own code in 1991 with the intention of creating a free academic version of UNIX. Later, this undertaking evolved into the Linux kernel.
- ✚ He specifically created this application for his personal PC since he desperately wanted to utilise a Unix 386 Intel machine but couldn't afford one. On MINIX and the GNU C compiler, he completed it. Although alternative compilers, such as the Intel C compiler, are also used, the GNU C compiler is still the preferred option for creating Linux code.



- ✚ He started it as a hobby and ended up with such a huge undertaking. It was later renamed to "**Linux**" from the original name, "**Freax**".
- ✚ Under his own license, he released the Linux kernel with limitations on its usage in business. The majority of the tools used by Linux are GNU products and are protected by GNU copyright. He distributed the kernel under the GNU General Public License in 1992.
- ✚ Structure of Linux Operating System :

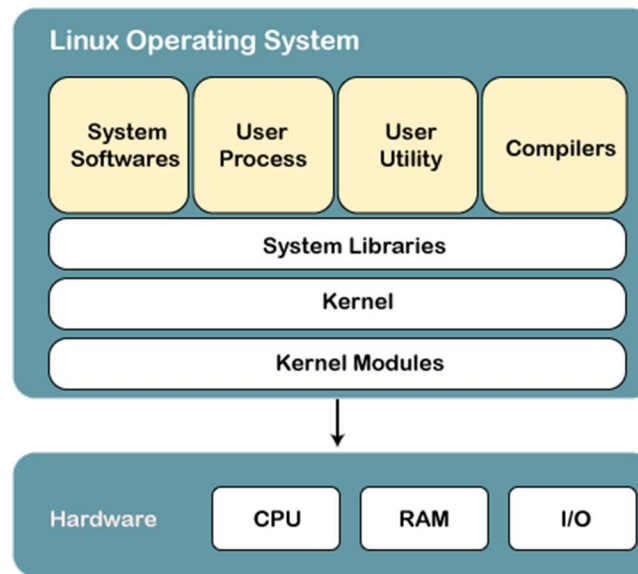


Figure 3.1: Linux Operating System Structure

## 3.2 LINUX COMMAND

- ✚ A utility for the Linux operating system is the Linux command. Any basic or complex task may be accomplished with commands. The **Linux terminal** is used to execute the commands. Similar to the command prompt in the Windows operating system, the terminal is a command-line interface for interacting with the system. Commands in Linux are **case – sensitive**.
- ✚ Linux terminals are user-friendly because they include a range of help options. Press “ **CTRL + ALT + T** ” to open the Linux terminal. Click the “ **ENTER** ” key to type a command.
- ✚ Approx. 150 commands were implemented in the three sessions and the various editors were learnt and tried to have familiar with editor. We have divided these commands into following sections so that you can easily identify their usage:
  - Linux Directory Commands
  - Linux File Commands
  - Linux File Content Commands
  - Linux User Commands
  - Linux Filter Commands
  - Linux Utility Commands
  - Linux Networking Commands

## Linux Directory Commands

### 3.2.1 *pwd Command*

✚ The [pwd](#) command is used to display the location of the current working directory.

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ pwd
/home/javatpoint
```

### 3.2.2 *mkdir Command*

✚ The [mkdir](#) command is used to create a new directory under any directory.

✚ **Syntax :**

```
mkdir < Directory_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ mkdir new_directory
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.3 *rmdir Command*

✚ The [rmdir](#) command is used to delete a directory.

✚ **Syntax :**

```
rmdir < Directory_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ rmdir new_directory
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.4 *ls Command*

✚ The [ls](#) command is used to display a lists of content of a directory.

✚ **Syntax :**

```
ls
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ rmdir new_directory
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.5 *cd Command*

✚ The [cd](#) command is used to change the current directory.

✚ **Syntax :**

```
cd < Directory_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ cd Desktop
javatpoint@javatpoint-Inspiron-3542:~/Desktop$
```

## Linux File Commands

### 3.2.6 *touch Command*

✚ The [touch](#) command is used to create empty files. We can create multiple files by executing it once.

✚ **Syntax :**

1. touch < File\_name >
2. touch < File1 > < File2 >

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ touch Demo.txt
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ touch Demo1.txt Demo2.txt
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ ls
Demo1.txt Demo2.txt Demo.txt
```

### 3.2.7 *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 :**

1. cat [ Option ] .... [ File ] ...

To create a file, execute it as follow :

1. cat > < File\_name >
2. // Enter file content

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

1. cat < File\_name >

### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ cat > Demo.txt
This is a text file.
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ cat Demo.txt
This is a text file.
```

### 3.2.8 *rm Command*

✚ The [rm](#) command is used to remove a file.

#### ✚ Syntax :

```
rm < File_name >
```

#### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ rm Demo.txt
javatpoint@javatpoint-Inspiron-3542:~/Newfolder$ rm Demo1.txt Demo2.txt
```

### 3.2.9 *cp Command*

✚ The [cp](#) command is used to copy a file or directory.

#### ✚ Syntax :

```
cp < Existing File_name > < New File_name >
```

#### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ cp demo.txt demo1.txt
javatpoint@javatpoint-Inspiron-3542:~$ cp demo.txt Documents
```

### 3.2.10 *mv Command*

✚ The [mv](#) command is used to move a file or a directory from one location to another location.

#### ✚ Syntax :

```
mv < File_name > < Directory_path >
```

#### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ mv demo.txt Directory
```

### 3.2.11 *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 :

```
javatpoint@javatpoint-Inspiron-3542:~$ rename 's/\.txt$/\.pdf/' *.txt
javatpoint@javatpoint-Inspiron-3542:~$ ls
a          Desktop          examples.desktop  Music          Python-3.8.0
Akash      Directory         hello.c           Newfolder      sample
a.out      Documents         hello.i           pico           snap
composer.phar Downloads         hello.o           Pictures        Templates
demo1.pdf  eclipse           hello.s           project        Test.pdf
Demo.sh    eclipse-installer index.html        Public         Videos
Demo.txt~  eclipse-workspace mail              Python
```

## LINUX FILE CONTENT COMMANDS

### 3.2.12 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 >
```

#### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ head Demo.txt
1
2
3
4
5
6
7
8
9
10
```

### 3.2.13 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 >
```

#### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ tail Demo.txt
2
3
4
5
6
7
8
9
10
11
```

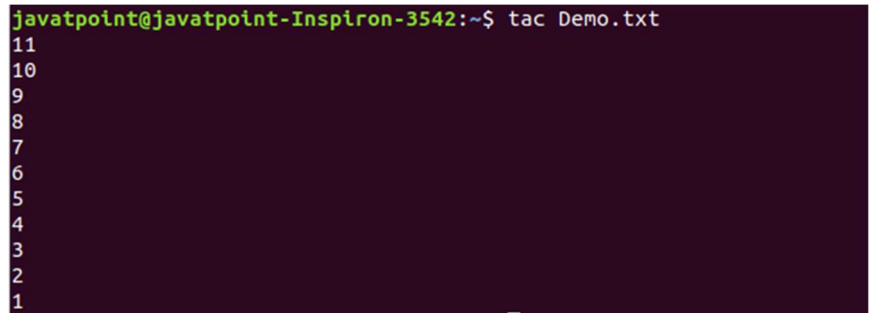
### 3.2.14 *tac Command*

- The [tac](#) command is the reverse of cat command, as its name specified. It displays the file content in the reverse order ( from the last line ).

- Syntax :**

```
tac < File_name >
```

- Output :**



```
javatpoint@javatpoint-Inspiron-3542:~$ tac Demo.txt
11
10
9
8
7
6
5
4
3
2
1
```

### 3.2.15 *more Command*

- The [more](#) command is quite similar to the cat command, as it is useful to display the file content in the same way that the cat command does. The only difference between both commands is that, in case of larger files, the more command displays screenful output at a time.

- In more command, the followings keys are used to scroll the page :

**ENTER key** : To scroll down page by line.

**Space bar** : To move to the next page.

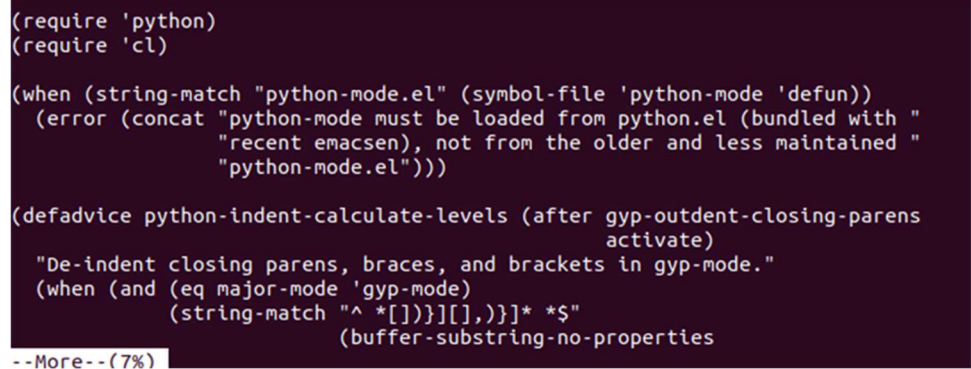
**b key** : To move to the previous page.

**/ key** : To search the string.

- Syntax :**

```
more < File_name >
```

- Output :**



```
(require 'python)
(require 'cl)

(when (string-match "python-mode.el" (symbol-file 'python-mode 'defun))
  (error (concat "python-mode must be loaded from python.el (bundled with "
    "recent emacs), not from the older and less maintained "
    "python-mode.el")))

(defadvice python-indent-calculate-levels (after gyp-outdent-closing-parens
  activate)
  "De-indent closing parens, braces, and brackets in gyp-mode."
  (when (and (eq major-mode 'gyp-mode)
    (string-match "^ *[]}]][[],)]]* *$"
    (buffer-substring-no-properties
      (point)
      (point-max))))))

--More--(7%)
```

## LINUX USER COMMANDS

### 3.2.16 *su Command*

✚ The [su](#) command provides administrative access to another user. In other words, it allows you to switch the Linux shell to another user.

✚ **Syntax :**

```
su < User_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ su javatpoint
Password:
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.17 *id Command*

✚ The [id](#) command is used to display the user ID ( UID ) and group ID ( GID ).

✚ **Syntax :**

```
id
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ id
uid=1000(javatpoint) gid=1000(javatpoint) groups=1000(javatpoint),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),116(lpadmin),126(sambashare)
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.18 *useradd Command*

✚ The [useradd](#) command is used to add or remove a user on a Linux server.

✚ **Syntax :**

```
useradd < User_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ sudo useradd JTP
[sudo] password for javatpoint:
javatpoint@javatpoint-Inspiron-3542:~$
```

### 3.2.19 *passwd Command*

✚ The [passwd](#) command is used to create and change the password for a user.



### ✚ Syntax :

```
passwd < User_name >
```

### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ sudo passwd JTP
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
```

## 3.2.20 groupadd Command

✚ The [groupadd](#) command is used to create a user group.

### ✚ Syntax :

```
groupadd < Group_name >
```

### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ sudo groupadd Developer
javatpoint@javatpoint-Inspiron-3542:~$
```

## LINUX FILTER COMMANDS

## 3.2.21 cat Command

✚ The [cat](#) command is also used as a filter. To filter a file, it is used inside pipes.

### ✚ Syntax :

```
cat < File_name > | cat or tac | | cat or tac | ...
```

### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ cat Demo.txt | tac | cat | cat | tac
1
2
3
4
5
6
7
8
9
10
11
```

## 3.2.22 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 < Search_word >
```

### Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ cat marks.txt | grep 9  
celena-90
```

## 3.2.23 tr Command

 The [tr](#) command is used to translate the file content like from lower case to upper case.

### Syntax :

```
< command > | tr < ' Old ' > < ' New ' >
```

### Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ cat marks.txt | tr 'prcu' 'PRCU'  
alex-50  
alen-70  
jon-75  
CaRRy-85  
Celena-90  
jUstin-80
```

## 3.2.24 uniq Command

 The [uniq](#) command is used to form a sorted list in which every word will occur only once.


### Syntax :

```
command < File_name > | uniq
```

### Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ sort marks.txt | uniq  
alen-70  
alex-50  
carry-85  
celena-90  
jon-75  
justin-80
```

## 3.2.25 wc Command

 The [wc](#) command is used to count the lines, words, and characters in file.

### Syntax :

```
wc < File_name >
```

### Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ wc marks.txt  
6 6 52 marks.txt
```

### 3.2.26 sort Command

The [sort](#) command is used to sort files in alphabetical order.

**Syntax :**

```
sort < File_name >
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ sort marks.txt
alen-70
alex-50
carry-85
celena-90
jon-75
justin-80
```

### 3.2.27 gzip Command

The [gzip](#) command is used to truncate the file size. It is compressing tool. It replace the original file by the compressed file having ‘.gz’ extension.

**Syntax :**

```
gzip < File1 > < File2 > < File3 >
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ gzip Demo.txt Demo1.txt
javatpoint@javatpoint-Inspiron-3542:~$ ls
a          Demo.txt.gz      examples.desktop  Music      Python-3.8.0
Akash     Desktop          hello.c           Newfolder  sample
a.out     Directory        hello.i           new.txt    snap
composer.phar Documents        hello.o           pico       Templates
demo1.pdf Downloads        hello.s           Pictures    Test.pdf
Demo1.txt.gz eclipse          index.html       project     Videos
Demo.sh   eclipse-installer mail              Public
Demo.txt~ eclipse-workspace marks.txt         Python
```

### 3.2.28 gunzip Command

The [gunzip](#) command is used to decompress a file. It is a reverse operation of gzip command.

**Syntax :**

```
gunzip < File1 > < File2 > < File3 >
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ gunzip Demo.txt Demo1.txt
javatpoint@javatpoint-Inspiron-3542:~$ ls
a          Demo.txt~        examples.desktop  Music      Python-3.8.0
Akash     Desktop          hello.c           Newfolder  sample
a.out     Directory        hello.i           new.txt    snap
composer.phar Documents        hello.o           pico       Templates
demo1.pdf Downloads        hello.s           Pictures    Test.pdf
Demo1.txt  eclipse          index.html       project     Videos
Demo.sh   eclipse-installer mail              Public
Demo.txt  eclipse-workspace marks.txt         Python
```

## LINUX UTILITY COMMANDS

### 3.2.29 *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 by name, by type, by date and more.

✚ The following symbols are used after the find command :

(.) : For current directory name

(/) : For root

✚ **Syntax :**

```
find . -name "*.pdf"
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ find . -name "*.pdf"
./Test.pdf
./Python-3.8.0/Doc/library/turtle-star.pdf
./Akash/Joomla/Original Copy/Brochure-Joomla-2019.pdf
./Akash/Joomla/Original Copy/Joomla-Guide-Final.pdf
./local/share/Trash/files/2400966-250544e72f817db3bcef-1587140240830.pdf
./local/share/Trash/files/2400966-3ad982eaa58c5d43fb53-1585763620407.pdf
find: './.anydesk/incoming': Permission denied
./Downloads/ConfirmationPage_20030070774.pdf
./demo1.pdf
find: './.dbus': Permission denied
find: './.cache/dconf': Permission denied
./Directory/demo.pdf
./Directory/demo2.pdf
./Directory/demo1.pdf
```

### 3.2.30 *locate Command*

✚ The [locate](#) command is used to search a file by filename. It is quite similar to find command; the difference is that it is a background process. It searches the file in the database, whereas the find command searches in the file system. It is familiar than the find command. To find the file with the locates command, keep your database updated.

✚ **Syntax :**

```
locate < File_name >
```

✚ **Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ locate sysctl.conf
/etc/sysctl.conf
/etc/sysctl.d/99-sysctl.conf
/etc/ufw/sysctl.conf
/snap/core/8935/etc/sysctl.conf
/snap/core/8935/etc/sysctl.d/99-sysctl.conf
```

### 3.2.31 *date Command*

The [date](#) command is used to display date, time, time zone, and more.

**Syntax :**

```
date
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ date
Fri May 22 21:51:05 IST 2020
```

### 3.2.32 *cal Command*

The [cal](#) command is used to display the current month's calendar with the current date highlighted.

**Syntax :**

```
cal
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ cal
      May 2020
Su Mo Tu We Th Fr Sa
                1  2
 3  4  5  6  7  8  9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
```

### 3.2.33 *sleep Command*

The [sleep](#) command is used to hold the terminal by specified amount of time. By default, it takes time in second.

**Syntax :**

```
Sleep < time >
```

**Output :**

```
javatpoint@javatpoint-Inspiron-3542:~$ sleep 4
```

### 3.2.34 *time Command*

The [time](#) command is used to display the time to execute a command.

**Syntax :**

```
time
```

### ✚ Output :

```
javatpoint@javatpoint-Inspiron-3542:~$ time
real    0m0.000s
user    0m0.000s
sys     0m0.000s
```

## 3.3 LINUX FILE SYSTEM

- ✚ In Linux, files are put in a directory. All directories are in a hierarchical structure ( Tree structure ).
- ✚ User can put and remove any directories on the tree. The Top directory is “ / ”, which is called slash or root.
- ✚ Users have the own directory which is called home directory.

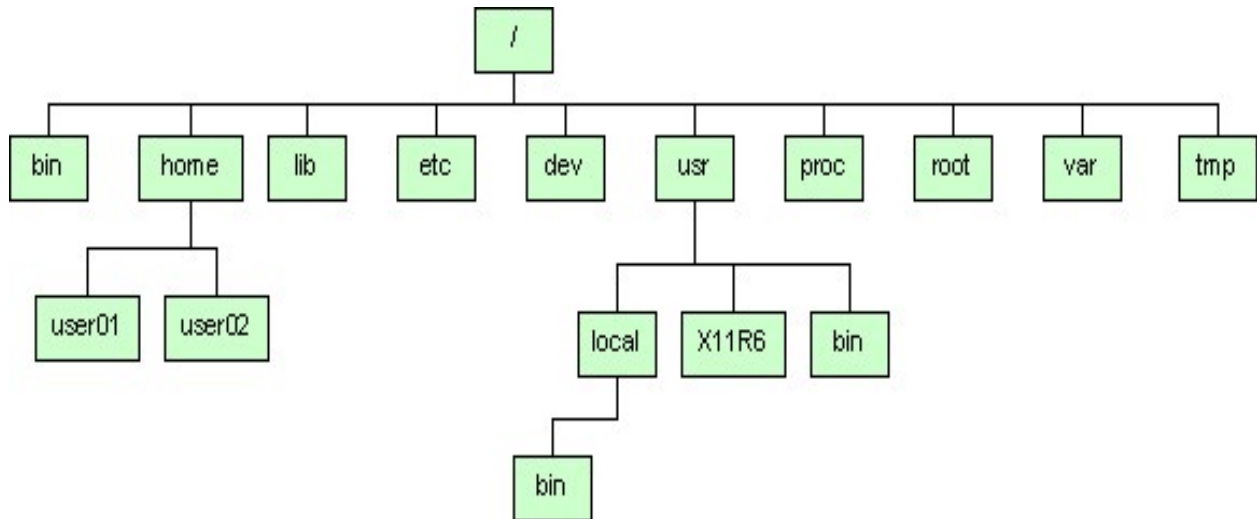


Figure 3.2 : Linux File System

Directory	Description
/	The root directory. Where everything begins.
<b>/bin</b>	Contains binaries ( programs ) that must be present for the system to boot and run.
<b>/lost + found</b>	Each formatted partition or device using a Linux file system. Such as ext3, will have this directory. It is used in the case of a partial recovery from a file system corruption event. Unless something really bad has happened to your system, this directory will remain empty.

<b><i>/boot</i></b>	<p>Contains the Linux kernel, initial RAM disk image ( for drivers needed at boot time ), and the boot loader.</p> <p>Interesting Files :</p> <ul style="list-style-type: none"> <li>• <b><i>/boot/grub/grub.conf</i></b> or <b><i>menu.lst</i></b>, which are used to configure the boot loader.</li> <li>• <b><i>/boot/vmlinuz</i></b>, the Linux kernel.</li> </ul>
<b><i>/dev</i></b>	<p>This is a special directory which contains <i>devices nodes</i>. “ Everything is a file ” also applies to devices. Here is where the kernel maintains a list of all the devices it understands.</p>
<b><i>/home</i></b>	<p>In normal configurations, each user is given a directory in <b><i>/home</i></b>. Ordinary users can only write files in their home directories. This limitation protects the system from errant user activity.</p>
<b><i>/etc</i></b>	<p>The <b><i>/etc</i></b> directory contains all of the system – wide configuration files. It also contains a collection of shell scripts which start each of system services at boot time. Everything in this directory should be readable text.</p> <p>Interesting Files : While everything in <b><i>/etc</i></b> is interesting, here are some of my all – time favorites :</p> <ul style="list-style-type: none"> <li>• <b><i>/etc/crontab</i></b>, a file that defines when automated jobs will run.</li> <li>• <b><i>/etc/fstab</i></b>, a table of storage devices and their associated mount points.</li> <li>• <b><i>/etc/passwd</i></b>, a list of the user accounts.</li> </ul>
<b><i>/lib</i></b>	<p>Contains shared library files used by the core system programs. These are similar to DLLs in Windows.</p>
<b><i>/media</i></b>	<p>On modern Linux System the <b><i>/media</i></b> directory will contain the mount points for removable media such as USB drivers, CD – ROMs, etc. that are mounted automatically at insertion.</p>
<b><i>/mnt</i></b>	<p>On older Linux systems, the <b><i>/mnt</i></b> directory contains mount points for removable devices that have been mounted manually</p>
<b><i>/opt</i></b>	<p>The <b><i>/opt</i></b> directory is used to install “ optional ” software. This mainly used to hold commercial software products that may be installed on your system.</p>

Table 3.1: Linux Directories

