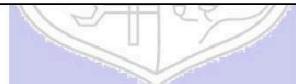




Experiment No. 2

Title: Understanding File System of Linux
Implementation of Basic Linux Commands



Experiment No: 2

Aim: Understanding Linux File system and executing basic commands in Linux

Resources needed: Any Open Source OS/CoCalc Linux terminal online

Theory:**Pre lab/Prior concepts:****File-system management:**

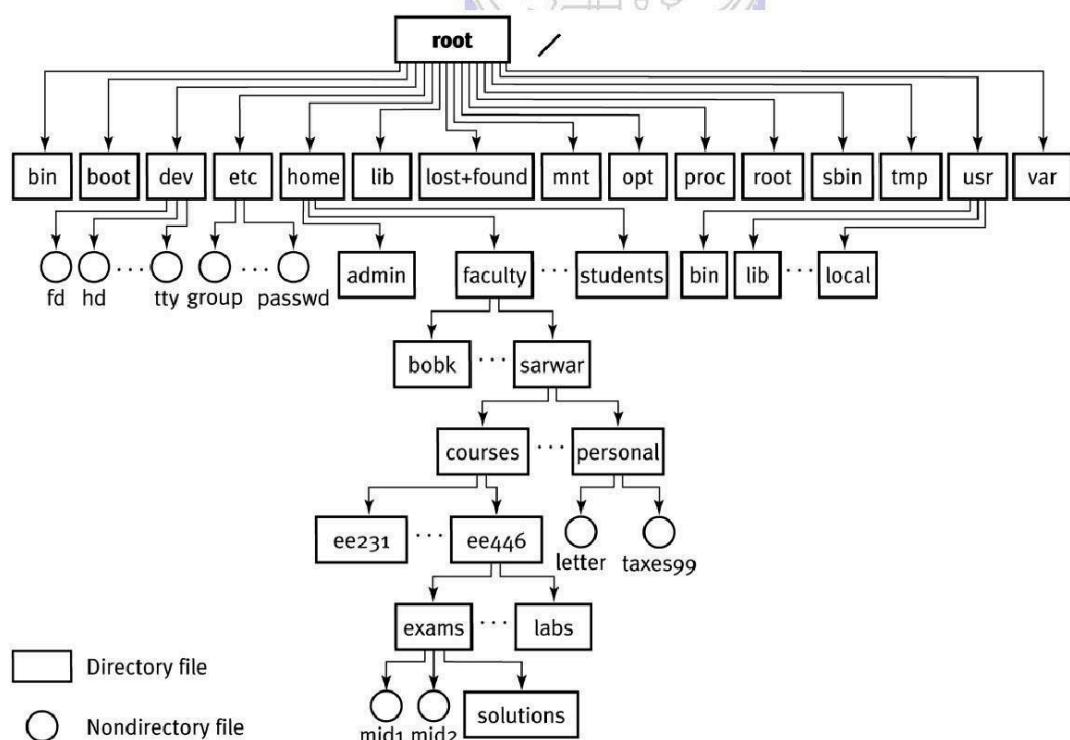
The file-system is the way an operating system manages all the files to be stored on the external storage - binaries, images, etc. Linux uses an advanced version of the Extended File-system from Unix, called ext2.

An important feature of the ext2 file-system is that it treats everything as files - directories are also represented as files containing pointers to other files. This does not stop only at directories, even the hardware can be addressed as files under the standard directory /dev.

One drawback in Linux has been the susceptibility of ext2 to damages due to power failures. But there has been significant development to rectify this shortcoming through the introduction of journaling file-systems like reiserfs, ext3. A journaling file-system has the inherent capability to be recovered to a stable state in case of a crash due to power failures.

Directories

In Linux, different partitions need not be assigned special names to access them. This is because Linux uses a standard directory structure to take care of all partitions. This structure ensures that a particular file for a particular program will almost always be present at the same place on any machine running Linux.



The figure above shows the hierarchical organization of directories created on the file-system by default, and which are considered to be standard for all installations. Let us take a look at some of the more important ones.

4. /dev is the directory through which all the devices on the machine are accessible as files. These include the serial terminals (COM ports), modem, mouse, sound card

... everything!

5. /var contains most of the "variable" data such as mails, log files, databases, etc.

6. /usr is where almost all the packages get installed. Discounting /mnt, it is the largest directory on the hard-disk. This directory itself has a pretty complicated sub-directory system used by the packages.

7. /etc contains all the configuration files, used by the operating system itself as well as various packages installed on the system.

8. /home contains the home directories for all the users created on the system.

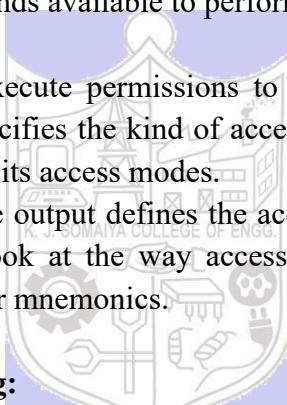
9. /mnt is conventionally used as the base for all directories which are not part of the standard directory hierarchy. It is most commonly used to mount the cd-rom drives, floppy drives, non-Linux partitions, etc.

10. /root is the home directory of the privileged user or the system administrator, called "root".

In Linux there are different commands available to perform file operations like create, edit, copy, rename and move files.

We can assign read, write, and execute permissions to file. Every file in Linux has a list of permissions attached to it, that specifies the kind of access that different users have to that file. The file permissions are also called its access modes.

The very first column in the above output defines the access modes for the file. Their meaning will become apparent when we look at the way access modes are represented. These can be expressed as either octal numbers or mnemonics.



Linux commands for file handling:

File handling commands include commands for creating files/directories, navigating through file system.

Commands to create a file

touch: creates one or more empty file(s).

syntax:

touch filename1 [filename2] [filename3]

cat: creates/displays file

syntax:

cat [options] [filename]

→

cat > [filename]

To create a file

→

cat [filename]

To view a file

→

cat >> [filename]

To append text to a file

mkdir : Make directory (or) To create a directory

Syntax :

mkdir [options] [dirname]

<code>mkdir -p /home/abc</code>	creates directory with subdirectories
<code>mkdir -m 777 ~/data</code>	creates data directory in home and assigns read, write, execute permissions to it

rmdir: Remove an empty directory. If you want to remove a directory with files in it type "rm -R directory"

Syntax:

`rmdir dirname`

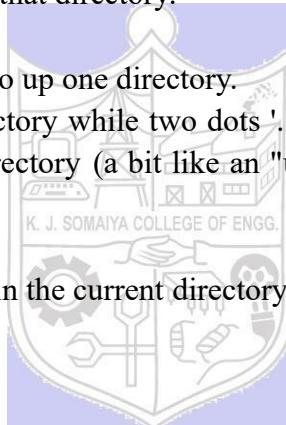
This will only remove the directory if it's empty otherwise it will exit with an error message.

pwd: Print working directory. Print the absolute (complete) path to the directory the user is currently in.

Syntax:

`pwd`

This will tell you the full path to the directory you are in, for example it may output "/usr/local/bin" if you are currently in that directory.



cd: Change directory. Use " cd .." to go up one directory.

One dot '.' represents the current directory while two dots '..' represent the parent directory. " cd -" will return you to the previous directory (a bit like an "undo"). You can also use cd absolute path or cd relative path

ls : List the Files and Directories within the current directory.

Syntax:

`ls [options] Options:`

`-l` List file with permission.

`-a` List hidden file.

`-i` List files and inode number.

`-R` List directories , sub directories and their contents.

`ls -options string` This lists files using a certain string. The string can contain standard wildcards

Type " ls -d */" to list all subdirectories of the current directory. Depending on the setup of your aliases you may simply be able to type lsd as the equivalent to ls -d */ .

Examples for ls -d :

`ls -d`

Lists all subdirectories of current directory.

`ls -d string*`

Lists directories that start with "string".

`ls -d /usr/*/*/doc`

Lists all directories that are two levels below the /usr/ directory

chmod: change mode(permission) for file/directory Chmod [rwxrwxrwx]/[421412421] filename

rm: Remove/delete a file(s) or directories(s). You can use standard wildcards with this command

Syntax:

rm -options file_or_folder

You can of course use standard wildcards to delete multiple files or multiple directories and files. Use the -R or -r option to remove recursively, this removes everything within subdirectories. Also try the -f option to force removal (useful when you don't want to be prompted).

mv: Move a file or a directory to a new location or rename a file/directory.

Rename example:

mv filename1 filename2 Renames filename1 to filename2.

To move a file or directory, simply type: mv original_file_or_folder new location

Note that this command can use standard wildcards to move files (not for renaming). Move and rename

Note that you can also move and rename a file in a single command. The difference is with the destination (right hand side) you change the filename to the new name of the file.

For example typing:

mv /etc/configuration.txt /home/joe/backupconfig

This would move the file "configuration.txt" to /home/joe/ and rename it "backupconfig"

cp: Copy a file. Has a number of useful options, such as -R (or -r) which recursively copies directories and subdirectories.

Syntax:

cp -options file_or_files new_location

Examples:

cp file1 file2

Simply copy file1 to file2 (in the same directory). cp /tmp/file1 ~/file2 /mnt/win_c

find: The following examples illustrate typical uses of the command find for finding files on a computer.

find / -name game

Looks for a file named "game" starting at the root directory (searching all directories including mounted filesystems). The '-name' option makes the search case sensitive. You can use the '-iname' option to find something regardless of case.

find /home -user joe

Find every file under the directory /home owned by the user joe

There are other commands to locate files like locate, whereis, which, whatis etc.

User administration:

Linux is a true multiuser environment. This means that the system can support different users with different privileges. Each user has access to a predefined set of system services and his/her own private data. The private data in turn can be shared with other users by granting access privileges to them. All the privilege checking is done with the help of user accounts maintained by the system. Linux provides a number of commands that can be used to create and manage user accounts. These are supported by a number of files and directories under /etc that are used to hold information about the users. The facilities provided can be broadly classified into two categories - user management and group management.

User accounts

Traditionally, the information regarding the users is placed in a file called /etc/passwd. This contains the login name, full name, home directory and other info in a standard format. It may also contain the encrypted password used by the user, hence the name of the file. But nowadays, better ways for user authentication are used, which store the password elsewhere.

Superuser Account

By default, every Linux installation has a specially privileged account called the root or superuser. This user has complete access to all the services and resources present on the system. The account is normally owned by the system administrator, and used to carry out special task that require special privileges not available to normal accounts. A person who logs in as root can modify any file on the entire system irrespective of the actual owner of the file and run any program anywhere on the system. As such, it is the most powerful account and has to be used with caution. Mistakes made while logged in as root can prove very dangerous to the system; hence its extremely important that the user should avoid using the root account unless absolutely necessary.

All other accounts are said to be non-privileged, since they have only access to a limited amount of services. Their privileges can be further controlled by use of groups which are used for collective management of user accounts.

The concept of “groups” in Linux

In Linux, users are divided into logical collections called groups. These are used to confer various kinds of privileges to system objects to a group of users together. One user may belong to a number of groups, but he/she will always have a default group, along with other groups which are said to be supplementary. When a user is added to a particular group, all the privileges that are conferred on the group are also conferred on the user.

File group

In order to implement access privileges, the first thing to do is define an owner and a group for the file. This information establishes who can claim control of the file. A file is given to an owner and a group as soon as it is created. Usually the owner is the current user and the group is the group of the directory within which the file is created; but this is system dependent.

Linux commands for user administration:

Adding new users

The standard command useradd can be used to create a new user on the system. It is one of a family of commands for user management that can only be invoked by a user with special privileges, ie, the root. The most common arguments provided to the command are as follows:

useradd :

To create a new user account and login directory for that new account. Useradd will create new entries in system files.

Syntax

useradd [*options*] [*user*]

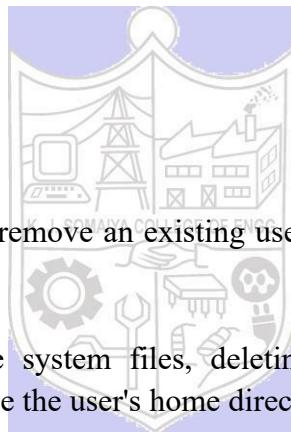
Options

- c Comment field.
- d Home directory
- e Account expiration date.

To assign password to this user use following command passwd [password]

When a new user account is created, its entries update the following system files.

1. /etc/passwd
2. /etc/group
3. /etc/shadow



Removing users

The command userdel is used to remove an existing user from a system. This can be invoked as follows:

userdel -r <username>

This command modifies all the system files, deleting all information about the specified username. The -r option will cause the user's home directory to be deleted along with any files or sub-directories it may contain.

Modifying user information

The command usermod is used to modify information about an existing user. The arguments accepted by this are almost the same as those accepted by useradd command. The only difference is that it modifies existing entries rather than creating new one's.

usermod -G newgroupname username

Managing groups

The superuser can use a set of commands analogous to the once used for user management.

New group is created by hand-editing the file /etc/group or by using groupadd command.

Syntax:

groupadd groupname

groupdel command is used to remove the group.

Syntax:

groupdel groupname

Groupmod is used to rename the existing groupname.

Syntax:

groupmod -n newname oldname

These commands have functions similar to the corresponding one's used for user accounts. Again, every group is assigned a unique number called GID, ie, the Group ID.

chgrp: change group of file

Syntax:

chgrp newgroupname filename

chown: change owner of file

Syntax:

chown user:group filename

Changing Ownership and Group

For changing the ownership of a file/directory, you can use the following command:

chown user

In case you want to change the user as well as group for a file or directory use the command

chown user:group filename

Let's see this in action

Check the current file ownership using ls -l

```
-rw-rw-r-- 1 root n10 18 2012-09-16 18:17 sample.txt
```

Change the file owner to n100 . You will need sudo

```
n10@N100:~$ sudo chown n100 sample.txt
```

ownership changed to n100

```
-rw-rw-r-- 1 n100 n10 18 2012-09-16 18:17 sample.txt
```

Changing user and group to root 'chown user:group file'

```
n10@N100:~$ sudo chown root:root sample.txt
```

User and Group ownership changed to root

```
-rw-rw-r-- 1 root root 18 2012-09-16 18:17 sample.txt
```

In case you want to change group-owner only, use the command

chgrp group_name filename

'chgrp' stands for change group.

Check the current file ownership using ls -dl

```
guru99@VirtualBox:~$ ls -dl test1
-rwxrwxrwx 1 root cdrom 0 Oct  6 11:27 test1
```

Change the file owner to root. You will need sudo

```
guru99@VirtualBox:~$ sudo chgrp root test1
```

Group ownership changed to root

```
guru99@VirtualBox:~$ ls -dl test1
-rwxrwxrwx 1 root root 0 Oct  6 11:27 test1
```

Note:

- The file /etc/group contains all the groups defined in the system
- You can use the command "groups" to find all the groups you are a member of

```
guru99@VirtualBox:~$ groups
cdrom guru99 adm sudo dip plugdev lpadmin sambashare
guru99@VirtualBox:~$
```

- You can use the command newgrp to work as a member of a group other than your default group

```
guru99@VirtualBox:~$ newgrp cdrom
guru99@VirtualBox:~$ cat > test
this is a test to change group
^C
guru99@VirtualBox:~$ ls -dl test
-rw-rw-r-- 1 guru99 cdrom 31 Oct 11 16:39 test
guru99@VirtualBox:~$
```

- You cannot have 2 groups owning the same file.
- You do not have nested groups in Linux. One group cannot be sub-group of another.
- Executing a directory means Being allowed to "enter" a dir and gain possible access to sub-dirs

chage: command let you specify an expiration limit for a user's account and password .

Syntax:

chage [option] username Option

-l lists the current password expiration.

-m set the min. days to change the password. - M set the max. days to change the password. - E specific expiration date for user account.

-I set inactive period (in days)

-W warning period, number of days before expiration.

Process management:

Process is running an instance of a program. Process management starts with the init command which is present in a file named /etc/initia. Init is the first process that runs on the system and can start other processes depending upon the run level. Every process has a process identification (PID) number. PID of init is 1.

Different types of process:

Daemon process User process

To display currently running processes on linux systems the following **ps** command is used.

Output of the ps command has following fields

Column	HeaderContents
%CPU	How much of the CPU the process is using
%MEM	How much memory the process is using
ADDR	Memory address of the process
C or CP	CPU usage and scheduling information
NI	nice value
PID	Process ID number
PPID	ID number of the process's parent process
PRI	Priority of the process
RSS	Real memory usage
S or STAT	Process status code
START or STIME	Time when the process started SZ Virtual memory usage
TIME	Total CPU usage
TT or TTY	Terminal associated with the process
UID or USER	Username of the process's owner
WCHAN	Memory address of the event the process is waiting for

To kill a process using PID command **kill** is used. And to kill process by name **killall** command is used Job management:

Job management uses the concept of foreground and background processes. Foreground processes always have access to the standard input stream to receive commands from the user and the standard output stream to print information to the user. Where the programs which run in the background do not have access to these streams. So they can't interact with the user .

Compiling and building software related programs can run in the background. Through command we can make any program executing in background to run in foreground and vice versa.

Linux commands for Process Management:

ps: used to list the process.To display information about processes specific to the active terminal.

Syntax:

ps [option] Options available:

-a : To display all process, excluding process not controlled by a terminal

-x : To include all processes not controlled by a terminal, such as the daemon process.

-l : To display a long list including more information such as the process owner's user id.

-u : To display the user name of the process owner.

-e : To view all the process ids

kill: used to send a particular process to get clear.

Syntax :

kill -9 <process id>

ps - aux is the command to view all process name and id

Example: kill -9 3743 (This example shows the kill command, option and the process id to kill.)

Renice: used to set the priority of a process. The priority value can range from -20 (highest priority) to 19 (Lowest priority)

Syntax :

renice - +(minus symbol or plus symbol) <priority number> -p <process id>

Example : renice -15 -p 1970

jobs command helps you to view the background processes.

Fg command is used to run the background process in the foreground (Front End) jobs <enter> to view the process running and job numbers

fg %2 (job number)

bg command is used to resume the suspended command in the back ground.

Activities:

1. Try out different file management commands. Browse manual pages of the commands and try-out different options of the commands

2. User Administration

Create a two users and assign passwords

Check for creation of the login directory of the user account.

See and note down userid, groupid of this user from /etc/passwd file and group form /etc/group file

Delete any one of the two users created above Create a new group1 and add the user to this group. Create three users and add them to a new group2.

Create a directory and use chgrp to change group of this directory to group2

Now login using first user of group 1 and try accessing this directory of group2 note down output

Check group and owner of the file and then change both group and owner of that file using chown

Explore chage command

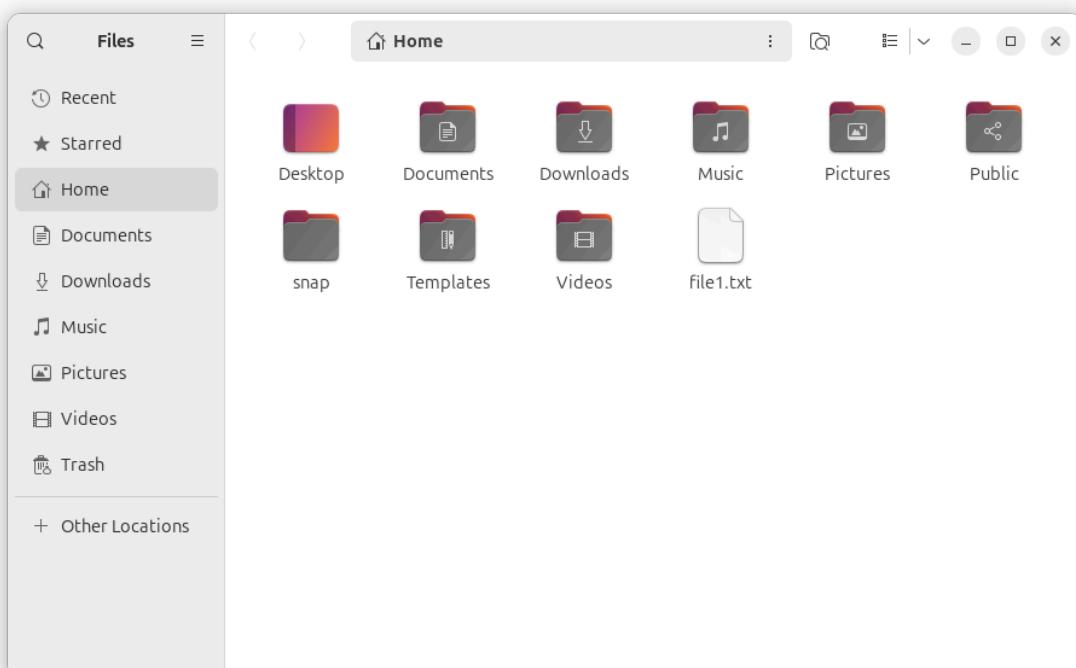
3. Process management

- explore ps command
 - list all jobs
 - start any new process in background
 - start its execution in foreground
 - suspend execution of this process
 - resume its execution in background
-

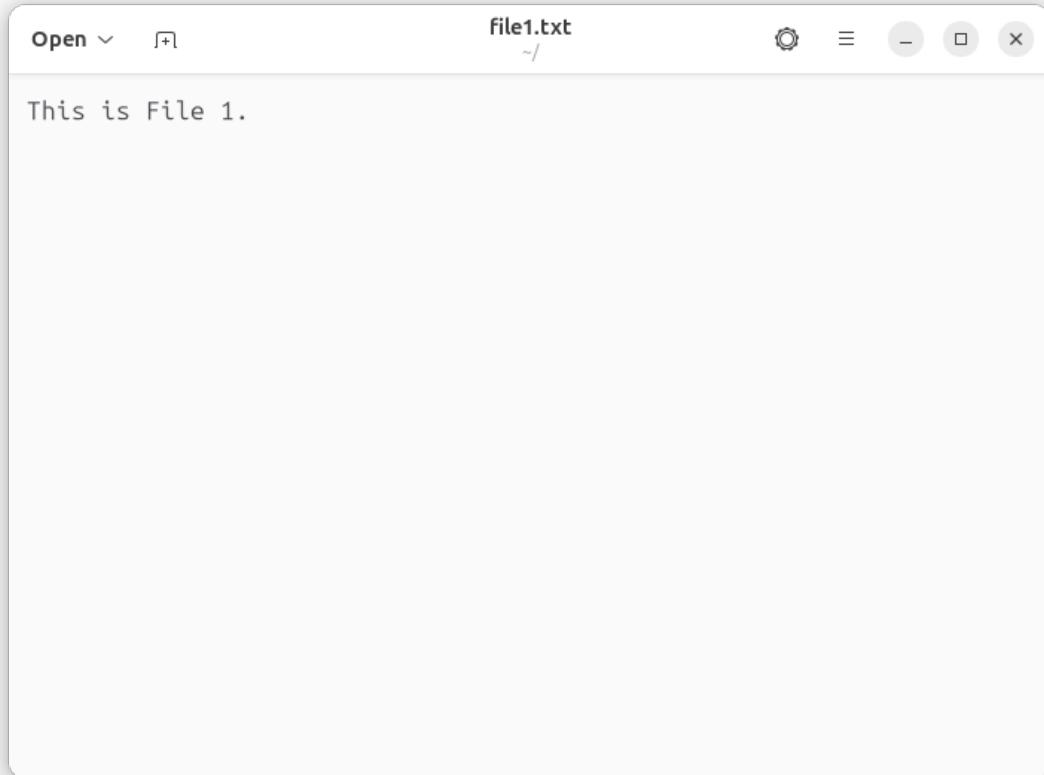
Results:

File-system management:

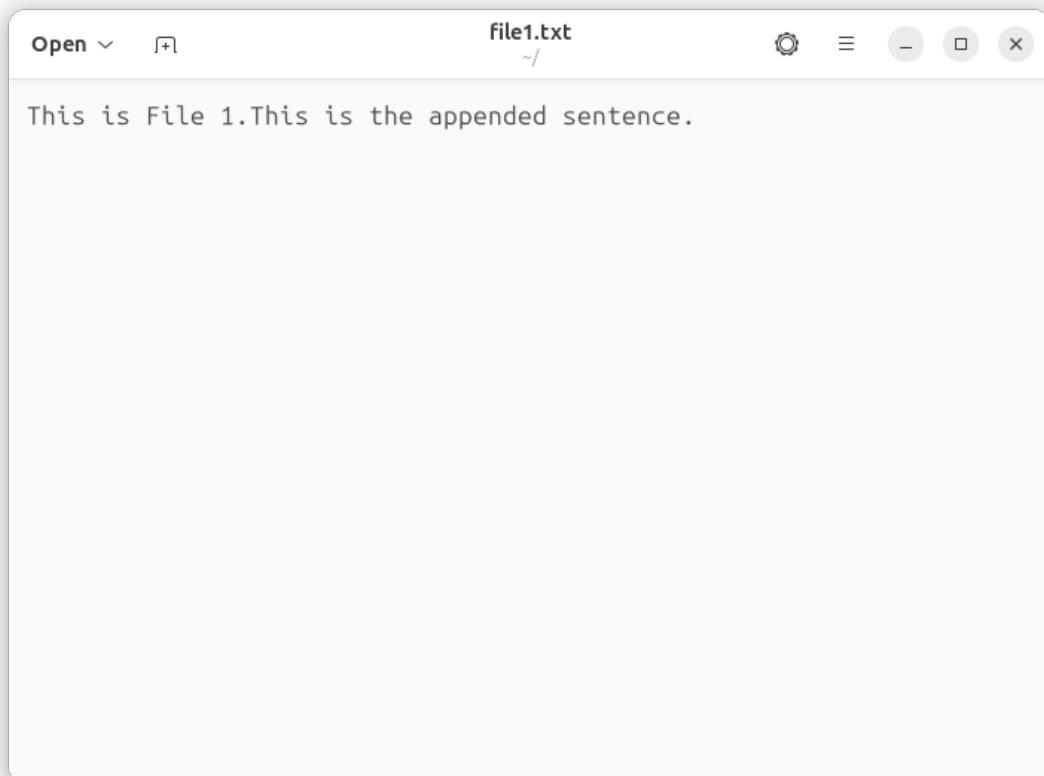
```
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file1.txt  
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file1.txt  
chandana-galgali@chandana-galgali-VirtualBox:~$ cat > file1.txt  
This is File 1.chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



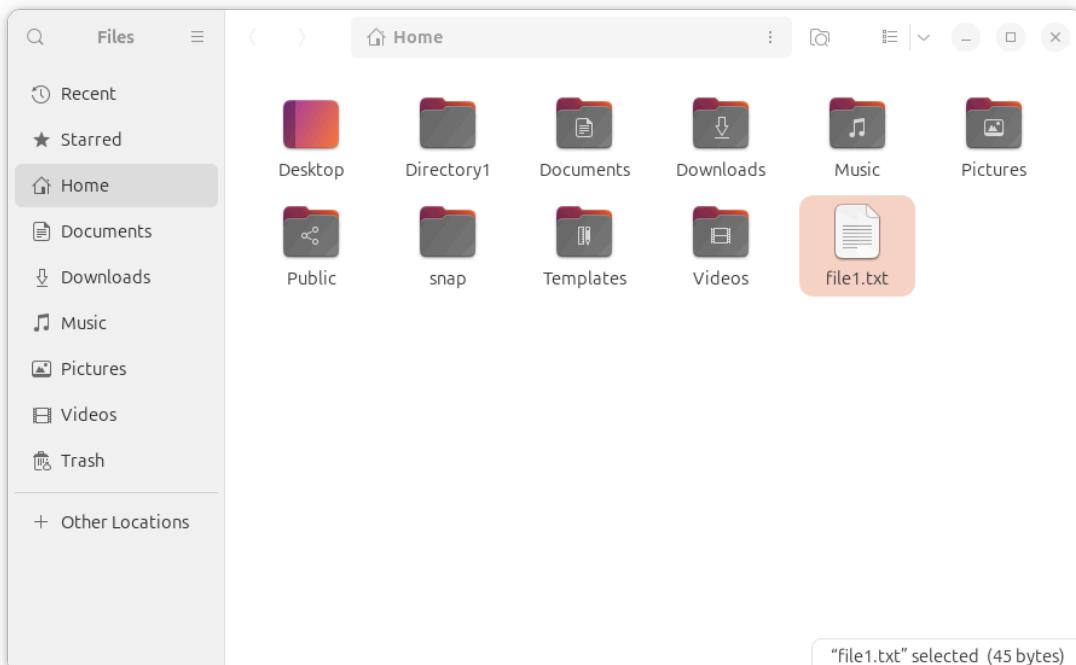
```
chandana-galgali@chandana-galgali-VirtualBox:~  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
chandana-galgali@chandana-galgali-VirtualBox:~$ cat file1.txt  
This is File 1.chandana-galgali@chandana-galgali-VirtualBox:~$ cat >> file1.txt  
This is the appended sentence.chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~
```

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

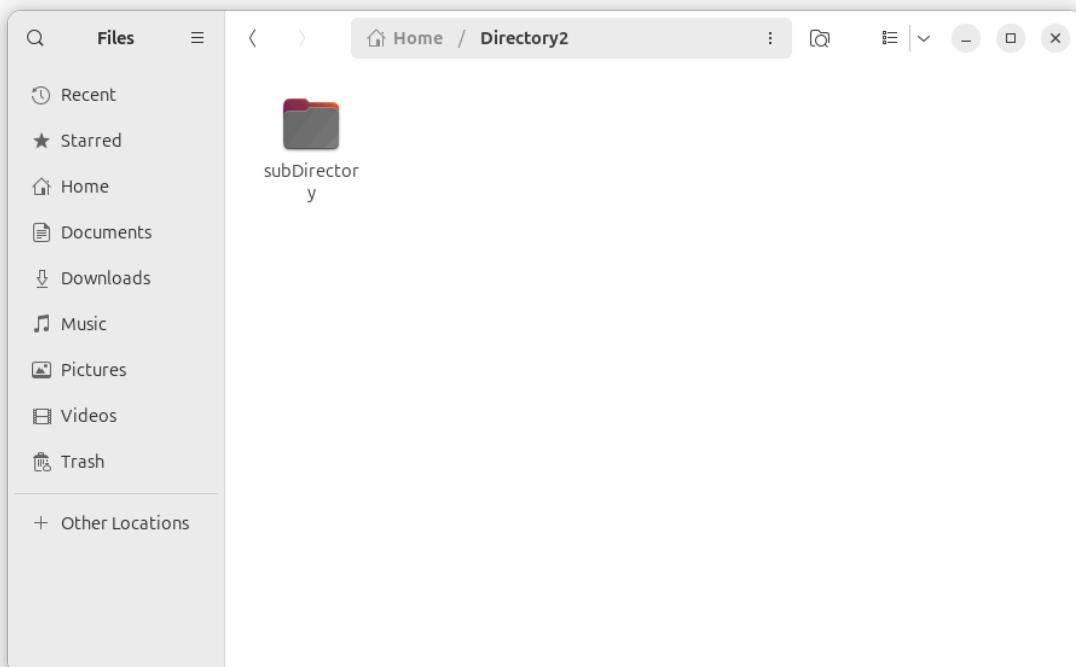
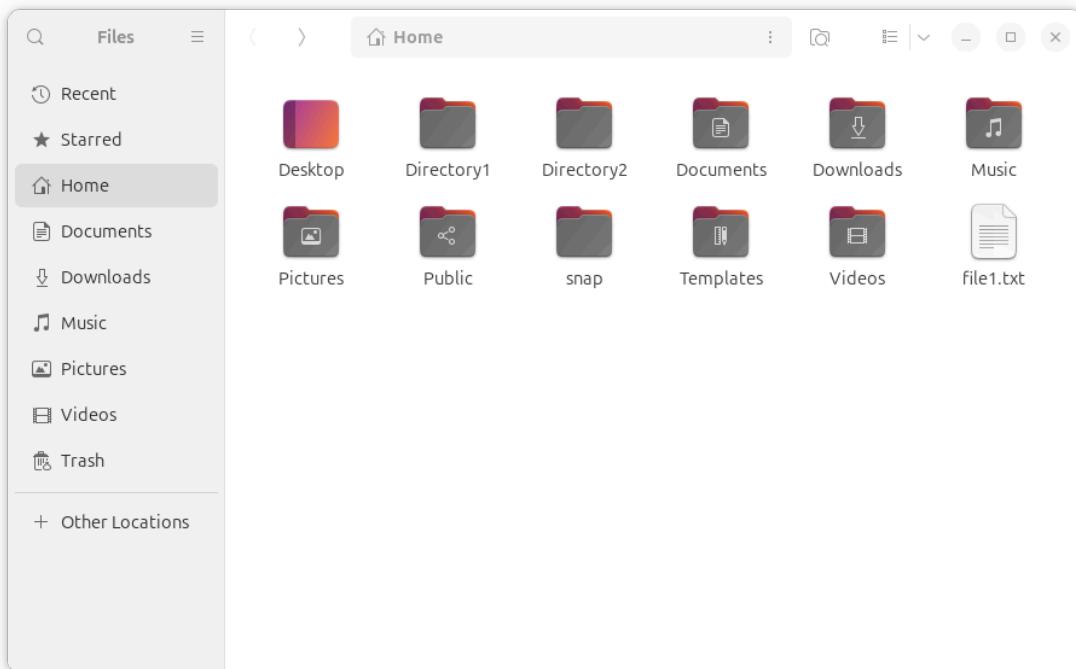
```
chandana-galgali@chandana-galgali-VirtualBox:~$ cat file1.txt
This is File 1.chandana-galgali@chandana-galgali-VirtualBox:~$ cat >> file1.txt
This is the appended sentence.chandana-galgali@chandana-galgali-VirtualBox:~$ cat file1.txt
This is File 1.This is the appended sentence.chandana-galgali@chandana-galgali-VirtualBox:~$ mkdir Directory1
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~
```

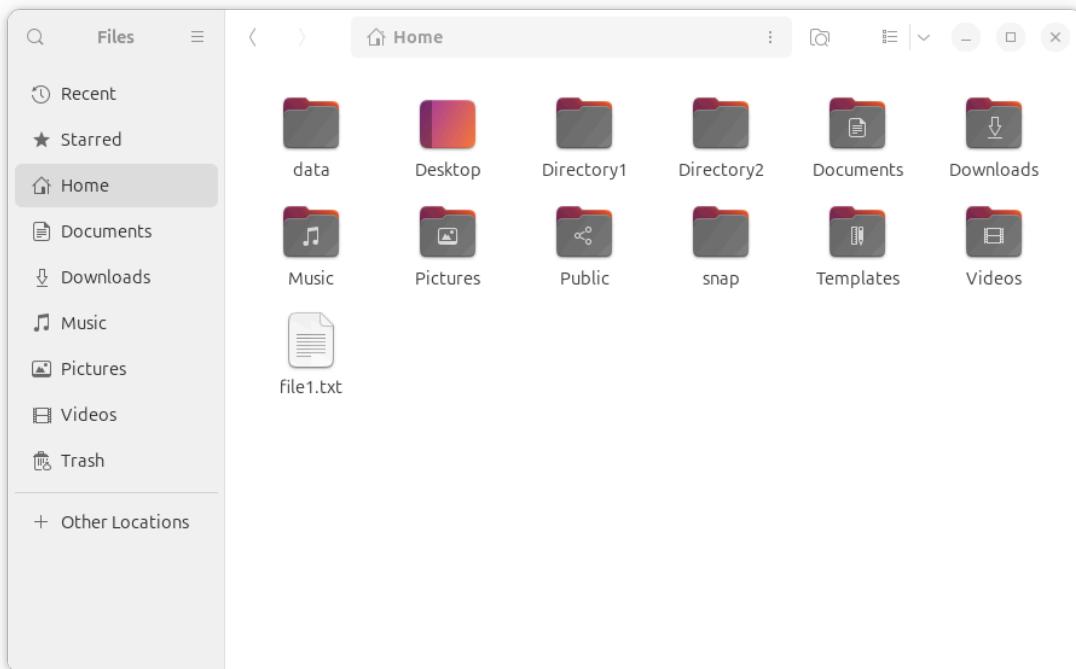
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

```
chandana-galgali@chandana-galgali-VirtualBox:~$ cat file1.txt
This is File 1.chandana-galgali@chandana-galgali-VirtualBox:~$ cat >> file1.txt
This is the appended sentence.chandana-galgali@chandana-galgali-VirtualBox:~$ cat file1.txt
This is File 1.This is the appended sentence.chandana-galgali@chandana-galgali-VirtualBox:~$ mkdir Directory1
chandana-galgali@chandana-galgali-VirtualBox:~$ mkdir -p Directory2/subDirectory
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```

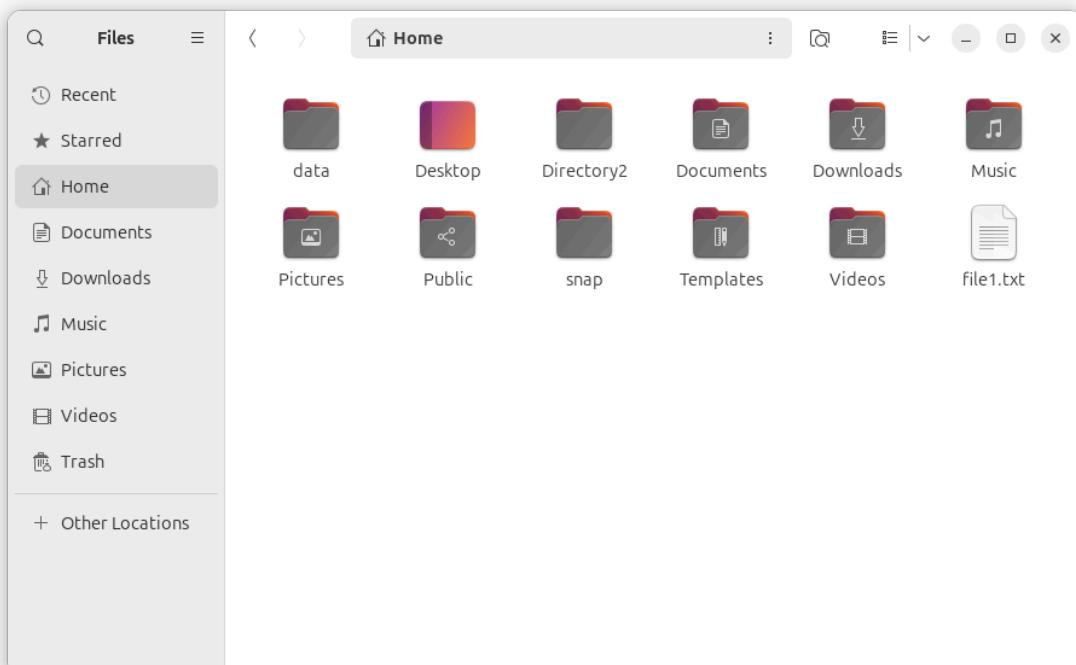


```
chandana-galgali@chandana-galgali-VirtualBox: ~
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

chandana-galgali@chandana-galgali-VirtualBox: $ mkdir -m 777 ~/data
chandana-galgali@chandana-galgali-VirtualBox: $
```



```
chandana-galgali@chandana-galgali-VirtualBox:~$ To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
chandana-galgali@chandana-galgali-VirtualBox:~$ mkdir -m 777 ~/data  
chandana-galgali@chandana-galgali-VirtualBox:~$ rmdir Directory1  
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~ To run a command as administrator (user "root"), use "sudo <command>". See "man sudo_root" for details.

chandana-galgali@chandana-galgali-VirtualBox:~$ mkdir -m 777 ~/data
chandana-galgali@chandana-galgali-VirtualBox:~$ rmdir Directory1
chandana-galgali@chandana-galgali-VirtualBox:~$ pwd
/home/chandana-galgali
chandana-galgali@chandana-galgali-VirtualBox:~$ cd ..
chandana-galgali@chandana-galgali-VirtualBox:/home$ cd -
/home/chandana-galgali
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -l
total 48
drwxrwxrwx 2 chandana-galgali chandana-galgali 4096 Aug  2 22:42 data
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Desktop
drwxrwxr-x  3 chandana-galgali chandana-galgali 4096 Aug  2 22:38 Directory2
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Documents
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Downloads
-rw-rw-r--  1 chandana-galgali chandana-galgali   45 Aug  2 22:32 file1.txt
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Music
drwxr-xr-x  3 chandana-galgali chandana-galgali 4096 Aug  2 22:19 Pictures
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Public
drwx----- 4 chandana-galgali chandana-galgali 4096 Aug  2 22:22 snap
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Templates
drwxr-xr-x  2 chandana-galgali chandana-galgali 4096 Aug  2 21:55 Videos
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -a
. .bash_history .bashrc .config Desktop  Documents  file1.txt .local Pictures  Public  .ssh      Videos
.. .bash_logout .cache data    Directory2 Downloads .gnupg   Music   .profile snap    Templates
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -i
1350628 data  1350625 Directory2 1098299 Downloads 1098303 Music     1098301 Public  1098300 Templates
1098298 Desktop 1098302 Documents 1098791 file1.txt 1098304 Pictures 1060077 snap    1098305 Videos
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```

```
chandana-galgali@chandana-galgali-VirtualBox:~ To run a command as administrator (user "root"), use "sudo <command>". See "man sudo_root" for details.

chandana-galgali@chandana-galgali-VirtualBox:~$ ls -R
.:
data Desktop  Directory2  Documents  Downloads  file1.txt  Music  Pictures  Public  snap  Templates  Videos

./data:
./Desktop:
./Directory2:
subDirectory

./Directory2/subDirectory:

./Documents:
./Downloads:
./Music:
./Pictures:
Screenshots

./Pictures/Screenshots:
'Screenshot from 2024-08-02 22-19-50.png'  'Screenshot from 2024-08-02 22-39-17.png'
'Screenshot from 2024-08-02 22-21-16.png'  'Screenshot from 2024-08-02 22-39-38.png'
'Screenshot from 2024-08-02 22-27-00.png'  'Screenshot from 2024-08-02 22-43-30.png'
'Screenshot from 2024-08-02 22-29-44.png'  'Screenshot from 2024-08-02 22-43-50.png'
'Screenshot from 2024-08-02 22-32-29.png'  'Screenshot from 2024-08-02 22-45-08.png'
'Screenshot from 2024-08-02 22-33-24.png'  'Screenshot from 2024-08-02 22-45-50.png'
'Screenshot from 2024-08-02 22-36-04.png'  'Screenshot from 2024-08-02 22-46-18.png'
```

```
chandana-galgali@chandana-galgali-VirtualBox:~ 
'Screenshot from 2024-08-02 22-36-04.png'  'Screenshot from 2024-08-02 22-46-18.png'
'Screenshot from 2024-08-02 22-36-24.png'  'Screenshot from 2024-08-02 22-48-16.png'
'Screenshot from 2024-08-02 22-38-56.png'  'Screenshot from 2024-08-02 22-48-54.png'

./Public:

./snap:
firefox snapd-desktop-integration

./snap/firefox:
4173 common current

./snap/firefox/4173:

./snap/firefox/common:

./snap/snapd-desktop-integration:
157 common current

./snap/snapd-desktop-integration/157:
Desktop Documents Downloads Music Pictures Public Templates Videos

./snap/snapd-desktop-integration/157/Desktop:

./snap/snapd-desktop-integration/157/Documents:

./snap/snapd-desktop-integration/157/Downloads:

./snap/snapd-desktop-integration/157/Music:

./snap/snapd-desktop-integration/157/Pictures:

./snap/snapd-desktop-integration/157/Public:
```

```
chandana-galgali@chandana-galgali-VirtualBox:~ 
./snap/firefox/4173:

./snap/firefox/common:

./snap/snapd-desktop-integration:
157 common current

./snap/snapd-desktop-integration/157:
Desktop Documents Downloads Music Pictures Public Templates Videos

./snap/snapd-desktop-integration/157/Desktop:

./snap/snapd-desktop-integration/157/Documents:

./snap/snapd-desktop-integration/157/Downloads:

./snap/snapd-desktop-integration/157/Music:

./snap/snapd-desktop-integration/157/Pictures:

./snap/snapd-desktop-integration/157/Public:

./snap/snapd-desktop-integration/157/Templates:

./snap/snapd-desktop-integration/157/Videos:

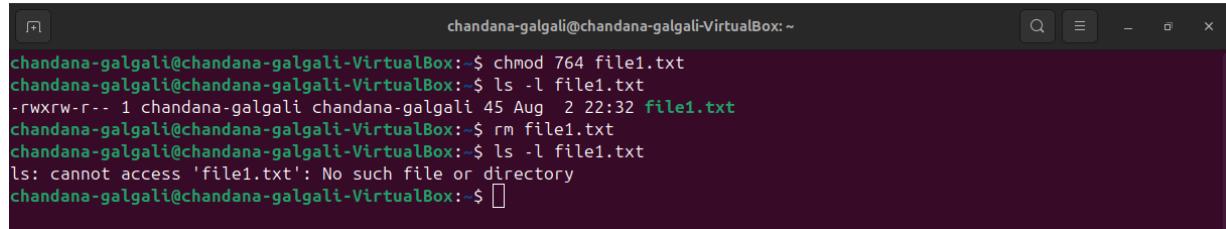
./snap/snapd-desktop-integration/common:

./Templates:

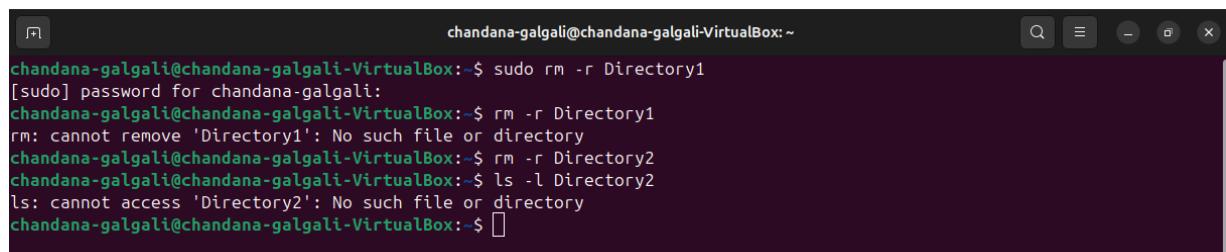
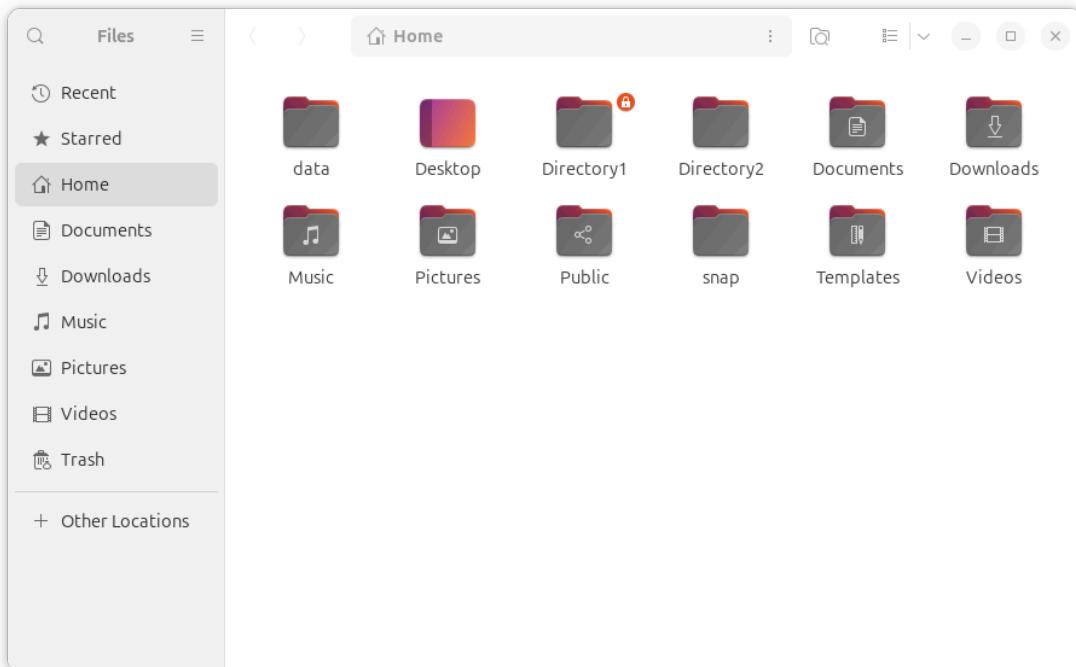
./Videos:
chandana-galgali@chandana-galgali-VirtualBox:~ $ 
```

```
chandana-galgali@chandana-galgali-VirtualBox:~ 
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

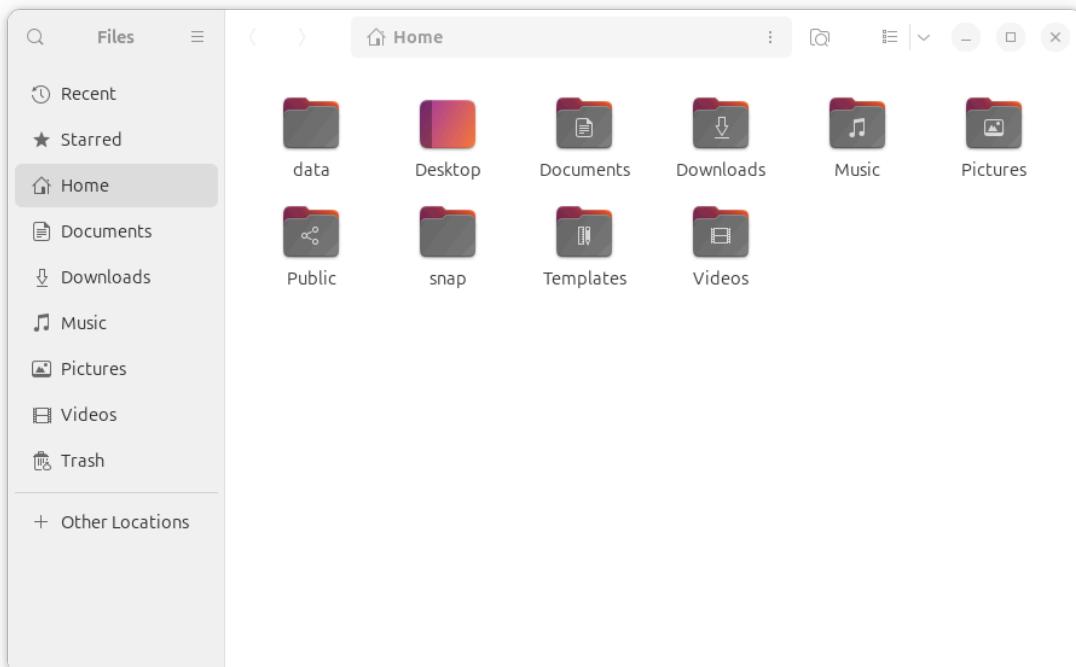
chandana-galgali@chandana-galgali-VirtualBox:~ $ ls -d */
data/ Desktop/ Directory2/ Documents/ Downloads/ Music/ Pictures/ Public/ snap/ Templates/ Videos/
chandana-galgali@chandana-galgali-VirtualBox:~ $ ls -d Do*
.
chandana-galgali@chandana-galgali-VirtualBox:~ $ ls -d Do*
Documents Downloads
chandana-galgali@chandana-galgali-VirtualBox:~ $ 
```



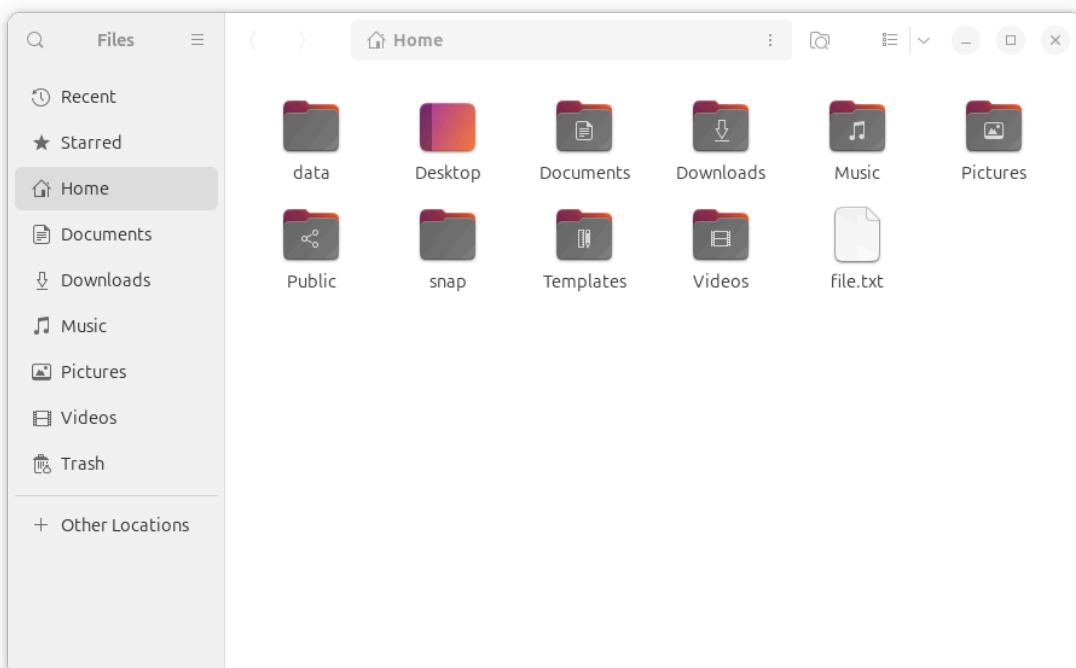
```
chandana-galgali@chandana-galgali-VirtualBox:~$ chmod 764 file1.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -l file1.txt
-rwxrw-r-- 1 chandana-galgali chandana-galgali 45 Aug 2 22:32 file1.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ rm file1.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -l file1.txt
ls: cannot access 'file1.txt': No such file or directory
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



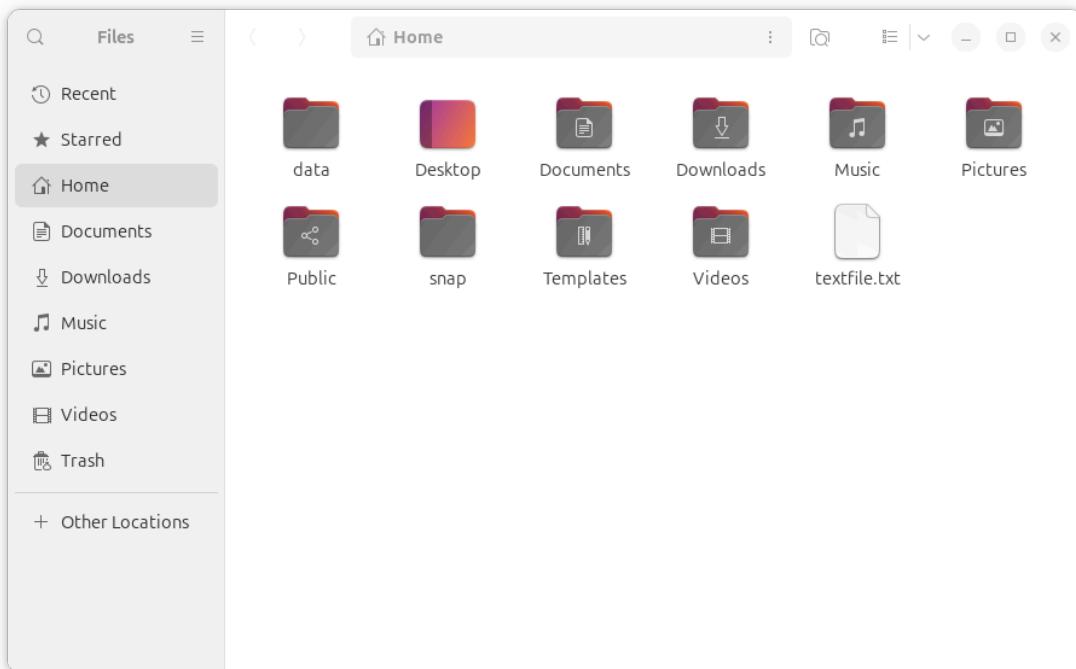
```
chandana-galgali@chandana-galgali-VirtualBox:~$ sudo rm -r Directory1
[sudo] password for chandana-galgali:
chandana-galgali@chandana-galgali-VirtualBox:~$ rm -r Directory1
rm: cannot remove 'Directory1': No such file or directory
chandana-galgali@chandana-galgali-VirtualBox:~$ rm -r Directory2
chandana-galgali@chandana-galgali-VirtualBox:~$ ls -l Directory2
ls: cannot access 'Directory2': No such file or directory
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file.txt  
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file.txt  
chandana-galgali@chandana-galgali-VirtualBox:~$ mv file.txt textfile.txt  
chandana-galgali@chandana-galgali-VirtualBox:~$ 
```



```
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file1.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ touch file2.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ cat > file1.txt
This sentence will get copied to the File 2.chandana-galgali@chandana-galgali-VirtualBox:~$ cp file1.txt file2.txt
chandana-galgali@chandana-galgali-VirtualBox:~$ cat file2.txt
This sentence will get copied to the File 2.chandana-galgali@chandana-galgali-VirtualBox:~$ 
```

```
chandana-galgali@chandana-galgali-VirtualBox:~$ sudo find / -name data
[sudo] password for chandana-galgali:
/snap/firmware-updater/127/bin/data
/snap/gnome-42-2204/176/usr/lib/python3/dist-packages/pkg_resources/tests/data
/snap/gnome-42-2204/176/usr/share/fcitx/data
/snap/gtk-common-themes/1535/share/icons/hicolor/128x128/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/16x16/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/192x192/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/22x22/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/24x24/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/256x256/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/32x32/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/36x36/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/48x48/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/512x512/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/64x64/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/72x72/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/96x96/stock/data
/snap/gtk-common-themes/1535/share/icons/hicolor/scalable/stock/data
/snap/snap-store/1124/bin/data
/snap/core22/1380/usr/lib/python3/dist-packages/pkg_resources/tests/data
/snap/core22/1380/usr/lib/python3/dist-packages/probert/tests/data
/run/udev/data
find: '/run/user/1000/doc': Permission denied
find: '/run/user/1000/gvfs': Permission denied
/var/lib/cloud/data
/sys/kernel/security/apparmor/features/query/label/data
/sys/kernel/boot_params/data
/sys/firmware/acpi/tables/data
/home/chandana-galgali/data
/usr/share/icons/hicolor/512x512/stock/data
/usr/share/icons/hicolor/48x48/stock/data
/usr/share/icons/hicolor/128x128/stock/data
```

```
chandana-galgali@chandana-galgali-VirtualBox: ~
/snap/core22/1380/usr/lib/python3/dist-packages/pkg_resources/tests/data
/snap/core22/1380/usr/lib/python3/dist-packages/probert/tests/data
/run/udev/data
find: '/run/user/1000/doc': Permission denied
find: '/run/user/1000/gvfs': Permission denied
/var/lib/cloud/data
/sys/kernel/security/apparmor/features/query/label/data
/sys/kernel/boot_params/data
/sys/firmware/acpi/tables/data
/home/chandana-galgali/data
/usr/share/icons/hicolor/512x512/stock/data
/usr/share/icons/hicolor/48x48/stock/data
/usr/share/icons/hicolor/128x128/stock/data
/usr/share/icons/hicolor/22x22/stock/data
/usr/share/icons/hicolor/96x96/stock/data
/usr/share/icons/hicolor/24x24/stock/data
/usr/share/icons/hicolor/64x64/stock/data
/usr/share/icons/hicolor/256x256/stock/data
/usr/share/icons/hicolor/192x192/stock/data
/usr/share/icons/hicolor/72x72/stock/data
/usr/share/icons/hicolor/36x36/stock/data
/usr/share/icons/hicolor/16x16/stock/data
/usr/share/icons/hicolor/32x32/stock/data
/usr/share/icons/hicolor/scalable/stock/data
/usr/share/hplip/data
/usr/share/language-selector/data
/usr/share/im-config/data
/usr/share/cups/data
/usr/share/ibus-table/data
/usr/lib/python3/dist-packages/wadllib/tests/data
/usr/lib/x86_64-linux-gnu/libpinyin/data
chandana-galgali@chandana-galgali-VirtualBox: ~ $ 
```

User administration:

```
root@chandana-galgali-VirtualBox: ~
chandana-galgali@chandana-galgali-VirtualBox: ~$ sudo su -
[sudo] password for chandana-galgali:
root@chandana-galgali-VirtualBox: ~# useradd chand
root@chandana-galgali-VirtualBox: ~# groupadd group
root@chandana-galgali-VirtualBox: ~# usermod -G group chand
root@chandana-galgali-VirtualBox: ~# groupmod -n newGroup group
```

```
root@chandana-galgali-VirtualBox: ~# touch file.txt
root@chandana-galgali-VirtualBox: ~# chgrp newGroup file.txt
root@chandana-galgali-VirtualBox: ~# ls -lg file.txt
-rw-r--r-- 1 newGroup 0 Aug 3 00:19 file.txt
root@chandana-galgali-VirtualBox: ~# chown chand:newGroup file.txt
root@chandana-galgali-VirtualBox: ~# ls -l file.txt
-rw-r--r-- 1 chand newGroup 0 Aug 3 00:19 file.txt
root@chandana-galgali-VirtualBox: ~# 
```

```
root@chandana-galgali-VirtualBox:~# chage -l chand
Last password change : Aug 02, 2024
Password expires      : never
Password inactive     : never
Account expires        : never
Minimum number of days between password change : 0
Maximum number of days between password change : 99999
Number of days of warning before password expires : 7
root@chandana-galgali-VirtualBox:~# chage -m 7 chand
root@chandana-galgali-VirtualBox:~# chage -l chand
Last password change : Aug 02, 2024
Password expires      : never
Password inactive     : never
Account expires        : never
Minimum number of days between password change : 7
Maximum number of days between password change : 99999
Number of days of warning before password expires : 7
root@chandana-galgali-VirtualBox:~# chage -E 2024-08-04 chand
root@chandana-galgali-VirtualBox:~# chage -l chand
Last password change : Aug 02, 2024
Password expires      : never
Password inactive     : never
Account expires        : Aug 04, 2024
Minimum number of days between password change : 7
Maximum number of days between password change : 99999
Number of days of warning before password expires : 7
root@chandana-galgali-VirtualBox:~# 
```

```
root@chandana-galgali-VirtualBox:~# userdel chand
root@chandana-galgali-VirtualBox:~# userdel chand
userdel: user 'chand' does not exist
root@chandana-galgali-VirtualBox:~# groupdel newGroup
root@chandana-galgali-VirtualBox:~# groupdel newGroup
groupdel: group 'newGroup' does not exist
root@chandana-galgali-VirtualBox:~# 
```

Process Management:

```
root@chandana-galgali-VirtualBox:~# ps
  PID TTY      TIME CMD
 9390 pts/1    00:00:00 sudo
 9391 pts/1    00:00:00 su
 9392 pts/1    00:00:00 bash
 10081 pts/1    00:00:00 ps
root@chandana-galgali-VirtualBox:~# ps -a
  PID TTY      TIME CMD
 1655 tty2    00:00:00 gnome-session-b
 9389 pts/0    00:00:00 sudo
 9391 pts/1    00:00:00 su
 9392 pts/1    00:00:00 bash
 10083 pts/1    00:00:00 ps
root@chandana-galgali-VirtualBox:~# ps -x
  PID TTY      STAT   TIME COMMAND
  1 ?        Ss     0:05 /sbin/init splash
  2 ?        S      0:00 [kthreadd]
  3 ?        S      0:00 [pool_workqueue_release]
  4 ?        I<    0:00 [kworker/R-rcu_g]
  5 ?        I<    0:00 [kworker/R-rcu_p]
  6 ?        I<    0:00 [kworker/R-slub_]
  7 ?        I<    0:00 [kworker/R-netns]
 12 ?        I<    0:00 [kworker/R-mm_pe]
 13 ?        I      0:00 [rcu_tasks_kthread]
 14 ?        I      0:00 [rcu_tasks_rude_kthread]
 15 ?        I      0:00 [rcu_tasks_trace_kthread]
 16 ?        S      0:02 [ksoftirqd/0]
 17 ?        I      0:21 [rcu_preempt]
 18 ?        S      0:01 [migration/0]
 19 ?        S      0:00 [idle_inject/0]
 20 ?        S      0:00 [cpuhp/0]
 21 ?        S      0:00 [cpuhp/1]
 22 ?        S      0:00 [idle_inject/1]
```

```
root@chandana-galgali-VirtualBox:~#
22 ? S 0:00 [idle_inject/1]
23 ? S 0:06 [migration/1]
24 ? S 0:21 [ksoftirqd/1]
27 ? S 0:00 [kdevtmpfs]
28 ? I< 0:00 [kworker/R-inet_]
30 ? S 0:00 [kauditfd]
31 ? S 0:00 [khungtaskd]
32 ? S 0:00 [oom_reaper]
34 ? I< 0:00 [kworker/R-write]
35 ? S 0:04 [kcompactd0]
36 ? SN 0:00 [ksmd]
38 ? SN 0:00 [khugepaged]
39 ? I< 0:00 [kworker/R-kinte]
40 ? I< 0:00 [kworker/R-kblock]
41 ? I< 0:00 [kworker/R-blkcg]
42 ? S 0:00 [irq/9-acpi]
43 ? I< 0:00 [kworker/R-tpm_d]
44 ? I< 0:00 [kworker/R-ata_s]
45 ? I< 0:00 [kworker/R-md]
46 ? I< 0:00 [kworker/R-md_bij]
47 ? I< 0:00 [kworker/R-edac]
48 ? I< 0:00 [kworker/R-devfr]
49 ? S 0:00 [watchdogd]
51 ? S 0:05 [kswapd0]
52 ? S 0:00 [ecryptfs-kthread]
53 ? I< 0:00 [kworker/R-kthrot]
54 ? I< 0:00 [kworker/R-acpi]
55 ? S 0:00 [scsi_eh_0]
56 ? I< 0:00 [kworker/R-scsi]
57 ? S 0:00 [scsi_eh_1]
58 ? I< 0:00 [kworker/R-scsi]
62 ? I< 0:00 [kworker/R-mld]
64 ? T< 0:00 [kworker/R-ipv6]
```

```
root@chandana-galgali-VirtualBox:~#
64 ? I< 0:00 [kworker/R-ipv6_]
72 ? I< 0:00 [kworker/R-kstrp]
74 ? I< 0:00 [kworker/u5:0-ttm]
87 ? I< 0:00 [kworker/R-charg]
139 ? S 0:00 [scsi_eh_2]
140 ? I< 0:00 [kworker/R-scsi]
187 ? S 0:03 [jbd2/sda2-8]
188 ? I< 0:00 [kworker/R-ext4-]
250 ? Ss 0:03 /usr/lib/systemd/systemd-journald
304 ? Ss 0:00 /usr/lib/systemd/systemd-udevd
363 ? S 0:00 [psimon]
561 ? Ssl 0:00 /usr/libexec/power-profiles-daemon
566 ? Ssl 0:02 /usr/lib/snapd/snapd
567 ? S<s 0:00 /usr/lib/systemd/systemd-logind
568 ? Ssl 0:01 /usr/libexec/accounts-daemon
569 ? Ss 0:00 /usr/sbin/cron -f -P
570 ? I< 0:00 [kworker/R-crypt]
571 ? Ssl 0:00 /usr/libexec/switcheroo-control
573 ? Ssl 0:01 /usr/libexec/udisks2/udisksd
575 ? S 0:00 [irq/18-vmwgfx]
593 ? I< 0:00 [kworker/R-ttm]
637 ? Ssl 0:01 /usr/sbin/NetworkManager --no-daemon
642 ? Ss 0:00 /usr/sbin/wpa_supplicant -u -s -O DIR=/run/wpa_supplicant GROUP=netdev
716 ? Ssl 0:00 /usr/sbin/ModemManager
1045 ? Ss 0:00 /usr/sbin/cupsd -l
1052 ? Ssl 0:00 /usr/bin/python3 /usr/share/unattended-upgrades/unattended-upgrade-shutdown --wait-for-sign
1063 ? Ssl 0:00 /usr/sbin/gdm3
1087 ? S 0:00 [psimon]
1271 ? Ssl 0:02 /usr/libexec/upowerd
1538 ? Sl 0:00 gdm-session-worker [pam/gdm-password]
1627 ? Ss 0:00 fusermount3 -o rw,nosuid,nodev,fsname=portal,auto_unmount,subtype=portal -- /run/user/1000/
2355 ? I< 0:00 [kworker/u5:1]
2429 ? Ss1 0:00 /usr/libexec/ubuntu-advantage-desktop-daemon
```

```
root@chandana-galgali-VirtualBox:~# ps -l
2429 ? Ssl 0:00 /usr/libexec/ubuntu-advantage-desktop-daemon
6305 ? Ssl 0:02 /usr/libexec/fwupd/fwupd
6331 ? Ss 0:00 gpg-agent --homedir /var/lib/fwupd/gnupg --use-standard-socket --daemon
6889 ? I 0:04 [kworker/0:2-events]
7744 ? I 0:07 [kworker/u4:2-ext4-rsv-conversion]
8902 ? I< 0:00 [kworker/0:2H-kblockd]
9284 ? I< 0:00 [kworker/0:1H-kblockd]
9378 ? I 0:03 [kworker/1:1-events]
9389 pts/0 S+ 0:00 sudo su -
9390 pts/1 Ss 0:00 sudo su -
9391 pts/1 S 0:00 su -
9392 pts/1 S 0:00 -bash
9439 ? I 0:01 [kworker/u4:3-events_unbound]
9531 ? I 0:01 [kworker/u4:0-events_unbound]
9574 ? I 0:00 [kworker/0:1-events]
9641 ? I< 0:00 [kworker/1:0H-kblockd]
9782 ? I< 0:00 [kworker/1:1H-kblockd]
9797 ? I 0:00 [kworker/1:0-cgroup_destroy]
9848 ? I 0:00 [kworker/0:0-events]
9972 ? I 0:00 [kworker/u4:1-events_power_efficient]
9973 ? I 0:00 [kworker/u4:4-events_power_efficient]
10071 ? I 0:00 [kworker/1:2]
10084 pts/1 R+ 0:00 ps -x
root@chandana-galgali-VirtualBox:~# ps -l
F S UID PID PPID C PRI NI ADDR SZ WCHAN TTY TIME CMD
1 S 0 9390 9389 0 80 0 - 4920 do_pol pts/1 00:00:00 sudo
4 S 0 9391 9390 0 80 0 - 3078 do_wai pts/1 00:00:00 su
4 S 0 9392 9391 0 80 0 - 2751 do_wai pts/1 00:00:00 bash
4 R 0 10085 9392 99 80 0 - 3446 - pts/1 00:00:00 ps
root@chandana-galgali-VirtualBox:~# ps -u
USER PID %CPU %MEM VSZ RSS TTY STAT START TIME COMMAND
root 9389 0.0 0.2 19680 7424 pts/0 S+ 00:06 0:00 sudo su -
root 9390 0.0 0.0 19680 2588 pts/1 Ss 00:06 0:00 sudo su -
root@chandana-galgali-VirtualBox:~# ps -u
```

```
root 9390 0.0 0.0 19680 2588 pts/1 Ss 00:06 0:00 sudo su -
root 9391 0.0 0.1 12312 4736 pts/1 S 00:06 0:00 su -
root 9392 0.0 0.1 11004 5120 pts/1 S 00:06 0:00 -bash
root 10086 533 0.1 13748 4608 pts/1 R+ 00:32 0:00 ps -u
root@chandana-galgali-VirtualBox:~# ps -e
PID TTY TIME CMD
1 ? 00:00:05 systemd
2 ? 00:00:00 kthreadd
3 ? 00:00:00 pool_workqueue_release
4 ? 00:00:00 kworker/R-rcu_g
5 ? 00:00:00 kworker/R-rcu_p
6 ? 00:00:00 kworker/R-slub_
7 ? 00:00:00 kworker/R-netns
12 ? 00:00:00 kworker/R-mm_pe
13 ? 00:00:00 rcu_tasks_kthread
14 ? 00:00:00 rcu_tasks_rude_kthread
15 ? 00:00:00 rcu_tasks_trace_kthread
16 ? 00:00:02 ksoftirqd/0
17 ? 00:00:21 rcu_preempt
18 ? 00:00:01 migration/0
19 ? 00:00:00 idle_inject/0
20 ? 00:00:00 cpuhp/0
21 ? 00:00:00 cpuhp/1
22 ? 00:00:00 idle_inject/1
23 ? 00:00:06 migration/1
24 ? 00:00:21 ksoftirqd/1
27 ? 00:00:00 kdevtmpfs
28 ? 00:00:00 kworker/R-inet_
30 ? 00:00:00 kauditd
31 ? 00:00:00 khungtaskd
32 ? 00:00:00 oom_reaper
34 ? 00:00:00 kworker/R-write
35 ? 00:00:04 kcompactd0
```

```
root@chandana-galgali-VirtualBox: ~
35 ?      00:00:04 kcompactd0
36 ?      00:00:00 ksmd
38 ?      00:00:00 khugepaged
39 ?      00:00:00 kworker/R-kinte
40 ?      00:00:00 kworker/R-kbloc
41 ?      00:00:00 kworker/R-blkcg
42 ?      00:00:00 irq/9-acpi
43 ?      00:00:00 kworker/R-tpm_d
44 ?      00:00:00 kworker/R-ata_s
45 ?      00:00:00 kworker/R-md
46 ?      00:00:00 kworker/R-md.bi
47 ?      00:00:00 kworker/R-edac-
48 ?      00:00:00 kworker/R-devfr
49 ?      00:00:00 watchdogd
51 ?      00:00:05 kswapd0
52 ?      00:00:00 encryptfs-kthread
53 ?      00:00:00 kworker/R-kthro
54 ?      00:00:00 kworker/R-acpi_
55 ?      00:00:00 scsi_eh_0
56 ?      00:00:00 kworker/R-scsi_
57 ?      00:00:00 scsi_eh_1
58 ?      00:00:00 kworker/R-scsi_
62 ?      00:00:00 kworker/R-mld
64 ?      00:00:00 kworker/R-ipv6_
72 ?      00:00:00 kworker/R-kstrp
74 ?      00:00:00 kworker/u5:0-ttm
87 ?      00:00:00 kworker/R-charg
139 ?     00:00:00 scsi_eh_2
140 ?     00:00:00 kworker/R-scsi_
187 ?     00:00:03 jbd2/sda2-8
188 ?     00:00:00 kworker/R-ext4-
250 ?     00:00:03 systemd-journal
304 ?     00:00:00 systemd-udevd
```

```
root@chandana-galgali-VirtualBox: ~
304 ?     00:00:00 systemd-udevd
363 ?     00:00:00 psimon
404 ?     00:00:11 systemd-oomd
411 ?     00:00:05 systemd-resolve
420 ?     00:00:00 systemd-timesyn
539 ?     00:00:00 avahi-daemon
540 ?     00:00:03 dbus-daemon
543 ?     00:00:00 gnome-remote-de
556 ?     00:00:01 polkitd
561 ?     00:00:00 power-profiles-
566 ?     00:00:02 snapd
567 ?     00:00:00 systemd-logind
568 ?     00:00:01 accounts-daemon
569 ?     00:00:00 cron
570 ?     00:00:00 kworker/R-crypt
571 ?     00:00:00 switcheroo-cont
573 ?     00:00:01 udisksd
575 ?     00:00:00 irq/18-vmwgfx
582 ?     00:00:00 avahi-daemon
593 ?     00:00:00 kworker/R-ttm
610 ?     00:00:00 rsyslogd
637 ?     00:00:01 NetworkManager
642 ?     00:00:00 wpa_supplicant
716 ?     00:00:00 ModemManager
1045 ?    00:00:00 cupsd
1052 ?    00:00:00 unattended-upgr
1060 ?    00:00:00 dbus
1063 ?    00:00:00 gdm3
1070 ?    00:00:00 cups-browsed
1079 ?    00:00:00 kerneloops
1084 ?    00:00:00 kerneloops
1087 ?    00:00:00 psimon
1125 ?    00:00:00 rtkit-daemon
```

```
root@chandana-galgali-VirtualBox: ~
1125 ? 00:00:00 rtkit-daemon
1232 ? 00:00:00 colord
1271 ? 00:00:02 upowerd
1538 ? 00:00:00 gdm-session-wor
1548 ? 00:00:01 systemd
1552 ? 00:00:00 (sd-pam)
1567 ? 00:00:22 pipewire
1568 ? 00:00:00 pipewire
1574 ? 00:00:10 wireplumber
1582 ? 00:00:10 pipewire-pulse
1591 ? 00:00:10 dbus-daemon
1592 ? 00:00:00 gnome-keyring-d
1597 ? 00:00:00 xdg-document-po
1619 ? 00:00:00 xdg-permission-
1627 ? 00:00:00 fusermount3
1647 tty2 00:00:00 gdm-wayland-ses
1655 tty2 00:00:00 gnome-session-b
1726 ? 00:00:00 gcr-ssh-agent
1730 ? 00:00:00 gnome-session-c
1739 ? 00:00:00 gvfsd
1759 ? 00:00:00 gvfsd-fuse
1768 ? 00:00:00 gnome-session-b
1805 ? 00:00:00 at-spi-bus-laun
1807 ? 00:35:13 gnome-shell
1817 ? 00:00:00 dbus-daemon
1862 ? 00:00:00 at-spi2-registr
1880 ? 00:00:00 gnome-shell-cal
1897 ? 00:00:00 evolution-sourc
1900 ? 00:00:00 gjs
1902 ? 00:01:08 ibus-daemon
1903 ? 00:00:00 gsd-a11y-settin
1904 ? 00:00:00 gsd-color
1906 ? 00:00:00 gsd-datetime
```

```
root@chandana-galgali-VirtualBox: ~
1911 ? 00:00:00 gsd-keyboard
1913 ? 00:00:01 gsd-media-keys
1917 ? 00:00:00 gsd-power
1918 ? 00:00:00 gsd-print-notif
1919 ? 00:00:00 gsd-rfkill
1921 ? 00:00:00 gsd-screensaver
1924 ? 00:00:00 gsd-sharing
1926 ? 00:00:00 gsd-smartcard
1931 ? 00:00:00 gsd-sound
1942 ? 00:00:00 gsd-wacom
1945 ? 00:00:00 evolution-alarm
1959 ? 00:00:00 gsd-disk-utilit
2067 ? 00:00:00 goa-daemon
2072 ? 00:00:00 gvfs-udisks2-vo
2082 ? 00:00:00 gsd-printer
2105 ? 00:00:00 ibus-dconf
2111 ? 00:00:08 ibus-extension-
2112 ? 00:00:00 evolution-calen
2123 ? 00:00:00 ibus-portal
2144 ? 00:00:00 goa-identity-se
2156 ? 00:00:01 gvfs-afc-volume
2168 ? 00:00:00 gvfs-mtp-volume
2169 ? 00:00:00 gvfsd-metadata
2174 ? 00:00:00 gvfs-gphoto2-vo
2181 ? 00:00:00 evolution-addre
2186 ? 00:00:00 gvfs-goa-volume
2209 ? 00:00:00 snapd-desktop-i
2210 ? 00:00:22 ibus-engine-sim
2279 ? 00:00:00 dconf-service
2281 ? 00:00:00 snapd-desktop-i
2304 ? 00:00:00 gvfsd-trash
2329 ? 00:00:12 gjs
2355 ? 00:00:00 kworker/u5:1
```

```
root@chandana-galgali-VirtualBox:~#
2355 ? 00:00:00 kworker/u5:1
2388 ? 00:00:12 tracker-miner-f
2417 ? 00:00:00 gjs
2426 ? 00:00:02 xdg-desktop-por
2429 ? 00:00:00 ubuntu-advantag
2440 ? 00:00:08 xdg-desktop-por
2471 ? 00:00:00 Xwayland
2472 ? 00:00:00 xdg-desktop-por
2482 ? 00:00:00 gsd-xsettings
2509 ? 00:00:00 ibus-x11
2511 ? 00:00:00 mutter-x11-fram
2644 ? 00:00:00 update-notifier
2783 ? 00:00:00 gvfsd-recent
3288 ? 00:01:47 gnome-terminal-
3401 ? 00:00:00 seahorse
3577 ? 00:14:58 firefox
3787 ? 00:00:00 Socket Process
3828 ? 00:00:01 WebExtensions
3854 ? 00:00:15 Privileged Cont
3899 ? 00:00:00 snap
4245 ? 00:17:32 Isolated Web Co
4414 ? 00:00:00 Utility Process
4546 ? 00:00:00 RDD Process
4755 ? 00:00:00 gvfsd-network
4774 ? 00:00:00 gvfsd-dnssd
6305 ? 00:00:02 fwupd
6331 ? 00:00:00 gpg-agent
7744 ? 00:00:07 kworker/u4:2-ext4-rsv-conversion
8889 ? 00:00:04 Isolated Servic
8902 ? 00:00:00 kworker/0:2H-kblockd
9068 ? 00:00:01 Web Content
9284 ? 00:00:00 kworker/0:1H-kblockd
9344 ? 00:00:01 Web Content
```

```
root@chandana-galgali-VirtualBox:~#
4245 ? 00:17:32 Isolated Web Co
4414 ? 00:00:00 Utility Process
4546 ? 00:00:00 RDD Process
4755 ? 00:00:00 gvfsd-network
4774 ? 00:00:00 gvfsd-dnssd
6305 ? 00:00:02 fwupd
6331 ? 00:00:00 gpg-agent
7744 ? 00:00:07 kworker/u4:2-ext4-rsv-conversion
8889 ? 00:00:04 Isolated Servic
8902 ? 00:00:00 kworker/0:2H-kblockd
9068 ? 00:00:01 Web Content
9284 ? 00:00:00 kworker/0:1H-kblockd
9344 ? 00:00:01 Web Content
9378 ? 00:00:03 kworker/1:1-events
9382 pts/0 00:00:00 bash
9389 pts/0 00:00:00 sudo
9390 pts/1 00:00:00 sudo
9391 pts/1 00:00:00 su
9392 pts/1 00:00:00 bash
9439 ? 00:00:01 kworker/u4:3-events_power_efficient
9531 ? 00:00:01 kworker/u4:0-events_unbound
9574 ? 00:00:00 kworker/0:1-events
9641 ? 00:00:00 kworker/1:0H-kblockd
9782 ? 00:00:00 kworker/1:1H-kblockd
9797 ? 00:00:00 kworker/1:0-cgroup_destroy
9809 ? 00:00:01 Web Content
9848 ? 00:00:00 kworker/0:0-events
9972 ? 00:00:00 kworker/u4:1-events_power_efficient
9973 ? 00:00:00 kworker/u4:4-events_unbound
10071 ? 00:00:00 kworker/1:2
10087 pts/1 00:00:00 ps
root@chandana-galgali-VirtualBox:~# 
```

```
root@chandana-galgali-VirtualBox:~# ps -aux
USER      PID %CPU %MEM    VSZ RSS TTY      STAT START   TIME COMMAND
root        1  0.0  0.4 23064 13512 ?        Ss Aug02  0:07 /sbin/init splash
root        2  0.0  0.0     0   0 ?        S  Aug02  0:00 [kthreadd]
root        3  0.0  0.0     0   0 ?        S  Aug02  0:00 [pool_workqueue_release]
root        4  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-rcu_g]
root        5  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-rcu_p]
root        6  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-slab_]
root        7  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-netns]
root       12  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-mm_pe]
root       13  0.0  0.0     0   0 ?        I  Aug02  0:00 [rcu_tasks_kthread]
root       14  0.0  0.0     0   0 ?        I  Aug02  0:00 [rcu_tasks_rude_kthread]
root       15  0.0  0.0     0   0 ?        I  Aug02  0:00 [rcu_tasks_trace_kthread]
root       16  0.0  0.0     0   0 ?        S  Aug02  0:03 [ksoftirqd/0]
root       17  0.2  0.0     0   0 ?        I  Aug02  0:27 [rcu_preempt]
root       18  0.0  0.0     0   0 ?        S  Aug02  0:01 [migration/0]
root       19  0.0  0.0     0   0 ?        S  Aug02  0:00 [idle_inject/0]
root       20  0.0  0.0     0   0 ?        S  Aug02  0:00 [cpuhp/0]
root       21  0.0  0.0     0   0 ?        S  Aug02  0:00 [cpuhp/1]
root       22  0.0  0.0     0   0 ?        S  Aug02  0:00 [idle_inject/1]
root       23  0.0  0.0     0   0 ?        S  Aug02  0:06 [migration/1]
root       24  0.2  0.0     0   0 ?        S  Aug02  0:25 [ksoftirqd/1]
root       27  0.0  0.0     0   0 ?        S  Aug02  0:00 [kdevtmpfs]
root       28  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-inet_]
root       30  0.0  0.0     0   0 ?        S  Aug02  0:00 [kaudittd]
root       31  0.0  0.0     0   0 ?        S  Aug02  0:00 [khungtaskd]
root       32  0.0  0.0     0   0 ?        S  Aug02  0:00 [oom_reaper]
root       34  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-write]
root       35  0.0  0.0     0   0 ?        S  Aug02  0:05 [kcompactd0]
root       36  0.0  0.0     0   0 ?        SN Aug02  0:00 [ksmd]
root       38  0.0  0.0     0   0 ?        SN Aug02  0:00 [khugepaged]
root       39  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-kinte]
root       40  0.0  0.0     0   0 ?        T< Aug02  0:00 [kworker/R-kbloc]
```

```
root@chandana-galgali-VirtualBox:~#
root       40  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-kbloc]
root       41  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-blkcg]
root       42  0.0  0.0     0   0 ?        S  Aug02  0:00 [irq/9-acpi]
root       43  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-tpm_d]
root       44  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-ata_s]
root       45  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-md]
root       46  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-md_b]
root       47  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-edac_]
root       48  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-devfr]
root       49  0.0  0.0     0   0 ?        S  Aug02  0:00 [watchdogd]
root       51  0.0  0.0     0   0 ?        S  Aug02  0:05 [kswapd0]
root       52  0.0  0.0     0   0 ?        S  Aug02  0:00 [ecryptfs-kthread]
root       53  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-kthrot]
root       54  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-acpi_]
root       55  0.0  0.0     0   0 ?        S  Aug02  0:00 [scsi_eh_0]
root       56  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-scsi_]
root       57  0.0  0.0     0   0 ?        S  Aug02  0:00 [scsi_eh_1]
root       58  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-scsi_]
root       62  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-mld]
root       64  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-ipv6_]
root       72  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-kstrp]
root       74  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/u5:0-ttm]
root       87  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-charg]
root      139  0.0  0.0     0   0 ?        S  Aug02  0:00 [scsi_eh_2]
root      140  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-scsi_]
root      187  0.0  0.0     0   0 ?        S  Aug02  0:04 [jbd2/sda2-8]
root      188  0.0  0.0     0   0 ?        I< Aug02  0:00 [kworker/R-ext4_]
root      250  0.0  0.5 50960 17024 ?        Ss Aug02  0:04 /usr/lib/systemd/systemd-journald
root      304  0.0  0.1 30420  5060 ?        Ss Aug02  0:00 /usr/lib/systemd/systemd-udevd
root      363  0.0  0.0     0   0 ?        S  Aug02  0:00 [psimon]
systemd+  404  0.1  0.2 17556  7040 ?        Ss Aug02  0:14 /usr/lib/systemd/systemd-oomd
systemd+  411  0.0  0.3 21968  9472 ?        Ss Aug02  0:06 /usr/lib/systemd/systemd-resolved
systemd+  420  0.0  0.2 91044  7040 ?        Ssl Aug02  0:00 /usr/lib/systemd/systemd-timesyncd
```


root@chandana-galgali-VirtualBox:~												
chandan+	1918	0.0	0.3	323648	10496	?	Ssl	Aug02	0:00	/usr/libexec/gsd-print-notifications		
chandan+	1919	0.0	0.2	531084	6144	?	Ssl	Aug02	0:00	/usr/libexec/gsd-rfkill		
chandan+	1921	0.0	0.1	309560	5760	?	Ssl	Aug02	0:00	/usr/libexec/gsd-screensaver-proxy		
chandan+	1924	0.0	0.3	543192	9472	?	Ssl	Aug02	0:00	/usr/libexec/gsd-sharing		
chandan+	1926	0.0	0.2	459548	7168	?	Ssl	Aug02	0:00	/usr/libexec/gsd-smartcard		
chandan+	1931	0.0	0.2	393636	8448	?	Ssl	Aug02	0:00	/usr/libexec/gsd-sound		
chandan+	1942	0.0	0.4	486368	13824	?	Ssl	Aug02	0:00	/usr/libexec/gsd-wacom		
chandan+	1945	0.0	1.3	809052	40836	?	Sl	Aug02	0:00	/usr/libexec/evolution-data-server/evolution-alarm-no		
chandan+	1959	0.0	0.2	305492	6784	?	Sl	Aug02	0:00	/usr/libexec/gsd-disk-utility-notify		
chandan+	2067	0.0	0.5	546636	17664	?	Sl	Aug02	0:00	/usr/libexec/goa-daemon		
chandan+	2072	0.0	0.3	389316	9472	?	Ssl	Aug02	0:01	/usr/libexec/gvfs-udisks2-volume-monitor		
chandan+	2082	0.0	0.3	416208	12160	?	Sl	Aug02	0:00	/usr/libexec/gsd-printer		
chandan+	2105	0.0	0.2	310464	6784	?	Sl	Aug02	0:00	/usr/libexec/ibus-dconf		
chandan+	2111	0.1	0.5	421472	15580	?	Sl	Aug02	0:10	/usr/libexec/ibus-extension-gtk3		
chandan+	2112	0.0	0.6	890764	20224	?	Ssl	Aug02	0:00	/usr/libexec/evolution-calendar-factory		
chandan+	2123	0.0	0.2	310428	6912	?	Sl	Aug02	0:00	/usr/libexec/ibus-portal		
chandan+	2144	0.0	0.2	389128	7936	?	Sl	Aug02	0:00	/usr/libexec/goa-identity-service		
chandan+	2156	0.0	0.2	389376	7424	?	Ssl	Aug02	0:02	/usr/libexec/gvfs-afc-volume-monitor		
chandan+	2168	0.0	0.2	309792	6400	?	Ssl	Aug02	0:00	/usr/libexec/gvfs-mtp-volume-monitor		
chandan+	2169	0.0	0.2	236340	6272	?	Ssl	Aug02	0:00	/usr/libexec/gvfsd-metadata		
chandan+	2174	0.0	0.2	310760	6400	?	Ssl	Aug02	0:00	/usr/libexec/gvfs-gphoto2-volume-monitor		
chandan+	2181	0.0	0.7	825408	24320	?	Ssl	Aug02	0:00	/usr/libexec/evolution-addressbook-factory		
chandan+	2186	0.0	0.2	309772	6272	?	Ssl	Aug02	0:00	/usr/libexec/gvfs-goa-volume-monitor		
chandan+	2209	0.0	0.0	38952	1664	?	Ss	Aug02	0:00	/snap/snapd-desktop-integration/157/usr/bin/snapd-des		
chandan+	2210	0.2	0.2	236772	7424	?	Sl	Aug02	0:24	/usr/libexec/ibus-engine-simple		
chandan+	2279	0.0	0.1	230232	5376	?	Ssl	Aug02	0:00	/usr/libexec/dconf-service		
chandan+	2281	0.0	0.0	429440	2572	?	Sl	Aug02	0:00	/snap/snapd-desktop-integration/157/usr/bin/snapd-des		
chandan+	2304	0.0	0.2	609572	8576	?	Sl	Aug02	0:01	/usr/libexec/gvfsd-trash --spawner :1.19 /org/gtk/gvf		
chandan+	2329	0.1	1.2	2806280	38740	?	Sl	Aug02	0:19	gjs /usr/share/gnome-shell/extensions/ding@rastersoft		
root	2355	0.0	0.0	0	0	?	I<	Aug02	0:00	[kworker/u5:1]		
chandan+	2388	0.2	0.9	1013004	27492	?	SNsl	Aug02	0:20	/usr/libexec/tracker-miner-fs-3		
chandan+	2417	0.0	0.4	2584784	14236	?	Sl	Aug02	0:00	/usr/bin/gjs -m /usr/share/gnome-shell/org.gnome.Scre		
chandan+	2426	0.0	0.4	701608	12732	?	Ssl	Aug02	0:04	/usr/libexec/xdg-desktop-portal		

root@chandana-galgali-VirtualBox:~												
chandan+	2426	0.0	0.4	701608	12732	?	Ssl	Aug02	0:04	/usr/libexec/xdg-desktop-portal		
root	2429	0.0	0.2	313228	6980	?	Ssl	Aug02	0:00	/usr/libexec/ubuntu-advantage-desktop-daemon		
chandan+	2440	0.1	7.0	1571768	215884	?	Ssl	Aug02	0:10	/usr/libexec/xdg-desktop-portal-gnome		
chandan+	2471	0.0	1.5	216416	45852	?	S	Aug02	0:00	/usr/bin/Xwayland :0 -rootless -noreset -accessx -cor		
chandan+	2472	0.0	0.5	417732	17532	?	Ssl	Aug02	0:00	/usr/libexec/xdg-desktop-portal-gtk		
chandan+	2482	0.0	1.8	613864	54932	?	Ssl	Aug02	0:00	/usr/libexec/gsd-xsettings		
chandan+	2509	0.0	0.4	267112	13884	?	Sl	Aug02	0:00	/usr/libexec/ibus-x11		
chandan+	2511	0.0	2.0	1090044	61392	?	Sl	Aug02	0:00	/usr/libexec/mutter-x11-frames		
chandan+	2644	0.0	0.5	491696	16260	?	Sl	Aug02	0:01	/usr/bin/update-notifier		
chandan+	2783	0.0	0.2	388348	8064	?	Sl	Aug02	0:00	/usr/libexec/gvfsd-recent --spawner :1.19 /org/gtk/gv		
chandan+	3288	1.4	1.7	702960	52364	?	Ssl	Aug02	2:06	/usr/libexec/gnome-terminal-server		
chandan+	3401	0.0	0.7	584724	21588	?	SLL	Aug02	0:00	/usr/bin/seahorse --gapplication-service		
chandan+	3577	12.1	12.2	11876288	372164	?	Sl	Aug02	17:37	/snap/firefox/4173/usr/lib/firefox/firefox		
chandan+	3787	0.0	1.0	210688	31744	?	Sl	Aug02	0:00	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	3828	0.0	2.2	2422900	69196	?	Sl	Aug02	0:01	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	3854	0.2	3.9	2480476	119040	?	Sl	Aug02	0:18	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	3899	0.0	0.2	1761888	7180	?	Sl	Aug02	0:00	/usr/bin/snap userd		
chandan+	4245	16.2	24.0	3508404	731024	?	Sl	Aug02	23:34	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	4414	0.0	1.0	344368	32768	?	Sl	Aug02	0:00	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	4546	0.0	1.0	343344	31360	?	Sl	Aug02	0:00	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
chandan+	4755	0.0	0.2	462192	8448	?	Sl	Aug02	0:00	/usr/libexec/gvfsd-network --spawner :1.19 /org/gtk/g		
chandan+	4774	0.0	0.2	390548	8960	?	Sl	Aug02	0:00	/usr/libexec/gvfsd-dnssd --spawner :1.19 /org/gtk/gv		
root	6305	0.0	4.5	581380	137852	?	Ssl	Aug02	0:02	/usr/libexec/fwupd/fwupd		
root	6331	0.0	0.0	83980	2872	?	Ss	Aug02	0:00	gpg-agent --homedir /var/lib/fwupd/gnupg --use-standa		
root	8902	0.0	0.0	0	0	?	I<	Aug02	0:00	[kworker/0:2H-kblockd]		
chandan+	9068	0.1	2.6	2403508	79464	?	Sl	0:00	0:05	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
root	9284	0.0	0.0	0	0	?	I<	0:03	0:00	[kworker/0:1H-kblockd]		
chandan+	9344	0.0	2.3	2389592	70656	?	Sl	0:00:05	0:01	/snap/firefox/4173/usr/lib/firefox/firefox -contentpr		
root	9378	0.2	0.0	0	0	?	I	0:00:05	0:06	[kworker/1:1-mm_percpu_wq]		
chandan+	9382	0.0	0.1	11024	5120	pts/0	Ss	0:00:06	0:00	bash		
root	9389	0.0	0.2	19680	7552	pts/0	S+	0:00:06	0:00	sudo su -		
root	9390	0.0	0.0	19680	2588	pts/1	Ss	0:00:06	0:00	sudo su -		
root	9391	0.0	0.1	12312	4736	pts/1	S	0:00:06	0:00	su -		

```
root@chandana-galgali-VirtualBox:~#
[1] 3899 Sl Aug02 0:00 /usr/bin/snap userd
[2] 4245 Sl Aug02 23:34 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
[3] 4414 Sl Aug02 0:00 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
[4] 4546 Sl Aug02 0:00 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
[5] 4755 Sl Aug02 0:00 /usr/libexec/gvfsd-network --spawner :1.19 /org/gtk/g
[6] 4774 Sl Aug02 0:00 /usr/libexec/gvfsd-dnssd --spawner :1.19 /org/gtk/gv
root 6305 Ssl Aug02 0:02 /usr/libexec/fwupd/fwupd
root 6331 Ss Aug02 0:00 gpg-agent --homedir /var/lib/fwupd/gnupg --use-standa
root 8902 I< Aug02 0:00 [kworker/0:2H-kblockd]
chandan+ 9068 Sl 00:00 0:05 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
root 9284 I< 00:03 0:00 [kworker/0:1H-kblockd]
chandan+ 9344 Sl 00:05 0:01 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
root 9378 I 00:05 0:06 [kworker/1:1-mm_percpu_wq]
chandan+ 9382 Ss 00:06 0:00 bash
root 9389 S+ 00:06 0:00 sudo su -
root 9390 Ss 00:06 0:00 sudo su -
root 9391 S 00:06 0:00 su -
root 9392 S 00:06 0:00 -bash
root 9439 I 00:07 0:03 [kworker/u4:3-events_power_efficient]
root 9531 I 00:12 0:03 [kworker/u4:0-events_unbound]
root 9641 I< 00:16 0:00 [kworker/1:0H-kblockd]
chandan+ 9809 Sl 00:24 0:01 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
root 9848 I 00:26 0:00 [kworker/0:0-events]
root 9973 I 00:28 0:02 [kworker/u4:4-events_unbound]
root 10242 I 00:33 0:00 [kworker/0:2-events]
chandan+ 10353 Sl 00:34 0:01 /snap/firefox/4173/usr/lib/firefox/firefox -contentpr
root 10444 I< 00:35 0:00 [kworker/1:2H-kblockd]
root 10731 I 00:39 0:00 [kworker/1:0-cgroup_destroy]
root 11037 I< 00:42 0:00 [kworker/1:1H-kblockd]
root 11339 R+ 00:47 0:00 ps -aux
root@chandana-galgali-VirtualBox:~# kill -9 10353
root@chandana-galgali-VirtualBox:~# 
```

```
root@chandana-galgali-VirtualBox:~#
root@chandana-galgali-VirtualBox:~# renice 19 -p 9809
9809 (process ID) old priority 19, new priority 19
root@chandana-galgali-VirtualBox:~# 
```

```
root@chandana-galgali-VirtualBox:~#
root@chandana-galgali-VirtualBox:~# sleep 100 &
[1] 12187
root@chandana-galgali-VirtualBox:~# fg %1
sleep 100
^C
root@chandana-galgali-VirtualBox:~# sleep 100 &
[1] 12199
root@chandana-galgali-VirtualBox:~# bg %1
-bash: bg: job 1 already in background
root@chandana-galgali-VirtualBox:~# 
```

Outcomes:

CO1: Understand basic structure of modern operating system

CO4: Demonstrate open source standards usage

Conclusion:

The writeup provides an overview of the Linux file system, basic file handling commands, user administration, and process management. It emphasizes the hierarchical organization of directories and treating everything as a file. The practical exercises offer hands-on experience in managing files, directories, user accounts, and processes, providing foundational knowledge for effectively operating and administering Linux systems.

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of faculty in-charge with date

References:

Books/ Journals/ Websites:

1. Richard Blum and Christine Bresnahan, “Linux CommandLine& Shell Scripting”, IIInd Edition, Wiley, 2012.
2. Guru99. (11 August 2020). File Permissions in Linux/Unix with Example. Retrieved from <https://www.guru99.com/file-Permissions.html>

