

## **1.Pwd**

**When you first open the terminal, you are in the home directory of your user.**  
**To know which directory you are in, you can use the “pwd” command. It gives us the absolute path, which means the path that starts from the root.**  
**The root is the base of the Linux file system. It is denoted by a forward slash( / ). The user directory is usually something like "/home/username".**

## **2.history**

**history command is particularly useful if you want to review the commands you have entered before.**

## **3. ls**

**Use the "ls" command to know what files are in the directory you are in. You can see all the hidden files by using the command “ls -a”.**

## **4. cd**

**Use the "cd" command to go to a directory.**

## **5.mkdir**

**Use the mkdir command when you need to create a folder or a directory.**

## **6. rmdir**

**Use rmdir to delete a directory. But rmdir can only be used to delete an empty directory. To delete a directory containing files, use rm.**

## **7. rm**

**Use the rm command to delete files and directories**

## **8.touch**

**The touch command is used to create a file. It can be anything, from an empty txt file to an empty zip file**

## **9.Cat**

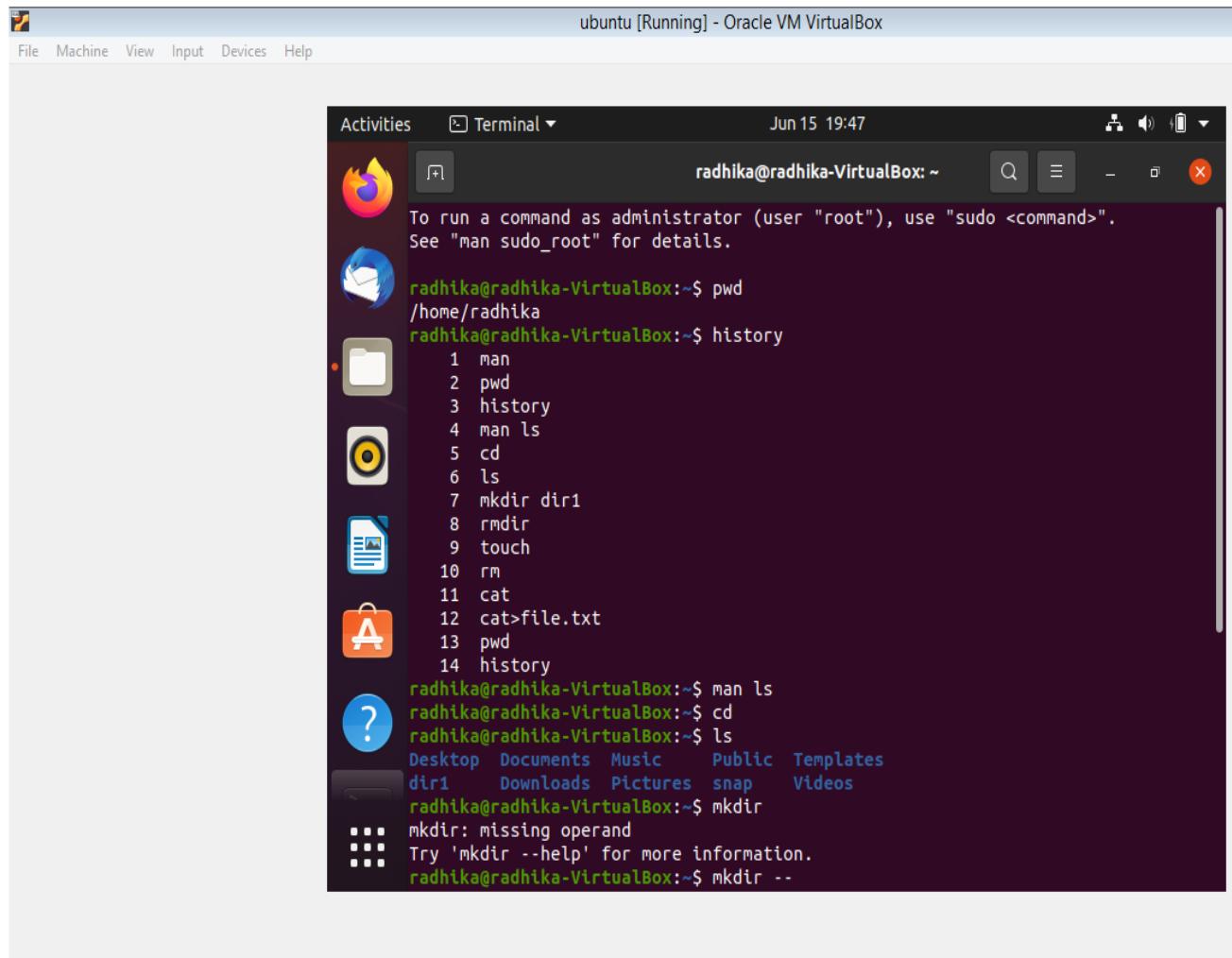
**Use the cat command to display the contents of a file. It is usually used to easily view programs.**

**Cat >> filename : append new content to existing content in a file.**

**Cat>filename: overwrite existing content in a file**

## **10. Man**

**To know more about a command and how to use it, use the man command. It shows the manual pages of the command. For example, “man cd” shows the manual pages of the cd command.**

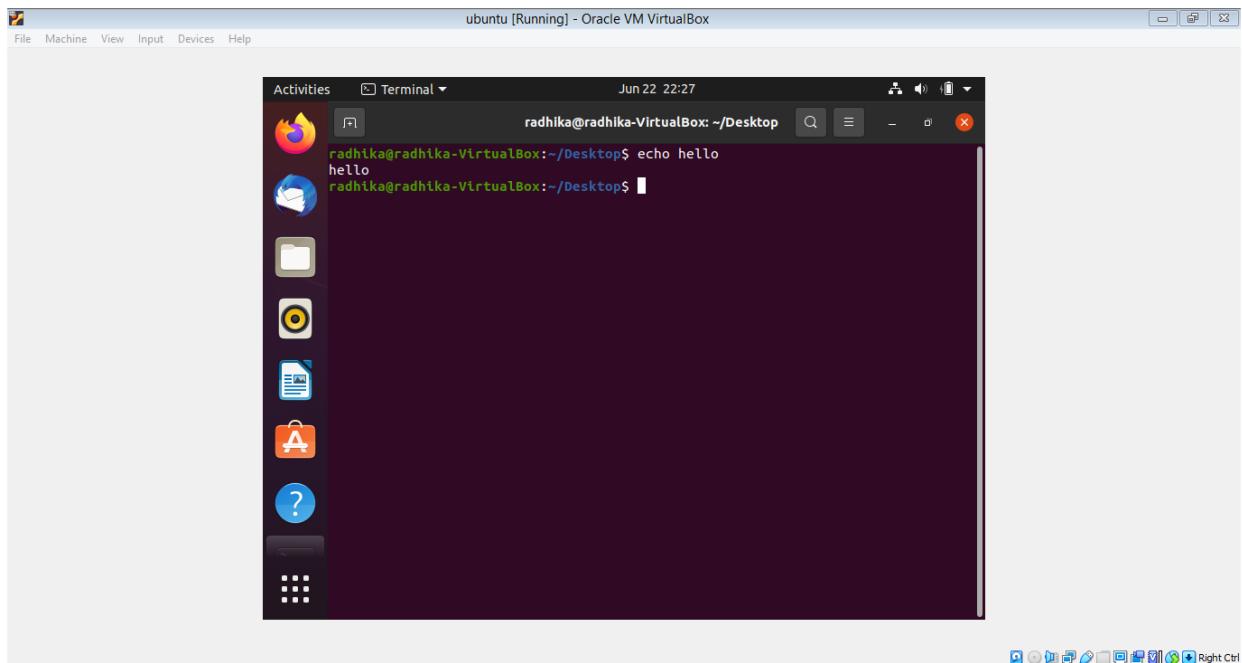


Activities Terminal ▾ Jun 15 19:37

radhika@radhika-VirtualBox:~\$ cat>file.txt  
12 cat>file.txt  
13 pwd  
14 history  
radhika@radhika-VirtualBox:~\$ man ls  
radhika@radhika-VirtualBox:~\$ cd  
radhika@radhika-VirtualBox:~\$ ls  
Desktop Documents Music Public Templates  
dir1 Downloads Pictures snap Videos  
radhika@radhika-VirtualBox:~\$ mkdir  
mkdir: missing operand  
Try 'mkdir --help' for more information.  
radhika@radhika-VirtualBox:~\$ mkdir --  
mkdir: missing operand  
Try 'mkdir --help' for more information.  
radhika@radhika-VirtualBox:~\$ mkdir dir1  
mkdir: cannot create directory 'dir1': File exists  
radhika@radhika-VirtualBox:~\$ rmdir  
rmdir: missing operand  
Try 'rmdir --help' for more information.  
radhika@radhika-VirtualBox:~\$ touch  
touch: missing file operand  
Try 'touch --help' for more information.  
radhika@radhika-VirtualBox:~\$ rm  
rm: missing operand  
Try 'rm --help' for more information.  
radhika@radhika-VirtualBox:~\$ rm file1.txt  
rm: cannot remove 'file1.txt': No such file or directory  
radhika@radhika-VirtualBox:~\$ cat

## **echo**

echo command in linux is used to display line of text/string that are passed as an argument . This is a built in command that is mostly used in shell scripts and batch files to output status text to the screen or a file. echo is one of the most commonly and widely used built-in command for Linux bash and C shells, that typically used in scripting language and batch files to display a line of text/string on standard output or a file. The echo command writes text to standard output (stdout). The syntax of using the echo command is pretty straightforward: ... Some common usages of the echo command are piping shell variable to other commands, writing text to stdout in a shell script, and redirecting text to a file.

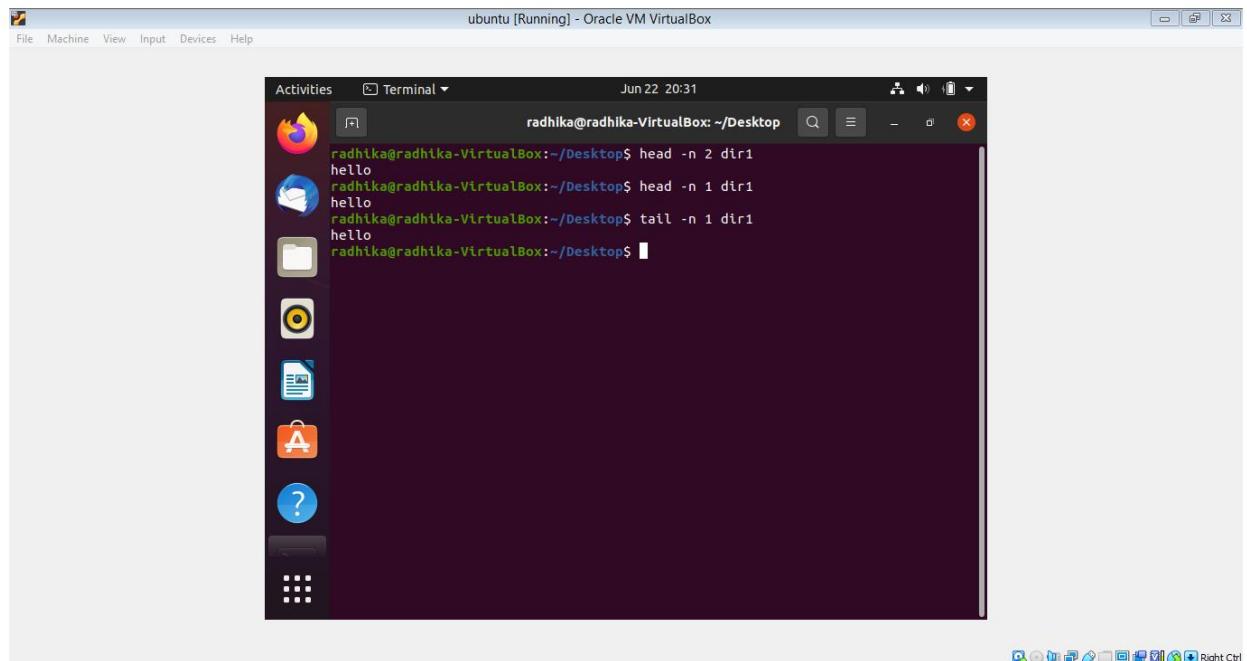


## **head**

The head command is a command-line utility for outputting the first part of files given to it via standard input. It writes results to standard output. By default head returns the first ten lines of each file that it is given. head is used to print the first ten lines (by default) or any other amount specified of a file or files. cat , on the other hand, is used to read a file sequentially and print it to the standard output (that is, it prints out the entire contents of the file).

Enter the head command, followed by the file of which you'd like to view: head /etc/passwd

To change the number of lines displayed, use the -n option: head -n 5 /etc/passwd



## tail

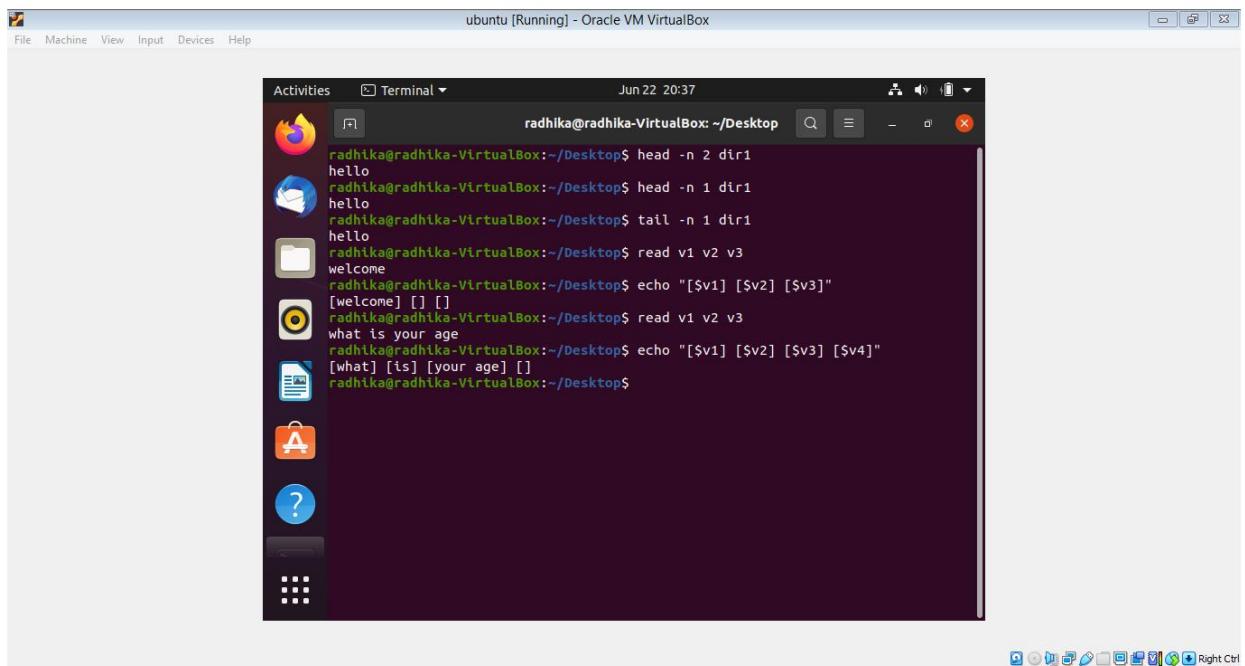
The tail command, as the name implies, print the last N number of data of the given input. By default it prints the last 10 lines of the specified files. If more than one file name is provided then data from each file is preceded by its file name. tail has two special command line option -f and -F (follow) that allows a file to be monitored. Instead of just displaying the last few lines and exiting, tail displays the lines and then monitors the file. As new lines are added to the file by another process, tail updates the display. Enter the tail command, followed by the file you'd like to view: tail /etc/passwd

To change the number of lines displayed, use the -n option: tail -n 5 /etc/passwd

## read

read command in Linux system is used to read from a file descriptor. Basically, this command read up the total number of bytes from the specified file descriptor into the buffer. If the number or count is zero then this command may detect the errors. But on success, it returns the number of bytes read.

Read is a bash builtin command that reads the contents of a line into a variable. It allows for word splitting that is tied to the special shell variable IFS. It is primarily used for catching user input but can be used to implement functions taking input from standard input.



The screenshot shows a terminal window titled "ubuntu [Running] - Oracle VM VirtualBox". The terminal output is as follows:

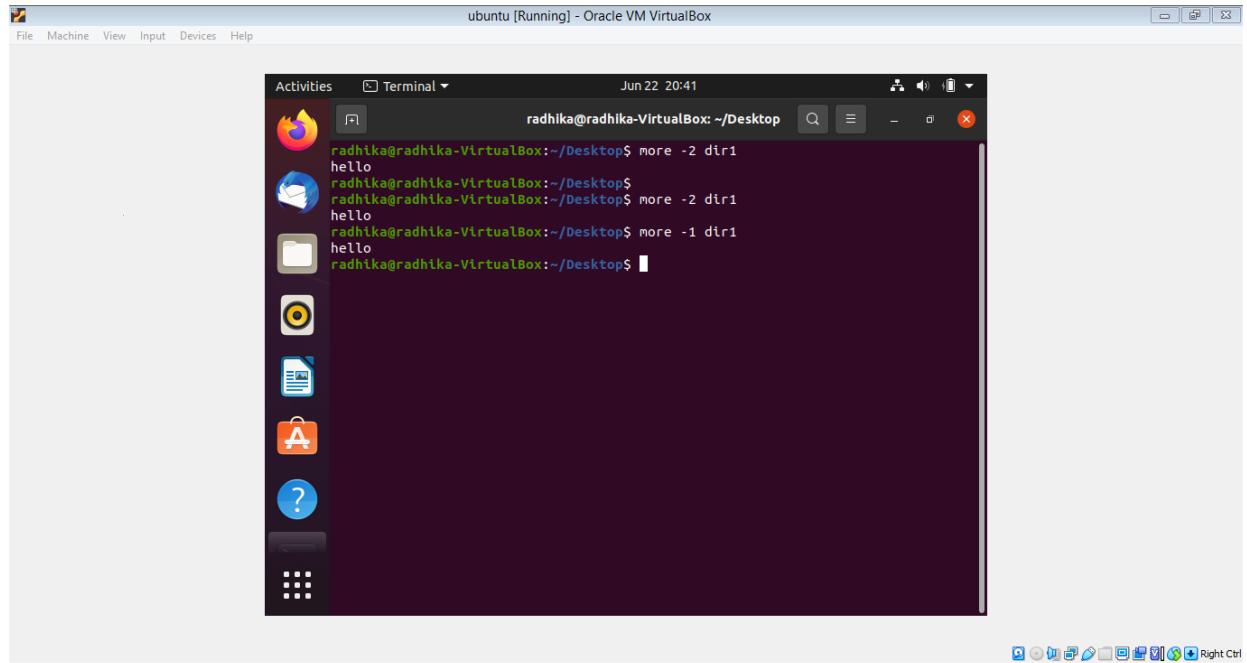
```
Activities Terminal Jun 22 20:37
radhika@radhika-VirtualBox:~/Desktop$ head -n 2 dir1
hello
radhika@radhika-VirtualBox:~/Desktop$ head -n 1 dir1
hello
radhika@radhika-VirtualBox:~/Desktop$ tail -n 1 dir1
hello
radhika@radhika-VirtualBox:~/Desktop$ read v1 v2 v3
welcome
radhika@radhika-VirtualBox:~/Desktop$ echo "[\$v1] [\$v2] [\$v3]"
[welcome] []
radhika@radhika-VirtualBox:~/Desktop$ read v1 v2 v3
what is your age
radhika@radhika-VirtualBox:~/Desktop$ echo "[\$v1] [\$v2] [\$v3] [\$v4]"
[what] [is] [your age] []
radhika@radhika-VirtualBox:~/Desktop$
```

## **more**

more command is used to view the text files in the command prompt, displaying one screen at a time in case the file is large (For example log files). The more command also allows the user do scroll up and down through the page. The syntax along with options and command is as follows. Another application of more is to use it with some other command after a pipe. When the output is large, we can use more command to see output one by one.

more [-options] [-num] [+pattern] [+linenum] [file\_name]

- [-options]: any option that you want to use in order to change the way the file is displayed. Choose any one from the followings: (-d, -l, -f, -p, -c, -s, -u)
- [-num]: type the number of lines that you want to display per screen.
- [+pattern]: replace the pattern with any string that you want to find in the text file.
- [+linenum]: use the line number from where you want to start displaying the text content.
- [file\_name]: name of the file containing the text that you want to display on the screen.

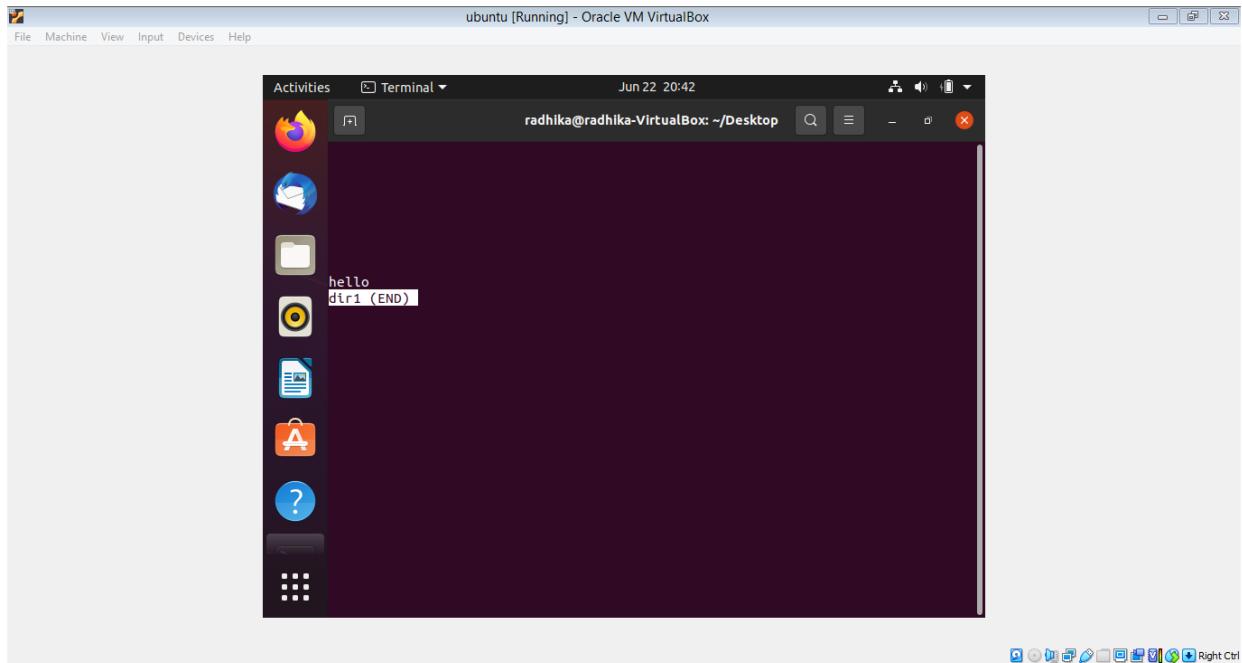


## less

Less command is linux utility which can be used to read contents of text file one page(one screen) per time. It has faster access because if file is large, it don't access complete file, but access it page by page.

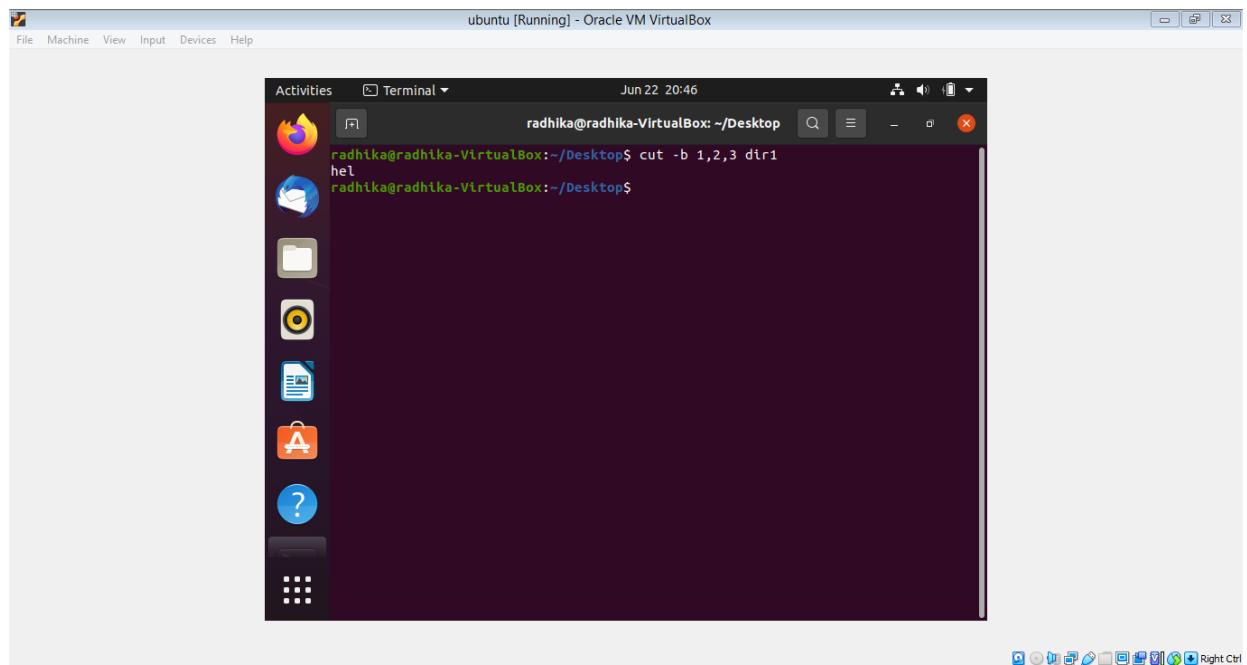
For example, if it's a large file and you are reading it using any text editor, then the complete file will be loaded to main memory, but less command don't load entire file, but load it part by part, which makes it faster.

mostly used Options



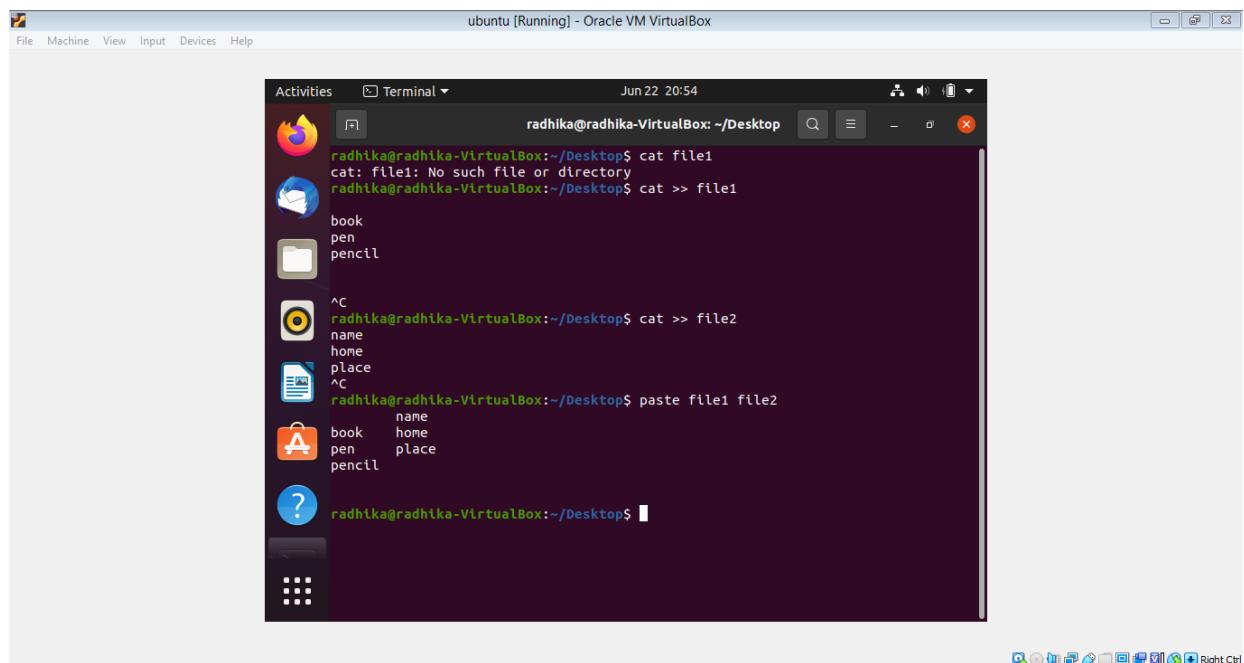
## cut

The cut command in linux is a command for cutting out the sections from each line of files and writing the result to standard output. It can be used to cut parts of a line by byte position, character and field. Basically the cut command slices a line and extracts the text. It is necessary to specify option with command otherwise it gives error. If more than one file name is provided then data from each file is not preceded by its file name.



# paste

Paste is a command that allows you to insert data from the clipboard into an application. The Paste command is most commonly used to copy text from one area to another. For example, you can copy a paragraph from a text document and paste it into an email message.



The screenshot shows a terminal window titled "ubuntu [Running] - Oracle VM VirtualBox". The terminal is running on a desktop environment with a dark theme. The user has run several commands:

```
radhika@radhika-VirtualBox:~/Desktop$ cat file1
cat: file1: No such file or directory
radhika@radhika-VirtualBox:~/Desktop$ cat >> file1
book
pen
pencil

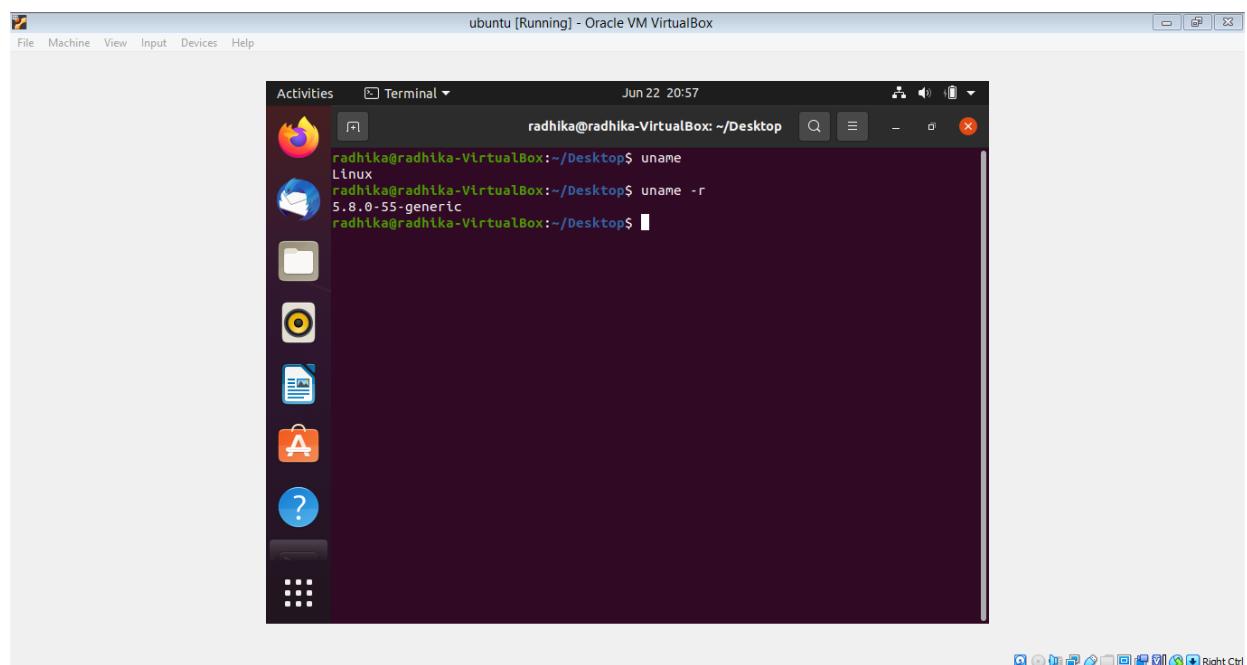
^C
radhika@radhika-VirtualBox:~/Desktop$ cat >> file2
name
home
place
^C
radhika@radhika-VirtualBox:~/Desktop$ paste file1 file2
book      name
pen      home
pencil   place

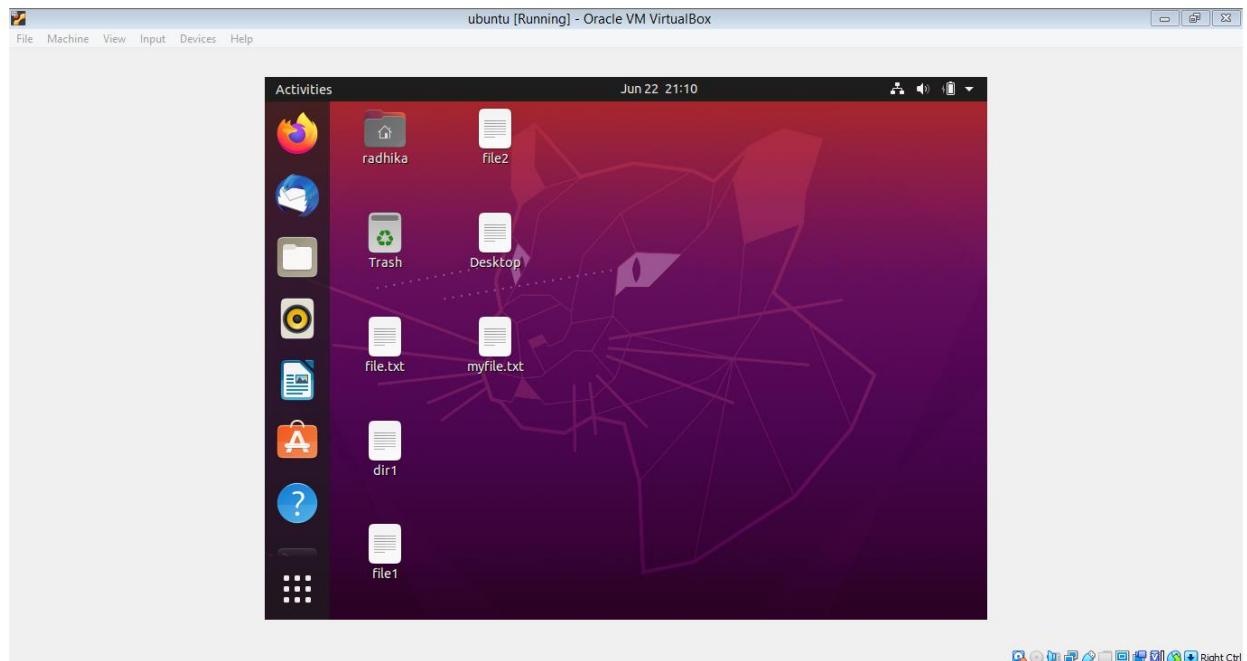
?
```

# uname

Uname command is used to display basic information about the operating system and hardware. With options, Uname prints kernel details, and system architecture. Uname is the short name for 'UNIX name'. Uname command works on all Linux and Unix like operating systems. uname is a command-line utility that prints basic information about the operating system name and system hardware.

The uname() function returns a string naming the current system in the character array sysname. The arrays release and version further identify the operating system. The array machine contains a name that identifies the hardware that the system is running on.

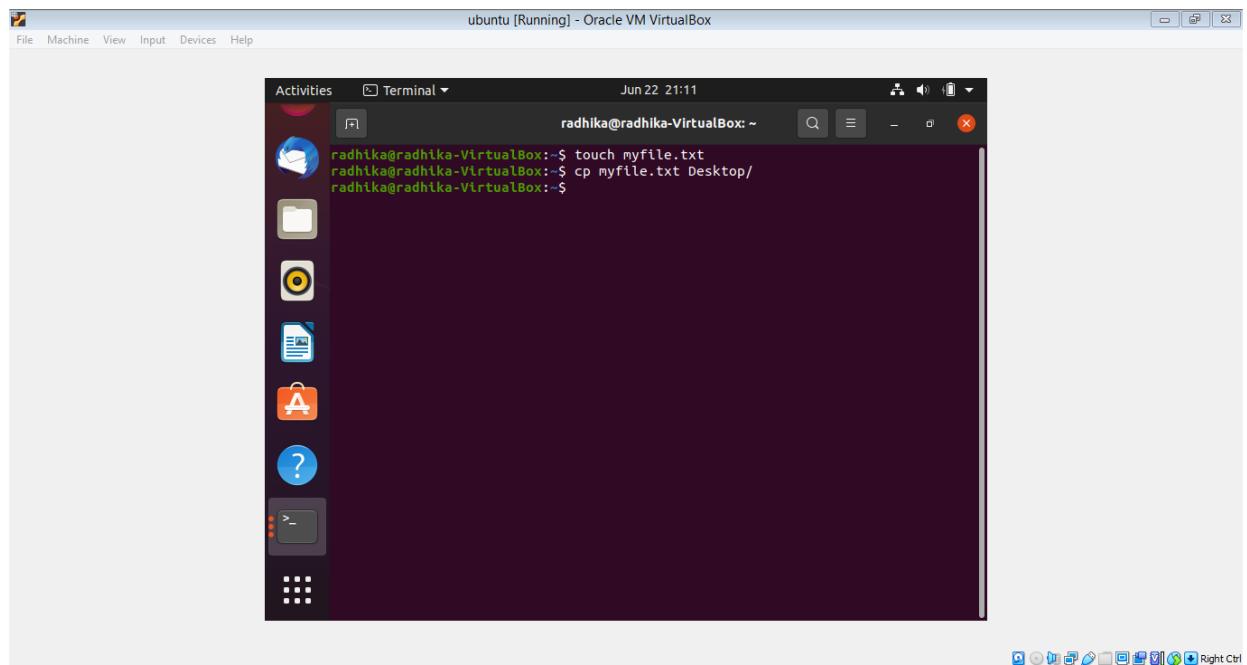




## cp

cp stands for copy. This command is used to copy files or group of files or directory. It creates an exact image of a file on a disk with different file name. cp command require at least two filenames in its arguments. Third syntax is used to copy multiple Sources(files) to Directory.

'cp' means copy. 'cp' command is used to copy a file or a directory. To copy a file into the same directory syntax will be, cp <existing file name> <new file name>

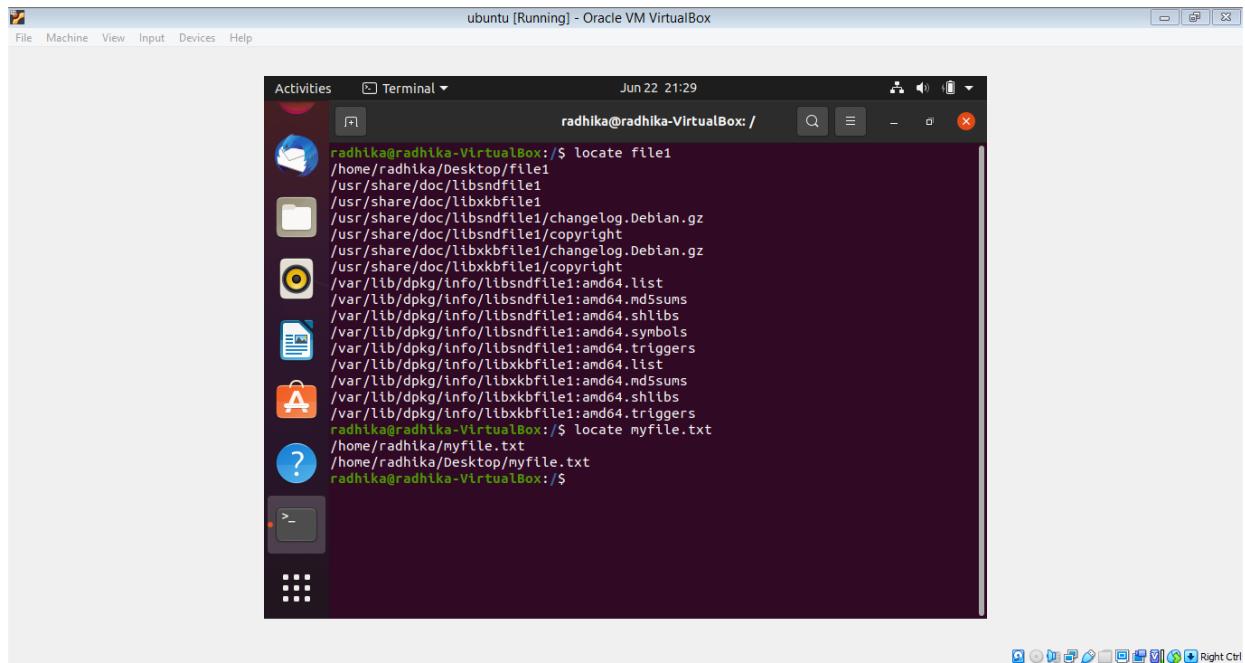


# locate

To use locate, open a terminal and type locate followed by the file name you are looking for. In this example, I'm searching for files that contain the word 'sunny' in their name. Locate can also tell you how many times a search keyword is matched in the database.

Command. locate is a Unix utility which serves to find files on filesystems. It searches through a prebuilt database of files generated by the updatedb command or by a daemon and compressed using incremental encoding. It operates significantly faster than find , but requires regular updating of the database.

Try using this command: sudo apt-get install locate . – ...

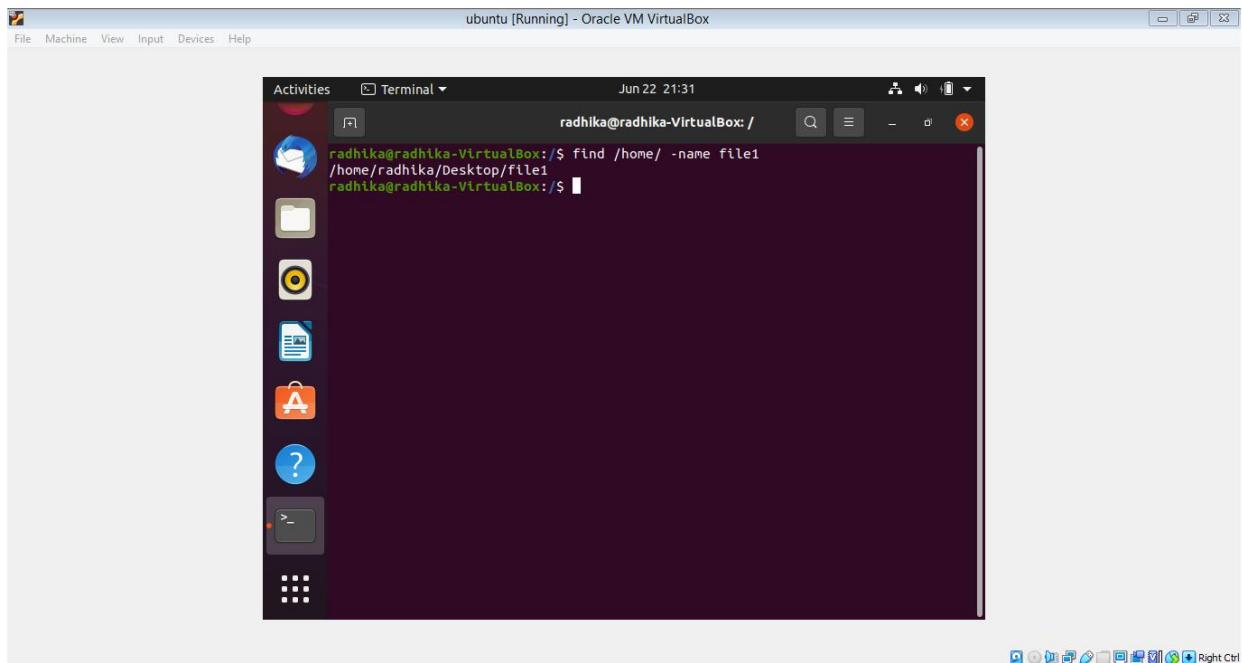


The screenshot shows a terminal window titled "ubuntu [Running] - Oracle VM VirtualBox". The terminal is running on a desktop environment with a dark theme. The user has run the command "locate file1" and "locate myfile.txt". The output of "locate file1" lists numerous paths containing "file1", while the output of "locate myfile.txt" lists two specific paths: "/home/radhika/myfile.txt" and "/home/radhika/Desktop/myfile.txt".

```
radhika@radhika-VirtualBox:~$ locate file1
/home/radhika/Desktop/file1
/usr/share/doc/libsndfile1
/usr/share/doc/libxkbfile1
/usr/share/doc/libxkbfile1/changelog.Debian.gz
/usr/share/doc/libxkbfile1/copyright
/usr/share/doc/libxkbfile1/changelog.Debian.gz
/usr/share/doc/libxkbfile1/copyright
/var/lib/dpkg/info/libsndfile1:amd64.list
/var/lib/dpkg/info/libsndfile1:amd64.md5sums
/var/lib/dpkg/info/libsndfile1:amd64.shlibs
/var/lib/dpkg/info/libsndfile1:amd64.symbols
/var/lib/dpkg/info/libsndfile1:amd64.triggers
/var/lib/dpkg/info/libxkbfile1:amd64.list
/var/lib/dpkg/info/libxkbfile1:amd64.md5sums
/var/lib/dpkg/info/libxkbfile1:amd64.shlibs
/var/lib/dpkg/info/libxkbfile1:amd64.triggers
radhika@radhika-VirtualBox:~$ locate myfile.txt
/home/radhika/myfile.txt
/home/radhika/Desktop/myfile.txt
radhika@radhika-VirtualBox:~$
```

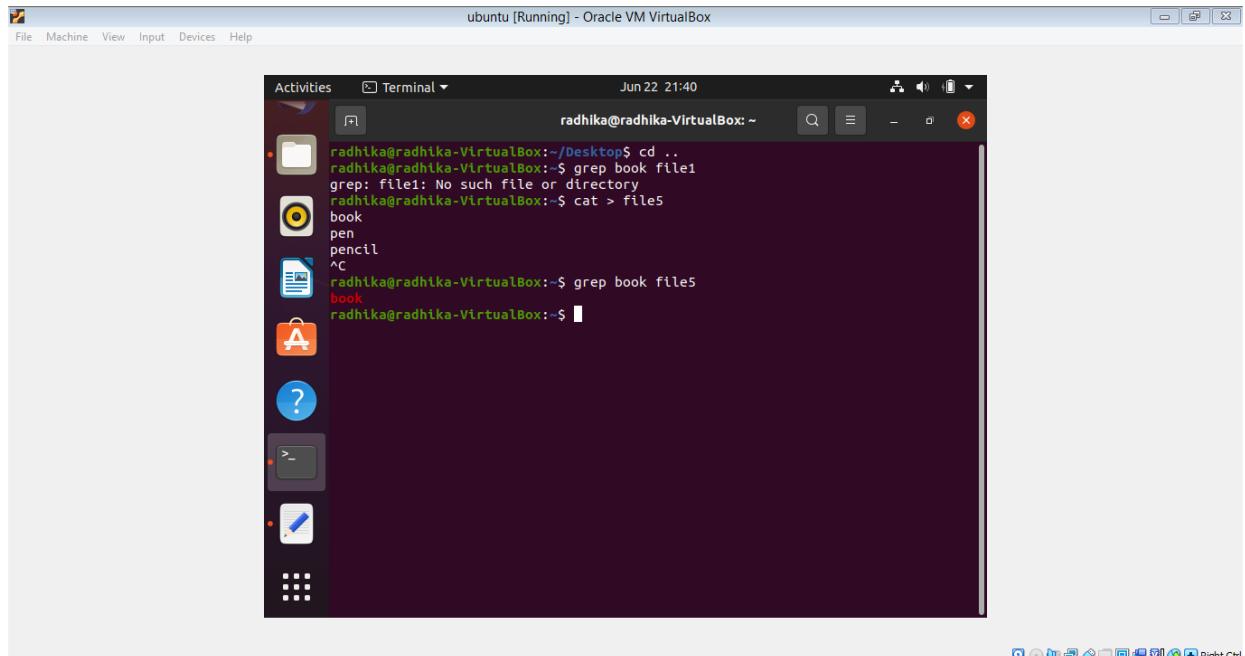
# find

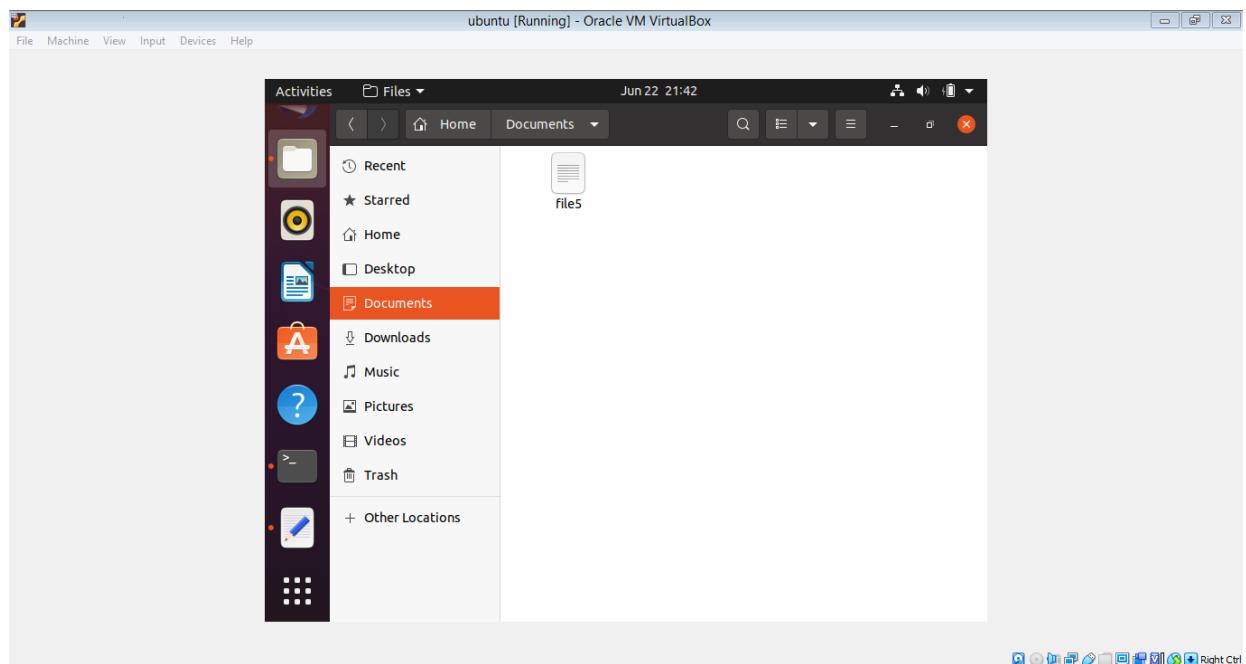
The find command is one of the most powerful tools in the Linux system administrators arsenal. It searches for files and directories in a directory hierarchy based on a user given expression and can perform user-specified action on each matched file.



# grep

To search multiple files with the grep command, insert the filenames you want to search, separated with a space character. The terminal prints the name of every file that contains the matching lines, and the actual lines that include the required string of characters. You can append as many filenames as needed.



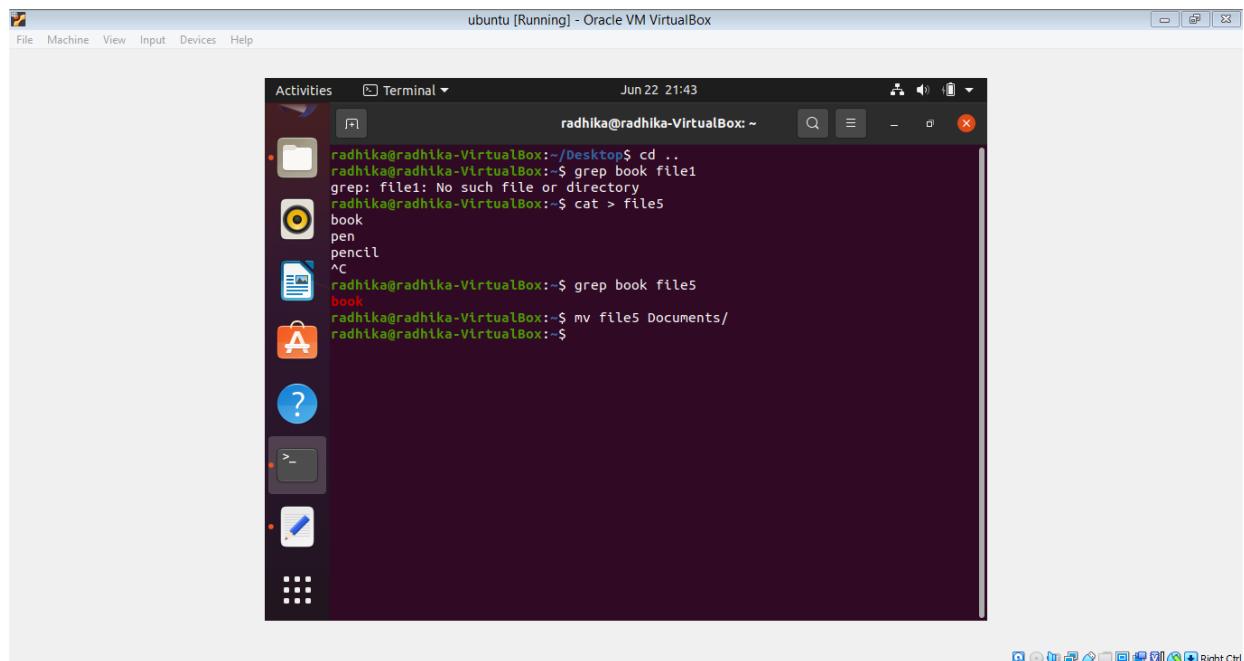


## **mv**

mv stands for move. mv is used to move one or more files or directories from one place to another in a file system like UNIX. It has two distinct functions:

- (i) It renames a file or folder.
- (ii) It moves a group of files to a different directory.

No additional space is consumed on a disk during renaming. This command normally works silently means no prompt for confirmation



The screenshot shows a terminal window in a Unity desktop environment. The terminal title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content shows the following session:

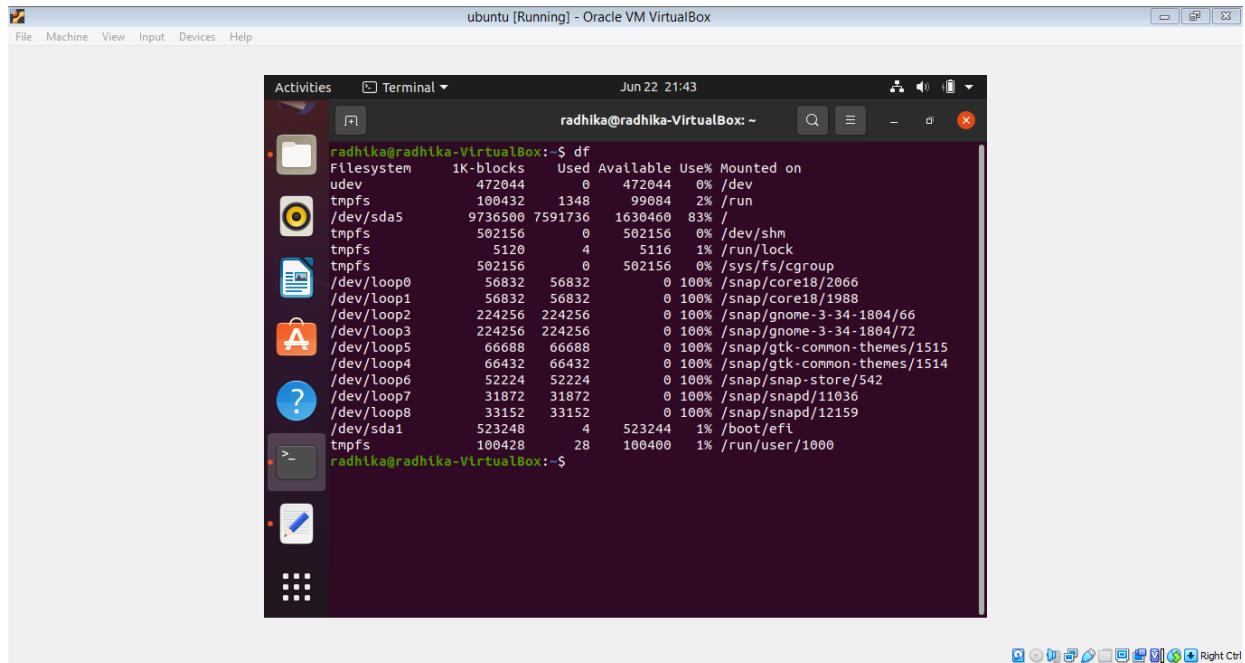
```
radhika@radhika-VirtualBox:~/Desktop$ cd ..
radhika@radhika-VirtualBox:~$ grep book file1
grep: file1: No such file or directory
radhika@radhika-VirtualBox:~$ cat > file5
book
pen
pencil
^C
radhika@radhika-VirtualBox:~$ grep book file5
book
radhika@radhika-VirtualBox:~$ mv file5 Documents/
radhika@radhika-VirtualBox:~$
```

# df

The df command (short for disk free), is used to display information related to file systems about total space and available space. If no file name is given, it displays the space available on all currently mounted file systems.

df (abbreviation for disk free) is a standard Unix command used to display the amount of available disk space for file systems on which the invoking user has appropriate read access. df is typically implemented using the statfs or statvfs system calls.

To view disk space usage run the df command. This will print a table of information to standard output. This can be useful to discover the amount of free space available on a system or filesystems. Use% - the percentage that the filesystem is in use.



A screenshot of a Linux desktop environment showing a terminal window. The terminal window title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content shows the output of the "df" command:

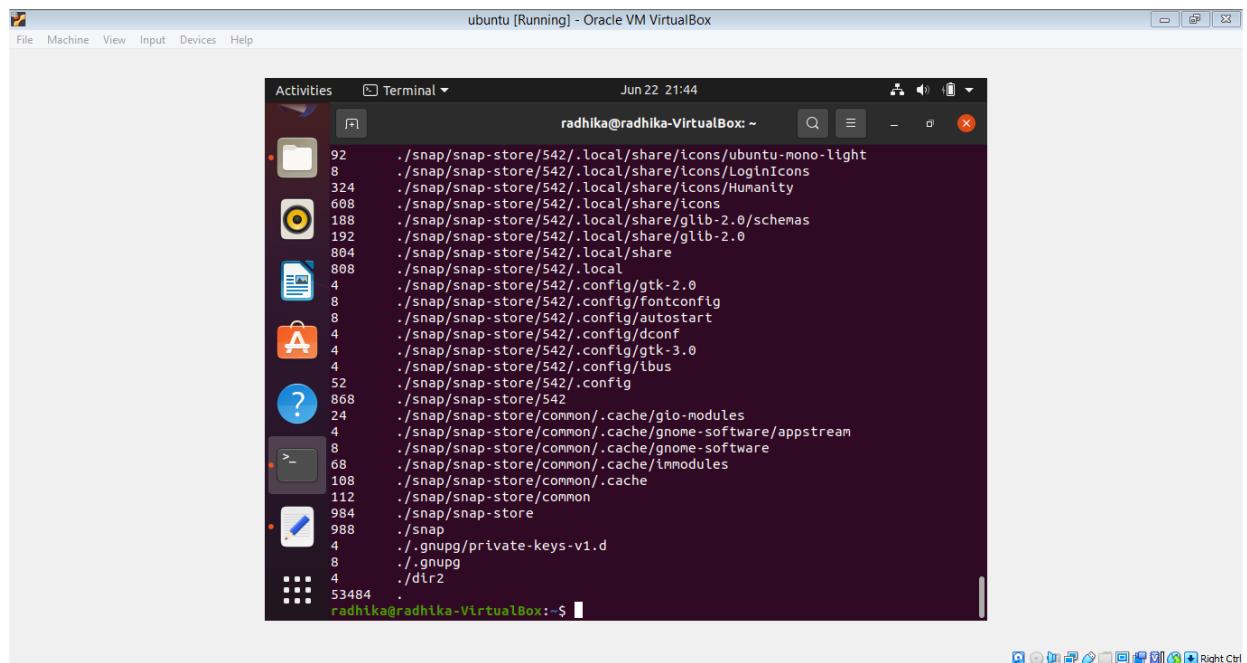
```
radhika@radhika-VirtualBox:~$ df
Filesystem      1K-blocks   Used   Available Use% Mounted on
udev              472044     0    472044  0% /dev
tmpfs             100432   1348    99084  2% /run
/dev/sda5        9736500 7591736 1630460  83% /
tmpfs              502156     0    502156  0% /dev/shm
tmpfs               5120      4     5116  1% /run/lock
tmpfs              502156     0    502156  0% /sys/fs/cgroup
/dev/loop0          56832      0     56832  0% /snap/core18/2066
/dev/loop1          56832      0     56832  0% /snap/core18/1988
/dev/loop2         224256 224256      0 100% /snap/gnome-3-34-1804/66
/dev/loop3         224256 224256      0 100% /snap/gnome-3-34-1804/72
/dev/loop5          66688      0     66688  0% /snap/gtk-common-themes/1515
/dev/loop4          66432      0     66432  0% /snap/gtk-common-themes/1514
/dev/loop6          52224      0     52224  0% /snap/snap-store/542
/dev/loop7          31872      0     31872  0% /snap/snapd/11036
/dev/loop8          33152      0     33152  0% /snap/snapd/12159
/dev/sda1         523248     4    523244  1% /boot/efi
tmpfs             100428    28    100400  1% /run/user/1000
radhika@radhika-VirtualBox:~$
```

# du

The du command is a standard Linux/Unix command that allows a user to gain disk usage information quickly. It is best applied to specific directories and allows many variations for customizing the output to meet your needs.

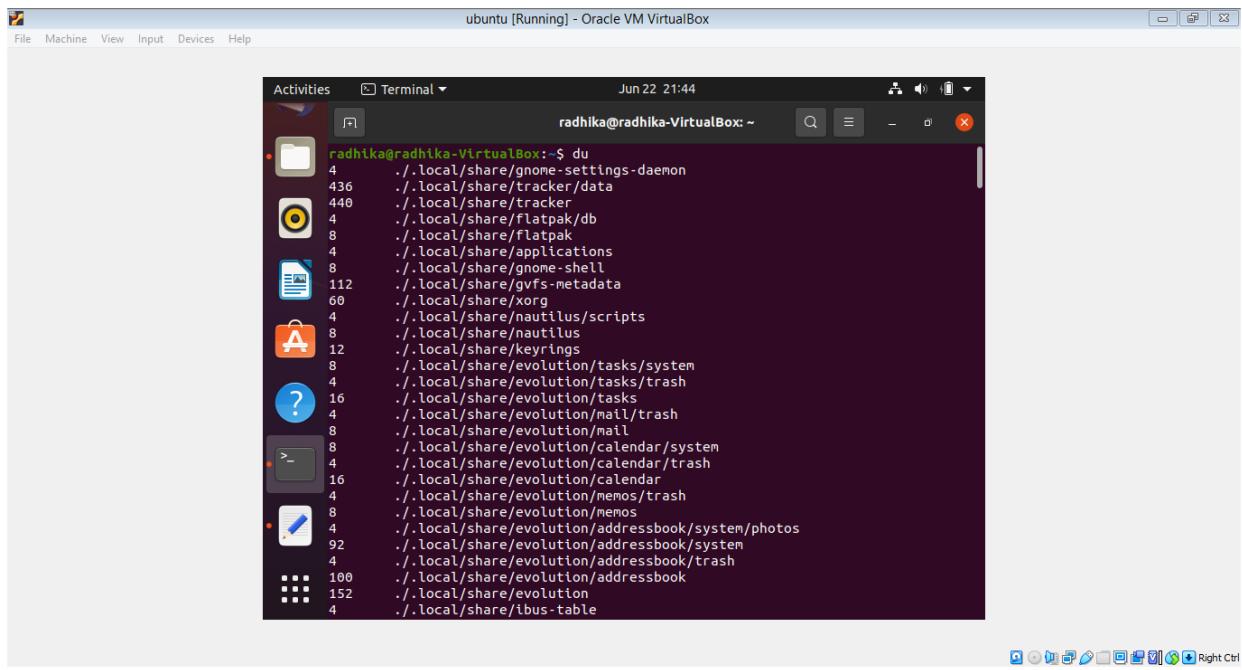
With no arguments, 'du' reports the disk space for the current directory. Normally the disk space is printed in units of 1024 bytes, but this can be overridden. Options -a --all Show counts for all files, not just directories.

As you may have seen that the du command in Linux outputs all the sizes of all the files. But if all you want to see is the summarized



A screenshot of a Linux desktop environment, specifically Ubuntu, running in a virtual machine. The desktop has a dark theme with icons for various applications like Dash, Home, and Dash to Dock. A terminal window is open in the center, titled 'Terminal'. The command 'du' is being run, and the output shows the disk usage for several files and directories under the root directory. The output is as follows:

```
ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Jun 22 21:44
radhika@radhika-VirtualBox: ~
92 ./snap/snap-store/542/.local/share/icons/ubuntu-mono-light
8 ./snap/snap-store/542/.local/share/icons/LoginIcons
324 ./snap/snap-store/542/.local/share/icons/Humanity
668 ./snap/snap-store/542/.local/share/icons
188 ./snap/snap-store/542/.local/share/glib-2.0/schemas
192 ./snap/snap-store/542/.local/share/glib-2.0
804 ./snap/snap-store/542/.local/share
888 ./snap/snap-store/542/.local
4 ./snap/snap-store/542/.config/gtk-2.0
8 ./snap/snap-store/542/.config/fontconfig
8 ./snap/snap-store/542/.config/autostart
4 ./snap/snap-store/542/.config/dconf
4 ./snap/snap-store/542/.config/gtk-3.0
4 ./snap/snap-store/542/.config/ibus
52 ./snap/snap-store/542/.config
868 ./snap/snap-store/542
24 ./snap/snap-store/common/.cache/gio-modules
4 ./snap/snap-store/common/.cache/gnome-software/appstream
8 ./snap/snap-store/common/.cache/gnome-software
68 ./snap/snap-store/common/.cache/immodules
198 ./snap/snap-store/common/.cache
112 ./snap/snap-store/common
984 ./snap
988 ./snap
4 ./gnupg/private-keys-v1.d
8 ./gnupg
4 ./dir2
53484
radhika@radhika-VirtualBox: ~
```



## **useradd**

Only root or users with sudo privileges can use the useradd command to create new user accounts. When invoked, useradd creates a new user account according to the options specified on the command line and the default values set in the /etc/default/useradd file.

In Linux, a 'useradd' command is a low-level utility that is used for adding/creating user accounts in Linux and other Unix-like operating

## **userdel**

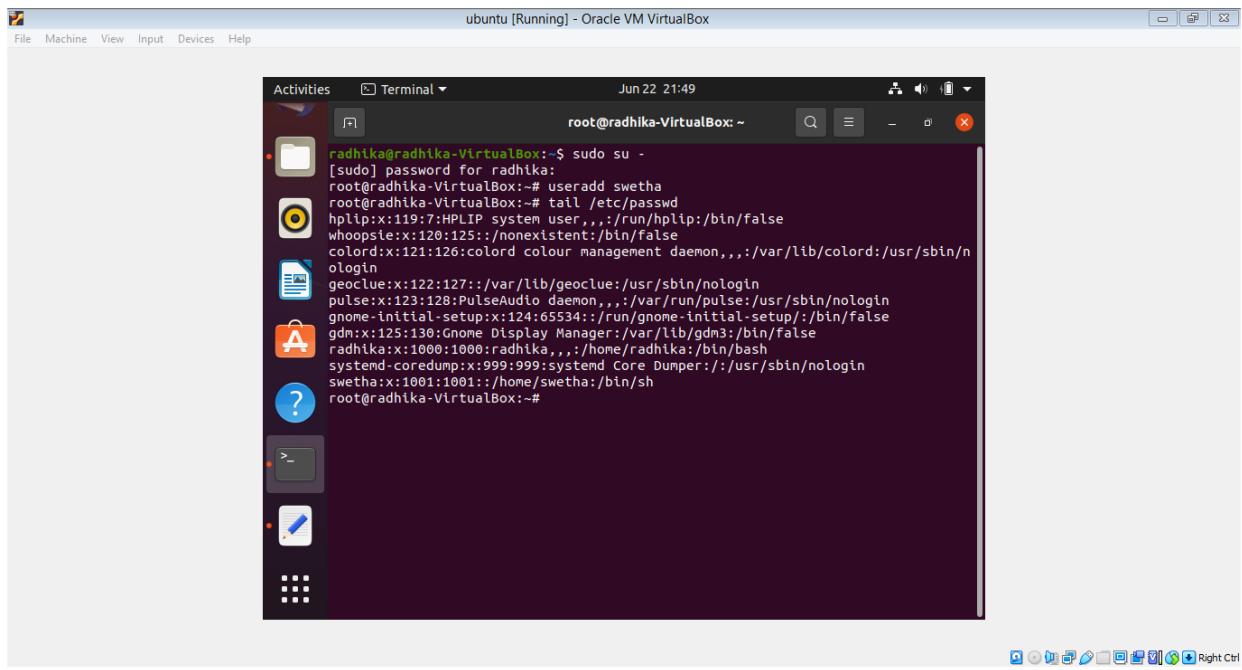
userdel command in Linux system is used to delete a user account and related files. This command basically modifies the system account files, deleting all the entries which refer to the username LOGIN. It is a low-level utility for removing the users.

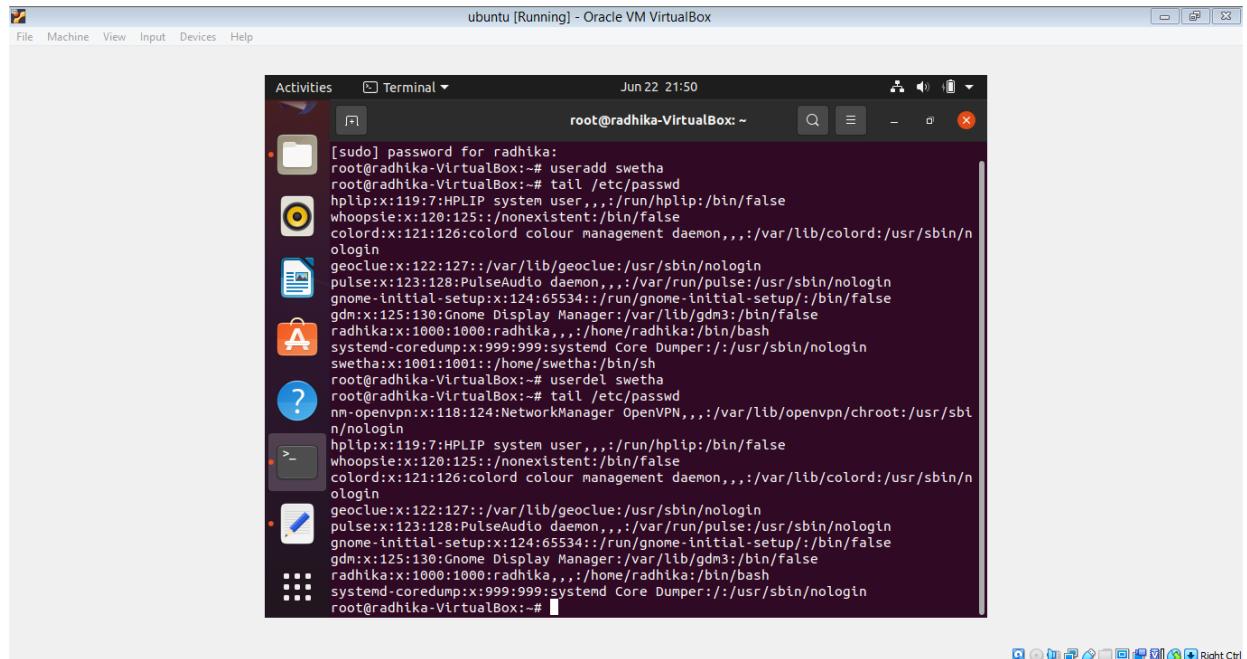
Another option is to use the -f ( --force ) option that tells userdel to forcefully remove the user account, even if the user is still logged in or if there are running processes that belong to the user

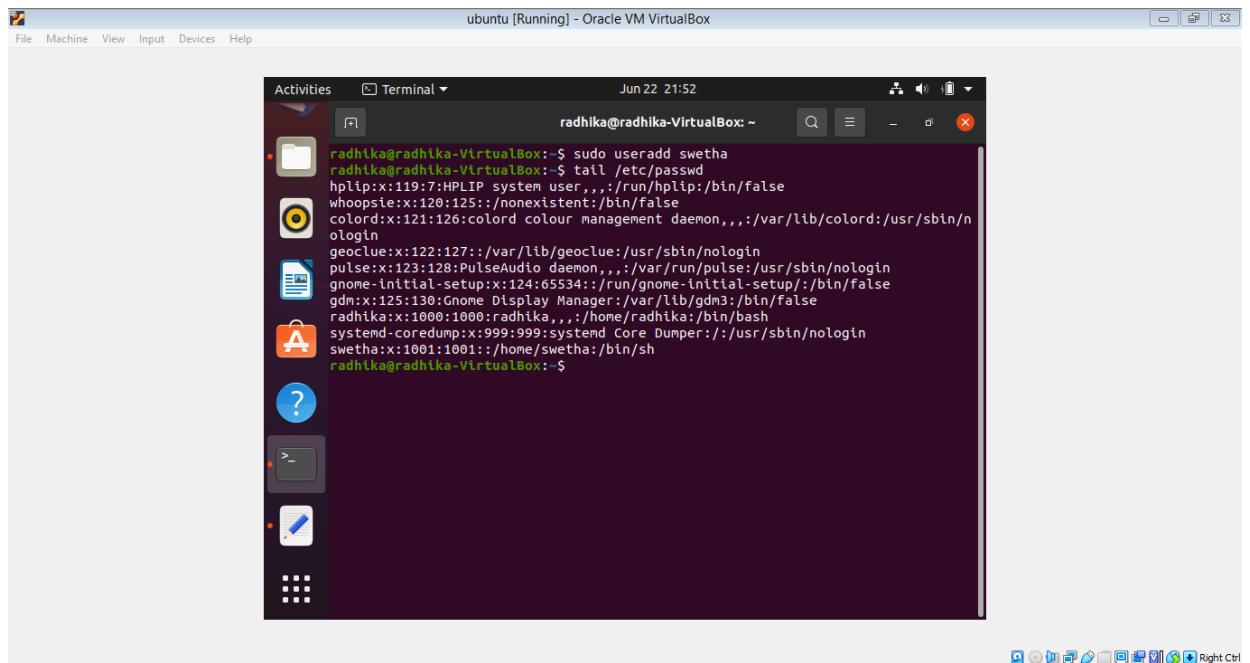
## **sudo**

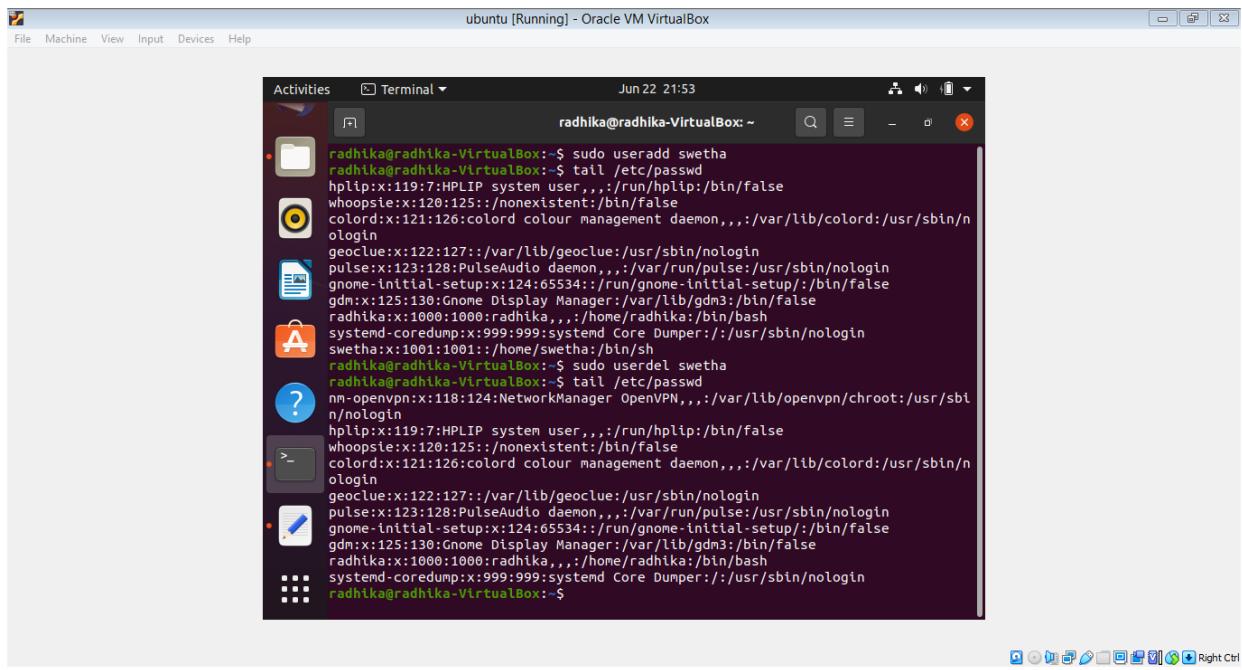
The sudo command allows you to run programs with the security privileges of another user (by default, as the superuser). It prompts you for your personal password and confirms your request to execute a command by checking a file, called sudoers , which the system administrator configures. Use the visudo command to edit the configuration file: sudo visudo. This will open /etc/sudoers for editing. To add a user and grant full sudo privileges, add the following line: [username] ALL=(ALL:ALL) ALL.

Save and exit the file.





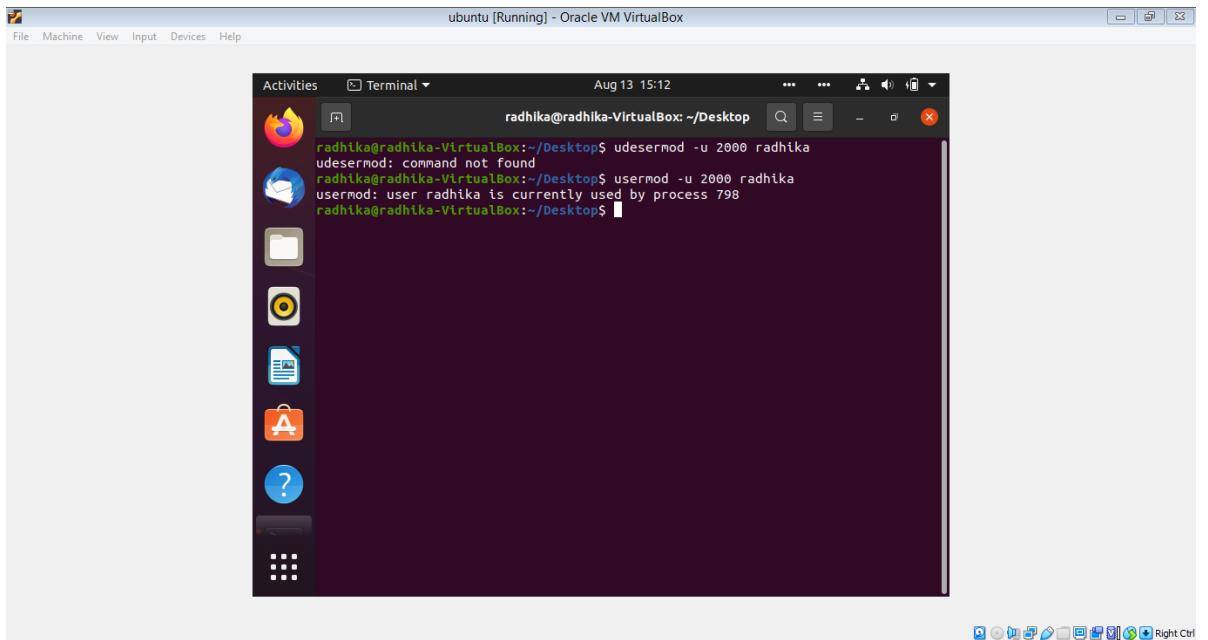




# BASIC LINUX COMMANDS

## 1. usermod

- usermod command is used to change the properties of a user in Linux through the command line.
- After creating a user we have to sometimes change their attributes like password or login directory.



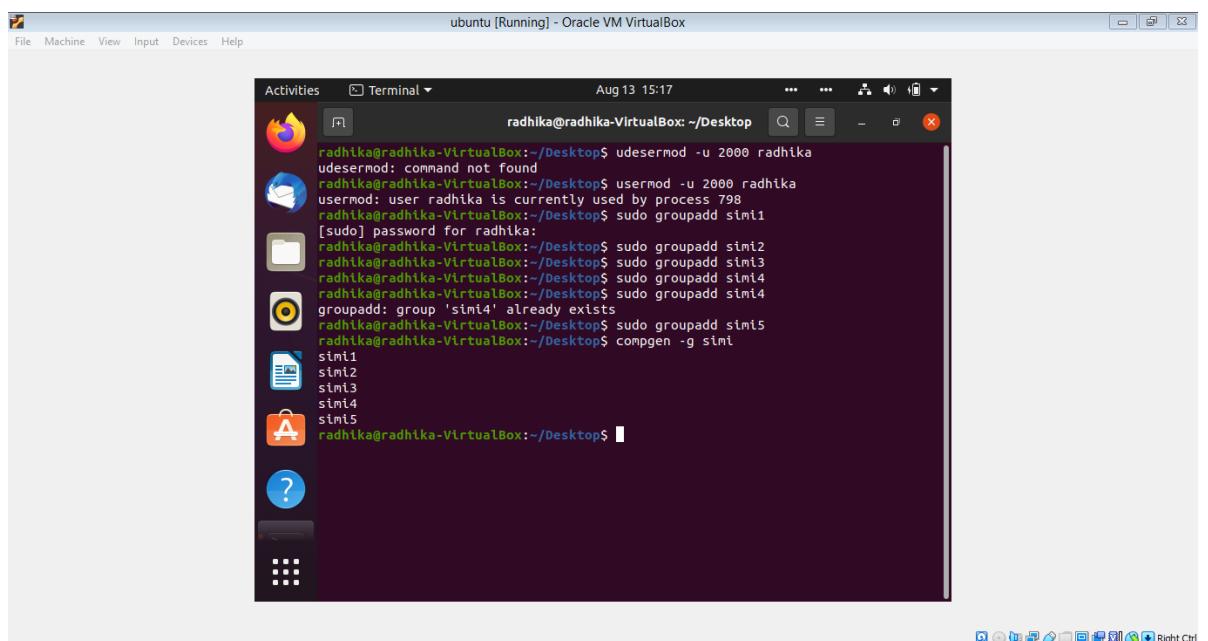
The screenshot shows a Linux desktop environment with a dark theme. A terminal window titled "Terminal" is open, showing the following command-line session:

```
radhika@radhika-VirtualBox:~/Desktop$ udesermod -u 2000 radhika
udesermod: command not found
radhika@radhika-VirtualBox:~/Desktop$ usermod -u 2000 radhika
usermod: user radhika is currently used by process 798
radhika@radhika-VirtualBox:~/Desktop$
```

The desktop interface includes a dock with icons for various applications like a browser, file manager, terminal, and system settings. The title bar of the terminal window indicates it is running on an "ubuntu [Running] - Oracle VM VirtualBox" machine.

## 2. groupadd

- groupadd command creates a new group account using the values specified on the command line and the default values from the system.
- It can be handled by superuser or root user.

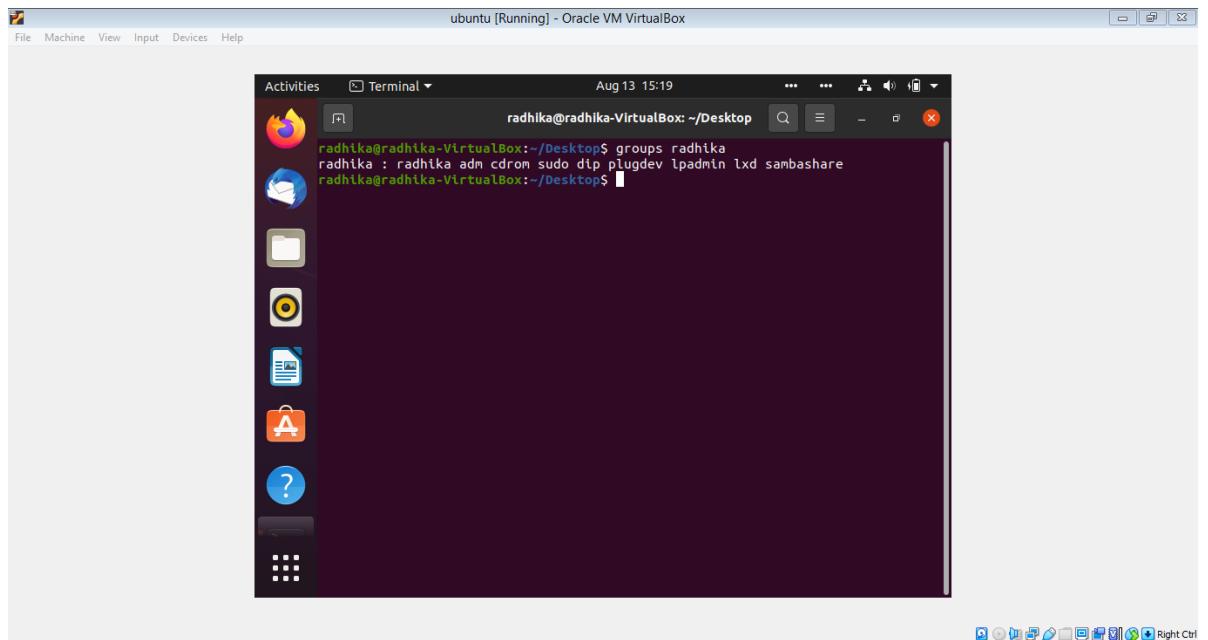


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content shows the following command execution:

```
radhika@radhika-VirtualBox:~/Desktop$ udesermod -u 2000 radhika
udesermod: command not found
radhika@radhika-VirtualBox:~/Desktop$ usermod -u 2000 radhika
usermod: user radhika is currently used by process 798
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi1
[sudo] password for radhika:
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi2
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi3
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi4
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi5
groupadd: group 'simi4' already exists
radhika@radhika-VirtualBox:~/Desktop$ sudo groupadd simi5
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi
simi1
simi2
simi3
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$
```

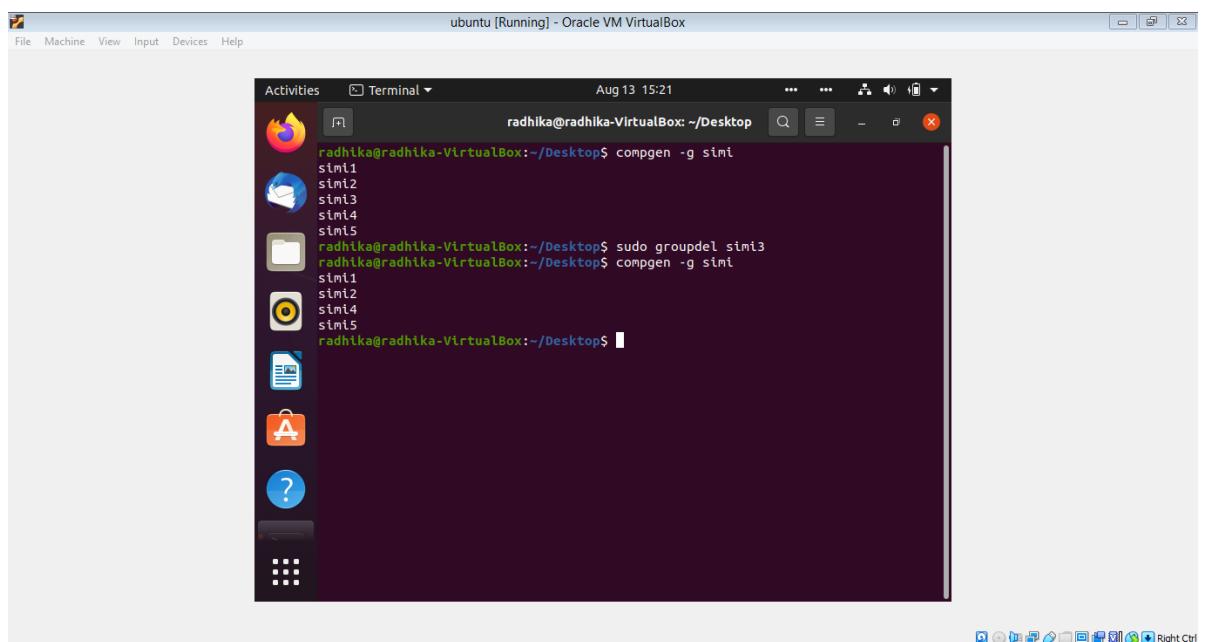
### 3. groups

- It prints the groups a user is in.
- Groups make it easy to manage users with the same security and access privileges.



## 4. groupdel

- groupdel command modifies the system account files, deleting all entries that refer to group and it is handled by super or root user.

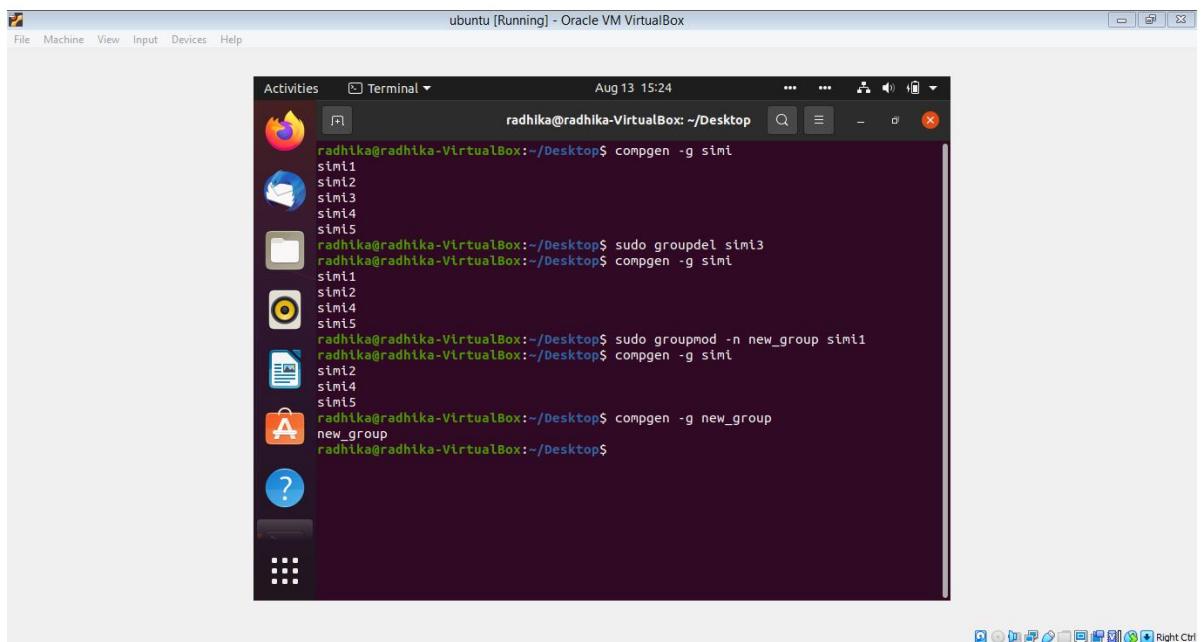


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content shows the following command execution:

```
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi1
simi1
simi2
simi3
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$ sudo groupdel simi3
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi1
simi1
simi2
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$
```

## 5. groupmod

- The groupmod command modifies the definition of the specified group by modifying the appropriate entry in the group database.

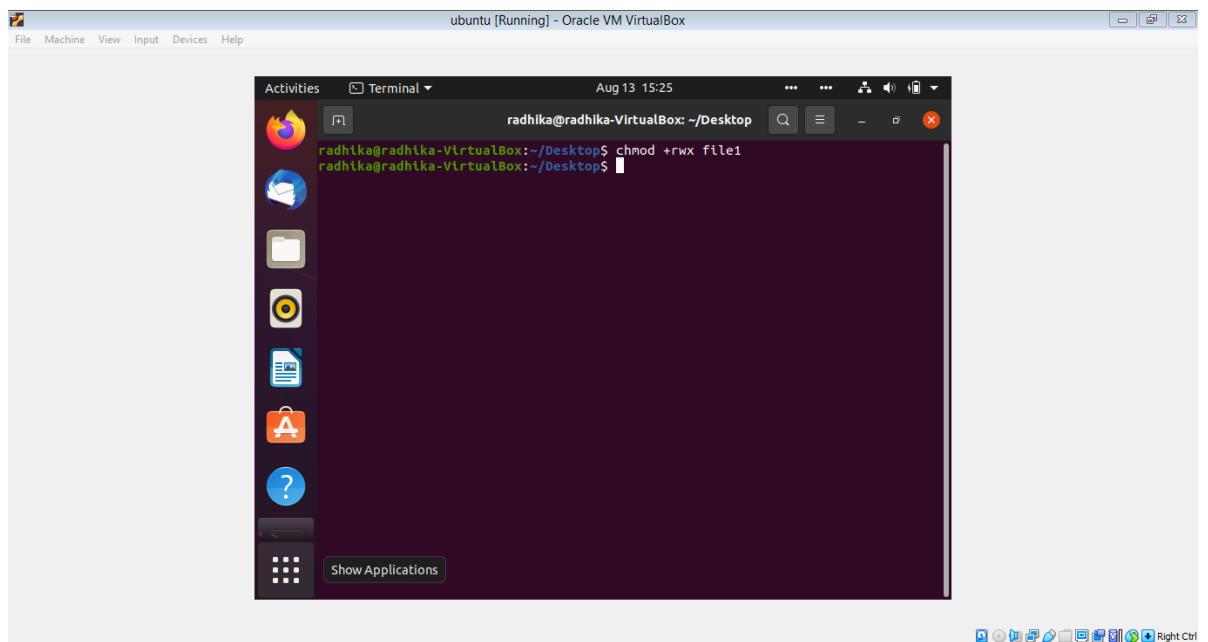


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "Activities Terminal" and the date and time are "Aug 13 15:24". The terminal content shows the following commands being run:

```
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi
simi1
simi2
simi3
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$ sudo groupdel simi3
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi
simi1
simi2
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$ sudo groupmod -n new_group simi1
radhika@radhika-VirtualBox:~/Desktop$ compgen -g simi
simi1
simi2
simi4
simi5
radhika@radhika-VirtualBox:~/Desktop$ compgen -g new_group
radhika@radhika-VirtualBox:~/Desktop$
```

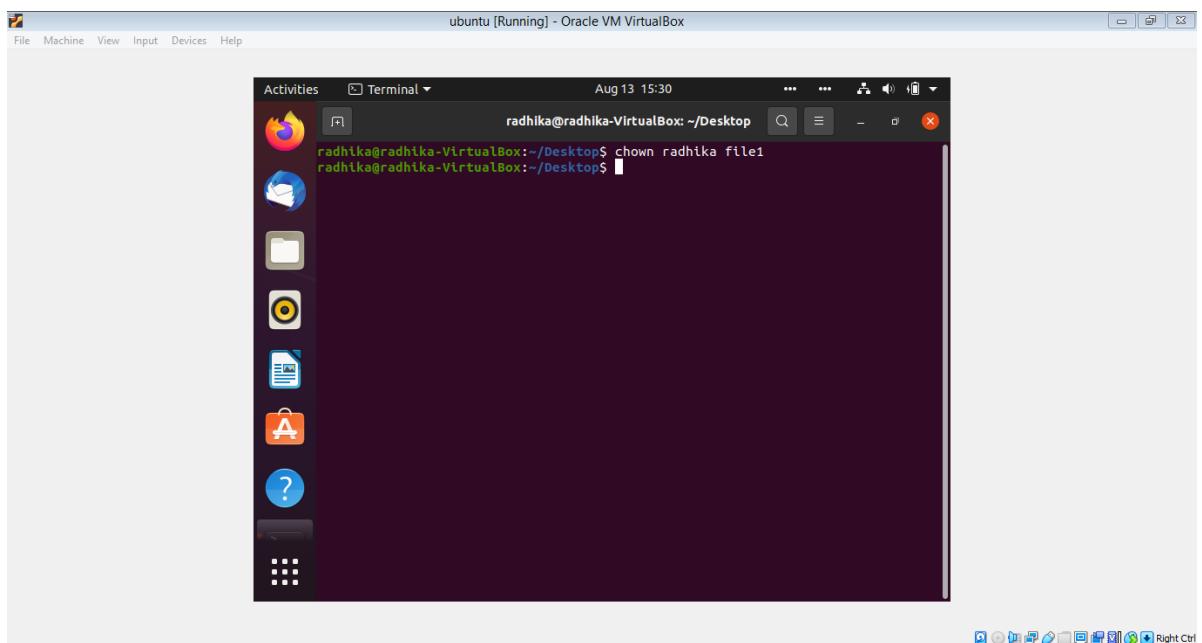
## 6. chmod

- Stands for change mode
- To change directory permissions of file or directory in Linux.



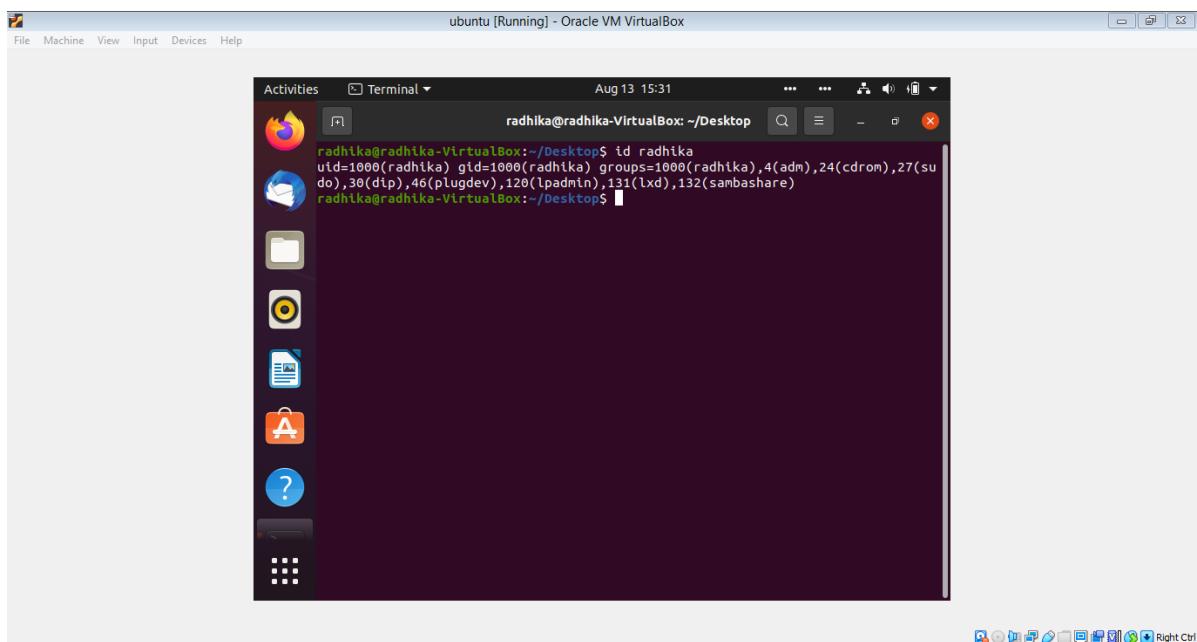
## 7. chown

- The chown command allows you to change the user and/or group ownership of a given file, directory.



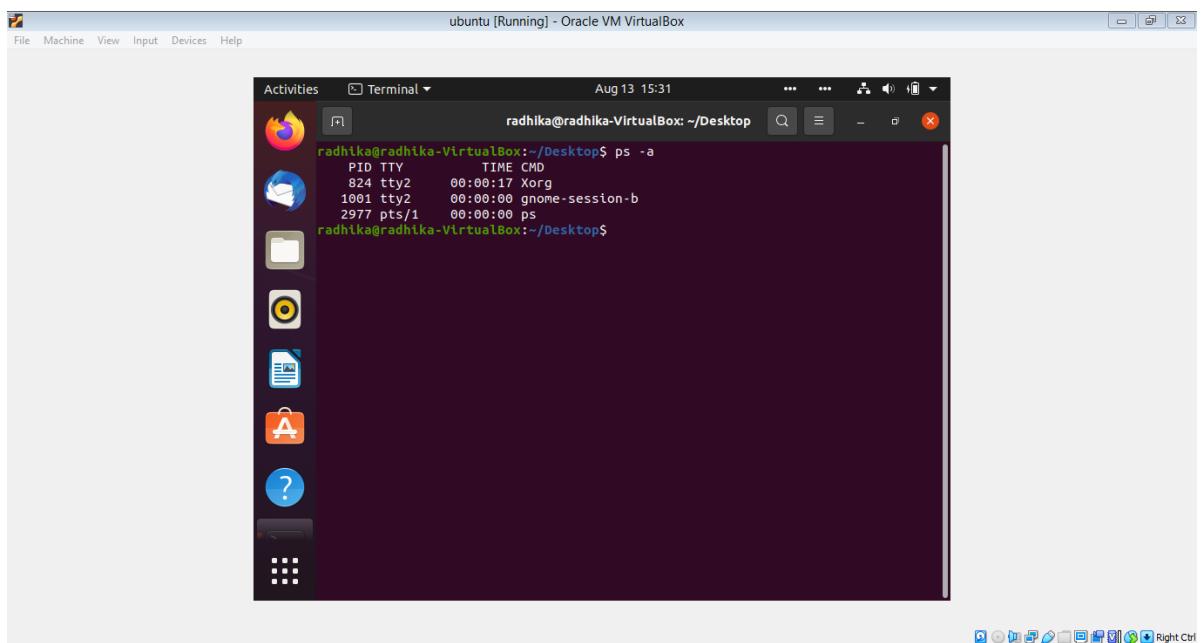
## 8. id

- id command in Linux is used to find out user and group names and numeric ID's (UID or group ID) of the current user.



## 9. ps

- Stands for Process Status.
- It is a command line utility that is used to display or view information related to the processes running in a Linux system.

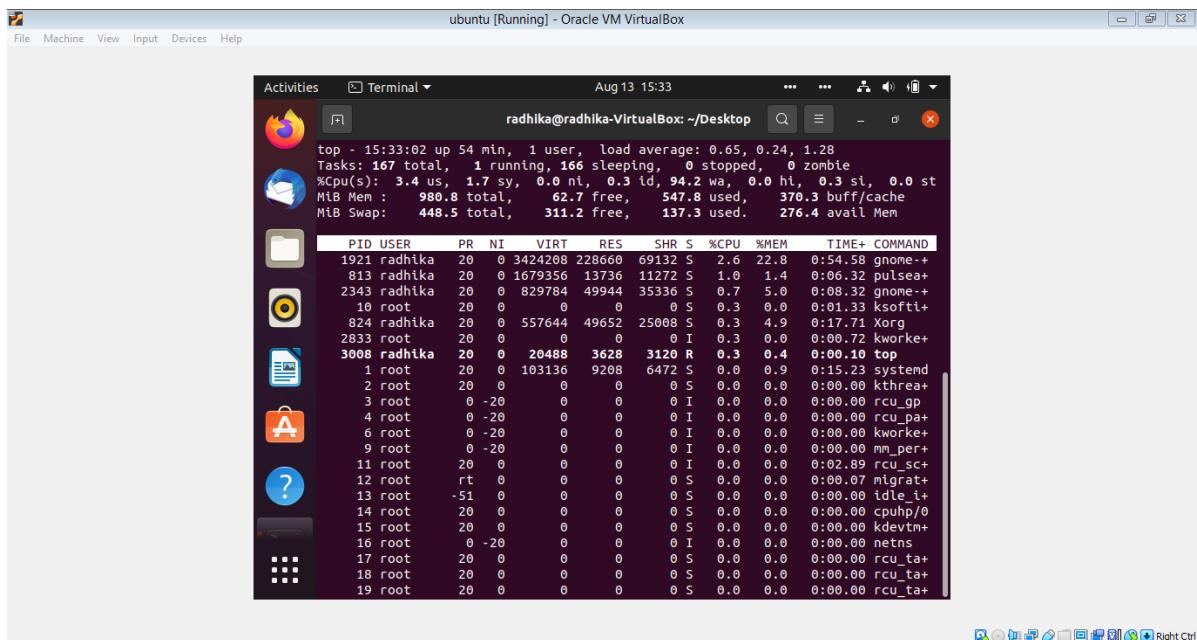


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content displays the output of the "ps -a" command:

```
radhika@radhika-VirtualBox:~/Desktop$ ps -a
PID TTY      TIME CMD
824 tty2    00:00:17 Xorg
1001 tty2    00:00:00 gnome-session-b
2977 pts/1    00:00:00 ps
radhika@radhika-VirtualBox:~/Desktop$
```

## 10. top

- top command is used to show the Linux processes.
- It provides a dynamic real-time view of the running system



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "Activities Terminal" and the command entered is "top". The output of the top command is displayed, showing system statistics and a list of running processes. The processes listed include various system daemons and user tasks, such as gnome+, pulseaudio, Xorg, ksoftirqd, and several rcu\_\* tasks. The terminal window has a standard Linux interface with icons for file operations and a scroll bar.

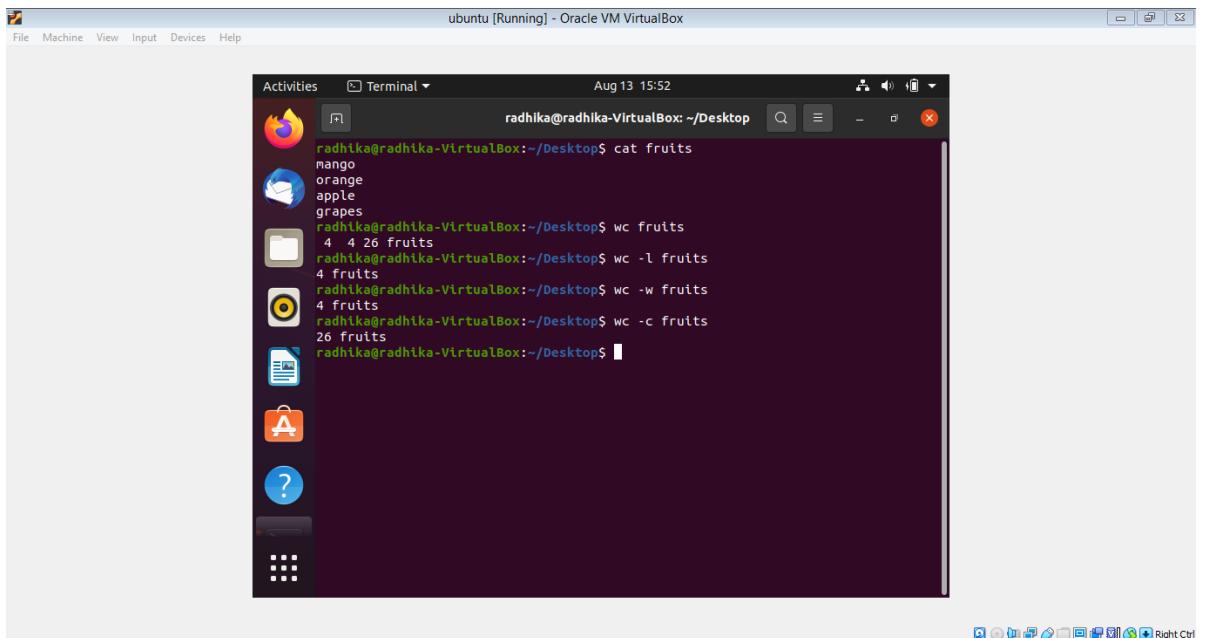
```
top - 15:33:02 up 54 min, 1 user, load average: 0.65, 0.24, 1.28
Tasks: 167 total, 1 running, 166 sleeping, 0 stopped, 0 zombie
%Cpu(s): 3.4 us, 1.7 sy, 0.0 ni, 0.3 id, 94.2 wa, 0.0 hi, 0.3 st, 0.0 st
Mem: 980.8 total, 62.7 free, 547.8 used, 370.3 buff/cache
Swap: 448.5 total, 311.2 free, 137.3 used. 276.4 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
1921 radhika 20 0 3424208 228660 69132 S 2.6 22.8 0:54.58 gnome+
813 radhika 20 0 1679356 13736 11272 S 1.0 1.4 0:06.32 pulseaudio
2343 radhika 20 0 829784 49944 35336 S 0.7 5.0 0:08.32 gnome+
10 root 20 0 0 0 0 S 0.3 0.0 0:01.33 ksoftirqd
824 radhika 20 0 557644 49652 25008 S 0.3 4.9 0:17.71 Xorg
2833 root 20 0 0 0 0 I 0.3 0.0 0:00.72 kworker+
3008 radhika 20 0 20488 3628 3120 R 0.3 0.4 0:00.10 top
1 root 20 0 103136 9208 6472 S 0.0 0.9 0:15.23 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
3 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_pa+
6 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker+
9 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 mm_perf+
11 root 20 0 0 0 0 I 0.0 0.0 0:02.89 rcu_sct+
12 root rt 0 0 0 0 S 0.0 0.0 0:00.07 migrat+
13 root -51 0 0 0 0 S 0.0 0.0 0:00.00 idle_i+
14 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
15 root 20 0 0 0 0 I 0.0 0.0 0:00.00 kdevtmpfs
16 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 netns
17 root 20 0 0 0 0 S 0.0 0.0 0:00.00 rcu_tat+
18 root 20 0 0 0 0 S 0.0 0.0 0:00.00 rcu_tat+
19 root 20 0 0 0 0 S 0.0 0.0 0:00.00 rcu_tat+
```

# BASIC LINUX COMMANDS

## 1. wc

- Stands for word count.
- Used for counting purpose.
- It is used to find out number of lines, word count, byte and characters count in the files specified in the file arguments.

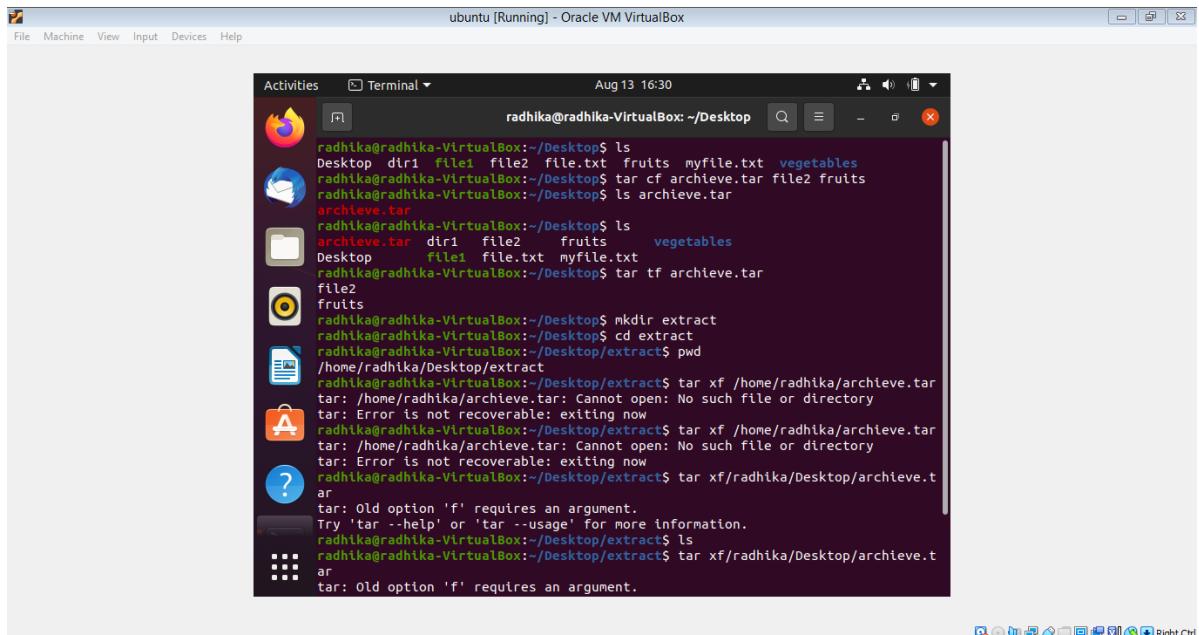


The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content shows the following command-line session:

```
radhika@radhika-VirtualBox:~/Desktop$ cat fruits
mango
orange
apple
grapes
radhika@radhika-VirtualBox:~/Desktop$ wc fruits
4 4 26 fruits
radhika@radhika-VirtualBox:~/Desktop$ wc -l fruits
4 fruits
radhika@radhika-VirtualBox:~/Desktop$ wc -w fruits
4 fruits
radhika@radhika-VirtualBox:~/Desktop$ wc -c fruits
26 fruits
radhika@radhika-VirtualBox:~/Desktop$
```

## 2. tar

- Stands for tape archive.
- It is used to create Archive and extract the Archive files.
- Linux tar command to create compressed or uncompressed Archive files.



```
Activities Terminal Aug 13 16:30
radhika@radhika-VirtualBox:~/Desktop$ ls
Desktop dir1 file1 file2 file.txt fruits myfile.txt vegetables
radhika@radhika-VirtualBox:~/Desktop$ tar cf archive.tar file2 fruits
radhika@radhika-VirtualBox:~/Desktop$ ls archive.tar
archive.tar
radhika@radhika-VirtualBox:~/Desktop$ ls archive.tar
dir1 file2 fruits vegetables
radhika@radhika-VirtualBox:~/Desktop$ tar tf archive.tar
file2
fruits
radhika@radhika-VirtualBox:~/Desktop$ mkdir extract
radhika@radhika-VirtualBox:~/Desktop$ cd extract
radhika@radhika-VirtualBox:~/Desktop/extract$ pwd
/home/radhika/Desktop/extract
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /home/radhika/archive.tar
tar: /home/radhika/archive.tar: Cannot open: No such file or directory
tar: Error is not recoverable. exiting now
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /home/radhika/archive.tar
tar: /home/radhika/archive.tar: Cannot open: No such file or directory
tar: Error is not recoverable. exiting now
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf/radhika/Desktop/archive.t
ar
tar: Old option 'f' requires an argument.
Try 'tar --help' or 'tar --usage' for more information.
radhika@radhika-VirtualBox:~/Desktop/extract$ ls
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf/radhika/Desktop/archive.t
ar
tar: Old option 'f' requires an argument.
```

ubuntu [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal Aug 13 16:35

```
radhika@radhika-VirtualBox: ~/Desktop
archieve.tar  dir1  file2  fruits  vegetables
Desktop      file1  file.txt myfile.txt
radhika@radhika-VirtualBox:~/Desktop$ tar tf archive.tar
file2
fruits
radhika@radhika-VirtualBox:~/Desktop$ mkdir extract
radhika@radhika-VirtualBox:~/Desktop$ cd extract
radhika@radhika-VirtualBox:~/Desktop/extract$ pwd
/home/radhika/Desktop/extract
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /home/radhika/archieve.tar
tar: /home/radhika/archieve.tar: Cannot open: No such file or directory
tar: Error is not recoverable: exiting now
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /home/radhika/archieve.tar
tar: /home/radhika/archieve.tar: Cannot open: No such file or directory
tar: Error is not recoverable: exiting now
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /radhika/Desktop/archieve.t
ar
tar: Old option 'f' requires an argument.
Try 'tar --help' or 'tar --usage' for more information.
radhika@radhika-VirtualBox:~/Desktop/extract$ ls
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /radhika/Desktop/archieve.t
ar
tar: Old option 'f' requires an argument.
Try 'tar --help' or 'tar --usage' for more information.
radhika@radhika-VirtualBox:~/Desktop/extract$ cd ..
radhika@radhika-VirtualBox:~/Desktop$ sudo tar czf mca1.tar.gz /etc
[sudo] password for radhika:
tar: Removing leading '/' from member names
^[[2;3~radhika@radhika-VirtualBox:~/Desktop$
```

Right Ctrl

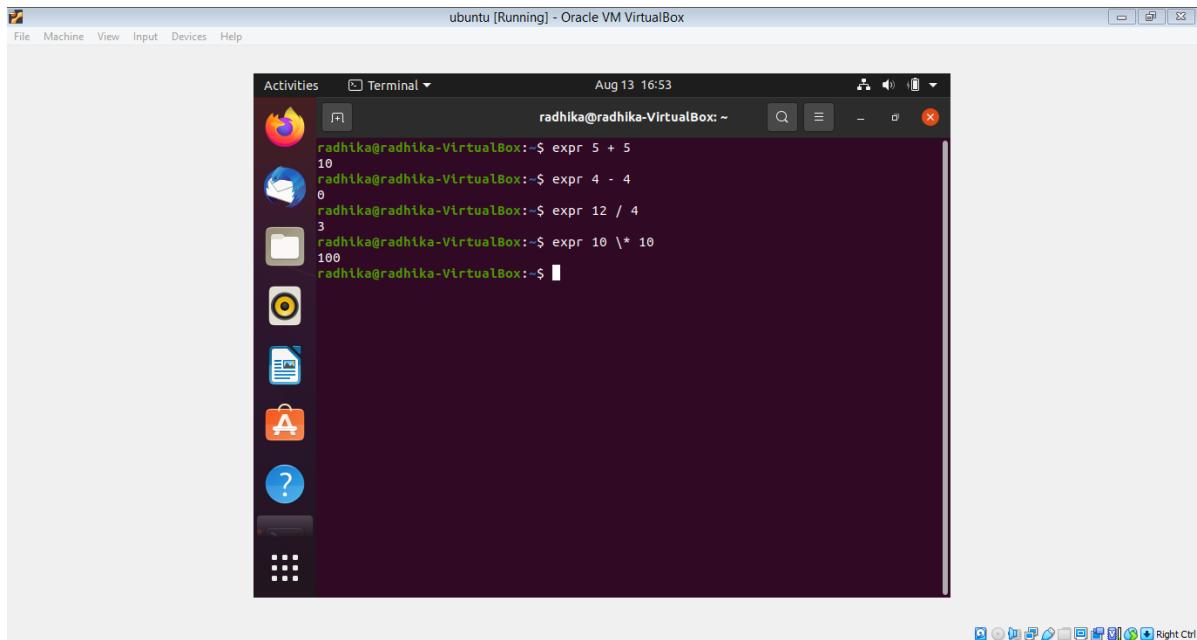
```
tar: Old option 'f' requires an argument.
Try 'tar --help' or 'tar --usage' for more information.
radhika@radhika-VirtualBox:~/Desktop/extract$ ls
radhika@radhika-VirtualBox:~/Desktop/extract$ tar xf /radhika/Desktop/archieve.t
ar
tar: Old option 'f' requires an argument.
Try 'tar --help' or 'tar --usage' for more information.
radhika@radhika-VirtualBox:~/Desktop/extract$ cd ..
radhika@radhika-VirtualBox:~/Desktop$ sudo tar czf mca1.tar.gz /etc
[sudo] password for radhika:
tar: Removing leading '/' from member names
^[[2;3~radhika@radhika-VirtualBox:~/Desktop$ ls
archive.tar  dir1  file1  file.txt  mca1.tar.gz  vegetables
Desktop      extract  file2  fruits  myfile.txt
radhika@radhika-VirtualBox:~/Desktop$ cd ..
radhika@radhika-VirtualBox:~$ cd radhika
bash: cd: radhika: No such file or directory
radhika@radhika-VirtualBox:~$ cd extract
bash: cd: extract: No such file or directory
radhika@radhika-VirtualBox:~$ sudo tar cjf regmca.tar.gz /etc
[sudo] password for radhika:
tar: Removing leading '/' from member names
^[[2;3~radhika@radhika-VirtualBox:~$
```

Activities Terminal Aug 13 16:48

```
radhika@radhika-VirtualBox:~/extract/lab
radhika@radhika-VirtualBox:~$ cd ..
radhika@radhika-VirtualBox:~$ mkdir extract
radhika@radhika-VirtualBox:~$ cd extract
radhika@radhika-VirtualBox:~/extract$ mkdir lab
radhika@radhika-VirtualBox:~/extract$ cd lab
radhika@radhika-VirtualBox:~/extract/lab$ ls
radhika@radhika-VirtualBox:~/extract/lab$ pwd
/home/radhika/extract/lab
radhika@radhika-VirtualBox:~/extract/lab$ tar xzf ^C
```

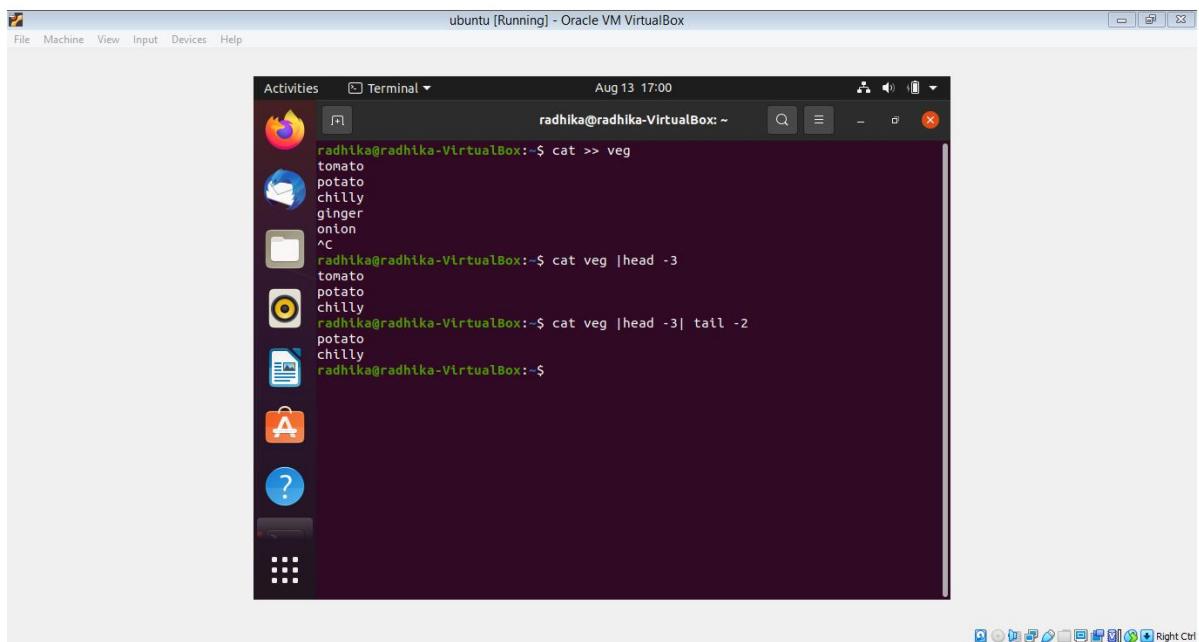
### 3. expr

- The expr command evaluates a given expression and displays its corresponding output.
- It is used for basic operations like addition, subtraction, multiplication, division, and modulus on integers.
- Evaluating regular expressions, string operations like substring, length of strings etc.
- Performing operations on variables inside a shell script.



## 4. redirections & piping

- A pipe is a form of redirection to send the output of one command/program/process to another command/program/process for further processing.
- Pipe is used to combine two or more commands, the output of one command acts as input to another command, and this command's output may act as input to the next command and so on.

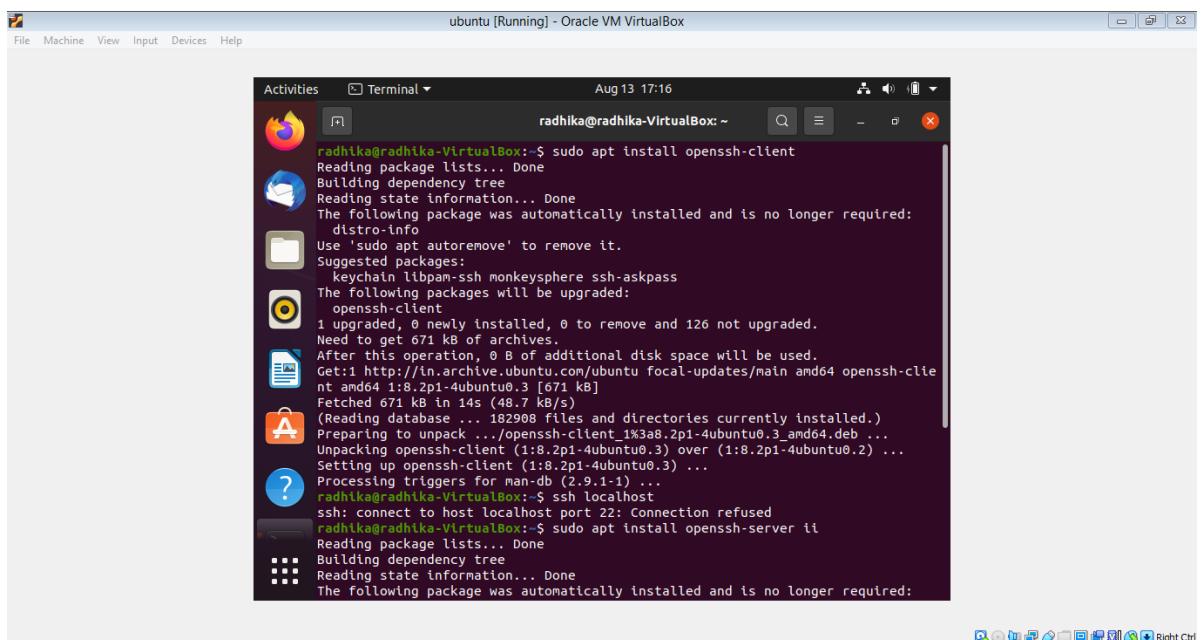


The screenshot shows a terminal window in a Unity desktop environment. The terminal title is "ubuntu [Running] - Oracle VM VirtualBox". The terminal content displays the following command execution:

```
radhika@radhika-VirtualBox:~$ cat >> veg
tomato
potato
chilly
ginger
onion
^C
radhika@radhika-VirtualBox:~$ cat veg |head -3
tomato
potato
chilly
radhika@radhika-VirtualBox:~$ cat veg |head -3| tail -2
potato
chilly
radhika@radhika-VirtualBox:~$
```

## 5. ssh

- Stands for “Secure Shell”.
- It is a protocol used to securely connect to a remote server/system.
- It is secure in the sense that it transfers the data in encrypted form between the host and the client.
- It transfers inputs from the client to the host and relays back the output.
- ssh runs at TCP/IP port 22.



The screenshot shows a terminal window titled "ubuntu [Running] - Oracle VM VirtualBox". The terminal is displaying the following command and its output:

```
radhika@radhika-VirtualBox:~$ sudo apt install openssh-client
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  distro-info
Use 'sudo apt autoremove' to remove it.
Suggested packages:
  keychain libpam-ssh monkeysphere ssh-askpass
The following packages will be upgraded:
  openssh-client
  1 upgraded, 0 newly installed, 0 to remove and 126 not upgraded.
Need to get 671 kB of archives.
After this operation, 0 B of additional disk space will be used.
Get:1 http://ln.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-client amd64 1:8.2p1-4ubuntu0.3 [671 kB]
Fetched 671 kB in 14s (48.7 kB/s)
(Reading database ... 182908 files and directories currently installed.)
Preparing to unpack .../openssh-client_1%3a8.2p1-4ubuntu0.3_amd64.deb ...
Unpacking openssh-client (1:8.2p1-4ubuntu0.3) over (1:8.2p1-4ubuntu0.2) ...
Setting up openssh-client (1:8.2p1-4ubuntu0.3) ...
Processing triggers for man-db (2.9.1-1) ...
radhika@radhika-VirtualBox:~$ ssh localhost
ssh: connect to host localhost port 22: Connection refused
radhika@radhika-VirtualBox:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
```

ubuntu [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal Aug 13 17:17

```
radhika@radhika-VirtualBox:~$ ssh localhost
ssh: connect to host localhost port 22: Connection refused
radhika@radhika-VirtualBox:~$ sudo apt install openssh-server i
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer required:
  distro-info
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
0 upgraded, 5 newly installed, 0 to remove and 126 not upgraded.
Need to get 703 kB of archives.
After this operation, 6,058 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 ii 1.8-2 [15.3 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 ncurses-term all 6.2-0ubuntu2 [249 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 ncurses-term all 6.2-0ubuntu2 [249 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 openssh-sftp
```

ubuntu [Running] - Oracle VM VirtualBox

File Machine View Input Devices Help

Activities Terminal Aug 13 17:23

```
radhika@radhika-VirtualBox:~$ ssh localhost
Processing triggers for ufw (0.36-6) ...
Error: Timeout was reached
radhika@radhika-VirtualBox:~$ ssh localhost
The authenticity of host 'localhost (127.0.0.1)' can't be established.
ECDSA key fingerprint is SHA256:uhA7iVetjIpmeHCAri4w7AZQp9qUgEC0aknyregI.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added 'localhost' (ECDSA) to the list of known hosts.
radhika@localhost's password:
Welcome to Ubuntu 20.04.2 LTS (GNU/Linux 5.8.0-55-generic x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

 133 updates can be installed immediately.
 51 of these updates are security updates.
 To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

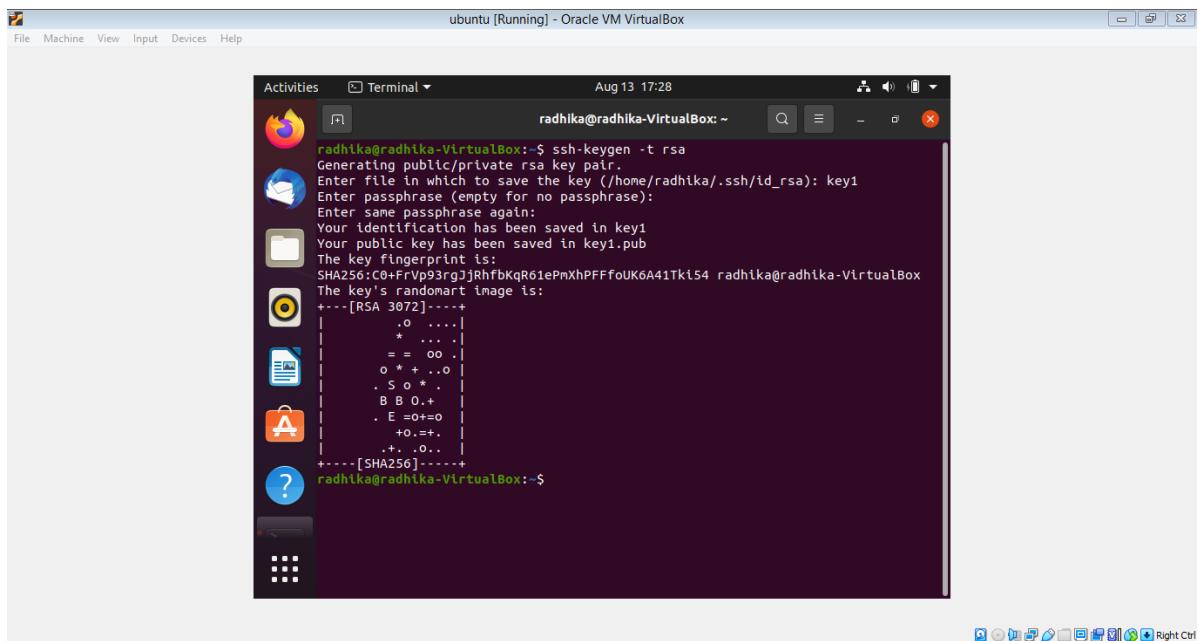
radhika@radhika-VirtualBox:~$
```

## **6. scp**

- Stands for secure copy is a command-line utility that allows you to securely.
- Copy files and directories between two locations.
- With scp, you can copy a file or directory from your local system to a remote system.
- Between two remote systems from your local system.
- Remote file system locations are specified in format.

## 7. ssh-keygen

- ssh-keygen command to generate a public/private authentication key pair.
- Authentication keys allow a user to connect to a remote system without supplying a password.
- Keys must be generated for each user separately.
- If you generate key pairs as the root user, only the root can use the keys.
- \$ssh-keygen -t rsa



The screenshot shows a terminal window titled "ubuntu [Running] - Oracle VM VirtualBox". The terminal output is as follows:

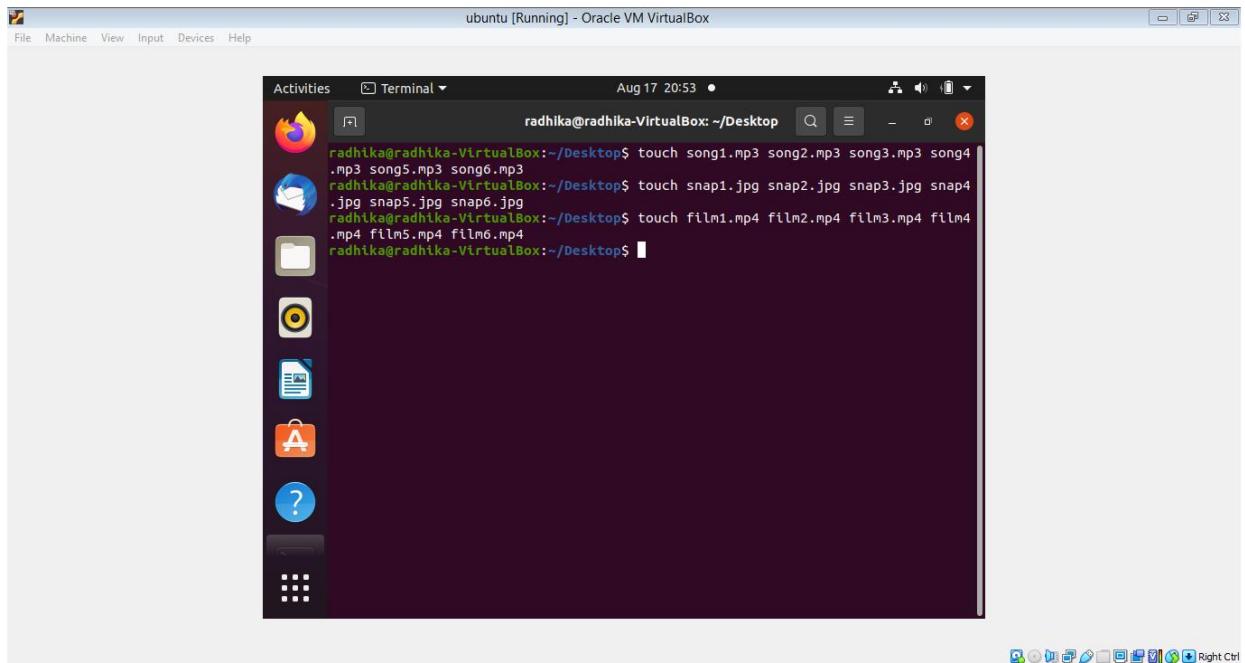
```
radhika@radhika-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/radhika/.ssh/id_rsa): key1
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in key1
Your public key has been saved in key1.pub
The key fingerprint is:
SHA256:C0+FrVp93rgJjhRhbKqR61ePmXhPFFoUK6A4iTki54 radhika@radhika-VirtualBox
-----[RSA 3072]-----
-----[SHA256]-----
```

## **8. ssh-copy-id**

- The ssh-copy-id command allows you to install an SSH key on a remote server's authorized keys.
- This command facilitates SSH key login, which removes the need for a password for each login, thus ensuring a password-less, automatic login process.
- \$ssh-copy-id username@remote\_host

## Lab Assignment Managing Files, Creating Users and Groups Using Command-line tools

- 1.a. Create six files with name of the form songX.mp3
- b. Create six files with name of the form snapX.jpg
- c. Create six files with name of the form filmX.mp3 (In each set, replace X with the numbers 1 through 6)



The screenshot shows a desktop environment for Ubuntu running in Oracle VM VirtualBox. A terminal window is open, displaying the following command-line session:

```
ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Aug 17 20:53 radhika@radhika-VirtualBox:~/Desktop$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
radhika@radhika-VirtualBox:~/Desktop$ touch snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg
radhika@radhika-VirtualBox:~/Desktop$ touch film1.mp4 film2.mp4 film3.mp4 film4.mp4 film5.mp4 film6.mp4
radhika@radhika-VirtualBox:~/Desktop$
```

2. From your home directory, move the song files into your music subdirectory, the snapshot files into your pictures subdirectory, and the movie files into videos subdirectory.

A screenshot of a Linux desktop environment, likely Ubuntu, running in Oracle VM VirtualBox. The desktop has a dark theme with a dock on the left containing icons for various applications like a browser, file manager, and system tools. A terminal window is open in the center, showing a command-line session:

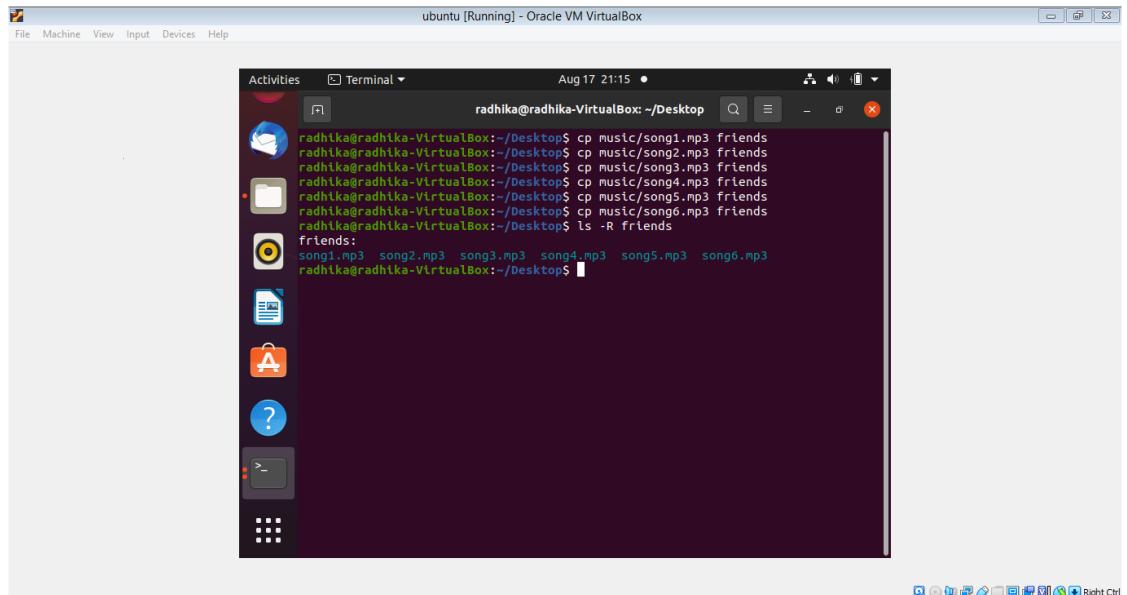
```
ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Aug 17 21:05 •
radhika@radhika-VirtualBox: ~/Desktop$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
radhika@radhika-VirtualBox: ~/Desktop$ mv song1.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$ mv song2.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$ mv song3.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$ mv song4.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$ mv song5.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$ mv song6.mp3 ./music/
radhika@radhika-VirtualBox: ~/Desktop$
```

3. In your home directory, create three subdirectories for organizing your files. Call these directories friends, family, and work. Create all three with one command

A screenshot of a Linux desktop environment, likely Ubuntu, running in Oracle VM VirtualBox. The desktop has a dark theme with a dock on the left containing icons for various applications like a browser, file manager, and system tools. A terminal window is open in the center, showing a command-line session:

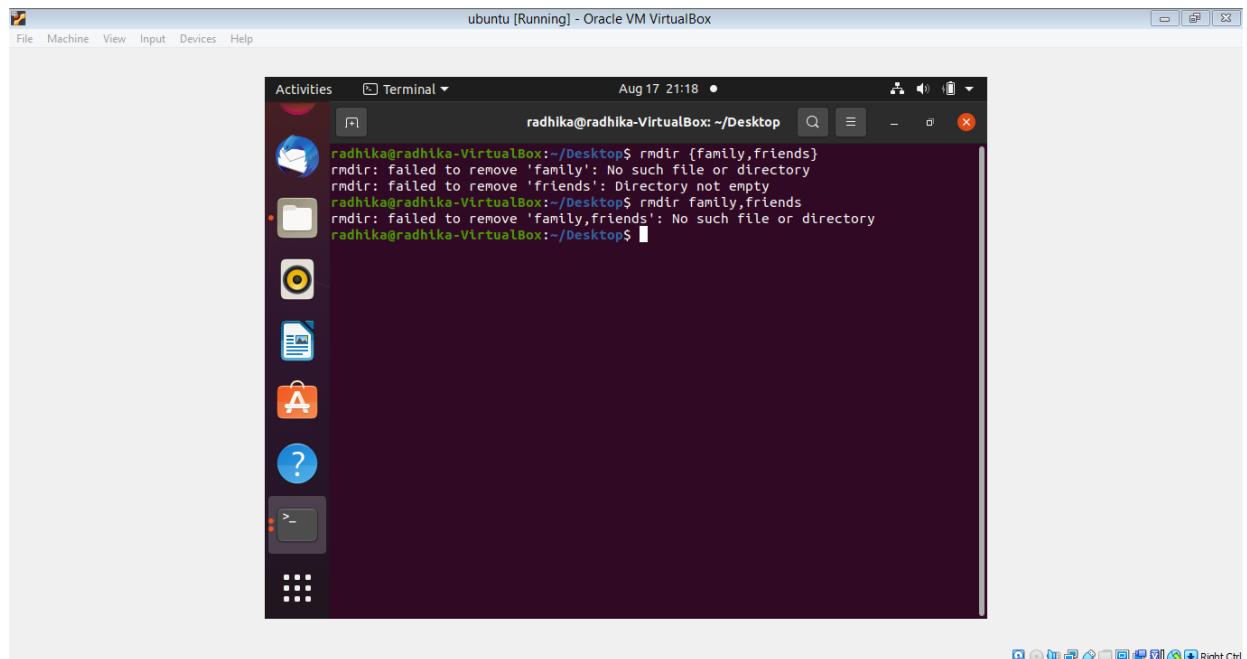
```
ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
Activities Terminal Aug 17 21:11 •
radhika@radhika-VirtualBox: ~/Desktop$ mkdir {friends,familt,work}
radhika@radhika-VirtualBox: ~/Desktop$ ls
archive.tar  file1  file3.mp4  fruits  snap2.jpg  vegetables
Desktop   file2  file4.mp4  mcal.tar.gz  snap3.jpg  work
dir1      file.txt  file5.mp4  music   snap4.jpg
extract   film1.mp4  file6.mp4  myfile.txt  snap5.jpg
familt    film2.mp4  friends  snap1.jpg  snap6.jpg
radhika@radhika-VirtualBox: ~/Desktop$
```

#### 4. Copy song files to the friends folder and snap files to family folder



```
ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Aug 17 21:15 •
radhika@radhika-VirtualBox: ~/Desktop
cp music/song1.mp3 friends
cp music/song2.mp3 friends
cp music/song3.mp3 friends
cp music/song4.mp3 friends
cp music/song5.mp3 friends
cp music/song6.mp3 friends
ls -R friends
friends:
song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
radhika@radhika-VirtualBox: ~/Desktop$
```

#### 5. Attempt to delete both family and friends projects with a single rmdir command



```
ubuntu [Running] - Oracle VM VirtualBox
Activities Terminal Aug 17 21:18 •
radhika@radhika-VirtualBox: ~/Desktop
rmdir {family,friends}
rmdir: failed to remove 'family': No such file or directory
rmdir: failed to remove 'friends': Directory not empty
rmdir family,friends
rmdir: failed to remove 'family,friends': No such file or directory
radhika@radhika-VirtualBox: ~/Desktop$
```

#### 6. Use another command that will succeed in deleting both the family and friends folder.

```

radhika@radhika-VirtualBox:~/Desktop$ rm -r family friends
rmdir: failed to remove 'family,friends': No such file or directory
radhika@radhika-VirtualBox:~/Desktop$ rm -r family friends
rm: cannot remove 'family': No such file or directory
radhika@radhika-VirtualBox:~/Desktop$ ls
archive.tar  file1  film3.mp4  mcal.tar.gz  snap3.jpg   work
Desktop      file2  film4.mp4  music       snap4.jpg
dir1        file.txt  film5.mp4  myfile.txt  snap5.jpg
extract     film1.mp4  film6.mp4  snap1.jpg  snap6.jpg
famil1     film2.mp4  fruits    snap2.jpg  vegetables
radhika@radhika-VirtualBox:~/Desktop$ 

```

7. Redirect a long listing of all home directory files, including hidden, into a file named allfiles.txt.  
Confirm that the file contains the listing

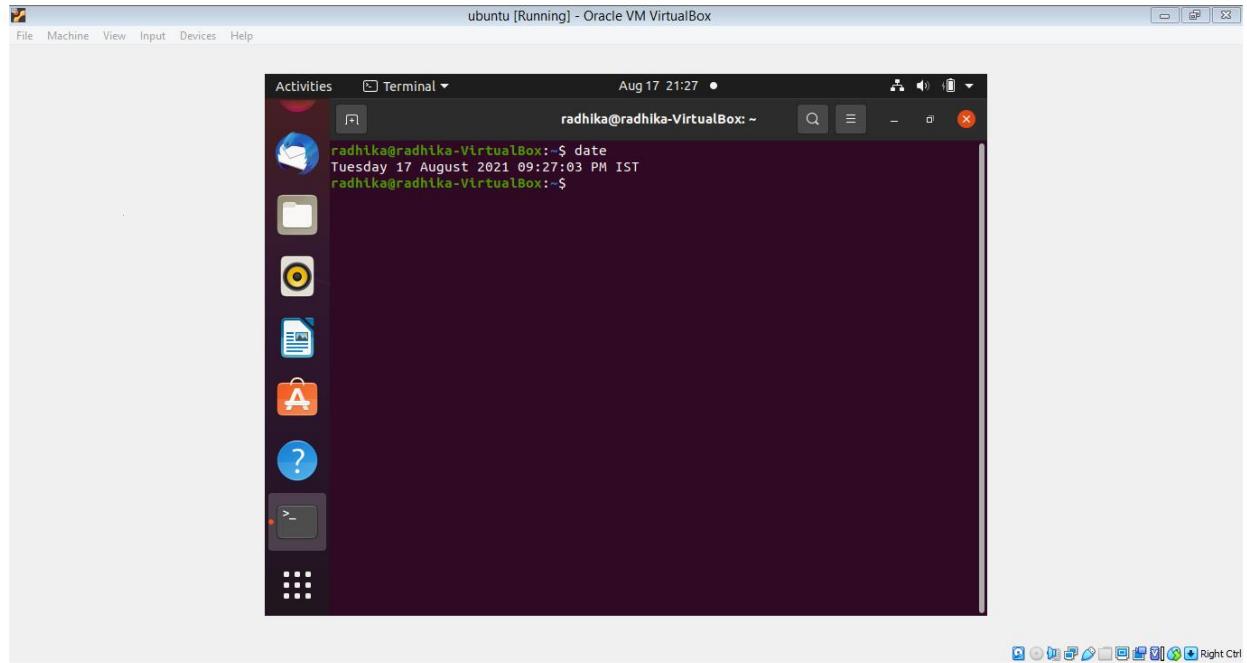
```

ubuntu [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

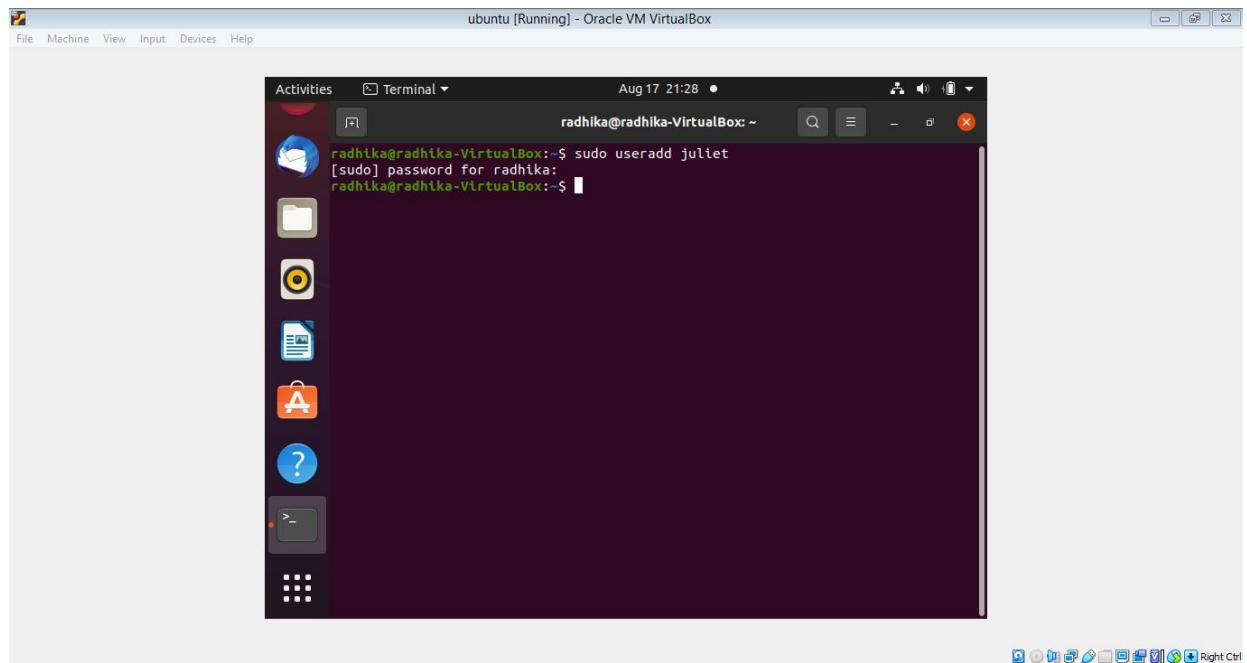
Activities Terminal Aug 17 21:21 •
radhika@radhika-VirtualBox:~/Desktop$ ls -al>allfiles.txt
radhika@radhika-VirtualBox:~/Desktop$ ls
allfiles.txt  famil1  film2.mp4  fruits    snap2.jpg  vegetables
archive.tar  file1   film3.mp4  mcal.tar.gz snap3.jpg   work
Desktop      file2   film4.mp4  music     snap4.jpg
dir1        file.txt  film5.mp4  myfile.txt snap5.jpg
extract     film1.mp4  film6.mp4  snap1.jpg  snap6.jpg
radhika@radhika-VirtualBox:~/Desktop$ ls -al
total 1300
drwxr-xr-x  7 radhika radhika  4096 Aug 17 21:20 .
drwxr-xr-x 22 radhika radhika  4096 Aug 13 17:27 ..
-rw-rw-r--  1 radhika radhika 1742 Aug 17 21:20 allfiles.txt
-rw-rw-r--  1 radhika radhika 10240 Aug 13 15:56 archive.tar
-rw-rw-r--  1 radhika radhika 19 Jun 22 21:00 Desktop
-rw-rw-r--  1 radhika radhika  6 Jun 22 20:20 dir1
drwxrwxr-x  2 radhika radhika  4096 Aug 13 15:58 extract
drwxrwxr-x  2 radhika radhika  4096 Aug 17 21:10 famil1
-rwxrwxr-x  1 radhika radhika 19 Jun 22 20:53 file1
-rw-rw-r--  1 radhika radhika 16 Jun 22 20:53 file2
-rw-rw-r--  1 radhika radhika  0 Jun 15 18:36 file.txt
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film1.mp4
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film2.mp4
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film3.mp4
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film4.mp4
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film5.mp4
-rw-rw-r--  1 radhika radhika  0 Aug 17 20:57 film6.mp4
-rw-rw-r--  1 radhika radhika 26 Aug 13 15:49 fruits

```

8. In the command window, display today's date with day of the week, month, date and year



## 9. Add the user Juliet



## 10. Confirm that Juliet has been added by examining the /etc/passwd file

A screenshot of a Linux desktop environment, likely Ubuntu, running in Oracle VM VirtualBox. The desktop has a dark theme with a dock at the bottom featuring icons for various applications like a browser, file manager, and terminal. A terminal window is open in the center, showing the command line interface. The terminal window title bar says "Activities Terminal" and the status bar shows the date and time as "Aug 17 21:30". The terminal content shows the user "radhika" running commands in a root shell (indicated by the \$ symbol). The commands are:

```
radhika@radhika-VirtualBox:~$ sudo useradd juliet  
[sudo] password for radhika:  
radhika@radhika-VirtualBox:~$ cat /etc/passwd | grep juliet  
juliet:x:1001:1006::/home/juliet:/bin/sh  
radhika@radhika-VirtualBox:~$
```

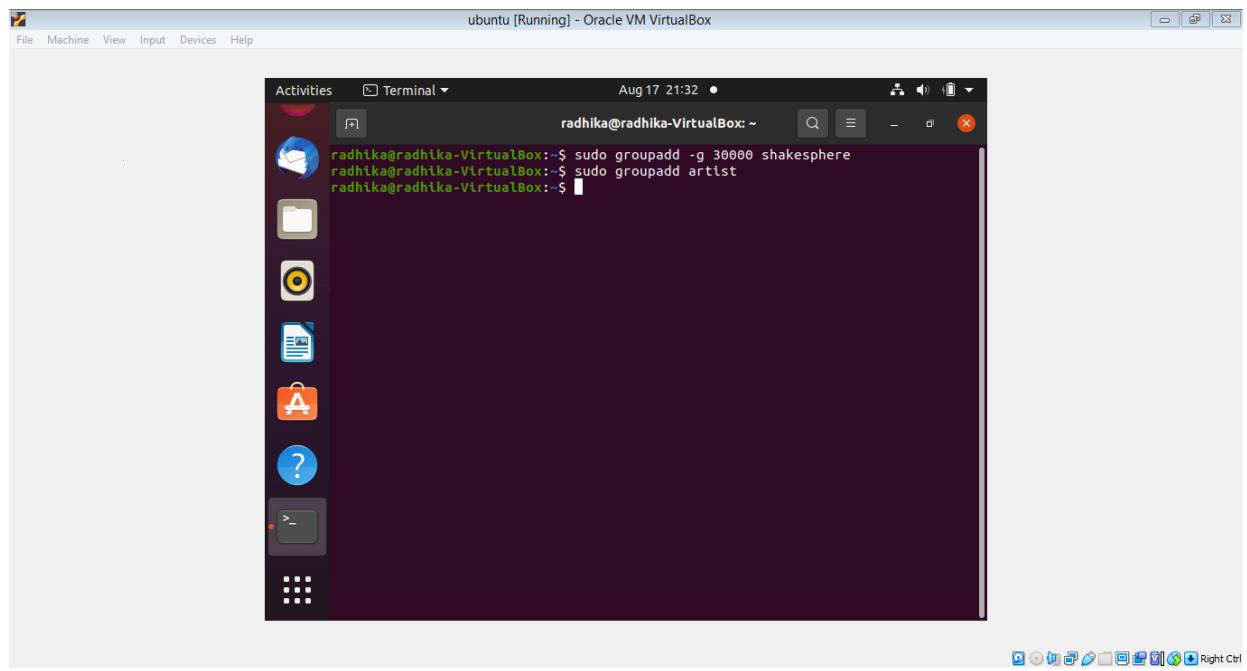
### 11. Use the passwd command to initialize Juliet's password

A screenshot of a Linux desktop environment, likely Ubuntu, running in Oracle VM VirtualBox. The desktop has a dark theme with a dock at the bottom featuring icons for various applications like a browser, file manager, and terminal. A terminal window is open in the center, showing the command line interface. The terminal window title bar says "Activities Terminal" and the status bar shows the date and time as "Aug 17 21:47". The terminal content shows the user "radhika" running the "passwd" command in a root shell (indicated by the \$ symbol) to initialize Juliet's password. The command entered is:

```
radhika@radhika-VirtualBox:~/Desktop$ sudo passwd juliet  
[sudo] password for radhika:  
New password:
```

### 12. Create a supplementary group called Shakespeare with a group id of 30000

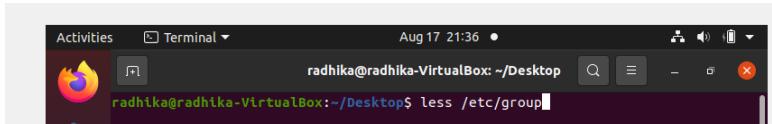
### 13. Create a supplementary group called artists.



A screenshot of a Linux desktop environment, likely Ubuntu, running in a virtual machine. The desktop interface includes a dock with icons for Home, File Manager, Dash, Applications, and Help. A terminal window is open, showing the command line:

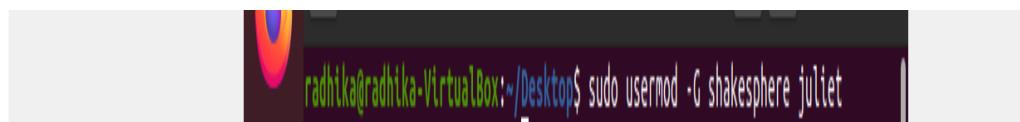
```
radhika@radhika-VirtualBox:~$ sudo groupadd -g 30000 shakesphere  
radhika@radhika-VirtualBox:~$ sudo groupadd artist  
radhika@radhika-VirtualBox:~$
```

14. Confirm that Shakespeare and artists have been added by examining the /etc/group file.



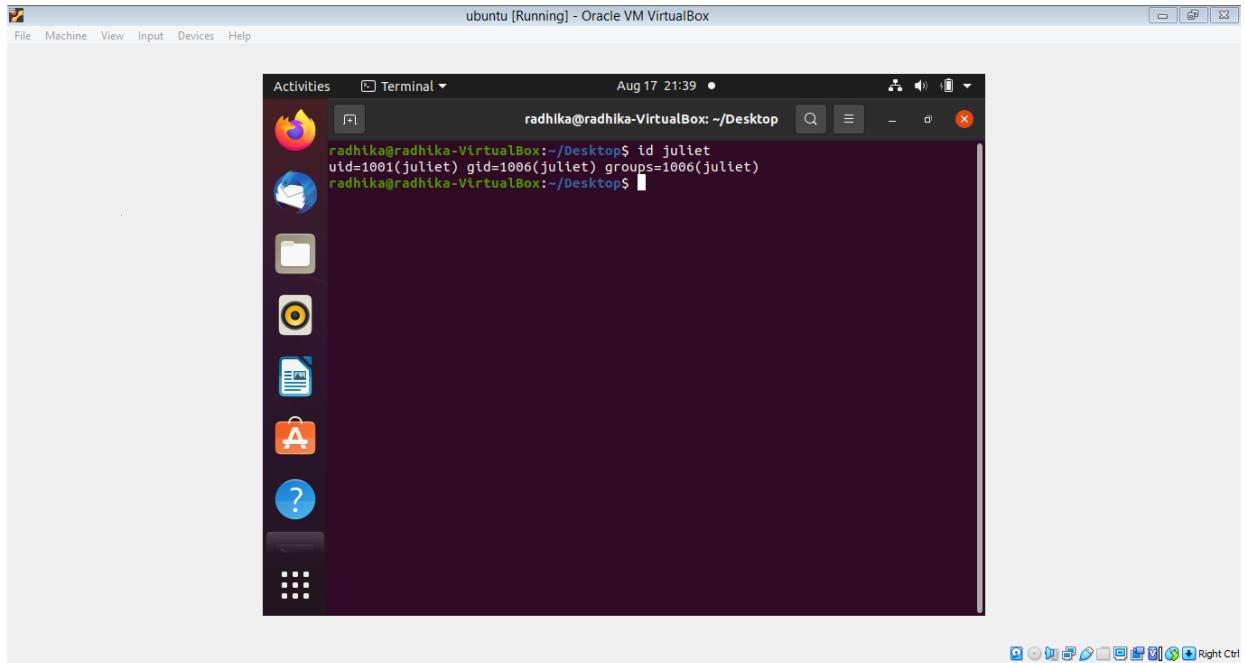
A screenshot of a Linux desktop environment showing a terminal window. The terminal shows the command less /etc/group being run, displaying the contents of the /etc/group file.

15. Add the Juliet user to the Shakespeare group as a supplementary group

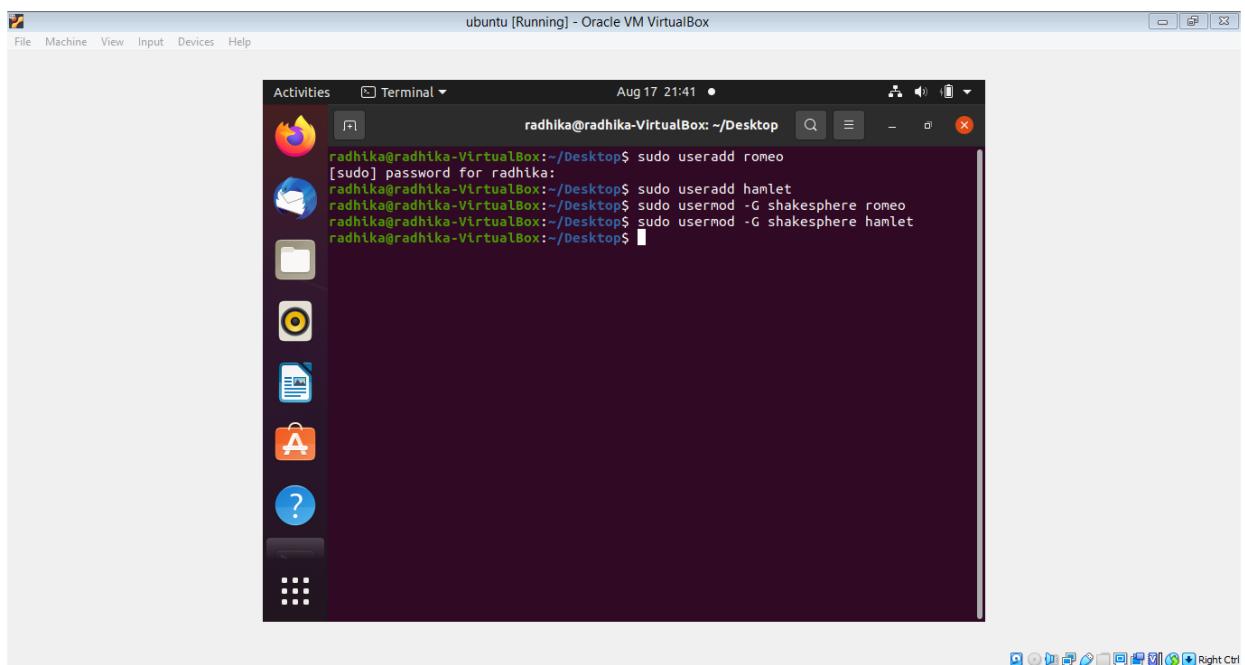


A screenshot of a Linux desktop environment showing a terminal window. The terminal shows the command sudo usermod -G shakesphere juliet being run.

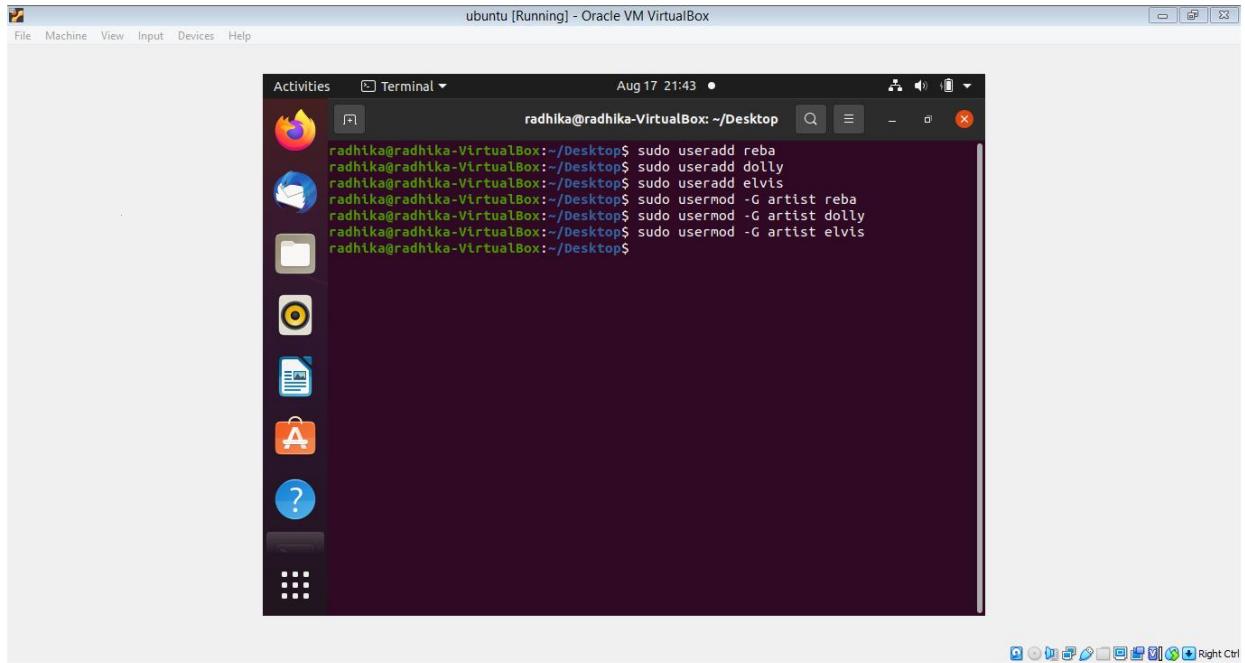
16. Confirm that Juliet has been added using the id command.



### 17. Add Romeo and Hamlet to the Shakespeare group



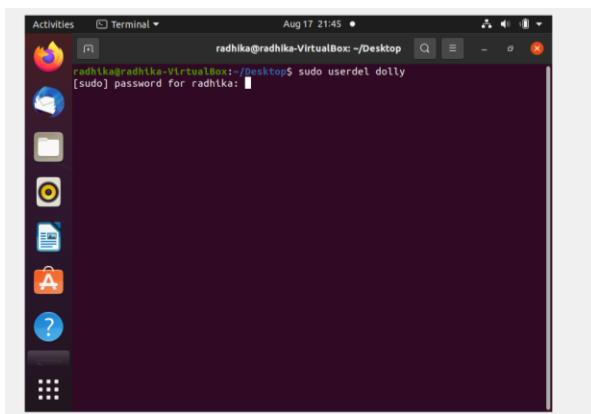
### 18. Add Reba, Dolly and Elvis to the artists group.



19. Verify the supplemental group memberships by examining the /etc/group file.



20. Attempt to remove user Dolly.

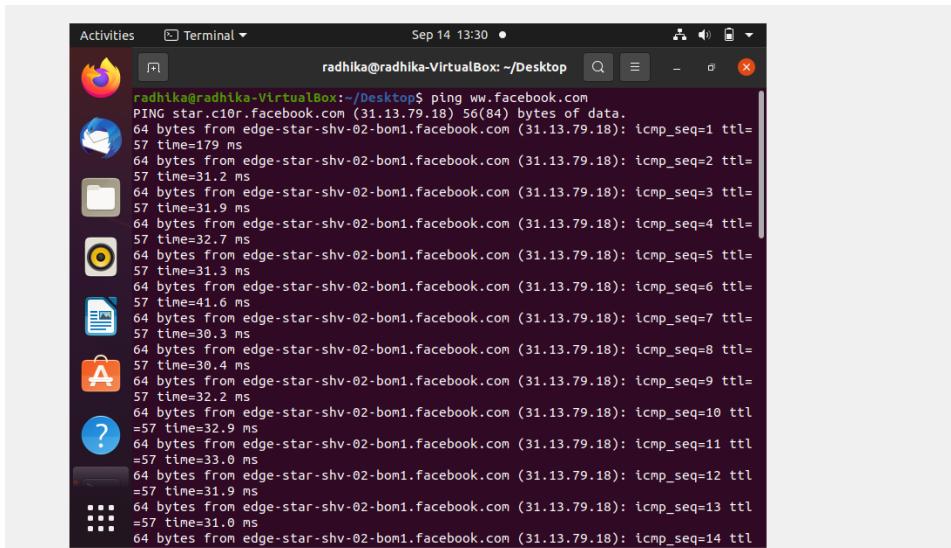


# **Q1. Ping, route, traceroute, nslookup, IpConfig, NetStat**

## LINUX

### 1. Ping

ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution. Used without parameters, this command displays Help content.



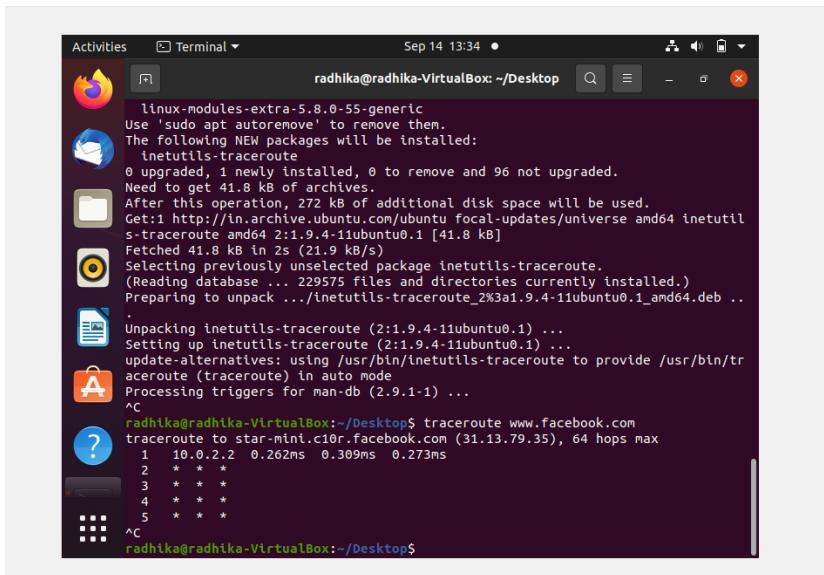
A screenshot of a Linux desktop environment showing a terminal window. The terminal title is "radhika@radhika-VirtualBox: ~/Desktop". The command entered is "ping www.facebook.com". The output shows multiple ICMP echo requests being sent to the IP address 31.13.79.18, with details like sequence number, TTL, and round-trip time (rtt) for each packet.

```
radhika@radhika-VirtualBox:~/Desktop$ ping www.facebook.com
PING star.c10r.facebook.com (31.13.79.18) 56(84) bytes of data.
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=1 ttl=
57 time=179 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=2 ttl=
57 time=31.2 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=3 ttl=
57 time=31.9 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=4 ttl=
57 time=32.7 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=5 ttl=
57 time=31.3 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=6 ttl=
57 time=41.6 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=7 ttl=
57 time=30.3 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=8 ttl=
57 time=30.4 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=9 ttl=
57 time=32.2 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=10 ttl=
57 time=32.9 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=11 ttl=
57 time=33.0 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=12 ttl=
57 time=31.9 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=13 ttl=
57 time=31.0 ms
64 bytes from edge-star-shv-02-bom1.facebook.com (31.13.79.18): icmp_seq=14 ttl=
```

### 2. Traceroute

Traceroute is a network diagnostic tool used to track in real-time the pathway taken by a packet on an IP network from source to destination, reporting the IP addresses of all the routers it pinged in between. Traceroute also records the time taken for each hop the packet makes during its route to the destination.

The difference between **tracert(windows)** and **traceroute(linux)** is that: tracert(windows) will only use ICMP echo requests. traceroute(linux) [and somewhat dependent on linux distro] default to UDP echo requests.



A screenshot of an Ubuntu desktop environment. A terminal window is open in the center, titled "radhika@radhika-VirtualBox: ~/Desktop". The terminal shows the output of a package installation command:

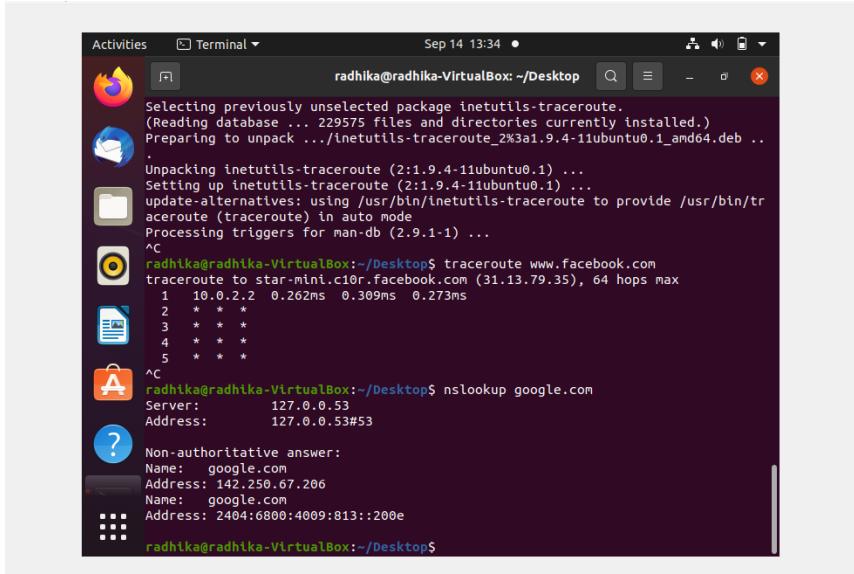
```
linux-modules-extra-5.8.0-55-generic  
Use 'sudo apt autoremove' to remove them.  
The following NEW packages will be installed:  
inetutils-traceroute  
0 upgraded, 1 newly installed, 0 to remove and 96 not upgraded.  
Need to get 41.8 kB of archives.  
After this operation, 272 kB of additional disk space will be used.  
Get:1 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 inetutil  
s-traceroute amd64 2:1.9.4-11ubuntu0.1 [41.8 kB]  
Fetched 41.8 kB in 2s (21.9 kB/s)  
Selecting previously unselected package inetutils-traceroute.  
(Reading database ... 229575 files and directories currently installed.)  
Preparing to unpack .../inetutils-traceroute_2%3a1.9.4-11ubuntu0.1_amd64.deb ..  
. .  
Unpacking inetutils-traceroute (2:1.9.4-11ubuntu0.1) ...  
Setting up inetutils-traceroute (2:1.9.4-11ubuntu0.1) ...  
update-alternatives: using /usr/bin/inetutils-traceroute to provide /usr/bin/traceroute (traceroute) in auto mode  
Processing triggers for man-db (2.9.1-1) ...  
^C
```

Then, the user runs a traceroute command:

```
radhika@radhika-VirtualBox:~/Desktop$ traceroute www.facebook.com  
traceroute to star-mini.c10r.facebook.com (31.13.79.35), 64 hops max  
1 10.0.2.2 0.262ms 0.309ms 0.273ms  
2 * * *  
3 * * *  
4 * * *  
5 * * *  
^C
```

### 3. Nslookup

Nslookup (stands for “Name Server Lookup”) is a **useful command for getting information from DNS server**. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record.



A screenshot of an Ubuntu desktop environment. A terminal window is open in the center, titled "radhika@radhika-VirtualBox: ~/Desktop". The terminal shows the output of a package installation command:

```
Selecting previously unselected package inetutils-traceroute.  
(Reading database ... 229575 files and directories currently installed.)  
Preparing to unpack .../inetutils-traceroute_2%3a1.9.4-11ubuntu0.1_amd64.deb ..  
. .  
Unpacking inetutils-traceroute (2:1.9.4-11ubuntu0.1) ...  
Setting up inetutils-traceroute (2:1.9.4-11ubuntu0.1) ...  
update-alternatives: using /usr/bin/inetutils-traceroute to provide /usr/bin/traceroute (traceroute) in auto mode  
Processing triggers for man-db (2.9.1-1) ...  
^C
```

Then, the user runs a traceroute command:

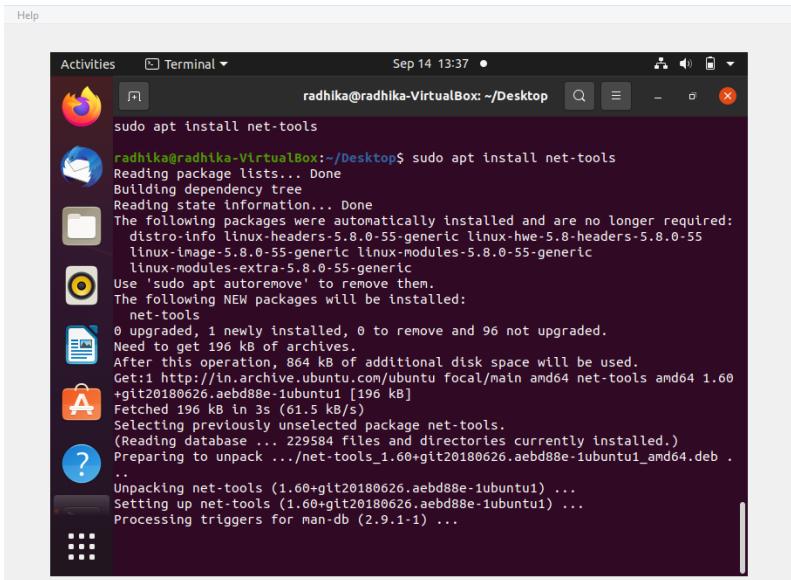
```
radhika@radhika-VirtualBox:~/Desktop$ traceroute www.facebook.com  
traceroute to star-mini.c10r.facebook.com (31.13.79.35), 64 hops max  
1 10.0.2.2 0.262ms 0.309ms 0.273ms  
2 * * *  
3 * * *  
4 * * *  
5 * * *  
^C
```

Finally, the user runs an nslookup command:

```
radhika@radhika-VirtualBox:~/Desktop$ nslookup google.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: google.com  
Address: 142.250.67.206  
Name: google.com  
Address: 2404:6800:4009:813::200e
```

#### 4. netstat -l

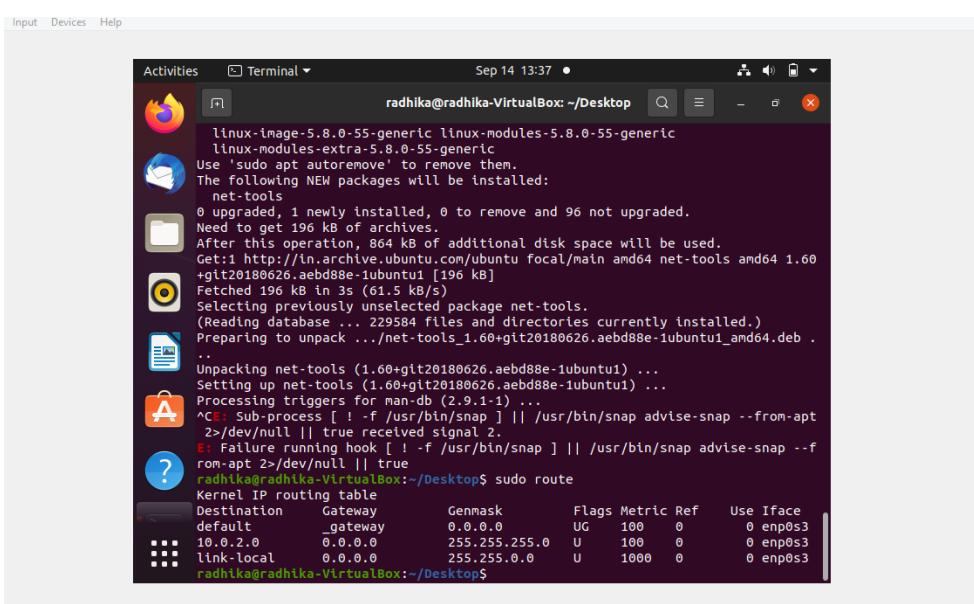
The netstat command symbolically **displays the contents of various network-related data structures for active connections**. The Interval parameter, which is specified in seconds, continuously displays information regarding packet traffic on the configured network interfaces.



```
Help Activities Terminal Sep 14 13:37 radhika@radhika-VirtualBox: ~/Desktop$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  distro-info linux-headers-5.8.0-55-generic linux-hwe-5.8-headers-5.8.0-55
  linux-image-5.8.0-55-generic linux-modules-5.8.0-55-generic
  linux-modules-extra-5.8.0-55-generic
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 96 not upgraded.
Need to get 196 kB of archives.
After this operation, 864 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 net-tools amd64 1.60+git20180626.aebd88e-1ubuntu1 [196 kB]
Fetched 196 kB in 3s (61.5 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 229584 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20180626.aebd88e-1ubuntu1_amd64.deb ...
Unpacking net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Setting up net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
```

#### 5. route

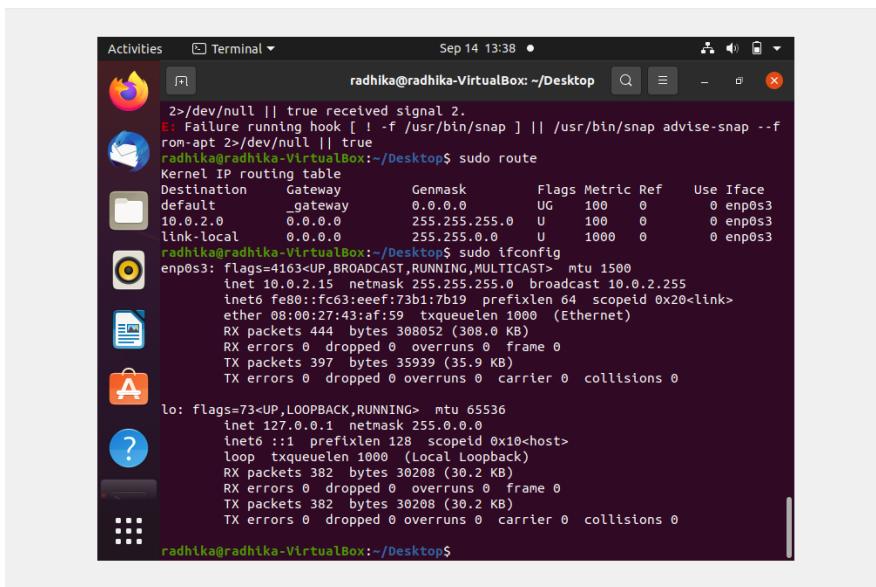
The route command allows **you to make manual entries into the network routing tables**. The route command distinguishes between routes to hosts and routes to networks by interpreting the network address of the Destination variable, which can be specified either by symbolic name or numeric address.



```
Input Devices Help Activities Terminal Sep 14 13:37 radhika@radhika-VirtualBox: ~/Desktop$ sudo route
linux-image-5.8.0-55-generic linux-modules-5.8.0-55-generic
linux-modules-extra-5.8.0-55-generic
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 96 not upgraded.
Need to get 196 kB of archives.
After this operation, 864 kB of additional disk space will be used.
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 net-tools amd64 1.60+git20180626.aebd88e-1ubuntu1 [196 kB]
Fetched 196 kB in 3s (61.5 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 229584 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20180626.aebd88e-1ubuntu1_amd64.deb ...
Unpacking net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Setting up net-tools (1.60+git20180626.aebd88e-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
^C: Sub-process [ ! -f /usr/bin/snap ] || /usr/bin/snap advise-snap --from-apt
2>/dev/null || true received signal 2.
E: Failure running hook [ ! -f /usr/bin/snap ] || /usr/bin/snap advise-snap --f
rom-apt 2>/dev/null || true
radhika@radhika-VirtualBox: ~/Desktop$ sudo route
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
default         _gateway       0.0.0.0       UG   100    0        0 enp0s3
10.0.2.0        0.0.0.0       255.255.255.0  U     100    0        0 enp0s3
link-local      0.0.0.0       255.255.0.0   U     1000   0        0 enp0s3
radhika@radhika-VirtualBox: ~/Desktop$
```

## 6.ipconfig

- ipconfig (standing for "Internet Protocol configuration") is a console application program of some computer operating systems that displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings.
- Ifconfig(interface configuration) command is used to configure the kernel-resident network interfaces. It is used at the boot time to set up the interfaces as necessary. After that, it is usually used when needed during debugging or when you need system tuning. Also, this command is used to assign the IP address and netmask to an interface or to enable or disable a given interface.
- The ifconfig command is supported by Unix-based operating systems. Functionality: The ipconfig command **displays all the currently connected network interfaces whether they are active or not**. On the other hand, the ifconfig command displays only the enabled network interfaces that are connected to the system.



The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is 'Terminal' and the date and time are 'Sep 14 13:38'. The user is radhika@radhika-VirtualBox. The terminal shows the following commands and their outputs:

```
>/dev/null || true received signal 2.  
E: Failure running hook [ ! -f /usr/bin/snap ] || /usr/bin/snap advise-snap --f  
rom-apt >/dev/null || true  
radhika@radhika-VirtualBox:~/Desktop$ sudo route  
Kernel IP routing table  
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface  
default         _gateway       0.0.0.0      UG   100    0        0 enp0s3  
10.0.2.0        0.0.0.0      255.255.255.0 U   100    0        0 enp0s3  
link-local      0.0.0.0      255.255.0.0   U     1000   0        0 enp0s3  
radhika@radhika-VirtualBox:~/Desktop$ sudo ifconfig  
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500  
        inet 10.0.2.15  netmask 255.255.255.0 broadcast 10.0.2.255  
              inet6 fe80::fc03:eeef%73:b1:7b19  prefixlen 64  scopeid 0x20<link>  
        ether 08:00:27:43:af:59  txqueuelen 1000  (Ethernet)  
          RX packets 444  bytes 308052 (308.0 KB)  
          RX errors 0  dropped 0  overruns 0  frame 0  
          TX packets 397  bytes 35939 (35.9 KB)  
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536  
        inet 127.0.0.1  netmask 255.0.0.0  
              inet6 ::1  prefixlen 128  scopeid 0x10<host>  
        loop  txqueuelen 1000  (Local Loopback)  
          RX packets 382  bytes 30208 (30.2 KB)  
          RX errors 0  dropped 0  overruns 0  frame 0  
          TX packets 382  bytes 30208 (30.2 KB)  
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0  
radhika@radhika-VirtualBox:~/Desktop$
```

## WINDOWS

### 1. ping

```
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.

C:\Users\hp>ping www.facebook.com

Pinging star-mini.c10r.facebook.com [157.240.16.35] with 32 bytes of data:
Reply from 157.240.16.35: bytes=32 time=35ms TTL=56
Reply from 157.240.16.35: bytes=32 time=34ms TTL=56
Reply from 157.240.16.35: bytes=32 time=35ms TTL=56
Reply from 157.240.16.35: bytes=32 time=35ms TTL=56

Ping statistics for 157.240.16.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 34ms, Maximum = 35ms, Average = 34ms

C:\Users\hp>
```

### 2. route

```
C:\Users\hp>route www.facebook.com

Manipulates network routing tables.

ROUTE [-f] [-p] [-4|-6] command [destination]
        [MASK netmask] [gateway] [METRIC metric] [IF interface]

-f      Clears the routing tables of all gateway entries. If this is
       used in conjunction with one of the commands, the tables are
       cleared prior to running the command.

-p      When used with the ADD command, makes a route persistent across
       boots of the system. By default, routes are not preserved
       when the system is restarted. Ignored for all other commands,
       which always affect the appropriate persistent routes.

-4      Force using IPv4.

-6      Force using IPv6.
```

### 3. tracert

```
C:\Users\hp>tracert www.facebook.com

Tracing route to star-mini.c10r.facebook.com [157.240.15.35]
over a maximum of 30 hops:

 1       1 ms      1 ms      1 ms  192.168.18.1
 2       3 ms      3 ms      3 ms  100.65.128.1
 3       3 ms      5 ms      3 ms  192.168.20.5
 4       4 ms      4 ms      4 ms  182.73.157.189
 5      47 ms     50 ms     53 ms  182.79.135.16
 6      50 ms     50 ms     51 ms  ae20.pr02.sin6.tfbnw.net [103.4.96.218]
 7      48 ms     47 ms     48 ms  po104.psw04.sin6.tfbnw.net [129.134.55.137]
 8      49 ms     48 ms     48 ms  157.240.37.67
 9      51 ms     50 ms     51 ms  edge-star-mini-shv-03-sin6.facebook.com [157.2
.15.35]

Trace complete.
```

#### 4.netstat

```
C:\Users\hp>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:135            user:0                LISTENING
  TCP    0.0.0.0:445            user:0                LISTENING
  TCP    0.0.0.0:1025           user:0                LISTENING
  TCP    0.0.0.0:1026           user:0                LISTENING
  TCP    0.0.0.0:1027           user:0                LISTENING
  TCP    0.0.0.0:1028           user:0                LISTENING
  TCP    0.0.0.0:1029           user:0                LISTENING
  TCP    0.0.0.0:1030           user:0                LISTENING
  TCP    0.0.0.0:5357           user:0                LISTENING
  TCP    0.0.0.0:8336           user:0                LISTENING
  TCP    0.0.0.0:61406          user:0                LISTENING
  TCP    127.0.0.1:5354          user:0                LISTENING
  TCP    127.0.0.1:8335          user:0                LISTENING
  TCP    127.0.0.1:21896          user:0                LISTENING
  TCP    127.0.0.1:22303          user:23783             ESTABLISHED
  TCP    127.0.0.1:23783          user:22303             ESTABLISHED
  TCP    127.0.0.1:27017          user:0                LISTENING
  TCP    127.0.0.1:39378          user:0                LISTENING
```

#### 5.ipconfig

```
C:\Users\hp>ipconfig

Windows IP Configuration

Wireless LAN adapter Local Area Connection* 3:
  Media State . . . : Media disconnected
  Connection-specific DNS Suffix . . .

Ethernet adapter Bluetooth Network Connection:
  Media State . . . : Media disconnected
  Connection-specific DNS Suffix . . .

Ethernet adapter Ethernet:
  Media State . . . : Media disconnected
  Connection-specific DNS Suffix . . .

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . . .
```

#### 6. nslookup

```
C:\Users\hp>nslookup google.com
Server:  UnKnown
Address: 192.168.18.1

Non-authoritative answer:
Name:   google.com
Addresses: 2404:6800:4009:82a::200e
          172.217.163.206
```

## Q2. Identify and perform 5 more network commands

### 1. hostname

A very simple command that displays the host name of your machine. This is much quicker than going to the control panel>system route.

```
C:\Users\hp>hostname  
user
```

### 2. getmac

Another very simple command that shows the MAC address of your network interfaces.

```
C:\Users\hp>getmac  
  
Physical Address      Transport Name  
=====  =====  
C4-46-19-19-B1-8C  \Device\Tcpip_{0D4A2401-3451-4D82-BA4B-1C9AB9164B7E}  
C8-0A-A9-B5-5E-D5  Media disconnected  
70-F3-95-31-F1-53  Media disconnected  
0A-00-27-00-00-1B  \Device\Tcpip_{A32AE3A3-7E1B-471E-8044-A5284B9570F4}
```

### 3. arp

This is used for showing the **address resolution cache**. This command must be used with a command line switch **arp -a** is the most common.

```
C:\Users\hp>arp -a  
  
Interface: 192.168.18.71 --- 0x3  
Internet Address      Physical Address      Type  
192.168.18.1          fc-1b-d1-8e-89-53  dynamic  
192.168.18.255        ff-ff-ff-ff-ff-ff  static  
224.0.0.22             01-00-5e-00-00-16  static  
224.0.0.251            01-00-5e-00-00-fb  static  
224.0.0.252            01-00-5e-00-00-fc  static  
239.255.255.250       01-00-5e-7f-ff-fa  static  
255.255.255.255       ff-ff-ff-ff-ff-ff  static  
  
Interface: 192.168.56.1 --- 0x1b  
Internet Address      Physical Address      Type  
192.168.56.255        ff-ff-ff-ff-ff-ff  static  
224.0.0.22             01-00-5e-00-00-16  static  
224.0.0.251            01-00-5e-00-00-fb  static  
224.0.0.252            01-00-5e-00-00-fc  static  
239.255.255.250       01-00-5e-7f-ff-fa  static  
255.255.255.255       ff-ff-ff-ff-ff-ff  static
```

#### 4. nbtstat

The nbtstat command is a diagnostic tool for NetBIOS over TCP/IP. Its primary design is to help troubleshoot NetBIOS name resolution problems. The command is included in several versions of Microsoft Windows. ... When a network is functioning normally, NetBIOS over TCP/IP (NetBT) resolves NetBIOS names to IP addresses.

```
C:\Users\hp>nbtstat -r

NetBIOS Names Resolution and Registration Statistics

Resolved By Broadcast      = 0
Resolved By Name Server    = 0

Registered By Broadcast    = 18
Registered By Name Server  = 0
```

#### 5.path ping

The pathping command which provides a combination of the best aspects of Tracert and Ping. This command takes 300 seconds to gather statistics and then returns reports on latency and packet loss statistics at intermediate hops between the source and the target in more detail than those reports provided by Ping or Tracert commands.

```
C:\Users\hp>pathping www.facebook.com

Tracing route to star-mini.c10r.facebook.com [157.240.16.35]
over a maximum of 30 hops:
  0  user [192.168.10.71]
  1  192.168.18.1
  2  100.65.128.1
  3  192.168.20.5
  4  172.16.1.9
  5  10.1.1.254
  6  103.22.170.158
  7  poi04.psw01.bomi.tfbn.net [157.240.53.65]
  8  157.240.38.85
  9  edge-star-mini-shw-01-bomi.facebook.com [157.240.16.35]

Computing statistics for 225 seconds...
Source to Here This Node/Link
Hop RTT Lost/Sent = Pct Lost/Sent = Pct Address
  0          0/ 100 = 0%   0/ 100 = 0% user [192.168.10.71]
  1  1ms   0/ 100 = 0%   0/ 100 = 0% 192.168.18.1
  2  5ms   0/ 100 = 0%   0/ 100 = 0% 100.65.128.1
  3  5ms   0/ 100 = 0%   0/ 100 = 0% 192.168.20.5
  4  4ms   0/ 100 = 0%   0/ 100 = 0% 172.16.1.9
  5  27ms  0/ 100 = 0%   0/ 100 = 0% 10.1.1.254
  6  ---   100/ 100 =100% 99/ 100 = 99% 103.22.170.158
  7  ---   100/ 100 =100% 99/ 100 = 99% poi04.psw01.bomi.tfbn.net [157.240.53.65]
  8  ---   100/ 100 =100% 99/ 100 = 99% 157.240.38.85
  9  35ms  1/ 100 = 1%   0/ 100 = 0% edge-star-mini-shw-01-bomi.facebook.com [157.240.16.35]

Trace complete.
```

## Install apache

- **Update your system**

```
sudo apt update
```

- **Install Apache using apt:**

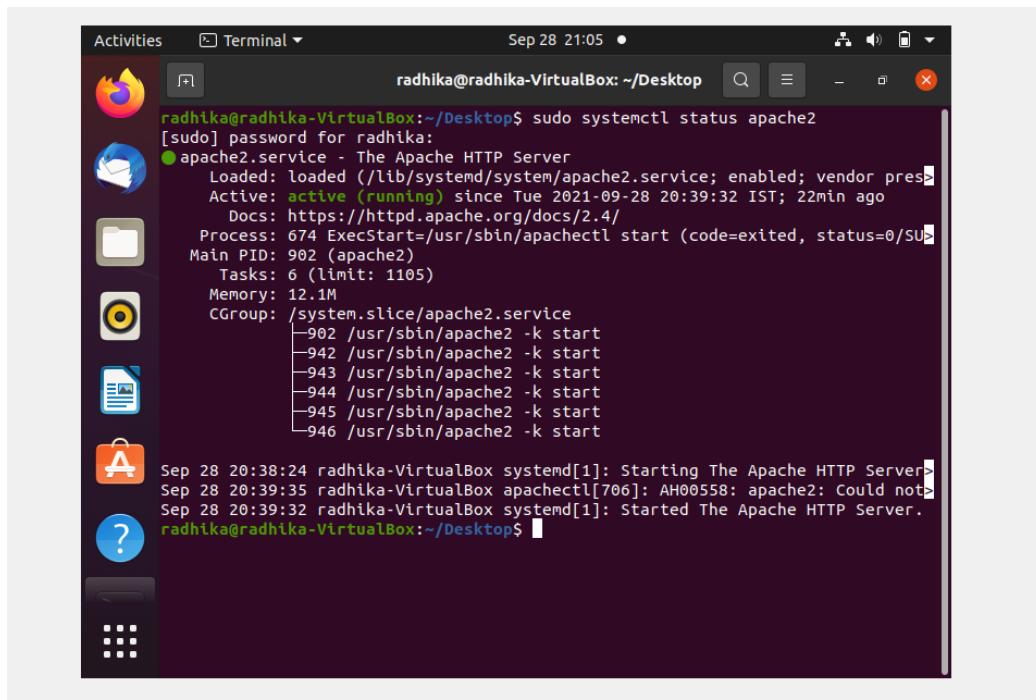
```
sudo apt install apache2
```

- **Confirm that Apache is now running with the following command:**

```
sudo systemctl status apache2
```

- **if it is not working**

```
sudo systemctl start apache2
```



```
Activities Terminal Sep 28 21:05 radhika@radhika-VirtualBox:~/Desktop$ sudo systemctl status apache2
[sudo] password for radhika:
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres
   Active: active (running) since Tue 2021-09-28 20:39:32 IST; 22min ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 674 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SU
 Main PID: 902 (apache2)
   Tasks: 6 (limit: 1105)
  Memory: 12.1M
    CGroup: /system.slice/apache2.service
            ├─902 /usr/sbin/apache2 -k start
            ├─942 /usr/sbin/apache2 -k start
            ├─943 /usr/sbin/apache2 -k start
            ├─944 /usr/sbin/apache2 -k start
            ├─945 /usr/sbin/apache2 -k start
            └─946 /usr/sbin/apache2 -k start

Sep 28 20:38:24 radhika-VirtualBox systemd[1]: Starting The Apache HTTP Server
Sep 28 20:39:35 radhika-VirtualBox apachectl[706]: AH00558: apache2: Could not
Sep 28 20:39:32 radhika-VirtualBox systemd[1]: Started The Apache HTTP Server.
radhika@radhika-VirtualBox:~/Desktop$
```

## Install mariadb

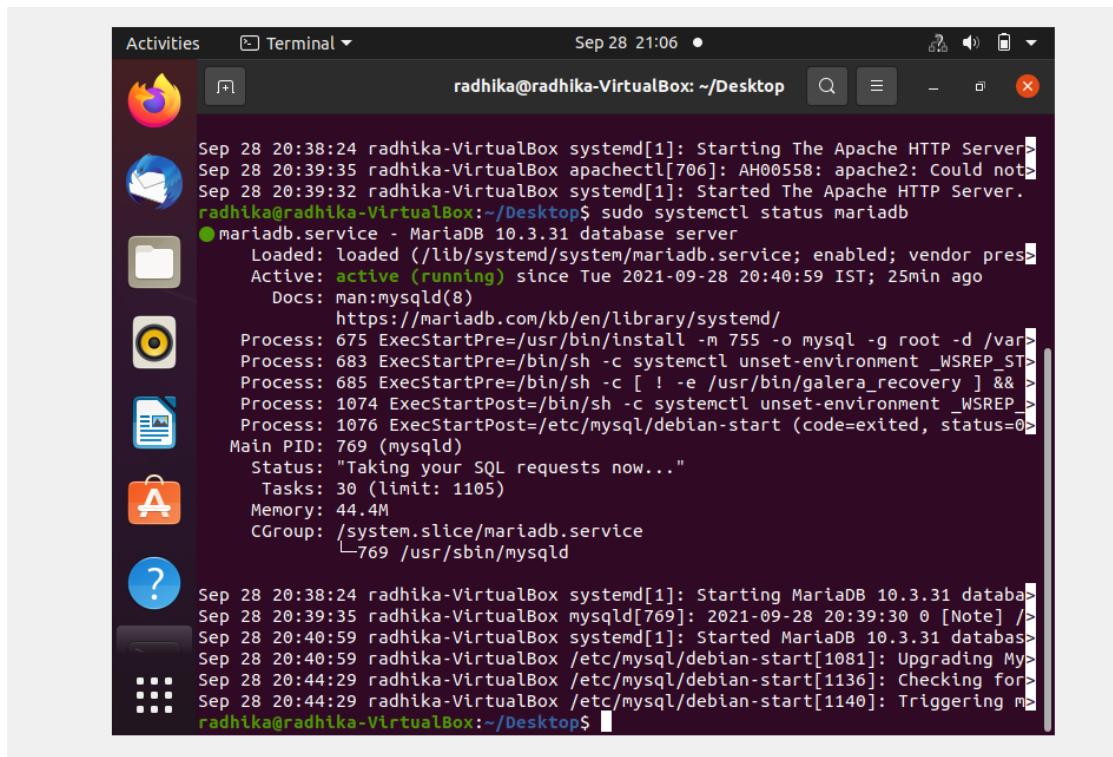
- **Install mariaDB**

```
sudo apt install mariadb-server mariadb-client
```

- **Check mariadb Installation**

```
sudo systemctl status mysql
```

(if it is not working sudo systemctl start mysql )



```
Activities Terminal Sep 28 21:06 ● radhika@radhika-VirtualBox: ~/Desktop Q - X
Sep 28 20:38:24 radhika-VirtualBox systemd[1]: Starting The Apache HTTP Server>
Sep 28 20:39:35 radhika-VirtualBox apachectl[706]: AH00558: apache2: Could not>
Sep 28 20:39:32 radhika-VirtualBox systemd[1]: Started The Apache HTTP Server.>
radhika@radhika-VirtualBox:~/Desktop$ sudo systemctl status mariadb
● mariadb.service - MariaDB 10.3.31 database server
   Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor pres>
   Active: active (running) since Tue 2021-09-28 20:40:59 IST; 25min ago
     Docs: man:mysqld(8)
           https://mariadb.com/kb/en/library/systemd/
  Process: 675 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var>
  Process: 683 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_ST>
  Process: 685 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && >
  Process: 1074 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_ST>
  Process: 1076 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0>
 Main PID: 769 (mysqld)
   Status: "Taking your SQL requests now..."
     Tasks: 30 (limit: 1105)
    Memory: 44.4M
      CGroup: /system.slice/mariadb.service
              └─769 /usr/sbin/mysqld

Sep 28 20:38:24 radhika-VirtualBox systemd[1]: Starting MariaDB 10.3.31 database>
Sep 28 20:39:35 radhika-VirtualBox mysqld[769]: 2021-09-28 20:39:30 0 [Note] />
Sep 28 20:40:59 radhika-VirtualBox systemd[1]: Started MariaDB 10.3.31 database>
Sep 28 20:40:59 radhika-VirtualBox /etc/mysql/debian-start[1081]: Upgrading My>
Sep 28 20:44:29 radhika-VirtualBox /etc/mysql/debian-start[1136]: Checking for>
Sep 28 20:44:29 radhika-VirtualBox /etc/mysql/debian.start[1140]: Triggering m>
radhika@radhika-VirtualBox:~/Desktop$
```

## Install PHP

- **Install PHP**

```
sudo apt install php libapache2-mod-php php-opcache php-cli php-gd php-curl php-mysql
```

- **Restart apache2**

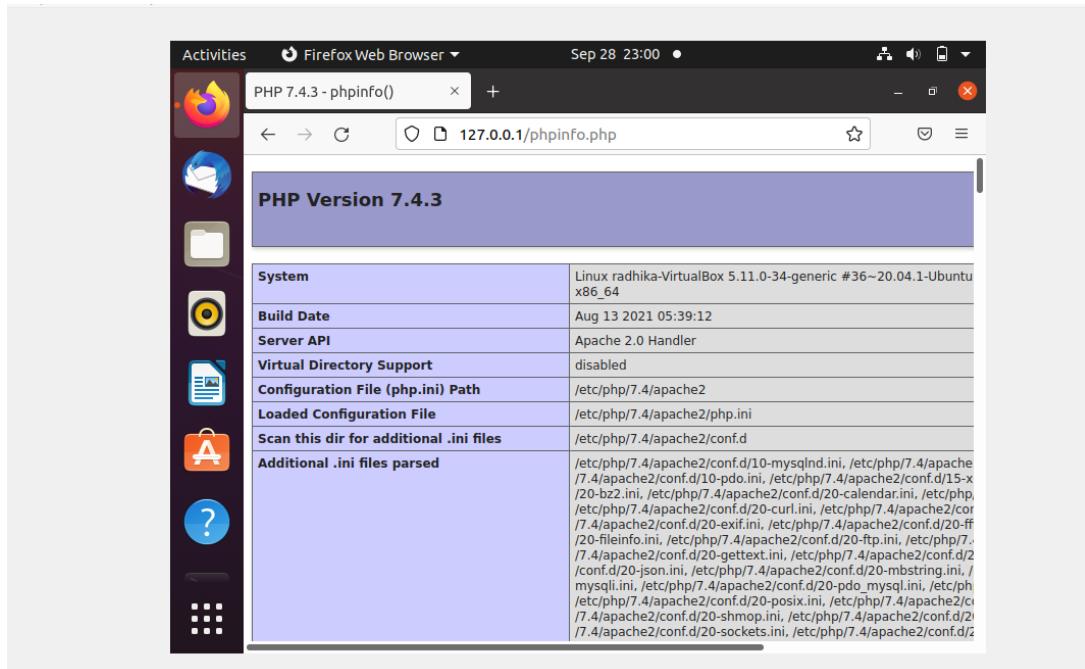
```
sudo systemctl restart apache2
```

- **Now you can check php installation**

```
sudo echo "<?php phpinfo(); ?>" | sudo tee -a /var/www/html/phpinfo.php >/dev/null
```

- **Open a browser**

<http://127.0.0.1/phpinfo.php>



## Install phpmyadmin

- **Install phpmyadmin**

```
sudo apt install phpmyadmin php-mbstring php-zip php-gd php-json php-curl
```

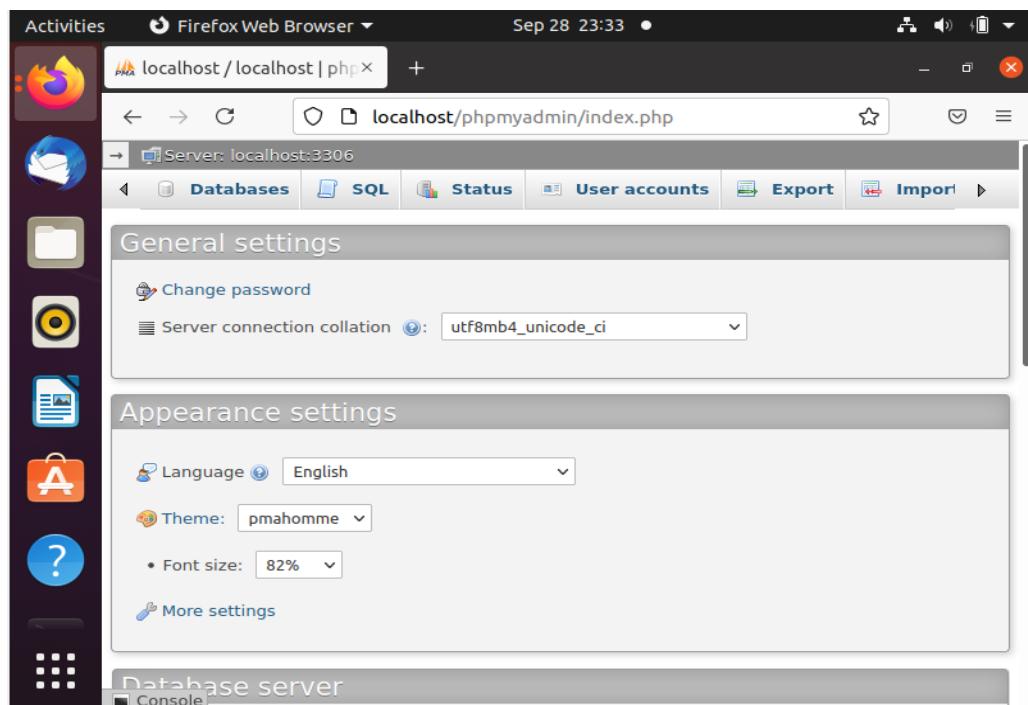
( It ask for webserver select apache2, select db configuration and set password )

- **Restart apache2**

```
sudo systemctl restart apache2
```

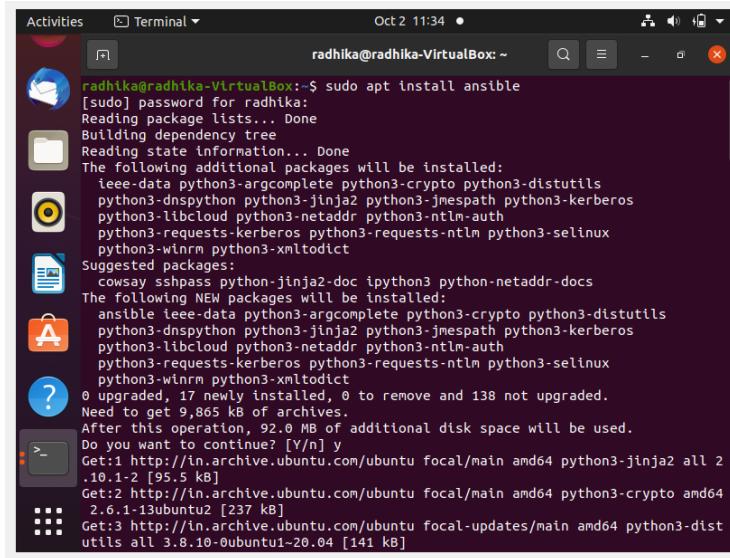
- **Check phpmyadmin**
- **Open a browser**

<http://localhost/phpmyadmin>

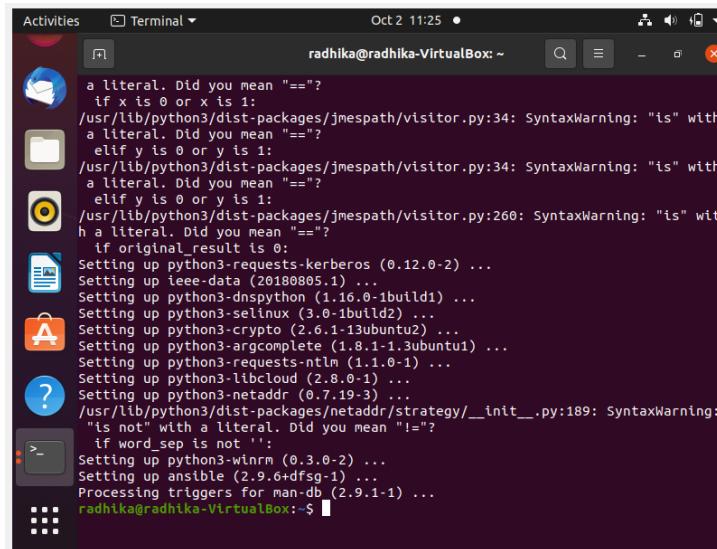


# 1.Explain the steps for the installation of ansible with your own screenshots.

sudo apt install ansib



```
Activities Terminal Oct 2 11:34 • radhika@radhika-VirtualBox:~ radhika@radhika-VirtualBox:~$ sudo apt install ansible [sudo] password for radhika: Reading package lists... Done Building dependency tree Reading state information... Done The following additional packages will be installed: ieee-data python3-argcomplete python3-crypto python3-distutils python3-dnspython python3-jinja2 python3-jmespath python3-kerberos python3-libcloud python3-netaddr python3-ntlm-auth python3-requests-kerberos python3-requests-ntlm python3-selinux python3-wlrm python3-xmltodict Suggested packages: Coway sshpass python-jinja2-doc ipython3 python-netaddr-docs The following NEW packages will be installed: ansible ieee-data python3-argcomplete python3-crypto python3-distutils python3-dnspython python3-jinja2 python3-jmespath python3-kerberos python3-libcloud python3-netaddr python3-ntlm-auth python3-requests-kerberos python3-requests-ntlm python3-selinux python3-wlrm python3-xmltodict 0 upgraded, 17 newly installed, 0 to remove and 138 not upgraded. Need to get 9,865 kB of archives. After this operation, 92.0 MB of additional disk space will be used. Do you want to continue? [Y/n] y Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-jinja2 all 2 .10.1-2 [95.5 kB] Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-crypto amd64 2.6.1-13ubuntu2 [237 kB] Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-dist utils all 3.8.10-0ubuntu1-20.04 [141 kB]
```



```
Activities Terminal Oct 2 11:25 • radhika@radhika-VirtualBox:~ radhika@radhika-VirtualBox:~ a literal. Did you mean "=="? if x is 0 or x is 1: /usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="? elif y is 0 or y is 1: /usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="? elif y is 0 or y is 1: /usr/lib/python3/dist-packages/jmespath/visitor.py:260: SyntaxWarning: "is" wit h a literal. Did you mean "=="? if original_result is 0: Setting up python3-requests-kerberos (0.12.0-2) ... Setting up ieee-data (20180805.1) ... Setting up python3-dnspython (1.16.0-1build1) ... Setting up python3-selinux (3.0-1build2) ... Setting up python3-crypto (2.6.1-13ubuntu2) ... Setting up python3-argcomplete (1.8.1-1.3ubuntu1) ... Setting up python3-requests-ntlm (1.1.0-1) ... Setting up python3-libcloud (2.8.0-1) ... Setting up python3-netaddr (0.7.19-3) ... /usr/lib/python3/dist-packages/netaddr/strategy/__init__.py:189: SyntaxWarning: "is not" with a literal. Did you mean "!="? if word_sep is not ' ': Setting up python3-wlrm (0.3.0-2) ... Setting up ansible (2.9.6+dfsg-1) ... Processing triggers for man-db (2.9.1-1) ... radhika@radhika-VirtualBox:~$
```

ansible --version

```
! Processing triggers for man-db (2.9.1-1) ...
radhika@radhika-VirtualBox:~$ ansible --version
ansible 2.9.6
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/radhika/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 3.8.10 (default, Jun  2 2021, 10:49:15) [GCC 9.4.0]
radhika@radhika-VirtualBox:~$
```

## Installation of tcpdump

```
sudo apt install tcpdump
```

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "radhika@radhika-VirtualBox: ~". The user has run the command "sudo apt install tcpdump" and received the following output:

```
[sudo] password for radhika:  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
tcpdump is already the newest version (4.9.3-4).  
tcpdump set to manually installed.  
0 upgraded, 0 newly installed, 0 to remove and 138 not upgraded.  
radhika@radhika-VirtualBox: ~
```

The desktop interface includes a dock on the left with icons for various applications like a file manager, terminal, and system settings.

## Sudo tcpdump

```
radhika@radhika-VirtualBox: ~
TR 84.170.224.35.bc.googleusercontent.com. (96)
11:56:10.972514 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51742: Flags [S.], seq 210304001, ack 1403834265, win 65535, options [mss
1460], length 0
11:56:10.972622 IP radhika-VirtualBox.51742 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [.], ack 1, win 64240, length 0
11:56:10.974217 IP radhika-VirtualBox.51742 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [P.], seq 1:88, ack 1, win 64240, length 87: HTTP: GET / HTTP
/1.1
11:56:10.975576 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51742: Flags [.], ack 88, win 65535, length 0
11:56:11.243794 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51742: Flags [P.], seq 1:149, ack 88, win 65535, length 148: HTTP: HTTP/1.
1 204 No Content
11:56:11.243867 IP radhika-VirtualBox.51742 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [.], ack 149, win 64092, length 0
11:56:11.244807 IP radhika-VirtualBox.51742 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [F.], seq 88, ack 149, win 64092, length 0
11:56:11.245464 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51742: Flags [.], ack 89, win 65535, length 0
11:56:11.250506 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51742: Flags [F.], seq 149, ack 89, win 65535, length 0
11:56:11.250596 IP radhika-VirtualBox.51742 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [.], ack 150, win 64092, length 0
^C
39 packets captured
39 packets received by filter
0 packets dropped by kernel
radhika@radhika-VirtualBox:~$
```

tcpdump -D

tcpdump -l emp0s3

sudo tcpdump -c 5

```
0 packets dropped by kernel
radhika@radhika-VirtualBox: ~$ tcpdump -D
1.eth0s3 [Up, Running]
2.lo [Up, Running, Loopback]
3.any [Pseudo-device that captures on all interfaces] [Up, Running]
4.bluetooth-monitor [Bluetooth Linux Monitor] [none]
5.nflog [Linux netfilter log (NFLOG) interface] [none]
6.nfqueue [Linux netfilter queue (NFQUEUE) interface] [none]
radhika@radhika-VirtualBox: ~$ sudo tcpdump -l emp0s3
tcpdump: emp0s3: You don't have permission to capture on that device
(socket: Operation not permitted)
radhika@radhika-VirtualBox: ~$ sudo tcpdump -c 5
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on emp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
^C
0 packets captured
0 packets received by filter
0 packets dropped by kernel
radhika@radhika-VirtualBox: ~$
```

Sudo tcpdump -i emp0s3 -c 5 port 80

```
0 packets received by filter
0 packets dropped by kernel
radhika@radhika-VirtualBox: ~$ sudo tcpdump -i emp0s3 -c 5 port 80
tcpdump: emp0s3: No such device exists
(SIOCGIFHWADDR: No such device)
radhika@radhika-VirtualBox: ~$ sudo tcpdump -i emp0s3 -c 5 port 80
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on emp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
12:16:31.529303 IP radhika-VirtualBox.51752 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [S], seq 3645471033, win 64240, options [mss 1460,sackOK,TS v
al 3455154872 ecr 0,nop,wscale 7], length 0
12:16:31.883572 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51752: Flags [S.], seq 213376001, ack 3645471034, win 65535, options [mss
1460], length 0
12:16:31.883669 IP radhika-VirtualBox.51752 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [.], ack 1, win 64240, length 0
12:16:31.884623 IP radhika-VirtualBox.51752 > 84.170.224.35.bc.googleusercontent
.com.http: Flags [P.], seq 1:88, ack 1, win 64240, length 87: HTTP: GET / HTTP
/1.1
12:16:31.885196 IP 84.170.224.35.bc.googleusercontent.com.http > radhika-Virtua
lBox.51752: Flags [.], ack 88, win 65535, length 0
5 packets captured
5 packets received by filter
0 packets dropped by kernel
radhika@radhika-VirtualBox: ~$
```

## Sudo tcpdump host 10.0.2.15

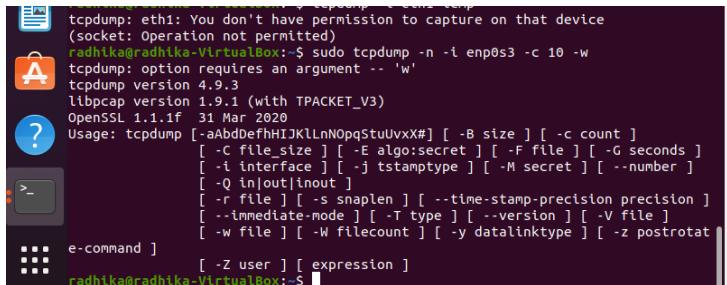
```
Activities Terminal Oct 2 12:21 • radhika@radhika-VirtualBox:~  
tcpdump: enp0s3: You don't have permission to capture on that device  
(socket: Operation not permitted)  
radhika@radhika-VirtualBox:~$ sudo tcpdump host 10.0.2.15  
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode  
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes  
12:19:34.685816 IP radhika-VirtualBox.60317 > 192.168.43.1.domain: 63489+ AAAA?  
connectivity-check.ubuntu.com. (47)  
12:19:34.689355 IP radhika-VirtualBox.36759 > 192.168.43.1.domain: 64869+ PTR?  
1.43.168.192.in-addr.arpa. (43)  
12:19:34.703809 IP 192.168.43.1.domain > radhika-VirtualBox.36759: 64869 NXDoma  
in 0/0/0 (43)  
12:19:34.703874 IP 192.168.43.1.domain > radhika-VirtualBox.60317: 63489 0/0/0  
(47)  
12:19:34.708485 IP radhika-VirtualBox.49325 > 192.168.43.1.domain: 10759+ AAAA?  
connectivity-check.ubuntu.com. (47)  
12:19:34.709962 IP radhika-VirtualBox.59372 > 192.168.43.1.domain: 64613+ PTR?  
15.2.0.10.in-addr.arpa. (40)  
12:19:34.714575 IP 192.168.43.1.domain > radhika-VirtualBox.49325: 10759 0/0/0  
(47)  
12:19:34.718452 IP 192.168.43.1.domain > radhika-VirtualBox.59372: 64613 NXDoma  
in 0/0/0 (40)  
12:19:39.890994 ARP, Request who-has _gateway tell radhika-VirtualBox, length 2  
8  
12:19:39.891346 ARP, Reply _gateway is-at 52:54:00:12:35:02 (oui Unknown), leng  
th 46  
12:19:39.892526 IP radhika-VirtualBox.45125 > 192.168.43.1.domain: 3925+ PTR? 2  
.2.0.10.in-addr.arpa. (39)  
12:19:39.900434 IP 192.168.43.1.domain > radhika-VirtualBox.45125: 3925 NXDomai  
n 0/0/0 (39)
```

```
radhika@radhika-VirtualBox:~  
12:19:34.709962 IP radhika-VirtualBox.59372 > 192.168.43.1.domain: 64613+ PTR?  
15.2.0.10.in-addr.arpa. (40)  
12:19:34.714575 IP 192.168.43.1.domain > radhika-VirtualBox.49325: 10759 0/0/0  
(47)  
12:19:34.718452 IP 192.168.43.1.domain > radhika-VirtualBox.59372: 64613 NXDoma  
in 0/0/0 (40)  
12:19:39.890994 ARP, Request who-has _gateway tell radhika-VirtualBox, length 2  
8  
12:19:39.891346 ARP, Reply _gateway is-at 52:54:00:12:35:02 (oui Unknown), leng  
th 46  
12:19:39.892526 IP radhika-VirtualBox.45125 > 192.168.43.1.domain: 3925+ PTR? 2  
.2.0.10.in-addr.arpa. (39)  
12:19:39.900434 IP 192.168.43.1.domain > radhika-VirtualBox.45125: 3925 NXDomai  
n 0/0/0 (39)  
12:20:10.435895 IP radhika-VirtualBox.mdns > 224.0.0.251.mdns: 0 [2q] PTR (QM)?  
_ippst._tcp.local. PTR (QM)? _ipp._tcp.local. (45)  
12:20:10.437766 IP radhika-VirtualBox.50202 > 192.168.43.1.domain: 50702+ PTR?  
251.0.0.224.in-addr.arpa. (42)  
12:20:10.444311 IP 192.168.43.1.domain > radhika-VirtualBox.50202: 50702 NXDoma  
in 0/0/0 (42)  
12:20:15.475063 ARP, Request who-has _gateway tell radhika-VirtualBox, length 2  
8  
12:20:15.475499 ARP, Reply _gateway is-at 52:54:00:12:35:02 (oui Unknown), leng  
th 46  
^C  
17 packets captured  
17 packets received by filter  
0 packets dropped by kernel  
radhika@radhika-VirtualBox:~$
```

tcpdump -i eth1 icmp

```
(SIOCGIFHWADDR: No such device)  
radhika@radhika-VirtualBox:~$ tcpdump -i eth1 icmp  
tcpdump: eth1: You don't have permission to capture on that device  
(socket: Operation not permitted)  
radhika@radhika-VirtualBox:~$
```

```
sudo tcpdump -n -i enp0s3 -c 10 -w
```



A screenshot of a terminal window with a dark background and light-colored text. The window has several icons in the top-left corner: a blue square with 'E', an orange square with 'A', a blue circle with a question mark, and a grey square with '>-'.

```
tcpdump: eth1: You don't have permission to capture on that device
(socket: Operation not permitted)
radhika@radhika-VirtualBox:~$ sudo tcpdump -n -i enp0s3 -c 10 -w
tcpdump: option requires an argument -- 'w'
tcpdump version 4.9.3
libpcap version 1.9.1 (with TPACKET_V3)
OpenSSL 1.1.1f  31 Mar 2020
Usage: tcpdump [-AAbDDefHhIJKLlnNOpqStuuVvxX#] [ -B size ] [ -c count ]
           [ -C file_size ] [ -E algo:secret ] [ -F file ] [ -G seconds ]
           [ -i interface ] [ -j timestamptype ] [ -M secret ] [ --number ]
           [ -Q in|out|inout ]
           [ -r file ] [ -s snaplen ] [ --time-stamp-precision precision ]
           [ --immediate-mode ] [ -T type ] [ --version ] [ -V file ]
           [ -w file ] [ -W filecount ] [ -y datalinktype ] [ -z postrotat
e-command ]
           [ -Z user ] [ expression ]
radhika@radhika-VirtualBox:~$
```

**1.** Write a shell script to ask your name, and college name and print it on the screen.

```
echo "enter details and view"
echo enter your name
read name
echo enter your college name
read c
clear
echo Details you entered
echo Name:$name
echo College:$c
```

**OUTPUT:**

```
enter details and view
enter your name
radhika
enter your college name
AJCE
```

**2.** Write a shell script to set a value for a variable and display it on command line interface.

```
echo "Display value of a variable"
a=50
echo $a
```

**OUTPUT:**

```
user@user-VirtualBox: $ bash 2.sh
Display value of a variable
50
```

**3.** Write a shell script to perform addition, subtraction, multiplication, division with two numbers that is accepted from user.

```
echo enter a number
read a
echo enter another number
read b
echo enter operation
echo "\n1.addition \n2.subtraction \n3.multiplication \n4.division"
read op
case "$op" in
"1") echo "a+b=$((a+b));;
"2") echo "a-b=$((a-b));;
"3") echo "a*b=$((a*b));;
"4") echo "a/b=$((a/b));;
esac
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 3.sh
enter a number
7
enter another number
8
enter operation
\n1.addition \n2.subtraction \n3.multiplication \n4.division
2
a-b=-1
```

**4.** Write a shell script to check the value of a given number and display whether the number is found or not.

```
echo enter a number
read a
if [ $a -eq 10 ];
then
echo "number found"
else
echo "not found"
fi
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 4.sh
enter a number
9
not found
```

## 5. Write a shell script to display current date, calendar.

```
echo "Today is $(date)"  
echo "calender:"  
cal
```

### OUTPUT:

```
user@user-VirtualBox:~$ bash 5.sh  
Today is Saturday 02 October 2021 05:53:45 PM IST  
calender:  
          October 2021  
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
```

## 6. Write a shell script to check a number is even or odd. #!/bin/bash

```
echo enter a number  
read n  
x=$(( $n % 2 ))  
if [ $x -eq 0 ];  
then  
echo "number is even"  
else  
echo "number is odd"  
fi
```

### OUTPUT:

```
user@user-VirtualBox:~$ bash 6.sh  
enter a number  
4  
number is even
```

## 7. Write a shell script to check a number is greater than, less than or equal to another number.

```
echo enter first number  
read a  
echo enter second number  
read b  
if [ $a -gt $b ];  
then
```

```
echo "$a is larger"
elif [ $b -gt $a ];
then
echo "$b is larger"
else
echo "both are equal"
fi
```

## OUTPUT:

```
user@user-VirtualBox:~$ bash 7.sh
enter first number
54
enter second number
34
54 is larger
```

## 8. Write a shell script to find the sum of first 10 numbers.

```
s=0
for ((i=0;i<=10;i++))
do
s=`expr $s + $i`
done
echo "sum of first 10 numbers=$s"
```

## OUTPUT:

```
user@user-VirtualBox:~$ bash 8.sh
sum of first 10 numbers=55
```

## 9. Write a shell script to find the sum, the average and the product of the four integers entered.

```
echo please enter your first number
read a
echo please enter your second number
read b
echo please enter your third number
read c
echo please enter your fourth number
read d
sum=$(($a + $b + $c + $d))
prod=$(($a * $b * $c * $d))
avg=$(echo $sum/4 | bc -l)
```

```
echo "the sum is:$sum
echo "the average is:$avg
echo "the product is:$prod
```

## OUTPUT:

```
user@user-VirtualBox:~$ bash 9.sh
please enter your first number
1
please enter your second number
2
please enter your third number
3
please enter your fourth number
4
the sum is:10
the average is:2.5000000000000000000000000000000
the product is:24
```

## 10. Write a shell script to find the smallest of three numbers.

```
echo enter first number
read a
echo enter second number
read b
echo enter third number
read c
if [ $a -lt $b ];
then
if [ $a -lt $c ];
then
echo "$a is smallest"
fi
elif [ $b -lt $c ];
then
echo "$b is smallest"
else
echo "$c is smallest";
fi
```

## OUTPUT:

```
user@user-VirtualBox:~$ bash 10.sh
enter first number
5
enter second number
2
enter third number
6
2 is smallest
```

**11.** Write a shell program to find factorial of given number.

```
echo enter a number
read n
f=1
for ((i=2;i<=n;i++))
do
f=$((f*i))
done
echo "factorial is $f"
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 11.sh
enter a number
5
factorial is 120
```

**12.** Write a shell program to check a number is palindrome or not.

```
echo enter a number
read n
rev=$(echo $n | rev)
if [ $n -eq $rev ];
then
echo "number is palindrome"
else
echo "number is not palindrome"
fi
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 12.sh
enter a number
1221
number is palindrome
```

**13.** Write a shell script to find the average of the numbers entered in command line.

```
echo enter size
read n
i=1
s=0
echo "enter numbers"
while [ $i -le $n ]
do
read num
s=$((s+num))
i=$((i+1))
done
avg=$(echo $s/$n | bc -l)
echo "average is $avg"
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 13.sh
enter size
5
enter numbers
6
7
8
9
4
average is 6.80000000000000000000000000
```

**14.** Write a shell program to find the sum of all the digits in a number.

```
echo enter a number
read n
s=0
while [ $n -gt 0 ]
do
mod=$((n%10))
s=$((s+mod))
n=$((n/10))
done
echo "sum of digit is $s"
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 14.sh
enter a number
678
sum of digit is 21
```

**15.** Write a shell Script to check whether given year is leap year or not.

```
echo enter year
read y
a=$((y%4))
b=$((y%100))
c=$((y%400))
if [ $a -eq 0 -a $b -ne 0 -o $c -eq 0 ];
then
echo "$y is leap year"
else
echo "$y is leap year"
fi
```

**OUTPUT:**

```
user@user-VirtualBox:~$ bash 15.sh
enter year
1994
1994 is leap year
```