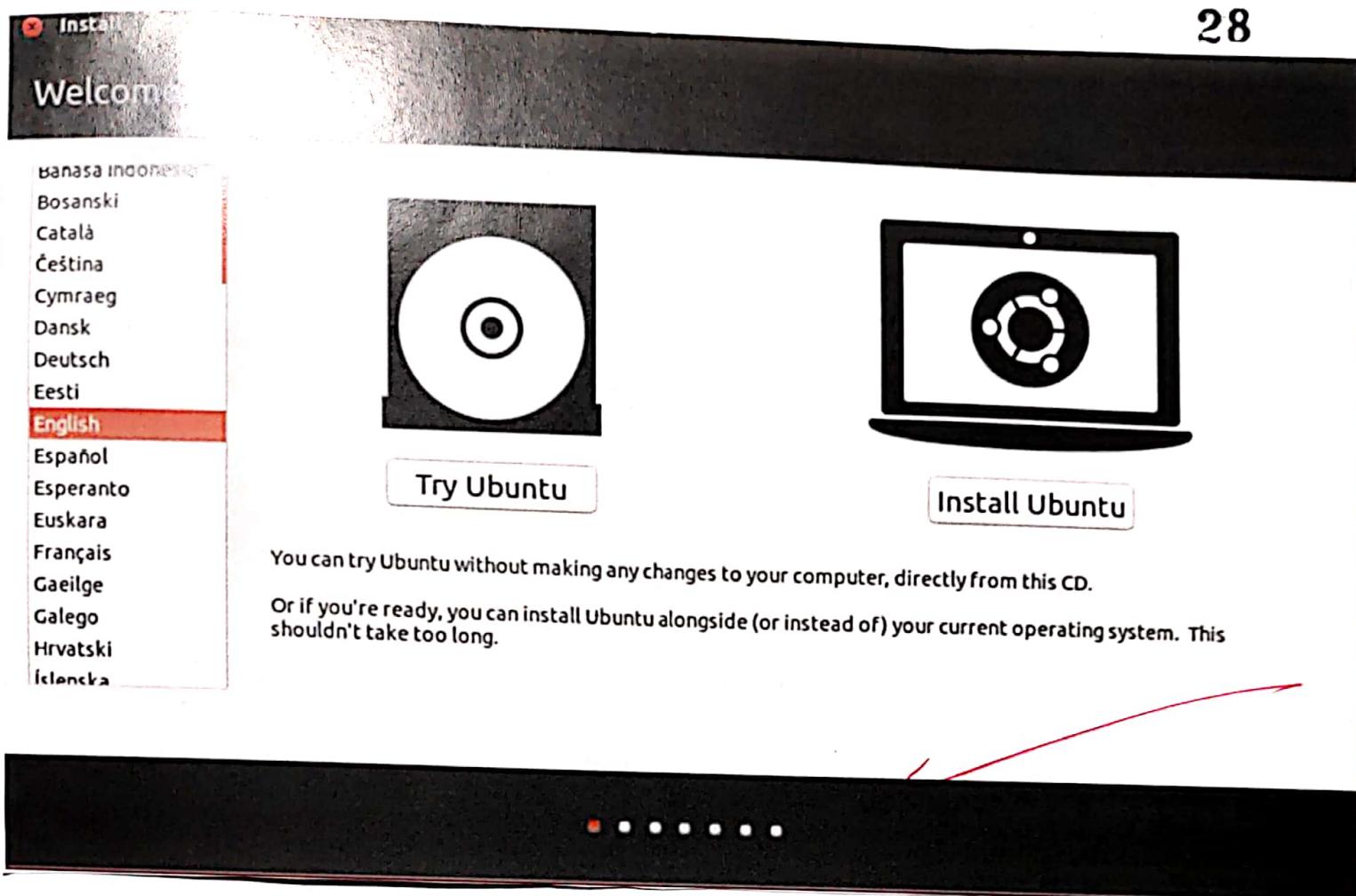


## Practical No. 1

Aim: a) Learn any open source operating system of your choice Linux, Android, FreeBSD, Open Solaris  
b) Learn the installation.  
c) Identify the unique feature of the os of your choice

- a) i) Linux is a family of open source Unix like operating system based on the Linux kernel an operating system kernel first released on September 17, 1991 by Linus Torvalds. Linux is typically packed in a Linux kernel.
- ii) Popular Linux distribution include Debian, Fedora and Ubuntu.
- iii) There are commercial distribution of Linux too such as Red Hat, Enterprise Linux and SUSE Linux Enterprise Server.
- iv) Linux is one of the most powerful & prominent examples of free and open source software collaboration. The source code may be used modified and distributed commercially or non-commercially by anyone under the terms of its respective license like GNU General Public License.



Install

## Keyboard layout

Choose your keyboard layout:

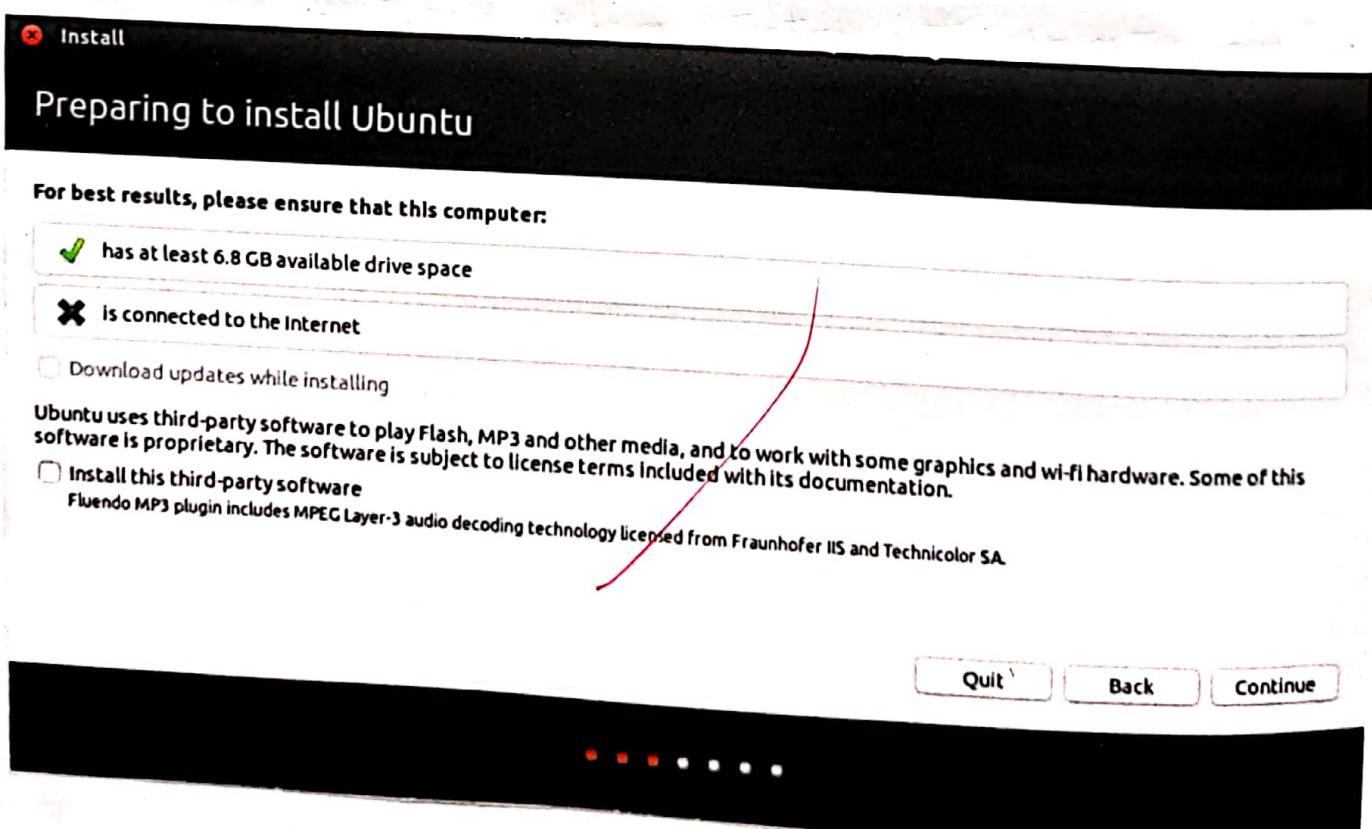
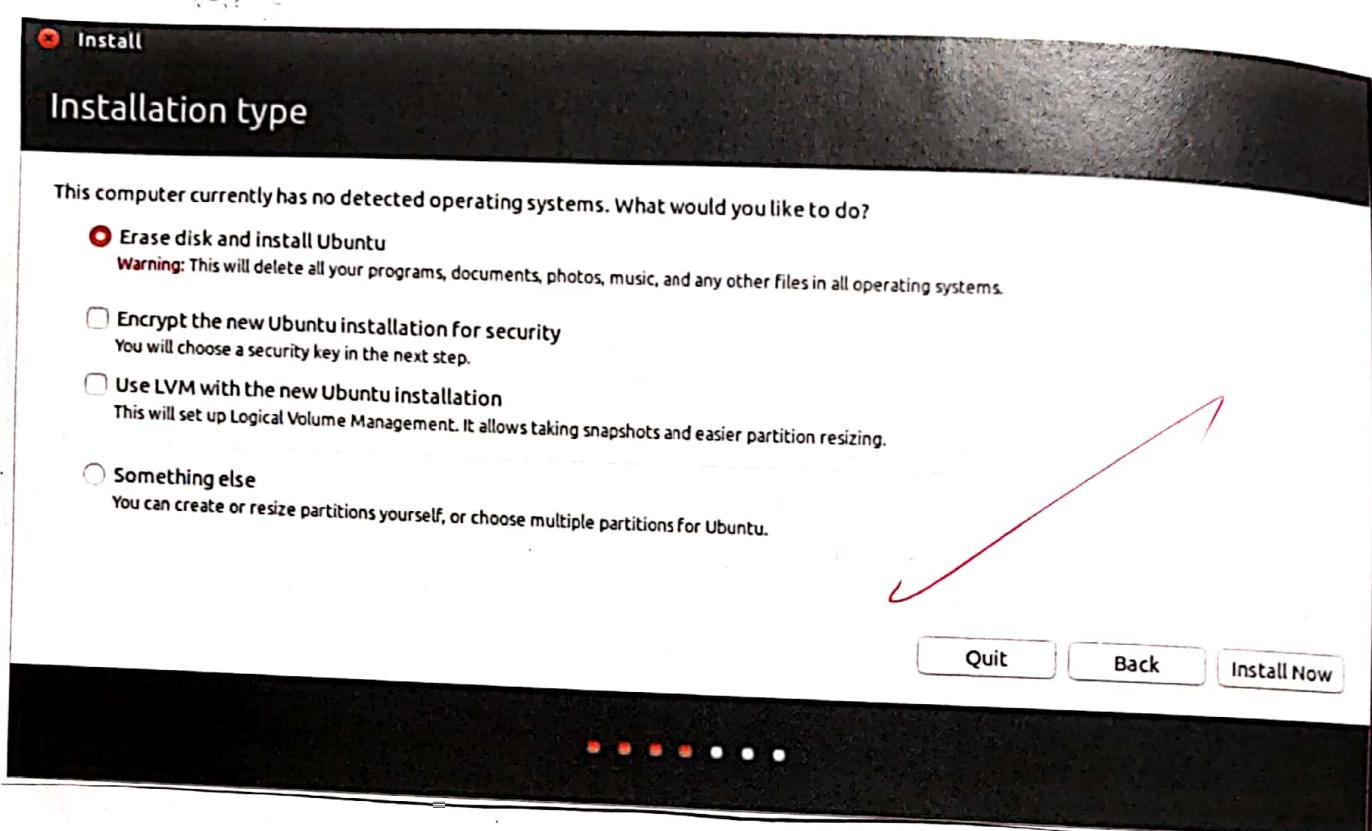
- English (Ghana)
- English (Nigeria)
- English (South Africa)
- English (UK)
- English (US)**
- Esperanto
- Estonian
- Faroese
- Filipino

Type here to test your keyboard

Detect Keyboard Layout

- English (US)**
- English (US) - Cherokee
- English (US) - English (Colemak)
- English (US) - English (Dvorak alternative international no dead keys)
- English (US) - English (Dvorak)
- English (US) - English (Dvorak, International with dead keys)
- English (US) - English (Macintosh)
- English (US) - English (US, alternative international)
- English (US) - English (US international with dead keys)

Back Continue



b) We are given to install the widely known distribution to Linux by UBUNTU

Step 1: Load the iso file in the bootable device or optical disk.

Step 2: Boot up the machine and it will prompt with two option either Try UBUNTU or Install UBUNTU. Click on install Ubuntu.

Step 3: The next page will ask you to configure your keyboard layout. Choose your desired keyboard and then click on continue.

Step 4: It will now ask you about the configuration related to the updates and other software. Configure this part accordingly to your requirement and then click on continue.

Step 5: On the next screen it will ask you to enter your location. After inserting your location click on continue.

PS:

Step 6: Now the screen will ask about the properties like your name, username, password etc.

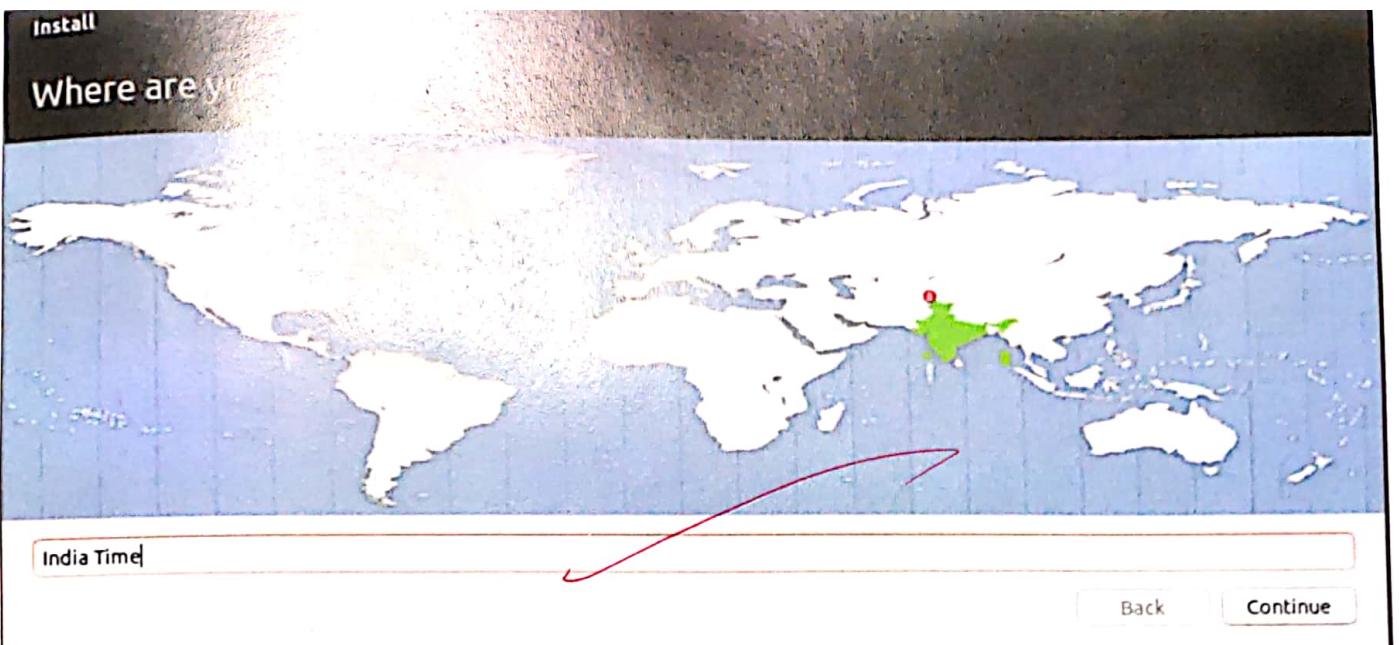
After setting up all those things click on continue.

Step 7: Wait for the setup to install the OS and load all the files.

Step 8: After the installation is complete it will tell you to restart the machine and the restart you are good to go.

c) The best and unique feature of UBUNTU are as follows:-

- 1) Easy to install.
- 2) Good support for hardware and easy to install printer, network devices etc.
- 3) Easy to launch commonly used application from the launcher on the left hand side.
- 4) Intuitive dash interface making it easy to find application.
- 5) Strong kernel application.



Who are you?

Your name: Dhaval ✓

Your computer's name: dhaval-VirtualBox ✓  
The name it uses when it talks to other computers.

Pick a username: dhaval ✓

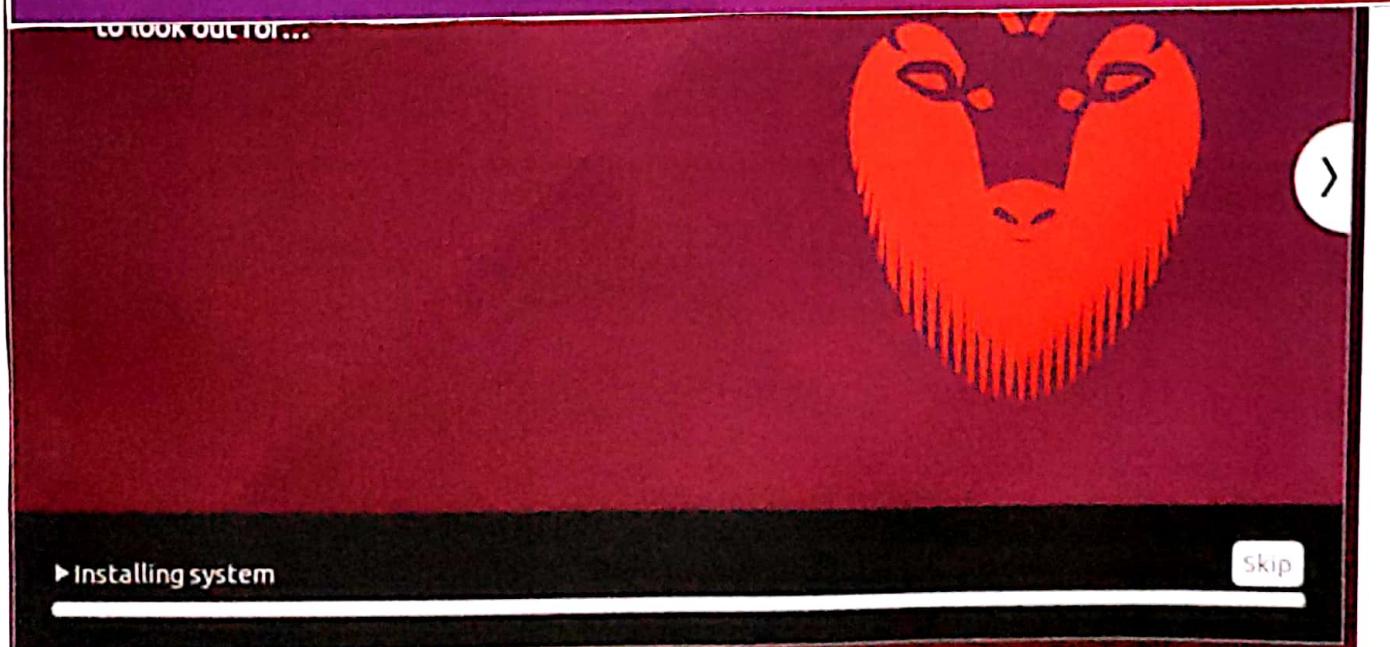
Choose a password:  Short password

Confirm your password:  ✓

Log in automatically  
 Require my password to log in  
 Encrypt my home folder

Back Continue

A progress bar consisting of several small, semi-transparent dots arranged horizontally.



08

## All Settings Appearance

## Look Behavior

## Background



Forever (2560 x 1695)

## Theme

#### **Launcher icon size**



### Ambiance (default)

34

- a) Install your choice of Linux distribution e.g Ubuntu, Fedora, Debian.
- b) Customize desktop environment by changing different default options like changing default background themes, screen savers.
- To access Appearance Settings in Ubuntu, let's click on the User menu at the top right corner, on the top Menu bar & select System settings. A window will pop-up with all settings divided into Personal, Hardware and System option icons. Let's first select the Appearance icon.

### Changing wallpaper picture

- On the left side of Background part, you can see your current wallpaper.
- On the right side is part where we can select one of Ubuntu wallpaper. Clicking on any thumbnail our wallpaper will be changed right away with a fading effect.
- If you want to select wallpaper from your Picture folder, click the drop-down menu above thumbnail and select them as your wallpaper.
- To add wallpaper that is in another folder, just click the plus icon below the thumbnail and then in pop-up window, select the path to our custom folder & choose picture inside of it.

## Changing Ubuntu theme.

- Ubuntu also has an option to change desktop theme which in one click will change the entire way your computer looks.
- To do that, click on the drop-down menu below the wallpaper thumbnails, and choose between Ambiance, Radiance or High Contrast.
- Ambiance is a light theme that look a bit more Mac like, while Radiance is the darker brown theme used in Ubuntu by default.

## c) Screen Resolution: Ascertain the current resolution for your desktop.

- You can change how big things appear on the screen by changing the screen resolution.
- You can change which way up things appear by changing the rotation.

1. Click the icon on the very right of the menu bar and select System Setting.

2. Open Screen display.

3. If you might have multiple display and they are not mirrored, you can have different setting on each display. Select a display in preview area.

Click Apply. The new setting will be applied for 30 seconds before reverting back. That way,

if you cannot see anything with the new.

- d) Time Setting Change the time zone of your system to (or New York Time)
- If you are currently in Indian time. How does the displayed time change after nothing the time change, change time zone back to your local time zone.
- Just click on the clock on the top bar, and choose Time and Date Setting, once the Time & Data window opens, choose Manually, so you can change the time and date manually, otherwise choose your time zone from the map, and choose Automatic.

Practical 2

Aim: Installing and removing software

a) Install gcc package. Verify that it runs and then remove it.

(Step 1: I'd got out no tools save as 'gcc' file)

First type 'gcc -v' to know if you have already installed gcc compiler or not if the output is blank then it means that you don't have gcc installed.

Step 2:

Type 'sudo apt-get install gcc'. After typing the following command installation will take place.

Step 3:

Type sudo apt-get install build-essential  
This will install all the libraries required for C and C++ programming language.

## NOW TO UNINSTALL GCC COMPILER

In GCC 5.1.0, although there is no top-level uninstall target, some directories do have it. In particular `gcc`, so you can do:

Type: `cd build/gcc` & then `sudo make uninstall`

This does not remove everything that was installed but it removes major executables like `gcc-g++`, `Cpp...` contained in that directory.

~~or~~

The `make uninstall` command does not work  
because we stop the package in

(`make config`) file every option here was not set  
again (and a configuration file)

please To make any function available  
in terminal set environment variable in file

The last file that we need

## Practical 3

time utilization of grep, man commands  
 Documentation

- a) finding info documentation from the command line : bring up the info page for the grep command . Bring up the usage section.

~~Ans: To find info about any command info command is used the syntax of info command info (command name).~~

We are going to find the info about the group command.

Open the terminal ( $\text{ctrl}+\text{alt}+\text{T}$ ) and type info grep

After typing this command following output will be displayed onto your screen.

You can also scroll through pages using (space = up) & backspace = down keys.

Furthermore ~~summarized~~ form of showing info is the 'man' command. The command is same as info , but required data.

b) finding man page from the Cmd line : Bring up the  
man page for the 'ls' command scroll down the  
example section. 36

Ans :- To use the 'man' command simple type  
'man (Command name)

Now are going to find the manual for 'ls'

Simple : 'man ls'

Name -

ls - ls directory contents

Synopsis : ls [Operation] ... [files]

list information in the about file

-a-all.

do not ignore entries starts.

-b- escape

print e-style escape.

c) finding man pages by topic what man pages  
are available that documents file or compression.

Ans : Tar, Zip are some man pages which are  
available for document file compression Simple  
type man 'man for.'

\* 'man Tar'

copy, extract and edit most archive files

Name: running a command on multiple partitions.

Tar A - Content & Create - The GNU version

Synopsis: tar [option] [file] ... [archive or directory]

Option d - different from Compart deleted

DESCRIPTION

Tar stores and extracts files from a steps.

\* 'man zip'

Name: extract most archive formats and copy

Zip package and Compress (Archive) filestion

Synopsis: zip [-option] [archive] [file] ...

zip cl See Separate man page

zip note (See Separate man page)

DESCRIPTION

Zip is compression and file packaging utility

UNIX, VMS, MSDOS, OS/2

finding man pages by section from the Cmdline

bring up the man page from the pinfo function,  
which manual page, section are libre function found

Ans: The number correspond to what section of  
the manual page is term, is user Command

while and is sys admin staff. The use command  
man itself explain it & listing the stdout

There are certain terms that have different page in different section e.g. `printf` as a command appears in section 1. as `stdlib` function` appears in section 3) in cases like that you can pass the Section no. to the `man` before the page name to change which one you want or use `man -o +t` to show every matching page in row.

You can tell which section a term falls in with `man -k` (required to a proper command). It will do sub matches to so you to use `grep` to limit it. Command line help lists the available operations for the command. How can you do this?

~~\$ mkdoin -m a = rwx directory name.~~

8  
R  
O  
V  
O

### Practical 4

#### Command Line Operation

- a) Install new package on your system

`sudo apt-get install (package name)`

- b) Remove the package you installed

`sudo apt-get remove (package name)`

- c) find the passwd file in / using find command

`# find / - name passwd`

- /usr/share/doc/nss-1.14.1-253/pam.d/passwd
- /usr/bin/passwd
- /etc/pam.d/passwd
- /etc/passwd

find the directory passwd file under root and one level down.

`# find / - maxdepth 2 - name passwd`

- /etc/passwd

find the passwd file under root and 2 level down

`# find / - maxdepth 3 - name passwd`

Q8

- /usr/bin/passwd
- /etc/pam.d/passwd.
- /etc/passwd.

+ both are

editing by shell command

step nof. to specify user id

find the password file b/w sub directories level 2

# find -maxdepth 3 -maxdepth 5 -names passwd  
• / user/bin/password

• /etc/pam.d/passwd.

basically diff files in diff direct ext diff

d) Create a symbolic link to the file you found  
in step.

# ln -s file1 file2.bash\sub\sub\sub\sub\sub\sub\sub

bash\sub\sub\sub\sub\sub\sub\sub

e) Create an empty file example.txt & move it to /tmp directory using relative path name.

# touch example.txt

# mv example.txt /tmp.

f) delete the file name moved to /tmp in previous step by absolute method.

# rm /tmp/example.txt.

8/10  
6/10

g) find the location of ls, ps, bash commands.

# whereis ls

ls : /bin / ls /usr /share /man / man1 / ls.1.g2

# where is ps

ps : /bin / ls /usr /share /mops : /bin/ps /usr /share /

man / man1 / ps.1.g2

# where is bash

bash : /bin / bash /etc / bash . bashrc / usr /share /

man / man1 / bash . 1.g2.

IN

## Practical 5 File system on Linux

1. Explore mounted file system on your computer.

Ans df -k

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```
jeba@jeba-VirtualBox:~$ df -k
Filesystem      1K-blocks    Used Available Use% Mounted on
udev              494436       0   494436   0% /dev
tmpfs             102416   3676    98740   4% /run
/dev/sda1        7092728 3383372  3326024  51% /
tmpfs             512076    216   511860   1% /dev/shm
tmpfs              5120      4    5116   1% /run/lock
tmpfs             512076       0   512076   0% /sys/fs/cgroup
tmpfs             102416     48   102368   1% /run/user/1000
jeba@jeba-VirtualBox:~$
```

2. What are the different ways of exploring mounted file system on Linux?

Ans

```
jeba@jeba-VirtualBox:~$ mount
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime)
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
udev on /dev type devtmpfs (rw,nosuid,relatime,size=494436k,nr_inodes=123689,mode=755)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,noexec,relatime,gid=5,mode=620,ptmxmode=755)
/dev/sda1 on / type ext4 (rw,relatime,errors=remount-ro,data=ordered)
securityfs on /sys/kernel/security type securityfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,noexec,relatime)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,relatime,size=5120k)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,mode=755)
cgroup on /sys/fs/cgroup/systemd-cgroups-agent type cgroup (rw,nosuid,nodev,noexec,relatime,xattr,release_agent=/lib/systemd/systemd-cgroups-agent,name=systemd,nsroot=/)
pstore on /sys/fs/pstore type pstore (rw,nosuid,nodev,noexec,relatime,xattr,release_agent=/)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime)
cgroup on /sys/fs/cgroup/net_cls,net_prio type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset,nsroot=_cls,_net_prio,nsroot=/)
cgroup on /sys/fs/cgroup/plids type cgroup (rw,nosuid,nodev,noexec,relatime,plids,nsroot=/)
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freezer,nsroot=/)
cgroup on /sys/fs/cgroup/cpu,cpuacct type cgroup (rw,nosuid,nodev,noexec,relatime,cpu,cpuacct,nsroot=/)
cgroup on /sys/fs/cgroup/devices type cgroup (rw,nosuid,nodev,noexec,relatime,devices,nsroot=/)
cgroup on /sys/fs/cgroup/memory type cgroup (rw,nosuid,nodev,noexec,relatime,memory,nsroot=/)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio,nsroot=/)
cgroup on /sys/fs/cgroup/perf_event type cgroup (rw,nosuid,nodev,noexec,relatime,perf_event,nsroot=/)
cgroup on /sys/fs/cgroup/hugepages type cgroup (rw,nosuid,nodev,noexec,relatime,hugepages,nsroot=/)
systemd-1 on /proc/sys/fs/binfmt_misc type autofs (rw,relatime,fd=32,pgrp=1,timeout=0,minproto=5,maxproto=5,direct)
hugepages on /dev/hugepages type hugepages (rw,relatime)
```

3. Copying text from files.  
Ans cp command, mv command

```
jeba@jeba-VirtualBox:~$ ls
Desktop  Downloads  .jeb  Music  Public  Videos
Documents examples.desktop  .jj  Pictures  Templates

jeba@jeba-VirtualBox:~$ cd jeb
jeba@jeba-VirtualBox:~/jeb$ cat .gg.txt
cat: .gg.txt: No such file or directory
jeba@jeba-VirtualBox:~/jeb$ cat gg.txt
cat: gg.txt: No such file or directory
jeba@jeba-VirtualBox:~/jeb$ cat >gg.txt
welcome
Linux
^C
jeba@jeba-VirtualBox:~/jeb$ touch dd.txt
jeba@jeba-VirtualBox:~/jeb$ ls
dd.txt  gg.txt
jeba@jeba-VirtualBox:~/jeb$ cp gg.txt dd.txt
jeba@jeba-VirtualBox:~/jeb$ cat gg.txt
welcome
Linux
jeba@jeba-VirtualBox:~/jeb$ cat dd.txt
welcome
Linux
jeba@jeba-VirtualBox:~/jeb$ █
```

```
jeba@jeba-VirtualBox:~/jeb$ touch ss.txt
jeba@jeba-VirtualBox:~/jeb$ mv gg.txt ss.txt
jeba@jeba-VirtualBox:~/jeb$ cat gg.txt
cat: gg.txt: No such file or directory
jeba@jeba-VirtualBox:~/jeb$ cat ss.txt
welcome
Linux
jeba@jeba-VirtualBox:~/jeb$ █
```

4. Archiving and backup the work directory using tar, gzip and bzip2 command  
Ans gzip filename.txt  
Bzip2 filename.txt

SA

```
jeba@jeba-VirtualBox:~/jeb$ bzip2 ss.txt
jeba@jeba-VirtualBox:~/jeb$ ls
dd.txt ss.txt.bz2
jeba@jeba-VirtualBox:~/jeb$ cat ss.txt.bz2
BZh91AY&SY
jeba@jeba-VirtualBox:~/jeb$ gzip dd.txt
jeba@jeba-VirtualBox:~/jeb$ ls
dd.txt.gz ss.txt.bz2
jeba@jeba-VirtualBox:~/jeb$ cat dd.txt.gz
jeba@jeba-VirtualBox:~/jeb$ Xz jeba@jeba-VirtualBox:~/jeb$
```

5: Use diff command to create diff of two files  
Ans diff filename1 filename2

```
jeba@jeba-VirtualBox:~/jeb$ ls
dd.txt.gz ss.txt.bz2
jeba@jeba-VirtualBox:~/jeb$ cat >aa.txt
hello world
^C
jeba@jeba-VirtualBox:~/jeb$ cat >bb.txt
this is linux^C
jeba@jeba-VirtualBox:~/jeb$ diff aa.txt bb.txt
1d0
< hello world
jeba@jeba-VirtualBox:~/jeb$ cat >bb.txt
this is Linux
^C
jeba@jeba-VirtualBox:~/jeb$ diff aa.txt bb.txt
1c1
< hello world
---
> this is Linux
jeba@jeba-VirtualBox:~/jeb$ gzip aa.txt
jeba@jeba-VirtualBox:~/jeb$ gzip bb.txt
jeba@jeba-VirtualBox:~/jeb$ diff aa.txt.gz bb.txt.gz
Binary files aa.txt.gz and bb.txt.gz differ
```

6. Use patch command to patch a file. And analyze the patch using patch command again.

```
jeba@jeba-VirtualBox:~/jeb$ cat >hi.txt
hi
hi
hi
^C
jeba@jeba-VirtualBox:~/jeb$ cat >hii.txt
hello
hello
hello
^C
jeba@jeba-VirtualBox:~/jeb$ diff -u hi.txt hii.txt >sam.patch
jeba@jeba-VirtualBox:~/jeb$ patch ,sam.patch
^C
jeba@jeba-VirtualBox:~/jeb$ patch <sam.patch
patching file hi.txt
jeba@jeba-VirtualBox:~/jeb$ cat sam.patch
--- hi.txt      2020-01-08 22:14:55.463569834 +0530
+++ hii.txt     2020-01-08 22:15:16.259898738 +0530
@@ -1,3 +1,3 @@
-hi
-hi
-hi
+hello
+hello
+hello
jeba@jeba-VirtualBox:~/jeb$
```

BS  
16/01

## Practical 6 Use Environment

a) Which account you are logged in? How do you find out?

Ans who command & whoami

```
jeba@jeba-VirtualBox:~$ who
jeba    tty7          2020-01-15 20:32 (:0)
jeba@jeba-VirtualBox:~$ whoami
jeba
jeba@jeba-VirtualBox:~$ who -l
LOGIN   tty1          2020-01-15 20:30          780 id=tty1
jeba@jeba-VirtualBox:~$
```

```
jeba@jeba-VirtualBox:~$ w
20:35:04 up 4 min, 1 user, load average: 0.70, 0.79, 0.38
USER      TTY      FROM           LOGIN@     IDLE     JCPU     PCPU WHAT
jeba      tty7      :0            20:32      4:28    8.19s  0.33s /sbin/upstart -
jeba@jeba-VirtualBox:~$ w -s
20:35:14 up 4 min, 1 user, load average: 0.60, 0.77, 0.37
USER      TTY      FROM           IDLE WHAT
jeba      tty7      :0            4:38     /sbin/upstart --user
jeba@jeba-VirtualBox:~$ w -h
jeba      tty7      :0            20:32      4:44    8.67s  0.33s /sbin/upstart -
jeba@jeba-VirtualBox:~$ w -f
20:36:12 up 5 min, 1 user, load average: 0.41, 0.69, 0.37
USER      TTY      LOGIN@     IDLE     JCPU     PCPU WHAT
jeba      tty7      20:32      5:36    9.00s  0.33s /sbin/upstart --user
```

- b) Display /etc/shadow file using cat command and understand the importance of shadow file. How its different than passwd file.  
 Ans cat /etc/shadow.

As with the passwd file, each field in the shadow file is also separated with ":" colons characters, and are as follows.

- Username, up to 8 character. Case-sensitive, usually all lowercase. A direct match to the username in the etc/passwd file.
- Password, 13 character encrypted. A blank entry (eg. ::) indicates a password is not required to the username to log in, and a '\*' entry (eg. \*:) indicates the account has been disabled.
- The number of days (since January 1, 1970) since the password was last changed.
- The number of days before password may be changed (0 indicates it may be changed at any time)
- The number of days after which password must be changed (99999 indicates user can keep his or her password unchanged for many, many years)
- The number of days to warn user of an expiring password (7 for a full week)
- The number of days after password expires that account is disabled.
- The number of days since January, 1 1970 that an account has been disabled.

\* reserved field for possible future use

```
jeba@jeba-VirtualBox:~$ sudo cat /etc/shadow
[sudo] password for jeba:
root:!:18240:0:99999:7:::
daemon:*:16911:0:99999:7:::
bin:*:16911:0:99999:7:::
sys:*:16911:0:99999:7:::
sync:*:16911:0:99999:7:::
games:*:16911:0:99999:7:::
man:*:16911:0:99999:7:::
lp:*:16911:0:99999:7:::
mail:*:16911:0:99999:7:::
news:*:16911:0:99999:7:::
```

Each field in a passwd entry is separated with ":" colon characters, and are as follows:

- Username, upto 8 characters. Case-sensitive, usually all lowercase.
- An "x" in the passwd field. Password are stored in the "/etc/shadow" file.
- Numeric user id. This is assigned by the "adduser" script. Unix uses this field, plus the following group field, to identify which files belong to the user.
- Numeric group id. Red Hat uses group id's in a fairly unique manner for enhanced file security. Usually the group id will match the user id.
- Full name of user. I'm not sure what maximum length for this field is, but try to keep it reasonable.
- User's home directory. Usually /home/username (eg /home/smith). All user's "shell account" often set to "/bin/bash" to web pages, mail forwarding etc.
- User "shell account": "/bin/bash" to provide access to bash shell.

```
jeba@jeba-VirtualBox:~$ sudo cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
```

c) Get your current working directory

Ans : pwd.

```
jeba@jeba-VirtualBox:~$ pwd
/home/jeba
jeba@jeba-VirtualBox:~$
```

d) Explore different ways of getting command history  
how to run previously executed command without  
typing it.

Ans: history  
!line number.

```
jeba@jeba-VirtualBox:~$ history
1 who
2 whoami
3 who -l
4 clear
5 w
6 w -s
7 w -h
8 w -f
9 clear
10 cat /etc/shadow
11 sudo cat /etc/shadow
12 clear
13 sudo cat /etc/passwd
14 pwd
15 clear
16 history
jeba@jeba-VirtualBox:~$ !13
who -l
jeba@jeba-VirtualBox:~$
```

- 24
- e) Create alias to most commonly used commands.  
Alias command instructs the shell to replace one string while executing the commands.  
Ans: alias label = "command"

```
jeba@jeba-VirtualBox:~$ alias m="mkdir new"
jeba@jeba-VirtualBox:~$ m
jeba@jeba-VirtualBox:~$ ls
Desktop  Downloads  m  Music  Pictures  Templates
Documents  examples.desktop  jj  new  Public  Videos
jeba@jeba-VirtualBox:~$
```

## Practical 7

## Linux Editors: Vi

- a) Create, modify, search and navigate a file in editor.  
 i) Creating a file

To create a file, on the terminal type vi followed by filename.

- ii) Modifying the file:

To modify a file, on the vi editor, type 'o'.

- iii) Search in a file:

To find a word press / followed by word to search.

- iv) Navigate:

Movement in four directions.

key	Action
k	Moves cursor up
j	Moves cursor down
h	Moves cursor left
l	Moves cursor right.

## Word Navigation

key

b Moves back to the beginning of word

e

Moves forward to the end of word

w

Moves forward to the beginning of word

0 (zero)

Moves to first character of a line.

\$

Move to the end of line

## Scrolling

key

ctrl + f

Action

Scrolls forward

ctrl + b

Scrolls backward

ctrl + d

Scrolls half page

ctrl + u

Scrolls half page backward.

b) Learn all essential commands like search/replace, highlight, show line numbers.

i) Replace.

Syntax : /g/word to be replaced/s//new word/gc 48

```
jeba@jeba-VirtualBox: ~
Hello
This is my Linux example
Welcome
Welldone
This is Vi Editor
Thank you

:g/my/s//our/gc
```

```
jeba@jeba-VirtualBox: ~
Hello
This is my Linux example
Welcome
Welldone
This is Vi Editor
Thank you

replace with our (y/n/a/q/l/^E/^Y)?
```

```
jeba@jeba-VirtualBox: ~
Hello
This is our Linux example
Welcome
Welldone
This is Vi Editor
Thank you
```

8

ii) Highlight

Use set hlsearch.

```
jeba@jeba-VirtualBox: ~
Hello
This is our Linux example
Welcome
Welldone
This is Vi Editor
Thank you

:set hlsearch
```

iii) Show the line number

Use set nu

```
jeba@jeba-VirtualBox: ~
1 Hello
2 This is our Linux example
3 Welcome
4 Welldone
5 This is Vi Editor
6 Thank you

:set nu
```

## Practical: 8

## Linux Security

- a) Use of sudo to change user privileges to root.  
Create an user named user1.

```
jeba@jeba-VirtualBox:~$ sudo useradd user1
[sudo] password for jeba:
jeba@jeba-VirtualBox:~$ sudo passwd user1
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
jeba@jeba-VirtualBox:~$
```

To give some user root privileges edit /etc/sudoer using visudo. Enter new line as highlighted below.

```
# Please consider adding local content in /etc/sudoers.d/ instead of
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
Defaults        env_reset
Defaults        mail_badpass
Defaults        secure_path="/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/
sbin:/bin"
#
# Host alias specification
#
# User alias specification
#
# Cmnd alias specification
#
# User privilege specification
root    ALL=(ALL:ALL) ALL
user1  ALL=(ALL:ALL) ALL
```

- b) Identify operation that require sudo privileges.

```
jeba@jeba-VirtualBox:~$ su user1
Password:
user1@jeba-VirtualBox:/home/jeba$ mkdir folder1
mkdir: cannot create directory 'folder1': Permission denied
user1@jeba-VirtualBox:/home/jeba$ sudo mkdir folder1
[sudo] password for user1:
user1 is not in the sudoers file. This incident will be reported.
```

c) Modify expiration date for new user using password ageing.

```
jeba@jeba-VirtualBox:~$ sudo chage -l user1
Last password change : Jan 20, 2020
Password expires      : never
Password inactive     : never
Account expires        : never
Minimum number of days between password change : 0
Maximum number of days between password change : 99999
Number of days of warning before password expires : 7
```

```
jeba@jeba-VirtualBox:~$ sudo chage user1
Changing the aging information for user1
Enter the new value, or press ENTER for the default

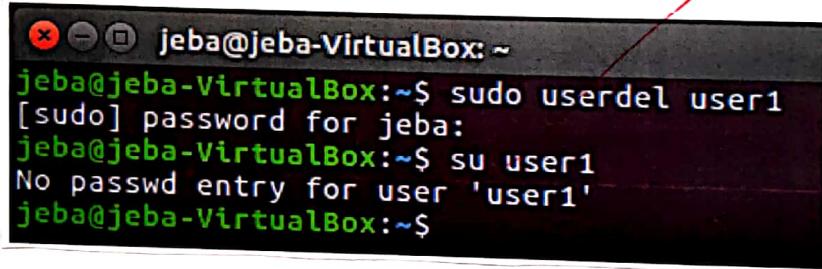
    Minimum Password Age [0]: 100
    Maximum Password Age [99999]: 200
    Last Password Change (YYYY-MM-DD) [2020-01-20]: 2020-01-21
    Password Expiration Warning [7]: 5
    Password Inactive [-1]:
    Account Expiration Date (YYYY-MM-DD) [-1]: 2020-01-31
jeba@jeba-VirtualBox:~$ sudo chage -l user1
Last password change : Jan 21, 2020
Password expires      : Aug 08, 2020
Password inactive     : never
Account expires        : Jan 31, 2020
Minimum number of days between password change : 100
Maximum number of days between password change : 200
Number of days of warning before password expires : 5
```

```
jeba@jeba-VirtualBox:~$ sudo chage -E 25/01/2020 -m 10 -M 90 -I 30 -W 30 user1
jeba@jeba-VirtualBox:~$ sudo chage -l user1
Last password change : Jan 21, 2020
Password expires      : Apr 20, 2020
Password inactive     : May 20, 2020
Account expires        : Jan 01, 2022
Minimum number of days between password change : 10
Maximum number of days between password change : 90
Number of days of warning before password expires : 30
```

Q8

- E: Expiration Date
- m: Minimum number of days before password change
- M: Number of days password is valid.
- I: Account inactive.
- W: Number of days of warning before a password change is required.

d) Delete newly added user.



```
jeba@jeba-VirtualBox:~$ sudo userdel user1
[sudo] password for jeba:
jeba@jeba-VirtualBox:~$ su user1
No passwd entry for user 'user1'
jeba@jeba-VirtualBox:~$
```

87  
93%

Practical: 9

## Network Management

- a) Get IP address of your machine using ifconfig.

```
jeba@jeba-VirtualBox:~$ ifconfig
enp0s3    Link encap:Ethernet HWaddr 08:00:27:0e:6b:69
          inet addr:10.0.2.15 Bcast:10.0.2.255 Mask:255.255.255.0
          inet6 addr: fe80::c0cd:53a0:d5a3:848e/64 Scope:Link
                  UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
                  RX packets:2 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:73 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1000
                  RX bytes:1180 (1.1 KB) TX bytes:8518 (8.5 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1 Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
                  UP LOOPBACK RUNNING MTU:65536 Metric:1
                  RX packets:53240 errors:0 dropped:0 overruns:0 frame:0
                  TX packets:53240 errors:0 dropped:0 overruns:0 carrier:0
                  collisions:0 txqueuelen:1
                  RX bytes:4225072 (4.2 MB) TX bytes:4225072 (4.2 MB)
```

- b) Get hostname of your machine.

```
jeba@jeba-VirtualBox:~$ hostname
jeba-VirtualBox
jeba@jeba-VirtualBox:~$
```

d) Using ping command to check network connectivity to remote machines.

```
jeba@jeba-VirtualBox:~$ ping www.google.com
PING www.google.com (172.217.31.196) 56(84) bytes of data.
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=1 ttl=54 time=
97.8 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=2 ttl=54 time=
82.0 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=3 ttl=54 time=
84.8 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=4 ttl=54 time=
87.1 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=5 ttl=54 time=
93.5 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=6 ttl=54 time=
86.9 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=7 ttl=54 time=
98.0 ms
64 bytes from maa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=8 ttl=54 time=
90.9 ms
^Z
[1]+ Stopped                  ping www.google.com
jeba@jeba-VirtualBox:~$
```

d) Use of dig command

```
jeba@jeba-VirtualBox:~$ dig www.google.com
; <>> DiG 9.10.3-P4-Ubuntu <>> www.google.com
; global options: +cmd
; Got answer:
; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 52068
; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; QUESTION SECTION:
;www.google.com.           IN      A
; ANSWER SECTION:
www.google.com.      91      IN      A      172.217.166.100
; Query time: 152 msec
; SERVER: 127.0.1.1#53(127.0.1.1)
; WHEN: Mon Jan 20 22:40:06 IST 2020
; MSG SIZE rcvd: 59
jeba@jeba-VirtualBox:~$
```

25  
e) Troubleshooting network using Traceroute, route command

```
jeba@jeba-VirtualBox:~$ traceroute www.google.com
traceroute to www.google.com (172.217.166.100), 30 hops max, 60 byte packets
 1  10.0.2.2 (10.0.2.2)  0.190 ms  0.143 ms  0.151 ms
 2  * * *
 3  10.0.2.2 (10.0.2.2)  68.568 ms  68.486 ms  68.405 ms
jeba@jeba-VirtualBox:~$
```

```
jeba@jeba-VirtualBox:~$ route
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref    Use Iface
default         10.0.2.2      0.0.0.0       UG    100    0        0 enp0s3
10.0.2.0        *             255.255.255.0 U      100    0        0 enp0s3
link-local      *             255.255.0.0   U      1000   0        0 enp0s3
jeba@jeba-VirtualBox:~$
```

f) Use of arp command

```
jeba@jeba-VirtualBox:~$ arp
Address          HWtype  HWaddress           Flags Mask Iface
10.0.2.2          ether   52:54:00:12:35:02 C            enp0s
```

g) Use of host command

```
jeba@jeba-VirtualBox:~$ host -V
host 9.10.3-P4-Ubuntu
jeba@jeba-VirtualBox:~$
```

b) Use of netstat command and Nmap command.

```
jeba@jeba-VirtualBox:~$ netstat
jeba@jeba-VirtualBox:~$ netstat
Active Internet connections (w/o servers)
Proto Recv Q send Q Local Address           Foreign Address         State
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State          I-Node Path
unix  2      [ ]     DGRAM
unix  2      [ ]     DGRAM
d/notify
unix  2      [ ]     DGRAM
syslog
unix  16     [ ]     DGRAM
dev-log
unix  7      [ ]     DGRAM
socket
unix  3      [ ]     DGRAM
unix  3      [ ]     STREAM   CONNECTED    9684  /run/systemd/notify
unix  3      [ ]     STREAM   CONNECTED    44042 @/tmp/dbus-CymTeI7AQG
unix  3      [ ]     STREAM   CONNECTED    43331  @/tmp/dbus-CymTeI7AQG
unix  3      [ ]     STREAM   CONNECTED    42988  @/tmp/dbus-CMGCc6G7PS
unix  3      [ ]     STREAM   CONNECTED    42690  @/tmp/dbus-CMGCc6G7PS
unix  3      [ ]     STREAM   CONNECTED    13242  /run/systemd/journal/
stdout
unix  3      [ ]     STREAM   CONNECTED    43113  /run/systemd/journal/
stdout
unix  3      [ ]     STREAM   CONNECTED    43013
stdout
unix  3      [ ]     STREAM   CONNECTED    42935
```

```
jeba@jeba-VirtualBox:~$ nmap www.google.com
Starting Nmap 7.01 ( https://nmap.org ) at 2020-01-20 22:51 IST
Nmap scan report for www.google.com (216.58.196.68)
Host is up (0.044s latency).
Other addresses for www.google.com (not scanned): 2404:6800:4007:811::2004
rDNS record for 216.58.196.68: bom05s11-in-f4.1e100.net
Not shown: 998 filtered ports
PORT      STATE SERVICE
80/tcp    open  http
443/tcp   open  https
Nmap done: 1 IP address (1 host up) scanned in 20.32 seconds
jeba@jeba-VirtualBox:~$
```

80  
443/01

## Practical 10

Aim: Shell Scripting

Basics of shell scripting.

- To get a shell, you need to start a terminal.
- To see what shell you have, run: echo \$shell.
- In Linux, the dollar sign (\$) stands for shell variable.
- The echo command just return whatever you type in.
- ~~#!/bin/bash - It is called shebang. It is written at the top of a shell and it passes the instruction to the program /bin/bash~~

Echo \$shell



```
tcsc@tcsc-VirtualBox ~
tcsc@tcsc-VirtualBox:~$ echo $SHELL
/bin/bash
tcsc@tcsc-VirtualBox:~$
```

vi filename.sh

#!/bin/bash

echo "This IS LINUX!"

54

tcsc@tcsc-VirtualBox: ~  
#!/bin/bash  
echo "THIS IS LINUX!"

"linux.sh" [New File]

chmod 777 filename.sh  
./filename.sh

```
tcsc@tcsc-VirtualBox: ~  
tcsc@tcsc-VirtualBox: $ vi linux.sh  
tcsc@tcsc-VirtualBox: $ chmod 777 linux.sh  
tcsc@tcsc-VirtualBox: $ ./linux.sh  
THIS IS LINUX!  
tcsc@tcsc-VirtualBox: $
```

Step to write and execute a shell scripting  
Shell script is just a simple text file  
with .sh extension, having executable permission

- a) Open terminal
- b) Navigate to the place where you want to create script using cd.
- c) Touch filename.sh.

- d) Vi filename.sh [you can use your favourite editor, to edit script]  
e) chmod 777 filename.sh (for making the script executable)  
f) sh filename.sh or ./filename.sh (for running the script)

Program to display your name

```
#!/bin/bash
```

```
echo "Enter your name".
```

```
read name.
```

```
echo "My name is:$name"
```

```
tcsc@tcsc-VirtualBox:~  
#!/bin/bash  
echo "Enter your name:"  
read name  
echo "My name is: $name"  
:wq
```

```
tcsc@tcsc-VirtualBox:~$ vi ubuntu.sh  
tcsc@tcsc-VirtualBox:~$ chmod 777 ubuntu.sh  
tcsc@tcsc-VirtualBox:~$ ./ubuntu.sh  
Enter your name:  
TANVI  
My name is: TANVI  
tcsc@tcsc-VirtualBox:~$
```

Program to find the sum of two variable

vi filename.sh

#!/bin/bash

a=100

b=25

sum=\$((a+b))

Echo "sum is : \$sum"

```
tcsc@tcsc-VirtualBox: ~
#!/bin/bash
a=100
b=25
sum=$((a+b))
echo "Sum is:$sum"

:wq
```

```
tcsc@tcsc-VirtualBox: ~
tcsc@tcsc-VirtualBox: ~$ vi linux2.sh
tcsc@tcsc-VirtualBox: ~$ chmod 777 linux2.sh
tcsc@tcsc-VirtualBox: ~$ ./linux2.sh
Sum is:125
tcsc@tcsc-VirtualBox: ~$
```

Program to find the sum of two numbers  
(Values passed during execution.)

The screenshot shows a terminal window titled "tcsc@tcsc-VirtualBox: ~". It contains the following text:

```
#!/bin/bash
sum=$(( $1+$2 ))
echo "sum is:$sum"
```

At the bottom of the terminal window, it says "lin.sh" 3 lines, 46 characters.

```
tcsc@tcsc-VirtualBox:~$ vi lin.sh
tcsc@tcsc-VirtualBox:~$ chmod 777 lin.sh
tcsc@tcsc-VirtualBox:~$ ./lin.sh 50 70
sum is:120
tcsc@tcsc-VirtualBox:~$
```

## Sed

Sed command or Stream Editor is very powerful utility offered by Linux system. It is mainly used for text substitution, find & replace but it can perform other text manipulation like insertion, deletion, search, etc. With sed, we can edit complete files without actually having to open it.

Consider the following text file.

```
tcsc@tcsc-VirtualBox: ~
subjects offered in cs
datastructure
database management
linux
python
green tech
softskill
stats
calclus
computer basic

:wq
```

1) Displaying partial text of a file.

With sed, we can view only part of a file rather than seeing whole file.

```
tcsc@tcsc-VirtualBox: ~
tcsc@tcsc-VirtualBox: $ vi cs.txt
tcsc@tcsc-VirtualBox: $ sed -n 3,5p cs.txt
database management
linux
python
tcsc@tcsc-VirtualBox: ~
```

2) Display all except some lines

To display all content of a file except for some portion, use option 'd'

```
tcsc@tcsc-VirtualBox:~$ sed 3,5d cs.txt
subjects offered in cs
datastructure
green tech
softskill
stats
calclus
computer basic
tcsc@tcsc-VirtualBox:~$
```

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### 3) Deleting a line

To delete a line, use line number followed by 'd'

```
tcsc@tcsc-VirtualBox:~$ vi linux.sh
tcsc@tcsc-VirtualBox:~$ chmod 777 linux.sh
tcsc@tcsc-VirtualBox:~$ ./linux.sh
THIS IS LINUX!
tcsc@tcsc-VirtualBox:~$
```

### 4) Search and Replacing a string.

's' option is for searching a word.

```
tcsc@tcsc-VirtualBox:~$ sed 's/cs/computer/' cs.txt
subjects offered in computer
datastructure
database management
linux
python
green tech
softskill
stats
calclus
computer basic
```

Replace a string on a particular line  
 To replace a string on a particular line, use line number with 's' option.

```
tcsc@tcsc-VirtualBox:~$ sed '6 s/cs/computer system /' cs.txt
subjects offered in cs
datastructure
database management
linux
python
green tech
softskill
stats
calculus
computer basic
```

Add a line after/before the matched string  
 To add a new line with some content after every pattern match, use option 'a'.

```
tcsc@tcsc-VirtualBox:~$ sed '/cs/a "this is linux"' cs.txt
subjects offered in cs
>this is linux"
datastructure
database management
linux
python
green tech
softskill
stats
calculus
computer basic
tcsc@tcsc-VirtualBox:~$
```

To add a new line with some content before every pattern match, use option 'i'.

```
tcsc@tcsc-VirtualBox:~$ sed '/cs/i "this is linux"' cs.txt
>this is linux"
subjects offered in cs
datastructure
database management
linux
python
green tech
softskill
stats
calculus
computer basic
tcsc@tcsc-VirtualBox:~$
```

- 7) To change a whole line with matched pattern  
To change a whole line to a new line when a search pattern matches, use option 'c'.

```
tcsc@tcsc-VirtualBox:~$ sed '/linux/c "this is linux"' cs.txt
subjects offered in cs
datastructure
database management
>this is linux"
python
green tech
softskill
stats
calculus
computer basic
```

- 8) Appending lines  
To add some content before every line with sed , use \* and & as follows.

```
tcsc@tcsc-VirtualBox:~$ sed -e 's/.*/Thanks &/' cs.txt
Thanks subjects offered in cs
Thanks datastructure
Thanks database management
Thanks linux
Thanks python
Thanks green tech
Thanks softskill
Thanks stats
Thanks calculus
Thanks computer basic
```

27/02