

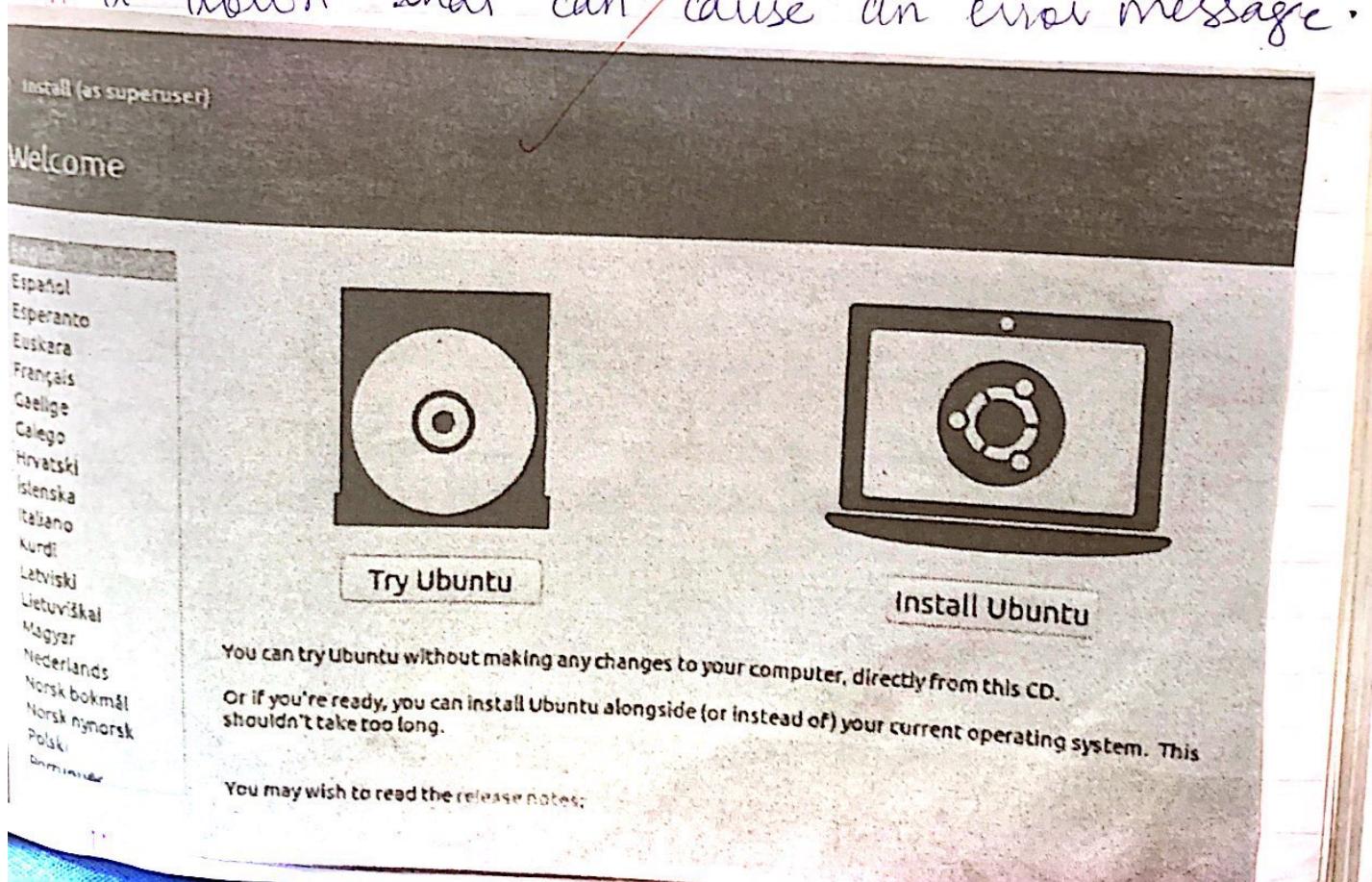
Practical- 01

Aim:- Installation of Ubuntu and Linux.

Install your choice of Linux distribution eg:-
Ubuntu, Fedora, Debian etc

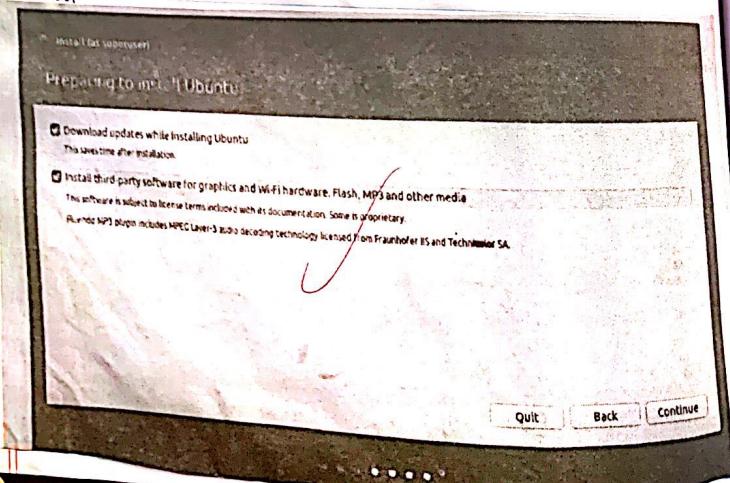
Using a USB drive.

- Most newer computers can boot from USB. You should see a welcome screen prompting you to choose your language and giving you the option to install Ubuntu or try it from the USB.
- If your computer doesn't automatically do so, you might need to press the F12 key to bring up the boot menu, but be careful not to hold it down. That can cause an error message.



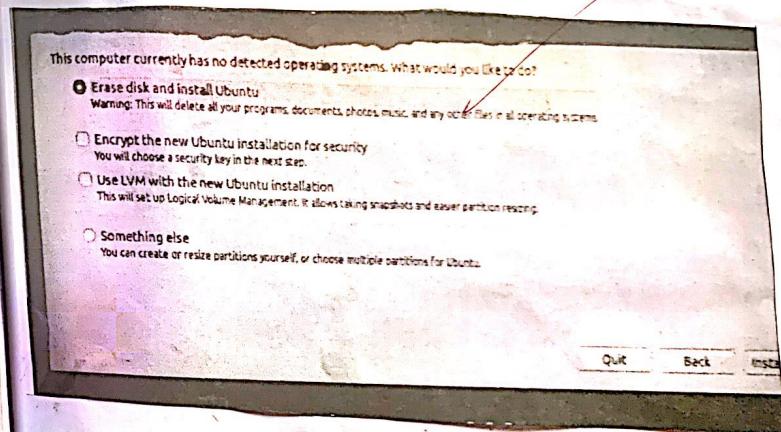
1. Prepare to Install Ubuntu:

- We recommend you plug your computer into a power source.
- You should also make sure you have enough space on your computer to install Ubuntu.
- We advise you to select Download updates while installing and install this third-party software now.
- You should also stay connected to the Internet so you can get the latest updates while you install Ubuntu.
- If you are not connected to the Internet, you will be asked to select a wireless network, if available. We advise you to connect during the installation so we can ensure your machine is up-to-date.



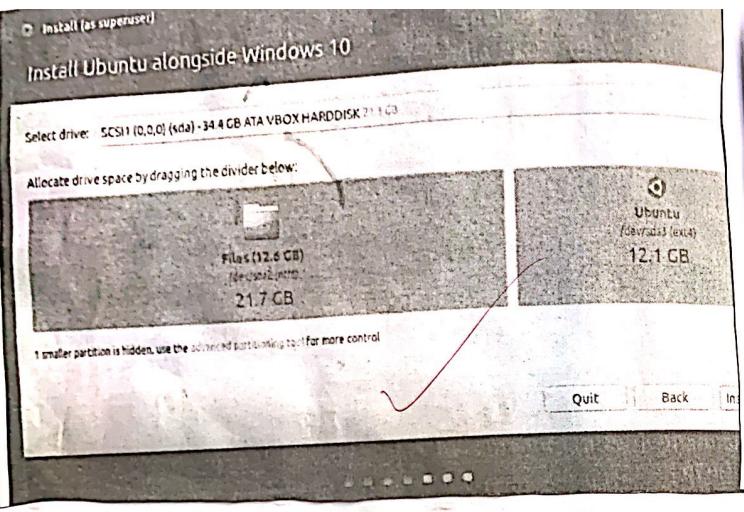
2. Allocate drive space:

- Use the checkboxes to choose whether you had like to install Ubuntu alongside another operating system, delete your existing operating system and replace it with Ubuntu, or if you are an advanced user choose the 'Something else' option.



3. Begin the Installation:

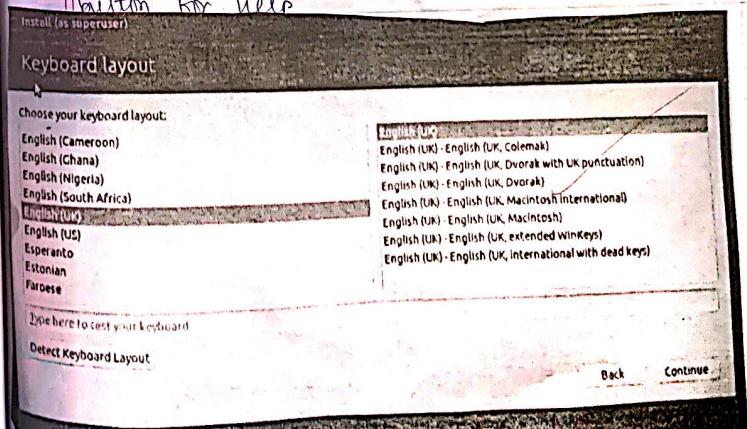
- Depending on your previous selections, you can now verify that you have chosen the way in which you would like to install Ubuntu.
- The installation process will begin when you click the 'Install Now' button.
- Ubuntu needs about 4.5 GB to install, so add a few extra GB to allow for your files.



4. Select your location:

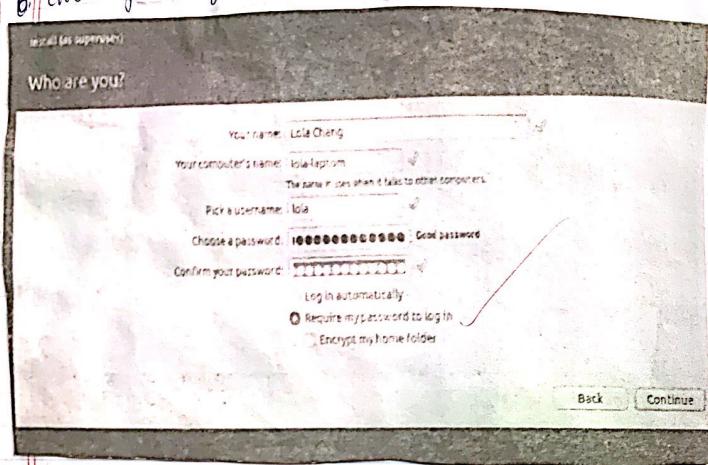
- If you are connected to the internet, this should be done automatically. Check your location is correct and click 'Forward' to proceed. If you are unsure of your time zone, type the name of the town you are in or click on the map and we will help you find it.
- TIP: If you are having problems connecting to the internet, use the menu in the top-right-hand corner to select a network.

5. Select your preferred keyboard layout.
• Click on the language option you need. If you're not sure, click the 'Select keyboard layout' button for help.



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Enter your login and password details:

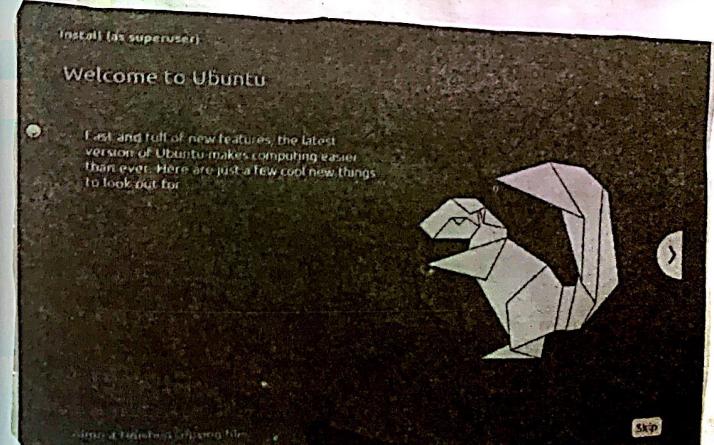
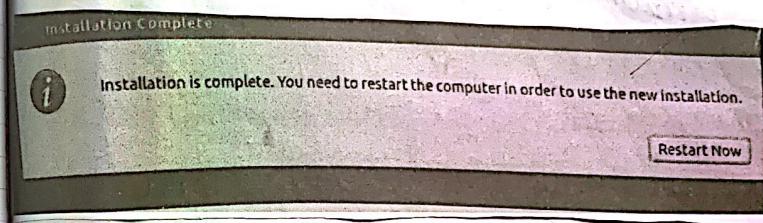


7. Learn more about while the system installs.

8. Finishes

All that's left is to restart your computer and start enjoying Ubuntu!

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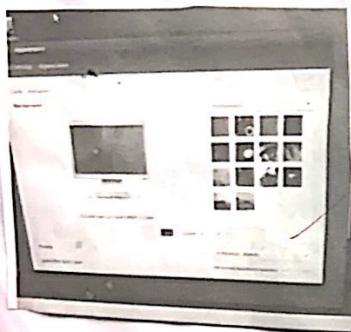
a) Install your choice of Linux distribution

e.g. Ubuntu, Fedora, Debian.

b) Customize desktop environment by changing different default options like changing default background, themes, screensavers.

Accessing Appearance Settings

- To access Appearance Settings in Ubuntu, let's click on our menu at the top right corner, on the top menu bar and 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.



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* changing Wallpaper picture.

- On the left side of Background part, you can see your current wallpaper.
- On the right side of part where we can select one of Ubuntu wallpapers. 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 thumbnails and select the Pictures folder.
- You will see all the pictures in your Pictures folder as thumbnails, where you can select them as your wallpaper.
- To add wallpaper that is in another folder, just click the plus icon below the thumbnails, then in pop-up window, select the path to our custom folder or choose file picture inside of it.

* Changing Ubuntu theme.

- Ubuntu also has an option to change the 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 looks a bit more Mac-like, while Radiance is the darker, brawn theme used in Ubuntu by default.

7) Screen Resolution: Ascertain the current screen resolution for your desktop.

Change the size or rotation of the screen:

- You can change how big (or detailed) things appear on the screen by changing the screen resolution.
- You can change which way up things appear (for eg. - if you have a rotating display) by changing the rotation.

8) Click the icon on the very right of the menu bar and select System Settings.

9) Open Screen Display.

- If you have multiple displays & they are not numbered, you can have different settings on each display. Select a display in the preview area.
- Select your desired resolution and rotation.
- Click Apply. The new settings will be applied for 30 seconds before reverting back. That way, if you cannot see anything with the new.

11) Time Settings:

Change the time zone of your system

If you are currently in Indian time; how does the time display change?

After noting the time change, change the time zone back to your local time zone.

Just click on the clock on the top bar, and choose Time and Date Settings, once the Time and Date 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:02

Aim:- Installing & removing Software
 a) Install gcc package, verify that it runs and then remove it.

Step 1:-

First type 'gcc -v' to know if you have already installed gcc compiler or not. If the o/p is blank then it means you haven't installed gcc.

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 end uninstall target, some directories do have it, in particular gcc, so you can do:

Type: cd build/gcc

sudo make uninstall

This does not remove anything that was installed, but it removes major executables like gcc, g++, cpp... contained in that directory.

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Practical:03

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Aim:- Utilization of grep, man commands.

Ques:- Finding info documentation :- from the command line : bring up the info page for the grep command . Bring up the usage section.

To find info about any command, 'info' command is used. The syntax of info command is "info (Command name)".

We are going to find the info about the 'grep' command.

Open the terminal (ctrl + Alt + T) and type 'info grep'.

After typing this command, following o/p will be displayed onto your screen.

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

More summarized form of showing info is the 'man' command. The command is same as 'info', but requires data.

This is the info menu. A few useful info commands
 'g' quits;
 '?' lists all the info commands
 'h' starts the info tutorial.
 'M' Textinfo RET visits the textinfo manual, etc

Q) Finding man pages from the command line: Bring up the man page for the 'ls' command. Scroll down to the 'egs.' section.

Ans: To use the 'man' command simply type 'man [command name]'.

Now we are going to find the manual for 'ls' command.

Simply type: 'man ls'.

Q) Find all man pages by topic: What man pages are available that document file compression.

Ans: 'tar', 'zip' are some man pages which are available for document file compression.

Simply type: man zip
man tar.

Name → zip - package and compress (archive) files.

Synopsis → zip [option] (see separate man page)

zipnote (" " " .. .)
zipsplit (" " " .. .).

Use → ① add → Update existing entries and add new files.

② update (-u) → Update existing entries if newer in the file system and add new files. If the archive does not exist issue warning then create a new archive.

③ freshen ff) → Update existing entries of an archive if newer in the filesystem. Does not add new files to the archive.

man ls
Name → ls - list directory contents.
Synopsis → ls [OPTION]... [FILE]...
Description :-

- a, -all : do not ignore entries starting with .
- A, --almost-all : do not list implied . and ..
- b, --escape : print C-style escapes for nongraphic characters.
- c : list entries by columns.
- d, --directory : list directories themselves, not their contents.

Q) finding man pages by section from the command line
bring up the man page for the printf lib function
which manual page section are library function found?

Ans:- The number corresponds to what section of the manual page is from; 1 is user command, while 8 is system stuff. The man page for man itself explains it and lists the details.

MANUAL SECTIONS

The standard sections of the manual include:

- 1 User commands
- 2 System calls
- 3 Library functions
- 4 Devices and special files
- 5 File formats and conventions
- 6 Games et al.
- 7 Miscellanea
- 8 System Administration tools and Daemons

Distributions customize the manual section to their specificity, which often include additional sections.

There are certain terms that have different pages in different sections (e.g.: 'printf' as a command appears in section 1, as a 'stdlib' function appears in section 3); in cases like that you can pass the section no. to the man before the page name to choose which one you want or use man -a to show every matching page in a row.

\$ man 1 printf	
\$ man 3 printf	
\$ man -a printf	
\$ man -k 'printf'	
printf	(1) - format and print data
printf	(1p) - write formatted output
printf	(3) - formatted output convention
printf	(3p) - print formatted output
printf [builtins]	(1) - bash built-in commands, see bash(1).

You can tell what section a term falls in with 'man -k' (equivalent to apropos command). It will do substring matching too. So you need to use 'grep' to limit.

Q) Command-Line Help list the available options for the mkdir command. How can you do this?

\$ mkdir -m a=rxw directoryname

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Practical-4

Command line operations :-

a) Install new package on your system.

→ sudo apt-get install [package name].

b) Remove the package installed.

→ sudo apt-get remove [package name].

c) Find the password file using find command.

→ # find / -name password

- /usr/share/doc/nss-1dap-253/pam.d/password
- /usr/bin/password
- /etc/pam.d/password
- /etc/password

Find the directory password file under root and one level down.

→ # find / -maxdepth 2 -name password

- /etc/password

Find the password file under root and 2 level down.

→ # find / -maxdepth 3 -name password

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

find the passed file b/w sub directions level 2 & 4.

find -maxdepth 3 -maxdepth 5 -name passed
 • /usr/bin/Passed
 • /etc/pam.d/Passed

1) Create a symbolic link to the file you found in last step

ln -s file1 file2

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

touch example.txt

mv example.txt /tmp

3) Delete the file moved to /tmp in previous step by absolute method

rm /tmp/example.txt

4) Find the location of ls, ps, bash commands.

whereis ls

ls: /bin/ls /usr/share/man/man1/ls.1.82

where is ps

ps: /bin/ps /usr/share/meps:/bin/ps /usr/share/man/man1/ps.1.82

Practical-5 - File Operations

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Explain mounted file systems on your computer.

⇒ df -k

```
jeba@jeba-VirtualBox:~$ df -k
Filesystem 1K-blocks Used Available Use% Mounted on
udev 494436 0 494436 0% /dev
tmpfs 102416 3676 98748 4% /run
/dev/sda1 7092728 3383372 3326024 51% /
tmpfs 512076 216 511860 1% /dev/shm
tmpfs 512076 4 5116 1% /run/lock
tmpfs 512076 0 512076 0% /sys/fs/cgroup
tmpfs 102416 48 102368 1% /run/user/1000
```

What are the different ways of exploring mounted file systems on Linux?

⇒ Mount

```
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,nodev,noexec,relatime,size=494436k,nr_inodes=123609,mode=755)
tmpfs on /tmp type tmpfs (rw,nosuid,nodev,noexec,relatime,gid=0,mode=020,ptmxnode=800)
tmpfs on /run type tmpfs (rw,nosuid,nodev,noexec,relatime,gid=0,mode=020,ptmxnode=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,size=2048k)
tmpfs on /run/lock type tmpfs (rw,nosuid,nodev,noexec,relatime,size=2048k)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,mode=755)
cgroup on /sys/fs/cgroup/systemd type cgroup (rw,nosuid,nodev,noexec,relatime,xattr,release_agent=/lib/systemd/systemd-cgroups-agent,namespaces,nsdelegate)
cgroup on /sys/fs/cgroup/pstore type pstore (rw,nosuid,nodev,noexec,relatime)
cgroup on /sys/fs/cgroup/cpuset type cgroup (rw,nosuid,nodev,noexec,relatime,cpuset,nsroot,-f)
cgroup on /sys/fs/cgroup/net_cls.net_prio type cgroup (rw,nosuid,nodev,noexec,relatime,net_cls,nsroot)
cgroup on /sys/fs/cgroup/pids type cgroup (rw,nosuid,nodev,noexec,relatime,pids,nsroot=[])
cgroup on /sys/fs/cgroup/freezer type cgroup (rw,nosuid,nodev,noexec,relatime,freeze,nsroot)
cgroup on /sys/fs/cgroup/blkio type cgroup (rw,nosuid,nodev,noexec,relatime,blkio,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/blktio 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/hugetlb type cgroup (rw,nosuid,nodev,noexec,relatime,hugetlb,nsroot=[])
sysctl on /proc/sys/fs/binfmt_misc type autofs (rw,relatime,fd=32,pgprot=1,timeout=0,min_flt=0,max_flt=0,max_protos=1,direct)
hugepages on /dev/hugepages type hugetlbfs (rw,relatime)
```

→ Copying text from file
→ cp command, mv command

```
jebajeba@VirtualBox:~$ ls
Desktop Examples desktop Music Pictures Public Templates Videos
jebajeba@VirtualBox:~/jobs$ cat .gg.txt
cat: .gg.txt: No such file or directory
jebajeba@VirtualBox:~/jobs$ cat gg.txt
cat: gg.txt: No such file or directory
jebajeba@VirtualBox:~/jobs$ cat >gg.txt
jebajeba@VirtualBox:~/jobs$ touch dd.txt
jebajeba@VirtualBox:~/jobs$ ls
dd.txt gg.txt
jebajeba@VirtualBox:~/jobs$ cp gg.txt dd.txt
jebajeba@VirtualBox:~/jobs$ cat dd.txt
dd.txt
Linux
jebajeba@VirtualBox:~/jobs$ cat dd.txt
dd.txt
Linux
jebajeba@VirtualBox:~/jobs$ touch ss.txt
jebajeba@VirtualBox:~/jobs$ mv gg.txt ss.txt
jebajeba@VirtualBox:~/jobs$ cat gg.txt
cat: gg.txt: No such file or directory
jebajeba@VirtualBox:~/jobs$ cat ss.txt
ss.txt
Welcome
Linux
jebajeba@VirtualBox:~/jobs$
```

4) Archiving and backup the work directory using tar, zip and bz2 commands:

\Rightarrow zip and bzip
zip file name.txt
bzip2 filename.txt

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```
jabed@jeba-VirtualBox:~/jeb$ bztpz ss.txt  
jabed@jeba-VirtualBox:~/jeb$ ls  
dd.txt ss.txt.bz2  
jabed@jeba-VirtualBox:~/jeb$ cat ss.txt.bz2  
BzH91AVASY=-----  
JewSS+-+-----  
Jabed@jeba-VirtualBox:~/jeb$ ls  
dd.txt ss.txt.bz2  
Jabed@jeba-VirtualBox:~/jeb$ cat dd.txt.gz  
-----  
Jabed@jeba-VirtualBox:~/jeb$ cat dd.txt.gz  
-----  
Jabed@jeba-VirtualBox:~/jeb$ cat dd.txt.gz  
-----
```

5) Use `diff` command to create `diff` of two files
⇒ `diff filename1 filename2`.

```
jeb@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  
ido  
< 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  
^C  
> this is Linux  
jeba@jeba-VirtualBox:~/jeb$ gzip aa.txt  
jeba@jeba-VirtualBox:~/jeb$ gzip bb.txt  
jeba@jeba-VirtualBox:~/jeb$ tar -zcf aa.txt.gz bb.txt.gz  
Binary files aa.txt.gz and bb.txt.gz differ
```

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

```
jeba@jeba-VirtualBox:~/Jeb5 cat >hl1.txt
ht
ht
ht
nc
jeba@jeba-VirtualBox:~/Jeb5 cat >hl1.txt
hello
hello
hello
nc
jeba@jeba-VirtualBox:~/Jeb5 diff -u hl1.txt hl1.txt >sam.patch
jeba@jeba-VirtualBox:~/Jeb5 patch <sam.patch
patching file hl1.txt
jeba@jeba-VirtualBox:~/Jeb5 cat sam.patch
--- hl1.txt      2020-01-08 22:34:55 +0530
+++ hl1.txt      2020-01-08 22:15:16 +0530
@@ -1,3 +1,3 @@
ht
-ht
+ht
+hello
+hello
+hello
jeba@jeba-VirtualBox:~/Jeb5
```

✓/X/✓

Pactical b:-

Use Environment

Q) Which account you are logged in? How do you find out?
Use who command & whoami

```
jeba@jeba-VirtualBox:~ who
jeba@jeba-VirtualBox:~$ who
jeba    pts/0        2020-01-15 20:32 (:0)
jeba@jeba-VirtualBox:~$ whoami
jeba
jeba@jeba-VirtualBox:~$ who -l
jeba    pts/1        2020-01-15 20:30
jeba@jeba-VirtualBox:~$ w
jeba@jeba-VirtualBox:~$ who -w
jeba@jeba-VirtualBox:~$ w -s
jeba@jeba-VirtualBox:~$ w -h
jeba@jeba-VirtualBox:~$ w -f
jeba@jeba-VirtualBox:~$ w -d
jeba@jeba-VirtualBox:~$ w -u
jeba@jeba-VirtualBox:~$ w -n
jeba@jeba-VirtualBox:~$ w -t
jeba@jeba-VirtualBox:~$ w -x
jeba@jeba-VirtualBox:~$ w -y
jeba@jeba-VirtualBox:~$ w -z
```

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

Q) cat /etc/shadow .

With the passwd file, each file in the shadow file is also separated with ":" colon character, and are as follows:
 • Username, up to 8 characters. Case-sensitive, usually all lowercase.
 • A direct match to the username in the /etc/passwd file.
 • Password, 13 character encrypted. A blank entry (e.g. ::) indicates a password is not required to log in (usually a bad idea), and a "*" entry (e.g.: *) indicates the account has been disabled.

- The number of days (since January 1, 1970) since the password was last changed.
- The no. of days before password may be changed (0 indicates it may be changed at any time).
- The no. of days after which password must be changed (99999 indicates user can keep his or her password unchanged for many, many years).
- The no. of days to warn user of an expiring password (7 for a full week).
- The no. of days after password expires that account is disabled.
- The no. of days since January 1, 1970 that an account has been disabled.
- A reserved field for possible future use.

```
jeba@jeba-VirtualBox:~$ sudo cat /etc/shadow
[sudo] password for jeba:
root::16911:0:99999:7:::
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 password entry is separated with ":" colon character, and are as follows:

- Username, up to 8 characters. Case-sensitive, usually all lowercase.
- An "x" in the password field. Passwords are stored in the "/etc/shadow" file.
- Numeric user id. This is assigned by the "adduser" script. Unix uses this field, thus the following group field, to identify which group belongs 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 the maximum length is, but try to keep it reasonable (under 30 char).
- User's home directory. Usually /home/username (eg. /home/jebah). All user's personal files, web pages, mail forwarding, etc. will be stored here.
- User's "shell account"- often set to "/bin/bash" to provide access to the bash shell.

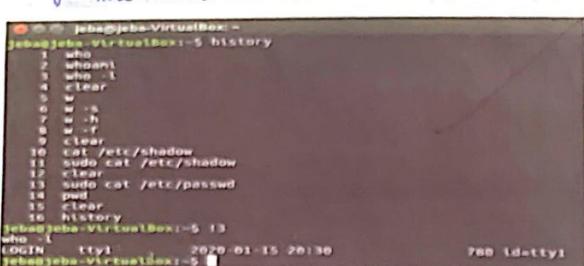
```
jeba@jeba-VirtualBox:~$ sudo cat /etc/passwd
root:x:0:0:root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin/nologin
bin:x:2:2:bin:/bin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
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
```

7 Get your current working directory.
dir 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



```
jebajeba@jeba-VirtualBox:~  
jebajeba@VirtualBox:~$ history  
1 who  
2 cat /etc/passwd  
3 who -l  
4 clear  
5 w  
6 w -s  
7 w -h  
8 w -r  
9 clear  
10 cat /etc/shadow  
11 sudo cat /etc/shadow  
12 clear  
13 sudo cat /etc/passwd  
14 pwd  
15 who  
16 history  
jebajeba@VirtualBox:~$ 13  
who -l  
LOGIN    ttys1          2020-01-15 20:30    788 (datty)
```

e) Create alias to most commonly used commands.

→ Alias commands instantly the shell to replace one thing with another thing while executing the command.

Ans - alias fake = "command".



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

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Practical 7:-

Linux Editor : Vi

i) Create, modify, search and navigate a file in editor.
↳ 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 (forward search) press / followed by the 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	Action
b	Moves back to the beginning of the word
e	Moves forward to the end of the word
w	Moves forward to the beginning of the word
0(zero)	Move to first character of a line
\$	Move to the end of line

scrolling

Key	Action
Ctrl+f	Scrolls forward
Ctrl+b	Scrolls backward
Ctrl+d	Scrolls half page
Ctrl+u	Scrolls half page backward

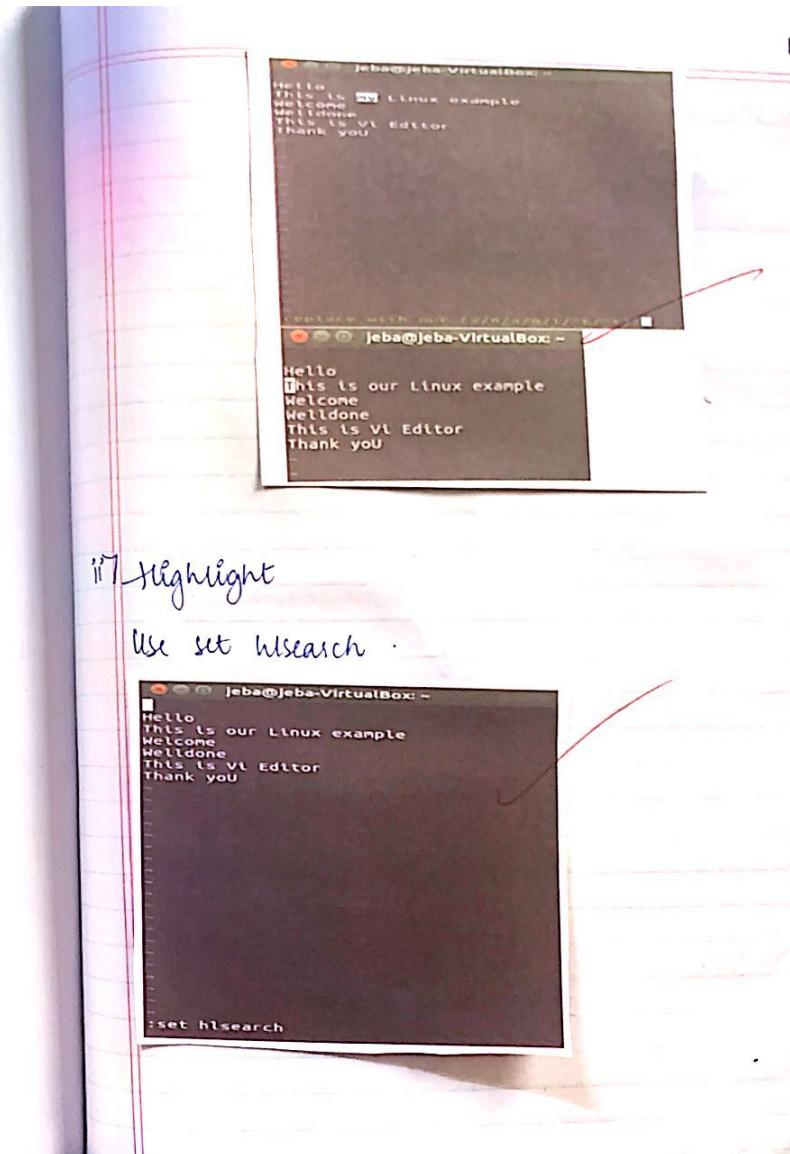
b) Learn all essential commands like search (replace), highlight, show line numbers.

Replace.

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

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

:9/ny///our/gc
```



ii) Highlight

Use set hlsearch .

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

:set hlsearch
```

Practical 8:- Linux Security

Q) Show the line number.

Use `cat`

```
jeba@jeba-VirtualBox:~$ cat
1 Hello
2 This is our Linux example
3 Welcome
4 to the
5 editor
6 THIS IS VI EDITOR
7 Thank you

jeba@jeba-VirtualBox:~$
```

DR. ~

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 users root privileges edit /etc/sudoers 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
```

Q) Identify operations 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.
```

Modify expiration date for new user using password ageing.

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

```
jeba@jeba-VirtualBox:~$ sudo chage -l user1
          Last password change : Aug 09, 2020
          Account expires     : never
          Minimum password age : Jan 21, 2020
          Maximum password age: 99999
          Number of days of warning before password change: 5
          Minimum number of days between password change: 100
          Maximum number of days between password change: 31
          Account inactive    : never
          Password expiries   : never
```

```
jeba@jeba-VirtualBox:~$ sudo chage -l user1
          Last password change : May 20, 2020
          Account expires     : Jan 01, 2022
          Minimum password age : Jan 21, 2020
          Maximum password age: 99999
          Number of days of warning before password change: 30
          Minimum number of days between password change: 90
          Maximum number of days between password change: 10
          Account inactive    : never
          Password expiries   : never
```

- 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.

Delete newly added user.

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

✓ 07/02

Practical 9:- Network Management

a) Get IP address of your machine using ifconfig

```
jeba@jeba-VirtualBox:~$ ifconfig
enp0s3 Link encap:Ethernet HWaddr 0B: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:53ab:1e84%enp0s3/64 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:~$
```

c) Use ping command to check the network connectivity to remote machine.

```
jeba@jeba-VirtualBox:~$ ping www.google.com
PING www.google.com (172.217.31.196) 56(84) bytes of data.
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=1 ttl=54 time=97.8 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=2 ttl=54 time=82.0 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=3 ttl=54 time=84.8 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=4 ttl=54 time=87.1 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=5 ttl=54 time=93.5 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=6 ttl=54 time=86.9 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=7 ttl=54 time=98.0 ms
64 bytes from naa03s28-in-f4.1e100.net (172.217.31.196): icmp_seq=8 ttl=54 time=90.9 ms
^Z
ping: Stopped.
```

d) Use of dig command

```
jeba@jeba-VirtualBox:~$ dig www.google.com
;; <> DTC 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:
ENDS: version: 0, flags: udp: 4696
QUESTION SECTION:
www.google.com. IN A
ANSWER SECTION:
www.google.com. 91 IN A 172.217.166.106
query time: 152 msec
SERVER: 127.0.1.1#53(127.0.1.1)
WHEN: Mon Jan 20 22:46:06 IST 2020
MSG SIZE rcvd: 59
jeba@jeba-VirtualBox:~$
```

e) Troubleshooting network using traceroute, route command

```
jeba@jeba-VirtualBox:~$ traceroute www.google.com
traceroute to www.google.com (172.217.166.106), 30 hops max, 60 byte packets
1 10.0.2.2 (10.0.2.2) 0.198 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:~$
```

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

f) Use of arp command

arp						
Address	Hwtype	Hwaddress	Flags	Mask	Iface	
10.0.2.2	ether	52:54:00:12:35:02	C			
3						

g) Use of host command

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

Use of netstat & Nmap command.

```
jeba@jeba-VirtualBox:~$ netstat -an | grep ':/tmp/*' | grep 'DGRAM'  
jeba@jeba-VirtualBox:~$ netstat -an | grep ':/tmp/*' | grep 'DGRAM'  
Proto Recv-Q Send-Q Local Address           Foreign Address         State  
Proto Recv-Q Send-Q Local Address           Foreign Address         State  
Active UNIX domain sockets (w/o servers)    Type      State          I-Node Path  
Proto Recv-Q Send-Q Local Address           Foreign Address         State  
Proto Recv-Q Send-Q Local Address           Foreign Address         State  
dnotify                                DGRAM    LISTEN        42149  /run/user/1000/system  
unix 2                                DGRAM    LISTEN        9694   /run/systemd/journal/  
unix 16                                DGRAM    LISTEN        9695   /run/systemd/journal/  
dev-log                                DGRAM    LISTEN        9704   /run/systemd/journal/  
unix 7                                DGRAM    LISTEN        9704   /run/systemd/journal/  
socket                                DGRAM    CONNECTED     9684   /run/systemd/notify  
unix 3                                STREAM   CONNECTED     44692  @/tmp/dbus-Cyente17AQG  
unix 3                                STREAM   CONNECTED     43111  @/tmp/dbus-Cyente17AQG  
unix 3                                STREAM   CONNECTED     42988  @/tmp/dbus-CMGGc8G7P5  
unix 3                                STREAM   CONNECTED     42698  @/tmp/dbus-CMGGc8G7P5  
unix 3                                STREAM   CONNECTED     13242  /run/systemd/journal/  
stdout                                STREAM   CONNECTED     43113  /run/systemd/journal/  
stderr                                STREAM   CONNECTED     43013  /run/systemd/journal/  
unix 3                                STREAM   CONNECTED     42935  /run/systemd/journal/
```

```
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::2804  
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:~$
```

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Practical 10: Shell Scripting .

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Basics of shell scripting :-

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

Echo \$SHELL .

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

vi filename.sh
#!/bin/bash
echo "THIS IS LINUX!"

```
tcsctcsc@tcsctcsc-VirtualBox: ~
#!/bin/bash
echo "THIS IS LINUX"
"linux.sh" [New File]
```

~~chmod #filename.sh
./filename.sh~~

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

Steps to write and execute a shell script:

Shell script is just a simple text file with .sh extension, having executable permission.

Open terminal:

Navigate to the place where you want to create script using cd command.

Touch filename.sh F

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7 Vi filename.sh [You can use your favorite editor to edit the script].

chmod 777 filename.sh (for making the script executable).
./filename.sh or ./filename.sh (for running script).

Program to display your name.

```
#!/bin/bash
echo "Enter your name:"
read name
echo "My name is: $name"
```

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

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

Program to find the sum of two variables.

```
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"
```

```
tcsc@tcsc-VirtualBox:~
```

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

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

```
tcsc@tcsc-VirtualBox:~
```

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

```
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 manipulations 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  
calculus  
computer basic
```

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

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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: ~ v1 cs.txt  
tcsc@tcsc-VirtualBox: ~ sed -n 3,5p cs.txt  
database management  
linux  
python  
tcsc@tcsc-VirtualBox: ~
```

display all except some lines.

display all content of a file except for some portion,
option `d`.

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  
calculus  
computer basic
```

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5) 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
```

6) 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
```

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