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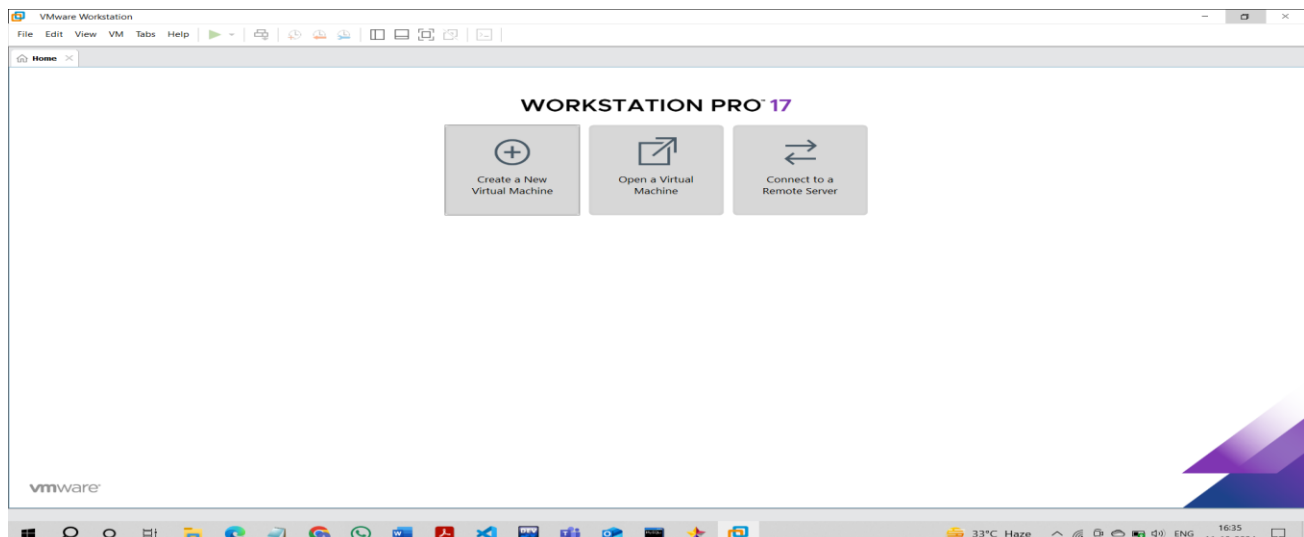
PRACTICAL-1

AIM- Installation of Linux Operating System.

THEORY-

- Linux is an open-source operating system (OS). Linux was designed to be like UNIX, but has evolved to run on a wide variety of hardware from phones to supercomputers.
- Every Linux-based OS involves the Linux kernel—which manages hardware resources—and a set of software packages that make up the rest of the operating system. Linux makes very efficient **use** of the system's resources.
- Linux runs on a range of hardware, right from supercomputers to watches. You can give new life to your old and slow Windows system by installing a lightweight Linux system, or even run a NAS or media streamer using a particular distribution of Linux.
- Linux is perfect for everyday tasks like browsing, emailing, photo management, financial management, and much more.

PROCEDURE-



New Virtual Machine Wizard

vmware
WORKSTATION
PRO™

17

What type of configuration do you want?

☒ Typical (recommended)
Create a Workstation 17.x virtual machine in a few easy steps.

☐ Custom (advanced)
Create a virtual machine with advanced options, such as a SCSI controller type, virtual disk type and compatibility with older VMware products.

Help

< Back

Next >

Cancel

New Virtual Machine Wizard

Guest Operating System Installation

A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

☐ Installer disc:
No drives available

☒ Installer disc image file (iso):
D:\Fedora-Workstation-Live-x86_64-38-1.6.iso
Browse...
Fedora 64-bit detected.
To use Easy Install, insert the first disc of the set.

☐ I will install the operating system later.
The virtual machine will be created with a blank hard disk.

Help

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Next >

Cancel

New Virtual Machine Wizard

Name the Virtual Machine

What name would you like to use for this virtual machine?

Virtual machine name:
Fedora 64-bit

Location:
C:\Users\Asus\Documents\Virtual Machines\Fedora 64-bit
Browse...
The default location can be changed at Edit > Preferences.

< Back

Next >

Cancel

New Virtual Machine Wizard

Ready to Create Virtual Machine

Click Finish to create the virtual machine and start installing Fedora 64-bit.

The virtual machine will be created with the following settings:

Name:	Fedora 64-bit
Location:	C:\Users\Asus\Documents\Virtual Machines\Fedora 64-bit
Version:	Workstation 17.x
Operating System:	Fedora 64-bit
Hard Disk:	20 GB, Split
Memory:	2048 MB
Network Adapter:	NAT
Other Devices:	CD/DVD, USB Controller, Printer, Sound Card

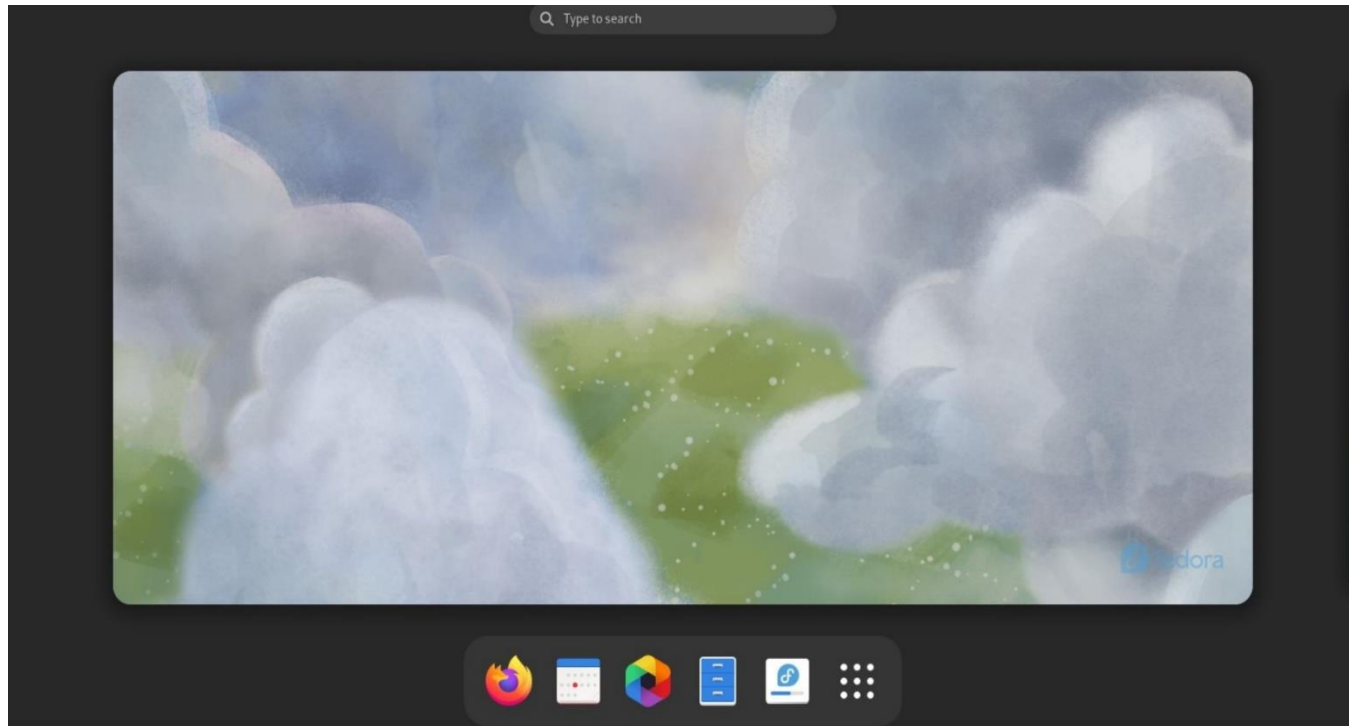
Customize Hardware...

☒ Power on this virtual machine after creation

< Back

Finish

Cancel



CONCLUSION- Fedora has been successfully installed on my device.

PRACTICAL 2

AIM - Study of logging/logout details.

THEORY -

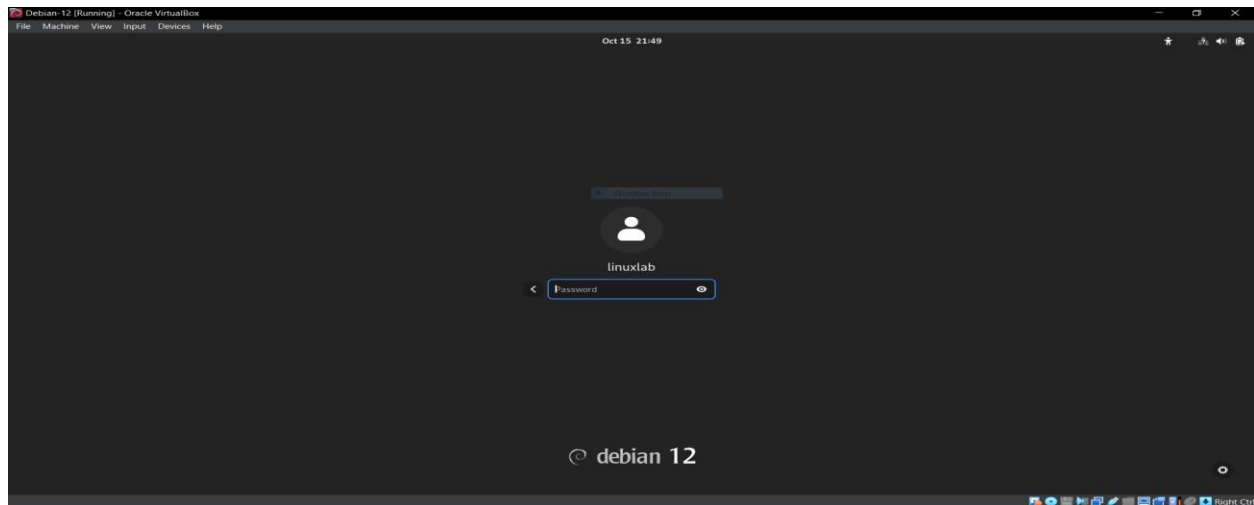
The process of logging in and logging out are fairly straightforward and similar to Windows. Logging and logout details are vital components of system administration and security management in multi-user environments. These logs provide a historical record of user activity, including login times, logout times, and session durations, which can be crucial for tracking users behavior and identifying security breaches.

The primary tools for monitoring user sessions in Linux include commands like ``last``, ``who``, and ``w``, which retrieve information from log files such as ``/var/log/wtmp`` and ``/var/log/btmp``. The ``wtmp`` file records all login and logout events, while the ``btmp`` file tracks failed login attempts, helping administrators detect unauthorized access attempts.

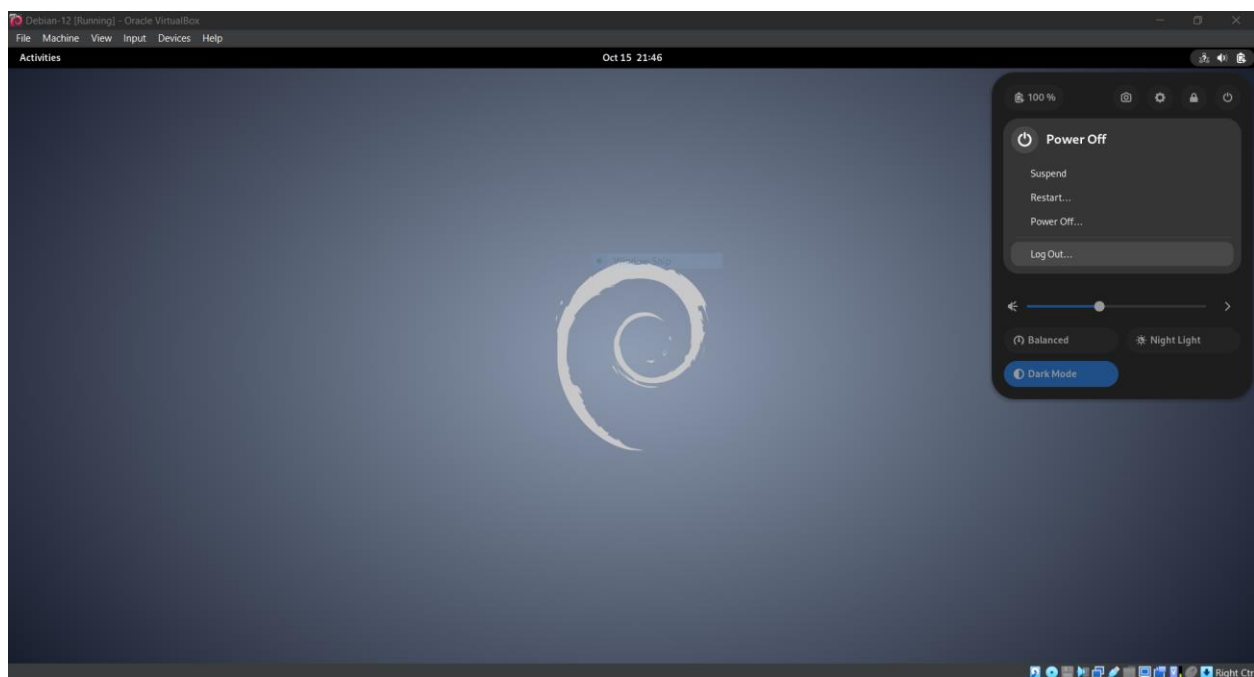
Monitoring login/logout details aids in resource management, ensuring users have appropriate access while minimizing the risk of unauthorized activities. Analyzing these logs can reveal patterns of usage, identify potential security threats, and facilitate compliance with security policies. Overall, maintaining a comprehensive record of user logins and logouts is essential for ensuring system integrity and security in any computing environment.

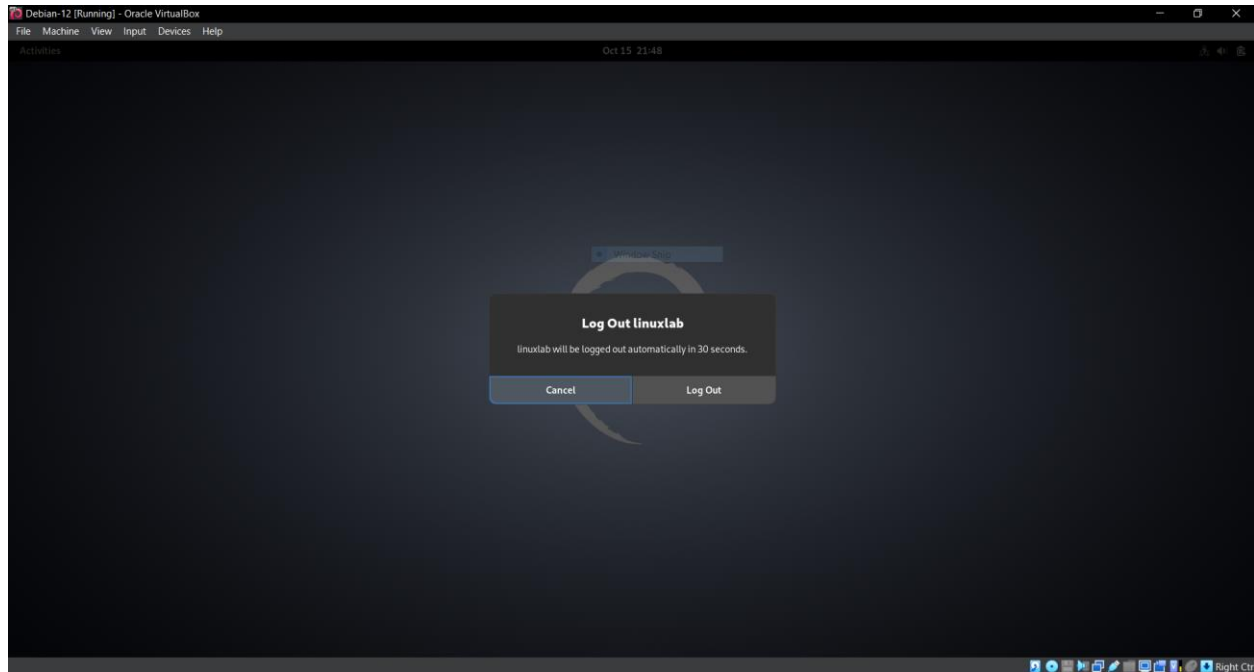
PROCEDURE -

Logging In:



Logging Out:





Commands that can be used to view login/logout details:

- last
 - displays a list of all users who have logged in and out of the system.
 - this command reads from the `/var/log/wtmp` file, showing user login/logout times and durations.

```
linuxlab@debian:~$ last
linuxlab tty2          tty2          Tue Oct 15 17:56      still logged in
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 17:55      still running
linuxlab tty2          tty2          Tue Oct 15 17:36 -    down      (00:00)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 17:35 -    17:36      (00:01)
linuxlab tty2          tty2          Tue Oct 15 17:33 -    down      (00:07)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 17:32 -    17:40      (00:07)
linuxlab tty2          tty2          Tue Oct 15 17:30 -    down      (00:03)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 17:30 -    17:34      (00:03)
linuxlab tty2          tty2          Tue Oct 15 17:14 -    crash      (00:15)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 17:14 -    17:34      (00:20)
linuxlab tty2          tty2          Tue Oct 15 16:58 -    down      (00:12)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 16:58 -    17:11      (00:12)
linuxlab tty2          tty2          Tue Oct 15 16:56 -    down      (00:01)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 16:53 -    16:58      (00:05)
linuxlab tty2          tty2          Tue Oct 15 16:47 -    16:56      (00:09)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 16:47 -    16:56      (00:09)
linuxlab tty1          Tue Oct 15 16:35 -    down      (00:11)
reboot  system boot      6.1.0-26-amd64 Tue Oct 15 16:35 -    16:47      (00:11)

wtmp begins Tue Oct 15 16:35:36 2024
```

- lastb
 - displays a list of failed login attempts.
 - this command reads from the `/var/log/btmp` file.

```
linuxlab@debian:~$ sudo lastb
[sudo] password for linuxlab:

btmp begins Tue Oct 15 16:27:26 2024
```

- who
 - shows currently logged-in users and their login times.

```
linuxlab@debian:~$ who
linuxlab tty2          2024-10-15 17:56 (tty2)
```

- w

- provides information about logged-in users and what they are currently doing, including their login time and idle time.

```
linuxlab@debian:~$ w
21:25:21 up 3:29, 1 user, load average: 0.91, 1.25, 1.17
USER      TTY      FROM            LOGIN@   IDLE   JCPU   PCPU WHAT
linuxlab  tty2     tty2            17:56    3:29m  0.04s  0.04s /usr/libexec/gnome-session-binary
```

- utmpdump
 - dumps the contents of the utmp, wtmp, or btmp files in a readable format.

```
linuxlab@debian:~$ utmpdump /var/log/wtmp
Utmp dump of /var/log/wtmp
[2] [00000] [~~ ] [reboot ] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:05:36,230054+00:00]
[1] [00053] [~~ ] [runlevel] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:05:38,274828+00:00]
[5] [00559] [tty1] [      ] [tty1   ] [      ] [0.0.0.0] [2024-10-15T11:05:38,303057+00:00]
[6] [00559] [tty1] [LOGIN ] [tty1   ] [      ] [0.0.0.0] [2024-10-15T11:05:38,303057+00:00]
[7] [00559] [      ] [linuxlab] [tty1   ] [      ] [0.0.0.0] [2024-10-15T11:05:45,846494+00:00]
[1] [00000] [~~ ] [shutdown] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:17:00,887417+00:00]
[2] [00000] [~~ ] [reboot ] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:17:05,410395+00:00]
[1] [00053] [~~ ] [runlevel] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:17:11,499739+00:00]
[7] [01212] [      ] [linuxlab] [tty2   ] [tty2   ] [0.0.0.0] [2024-10-15T11:17:16,733085+00:00]
[8] [01212] [      ] [      ] [tty2   ] [tty2   ] [0.0.0.0] [2024-10-15T11:26:26,326648+00:00]
[1] [00000] [~~ ] [shutdown] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:26:26,802336+00:00]
[2] [00000] [~~ ] [reboot ] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:23:18,337118+00:00]
[1] [00053] [~~ ] [runlevel] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:26:45,157494+00:00]
[7] [01213] [      ] [linuxlab] [tty2   ] [tty2   ] [0.0.0.0] [2024-10-15T11:26:49,116259+00:00]
[1] [00000] [~~ ] [shutdown] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:28:27,229125+00:00]
[2] [00000] [~~ ] [reboot ] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:28:21,941310+00:00]
[1] [00053] [~~ ] [runlevel] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:28:40,982413+00:00]
[7] [01934] [      ] [linuxlab] [tty2   ] [tty2   ] [0.0.0.0] [2024-10-15T11:28:44,196632+00:00]
[1] [00000] [~~ ] [shutdown] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:41:20,830795+00:00]
[2] [00000] [~~ ] [reboot ] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:44:19,823383+00:00]
[1] [00053] [~~ ] [runlevel] [~      ] [6.1.0-26-amd64] [0.0.0.0] [2024-10-15T11:44:36,177142+00:00]
[7] [02001] [      ] [linuxlab] [tty2   ] [tty2   ] [0.0.0.0] [2024-10-15T11:44:39,264880+00:00]
```

- finger
 - provides detailed information about users, including their login times and idle status.

```
linuxlab@debian:~$ sudo apt install finger
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  finger
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 19.8 kB of archives.
After this operation, 50.2 kB of additional disk space will be used.
Get:1 http://deb.debian.org/debian bookworm/main amd64 finger amd64 0.17-17 [19.8 kB]
Fetched 19.8 kB in 0s (66.0 kB/s)
Selecting previously unselected package finger.
(Reading database ... 115119 files and directories currently installed.)
Preparing to unpack .../finger_0.17-17_amd64.deb ...
Unpacking finger (0.17-17) ...
Setting up finger (0.17-17) ...
Processing triggers for man-db (2.11.2-2) ...
linuxlab@debian:~$ finger
Login      Name      Tty      Idle  Login Time   Office      Office Phone
linuxlab           tty2      3:30  Oct 15 17:56 (tty2)
linuxlab@debian:~$
```

CONCLUSION: Used commands that can be used to get login/logout details.

PRACTICAL 3

AIM: Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands.

PROCEDURE-

- **man command**

Used to display the user manual of any command that we can run on the terminal.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ man
What manual page do you want?
For example, try 'man man'.
linuxlab@linuxlab-VirtualBox:~/Desktop$ man echo
linuxlab@linuxlab-VirtualBox:~/Desktop$ echo hello
hello
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **pwd command**

Used to find current path

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ pwd
/home/linuxlab/Desktop
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ls command**

It is used to list files in current directory.

```
linuxlab@linuxlab-VirtualBox:~$ ls
dead.letter  Documents  Music      Public      Templates  Vifile.txt
Desktop      Downloads  Pictures   shellfile.sh Videos
linuxlab@linuxlab-VirtualBox:~$
```

- **ls -ltr command**

It is used to list files by time in reverse order with long listing.

```
linuxlab@linuxlab-VirtualBox:~$ ls -ltr
total 44
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov  9 17:39 Templates
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov  9 17:39 Public
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 11:24 Documents
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 11:25 Downloads
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 11:25 Music
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 11:25 Pictures
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 11:25 Videos
-rw-rw-r-- 1 linuxlab linuxlab   21 Nov 10 11:40 VIfile.txt
-rw-rw-r-- 1 linuxlab linuxlab   18 Nov 10 11:46 shellfile.sh
-rw-rw-r-- 1 linuxlab mail    372 Nov 10 13:07 dead.letter
drwxr-xr-x 2 linuxlab linuxlab 4096 Nov 10 17:47 Desktop
linuxlab@linuxlab-VirtualBox:~$
```

- **history command**

This command displays all the commands that were previously being executed by the user.

```
linuxlab@linuxlab-VirtualBox:~$ history
1  docker
2  sudo apt install docker.io
3  docker --version
4  sudo systemctl status docker
5  sudo apt-get update
6  sudo docker run hello-world
7  docker images
8  sudo docker images
9  docker ps
10 sudo docker ps
11 sudo docker ps -a
12 sudo chmod compare.sh
13 cat > compare.sh
14 bash compare.sh
15 cat > string.sh
16 bash string.shj
17 bash string.sh
18 cat >logical.sh
```

- ping command

The ping command (packet internet groper) checks connectivity status between host to server. Ping uses ICMP (Internet Control Message protocol) and sends an ICMP echo to the server. It takes an

```
linuxlab@linuxlab-VirtualBox:~$ ping google.com
PING google.com (142.250.192.110) 56(84) bytes of data.
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=1 ttl=58 time=26.4 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=2 ttl=58 time=28.2 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=3 ttl=58 time=26.6 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=4 ttl=58 time=27.5 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=5 ttl=58 time=27.4 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=6 ttl=58 time=27.4 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=7 ttl=58 time=27.6 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=8 ttl=58 time=27.0 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=9 ttl=58 time=27.9 ms
64 bytes from bom12s17-in-f14.1e100.net (142.250.192.110): icmp_seq=10 ttl=58 t
```

input of an IP address or URL.

- df command- The df command is used to display the disk space used in the file system. It displays the output as in the number of used blocks, available blocks, and the mounted directory

```
linuxlab@linuxlab-VirtualBox:~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev             723808         0      723808   0% /dev
tmpfs            151200      1352      149848   1% /run
/dev/sda5        9736500 8242036      980160  90% /
tmpfs            755984         0      755984   0% /dev/shm
tmpfs            5120          4         5116   1% /run/lock
tmpfs            755984         0      755984   0% /sys/fs/cgroup
/dev/loop5         128         128           0 100% /snap/bare/5
/dev/loop0        224256    224256           0 100% /snap/gnome-3-34-1804/66
/dev/loop1         66432     66432           0 100% /snap/gtk-common-themes/1514
/dev/loop3         31872     31872           0 100% /snap/snapd/11036
/dev/loop4         52352     52352           0 100% /snap/snap-store/518
/dev/loop7        224256    224256           0 100% /snap/gnome-3-34-1804/72
/dev/loop6         66816     66816           0 100% /snap/gtk-common-themes/1519
/dev/loop2         56832     56832           0 100% /snap/core18/1988
/dev/loop8         52224     52224           0 100% /snap/snap-store/547
/dev/loop10        43264     43264           0 100% /snap/snapd/13831
/dev/loop9         56832     56832           0 100% /snap/core18/2246
/dev/sda1         523248         4      523244   1% /boot/efi
tmpfs            151196        20      151176   1% /run/user/1000
linuxlab@linuxlab-VirtualBox:~$
```

- **cd command**

The “cd” command is used to change the current directory.

```
linuxlab@linuxlab-VirtualBox:~$ cd Desktop
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **cat command**

The “cat” command is a multi-purpose utility in the Linux system. It can be used to create a file, display content of the file, copy the content of one file to another file, and more.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ cat > sample.txt
abc
def
aa
ads
^C
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ps command**

To view the processes that you’re running, use ps command.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ps
  PID TTY          TIME CMD
 2160 pts/0    00:00:00 bash
 2318 pts/0    00:00:00 ps
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **top command**

Command used to view all the processes that are running.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ top

top - 18:15:12 up 21 min,  1 user,  load average: 0.01, 0.07, 0.09
Tasks: 181 total,   1 running, 180 sleeping,   0 stopped,   0 zombie
%Cpu(s):  9.9 us,  1.4 sy,  0.0 ni, 88.4 id,  0.0 wa,  0.0 hi,  0.3 si,  0.0 st
MiB Mem :  1476.5 total,   86.9 free,   723.3 used,   666.4 buff/cache
MiB Swap:   448.5 total,   447.5 free,    1.0 used.   613.6 avail Mem

  PID USER      PR  NI   VIRT   RES   SHR  S  %CPU  %MEM    TIME+  COMMAND
 1290 linuxlab  20   0 3439632 326104 118224 S   6.0   21.6  0:33.75 gnome-+
   732 linuxlab  20   0  529888  58988  38268 S   3.0    3.9  0:07.77 Xorg
 2152 linuxlab  20   0  823280  50748  38280 S   2.0    3.4  0:02.33 gnome-+
    12 root      20   0      0      0      0 S   0.3    0.0  0:00.17 ksofti+
 1621 linuxlab  20   0  912320  32408  21688 S   0.3    2.1  0:00.38 gsd-me+
 2321 linuxlab  20   0   20488   3688   3176 R   0.3    0.2  0:00.03 top
     1 root      20   0 167776  11584   8436 S   0.0    0.8  0:02.17 systemd
     2 root      20   0      0      0      0 S   0.0    0.0  0:00.00 kthrea+
     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 kworke+
     9 root       0 -20      0      0      0 I   0.0    0.0  0:00.00 mm_per+
    10 root      20   0      0      0      0 S   0.0    0.0  0:00.00 rcu_ta+
    11 root      20   0      0      0      0 S   0.0    0.0  0:00.00 rcu_ta+
    13 root      20   0      0      0      0 I   0.0    0.0  0:00.85 rcu_sc+
    14 root      rt    0      0      0      0 S   0.0    0.0  0:00.02 migrat+
    15 root     -51   0      0      0      0 S   0.0    0.0  0:00.00 idle_i+
    16 root      20   0      0      0      0 S   0.0    0.0  0:00.00 cpuhp/0
    17 root      20   0      0      0      0 S   0.0    0.0  0:00.00 kdevtm+
```

- **mkdir command**

To create a new directory, use “mkdir”.

- **rmdir command**

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ mkdir linux
linuxlab@linuxlab-VirtualBox:~/Desktop$ ls
linux  sample.txt
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **head command**

“head” command displays the top part of a file. It displays the first 10 lines in a file.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ head sample.txt
abc
def
aa
ads
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **head command for n lines**

Command used to display the n number of lines in a file.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ head -n 2 sample.txt
abc
def
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **tail command**

“tail” command displays the last part of a file. It displays the last 10 lines in a file.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ tail sample.txt
abc
def
aa
ads
linuxlab@linuxlab-VirtualBox:~/Desktop$
```


- **tail command for n lines**

Command used to display the n number of lines in a file.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ tail -n 2 sample.txt
aa
ads
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **cp command**

The “cp” command is used to copy a file or directory.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ cat abcd.txt
abc
def
aa
ads
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

19.id command

The “id” command is used to display the user ID (UID) and group ID (GID).

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ id
uid=1000(linuxlab) gid=1000(linuxlab) groups=1000(linuxlab),4(adm),24(cdrom),27(sudo),30(dip),46(plugdev),120(lpadmin),131(lxd),132(sambashare)
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **wc command**

The “wc” command is used to count the lines, words, and characters in a file.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ wc sample.txt
 4  4 15 sample.txt
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

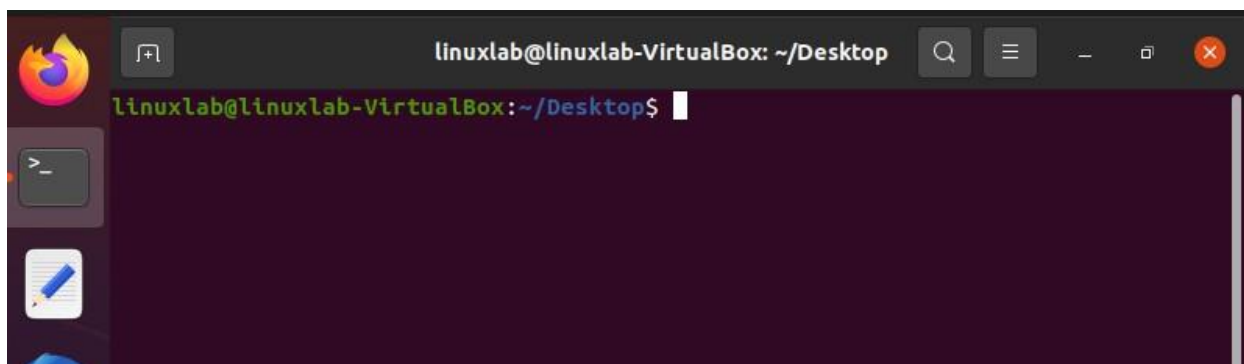
- **host command**

The “host” command is used to display the IP address for a given domain name and vice versa. It performs the DNS lookups for the DNS Query.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ host google.com
google.com has address 142.250.192.142
google.com has IPv6 address 2404:6800:4009:825::200e
google.com mail is handled by 10 aspmx.l.google.com.
google.com mail is handled by 30 alt2.aspmx.l.google.com.
google.com mail is handled by 50 alt4.aspmx.l.google.com.
google.com mail is handled by 40 alt3.aspmx.l.google.com.
google.com mail is handled by 20 alt1.aspmx.l.google.com.
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **clear command**

Linux **clear** command is used to clear the terminal screen.



- **less command**

“less” displays a file, allowing forward/backward movement within it.

```
abc  
def  
aa  
ads  
sample.txt (END)
```

- **ls -l command**

Command used to display the files in long list format.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ls -l  
total 8  
-rw-rw-r-- 1 linuxlab linuxlab 15 Nov 10 18:19 abcd.txt  
-rw-rw-r-- 1 linuxlab linuxlab 15 Nov 10 18:13 sample.txt  
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ls -t command**

Command used to display the files in sorting format of time modification.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ls -t  
abcd.txt sample.txt  
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ls -h command**

Command used to display the file sizes in human readable format.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ls -h  
abcd.txt sample.txt  
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ls -r command**

Command used to display the files in reverse order format.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ls -r
sample.txt  abcd.txt
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **ip command-**

: Linux “ip” command is an updated version of the ipconfig command. It is used to assign an IP address, initialize an interface, disable an interface.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ ip
Usage: ip [ OPTIONS ] OBJECT { COMMAND | help }
       ip [ -force ] -batch filename
where  OBJECT := { link | address | addrlabel | route | rule | neigh | ntable |
                  tunnel | tuntap | maddress | mroute | mrule | monitor | xfrm
                  |
                  netns | l2tp | fou | macsec | tcp_metrics | token | netconf
                  | ila |
                  vrf | sr | nexthop }
      OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |
                  -h[uman-readable] | -iec | -j[son] | -p[retty] |
                  -f[amily] { inet | inet6 | mpls | bridge | link } |
                  -4 | -6 | -I | -D | -M | -B | -O |
                  -l[oops] { maximum-addr-flush-attempts } | -br[ief] |
                  -o[neline] | -t[imestamp] | -ts[hort] | -b[atch] [filename]
                  |
                  -rc[vbuf] [size] | -n[etns] name | -N[umeric] | -a[ll] |
                  -c[olor]}
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- **exit command**

Linux **exit** command is used to exit from the current shell.

CONCLUSION- The general-purpose utility commands were explored and used.

PRACTICAL-4

AIM- Study of Vi Editor.

THEORY-

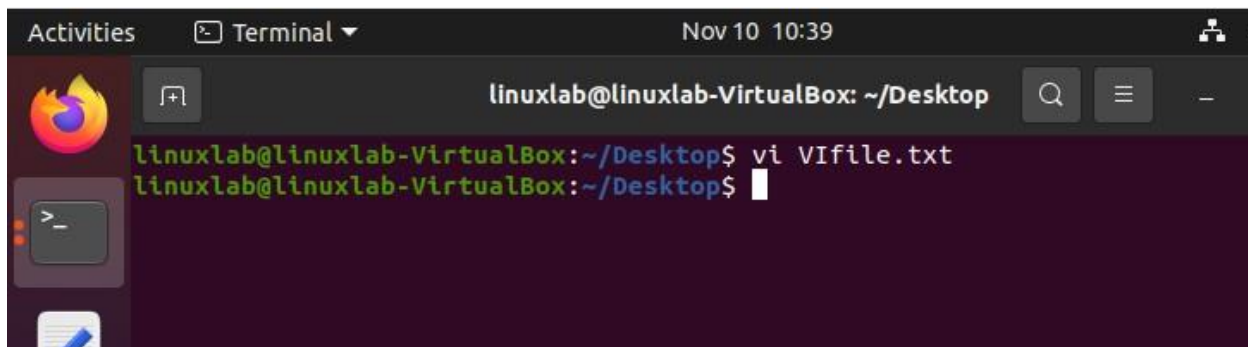
vi Editor is used to edit files in Unix. It is done using the screen-oriented text editor, vi is one of the best ways. This editor enables you to edit lines in context with other lines in the file.

An improved version of the vi editor which is called the VIM has also been made available now. Here, VIM stands for vi improved.

- vi is generally considered the de facto standard in Unix editors because –
- It's usually available on all the flavors of Unix system.
- Its implementations are very similar across the board.
- It requires very few resources.
- It is more user-friendly than other editors such as the ed or the ex.

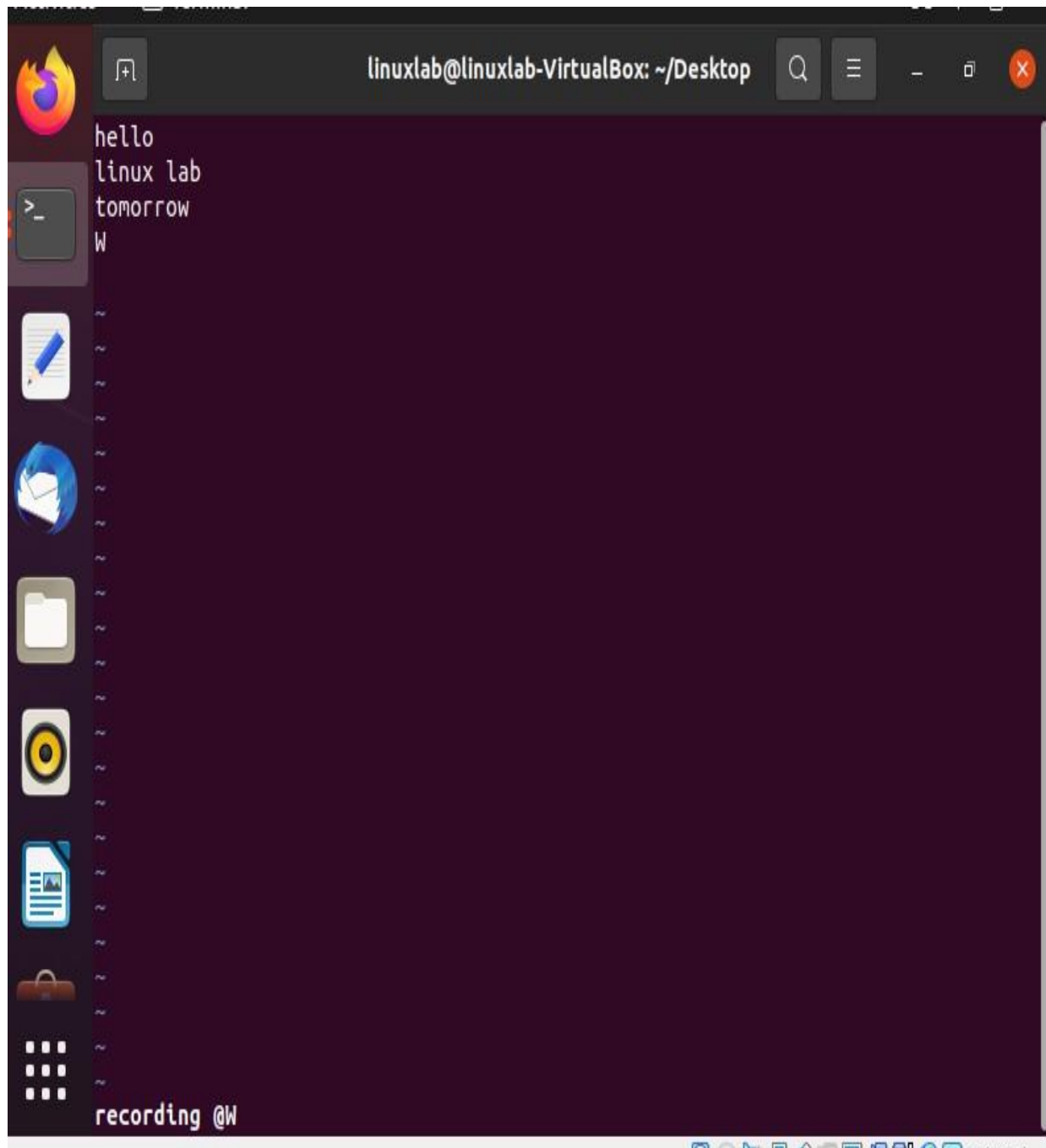
You can use the vi editor to edit an existing file or to create a new file from scratch. You can also use this editor to just read a text file.

PROCEDURE:

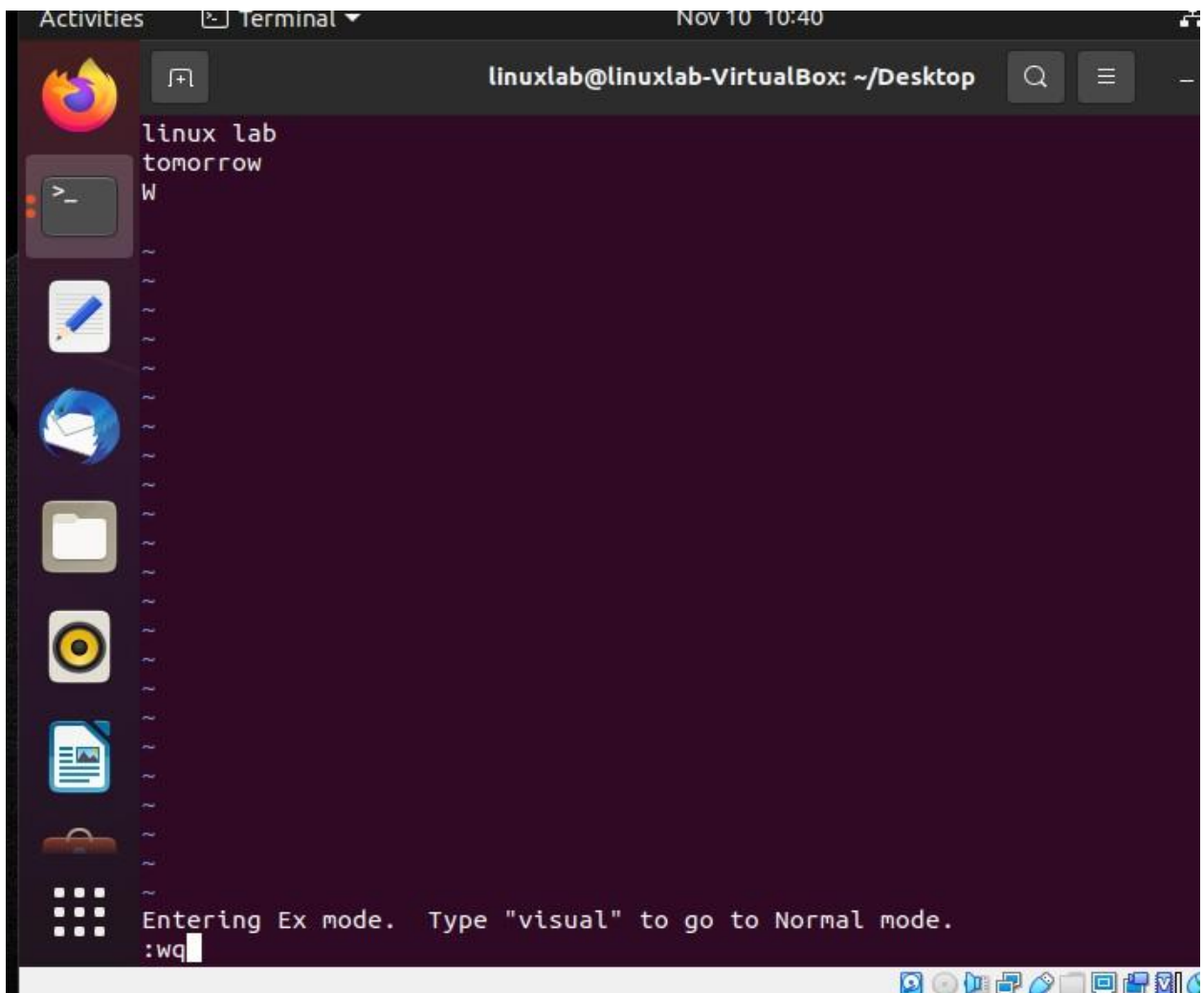
A screenshot of a terminal window titled 'Terminal' with a date and time of 'Nov 10 10:39'. The terminal shows the prompt 'linuxlab@linuxlab-VirtualBox: ~/Desktop' and the command 'vi VIfile.txt' being entered. The terminal background is dark purple, and the text is in a light green font. The window has a standard Ubuntu-style title bar with 'Activities' and 'Terminal' buttons, and a search icon on the right.

- **vi filename command:** Creates a new file if it already does not exist, otherwise opens an existing file.

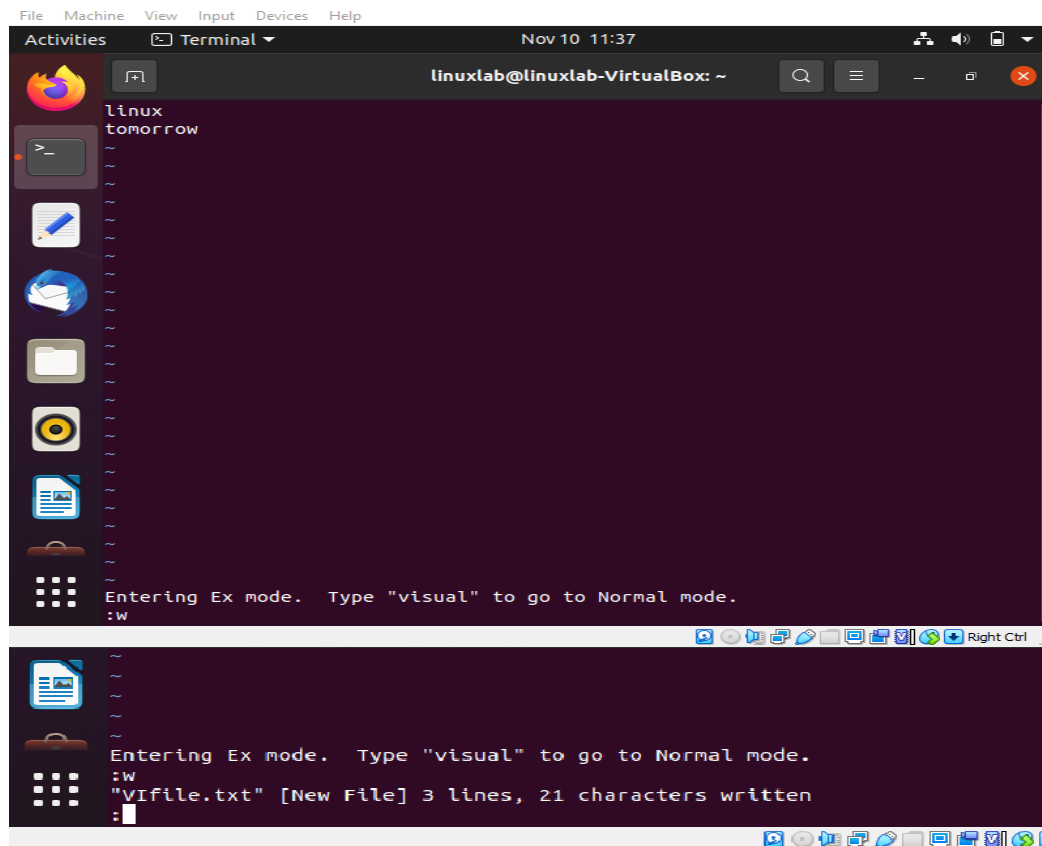
- **Inserting in vi:** use 'I' to enter insertion mode.



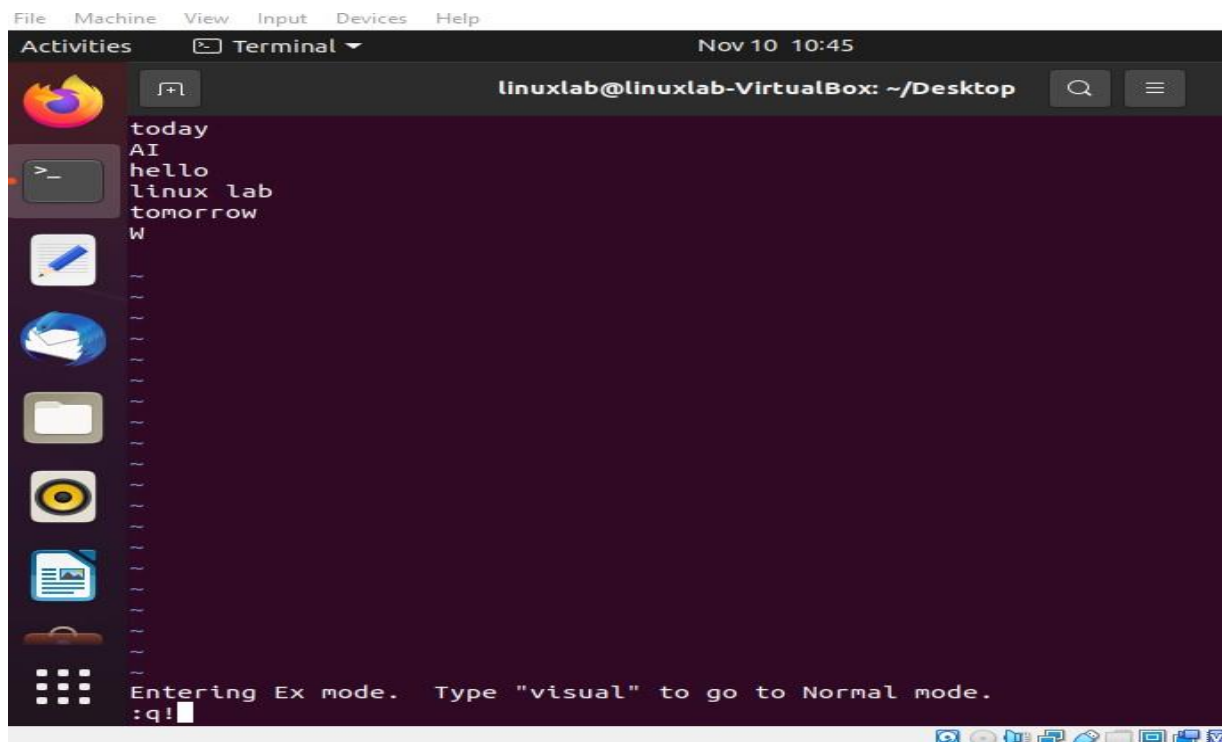
1. **wq**- To exit vi editor.



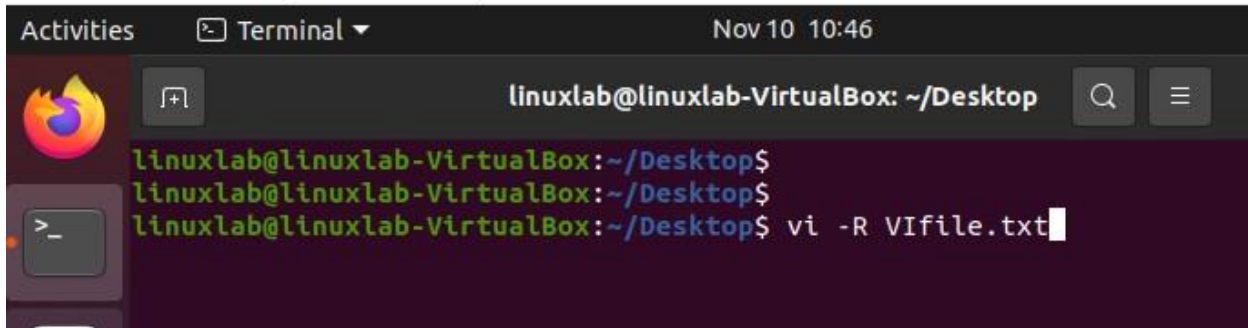
- **:w-** To save edited content in vi editor.



- **:q!** - To exit vi editor without saving.

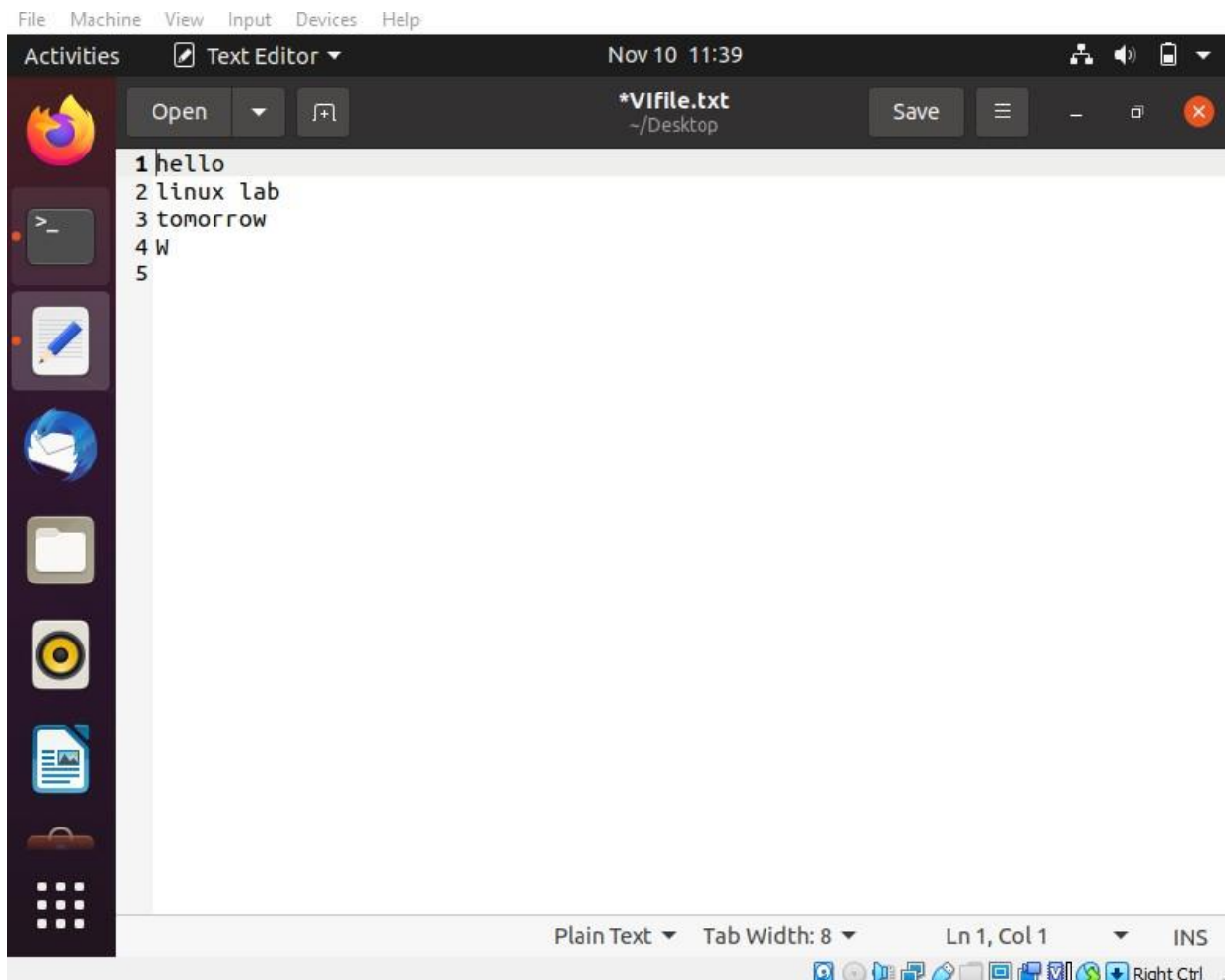


- **vi -R filename:** Opens an existing file in the read-only mode.



A terminal window titled 'Terminal' with a timestamp of 'Nov 10 10:46'. The prompt is 'linuxlab@linuxlab-VirtualBox: ~/Desktop'. The user enters the command 'vi -R VIfile.txt'.

```
linuxlab@linuxlab-VirtualBox:~/Desktop$  
linuxlab@linuxlab-VirtualBox:~/Desktop$  
linuxlab@linuxlab-VirtualBox:~/Desktop$ vi -R VIfile.txt
```



A text editor window titled 'Text Editor' with a timestamp of 'Nov 10 11:39'. The file is named '*VIfile.txt' and is located at '~/Desktop'. The file contains five lines of text:

```
1 hello  
2 linux lab  
3 tomorrow  
4 W  
5
```

The status bar at the bottom indicates 'Plain Text', 'Tab Width: 8', 'Ln 1, Col 1', and 'INS'.

CONCLUSION: VI editor was explored and basic utility commands were executed.

PRACTICAL 5

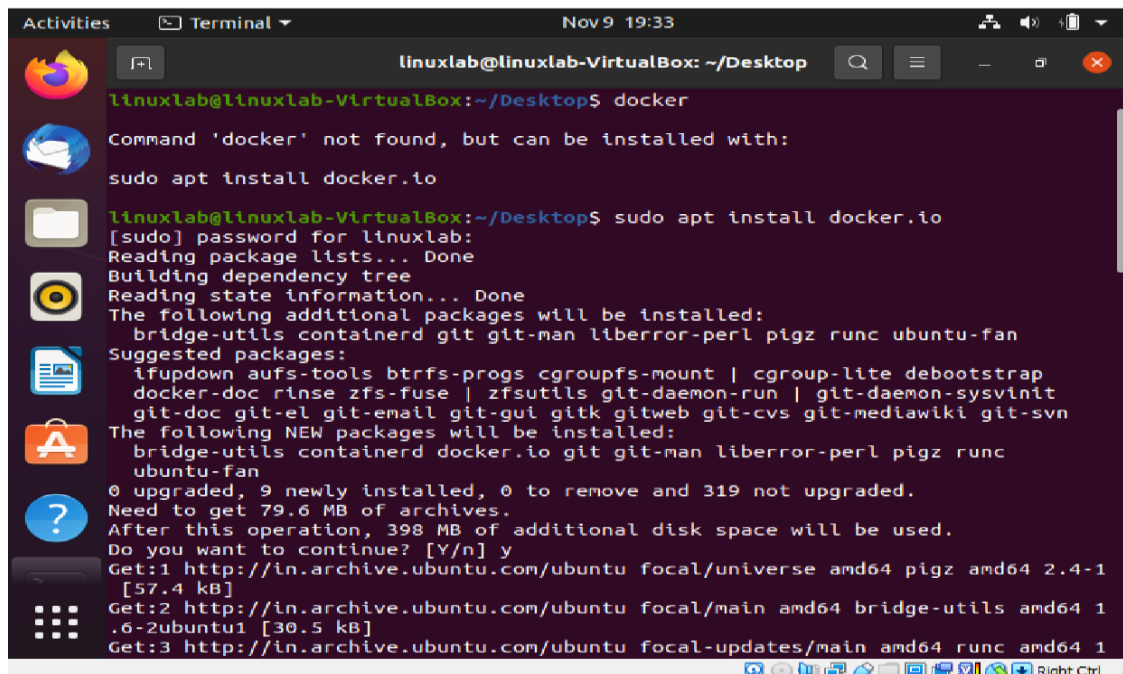
AIM- Implementation of docker on Linux operating system.

THEORY-

- Docker is an open source containerization platform. It enables developers to package applications into containers—standardized executable components combining application source code with the operating system (OS) libraries and dependencies required to run that code in any environment. Containers simplify delivery of distributed applications, and have become increasingly popular as organizations shift to cloud-native development and hybrid multicloud environments.
- Developers can create containers without Docker, but the platform makes it easier, simpler, and safer to build, deploy and manage containers. Docker is essentially a toolkit that enables developers to build, deploy, run, update, and stop containers using simple commands and work- saving automation through a single API.
- Docker is so popular today that “Docker” and “containers” are used interchangeably. But the first container-related technologies were available for years — even decades (link resides outside IBM) — before Docker was released to the public in 2013.

PROCEDURE-

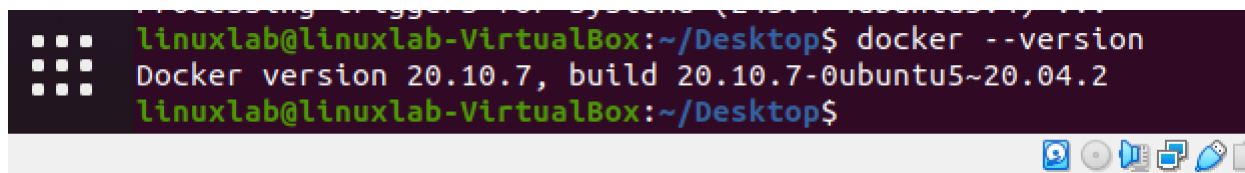
- Installing Docker



```
linuxlab@linuxlab-VirtualBox: ~/Desktop
linuxlab@linuxlab-VirtualBox:~/Desktop$ docker
Command 'docker' not found, but can be installed with:
sudo apt install docker.io

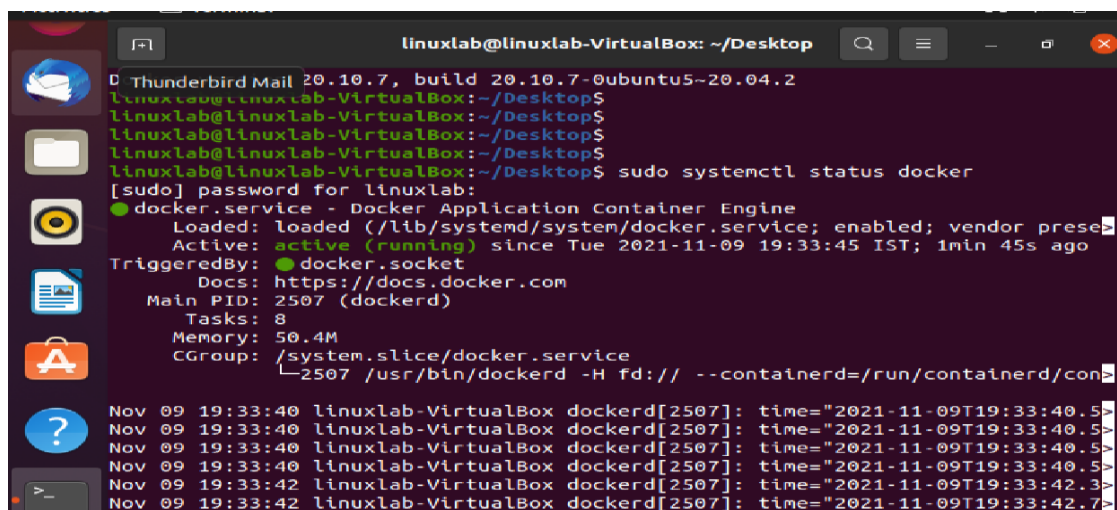
linuxlab@linuxlab-VirtualBox:~/Desktop$ sudo apt install docker.io
[sudo] password for linuxlab:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  bridge-utils containerd git git-man liberror-perl pigz runc ubuntu-fan
Suggested packages:
  ifupdown aufs-tools btrfs-progs cgroupfs-mount | cgroup-lite debootstrap
  docker-doc rinse zfs-fuse | zfsutils git-daemon-run | git-daemon-sysvinit
  git-doc git-el git-email git-gui gitk gitweb git-cvs git-mediawiki git-svn
The following NEW packages will be installed:
  bridge-utils containerd docker.io git git-man liberror-perl pigz runc
  ubuntu-fan
0 upgraded, 9 newly installed, 0 to remove and 319 not upgraded.
Need to get 79.6 MB of archives.
After this operation, 398 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/universe amd64 pigz amd64 2.4-1
[57.4 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 bridge-utils amd64 1
.6-2ubuntu1 [30.5 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 runc amd64 1
```

- Checking version of docker



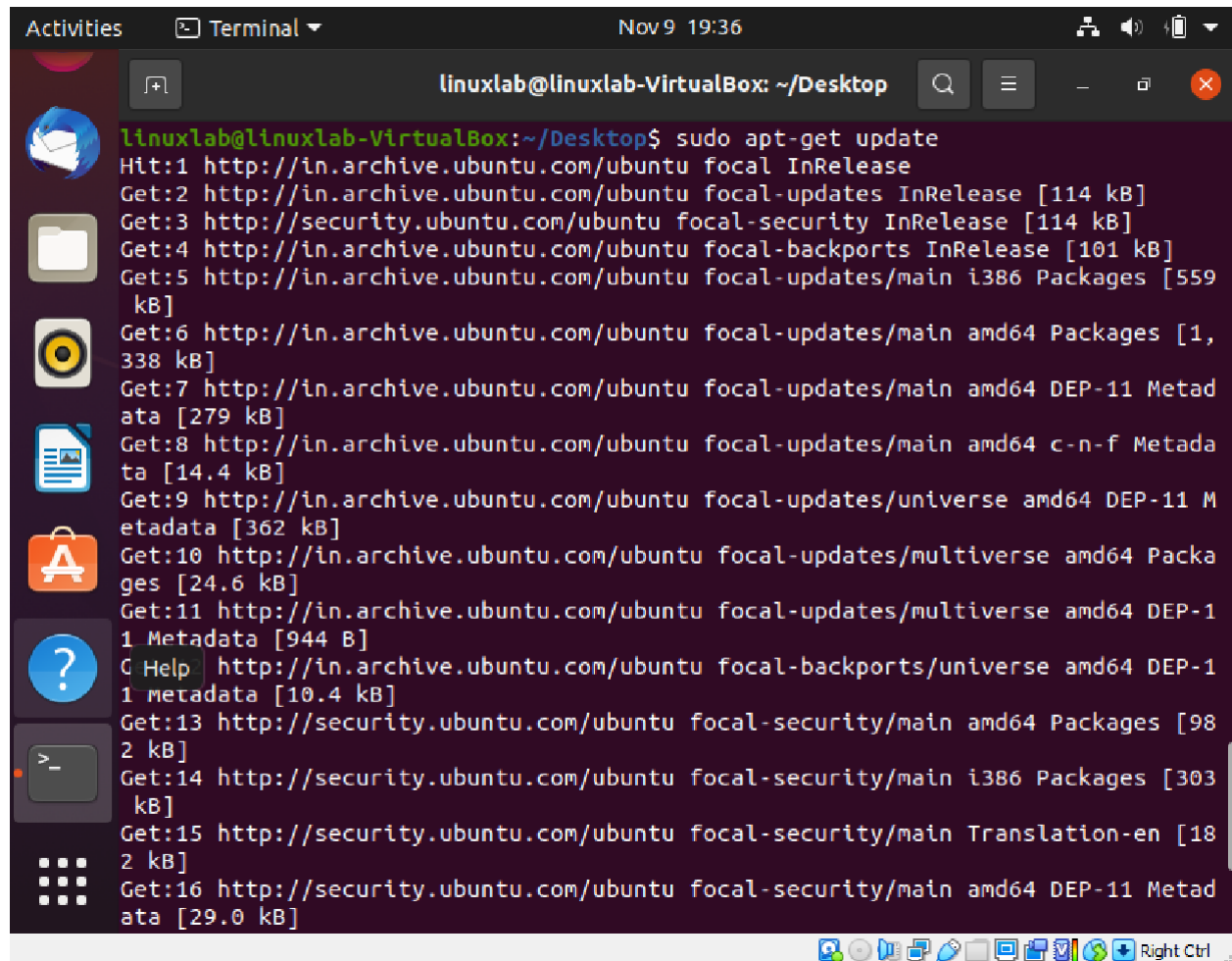
```
linuxlab@linuxlab-VirtualBox:~/Desktop$ docker --version
Docker version 20.10.7, build 20.10.7-0ubuntu5~20.04.2
linuxlab@linuxlab-VirtualBox:~/Desktop$
```

- Checking enables status of docker(active/inactive)



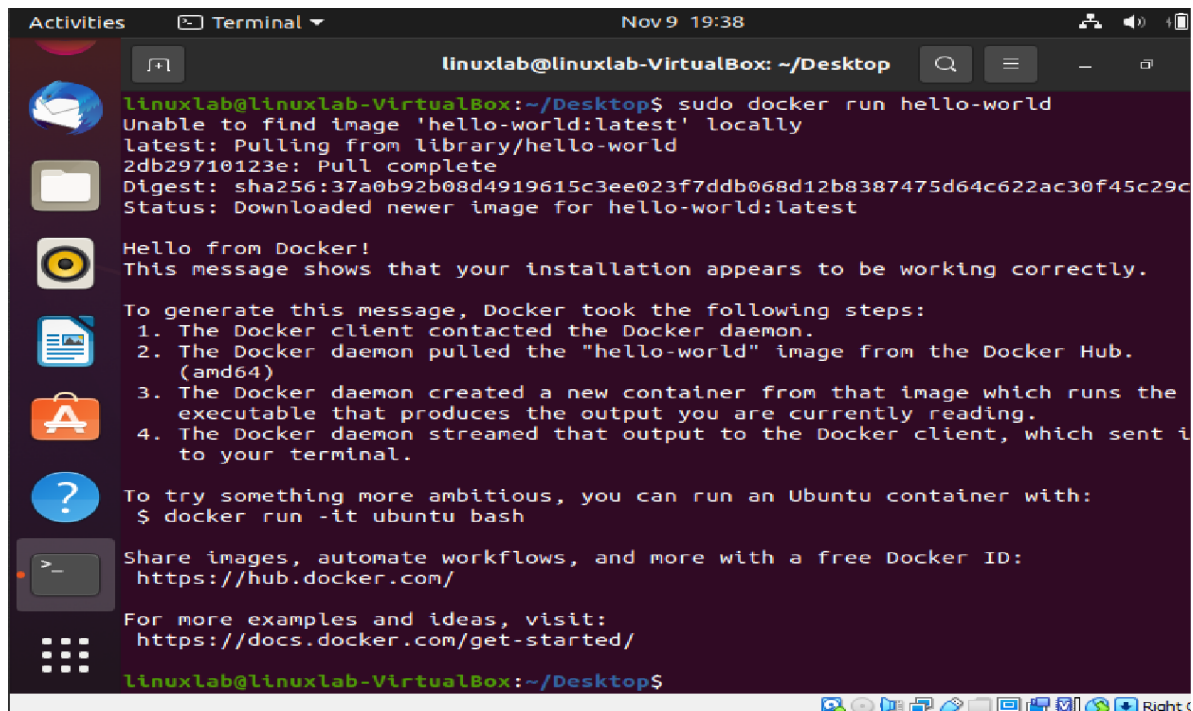
```
linuxlab@linuxlab-VirtualBox: ~/Desktop
D Thunderbird Mail 20.10.7, build 20.10.7-0ubuntu5~20.04.2
linuxlab@linuxlab-VirtualBox:~/Desktop$
linuxlab@linuxlab-VirtualBox:~/Desktop$
linuxlab@linuxlab-VirtualBox:~/Desktop$
linuxlab@linuxlab-VirtualBox:~/Desktop$
linuxlab@linuxlab-VirtualBox:~/Desktop$ sudo systemctl status docker
[sudo] password for linuxlab:
● docker.service - Docker Application Container Engine
   Loaded: loaded (/lib/systemd/system/docker.service; enabled; vendor prese
   Active: active (running) since Tue 2021-11-09 19:33:45 IST; 1min 45s ago
   TriggeredBy: ● docker.socket
     Docs: https://docs.docker.com
    Main PID: 2507 (dockerd)
       Tasks: 8
      Memory: 50.4M
      CGroup: /system.slice/docker.service
              └─2507 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/con

Nov 09 19:33:40 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:40.5
Nov 09 19:33:40 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:40.5
Nov 09 19:33:40 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:40.5
Nov 09 19:33:40 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:40.5
Nov 09 19:33:42 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:42.3
Nov 09 19:33:42 linuxlab-VirtualBox dockerd[2507]: time="2021-11-09T19:33:42.7
```



```
linuxlab@linuxlab-VirtualBox: ~/Desktop
linuxlab@linuxlab-VirtualBox:~/Desktop$ sudo apt-get update
Hit:1 http://in.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease [101 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal-updates/main i386 Packages [559 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [1,338 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [279 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [14.4 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [362 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [24.6 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [944 B]
Get:12 http://in.archive.ubuntu.com/ubuntu focal-backports/universe amd64 DEP-11 metadata [10.4 kB]
Get:13 http://security.ubuntu.com/ubuntu focal-security/main amd64 Packages [982 kB]
Get:14 http://security.ubuntu.com/ubuntu focal-security/main i386 Packages [303 kB]
Get:15 http://security.ubuntu.com/ubuntu focal-security/main Translation-en [182 kB]
Get:16 http://security.ubuntu.com/ubuntu focal-security/main amd64 DEP-11 Metadata [29.0 kB]
```

- Run hello world



A terminal window titled 'linuxlab@linuxlab-VirtualBox: ~/Desktop' showing the output of the command 'sudo docker run hello-world'. The output indicates that the 'hello-world:latest' image was pulled from the Docker Hub and a container was successfully created and executed, displaying a 'Hello from Docker!' message and a list of steps taken by Docker.

```
linuxlab@linuxlab-VirtualBox: ~/Desktop$ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
2db29710123e: Pull complete
Digest: sha256:37a0b92b08d4919615c3ee023f7ddb068d12b8387475d64c622ac30f45c29c
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
   (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.

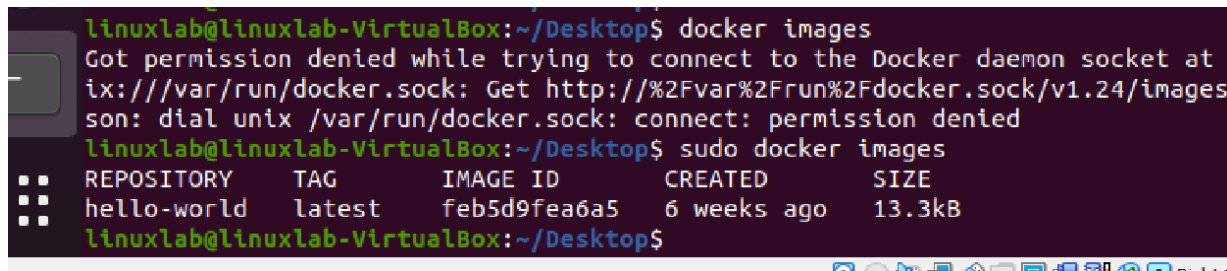
To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/

linuxlab@linuxlab-VirtualBox: ~/Desktop$
```

- Run image pulled from repository



A terminal window showing the output of 'docker images' (which failed due to permission denied) and 'sudo docker images' (which succeeded and displayed a table of installed images).

```
linuxlab@linuxlab-VirtualBox: ~/Desktop$ docker images
Got permission denied while trying to connect to the Docker daemon socket at
ix:///var/run/docker.sock: Get http://%2Fvar%2Frun%2Fdocke.../v1.24/images
son: dial unix /var/run/docker.sock: connect: permission denied
linuxlab@linuxlab-VirtualBox: ~/Desktop$ sudo docker images
REPOSITORY      TAG         IMAGE ID      CREATED       SIZE
hello-world     latest     feb5d9fea6a5  6 weeks ago  13.3kB
linuxlab@linuxlab-VirtualBox: ~/Desktop$
```

- Checking if containers are still running in machine

docker ps: Checks if container is running

```
linuxlab@linuxlab-VirtualBox:~/Desktop$ docker ps
Got permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Get http://%2Fvar%2Frun%2Fdocker.sock/v1.24/containers/json: dial unix /var/run/docker.sock: connect: permission denied
linuxlab@linuxlab-VirtualBox:~/Desktop$ sudo docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS          NAMES
linuxlab@linuxlab-VirtualBox:~/Desktop$ sudo docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS          NAMES
4fc3eb5d21b3   hello-world    "/hello"                About a minute ago    Exited (0) About a minute ago
clever_galois
```

CONCLUSION- Docker was implemented, and basic utility commands were explored.

PRACTICAL-6

AIM- Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.

THEORY-

vi Editor is used to edit files in Unix. It is done using the screen-oriented text editor, vi is one of the best ways. This editor enables you to edit lines in context with other lines in the file.

An improved version of the vi editor which is called the VIM has also been made available now. Here, VIM stands for vi improved.

- vi is generally considered the de facto standard in Unix editors because –
- It's usually available on all the flavors of Unix system.
- Its implementations are very similar across the board.
- It requires very few resources.
- It is more user-friendly than other editors such as the ed or the ex.

You can use the vi editor to edit an existing file or to create a new file from scratch. You can also use this editor to just read a text file.

In Unix, there are two major types of shells –

2. **Bourne shell** – If you are using a Bourne-type shell, the \$ character is the default prompt.
3. **C shell** – If you are using a C-type shell, the % character is the default prompt.

The Bourne Shell has the following subcategories: Bourne shell (sh), Korn shell (ksh), Bourne Again shell (bash), POSIX shell (sh).

The different C-type shells follow: C shell (csh), TENEX/TOPS C shell (tcsh).

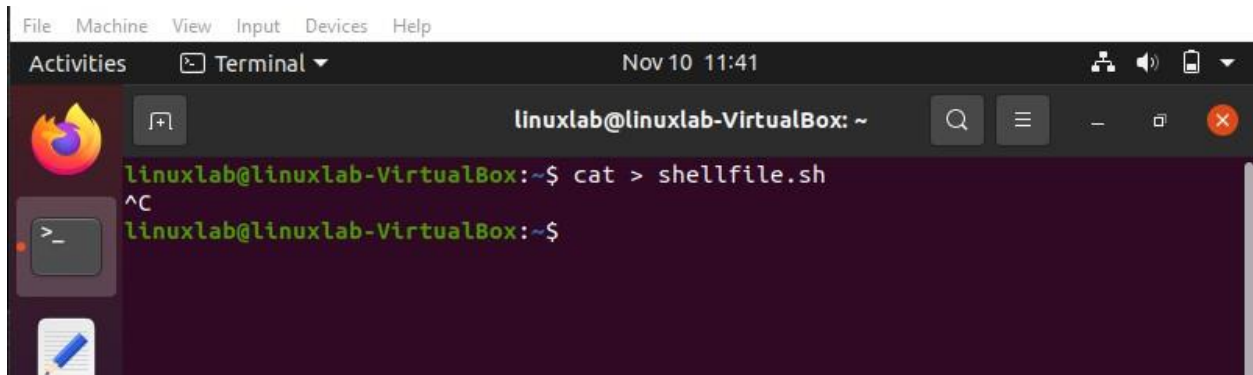
The original Unix shell was written in the mid-1970s by Stephen R. Bourne while he was at the AT&T Bell Labs in New Jersey.

Bourne shell was the first shell to appear on Unix systems, thus it is referred to as "the shell".

Bourne shell is usually installed as **/bin/sh** on most versions of Unix. For this reason, it is the shell of choice for writing scripts that can be used on different versions of Unix.

PROCEDURE-

- Creating <filename>.sh file:



The screenshot shows a terminal window titled 'linuxlab@linuxlab-VirtualBox: ~'. The user has entered the command 'cat > shellfile.sh' and pressed the Enter key, which is indicated by the '^C' prompt. The prompt returns to 'linuxlab@linuxlab-VirtualBox:~\$'.

```
linuxlab@linuxlab-VirtualBox:~$ cat > shellfile.sh
^C
linuxlab@linuxlab-VirtualBox:~$
```

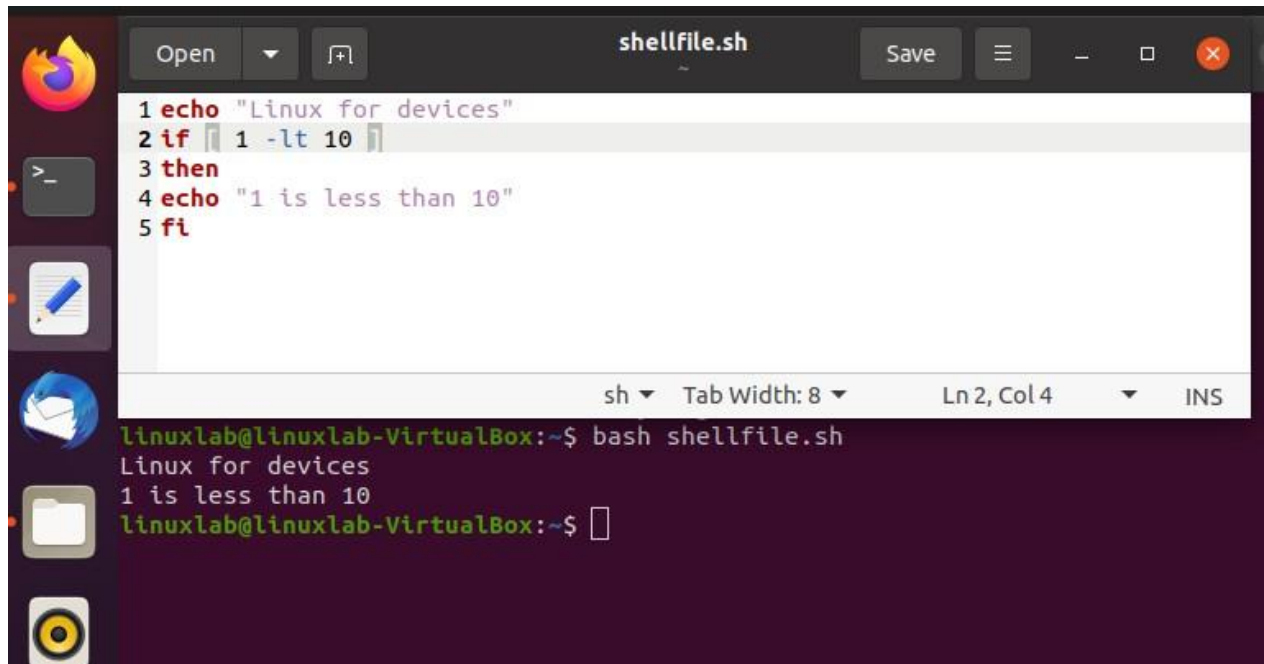
- Inserting linux command in .sh file:



The screenshot shows a text editor window titled 'shellfile.sh'. The file contains five lines of shell script code. The status bar at the bottom indicates 'sh', 'Tab Width: 8', 'Ln 2, Col 4', and 'INS'.

```
1 echo "Linux for devices"
2 if 1 -lt 10
3 then
4 echo "1 is less than 10"
5 fi
```

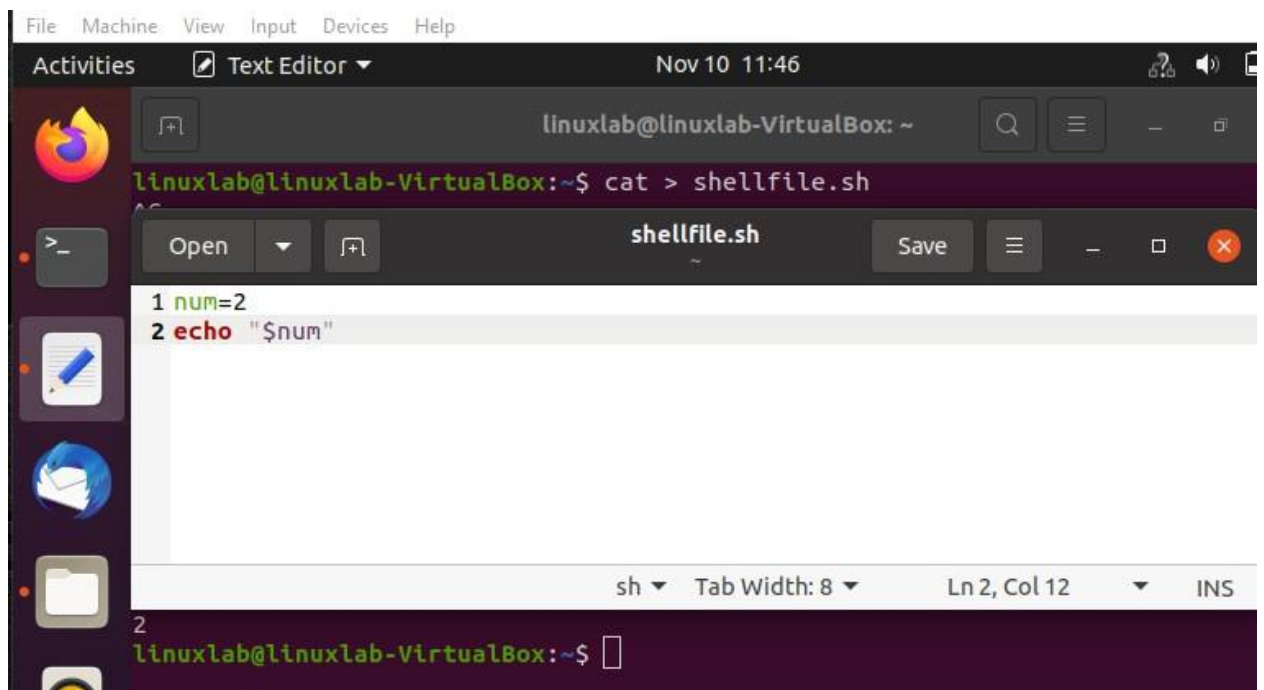

- Running the .sh file.



```
1 echo "Linux for devices"
2 if [ 1 -lt 10 ]
3 then
4 echo "1 is less than 10"
5 fi

linuxlab@linuxlab-VirtualBox:~$ bash shellfile.sh
Linux for devices
1 is less than 10
linuxlab@linuxlab-VirtualBox:~$
```

- Creating Variable in .sh file and executing it:



```
1 num=2
2 echo "$num"

linuxlab@linuxlab-VirtualBox:~$ cat > shellfile.sh
linuxlab@linuxlab-VirtualBox:~$ bash shellfile.sh
2
linuxlab@linuxlab-VirtualBox:~$
```

CONCLUSION: Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.

PRACTICAL 7

AIM- Study of Unix/Linux file system (tree structure).

THEORY-

The Unix/Linux file system is a hierarchical directory structure that organizes files and directories into a tree-like layout. It starts at the root directory (/) and branches into various subdirectories, each containing files and other directories. This design makes it easier to manage, locate, and access files.

The key principles behind the Unix/Linux file system are:

- **Hierarchical Structure:** Files and directories are organized in a hierarchical tree.
- **Everything is a File:** Devices, directories, and even system information are treated as files.
- **Modular Components:** Different directories serve different purposes, such as storing system binaries, user data, or configuration files.

Unix/Linux File System Structure

The Unix/Linux file system can be visualized as a tree with the root directory (/) as the top node. From there, it branches into various directories, each serving a specific function.

Some key directories in the Unix/Linux file system:

- **/ (Root):** The base of the file system hierarchy. All other directories and files stem from here.
- **/bin:** Contains essential system binaries (commands like ls, cat, etc.).
- **/boot:** Holds files required for booting the system, such as the kernel.
- **/dev:** Contains device files, representing hardware devices (e.g., disks, terminals).
- **/etc:** Stores system-wide configuration files.
- **/home:** The home directories for regular users.
- **/lib:** Shared library files used by binaries in /bin and other programs.
- **/usr:** User binaries, documentation, libraries, and source code.
- **/var:** Files that change frequently during system operation, like logs, cache, and spool files.
- **/tmp:** Temporary files created by users and processes.
- **/proc:** A virtual filesystem containing runtime system information.
- **/mnt or /media:** Temporary mount points for removable devices.

PROCEDURE:

- Accessing the File System:

- Open a terminal on your Unix/Linux system.

```
ubuntu@ip-172-31-2-57:~$  
ubuntu@ip-172-31-2-57:/home$
```

- Navigating Directories

- Use the cd (change directory) command to navigate between directories.

```
ubuntu@ip-172-31-2-57:/home$ cd ubuntu/  
ubuntu@ip-172-31-2-57:/home/ubuntu$
```

- Listing Directory Contents

- Use the ls command to list the contents of a directory.

```
ubuntu@ip-172-31-2-57:/home$ ls  
ubuntu
```

- Displaying the Tree Structure

- Use the tree command to view the directory structure in a tree format. Install it if it's not available by default.

```
ubuntu@ip-172-31-2-57:/home$ tree  
.  
├── ubuntu  
│   ├── snap  
│   │   └── tree  
│   │       ├── 54  
│   │       ├── common  
│   │       └── current -> 54
```

- Checking File Types

- Use ls -l to check file types and permissions. Files are prefixed with:
 - - for regular files
 - d for directories
 - l for symbolic links
 - c for character devices

- b for block devices

```
ubuntu@ip-172-31-2-57:/home$ ls -l
total 4
drwxr-x--- 5 ubuntu ubuntu 4096 Oct 15 16:15 ubuntu
```

- Viewing Disk Usage
 - Use `du` (disk usage) to analyze the space taken up by files and directories.

```
ubuntu@ip-172-31-2-57:/home$ du
4      ./ubuntu/snap/tree/common/.local/lib/locale
8      ./ubuntu/snap/tree/common/.local/lib
12     ./ubuntu/snap/tree/common/.local
16     ./ubuntu/snap/tree/common
4      ./ubuntu/snap/tree/54
24     ./ubuntu/snap/tree
28     ./ubuntu/snap
4      ./ubuntu/.ssh
4      ./ubuntu/.cache
52     ./ubuntu
56     .
```

- Viewing File System Usage
 - The `df` command shows the available and used disk space on all mounted file systems.

```
ubuntu@ip-172-31-2-57:/home$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
/dev/root        7034376 1707400   5310592  25% /
tmpfs            490200      0    490200    0% /dev/shm
tmpfs            196084      872   195212    1% /run
tmpfs             5120        0     5120    0% /run/lock
/dev/xvda16      901520    77020   761372   10% /boot
/dev/xvda15     106832     6246   100586    6% /boot/efi
tmpfs            98040      12    98028    1% /run/user/1000
```

CONCLUSION: The Unix/Linux file system is designed for flexibility, security, and efficiency. The tree structure allows for easy navigation, organized storage, and quick access to files and directories.

PRACTICAL 8

AIM- Study of .bashrc, /etc/bashrc and Environment variables.

THEORY-

The .bashrc file is a script that Bash runs whenever a new terminal session is started in interactive mode (i.e., when you open a new terminal or log in to a shell session). Located in the user's home directory (~/.bashrc), it allows users to customize their shell environment by defining aliases, functions, and environment variables, as well as configuring shell behavior. It's a powerful tool for automation and personalization of terminal sessions, allowing users to tweak settings for optimal productivity.

Typical things you can configure in .bashrc include:

- **Aliases:** Shortcuts for common commands (e.g., `alias ll='ls -lah'`).
- **Prompt customization:** Adjusting how the shell prompt looks (e.g., displaying the current directory).
- **Shell options:** Setting terminal options like history size or enabling colored output.
- **Program execution:** Automating the execution of certain scripts or commands when a terminal session starts.

and much more.

It is a lot like a startup script anytime the user logs in and starts a terminal session.

Environmental variables are dynamic values that affect the behavior of processes running on a Linux system. These variables contain system-wide and user-specific data such as the location of executable files, the user's home directory, and configuration settings for various applications.

Key examples of environmental variables:

- **PATH:** Specifies directories where the system looks for executable files.
- **HOME:** Points to the current user's home directory.
- **USER:** Contains the username of the current user.
- **SHELL:** Defines the default shell (e.g., `/bin/bash`).

While .bashrc is the personal startup/setup script for individual users, /etc/bashrc has some global settings and

functions which are defined for all users on the workstation.

PROCEDURE -

For this experiment, we will tweak the .bashrc file to add a startup prompt and assign values to some environmental variables

```
# echo Greetings User, the current date and time is $(date)
Greetings User, the current date and time is Tue 15 Oct 21:31:08 IST 2024
# █
```

This small commandlet is the perfect for a fresh bash session. To see this everytime we log in, lets modify the ~/.bashrc file and add this commandlet at the end of it.

```
# vim ~/.bashrc
# █
```

```
# .bashrc

# Source global definitions
if [ -f /etc/bashrc ]; then
    . /etc/bashrc
fi

# User specific environment
if ! [[ "$PATH" =~ "$HOME/.local/bin:$HOME/bin:" ]]
then
    PATH="$HOME/.local/bin:$HOME/bin:$PATH"
fi

PATH=/go/bin:$PATH
export PATH

# Uncomment the following line if you don't like systemctl's auto-paging feature:
# export SYSTEMD_PAGER=

alias ss='sudo su'
alias xx='exit'
alias op='xdg-open'
alias cls="clear"
alias clip="xclip -selection clipboard"
export PS1="# "
# User specific aliases and functions
if [ -d ~/.bashrc.d ]; then
    for rc in ~/.bashrc.d/*; do
        if [ -f "$rc" ]; then
            . "$rc"
        fi
    done
fi

echo Greetings User, the date and time is $(date)

export SESSION_START=$(date)
```

Then exit using `:q!`

We have also added a variable called `SESSION_START` to keep track of how much time the terminal has been open for.

Now if we open a new terminal, we are greeted with the following prompt.

```
Greetings User, the date and time is Tue 15 Oct 21:38:07 IST 2024
# source ~/.bashrc
Greetings User, the date and time is Tue 15 Oct 21:38:20 IST 2024
#
```

Note: Loading a new shell session can also be triggered with the `source` command as shown above.

Now in this session, a variable `SESSION_START` exists which holds the value(of date and time) when the terminal session began

```
Greetings User, the date and time is Tue 15 Oct 21:38:20 IST 2024
# echo $SESSION_START
Tue 15 Oct 21:38:20 IST 2024
#
```

We can add another prompt to the `/etc/bashrc` to see both of them execute.

```
# sudo vim /etc/bashrc
#
```

Since its a file all the users(including root), it cannot be changed without sudo privileges

```
# /etc/bashrc

# System wide functions and aliases
# Environment stuff goes in /etc/profile

# It's NOT a good idea to change this file unless you know what you
# are doing. It's much better to create a custom.sh shell script in
# /etc/profile.d/ to make custom changes to your environment, as this
# will prevent the need for merging in future updates.

echo "This is from the /etc/bashrc"

# Prevent doublesourcing
if [ -z "$BASHRC_SOURCED" ]; then
    BASHRC_SOURCED="Y"

# are we an interactive shell?
if [ "$PS1" ]; then
    if [ -z "$PROMPT_COMMAND" ]; then
        case $TERM in
            xterm*)
                if [ -e /etc/sysconfig/bash-prompt-xterm ]; then
                    PROMPT_COMMAND=/etc/sysconfig/bash-prompt-xterm
                else
                    PROMPT_COMMAND='printf "\033]0;%s@%s:%s\007" "${USER}" "${HOSTNAME%%.*}" "${PWD/#$HOME/\~}"'
                fi
            ;;
            screen*)
                if [ -e /etc/sysconfig/bash-prompt-screen ]; then
                    PROMPT_COMMAND=/etc/sysconfig/bash-prompt-screen
                else
                    PROMPT_COMMAND='printf "\033k%s@%s:%s\033\\\" "${USER}" "${HOSTNAME%%.*}" "${PWD/#$HOME/\~}"'
                fi
            ;;
            *)
                [ -e /etc/sysconfig/bash-prompt-default ] && PROMPT_COMMAND=/etc/sysconfig/bash-prompt-default
            ;;
        esac
    fi
# Turn on parallel history
shopt -s histappend
# Turn on checkwinsize
shopt -s checkwinsize
[ "$PS1" = "\ls-llvlls " ] && PS1="\u@\h \W\\$ "
# You might want to have e.g. tty in prompt (e.g. more virtual machines)
# and console windows
```

Now sourcing the bashrc of any user will show both prompts

```
# source ~/.bashrc
This is from the /etc/bashrc
Greetings User, the date and time is Tue 15 Oct 21:43:46 IST 2024
#
```

CONCLUSION:

The usage of environmental variables and utilisation of the .bashrc and /etc/bashrc files were closely studied and their contribution in making a linux system more optimal for individual performance has been established.

PRACTICAL 9

AIM: Write a shell script program to display list of user currently logged in.

THEORY –

- `#!/bin/bash`: This is the shebang line that tells the system to use the Bash shell to execute the script.
- `echo "List of users currently logged in:"`: This prints a message to the terminal.
- `who`: This command lists all users currently logged into the system, along with their login details (e.g., terminal, login time).

PROCEDURE-

- Open a text editor and paste the code.

```
#!/bin/bash
# Script to display the list of users currently logged in

echo "List of users currently logged in:"
who
```

- Save the file with a .sh extension, for example who.sh.

```
HELLO WORLD
ubuntu@ip-172-31-2-57:/home$ sudo nano who.sh
```

- Open a terminal and navigate to the directory where the script is saved.

- Make the script executable by running

```
ubuntu@ip-172-31-2-57:/home$ sudo nano who.sh
ubuntu@ip-172-31-2-57:/home$ sudo chmod +x who.sh
```

- Run the script.

```
ubuntu@ip-172-31-2-57:/home$ ./who.sh
List of users currently logged in:
ubuntu pts/0 2024-10-15 16:06 (13.233.177.5)
```

CONCLUSION: Script was made and executed successfully.

PRACTICAL 10

AIM- Write a shell script program to display “HELLO WORLD”

THEORY-

Bash is a command language interpreter. It is widely available on various operating systems and is a default command interpreter on most GNU/Linux systems. The name is an acronym for the ‘**B**ourne-**A**gain **S**hell’. Bash is a shell program. Bash is a command processor that typically runs in a text window where the user types of commands that cause actions. Bash can also read and execute commands from a file, called a shell script. A shell program is typically an executable binary that takes commands that you type and (once you hit return), translates those commands into (ultimately) system calls to the Operating System API. Bash is not the only kind of shell. Other shells include:

Sh, ash, dash, ksh, tcsh, zsh, tcsh.

SHELL-

Shell is a macro processor which allows for interactive or non-interactive command execution.

SCRIPTING-

Scripting allows for an automatic commands execution that would otherwise be executed interactively one-by-one.

All our scripts will include shell interpreter definition `#!/bin/bash`.

In Computer programming, a script is a set of commands for an appropriate run time environment which is used to automate the execution of tasks.

- Bash Script:

A Bash Shell Script is a plain text file containing a set of various commands that we usually type in the command line. It is used to automate repetitive tasks on Linux filesystem. It might include a set of commands, or a single command, or it might contain the hallmarks of imperative programming like loops, functions, conditional constructs, etc. Effectively, a Bash script is a computer program written in the Bash programming language.

PROCEDURE-

- To create an empty bash script, first, change the directory in which you want to save your script using cd command. Try to use text editor like gedit in which you want to type the shell commands.
- Use touch command to create the zero bytes sized script.
- touch file_name.
- To open the script in the text editor (eg., gedit), type
- gedit file_name.sh

Here, .sh is suffixed as an extension that you have to provide for execution.

- Type the shell commands for your bash script in the newly opened text window or the text editor. Before typing bash shell commands, first, look at the base of any bash script.

Each Bash based Linux script starts by the line- `#!/bin/bash`

Where `#!` is referred to as the shebang and rest of the line is the path to the interpreter specifying the location of bash shell in our operating system.

Bash use `#` to comment any line.

Bash use `echo` command to print the output.

At the end, execute the bash script prefixing with `./`.

Have a look at the basic terms of a Bash Script, i.e., SheBang and echo command. SheBang (#!)

The She Bang (#!) is a character sequence consisting of the characters number sign (#) and exclamation mark (!) at the beginning of a script.

Under the Unix-like operating systems, when a script with a shebang runs as a program, the program loader parses the rest of the lines with the first line as an interpreter directive. So, SheBang denotes an interpreter to execute the script lines, and it is known as the path directive for the execution of different kinds of Scripts like Bash, Python, etc.

Here is the correct SheBang format for the discussed Bash Script.

- `#!/bin/bash`

The formatting for shebang is most important. Its incorrect format can cause improper working of commands. So, always remember these two points of SheBang formatting while creating a Script as follows:

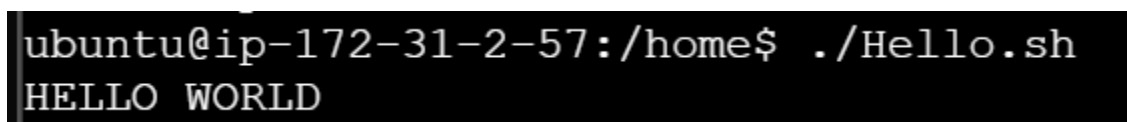
- It should always be on the very first line of the Script.
- There should not be any space before the hash (#), between the hash exclamation marks (#!), and the path to the interpreter.

echo

echo is a built-in command in Bash, which is used to display the standard output by passing the arguments. It is the most widely used command for printing the lines of text/String to the screen. Its performance is the same on both the platforms: Bash Shell and Command Line Terminal.



```
echo "HELLO WORLD"
```



```
ubuntu@ip-172-31-2-57:/home$ ./Hello.sh  
HELLO WORLD
```

CONCLUSION: Script was written and executed successfully.