



Parul University

Faculty of Engineering & Technology

BACHELOR OF TECHNOLOGY

High Performance Computing (303105356)

3rd Year / 6th Semester

COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

Laboratory Manual

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CERTIFICATE

This is to certify that

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Computer Science & Engineering during the academic

year 2025 - 26



Date of Submission

Staff In charge

Head of Department

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Subject Code: 303105356

Subject : High Performance Computing

Class: 3rd Year / 6th Sem

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		From	To				
01.	Study the facilities provided by Google Colab.						
02.	Demonstrate basic Linux Commands.						
03.	Using Divide and Conquer Strategies design a class for Concurrent Quick Sort using C++.						
04.	Demonstrate MPI functions through a simple program.						
05.	Write a program to check task distribution using Gprof.						
06.	Write a simple CUDA program to print "Hello World!"						
07.	Write a simple CUDA program to add two numbers.						
08.	Write a CUDA program to add two arrays.						
09.	Analyze the code using Nvidia-Profilers.						
10.	Demonstration of OpenMP and pthread functions.						

Practical 2

Aim : Demonstrate basic Linux Commands.

Overview : This practical focuses on introducing fundamental Linux commands essential for navigating and managing a Linux-based operating system using Command Line Interface(CLI). We will learn how to use terminal commands for file manipulation, directory navigation, system monitoring, and user management. Key topics include creating, moving, and deleting files and directories, understanding file permissions.

Commands :

1. ls

Lists files and directories in the current directory.

Syntax :

ls

Output:



```
File Actions Edit View Help
(kali) kali-[~]
$ ls
Desktop Documents Downloads MANISH Music Pictures Public Templates Videos
(kali) kali-[~]
$
```

Practical 2

2. pwd

Prints the working directory (shows the current directory path)

Syntax :

pwd

Output:

A terminal window with a dark background and green/yellow accents. The prompt is (kali) kali-[~]. The command \$ pwd is entered, and the output is /home/kali.

```
(kali) kali-[~]  
$ pwd  
/home/kali  
  
(kali) kali-[~]  
$
```

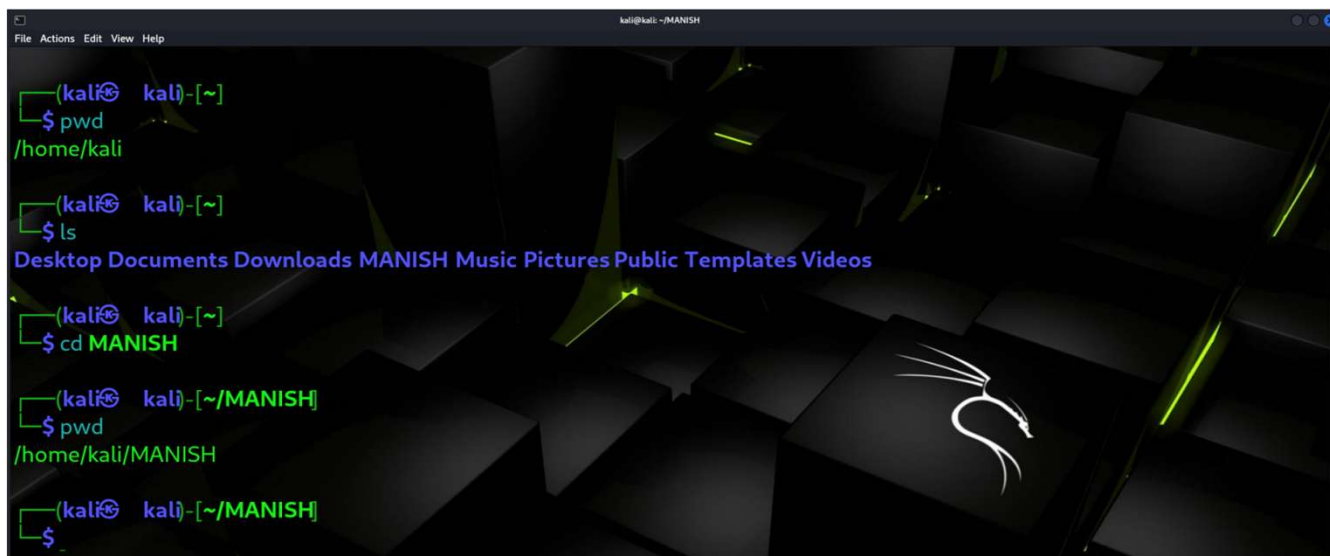
3. cd

Changes the current directory.

Syntax :

cd "directory_name"

Output:

A terminal window with a dark background and green/yellow accents. The prompt is (kali) kali-[~]. The command \$ pwd is entered, and the output is /home/kali. The prompt is (kali) kali-[~]. The command \$ ls is entered, and the output is Desktop Documents Downloads MANISH Music Pictures Public Templates Videos. The prompt is (kali) kali-[~]. The command \$ cd MANISH is entered, and the output is (kali) kali-[~/MANISH]. The prompt is (kali) kali-[~/MANISH]. The command \$ pwd is entered, and the output is /home/kali/MANISH. The prompt is (kali) kali-[~/MANISH].

```
(kali) kali-[~]  
$ pwd  
/home/kali  
  
(kali) kali-[~]  
$ ls  
Desktop Documents Downloads MANISH Music Pictures Public Templates Videos  
  
(kali) kali-[~]  
$ cd MANISH  
  
(kali) kali-[~/MANISH]  
$ pwd  
/home/kali/MANISH  
  
(kali) kali-[~/MANISH]  
$
```

Practical 2

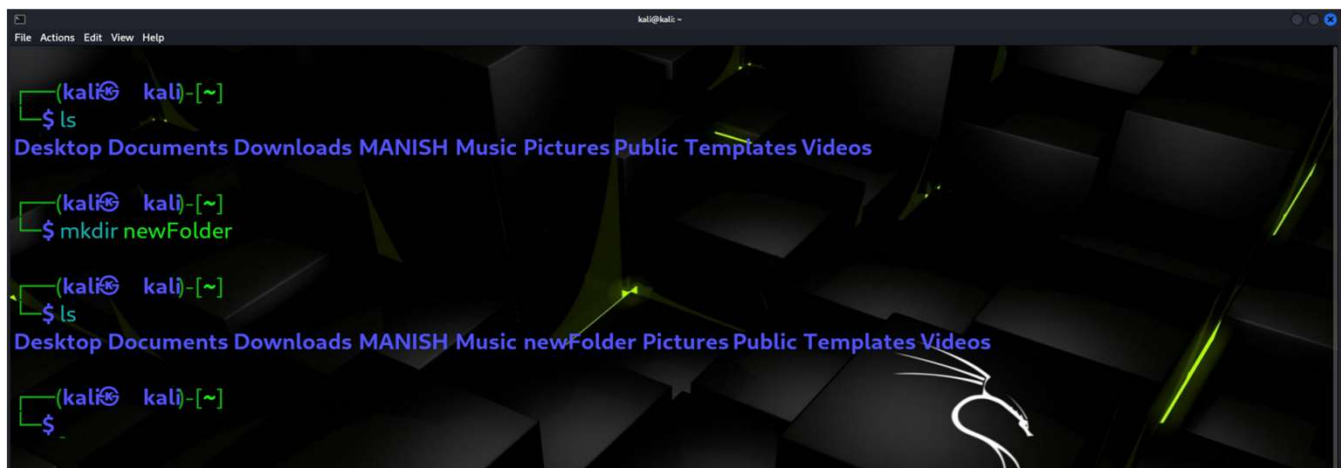
4. mkdir

Creates a new directory.

Syntax :

mkdir “directory_name”

Output:

A terminal window with a dark background and green/yellow text. The prompt is '(kali㉿ kali)-[~]'. The first command is '\$ ls', showing directory listings: Desktop, Documents, Downloads, MANISH, Music, Pictures, Public, Templates, Videos. The second command is '\$ mkdir newFolder'. The third command is '\$ ls', showing the updated listing with 'newFolder' added. A white arrow points to 'newFolder' in the listing.

```
(kali㉿ kali)-[~]
$ ls
Desktop Documents Downloads MANISH Music Pictures Public Templates Videos

(kali㉿ kali)-[~]
$ mkdir newFolder

(kali㉿ kali)-[~]
$ ls
Desktop Documents Downloads MANISH Music newFolder Pictures Public Templates Videos

(kali㉿ kali)-[~]
$
```

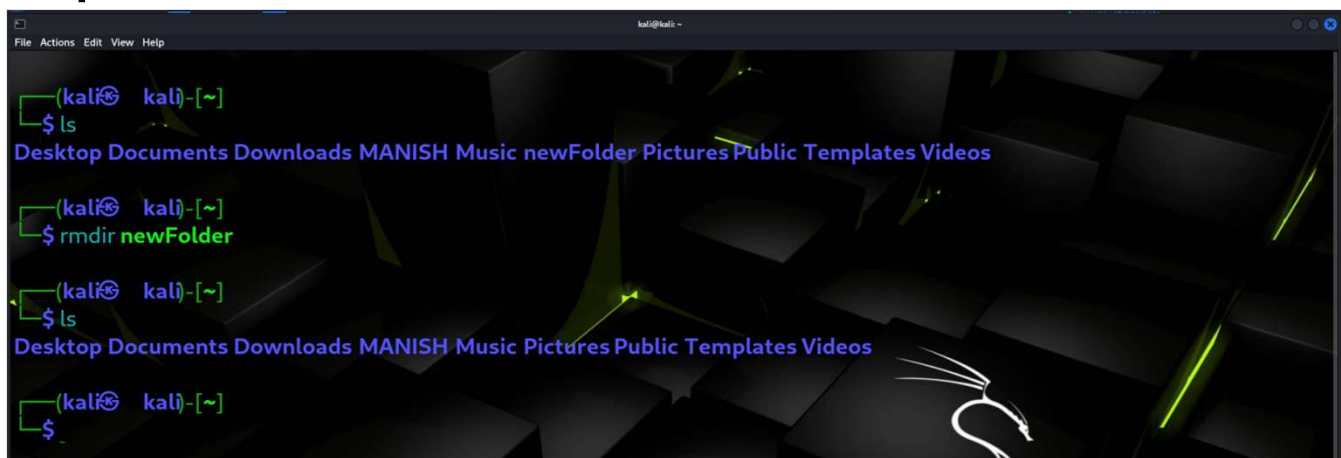
5. rmdir

Removes a directory.

Syntax :

rmdir “directory_name”

Output:

A terminal window with a dark background and green/yellow text. The prompt is '(kali㉿ kali)-[~]'. The first command is '\$ ls', showing directory listings: Desktop, Documents, Downloads, MANISH, Music, newFolder, Pictures, Public, Templates, Videos. The second command is '\$ rmdir newFolder'. The third command is '\$ ls', showing the updated listing with 'newFolder' removed. A white arrow points to 'newFolder' in the listing.

```
(kali㉿ kali)-[~]
$ ls
Desktop Documents Downloads MANISH Music newFolder Pictures Public Templates Videos

(kali㉿ kali)-[~]
$ rmdir newFolder

(kali㉿ kali)-[~]
$ ls
Desktop Documents Downloads MANISH Music Pictures Public Templates Videos

(kali㉿ kali)-[~]
$
```

Practical 2

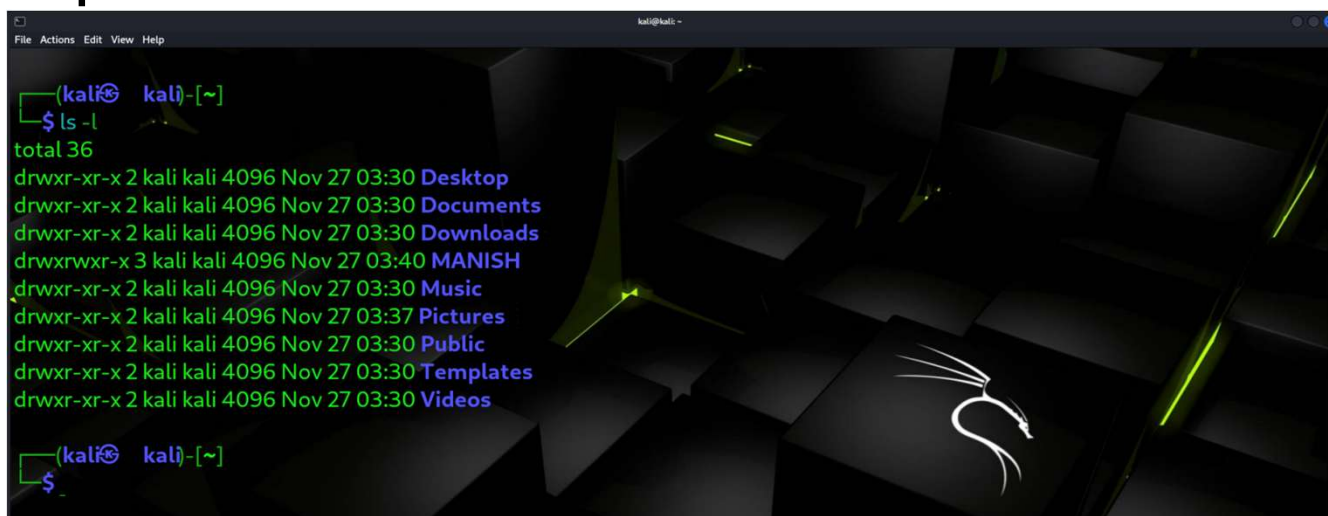
6. `ls -l`

Used to list the contents of a directory in long format, providing detailed information.

Syntax :

`ls -l`

Output:



```
(kali) kali-[~]
$ ls -l
total 36
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Desktop
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Documents
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Downloads
drwxrwxr-x 3 kali kali 4096 Nov 27 03:40 MANISH
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Music
drwxr-xr-x 2 kali kali 4096 Nov 27 03:37 Pictures
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Public
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Templates
drwxr-xr-x 2 kali kali 4096 Nov 27 03:30 Videos

(kali) kali-[~]
```

7. `touch`

Creates an empty file or updates the timestamp of an existing file.

Syntax :

`touch filename.txt`

Output:



```
(kali) kali-[~/MANISH]
$ touch demo.txt

(kali) kali-[~/MANISH]
$ ls
demo.txt Lab1

(kali) kali-[~/MANISH]
$
```


Practical 2

8. cat

Concatenates and displays the content of a file.

Syntax :

cat >> filename.txt {To create a file with data}
cat fileName.txt {To display data of file }

Output:



```
(kali㉿kali)-[~]  
$ ls  
Desktop Documents Downloads MANISH Music Pictures Public Templates Videos  
  
(kali㉿kali)-[~]  
$ cd MANISH  
  
(kali㉿kali)-[~/MANISH]  
$ cat >> demo.txt  
This is a demo text file  
Demo texts is in demo file  
^Z  
zsh: suspended cat >> demo.txt  
  
(kali㉿kali)-[~/MANISH]  
$ cat demo.txt  
This is a demo text file  
Demo texts is in demo file
```

9. cd

Returns to the root directory

Syntax :

cd

Output:



```
(kali㉿kali)-[~]  
$ cd MANISH  
  
(kali㉿kali)-[~/MANISH]  
$ cd  
  
(kali㉿kali)-[~]  
$ pwd  
/home/kali
```


Practical 2

10. cp

Copies data from one file to another file.

Syntax :

cp oldFile.txt newFile.txt

Output:

A terminal window with a dark background and green/yellow text. The prompt is '(kali㉿kali)-[~/MANISH]'. The user runs 'ls' showing 'demo.txt new.txt old.txt'. Then 'cat >> old.txt' is run, followed by 'This text is in old file.' and a Ctrl-Z (^Z) which suspends the process. Pressing 'q' resumes it as 'zsh: suspended cat >> old.txt'. Then 'cp old.txt new.txt' is run. Finally, 'cat new.txt' is run, outputting 'This text is in old file.'

```
(kali㉿kali)-[~/MANISH]
$ ls
demo.txt  new.txt  old.txt

(kali㉿kali)-[~/MANISH]
$ cat >> old.txt
This text is in old file.
^Z
zsh: suspended cat >> old.txt

(kali㉿kali)-[~/MANISH]
$ cp old.txt new.txt

(kali㉿kali)-[~/MANISH]
$ cat new.txt
This text is in old file.
```

11. mv

Moves data from one file to another file.

Syntax :

mv oldFile.txt newFile.txt

Output:

A terminal window with a dark background and green/yellow text. The prompt is '(kali㉿kali)-[~/MANISH]'. The user runs 'ls' showing 'demo.txt new.txt old.txt'. Then 'mv old.txt new.txt' is run. Then 'cat old.txt' is run, outputting 'cat: old.txt: No such file or directory'. Finally, 'cat new.txt' is run, outputting 'This text is in old file.'

```
(kali㉿kali)-[~/MANISH]
$ ls
demo.txt  new.txt  old.txt

(kali㉿kali)-[~/MANISH]
$ mv old.txt new.txt

(kali㉿kali)-[~/MANISH]
$ cat old.txt
cat: old.txt: No such file or directory

(kali㉿kali)-[~/MANISH]
$ cat new.txt
This text is in old file.
```

Practical 2

12. rm

Removes files or directories.

Syntax :

rm file1.txt

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ ls
demo.txt  new.txt

(kali@kali)-[~/MANISH]
$ rm demo.txt

(kali@kali)-[~/MANISH]
$ ls
new.txt
```

13. ps

Displays information about running processes.

Syntax :

ps

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ ps
  PID TTY          TIME CMD
  6618 pts/0    00:00:03 zsh
 10453 pts/0    00:00:00 cat
 12860 pts/0    00:00:00 cat
 14936 pts/0    00:00:00 ps

(kali@kali)-[~/MANISH]
$
```

Practical 2

14. who

Displays who is logged into the system.

Syntax :

who

Output:

A terminal window with a dark background and a 3D cube pattern. The prompt is '(kali㉿kali)-[~/MANISH]'. The user enters '\$ who'. The output is 'kali tty7 2024-12-10 09:57 (:0)'. The prompt returns to '(kali㉿kali)-[~/MANISH]'.

```
(kali㉿kali)-[~/MANISH]
$ who
kali    tty7    2024-12-10 09:57 (:0)
(kali㉿kali)-[~/MANISH]
$
```

15. date

Displays or sets the system date and time.

Syntax :

date

Output:

A terminal window with a dark background and a 3D cube pattern. The prompt is '(kali㉿kali)-[~/MANISH]'. The user enters '\$ date'. The output is 'Tue Dec 10 10:23:59 AM EST 2024'. The prompt returns to '(kali㉿kali)-[~/MANISH]'.

```
(kali㉿kali)-[~/MANISH]
$ date
Tue Dec 10 10:23:59 AM EST 2024
(kali㉿kali)-[~/MANISH]
$
```

Practical 2

16. whoami

Used to display the current username.

Syntax :

whoami

Output:



```
kali@kali: ~/MANISH
(kali@kali)~$ whoami
kali
(kali@kali)~$
```

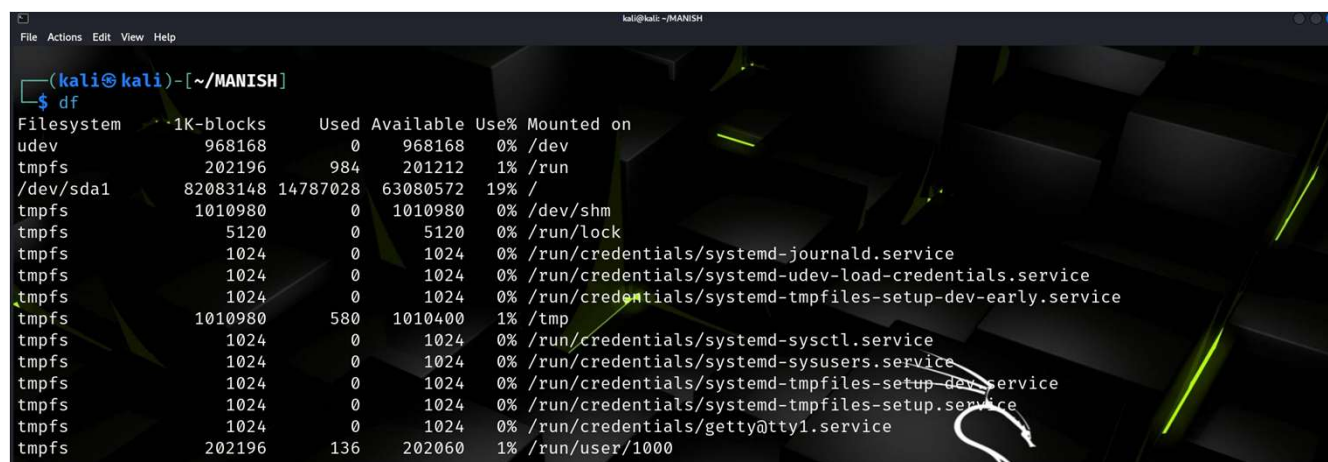
17. df

Gets the details of the File System

Syntax :

df

Output:



```
kali@kali: ~/MANISH
(kali@kali)~$ df
Filesystem      1K-blocks    Used Available Use% Mounted on
udev            968168      0    968168   0% /dev
tmpfs           202196    984    201212   1% /run
/dev/sda1      82083148 14787028 63080572  19% /
tmpfs          1010980      0    1010980   0% /dev/shm
tmpfs           5120      0      5120   0% /run/lock
tmpfs           1024      0      1024   0% /run/credentials/systemd-journald.service
tmpfs           1024      0      1024   0% /run/credentials/systemd-udev-load-credentials.service
tmpfs           1024      0      1024   0% /run/credentials/systemd-tmpfiles-setup-dev-early.service
tmpfs          1010980    580    1010400   1% /tmp
tmpfs           1024      0      1024   0% /run/credentials/systemd-sysctl.service
tmpfs           1024      0      1024   0% /run/credentials/systemd-sysusers.service
tmpfs           1024      0      1024   0% /run/credentials/systemd-tmpfiles-setup-dev.service
tmpfs           1024      0      1024   0% /run/credentials/systemd-tmpfiles-setup.service
tmpfs           1024      0      1024   0% /run/credentials/getty@tty1.service
tmpfs           202196    136    202060   1% /run/user/1000
```

Practical 2

18. echo

Displays a message or the value of a variable.

Syntax :

echo "Message to print."

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ echo Hello World!
Hello World!

(kali@kali)-[~/MANISH]
$
```

19. time

Displays the current time

Syntax :

time

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ time

real    1437.87s
user    2.10s
sys     2.21s
cpu      0%

real    1437.87s
user    0.79s
sys     0.37s
cpu      0%

(kali@kali)-[~/MANISH]
$
```

Practical 2

20. cal

Displays a calendar(current month).

Syntax :

cal

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ cal
December 2024
Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6  7
 8  9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31

(kali@kali)-[~/MANISH]
$
```

21. id

Displays User ID (UID) and Group ID (GID)

Syntax :

id

Output:



```
kali@kali: ~/MANISH
File Actions Edit View Help

(kali@kali)-[~/MANISH]
$ id
uid=1000(kali) gid=1000(kali) groups=1000(kali),4(adm),20(dialout),24(cdrom),25(floppy),27(sudo),29(audio),30(dip),44(video),46(plugindev),100(users),101(netdev),106(bluetooth),113(scanner),136(wireshark),137(kaboxer),138(vboxsf)

(kali@kali)-[~/MANISH]
$
```