

20MCA-136
NETWORKING AND SYSTEM
ADMINISTRATION LAB

RECORD

**SWARNA MOL K K,
S2-RMCA-B
ROLL NO:29**

TABLE OF CONTENT

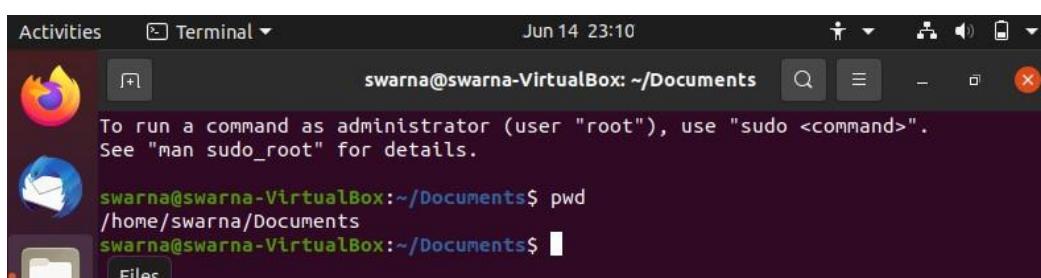
EXP NO	EXPERIMENT	PAGE NO
01	BASIC LINUX COMMANDS	03
02	NETWORK COMMANDS	27
03	LAMP INSTALLATION	41
04	ANSIBLE INSTALLATION	45
05	TCPDUMP INSTALLATION	46
06	SHELL SCRIPTING	48
07	DOCKER INSTALLATION	55
08	WIRESHARK INSTALLATION	59

BASIC LINUX COMMANDS-1

1. pwd
2. history
3. man
4. ls
5. cd
6. mkdir
7. rmdir
8. touch
9. rm
10. cat

1. **pwd** (Print Working Directory)

- Use the pwd command to find out the path of the current working directory (you're in
- The command will return an absolute (path, which is basically a path of all the directories that starts with a forward slash



The screenshot shows a terminal window titled "Terminal" with the command "pwd" entered and its output displayed. The terminal window is part of a desktop environment with icons for a browser, file manager, and terminal visible in the dock.

```
Activities Terminal ▾ Jun 14 23:10
swarna@swarna-VirtualBox: ~/Documents
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
swarna@swarna-VirtualBox:~/Documents$ pwd
/home/swarna/Documents
swarna@swarna-VirtualBox:~/Documents$
```

2. **history**

- When you have been using Linux for a certain period of time, you will quickly notice that you can run hundreds of commands every day. As such, running history command is particularly useful if you want to review the commands you have entered before
- #history
- !command number to run a command from history

```

40 ls -R
41 ls -l
42 ls -a
43 ls -al
44 ls -t
45 ls -r
46 ls -tr
47 cd mca
48 cd MCA
49 cd Mca
50 ajce
51 pwd
52 history
53 ls
54 man pwd
55 pwd
56 ls
57 cd ajce
58 cd mca
59 ls
60 cd s2/
61 ls
62 cd s2
63 pwd
64 history
swarna@swarna-VirtualBox:~/Documents$ !59
ls
ajce
swarna@swarna-VirtualBox:~/Documents$ man pwd

```

3. man

- Confused about the function of certain Linux commands? Don't worry, you can easily learn how to use them right from Linux's shell by using the man command. For instance, entering man tail will show the manual instruction of the tail command.
- Use the command man man to start learning about man utility

```

PWD(1)                               User Commands                               PWD(1)

NAME
    pwd - print name of current/working directory

SYNOPSIS
    pwd [OPTION]...

DESCRIPTION
    Print the full filename of the current working directory.

    -L, --logical
        use PWD from environment, even if it contains symlinks

    -P, --physical
        avoid all symlinks

    --help display this help and exit

    --version
        output version information and exit

    If no option is specified, -P is assumed.

    NOTE: your shell may have its own version of pwd, which usually super-
    sedes the version described here. Please refer to your shell's docu-
    mentation for details about the options it supports.

Manual page pwd(1) line 1 (press h for help or q to quit)

```

4. cd

- To navigate through the Linux files and directories, use the cd

- It requires either the full path or the name of the directory, depending on the current working directory that you're in
- cd .. (with two dots) to move one directory up
- cd to go straight to the home folder
- cd --(with a hyphen) to move to your previous directory

```
swarna@swarna-VirtualBox:~/Documents$ cd ajce
swarna@swarna-VirtualBox:~/Documents/ajce$ cd ..
swarna@swarna-VirtualBox:~/Documents$ cd -
/home/swarna/Documents/ajce
swarna@swarna-VirtualBox:~/Documents/ajce$ cd
swarna@swarna-VirtualBox:~$ ls
```

5. ls

- The ls command is used to view the contents of a directory By default, this command will display the contents of your current working directory
- If you want to see the content of other directories, type ls and then the directory's
- There are variations you can use with the ls command
- ls -R will list all the files in the sub directories as well
- ls -l long listing
- ls -a will show the hidden files
- ls -al will list the files and directories with detailed information like the permissions, size, owner, etc
- ls -t lists files sorted in the order of "last modified"
- ls -r option will reverse the natural sorting order Usually used in combination with other switches such as ls tr This will reverse the time wise listing

```
drwx----- 11 swarna swarna 4096 Jun 14 21:21 .config
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Desktop
drwxr-xr-x  3 swarna swarna 4096 Jun 14 20:59 Documents
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Downloads
drwx-----  3 swarna swarna 4096 Jun  9 00:31 .gnupg
drwx-----  3 swarna swarna 4096 Jun  9 00:31 .local
drwx-----  4 swarna swarna 4096 Jun 14 20:50 .mozilla
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Music
drwxr-xr-x  2 swarna swarna 4096 Jun 14 21:30 Pictures
-rw-r--r--  1 swarna swarna  807 Jun  9 00:06 .profile
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Public
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Templates
drwx-----  6 swarna swarna 4096 Jun 14 20:50 .thunderbird
drwxr-xr-x  2 swarna swarna 4096 Jun  9 00:31 Videos
swarna@swarna-VirtualBox:~$ ls -t
Pictures Documents Desktop Downloads Music Public Templates Videos
swarna@swarna-VirtualBox:~$ ls -r
Videos Templates Public Pictures Music Downloads Documents Desktop
swarna@swarna-VirtualBox:~$ █
```

```

swarna@swarna-VirtualBox:~/Documents$ cd
swarna@swarna-VirtualBox:~$ ls
Desktop Documents Downloads Music Pictures Public Templates Videos
swarna@swarna-VirtualBox:~$ ls -l
total 32
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Desktop
drwxr-xr-x 3 swarna swarna 4096 Jun 14 20:59 Documents
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Downloads
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Music
drwxr-xr-x 2 swarna swarna 4096 Jun 14 21:30 Pictures
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Public
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Templates
drwxr-xr-x 2 swarna swarna 4096 Jun  9 00:31 Videos
swarna@swarna-VirtualBox:~$ ls -a
.           .bashrc  Documents  .mozilla  Public
..          .cache   Downloads  Music     Templates
.bash_history .config   .gnupg    Pictures  .thunderbird
.bash_logout  Desktop   .local    .profile  Videos
swarna@swarna-VirtualBox:~$ ls -al
total 80
drwxr-xr-x 16 swarna swarna 4096 Jun 14 20:50 .
drwxr-xr-x  3 root  root   4096 Jun  9 00:06 ..
-rw-----  1 swarna swarna  578 Jun 14 23:40 .bash_history
-rw-r--r--  1 swarna swarna  220 Jun  9 00:06 .bash_logout
-rw-r--r--  1 swarna swarna 3771 Jun  9 00:06 .bashrc
drwx----- 13 swarna swarna 4096 Jun 14 20:50 .cache

```

6. mkdir

- Use mkdir command to make a new directory if you type mkdir Music it will create a directory called Music
- To generate a new directory inside another directory, use this Linux basic command mkdir
- use the p (option to create a directory in between two existing directories .

```

swarna@swarna-VirtualBox:~/Documents$ mkdir programs
swarna@swarna-VirtualBox:~/Documents$ mkdir -p sample/sample1
swarna@swarna-VirtualBox:~/Documents$ ls
ajce programs sample
swarna@swarna-VirtualBox:~/Documents$ ls sample/
sample1
swarna@swarna-VirtualBox:~/Documents$ 

```

7. rmdir

- If you need to delete a directory, use the rmdir command However, rmdir only allows you to delete empty directories

```

swarna@swarna-VirtualBox:~/Documents$ rmdir sample1/
rmdir: failed to remove 'sample1/': No such file or directory
swarna@swarna-VirtualBox:~/Documents$ 

```

8. touch

- The touch command allows you to create a blank new file through the Linux command line

```
swarna@swarna-VirtualBox:~/Documents$ touch file1
swarna@swarna-VirtualBox:~/Documents$ ls
ajce  file1  programs  sample
swarna@swarna-VirtualBox:~/Documents$
```

9. rm

- The rm command is used to delete directories and the contents within them
If you only want to delete the directory as an alternative to rmdir use
rm -r

```
swarna@swarna-VirtualBox:~/Documents$ rm file1
swarna@swarna-VirtualBox:~/Documents$ ls
ajce  programs  sample
swarna@swarna-VirtualBox:~/Documents$ rm -r sample/
swarna@swarna-VirtualBox:~/Documents$ ls
ajce  programs
swarna@swarna-VirtualBox:~/Documents$
```

10. cat

- cat (short for concatenate) is one of the most frequently used commands in Linux. It is used to list the contents of a file on the standard output stdout
- To run this command, type cat followed by the file's name and its extension. For instance cat file.txt
- Here are other ways to use the cat command
- cat filename creates a new file
- cat filename1 filename2 >filename3 joins two files 1 and 2 and stores the output of them in a new file 3
- to convert a file to upper or lower case use, cat filename | tr a z A Z >output.txt
- cat myfile insert data to a file

```
swarna@swarna-VirtualBox:~/Documents$ touch cmd1 cmd2
swarna@swarna-VirtualBox:~/Documents$ ls
ajce cmd1 cmd2 programs
swarna@swarna-VirtualBox:~/Documents$ cat >cmd1
pwd
man
history
^C
swarna@swarna-VirtualBox:~/Documents$ cat cmd1
pwd
man
history
swarna@swarna-VirtualBox:~/Documents$ cat >cmd2
clear
ls
cd
^C
swarna@swarna-VirtualBox:~/Documents$ cat >>cmd1
ls -a
cd ..
^C
swarna@swarna-VirtualBox:~/Documents$ cat cmd1
pwd
man
history
ls -a
cd ..
swarna@swarna-VirtualBox:~/Documents$
```

BASIC LINUX COMMANDS-2

1. Echo
2. Head
3. Tail
4. read
5. more
6. less
7. cut
8. paste
9. uname
10. cp
11. mv
12. locate
13. find
14. grep
15. df
16. du
17. useradd
18. userdel
19. sudo
20. passwd

1. echo

The echo command is used to move some data into a file.

```
swarna@swarna-VirtualBox:~/Desktop$ echo swarna >> song1.txt
swarna@swarna-VirtualBox:~/Desktop$ cat song1.txt
swarna
swarna@swarna-VirtualBox:~/Desktop$
```

2. head

The head command is used to view the first lines of any text file. By default, it will show the first ten lines, but you can change this number to your liking.

```
swarna@swarna-VirtualBox:~/Desktop$ head -n 3 /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
swarna@swarna-VirtualBox:~/Desktop$
```

3. tail

The tail command will display the last ten lines of a text file.

```
swarna@swarna-VirtualBox:~/Desktop$ tail /etc/passwd
nm-openvpn:x:118:124:NetworkManager OpenVPN,,,:/var/lib/openvpn/chroot:/usr/sbin/nologin
hplip:x:119:7:HPLIP system user,,,:/run/hplip:/bin/false
whoopsie:x:120:125::/nonexistent:/bin/false
colord:x:121:126:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/nologin
geoclue:x:122:127::/var/lib/geoclue:/usr/sbin/nologin
pulse:x:123:128:PulseAudio daemon,,,:/var/run/pulse:/usr/sbin/nologin
gnome-initial-setup:x:124:65534::/run/gnome-initial-setup/:/bin/false
gdm:x:125:130:Gnome Display Manager:/var/lib/gdm3:/bin/false
swarna:x:1000:1000:Swarna,,,:/home/swarna:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:/:/usr/sbin/nologin
swarna@swarna-VirtualBox:~/Desktop$
```

4. read

The read command will read the contents of a line into a variable. The read command can be used with and without arguments.

```
swarna@swarna-VirtualBox:~/Desktop$ read v1 v2 v3
Amal Jyothi College
swarna@swarna-VirtualBox:~/Desktop$ echo ["$v1"]["$v2"]["$v3"]
[Amal][Jyothi][College]
swarna@swarna-VirtualBox:~/Desktop$
```

5. more

The more command is used to view the text files in the command prompt, displaying one screen at a time in case the file is large. The more command also allows the user to scroll up and down through the page.

```
swarna@swarna-VirtualBox:~/Desktop$ more /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/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
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin/nologin
systemd-timesync:x:102:104:systemd Time Synchronization,,,:/run/systemd:/usr/sbin/nologin
messagebus:x:103:106::/nonexistent:/usr/sbin/nologin
syslog:x:104:110::/home/syslog:/usr/sbin/nologin

_apt:x:105:65534::/nonexistent:/usr/sbin/nologin
tss:x:106:111:TPM software stack,,,:/var/lib/tpm:/bin/false
--More--(48%)
```

6. less

Less command is linux utility which can be used to read contents of text file onepage(one screen) per time.

```
swarna@swarna-VirtualBox:~/Desktop$ less /etc/passwd
swarna@swarna-VirtualBox:~/Desktop$ ls
song1.txt
swarna@swarna-VirtualBox:~/Desktop$ █
```

7. cut

The cut command is used for cutting out the sections from each line of files and writing the result to standard output. It can be used to cut parts of a line by byte position, character and field .

```
swarna@swarna-VirtualBox:~/Desktop$ echo cat >> song1.txt
swarna@swarna-VirtualBox:~/Desktop$ echo flower >> song1.txt
swarna@swarna-VirtualBox:~/Desktop$ cat song1.txt
swarna
cat
flower
swarna@swarna-VirtualBox:~/Desktop$ cut -b 1,2,3 song1.txt
swa
cat
flo
swarna@swarna-VirtualBox:~/Desktop$ █
```

8. paste

It is used to join files horizontally (parallel merging) by outputting lines consisting of lines from each file specified, separated by tab as delimiter, to the standard output.

```
swarna@swarna-VirtualBox:~/Desktop$ touch number.txt
swarna@swarna-VirtualBox:~/Desktop$ paste number.txt song1.txt
      swarna
      cat
      flower
swarna@swarna-VirtualBox:~/Desktop$ █
```

9. uname

The uname command, short for Unix Name, will print detailed information about your Linux system like the machine name, operating system, kernel, and so on.

```
swarna@swarna-VirtualBox:~/Desktop$ uname
Linux
swarna@swarna-VirtualBox:~/Desktop$ uname -r
5.8.0-55-generic
swarna@swarna-VirtualBox:~/Desktop$ uname -v
#62~20.04.1-Ubuntu SMP Wed Jun 2 08:55:04 UTC 2021
swarna@swarna-VirtualBox:~/Desktop$ man uname
swarna@swarna-VirtualBox:~/Desktop$ uname -p
x86_64
swarna@swarna-VirtualBox:~/Desktop$ █
```

10. cp

The cp command is used to copy files from the current directory to a different directory.

```
swarna@swarna-VirtualBox:~/Desktop$ touch v1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$ ls
number.txt song1.txt v1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$ mkdir ajce
swarna@swarna-VirtualBox:~/Desktop$ ls
ajce number.txt song1.txt v1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$ cp v1.txt ajce/
swarna@swarna-VirtualBox:~/Desktop$ ls ajce
v1.txt
swarna@swarna-VirtualBox:~/Desktop$ cp v2.txt ajce/
swarna@swarna-VirtualBox:~/Desktop$ ls ajce
v1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$
```

11. mv

The primary use of the mv command is to move files, it can also be used to rename files. The arguments in mv are similar to the cp command. You need to type mv, the file's name, and the destination's directory.

```
swarna@swarna-VirtualBox:~/Desktop$ mv v1.txt ajce/
swarna@swarna-VirtualBox:~/Desktop$ ls ajce
v1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$
```

12. locate

To locate a file, just like the search command in Windows.

```
swarna@swarna-VirtualBox:~/Desktop$ locate number*song
Command 'locate' not found, but can be installed with:
sudo apt install mlocate
```

13. find

Similar to the locate command, using find also searches for files and directories. The difference is, you use the find command to locate files within a given directory.

```
swarna@swarna-VirtualBox:~/Desktop$ find /home/ -name song1.txt
/home/swarna/Desktop/song1.txt
swarna@swarna-VirtualBox:~/Desktop$ ls
ajce number.txt song1.txt v2.txt
swarna@swarna-VirtualBox:~/Desktop$ find /home/ -name v2.txt
/home/swarna/Desktop/v2.txt
/home/swarna/Desktop/ajce/v2.txt
/home/swarna/.local/share/Trash/files/v2.txt
/home/swarna/.local/share/Trash/files/ajce/v2.txt
swarna@swarna-VirtualBox:~/Desktop$
```

14. grep

Another basic Linux command that is undoubtedly helpful for everyday use is grep. It helps to search through all the text in a given file.

15. df

```
swarna@swarna-VirtualBox:~/Desktop$ cat song1.txt
swarna
cat
flower
swarna@swarna-VirtualBox:~/Desktop$ grep cat song1.txt
cat
swarna@swarna-VirtualBox:~/Desktop$
```

Use df command to get a report on the system's disk space usage, shown in percentage and KBs. If you want to see the report in megabytes, type df -m.

```
swarna@swarna-VirtualBox:~/Desktop$ df -m
Filesystem      1M-blocks  Used  Available Use% Mounted on
udev            587      0     587    0% /dev
tmpfs           124      2     122    2% /run
/dev/sda5       9509    6895   2112   77% /
tmpfs           616      0     616    0% /dev/shm
tmpfs            5      1      5    1% /run/lock
tmpfs           616      0     616    0% /sys/fs/cgroup
/dev/loop0        56      56     0  100% /snap/core18/1988
/dev/loop1        56      56     0  100% /snap/core18/2066
/dev/loop2        219     219     0  100% /snap/gnome-3-34-1804/66
/dev/loop3        219     219     0  100% /snap/gnome-3-34-1804/72
/dev/loop4        65      65     0  100% /snap/gtk-common-themes/1514
/dev/loop5        66      66     0  100% /snap/gtk-common-themes/1515
/dev/loop6        33      33     0  100% /snap/snapd/12057
/dev/loop7        51      51     0  100% /snap/snap-store/542
/dev/loop8        33      33     0  100% /snap/snapd/12159
/dev/loop9        51      51     0  100% /snap/snap-store/547
/dev/sda1         511     1     511    1% /boot/efi
tmpfs           124      1     124    1% /run/user/1000
swarna@swarna-VirtualBox:~/Desktop$
```

16.du

The du (Disk Usage) command is used to check how much space a file or a directory takes. However, the disk usage summary will show disk block numbers instead of the usual size format. If you want to see it in bytes, kilobytes, and megabytes, add the -h argument to the command line.

- \$du -h

```
swarna@swarna-VirtualBox:~/Desktop$ du -h
4.0K  ./ajce
12K  .
swarna@swarna-VirtualBox:~/Desktop$
```

16. useradd

The useradd is used to create a new user, while passwd is adding a password to that user's account. To add a new person named John type, useradd John and then to add his password type, passwd 123456789

```
swarna@swarna-VirtualBox:~$ sudo su -
root@swarna-VirtualBox:~# useradd zera
root@swarna-VirtualBox:~# useradd zera
useradd: user 'zera' already exists
root@swarna-VirtualBox:~#
```

17. userdel

Remove a user is very similar to adding a new user. To delete the users account type, userdel UserName

```
root@swarna-VirtualBox:~# userdel zera
root@swarna-VirtualBox:~# userdel zera
userdel: user 'zera' does not exist
root@swarna-VirtualBox:~#
```

18. sudo

SuperUser Do(sudo) command enables you to perform tasks that require administrative or root permissions.

```
swarna@swarna-VirtualBox:~$ sudo useradd swr
[sudo] password for swarna:
swarna@swarna-VirtualBox:~$ sudo useradd swr
useradd: user 'swr' already exists
swarna@swarna-VirtualBox:~$
```

19. passwd

Changes passwords for user accounts. A normal user may only change the password for their own account, while the superuser may change the password for any account.

```
swarna@swarna-VirtualBox:~$ passwd
Changing password for swarna.
Current password:
New password:
Retype new password:
passwd: password updated successfully
swarna@swarna-VirtualBox:~$
```

BASIC LINUX COMMANDS-3

1. usermod
2. groupadd
3. groups
4. groupdel
5. groupmod
6. chmod
7. chown
8. id
9. ps
10. top

1. usermod

- usermod command is used to change the properties of a user in Linux through the command line
- command-line utility that allows you to modify a user's login information
- #usermod--help
- #usermod-u 2000 Tom

```
swarna@swarna-VirtualBox:~/Desktop$ usermod --help
Usage: usermod [options] LOGIN

Options:
  -b, --badnames      allow bad names
  -c, --comment COMMENT new value of the GECOS field
  -d, --home HOME_DIR new home directory for the user account
  -e, --expiredate EXPIRE_DATE set account expiration date to EXPIRE_DATE
  -f, --inactive INACTIVE set password inactive after expiration
                           to INACTIVE
  -g, --gid GROUP     force use GROUP as new primary group
  -G, --groups GROUPS new list of supplementary GROUPS
  -a, --append         append the user to the supplemental GROUPS
                           mentioned by the -G option without removing
                           the user from other groups
  -h, --help           display this help message and exit
  -l, --login NEW_LOGIN new value of the login name
  -L, --lock            lock the user account
  -m, --move-home      move contents of the home directory to the
                           new location (use only with -d)
  -o, --non-unique     allow using duplicate (non-unique) UID
  -p, --password PASSWORD use encrypted password for the new password
  -R, --root CHROOT_DIR directory to chroot into
  -P, --prefix PREFIX_DIR prefix directory where are located the /etc/* f
 iles
  -s, --shell SHELL    new login shell for the user account
  -u, --uid UID        new UID for the user account
  -U, --unlock          unlock the user account
  -v, --add-subuids FIRST-LAST add range of subordinate uids

  -V, --del-subuids FIRST-LAST remove range of subordinate uids
  -w, --add-subgids FIRST-LAST add range of subordinate gids
  -W, --del-subgids FIRST-LAST remove range of subordinate gids
  -Z, --selinux-user SEUSER  new SELinux user mapping for the user account

swarna@swarna-VirtualBox:~/Desktop$ usermod -u 2000 swarna
usermod: user swarna is currently used by process 681
swarna@swarna-VirtualBox:~/Desktop$
```

2. groupadd

- groupadd command creates a new group account using the values specified on the command line and the default values from the system.
- #groupadd student

```
swarna@swarna-VirtualBox:~/Desktop$ sudo groupadd student
[sudo] password for swarna:
swarna@swarna-VirtualBox:~/Desktop$
```

3.groups

- print the groups a user is in
- #groups alice

```
swarna@swarna-VirtualBox:~/Desktop$ groups swarna
swarna : swarna adm cdrom sudo dip plugdev lpadmin lxd sambashare
swarna@swarna-VirtualBox:~/Desktop$
```

4.groupdel

- groupdel command modifies the system account files, deleting all entries that refer to group. The named group must exist
- #groupdel marketing

```
swarna@swarna-VirtualBox:~/Desktop$ sudo groupdel student
swarna@swarna-VirtualBox:~/Desktop$
```

5.groupmod

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

groupmod -n group1 group2

```
swarna@swarna-VirtualBox:~/Desktop$ sudo groupadd student1
swarna@swarna-VirtualBox:~/Desktop$ sudo groupmod -n student2 student1
swarna@swarna-VirtualBox:~/Desktop$
```

6.chmod

- To change directory permissions of file/ Directory in Linux.

#chmod who what which file/directory

- **chmod+rwx filename** to add permissions.
- **chmod-rwx directory name** to remove permissions.
- **chmod+x filename** to allow executable permissions.
- **chmod-wx filename** to take out write and executable permissions.

```
#chmod u+xt
est
#chmod g-
rwx test
#chmod o-r
test
```

```
swarna@swarna-VirtualBox:~/Downloads$ chmod +rwx quest.txt
swarna@swarna-VirtualBox:~/Downloads$
```

7.chown

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

```
swarna@swarna-VirtualBox:~/Downloads$ chown swarna capital.txt
swarna@swarna-VirtualBox:~/Downloads$
```

8.id

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

#id

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

9.ps

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

- PID–This is the unique process ID
- TTY–This is the type of terminal that the user is logged in to
- TIME–This is the time in minutes and seconds that the process has been running
- CMD–The command that launched

the process #ps -a

```
swarna@swarna-VirtualBox:~/Downloads$ ps -a
 PID TTY      TIME CMD
 733 tty2    00:00:08 Xorg
 855 tty2    00:00:00 gnome-session-b
 2430 pts/0    00:00:00 ps
swarna@swarna-VirtualBox:~/Downloads$
```

10.top

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

```
swarna@swarna-VirtualBox:~/Downloads$ top
top - 00:11:43 up 1:22, 1 user, load average: 0.03, 0.01, 0.00
Tasks: 170 total, 1 running, 169 sleeping, 0 stopped, 0 zombie
%Cpu(s): 2.1 us, 1.0 sy, 0.0 ni, 96.9 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 1231.3 total, 60.8 free, 696.4 used, 474.1 buff/cache
MiB Swap: 448.5 total, 437.2 free, 11.3 used. 379.1 avail Mem

 PID USER      PR  NI    VIRT    RES   SHR S %CPU %MEM TIME+ COMMAND
 719 swarna     9 -11 2203496 18108 14388 S  2.3  1.4  0:32.32 pulseaudio
 560 root       20   0  630012 27420 15992 S  0.3  2.2  0:00.91 snapd
 993 swarna     20   0 3718568 332720 118044 S  0.3 26.4  0:33.56 gnome+-+
1689 swarna     20   0 396728 66764 32820 S  0.3  5.3  0:08.42 orca
1713 swarna     20   0 590252 9968 6820 S  0.3  0.8  0:03.24 sd_esp+
2115 swarna     20   0 823536 50640 38052 S  0.3  4.0  0:01.55 gnome+-+
 1 root        20   0 102052 11112 8352 S  0.0  0.9  0:01.33 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 kworker+
 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  0:00.12 ksoftirqd
11 root       20   0      0      0      0 I  0.0  0.0  0:00.53 rCU_sc+
12 root       rt   0      0      0      0 S  0.0  0.0  0:00.07 migrat+
13 root      -51   0      0      0      0 S  0.0  0.0  0:00.00 idle_i+
14 root       20   0      0      0      0 S  0.0  0.0  0:00.00 cpuhp/0
15 root       20   0      0      0      0 S  0.0  0.0  0:00.00 kdevtmpfs
16 root        0 -20      0      0      0 I  0.0  0.0  0:00.00 netns
```

BASIC LINUX COMMANDS-4

1. wc
2. tar
3. expr
4. redirection and piping
5. ssh
6. scp
7. ssh-keygen
8. ssh-copy-id

1. wc

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

```
#wc state.txt
 6   8   54
state.txt (lines) (words)
(characters)
#wc state.txt capital.txt
wc -l state.txt
wc -w state.txt capital.txt
wc -c state.txt
wc-m state.txt
```

```
swarna@swarna-VirtualBox:~/Documents$ cat vegetables
carrot
tomato
potato
onion
ginger
chilly
cabbage
beans
swarna@swarna-VirtualBox:~/Documents$ wc vegetables
 8  8 55 vegetables
swarna@swarna-VirtualBox:~/Documents$ wc -l vegetables
8 vegetables
swarna@swarna-VirtualBox:~/Documents$ wc -w vegetables
8 vegetables
swarna@swarna-VirtualBox:~/Documents$ wc -c vegetables
55 vegetables
swarna@swarna-VirtualBox:~/Documents$
```

2. tar

- The Linux 'tar' stands for tape archive, is used to create archive and extract the archive files
- Linux tar command to create compressed or uncompressed archive files
- Options:
 - c: Creates Archive
 - x: Extract the archive
 - f: creates archive with given file name
 - t: displays or lists files in archived file
 - u: archives and adds to an existing archive file
 - v: Displays Verbose Information
 - A: Concatenates the archive files
 - z: zip, tells tar command that creates tar file using gzip
 - j: filter archive tar file using tbzip
 - W: Verify a archive file
 - r: update or add file or directory in already existed .tar file
 #tar cfarchive.tar state.txt
 capital.txt //create archive file #ls
 archive.tar
#tar tf/archive.tar // list contents of tar archive file

- Extract an archive created with tar #mkdir backup
#cd backup
#tar xf/home/meera/Documents/Meera_Linux/archive.tar

•Compression

Types

```
gzip(z),bzip2(j),  

xz(J) #tar  

czf/abc.tar.gz  

/etc  

#tar cjf/abcd.tar.bz2  

/etc #tar  

cJf/abcde.tar.xz/etc
```

.Extract an archive

```
#mkdirbacku  

p1 #cd  

backup1  

#tar  

xf/abc.tar.gz  

#mkdirbacku  

p2 #cd  

backup2  

#tar  

xjf/abcd.tar.bz2  

#mkdirbackup  

3  

#cd backup3  

#tar xJf/abcde.tar.xz
```

```

swarna@swarna-VirtualBox:~$ ls
arts  Documents  fruits  Pictures  Templates  Videos
Desktop  Downloads  Music  Public  vegetables
swarna@swarna-VirtualBox:~$ tar cf archive.tar fruits vegetables
swarna@swarna-VirtualBox:~$ ls archive.tar
archive.tar
swarna@swarna-VirtualBox:~$ ls
archive.tar  Desktop  Downloads  Music  Public  vegetables
arts  Documents  fruits  Pictures  Templates  Videos
swarna@swarna-VirtualBox:~$ tar tf archive.tar
fruits
vegetables
swarna@swarna-VirtualBox:~$ mkdir extract
swarna@swarna-VirtualBox:~$ cd extract
swarna@swarna-VirtualBox:~/extract$ pwd
/home/swarna/extract
swarna@swarna-VirtualBox:~/extract$ tar xf /home/swarna/archive.tar
swarna@swarna-VirtualBox:~/extract$ ls
fruits  vegetables
swarna@swarna-VirtualBox:~/extract$ sudo tar czf mca1.tar.gz /etc
[sudo] password for swarna:
tar: Removing leading '/' from member names
swarna@swarna-VirtualBox:~/extract$ ls
fruits  mca1.tar.gz  vegetables

```

Compressing files using gz,bz2,xz

```

swarna@swarna-VirtualBox:~/extract$ ls
fruits  vegetables
swarna@swarna-VirtualBox:~/extract$ sudo tar czf mca1.tar.gz /etc
[sudo] password for swarna:
tar: Removing leading '/' from member names
swarna@swarna-VirtualBox:~/extract$ ls
fruits  mca1.tar.gz  vegetables
swarna@swarna-VirtualBox:~/extract$ cd ..
swarna@swarna-VirtualBox:~$ cd swarna
bash: cd: swarna: No such file or directory
swarna@swarna-VirtualBox:~$ cd extract
swarna@swarna-VirtualBox:~/extract$ sudo tar cjf regmca.tar.gz /etc
tar: Removing leading '/' from member names
swarna@swarna-VirtualBox:~/extract$ ls
fruits  mca1.tar.gz  regmca.tar.gz  vegetables
swarna@swarna-VirtualBox:~/extract$ sudo tar cjf regmca.tar.b2 fruits vegetables
swarna@swarna-VirtualBox:~/extract$ sudo tar cjf regmca.tar.b2 fruits vegetables
swarna@swarna-VirtualBox:~/extract$ ls
fruits  mca1.tar.gz  regmca.tar.b2  regmca.tar.gz  regmca.tar.xz  vegetables
swarna@swarna-VirtualBox:~/extract$ sudo tar cjf regmca.tar.xz fruits vegetables
swarna@swarna-VirtualBox:~/extract$ ls
fruits  mca1.tar.gz  regmca.tar.b2  regmca.tar.gz  regmca.tar.xz  vegetables
swarna@swarna-VirtualBox:~/extract$ mkdir lab
swarna@swarna-VirtualBox:~/extract$ 

```

Extracting using gzip

```

swarna@swarna-VirtualBox:~/extract$ cd lab
swarna@swarna-VirtualBox:~/extract/lab$ ls
swarna@swarna-VirtualBox:~/extract/lab$ pwd
/home/swarna/extract/lab
swarna@swarna-VirtualBox:~/extract/lab$ tar xzf /home/swarna/extract/mca1.tar.gz
swarna@swarna-VirtualBox:~/extract/lab$ ls
etc
swarna@swarna-VirtualBox:~/extract/lab$ ls etc
acpt          hdparm.conf      pnm2ppa.conf
adduser.conf   host.conf       polkit-1
alsa          hostname        popularity-contest.conf
alternatives   hosts          ppp
anacrontab    hosts.allow     profile
apg.conf      hosts.deny     protocols
apm           hp             pulse
apparmor      ifplugd        python3
apparmor.d    init           python3.8
apport         init.d         rc0.d
appstream.conf initramfs-tools rci.1.d
apt           inputrc        rc2.d
avahi         inserv.conf.d  rc3.d
bash.bashrc   iproute2       rc4.d
bash_completion  issue        rcs.d
bash_completion.d  issue.net   rc6.d
bindresvport.blacklist  kernel      rcs.5.d
bluetooth     kernel-img.conf resolv.conf

```

Extracting using xz

```

swarna@swarna-VirtualBox:~/extract/lab$ ls
etc
swarna@swarna-VirtualBox:~/extract/lab$ tar xjf /home/swarna/extract/regmca.tar.xz
swarna@swarna-VirtualBox:~/extract/lab$ ls
etc  fruits  vegetables
swarna@swarna-VirtualBox:~/extract/lab$ 

```

Extracting using bz2

```

swarna@swarna-VirtualBox:~/extract/lab$ tar xjf /home/swarna/extract/regmca.tar.bz2
swarna@swarna-VirtualBox:~/extract/lab$ ls
etc  fruits  vegetables
swarna@swarna-VirtualBox:~/extract/lab$ 

```

3. expr

- The expr command evaluates a given expression and displays its corresponding output .It is used for:
- Basic operations like addition,subtraction,multiplication,division, and modulus on integers.
- Evaluating regular expressions,string operations like substring,length of strings etc.
- Performing operations on variables inside a shell script #expr10+2

```
swarna@swarna-VirtualBox:~/extract/lab$ expr 5 + 5
10
swarna@swarna-VirtualBox:~/extract/lab$ expr 2 - 2
0
swarna@swarna-VirtualBox:~/extract/lab$ expr 12 / 2
6
swarna@swarna-VirtualBox:~/extract/lab$ expr 10 \* 10
100
swarna@swarna-VirtualBox:~/extract/lab$
```

4. Redirections & Piping

- A pipe is a form of redirection to send the output of one command/program/process to another command/program/process for further processing.
- Pipe is used to combine two or more commands, the output of one command acts as input to another command, and this command's output may act as input to the next command and so on.
#ls -l | wc-l
#cat /etc/passwd.txt | head -7 | tail -5

```
swarna@swarna-VirtualBox:~$ cat vegetables
carrot
tomato
potato
onion
ginger
chilly
cabbage
beans
cucumber
cauliflower
corn
eggplant
green pepper
brocoli
swarna@swarna-VirtualBox:~$ cat vegetables |head -5
carrot
tomato
potato
onion
ginger
swarna@swarna-VirtualBox:~$ cat vegetables |head -5| tail -3
potato
onion
ginger
swarna@swarna-VirtualBox:~$
```

5. ssh

- ssh stands for “Secure Shell”.
- It is a protocol used to securely connect to a remote server/system.
- ssh is secure in the sense that it transfers the data in encrypted form between the host and the client.
- It transfers inputs from the client to the host and relays back the output. ssh runs at TCP/IP port 22. #sshuser_name@host(IP/Domain_name)
#ssh-X <root@server1.example.com>

```
swarna@swarna-VirtualBox:~$ ssh --help
unknown option -- -
usage: ssh [-46AcfgKkMNnqsTtVvXXyy] [-B bind_interface]
           [-b bind_address] [-c cipher_spec] [-D [bind_address:]port]
           [-E log_file] [-e escape_char] [-F configfile] [-I pkcs11]
           [-i identity_file] [-J [user@]host[:port]] [-L address]
           [-l login_name] [-m mac_spec] [-O ctl_cmd] [-o option] [-p port]
           [-Q query_option] [-R address] [-S ctl_path] [-W host:port]
           [-w local_tun[:remote_tun]] destination [command]
swarna@swarna-VirtualBox:~$ ssh swarna@LAPTOP-VVDMN7SE
ssh: Could not resolve hostname laptop-vvdmn7se: Temporary failure in name resolution
```

```
swarna@swarna-VirtualBox:~$ sudo apt install openssh-client
[sudo] password for swarna:
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  keychain libpam-ssh monkeysphere ssh-askpass
The following packages will be upgraded:
  openssh-client
1 upgraded, 0 newly installed, 0 to remove and 92 not upgraded.
Need to get 671 kB of archives.
After this operation, 0 B of additional disk space will be used.
Err:1 http://security.ubuntu.com/ubuntu focal-security/main amd64 openssh-client amd64 1:8.2p1-4ubuntu0.2
  Temporary failure resolving 'security.ubuntu.com'
E: Failed to fetch http://security.ubuntu.com/ubuntu/pool/main/o/openssh/openssh-client_8.2p1-4ubuntu0.2_amd64.deb  Temporary failure resolving 'security.ubuntu.com'
E: Unable to fetch some archives, maybe run apt-get update or try with --fix-missing?
swarna@swarna-VirtualBox:~$ ssh localhost
ssh: connect to host localhost port 22: Connection refused
swarna@swarna-VirtualBox:~$ sudo apt install openssh-server ii
Reading package lists... Done
Building dependency tree
Reading state information... Done
E: Unable to locate package ii
swarna@swarna-VirtualBox:~$ ssh localhost
```

6. scp

- SCP (secure copy) is a command-line utility that allows you to securely copy files and directories between two locations.
- With scp, you can copy a file or directory:
- From your local system to a remote system.
- From a remote system to your local system.
- Between two remote systems from your local system.
- Remote file system locations are specified in format [user@]host:/path

Syntax:

```
scp[OPTION] [user@]SRC_HOST:]file1 [user@]DEST_HOST:]file2
$scp/etc/yum.config/etc/hosts ServerX:/home/student
$scpServerX:/etc/hostname /home/student
```

7. ssh-keygen

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

```
$ssh-keygen -t rsa
```

```
swarna@swarna-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/swarna/.ssh/id_rsa): key1
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in key1
Your public key has been saved in key1.pub
The key's randomart image is:
+--[RSA 3072]----+
|   o=+=.
|   o.=+=.
|   . .+=
|   . o+=
|   . * ++ S
|... * .+
|.=+ ooo.
|ooo* o++o
|ooo+=E+
+---[SHA256]-----+
swarna@swarna-VirtualBox:~$
```

8. ssh-copy-id

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

```
$ssh-copy-id username@remote_host
```

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

1.a. Create six files with name of the form

songX.mp3

```
swarna@swarna-VirtualBox:~$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3
```

b. Create six files with name of the form

snapX.jpg

```
swarna@swarna-VirtualBox:~$ touch snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg
```

c. Create six files with name of the form filmX.mp4

```
swarna@swarna-VirtualBox:~$ touch film1.mp4 film2.mp4 film3.mp4 film4.mp4 film5.mp4 film6.mp4
```

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

```
swarna@swarna-VirtualBox:~$ mv *.mp3 ./Music/
swarna@swarna-VirtualBox:~$ mv *.jpg ./Pictures/
swarna@swarna-VirtualBox:~$ mv *.mp4 ./Videos/
```

3.In your home directory, create three subdirectories for organizing your files.

```
swarna@swarna-VirtualBox:~$ mkdir -p {friends,family,work}
```

Call these directories friends, family, and work. Create all three with one command.

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

```
swarna@swarna-VirtualBox:~$ cp /home/swarna/Music/ song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3 /home/swarna/friends/
swarna@swarna-VirtualBox:~$ cp /home/swarna/pictures snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg /home/swarna/family/
```

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

```
swarna@swarna-VirtualBox:~$ rmdir {friends,family}
```

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

```
swarna@swarna-VirtualBox:~$ rm -r friends family
```

7.Redirect a long listing of all home directory files, including hidden, into a

```
swarna@swarna-VirtualBox:~$ ls -a > allfiles.txt
```

file named allfiles.txt Confirm that the file contains the listing.

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

```
swarna@swarna-VirtualBox:~$ date
Tuesday 17 August 2021 07:13:51 PM IST
```

9.Add the user Juliet

```
swarna@swarna-VirtualBox:~$ sudo useradd juliet
[sudo] password for swarna:
```

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

```
swarna@swarna-VirtualBox:~$ cat /etc/passwd | grep juliet
juliet:x:1001:1002::/home/juliet:/bin/sh
```

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

```
swarna@swarna-VirtualBox:~$ sudo passwd juliet  
New password:  
Retype new password:  
passwd: password updated successfully
```

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

```
swarna@swarna-VirtualBox:~$ sudo groupadd -g 30000 shakespeare
```

13. Create a supplementary group called artists.

```
swarna@swarna-VirtualBox:~$ sudo groupadd artist
```

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

```
swarna@swarna-VirtualBox:~$ less /etc/group  
shakespeare:x:30000:  
artist:x:30001:  
(END)
```

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

```
swarna@swarna-VirtualBox:~$ sudo usermod -G shakespeare juliet
```

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

```
swarna@swarna-VirtualBox:~$ id juliet  
uid=1001(juliet) gid=1002(juliet) groups=1002(juliet),30000(shakespeare)
```

17. Add Romeo and Hamlet to the Shakespeare group.

```
swarna@swarna-VirtualBox:~$ sudo useradd Romeo  
swarna@swarna-VirtualBox:~$ sudo useradd Hamlet  
swarna@swarna-VirtualBox:~$ sudo usermod -G shakespeare Romeo  
swarna@swarna-VirtualBox:~$ sudo usermod -G shakespeare Hamlet
```

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

```
swarna@swarna-VirtualBox:~$ sudo useradd Reba  
swarna@swarna-VirtualBox:~$ sudo useradd Dolly  
swarna@swarna-VirtualBox:~$ sudo useradd Elvis  
swarna@swarna-VirtualBox:~$ sudo usermod -G artist Reba  
swarna@swarna-VirtualBox:~$ sudo usermod -G artist Dolly  
swarna@swarna-VirtualBox:~$ sudo usermod -G artist Elvis
```

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

```
swarna@swarna-VirtualBox:~$ less /etc/group  
juliet:x:1002:  
shakespeare:x:30000:juliet,Romeo,Hamlet  
artist:x:30001:Reba,Dolly,Elvis  
Romeo:x:30002:  
Hamlet:x:1003:  
Reba:x:1004:  
Dolly:x:1005:  
Elvis:x:1006:  
(END)
```

20. Attempt to remove user Dolly.

```
swarna@swarna-VirtualBox:~$ sudo userdel Dolly
```

Q1.Try out these network commands in Window as well as in Linux and perform at least 4 options with each command: ping route traceroute, nslookup, IpConfig, NetStat.

LINUX

1. Ping

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

```
swarna@swarna-VirtualBox:~$ ping www.google.com
PING www.google.com (216.58.200.132) 56(84) bytes of data.
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=1 ttl=111 time=119 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=2 ttl=111 time=130 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=3 ttl=111 time=101 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=4 ttl=111 time=116 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=5 ttl=111 time=123 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=6 ttl=111 time=110 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=7 ttl=111 time=134 ms
64 bytes from maa05s10-in-f4.1e100.net (216.58.200.132): icmp_seq=8 ttl=111 time
```

```
swarna@swarna-VirtualBox:~$ ping -a google.com
PING google.com (142.250.182.14) 56(84) bytes of data.
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=1 ttl=112 time=421 ms
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=2 ttl=112 time=234 ms
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=3 ttl=112 time=292 ms
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=4 ttl=112 time=191 ms
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=5 ttl=112 time=210 ms
64 bytes from maa05s18-in-f14.1e100.net (142.250.182.14): icmp_seq=6 ttl=112 time
```

```
swarna@swarna-VirtualBox:~$ ping -V google.com
ping from iputils s20190709
```

```
swarna@swarna-VirtualBox:~$ ping -b google.com
PING google.com (142.250.77.110) 56(84) bytes of data.
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=1 ttl=112 time=147 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=2 ttl=112 time=100 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=3 ttl=112 time=87.4 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=4 ttl=112 time=110 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=5 ttl=112 time=109 ms
64 bytes from maa05s15-in-f14.1e100.net (142.250.77.110): icmp_seq=6 ttl=112 time=106 ms
```

2. Route

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

```
swarna@swarna-VirtualBox:~$ route
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref  Use Iface
default         _gateway       0.0.0.0        UG    100    0      0 enp0s3
10.0.2.0        0.0.0.0        255.255.255.0   U     100    0      0 enp0s3
link-local      0.0.0.0        255.255.0.0    U     1000   0      0 enp0s3
swarna@swarna-VirtualBox:~$ route -n
Kernel IP routing table
Destination     Gateway         Genmask        Flags Metric Ref  Use Iface
0.0.0.0         10.0.2.2      0.0.0.0        UG    100    0      0 enp0s3
10.0.2.0        0.0.0.0        255.255.255.0   U     100    0      0 enp0s3
169.254.0.0     0.0.0.0        255.255.0.0    U     1000   0      0 enp0s3
swarna@swarna-VirtualBox:~$ route -Cn
Kernel IP routing cache
Source          Destination     Gateway         Flags Metric Ref  Use Iface
swarna@swarna-VirtualBox:~$ ip route
default via 10.0.2.2 dev enp0s3 proto dhcp metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100
169.254.0.0/16 dev enp0s3 scope link metric 1000
```

3. Traceroute

Traceroute is a network diagnostic tool used to track in real-time the pathway taken by a packet on an IP network from source to destination, reporting the IP addresses of all the routers it pinged in between.

Traceroute also records the time taken for each hop the packet makes during its route to the destination.

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

```
swarna@swarna-VirtualBox:~$ traceroute google.com
traceroute to google.com (142.250.182.14), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  1.454 ms  1.390 ms  1.371 ms
 2 _gateway (10.0.2.2)  5.881 ms  5.519 ms  5.455 ms
swarna@swarna-VirtualBox:~$ traceroute -V
Modern traceroute for Linux, version 2.1.0
Copyright (c) 2016 Dmitry Butskoy, License: GPL v2 or any later
```

4. Nslookup

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

```
swarna@swarna-VirtualBox:~$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.182.14
Name:   google.com
Address: 2404:6800:4007:819::200e

swarna@swarna-VirtualBox:~$ nslookup -q=MX google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
google.com    mail exchanger = 20 alt1.aspmx.l.google.com.
google.com    mail exchanger = 10 aspmx.l.google.com.
google.com    mail exchanger = 40 alt3.aspmx.l.google.com.
google.com    mail exchanger = 30 alt2.aspmx.l.google.com.
google.com    mail exchanger = 50 alt4.aspmx.l.google.com.

Authoritative answers can be found from:
```

```
swarna@swarna-VirtualBox:~$ nslookup -type=soa redhat.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
redhat.com
origin = a1-68.akam.net
mail addr = noc.redhat.com
serial = 2021091300
refresh = 300
retry = 180
expire = 604800
minimum = 14400

Authoritative answers can be found from:

swarna@swarna-VirtualBox:~$ nslookup -type=a google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.77.110
```

5.ipconfig

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

enabled network interfaces that are connected to the system.

```
swarna@swarna-VirtualBox:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
        inet6 fe80::24ed:c4ea:d2d1:8e4e prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:1d:97:c7 txqueuelen 1000 (Ethernet)
            RX packets 1302 bytes 1150313 (1.1 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1177 bytes 103184 (103.1 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 8620 bytes 524944 (524.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 8620 bytes 524944 (524.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

swarna@swarna-VirtualBox:~$ ifconfig -v
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
        inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
        inet6 fe80::24ed:c4ea:d2d1:8e4e prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:1d:97:c7 txqueuelen 1000 (Ethernet)
            RX packets 1306 bytes 1150641 (1.1 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1181 bytes 103512 (103.5 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
        inet 127.0.0.1 netmask 255.0.0.0
        inet6 ::1 prefixlen 128 scopeid 0x10<host>
          loop txqueuelen 1000 (Local Loopback)
            RX packets 8670 bytes 527996 (527.9 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 8670 bytes 527996 (527.9 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

swarna@swarna-VirtualBox:~$ ifconfig -s
Iface      MTU     RX-OK RX-ERR RX-DRP RX-OVR     TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500      1306      0      0      0       1181      0      0      0 BMRU
lo        65536     8694      0      0      0       8694      0      0      0 LRU
```

6.Netstat

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

```
swarna@swarna-VirtualBox:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 swarna-VirtualBo:bootpc _gateway:bootps          ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags       Type      State         I-Node Path
unix 2          [ ]      DGRAM          25846   /run/user/1000/syste
md/notify
unix 2          [ ]      DGRAM          15158   /run/systemd/journal
/syslog
unix 15         [ ]      DGRAM          15168   /run/systemd/journal
/dev-log
unix 8          [ ]      DGRAM          15172   /run/systemd/journal
/socket
unix 3          [ ]      DGRAM          15144   /run/systemd/notify
unix 3          [ ]      STREAM   CONNECTED    31218   /run/user/1000/bus
unix 3          [ ]      STREAM   CONNECTED    32634
unix 3          [ ]      STREAM   CONNECTED    26832   /run/user/1000/bus
unix 3          [ ]      STREAM   CONNECTED    21951
unix 3          [ ]      STREAM   CONNECTED    31360
unix 3          [ ]      STREAM   CONNECTED    23311   /run/dbus/system_bus
_socket
unix 2          [ ]      DGRAM          32080
unix 3          [ ]      STREAM   CONNECTED    32623
unix 3          [ ]      STREAM   CONNECTED    29475   /run/dbus/system_bus
_socket
unix 3          [ ]      STREAM   CONNECTED    32152

```

```
swarna@swarna-VirtualBox:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Local Address           Foreign Address         State
tcp      0    localhost:mysql       0.0.0.0:*
tcp      0    localhost:domain     0.0.0.0:*
tcp      0    localhost:ipp        0.0.0.0:*
tcp      0    swarna-VirtualBox:60932 32.121.122.34.bc.g:http ESTABLISHED
tcp6     0    [::]:http            [::]:*
tcp6     0    ip6-localhost:ipp    [::]:*
udp      0    localhost:domain     0.0.0.0:*
udp      0    swarna-VirtualBo:bootpc _gateway:bootps      ESTABLISHED
udp      0    0.0.0.0:mdns        0.0.0.0:*
udp      0    0.0.0.0:46352       0.0.0.0:*
udp      0    0.0.0.0:631        0.0.0.0:*
udp6     0    [::]:mdns          [::]:*
udp6     0    [::]:33759         [::]:*
raw6     0    [::]:ipv6-icmp     [::]:*                7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags     Type      State       I-Node   Path
unix  2      [ ACC ]     STREAM    LISTENING  28686   @/tmp/.ICE-unix/1136
unix  2      [ ACC ]     SEQPACKET  LISTENING  15174   /run/udev/control
unix  2      [ ACC ]     STREAM    LISTENING  15147   /run/systemd/private
unix  2      [ ]        DGRAM     LISTENING  25846   /run/user/1000/syste
md/notify
unix  2      [ ACC ]     STREAM    LISTENING  15149   /run/systemd/userdb/
io.systemd.DynamicUser
unix  2      [ ACC ]     STREAM    LISTENING  25850   /run/user/1000/systemd
```

WINDOWS

1. Ping

```
C:\Users\HP>ping -a google.com

Pinging google.com [2404:6800:4007:816::200e] with 32 bytes of data:
Reply from 2404:6800:4007:816::200e: time=93ms
Reply from 2404:6800:4007:816::200e: time=87ms
Reply from 2404:6800:4007:816::200e: time=111ms
Reply from 2404:6800:4007:816::200e: time=105ms

Ping statistics for 2404:6800:4007:816::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 87ms, Maximum = 111ms, Average = 99ms
```

```
C:\Users\HP>ping -t google.com

Pinging google.com [2404:6800:4007:816::200e] with 32 bytes of data:
Reply from 2404:6800:4007:816::200e: time=80ms
Reply from 2404:6800:4007:816::200e: time=107ms
Reply from 2404:6800:4007:816::200e: time=101ms
Reply from 2404:6800:4007:816::200e: time=113ms
Reply from 2404:6800:4007:816::200e: time=106ms
Reply from 2404:6800:4007:816::200e: time=81ms
Reply from 2404:6800:4007:816::200e: time=111ms
Reply from 2404:6800:4007:816::200e: time=115ms
Reply from 2404:6800:4007:816::200e: time=111ms
Reply from 2404:6800:4007:816::200e: time=103ms
Reply from 2404:6800:4007:816::200e: time=96ms
Reply from 2404:6800:4007:816::200e: time=79ms
Reply from 2404:6800:4007:816::200e: time=123ms
Reply from 2404:6800:4007:816::200e: time=126ms
Reply from 2404:6800:4007:816::200e: time=102ms
Reply from 2404:6800:4007:816::200e: time=105ms
Reply from 2404:6800:4007:816::200e: time=133ms
Reply from 2404:6800:4007:816::200e: time=84ms
Reply from 2404:6800:4007:816::200e: time=99ms
Reply from 2404:6800:4007:816::200e: time=100ms
Reply from 2404:6800:4007:816::200e: time=114ms
Reply from 2404:6800:4007:816::200e: time=103ms
Reply from 2404:6800:4007:816::200e: time=101ms
Reply from 2404:6800:4007:816::200e: time=109ms
Reply from 2404:6800:4007:816::200e: time=138ms
Reply from 2404:6800:4007:816::200e: time=104ms
Reply from 2404:6800:4007:816::200e: time=87ms
Reply from 2404:6800:4007:816::200e: time=120ms
Reply from 2404:6800:4007:816::200e: time=125ms
Reply from 2404:6800:4007:816::200e: time=96ms
Reply from 2404:6800:4007:816::200e: time=96ms
Reply from 2404:6800:4007:816::200e: time=77ms

Ping statistics for 2404:6800:4007:816::200e:
  Packets: Sent = 32, Received = 32, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
  Minimum = 77ms, Maximum = 138ms, Average = 104ms
```

```
C:\Users\HP>ping -j google.com

Pinging google.com [172.217.166.110] with 32 bytes of data:
General failure.
General failure.
General failure.
General failure.

Ping statistics for 172.217.166.110:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

2.Route

```
C:\Users\HP>ping -4 google.com

Pinging google.com [172.217.166.110] with 32 bytes of data:
Reply from 172.217.166.110: bytes=32 time=73ms TTL=112
Reply from 172.217.166.110: bytes=32 time=73ms TTL=112
Reply from 172.217.166.110: bytes=32 time=102ms TTL=112
Reply from 172.217.166.110: bytes=32 time=100ms TTL=112

Ping statistics for 172.217.166.110:
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
  Minimum = 73ms, Maximum = 102ms, Average = 87ms
```

```
C:\Users\HP>route print
=====
Interface List
 18...30 24 a9 41 7a d1 ....Realtek PCIe GbE Family Controller
 8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
 17...5e 38 cf ed 31 a0 ....Remote NDIS based Internet Sharing Device
 14...da c0 a6 fd 00 bd ....Microsoft Wi-Fi Direct Virtual Adapter
 19...fa c0 a6 fd 00 bd ....Microsoft Wi-Fi Direct Virtual Adapter #2
 6...d8 c0 a6 fd 00 bd ....Realtek RTL8821CE 802.11ac PCIe Adapter
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask     Gateway       Interface Metric
          0.0.0.0        0.0.0.0   192.168.42.129  192.168.42.68    25
          127.0.0.0      255.0.0.0   On-link        127.0.0.1    331
          127.0.0.1      255.255.255.255  On-link        127.0.0.1    331
 127.255.255.255  255.255.255.255  On-link        127.0.0.1    331
          192.168.42.0    255.255.255.0   On-link      192.168.42.68    281
          192.168.42.68    255.255.255.255  On-link      192.168.42.68    281
 192.168.42.255  255.255.255.255  On-link      192.168.42.68    281
          192.168.56.0    255.255.255.0   On-link      192.168.56.1    281
          192.168.56.1    255.255.255.255  On-link      192.168.56.1    281
 192.168.56.255  255.255.255.255  On-link      192.168.56.1    281
          224.0.0.0        240.0.0.0   On-link        127.0.0.1    331
          224.0.0.0        240.0.0.0   On-link      192.168.56.1    281
          224.0.0.0        240.0.0.0   On-link      192.168.42.68    281
 255.255.255.255  255.255.255.255  On-link        127.0.0.1    331
 255.255.255.255  255.255.255.255  On-link      192.168.56.1    281
 255.255.255.255  255.255.255.255  On-link      192.168.42.68    281
=====

Persistent Routes:
 None

IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
17      41 ::/0           fe80::44b0:5fff:fe1d:2dbd
1       331 ::1/128        On-link
17      41 2409:4073:482:5322::/64  On-link
17      281 2409:4073:482:5322:617d:b575:6807:da6b/128
17      281 2409:4073:482:5322:9d4b:8566:78:691f/128
17      281 fe80::/64         On-link
17      281 fe80::/64         On-link
8       281 fe80::49f:9d29:1fd3:189f/128
17      281 fe80::617d:b575:6807:da6b/128
=====
```

```
C:\Users\HP>route print -4
=====
Interface List
 18...30 24 a9 41 7a d1 ....Realtek PCIe GbE Family Controller
 8...0a 00 27 00 00 08 ....VirtualBox Host-Only Ethernet Adapter
 17...5e 38 cf ed 31 a0 ....Remote NDIS based Internet Sharing Device
 14...da c0 a6 fd 00 bd ....Microsoft Wi-Fi Direct Virtual Adapter
 19...fa c0 a6 fd 00 bd ....Microsoft Wi-Fi Direct Virtual Adapter #2
 6...d8 c0 a6 fd 00 bd ....Realtek RTL8821CE 802.11ac PCIe Adapter
 1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
Network Destination      Netmask     Gateway       Interface Metric
          0.0.0.0        0.0.0.0   192.168.42.129  192.168.42.68    25
          127.0.0.0      255.0.0.0   On-link        127.0.0.1    331
          127.0.0.1      255.255.255.255  On-link        127.0.0.1    331
 127.255.255.255  255.255.255.255  On-link        127.0.0.1    331
          192.168.42.0    255.255.255.0   On-link      192.168.42.68    281
          192.168.42.68    255.255.255.255  On-link      192.168.42.68    281
 192.168.42.255  255.255.255.255  On-link      192.168.42.68    281
          192.168.56.0    255.255.255.0   On-link      192.168.56.1    281
          192.168.56.1    255.255.255.255  On-link      192.168.56.1    281
 192.168.56.255  255.255.255.255  On-link      192.168.56.1    281
          224.0.0.0        240.0.0.0   On-link        127.0.0.1    331
          224.0.0.0        240.0.0.0   On-link      192.168.56.1    281
          224.0.0.0        240.0.0.0   On-link      192.168.42.68    281
 255.255.255.255  255.255.255.255  On-link        127.0.0.1    331
 255.255.255.255  255.255.255.255  On-link      192.168.56.1    281
 255.255.255.255  255.255.255.255  On-link      192.168.42.68    281
=====

Persistent Routes:
 None
```

```
C:\Users\HP>tracert 192.168.1.1
Tracing route to 192.168.1.1 over a maximum of 30 hops
  1  4 ms    1 ms    2 ms  192.168.42.129
  2  *        *        * Request timed out.
  3  89 ms   71 ms   80 ms  10.72.51.51
  4  84 ms   74 ms   76 ms  192.168.47.38
  5  99 ms   73 ms   77 ms  172.26.75.38
  6  92 ms   73 ms   78 ms  172.26.75.67
  7  *        *        * Request timed out.
```

```
C:\Users\HP>tracert www.google.com
Tracing route to www.google.com [2404:6800:4007:826::2004]
over a maximum of 30 hops:
 1   3 ms    2 ms    2 ms  2409:4073:482:5322::4b
 2   *         *         * Request timed out.
 3   82 ms    78 ms    84 ms  2405:200:314:1503::2
 4   70 ms    77 ms    78 ms  2405:200:801:1100::468
 5   77 ms    *         85 ms  2405:200:801:1100::451
 6   99 ms    83 ms    87 ms  2001:4860:1:1::171
 7   110 ms   92 ms    74 ms  2001:4860:1:1::170
 8   110 ms   98 ms    79 ms  2404:6800:8123::1
 9   *         *         104 ms  2001:4860:0:1::564e
10   95 ms    82 ms    74 ms  2001:4860:0:e00::a
11   114 ms   96 ms    87 ms  2001:4860:0:1340::1
12   121 ms   77 ms    83 ms  2001:4860:0:1::55e5
13   123 ms   86 ms    77 ms  maa03s41-in-x04.le100.net [2404:6800:4007:826::2004]

Trace complete.
```

```
C:\Users\HP>tracert -d www.google.com
Tracing route to www.google.com [2404:6800:4007:826::2004]
over a maximum of 30 hops:
 1   2 ms    2 ms    3 ms  2409:4073:482:5322::4b
 2   *         *         * Request timed out.
 3   334 ms   91 ms   100 ms  2405:200:314:1503::2
 4   96 ms    69 ms    72 ms  2405:200:801:1100::468
 5   88 ms    71 ms    80 ms  2405:200:801:1100::451
 6   123 ms   91 ms    79 ms  2001:4860:1:1::171
 7   103 ms   80 ms   122 ms  2001:4860:1:1::170
 8   477 ms   323 ms   84 ms  2404:6800:8123::1
 9   694 ms   *         *      2001:4860:0:1::564e
10   150 ms   665 ms   247 ms  2001:4860:0:e00::a
11   130 ms   100 ms   303 ms  2001:4860:0:1340::1
12   *         134 ms   106 ms  2001:4860:0:1::55e5
13   165 ms   146 ms   126 ms  2404:6800:4007:826::2004

Trace complete.
```

```
C:\Users\HP>tracert 22.110.0.1
Tracing route to 22.110.0.1 over a maximum of 30 hops
 1   2 ms    1 ms    2 ms  192.168.42.129
 2   *         *         * Request timed out.
 3   367 ms   247 ms   270 ms  10.72.51.35
 4   83 ms    77 ms    79 ms  192.168.47.42
 5   183 ms   68 ms    62 ms  172.26.75.38
 6   1659 ms   892 ms  1021 ms  172.26.75.67
 7   796 ms   423 ms   162 ms  192.168.47.16
 8   *         *         * Request timed out.
 9   *         *         * Request timed out.
10   97 ms    119 ms   865 ms  103.198.140.174
11   254 ms   540 ms   367 ms  103.198.140.27
12   264 ms   295 ms   211 ms  103.198.140.27
13   913 ms   603 ms   286 ms  hurricane.mrs.franceix.net [37.49.232.13]
14   323 ms   297 ms   219 ms  port-channel1.core2.mrs1.he.net [184.104.197.42]
15   581 ms   407 ms   298 ms  ve952.core1.biol.he.net [184.104.196.78]
16   598 ms   367 ms   639 ms  100ge0-30.core1.orf2.he.net [184.105.64.122]
17   459 ms   795 ms   366 ms  100ge15-1.core2.ash1.he.net [184.105.64.121]
18   *         *         * Request timed out.
```

1. Nslookup

```
C:\Users\HP>nslookup
Default Server: Unknown
Address: 192.168.42.129
```

```
C:\Users\HP>nslookup -g=MX google.com
*** Invalid option: g=MX
Server: UnKnown
Address: 192.168.42.129

Non-authoritative answer:
Name:      google.com
Addresses: 2404:6800:4007:816::200e
          142.250.77.110
```

2. ipconfig

```
C:\Users\HP>ipconfig

Windows IP Configuration

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

Ethernet adapter VirtualBox Host-Only Network:
  Connection-specific DNS Suffix . . . . . :
  Link-local IPv6 Address . . . . . : fe80::49f:9d29:1fd3:189f%8
  IPv4 Address . . . . . : 192.168.56.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : 

Ethernet adapter Ethernet 2:
  Connection-specific DNS Suffix . . . . . :
  IPv6 Address . . . . . : 2409:4073:49f:68b7:304f:d53f:192b:531c
  Temporary IPv6 Address . . . . . : 2409:4073:49f:68b7:f967:bfe7:fa09:e81
  Link-local IPv6 Address . . . . . : fe80::304f:d53f:192b:531c%17
  IPv4 Address . . . . . : 192.168.42.239
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::d413:4cff:fe64:e53e%17
                                         192.168.42.129

Wireless LAN adapter Local Area Connection* 1:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . . . . . : 

Wireless LAN adapter Local Area Connection* 2:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . . . . . : 

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

```
C:\Users\HP>ipconfig /displaying
Error: unrecognized or incomplete command line.

USAGE:
  ipconfig [/allcompartments] [/? | /all | 
    /renew [adapter] | /release [adapter] | 
    /renew6 [adapter] | /release6 [adapter] | 
    /flushdns | /displaydns | /registerdns | 
    /showclassid adapter | 
    /setclassid adapter [classid] | 
    /showclassid6 adapter | 
    /setclassid6 adapter [classid] ]

where
  adapter          Connection name
  (wildcard characters * and ? allowed, see examples)

  Options:
    /?             Display this help message
    /all           Display full configuration information.
    /release       Release the IPv4 address for the specified adapter.
    /release6     Release the IPv6 address for the specified adapter.
    /renew         Renew the IPv4 address for the specified adapter.
    /renew6        Renew the IPv6 address for the specified adapter.
    /flushdns     Purges the DNS Resolver cache.
    /registerdns Refreshes all DHCP leases and re-registers DNS names
    /displaydns   Displays the contents of the DNS Resolver Cache.
    /showclassid  Displays all the dhcp class IDs allowed for adapter.
    /setclassid   Modifies the dhcp class id.
    /showclassid6 Displays all the IPv6 DHCP class IDs allowed for adapter.
    /setclassid6 Modifies the IPv6 DHCP class id.

The default is to display only the IP address, subnet mask and
default gateway for each adapter bound to TCP/IP.

For Release and Renew, if no adapter name is specified, then the IP address
leases for all adapters bound to TCP/IP will be released or renewed.

For Setclassid and Setclassid6, if no ClassId is specified, then the ClassId is removed.

Examples:
  > ipconfig           ... Show information
  > ipconfig /all      ... Show detailed information
  > ipconfig /renew    ... renew all adapters
  > ipconfig /renew EL*  ... renew any connection that has its
                           name starting with EL
  > ipconfig /release *Con* ... release all matching connections,
                             eg. "Wired Ethernet Connection 1" or
                                 "Wired Ethernet Connection 2"
  > ipconfig /allcompartments ... Show information about all
                                compartments
  > ipconfig /allcompartments /all ... Show detailed information about all
                                compartments 
```

3. netstat

```
C:\Users\HP>netstat
Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    127.0.0.1:1026       activate:1027        ESTABLISHED
  TCP    127.0.0.1:1027       activate:1026        ESTABLISHED
  TCP    127.0.0.1:1028       activate:1029        ESTABLISHED
  TCP    127.0.0.1:1029       activate:1028        ESTABLISHED
  TCP    127.0.0.1:5862       activate:5863        ESTABLISHED
  TCP    127.0.0.1:5863       activate:5862        ESTABLISHED
  TCP    127.0.0.1:6915       activate:6916        ESTABLISHED
  TCP    127.0.0.1:6916       activate:6915        ESTABLISHED
  TCP    127.0.0.1:6917       activate:6918        ESTABLISHED
  TCP    127.0.0.1:6918       activate:6917        ESTABLISHED
  TCP    127.0.0.1:12319      activate:12318       TIME_WAIT
  TCP    192.168.42.239:5251  20.197.71.89:https  ESTABLISHED
  TCP    192.168.42.239:5264  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:5266  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:5269  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:5272  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:5274  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:6483  91.108.56.200:https  ESTABLISHED
  TCP    192.168.42.239:10040 52.113.195.132:https  TIME_WAIT
  TCP    192.168.42.239:10187 49.44.113.154:https  CLOSE_WAIT
  TCP    192.168.42.239:10188 49.44.113.154:https  CLOSE_WAIT
  TCP    192.168.42.239:10189 49.44.113.154:https  CLOSE_WAIT
  TCP    192.168.42.239:10190 49.44.113.154:https  CLOSE_WAIT
  TCP    192.168.42.239:10199  server-13-32-37-109:https  CLOSE_WAIT
  TCP    192.168.42.239:10202  server-13-249-219-182:http  CLOSE_WAIT
  TCP    192.168.42.239:10219  server-13-249-219-130:http  CLOSE_WAIT
  TCP    192.168.42.239:10220  server-13-32-37-109:https  CLOSE_WAIT
  TCP    192.168.42.239:10222  a104-115-64-190:https  CLOSE_WAIT
  TCP    192.168.42.239:10267  91.108.23.100:https  ESTABLISHED
  TCP    192.168.42.239:11205  ec2-3-6-206-22:8080  ESTABLISHED
  TCP    192.168.42.239:12322  ec2-3-6-199-181:https  TIME_WAIT
  TCP    192.168.42.239:14704  maa05s09-in-f14:https  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:3044  sf-in-f188:https  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:4787  maa05s09-in-x0e:https  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:6914  maa05s06-in-x05:https  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:7316  maa05s20-in-x0a:https  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:8673  sf-in-f188:https  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:9127  maa05s06-in-x05:https  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10201  [2405:200:1630:1400::b854:b039]:https  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10205  [2405:200:1630:1400::b854:b039]:https  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10206  [2405:200:1630:1400::b854:b039]:https  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10207  [2405:200:1630:1400::b854:b039]:https  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:11204  maa05s22-in-x03:https  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:14431  maa05s06-in-x05:https  TIME_WAIT
```

```
C:\Users\HP>netstat -n 5
Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    127.0.0.1:1026       127.0.0.1:1027        ESTABLISHED
  TCP    127.0.0.1:1027       127.0.0.1:1026        ESTABLISHED
  TCP    127.0.0.1:1028       127.0.0.1:1029        ESTABLISHED
  TCP    127.0.0.1:1029       127.0.0.1:1028        ESTABLISHED
  TCP    127.0.0.1:5862       127.0.0.1:5863        ESTABLISHED
  TCP    127.0.0.1:5863       127.0.0.1:5862        ESTABLISHED
  TCP    127.0.0.1:6836       127.0.0.1:6837        ESTABLISHED
  TCP    127.0.0.1:6837       127.0.0.1:6836        ESTABLISHED
  TCP    192.168.42.239:1841  172.217.163.206:443  ESTABLISHED
  TCP    192.168.42.239:5251  20.197.71.89:443        ESTABLISHED
  TCP    192.168.42.239:5264  91.108.23.100:443       ESTABLISHED
  TCP    192.168.42.239:5266  91.108.23.100:443       ESTABLISHED
  TCP    192.168.42.239:5269  91.108.23.100:443       ESTABLISHED
  TCP    192.168.42.239:5272  91.108.23.100:443       ESTABLISHED
  TCP    192.168.42.239:5274  91.108.23.100:443       ESTABLISHED
  TCP    192.168.42.239:5444  3.6.206.22:8080        CLOSE_WAIT
  TCP    192.168.42.239:5445  13.126.54.6:8080        CLOSE_WAIT
  TCP    192.168.42.239:5446  13.126.54.6:8080        CLOSE_WAIT
  TCP    192.168.42.239:5453  91.108.56.200:443       ESTABLISHED
  TCP    192.168.42.239:10187 49.44.113.154:443       CLOSE_WAIT
  TCP    192.168.42.239:10188 49.44.113.154:443       CLOSE_WAIT
  TCP    192.168.42.239:10189 49.44.113.154:443       CLOSE_WAIT
  TCP    192.168.42.239:10190 49.44.113.154:443       CLOSE_WAIT
  TCP    192.168.42.239:10199 13.32.37.109:443        CLOSE_WAIT
  TCP    192.168.42.239:10202 13.249.219.182:80       CLOSE_WAIT
  TCP    192.168.42.239:10219 13.249.219.130:80       CLOSE_WAIT
  TCP    192.168.42.239:10220 13.32.37.109:443        CLOSE_WAIT
  TCP    192.168.42.239:10222 104.115.64.190:443       CLOSE_WAIT
  TCP    192.168.42.239:10267  91.108.23.100:443       ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:3044  [2404:6800:4003:c03::bc]:443  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:5443  [2404:6800:4007:828::2005]:443  TIME_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:7316  [2404:6800:4007:81b::200a]:443  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:8673  [2404:6800:4003:c03::bc]:443  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:8842  [2404:6800:4007:811::200e]:443  ESTABLISHED
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10201  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10205  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10206  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10207  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
  TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:13429  [2404:6800:4007:820::200a]:443  ESTABLISHED
```

```
C:\Users\HP>netstat -n
Active Connections

Proto  Local Address          Foreign Address        State
TCP    127.0.0.1:1026         127.0.0.1:1027       ESTABLISHED
TCP    127.0.0.1:1027         127.0.0.1:1026       ESTABLISHED
TCP    127.0.0.1:1028         127.0.0.1:1029       ESTABLISHED
TCP    127.0.0.1:1029         127.0.0.1:1028       ESTABLISHED
TCP    127.0.0.1:5862         127.0.0.1:5863       ESTABLISHED
TCP    127.0.0.1:5863         127.0.0.1:5862       ESTABLISHED
TCP    127.0.0.1:6836         127.0.0.1:6837       ESTABLISHED
TCP    127.0.0.1:6837         127.0.0.1:6836       ESTABLISHED
TCP    192.168.42.239:5251    20.197.71.89:443     ESTABLISHED
TCP    192.168.42.239:5264    91.108.23.100:443    ESTABLISHED
TCP    192.168.42.239:5266    91.108.23.100:443    ESTABLISHED
TCP    192.168.42.239:5269    91.108.23.100:443    ESTABLISHED
TCP    192.168.42.239:5272    91.108.23.100:443    ESTABLISHED
TCP    192.168.42.239:5274    91.108.23.100:443    ESTABLISHED
TCP    192.168.42.239:5444    3.6.206.22:8080      CLOSE_WAIT
TCP    192.168.42.239:5445    13.126.54.6:8080      CLOSE_WAIT
TCP    192.168.42.239:5446    13.126.54.6:8080      CLOSE_WAIT
TCP    192.168.42.239:5448    91.108.56.200:80      FIN_WAIT_1
TCP    192.168.42.239:5451    91.108.56.200:443    SYN_SENT
TCP    192.168.42.239:5452    91.108.56.200:80      SYN_SENT
TCP    192.168.42.239:10187   49.44.113.154:443    CLOSE_WAIT
TCP    192.168.42.239:10188   49.44.113.154:443    CLOSE_WAIT
TCP    192.168.42.239:10189   49.44.113.154:443    CLOSE_WAIT
TCP    192.168.42.239:10190   49.44.113.154:443    CLOSE_WAIT
TCP    192.168.42.239:10199   13.32.37.109:443     CLOSE_WAIT
TCP    192.168.42.239:10202   13.249.219.182:80     CLOSE_WAIT
TCP    192.168.42.239:10219   13.249.219.130:80     CLOSE_WAIT
TCP    192.168.42.239:10220   13.32.37.109:443     CLOSE_WAIT
TCP    192.168.42.239:10222   104.115.64.190:443    CLOSE_WAIT
TCP    192.168.42.239:10267   91.108.23.100:443    ESTABLISHED
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:3044  [2404:6800:4003:c03::bc]:443  ESTABLISHED
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:5443  [2404:6800:4007:828::2005]:443  TIME_WAIT
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:7316  [2404:6800:4007:81b::200a]:443  ESTABLISHED
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:8673  [2404:6800:4003:c03::bc]:443  ESTABLISHED
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10201  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10205  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10206  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:10207  [2405:200:1630:1400::b854:b039]:443  CLOSE_WAIT
TCP    [2409:4073:49f:68b7:f967:bfe7:fa09:e81]:13429  [2404:6800:4007:820::200a]:443  ESTABLISHED
```

```
C:\Users\HP>netstat -a
Active Connections

  Proto  Local Address        Foreign Address      State
  TCP    0.0.0.0:135          LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:445          LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:1025         LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:3306         LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:5040         LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:33060        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:49664        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:49665        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:49666        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:49667        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    0.0.0.0:49668        LAPTOP-VVDMN7SE:0  LISTENING
  TCP    127.0.0.1:1026       activate:1027      ESTABLISHED
  TCP    127.0.0.1:1027       activate:1026      ESTABLISHED
  TCP    127.0.0.1:1028       activate:1029      ESTABLISHED
  TCP    127.0.0.1:1029       activate:1028      ESTABLISHED
  TCP    127.0.0.1:5862       activate:5863      ESTABLISHED
  TCP    127.0.0.1:5863       activate:5862      ESTABLISHED
  TCP    127.0.0.1:6836       activate:6837      ESTABLISHED
  TCP    127.0.0.1:6837       activate:6836      ESTABLISHED
  TCP    127.0.0.1:9093       LAPTOP-VVDMN7SE:0  LISTENING
  TCP    127.0.0.1:17400      LAPTOP-VVDMN7SE:0  LISTENING
  TCP    127.0.0.1:27017      LAPTOP-VVDMN7SE:0  LISTENING
  TCP    192.168.42.239:139   LAPTOP-VVDMN7SE:0  LISTENING
  TCP    192.168.42.239:5251  20.197.71.89:https  ESTABLISHED
  TCP    192.168.42.239:5264  91.108.23.100:https ESTABLISHED
  TCP    192.168.42.239:5266  91.108.23.100:https ESTABLISHED
  TCP    192.168.42.239:5269  91.108.23.100:https ESTABLISHED
  TCP    192.168.42.239:5272  91.108.23.100:https ESTABLISHED
  TCP    192.168.42.239:5274  91.108.23.100:https ESTABLISHED
  TCP    192.168.42.239:5453  91.108.56.200:https ESTABLISHED
  TCP    192.168.42.239:9562  52.109.56.20:https TIME_WAIT
  TCP    192.168.42.239:10187 49.44.113.154:https CLOSE_WAIT
  TCP    192.168.42.239:10188 49.44.113.154:https CLOSE_WAIT
  TCP    192.168.42.239:10189 49.44.113.154:https CLOSE_WAIT
  TCP    192.168.42.239:10190 49.44.113.154:https CLOSE_WAIT
  TCP    192.168.42.239:10199 server-13-32-37-109:https CLOSE_WAIT
  TCP    192.168.42.239:10202 server-13-249-219-182:http  CLOSE_WAIT
  TCP    192.168.42.239:10219 server-13-249-219-130:http  CLOSE_WAIT
  TCP    192.168.42.239:10220 server-13-32-37-109:https CLOSE_WAIT
  TCP    192.168.42.239:10222 a104-115-64-190:https  CLOSE_WAIT
  TCP    192.168.42.239:10267 91.108.23.100:https ESTABLISHED
  TCP    192.168.56.1:139     LAPTOP-VVDMN7SE:0  LISTENING
  TCP    [::]:135              LAPTOP-VVDMN7SE:0  LISTENING
```

Q2. Identify and perform 5 more network commands and it's working.

i. ARP

The ARP command corresponds to the Address Resolution Protocol. Although it is easy to think of network communications in terms of IP addressing, packet delivery is ultimately dependent on the Media Access Control (MAC) address of the device's network adapter. This is where the Address Resolution Protocol comes into play. Its job is to map IP addresses to MAC addresses.

Windows devices maintain an ARP cache, which contains the results of recent ARP queries. You can see the contents of this cache by using the ARP -A command.

```
C:\Users\HP>arp -a

Interface: 192.168.56.1 --- 0x8
  Internet Address        Physical Address      Type
  192.168.56.255          ff-ff-ff-ff-ff-ff  static
  224.0.0.22               01-00-5e-00-00-16  static
  224.0.0.251              01-00-5e-00-00-fb  static
  224.0.0.252              01-00-5e-00-00-fc  static
  239.255.255.250          01-00-5e-7f-ff-fa  static
  255.255.255.255          ff-ff-ff-ff-ff-ff  static

Interface: 192.168.42.239 --- 0x11
  Internet Address        Physical Address      Type
  192.168.42.129          d6-13-4c-64-e5-3e  dynamic
  192.168.42.255          ff-ff-ff-ff-ff-ff  static
  224.0.0.22               01-00-5e-00-00-16  static
  224.0.0.251              01-00-5e-00-00-fb  static
  224.0.0.252              01-00-5e-00-00-fc  static
  239.255.255.250          01-00-5e-7f-ff-fa  static
  255.255.255.255          ff-ff-ff-ff-ff-ff  static
```

ii. NbtStat

Computers that are running a Windows operating system are assigned a computer name. Oftentimes, there is a domain name or a workgroup name that is also assigned to the computer. The computer name is sometimes referred to as the NetBIOS name. Windows uses several different methods to map NetBIOS names to IP addresses, such as broadcast, LMHost lookup, or even using the nearly extinct method of querying a WINS server. Of course, NetBIOS over TCP/IP can occasionally break down. The NbtStat command can help you to diagnose and correct such problems. The NbtStat -n command for example, shows the NetBIOS names that are in use by a device. The NbtStat -r command shows how many NetBIOS names the device has been able to resolve recently.

```
C:\Users\HP>nbtstat -r
NetBIOS Names Resolution and Registration Statistics
-----
Resolved By Broadcast      = 0
Resolved By Name Server    = 0
Registered By Broadcast   = 681
Registered By Name Server = 0
```

iii. Hostname

The previously discussed NbtStat command can provide you with the host name that has been assigned to a Windows device, if you know which switch to use with the command. However, if you're just looking for a fast and easy way of verifying a computer's name, then try using the Hostname command.

Typing Hostname at the command prompt returns the local computer name.

```
C:\Users\HP>hostname
LAPTOP-VVDMN7SE
```

iv. PathPing Earlier

I talked about the Ping utility and the Tracert utility, and the similarities between them. As you might have guessed, the PathPing tool is a utility that combines the best aspects of Tracert and Ping. Entering the PathPing command followed by a host name initiates what looks like a somewhat standard Tracert process. Once this process completes however, the tool takes 300 seconds (five minutes) to gather statistics, and then reports latency and packet loss statistics that are more detailed than those provided by Ping or Tracert.

```
C:\Users\HP>pathping www.google.com
Tracing route to www.google.com [2404:6800:4007:809::2004]
over a maximum of 30 hops:
  0  LAPTOP-VVDMN7SE [2409:4073:49f:68b7:f967:bfe7:fa09:e81]
  1  2409:4073:49f:68b7::3
  2  *       *       *
Computing statistics for 25 seconds...
```

v. getmac

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

```
C:\Users\HP>getmac
Physical Address      Transport Name
=====
30-24-A9-41-7A-D1    Media disconnected
D8-C0-A6-FD-00-BD    Media disconnected
0A-00-27-00-00-08    \Device\Tcpip_{65BB5BB1-C342-4ED0-A419-73E9A3F2AF83}
9A-A0-9F-06-88-88    \Device\Tcpip_{D223DFE-8011-48DB-A36B-8D70CE6C7F20}
```

LAMP INSTALLATION

Install apache

- Update your system

sudo apt update

- Install Apache using apt:

sudo apt install apache2

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

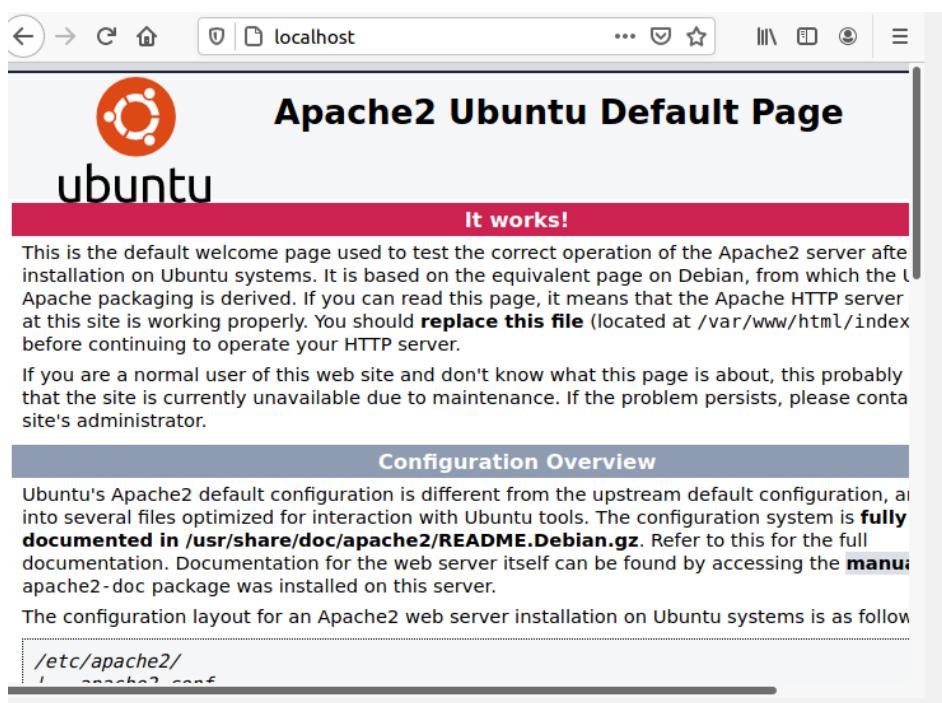
sudo systemctl status apache2

- if it is not working

sudo systemctl start apache2

```
swarna@swarna-VirtualBox:~$ sudo systemctl status apache2
[sudo] password for swarna:
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor pres
   Active: active (running) since Wed 2021-09-29 16:50:21 IST; 3min 59s ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 616 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SU
 Main PID: 708 (apache2)
   Tasks: 6 (limit: 1408)
  Memory: 17.5M
    CGroup: /system.slice/apache2.service
            └─708 /usr/sbin/apache2 -k start
                ├─747 /usr/sbin/apache2 -k start
                ├─752 /usr/sbin/apache2 -k start
                ├─753 /usr/sbin/apache2 -k start
                ├─754 /usr/sbin/apache2 -k start
                └─755 /usr/sbin/apache2 -k start

Sep 29 16:50:21 swarna-VirtualBox systemd[1]: Starting The Apache HTTP Server...
Sep 29 16:50:21 swarna-VirtualBox apachectl[635]: AH00558: apache2: Could not
Sep 29 16:50:21 swarna-VirtualBox systemd[1]: Started The Apache HTTP Server.
lines 1-19/19 (END)
```



Install mariadb

- **Install mariaDB**

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

- **Check mariadb Installation**

```
sudo systemctl status mysql
```

(if it is not working sudo systemctl start mysql)

```
swarna@swarna-VirtualBox:~$ sudo systemctl status mysql
● mariadb.service - MariaDB 10.3.31 database server
   Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor pres>
   Active: active (running) since Wed 2021-09-29 16:50:24 IST; 6min ago
     Docs: man:mysqld(8)
           https://mariadb.com/kb/en/library/systemd/
  Process: 618 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var>
  Process: 638 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_ST>
  Process: 676 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && >
  Process: 915 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_S>
  Process: 921 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0/>
 Main PID: 743 (mysqld)
   Status: "Taking your SQL requests now..."
      Tasks: 30 (limit: 1408)
     Memory: 76.8M
        CPU: 0.000 CPU(s) @ 2.40GHz
       CGroup: /system.slice/mariadb.service
                 └─ 743 /usr/sbin/mysqld

Sep 29 16:50:21 swarna-VirtualBox systemd[1]: Starting MariaDB 10.3.31 database>
Sep 29 16:50:22 swarna-VirtualBox mysqld[743]: 2021-09-29 16:50:22 0 [Note] /u>
Sep 29 16:50:24 swarna-VirtualBox systemd[1]: Started MariaDB 10.3.31 database>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[924]: Upgrading MySQL>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[929]: Looking for 'm>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[929]: Looking for 'm>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[929]: This installat>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[951]: Checking for i>
Sep 29 16:50:24 swarna-VirtualBox /etc/mysql/debian-start[955]: Triggering myi>
lines 1-26/26 (END)
```

Install PHP

- **Install PHP**

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

- **Restart apache2**

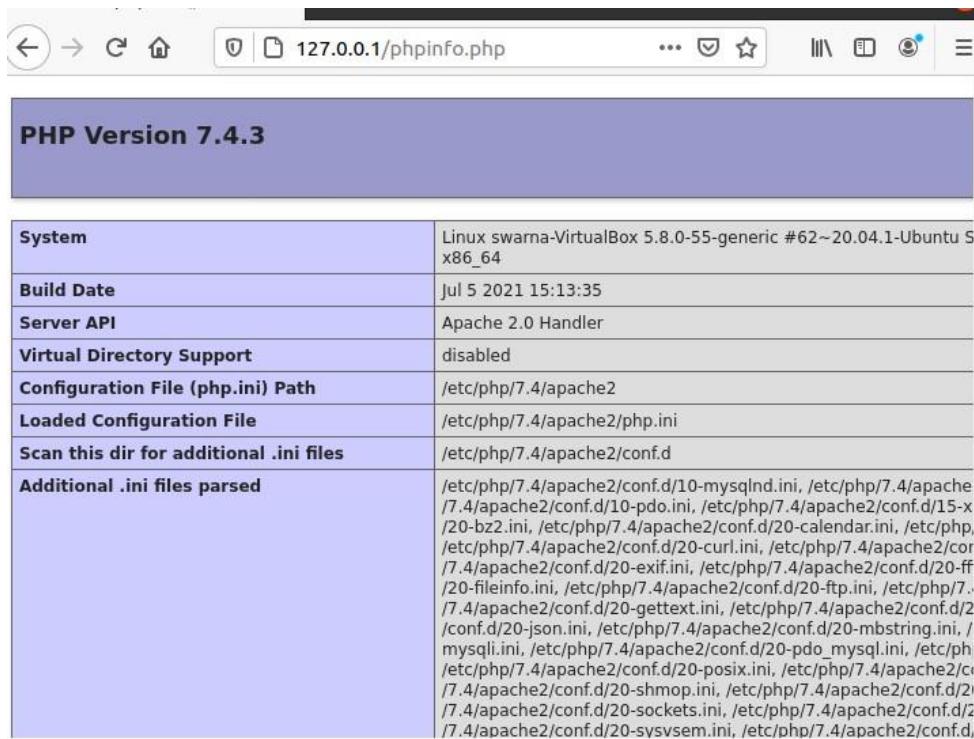
```
sudo systemctl restart apache2
```

- **Now you can check php installation**

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

- **Open a browser**

```
http://127.0.0.1/phpinfo.php
```



PHP Version 7.4.3	
System	Linux swarna-VirtualBox 5.8.0-55-generic #62~20.04.1-Ubuntu x86_64
Build Date	Jul 5 2021 15:13:35
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/7.4/apache2
Loaded Configuration File	/etc/php/7.4/apache2/php.ini
Scan this dir for additional .ini files	/etc/php/7.4/apache2/conf.d
Additional .ini files parsed	/etc/php/7.4/apache2/conf.d/10-mysqlnd.ini, /etc/php/7.4/apache2/conf.d/10-pdo.ini, /etc/php/7.4/apache2/conf.d/15-x20-bz2.ini, /etc/php/7.4/apache2/conf.d/20-calendar.ini, /etc/php/7.4/apache2/conf.d/20-curl.ini, /etc/php/7.4/apache2/conf.d/20-exif.ini, /etc/php/7.4/apache2/conf.d/20-ftp.ini, /etc/php/7.4/apache2/conf.d/20-fileinfo.ini, /etc/php/7.4/apache2/conf.d/20-gettext.ini, /etc/php/7.4/apache2/conf.d/20-mbstring.ini, /etc/php/7.4/apache2/conf.d/20-pdo_mysql.ini, /etc/php/7.4/apache2/conf.d/20-posix.ini, /etc/php/7.4/apache2/conf.d/20-shmop.ini, /etc/php/7.4/apache2/conf.d/20-sockets.ini, /etc/php/7.4/apache2/conf.d/20-sysvsem.ini, /etc/php/7.4/apache2/conf.d/20-sysvshm.ini

Install phpmyadmin

- **Install phpmyadmin**

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

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

- **Restart apache2**

```
sudo systemctl restart apache2
```

- **Check phpmyadmin**

- **Open a browser**

<http://localhost/phpmyadmin>

localhost/phpmyadmin

Welcome to phpMyAdmin

Language

English

Log in

Username: swarna

Password:

Go

PMA localhost/phpmyadmin/index.php

Server: localhost:3306

Databases SQL Status Export Import Settings

General settings

Change password

Server connection collation: utf8mb4_unicode_ci

Appearance settings

Language: English

Theme: pmahomme

Font size: 82%

More settings

Database server

Console

ANSIBLE INSTALLATION

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

Install ansible

sudo apt install ansible

```
swarna@swarna-VirtualBox:~$ sudo apt install ansible
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  ieee-data python3-argcomplete python3-crypto python3-distutils
  python3-dnspython python3-jinja2 python3-jmespath python3-kerberos
  python3-lib2to3 python3-libcloud python3-netaddr python3-ntlm-auth
  python3-requests-kerberos python3-requests-ntlm python3-selinux
  python3-winrm python3-xmldict
Suggested packages:
  cowsay sshpass python-jinja2-doc ipython3 python-netaddr-docs
The following NEW packages will be installed:
  ansible ieee-data python3-argcomplete python3-crypto python3-distutils
  python3-dnspython python3-jinja2 python3-jmespath python3-kerberos
  python3-libcloud python3-netaddr python3-ntlm-auth
  python3-requests-kerberos python3-requests-ntlm python3-selinux
  python3-winrm python3-xmldict
The following packages will be upgraded:
  python3-lib2to3
1 upgraded, 17 newly installed, 0 to remove and 350 not upgraded.
Need to get 237 kB/9,942 kB of archives.
After this operation, 92.0 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-crypto amd64
 2.6.1-13ubuntu2 [237 kB]
Fetched 237 kB in 1s (176 kB/s)
Selecting previously unselected package python3-jinja2.
```

ansible --version

```
/usr/lib/python3/dist-packages/jmespath/visitor.py:260: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if original_result is 0:
Setting up python3-requests-kerberos (0.12.0-2) ...
Setting up ieee-data (20180805.1) ...
Setting up python3-dnspython (1.16.0-1build1) ...
Setting up python3-selinux (3.0-1build2) ...
Setting up python3-crypto (2.6.1-13ubuntu2) ...
Setting up python3-argcomplete (1.8.1-1.3ubuntu1) ...
Setting up python3-lib2to3 (3.8.10-0ubuntu1~20.04) ...
Setting up python3-distutils (3.8.10-0ubuntu1~20.04) ...
Setting up python3-requests-ntlm (1.1.0-1) ...
Setting up python3-libcloud (2.8.0-1) ...
Setting up python3-netaddr (0.7.19-3) ...
/usr/lib/python3/dist-packages/netaddr/strategy/__init__.py:189: SyntaxWarning:
  "is not" with a literal. Did you mean "!="?
  if word_sep is not '':
Setting up python3-winrm (0.3.0-2) ...
Setting up ansible (2.9.6+dfsg-1) ...
Processing triggers for man-db (2.9.1-1) ...
swarna@swarna-VirtualBox:~$ ansible --version
ansible 2.9.6
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['~/home/swarna/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 3.8.5 (default, Jul 28 2020, 12:59:40) [GCC 9.3.0]
swarna@swarna-VirtualBox:~$
```

TCPDUMP INSTALLATION

Q. Execute tcpdump and its options on your own system, and submit the output screenshot as a document.

Install tcpdump

On Debianbased distributions tcpdumpcan be installed with the APT command :

```
#sudoapt update && sudoapt install tcpdump
```

```
swarna@swarna-VirtualBox:~$ sudo apt update && sudo apt install tcpdump
[sudo] password for swarna:
Get:1 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
Hit:3 http://in.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:4 http://in.archive.ubuntu.com/ubuntu focal-backports InRelease
Fetched 379 kB in 7s (57.7 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
350 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree
Reading state information... Done
tcpdump is already the newest version (4.9.3-4).
tcpdump set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 350 not upgraded.
swarna@swarna-VirtualBox:~$ sudo tc...
```

Execute tcpdump

Capturing Packets with tcpdump

- Only root or user with sudoprivileges can run tcpdump. If you try to run the command as an unprivileged user, you'll get an error saying: "You don't have permission to capture on that device".
- The most simple use case is to invoke tcpdumpwithout any options and filters:
- #sudotcpdump
- tcpdumpwill continue to capture packets and write to the standard output until it receives an interrupt signal. Use the Ctrl+Ckey combination to send an interrupt signal and stop the command.

```
swarna@swarna-VirtualBox:~$ sudo tcpdump
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
10:54:06.003307 IP swarna-VirtualBox.55375 > 192.168.42.129.domain: 28043+ AAAA
? connectivity-check.ubuntu.com. (47)
10:54:06.007149 IP swarna-VirtualBox.58791 > 192.168.42.129.domain: 14072+ PTR?
129.42.168.192.in-addr.arpa. (45)
10:54:06.012038 IP 192.168.42.129.domain > swarna-VirtualBox.55375: 28043 0/0/0
(47)
10:54:06.012820 IP 192.168.42.129.domain > swarna-VirtualBox.58791: 14072 NXDom
ain 0/0/0 (45)
10:54:06.013833 IP swarna-VirtualBox.39319 > 192.168.42.129.domain: 49379+ AAAA
? connectivity-check.ubuntu.com. (47)
10:54:06.014276 IP swarna-VirtualBox.47516 > 192.168.42.129.domain: 32780+ PTR?
15.2.0.10.in-addr.arpa. (40)
10:54:06.017734 IP 192.168.42.129.domain > swarna-VirtualBox.39319: 49379 0/0/0
```

```
10:59:50.586970 ARP, Request who-has _gateway tell swarna-VirtualBox, length 28
10:59:50.587469 ARP, Reply _gateway is-at 52:54:00:12:35:02 (oui Unknown), leng
th 46
^C
50 packets captured
50 packets received by filter
0 packets dropped by kernel
```

Tcpdump options

tcpdump command options

You need to be root or run tcpdump. It includes many options and filters. Running tcpdump without any options will capture all packets flowing through the default interface. To see the list of network interfaces available on the system and on which tcpdump can capture packets.

```
# tcpdump -D
```

```
swarna@swarna-VirtualBox:~$ tcpdump -D
1.enp0s3 [Up, Running]
2.lo [Up, Running, Loopback]
3.any (Pseudo-device that captures on all interfaces) [Up, Running]
4.bluetooth-monitor (Bluetooth Linux Monitor) [none]
5.nflog (Linux netfilter log (NFLOG) interface) [none]
6.nfqueue (Linux netfilter queue (NFQUEUE) interface) [none]
```

To capture packets flowing through a specific interface, use the **-i** flag with the interface name. Without the **-i** interface tcpdump will pick up the first network interface it comes across.

```
# tcpdump -i enp2s0
```

```
sudo tcpdump -i enp2s0
```

```
swarna@swarna-VirtualBox:~$ sudo tcpdump -i enp2s0
[sudo] password for swarna:
tcpdump: enp2s0: No such device exists
(SIOCGIFHWADDR: No such device)
```

tcpdump -c 5

```
swarna@swarna-VirtualBox:~$ tcpdump -c 5
tcpdump: enp0s3: You don't have permission to capture on that device
(socket: Operation not permitted)
swarna@swarna-VirtualBox:~$ sudo tcpdump -c 5
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
11:16:52.885584 IP swarna-VirtualBox.48807 > golem.canonical.com.ntp: NTPv4, client, length 48
11:16:52.888135 IP swarna-VirtualBox.52555 > 192.168.42.129.domain: 17297+ PTR?
15.2.0.10.in-addr.arpa. (40)
11:16:52.892080 IP 192.168.42.129.domain > swarna-VirtualBox.52555: 17297 NXDomain 0/0/0 (40)
11:16:52.893130 IP swarna-VirtualBox.55496 > 192.168.42.129.domain: 37852+ PTR?
129.42.168.192.in-addr.arpa. (45)
11:16:52.895755 IP 192.168.42.129.domain > swarna-VirtualBox.55496: 37852 NXDomain 0/0/0 (45)
5 packets captured
5 packets received by filter
0 packets dropped by kernel
```

Shell Scripting Lab Assignments

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

```
#!/bin/bash
echo " Enter Details and View"
echo "=====
echo Enter your Name
read name
echo Enter your College name
read college
clear
echo Details you entered
echo Name: $name
echo College: $college
swarna@swarna-VirtualBox:~$ chmod +x shellscript.sh
swarna@swarna-VirtualBox:~$ ./shellscript.sh
enter details and view
=====
enter your name
swarna
enter your college name
AJCE
details you entered
name: swarna
college: AJCE
```

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

```
#!/bin/bash
echo "Display value of a Variable "
echo "=====
a=10
echo "$a"
swarna@swarna-VirtualBox:~$ chmod +x shellscript1.sh
swarna@swarna-VirtualBox:~$ ./shellscript1.sh
display value of variable
=====
10
```

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

```
#!/bin/bash
echo "ARITHMETIC OPERATIONS"
echo "=====
echo "Enter a number"
read a
echo "Enter another number"
read b
echo "Enter operation needed"
echo "\n1.Addition\n2.Subtraction\n3.Multiplication\n4.Division"
read op

case "$op" in
"1") echo "a+b=$((a+b));"
```

```
"2") echo "a-b=\"$((a-$b))";;
"3") echo "a*b=\"$((a*$b))";;
"4") echo "a/b=\"$((a/$b))";;
Esac
```

```
swarna@swarna-VirtualBox:~$ vi sh3.sh
swarna@swarna-VirtualBox:~$ chmod +x sh3.sh
swarna@swarna-VirtualBox:~$ ./sh3.sh
ARITHMETIC OPERATIONS
=====
enter a number
2
enter another number
1
enter operation needed
\1.addition\2.substraction\3.multiplication\4.divition
1
a+b=3
```

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

```
#!/bin/bash
echo "Finding a number"
echo "===== "
echo "Enter a number"
read a
if [ $a == 10 ]; then
echo "Number found ;)"
else
echo "Number NOT found !"
fi
```

```
swarna@swarna-VirtualBox:~$ ./sh4.sh
finding a number
=====
enter a number
10
number found!
swarna@swarna-VirtualBox:~$ ./sh4.sh
finding a number
=====
enter a number
15
number NOT found!
```

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

```
#!/bin/bash
echo "Time and Calendar"
echo "===== "
echo "Today is $(date)"
echo ""
echo "Calendar :"
cal
```

```
swarna@swarna-VirtualBox:~$ bash sh5.sh
time and calendar
=====
today is Saturday 02 October 2021 10:31:07 PM IST

calendar:
    October 2021
Su Mo Tu We Th Fr Sa
        1 2
3 4 5 6 7 8 9
10 11 12 13 14 15 16
17 18 19 20 21 22 23
24 25 26 27 28 29 30
31
```

6. Write a shell script to check a number is even or odd.

```
#!/bin/bash
echo "EVEN OR ODD"
echo "====="
echo "Enter a number"
read n
x=$((n%2))
if [ $x -eq 0 ]; then
echo "Number is Even"
else
echo "Number is odd"
fi
```

```
swarna@swarna-VirtualBox:~$ bash sh6.sh
EVEN OR ODD
=====
enter a number
23
number is odd
```

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

```
#!/bin/bash
echo "Comparing numbers"
echo "====="
echo "Enter first number"
read a
echo "Enter second number"
read b
if [ $a -gt $b ]; then
echo "$a is greater"
elif [ $b -gt $a ];then
echo "$b is greater"
else
echo "Both are Equal"
fi
```

```
swarna@swarna-VirtualBox:~$ bash sh7.sh
comparing numbers
=====
enter first number
2
enter second number
4
b is greater
```

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

```
#!/bin/bash
echo "Sum of Numbers "
echo "====="
s=0
for (( i=1;i<=10;i++ ))
do
s=`expr $s + $i`
done
echo "Sum of first 10 numbers = $s"
```

```
swarna@swarna-VirtualBox:~$ bash sh8.sh
sum of numbers
=====
sum of first 10 numbers=55
```

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

```
#!/bin/bash
echo "AVG, SUM & Product of 4 No."
echo "===== "
echo "Please enter your first number: "
read a
echo "Second number: "
read b
echo "Third number: "
read c
echo "Fourth number: "
read d
sum=$((a + b + c + d))
avg=$(echo $sum / 4 | bc -l )
prod=$((a * b * c * d))
echo "The sum of these numbers is: " $sum
echo "The average of these numbers is: " $avg
echo "The product of these numbers is: " $prod
```

```
swarna@swarna-VirtualBox:~$ vi sh9.sh
swarna@swarna-VirtualBox:~$ bash sh9.sh
avg,sum,product of 4 numbers
=====
enter first number:
2
enter 2nd number
3
enter 3rd number
4
enter 4th number
7
the sum of these numbers :16
the average of these numbers :4.00000000000000000000000000
the product of these numbers :168
swarna@swarna-VirtualBox:~$
```

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

```
#!/bin/bash
echo "LARGEST OF THREE"
echo "===== "
echo "Enter first number"
```

```

read a
echo "Enter second number"
read b
echo "Enter third number"
read c
if [$a -gt $b]; then
if [$a -gt $c]; then
echo "$a is big"
else
echo "$c is big"
fi
elif [$b -gt $c];then
echo "$b is big"
else
echo "$c is big"
fi

```

```

swarna@swarna-VirtualBox:~$ bash sh10.sh
largest of 3 numbers
=====
enter 1st number
21
enter 2nd number
32
enter 3rd number
4
32 is big

```

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

```

#!/bin/bash
echo "Factorial"
echo "===== "
echo "Enter a number"
read num
fact=1
for((i=2;i<=num;i++))
{
fact=$((fact * i)) #fact = fact * i
}
echo "Factorial is $fact"

```

```

swarna@swarna-VirtualBox:~$ vi sh11.sh
swarna@swarna-VirtualBox:~$ bash sh11.sh
factorial
=====
enter a number
3
factorial is 6

```

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

```

#!/bin/bash
echo "Palindrome or Not"
echo "===== "
echo "Enter number to check"
read n
rev=$(echo $n | rev)
if [ $n -eq $rev ]; then

```

```

echo "Number is Palindrome"
else
echo "Number is not Palindrome"
fi

```

```

swarna@swarna-VirtualBox:~$ vi sh12.sh
swarna@swarna-VirtualBox:~$ bash sh12.sh
palindrome or not
=====
enter number to check
123
number is not palindrome
swarna@swarna-VirtualBox:~$ bash sh12.sh
palindrome or not
=====
enter number to check
1441
number is palindrome

```

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

```

#!/bin/bash
echo "Average of N numbers"
echo "====="
echo "Enter Size"
read n
i=1
sum=0
echo "Enter Numbers"
while [ $i -le $n ]
do
read num
sum=$((sum + num))
i=$((i + 1))
done
avg=$(echo $sum / $n | bc -l)
echo $avg

```

```

swarna@swarna-VirtualBox:~$ bash sh13.sh
average of n numbers
=====
enter size
4
enter numbers
1
2
4
3
2.50000000000000000000000000000000

```

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

```

#!/bin/bash
echo "Sum of all digits"
echo "====="
echo "Enter a number:"
read num
sum=0
while [ $num -gt 0 ]
do
mod=$((num % 10))

```

```
sum=$((sum + mod))
num=$((num / 10))
done
echo "Sum of digits is $sum"
```

```
swarna@swarna-VirtualBox:~$ bash sh14.sh
sum of all digits
=====
enter a number:
234
sum of digits is 9
```

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

```
#!/bin/bash
echo "LEAP YEAR OR NOT"
echo "===== "
echo "Enter the year"
read y
a=`expr $y % 4`
b=`expr $y % 100`
c=`expr $y % 400`
if [ $a -eq 0 -a $b -ne 0 -o $c -eq 0 ];
then
echo "$y is leap year"
else
echo "$y is not leap year"
fi
```

```
swarna@swarna-VirtualBox:~$ bash sh15.sh
leap year or not
=====
enter the year
2001
2001 is not leap year
swarna@swarna-VirtualBox:~$ bash sh15.sh
leap year or not
=====
enter the year
2004
2004 is leap year
```

DOCKER INSTALLATION

Q. Install Docker application to your system and run a docker image instance in your system from docker hub.

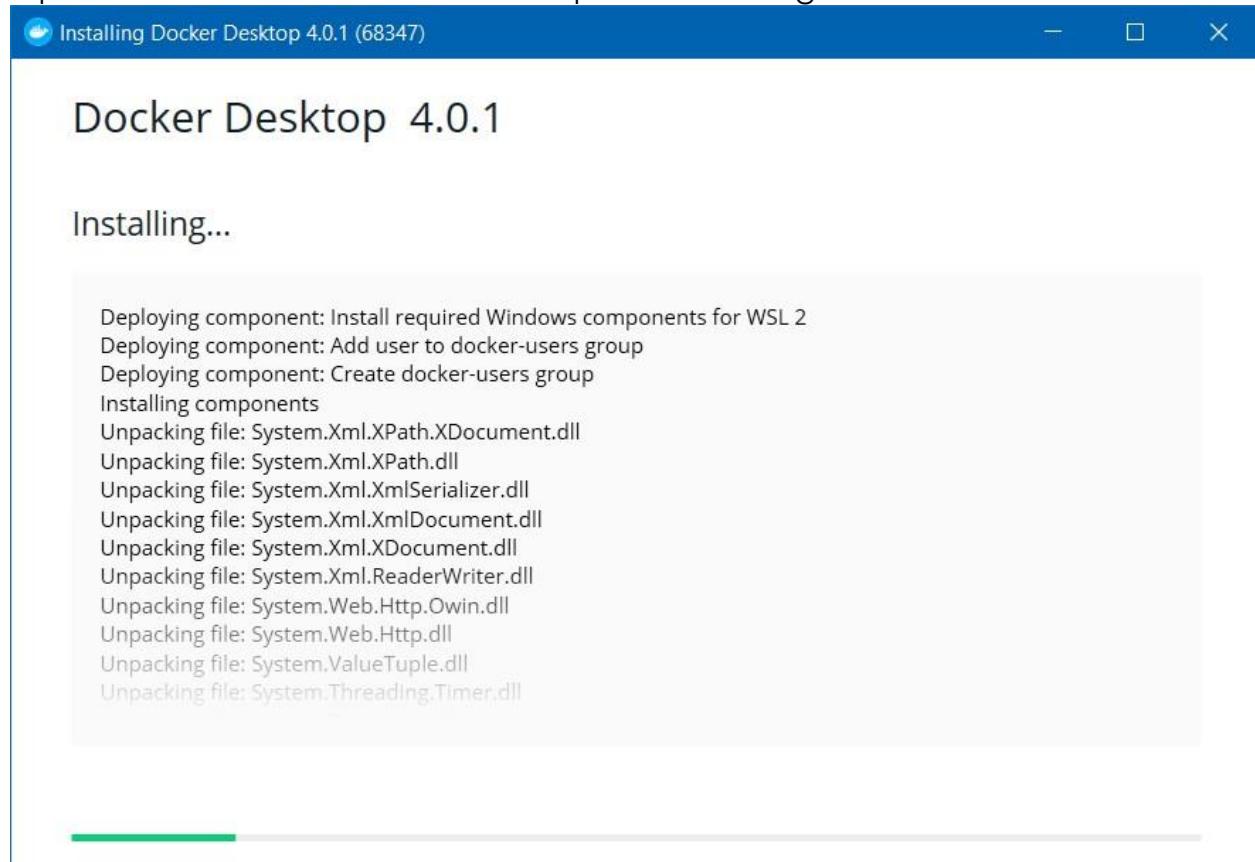
Step-I

Download Docker Desktop installer for Windows from
<https://desktop.docker.com/win/main/amd64/Docker%20Desktop%20Installer.exe>



Step-II

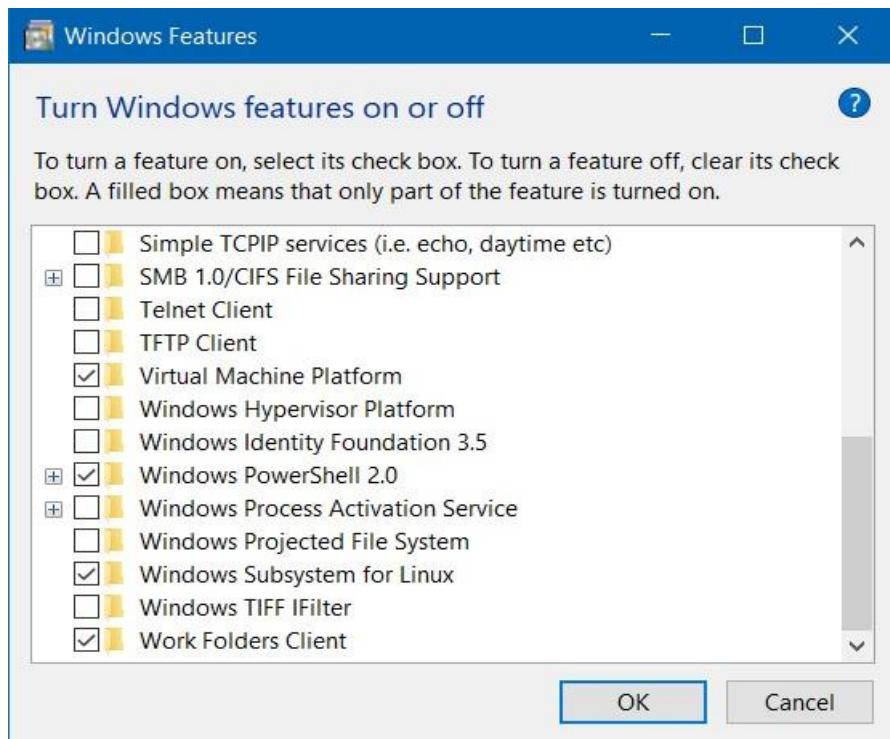
Open the .exe file and follow the steps after clicking install button.



Step-III

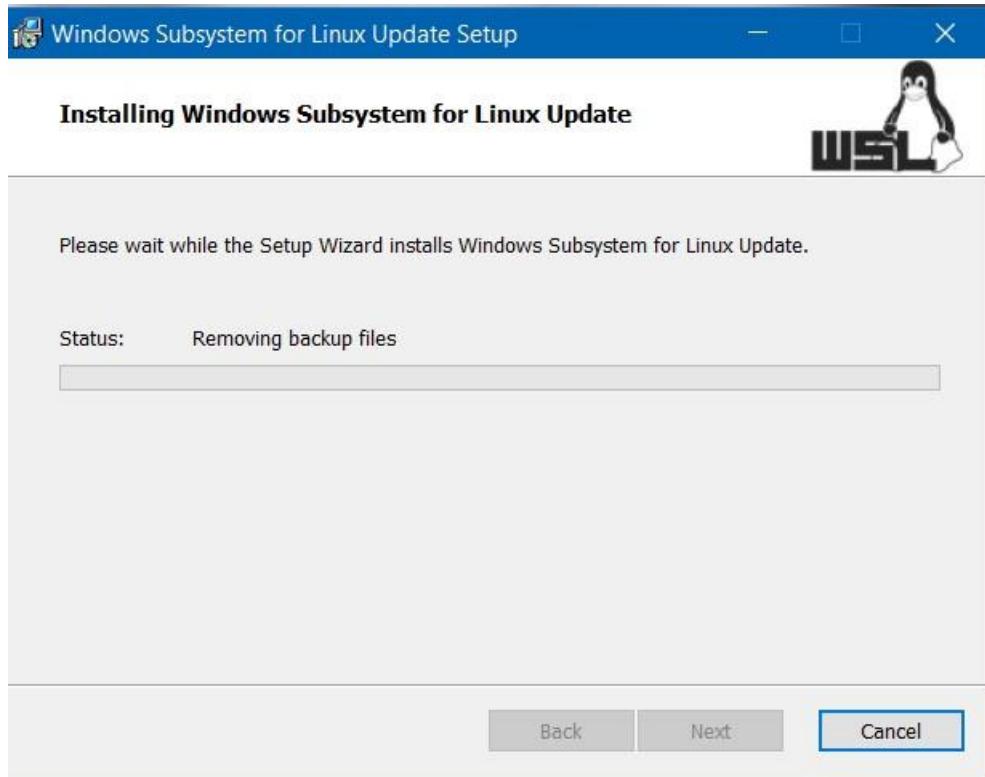
Once installed go to programs and features and click turn on windows features on or off

Scroll to the bottom and select windows subsystem for Linux



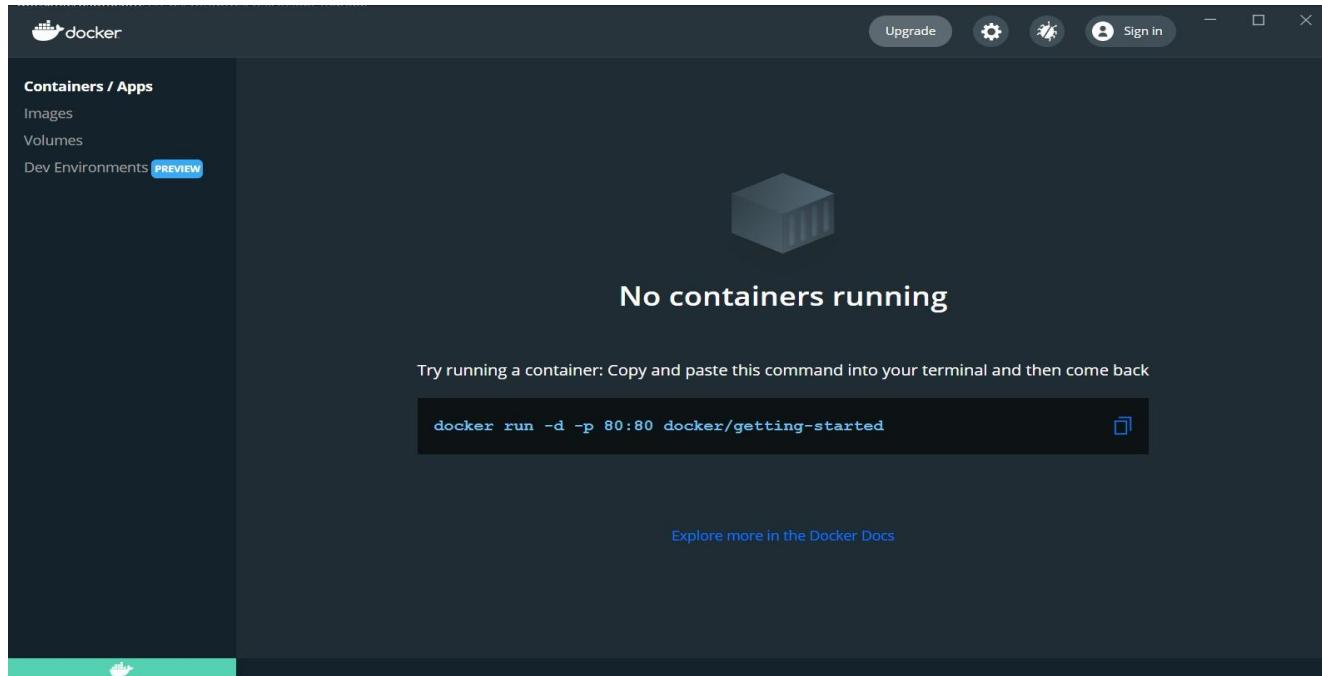
Step-IV

If any WSL 2 error occurs download windows subsystem for linux update package and install the .exe file, after the installation restart the windows device.



Step-V

Once installed, open the docker desktop app, and signin using the dockerID



Step-VI

Now pull any image from docker hub using the docker pull command in the command prompt (eg: docker pull ubuntu)

```

Administrator: Command Prompt
Microsoft Windows [Version 10.0.19042.1081]
(c) Microsoft Corporation. All rights reserved.

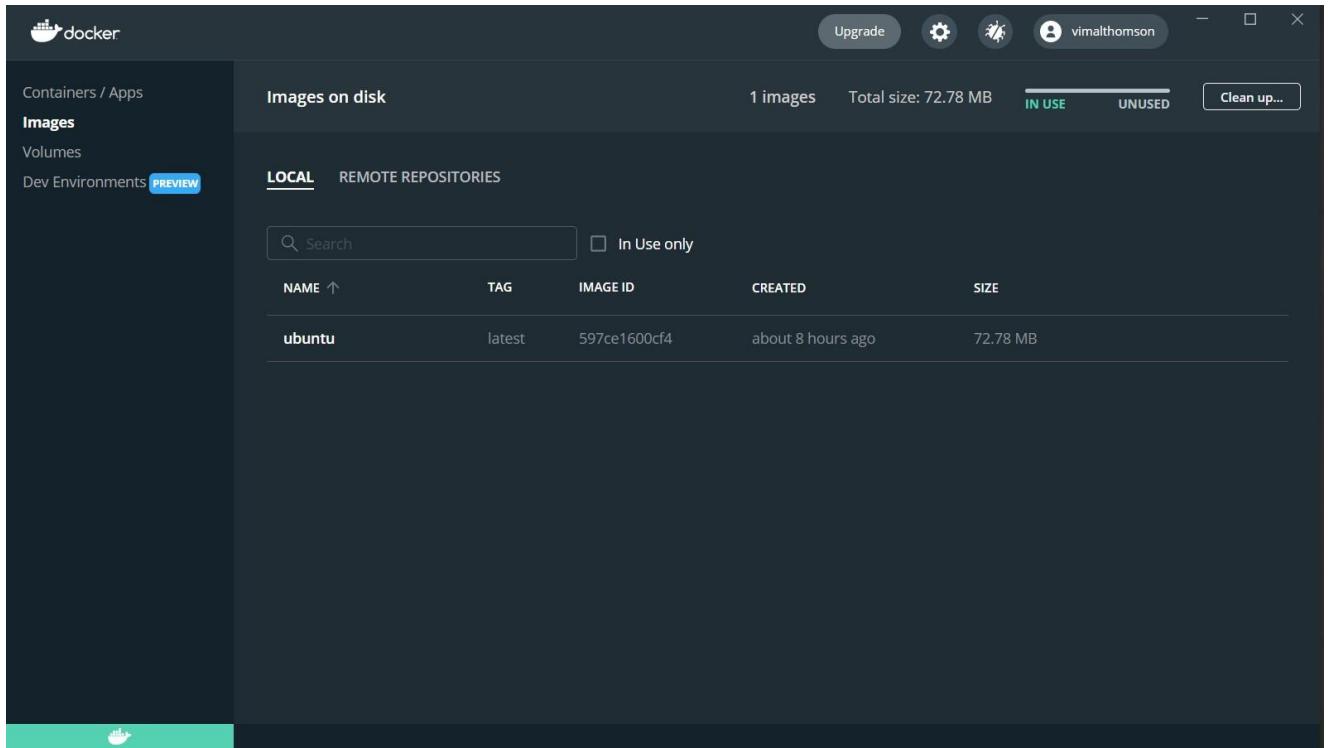
C:\Windows\system32>docker run -d -p 80:80 docker/getting-started
Unable to find image 'docker/getting-started:latest' locally
docker: Error response from daemon: Get "https://registry-1.docker.io/v2/": dial tcp: lookup registry-1.docker.io on 192.168.65.5:53: no such host.
See 'docker run --help'.

C:\Windows\system32>docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
f3ef4ff62e0d: Pull complete
Digest: sha256:65de08a8dabf289ef114053ab32f79e0c333a4fbfa1fe3778bb13ae921a7849b
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest

C:\Windows\system32>

```

Now in the images tab an image of ubuntu will be displayed, we can run the ubuntu instance using the cli.



WIRESHARK INSTALLATION

Q. Analyzing network packet stream using wireshark. Perform basic network service tests using nc.

Installing Wireshark on Linux can be a little different depending on the Linux distribution. If you aren't running one of the following distros, please double-check the commands.

Ubuntu

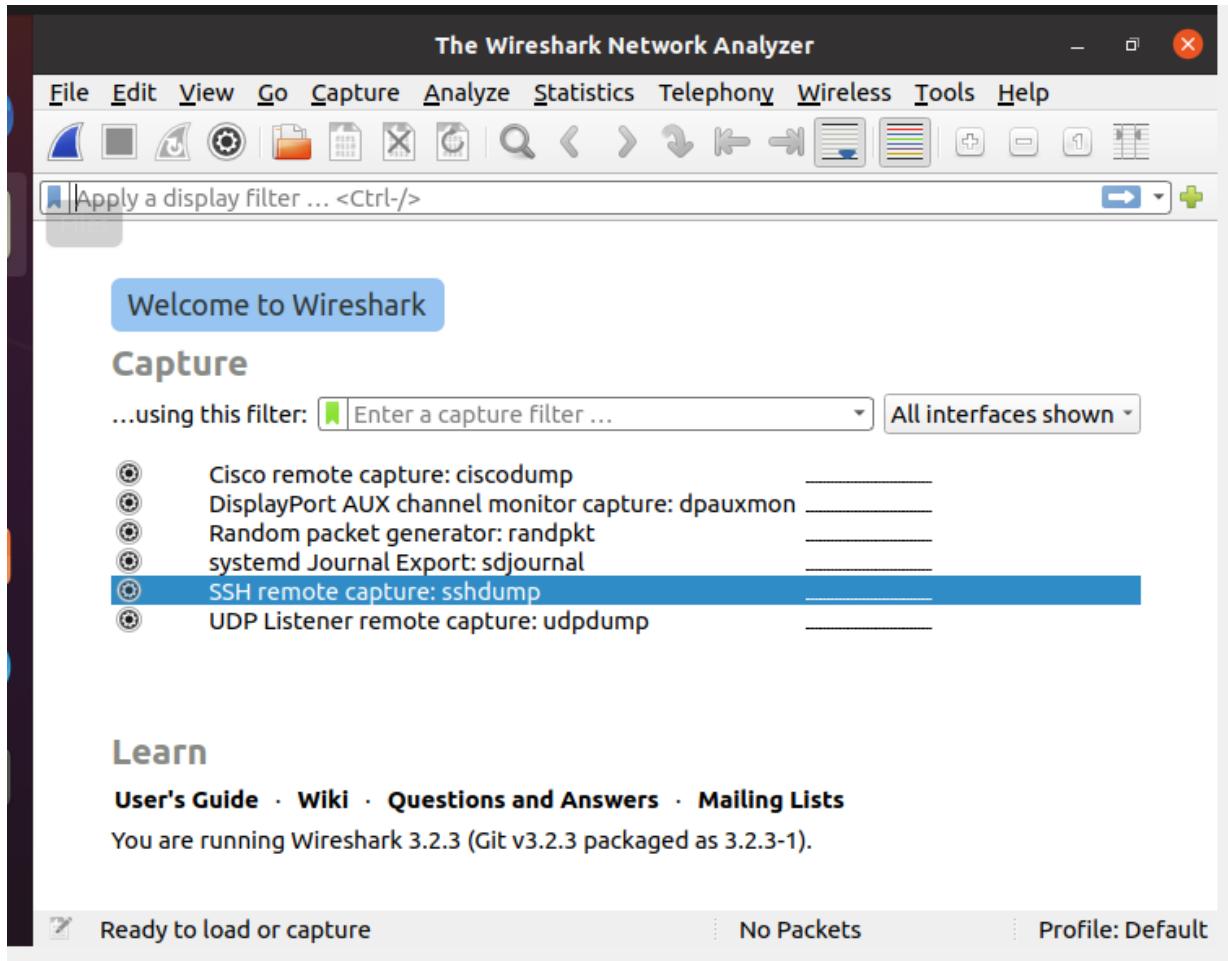
- From a terminal prompt, run these commands:
- sudo apt-get install wireshark
- sudo dpkg-reconfigure wireshark-common
- sudo adduser \$USER wireshark

```
swarna@swarna-VirtualBox:~$ sudo apt-get install wireshark
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libc-ares2 libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5
  libqt5guis libqt5multimedia5 libqt5multimedia5-plugins
  libqt5multimediasgtools5 libqt5multimediawidgets5 libqt5network5
  libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2ldbl
  libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10
  libwsutil11 libxcb-xinerama0 libxcb-xinput0 qt5-gtk-platformtheme
  qttranslations5-l10n wireshark-common wireshark-qt
Suggested packages:
  qt5-image-formats-plugins qtwayland5 snmp-mibs-downloader geoipupdate
  geoip-database geoip-database-extra libjs-leaflet
  libjs-leaflet.markercluster wireshark-doc
The following NEW packages will be installed:
  libc-ares2 libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5
  libqt5guis libqt5multimedia5 libqt5multimedia5-plugins
  libqt5multimediasgtools5 libqt5multimediawidgets5 libqt5network5
  libqt5opengl5 libqt5printsupport5 libqt5svg5 libqt5widgets5 libsmi2ldbl
  libspandsp2 libssh-gcrypt-4 libwireshark-data libwireshark13 libwiretap10
  libwsutil11 libxcb-xinerama0 libxcb-xinput0 qt5-gtk-platformtheme
  qttranslations5-l10n wireshark wireshark-common wireshark-qt
0 upgraded, 29 newly installed, 0 to remove and 350 not upgraded.
Need to get 4,202 kB/32.8 MB of archives.
```

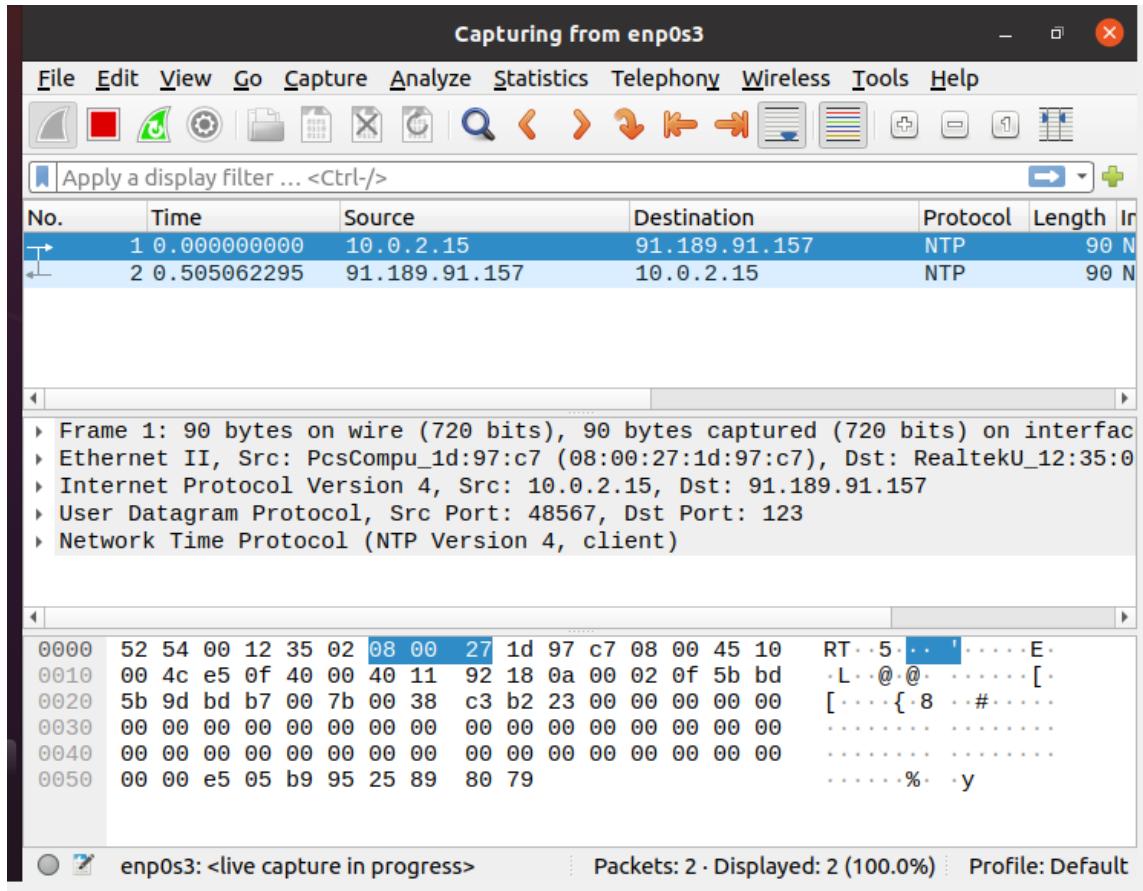
```
Setting up libqt5subuss:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up libwireshark13:amd64 (3.2.3-1) ...
Setting up libqt5network5:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up wireshark-common (3.2.3-1) ...
Setting up libqt5gui5:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up libqt5widgets5:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up qt5-gtk-platformtheme:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up libqt5multimedia5:amd64 (5.12.8-0ubuntu1) ...
Setting up libqt5printsupport5:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up wireshark-qt (3.2.3-1) ...
Setting up libqt5opengl5:amd64 (5.12.8+dfsg-0ubuntu1) ...
Setting up wireshark (3.2.3-1) ...
Setting up libqt5svg5:amd64 (5.12.8-0ubuntu1) ...
Setting up libqt5multimedawidgets5:amd64 (5.12.8-0ubuntu1) ...
Setting up libqt5multimedadiags-tools5:amd64 (5.12.8-0ubuntu1) ...
Setting up libqt5multimedia5-plugins:amd64 (5.12.8-0ubuntu1) ...
Processing triggers for mime-support (3.64ubuntu1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1ubuntu1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.2) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for shared-mime-info (1.15-1) ...
Processing triggers for desktop-file-utils (0.24-1ubuntu3) ...
swarna@swarna-VirtualBox:~$ sudo dpkg-reconfigure wireshark
swarna@swarna-VirtualBox:~$ sudo adduser $USER wireshark
Adding user 'swarna' to group 'wireshark' ...
Adding user swarna to group wireshark
Done.
swarna@swarna-VirtualBox:~$ █
```

Capturing Data Packets on Wireshark

- When you open Wireshark, you see a screen that shows you a list of all of the network connections you can monitor. You also have a capture filter field, so you only capture the network traffic you want to see.



- You can select one or more of the network interfaces using “shift left-click.” Once you have the network interface selected, you can start the capture, and there are several ways to do that.
- Click the first button on the toolbar, titled “Start Capturing Packets.”
- You can select the menu item Capture -> Start.
- Or you could use the keystroke Control – E.
- During the capture, Wireshark will show you the packets that it captures in real-time.



- Once you have captured all the packets you need, you use the same buttons or menu options to stop the capture.
- Best practice says that you should stop Wireshark packet capture before you do analysis.