

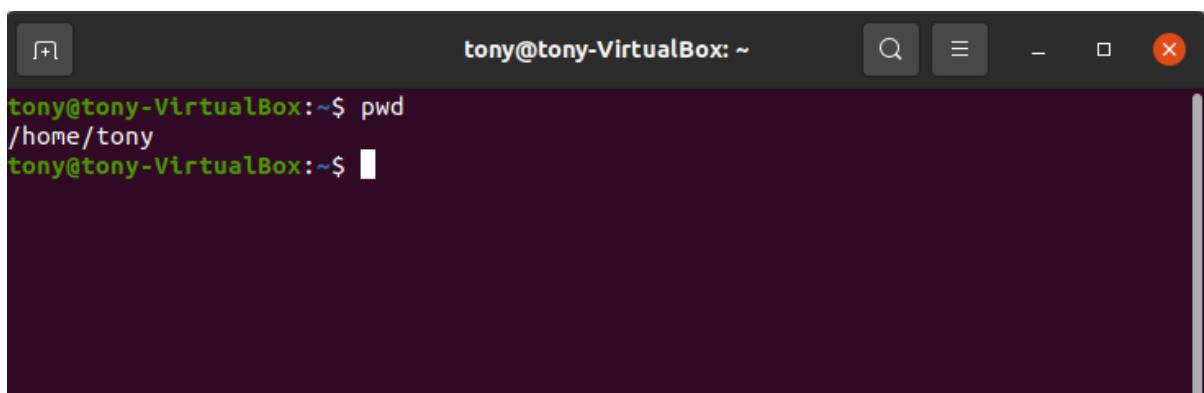
NETWORKING AND SYSTEM ADMINISTRATION LAB RECORD

**Tony Joseph
RMCA S2, B
Roll No: 37**

Q. Explain linux commands pwd, history, man, ls, cd, mkdir, rmdir, touch, rm, cat with

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

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



A screenshot of a terminal window titled "tony@tony-VirtualBox: ~". The window shows the command "pwd" being run, followed by its output "/home/tony". The terminal has a dark background with light-colored text. The title bar is at the top, and there are standard window control buttons (minimize, maximize, close) on the right.

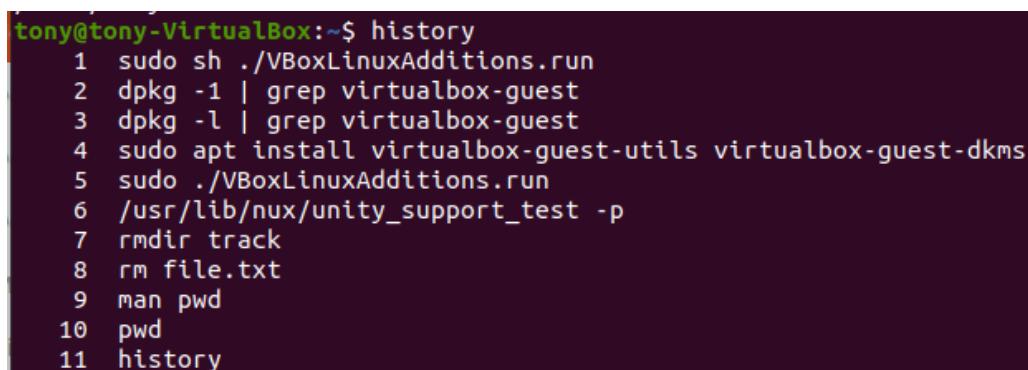
```
tony@tony-VirtualBox:~$ pwd
/home/tony
tony@tony-VirtualBox:~$
```

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 everyday. 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**



A screenshot of a terminal window titled "tony@tony-VirtualBox: ~". The window shows the command "history" being run, followed by a list of 11 previous commands. The terminal has a dark background with light-colored text. The title bar is at the top, and there are standard window control buttons (minimize, maximize, close) on the right.

```
tony@tony-VirtualBox:~$ history
 1 sudo sh ./VBoxLinuxAdditions.run
 2 dpkg -1 | grep virtualbox-guest
 3 dpkg -l | grep virtualbox-guest
 4 sudo apt install virtualbox-guest-utils virtualbox-guest-dkms
 5 sudo ./VBoxLinuxAdditions.run
 6 /usr/lib/nux/unity_support_test -p
 7 rmdir track
 8 rm file.txt
 9 man pwd
10 pwd
11 history
```

```
tony@tony-VirtualBox:~$ !9
man pwd
tony@tony-VirtualBox:~$
```

3. man

- If we are confused about the function of certain Linux commands we 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.

man ls

```
tony@tony-VirtualBox: ~
LS(1)                               User Commands                               LS(1)

NAME
    ls - list directory contents

SYNOPSIS
    ls [OPTION]... [FILE]...

DESCRIPTION
    List information about the FILEs (the current directory by default).
    Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

    Mandatory arguments to long options are mandatory for short options
    too.

    -a, --all
        do not ignore entries starting with .

    -A, --almost-all
        do not list implied . and ..

    --author
Manual page ls(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.

- Shortcuts to help you navigate quickly:

- cd ..(with two dots) to move one directory up
- cd to go straight to the home folder
- cd - (withahyphen) to move to your previous directory

```
tony@tony-VirtualBox:~$ cd Documents  
tony@tony-VirtualBox:~/Documents$ █
```

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 path. For example, enter **ls/home/username/Documents** to view the content of **Documents**.
- There are variations we can use with the ls command:
 - ls -R** will list all the files in the sub-directories as well
 - ls -l**—longlisting
 - 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.

```
tony@tony-VirtualBox:~$ ls
Desktop Documents Downloads Music Pictures Public snap Templates Videos
tony@tony-VirtualBox:~$ ls -R
.:
Desktop Documents Downloads Music Pictures Public snap Templates Videos

./Desktop:
./Documents:
./Downloads:
./Music:
./Pictures:
./Public:
./snap:
snap-store

./snap/snap-store:
518 common current
```

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

```
tony@tony-VirtualBox:~$ mkdir dir1
tony@tony-VirtualBox:~$
```

7. rmdir

- If we need to delete a directory, use the **rmdir** command. However, rmdir only allows us to delete empty directories.

```
tony@tony-VirtualBox:~$ rmdir dir1
tony@tony-VirtualBox:~$
```

8. touch

- The **touch** command allows us to create a blank new file through the Linux command line.
- As an example, enter **touch /home/username/Documents/Web.html** to create an HTML file entitled Web under the Documents directory

```
tony@tony-VirtualBox:~$ touch file1.txt  
tony@tony-VirtualBox:~$ █
```

9. rm

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

```
tony@tony-VirtualBox:~$ rm file1.txt  
tony@tony-VirtualBox:~$ █
```

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 newfile
- cat filename1 filename2 > filename3** joins two files(1and2) and stores the output of them in a newfile(3)
- to convert a file to upper or lower case use, **catfilename | tr a-z A-Z > output.txt**

- cat >> myfile** insert data to a file

```
tony@tony-VirtualBox:~$ cat > file1.txt
hello
world
^C
tony@tony-VirtualBox:~$ cat file1.txt
hello
world
tony@tony-VirtualBox:~$ cat file1.txt >> file2.txt
tony@tony-VirtualBox:~$ cat file2.txt
hello
world
```

```
tony@tony-VirtualBox:~$ cat file2.txt | tr a-z A-Z
HELLO
WORLD
tony@tony-VirtualBox:~$ █
```

Q. Explain linux commands echo, head, tail, read, more, less, cut, paste, uname, cp, mv, locate, find, grep, df, du, useradd, userdel, sudo, passwd with examples.

1. echo

- echo command is used to move some data into a file.
- If we want to add the text, “Hello, my name is John” into a file called name.txt, we would type echo Hello, my name is John >> name.txt

```
tony@tony-VirtualBox:~$ echo hello, my name is john >> name.txt
tony@tony-VirtualBox:~$ cat name.txt
hello, my name is john
tony@tony-VirtualBox:~$ █
```

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 our liking.
- If you only want to show the first five lines, type head -n 5 filename.txt

```
tony@tony-VirtualBox:~$ head -n 5 /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin sync
tony@tony-VirtualBox:~$ █
```

3. tail

- This one has a similar function to the head command, but instead of showing the first lines, the tail command will display the last ten lines of a text file.
- tail -n filename.txt

```
tony@tony-VirtualBox:~$ tail -n 3 /etc/passwd
tony:x:1000:1000:Tony Joseph,,,:/home/tony:/bin/bash
systemd-coredump:x:999:999:systemd Core Dumper:/:/usr/sbin/nologin
vboxadd:x:998:1::/var/run/vboxadd:/bin/false
tony@tony-VirtualBox:~$
```

4. read

- read the contents of a line into a variable.
- The read command can be used with and without arguments
- read command is used to read [options] [name...]
- \$read
- \$read var1 var2 var3
- \$echo “[\${var1}] [\${var2}] [\${var3}]”

```
tony@tony-VirtualBox:~$ read
hi
tony@tony-VirtualBox:~$ read v1 v2 v3
how are you
tony@tony-VirtualBox:~$ echo ["$v1"]["$v2"]["$v3"]
[how][are][you]
tony@tony-VirtualBox:~$
```

5. more

- Like cat command, more command displays the content of a file. Only difference is that, in case of larger files, 'cat' command output will scroll off our screen while 'more' command displays output one screen at a time.
- Syntax: more
- more /etc/passwd

```
root:x:0:0:root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
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
--More--(40%)
```

6. less

- The 'less' command is same as 'more' command but include some more features.
- It automatically adjust with the width and height of the terminal window, while 'more' command cuts the content as the width of the terminal window get shorter.
- less
- less /etc/passwd

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

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
- cut OPTION... [FILE]...
- \$cut -b 1,2,3 state.txt

```
tony@tony-VirtualBox:~$ cat > state.txt
Andhra Pradesh (Hyderabad) ...
Arunachal Pradesh (Itanagar) ...
Assam (Dispur) ...
Bihar (Patna) ...
Chhattisgarh (Raipur) ...
Gujarat (Gandhinagar) ...
Haryana - Chandigarh (Shared with Punjab) ...
Himachal Pradesh (Shimla)
^C
tony@tony-VirtualBox:~$ cut -b 5,6,7 state.txt
And
Aru
Ass
Bih
Chh
Guj
Har
Him
tony@tony-VirtualBox:~$
```

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.
- paste [OPTION]... [FILES]...
- paste state.txt number.txt

```
tony@tony-VirtualBox:~$ paste number.txt state.txt
1      Andhra Pradesh (Hyderabad) ...
2      Arunachal Pradesh (Itanagar) ...
3      Assam (Dispur) ...
4      Bihar (Patna) ...
5      Chhattisgarh (Raipur) ...
6      Gujarat (Gandhinagar) ...
7      Haryana - Chandigarh (Shared with Punjab) ...
          Himachal Pradesh (Shimla)
tony@tony-VirtualBox:~$
```

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.
- \$uname
- \$uname -r

```
tony@tony-VirtualBox:~$ uname  
Linux  
tony@tony-VirtualBox:~$ uname -r  
5.8.0-53-generic  
tony@tony-VirtualBox:~$
```

10. cp

- cp command is used to copy files from the current directory to a different directory. For instance, the command cp scenery.jpg /home/username/Pictures would create a copy of scenery.jpg (from your current directory) into the Pictures directory.
- cp -i will ask for user's consent in case of a potential file overwrite.
- cp -p will preserve source files' mode, ownership and timestamp.
- cp -r will copy directories recursively.
- cp -u copies files only if the destination file is not existing or the source file is newer than the destination file.

```
tony@tony-VirtualBox:~$ touch file1.txt  
tony@tony-VirtualBox:~$ ls  
Desktop   Downloads  Music      number.txt  Public    state.txt  Videos  
Documents  file1.txt  name.txt  Pictures    snap     Templates  
tony@tony-VirtualBox:~$ cp file1.txt Documents/  
tony@tony-VirtualBox:~$ ls Documents/  
file1.txt  
tony@tony-VirtualBox:~$
```

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.
- mv file.txt /home/username/Documents

```
tony@tony-VirtualBox:~$ mv file1.txt Downloads/  
tony@tony-VirtualBox:~$ ls Downloads  
file1.txt
```

```
tony@tony-VirtualBox:~$ ls  
Desktop   Downloads  name.txt    Pictures  snap      Templates  
Documents  Music     number.txt  Public    state.txt  Videos  
tony@tony-VirtualBox:~$ █
```

12. locate

- To locate a file, just like the search command in Windows.
- What's more, using the -i argument along with this command will make it caseinsensitive, so you can search for a file even if you don't remember its exact name.
- To search for a file that contains two or more words, use an asterisk (*).
- For example, locate -i school*note command will search for any file that contains the word "school" and "note", whether it is uppercase or lowercase.

```
tony@tony-VirtualBox:~$ locate state.txt  
/home/tony/state.txt  
tony@tony-VirtualBox:~$ █
```

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.

- As an example, find /home/ -name notes.txt command will search for a file called notes.txt within the home directory and its subdirectories.
- Other variations when using the find are:
- To find files in the current directory use, find . -name notes.txt
- To look for directories use, / -type d -name notes.txt

```
tony@tony-VirtualBox:~$ find /home/ -name state.txt
/home/tony/state.txt
tony@tony-VirtualBox:~$ █
```

14. grep

- Another basic Linux command that is undoubtedly helpful for everyday use is grep. It lets you search through all the text in a given file.
- To illustrate, grep blue notepad.txt will search for the word blue in the notepad file. Lines that contain the searched word will be displayed fully. Usually output of a previous command is piped into the grep command. For example ls -l | grep “kernel”

```
tony@tony-VirtualBox:~$ grep Assam state.txt
    Assam (Dispur) ...
tony@tony-VirtualBox:~$ █
```

15. df

- 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.

```
tony@tony-VirtualBox:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            953M    0  953M   0% /dev
tmpfs           197M  1.4M 195M   1% /run
/dev/sda5        8.8G  6.9G 1.5G  83% /
tmpfs           982M    0  982M   0% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           982M    0  982M   0% /sys/fs/cgroup
/dev/loop2        56M   56M    0 100% /snap/core18/2066
/dev/loop1       219M  219M    0 100% /snap/gnome-3-34-1804/66
/dev/loop4        66M   66M    0 100% /snap/gtk-common-themes/1515
/dev/loop0       56M   56M    0 100% /snap/core18/1988
/dev/loop6        33M   33M    0 100% /snap/snapd/12057
/dev/loop7        33M   33M    0 100% /snap/snapd/12159
/dev/loop5        52M   52M    0 100% /snap/snap-store/518
/dev/loop3       65M   65M    0 100% /snap/gtk-common-themes/1514
/dev/sda2       512M  4.0K  512M   1% /boot/efi
tmpfs           197M   48K 197M   1% /run/user/1000
/dev/sr0          59M   59M    0 100% /media/tony/VBox_GAs_6.1.22
tony@tony-VirtualBox:~$ █
```

16. du

- If you want to check how much space a file or a directory takes, the du (Disk Usage) command is the answer. 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

```
tony@tony-VirtualBox:~$ du -h
12K    ./cache/update-manager-core
12K    ./cache/fontconfig
20K    ./cache/ibus/bus
24K    ./cache/ibus
7.3M   ./cache/tracker
8.0K   ./cache/ubuntu-report
4.0K   ./cache/libgweather
8.0K   ./cache/mesa_shader_cache/5d
8.0K   ./cache/mesa_shader_cache/e3
8.0K   ./cache/mesa_shader_cache/c4
12K   ./cache/mesa_shader_cache/d6
16K   ./cache/mesa_shader_cache/2b
```

17. useradd

- This is available only to system admins
- Since Linux is a multi-user system, this means more than one person can interact with the same system at the same time.
- 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

```
tony@tony-VirtualBox:~$ sudo useradd user2
```

```
tony@tony-VirtualBox:~$ passwd user2
passwd: You may not view or modify password information for user2.
tony@tony-VirtualBox:~$ sudo passwd user2
New password:
Retype new password:
passwd: password updated successfully
tony@tony-VirtualBox:~$ █
```

18. userdel

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

```
tony@tony-VirtualBox:~$ sudo userdel user2
tony@tony-VirtualBox:~$ █
```

19. sudo

- Short for “SuperUser Do”, this command enables you to perform tasks that require administrative or root permissions. You must have sufficient permissions to use this command.
- sudo useradd maria

```
tony@tony-VirtualBox:~$ sudo userdel user2
tony@tony-VirtualBox:~$ █
```

20. 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.
- passwd[option] [username]
- passwd
- passwd user1

```
tony@tony-VirtualBox:~$ passwd user2
passwd: You may not view or modify password information for user2.
tony@tony-VirtualBox:~$ sudo passwd user2
New password:
Retype new password:
passwd: password updated successfully
tony@tony-VirtualBox:~$ █
```

Q. Basic Linux Commands: Explain linux commands usermod, groupadd, groups, groupmod, groupdel, chmod, chown, id, ps, top with examples

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

```
tony@tony-VirtualBox:~$ 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
```

```
tony@tony-VirtualBox:~$ usermod -u 2000 tony
usermod: user tony is currently used by process 872
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ sudo groupadd student
[sudo] password for tony:
tony@tony-VirtualBox:~$
```

3. groups -print the groups a user is in

- #groups alice

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

4. groupdel

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

```
tony@tony-VirtualBox:~$ sudo groupdel student
tony@tony-VirtualBox:~$
```

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
```

```
tony@tony-VirtualBox:~$ sudo groupmod -n stud stud2
tony@tony-VirtualBox:~$
```

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+x test
```

```
#chmod g-rwx test
```

```
tony@tony-VirtualBox:~$ chmod -wx test
tony@tony-VirtualBox:~$ ls -ld test
dr--r--r-- 2 tony tony 4096 Aug 12 22:21 test
tony@tony-VirtualBox:~$
```

7. chown

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

#chown Tom Test

```
tony@tony-VirtualBox:~$ chown tony state.txt
tony@tony-VirtualBox:~$
```

8. id

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

•#id

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

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 into
- TIME– This is the time in minutes and seconds that the process has been running
- CMD– The command that launched the process

#ps -a

```
tony@tony-VirtualBox:~$ ps -a
  PID TTY      TIME CMD
  894 tty2    00:00:01 Xorg
  984 tty2    00:00:00 gnome-session-b
 2160 pts/0    00:00:00 ps
tony@tony-VirtualBox:~$
```

10. top

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

#top -u rose

```
top - 12:13:32 up 17 min,  1 user,  load average: 0.02, 0.26, 0.33
Tasks: 184 total,  1 running, 183 sleeping,  0 stopped,  0 zombie
%Cpu(s):  0.3 us,  0.3 sy,  0.0 ni, 98.7 id,  0.7 wa,  0.0 hi,  0.0 si,  0.0 st
MiB Mem : 1963.3 total,   111.7 free,   676.5 used, 1175.1 buff/cache
MiB Swap: 424.5 total,   422.3 free,     2.3 used. 1093.0 avail Mem

      PID USER      PR  NI      VIRT      RES      SHR S %CPU %MEM     TIME+ COMMAND
  877 tony      20   0    19284    10568    8200 S  0.0  0.5  0:00.42 systemd
  878 tony      20   0   103520     3576      0 S  0.0  0.2  0:00.00 (sd-pam)
  883 tony      9 -11   1154764   16844   12964 S  0.0  0.8  0:00.49 pulseaudio
  886 tony     39  19   519888   22000   14132 S  0.0  1.1  0:00.16 tracker+
```

Q. Explain linux commands wc, tar(create, extract using gzip, xz, bzip2), expr, redirections and piping, ssh, ssh-keygen, scp, ssh-copy-id with examples

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

•wc -l state.txt

```
tony@tony-VirtualBox:~$ wc name.txt
1 5 23 name.txt
tony@tony-VirtualBox:~$ wc -l name.txt
1 name.txt
```

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 filename

```
tony@tony-VirtualBox:~$ tar cf archive.tar name.txt state.txt
tony@tony-VirtualBox:~$ ls archive.tar
archive.tar
tony@tony-VirtualBox:~$
```

3. expr

- The expr expr command evaluates a given expression and displays 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

#expr 10+2

```
tony@tony-VirtualBox:~$ expr 10 + 2
12
tony@tony-VirtualBox:~$
```

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 | head -7 | tail -5
```

```
tony@tony-VirtualBox:~$ cat /etc/passwd | head -7 | tail -5
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
tony@tony-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.

```
#ssh user_name@host(IP/Domain_name)
#ssh -X root@server1.example.com
```

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]

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
```

```
tony@tony-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/tony/.ssh/id_rsa):
/home/tony/.ssh/id_rsa already exists.
Overwrite (y/n)? y
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/tony/.ssh/id_rsa
Your public key has been saved in /home/tony/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:EVLbhX5HFxcGrYMUHTWZB/08tokCfhVmW6GLL90Tgxc tony@tony-VirtualBox
The key's randomart image is:
+---[RSA 3072]---+
|       ..o .++=@X|
|       . +..o*o+B|
|       o..ooEooo|
|       oo =.=oo|
|       S..+=o.+|
|       .ooo..oo|
|       ..o.o |
|       . . . |
+---[ SHA256 ]---+
tony@tony-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
```

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

1. a. Create six files with name of the form songX.mp3
- b. Create six files with name of the form snapX.jpg
- c. Create six files with name of the form filmX.mp4 (In each set, replace X with the numbers 1 through 6)

```
tony@tony-VirtualBox:~$ touch song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3  
song6.mp3  
tony@tony-VirtualBox:~$ ls -l  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song1.mp3  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song2.mp3  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song3.mp3  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song4.mp3  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song5.mp3  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:17 song6.mp3
```

```
tony@tony-VirtualBox:~$ touch snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg  
snap6.jpg  
tony@tony-VirtualBox:~$ ls -l  
total 88  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap1.jpg  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap2.jpg  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap3.jpg  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap4.jpg  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap5.jpg  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:31 snap6.jpg
```

```
tony@tony-VirtualBox:~$ touch film1.mp4 film2.mp4 film3.mp4 film4.mp4 film5.mp4  
film6.mp4  
tony@tony-VirtualBox:~$ ls -l  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 film1.mp4  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 film2.mp4  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 film3.mp4  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 film4.mp4  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 film5.mp4  
-rw-rw-r-- 1 tony tony 0 Aug 17 21:33 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.

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

```
tony@tony-VirtualBox:~$ ls ./Music/  
song1.mp3 song2.mp3 song3.mp3 song4.mp3 song5.mp3 song6.mp3  
tony@tony-VirtualBox:~$ ls ./Pictures/  
snap1.jpg snap2.jpg snap3.jpg snap4.jpg snap5.jpg snap6.jpg  
tony@tony-VirtualBox:~$ ls ./Videos/  
film1.mp4 film2.mp4 film3.mp4 film4.mp4 film5.mp4 film6.mp4  
tony@tony-VirtualBox:~$
```

3. In your home directory, create three subdirectories for organizing your files. Call these directories friends, family, and work. Create all three with one command.

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

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

```
tony@tony-VirtualBox:~$ cp ./Music/*.mp3 ./friends/
tony@tony-VirtualBox:~$ ls ./friends/
song1.mp3  song2.mp3  song3.mp3  song4.mp3  song5.mp3  song6.mp3
tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ cp ./Pictures/*.jpg ./family/
tony@tony-VirtualBox:~$ ls ./family/
snap1.jpg  snap2.jpg  snap3.jpg  snap4.jpg  snap5.jpg  snap6.jpg
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ rmdir friends family
rmdir: failed to remove 'friends': Directory not empty
rmdir: failed to remove 'family': Directory not empty
tony@tony-VirtualBox:~$
```

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

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

7. Redirect a long listing of all home directory files, including hidden, into a file named allfiles.txt. Confirm that the file contains the listing

```
tony@tony-VirtualBox:~$ ls -a > `allfiles.txt
tony@tony-VirtualBox:~$ cat allfiles.txt
.
..
allfiles.txt
archive.tar
.bash_history
.bash_logout
.bashrc
.cache
.config
Desktop
Documents
Downloads
```

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

```
tony@tony-VirtualBox:~$ date  
Tuesday 17 August 2021 10:07:46 PM IST  
tony@tony-VirtualBox:~$
```

9. Add the user Juliet

```
tony@tony-VirtualBox:~$ sudo useradd Juliet  
[sudo] password for tony:  
tony@tony-VirtualBox:~$
```

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

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

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

```
tony@tony-VirtualBox:~$ sudo passwd Juliet  
New password:  
Retype new password:  
passwd: password updated successfully  
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ sudo groupadd -g 30000 Shakespeare  
tony@tony-VirtualBox:~$
```

13. Create a supplementary group called artists

```
tony@tony-VirtualBox:~$ sudo groupadd artists  
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ tail -2 /etc/group  
Shakespeare:x:30000:  
artists:x:30001:  
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ sudo usermod -aG Shakespeare Juliet  
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ id Juliet
uid=1001(Juliet) gid=1002(Juliet) groups=1002(Juliet),30000(Shakespeare)
tony@tony-VirtualBox:~$
```

17. Add Romeo and Hamlet to the Shakespeare group.

```
tony@tony-VirtualBox:~$ sudo useradd Romeo
tony@tony-VirtualBox:~$ sudo useradd Hamlet
tony@tony-VirtualBox:~$ sudo usermod -G Shakespeare Romeo
tony@tony-VirtualBox:~$ sudo usermod -G Shakespeare Hamlet
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ sudo useradd Reba
tony@tony-VirtualBox:~$ sudo useradd Dolly
tony@tony-VirtualBox:~$ sudo useradd Elvis
tony@tony-VirtualBox:~$ sudo usermod -G artists Reba
tony@tony-VirtualBox:~$ sudo usermod -G artists Dolly
tony@tony-VirtualBox:~$ sudo usermod -G artists Elvis
tony@tony-VirtualBox:~$
```

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

```
tony@tony-VirtualBox:~$ tail /etc/group
mlocate:x:133:
stud:x:1001:
Juliet:x:1002:
Shakespeare:x:30000:Juliet,Romeo,Hamlet
artists:x:30001:Reba,Dolly,Elvis
Romeo:x:30002:
Hamlet:x:1003:
Reba:x:1004:
Dolly:x:1005:
Elvis:x:1006:
tony@tony-VirtualBox:~$
```

20. Attempt to remove user Dolly.

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

1. 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, Ip Config, NetStat.

Windows

ping

```
C:\> Command Prompt  
Microsoft Windows [Version 10.0.17763.1039]  
(c) 2018 Microsoft Corporation. All rights reserved.  
  
C:\Users\USER>ping www.google.com  
  
Pinging www.google.com [2404:6800:4009:80d::2004] with 32 bytes of data:  
Reply from 2404:6800:4009:80d::2004: time=88ms  
Reply from 2404:6800:4009:80d::2004: time=65ms  
Reply from 2404:6800:4009:80d::2004: time=68ms  
Reply from 2404:6800:4009:80d::2004: time=84ms  
  
Ping statistics for 2404:6800:4009:80d::2004:  
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 65ms, Maximum = 88ms, Average = 76ms  
  
C:\Users\USER>
```

```
C:\Users\USER>ping -t www.google.com  
  
Pinging www.google.com [2404:6800:4009:80d::2004] with 32 bytes of data:  
Reply from 2404:6800:4009:80d::2004: time=108ms  
Reply from 2404:6800:4009:80d::2004: time=60ms  
Reply from 2404:6800:4009:80d::2004: time=68ms  
Reply from 2404:6800:4009:80d::2004: time=76ms  
Reply from 2404:6800:4009:80d::2004: time=89ms  
Reply from 2404:6800:4009:80d::2004: time=89ms  
Reply from 2404:6800:4009:80d::2004: time=98ms  
Reply from 2404:6800:4009:80d::2004: time=58ms  
  
Ping statistics for 2404:6800:4009:80d::2004:  
    Packets: Sent = 8, Received = 8, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
    Minimum = 58ms, Maximum = 108ms, Average = 80ms
```

```
C:\Users\USER>ping -j www.google.com  
  
Pinging www.google.com [142.250.195.196] with 32 bytes of data:  
General failure.  
General failure.  
General failure.  
General failure.  
  
Ping statistics for 142.250.195.196:  
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),  
C:\Users\USER>
```

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

Pinging www.google.com [2404:6800:4009:80d::2004] with 32 bytes of data:
Reply from 2404:6800:4009:80d::2004: time=57ms
Reply from 2404:6800:4009:80d::2004: time=69ms
Reply from 2404:6800:4009:80d::2004: time=55ms
Reply from 2404:6800:4009:80d::2004: time=52ms

Ping statistics for 2404:6800:4009:80d::2004:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 52ms, Maximum = 69ms, Average = 58ms

C:\Users\USER>
```

route

```
cmd Command Prompt
C:\Users\USER>route print
=====
Interface List
20...b4 a9 fc 0f 9b 2e .....Realtek PCIe GbE Family Controller
15...0a 00 27 00 00 0f .....VirtualBox Host-Only Ethernet Adapter
10...3e 91 80 cf 86 35 .....Microsoft Wi-Fi Direct Virtual Adapter
23...4e 91 80 cf 86 35 .....Microsoft Wi-Fi Direct Virtual Adapter #2
5...3c 91 80 cf 86 35 .....Qualcomm Atheros QCA9377 Wireless Network 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   192.168.43.218  192.168.43.215    55
         127.0.0.0    255.0.0.0        On-link       127.0.0.1    331
         127.0.0.1    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
         192.168.43.0   255.255.255.0        On-link     192.168.43.215    311
        192.168.43.215 255.255.255.255        On-link     192.168.43.215    311
        192.168.43.255 255.255.255.255        On-link     192.168.43.215    311
         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
         192.168.137.0  255.255.255.0        On-link     192.168.137.1    281
         192.168.137.1  255.255.255.255        On-link     192.168.137.1    281
        192.168.137.255 255.255.255.255        On-link     192.168.137.1    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     192.168.43.215    311
         224.0.0.0     240.0.0.0        On-link     192.168.137.1    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     192.168.43.215    311
        255.255.255.255 255.255.255.255        On-link     192.168.137.1    281
=====

Persistent Routes:
  None
```

```
IPv6 Route Table
=====
Active Routes:
If Metric Network Destination      Gateway
 5      71 ::/0                      fe80::c210:b1ff:fe03:2ba5
 1     331 ::1/128                  On-link
 5      71 2402:3a80:1931:2a7d::/64  On-link
 5     311 2402:3a80:1931:2a7d:64ce:c7c6:2497:22d9/128
                                         On-link
 5     311 2402:3a80:1931:2a7d:e0ba:3807:3210:1af1/128
                                         On-link
15     281 fe80::/64                On-link
 5     311 fe80::/64                On-link
23     281 fe80::/64                On-link
23     281 fe80::20f9:32f1:fdb3:a618/128
                                         On-link
15     281 fe80::2cc8:2501:33e5:85e0/128
                                         On-link
 5     311 fe80::64ce:c7c6:2497:22d9/128
                                         On-link
 1     331 ff00::/8                 On-link
15     281 ff00::/8                 On-link
 5     311 ff00::/8                 On-link
23     281 ff00::/8                 On-link
=====
Persistent Routes:
  None

C:\Users\USER>
```

```
C:\Users\USER>route print -6
=====
Interface List
 20...b4 a9 fc 0f 9b 2e .... Realtek PCIe GbE Family Controller
 15...0a 00 27 00 00 0f .... VirtualBox Host-Only Ethernet Adapter
 10...3e 91 80 cf 86 35 .... Microsoft Wi-Fi Direct Virtual Adapter
 23...4e 91 80 cf 86 35 .... Microsoft Wi-Fi Direct Virtual Adapter #2
  5...3c 91 80 cf 86 35 .... Qualcomm Atheros QCA9377 Wireless Network Adapter
  1..... Software Loopback Interface 1
=====

IPv6 Route Table
=====
Active Routes:
 If Metric Network Destination      Gateway
  5    71 ::/0                      fe80:::c210:b1ff:fe03:2ba5
  1    331 ::1/128                 On-link
  5    71 2402:3a80:1931:2a7d::/64 On-link
  5    311 2402:3a80:1931:2a7d:64ce:c7c6:2497:22d9/128
                                         On-link
  5    311 2402:3a80:1931:2a7d:e0ba:3807:3210:1af1/128
                                         On-link
 15   281 fe80::/64                On-link
  5    311 fe80::/64                On-link
 23   281 fe80::/64                On-link
 23   281 fe80::20f9:32f1:fdb3:a618/128
                                         On-link
 15   281 fe80::2cc8:2501:33e5:85e0/128
                                         On-link
  5    311 fe80::64ce:c7c6:2497:22d9/128
                                         On-link
  1    331 ff00::/8                 On-link
 15   281 ff00::/8                 On-link
  5    311 ff00::/8                 On-link
 23   281 ff00::/8                 On-link
=====

Persistent Routes:
  None
```

```
C:\Users\USER>route print -4
=====
Interface List
20...b4 a9 fc 0f 9b 2e ....Realtek PCIe GbE Family Controller
15...0a 00 27 00 00 0f ....VirtualBox Host-Only Ethernet Adapter
10...3e 91 80 cf 86 35 ....Microsoft Wi-Fi Direct Virtual Adapter
23...4e 91 80 cf 86 35 ....Microsoft Wi-Fi Direct Virtual Adapter #2
5...3c 91 80 cf 86 35 ....Qualcomm Atheros QCA9377 Wireless Network 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    192.168.43.218  192.168.43.215    55
         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
        192.168.43.0    255.255.255.0   On-link    192.168.43.215    311
  192.168.43.215  255.255.255.255   On-link    192.168.43.215    311
  192.168.43.255  255.255.255.255   On-link    192.168.43.215    311
        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
        192.168.137.0    255.255.255.0   On-link    192.168.137.1    281
        192.168.137.1    255.255.255.255   On-link    192.168.137.1    281
  192.168.137.255  255.255.255.255   On-link    192.168.137.1    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    192.168.43.215    311
        224.0.0.0        240.0.0.0   On-link    192.168.137.1    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    192.168.43.215    311
  255.255.255.255  255.255.255.255   On-link    192.168.137.1    281
=====
Persistent Routes:
  None
```

```
C:\Users\USER>route PRINT 157*
=====
Interface List
20...b4 a9 fc 0f 9b 2e ....Realtek PCIe GbE Family Controller
15...0a 00 27 00 00 0f ....VirtualBox Host-Only Ethernet Adapter
10...3e 91 80 cf 86 35 ....Microsoft Wi-Fi Direct Virtual Adapter
23...4e 91 80 cf 86 35 ....Microsoft Wi-Fi Direct Virtual Adapter #2
5...3c 91 80 cf 86 35 ....Qualcomm Atheros QCA9377 Wireless Network Adapter
1.....Software Loopback Interface 1
=====

IPv4 Route Table
=====
Active Routes:
  None
Persistent Routes:
  None

IPv6 Route Table
=====
Active Routes:
  None
Persistent Routes:
  None
```

tracert

```
C:\Users\USER>tracert 192.168.137.1

Tracing route to LAPTOP-SMNQHMAF.mshome.net [192.168.137.1]
over a maximum of 30 hops:

 1  <1 ms    <1 ms    <1 ms  LAPTOP-SMNQHMAF.mshome.net [192.168.137.1]

Trace complete.
```

```
C:\Users\USER>tracert -d www.yahoo.com

Tracing route to new-fp-shed.wg1.b.yahoo.com [2406:2000:e4:1605::9001]
over a maximum of 30 hops:

 1      4 ms      2 ms      3 ms  2402:3a80:1931:2a7d::ba
 2     76 ms     42 ms     41 ms  2402:8100:12:5:3000::31f
 3      *        *        * Request timed out.
 4      *        *        * Request timed out.
 5      *        *        * Request timed out.
 6      *        *        * Request timed out.
 7      *        *        * Request timed out.
 8      *        *        * Request timed out.
```

nslookup

```
C:\Users\USER>nslookup
Default Server: UnKnown
Address: 192.168.43.218
```

```
C:\Users\USER>nslookup www.google.com
Server: UnKnown
Address: 192.168.43.218

Non-authoritative answer:
Name: www.google.com
Addresses: 2404:6800:4009:80d::2004
           172.217.166.68
```

```
C:\Users\USER>nslookup -type=ns google.com
Server: UnKnown
Address: 192.168.43.218

Non-authoritative answer:
google.com      nameserver = ns4.google.com
google.com      nameserver = ns1.google.com
google.com      nameserver = ns3.google.com
google.com      nameserver = ns2.google.com
```

```
C:\Users\USER>nslookup -q=MX google.com
Server: UnKnown
Address: 192.168.43.218

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

ipconfig

```
C:\Users\USER>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::2cc8:2501:33e5:85e0%15
  IPv4 Address. . . . . : 192.168.56.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

  Connection-specific DNS Suffix . :
  Link-local IPv6 Address . . . . . : fe80::20f9:32f1:fdb3:a618%23
  IPv4 Address. . . . . : 192.168.137.1
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

  Connection-specific DNS Suffix . :
  IPv6 Address. . . . . : 2402:3a80:1931:2a7d:64ce:c7c6:2497:22d9
  Temporary IPv6 Address. . . . . : 2402:3a80:1931:2a7d:e0ba:3807:3210:1af1
  Link-local IPv6 Address . . . . . : fe80::64ce:c7c6:2497:22d9%5
  IPv4 Address. . . . . : 192.168.43.215
  Subnet Mask . . . . . : 255.255.255.0
  Default Gateway . . . . . : fe80::c210:b1ff:fe03:2ba5%5
  192.168.43.218
```

```
C:\Users\USER>ipconfig /allcompartments

Windows IP Configuration

=====

Network Information for Compartment 1 (ACTIVE)
=====

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::2cc8:2501:33e5:85e0%15
    IPv4 Address. . . . . : 192.168.56.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

    Connection-specific DNS Suffix . :
    Link-local IPv6 Address . . . . . : fe80::20f9:32f1:fdb3:a618%23
    IPv4 Address. . . . . : 192.168.137.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2402:3a80:1931:2a7d:64ce:c7c6:2497:22d9
    Temporary IPv6 Address. . . . . : 2402:3a80:1931:2a7d:e0ba:3807:3210:1af1
    Link-local IPv6 Address . . . . . : fe80::64ce:c7c6:2497:22d9%5
    IPv4 Address. . . . . : 192.168.43.215
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::c210:b1ff:fe03:2ba5%5
                                192.168.43.218
```

```
C:\Users\USER>ipconfig /displaydns

Windows IP Configuration

    static.criteo.net
    -----
    Record Name . . . . . : static.criteo.net
    Record Type . . . . . : 5
    Time To Live . . . . . : 1187
    Data Length . . . . . : 8
    Section . . . . . . . : Answer
    CNAME Record . . . . . : static.hk5.vip.prod.criteo.net

    Record Name . . . . . : static.hk5.vip.prod.criteo.net
    Record Type . . . . . : 28
    Time To Live . . . . . : 1187
    Data Length . . . . . : 16
    Section . . . . . . . : Answer
    AAAA Record . . . . . : 2406:2600:1::4

    laptop-smnqhmaf.mshome.net
    -----
    No records of type AAAA

    laptop-smnqhmaf.mshome.net
    -----
    Record Name . . . . . : LAPTOP-SMNQHMAF.mshome.net
    Record Type . . . . . : 1
    Time To Live . . . . . : 0
    Data Length . . . . . : 4
    Section . . . . . . . : Answer
    A (Host) Record . . . . : 192.168.137.1
```

```
C:\Users\USER>ipconfig /release

Windows IP Configuration

No operation can be performed on Ethernet while it has its media disconnected.
No operation can be performed on Local Area Connection* 1 while it has its media disconnected.

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::2cc8:2501:33e5:85e0%15
    IPv4 Address. . . . . : 192.168.56.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

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

Wireless LAN adapter Local Area Connection* 2:

    Connection-specific DNS Suffix . :
    Link-local IPv6 Address . . . . . : fe80::20f9:32f1:fdb3:a618%23
    IPv4 Address. . . . . : 192.168.137.1
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix . :
    IPv6 Address. . . . . : 2402:3a80:1931:2a7d:64ce:c7c6:2497:22d9
    Temporary IPv6 Address. . . . . : 2402:3a80:1931:2a7d:e0ba:3807:3210:1af1
    Link-local IPv6 Address . . . . . : fe80::64ce:c7c6:2497:22d9%5
    Default Gateway . . . . . : fe80::c210:b1ff:fe03:2ba5%5
```

NetStat

```
C:\Users\USER>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:55453  si-in-f188:https      ESTABLISHED
  TCP    [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:57170  g2600-1417-0075-0c8e-0000-0000-0000-0057:https  ESTABLISHED
```

```
C:\Users\USER>netstat -a
```

Active Connections

| Proto | Local Address | Foreign Address | State |
|-------|--------------------|-------------------|-----------|
| TCP | 0.0.0.0:135 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:445 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:5040 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:5357 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:7250 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:7680 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49664 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49665 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49666 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49667 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49668 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 0.0.0.0:49670 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 127.0.0.1:27017 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 127.0.0.1:51586 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 169.254.34.217:139 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 192.168.56.1:139 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | 192.168.137.1:139 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:135 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:445 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:5357 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:7250 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:7680 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:49664 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:49665 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:49666 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:49667 | LAPTOP-SMNQHMAF:0 | LISTENING |
| TCP | [::]:49668 | LAPTOP-SMNQHMAF:0 | LISTENING |

```
C:\Users\USER>netstat -n 5
```

Active Connections

| Proto | Local Address | Foreign Address | State |
|-------|---|------------------------------|-------------|
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:55453 | [2404:6800:4003:c04::bc]:443 | ESTABLISHED |
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:57170 | [2600:1417:75:c8e::57]:443 | CLOSE_WAIT |

Active Connections

| Proto | Local Address | Foreign Address | State |
|-------|---|------------------------------|-------------|
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:55453 | [2404:6800:4003:c04::bc]:443 | ESTABLISHED |
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:57170 | [2600:1417:75:c8e::57]:443 | CLOSE_WAIT |

Active Connections

| Proto | Local Address | Foreign Address | State |
|-------|---|------------------------------|-------------|
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:55453 | [2404:6800:4003:c04::bc]:443 | ESTABLISHED |
| TCP | [2402:3a80:1931:2a7d:e0ba:3807:3210:1af1]:57170 | [2600:1417:75:c8e::57]:443 | CLOSE_WAIT |

Linux

ping

```
tony@tony-VirtualBox:~$ ping www.google.com
PING www.google.com (172.217.166.68) 56(84) bytes of data.
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=1 ttl=115 time=72.8 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=2 ttl=115 time=95.6 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=3 ttl=115 time=118 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=4 ttl=115 time=140 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=5 ttl=115 time=62.1 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=6 ttl=115 time=113 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=7 ttl=115 time=136 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=8 ttl=115 time=62.3 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=9 ttl=115 time=68.6 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=10 ttl=115 time=107 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=11 ttl=115 time=130 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=12 ttl=115 time=153 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=13 ttl=115 time=71.9 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=14 ttl=115 time=94.5 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=15 ttl=115 time=118 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=16 ttl=115 time=141 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=17 ttl=115 time=62.7 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=18 ttl=115 time=85.3 ms
64 bytes from bom05s15-in-f4.1e100.net (172.217.166.68): icmp_seq=19 ttl=115 time=109 ms
```

```
tony@tony-VirtualBox:~$ ping -a google.com
PING google.com (142.250.196.78) 56(84) bytes of data.
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=1 ttl=114 time=83.4 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=2 ttl=114 time=50.8 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=3 ttl=114 time=51.4 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=4 ttl=114 time=49.7 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=5 ttl=114 time=74.2 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=6 ttl=114 time=73.1 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=7 ttl=114 time=70.9 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=8 ttl=114 time=75.2 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=9 ttl=114 time=68.2 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=10 ttl=114 time=66.9 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=11 ttl=114 time=65.6 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=12 ttl=114 time=63.0 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=13 ttl=114 time=62.2 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=14 ttl=114 time=61.8 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=15 ttl=114 time=60.8 ms
```

```
tony@tony-VirtualBox:~$ ping -V
ping from iputils s20190709
```

```
tony@tony-VirtualBox:~$ ping -b google.com
PING google.com (142.250.196.78) 56(84) bytes of data.
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=1 ttl=114 time=116 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=2 ttl=114 time=56.4 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=3 ttl=114 time=52.6 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=4 ttl=114 time=50.0 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=5 ttl=114 time=54.8 ms
64 bytes from maa03s46-in-f14.1e100.net (142.250.196.78): icmp_seq=6 ttl=114 time=52.3 ms
```

Route

```
tony@tony-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
tony@tony-VirtualBox:~$
```

```
tony@tony-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
tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ route -Cn
Kernel IP routing cache
Source          Destination      Gateway        Flags Metric Ref    Use Iface
tony@tony-VirtualBox:~$
```

```
tony@tony-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
tony@tony-VirtualBox:~$
```

traceroute

```
tony@tony-VirtualBox:~$ traceroute google.com
traceroute to google.com (142.250.66.14), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  0.654 ms  0.615 ms  0.974 ms
 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 * * *
tony@tony-VirtualBox:~$ █
```

```
tony@tony-VirtualBox:~$ traceroute -4 google.com
traceroute to google.com (142.250.66.14), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  0.483 ms  0.448 ms  0.440 ms
 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 * * *

tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ sudo traceroute -d google.com
traceroute to google.com (142.250.66.14), 30 hops max, 60 byte packets
 1 _gateway (10.0.2.2)  0.472 ms  0.405 ms  0.393 ms
 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 * * *

tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ traceroute -6 google.com
traceroute to google.com (2404:6800:4009:82c::200e), 30 hops max, 80 byte packets
connect: Network is unreachable
tony@tony-VirtualBox:~$
```

nslookup

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

Non-authoritative answer:
Name:   google.com
Address: 142.250.66.14
Name:   google.com
Address: 2404:6800:4009:82c::200e

tony@tony-VirtualBox:~$
```

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

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

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

Non-authoritative answer:
google.com
origin = ns1.google.com
mail addr = dns-admin.google.com
serial = 396194125
refresh = 900
retry = 900
expire = 1800
minimum = 60
```

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

Non-authoritative answer:
Name:   google.com
Address: 142.250.66.14
```

ifconfig

```
tony@tony-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::9a27:4e0:e0ff:78 prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:39:02:e7 txqueuelen 1000 (Ethernet)
            RX packets 2836 bytes 3504899 (3.5 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1716 bytes 150849 (150.8 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 4661 bytes 337475 (337.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 4661 bytes 337475 (337.4 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ ifconfig -a
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::9a27:4e0:e0ff:78 prefixlen 64 scopeid 0x20<link>
          ether 08:00:27:39:02:e7 txqueuelen 1000 (Ethernet)
            RX packets 2842 bytes 3505478 (3.5 MB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 1722 bytes 151333 (151.3 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 4661 bytes 337475 (337.4 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 4661 bytes 337475 (337.4 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ ifconfig -s
Iface      MTU     RX-OK RX-ERR RX-DRP RX-OVR     TX-OK TX-ERR TX-DRP TX-OVR Flg
enp0s3    1500     2842      0      0 0       1722      0      0 0     BMRU
lo        65536    4661      0      0 0       4661      0      0 0     LRU
tony@tony-VirtualBox:~$
```

```
tony@tony-VirtualBox:~$ ifconfig -V
net-tools 2.10-alpha
tony@tony-VirtualBox:~$
```

netstat

```
tony@tony-VirtualBox:~$ netstat
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 tony-VirtualBox:bootpc  _gateway:bootps       ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State          I-Node  Path
unix  2      [ ]    DGRAM    CONNECTED       28195  /run/user/1000/systemd/notify
unix  2      [ ]    DGRAM    CONNECTED       15174  /run/systemd/journal/syslog
unix  15     [ ]    DGRAM    CONNECTED       15184  /run/systemd/journal/dev-log
unix  8      [ ]    DGRAM    CONNECTED       15188  /run/systemd/journal/socket
unix  3      [ ]    DGRAM    CONNECTED       15160  /run/systemd/notify
unix  3      [ ]    STREAM   CONNECTED      35053
unix  3      [ ]    STREAM   CONNECTED      34701
unix  3      [ ]    STREAM   CONNECTED      29008  /run/dbus/system_bus_socket
unix  3      [ ]    STREAM   CONNECTED      22288
unix  3      [ ]    STREAM   CONNECTED      24554
unix  3      [ ]    STREAM   CONNECTED      20645
unix  3      [ ]    STREAM   CONNECTED      33724
unix  3      [ ]    STREAM   CONNECTED      32935  @/tmp/dbus-LnYRqliFZc
unix  3      [ ]    STREAM   CONNECTED      32044
unix  3      [ ]    STREAM   CONNECTED      31009  /run/user/1000/bus
unix  3      [ ]    STREAM   CONNECTED      34693
unix  3      [ ]    STREAM   CONNECTED      29649
unix  3      [ ]    STREAM   CONNECTED      29055  /run/user/1000/bus
unix  3      [ ]    STREAM   CONNECTED      28162  /run/systemd/journal/stdout
unix  3      [ ]    STREAM   CONNECTED      35059  @/tmp/dbus-LnYRqliFZc
unix  3      [ ]    STREAM   CONNECTED      33254  /run/user/1000/bus
unix  3      [ ]    STREAM   CONNECTED      32931  @/tmp/dbus-LnYRqliFZc
unix  3      [ ]    STREAM   CONNECTED      31999
unix  3      [ ]    STREAM   CONNECTED      31019  /run/systemd/journal/stdout
unix  3      [ ]    STREAM   CONNECTED      35054  @/tmp/.X11-unix/X0
unix  3      [ ]    STREAM   CONNECTED      34702  @/tmp/dbus-LnYRqliFZc
```

```
tony@tony-VirtualBox:~$ netstat -n
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
udp        0      0 10.0.2.15:68          10.0.2.2:67       ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State          I-Node  Path
unix  2      [ ]    DGRAM    CONNECTED       28195  /run/user/1000/systemd/notify
unix  2      [ ]    DGRAM    CONNECTED       15174  /run/systemd/journal/syslog
unix  15     [ ]    DGRAM    CONNECTED       15184  /run/systemd/journal/dev-log
unix  8      [ ]    DGRAM    CONNECTED       15188  /run/systemd/journal/socket
unix  3      [ ]    DGRAM    CONNECTED       15160  /run/systemd/notify
unix  3      [ ]    STREAM   CONNECTED      35053
unix  3      [ ]    STREAM   CONNECTED      34701
unix  3      [ ]    STREAM   CONNECTED      29008  /run/dbus/system_bus_socket
unix  3      [ ]    STREAM   CONNECTED      22288
unix  3      [ ]    STREAM   CONNECTED      24554
```

```
tony@tony-VirtualBox:~$ netstat -n 5
Active Internet connections (w/o servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      1 10.0.2.15:38406      34.122.121.32:80      SYN_SENT
tcp        0      1 10.0.2.15:38412      34.122.121.32:80      SYN_SENT
tcp        0      1 10.0.2.15:38408      34.122.121.32:80      SYN_SENT
tcp        0      1 10.0.2.15:38410      34.122.121.32:80      SYN_SENT
udp        0      0 10.0.2.15:68          10.0.2.2:67       ESTABLISHED
Active UNIX domain sockets (w/o servers)
Proto RefCnt Flags     Type      State          I-Node  Path
unix  2      [ ]    DGRAM    CONNECTED       28195  /run/user/1000/systemd/notify
unix  2      [ ]    DGRAM    CONNECTED       15174  /run/systemd/journal/syslog
```

```

tony@tony-VirtualBox:~$ netstat -a
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp      0      0 localhost:mysql          0.0.0.0:*
tcp      0      0 localhost:domain        0.0.0.0:*
tcp      0      0 localhost:ipp          0.0.0.0:*
tcp6     0      0 [::]:http              [::]:*                LISTEN
tcp6     0      0 ip6-localhost:ipp       [::]:*                LISTEN
udp      0      0 localhost:domain        0.0.0.0:*
udp      0      0 tony-VirtualBox:bootpc _gateway:bootps        ESTABLISHED
udp      0      0 0.0.0.0:mdns          0.0.0.0:*
udp      0      0 0.0.0.0:631          0.0.0.0:*
udp      0      0 0.0.0.0:33438         0.0.0.0:*
udp6     0      0 [::]:mdns            [::]:*                LISTEN
udp6     0      0 [::]:33394           [::]:*                LISTEN
raw6     0      0 [::]:ipv6-icmp        [::]:*                7
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags       Type      State     I-Node   Path
unix  2      [ ACC ]     STREAM    LISTENING  30137   @/tmp/.ICE-unix/1321
unix  2      [ ACC ]     SEQPACKET  LISTENING  15190   /run/udev/control

```

2. Identify and perform 5 more network commands and its working.

1. 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. If you are having problems communicating with one specific host, you can append the remote host's IP address to the ARP -A command.

```

C:\Users\USER>arp -a

Interface: 192.168.43.215 --- 0x5
  Internet Address        Physical Address      Type
  192.168.43.161          c0-10-b1-03-2b-a5  dynamic
  192.168.43.255          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: 192.168.56.1 --- 0xf
  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

Interface: 192.168.137.1 --- 0x17
  Internet Address        Physical Address      Type
  192.168.137.255          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

```

2. nbtstat

As I am sure you probably know, 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\USER>nbtstat -r

NetBIOS Names Resolution and Registration Statistics
-----
Resolved By Broadcast      = 0
Resolved By Name Server   = 0

Registered By Broadcast   = 804
Registered By Name Server = 0

C:\Users\USER>
```

3. 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\USER>hostname
LAPTOP-SMNQHMAF

C:\Users\USER>
```

4. 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\USER>pathping google.com

Tracing route to google.com [2404:6800:4009:82c::200e]
over a maximum of 30 hops:
  0  LAPTOP-SMNQHMAF [2402:3a80:1e6b:63a9:dd8f:480a:40a:4533]
  1  2402:3a80:1e6b:63a9::e6
  2  2403:8100:20:5::1f
  3  *      *      *
Computing statistics for 50 seconds...
          Source to Here   This Node/Link
Hop  RTT    Lost/Sent = Pct  Lost/Sent = Pct  Address
  0          0/ 100 = 0%      0/ 100 = 0%  LAPTOP-SMNQHMAF [2402:3a80:1e6b:63a9:dd8f:480a:40a:4533]
  1     3ms    0/ 100 = 0%    0/ 100 = 0%  2402:3a80:1e6b:63a9::e6
  2    57ms    0/ 100 = 0%    0/ 100 = 0%  2403:8100:20:5::1f

Trace complete.
```

5. getmac

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

```
C:\Users\USER>getmac

Physical Address      Transport Name
=====
B4-A9-FC-0F-9B-2E  Media disconnected
3C-91-80-CF-86-35  \Device\Tcpip_{26DACAFA-13BF-4FB1-A686-5D4DD508888D}
4E-91-80-CF-86-35  \Device\Tcpip_{FADF7740-D252-4595-9810-9D58372CF65A}
0A-00-27-00-00-0F  \Device\Tcpip_{91C7FF7A-0E46-48DC-8FBD-A36BFB6BFDEC}

C:\Users\USER>
```

LAMP INSTALLATION on ubuntu 18.04

Update your system:

```
sudo apt update
```

Install Apache using apt:

```
sudo apt install apache2
```

Confirm that Apache is now running with the following command:

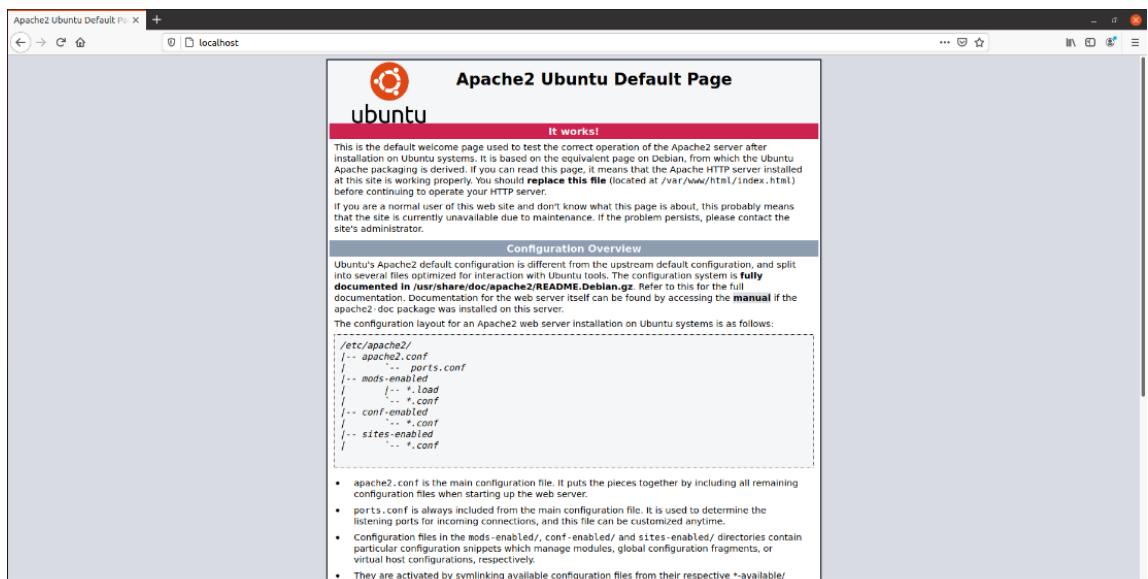
```
sudo systemctl status apache2
```

```
tony@tony-VirtualBox:~$ sudo systemctl status apache2
[sudo] password for tony:
● apache2.service - The Apache HTTP Server
  Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
  Active: active (running) since Tue 2021-09-28 19:26:22 IST; 1h 16min ago
    Docs: https://httpd.apache.org/docs/2.4/
   Process: 725 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
 Main PID: 841 (apache2)
   Tasks: 11 (limit: 5197)
     Memory: 98.9M
      CGroup: /system.slice/apache2.service
              └─ 841 /usr/sbin/apache2 -k start
                  ├─ 902 /usr/sbin/apache2 -k start
                  ├─ 903 /usr/sbin/apache2 -k start
                  ├─ 904 /usr/sbin/apache2 -k start
                  ├─ 4095 /usr/sbin/apache2 -k start
                  ├─ 4101 /usr/sbin/apache2 -k start
                  ├─ 4102 /usr/sbin/apache2 -k start
                  ├─ 4103 /usr/sbin/apache2 -k start
                  ├─ 4109 /usr/sbin/apache2 -k start
                  ├─ 4110 /usr/sbin/apache2 -k start
                  └─ 4111 /usr/sbin/apache2 -k start

Sep 28 19:26:14 tony-VirtualBox systemd[1]: Starting The Apache HTTP Server...
Sep 28 19:26:22 tony-VirtualBox apache2[752]: AH00558: apache2: Could not reliably determine
Sep 28 19:26:22 tony-VirtualBox systemd[1]: Started The Apache HTTP Server.
```

Once installed, test by accessing your server's IP in your browser:

<http://youripaddress>



Install mariaDB:

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

Check mariadb Installation:

```
sudo systemctl status mysql
```

```
tony@tony-VirtualBox:~$ sudo systemctl status mysql
● mariadb.service - MariaDB 10.3.31 database server
  Loaded: loaded (/lib/systemd/system/mariadb.service; enabled; vendor preset: enabled)
  Active: active (running) since Tue 2021-09-28 19:26:26 IST; 1h 55min ago
    Docs: man:mysqld(8)
          https://mariadb.com/kb/en/library/systemd/
   Process: 726 ExecStartPre=/usr/bin/install -m 755 -o mysql -g root -d /var/run/mysql
   Process: 733 ExecStartPre=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION
   Process: 735 ExecStartPre=/bin/sh -c [ ! -e /usr/bin/galera_recovery ] && VAR= ||
   Process: 893 ExecStartPost=/bin/sh -c systemctl unset-environment _WSREP_START_POSITION
   Process: 895 ExecStartPost=/etc/mysql/debian-start (code=exited, status=0/SUCCESS)
 Main PID: 801 (mysqld)
   Status: "Taking your SQL requests now..."
     Tasks: 30 (limit: 5197)
    Memory: 105.5M
      CGroup: /system.slice/mariadb.service
              └─801 /usr/sbin/mysqld

Sep 28 19:26:20 tony-VirtualBox mysqld[801]: 2021-09-28 19:26:20 0 [Note] /usr/sbin/mysq
Sep 28 19:26:26 tony-VirtualBox systemd[1]: Started MariaDB 10.3.31 database server.
Sep 28 19:26:26 tony-VirtualBox /etc/mysql/debian-start[897]: Upgrading MySQL tables if
```

Secure your newly installed MariaDB service:

```
sudo mysql_secure_installation
```

(This will set password for mariadb, and strengthen the security).

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:

```
php -v
```

```
tony@tony-VirtualBox:~$ php -v
PHP 7.4.3 (cli) (built: Jul 5 2021 15:13:35) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.3, Copyright (c), by Zend Technologies
tony@tony-VirtualBox:~$
```

Install phpmyadmin:

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

(It asks for webserver select apache2, select db-configuration and set
password)

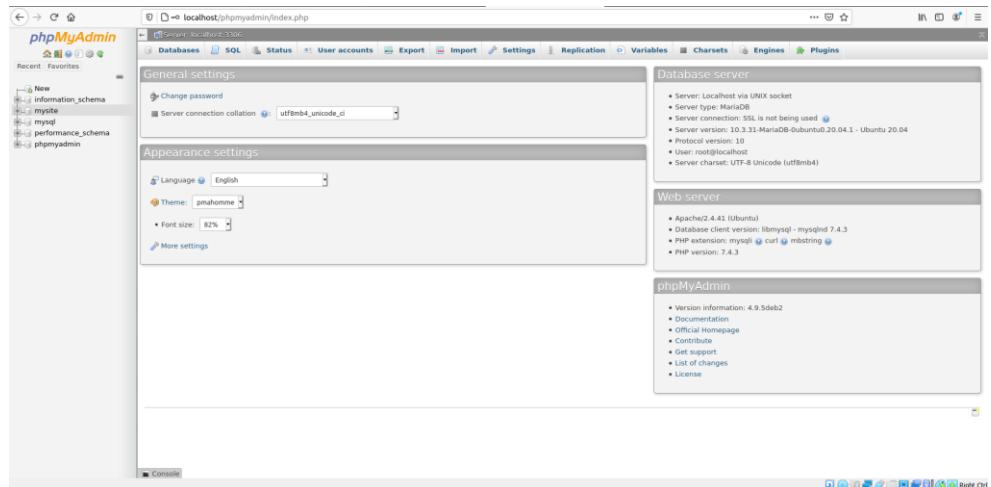
Restart apache2

```
sudo systemctl restart apache2
```

Check phpmyadmin

Open a browser

<http://localhost/phpmyadmin>



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

```
tony@tony-VirtualBox: $ sudo apt-get install ansible
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gyp libc-ares2 libjs-inherits libjs-is-typedarray libjs-psl
  libjs-typedarray-to-buffer libpython2-stdlib libpython2.7-minimal
  libpython2.7-stdlib libssl-dev libuv1-dev nodejs-doc python-pkg-resources
  python2 python2-minimal python2.7 python2.7-minimal
Use 'sudo apt autoremove' to remove them.
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 351 not upgraded.
Need to get 9,865 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-jinja2 all 2.10.1-2 [95.5 kB]
Get:2 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-crypto amd64 2.6.1-13ubuntu2 [237 kB]
Get:3 http://in.archive.ubuntu.com/ubuntu focal-updates/main amd64 python3-distutils all 3.8.10-0ubuntu1~20.04 [141 kB]
Get:4 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-dnspython all 1.16.0-1build1 [89.1 kB]
Get:5 http://in.archive.ubuntu.com/ubuntu focal/main amd64 ieee-data all 20180805.1 [1,589 kB]
Get:6 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-netaddr all 0.7.19-3 [235 kB]
Get:7 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 ansible all 2.9.6+dfsg-1 [5,794 kB]
Get:8 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-argcomplete all 1.8.1-1.3ubuntu1 [27.2 kB]
Get:9 http://in.archive.ubuntu.com/ubuntu focal/main amd64 python3-jmespath all 0.9.4-2 [21.3 kB]
Get:10 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-kerberos amd64 1.1.14-3.1build1 [22.6 kB]
Get:11 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-libcloud all 2.8.0-1 [1,403 kB]
Get:12 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-ntlm-auth all 1.1.0-1 [19.6 kB]
Get:13 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-requests-kerberos all 0.12.0-2 [11.9 kB]
Get:14 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-requests-ntlm all 1.1.0-1 [6,004 B]
Get:15 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-selinux amd64 3.0-1build2 [139 kB]
Get:16 http://in.archive.ubuntu.com/ubuntu focal/universe amd64 python3-xmldict all 0.12.0-1 [12.6 kB]
```

```
Preparing to unpack .../03-python3-distutils_3.8.10-0ubuntu1-20.04_all.deb ...
Unpacking python3-distutils (3.8.10-0ubuntu1-20.04) ...
Selecting previously unselected package python3-dnspython.
Preparing to unpack .../04-python3-dnspython_1.16.0-1build1_all.deb ...
Unpacking python3-dnspython (1.16.0-1build1) ...
Selecting previously unselected package ieee-data.
Preparing to unpack .../05-ieee-data_20180805.1_all.deb ...
Unpacking ieee-data (20180805.1) ...
Selecting previously unselected package python3-netaddr.
Preparing to unpack .../06-python3-netaddr_0.7.19-3_all.deb ...
Unpacking python3-netaddr (0.7.19-3) ...
Selecting previously unselected package ansible.
Preparing to unpack .../07-ansible_2.9.6+dfsg-1_all.deb ...
Unpacking ansible (2.9.6+dfsg-1) ...
Selecting previously unselected package python3-argcomplete.
Preparing to unpack .../08-python3-argcomplete_1.8.1-1.3ubuntu1_all.deb ...
Unpacking python3-argcomplete (1.8.1-1.3ubuntu1) ...
Selecting previously unselected package python3-jmespath.
Preparing to unpack .../09-python3-jmespath_0.9.4-2_all.deb ...
Unpacking python3-jmespath (0.9.4-2) ...
Selecting previously unselected package python3-kerberos.
Preparing to unpack .../10-python3-kerberos_1.1.14-3.1build1_amd64.deb ...
Unpacking python3-kerberos (1.1.14-3.1build1) ...
Selecting previously unselected package python3-libcloud.
Preparing to unpack .../11-python3-libcloud_2.8.0-1_all.deb ...
Unpacking python3-libcloud (2.8.0-1) ...
Selecting previously unselected package python3-ntlm-auth.
Preparing to unpack .../12-python3-ntlm-auth_1.1.0-1_all.deb ...
Unpacking python3-ntlm-auth (1.1.0-1) ...
Selecting previously unselected package python3-requests-kerberos.
Preparing to unpack .../13-python3-requests-kerberos_0.12.0-2_all.deb ...
Unpacking python3-requests-kerberos (0.12.0-2) ...
Selecting previously unselected package python3-requests-ntlm.
Preparing to unpack .../14-python3-requests-ntlm_1.1.0-1_all.deb ...
Unpacking python3-requests-ntlm (1.1.0-1) ...
Selecting previously unselected package python3-selinux.
Preparing to unpack .../15-python3-selinux_3.0-1build2_amd64.deb ...
Unpacking python3-selinux (3.0-1build2) ...
Selecting previously unselected package python3-xmldict.
Preparing to unpack .../16-python3-xmldict_0.12.0-1_all.deb ...
Unpacking python3-xmldict (0.12.0-1) ...
Selecting previously unselected package python3-winrm.
Preparing to unpack .../17-python3-winrm_0.3.0-2_all.deb ...
Unpacking python3-winrm (0.3.0-2) ...
Setting up python3-ntlm-auth (1.1.0-1) ...
Setting up python3-kerberos (1.1.14-3.1build1) ...
Setting up python3-requests-kerberos (0.12.0-1) ...
Setting up python3-xmldict (0.12.0-1) ...
Setting up python3-jinja2 (2.10.1-2) ...
```

```
Preparing to unpack .../17-python3-winrm_0.3.0-2_all.deb ...
Unpacking python3-winrm (0.3.0-2) ...
Setting up python3-ntlm-auth (1.1.0-1) ...
Setting up python3-kerberos (1.1.14-3.1build1) ...
Setting up python3-xmltodict (0.12.0-1) ...
Setting up python3-jinja2 (2.10.1-2) ...
Setting up python3-jmespath (0.9.4-2) ...
/usr/lib/python3/dist-packages/jmespath/visitor.py:32: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if x is 0 or x is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:32: SyntaxWarning: "is" with a literal. Did you mean "=="?
  if x is 0 or x is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="?
  elif y is 0 or y is 1:
/usr/lib/python3/dist-packages/jmespath/visitor.py:34: SyntaxWarning: "is" with a literal. Did you mean "=="?
  elif y is 0 or y is 1:
/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) ...
```

```
tony@tony-VirtualBox:~$ ansible --version
ansible 2.9.6
  config file = /etc/ansible/ansible.cfg
  configured module search path = ['/home/tony/.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]
tony@tony-VirtualBox:~$
```

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

```
sudo tcpdump
```

```
tony@tony-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
15:54:51.824823 IP tony-VirtualBox.mdns > ff02::fb.mdns: 0 [2q] PTR (QM)? _ipps._tcp.local. PTR (QM)
15:54:51.828714 IP tony-VirtualBox.33418 > 192.168.162.35.domain: 23289+ [1au] PTR? b.f.0.0.0.0.0.0.0.
15:54:51.867593 IP tony-VirtualBox.mdns > 224.0.0.251.mdns: 0 [2q] PTR (QM)? _ipps._tcp.local. PTR (QM)
15:54:51.921955 IP 192.168.162.35.domain > tony-VirtualBox.33418: 23289 NXDomain 0/1/1 (165)
15:54:51.924399 IP tony-VirtualBox.33418 > 192.168.162.35.domain: 23289+ PTR? b.f.0.0.0.0.0.0.0.0.
15:54:51.930690 IP 192.168.162.35.domain > tony-VirtualBox.33418: 23289 NXDomain 0/0/0 (90)
15:54:51.934473 IP tony-VirtualBox.54908 > 192.168.162.35.domain: 15625+ [1au] PTR? 8.7.0.0.f.f.0.e.0.
15:54:51.942911 IP 192.168.162.35.domain > tony-VirtualBox.54908: 15625 NXDomain 0/0/0 (90)
15:54:51.943991 IP tony-VirtualBox.54908 > 192.168.162.35.domain: 15625+ PTR? 8.7.0.0.f.f.0.e.0.e.4.
15:54:51.950286 IP 192.168.162.35.domain > tony-VirtualBox.54908: 15625 NXDomain 0/0/0 (90)
15:54:51.953512 IP tony-VirtualBox.42101 > 192.168.162.35.domain: 18467+ [1au] PTR? 35.162.168.192.in-addr.arpa. (56)
15:54:52.007793 IP 192.168.162.35.domain > tony-VirtualBox.42101: 18467 NXDomain 0/0/1 (56)
15:54:52.007960 IP tony-VirtualBox.42101 > 192.168.162.35.domain: 18467+ PTR? 35.162.168.192.in-addr.arpa. (56)
15:54:52.049349 IP 192.168.162.35.domain > tony-VirtualBox.42101: 18467 NXDomain 0/0/0 (45)
```

To capture packets flowing through a specific interface, use the -i flag with the interface name

```
sudo tcpdump -i enp0s3
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -i enp0s3
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
15:59:19.953716 IP tony-VirtualBox.37896 > 17.111.232.35.bc.googleusercontent.com.http: Flags [S], seq 834050923, win 64
15:59:19.954667 IP tony-VirtualBox.36187 > 192.168.162.35.domain: 21241+ [1au] PTR? 17.111.232.35.in-addr.arpa. (55)
15:59:20.065352 IP 192.168.162.35.domain > tony-VirtualBox.36187: 21241 1/0/1 PTR 17.111.232.35.bc.googleusercontent.com.
15:59:20.067255 IP tony-VirtualBox.49429 > 192.168.162.35.domain: 55347+ [1au] PTR? 15.2.0.10.in-addr.arpa. (51)
15:59:20.073684 IP 192.168.162.35.domain > tony-VirtualBox.49429: 55347 NXDomain 0/0/0 (40)
15:59:20.076120 IP tony-VirtualBox.49429 > 192.168.162.35.domain: 55347+ PTR? 15.2.0.10.in-addr.arpa. (40)
15:59:20.081169 IP 192.168.162.35.domain > tony-VirtualBox.49429: 55347 NXDomain 0/0/0 (40)
15:59:20.083433 IP tony-VirtualBox.46890 > 192.168.162.35.domain: 46131+ [1au] PTR? 35.162.168.192.in-addr.arpa. (56)
15:59:20.247214 IP 17.111.232.35.bc.googleusercontent.com.http > tony-VirtualBox.37896: Flags [S.], seq 9152001, ack 83
15:59:20.247248 IP tony-VirtualBox.37896 > 17.111.232.35.bc.googleusercontent.com.http: Flags [.], ack 1, win 64240, length 1
15:59:20.247445 IP tony-VirtualBox.37896 > 17.111.232.35.bc.googleusercontent.com.http: Flags [P.], seq 1:88, ack 1, win 65535, length 87
15:59:20.248027 IP 17.111.232.35.bc.googleusercontent.com.http > tony-VirtualBox.37896: Flags [.], ack 88, win 65535, length 1
15:59:20.528446 IP 17.111.232.35.bc.googleusercontent.com.http > tony-VirtualBox.37896: Flags [P.], seq 1:149, ack 88, win 64092, length 148
15:59:20.528464 IP tony-VirtualBox.37896 > 17.111.232.35.bc.googleusercontent.com.http: Flags [.], ack 149, win 64092, length 1
```

To capture only a set of lines, say 5, use the -c flag:

```
sudo tcpdump -c 5
```

```
tony@tony-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
16:12:42.082191 IP tony-VirtualBox.48195 > chilipepper.canonical.com.ntp: NTPv4, Client, length 48
16:12:42.083614 IP tony-VirtualBox.53179 > 192.168.162.35.domain: 29114+ [1au] PTR? 15.2.0.10.in-addr.arpa. (51)
16:12:42.088704 IP 192.168.162.35.domain > tony-VirtualBox.53179: 29114 NXDomain 0/0/0 (40)
16:12:42.088877 IP tony-VirtualBox.53179 > 192.168.162.35.domain: 29114+ PTR? 15.2.0.10.in-addr.arpa. (40)
16:12:42.092305 IP 192.168.162.35.domain > tony-VirtualBox.53179: 29114 NXDomain 0/0/0 (40)
5 packets captured
9 packets received by filter
0 packets dropped by kernel
tony@tony-VirtualBox:~$
```

Use port filter to view packets arriving at a specific port:

```
sudo tcpdump -i enp0s3 -c 5 port 80
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -i enp0s3 -c 5 port 80
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
16:19:20.016521 IP tony-VirtualBox.37906 > 17.111.232.35.bc.googleusercontent.com.http: Flags [S], seq 223348220, win 64240
16:19:20.292497 IP 17.111.232.35.bc.googleusercontent.com.http > tony-VirtualBox.37906: Flags [S.], seq 17728001, ack 223348220
16:19:20.292534 IP tony-VirtualBox.37906 > 17.111.232.35.bc.googleusercontent.com.http: Flags [.], ack 1, win 64240, length 1
16:19:20.292988 IP tony-VirtualBox.37906 > 17.111.232.35.bc.googleusercontent.com.http: Flags [P.], seq 1:88, ack 1, win 65535, length 87
16:19:20.293569 IP 17.111.232.35.bc.googleusercontent.com.http > tony-VirtualBox.37906: Flags [.], ack 88, win 65535, length 1
5 packets captured
5 packets received by filter
0 packets dropped by kernel
tony@tony-VirtualBox:~$
```

To capture all packets arriving at or leaving from the host with IP address of 10.0.2.15:

```
sudo tcpdump host 10.0.2.15
```

```
tony@tony-VirtualBox:~$ sudo tcpdump host 10.0.2.15
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
16:24:20.026079 IP tony-VirtualBox.49533 > 192.168.162.35.domain: 33037+ [bau] A? connectivity-check.ubuntu.com. (58)
16:24:20.026786 IP tony-VirtualBox.57154 > 192.168.162.35.domain: 2432+ [bau] PTR? 35.162.168.192.in-addr.arpa. (56)
16:24:20.031914 IP 192.168.162.35.domain > tony-VirtualBox.57154: 2432 NXDomain 0/0/0 (45)
16:24:20.032905 IP tony-VirtualBox.57154 > 192.168.162.35.domain: 2432+ PTR? 35.162.168.192.in-addr.arpa. (45)
16:24:20.037407 IP 192.168.162.35.domain > tony-VirtualBox.57154: 2432 NXDomain 0/0/0 (45)
16:24:20.038017 IP tony-VirtualBox.52694 > 192.168.162.35.domain: 24139+ [bau] PTR? 15.2.0.10.in-addr.arpa. (51)
16:24:20.043221 IP 192.168.162.35.domain > tony-VirtualBox.52694: 24139 NXDomain 0/0/0 (40)
16:24:20.043360 IP tony-VirtualBox.52694 > 192.168.162.35.domain: 24139+ PTR? 15.2.0.10.in-addr.arpa. (40)
16:24:20.048884 IP 192.168.162.35.domain > tony-VirtualBox.52694: 24139 NXDomain 0/0/0 (40)
16:24:20.069626 IP 192.168.162.35.domain > tony-VirtualBox.49533: 33037 3/0/1 A 35.232.111.17, A 35.224.170.84, A 34.122.121.32 (106)
16:24:20.097669 IP tony-VirtualBox.46162 > 32.121.122.34.bc.googleusercontent.com.http: Flags [S], seq 692512774, win 64240, options [mss 1460]
16:24:20.098077 IP tony-VirtualBox.52570 > 192.168.162.35.domain: 25639+ [bau] PTR? 32.121.122.34.in-addr.arpa. (55)
16:24:20.198320 IP 192.168.162.35.domain > tony-VirtualBox.52570: 25639 1/0/1 PTR 32.121.122.34.bc.googleusercontent.com. (107)
16:24:20.377333 IP 32.121.122.34.bc.googleusercontent.com.http > tony-VirtualBox.46162: Flags [S], seq 19200001, ack 692512775, win 65535,
```

To capture packets of a specific protocol type, for example, arp, on enp0s3 interface:

```
sudo tcpdump -i enp0s3 arp
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -i enp0s3 arp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
16:37:55.145890 ARP, Request who-has _gateway tell tony-VirtualBox, length 28
16:37:55.146870 ARP, Reply _gateway is-at 52:54:00:12:35:02 (oui Unknown), length 46
```

Packets from a specific IP and destined for a specific port:

```
sudo tcpdump -n -i enp0s3 src 10.0.2.15 and dst port 80
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -n -i enp0s3 src 10.0.2.15 and dst port 80
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
16:54:20.062512 IP 10.0.2.15.46174 > 34.122.121.32.80: Flags [S], seq 3005138725, win 64240, options [mss 1460,sackOK,TSAckOk]
16:54:20.549957 IP 10.0.2.15.46174 > 34.122.121.32.80: Flags [.], ack 27776002, win 64240, length 0
16:54:20.550220 IP 10.0.2.15.46174 > 34.122.121.32.80: Flags [P.], seq 0:87, ack 1, win 64240, length 87: HTTP: GET / HTTP/1.1
16:54:20.4086436 IP 10.0.2.15.46174 > 34.122.121.32.80: Flags [F.], seq 87, ack 1, win 64240, length 0
16:54:20.744727 IP 10.0.2.15.51558 > 35.224.170.84.80: Flags [S], seq 422920911, win 64240, options [mss 1460,sackOK,TSAckOk]
16:54:21.018411 IP 10.0.2.15.51558 > 35.224.170.84.80: Flags [.], ack 30528002, win 64240, length 0
16:54:21.019202 IP 10.0.2.15.51558 > 35.224.170.84.80: Flags [P.], seq 0:87, ack 1, win 64240, length 87: HTTP: GET / HTTP/1.1
16:54:21.307958 IP 10.0.2.15.51558 > 35.224.170.84.80: Flags [.], ack 149, win 64092, length 0
16:54:21.308118 IP 10.0.2.15.51558 > 35.224.170.84.80: Flags [F.], seq 87, ack 150, win 64091, length 0
```

To capture all packets except ICMP, use the NOT operator:

```
sudo tcpdump -i enp0s3 not icmp
```

PCAP stands for packet capture. The following command saves 10 lines of output on the enp0s3 interface to icmp.pcap

```
sudo tcpdump -i enp0s3 -c 10 -w icmp.pcap
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -i enp0s3 -c 10 -w icmp.pcap
[sudo] password for tony:
tcpdump: listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
10 packets captured
12 packets received by filter
0 packets dropped by kernel
tony@tony-VirtualBox:~$ █
```

You can read this file with -r flag:

```
sudo tcpdump -r icmp.pcap
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -r icmp.pcap
reading from file icmp.pcap, link-type EN10MB (Ethernet)
18:55:43.709178 IP tony-VirtualBox.43095 > 192.168.162.35.domain: 32966+ [rau] A? connectivity-check.ubuntu.com. (58)
18:55:43.773446 IP 192.168.162.35.domain > tony-VirtualBox.43095: 32966 3/0/1 A 34.122.121.32, A 35.232.111.17, A 35.224.170.84 (106)
18:55:43.777480 IP tony-VirtualBox.51632 > 84.170.224.35.bc.googleusercontent.com.http: Flags [S], seq 3320550811, win 64240, options [mss 1460,sackOK,T5 val 2387881186 ecr 0,nop,wscale 7], length 0
18:55:43.782521 IP 84.170.224.35.bc.googleusercontent.com.http > tony-VirtualBox.51632: Flags [F.], seq 3320550811, ack 3320550752, win 65535, options [mss 1460], length 0
18:55:44.052043 IP tony-VirtualBox.51632 > 84.170.224.35.bc.googleusercontent.com.http: Flags [P.], seq 1:88, ack 1, win 64240, length 0
18:55:44.052295 IP tony-VirtualBox.51632 > 84.170.224.35.bc.googleusercontent.com.http: Flags [P.], seq 1:88, ack 1, win 64240, length 0
18:55:44.053046 IP 84.170.224.35.bc.googleusercontent.com.http > tony-VirtualBox.51632: Flags [., ack 88, win 65535], length 0
18:55:44.530193 IP 84.170.224.35.bc.googleusercontent.com.http > tony-VirtualBox.51632: Flags [P.], seq 1:149, ack 88, win 65535, length 148: HTTP: HTTP/1.1 204 No Content
18:55:44.530209 IP tony-VirtualBox.51632 > 84.170.224.35.bc.googleusercontent.com.http: Flags [., ack 149, win 64992, length 0
18:55:44.530229 IP 84.170.224.35.bc.googleusercontent.com.http > tony-VirtualBox.51632: Flags [F.], seq 149, ack 88, win 65535, length 0
tony@tony-VirtualBox:~$ █
```

To view packet contents use -A option. This prints the packet contents in ASCII, which can be of help in network troubleshooting.

```
sudo tcpdump -c10 -i enp0s3 -n -A port 80
```

```
tony@tony-VirtualBox:~$ sudo tcpdump -c10 -i enp0s3 -n -A port 80
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), capture size 262144 bytes
19:00:43.702938 IP 10.0.2.15.46252 > 34.122.121.32.80: Flags [S], seq 1253739217, win 64240, options [mss 1460,sackOK,T5 val 1308266380 ecr 0,nop,wscale 7], length 0
E..<...@.0...
...."zy ...P3.....M...
M.....
19:00:44.004413 IP 34.122.121.32.80 > 10.0.2.15.46252: Flags [S.], seq 82624001, ack 1253739218, win 65535, options [mss 1460], length 0
E..<...@.0...
...."zy ..P...J.....
19:00:44.004533 IP 10.0.2.15.46252 > 34.122.121.32.80: Flags [., ack 1, win 64240], length 0
E..(./0.0...
...."zy .....P.....
19:00:44.005670 IP 10.0.2.15.46252 > 34.122.121.32.80: Flags [P.], seq 1:88, ack 1, win 64240, length 87: HTTP: GET / HTTP/1.1
E..<...@.0...
...."zy ...P.....P.....GET / HTTP/1.1
Host: connectivity-check.ubuntu.com
Accept: */*
Connection: close

19:00:44.007495 IP 34.122.121.32.80 > 10.0.2.15.46252: Flags [., ack 88, win 65535, length 0
E..(....@.r"zy
....P.....J...P....\.....19:00:45.021933 IP 34.122.121.32.80 > 10.0.2.15.46252: Flags [P.], seq 1:149, ack 88, win 65535, length 148: HTTP: HTTP/1.1 204 No Content
E..<...@."zy
....P.....J...)P...W...HTTP/1.1 204 No Content
Date: Thu, 30 Sep 2021 13:30:44 GMT
Server: Apache/2.4.18 (Ubuntu)
X-NetworkManager-Status: online
Connection: close
tony@tony-VirtualBox:~$ █
```

Shell Scripting

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

```
echo "enter details and view" echo enter your name  
read name echo enter your college name read c clear  
echo Details you entered  
echo Name:$name echo  
College:$c
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 1.sh  
enter details and view  
enter your name  
sreya  
enter your college name  
amal jyothi college  
  
Details you entered  
Name:sreya  
College:amal jyothi college  
user@user-VirtualBox:~$
```

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

```
echo "Display value of a variable"  
a=50 echo $a
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 2.sh  
Display value of a variable  
50
```

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

```
echo enter a number read a echo enter another number read b echo
enter operation 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
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 3.sh
enter a number
7
enter another number
8
enter operation
\n1.addition \n2.subtraction \n3.multiplication \n4.division
2
a-b=-1
```

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

```
echo enter a
number read a if [
$a -eq 10 ]; then
echo "number found"
else
echo "not
found" fi
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 4.sh
enter a number
9
not found
```

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

```
echo "Today is $(date)"
echo "calender:" cal
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 5.sh
Today is Saturday 02 October 2021 05:53:45 PM IST
calender:
          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 enter a number
read n x=$(( $n % 2
)) if [ $x -eq 0 ];
then echo "number is
even" else echo
"number is odd" fi
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 6.sh
enter a number
4
number is even
```

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

```
echo enter first number
read a
echo enter second number
read b if [ $a -gt $b ];
then
echo "$a is larger"
elif [ $b -gt $a ];
then echo "$b is
larger" else echo
"both are equal" fi
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 7.sh
enter first number
54
enter second number
34
54 is larger
```

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

```
s=0 for ((i=0;i<=10;i++)) do  
s=`expr $s + $i` done echo "sum  
of first 10 numbers=$s"
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 8.sh  
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.

```
echo please enter your first number  
read a  
echo please enter your second number  
read b echo please enter your third  
number read c  
echo please enter your fourth number  
read d sum=$((a + b + c + d))  
prod=$((a * b * c * d))  
avg=$(echo $sum/4 | bc -l)  
echo "the sum is:$sum echo  
"the average is:$avg echo  
"the product is:$prod
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 9.sh  
please enter your first number  
1  
please enter your second number  
2  
please enter your third number  
3  
please enter your fourth number  
4  
the sum is:10  
the average is:2.5000000000000000000000000000000  
the product is:24
```

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

```
echo enter first number
read a echo enter
second number read b
echo enter third number
read c if [ $a -lt $b
]; then if [ $a -lt $c
]; then echo "$a is
smallest" fi
elif [ $b -lt $c ];
then
echo "$b is smallest"
else echo "$c is
smallest"; fi
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 10.sh
enter first number
5
enter second number
2
enter third number
6
2 is smallest
```

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

```
echo enter a number
read n f=1 for
((i=2;i<=n;i++)) do
f=$((f*i)) done echo
"factorial is $f"
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 11.sh
enter a number
5
factorial is 120
```

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

```
echo enter a number read n
rev=$(echo $n | rev) if [ $n -
eq $rev ]; then echo "number
```

```
is palindrome" else echo  
"number is not palindrome" fi
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 12.sh  
enter a number  
1221  
number is palindrome
```

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

```
echo enter size read n  
i=1 s=0 echo "enter  
numbers" while [ $i -le  
$n ] do read num  
s=$((s+num)) i=$((i+1))  
done avg=$(echo $s/$n |  
bc -l)  
echo "average is $avg"
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 13.sh  
enter size  
5  
enter numbers  
6  
7  
8  
9  
4  
average is 6.80000000000000000000000000000000
```

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

```
echo enter a
number read n s=0
while [ $n -gt 0 ]
do
mod=$((n%10))
s=$((s+mod))
n=$((n/10))
done
echo "sum of digit is $s"
```

OUTPUT:

```
user@user-VirtualBox:~$ bash 14.sh
enter a number
678
sum of digit is 21
```

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

```
echo enter year read y a=$((y%4))
b=$((y%100)) c=$((y%400)) if [ $a -eq
0 -a $b -ne 0 -o $c -eq 0 ]; then echo
"$y is leap year" else echo "$y is leap
year" fi
```

OUTPUT:

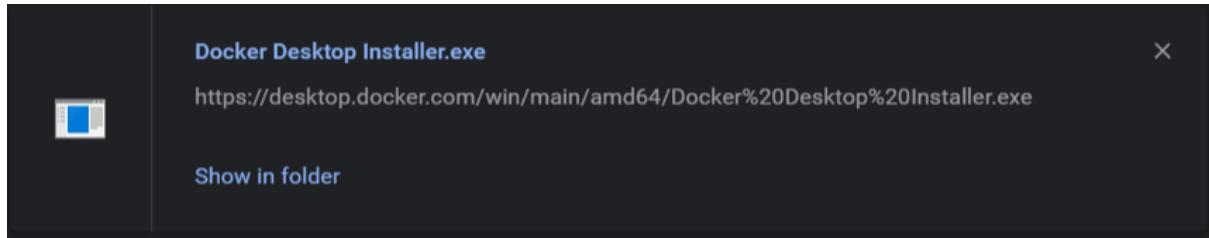
```
user@user-VirtualBox:~$ bash 15.sh
enter year
1994
1994 is leap year
```

Installation and deployment of Docker

Step1:

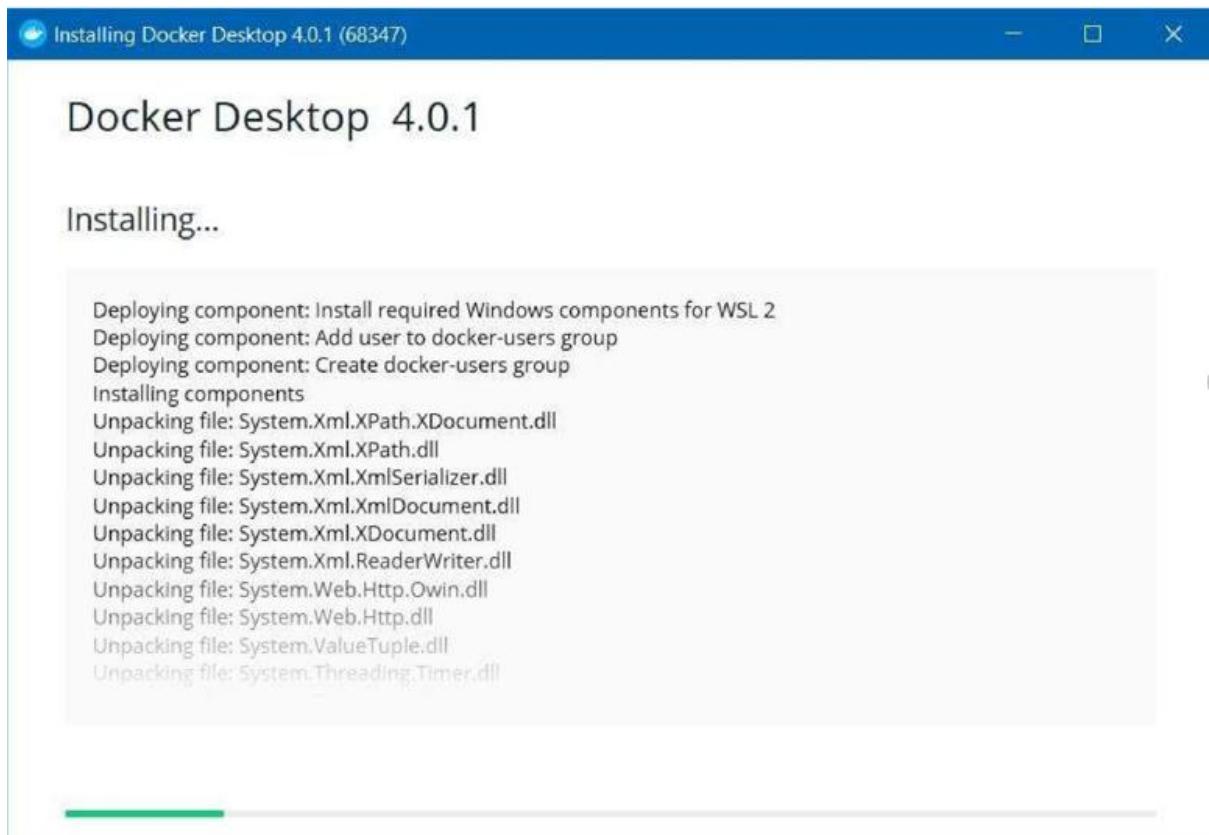
Download Docker Desktop installer for Windows from

<https://desktop.docker.com/win/main/amd64/Docker%20Desktop%20Installer.exe>.



Step 2:

Open the exe file and follow the steps in the installation process.



Step 3:

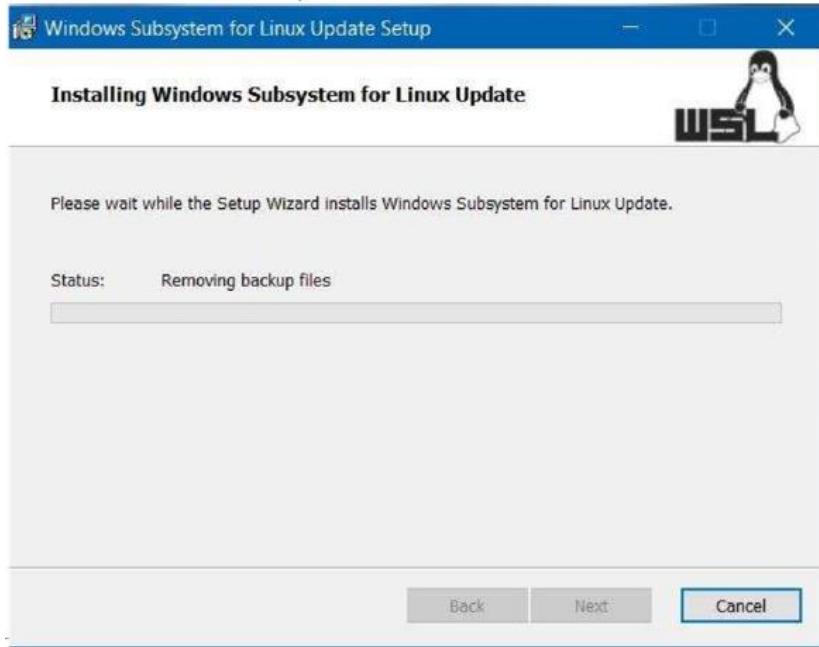
After installing go to programs and features and click turn on windows features on or off.

Scroll to the bottom and select windows subsystem for Linux



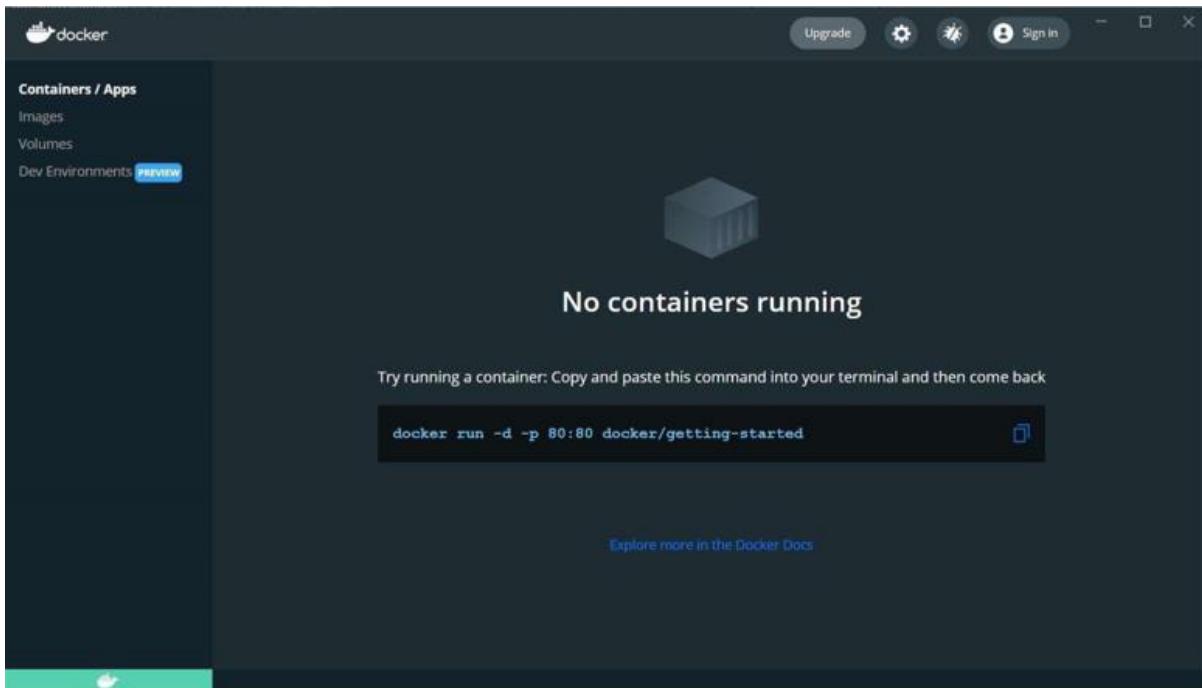
Step 4:

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 5:

Once installed, open the Docker desktop app, and sign in using the Docker ID.



Step 6:

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.

The screenshot shows the Docker desktop application interface. On the left, there's a sidebar with tabs for 'Containers / Apps', 'Images' (which is selected), 'Volumes', and 'Dev Environments'. The main area is titled 'Images on disk' and shows '1 images' with a total size of '72.78 MB'. There are two buttons at the top right: 'Upgrade' and 'Clean up...'. Below this, there are two tabs: 'LOCAL' (selected) and 'REMOTE REPOSITORIES'. A search bar and a checkbox for 'In Use only' are also present. A table lists the single image entry:

| NAME | TAG | IMAGE ID | CREATED | SIZE |
|--------|--------|--------------|-------------------|----------|
| ubuntu | latest | 597ce1600cf4 | about 8 hours ago | 72.78 MB |

Analyzing network packet stream using nc and wireshark

sudo apt-get install wireshark

```
tony@tony-VirtualBox:~$ sudo apt-get install wireshark
[sudo] password for tony:
Sorry, try again.
[sudo] password for tony:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gyp libjs-inherits libjs-is-typedarray libjs-psl libjs-typedarray-to-buffer
  libssl-dev libuv1-dev nodejs-doc python-pkg-resources
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5 libqt5gui5
  libqt5multimedia5 libqt5multimedia5-plugins libqt5multimediasupports5
  libqt5multimediacomposition5 libqt5network5 libqt5opengl5 libqt5printsupport5
  libqt5svg5 libqt5widgets5 libsmi2ldbl libspandsp2 libssh-gcrypt-4
  libwireshark-data libwireshark13 libwiredtap10 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:
  libdouble-conversion3 libpcre2-16-0 libqt5core5a libqt5dbus5 libqt5gui5
  libqt5multimedia5 libqt5multimedia5-plugins libqt5multimediasupports5
  libqt5multimediacomposition5 libqt5network5 libqt5opengl5 libqt5printsupport5
```

Package configuration

Configuring wireshark-common

Dumpcap can be installed in a way that allows members of the "wireshark" system group to capture packets. This is recommended over the alternative of running Wireshark/Tshark directly as root, because less of the code will run with elevated privileges.

For more detailed information please see
</usr/share/doc/wireshark-common/README.Debian>.

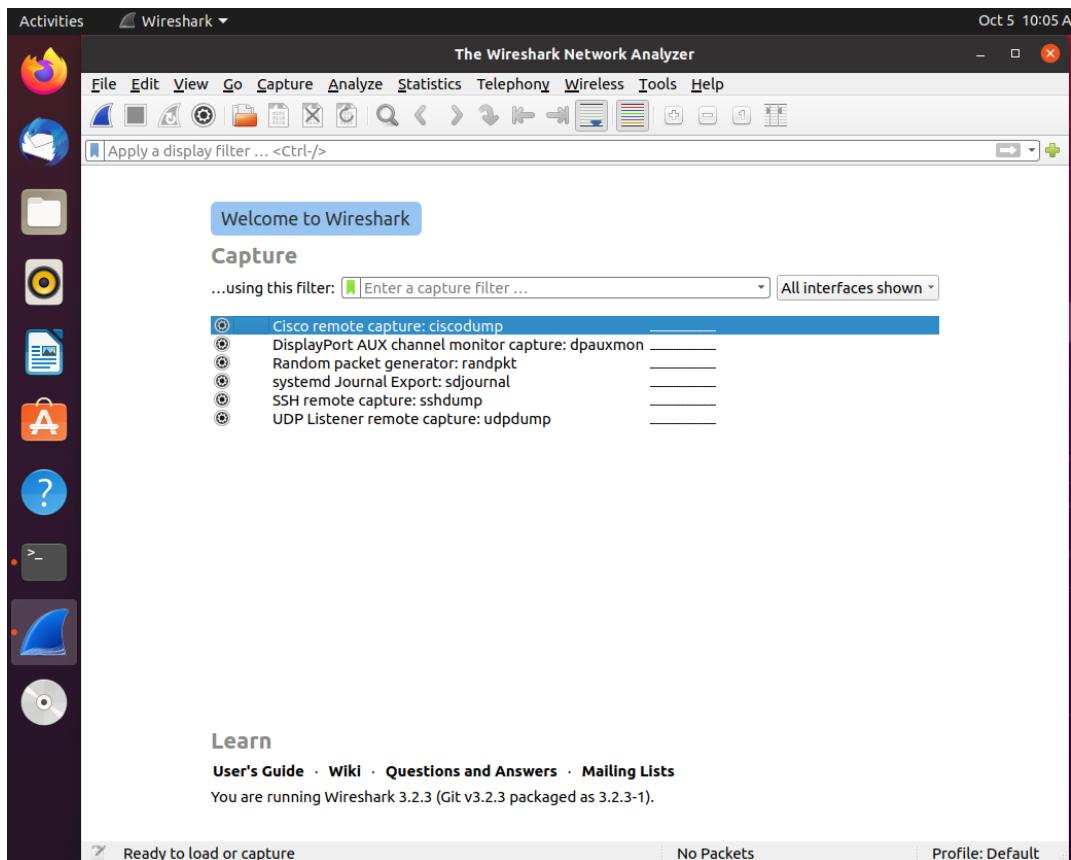
Enabling this feature may be a security risk, so it is disabled by default. If in doubt, it is suggested to leave it disabled.

Should non-superusers be able to capture packets?

<Yes> 

<No>

Open from App list



Netcat

```
tony@tony-VirtualBox:~$ nc -z -v 10.0.2.15 20-80
nc: connect to 10.0.2.15 port 20 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 21 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 22 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 23 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 24 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 25 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 26 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 27 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 28 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 29 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 30 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 31 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 32 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 33 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 34 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 35 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 36 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 37 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 38 (tcp) failed: Connection refused
nc: connect to 10.0.2.15 port 39 (tcp) failed: Connection refused
```