CEIS 106 FINAL COURSE PROJECT ON OPERATING SYSTEMS

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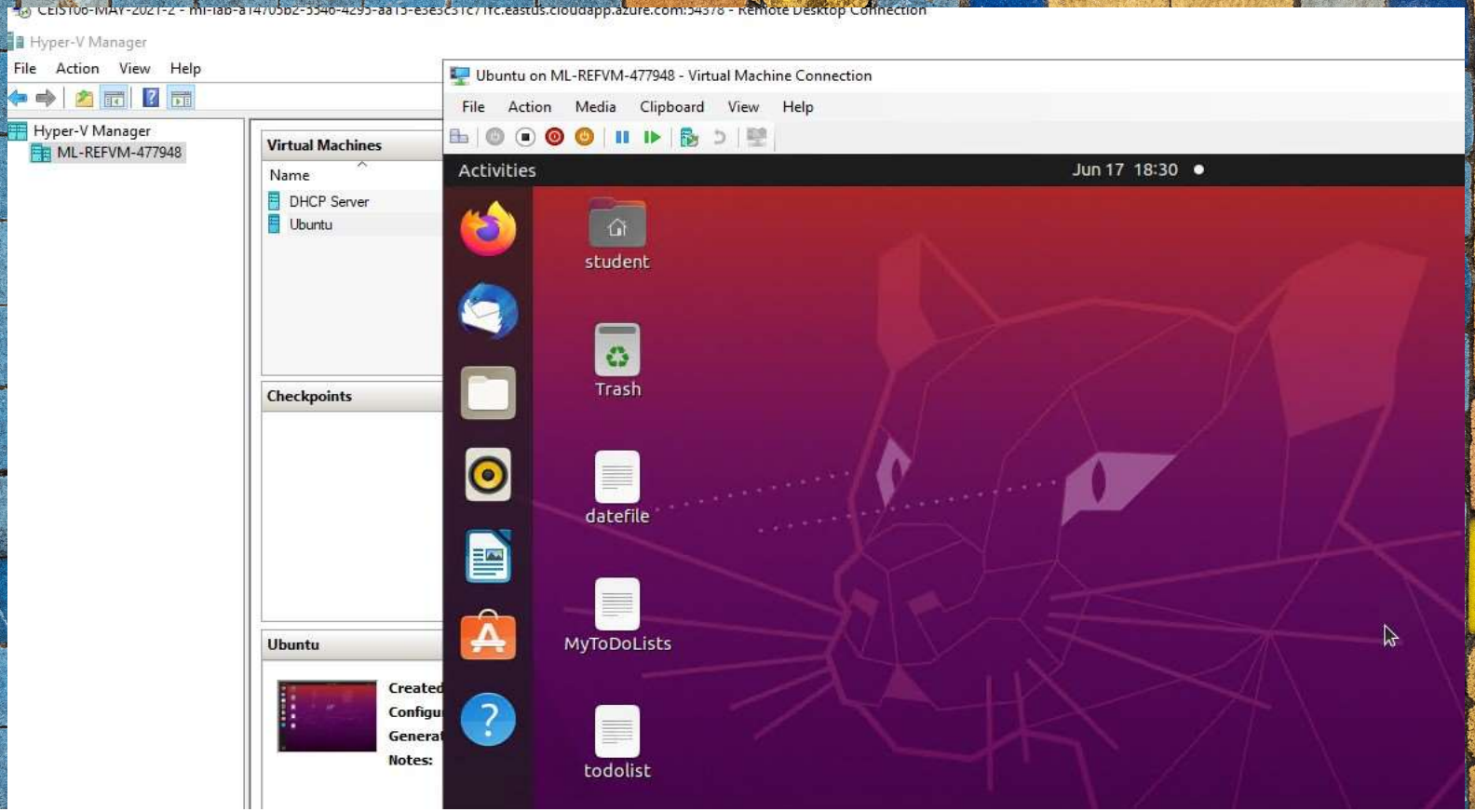
Introduction

This PowerPoint Demonstrates a detailed Summary of knowledge I gained over 8 weeks in Ceis106 Introduction to Operating System at DeVry University under the directions of Professor Simon Obeid.

Screenshot of Installed Linux's Ubuntu downloaded from software called VMware workstation through Azure Las services



LINUX FLE SYSTEM HIRARCHY

- It’s a tree structure that organizes files into directories and folders. Starting from the root, directories can contain subdirectories and files within them. Files in a directory are physically stored in the filesystem of a disk partition. Hence, without a solid understanding of filesystem hierarchy it can be very difficult to store and retrieve data in Linux.
- Some of the useful commands are as following: cd ~, pwd, tree –d –L 2., cd Documents, cd .., cd /, tree –d –L 3. etc.

the LiNavigate The Linux File System Tree

1. What is the *pwd* command an acronym for? What about the *cd* command?

Answer here:The pwd command is an acronym for “Print Working Directory”. It’s used a lot in Linux system. The cd command stand for ‘change directory’ and just like the name suggest it helps change the location of the current directory to any other directory of your choice.

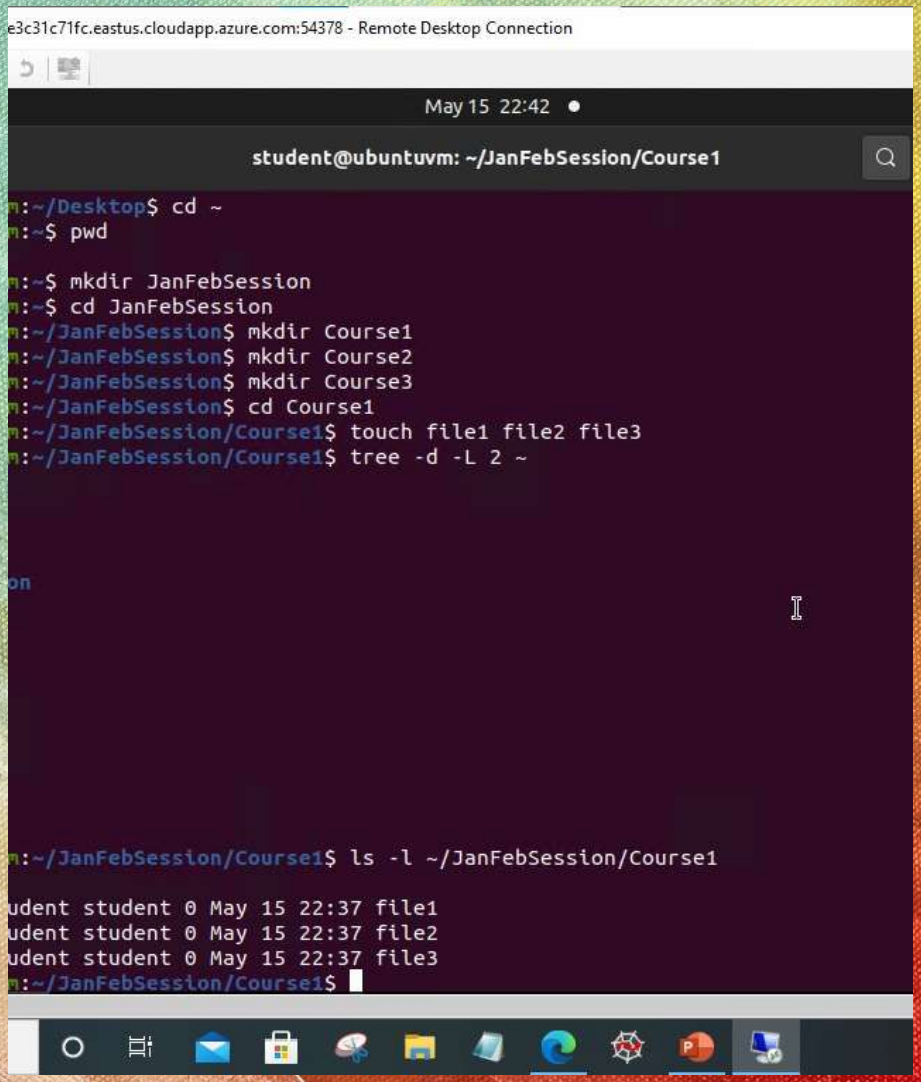
2. Explain the differences between a relative path and an absolute/full path in Linux.

Answer here: The absolute path or full-pathway starts from root and use / command and use absolute URL. Whereas. The relative path also known as non-absolute pathway or parted pathway contains a specified current path only and uses two dots “..” command along with relative URL.

References:

1. a. www.maketecheasier.com/pwd-command-linux-guide/
b. linuxhandbook.com/cd-command-examples/

2 . Difference Between Absolute and Relative Path (With Table) – Ask Any Difference



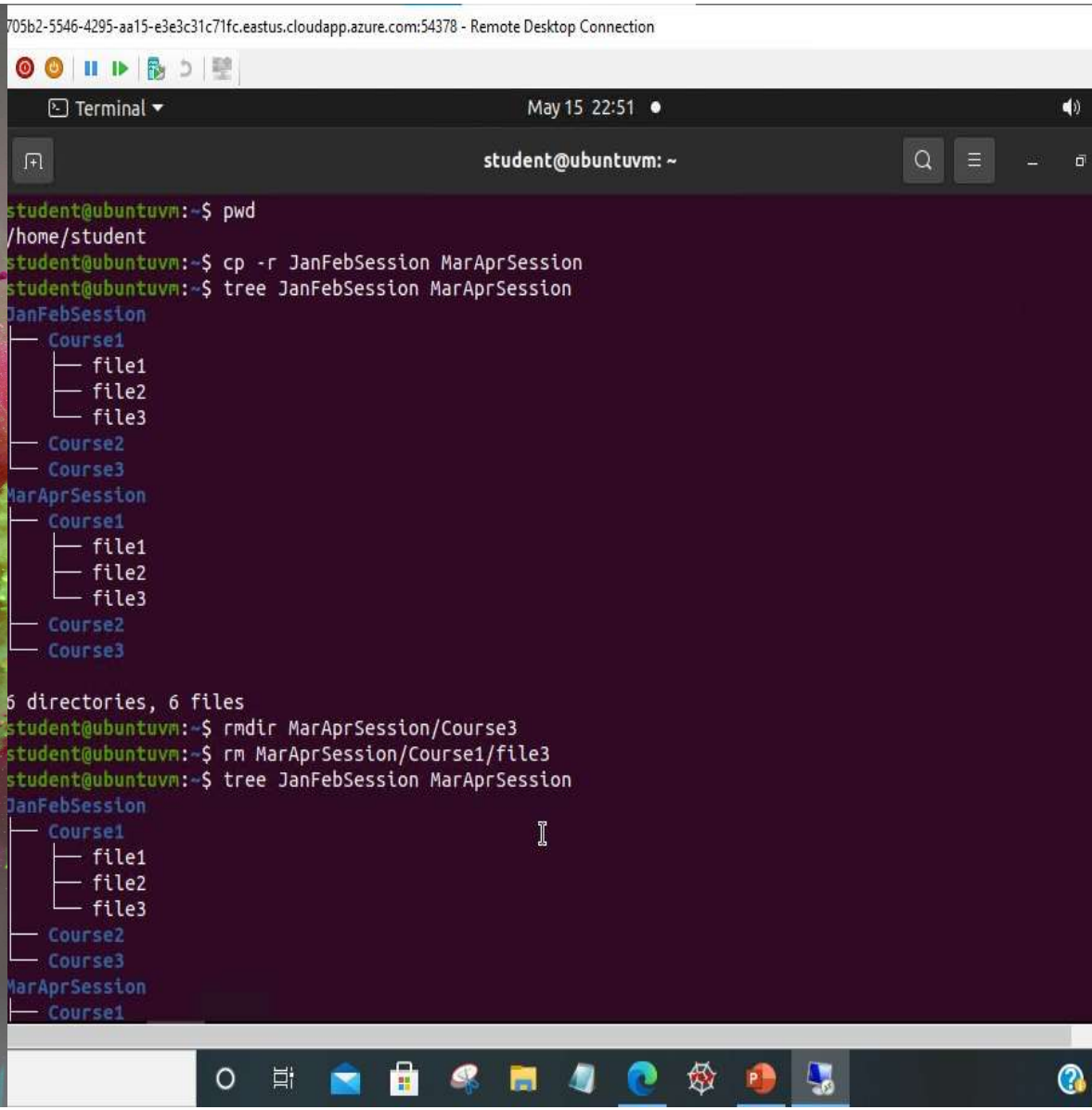
Create Directories & Files

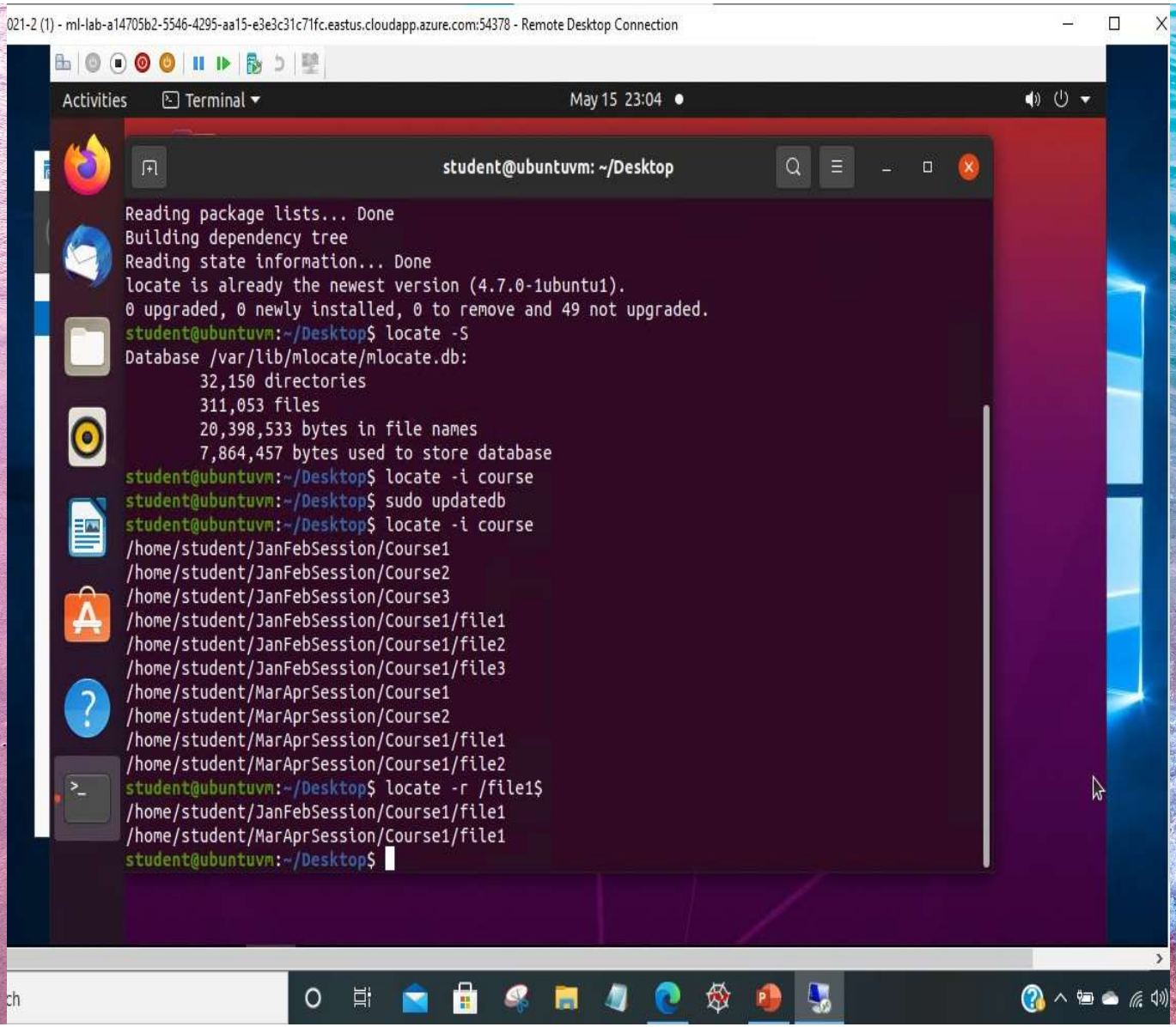
Here I created a subdirectory by entering mkdir JanFebSession , new directories were created by using touch command and tree –d –L 2 command was used to view the entire home directory tree along with newly created subdirectories. Command ls –l ~/JanFebSession/Course1 was entered to list the three new files as shown in the screenshot on the left.

Remove directories and Files

Here rmdir was used to remove the subdirectories and rm to remove file from the subdirectories as shown in the image

The tree command along with the name of subdirectory can be used toverify the successful removal of the file and subdirectory.





Locate Directories & Files

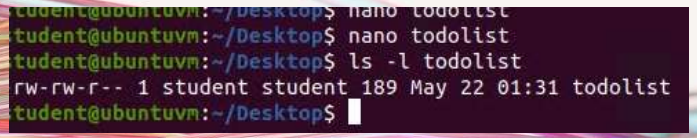
I can locate directories and files by using the command locate –and to search for the exact directory or file name, use –e command and the $ character at the end of the each term.

LINUX SHELL SCRIPTS

A shell script is a file that contains Linux commands and special constructs. It is used to perform and automate administrative tasks, by combining a lengthy sequence of commands into one script. A script is interpreted and executed by the Linux shell. Hence, any command that can be entered on the Linux command line can be part of a shell script. A shell script is often created as an ASCII text file by using a text editor program. I will create and execute a shell script by experimenting with the standard input, user defines

Create a shell script

- 1. What are the file permissions of the script?
- Answer here:

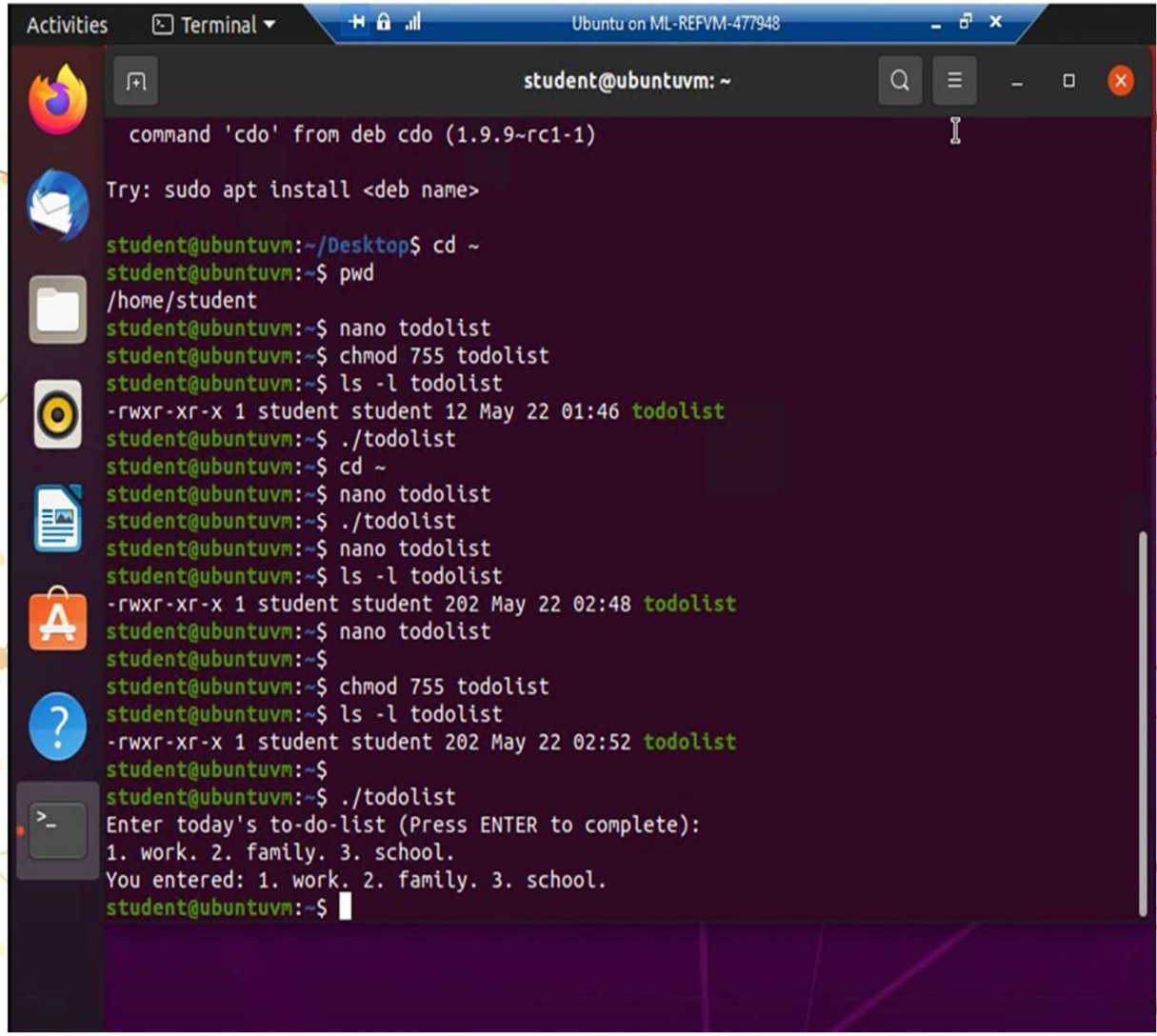


- 2. What's the name of the user-defined variable in the script?
- Answer here: Text is the name of the user-defined variable in the script.

- 3. Which redirection meta-character is used in the script? What does it do?
- Answer here: The meta-character used in script is ">>". It redirects output from date to the file MyToDoLists.

Change Script File Permissions

The scripts can be made executable by using chmod 755 command and the command ls –l can be used to verify the file permissions. Command ./todolist can be used to execute the script by calling it's name. Note that the .(dot) character represents the current directory, and ./todolist is the relative path name of the script.



Set The Path Variable

Path creates a list of directories and can be set by entering the command echo $PATH

```
student@ubuntuvm:~$ ls -a .bash*
.bash_history  .bash_logout  .bashrc
student@ubuntuvm:~$ cp .bashrc .bashrc.old
student@ubuntuvm:~$ nano .bashrc
student@ubuntuvm:~$ todolist

Command 'todolist' not found, but can be installed with:

sudo snap install todolist

student@ubuntuvm:~$ source .bashrc
student@ubuntuvm:~$ todolist
Enter today's to-do-list (Press ENTER to complete):
```

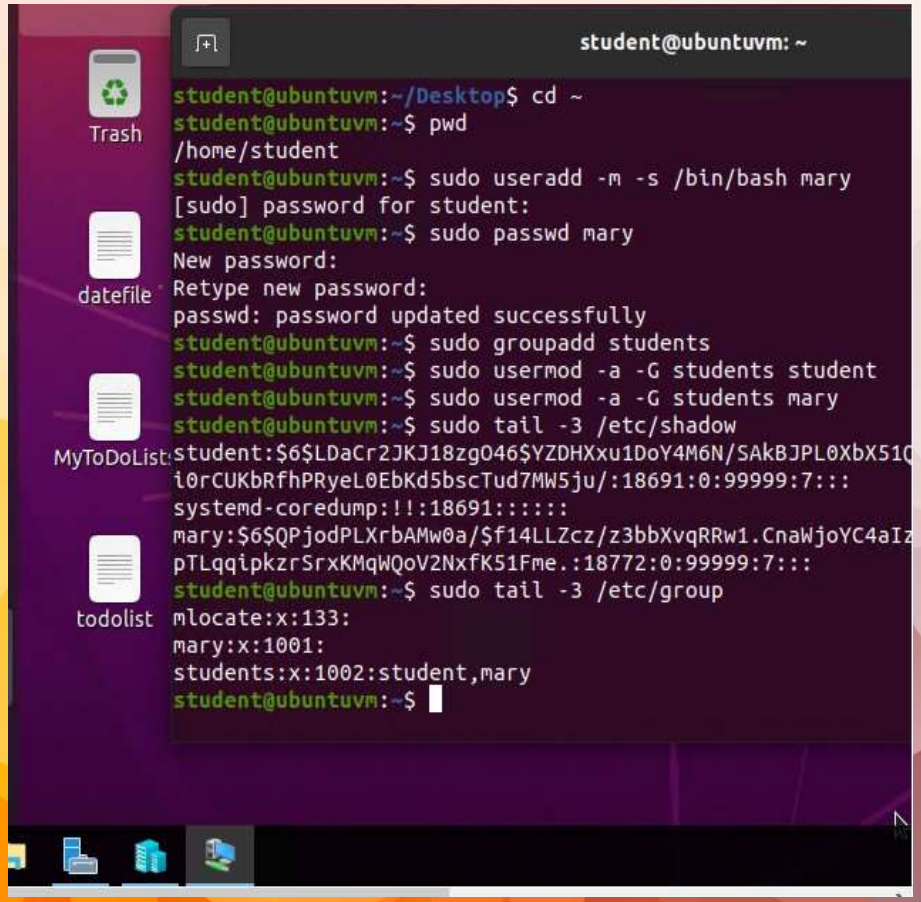
```
student@ubuntuvm:~$ cd ~
student@ubuntuvm:~$ pwd
/home/student
student@ubuntuvm:~$ todolist

Command 'todolist' not found, but can be installed with:

sudo snap install todolist
```

Make the PATH variable permanent

You can set a path variable permanently by modifying the hidden .bshrc file which runs every time a new terminal window is opened. To do this enter command ls –a .bash* to list the .bshrc file. You can also make a copy of it by entering cp .bashrc .bashrc.old command. You can use nano. Bashrc to open the .bashrc file. You can add a new line command by export PATH=$PATH:/home/username. Press ^x(control+x) and answer y to the question “Save modified buffer?” and press enter to keep the file name same. To active the change enter source.bashrc. Now you can easily open new terminal window and run the todolist script in both windows.

User & Group Management

User and group management is a common Linux administration task. Linux system requires a valid username and password like any other system for a user to log in. Only an authenticated user is granted access to system resources (e.g., files and directories) based on the user account. Groups are created so that administrative rights and file access are assigned to a group of users rather than one user at a time. To manage Linux users and groups, both Command Line Interface (CLI) and Graphical User Interface (GUI) can be utilized



Add users and groups in CLI

1. What does the *–m* option in the useradd command do?

Answer here: Its used to add a new user and only root user can do that!

2. What does the *-3* option in the tail command do?

Answer here: It's used to print last K number of lines.

3. Which line of the */etc/group* file lists members of the "students" group? Copy it here.

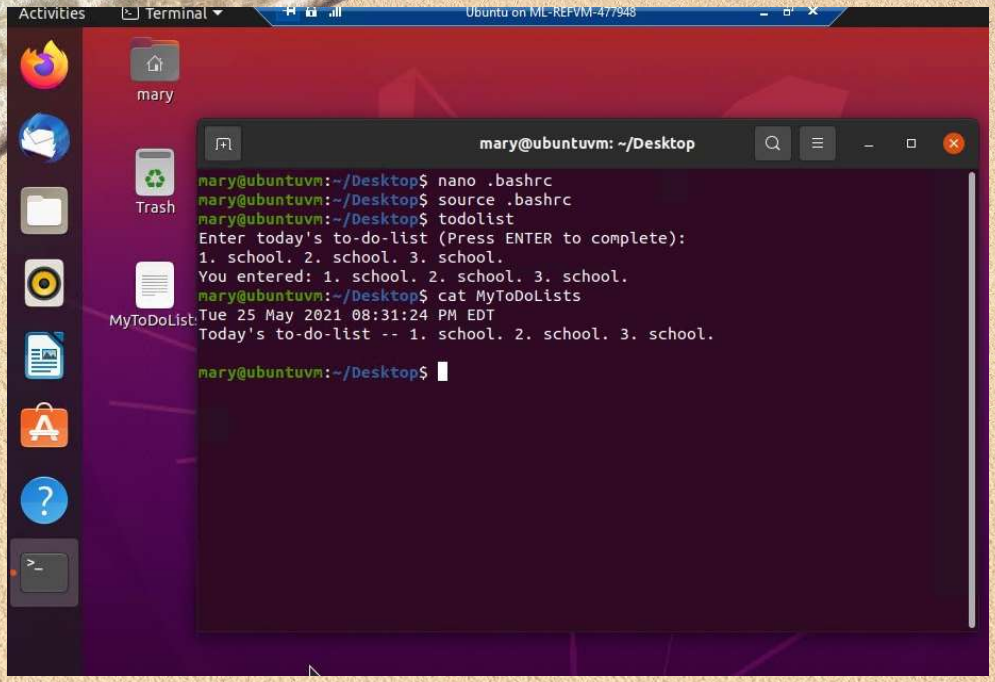
References:

1.Google

Test User & Group Settings

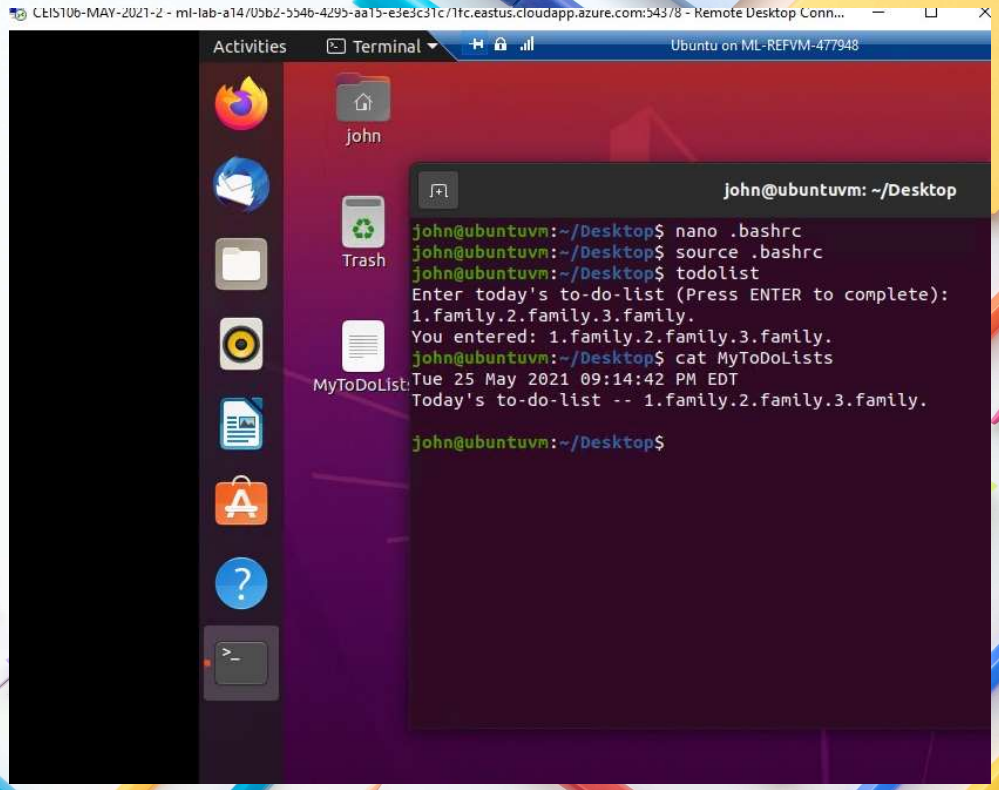
This can be done by using command sudo chgrp students todolist to change ownership of the todolist scripts to the “students” group.These changes can be verified by using ls –l command. Sudo chmod 750 todolist to modify the file permissions of the todolist scriptso others can use the file as well. Again this can be verified by using the command ls –l. then log out and log in as new user from the drop down menu. Then use nano .bashrc and open a new file in a new terminal window. In order to activate the change add a new line export PATH=$PATH:/home/student and entr the command source .bashrc. Finally, enter the todolist to execute the script and to view this new entry use cat MyToDoLists

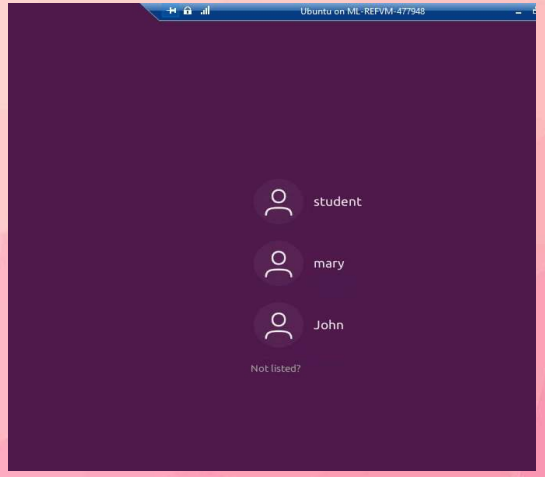
Take a screenshot of the output in Step 6.

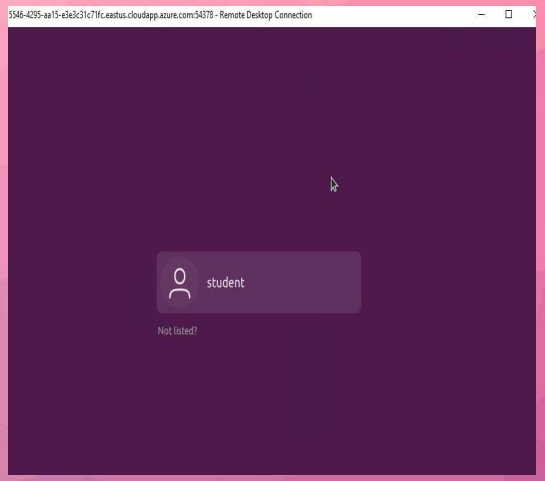


Add Users in GUI

Click nine dots on the bottom left corner in Ubuntu and launch GUI by clicking Users and Groups.
Then click on the Add button and create a new user with name “John” and assign a password. Next, highlight John on the user list and click Manage Groups and select “students” in the groups available on the system: list and click the “Properties” button. In the Group “students” Properties window check the name “John” on the “Group Member” list and click “ok” to close window. Click “close” twice and logout of the previous user and log in with the new user created. (ex. John)







Remove users and groups

The screenshot of the log on page with three user accounts.

These users can be removed with command sudo userdel –r xxxx (username). And the group can be removed by using command sudo groupdel xxxx(group name). Then log out and you can always log in to verify only your name is listed as the user account.

The screenshot of the log on page with only your user account (i.e., student).

NETWORK CONFIGURATION

A Linux machine requires an IP configurations including an IPv4/IPv6 address, default gateway, DNS server, etc. to be able to function on a network. A unique IP consists of a network portion and a host portion, is assigned to a computer to a computer to identify itself on a network. Networks with same IP addresses can communicate with each other without the use of a routing device. Therefore, computers on a local area network (LAN) segment have IP addresses with the same network portion but different host portions. Communications beyond a LAN segment, however require a routing device (i.e., default gateway) that forwards packets to and from a different network or network segment. In the following slides you will discover the IP configurations of your Linux machine and explore different network utility programs

Discover host IP configurations

1. What is the IP address of your Ubuntu machine?

Answer here: inet 192.168.1.105/24

2. What is the IP address of its default gateway?

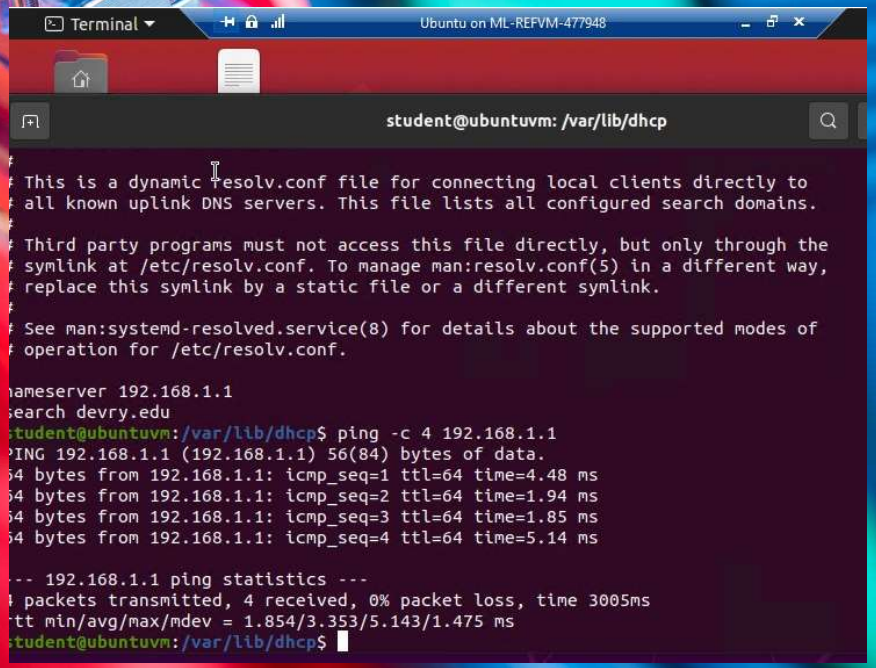
Answer here:192.168.1.1

3. What is the IP address of its DHCP server?

Answer here:192.168.1.1

4. What is the IP address of its DNS server?

Answer here:192.168.1.1



Manage network interfaces

1. Which DHCP message is shown in the output of the **sudo dhclient –v –r eth0** command? [hint: the message name is in uppercase.]

```
student@ubuntuvm:~$ sudo dhclient -v -r eth0
Internet Systems Consortium DHCP Client 4.4.1
Copyright 2004-2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/eth0/00:15:5d:00:04:01
Sending on   LPF/eth0/00:15:5d:00:04:01
Sending on   Socket/fallback
DHCPRELEASE of 192.168.1.105 on eth0 to 192.168.1.1 port 67 (xid=0x53debf5f)
```

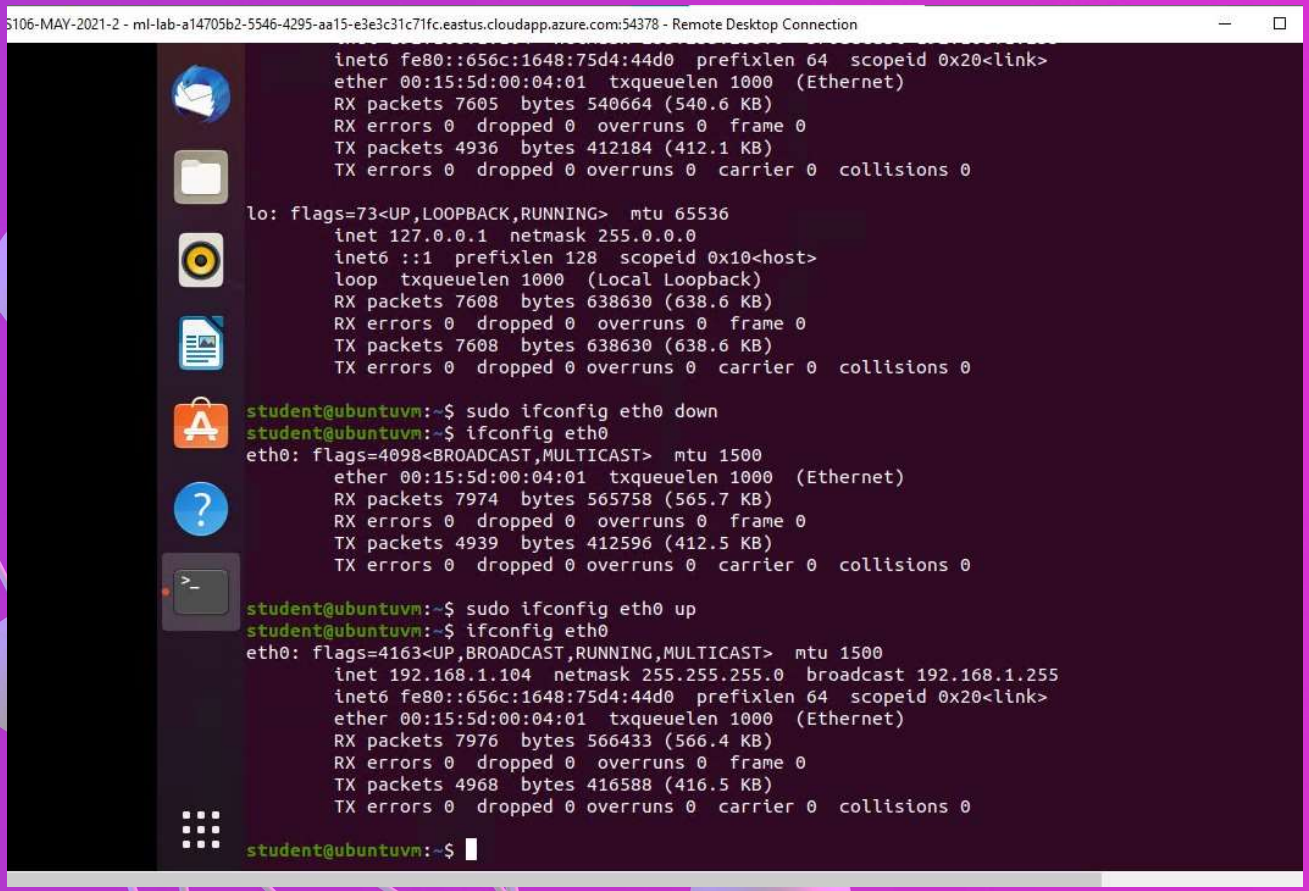
2. Which four DHCP messages are shown in the output of the **sudo dhclient –v eth0** command? [hint: the message names are in uppercase.]

Answer here:

```
student@ubuntuvm:~$ sudo dhclient -v eth0
Ubuntu Software
s Consortium DHCP Client 4.4.1
2018 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/eth0/00:15:5d:00:04:01
Sending on   LPF/eth0/00:15:5d:00:04:01
Sending on   Socket/fallback
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 3 (xid=0x24aa371c)
DHCPOFFER of 192.168.1.105 from 192.168.1.1
DHCPREQUEST for 192.168.1.105 on eth0 to 255.255.255.255 port 67 (xid=0x1c37aa24)
DHCPACK of 192.168.1.105 from 192.168.1.1 (xid=0x24aa371c)
bound to 192.168.1.105 -- renewal in 269 seconds.
```

Use network utilities

IP addresses assigned to all network interfaces can be displayed by using command ifconfig. Command sudo ifconfig eth0 down can be used to disable/deactivate the eth0 interface. Command ifconfig eth0 can be used to verify that the interface no longer has an IP address. Finally command sudo ifconfig eth0 can be used to enable/activate the eth0 interface. Enter ifconfig eth0 to verify it's status as RUNNING.(screenshot on the left shows that)



SYSTEM PERFORMANCE MONITORING

Linux System Performance could be affected by factors such as the amount of RAM, CPU utilization, storage device speed, and process load. A constant investigation is essential in order to keep the system up and running. Various CLI and GUI monitoring tools can be used to monitor system performance detect root causes of any problems.

Monitoring Linux Processes

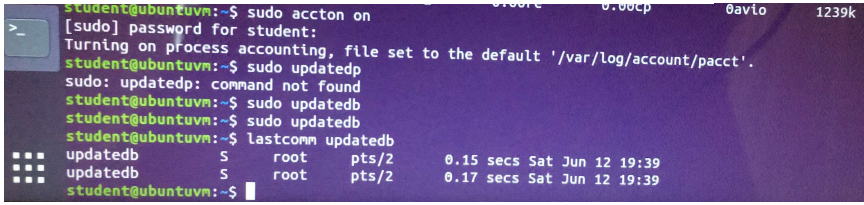
- **1. What is the default action of the *15 SIGTERM* kill signal?**
- **Answer here: It terminates/kill the task or application right away. For example, if an application such as calculator is running, we can immediately terminate it by pressing letter K and then pressing enter after 15 SIGTERM appears.**

- **2. In the System Monitor window, click on *% CPU* to sort the processes by CPU load. Which process shows the highest percentage of CPU usage?**
- **Answer here: gnome shell show the highest % of CPU used.**

- **References:**
- **1.Google**

Monitor user activities

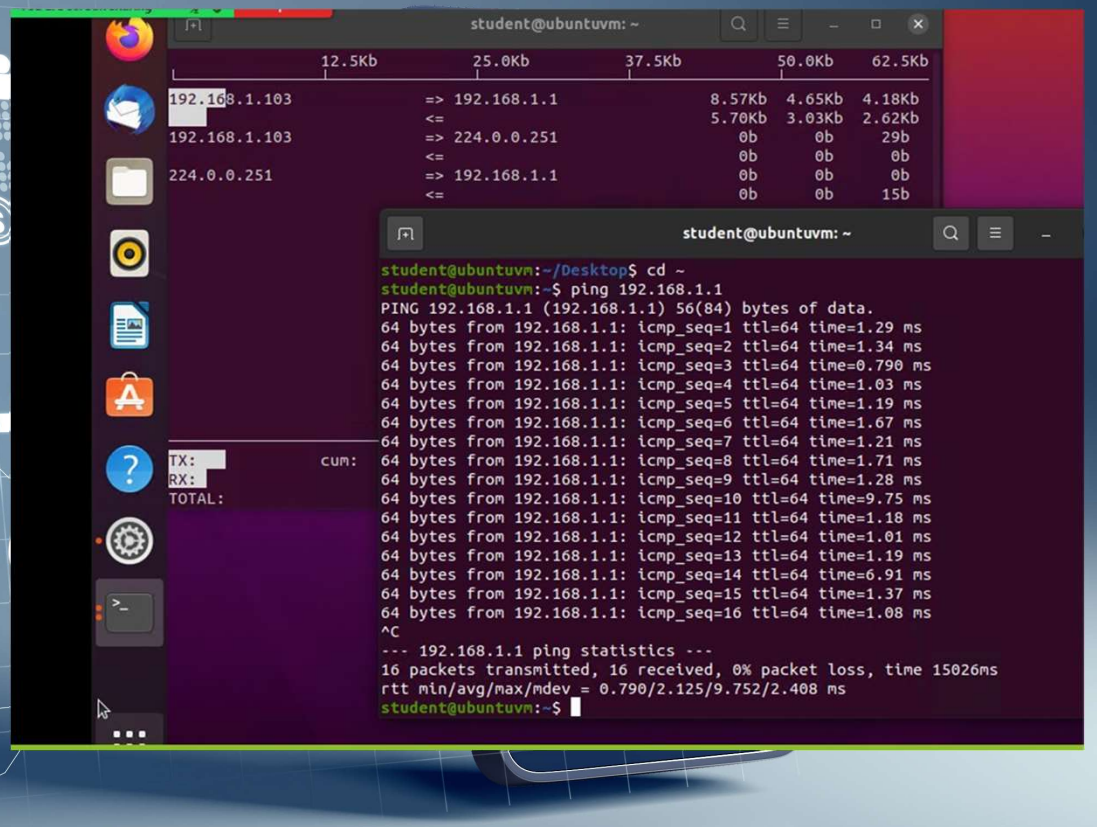
- Issue the **sudo accton on** command to turn on GNC accounting. Run the **sudo updatedb** command. Enter **lastcomm updatedb** to check if the *updatedb* command was executed before. Remember to turn off GNC accounting (**sudo accton off**) after answering the questions.
- 1. What flag value is displayed in the output?
- Answer here:



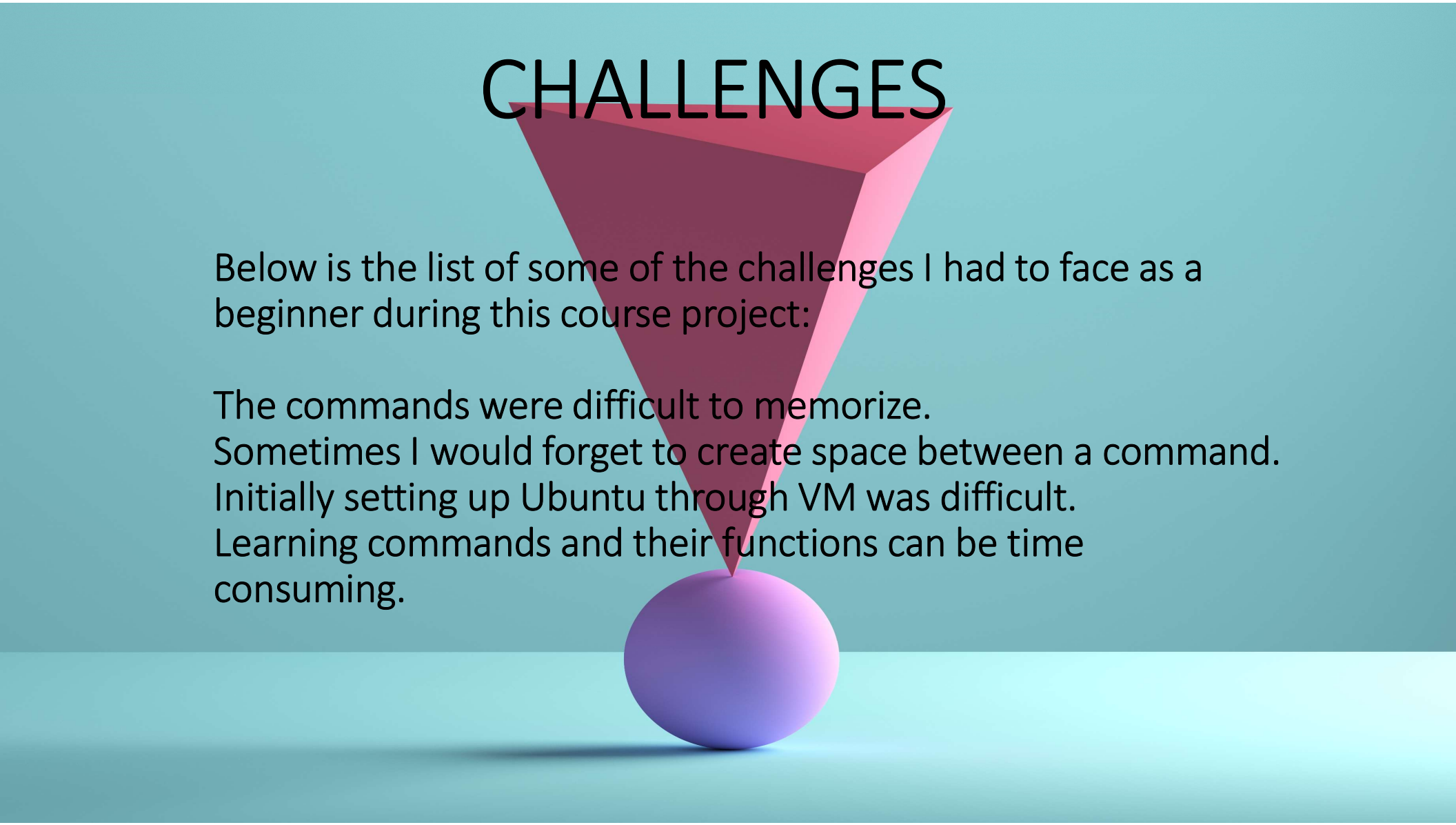
- 2. Why is the name of the user who ran the processes shown as root, not student?
- Answer here: Since my user is the default account on Linux system it has root privileges, I used the sudo command to execute the updated process. Hence, it was run with root privileges that's why it's shown as root and not as studend.

Monitoring Network Bandwidth usage

To display bandwidth usage you can usethe command sudo iftop and in another window type in ping 192.168.1.1. The display can be paused by typing in upper-case P and q to close the iftop utility. Letter n can be used to toggle DNS reverse lookup on/off.



CHALLENGES



Below is the list of some of the challenges I had to face as a beginner during this course project:

The commands were difficult to memorize.
Sometimes I would forget to create space between a command.
Initially setting up Ubuntu through VM was difficult.
Learning commands and their functions can be time consuming.

CAREER SKILLS

Basic career skills that I acquired during this project are:

Thinking with patience before proceeding.
Good understanding of basic Linux commands and their functions.
Networking.
Troubleshooting.
Security.
creating users and groups.
Managing IP addresses.
Analyzing and Planning.
Basic understanding of Operating Systems and their functions.
Characteristics of Linux and importance in the world today.

CONCLUSION

With some basic understanding of Operating Systems through Linux I feel more confident about my future in IT. It's been interesting experience but definitely required time and practice to excel!