CEIS106 Final Course Project

Operating Systems

Presented by Hector Acosta

Introduction

Throughout this project, I've navigated the complexity of Linux system administration, acquiring essential skills and knowledge to excel in the field. Beginning with Module 2, I explored the Linux filesystem, mastering commands for directory and file management—a crucial foundation laid in my journey as a system administrator. In Module 3, I delved into shell scripting, crafting scripts to automate tasks and solidify my understanding of Linux command line operations. Moving forward to Module 4, I took on the challenge of user and group management, honing my abilities to administer Linux systems effectively—a competency I've cultivated through hands-on practice and exploration in this project. Module 5 broadened my horizons with networking essentials, equipping me with the knowledge of IP configurations and utilities essential for seamless network participation. Module 6 provided invaluable insights into system monitoring, empowering me to maintain optimal performance and troubleshoot issues effectively—an expertise I've honed through diligent study and application. Finally, in Module 7, I embarked on the path towards certification, focusing on the prestigious CompTIA Linux+ certification—a milestone that validates my expertise and marks the culmination of my journey towards becoming a proficient Linux system administrator. Through this project, I've gained the confidence to showcase my skills and embark on a fulfilling career journey in the field of Linux system administration.

Module 2
Linux Filesystem Hierarchy

- Objective: In this module of the course project, I explore the Linux filesystem tree and common Linux commands used to manage directories and files.
- Overview: The Linux filesystem hierarchy is a tree structure that organizes files into directories or folders. Starting from the root, directories can contain other directories (called subdirectories) and files. Files in a directory are physically stored in the filesystem of a disk partition. A solid understanding of the filesystem hierarchy is the foundation of storing and retrieving data in Linux.

Navigate the Linux filesystem tree

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

- The command "pwd" (print working directory) writes the full pathname of the current working directory to the standard output and is used to verify the current directory upon pressing Enter.

- The command "cd" (Change Directory) is used to return to the Home directory any time upon pressing Enter.

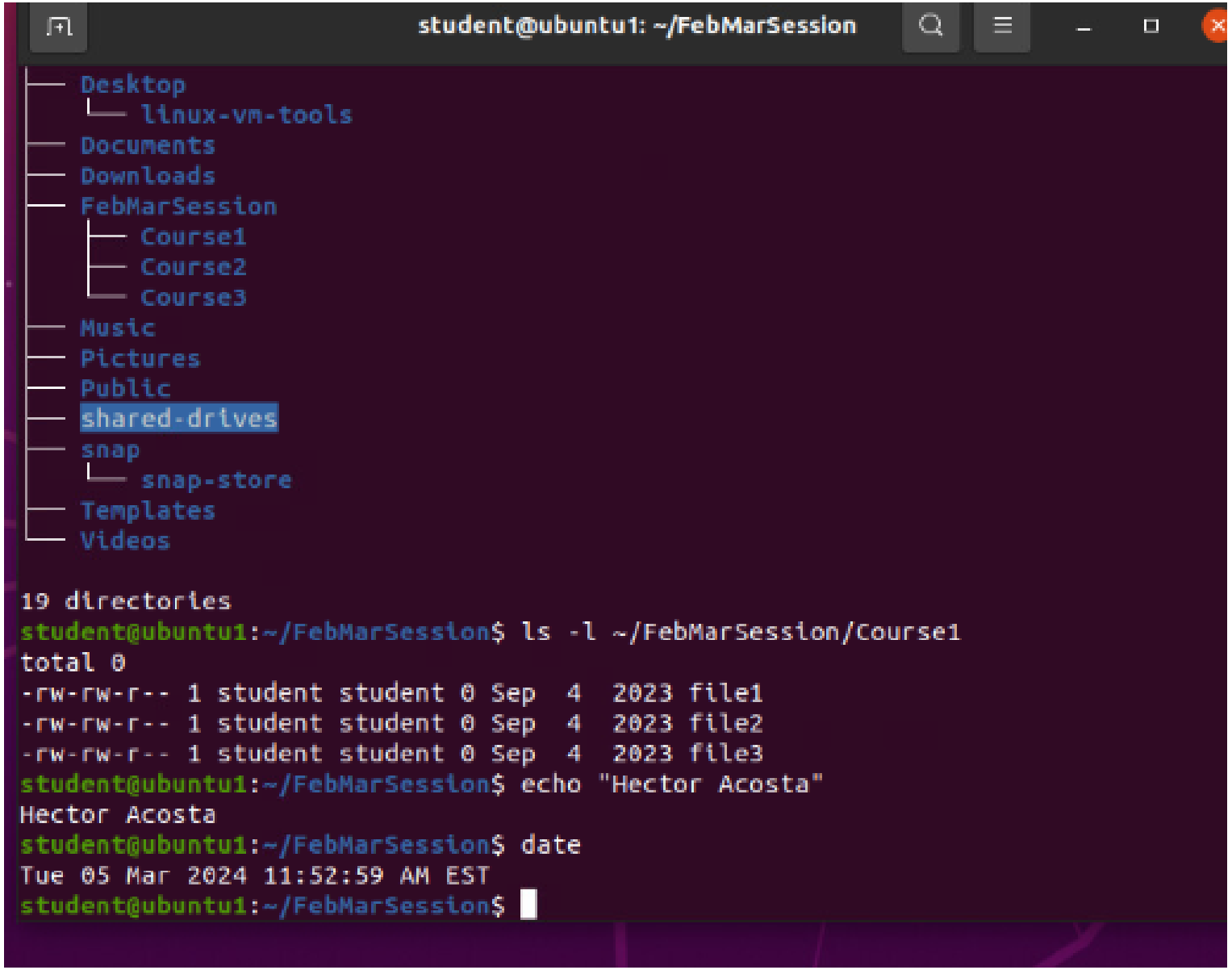
2. Explain the differences between a relative path and an absolute/full path in Linux.

- Understanding the difference between absolute and relative paths is crucial for navigating file systems effectively. An absolute path specifies the complete path from the root directory, while a relative path is related to the present working directory. By mastering these concepts, you can quickly change directories and access the files you need. For example, if you are in /var/log and want to change the directory to /var/log/kernel, you can use the relative path concept to achieve your goal efficiently. An absolute path specifies the complete path from the root directory, while a relative path is related to the present working directory. For instance, if you are in /var/log and want to change the directory to /var/log/kernel, you can use the relative path concept.

- References:

- 1.(2022, May 28). *Classic SysAdmin: Absolute Path vs Relative Path in Linux/Unix*. THE LINUX FOUNDATION. Retrieved March 5, 2024, from https://www.linuxfoundation.org/blog/blog/classic-sysadmin-absolute-path-vs-relative-path-in-linux-unix

Create directories and files

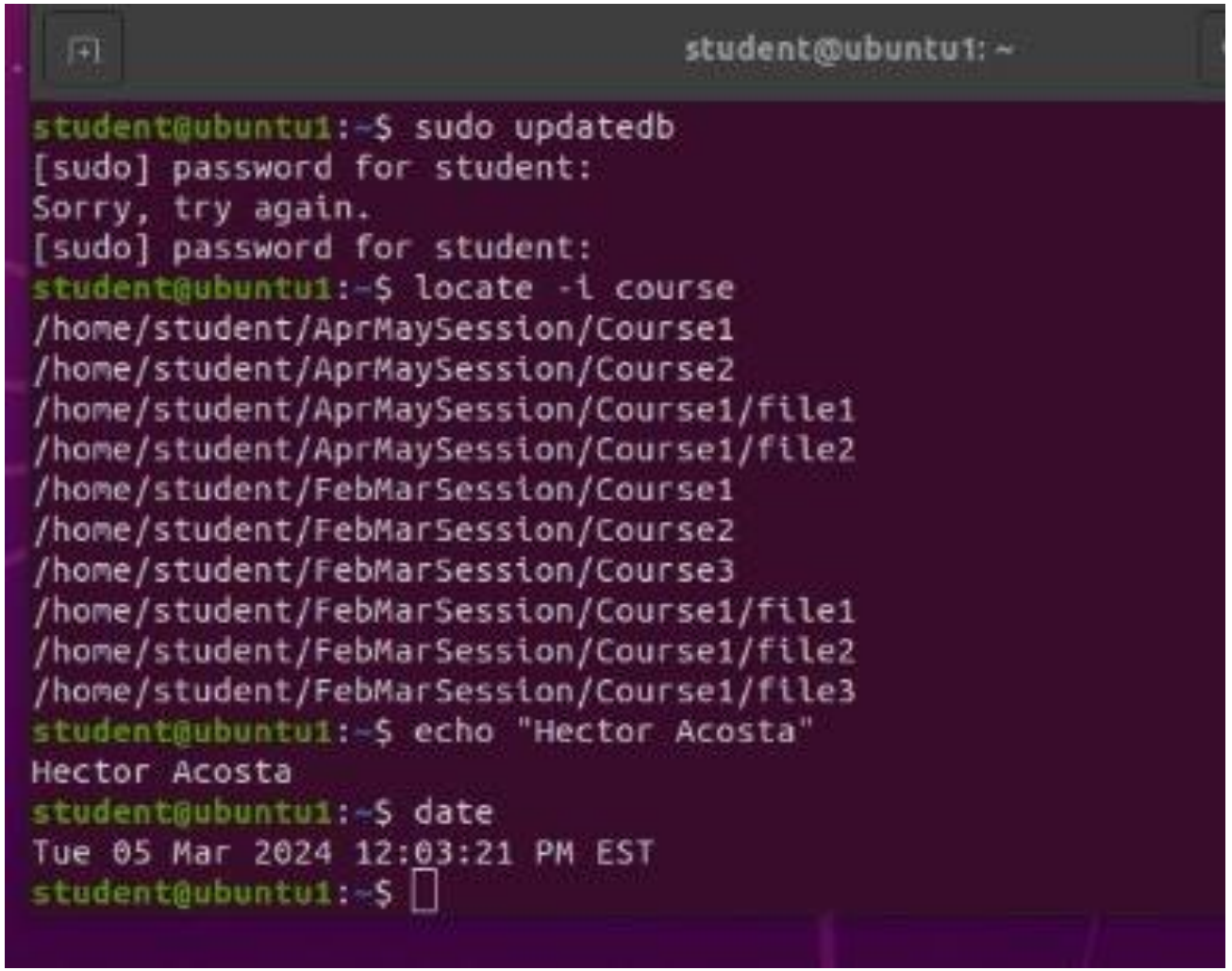


Copy and remove directories and files

```
-rw-rw-r-- 1 student student 0 Sep  4  2023 file3
student@ubuntu1:~/FebMarSession$ echo "Hector Acosta"
Hector Acosta
student@ubuntu1:~/FebMarSession$ date
Tue 05 Mar 2024 11:52:59 AM EST
student@ubuntu1:~/FebMarSession$ cd ~
student@ubuntu1:~$ pwd
/home/student
student@ubuntu1:~$ tree FebMarSession AprMaySession
FebMarSession
├── Course1
│   ├── file1
│   ├── file2
│   └── file3
├── Course2
└── Course3
AprMaySession
├── Course1
│   ├── file1
│   └── file2
└── Course2

5 directories, 5 files
student@ubuntu1:~$ echo "Hector Acosta"
Hector Acosta
student@ubuntu1:~$ date
Tue 05 Mar 2024 11:56:03 AM EST
```

Locate directories and files



3 Module Linux Shell Scripts

- Objective: In this module of the course project, I create and execute a shell script by experimenting with the standard input, user-defined variables, redirection, file permissions, and environment variables.
- Overview: A shell script is a file that contains Linux commands and special constructs. It is widely 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. Therefore, 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.

Create a shell script

1. What are the file permissions of the script?

- -rw-rw—r-
- User => rw (6), group => rw(6), others=> r(4)

2. What's the name of the user-defined variable in the script?

- text

3. Which redirection meta-character is used in the script? What does it do?

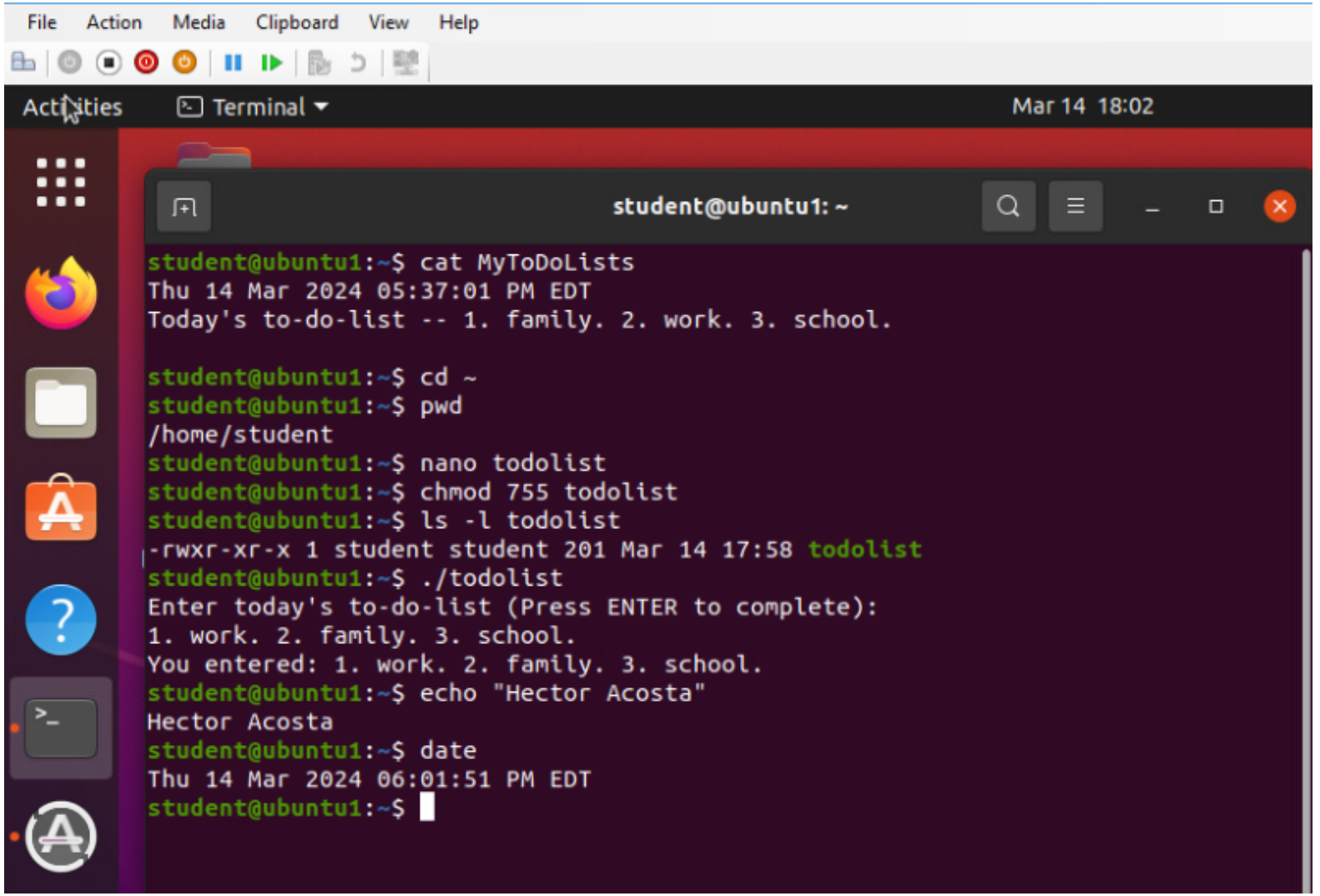
- ">>" , it redirects output to the files and append the data.

References:

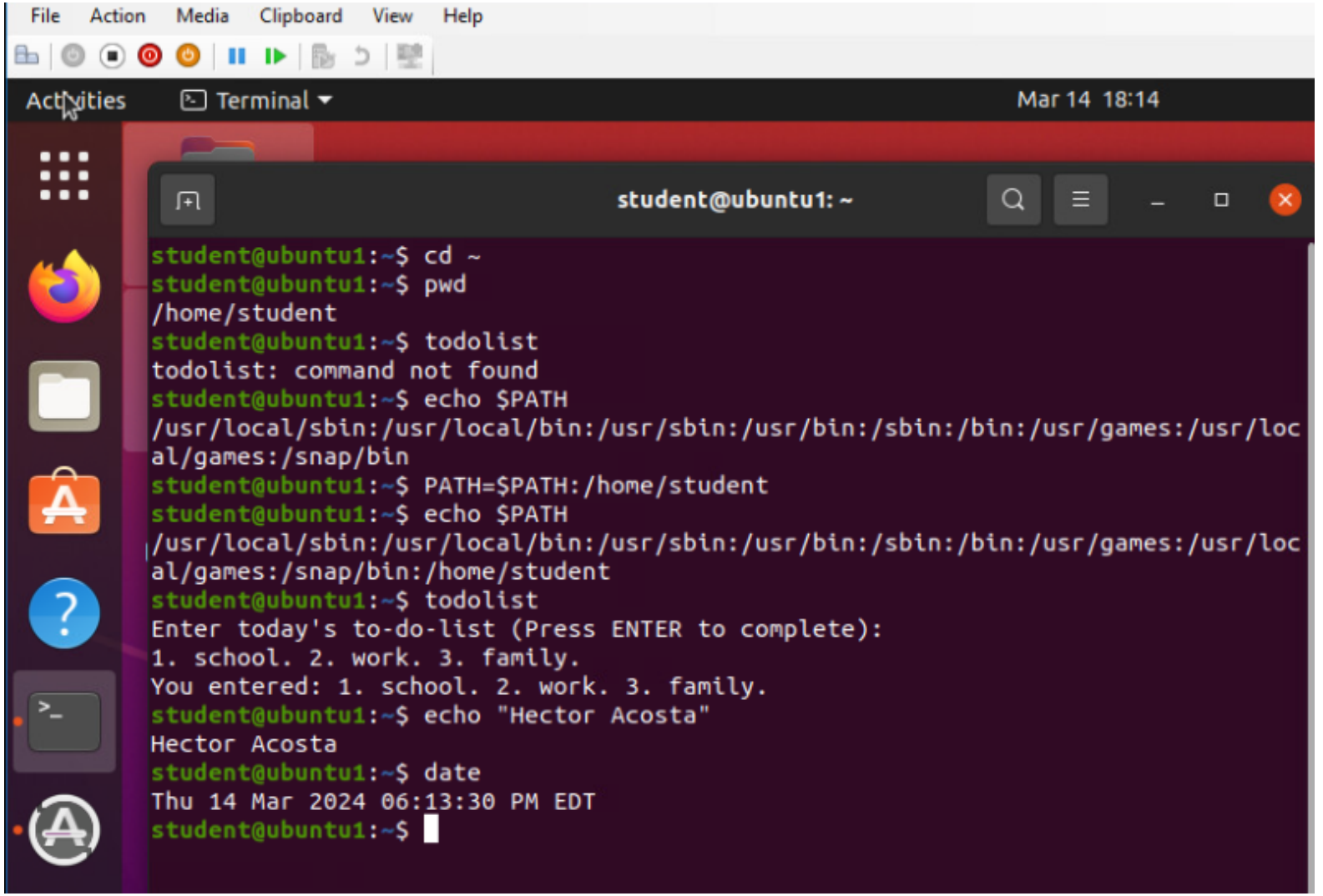
1.Cengage

2.Live class

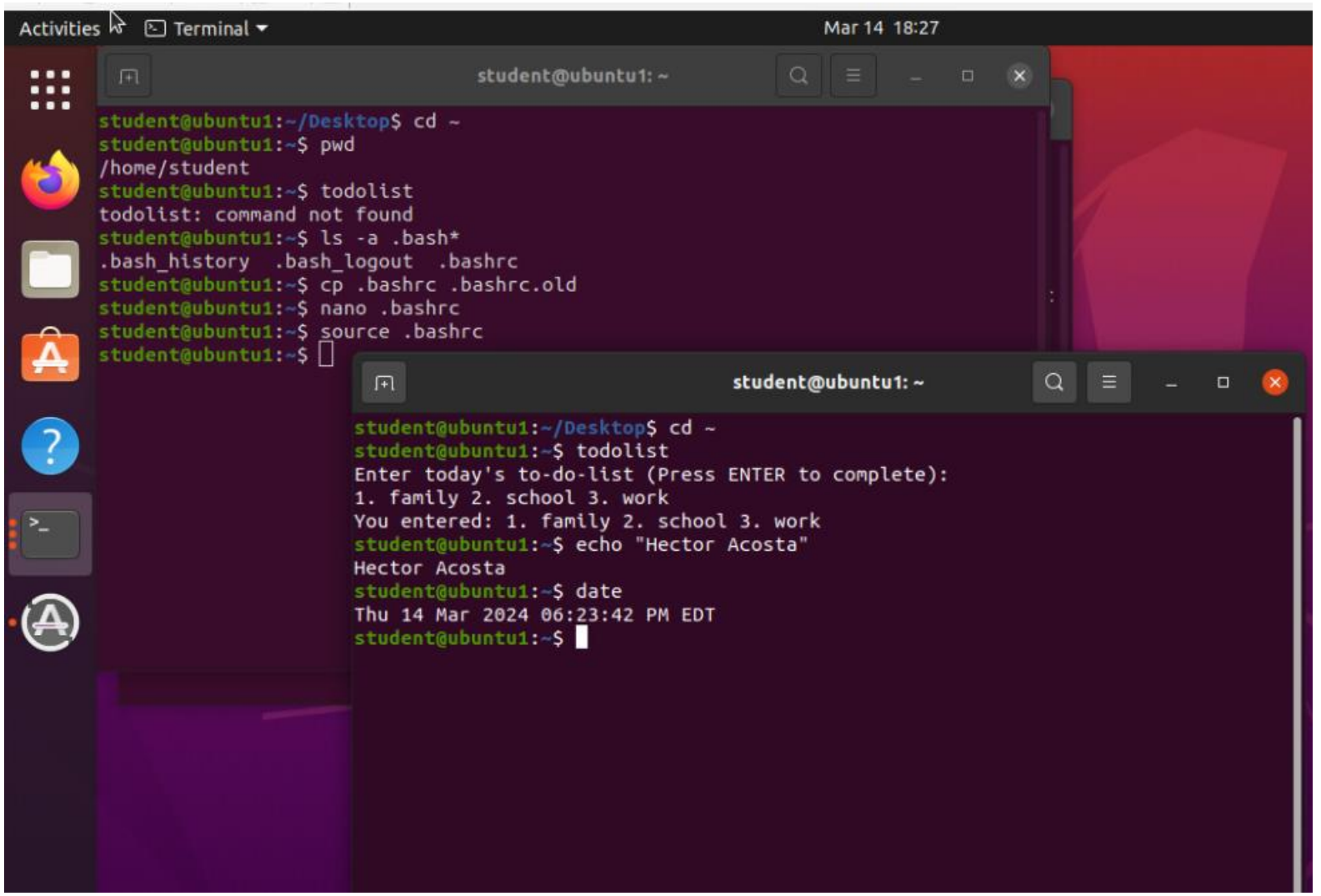
Change script file permissions



Set
the PATH variable



Make the PATH variable permanent



Module 4 User and Group Management

- Objective: In this module of the course project, I create, modify, and delete user and group accounts using both CLI and GUI.

- Overview: User and group management is a common Linux administration task. A user must have a valid username and password before logging in to a Linux system. An authenticated user is then granted access to system resources (e.g., files and directories) based on the user account. In addition, 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) utilities are available.

Add users and groups in CLI

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

The –m option in the useradd command specifies that a home directory should be created for the user account; on most Linux distributions, home directories are created for all users by default via the CREATE_HOME entry in the /etc/login.defs file

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

The –3 option in the the tail command it will display the last 3 lines of the file.

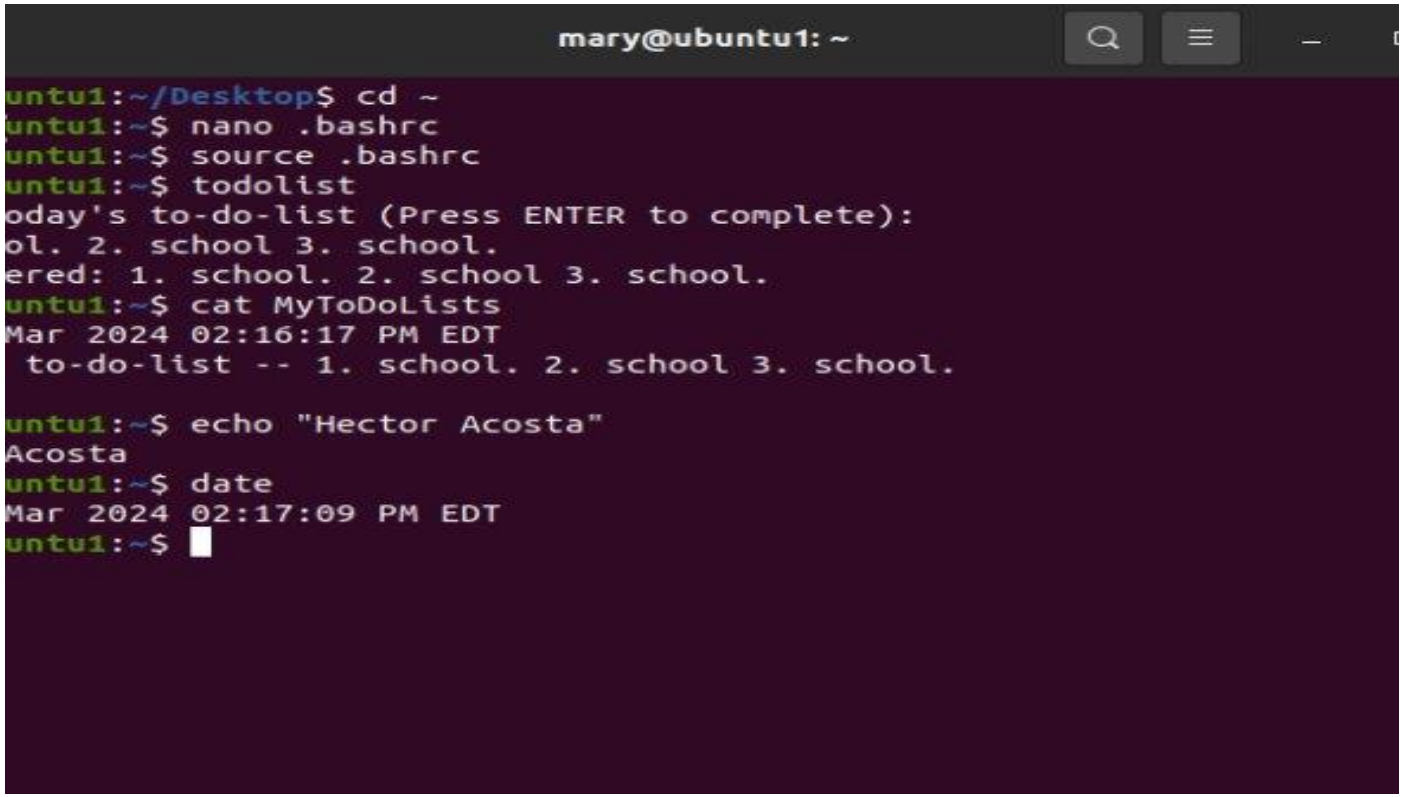
3. Which line of the */etc/group* file lists members of the “students” group?

Students:x:1002:student,mary

References:

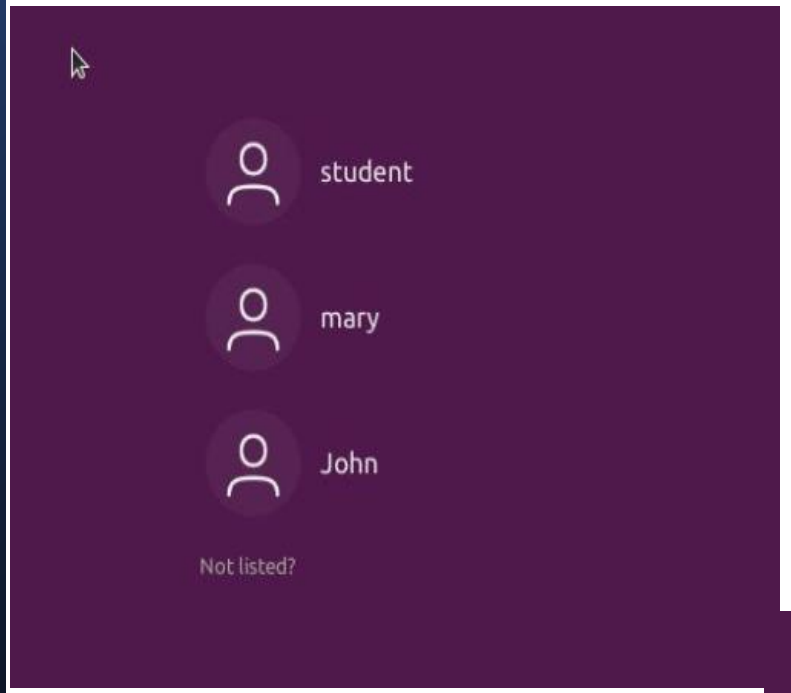
1.Cengage

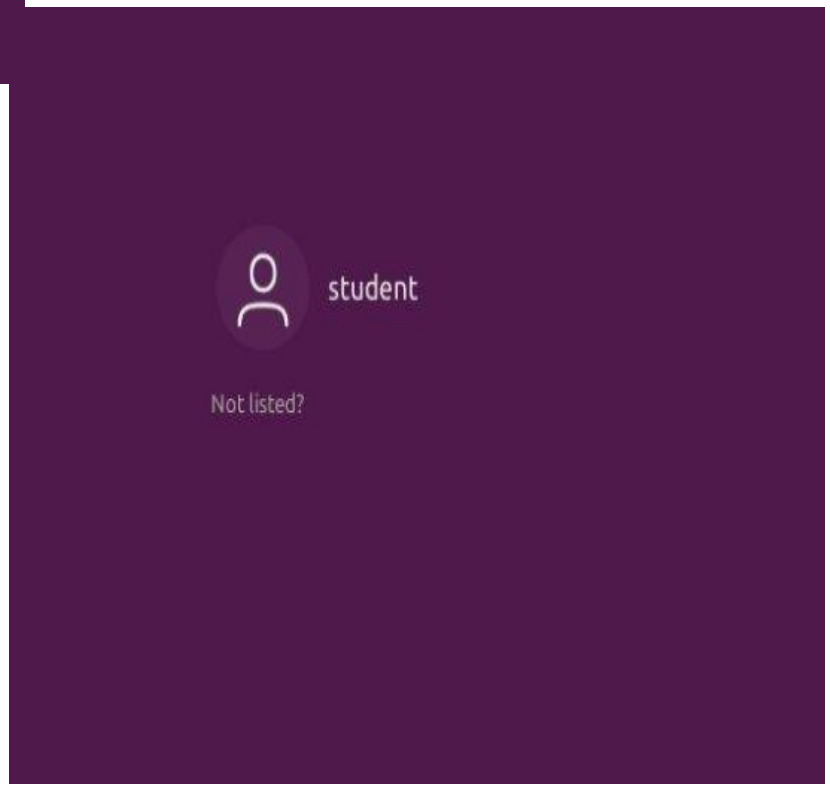
Test user and group settings



Add users in GUI

Remove users and groups



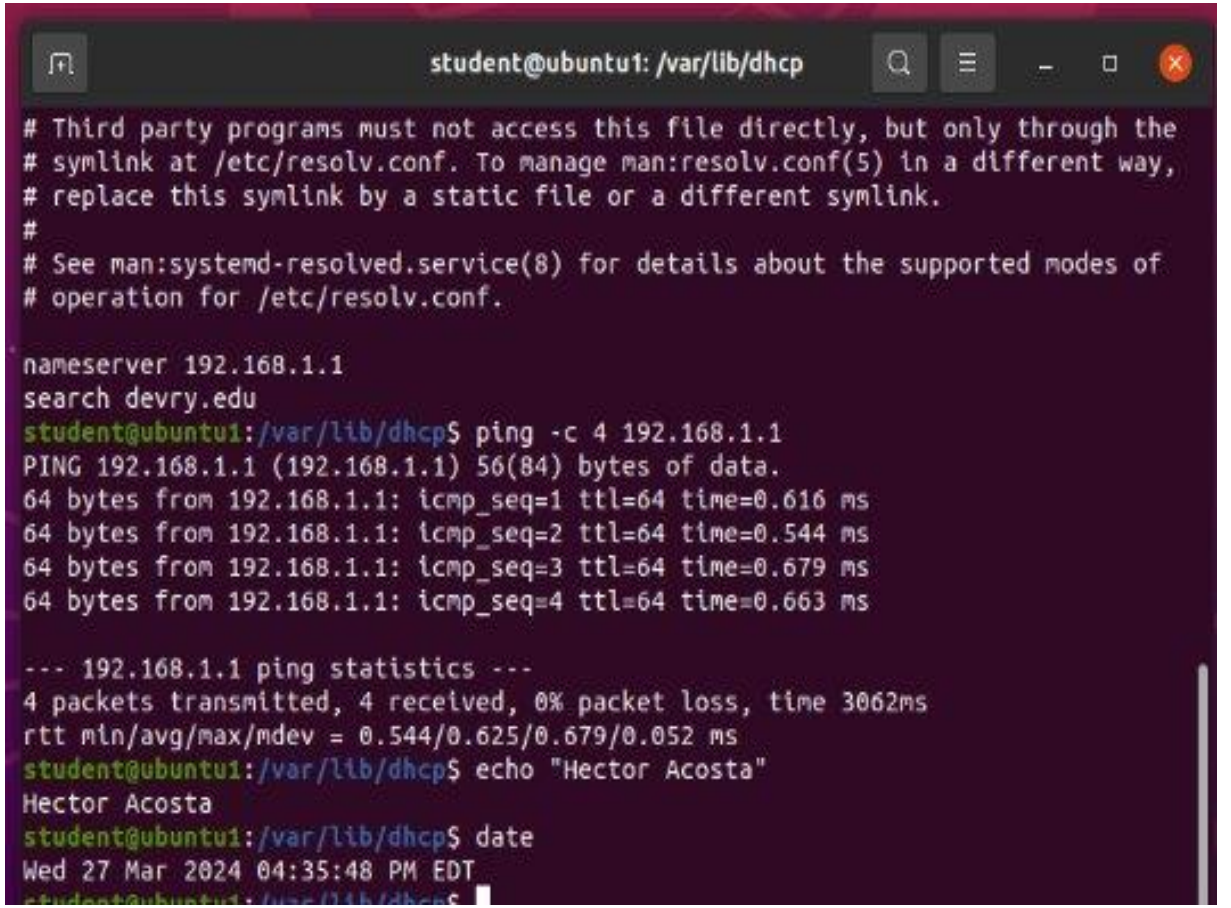


Module 5 Network Configuration

- Objective: In this module of the course project, I discover the IP configurations of my Linux machine and I explore different networking utility programs.

- Overview: To fully participate on a network, a Linux machine requires valid IP configurations including an IPv4/IPv6 address, default gateway, DNS server, etc. A unique IP address, consisting of a network portion and a host portion, is assigned to a computer to identify itself on a network. Only computers that share the same network portion of their 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.

Discover host IP configurations



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

192.168.1.107

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

192.168.1.1

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

192.168.1.1

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

192.168.1.1

Manage network interfaces

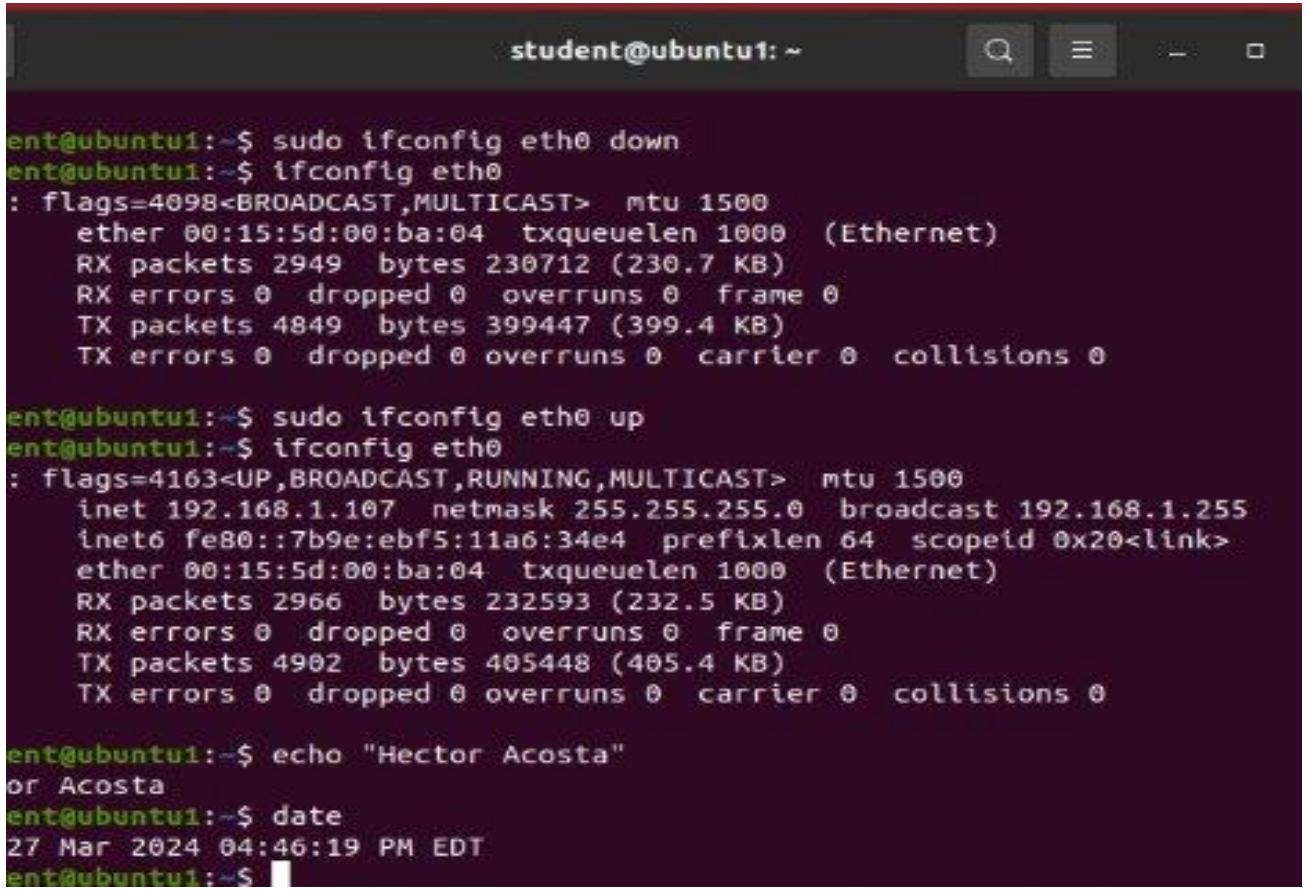
1. Which DHCP message is shown in the output of the **sudo dhclient –v –r ens33** command?

DHCPRELEASE

2. Which four DHCP messages are shown in the output of the **sudo dhclient –v ens33** command?

DHCPDISCOVER
DHCPOFFER
DHCPREQUEST
DHCPACK

Use network utilities



6 System Performance Monitoring

- Objective: In this module of the course project, I explore Linux utilities that monitor processes, user activities, and network usage.
- Overview: Linux system performance could be affected by factors such as the amount of RAM, CPU utilization, storage device speed, and process load. The usual culprits include processes that generate many read/write requests to databases, processes that send/receive a large amount of data on the network, or simply too many processes that are running on a machine. Monitoring Linux system performance and investigating performance problems are critical to keeping systems up and running. Various CLI and GUI monitoring tools can be used to monitor system performance and help identify the root causes of problems.

Monitor Linux processes

1. What is the default action of the *15 SIGTERM* kill signal?

   The default action is to kill the process.

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?

   The process which shows the higest percentage of CPU usae was the gnome –shell.

References:

1. Live session

Monitor user activities

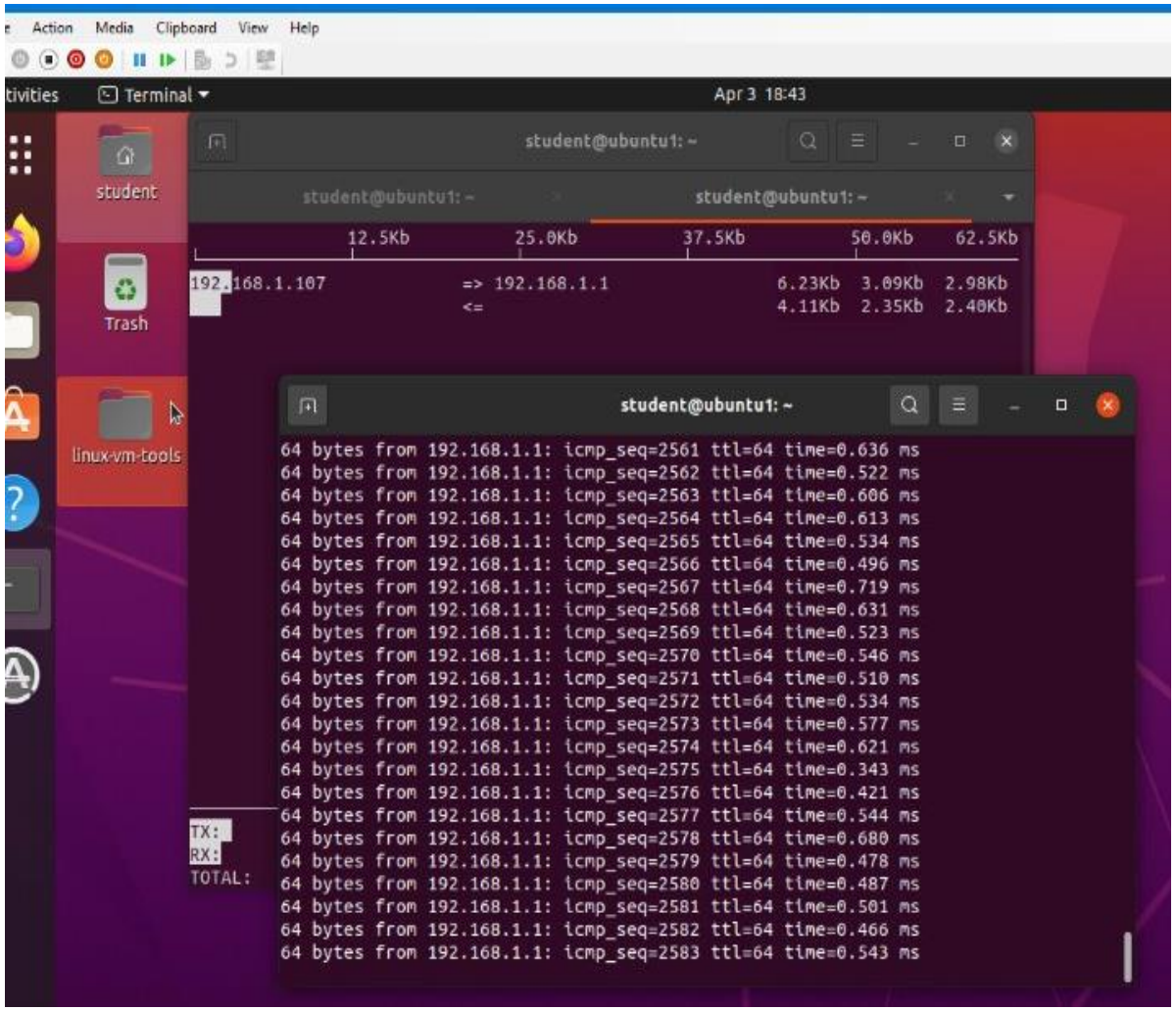
I issue the (**sudo accton on)** This command turn on the GNC accounting. I ran the (**sudo updatedb)** command, and then I ran after that the (**lastcomm updatedb)** to check if the ***updatedb*** command was executed before. After that I turn off GNC accounting (**sudo accton off**) to answering the questions.

1. What flag value is displayed in the output?
The flag value displayed in the output was 'S'.

2. Why is the name of the user who ran the processes shown as root, not student?
The reason why the of the user who ran the process shown as root, it is because root is the superuser.

References:
1.Live session

Monitor network bandwidth usage



Module 7 Careers

- This module focuses on the Computing Technology Industry Association (CompTIA) and the Linux+ certification offered by CompTIA. Helping members network and grow, CompTIA offers an avenue for IT professionals to take various certification exams. CompTIA Linux+ is a vendor-neutral certification that is recognized worldwide as a benchmark for entry-level system administrators supporting Linux systems. You will also view a series of certification preparation videos and take a practice exam.

Preparing For The Linux+ Exam

Aspiring IT security technicians can round off their training prior to sitting for the CompTIA®'s Linux+ Certification (XK0-004 exam) by preparing for the exam. Again, Linux+ is a vendor-neutral certification that is recognized worldwide as a benchmark for entry-level operating systems technicians.

1. Overview
2. What is Linux?
3. Linux Distributions
4. Installing Linux
5. Using a Terminal in Linux and Command Line Interface (CLI)
6. Getting Help in Linux
7. Installing and Managing Software with DNF/APT
8. Supporting Sandboxed Applications
9. Building Applications from Source Click Overview to start.

Sources:

1. IT Pro TV link.
2. UDEMY

Challenge in this project

Overcoming Network Configuration Challenges

Challenge: Understanding the intricacies of IP configurations on Linux machines posed a significant challenge. To fully participate in a network, Linux systems require valid IP configurations, including IPv4/IPv6 addresses, default gateways, DNS servers, and more. The unique IP address, comprising a network portion and a host portion, is essential for network identification. Communication within a local area network (LAN) segment relies on sharing the same network portion of IP addresses, while communication beyond LAN segments necessitates a routing device, such as a default gateway.

Solution: To address this challenge, I pursued additional learning through a course on Coursera, which provided comprehensive insights into network configuration principles. Through dedicated study and hands-on practice, I gained a better understanding of IP configurations and network segmentation, enabling me to overcome this obstacle and confidently navigate network configurations in Linux environments.

Career Skill

Key Skill: Linux Proficiency

Overview: Linux proficiency is a vital skill for individuals aspiring to excel in diverse career paths such as software development, cybersecurity, and IT support. With the increasing demand for IT professionals adept in Linux, mastering this operating system opens doors to lucrative opportunities in some of the fastest-growing and in-demand fields, including Cloud computing, Data Science, DevOps, and Cybersecurity. As a Linux professional, I bring to the table comprehensive expertise that empowers me to provide well-rounded advice to employers or clients. My proficiency in Linux not only enhances my employability but also positions me as a valuable asset in today's competitive job market, ready to contribute effectively to the success of any organization.

Conclusion

In conclusion, this project has been a transformative journey, equipping me with the essential skills and knowledge needed to excel in the field of Linux system administration. Beginning with mastering the Linux filesystem in Module 2 and going through into shell scripting in Module 3, I've built a solid foundation in Linux command line operations. Module 4 challenged me to enhance my abilities in user and group management, while Module 5 broadened my understanding of networking essentials. In Module 6, I gained invaluable insights into system monitoring, honing my skills to maintain optimal performance. Finally, Module 7 provided me with the opportunity to pursue certification, validating my expertise as a proficient Linux system administrator. Throughout this journey, I've overcome challenges such as understanding IP configurations through dedicated learning and practice. My proficiency in Linux not only enhances my employability in fields like software development, cybersecurity, and IT support but also positions me as a valuable asset capable of providing well-rounded advice to employers or clients. As I embark on my career journey, I am confident in my ability to contribute effectively to the success of any organization in today's competitive job market.