



# Exploring Linux (Ubuntu)

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CEIS106 – Introduction to Operating Systems

```
... object to mirror_mod.mirror_object
operation == "MIRROR_X":
    mirror_mod.use_x = True
    mirror_mod.use_y = False
    mirror_mod.use_z = False
operation == "MIRROR_Y":
    mirror_mod.use_x = False
    mirror_mod.use_y = True
    mirror_mod.use_z = False
operation == "MIRROR_Z":
    mirror_mod.use_x = False
    mirror_mod.use_y = False
    mirror_mod.use_z = True
```

```
selection at the end -add
mirror_ob.select= 1
modifier_ob.select=1
context.scene.objects.active
("Selected" + str(modifier_ob
mirror_ob.select = 0
= bpy.context.selected_object
data.objects[one.name].select
print("please select exactly
```

--- OPERATOR CLASSES ---

```
types.Operator):
    "X mirror to the selected
object.mirror_mirror_x"
mirror X"
```

```
context):
context.active_object is not
```



# My Portfolio Contains:

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1. Introduction
2. Modules
3. Questions asked within each module
4. Challenges within each module
5. Conclusion (What was learned)

# Introduction



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## **What is an operating system?**

*An operating system (OS) is a system software that handles computer hardware, software resources, and offers essential services for computer programs.*



# Module 1: Linux Installation

*In this first module, we had to learn to install the Virtual Machine and the Linux OS (Ubuntu).*

# Access the BIOS settings

1. Research how to access the BIOS settings on your computer. What key or key combination or procedure do you use to access it?

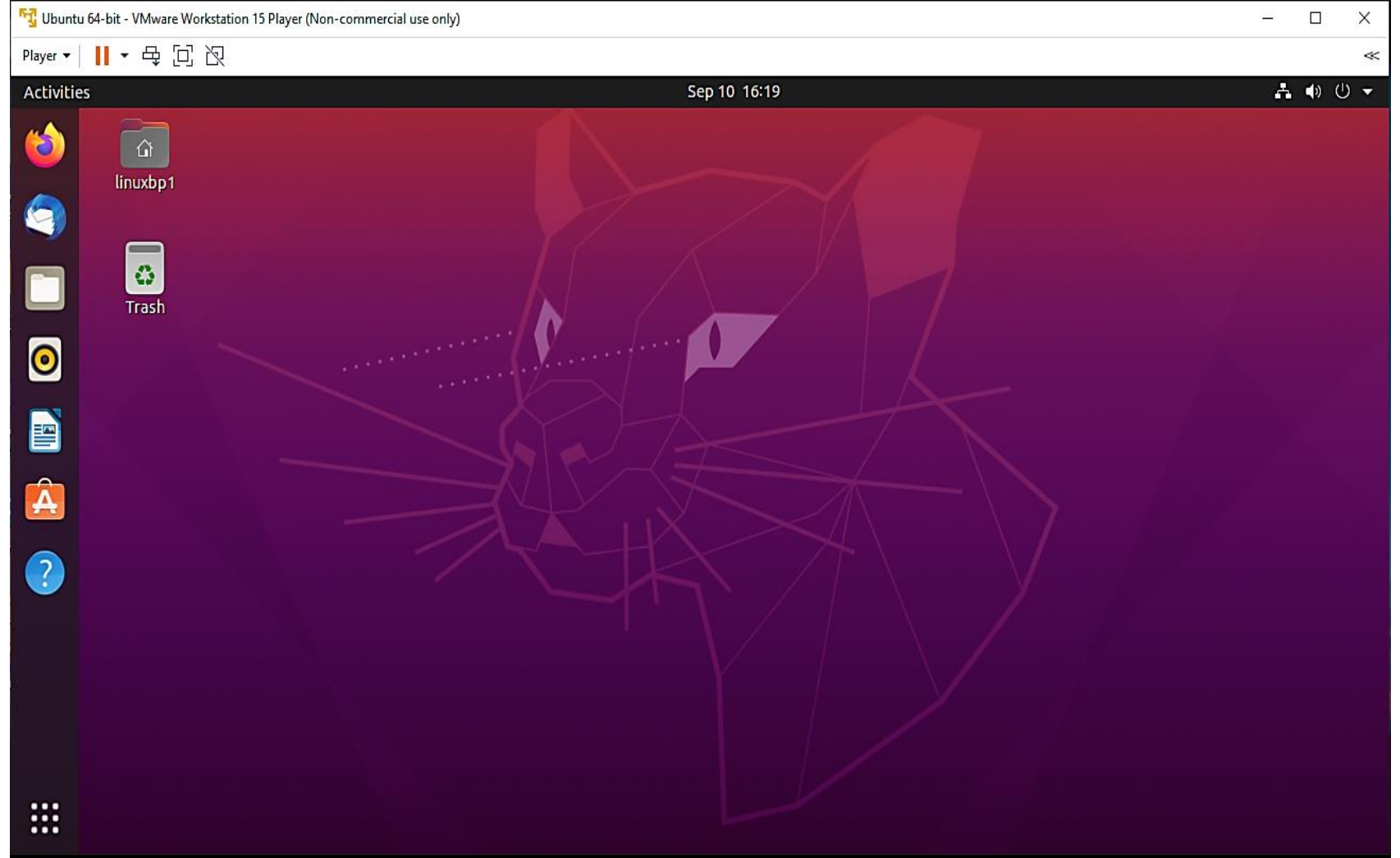
*Answer: On start up press the DEL or even the ESC keys to enter the setup menu. Then, press a designated key (F1, F2, F10, or F12) access the BIOS settings.*

2. Do you have Virtualization or Virtualization Technology enabled in the BIOS settings of your computer?

*Answer: Yes, I had followed the procedure as directed in the project guide to ensure that the virtualization was enabled.*

# Install Ubuntu

A screen capture of the  
Ubuntu Desktop.



## Challenges in the module:

- *Understanding the Linux (Ubuntu) OS and how it functions.*
- *Figuring out the software within the OS.*



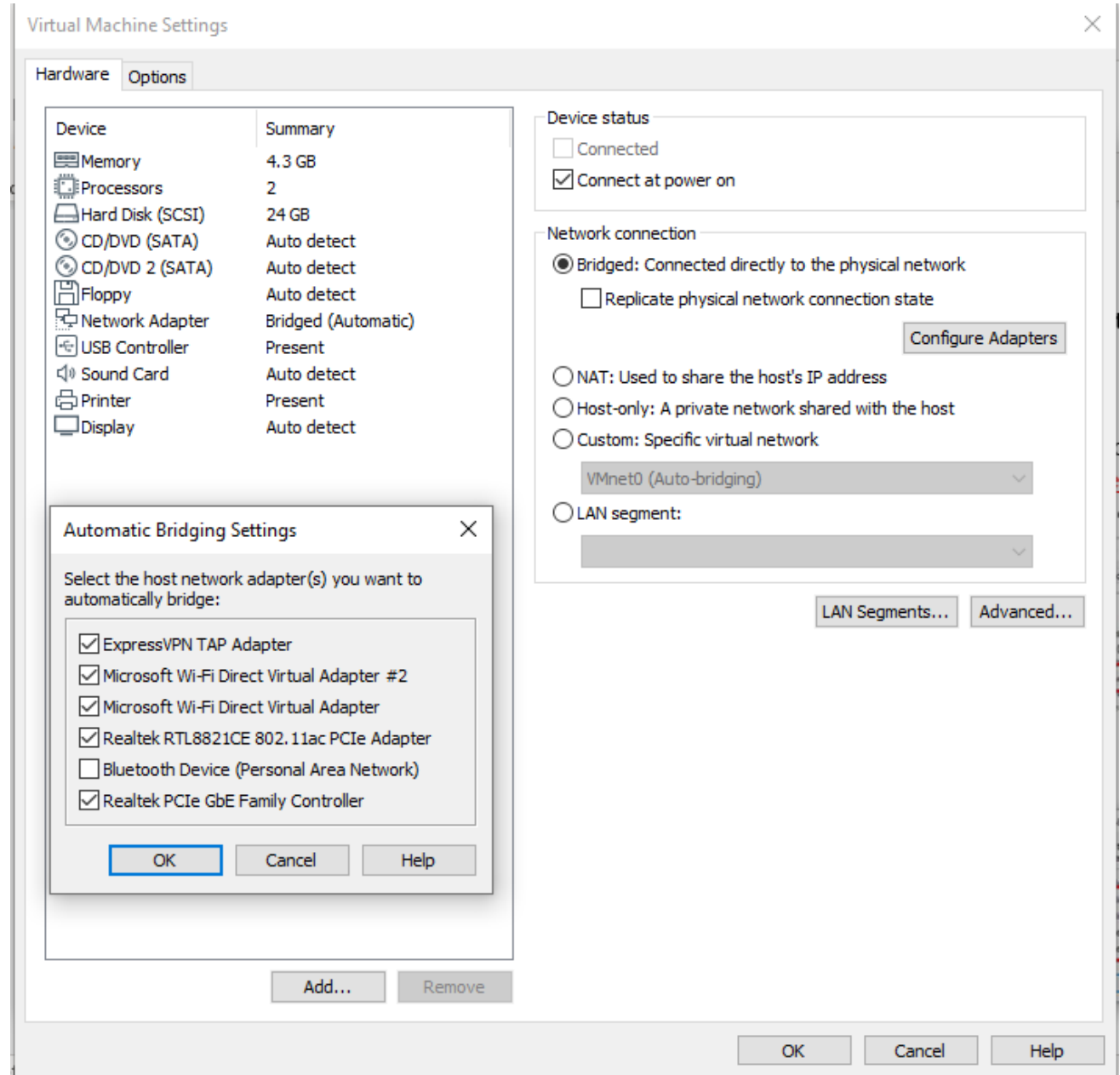
# Module 2: Linux Filesystem Hierarchy

*In this module, the following five objectives had to be completed:*

- 1. Connecting the Virtual Machine (VM) to the Internet.*
- 2. Navigating the Linux filesystem tree.*
- 3. Create directories and files.*
- 4. Copy and remove directories and files.*
- 5. Locating the directories and files.*

# Connect the Ubuntu VM to the Internet

A screen capture of the Automatic Bridging Settings window.



# Navigate the Linux filesystem tree

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

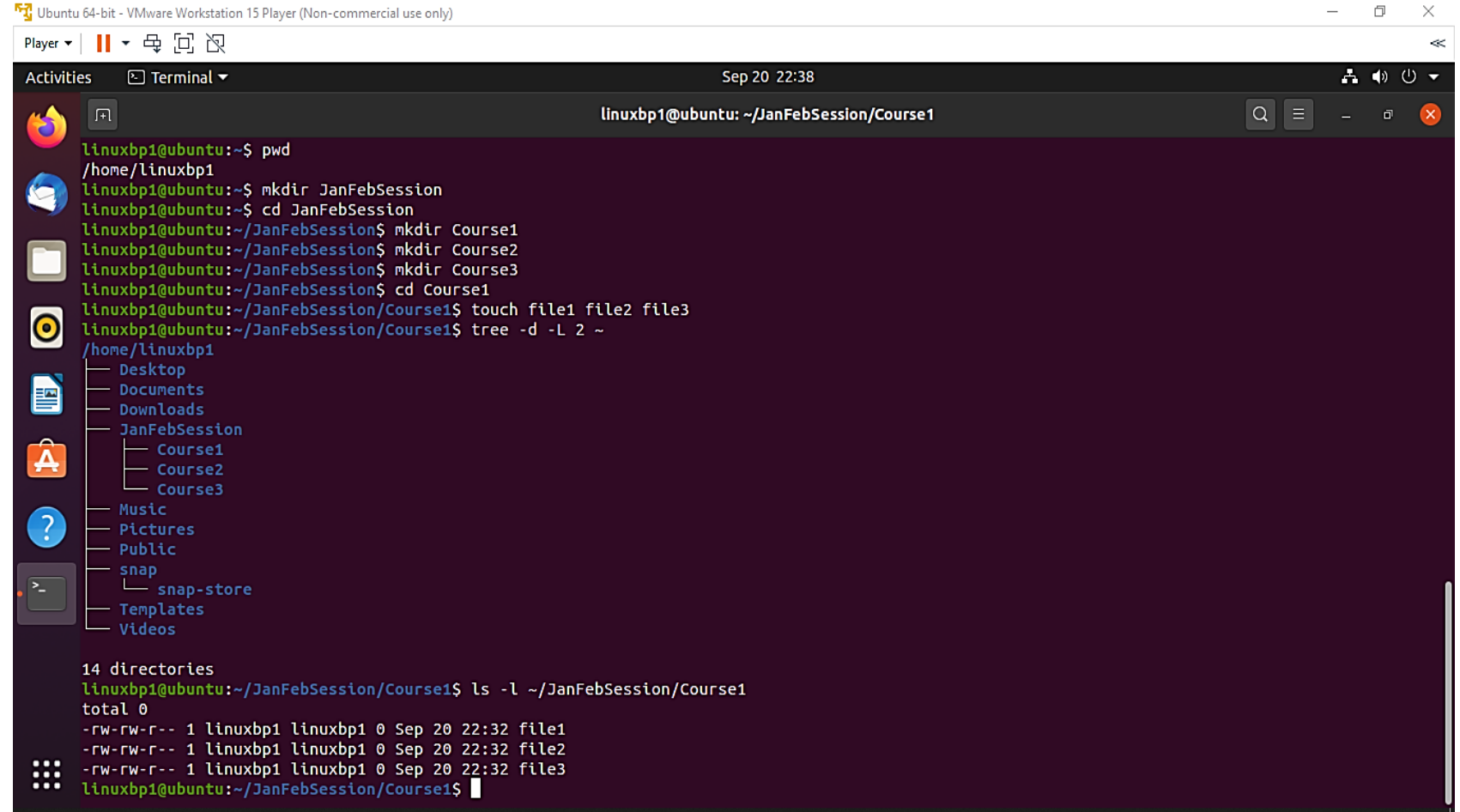
*Answer: The pwd command (print working directory) would write the full pathname of the current working directory to the normal output. The cd (change directory) command is a command-line shell command used to modify the existing working directory in different operating systems.*

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

*Answer: The absolute (full) path begins from the root directory (/) and goes up to the actual object (file or directory). It contains the names of all directories that come in the middle of the root directory and the actual file. The name of the parent directory is written to the left. The relative path begins from the current directory and works up to the actual object. The relative path is based on the current directory. When we change the directory, the relative path changes as well. Just like the absolute direction, the name of the parent directory is written on the left side. In comparison to the absolute path, all the slashes in the relative path represent the directory separator.*

# Create directories and files

A screen capture of the output.



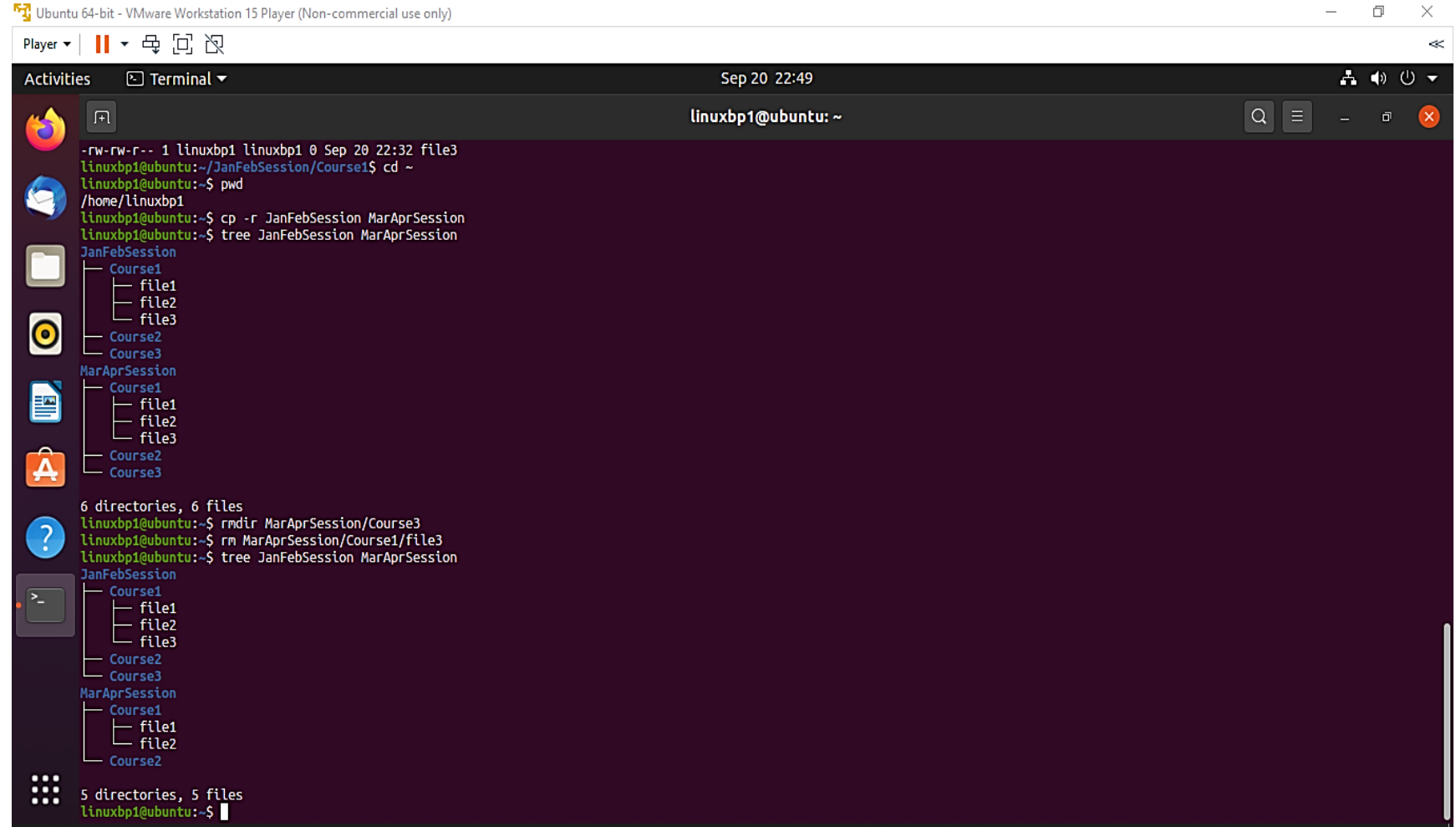
```
Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)
Player | [Icons] | Sep 20 22:38
Activities | Terminal | linuxbp1@ubuntu: ~/JanFebSession/Course1

linuxbp1@ubuntu:~$ pwd
/home/linuxbp1
linuxbp1@ubuntu:~$ mkdir JanFebSession
linuxbp1@ubuntu:~$ cd JanFebSession
linuxbp1@ubuntu:~/JanFebSession$ mkdir Course1
linuxbp1@ubuntu:~/JanFebSession$ mkdir Course2
linuxbp1@ubuntu:~/JanFebSession$ mkdir Course3
linuxbp1@ubuntu:~/JanFebSession$ cd Course1
linuxbp1@ubuntu:~/JanFebSession/Course1$ touch file1 file2 file3
linuxbp1@ubuntu:~/JanFebSession/Course1$ tree -d -L 2 ~
/home/linuxbp1
├── Desktop
├── Documents
├── Downloads
├── JanFebSession
│   ├── Course1
│   ├── Course2
│   └── Course3
├── Music
├── Pictures
├── Public
├── snap
│   └── snap-store
├── Templates
└── Videos

14 directories
linuxbp1@ubuntu:~/JanFebSession/Course1$ ls -l ~/JanFebSession/Course1
total 0
-rw-rw-r-- 1 linuxbp1 linuxbp1 0 Sep 20 22:32 file1
-rw-rw-r-- 1 linuxbp1 linuxbp1 0 Sep 20 22:32 file2
-rw-rw-r-- 1 linuxbp1 linuxbp1 0 Sep 20 22:32 file3
linuxbp1@ubuntu:~/JanFebSession/Course1$
```

# Copy and remove directories and files

A screen capture of the output.



The screenshot shows a terminal window titled 'linuxbp1@ubuntu: ~' with a dark purple background. The terminal output shows a series of commands and their results:

```
-rw-rw-r-- 1 linuxbp1 linuxbp1 0 Sep 20 22:32 file3
linuxbp1@ubuntu:~/JanFebSession/Course1$ cd ~
linuxbp1@ubuntu:~$ pwd
/home/linuxbp1
linuxbp1@ubuntu:~$ cp -r JanFebSession MarAprSession
linuxbp1@ubuntu:~$ tree JanFebSession MarAprSession
JanFebSession
├── Course1
│   ├── file1
│   ├── file2
│   └── file3
├── Course2
└── Course3
MarAprSession
├── Course1
│   ├── file1
│   ├── file2
│   └── file3
├── Course2
└── Course3

6 directories, 6 files
linuxbp1@ubuntu:~$ rmdir MarAprSession/Course3
linuxbp1@ubuntu:~$ rm MarAprSession/Course1/file3
linuxbp1@ubuntu:~$ tree JanFebSession MarAprSession
JanFebSession
├── Course1
│   ├── file1
│   ├── file2
│   └── file3
├── Course2
└── Course3
MarAprSession
├── Course1
│   ├── file1
│   └── file2
└── Course2

5 directories, 5 files
linuxbp1@ubuntu:~$
```

The left sidebar of the terminal window shows icons for various applications: Firefox, a mail client, a file manager, a terminal, a help icon, and a settings icon. The top of the window shows the title bar 'Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)' and standard window controls.

# Locate directories and files

A screen capture of the  
output.

**Note:** I had tried to the “sudo apt update” and then tried the “sudo apt install locate”; nothing came up.

Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)

```
Player ▾ || 🔍 📄 🖨️ 🗑️
Activities Terminal ▾
5 directories, 5 files
linuxbp1@ubuntu:~$ find ~ -iname course* -type d
/home/linuxbp1/JanFebSession/Course3
/home/linuxbp1/JanFebSession/Course2
/home/linuxbp1/JanFebSession/Course1
/home/linuxbp1/MarAprSession/Course2
/home/linuxbp1/MarAprSession/Course1
linuxbp1@ubuntu:~$ find ~ -iname file1
/home/linuxbp1/JanFebSession/Course1/file1
/home/linuxbp1/MarAprSession/Course1/file1
linuxbp1@ubuntu:~$ sudo apt install locate
[sudo] password for linuxbp1:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  locate
0 upgraded, 1 newly installed, 0 to remove and 106 not upgraded.
Need to get 85.3 kB of archives.
After this operation, 265 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 locate amd64 4.7
  Fetched 85.3 kB in 0s (192 kB/s)
Selecting previously unselected package locate.
(Reading database ... 179807 files and directories currently installed.)
Preparing to unpack .../locate_4.7.0-1ubuntu1_amd64.deb ...
Unpacking locate (4.7.0-1ubuntu1) ...
Setting up locate (4.7.0-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
linuxbp1@ubuntu:~$ locate -s
linuxbp1@ubuntu:~$ locate -i course
linuxbp1@ubuntu:~$ locate -r /file1$
linuxbp1@ubuntu:~$ sudo apt run update
E: Invalid operation run
linuxbp1@ubuntu:~$ sudo apt update
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [111 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease [98.3 kB]
Fetched 317 kB in 2s (171 kB/s)
```

Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)

```
Player ▾ || 🔍 📄 🖨️ 🗑️
Activities Terminal ▾ Sep 20 23:05 linuxbp1@ubuntu:~
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  locate
0 upgraded, 1 newly installed, 0 to remove and 106 not upgraded.
Need to get 85.3 kB of archives.
After this operation, 265 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu focal/universe amd64 locate amd64 4.7.0-1ubuntu1 [85.3 kB]
Fetched 85.3 kB in 0s (192 kB/s)
Selecting previously unselected package locate.
(Reading database ... 179807 files and directories currently installed.)
Preparing to unpack .../locate_4.7.0-1ubuntu1_amd64.deb ...
Unpacking locate (4.7.0-1ubuntu1) ...
Setting up locate (4.7.0-1ubuntu1) ...
Processing triggers for man-db (2.9.1-1) ...
linuxbp1@ubuntu:~$ locate -s
linuxbp1@ubuntu:~$ locate -i course
linuxbp1@ubuntu:~$ locate -r /file1$
linuxbp1@ubuntu:~$ sudo apt run update
E: Invalid operation run
linuxbp1@ubuntu:~$ sudo apt update
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease [111 kB]
Get:3 http://security.ubuntu.com/ubuntu focal-security InRelease [107 kB]
Get:4 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease [98.3 kB]
Fetched 317 kB in 2s (171 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
106 packages can be upgraded. Run 'apt list --upgradable' to see them.
linuxbp1@ubuntu:~$ sudo apt install locate
Reading package lists... Done
Building dependency tree
Reading state information... Done
locate is already the newest version (4.7.0-1ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 106 not upgraded.
linuxbp1@ubuntu:~$ locate -s
linuxbp1@ubuntu:~$ locate -i course
linuxbp1@ubuntu:~$ locate -r /file1$
linuxbp1@ubuntu:~$
```

## Challenges in the module:

- *Investigating the “sudo apt update” and the “sudo apt install locate” and nothing was ever found.*
- *Figuring out what commands to enter in the output.*
- *Defining certain commands and when they should be used.*





## Module 3: Linux Shell Scripts

*The purpose of this module was to execute a shell script by experimenting with the standard input, user-defined variables, redirection, file permissions, and environment variables.*

# Create a shell script

1. What are the file permissions of the script?

Answer: *I was expecting the permission such as rwx-rwr-rrr. This is available from running ls -l command.*

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

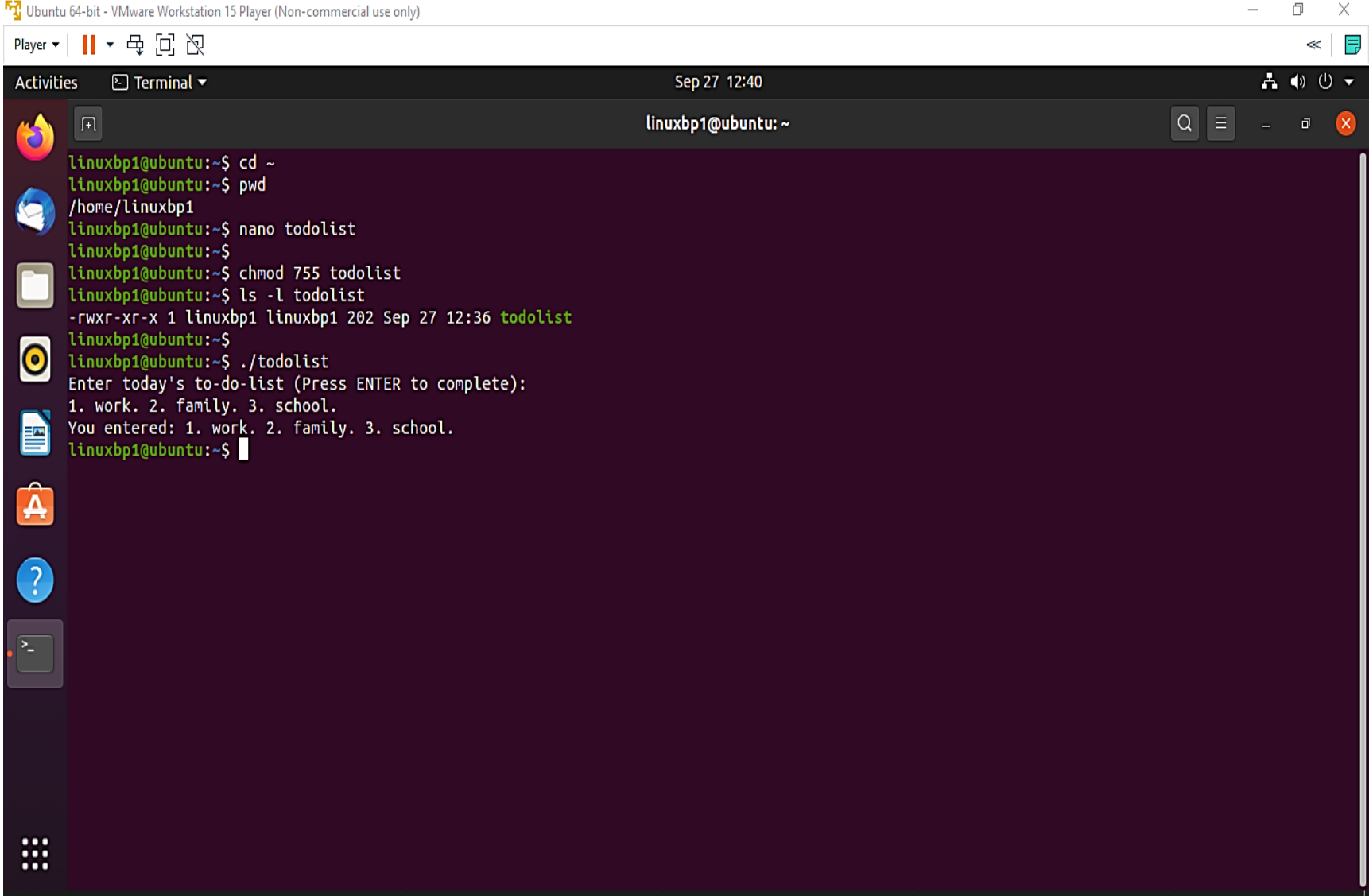
Answer: *The user variable that I have defined is "text" in the script.*

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

Answer: *">>" – This redirection meta-character is the standard output for the script.*

# Change script file permissions

A screen capture of the  
output.

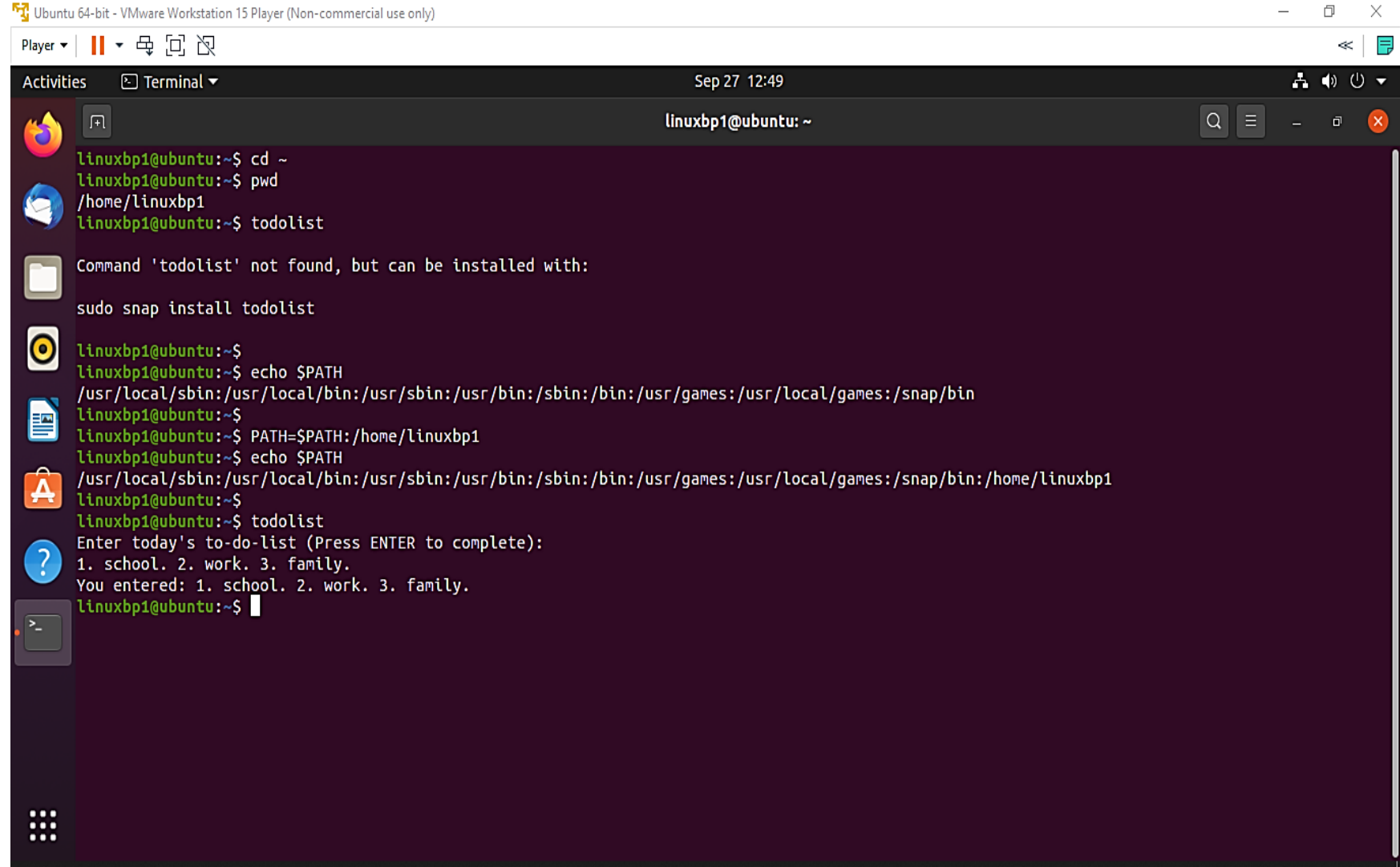


The screenshot shows a terminal window titled "linuxbp1@ubuntu: ~" running within a "Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)". The terminal displays the following commands and output:

```
linuxbp1@ubuntu:~$ cd ~
linuxbp1@ubuntu:~$ pwd
/home/linuxbp1
linuxbp1@ubuntu:~$ nano todolist
linuxbp1@ubuntu:~$
linuxbp1@ubuntu:~$ chmod 755 todolist
linuxbp1@ubuntu:~$ ls -l todolist
-rwxr-xr-x 1 linuxbp1 linuxbp1 202 Sep 27 12:36 todolist
linuxbp1@ubuntu:~$
linuxbp1@ubuntu:~$ ./todolist
Enter today's to-do-list (Press ENTER to complete):
1. work. 2. family. 3. school.
You entered: 1. work. 2. family. 3. school.
linuxbp1@ubuntu:~$
```

# Set the PATH variable

A screen capture of the output.



```
Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)
Player | [Icons]
Activities | Terminal | Sep 27 12:49 | linuxbp1@ubuntu: ~
linuxbp1@ubuntu:~$ cd ~
linuxbp1@ubuntu:~$ pwd
/home/linuxbp1
linuxbp1@ubuntu:~$ todolist
Command 'todolist' not found, but can be installed with:
sudo snap install todolist
linuxbp1@ubuntu:~$
linuxbp1@ubuntu:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
linuxbp1@ubuntu:~$
linuxbp1@ubuntu:~$ PATH=$PATH:/home/linuxbp1
linuxbp1@ubuntu:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin:/home/linuxbp1
linuxbp1@ubuntu:~$
linuxbp1@ubuntu:~$ todolist
Enter today's to-do-list (Press ENTER to complete):
1. school. 2. work. 3. family.
You entered: 1. school. 2. work. 3. family.
linuxbp1@ubuntu:~$
```

Run the “todolist” script in both windows.



## Challenges in the module:

- *Defining what a shell script and a PATH variable are.*
- *Determining what commands to enter to confirm the output.*





## Module 4: User and Group Management

*In this module, we were to create, modify, and delete user and group account; using both the Command Line Interface (CLI) and the graphical user interface (GUI).*

# Add users and groups in CLI

1. What does the `-m` option in the `useradd` command do?

Answer: *The `-m` choice is used to make a new user without having a home directory for that user.*

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

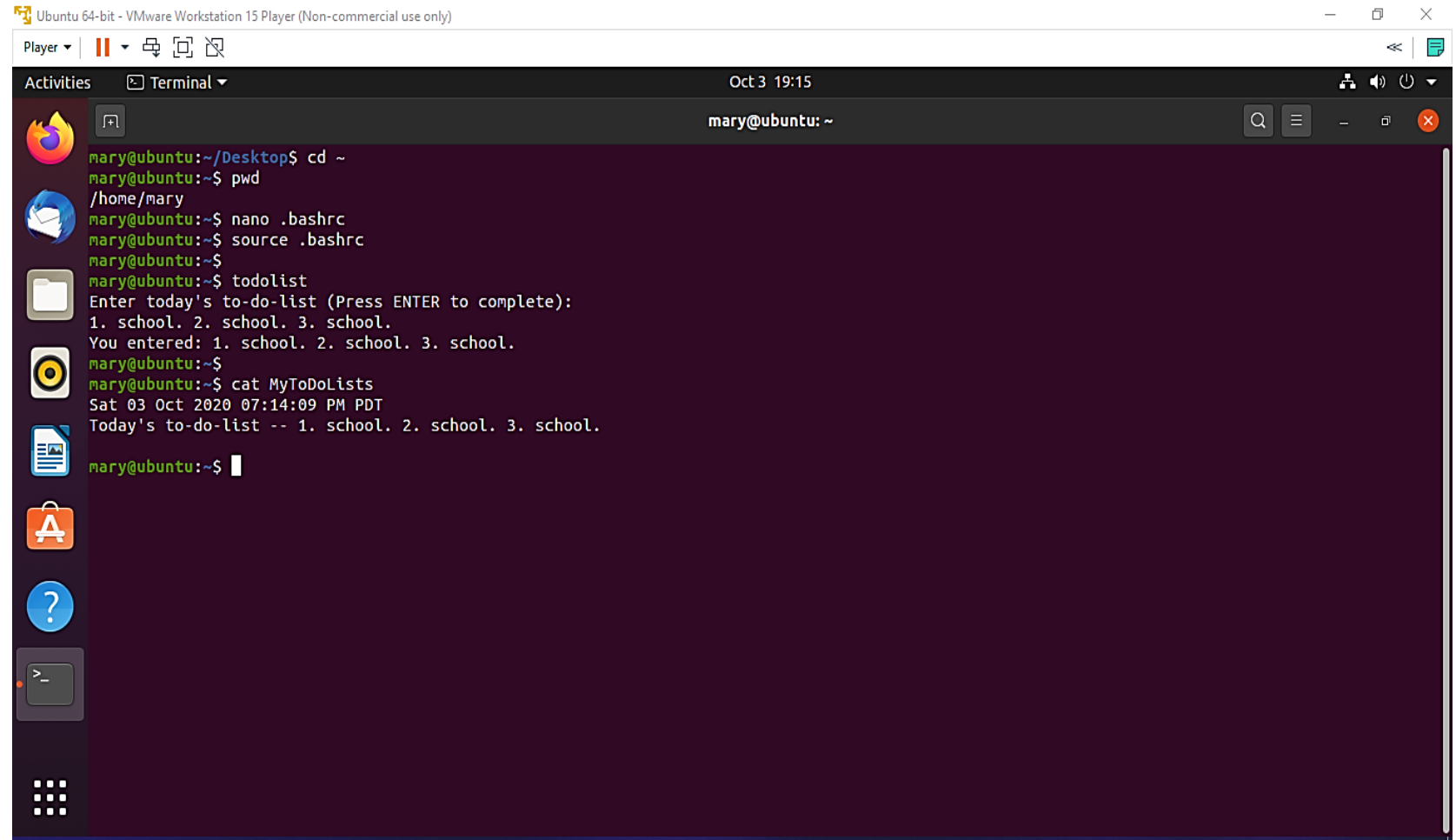
Answer: *The `-3` option confirms the new user account and confirms that both the new user and another user are under the same group name.*

3. Which line of the `/etc/group` file lists members of the “students” group? Copy it here.

Answer: *The file is listed as shown here: `students:x:1002:linuxbp1,mary`*

# Test user and group settings

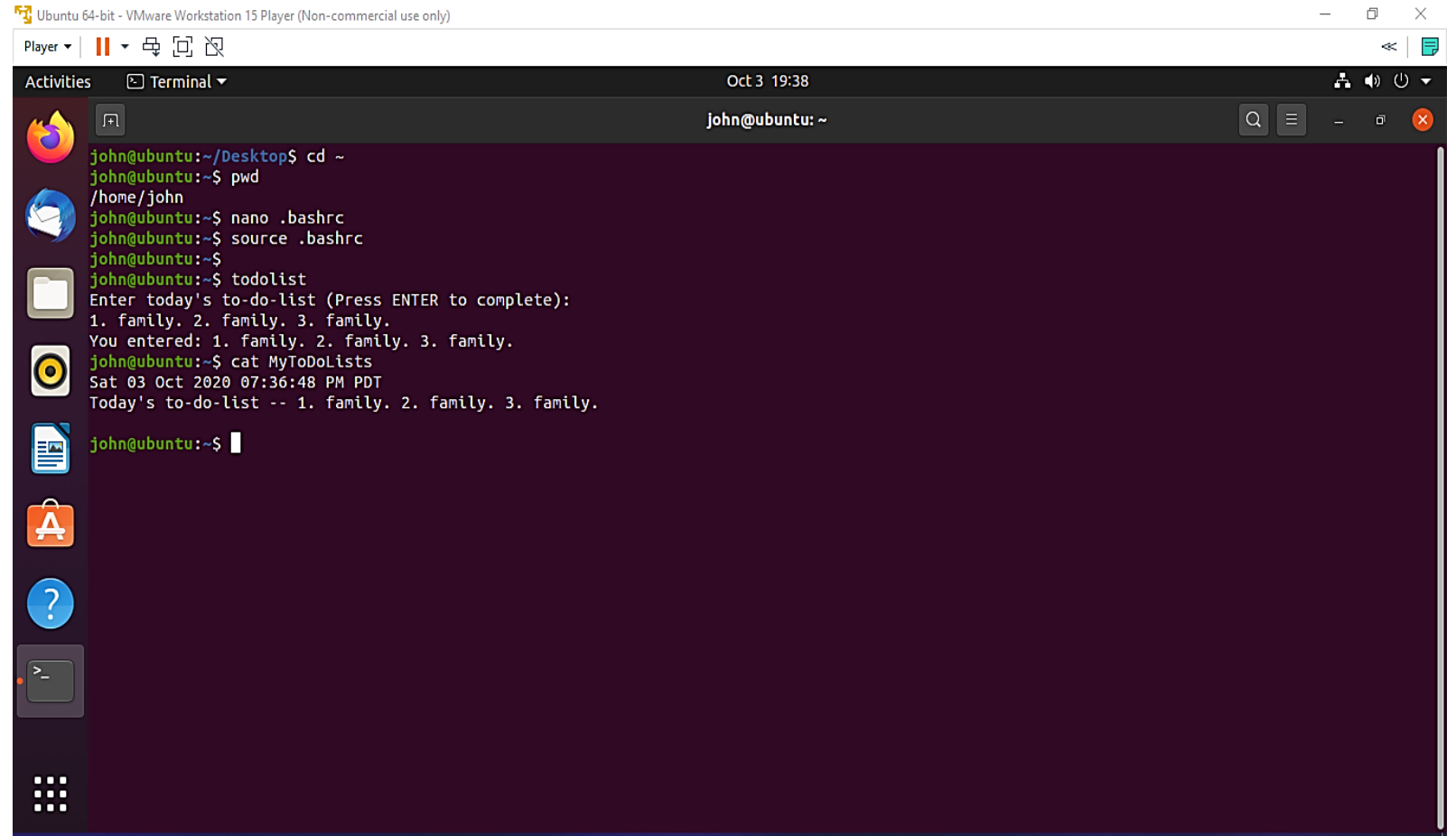
A screen capture of the  
output.



```
mary@ubuntu:~/Desktop$ cd ~
mary@ubuntu:~$ pwd
/home/mary
mary@ubuntu:~$ nano .bashrc
mary@ubuntu:~$ source .bashrc
mary@ubuntu:~$
mary@ubuntu:~$ todolist
Enter today's to-do-list (Press ENTER to complete):
1. school. 2. school. 3. school.
You entered: 1. school. 2. school. 3. school.
mary@ubuntu:~$
mary@ubuntu:~$ cat MyToDoLists
Sat 03 Oct 2020 07:14:09 PM PDT
Today's to-do-list -- 1. school. 2. school. 3. school.
mary@ubuntu:~$
```

# Add users in GUI

A screen capture of the output.



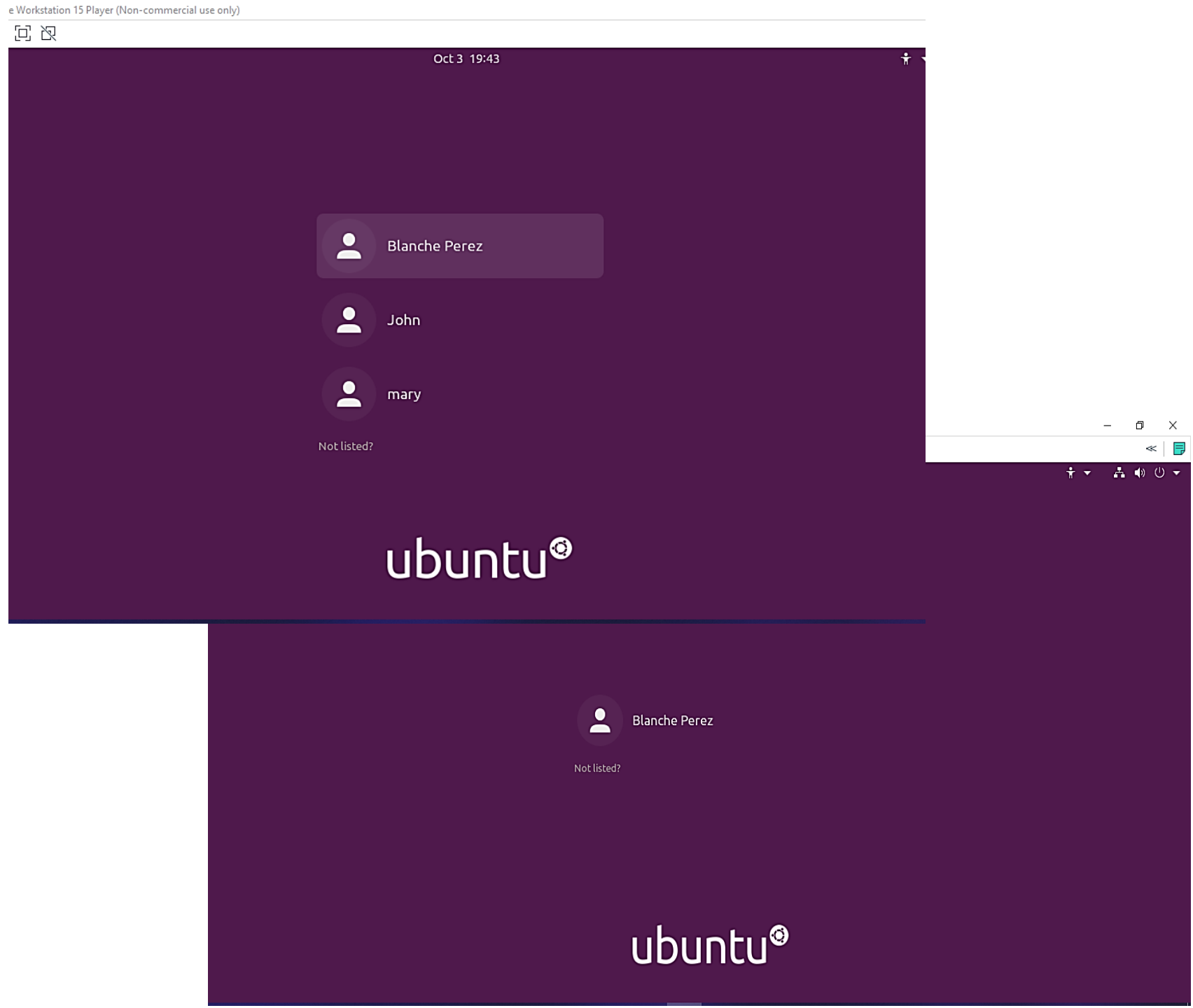
The screenshot shows a VMware Workstation 15 Player window titled "Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)". The window displays the Ubuntu desktop environment. On the left is a dock with icons for Firefox, Mail, Files, Music, and the Dash. The main area is a terminal window titled "Terminal" with the prompt "john@ubuntu: ~". The terminal shows the following commands and output:

```
john@ubuntu:~/Desktop$ cd ~
john@ubuntu:~$ pwd
/home/john
john@ubuntu:~$ nano .bashrc
john@ubuntu:~$ source .bashrc
john@ubuntu:~$
john@ubuntu:~$ todolist
Enter today's to-do-list (Press ENTER to complete):
1. family. 2. family. 3. family.
You entered: 1. family. 2. family. 3. family.
john@ubuntu:~$ cat MyToDoLists
Sat 03 Oct 2020 07:36:48 PM PDT
Today's to-do-list -- 1. family. 2. family. 3. family.
john@ubuntu:~$
```

# Remove users and groups

A screen capture of the log on page with three user accounts.

Also, the log on page with only my user account.



## Challenges in the module:

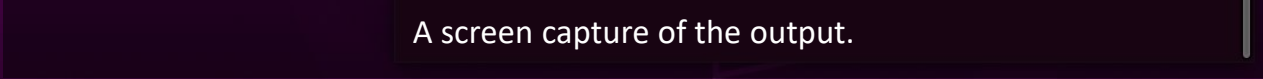
- *Investigating how to add more users through the terminal.*
- *Adding and removing users from a group.*
- *Using specific commands to run through other users.*





## Module 5: Network Configuration

*In this module, I had to learn the IP configurations of my Linux machine and explore different networking utility programs.*



Answer: 10.0.0.117

Answer: 10.0.0.1

*Answer: It is the same as the default and Ubuntu.*

Answer: It is the same as above. (I was unable to go any further. Even under root, I could not gain access.)

# Manage network interfaces

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

Answer: *The message displayed as follows:*

- 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/ens33/00:0c:29:0e:95:ff
- Sending on LPF/ens33/00:0c:29:0e:95:ff
- Sending on Socket/fallback

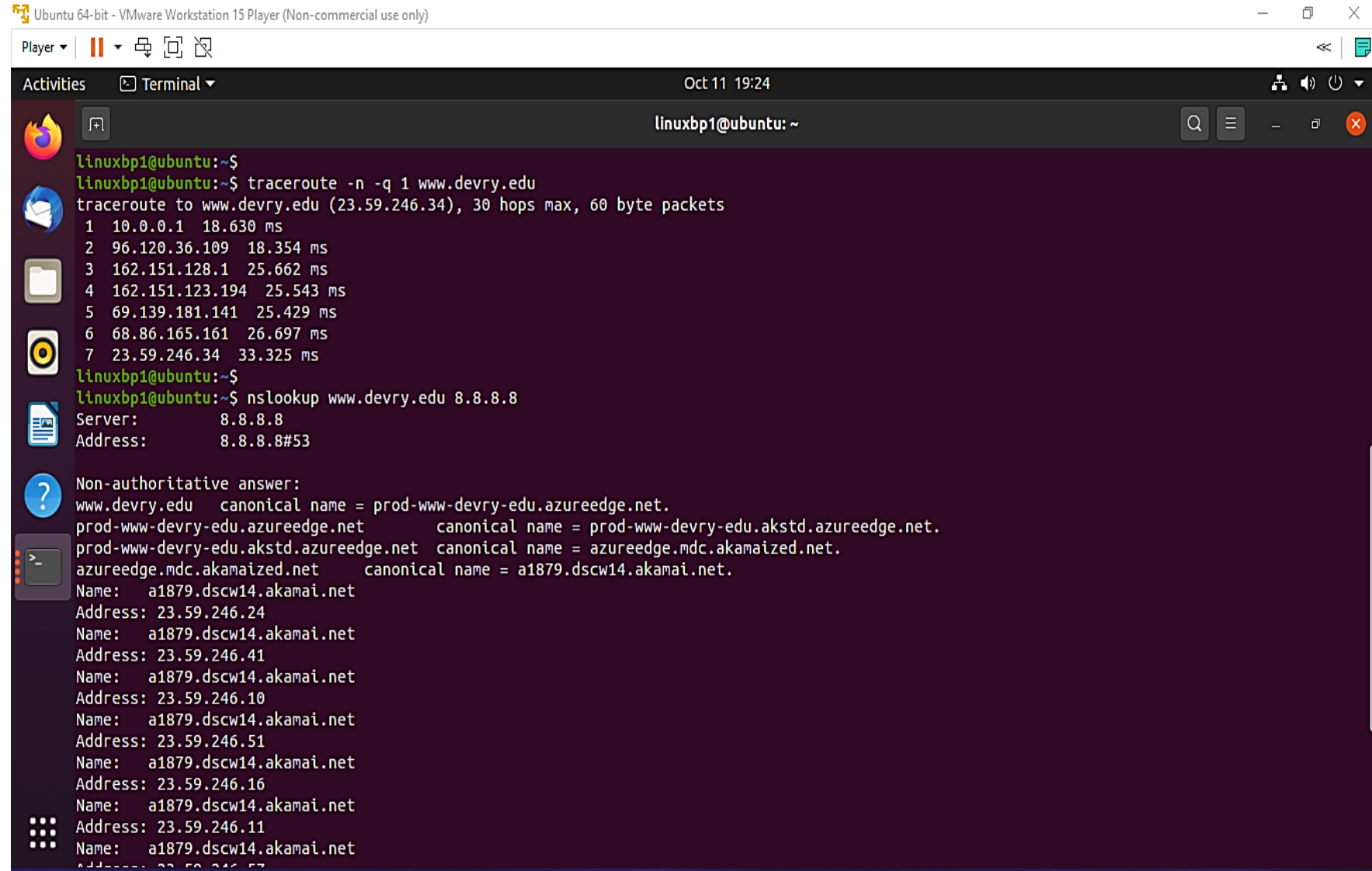
2. Which four DHCP messages are shown in the output of the **sudo dhclient -v ens33** command?

Answer: *The four DHCP messages displays as follows:*

- DHCPDISCOVER on ens33 to 255.255.255.255 port 67 interval 3 (xid=0xa6b3ee03)
- DHCPOFFER of 10.0.0.117 from 10.0.0.1
- DHCPREQUEST for 10.0.0.117 on ens33 to 255.255.255.255 port 67 (xid=0x3eeb3a6)
- DHCPACK of 10.0.0.117 from 10.0.0.1 (xid=0xa6b3ee03)

# Use network utilities

A screen capture of the  
output.



The screenshot shows a terminal window titled "Ubuntu 64-bit - VMware Workstation 15 Player (Non-commercial use only)". The terminal is running a series of commands to trace the route to www.devry.edu and perform a DNS lookup. The output of the traceroute command shows a path of 7 hops, with the final hop being 23.59.246.34. The output of the nslookup command shows the canonical name of www.devry.edu as prod-www-devry-edu.azureedge.net, and the canonical name of prod-www-devry-edu.azureedge.net as prod-www-devry-edu.akstd.azureedge.net. The output of the nslookup command also shows the canonical name of prod-www-devry-edu.akstd.azureedge.net as azureedge.mdc.akamaized.net, and the canonical name of azureedge.mdc.akamaized.net as a1879.dscw14.akamai.net. The terminal window has a dark background and a light-colored text.

```
linuxbp1@ubuntu:~$ traceroute -n -q 1 www.devry.edu
traceroute to www.devry.edu (23.59.246.34), 30 hops max, 60 byte packets
 1  10.0.0.1  18.630 ms
 2  96.120.36.109  18.354 ms
 3  162.151.128.1  25.662 ms
 4  162.151.123.194  25.543 ms
 5  69.139.181.141  25.429 ms
 6  68.86.165.161  26.697 ms
 7  23.59.246.34  33.325 ms
linuxbp1@ubuntu:~$ nslookup www.devry.edu 8.8.8.8
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
www.devry.edu canonical name = prod-www-devry-edu.azureedge.net.
prod-www-devry-edu.azureedge.net canonical name = prod-www-devry-edu.akstd.azureedge.net.
prod-www-devry-edu.akstd.azureedge.net canonical name = azureedge.mdc.akamaized.net.
azureedge.mdc.akamaized.net canonical name = a1879.dscw14.akamai.net.
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.24
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.41
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.10
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.51
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.16
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.11
Name:   a1879.dscw14.akamai.net
Address: 23.59.246.57
```

## Challenges in the module:

- *Determine where to locate the IP addresses and what they are for.*
- *Learning about the DHCP messages and what they mean.*
- *Investigating the use of the network utilities.*





# Module 6: System Performance Monitoring

*In this final module, exploring the Linux utilities that monitor processes, user activities, and network usage were investigated.*

# Monitor Linux processes

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

*Answer: The (obvious) default action for all signals is to allow the process to stop. The SIGTERM signal is a generic signal used to end the program. In comparison to SIGKILL, this signal can be blocked, managed, and ignored. It's the usual way to respectfully ask the program to terminate.*

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: The two processes are the gnome-shell and gnome-system-monitor are both showing high (or low) percentages.*

# Monitor user activities

Issue the **sudo accton on** command to turn on GNC accounting. Enter **lastcomm apt** to check if the apt 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?

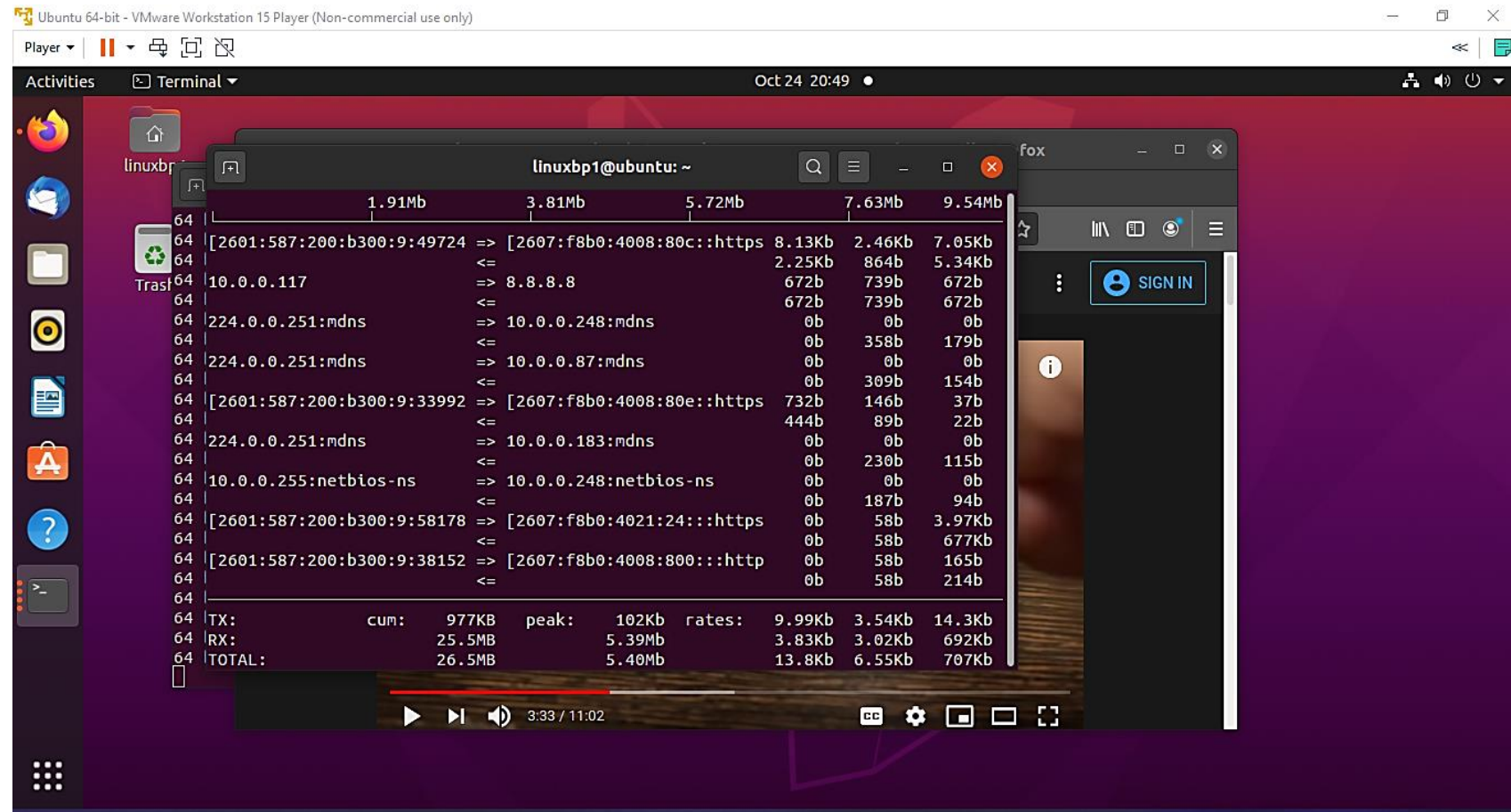
Answer here: *There was not a flag value displayed, other than ac -d, ac -dp, and sa -m.*

2. Why is the name of the user who ran the processes shown as root, not your username?

Answer here: *The root is a user or account that has access to all commands and files on a Linux or other Unix-like operating system by default. It is sometimes referred to as root user, root account, and superuser.*

# Monitor network bandwidth usage

When the DNS resolution is off and only IP addresses are displayed on the output.



## Challenges in the module:

- *Understanding what a flag value is and how it confirms certain commands in the output.*
- *Investigating how network bandwidth usage works, using the command prompt.*
- *Figuring out why the root user is used when monitoring processes.*





# What Was Learned...

*In a nutshell, Linux is an operating system (OS) which is mostly used for IT professions. It requires plenty of time and management to maintain a working OS and its data bases. Throughout the course, learning about an operating system, such as Linux (Ubuntu) was a definite learning experience. Especially, when a single person is very new to trying a software skill that is far beyond his or her knowledge.*

# Thank you.

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Feedback is welcome!