

# Template Week 5 – Operating Systems

Student number: 575798

## Assignment 5.1: Unix-like

- a) Find out what the difference is between UNIX and Unix-like operating systems?

Unix is original and mainly used for commercial purposes. Unix is also certified by the Single Unix Specification. However, Unix like operating systems are usually open source and are not certified.

- b) Study the image above named UNIX timeline. Find out who Ken Thompson, Dennis Ritchie, Bill Joy, Richard Stallman, and Linus Torvalds are and what they have contributed to the development of UNIX or Unix-like systems and to IT in general. **TIP!** English-language sources often contain more detailed information about these individuals.

Ken Thompson is one of the creators of UNIX. He had developed the first version of the UNIX operating system. He also managed to create the B programming language along with someone else which had later influenced the language C. He helped to make small programs which would all work together.

Dennis Ritchie is mainly known as the creator of C programming language. C was used to rewrite UNIX to make it portable across different types of hardware platforms. He had a huge influence on operating systems since most of them are written in C.

Bill Joy created the vi-text editor and contributed to the TCP/IP networking stack. He also co-founded Sun Microsystems which developed another major UNIX system. His work influenced networking and modern UNIX systems.

Richard Stallman is the founder of the free software movement and the GNU project. He wanted to create a free version of UNIX. He later developed tools like the GNU compiler, GNU Emacs and the GNU.

- c) What is the philosophy of the GNU movement?

The philosophy of the GNU movement is that software should be free therefore the users have the freedom to have control over it.

- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement? Please explain your answer.

Ubuntu does conform to the philosophy of the GNU movement. Most of the software is free and open source. Ubuntu also encourages users to make contributions.

- e) Find out what is the Windows Subsystem for Linux?

Windows Subsystem for Linux is a feature in Microsoft windows that allows users to run a Linux environment directly on Windows without needing a virtual machine or dual boot.

- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?

Android belongs to Linux; iOS belongs to the UNIX family and ChromeOS belongs to the Linux family.

## Assignment 5.2: Supercomputers and gameconsoles

- a) Research on this site what supercomputers are used for and write a short summary of it:  
<https://www.computerhistory.org/timeline/search/?q=Supercomputer>

Supercomputers are used in astrophysics, weather and ocean modeling. A supercomputer was used to create Road runner and also created a design for the architecture in supercomputers. A supercomputer was used to help with the maintenance of the US nuclear arsenal. Japan used a super computer to create global climate models. This was to help it from earthquakes. Intel's touchstone delta supercomputer was used to prototype for projects like real time processing of satellite images or simulating molecular models in AIDS research. China used it to run massive solar energy simulations as well as complex molecular studies. America used it for nuclear arsenal, analyse financial data as well as render 3D medical images in real time. Therefore, supercomputers handle large sets of data and help us to understand very complex conceptions.

- b) IBM is a company that has already built a number of supercomputers. One of them is IBM's Roadrunner. The CPU developed for this supercomputer was further developed at a later stage as the CPU for the PlayStation 3 console. Find out what a **PlayStation 3 cluster** is and what it was used for?

The PS3 cluster is almost like a mini supercomputer which was created by linking many PS3 consoles together which was mainly used for military purposes which required a lot of parallel computing power.

- c) You can build a supercomputer by putting a few computers together in a cluster. Here's what Oracle did with a collection of Raspberry Pi's, for example:

<https://blogs.oracle.com/developers/post/building-the-worlds-largest-raspberry-pi-cluster>

What specific operating system is running on this cluster?

Oracle Linux was running on this cluster.

- d) Does Oracle's Raspberry Pi supercomputer appear in the list of the 500 fastest supercomputers in the world? Make a logical decision for this, without going through the entire list.

<https://www.top500.org/lists/top500/list/2023/06/>

No since the computing power of a Raspberry Pi is very low level compared to huge companies who would've invested millions into supercomputers.

- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?  
What operating systems run on these consoles?  
What conclusion can you draw from the answer to the previous question?

PlayStation 5 uses Custom AMD Zen 2 based CPU x86-64 and so does Xbox. For the operating system, PS 5 uses Orbis OS and for Xbox, Xbox OS is used. This shows that modern consoles are basically PCs with custom operating systems that use the same architecture as mainstream computers.

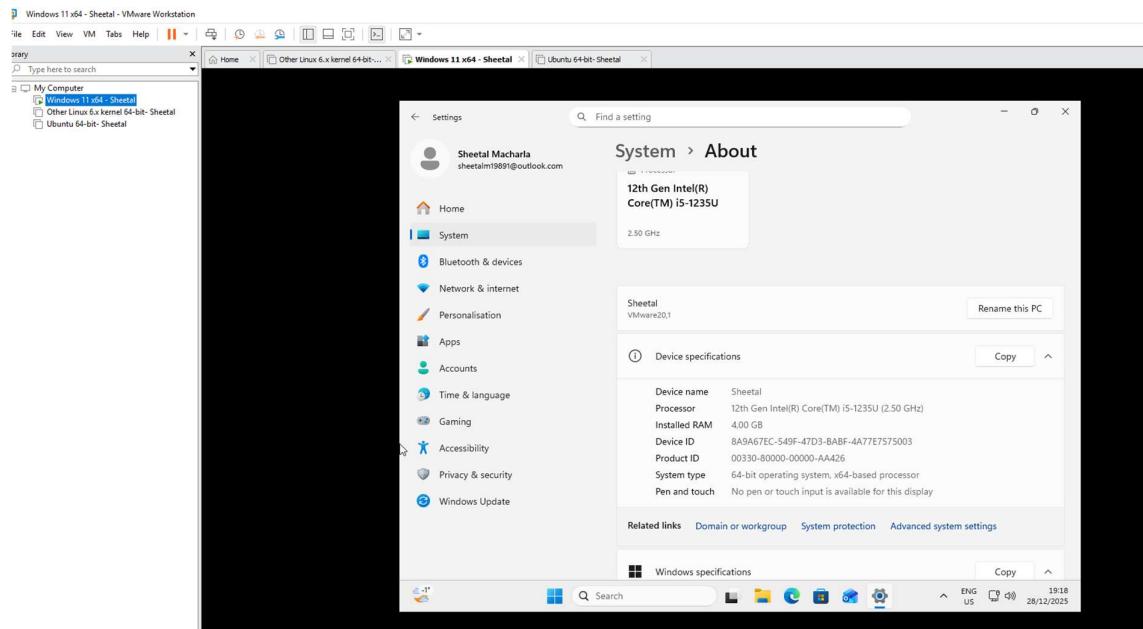
### Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

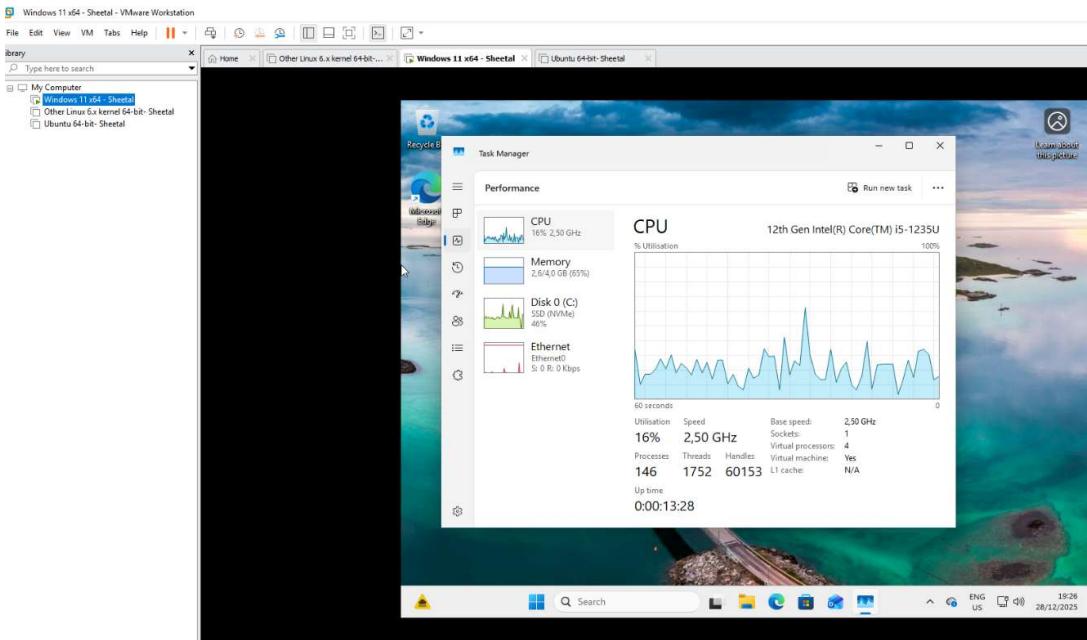
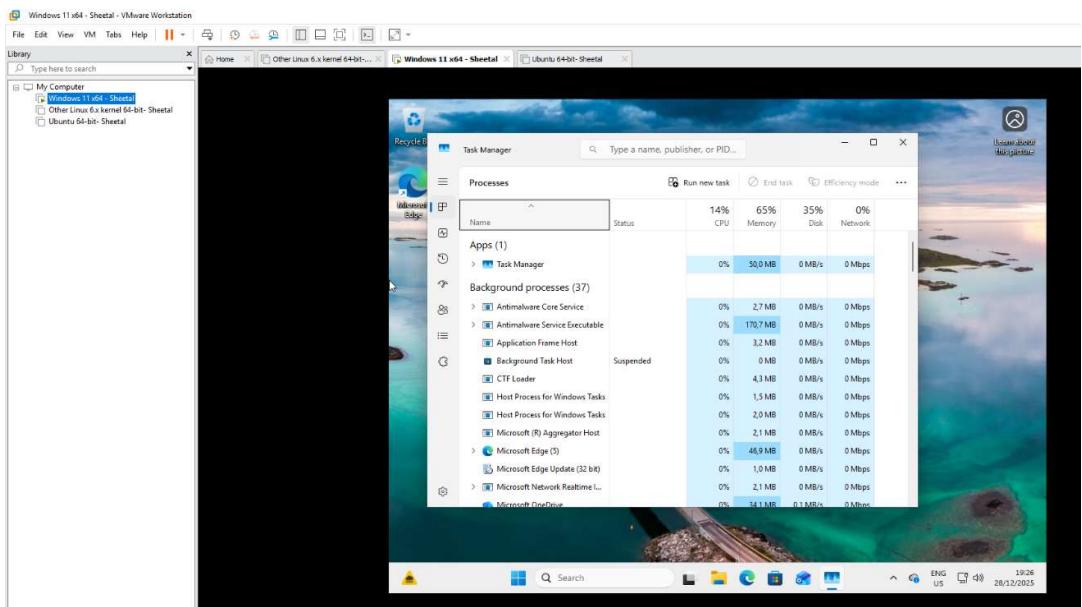
- Practice for about 10 minutes with the **Windows** keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.
- The file explorer can be opened with **Windows + E**, Which key combination could you also use?

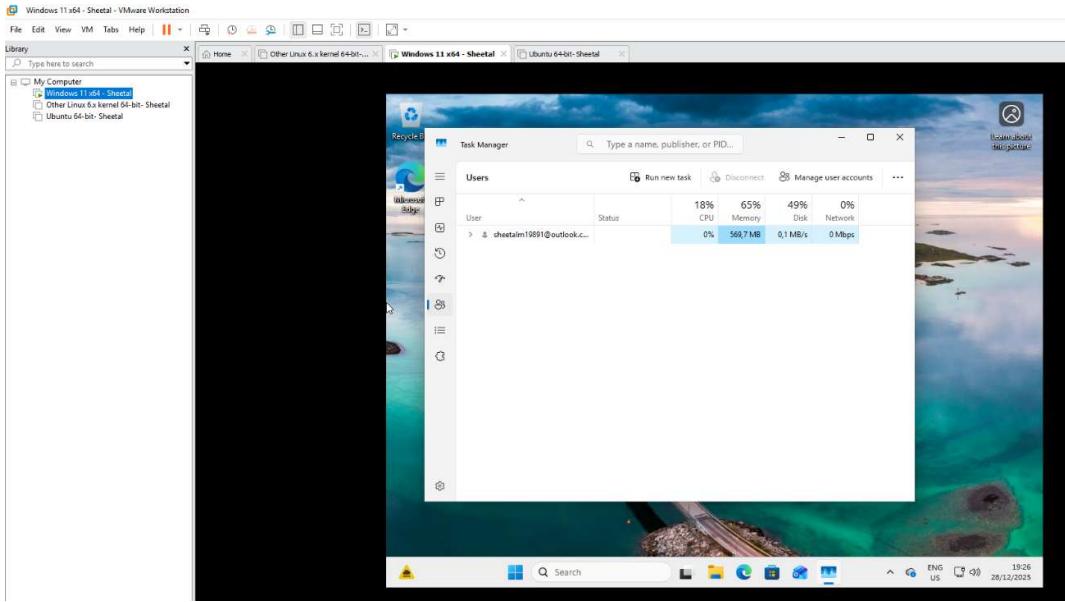
Windows + R and then type explorer.

- Open the system properties with a **Windows** key combination, take a screenshot of the open screen. Paste this screenshot into this template.



- Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.





- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector, or the second screen. Which key combination should you use for this?

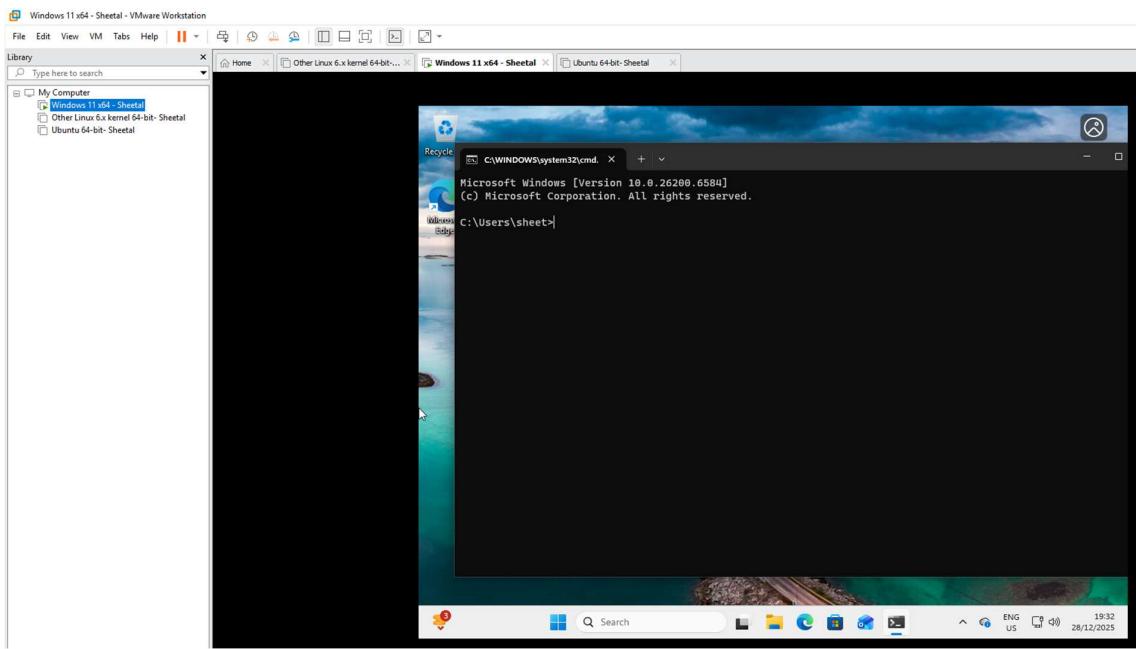
Windows + P

- f) If you leave the classroom for a while and you leave your laptop behind, it is wise to lock the screen. Your Apps will continue to run in the background. So, for example, if you're waiting for a download that takes a while, lock the screen and get a cup of coffee. Which key combination do you use for this?

Windows + L

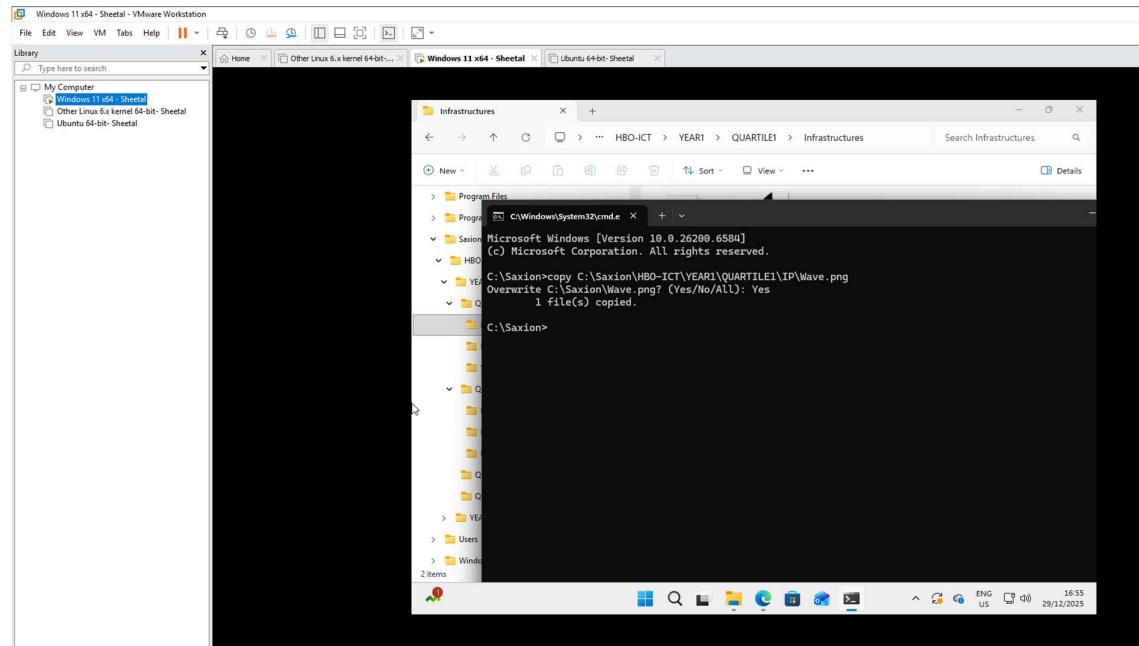
- g) Open the Run screen with a key combination. On this screen, type CMD and press <enter>. Take a screenshot of this result and paste it into this template.

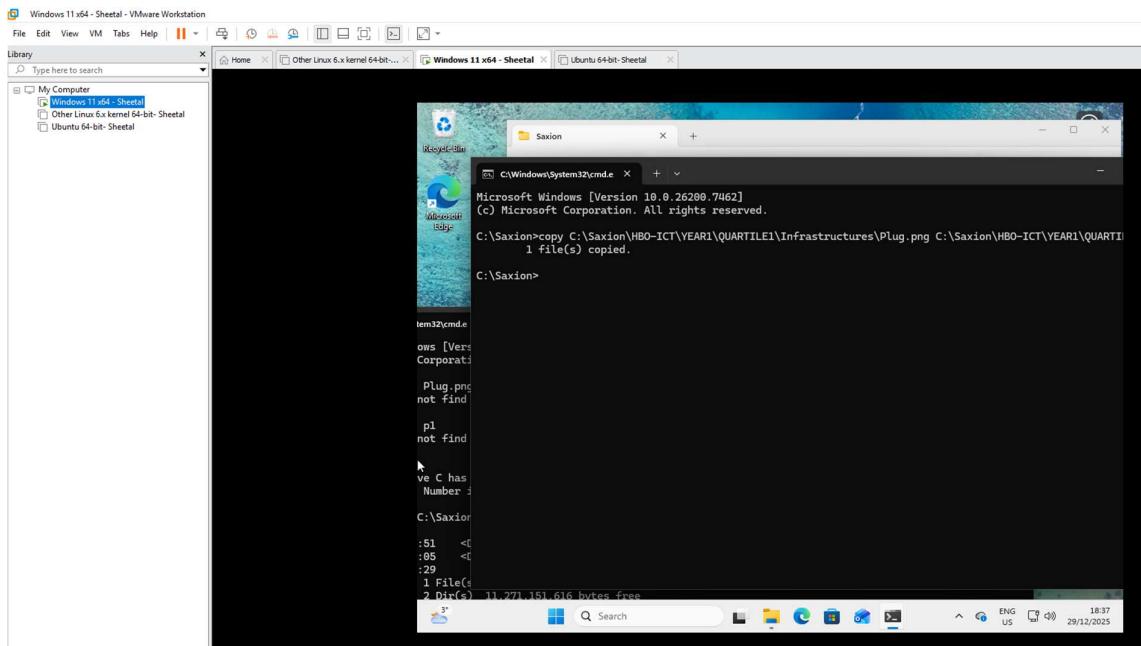
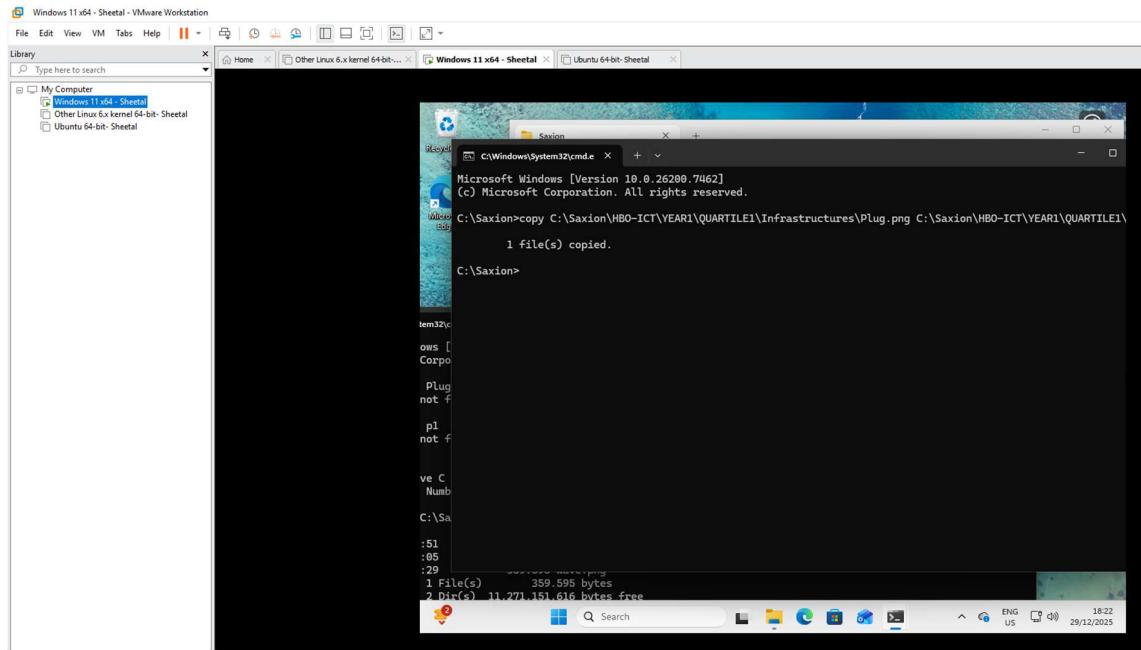
I used Windows + R and typed cmd



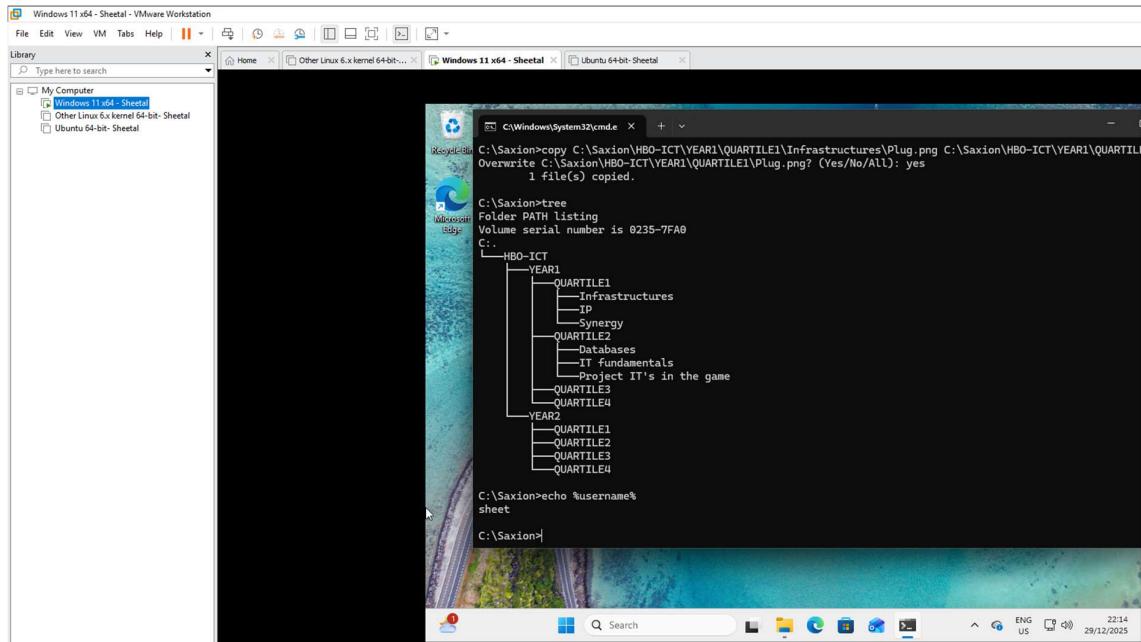
## Working in the File Explorer

Relevant screenshots **copy** command:

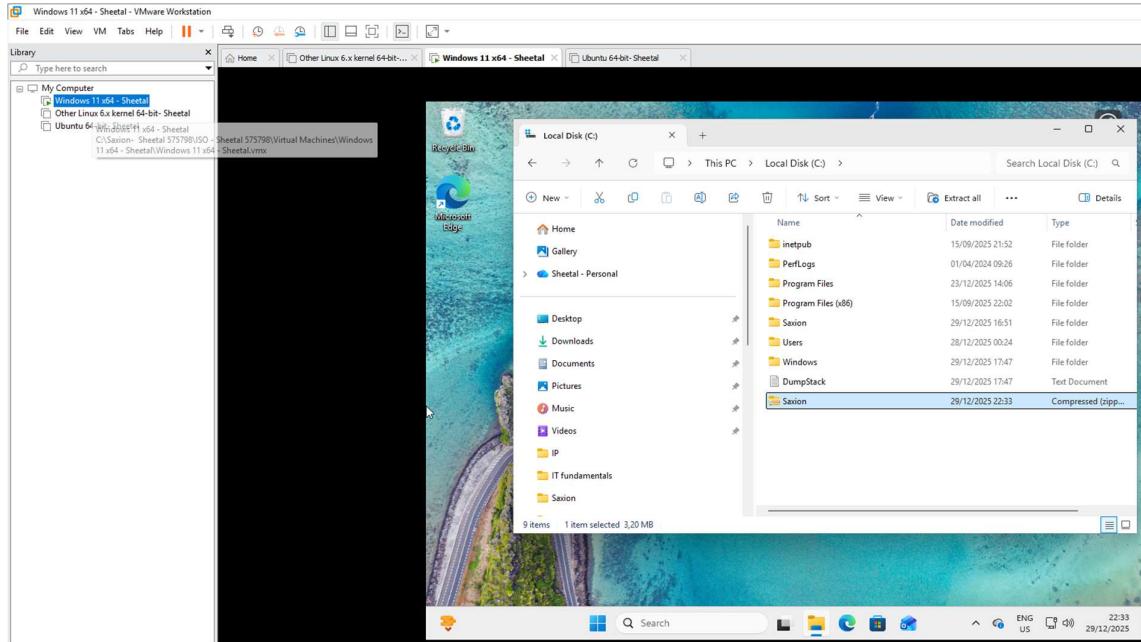


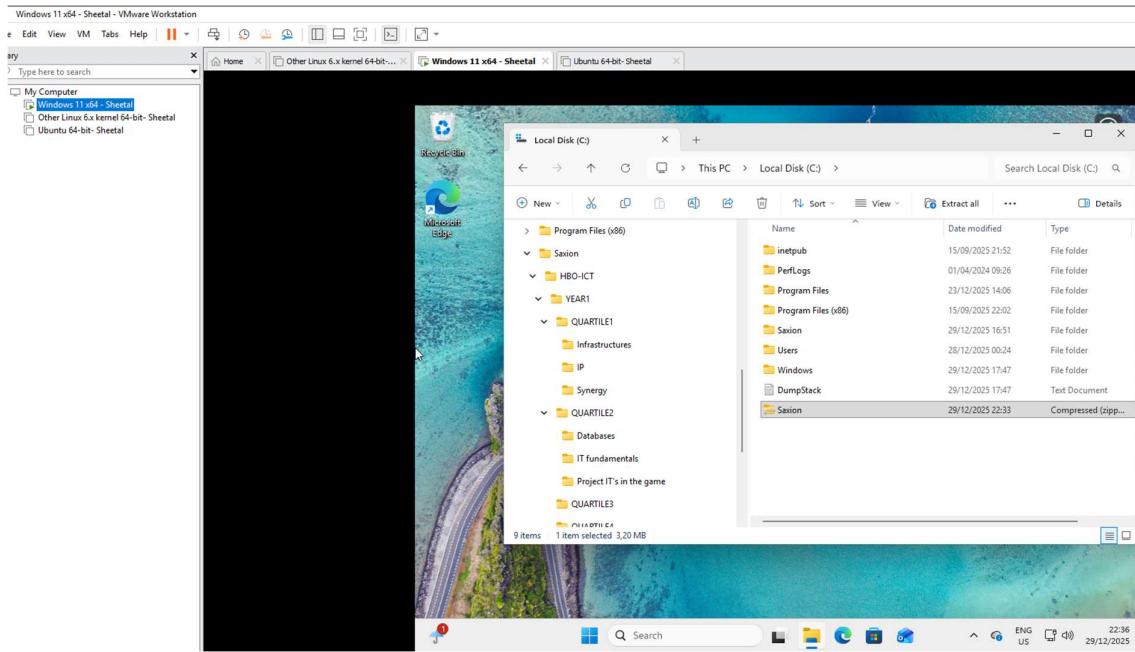


Relevant screenshots **tree** command:



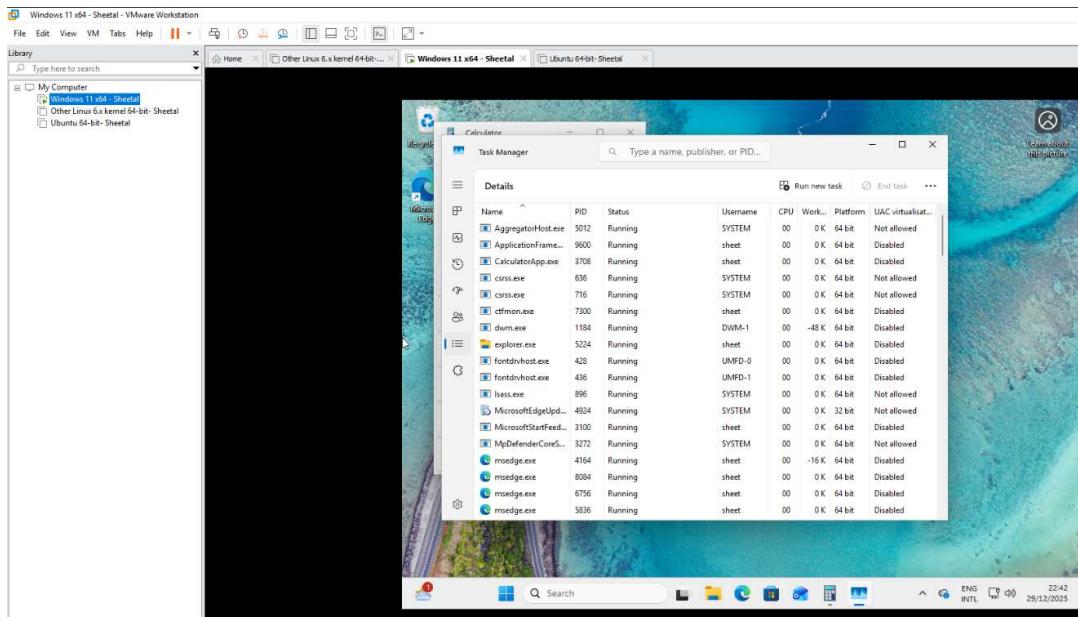
Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.

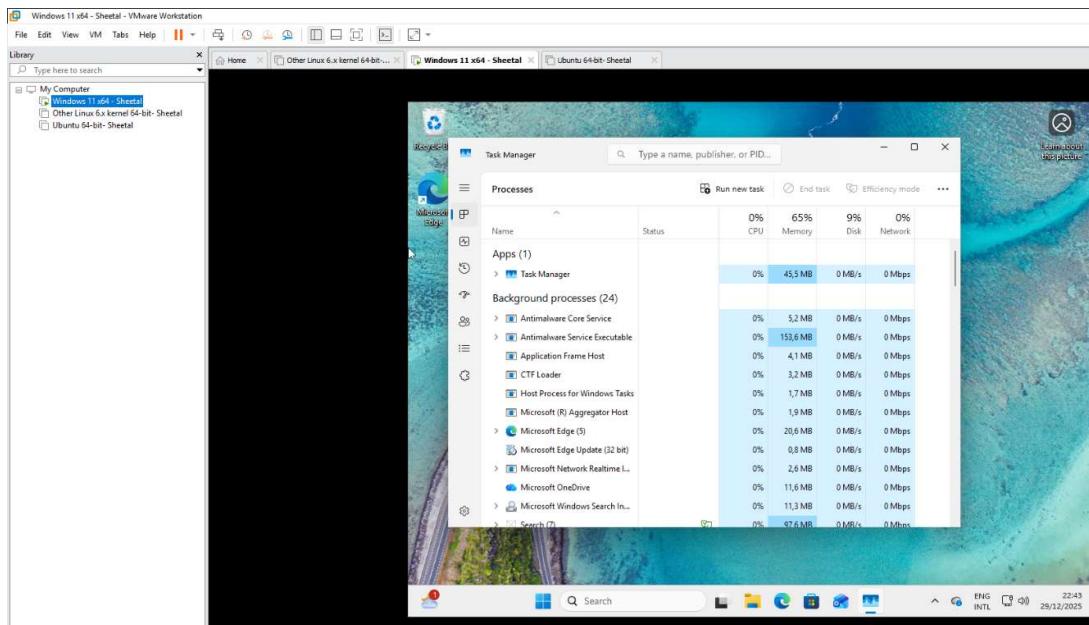
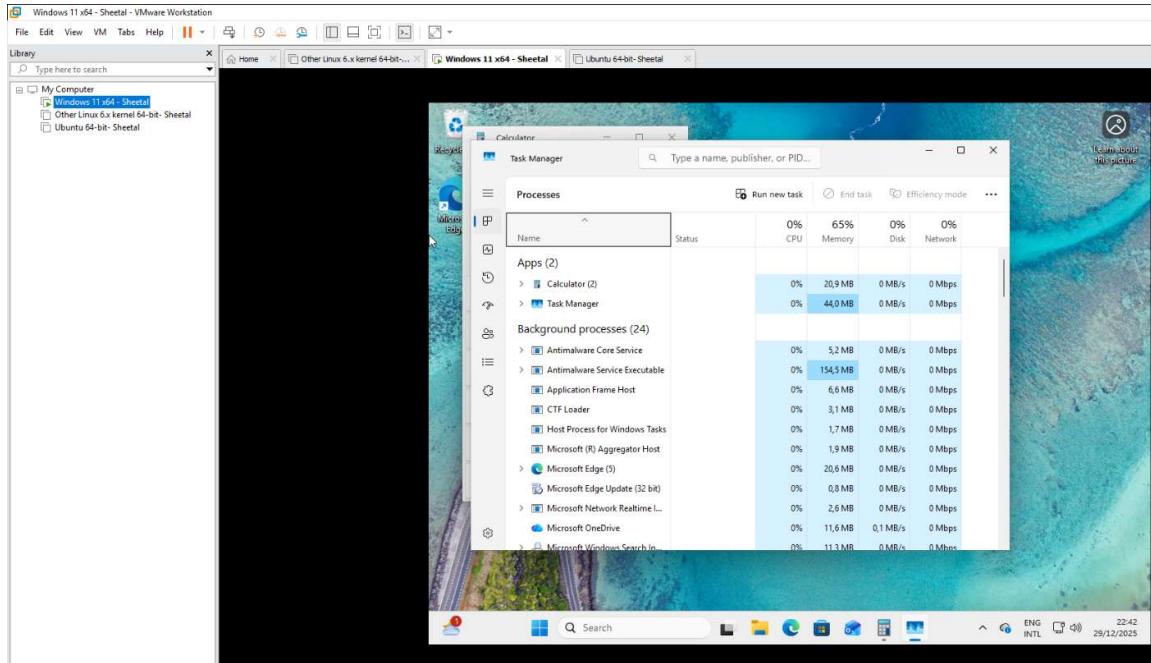




## Terminating Processes

Relevant Screenshots Task Manager Window:

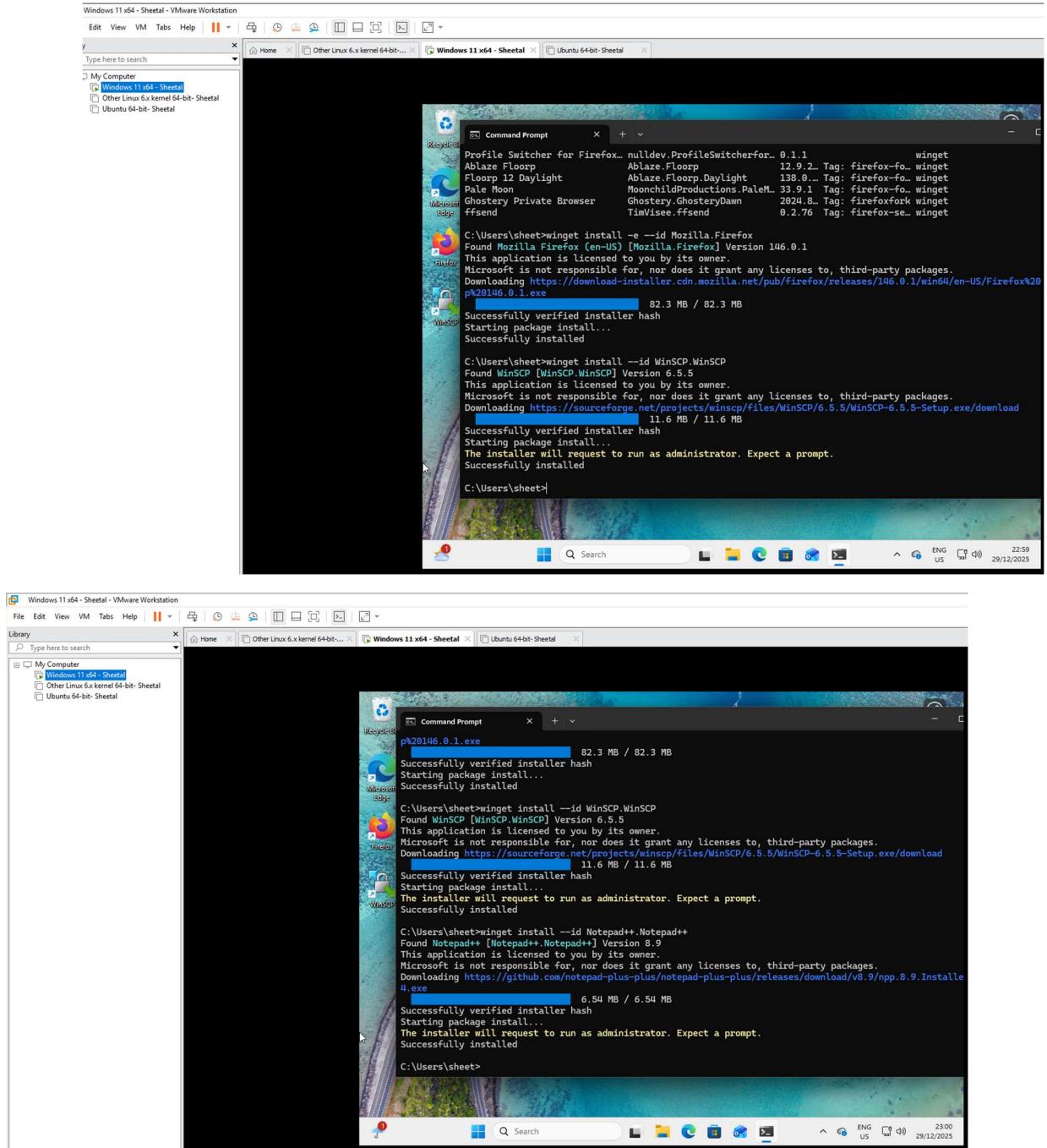


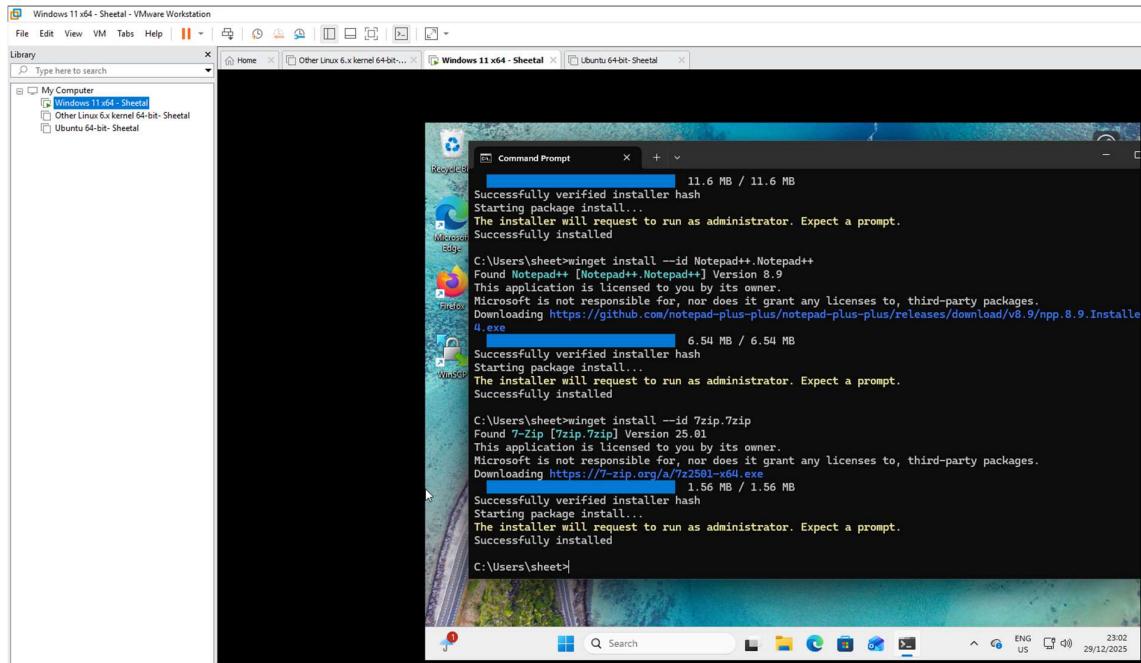


## Install Software

Relevant screenshots that the following software is installed with winget:

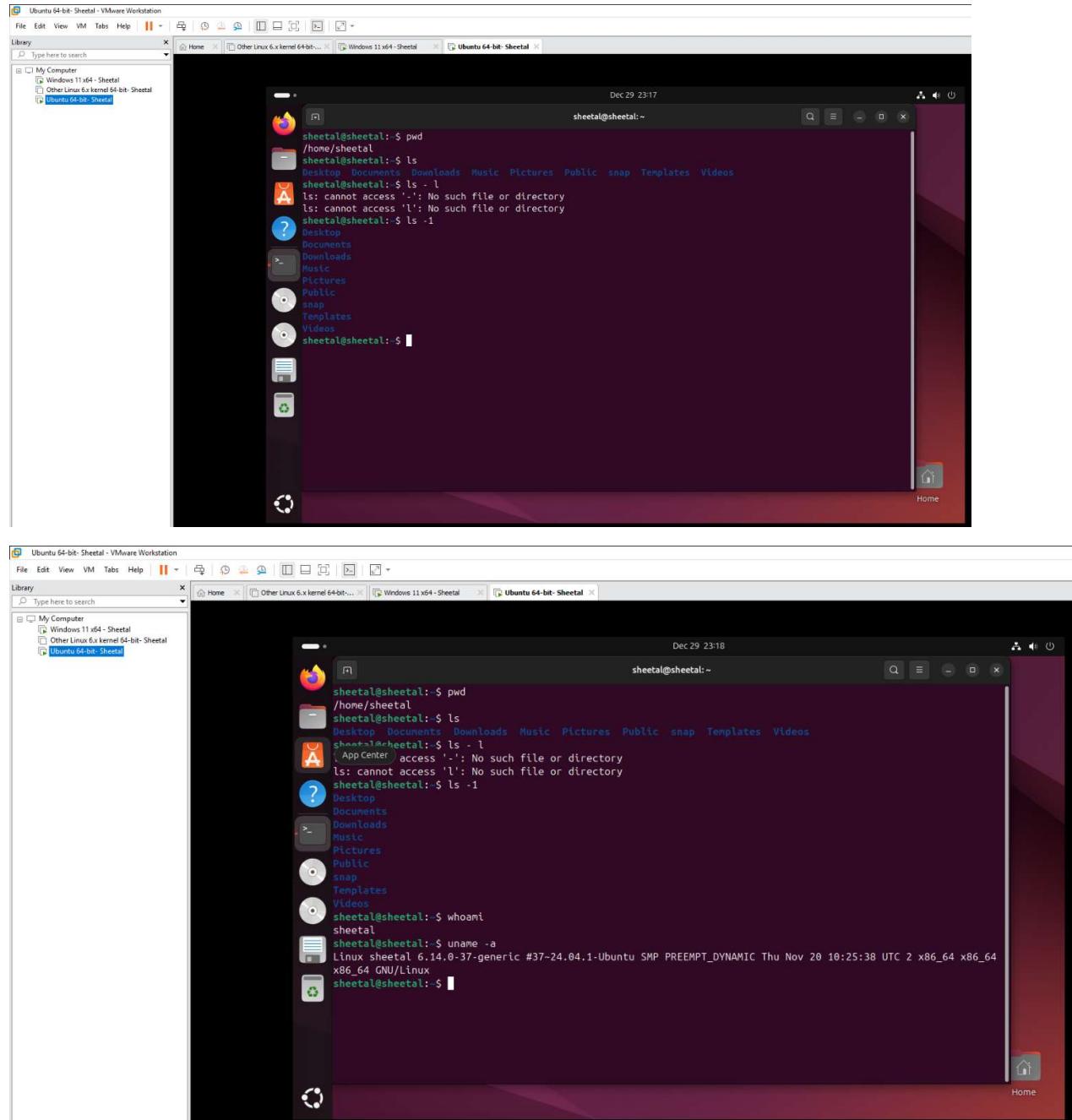
- WinSCP
- Notepad++
- 7zip





## Assignment 5.4: Working with Linux

Relevant screenshots + motivation



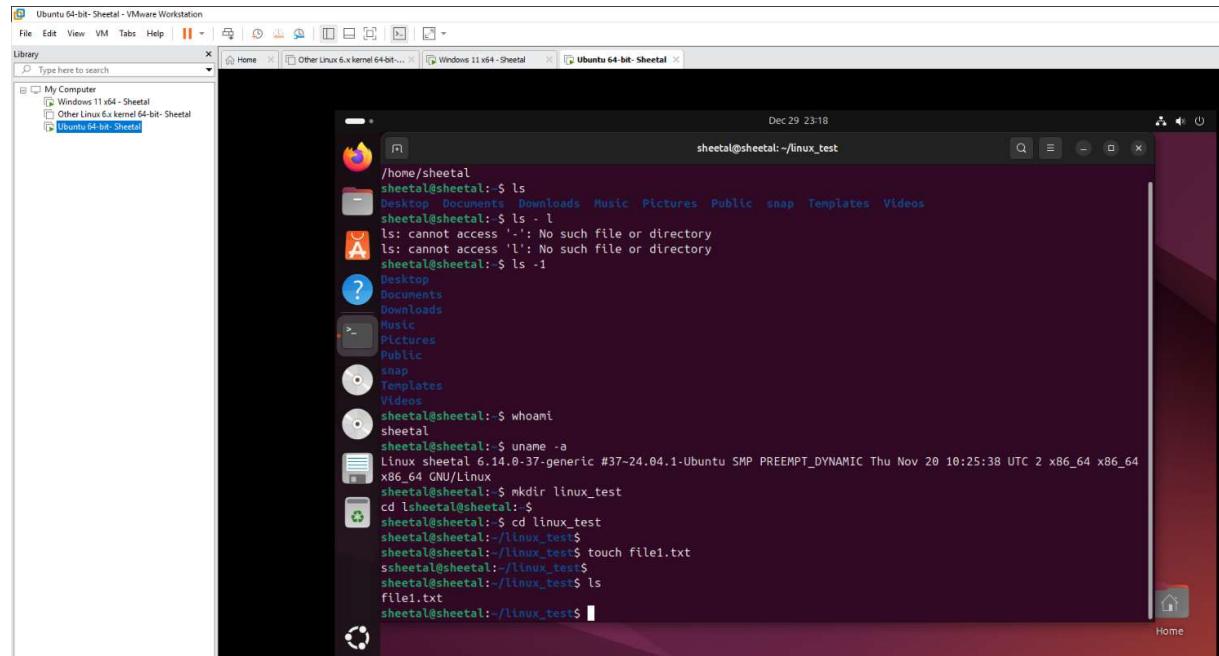
As you can see this screenshot shows the use of the `pwd` command which displays the current working directory in the Ubuntu 24.04 Desktop VM.

The `whoami` screenshots displays the active logged in user by using this command.

The `uname -a` command shows the system and kernel level information confirming the system is Ubuntu 24.04 running on a 64 bit Linux kernel.

## Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation



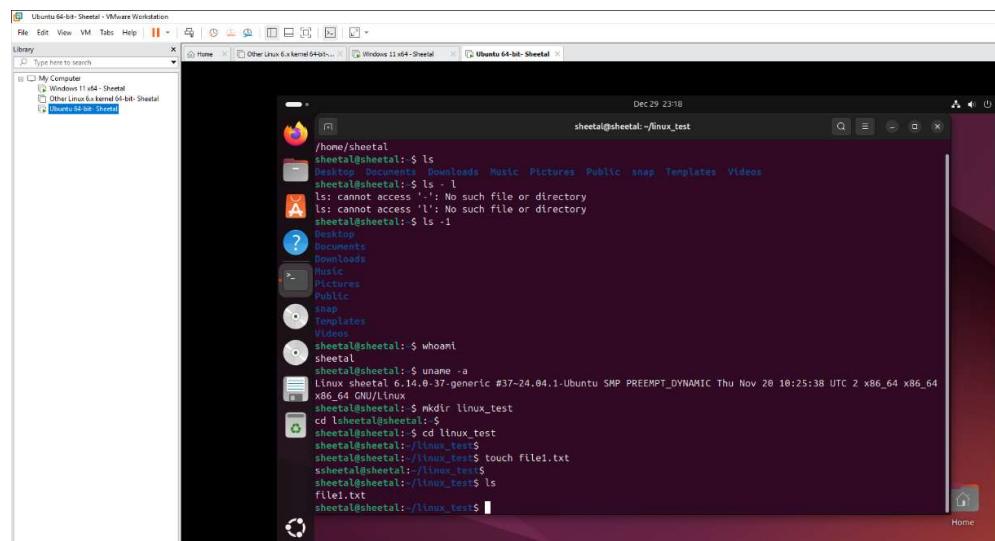
The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "sheetal@sheetal: ~/linux\_test". The terminal content shows the following command-line session:

```
/home/sheetal
sheetal@sheetal: $ ls
Desktop Documents Downloads Music Pictures Public snap Templates Videos
sheetal@sheetal: $ ls -l
ls: cannot access '-': No such file or directory
ls: cannot access 'l': No such file or directory
sheetal@sheetal: $ ls -1
Desktop
Documents
Downloads
Music
Pictures
Public
snap
Templates
Videos
sheetal@sheetal: $ whoami
sheetal
sheetal@sheetal: $ uname -a
Linux sheetal 6.14.0-37-generic #37~24.04.1-Ubuntu SMP PREEMPT_DYNAMIC Thu Nov 20 10:25:38 UTC 2 x86_64 x86_64
x86_64 GNU/Linux
sheetal@sheetal: $ mkdir linux_test
cd linux_test
sheetal@sheetal: $ cd linux_test
sheetal@sheetal: /linux_test$ touch file1.txt
ssheetal@sheetal: /linux_test$ sheetal@sheetal: /linux_test$ ls
file1.txt
sheetal@sheetal: /linux_test$
```

This screenshot shows the contents of the home directory. The `ls -l` shows the same list but in a column instead.

## Assignment 5.6: View the contents of files

Relevant screenshots + motivation



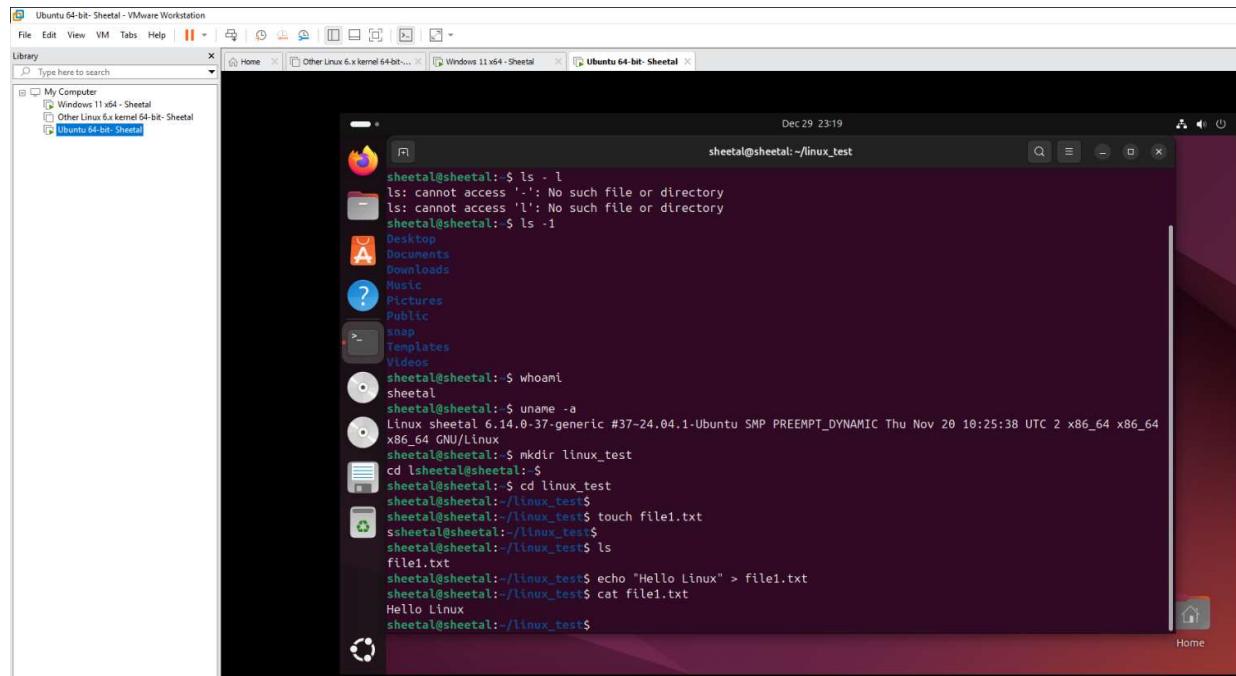
The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "sheetal@sheetal: ~/linux\_test". The terminal content shows the following command-line session:

```
/home/sheetal
sheetal@sheetal: $ ls
Desktop Documents Downloads Music Pictures Public snap Templates Videos
sheetal@sheetal: $ ls -l
ls: cannot access '-': No such file or directory
ls: cannot access 'l': No such file or directory
sheetal@sheetal: $ ls -1
Desktop
Documents
Downloads
Music
Pictures
Public
snap
Templates
Videos
sheetal@sheetal: $ whoami
sheetal
sheetal@sheetal: $ uname -a
Linux sheetal 6.14.0-37-generic #37~24.04.1-Ubuntu SMP PREEMPT_DYNAMIC Thu Nov 20 10:25:38 UTC 2 x86_64 x86_64
x86_64 GNU/Linux
sheetal@sheetal: $ mkdir linux_test
cd linux_test
sheetal@sheetal: $ cd linux_test
sheetal@sheetal: /linux_test$ touch file1.txt
sheetal@sheetal: /linux_test$ sheetal@sheetal: /linux_test$ ls
file1.txt
sheetal@sheetal: /linux_test$
```

The mkdir linux\_test command shows the creation of a new directory. The cd command shows the navigation into the new directory.

### Assignment 5.7: Digital forensics

Relevant screenshots + motivation



```
sheetal@sheetal: ~$ ls -l
ls: cannot access '.': No such file or directory
ls: cannot access '|': No such file or directory
sheetal@sheetal: ~$ ls -l
Desktop
Documents
Downloads
Music
Pictures
Public
snap
Templates
Videos
sheetal@sheetal: ~$ whoami
sheetal
sheetal@sheetal: ~$ uname -a
Linux sheetal 6.14.0-37-generic #37~24.04.1-Ubuntu SMP PREEMPT_DYNAMIC Thu Nov 20 10:25:38 UTC 2 x86_64 x86_64
sheetal@sheetal: ~$ mkdir linux_test
cd sheetal@sheetal: ~
sheetal@sheetal: ~$ cd linux_test
sheetal@sheetal: ~/linux_test$ touch file1.txt
sheetal@sheetal: ~/linux_test$ 
sheetal@sheetal: ~/linux_test$ ls
file1.txt
sheetal@sheetal: ~/linux_test$ echo "Hello Linux" > file1.txt
sheetal@sheetal: ~/linux_test$ cat file1.txt
Hello Linux
sheetal@sheetal: ~/linux_test$
```

This screenshot shows the creation of an empty file. The ls confirms that the new file exists in the directory.

### Assignment 5.8: Steganography

Relevant screenshots + motivation

```

sheetal@sheetal:~$ ls -l
ls: Cannot access `-':: No such file or directory
ls: Cannot access `l': No such file or directory
sheetal@sheetal:~$ ls -i
desktop
Documents
Downloads
Music
Pictures
Public
snap
Templates
Videos
sheetal@sheetal:~$ whoami
sheetal
sheetal@sheetal:~$ uname -a
Linux sheetal 6.14.0-37-generic #37~24.04.1-Ubuntu SMP PREEMPT_DYNAMIC Thu Nov 20 10:25:38 UTC 2 x86_64 x86_64
x86_64 GNU/Linux
sheetal@sheetal:~$ mkdir linux_test
cd linux_test
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ touch file1.txt
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ ls
file1.txt
sheetal@sheetal:~/linux_test$ echo "Hello Linux" > file1.txt
sheetal@sheetal:~/linux_test$ cat file1.txt
Hello Linux
sheetal@sheetal:~/linux_test$ 

```

The echo line command shows the text being written to a file. The cat command shows the demonstration of reading the contents of a file,

### Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:

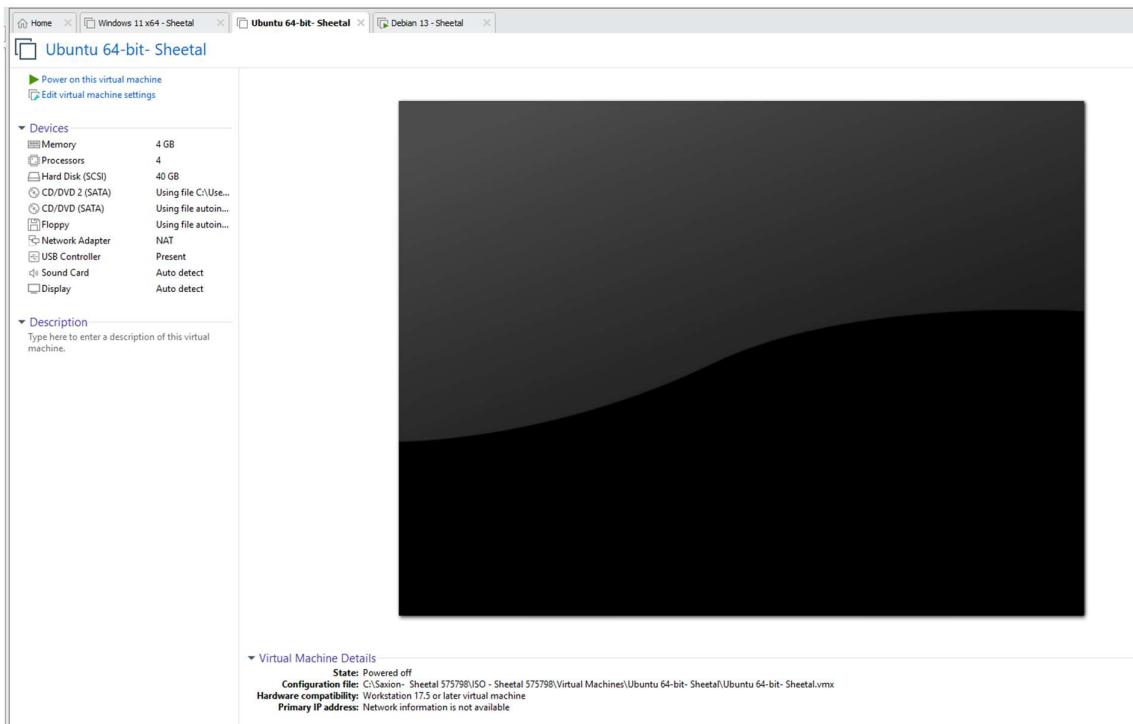
```

sheetal@sheetal:~$ ls -l
ls: Cannot access `-':: No such file or directory
ls: Cannot access `l': No such file or directory
sheetal@sheetal:~$ ls -i
desktop
Documents
Downloads
Music
Pictures
Public
snap
Templates
Videos
sheetal@sheetal:~$ whoami
sheetal
sheetal@sheetal:~$ uname -a
Linux sheetal 6.14.0-37-generic #37~24.04.1-Ubuntu SMP PREEMPT_DYNAMIC Thu Nov 20 10:25:38 UTC 2 x86_64 x86_64
x86_64 GNU/Linux
sheetal@sheetal:~$ mkdir linux_test
cd linux_test
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ touch file1.txt
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ ls
file1.txt
sheetal@sheetal:~/linux_test$ echo "Hello Linux" > file1.txt
sheetal@sheetal:~/linux_test$ cat file1.txt
Hello Linux
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ cd ~/linux_test
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ ls
file1.txt
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ cat file1.txt
Hello Linux
sheetal@sheetal:~/linux_test$ 
sheetal@sheetal:~/linux_test$ 

```

This screenshot verifies that the new file is stored in the home directory with its relevant contents.

- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.
- Proof that you can restore the back-up image into an empty VM.



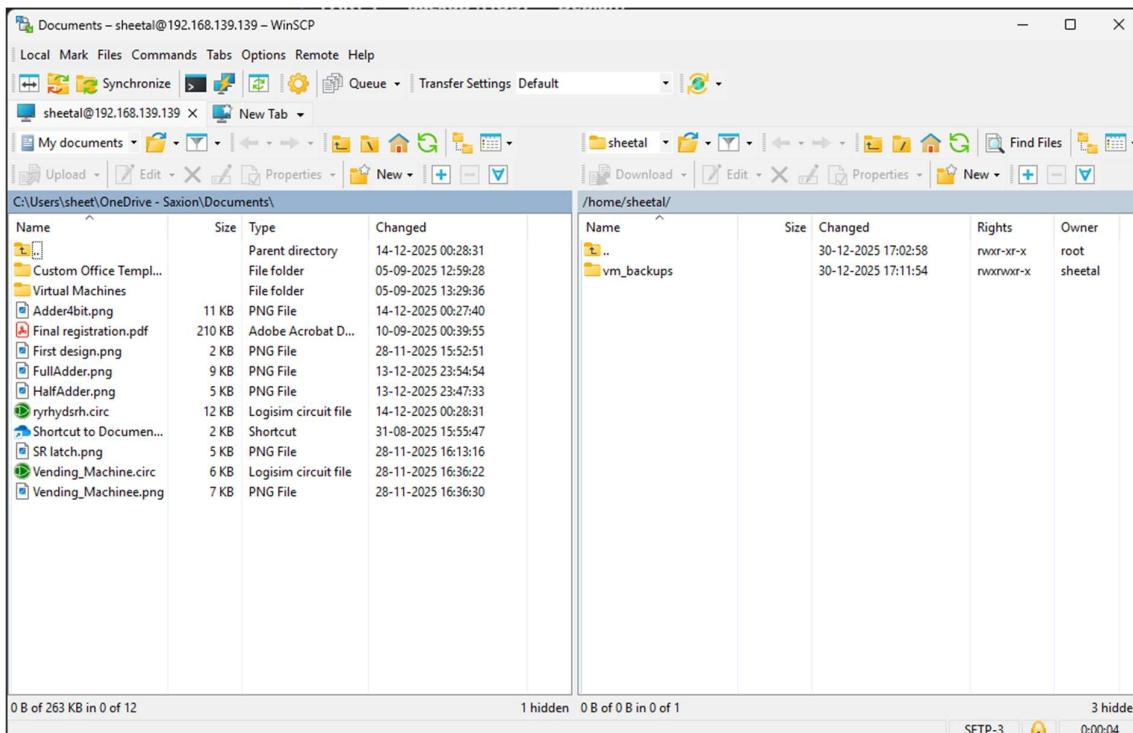
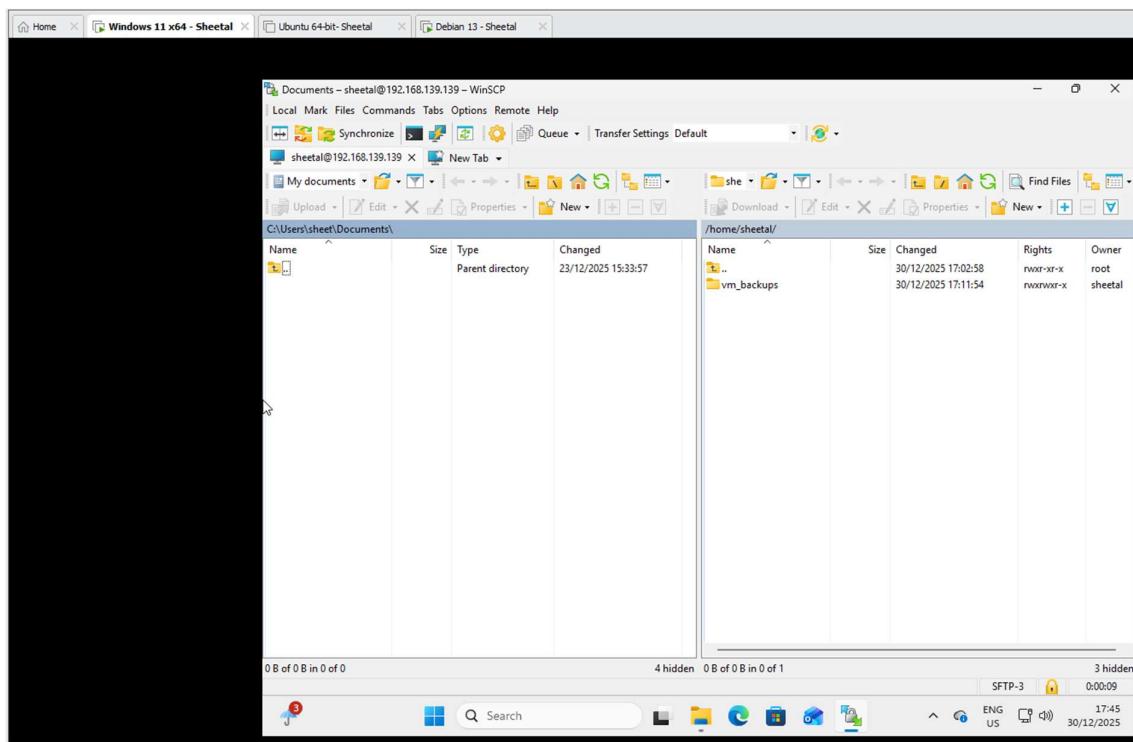
```

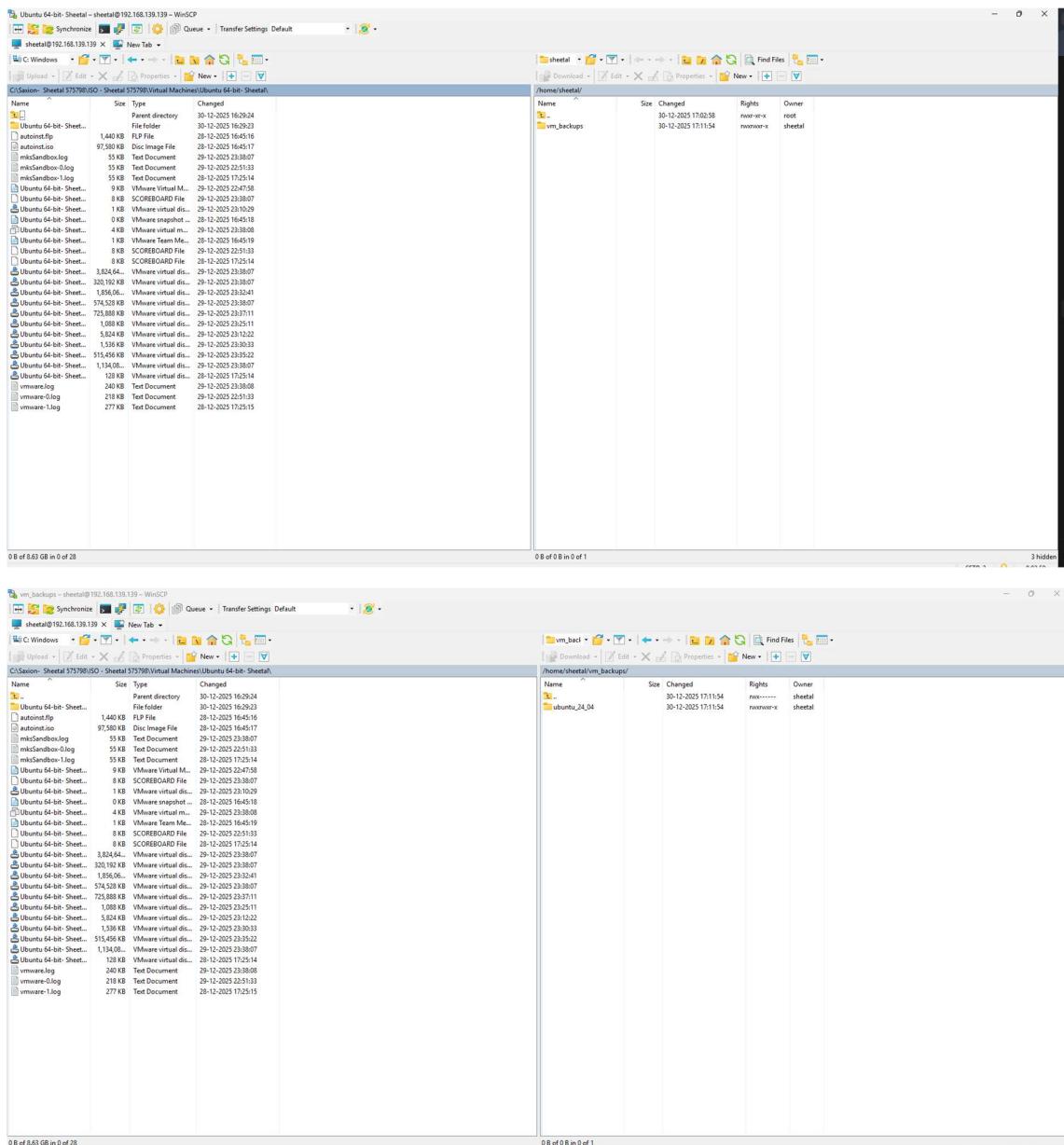
Debian GNU/Linux 13 sheetal tty1
sheetal login: Welcome01
Password:

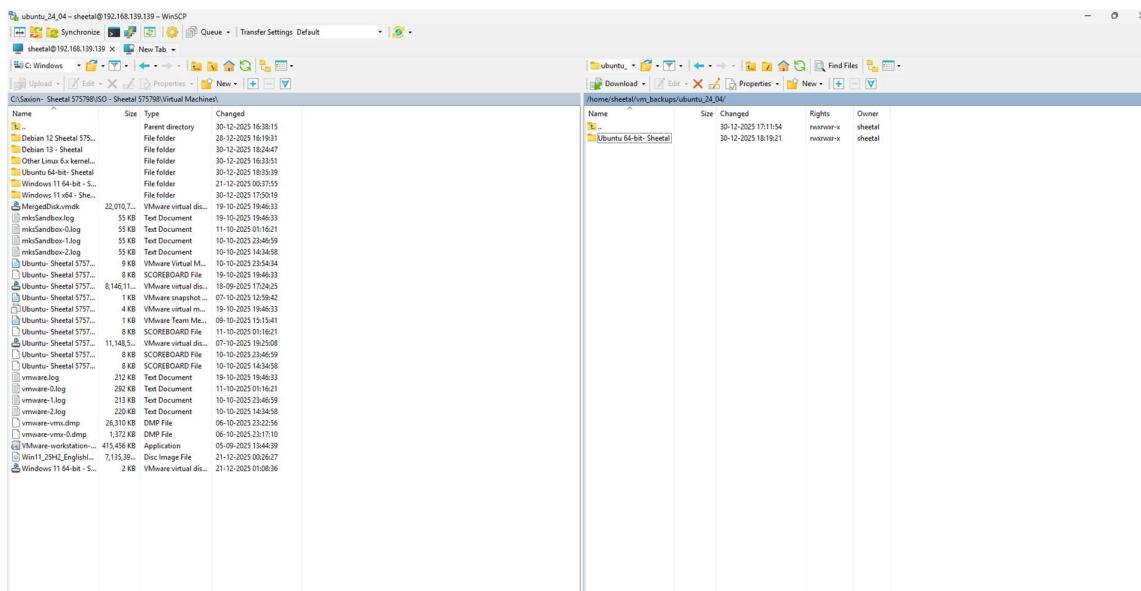
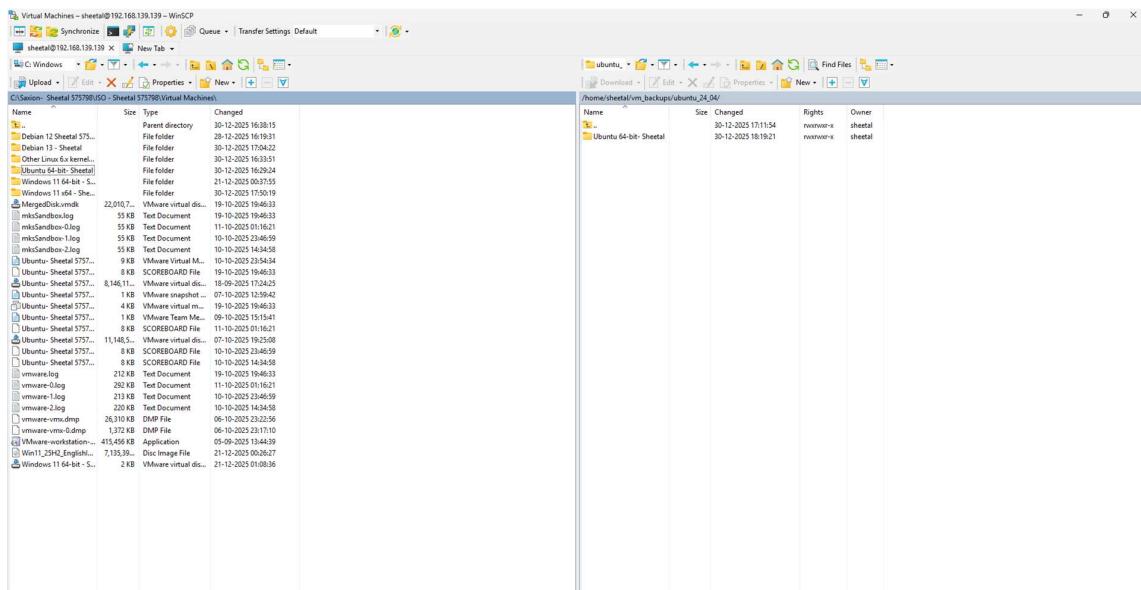
WeLogin incorrect
sheetal login: sheetal
Password:
Linux sheetal 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) x86_64

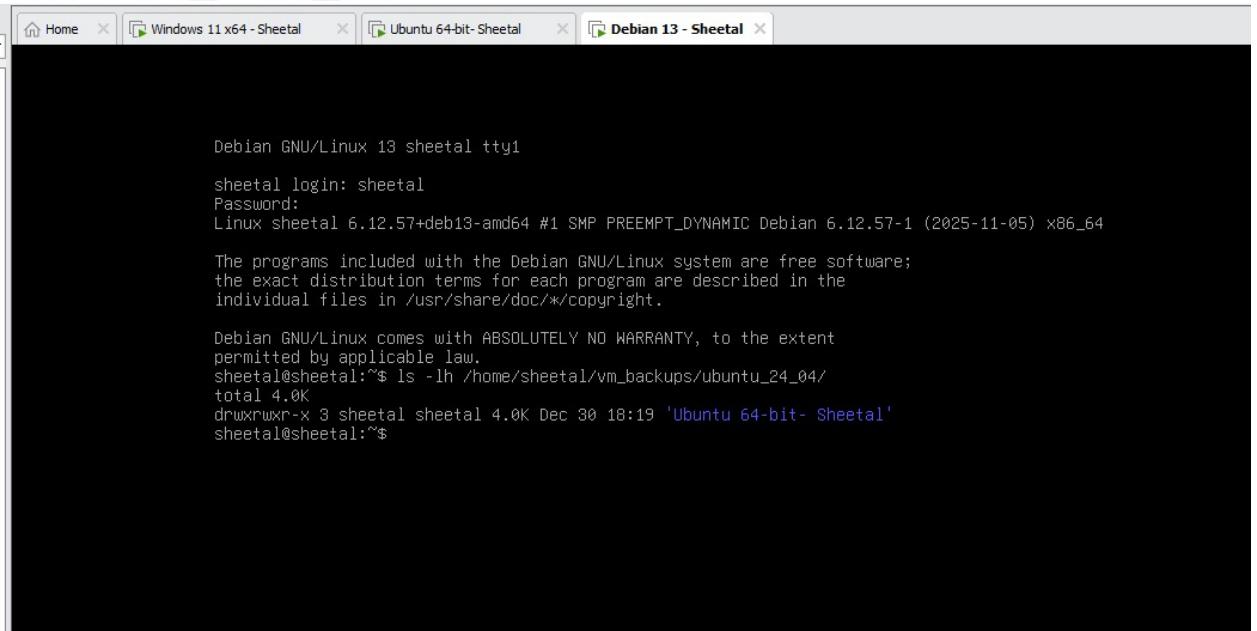
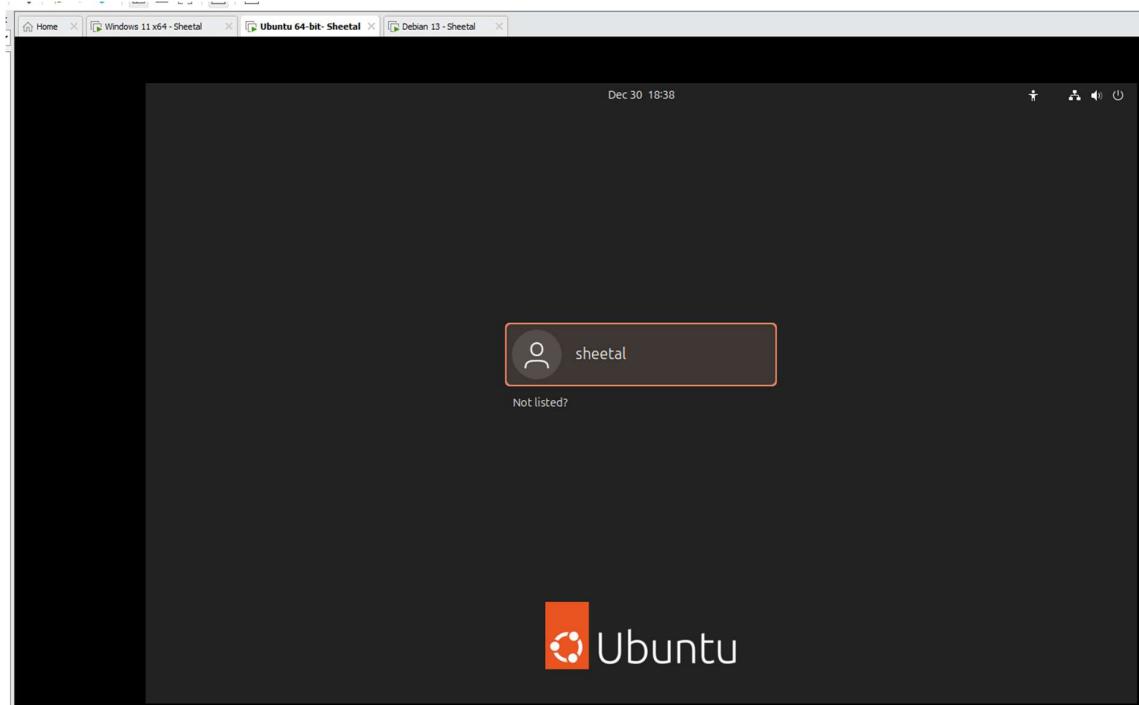
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
sheetal@sheetal:~$ mkdir -p ~/vm_backups/ubuntu_24_04
sheetal@sheetal:~$ ls ~/vm_backups
ubuntu_24_04
sheetal@sheetal:~$
```









```
Debian GNU/Linux 13 sheetal tty1
sheetal login: sheetal
Password:
Linux sheetal 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
sheetal@sheetal:~$ ls -lh /home/sheetal/vm_backups/ubuntu_24_04/
total 4.0K
drwxrwxr-x 3 sheetal sheetal 4.0K Dec 30 18:19 'Ubuntu 64-bit- Sheetal'
sheetal@sheetal:~$
```

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