

Template Week 5 – Operating Systems

Student number:

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Assignment 5.1: Unix-like

- a) Find out what the difference is between UNIX and unix-like operating systems?
UNIX is separate operating system, while Unix-like system are other systems that resemble UNIX behaviour but are different in some ways.
- 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: He created UNIX, B programming language.

Dennis Ritchie: He created the C programming language and co-developed UNIX.

Bill Joy: He was a major contributor to BSD UNIX and he also helped design early versions of TCP/IP.

Richard Stallman: He founded the Free Software Movement/Foundation and the GNU Project.

He also developed GCC compiler.

Linus Torvalds: He created Linux and GIT.

- c) What is the philosophy of the GNU movement?
It says that users should have freedom to run, study, share, and modify software.
- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement?
Please explain your answer.
Eventhough Ubuntu is mostly built using GNU components, Ubuntu doesn't follow the GNU movement's idea of 100% free software.
- e) Find out what is the Windows Subsystem for Linux?
It allows you to run Linux environment on your Windows machine.
- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?
Android and ChromeOS are UNIX-like and are based on Linux, while iOS is also UNIX-like but based on BSD/macOS.

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 fields that require heavy calculations, like: Weather forecasting, Engineering and Aerospace, Medicine, Biology and Scientific Researches.
- 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?
Basically, people were making supercomputers out of PS3 consoles, because it was cheaper to just use PS3's Cell CPU than buying specialized hardware.
Even U.S. Air Force used it; They built a computer called Condor Cluster, that housed 1760 PS3 Consoles and it was ranked 33rd most powerful supercomputer.
- 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 for ARM
- 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, it doesn't even come close. Raspberry Pi's are super low-power, you would need tenth of thousands of them to even come close.
- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?
They use a custom AMD Zen 2 architecture.

What operating systems run on these consoles?

PS5 uses Orbis OS (Based on FreeBSD).

Xbox uses Xbox OS (Based on Windows NT)

What conclusion can you draw from the answer to the previous question?

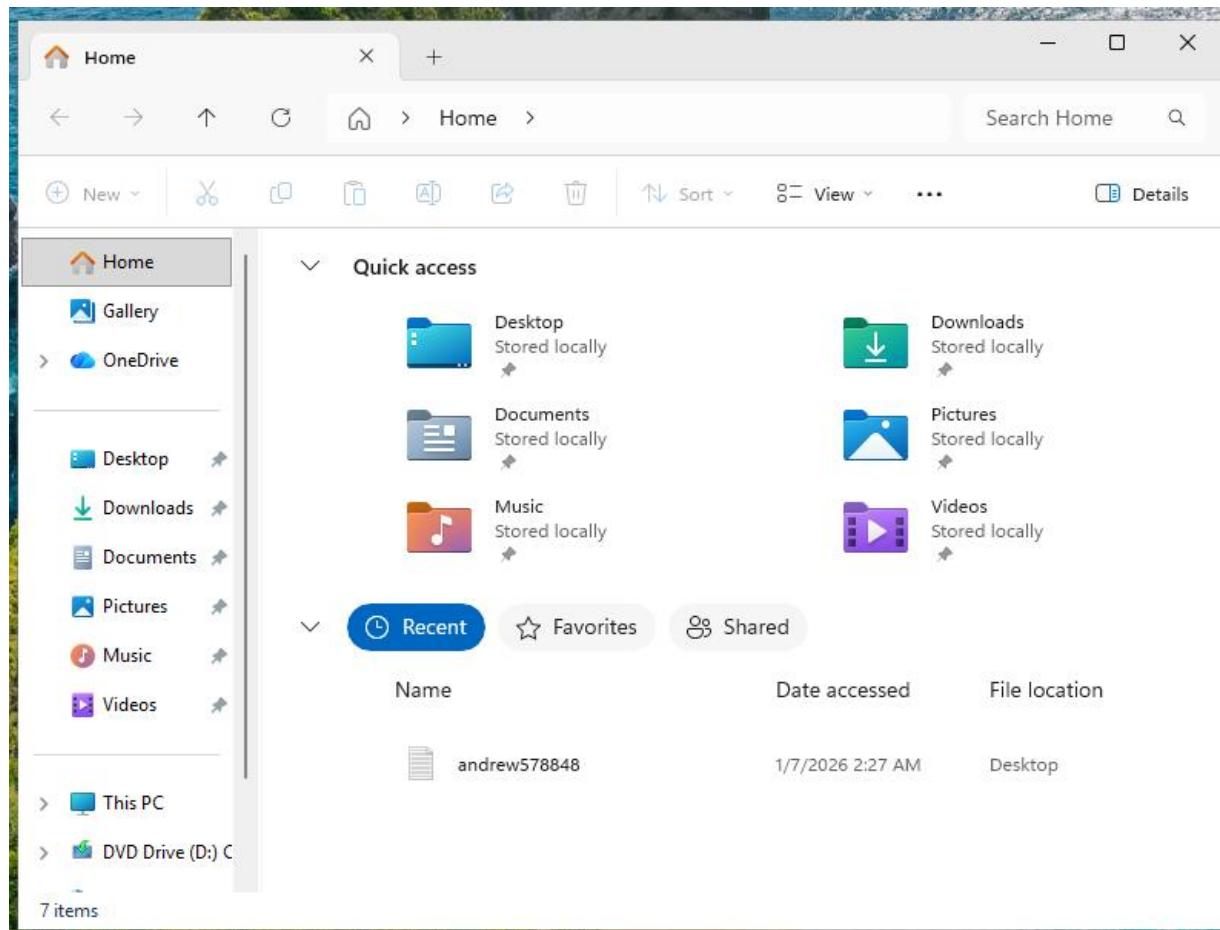
PS5 and Xbox are just computers, optimized and marketed as gaming consoles.

Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

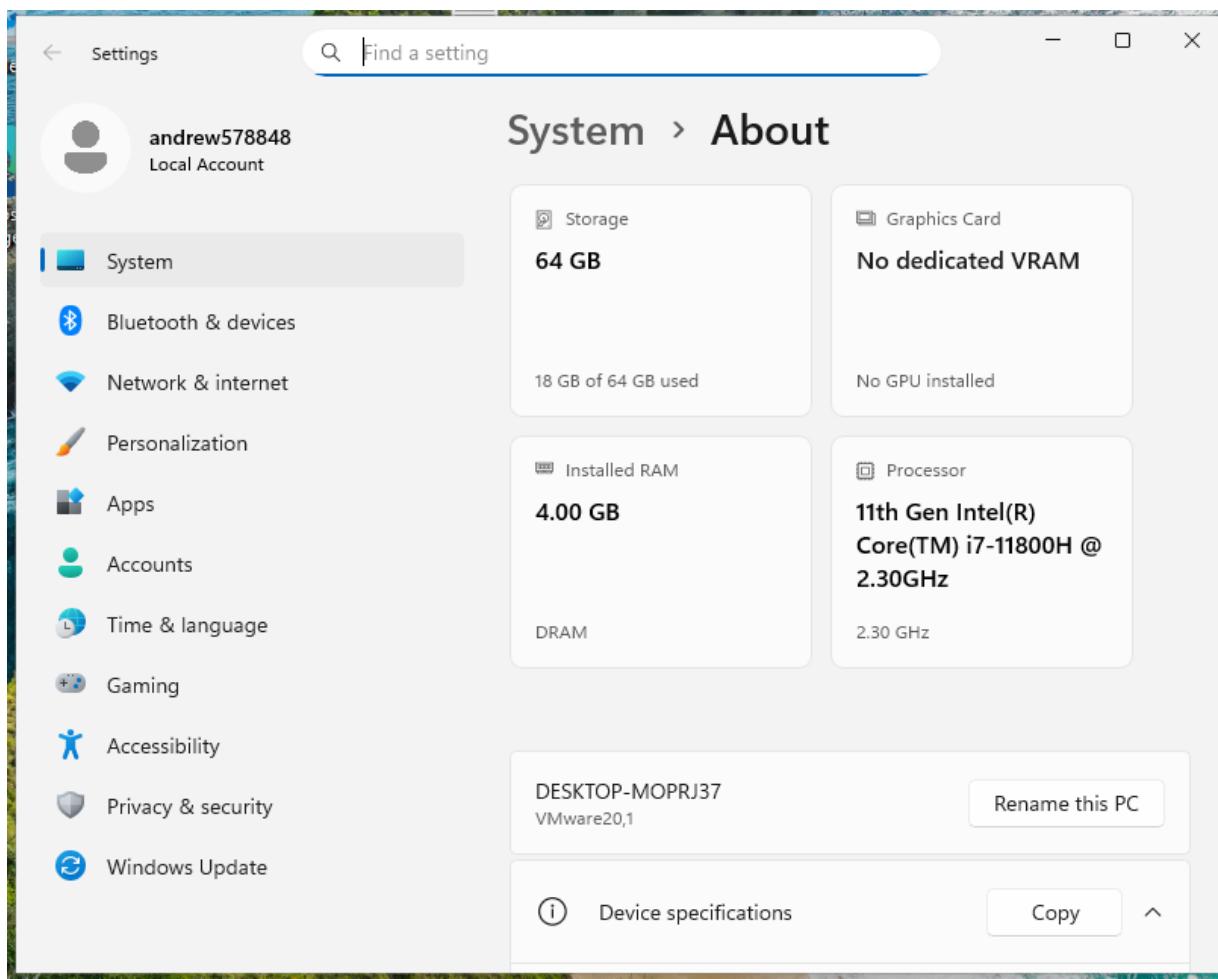
- Practice for about 10 minutes with the **Windows** keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.
- The file explorer can be opened with **Windows + E**, Which key combination could you also use?

Win + X + E



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

Win + X + Y



- d) 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.
Ctrl + Shift + Esc

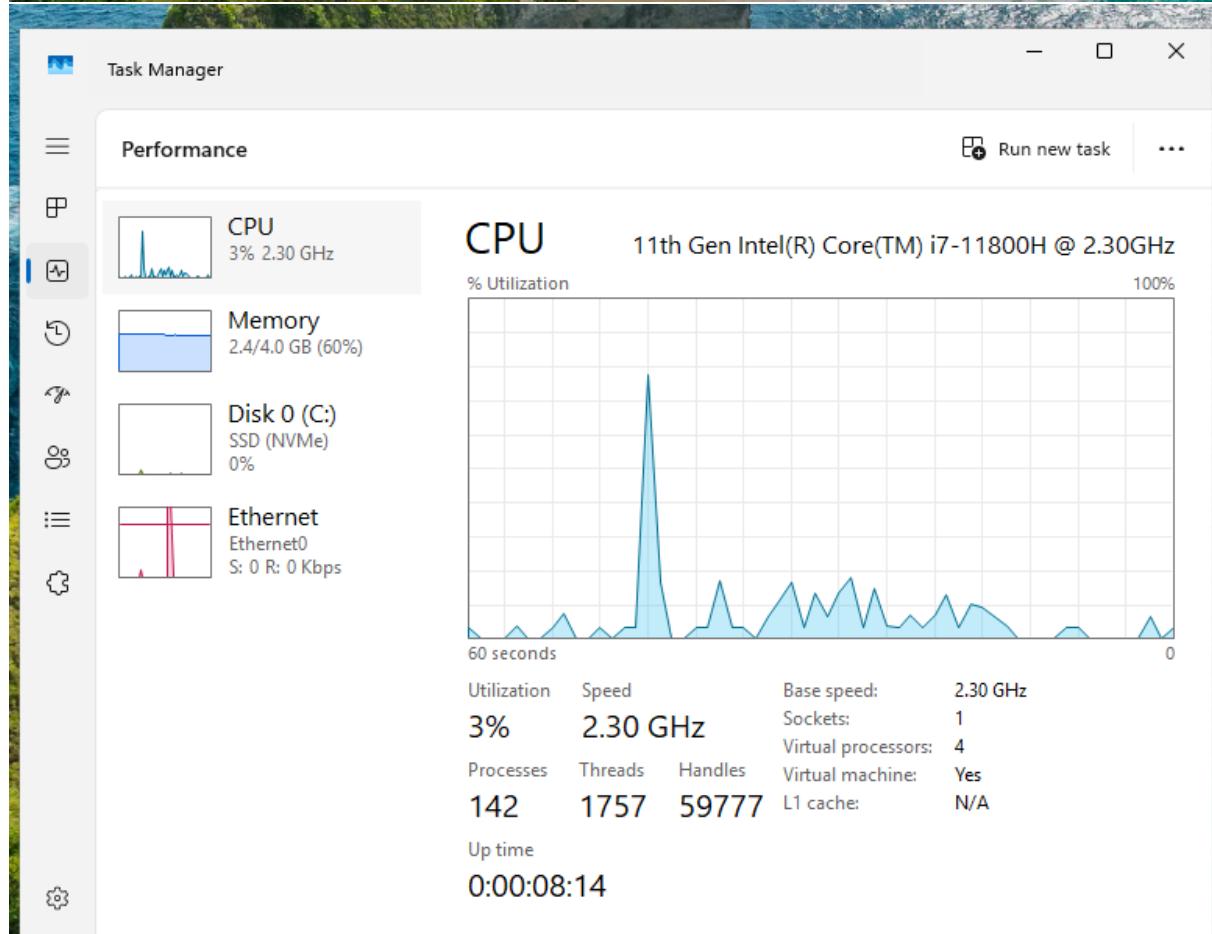
Task Manager

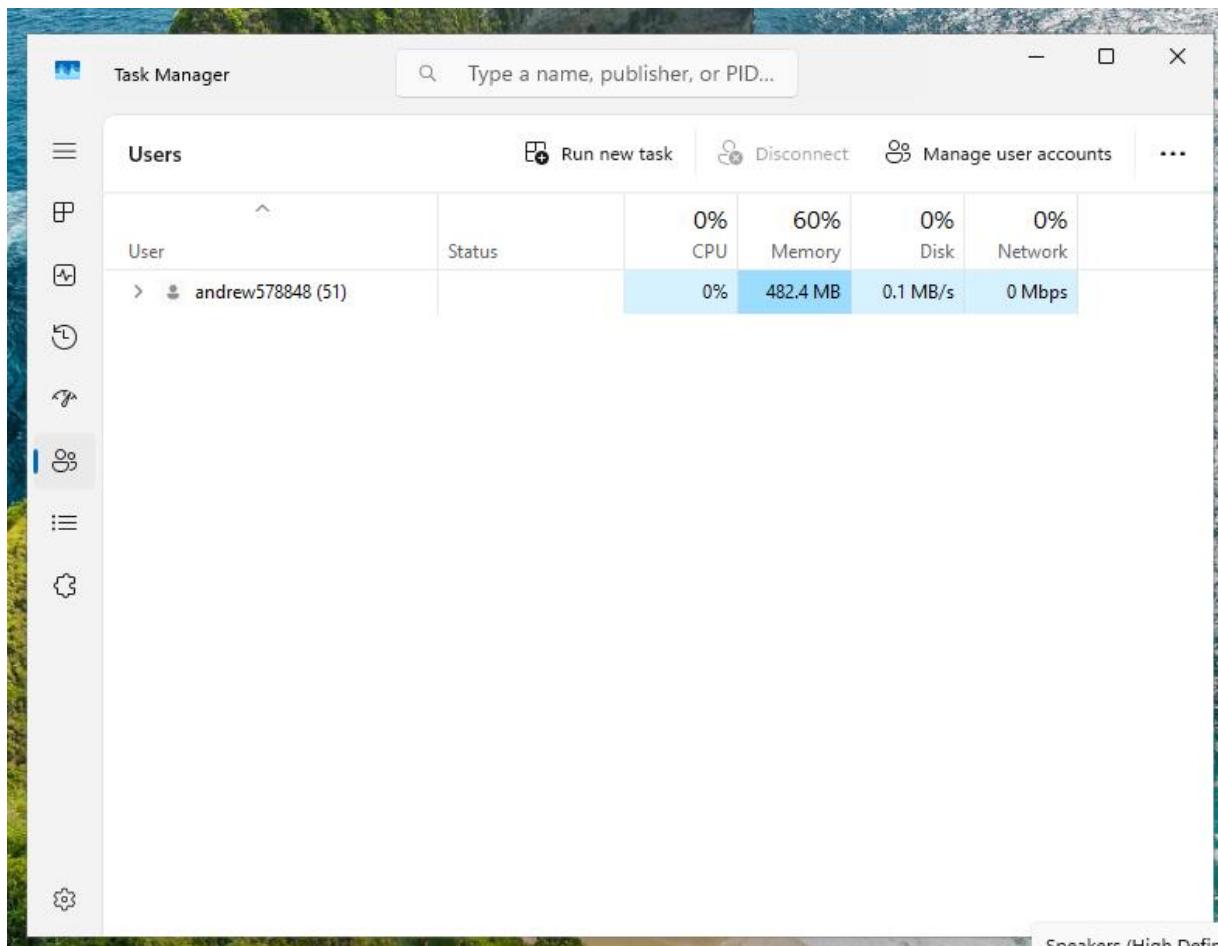
Type a name, publisher, or PID...

Processes

Run new task End task Efficiency mode

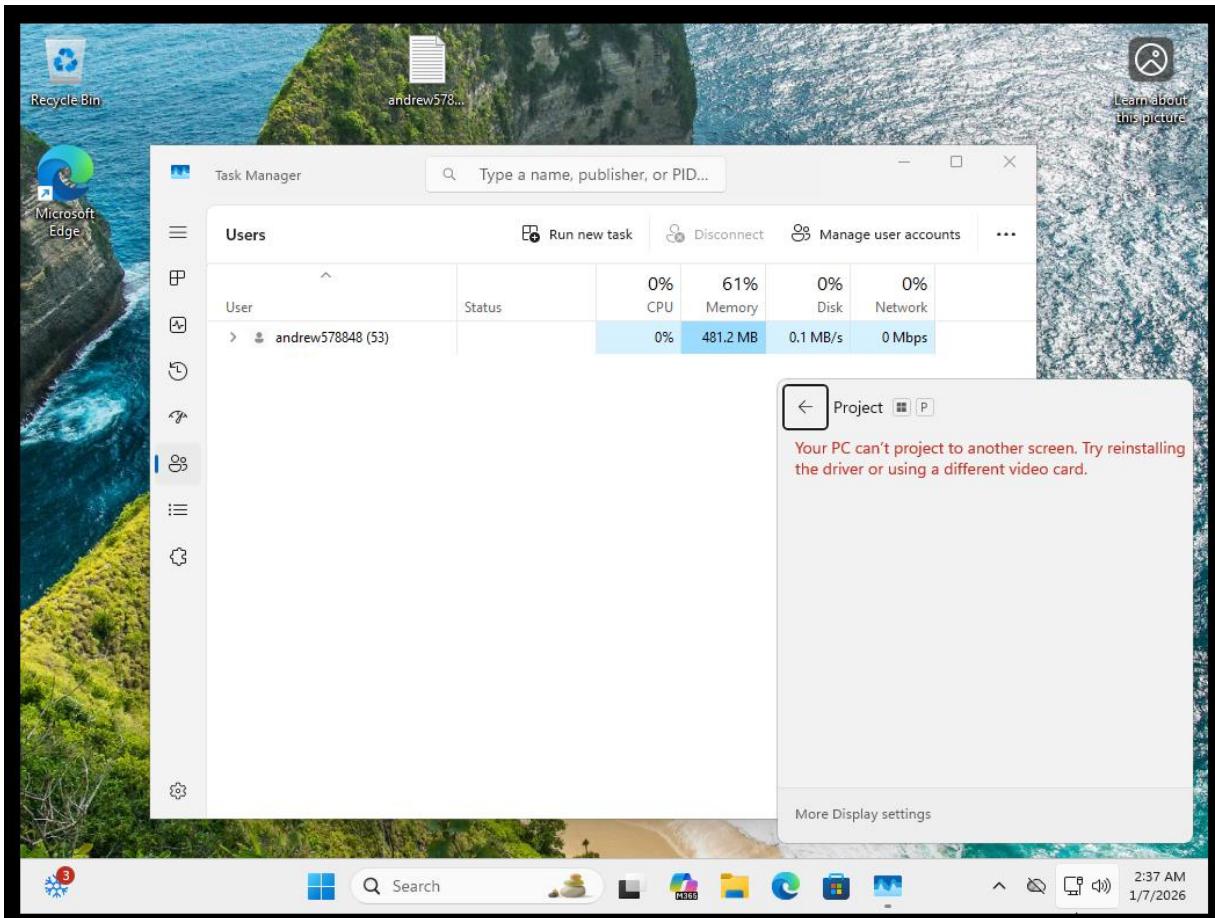
Name	Status	17% CPU	63% Memory	2% Disk	0% Network
Apps (1)					
Task Manager		3.4%	44.6 MB	0.1 MB/s	0 Mbps
Background processes (37)					
Application Frame Host		0%	4.1 MB	0 MB/s	0 Mbps
COM Surrogate		0%	1.0 MB	0 MB/s	0 Mbps
CrossDeviceResume		0%	3.5 MB	0 MB/s	0 Mbps
CTF Loader		0%	4.7 MB	0 MB/s	0 Mbps
Host Process for Windows Tasks		0%	0.7 MB	0 MB/s	0 Mbps
Host Process for Windows Tasks		0%	2.1 MB	0 MB/s	0 Mbps
Microsoft (R) Aggregator Host		0%	1.7 MB	0 MB/s	0 Mbps
Microsoft Edge (6)		0%	43.8 MB	0 MB/s	0 Mbps
Microsoft Edge Update (32 bit)		0%	0.8 MB	0 MB/s	0 Mbps
Microsoft OneDrive		0%	29.2 MB	0.1 MB/s	0 Mbps
Microsoft OneDrive Sync Servi...		0%	11.4 MB	0 MB/s	0 Mbps
Microsoft Windows Search Filt...		0%	1.3 MB	0 MB/s	0 Mbps





- 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?

Win + P



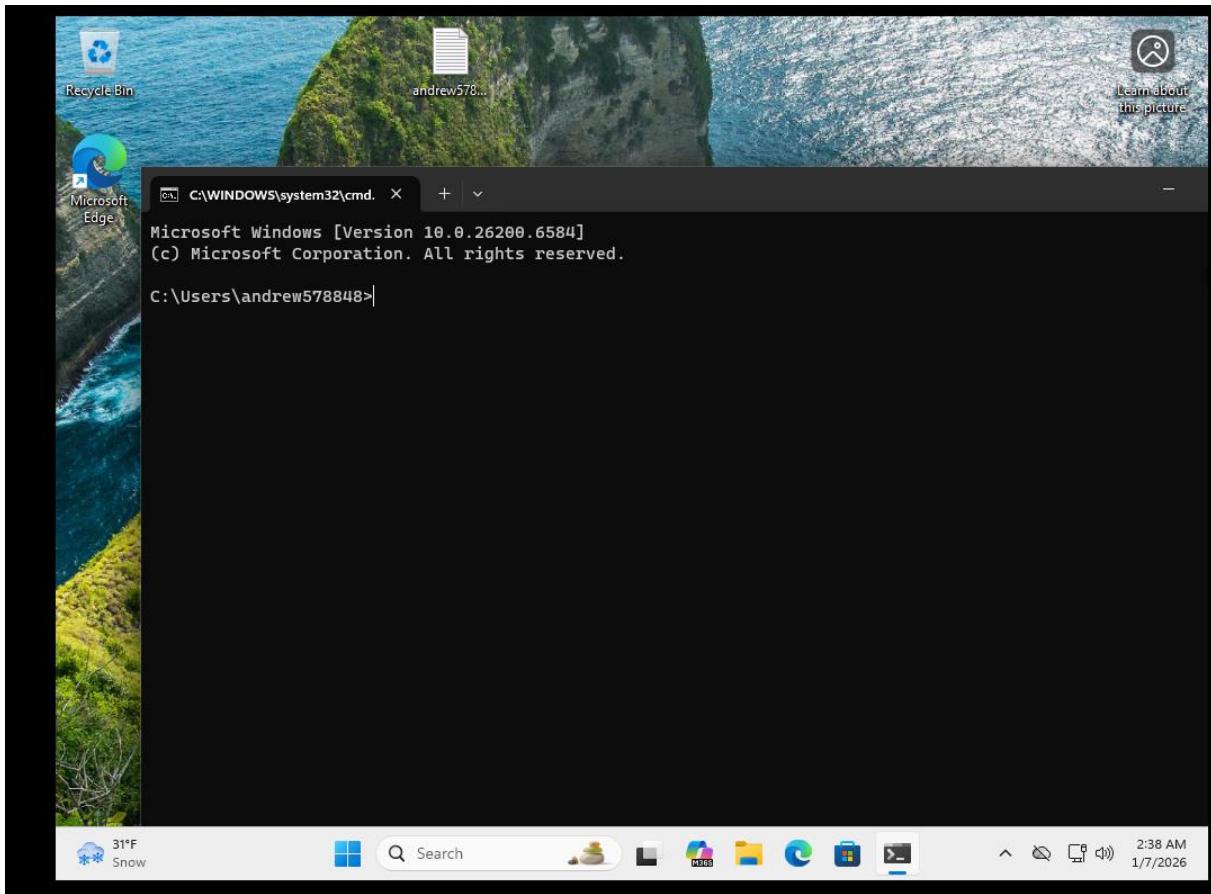
- f) If you leave the classroom for a while and you leave your laptop behind, it is wise to lock the screen. Your Apps will continue to run in the background. So, for example, if you're waiting for a download that takes a while, lock the screen and get a cup of coffee. Which key combination do you use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

Win + 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.

Win + R



Working in the File Explorer

Relevant screenshots **copy** command:

```
C:\SAXION>copy Wave.png "C:\SAXION\HBOICT\YEAR1\QUARTILE1\Introduction to Programming"
1 file(s) copied.

C:\SAXION>copy Plug.png "C:\SAXION\HBOICT\YEAR1\QUARTILE1\IT Infrastructure"
1 file(s) copied.

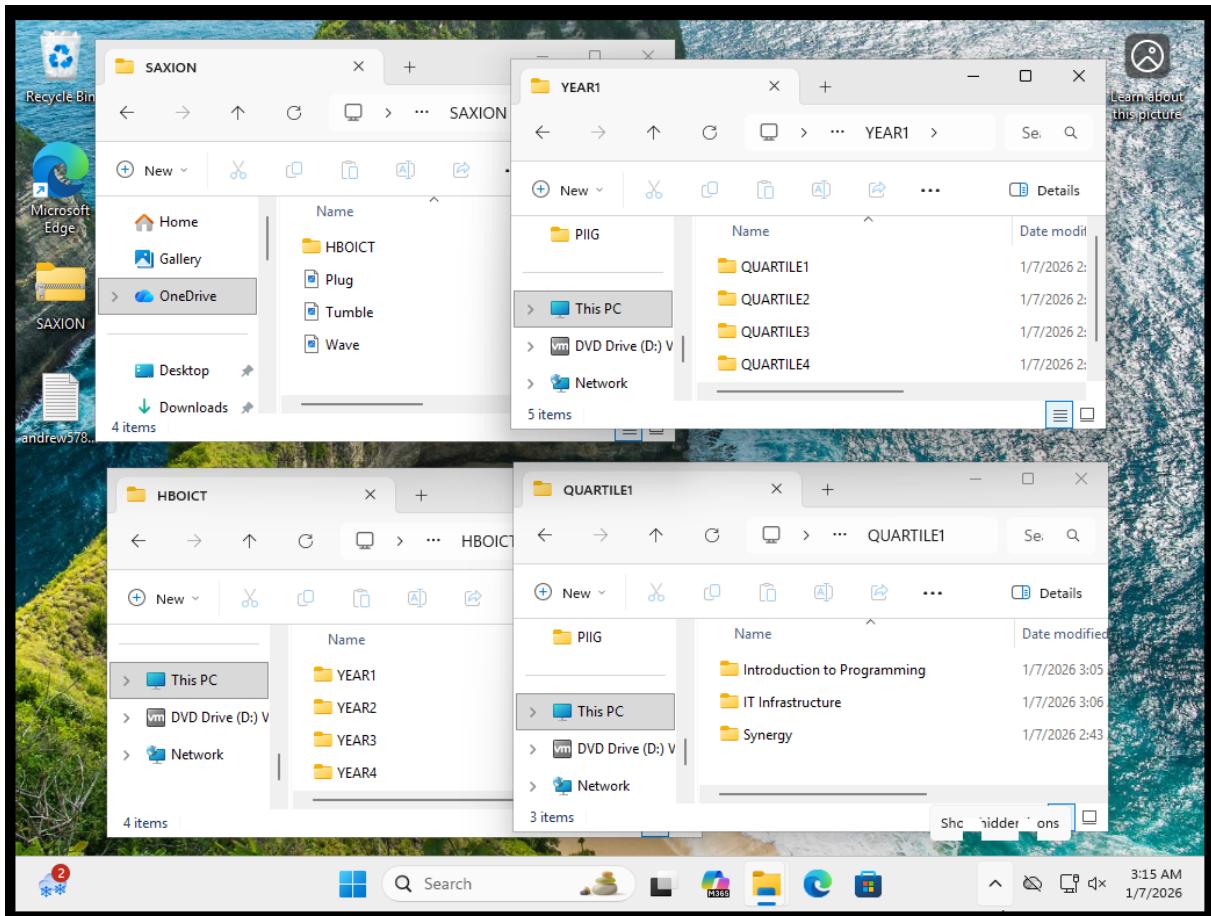
C:\SAXION>copy Tumble.png "C:\SAXION\HBOICT\YEAR1\QUARTILE1\Synergy"
1 file(s) copied.
```

Relevant screenshots **tree** command:

```
C:\SAXION>tree
Folder PATH listing
Volume serial number is A435-3007
C:.
└── HBOICT
    ├── YEAR1
    │   ├── QUARTILE1
    │   │   ├── Introduction to Programming
    │   │   ├── IT Infrastructure
    │   │   └── Synergy
    │   ├── QUARTILE2
    │   │   ├── Databases
    │   │   ├── IT Fundamentals
    │   │   └── PIIG
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR2
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR3
    └── YEAR4
```

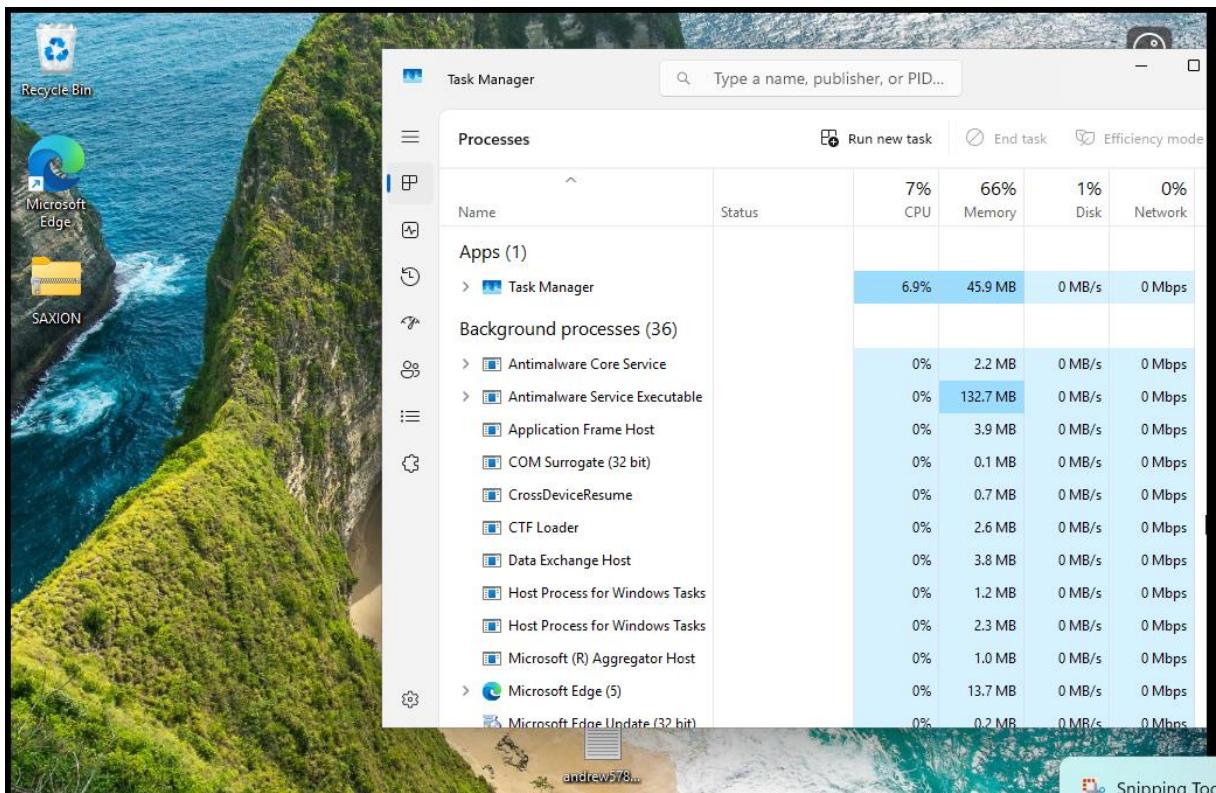
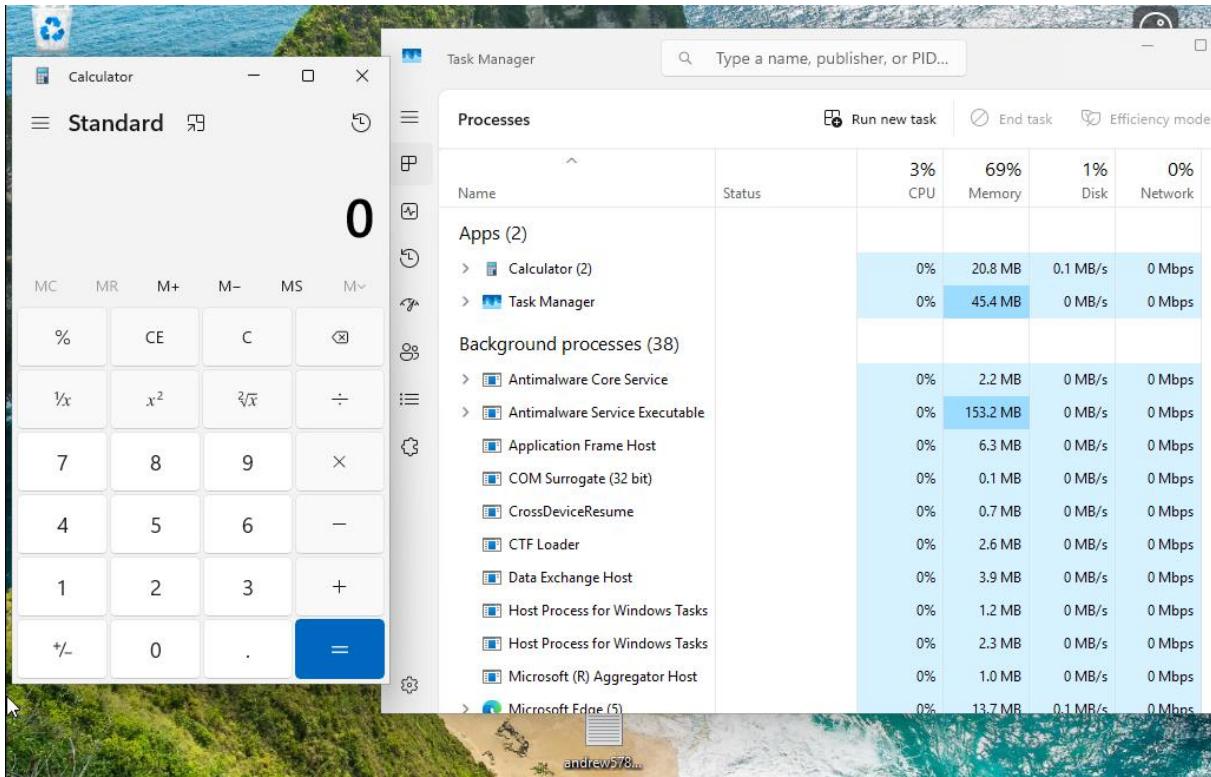
```
C:\SAXION>echo %username%
andrew578848
```

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

In winget install -e --id Mozilla.Firefox:

-e: Matches the exact provided string

--id: Allows you to provide a specific ID for installation

Firefox:

```
C:\Windows\System32>winget install -e --id Mozilla.Firefox
Found Mozilla Firefox (en-US) [Mozilla.Firefox] Version 146.0.1
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://download-installer.cdn.mozilla.net/pub/firefox/releases/146.0.1/win64/en-US/Firefox%20Setup%20146.0.
1.exe
███████████████████ 82.3 MB / 82.3 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

WinSCP:

```
C:\Windows\System32>winget install winscp
Found WinSCP [WinSCP.WinSCP] Version 6.5.5
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.5.5/WinSCP-6.5.5-Setup.exe/download
███████████████████ 11.6 MB / 11.6 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

NotePad++:

```
C:\Windows\System32>winget install notepad++
Found Notepad++ [Notepad++.Notepad++] Version 8.9
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://github.com/notepad-plus-plus/notepad-plus-plus/releases/download/v8.9/npp.8.9.Installer.x64.exe
███████████████████ 6.54 MB / 6.54 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

7zip:

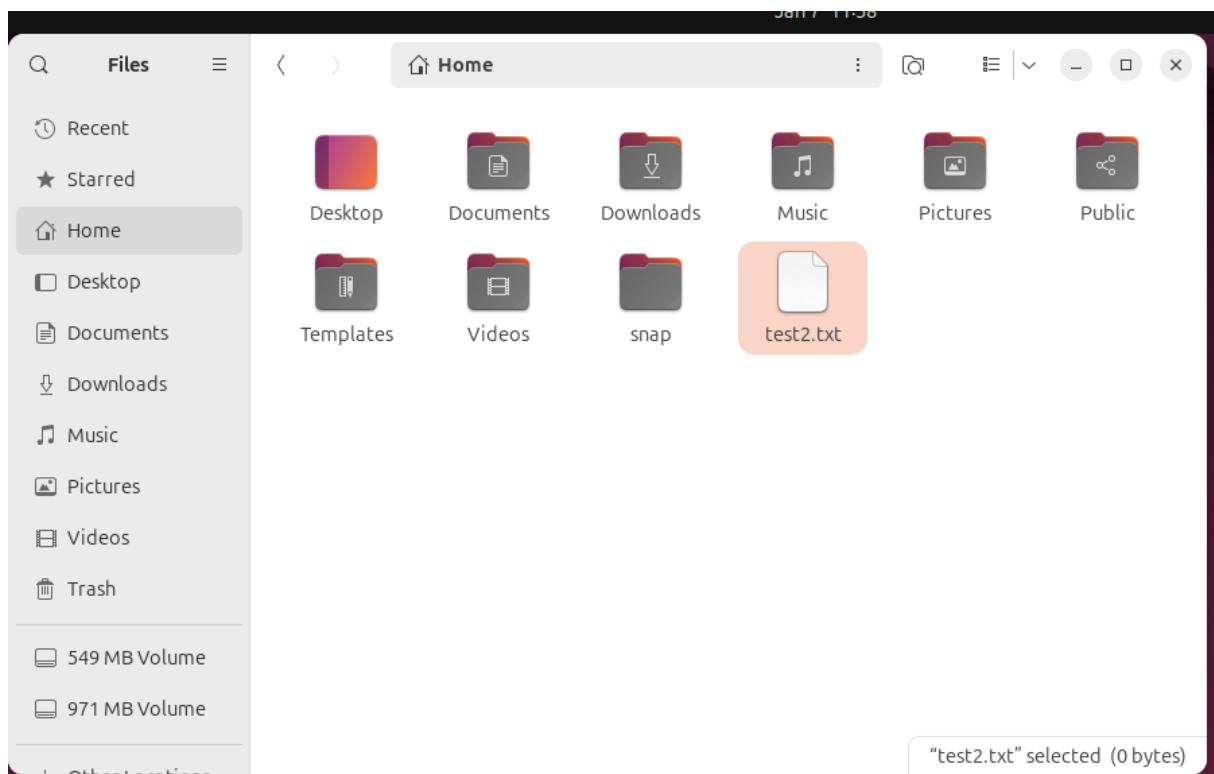
```
C:\Windows\System32>winget install 7zip
Found 7-Zip [7zip.7zip] Version 25.01
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://7-zip.org/a/7z2501-x64.exe
███████████████████ 1.56 MB / 1.56 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

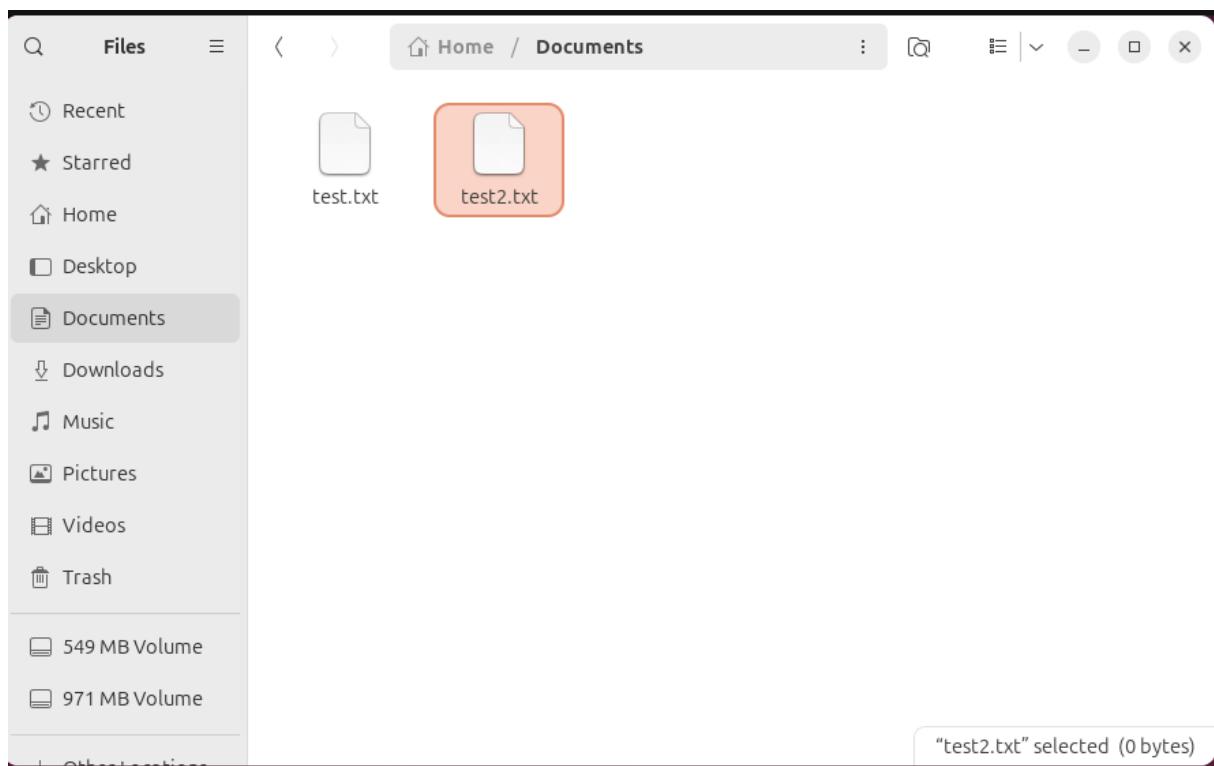
Assignment 5.4: Working with Linux

Relevant screenshots + motivation

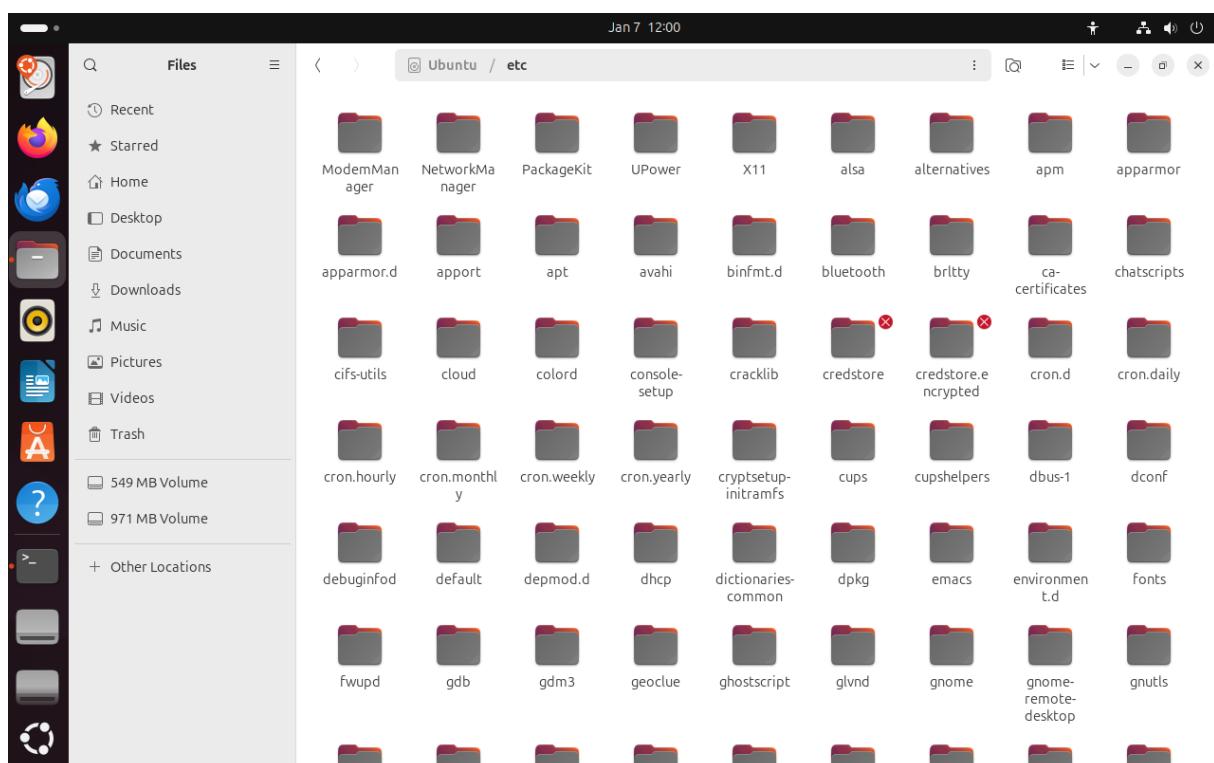
Copying files:

```
ubuntu@ubuntu:~$ touch test.txt
ubuntu@ubuntu:~$ cp test.txt Documents/
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  snap
Documents  Music      Public     Videos      test.txt
ubuntu@ubuntu:~$ cd Documents/
ubuntu@ubuntu:~/Documents$ ls
test.txt
ubuntu@ubuntu:~/Documents$ andrew578848
```





Navigating the file structure:



```

ubuntu@ubuntu:/$ ls
bin          dev  lib usr-is-merged  opt   run           srv  var
bin usr-is-merged etc  lib64           proc  sbin         sys
boot        home media           rofs  sbin usr-is-merged tmp
cdrom       lib   mnt            root  snap           usr
ubuntu@ubuntu:/$ cd etc
ubuntu@ubuntu:/etc$ cd -
/
ubuntu@ubuntu:/$ andrew578848

```

The main difference in Linux and Windows FS's, is that Linux stores everything in unified root directory (/), while Widows uses drives. (C:, D:)

The /etc directory stores all system configuration files.

Compress files:

tar -czf [name] [file] – command for compressing.

-c stands for create

-z stands for gzip compression

-f stands for output name

tar -zxf [name] [file] – command for extracting.

-x stands for extract

```

ubuntu@ubuntu:~$ tar -zxf compressed.tar.gz test.txt
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  snap
Documents  Music    Public     Videos    test.txt
ubuntu@ubuntu:~$ tar -czf compressed.tar.gz test.txt
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz  test.txt
Documents  Music    Public     Videos    snap
ubuntu@ubuntu:~$ tar -zxf compressed.tar.gz test.txt
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz  test.txt
Documents  Music    Public     Videos    snap
ubuntu@ubuntu:~$ rm -rf test.txt
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz
Documents  Music    Public     Videos    snap
ubuntu@ubuntu:~$ tar -zxf compressed.tar.gz test.txt
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz  test.txt
Documents  Music    Public     Videos    snap
ubuntu@ubuntu:~$ andrew578848

```

View processes:

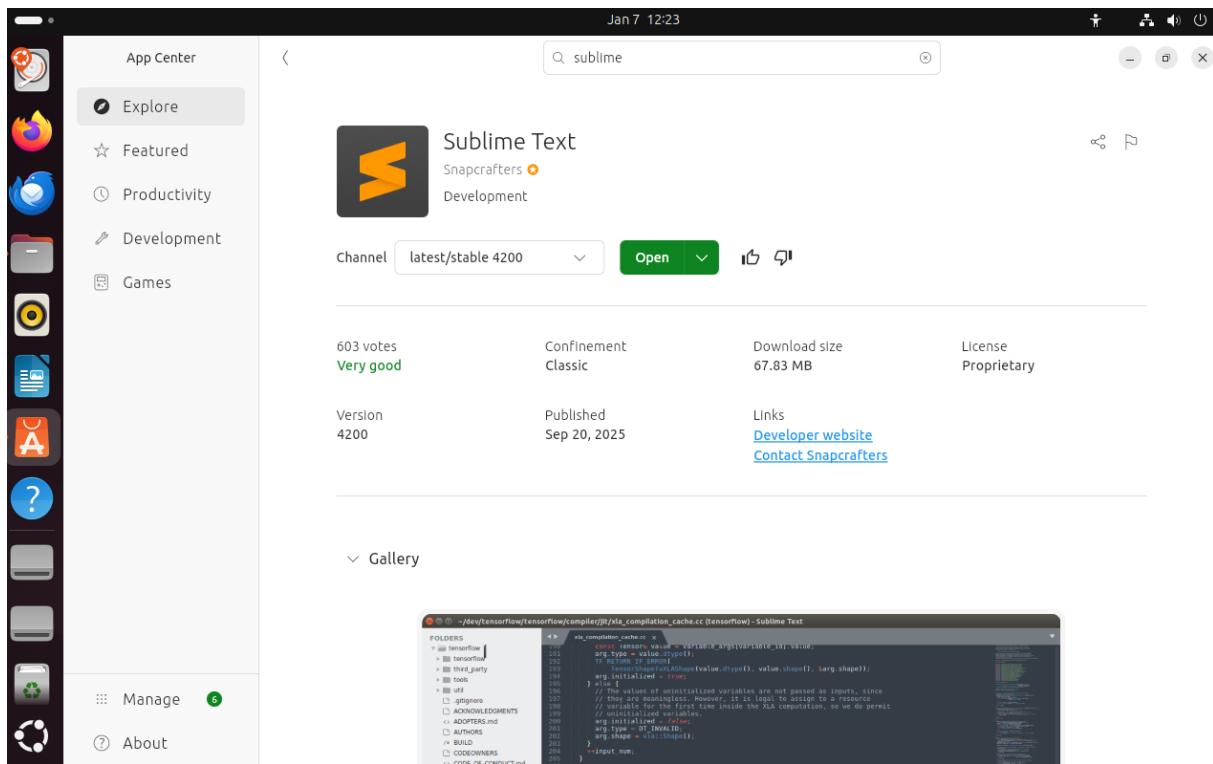
htop works like a task manager in Windows. It shows information about all your processes and memory usage.

The screenshot shows the htop process viewer running in a terminal window on an Ubuntu system. The window title is "ubuntu@ubuntu: ~". The main display shows system statistics: CPU usage (0%, 1%, 2%, 3%), memory usage (Mem: 1.50G/3.78G), and swap usage (Swp: 0K/0K). Below the stats, there's a configuration menu with tabs for "Setup", "Categories", "Display options", "Header layout", "Meters", "Screens", and "Colors". The "Display options" tab is active, showing settings for the current screen tab (Main) and global options. Global options include checkboxes for showing tabs for screens, shadowing other users' processes, hiding kernel threads, hiding userland process threads, hiding processes in containers, displaying threads in different colors, showing custom thread names, and showing program paths. F1 through F10 keys are mapped to various functions at the bottom of the menu.

```
0[|] 1[|||] 2[|||] 3[|||] 1.3%] Tasks: 117, 382 thr, 211 kthr; 1 runni
1[|||] 4.6%] Load average: 0.08 0.06 0.06
2[|||] 4.6%] Uptime: 00:35:24
3[|||] 2.0%]
Mem[|||||||||||||1.50G/3.78G]
Swp[ 0K/0K]

Setup Categories Display options
For current screen tab: Main
Header layout [ ] Tree view
Meters [ ] - Tree view is always sorted by PID (htop 2 behavior)
Screens [ ] - Tree view is collapsed by default
Colors Global options:
[x] Show tabs for screens
[ ] Shadow other users' processes
[x] Hide kernel threads
[ ] Hide userland process threads
[ ] Hide processes running in containers
[x] Display threads in a different color
[ ] Show custom thread names
[x] Show program path
F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 Done
```

Installing Software:



```
tream) in auto mode
update-alternatives: using /usr/bin/stream-im6.q16 to provide /usr/bin/stream-im6 (stream-im6) in auto mode
update-alternatives: using /usr/bin/display-im6.q16 to provide /usr/bin/display (display) in auto mode
update-alternatives: using /usr/bin/display-im6.q16 to provide /usr/bin/display-im6 (display-im6) in auto mode
update-alternatives: using /usr/bin/montage-im6.q16 to provide /usr/bin/montage (montage) in auto mode
update-alternatives: using /usr/bin/montage-im6.q16 to provide /usr/bin/montage-im6 (montage-im6) in auto mode
update-alternatives: using /usr/bin/mogrify-im6.q16 to provide /usr/bin/mogrify (mogrify) in auto mode
update-alternatives: using /usr/bin/mogrify-im6.q16 to provide /usr/bin/mogrify-im6 (mogrify-im6) in auto mode
Setting up w3m-img (0.5.3+git20230121-2ubuntu5) ...
Setting up libmagickcore-6.q16-7-extra:amd64 (8:6.9.12.98+dfsg1-5.2build2) ...
Setting up imagemagick (8:6.9.12.98+dfsg1-5.2build2) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1.1ubuntu3) ...
Processing triggers for libc-bin (2.39-0ubuntu8.5) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for desktop-file-utils (0.27-2build1) ...
ubuntu@ubuntu:~$ the command was sudo apt-get install neofetch (andrew578848)
```

The screenshot shows a terminal window titled "ubuntu@ubuntu:~". The terminal displays the output of the "neofetch" command. On the left, there is a large, artistic ASCII art representation of the word "Ubuntu" composed of various symbols like dots, dashes, and letters. On the right, the "neofetch" command provides detailed system information:

```
ubuntu@ubuntu:~$ the command was sudo apt-get install neofetch (an
bash: syntax error near unexpected token `('
ubuntu@ubuntu:~$ neofetch
      .-/+oossssoo+/-.
      `:+ssssssssssssssssssss+:'.
      -+ssssssssssssssssssyssss+-.
      .osssssssssssssssssdMMMNyssso.
      /sssssssssssshdmmNNmyNMMMHhssssss/
      +ssssssssshmydMMMMMMNdddyssssssss+
      /sssssssshNMMMyhyyyyhmNMMMNhssssssss/
      .ssssssssdMMMNhsssssssssshNMMMdssssssss.
      +sssshhhyNMMNyssssssssssyNMMMyssssssss+
      ossyNMMMyMMhsssssssssssssshmmhssssssso
      ossyNMMMyMMhsssssssssssssshmmhssssssso
      +sssshhhyNMMNyssssssssssyNMMMyssssssss+
      .ssssssssdMMMNhsssssssssshNMMMdssssssss.
      /sssssssshNMMMyhyyyyhdNMMMNhssssssss/
      +sssssssssdmydMMMMMMMdddyssssssss+
      /sssssssssssshdmNNNNmyNMMMHhssssssss/
      .osssssssssssssssssdMMMNyssso.
      -+ssssssssssssssssssyyssss+-.
      `:+ssssssssssssssssss+:'.
      .-/+oossssoo+/-.
```

ubuntu@ubuntu

OS: Ubuntu 24.04.3 LTS x86_64
Host: VMware Virtual Platform None
Kernel: 6.14.0-27-generic
Uptime: 39 mins
Packages: 1845 (dpkg), 14 (snap)
Shell: bash 5.2.21
Resolution: 1280x800
DE: GNOME 46.0
WM: Mutter
WM Theme: Adwaita
Theme: Yaru [GTK2/3]
Icons: Yaru [GTK2/3]
Terminal: gnome-terminal
CPU: 11th Gen Intel i7-11800H (4) @
GPU: 00:0f.0 VMware SVGA II Adapter
Memory: 1688MiB / 3867MiB

It shows details about my system.

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

The screenshot shows a terminal window titled "ubuntu@ubuntu:~". The terminal displays the following sequence of commands and their outputs:

```
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz  test.txt
Documents  Music    Public     Videos    snap
ubuntu@ubuntu:~$ rm -rf test.txt
ubuntu@ubuntu:~$ touch test.txt
ubuntu@ubuntu:~$ nano test.txt
ubuntu@ubuntu:~$ mkdir hello
ubuntu@ubuntu:~$ cp test.txt hello/hello.sh
ubuntu@ubuntu:~$ chmod 744 hello/hello.sh
ubuntu@ubuntu:~$ ls
Desktop  Downloads  Pictures  Templates  compressed.tar.gz  snap
Documents  Music    Public     Videos    hello           test.txt
ubuntu@ubuntu:~$ ls hello
hello.sh
ubuntu@ubuntu:~$ andrew578848
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

cat, wc, less, tail, head & grep:

- **cat:** Displays the contents of the file.
- **wc:** Basically, means word count, it counts words.
- **less:** Also opens a file, but with a scrollable thingy
- **tail:** Shows last 10 lines of the file
- **head:** Show first 10 lines of the file
- **grep:** Searches for text inside of a file

```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ wc sherlock.txt  
12306 107562 607504 sherlock.txt
```

Lines: 12306

Words: 107562

Characters: 607504

```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ grep -n "kingdom" sherlock.txt  
490:"I tell you that I would give one of the provinces of my kingdom to  
1124:And that was how a great scandal threatened to affect the kingdom of
```

Lines with word “kingdom”: 2

Above and below the word kingdom:

```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ head -n 490 sherlock.txt  
The Project Gutenberg eBook of The Adventures of Sherlock Holmes,  
by Arthur Conan Doyle  
  
This eBook is for the use of anyone anywhere in the United States and  
most other parts of the world at no cost and with almost no restrictions  
whatsoever. You may copy it, give it away or re-use it under the terms  
of the Project Gutenberg License included with this eBook or online at  
www.gutenberg.org. If you are not located in the United States, you  
will have to check the laws of the country where you are located before  
using this eBook.
```

```
I tell you that I would give one of the provinces of my Kingdom to  
andrew578848@andrew578848-VMware-Virtual-Platform:~$ tail -n 490 sherlock.txt  
save a little pallet bed, a small table, and a basketful of linen. The  
skylight above was open, and the prisoner gone.
```

"There has been some villainy here," said Holmes; "this beauty has guessed Miss Hunter's intentions and has carried his victim off."

"But how?"

"Through the skylight. We shall soon see how he managed it." He swung himself up onto the roof. "Ah, yes," he cried, "here's the end of a long light ladder against the eaves. That is how he did it."

"But it is impossible," said Miss Hunter; "the ladder was not there when the Rucastles went away."

"He has come back and done it. I tell you that he is a clever and dangerous man. I should not be very much surprised if this were he

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

EXIF:

```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ exif oldcar.jpg
EXIF tags in 'oldcar.jpg' ('Motorola' byte order):
-----
Tag |Value
-----
Manufacturer |motorola
Model |moto g(6) play
X-Resolution |72
Y-Resolution |72
Resolution Unit |Inch
Software |aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys
Date and Time |2020:11:07 15:08:57
YCbCr Positioning |Centered
Compression |JPEG compression
X-Resolution |72
Y-Resolution |72
Resolution Unit |Inch
Exposure Time |1/33 sec.
F-Number |f/2.0
Exposure Program |Normal program
ISO Speed Ratings |64
Exif Version |Exif Version 2.2
Date and Time (Original) |2020:11:07 15:08:57
Date and Time (Digitized) |2020:11:07 15:08:57
Components Configuration |Y Cb Cr -
Shutter Speed |5.05 EV (1/33 sec.)
Aperture |2.00 EV (f/2.0)
Brightness |+1.00 EV (1.71 cd/m^2)
Exposure Bias |0.00 EV
Maximum Aperture Value |2.00 EV (f/2.0)
```

Brand: Motorola

Type: Moto G(6) play

There are coordinates and they point to:

https://www.google.com/maps/place/53%C2%B001'39.7%22N+6%C2%B0032'12.9%22E/@53.1944263,6.5357258,17z/data=!4m4!3m3!8m2!3d53.1943556!4d6.5369167?entry=ttu&g_ep=EgoyMDI1MTlwOS4wIKXMDSoASAFQAw%3D%3D

Located in Groningen, Netherlands.

Filename extensions:

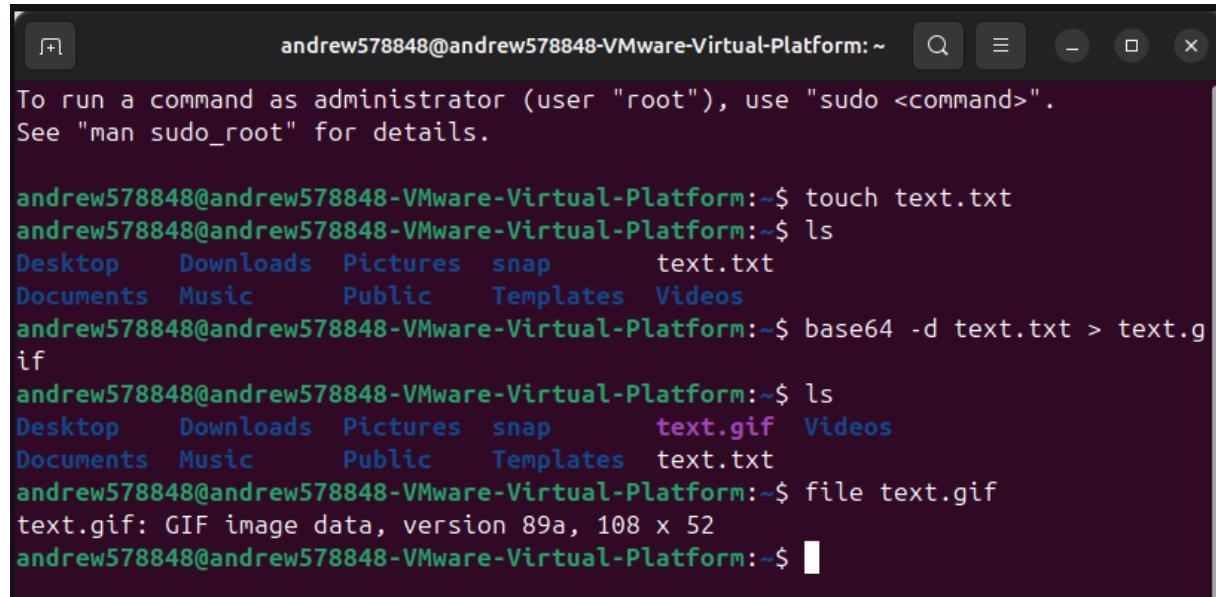
```
andrew578848@andrew578848-VMware-Virtual-Platform: $ cp oldcar.jpg oldcar
andrew578848@andrew578848-VMware-Virtual-Platform: $ ls
Desktop Documents Downloads Music oldcar oldcar.jpg Pictures Public snap Templates Videos
andrew578848@andrew578848-VMware-Virtual-Platform: $ file oldcar
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1, segment length 16, Exif Standard: [TIFF image data, big-endian, direntries=10, manufacturer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolution unit=2, software=aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys, datetime=2020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
andrew578848@andrew578848-VMware-Virtual-Platform: $
```

Surprisingly, yes, it does still consider it a JPEG file.

Assignment 5.8: Steganography

Relevant screenshots + motivation

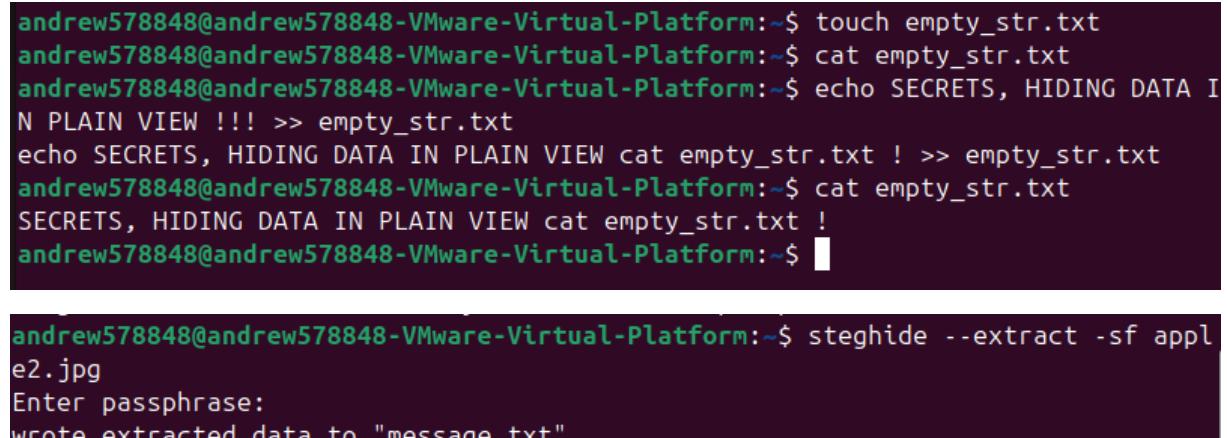
File extensions:



```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ touch text.txt
andrew578848@andrew578848-VMware-Virtual-Platform:~$ ls
Desktop Downloads Pictures snap text.txt
Documents Music Public Templates Videos
andrew578848@andrew578848-VMware-Virtual-Platform:~$ base64 -d text.txt > text.gif
if
andrew578848@andrew578848-VMware-Virtual-Platform:~$ ls
Desktop Downloads Pictures snap text.gif Videos
Documents Music Public Templates text.txt
andrew578848@andrew578848-VMware-Virtual-Platform:~$ file text.gif
text.gif: GIF image data, version 89a, 108 x 52
andrew578848@andrew578848-VMware-Virtual-Platform:~$
```

The command is: **base64 -d text.txt > text.gif**

Steganography:



```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ touch empty_str.txt
andrew578848@andrew578848-VMware-Virtual-Platform:~$ cat empty_str.txt
andrew578848@andrew578848-VMware-Virtual-Platform:~$ echo SECRETS, HIDING DATA IN PLAIN VIEW !!! >> empty_str.txt
echo SECRETS, HIDING DATA IN PLAIN VIEW cat empty_str.txt ! >> empty_str.txt
andrew578848@andrew578848-VMware-Virtual-Platform:~$ cat empty_str.txt
SECRETS, HIDING DATA IN PLAIN VIEW cat empty_str.txt !
andrew578848@andrew578848-VMware-Virtual-Platform:~$
```



```
andrew578848@andrew578848-VMware-Virtual-Platform:~$ steghide --extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
```

The command is: **steghide --extract -sf apple2.jpg**

Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:

- 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.

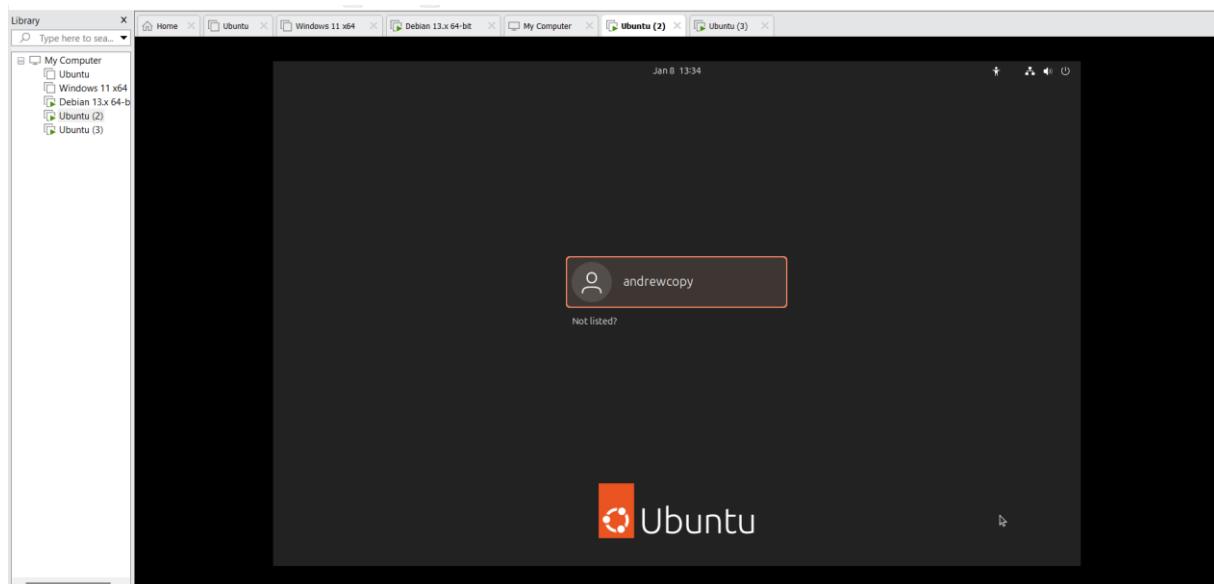
Debian configuration:

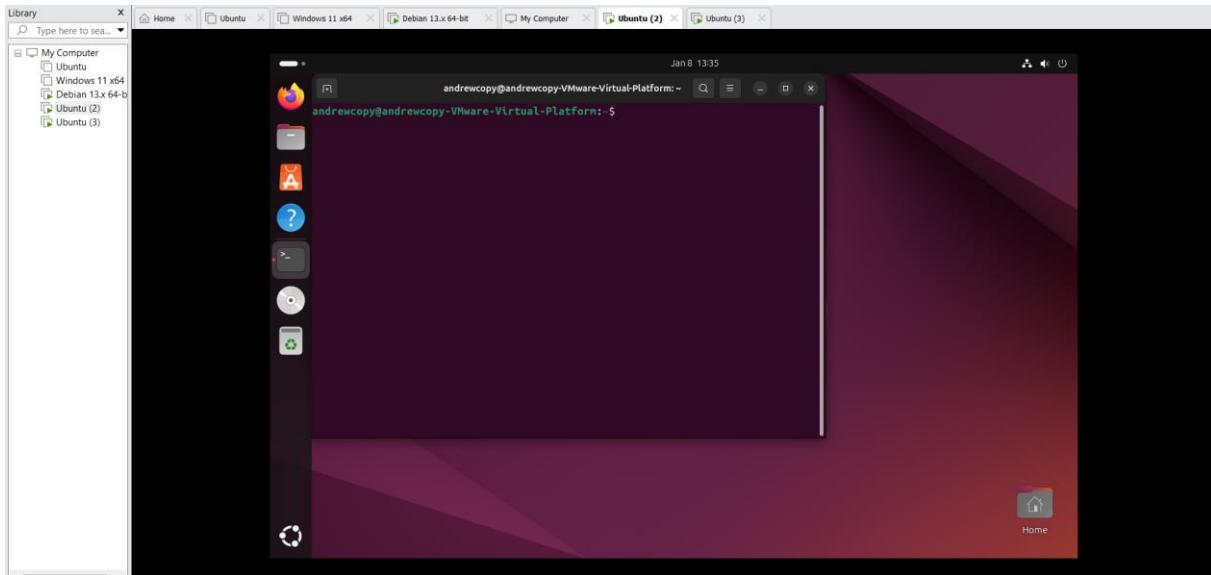
```
andrew@andrew578848:/srv/images$ sudo apt update
[sudo] password for andrew:
Hit:1 http://deb.debian.org/debian trixie InRelease
Hit:2 http://deb.debian.org/debian trixie-updates InRelease
Hit:3 http://security.debian.org/debian-security trixie-security InRelease
All packages are up to date.
andrew@andrew578848:/srv/images$ sudo mkdir -p /srv/images
andrew@andrew578848:/srv/images$ sudo chown $USER:$USER /srv/images
```

(The dir had been created previously; I just forgot to screenshot)

Ubuntu (Getting image) configuration:

```
ubuntu@ubuntu:~$ sudo dd if=/dev/nvme0n1 bs=4M status=progress | gzip | ssh andrew@192.168.110.134 "cat > /srv/images/ubuntu2404_vm.img.gz"
The authenticity of host '192.168.110.134 (192.168.110.134)' can't be established.
ED25519 key fingerprint is SHA256:K4fix2Wp/eCLSVsQ5RK3TDNUm3yRbfzaVJavJW4k2vE.
This key is not known by any other names.
230686720 bytes (231 MB, 220 MiB) copied, 1 s, 229 MB/s [syserint]?
Warning: Permanently added '192.168.110.134' (ED25519) to the list of known hosts.
andrew@192.168.110.134's password:
21281898496 bytes (21 GB, 20 GiB) copied, 90 s, 236 MB/s
5120+0 records in
5120+0 records out
21474836480 bytes (21 GB, 20 GiB) copied, 91.0199 s, 236 MB/s
ubuntu@ubuntu:~$
```



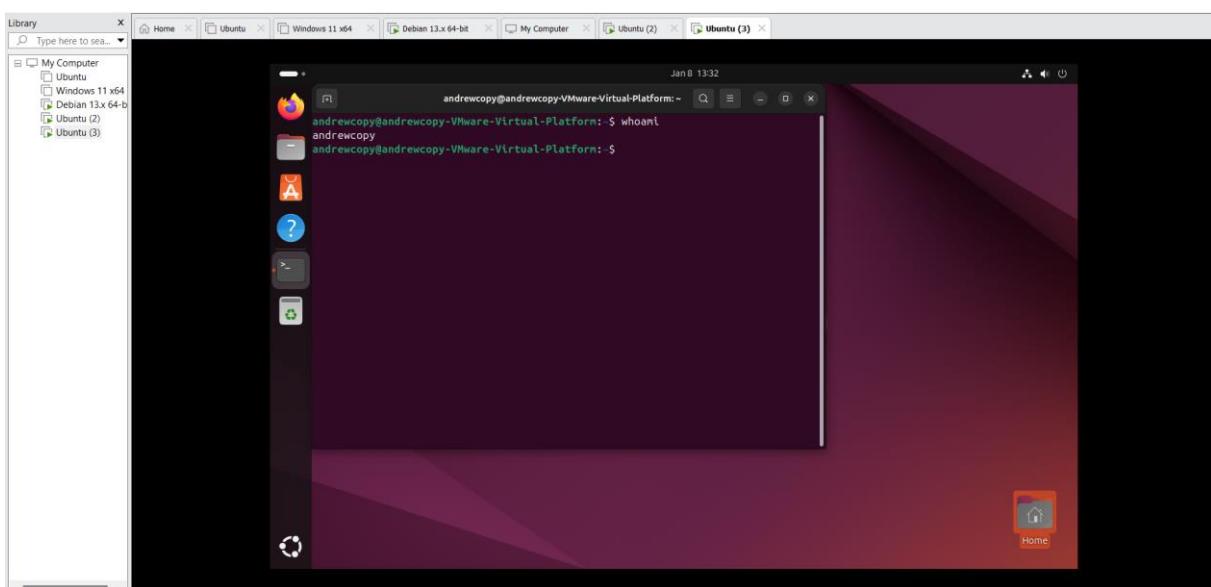
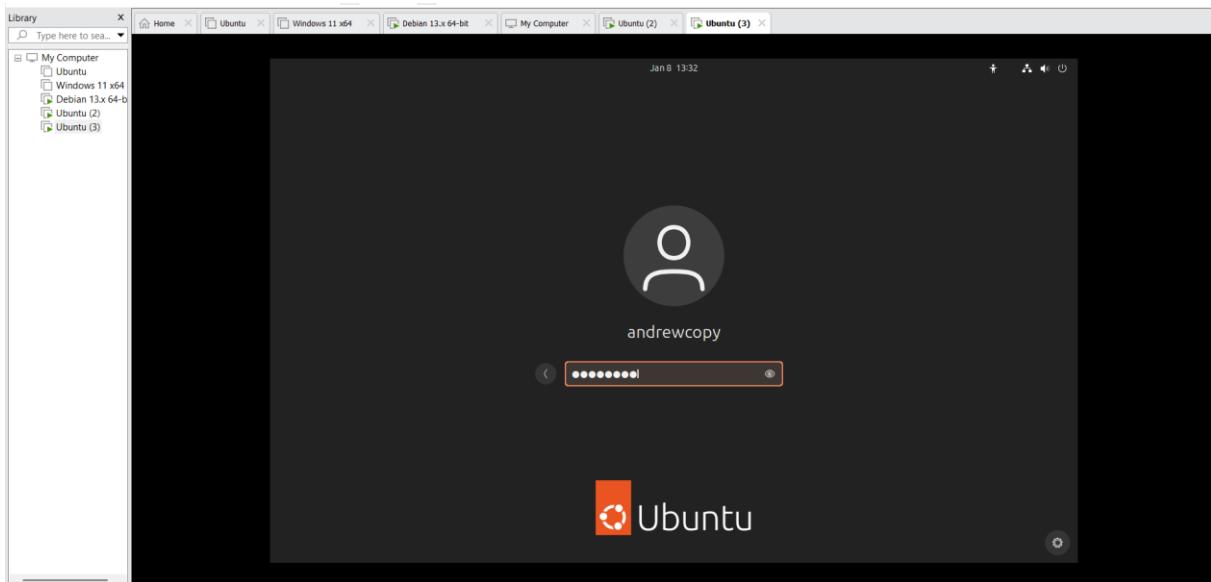


The system is going to look the same once I transfer it.

```
andrew@andrew578848:/srv/images$ ls  
ubuntu2404_vm.img.gz
```

Ubuntu (Restoring image) configuration:

```
129719072960 bytes (15 GB, 15 GiB) copied, 237.9037 s, 277 MB/s  
ubuntu@ubuntu:~$ ssh andrew@192.168.110.134 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress  
The authenticity of host '192.168.110.134 (192.168.110.134)' can't be established.  
ED25519 key fingerprint is SHA256:K4fix2Wp/eCLSVsQ5RK3TDNUm3yRbfzaVJavJW4k2vE.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.110.134' (ED25519) to the list of known hosts.  
andrew@192.168.110.134's password:  
21356249088 bytes (21 GB, 20 GiB) copied, 77 s, 277 MB/s  
0+651057 records in  
0+651057 records out  
21474836480 bytes (21 GB, 20 GiB) copied, 77.7985 s, 276 MB/s
```



Same user and data as in first VM.

Ready? Save this file and export it as a pdf file with the name: **week5.pdf**