Template Week 5 – Operating Systems

Student number:

Assignment 5.1: Unix-like

a) Find out what the difference is between UNIX and unix-like operating systems?
UNIX is a registered trademark. If an OS wants to be called UNIX the owner of that OS must buy UNIX trademark. Unix-like operating systems are designed to behave very similar to UNIX, however they are not totally UNIX and do not have its trademark (they are mostly open-source projects).

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 the father of UNIX who wrote the original version in 1969.

Dennis Ritchie created the C programming language. This enabled UNIX to run on any computer.

Bill Joy created BSD Unix and the TCP/IP software that allows computers to connect to the internet.

Richard Stallman was an activist who founded GNU and the Free Software Movement, believing all code should be open-source.

Linus Torvalds is the creator of Linux kernel and git. Linux Kernel + GNU makes the modern Linux OS.

c) What is the philosophy of the GNU movement?

The freedom to run the program as you wish, for any purpose.

The freedom to study how the program works and change it.

The freedom to redistribute copies so you can help your neighbor.

The freedom to distribute copies of your modified versions to others.

d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement? Please explain your answer.
Not entirely. Altough Ubuntu is based on Linux/GNU, it contains non-free softwares in the kernel. Also, it promotes its Snap Store (a software store for Ubuntu machines) that contains non-free softwares. Plus, Richard Stallman as the founder of GNU stated before that Ubunu does not conform to the philosophy of the GNU movement.

e) Find out what is the Windows Subsystem for Linux?
WSL (Windows subsystem for linux) is a feature in Windows 10 and Windows 11 that allows developers to run a Linux environment directly on Windows without the overhead of a traditional virtual machine or dual-boot setup.

f) Find out, which operating system family belongs to Android, iOS and ChromeOS?
Android → Linux family (Unix-like)

IOS → BSD based. It shares the same core with macOS. Since macOS is a certified UNIX system, IOS is a direct descendant of UNIX.

ChromeOS → Linux family (Unix-like)

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
A supercomputer is an extremely powerful computer designed to perform billions (or even quadrillions) of calculations per second. supercomputers are used for specialized tasks that require processing huge amounts of data:

- *Simulating the Planet: The Earth Simulator (2002) was designed to create virtual models of the Earth to predict climate change and weather patterns.*
- *Space Research: The Columbia supercomputer (2005) was used by NASA at the Ames Research Center to help with space exploration and aeronautics research.*
- *Artificial Intelligence & Games: The Deep Blue supercomputer (1997) was famous for using its immense processing power to calculate chess moves, eventually defeating world champion Garry Kasparov.*
- *Scientific & Government Research: Machines like the Cray-1 (1976), ASCI Red (1997), and Roadrunner (2009) were built to handle the most difficult calculations for government labs and scientific institutes, often speeding up research that would take humans or normal computers years to finish.*

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?

A PS3 cluster is a collection of dozens to thousands of PS3 consoles connected via Ethernet running Linux (which Sony officially supported on early PS3 models via "OtherOS"). It is programmed using MPI (Message Passing Interface) or similar parallel frameworks. Together, these consoles acted as a distributed supercomputer.

It was used for:

- ***scientific researches***
- ***Defense and government research***
- ***Academic supercomputing***
- ***Distributed computing projects***

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. It is Oracle-made Linux distribution tailored for ARM architectures rather than the default Raspberry Pi OS.

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, Oracle's raspberryPi supercomputer does not appear in the list of the 500 fastest supercomputers in the world. A cluster made of hundreds or even a thousand Raspberry Pi boards has very limited floating-point throughput compared to real HPC systems built with server-class CPUs + GPUs + low-latency interconnects.

e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?
They both use x86-64
What operating systems run on these consoles?
Xbox series X → Runs on a specialized version of Microsoft Windows.
PlayStation 5 → Runs Orbis OS, which is a modified version of FreeBSD.

What conclusion can you draw from the answer to the previous question?
Consoles are just specialized PCs for gaming uses. There is a rivarl between Windows and Unix even in consoles industry.

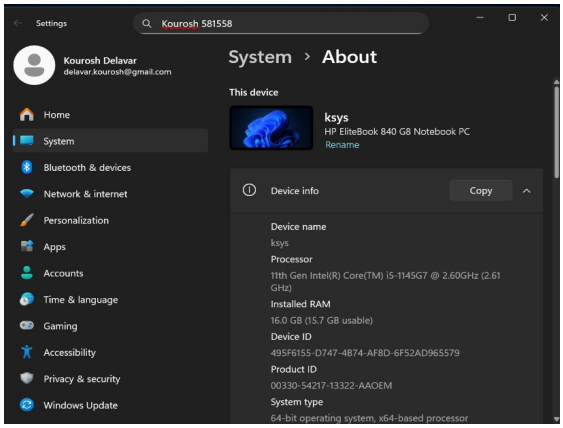
Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

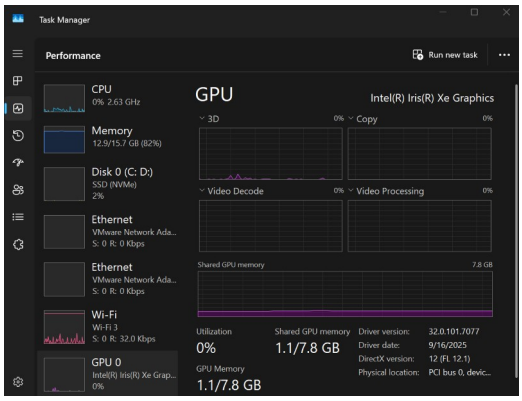
a) Practice for about 10 minutes with the ⊞ keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.

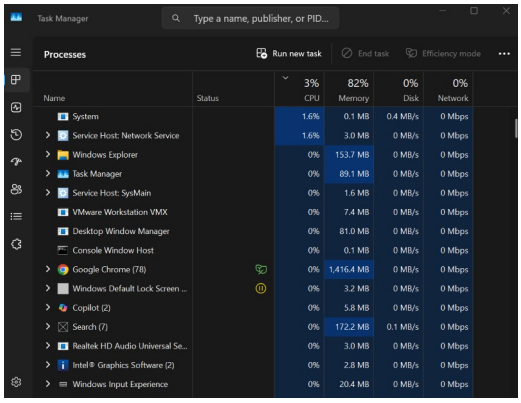
b) The file explorer can be opened with ⊞ + E, Which key combination could you also use?
Win + X, then press E

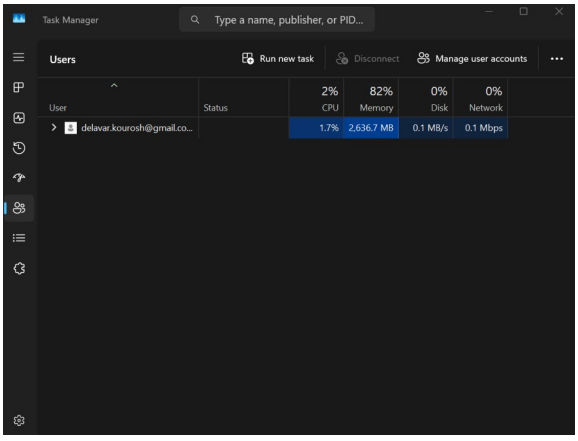
c) Open the system properties with a ⊞ key combination, take a screenshot of the open screen. Paste this screenshot into this template.



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.



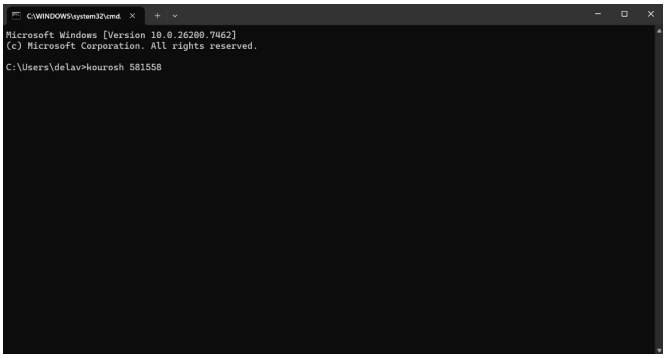




e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

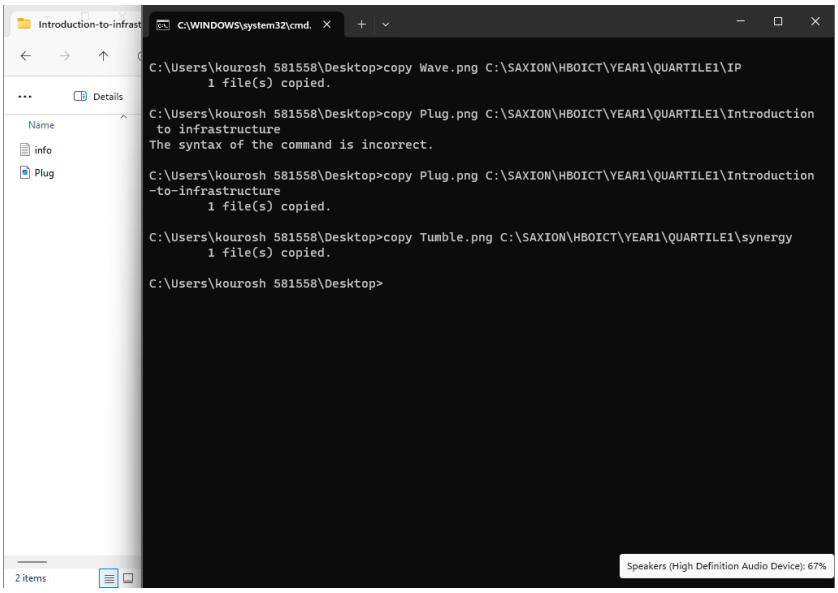
f) If you leave the classroom for a while and you leave your laptop behind, it is wise to lock the screen. Your Apps will continue to run in the background. So, for example, if you're waiting for a download that takes a while, lock the screen and get a cup of coffee. Which key combination do you use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

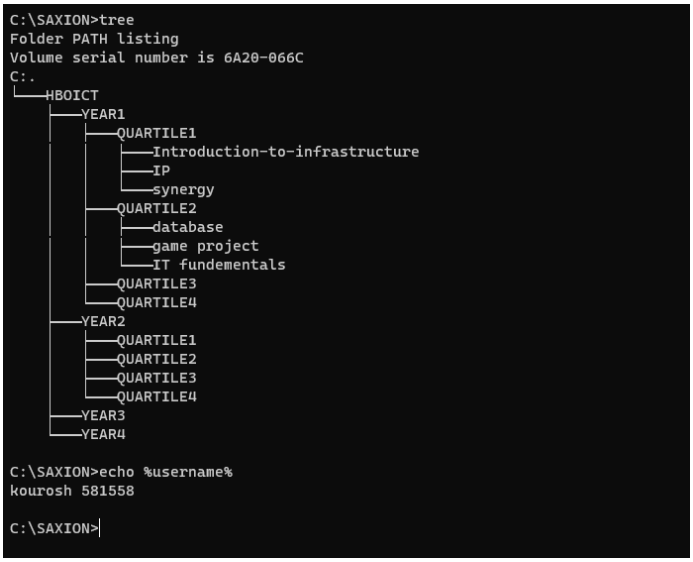


Working in the File Explorer

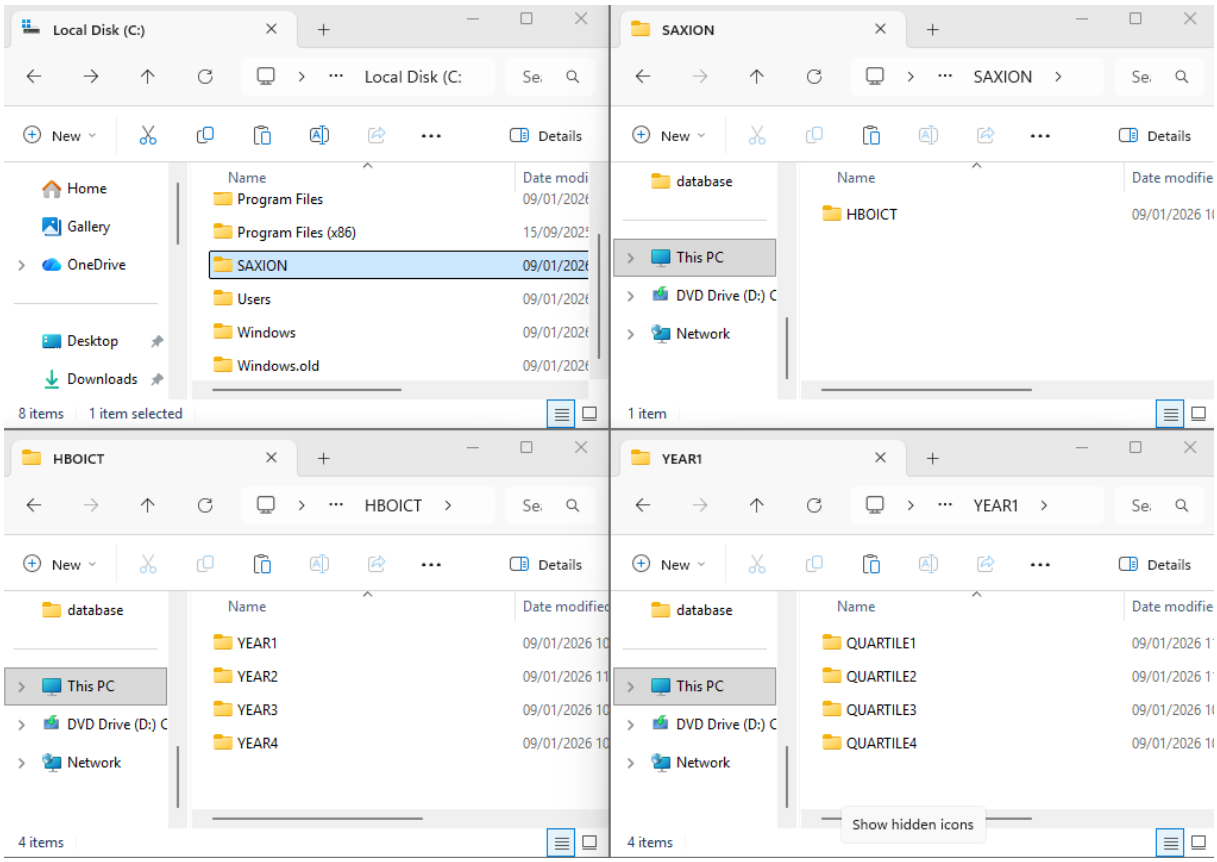
Relevant screenshots **copy** command:

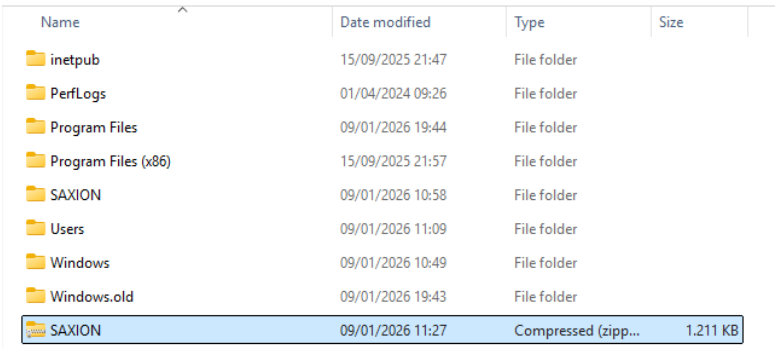


Relevant screenshots **tree** command:



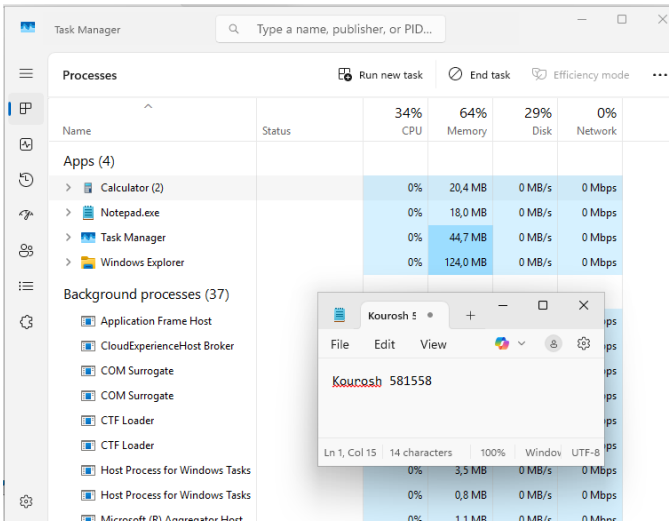
Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.





Terminating Processes

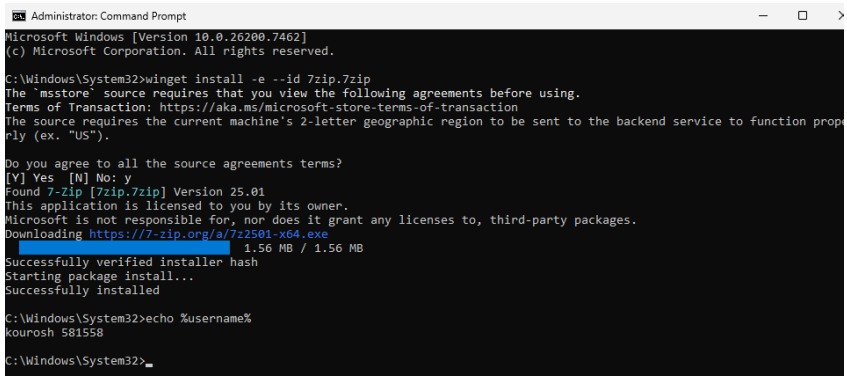
Relevant Screenshots Task Manager Window:

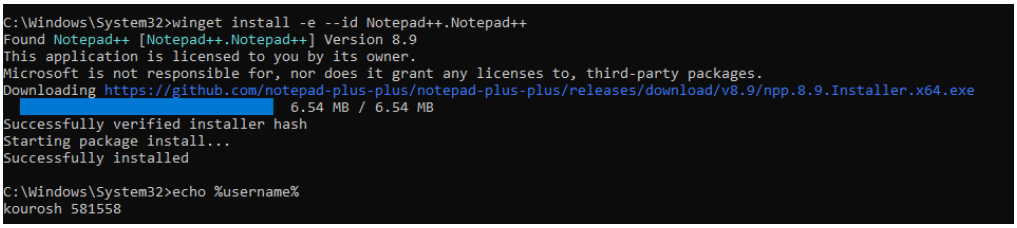


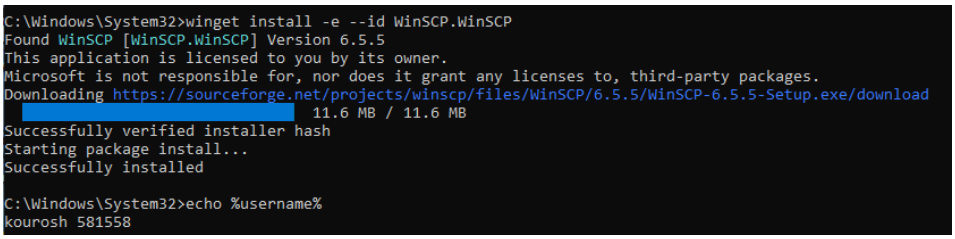
Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip



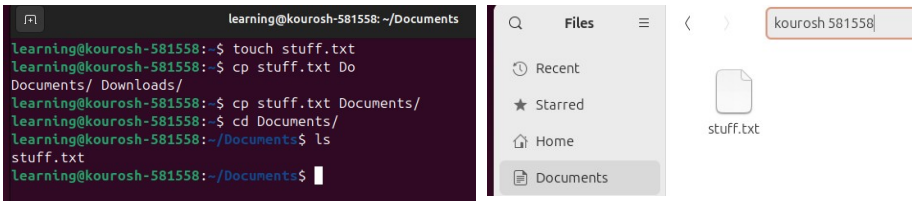




Assignment 5.4: Working with Linux

Relevant screenshots + motivation

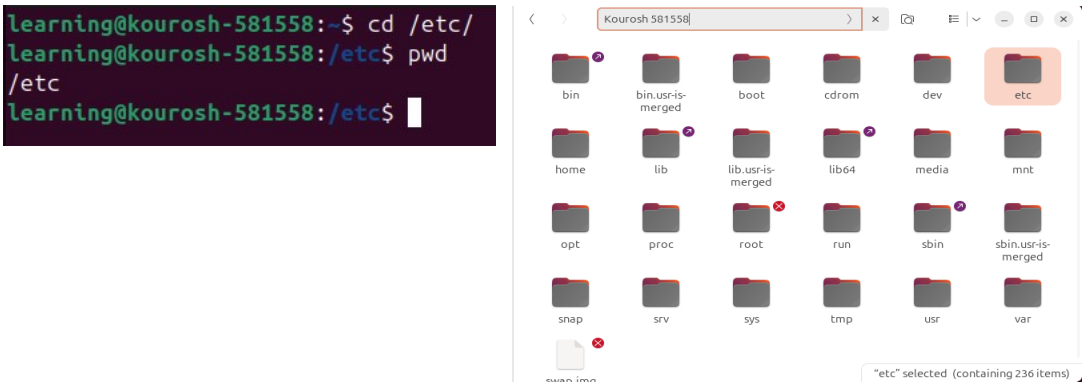
Copying files:



Navigating the file structure:

in Gnome file explorer:

1. ***open the file explorer and check the left bar***
2. ***click on "other locations" and then navigate through "Ubuntu". We must find the /etc directory there.***



How to get back to your home folder in the terminal? ***Using "cd ~" command***

Name one significant difference in Linux's file structure when comparing it to Windows:

storage on windows is separated to drivers, each have its own root, but on Linux there is only one root and no driver structure

What is the /etc directory usually used for? ***It stores information and configurations of the system in plain text files (Can be edited)***

Compress files:

Which command in the terminal would you use to compress a text file into a tar archive?

tar -cvf archive.tar file.txt

With which command in the terminal would you be able to extract a tar file?

tar -xvf archive.tar

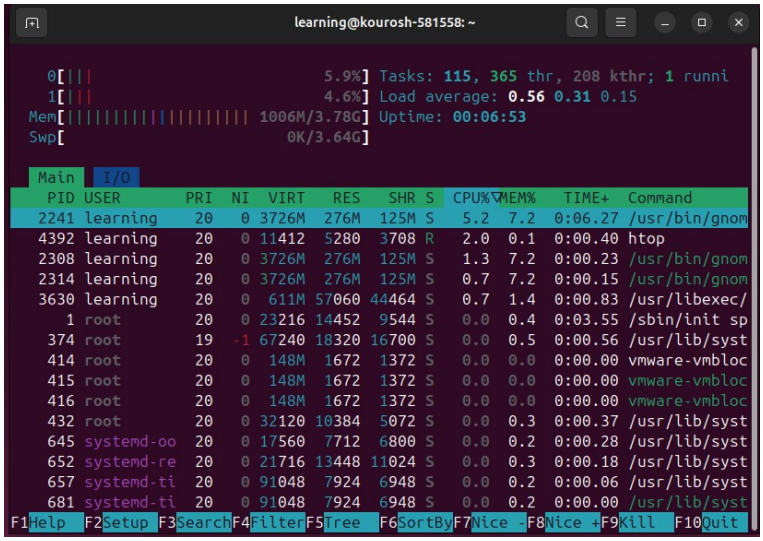
```
learning@kourosh-581558: ~
learning@kourosh-581558:~$ ls
Desktop    Downloads  Pictures  snap       Templates
Documents  Music      Public    stuff.txt  Videos
learning@kourosh-581558:~$ tar -cvf archive.tar stuff.txt
stuff.txt
learning@kourosh-581558:~$ ls
archive.tar  Documents  Music     Public  stuff.txt  Videos
Desktop      Downloads  Pictures  snap    Templates
learning@kourosh-581558:~$
```

```
learning@kourosh-581558:~$ gzip archive.tar
learning@kourosh-581558:~$ ls
archive.tar.gz  Documents  Music     Public  stuff.txt  Videos
Desktop         Downloads  Pictures  snap    Templates
learning@kourosh-581558:~$
```

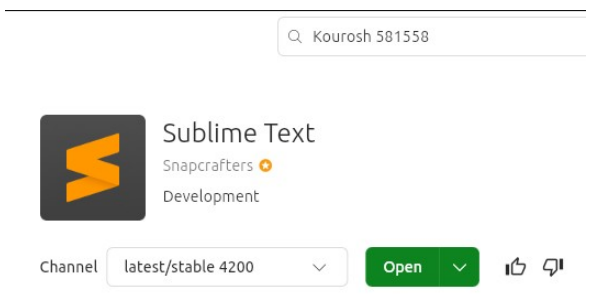
View processes:

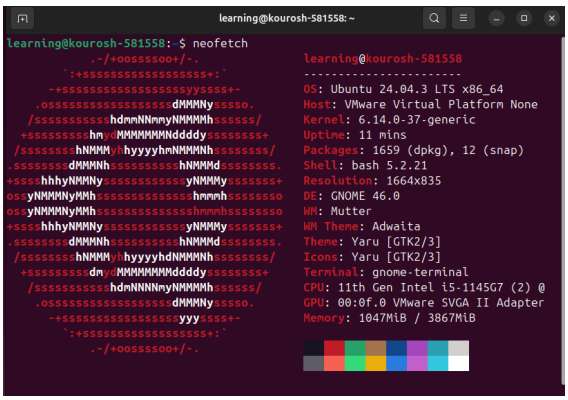
Launch the htop application. Explain what this application shows:

htop is a interactive system monitoring application which provides more readability and insight compared to "top".



Install Software:

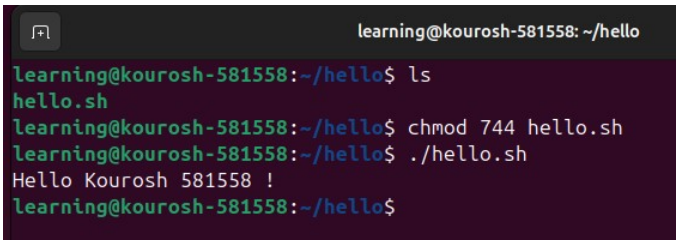




What does neofetch application show when you launch it? ***A summary of hardware resources and UI configurations***

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

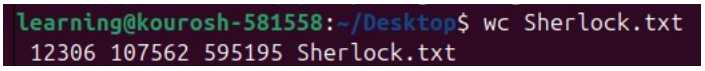


Assignment 5.6: View the contents of files

Relevant screenshots + motivation

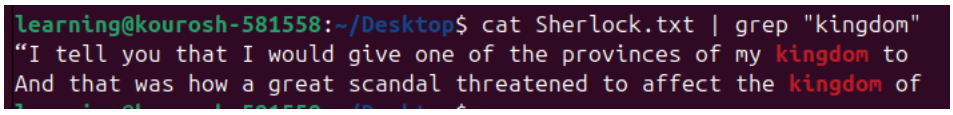
How many lines does the file have? How many words? And how many characters?

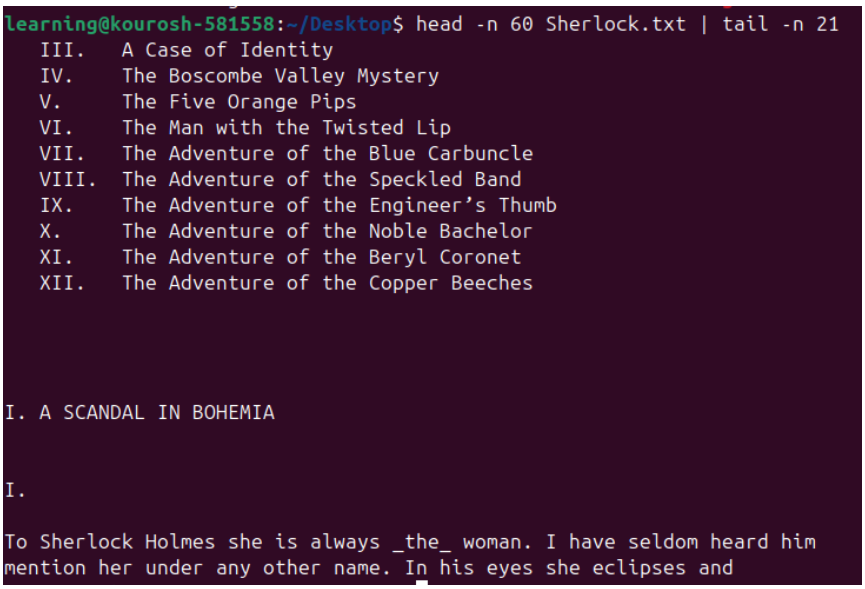
Using "wc" command gives us three numbers which are the number of lines, the number of words and characters respectively.



On which lines is the word "kingdom" in the file?

Using grep we can filter a view.





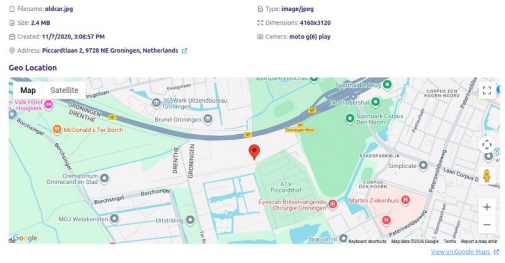
Assignment 5.7: Digital forensics

Relevant screenshots + motivation

Identify phone brand/type → ***moto g(6) play***

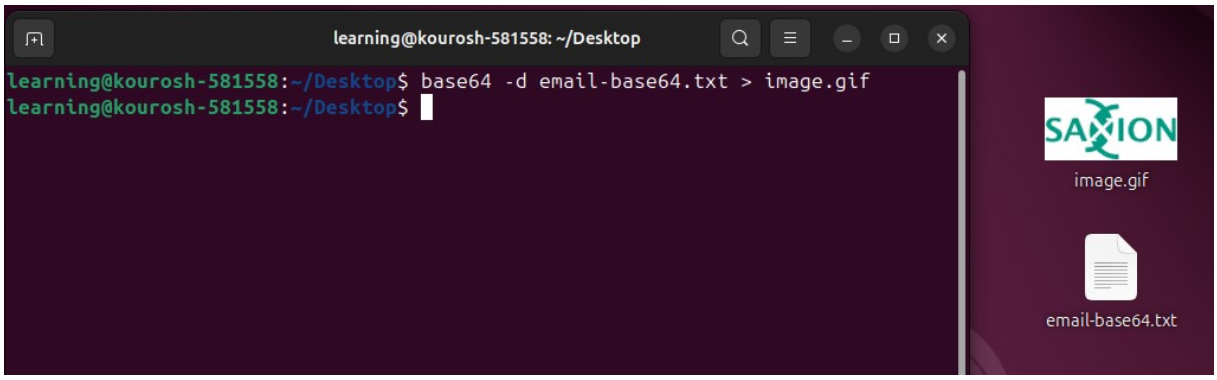
Are there GPS coordinates known? ***Yes***

If yes: look up the location in Google maps and Streetview



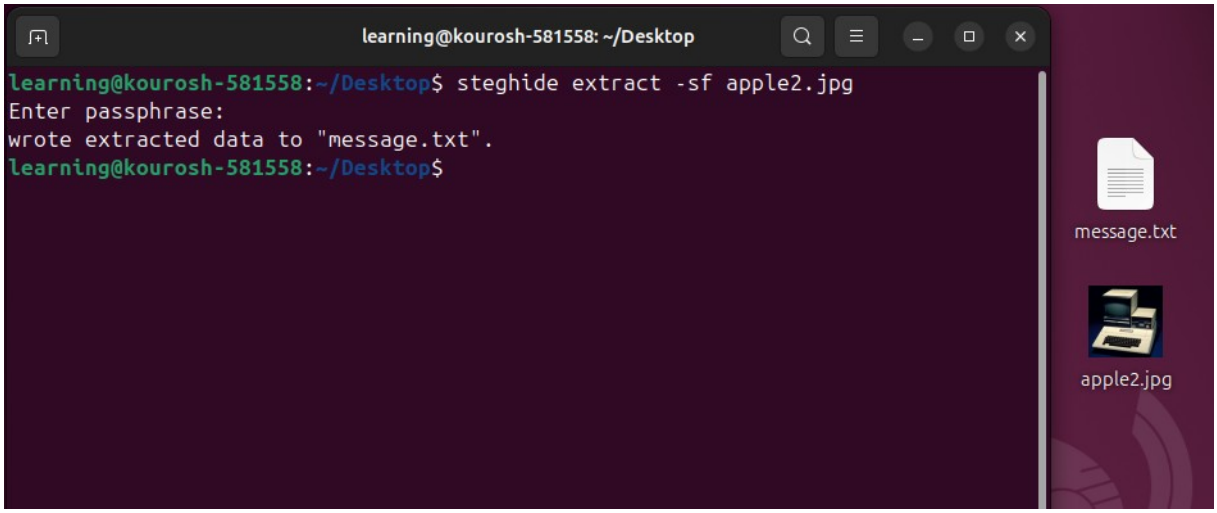
In which city was this photo taken? ***Groningen***

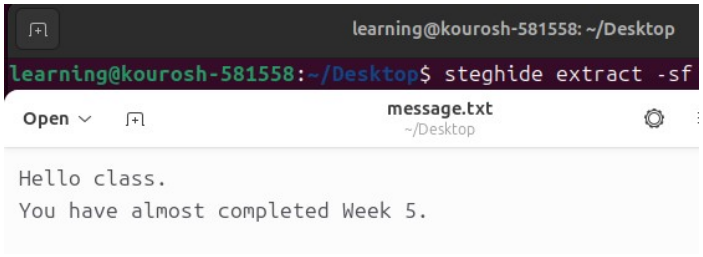
BASE64:



Assignment 5.8: Steganography

Relevant screenshots + motivation

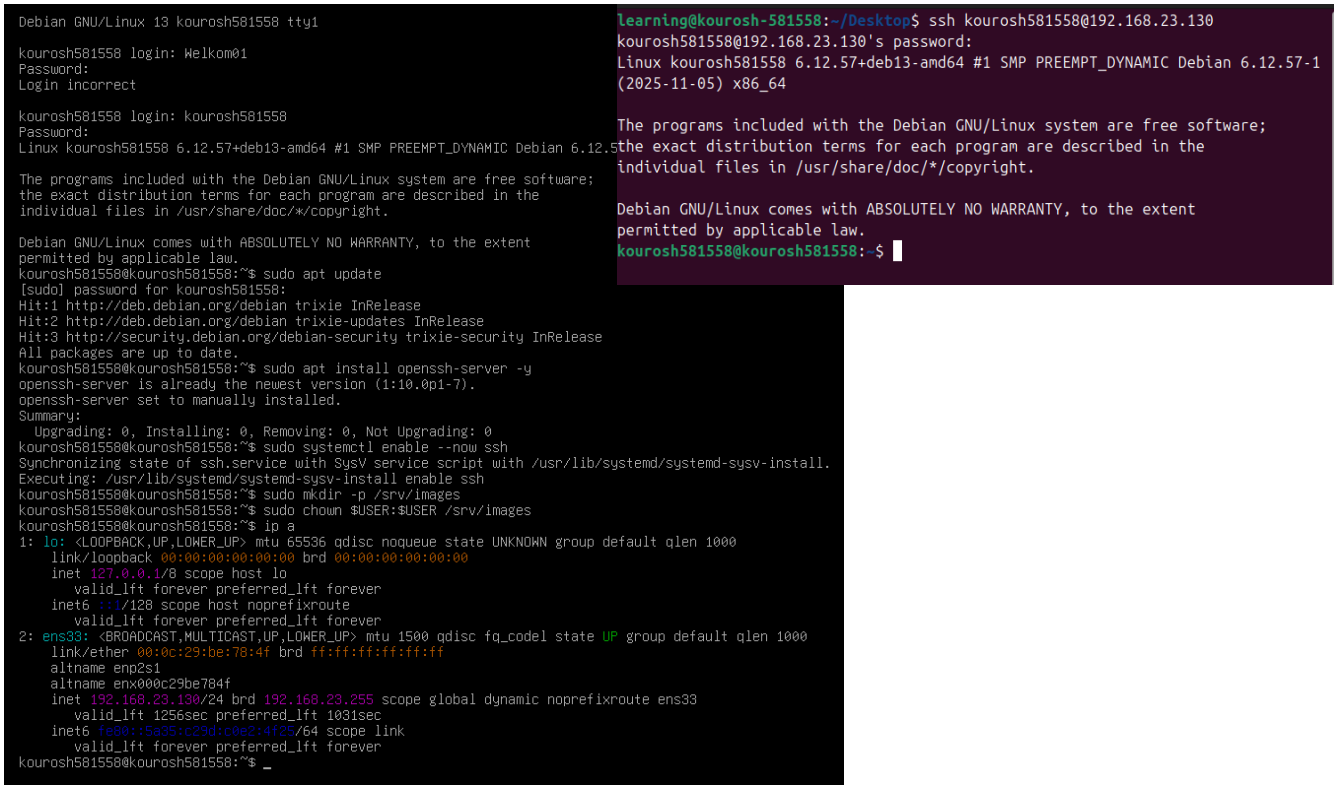




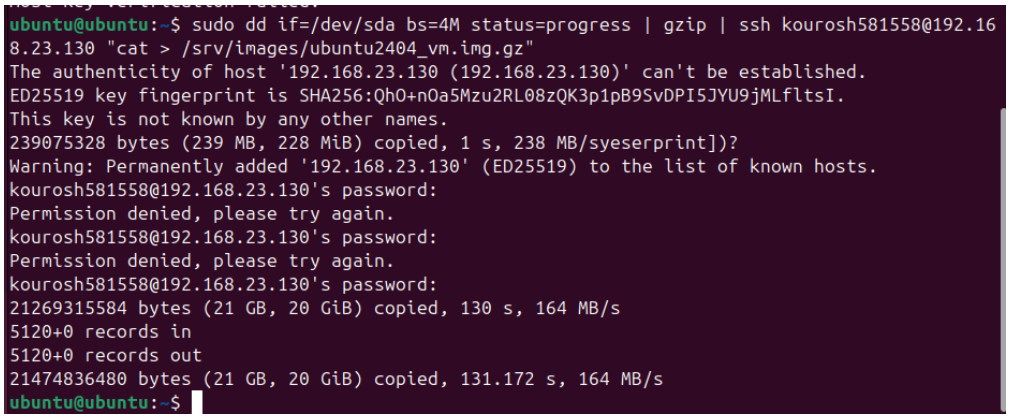
Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:

- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.

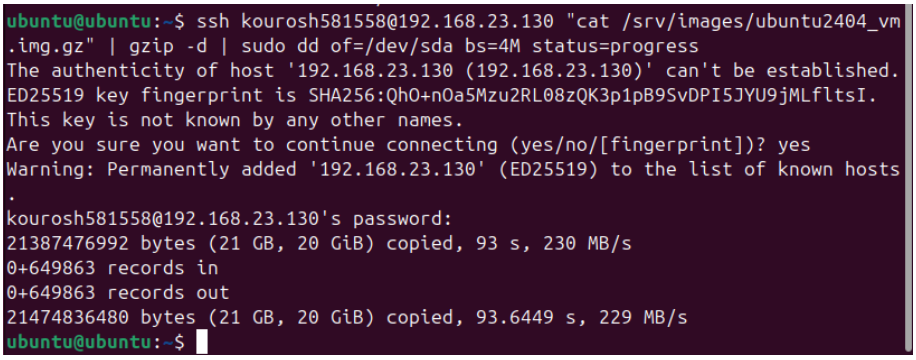


Backup captured:



- Proof that you can restore the back-up image into an empty VM.

Restored in the target storage



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