

# Template Week 5 – Operating Systems

Student number: 589530

## Assignment 5.1: Unix-like

- a) Find out what the difference is between UNIX and Unix-like operating systems?
  - a. Unix is het “originele” OS, dat is ontwikkeld in 1970, UNIX like OS’s zijn geïnspireerd op UNIX, het deelt dan of een deel van de source code, of is geïnspireerd op de structuur van UNIX.
- 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.
  - a. Ken Thimpson samen met Dennis Ritchie zijn in de late 1960 en begin 1970 begonnen met de ontwikkeling van de UNIX. Je zou kunnen zeggen dat dit de grondleggers zijn de computers infrastructuur die we nu kennen.
  - b. Bill Joy: Was een belangrijk persoon voor BSD UNIX, verder is hij de persoon die V-Ram toevoegde in UNIX.
  - c. Richard Stallman: Staat vooral bekend om zijn mening over Open source/ free software, in 1983 schreef hij het eerste UNIX like OS dat volledig bestaat uit free software.
  - d. Linus Torvalds: is de grondlegger van linix, sinds 1969 is hij de maker en maintainer van DE linux kerel die eigenlijk de (bijna) alle computers van de wereld op draaien. Verder wat hij ook nauw betrokken met de beginfase van GIT.
- c) What is the philosophy of the GNU movement?
  - a. Is een movement voor “free software”, dat zich vooral richt op het behouden en uitbreiden van open source, zodat de technologie open is voor iederen. Dit heeft veel voordelen voor transparantie en veiligheid. Wiens oprichter Richard Stallman is.
- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement?  
Please explain your answer.
  - a. Ja en nee; veel componenten zijn GNU, denk aan libraries en utilities, echter is Ubuntu gebouwd op de Linix kernel en deze is niet deel van de GNU. Dus veel van Ubuntu is deel van GNU maar niet 100%.
- e) Find out what is the Windows Subsystem for Linux?
  - a. Dit zorgt ervoor dat je Linix omgeving kan hebben op je windows computer, zonder dat een VM (virtual machine) gebruikt.
- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?
  - a. Android en ChomeOS komen van UNIX like OS. En iOS komt van macOS is gebaseerd op Darwin en stamt af van BSD UNIX is ook een UNIX OS.

## 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. Supercomputers worden gebruikt voor verschillende dingen die veel computing kracht nodig hebben, denk aan weervoorspellingen maar ook klimaat onderzoeken of fysieke simulaties. Maar eigenlijk alles waarvoor je veel data word gebruikt om iets snel te processen.
- 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. Zijn simpel weg heel veel ps3 die samen werken als 1, dit door een betaalbare en snelle CPU een goed alternatief zijn voor een "normale" super computer.
- 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?
- a. Oracle Linix voor 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/>
- a. Ik denk het niet, we hebben het over de wereld en at the core zijn het maar rasberry pi, maar ik denk wel als je maar genoeg rasberry pi bij elkaar toevoegt je wel dichtbij kan komen maar dan is het een kwestie van electicitet en hoe kom je aan zoveel rasberry pi's?
- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?
- a. Allerbei gebruiken custom AMD processors.

What operating systems run on these consoles?

PS5 loopt een custom OS dat ontwikkeld is door Sony

Xbox series X loopt op de Xbox System Software van Microsoft.

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

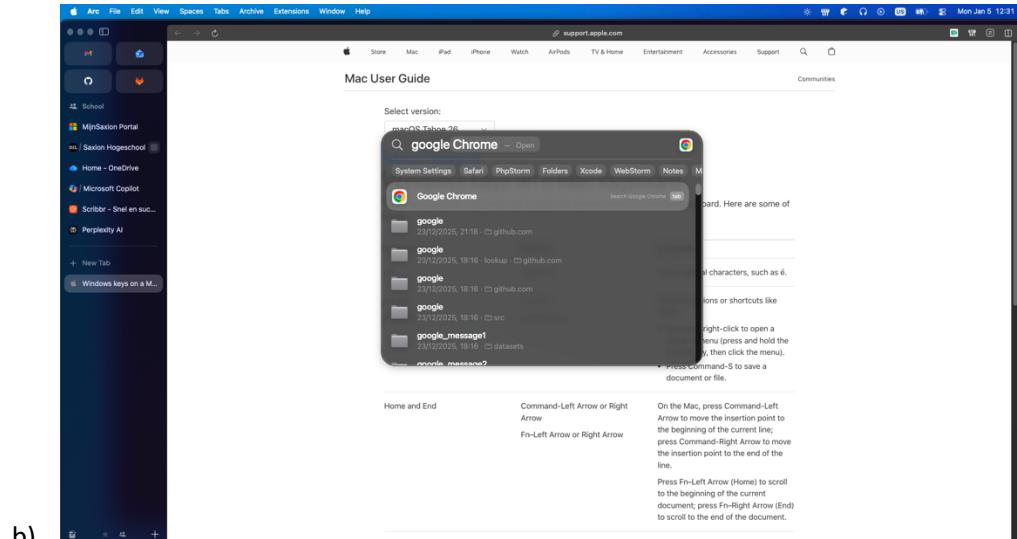
Dat console gaming en PC gaming erg op elkaar lijken maar toch nog moet worden aangepast, aangezien ze wel een AMD CPU gebruiken alleen aangepast, zelfde voor de software, het lijkt we een beetje op, ik denk als console makers zoals Sony meer richting de PC kant gaan denk aan zelfde CPU etc. de prijzen omlaag kunnen en ook veel meer ruimte is om zelf upgrades te doen.

## Assignment 5.3: Working with Windows

Al deze opdrachten zijn echt windows gerelateerd ik zie niet hoe ik hetzelfde kan bereiken op een mac. Ik heb mijn best gedaan maar dit werkt allemaal heel anders dan mac.

Take relevant screenshots of the assignments below

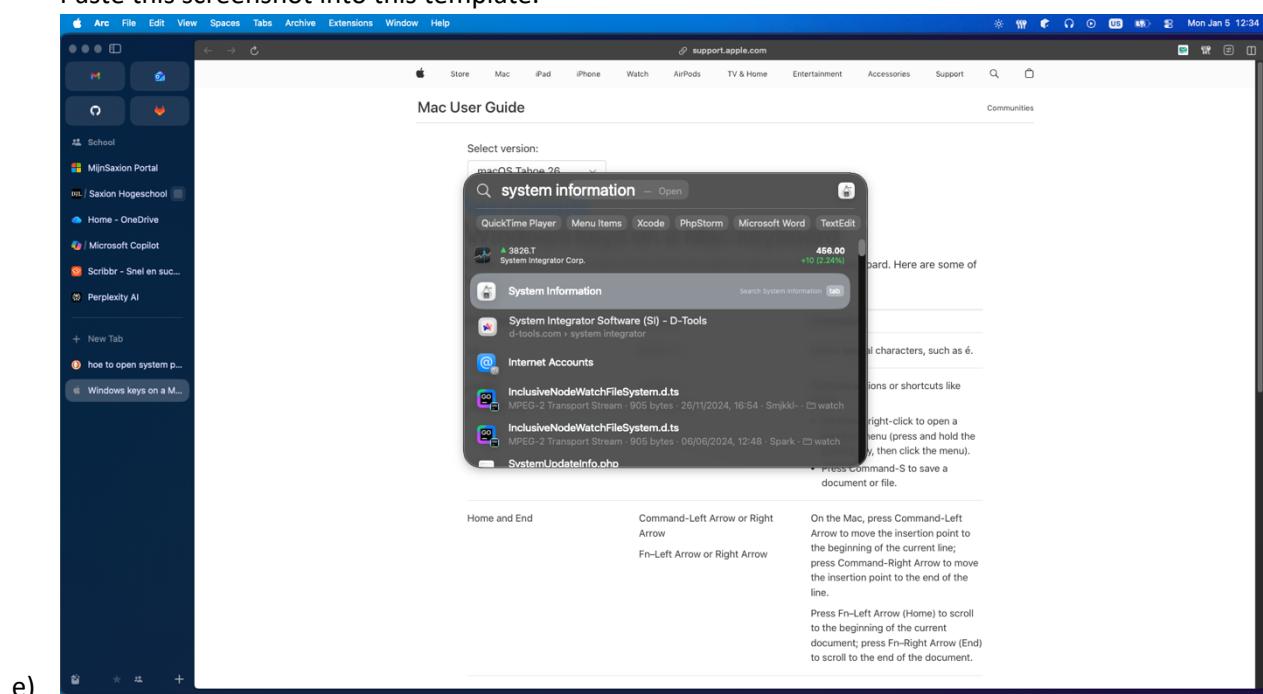
- a) Practice for about 10 minutes with the  keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.



- c) The file explorer can be opened with  + E, Which key combination could you also use?

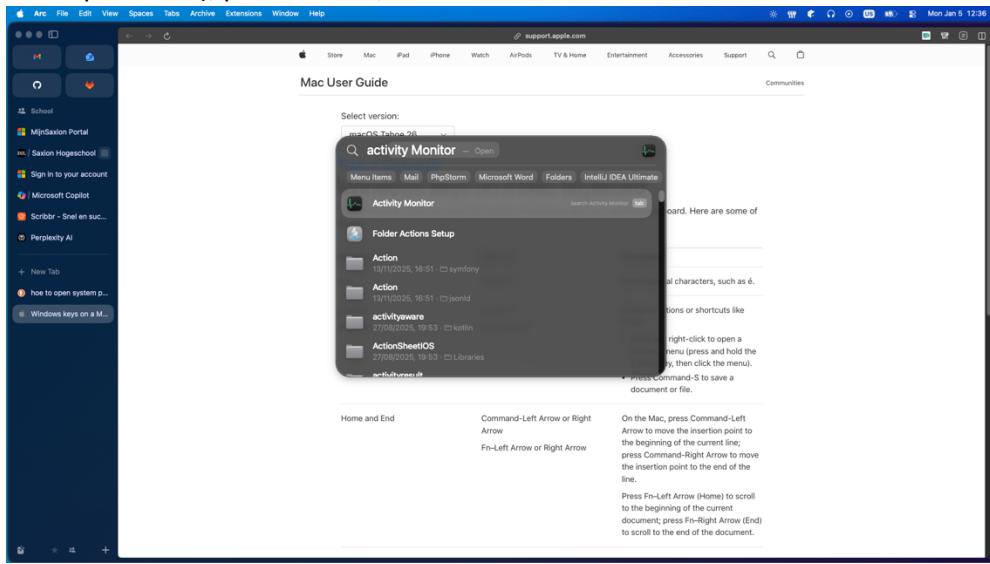
a. Mac: Command + spatie.

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

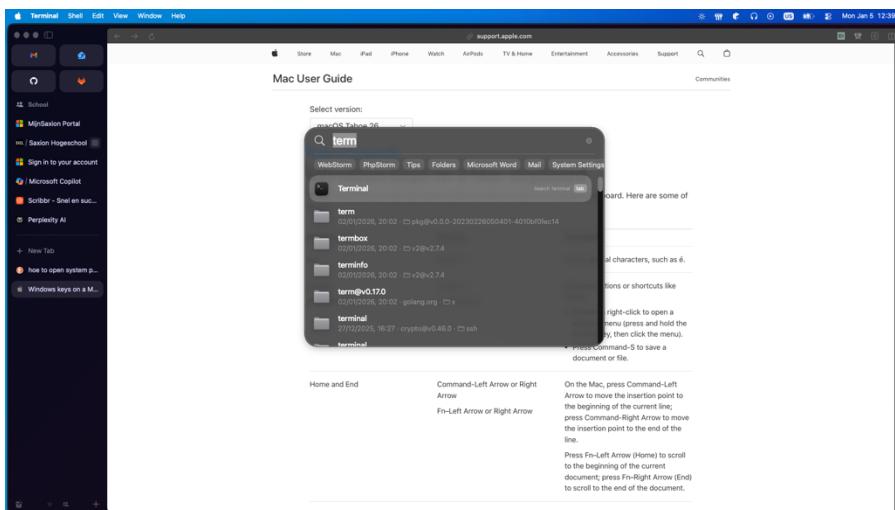




- f) Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.

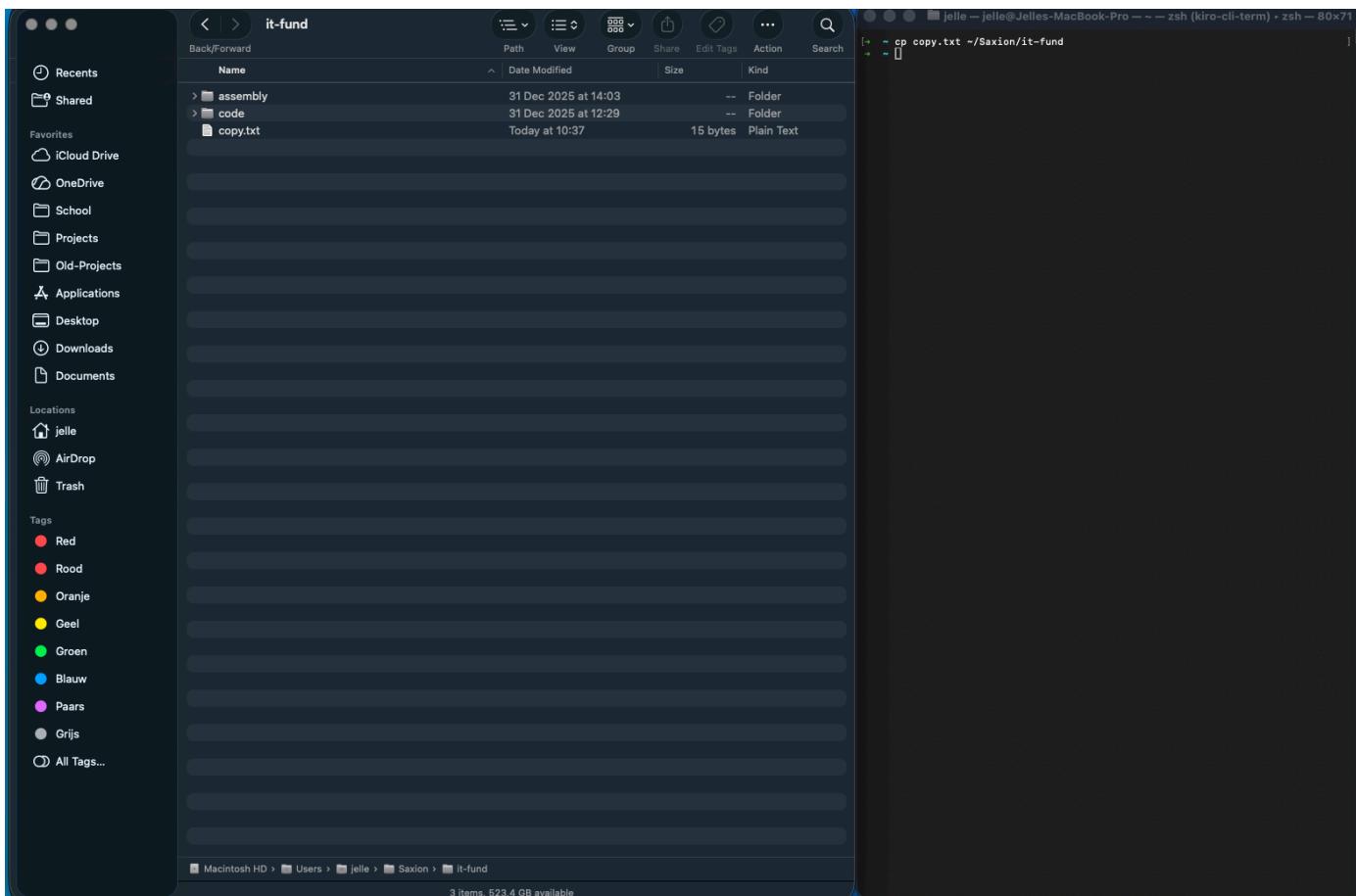


- g) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector, or the second screen. Which key combination should you use for this?
- Command + F1 toggles mirror display
  - Options F1 opens display settings.
- h) 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?
- Klik op finger afdruk knop op toestenbord
  - Of Control command Q
- i) 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:

```
Saxion — jelle@Jelles-MacBook-Pro — ~/saxion — zsh (kiro-cli-term) > zsh...
└── Exercise8
    └── Application.class
    ├── resources
    │   ├── SAXIONApp.jar
    │   ├── star-filled.svg
    │   └── star-outlined.svg
    ├── Zip archive.zip
    └── nightSky
        ├── nightSky.iml
        ├── out
        │   ├── production
        │   │   ├── NightSky
        │   │   │   ├── Application.class
        │   │   │   └── Star.class
        │   ├── resources
        │   │   ├── SAXIONApp.jar
        │   ├── src
        │   │   ├── Application.java
        │   │   ├── Star.java
        │   │   └── stars.csv
        │   └── nightSky.solution
        │       ├── NightSky-Exam-EN.md
        │       ├── NightSky-Exam-EN.pdf
        │       ├── NightSky-Exam-NL.md
        │       ├── NightSky-Exam-NL.pdf
        │       ├── nightSky.iml
        │       ├── resources
        │       │   ├── SAXIONApp.jar
        │       │   ├── brightestStar.png
        │       │   ├── loadStars.png
        │       │   ├── menu.png
        │       │   ├── menuError.png
        │       │   ├── nightsky.png
        │       │   ├── printStars.png
        │       │   └── printStarsCropped.png
        │       ├── src
        │       │   ├── Application.java
        │       │   └── Star.java
        │       └── stars.csv
        └── test
            ├── out
            │   ├── production
            │   │   ├── test
            │   │   │   └── Main.class
            │   ├── src
            │   │   └── Main.java
            └── test.iml
    ├── Screenshots
    │   ├── IT Fund
    │   │   ├── 2.4.circ
    │   │   ├── 2.4.png
    │   │   ├── Vending_Machine copy.circ
    │   │   └── Vending_Machine.circ
    └── it-fund
        ├── assembly
        │   └── week4.asm
        └── code
            ├── Fibonacci.class
            ├── Fibonacci.java
            ├── a.out
            ├── fib.c
            ├── fib.py
            ├── fib.sh
            ├── fib_02
            └── runall.sh
[ 162] ~$abloon requirements Energy4You.docx
333 directories, 423 files
[+ saxion echo Jelle
Jelle
[+ saxion ]
```

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

The screenshot shows a file explorer window titled "assignments". The left sidebar contains navigation links for Recents, Shared, Favorites, OneDrive, School, Projects, Old-Projects, Applications, Desktop, Downloads, and Documents. Below these are sections for Locations (iCloud Drive, OneDrive), Tags (Red, Rood, Oranje, Geel, Groen, Blauw, Paars, Grijs), and All Tags... The main pane displays a list of files and folders:

Name	Date Modified	Size	Kind
4pixelsEdited.bmp	28 Dec 2025 at 16:57	134 bytes	Windo...P image
Week1	28 Dec 2025 at 16:58	655 KB	PDF Document
Week1.docx	28 Dec 2025 at 16:58	621 KB	Micros...(docx)
week2	28 Dec 2025 at 17:39	233 KB	PDF Document
week2.docx	28 Dec 2025 at 17:38	231 KB	Micros...(docx)
week3	28 Dec 2025 at 19:01	246 KB	PDF Document
week3.docx	28 Dec 2025 at 18:59	278 KB	Micros...(docx)
Week4.docx	31 Dec 2025 at 14:27	290 KB	Micros...(docx)
week5.docx	Today at 10:19	3,8 MB	Micros...(docx)

The bottom status bar indicates the path: OneDrive > 2025-2026 > Kwartiel 2 > IT Fundamentals > assignments, and shows 9 items, 523,65 GB available.

## Terminating Processes

Relevant Screenshots Task Manager Window:



## Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip

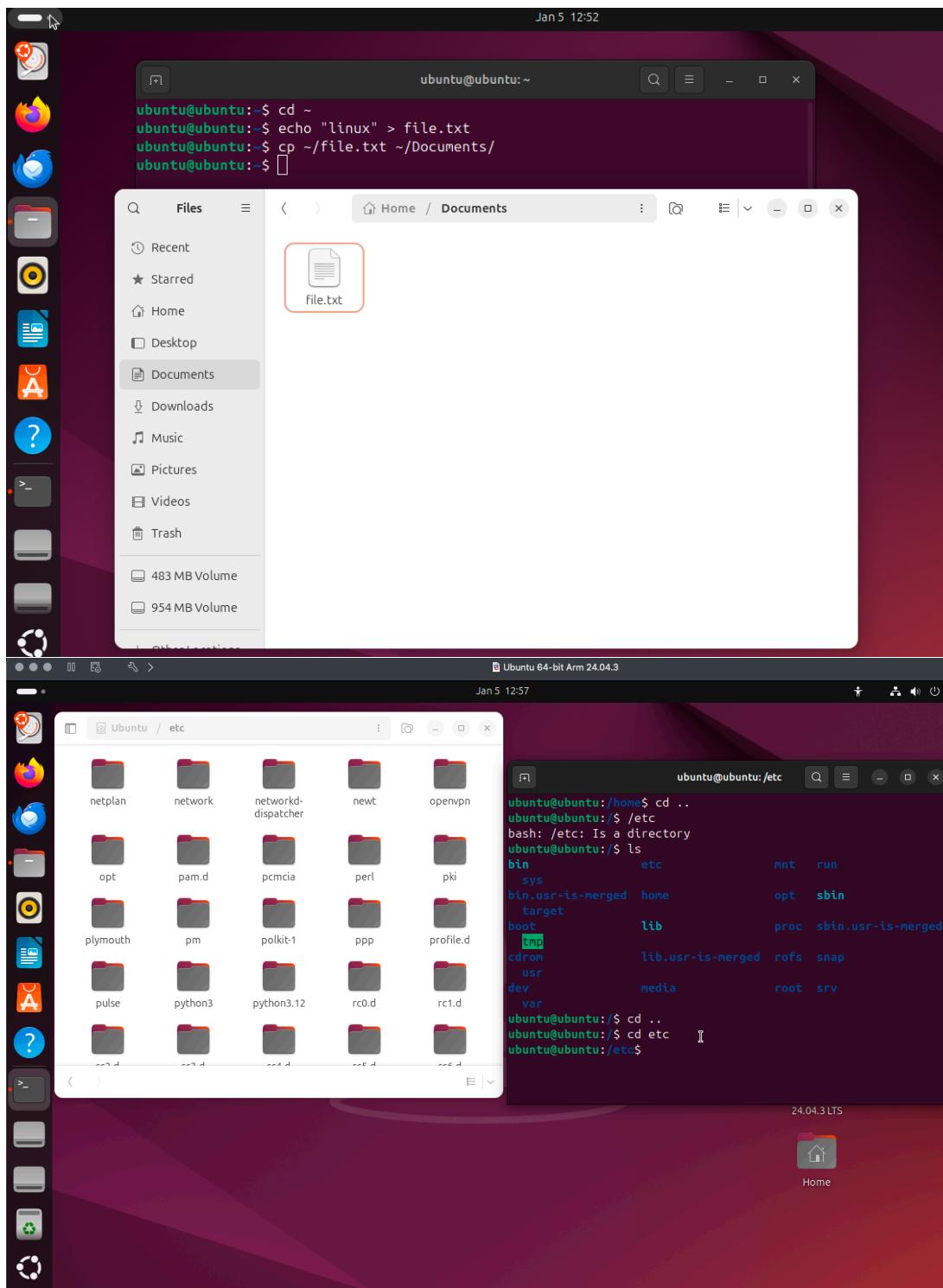
```
[→ saxion brew install WinSCP
✓ JSON API formula.jws.json
✓ JSON API cask.jws.json
Warning: No available formula with the name "winscp".
==> Searching for similarly named formulae and casks...
==> Casks
wins
winzip

To install wins, run:
brew install --cask wins
[→ saxion brew install Notepad++
Warning: No available formula with the name "notepad++".
==> Searching for similarly named formulae and casks...
==> Casks
notepadexe

To install notepadexe, run:
brew install --cask notepadexe
[→ saxion brew install 7zip
==> Fetching downloads for: sevenzip
✓ Bottle Manifest sevenzip (25.01)
✓ Bottle sevenzip (25.01)
Downloaded 9.8KB/ 9.8KB
Downloaded 1.9MB/ 1.9MB
==> Pouring sevenzip--25.01.arm64_tahoe.bottle.1.tar.gz
↳ /opt/homebrew/Cellar/sevenzip/25.01: 6 files, 4.4MB
==> Running `brew cleanup sevenzip`...
Disable this behaviour by setting `HOMEBREW_NO_INSTALL_CLEANUP=1`.
Hide these hints with `HOMEBREW_NO_ENV_HINTS=1` (see `man brew`).
→ saxion ]
```

## Assignment 5.4: Working with Linux

Relevant screenshots + motivation

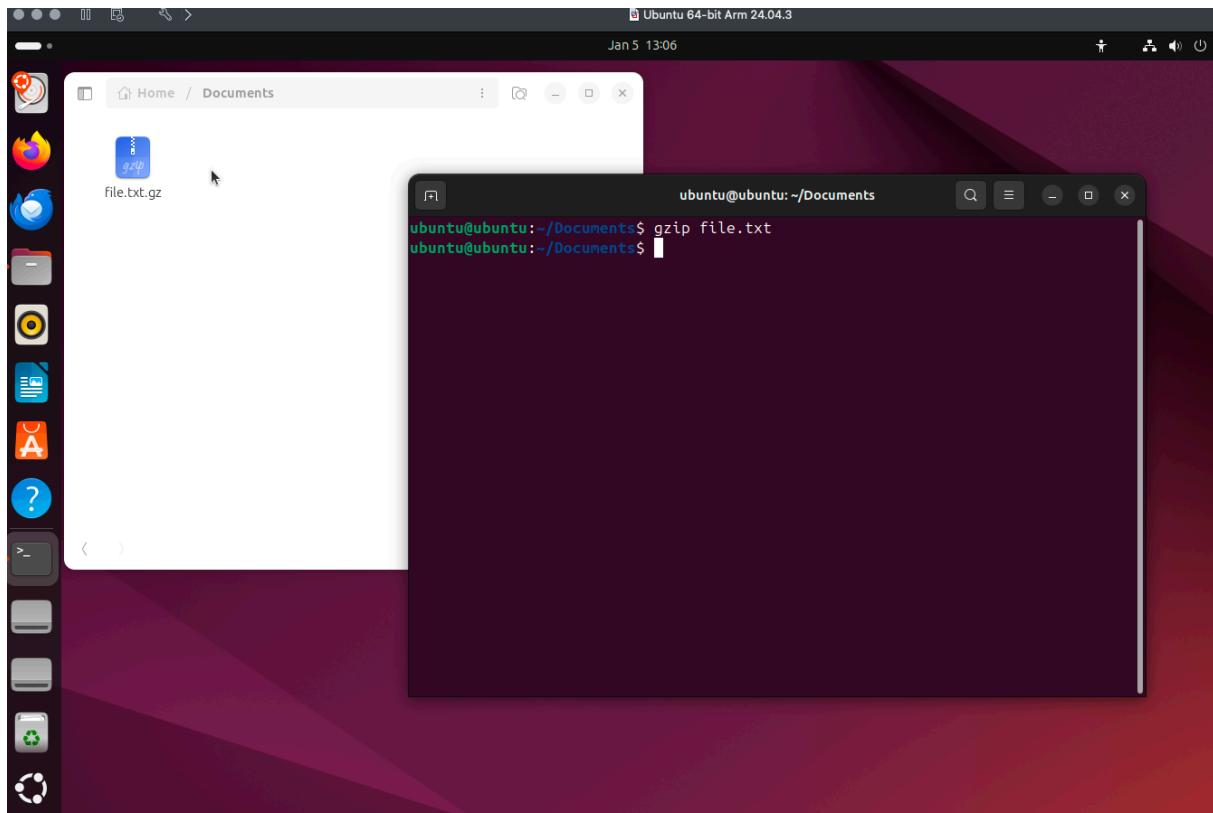


What is the /etc directory usually used for?:

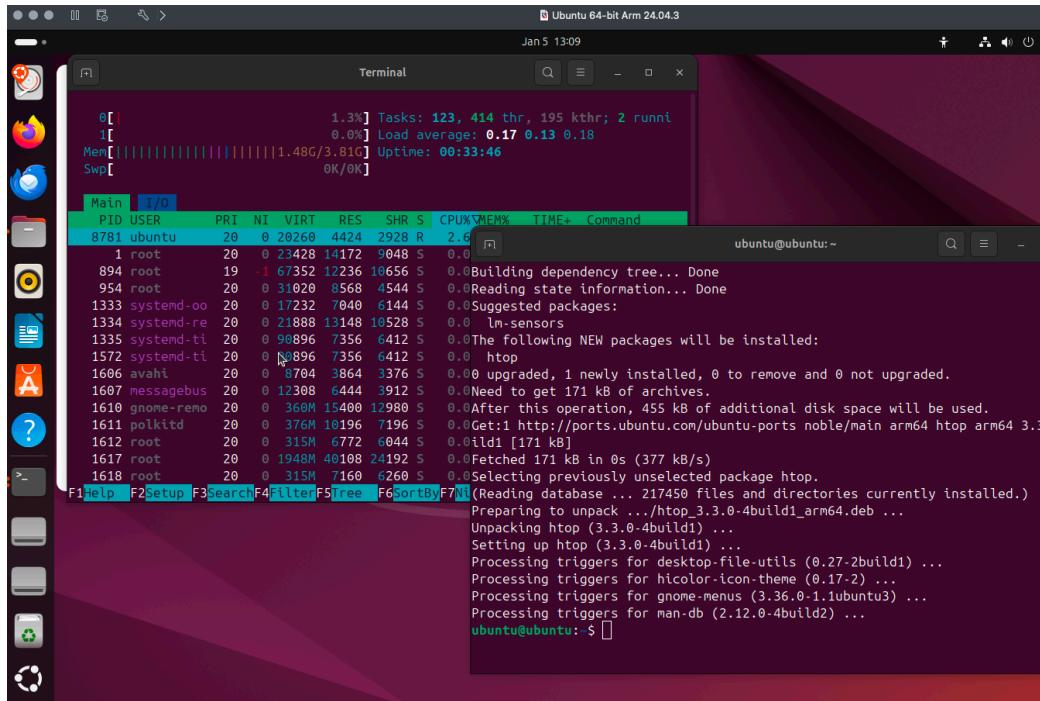
Voor system config bestanden.

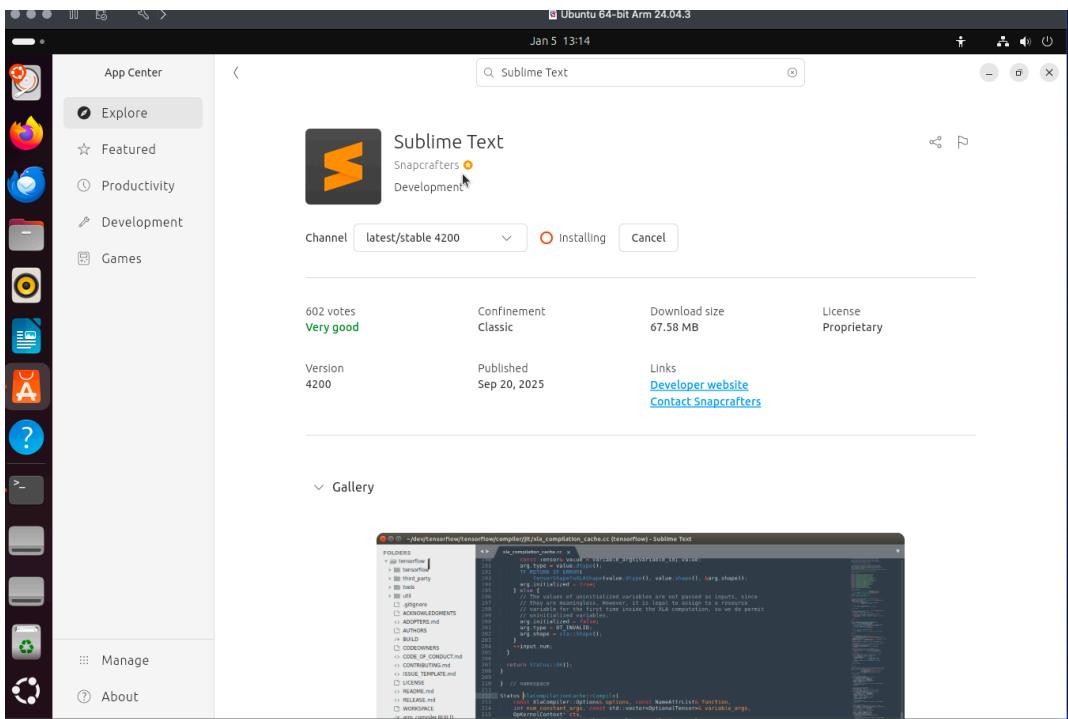
tar -cvf archive.tar myfile.txt: om een bestand de archieven

tar -cvf archive.tar myfile.txt: om text te extracten.



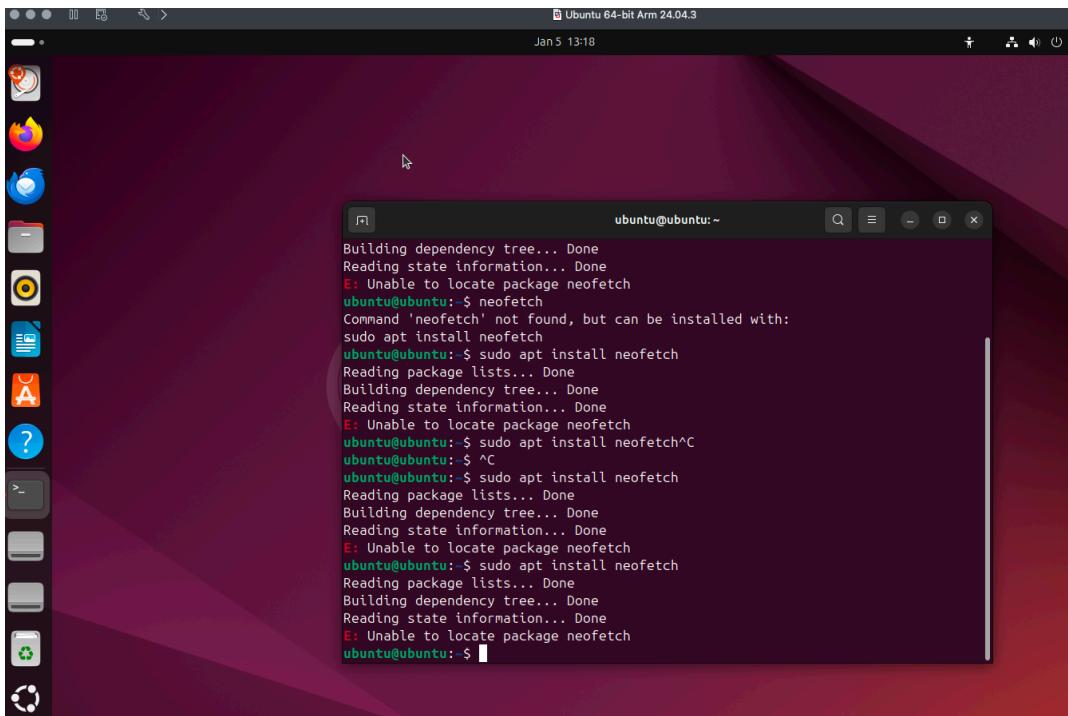
Htop: is interactieve process viewer, je kan je processen die lopen, CPU ussage per core, etc.





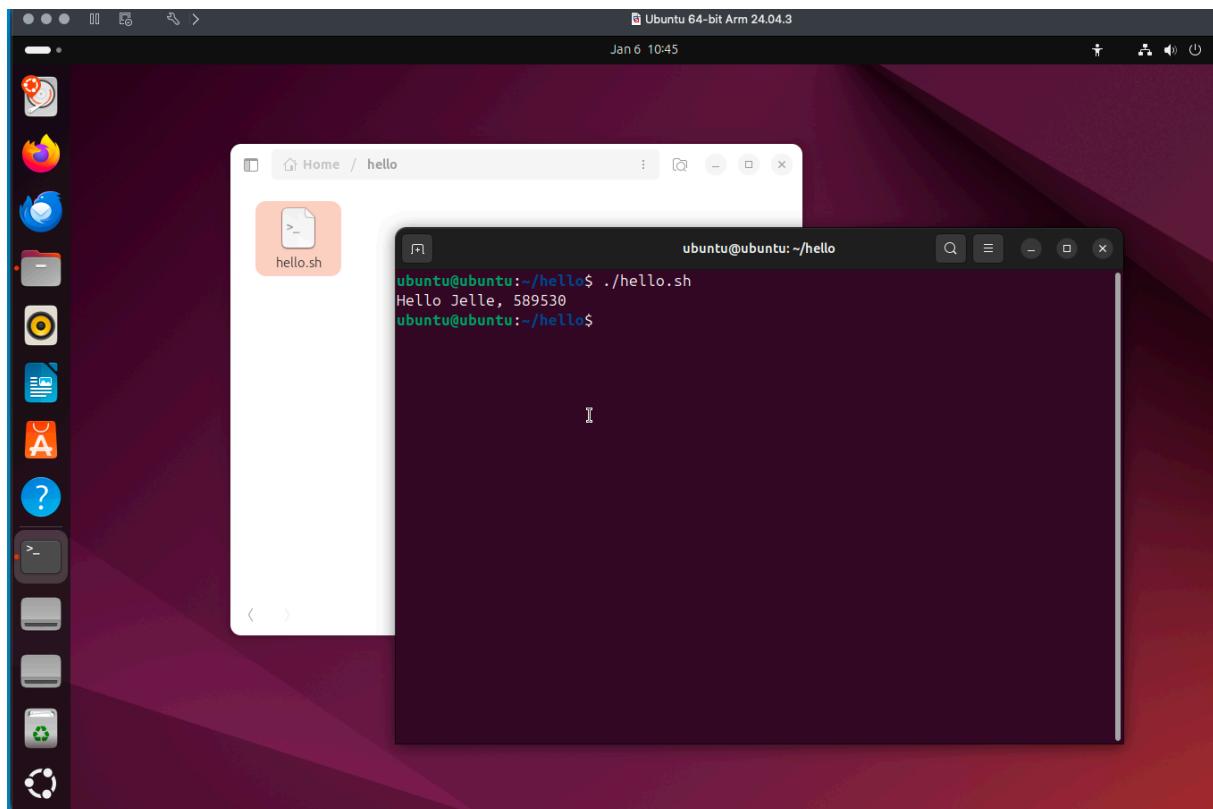
**NeoFetch:** laat systeem informatie zien, denk aan je OS-versie, kernel version, ram ussae etc.

(ik kon NeoFetch helaas niet instaleren ik heb veel dingen geprobeerd maar bleef deze error krijgen.)



## Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation



Met Chmod kan je aangeven de permissie van het bestand, als je alleen logged-in users wil kan ze het kunnen uitvoeren en de rest alleen view moet je: 544.

Want

User: 5 (Read + execute)

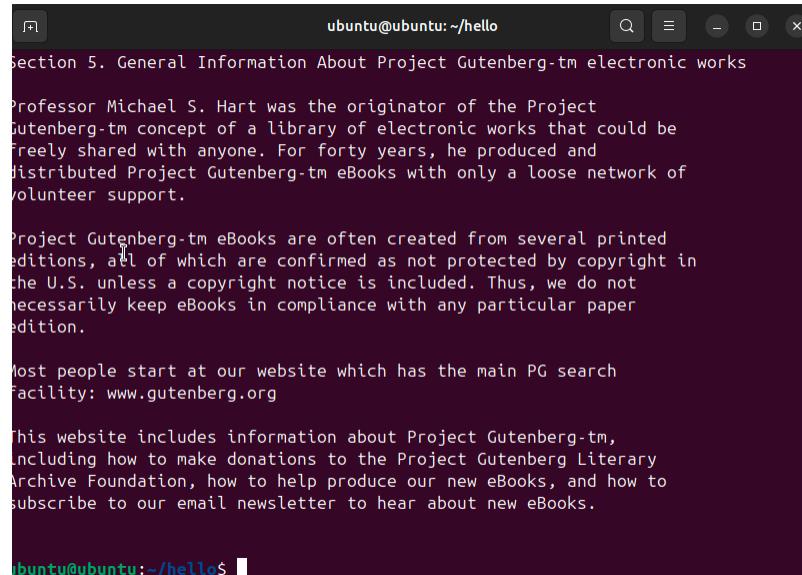
Group: 4 (Read)

Others:4 (Read)

## Assignment 5.6: View the contents of files

Relevant screenshots + motivation

Cat: om de content van het bestand te zien:



```
ubuntu@ubuntu:~/hello
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Gutenberg-tm concept of a library of electronic works that could be
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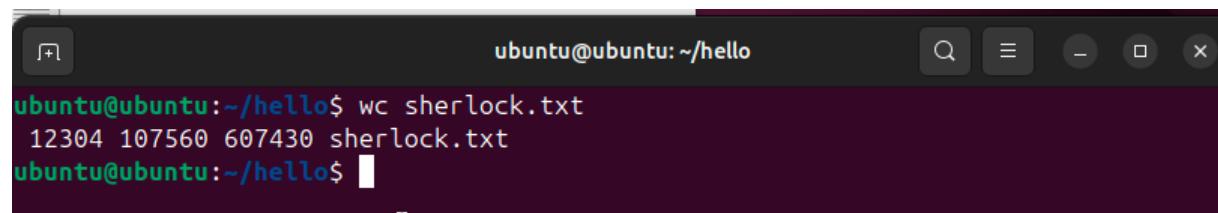
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Archive Foundation, how to help produce our new eBooks, and how to
subscribe to our email newsletter to hear about new eBooks.

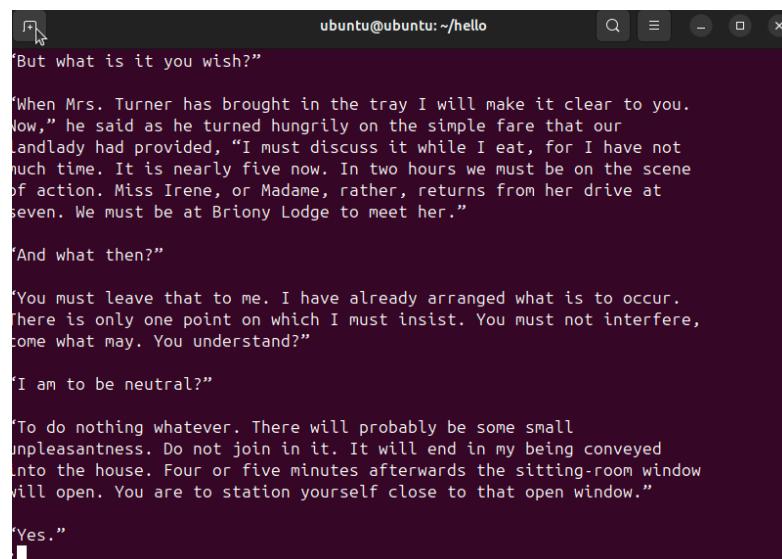
ubuntu@ubuntu:~/hello$
```

wc: telt het aantal regels, woorden en bytes in het bestand.



```
ubuntu@ubuntu:~/hello
ubuntu@ubuntu:~/hello$ wc sherlock.txt
12304 107560 607430 sherlock.txt
ubuntu@ubuntu:~/hello$
```

Less: less zorgt ervoor dat je niet alles in 1 keer inlaad/ leest maar per pagina handig voor hele grote bestanden.



```
'But what is it you wish?'
When Mrs. Turner has brought in the tray I will make it clear to you.
Now," he said as he turned hungrily on the simple fare that our
landlady had provided, "I must discuss it while I eat, for I have not
much time. It is nearly five now. In two hours we must be on the scene
of action. Miss Irene, or Madame, rather, returns from her drive at
seven. We must be at Briony Lodge to meet her."
'And what then?'
>You must leave that to me. I have already arranged what is to occur.
There is only one point on which I must insist. You must not interfere,
come what may. You understand?'
'I am to be neutral?'
>To do nothing whatever. There will probably be some small
unpleasantness. Do not join in it. It will end in my being conveyed
into the house. Four or five minutes afterwards the sitting-room window
will open. You are to station yourself close to that open window."
'Yes.'
```

Tail: zorgt ervoor dat je de laatste 10 regels alleen krijgt.

Head: zelde als tail maar dan voor de head, je ziet alleen de eerste 10 regels.

```
ubuntu@ubuntu:~/hello$ tail sherlock.txt
lost people start at our website which has the main PG search
facility: www.gutenberg.org

this website includes information about Project Gutenberg-tm,
including how to make donations to the Project Gutenberg Literary
Archive Foundation, how to help produce our new eBooks, and how to
subscribe to our email newsletter to hear about new eBooks.

ubuntu@ubuntu:~/hello$ head sherlock.txt
The Project Gutenberg eBook of The Adventures of Sherlock Holmes, by Arthur Cona
 Doyle

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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.

ubuntu@ubuntu:~/hello$
```

Grep: Laat je zoeken in het bestand voor een woord:

```
ubuntu@ubuntu:~/hello$ grep "eBook" sherlock.txt
The Project Gutenberg eBook of The Adventures of Sherlock Holmes, by Arthur Cona
 Doyle
This eBook is for the use of anyone anywhere in the United States and
of the Project Gutenberg License included with this eBook or online at
using this eBook.  []
Release Date: November 29, 2002 [eBook #1661]
and may not be used if you charge for an eBook, except by following
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necessarily keep eBooks in compliance with any particular paper
Archive Foundation, how to help produce our new eBooks, and how to
subscribe to our email newsletter to hear about new eBooks.

ubuntu@ubuntu:~/hello$
```

## Assignment 5.7: Digital forensics

Relevant screenshots + motivation

Identify phone brand/type

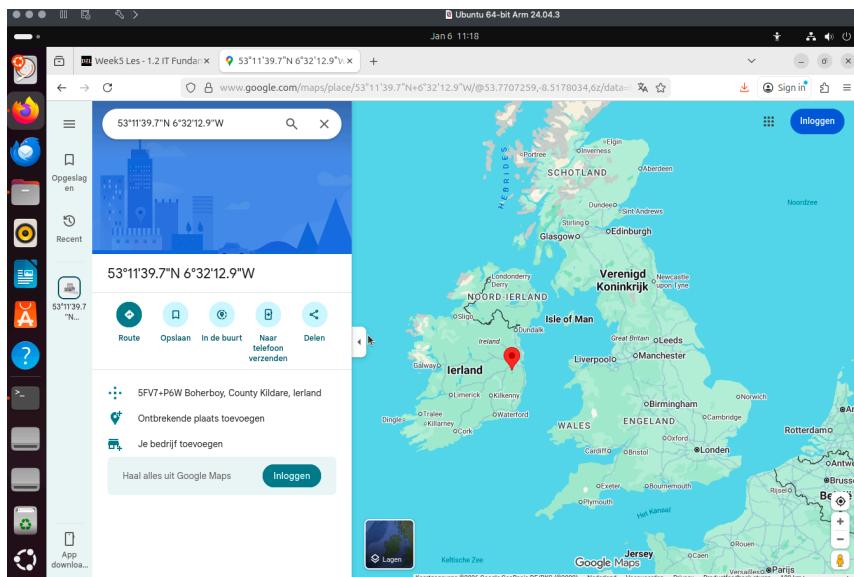
Motorola

Are there GPS coordinates known?

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

In which city was this photo taken?

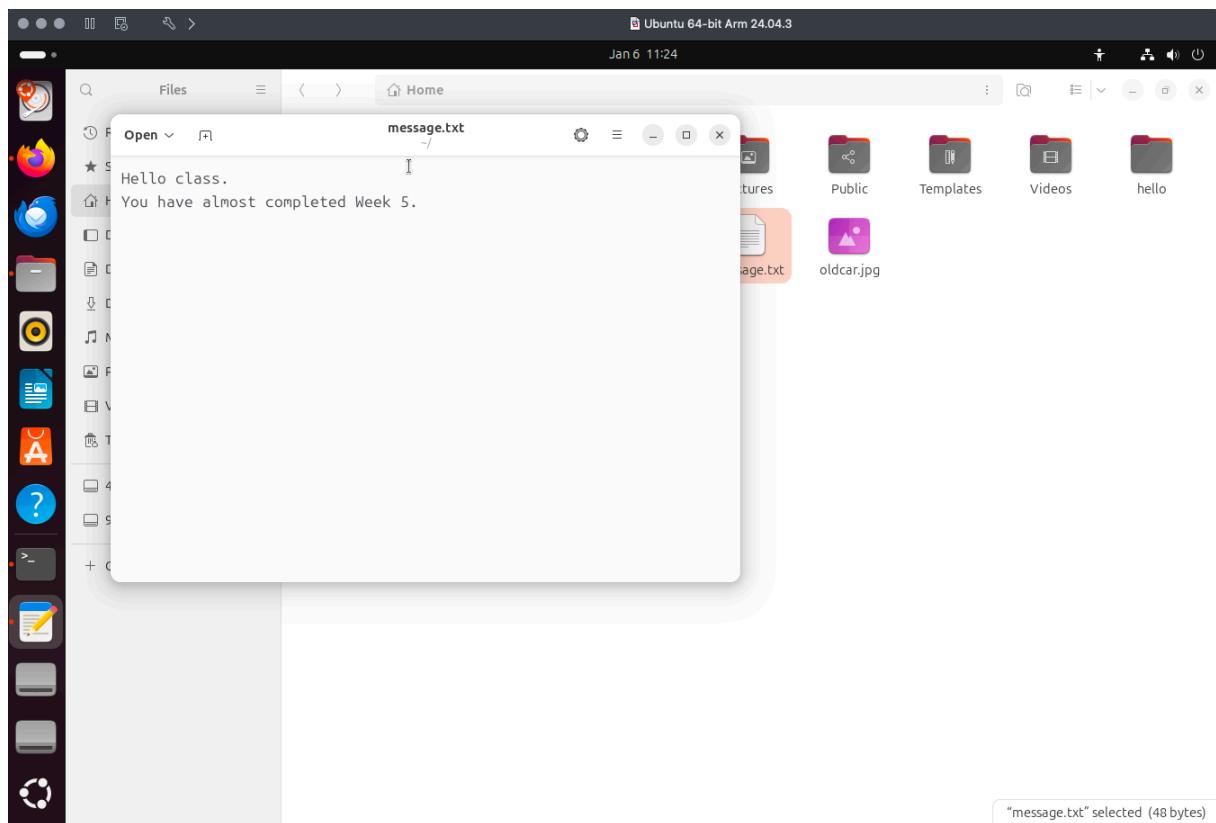
Dicht bij Dublin



```
ubuntu@ubuntu:~$ exiftool oldcar.jpg
ExifTool Version Number      : 12.76
File Name                   : oldcar.jpg
Directory                  : .
File Size                   : 2.4 MB
File Modification Date/Time : 2026:01:06 11:09:18+01:00
File Access Date/Time       : 2026:01:06 11:09:50+01:00
File Inode Change Date/Time: 2026:01:06 11:09:18+01:00
File Permissions            : -rw-rw-r--
File Type                   : JPEG
File Type Extension         : jpg
MIME Type                   : image/jpeg
JFIF Version               : 1.01
Exif Byte Order              : Big-endian (Motorola, MM)
Make                         : motorola
Model                        : moto g(6) play
X Resolution                : 72
Y Resolution                : 72
Resolution Unit             : inches
Software                     : aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys
Modify Date                 : 2020:11:07 15:08:57
Y Cb Cr Positioning        : Centered
Exposure Time               : 1/33
F Number                     : 2.0
Exposure Program             : Program AE
ISO                          : 64
Exif Version                : 0220
Date/Time Original          : 2020:11:07 15:08:57
Create Date                 : 2020:11:07 15:08:57
Components Configuration     : Y, Cb, Cr, -
Shutter Speed Value          : 1/33
Aperture Value               : 2.0
Brightness Value             : -1
Exposure Compensation        : 0
Max Aperture Value           : 2.0
Metering Mode                : Center-weighted average
```

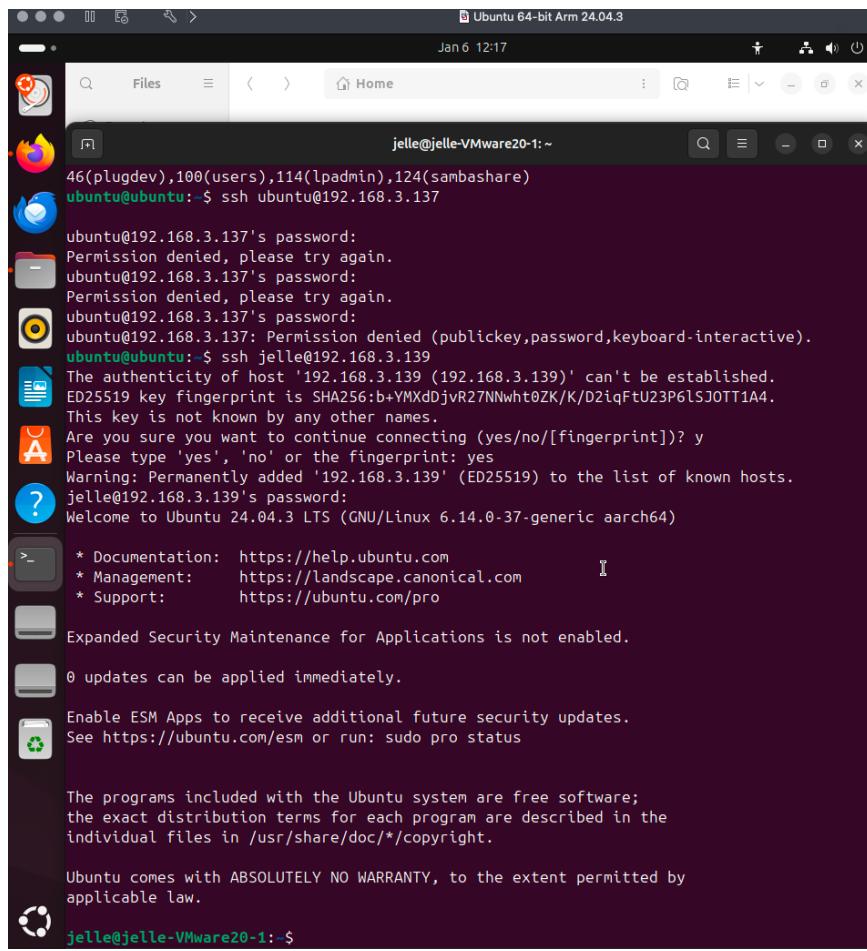
## Assignment 5.8: Steganography

Relevant screenshots + motivation



## Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:



The screenshot shows a terminal window titled "Ubuntu 64-bit Arm 24.04.3" running on a desktop environment. The terminal output is as follows:

```
jelle@jelle-VMware20-1:~$ ssh ubuntu@192.168.3.137
ubuntu@192.168.3.137's password:
Permission denied, please try again.
ubuntu@192.168.3.137's password:
Permission denied, please try again.
ubuntu@192.168.3.137's password:
ubuntu@192.168.3.137: Permission denied (publickey,password,keyboard-interactive).
ubuntu@ubuntu: $ ssh jelle@192.168.3.139
The authenticity of host '192.168.3.139 (192.168.3.139)' can't be established.
ED25519 key fingerprint is SHA256:b+YMXdDjvR27NNwht0ZK/K/D2iqFtU23P6lSJ0TT1A4.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added '192.168.3.139' (ED25519) to the list of known hosts.
jelle@192.168.3.139's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-37-generic aarch64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

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

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

jelle@jelle-VMware20-1: $
```

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

```
jelle@jelle-VMware20-1:~$ sudo dd if=/dev/nvme0n1 bs=4M status=progress | gzip | ssh jelle@192.168.3.1
39 'cat > /srv/images/ubuntu2404_vm.img.gz'
jelle@192.168.3.139's password:
21365784576 bytes (21 GB, 20 GiB) copied, 226 s, 94.5 MB/s
5120+0 records in
5120+0 records out
21474836480 bytes (21 GB, 20 GiB) copied, 226.441 s, 94.8 MB/s
jelle@jelle-VMware20-1:~$
```

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

```
ubuntu@ubuntu:~$ ssh jelle@192.168.3.139 "cat /srv/images/ubuntu2404_vm.img.gz"
gzip -d | sudo dd of=/dev/sda bs=4M status=progress-
d: invalid status level: 'progress~'
try 'dd -help' for more information.
he authenticity of host '192.168.3.139 (192.168.3.139)' can't be established.
D25519 key fingerprint is SHA256:b+YMXdDjvR27NNwht0ZK/K/D2iqFtU23P6lsJOTT1A4.
his key is not known by any other names.
re you sure you want to continue connecting (yes/no/[fingerprint])? yes
arning: Permanently added '192.168.3.139' (ED25519) to the list of known hosts.
elle@192.168.3.139's password:
ubuntu@ubuntu:~$
```

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