

# 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?

Een Unix systeem is officieel gecertificeerd door de SUS.

Ook is Unix een afstammeling van de originele AT&T Bell Labs code. Vaak zijn officiële Unix systemen veel meer gesloten. Denk hierbij aan MacOS

Een Unix-like systeem is van de grond opgebouwd en lijkt erg op een officieel Unix systeem.

Deze zijn meestal Open Source, maar zijn niet gecertificeerd.

Voorbeelden hiervan zijn Ubuntu, Kubuntu, Uwuntu.

- 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:

Hij is een mede-ontwikkelaar bij de originele UNIX van Bell-Labs in 1969. Ook heeft hij de 'B' programmeertaal ontwikkeld. Dit was een voorloper van C.

Daarnaast heeft hij ook meegeholpen met de ontwikkeling van Go.

Ten slotte heeft hij UTF-8 ontwikkeld.

Dennis Ritchie:

Was de grondlegger voor 'C'. Deze is ontwikkeld op basis van de 'B' programmeertaal van Ken Thompson. Daarnaast was hij ook een mede-ontwikkelaar van de portable versie van Unix in C.

Bill Joy:

Hij was een medeontwikkelaar van BSD van Unix. Dit was de eerste open-source variant van Unix die TCP ingebouwd had.

Ook is hij de oorspronkelijke maker van de 'Vi' text-editor.

Richard Stallman:

Hij is de oprichter van GNU. Dit was een project met als doel een vrij (Unix-like) OS te maken. GNU staat voor "GNU's Not Unix!".

Hij geloofde dat gebruikers het recht hebben om hun software te wijzigen, bestuderen, of delen.

Linus Torvalds:

Hij is de oorspronkelijke ontwikkelaar van Linux. Deze naam bestaat uit Linus, en UNIX.

Ook heeft hij meegeholpen met de ontwikkeling van Git. Git is een versiebeheersysteem voor het ontwikkelen van software. Het is de standaard software voor ontwikkeling rond de hele wereld.

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

Dat gebruikers ZELF hun software mogen bestuderen, wijzigen of delen. Zo veel mogelijk vrijheid aan de gebruiker geven.

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

Yes and no. Yes because it is open-source, and users can basically study or edit anything they want.

No because the users are still locked out of folders like 'root'. It is not FULL freedom.

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

Hiermee kan je Linux native programma's of scripts direct op Windows uitvoeren, zonder er een gehele VM voor te hoeven starten.

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

Android is based on Linux

iOS is based on UNIX

ChromeOS is based on Linux

## 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>

Voor het berekenen van enorm complexe data. Denk hierbij aan weersvoorspelling, kernfysica, of zelfs ruimtemissies.

- 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?

De PS3 had een erg specifieke Cell Processor. Deze was gespecialiseerd in parallelle verwerkingen. Daarom was hij erg geschikt voor het maken van snelle complexe berekeningen.

Aangezien de Cell-chip erg goedkoop was, en voor zijn tijd ook enorm sterk, werd hij massaal door bedrijven opgekocht om ze samen te clusteren als 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/>

Elke Raspberry Pi heeft 4 cores. De totale cluster bevat 1050 raspberry pi's.

$4 * 1050 = 4200$  cores

Ook is de Raspberry Pi niet enorm sterk. Ik verwacht dat deze cluster **niet** in deze lijst staat. Ook omdat andere supercomputers specifiek met doel als supercomputer zijn gebouwd. Dit is meer een leuk experiment, niet bedoeld voor al te serieuze projecten.

- 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?

De XBOX Series X en PS5 gebruiken beide de AMD Zen 2 architectuur.

De XBOX Series X gebruikt als besturingssysteem een gestroomlijnde versie van Windows.

De PS5 gebruikt een custom OS gebaseerd op de FreeBSD-familie.

## Assignment 5.3: Working with Windows

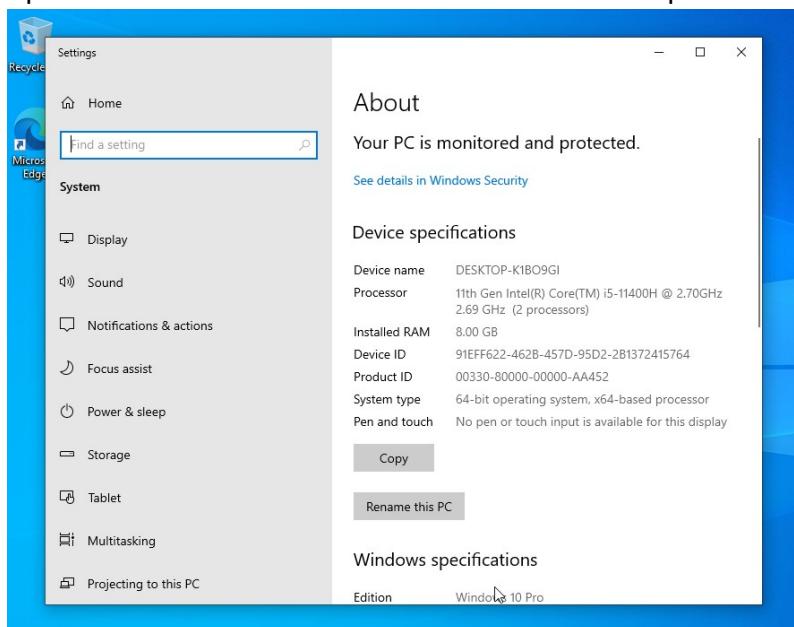
Take relevant screenshots of the assignments below

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

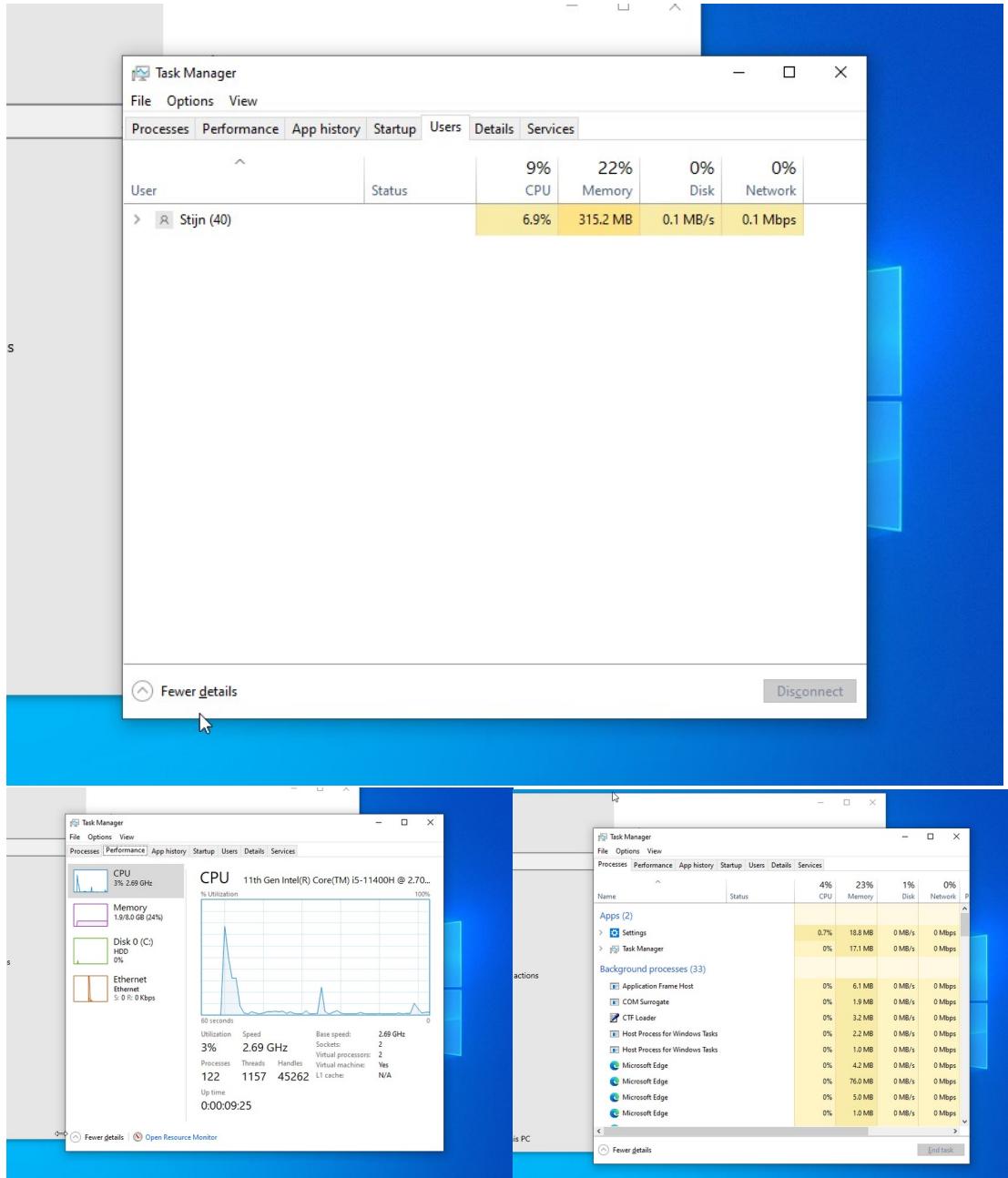
- b) The file explorer can be opened with W + E, Which key combination could you also use?

Er is geen andere combinatie. Het dichtst bij is W+R. Dit opent de run dialog box. Als je hier explorer.exe invult, opent de explorer.

- c) Open the system properties with a W 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.



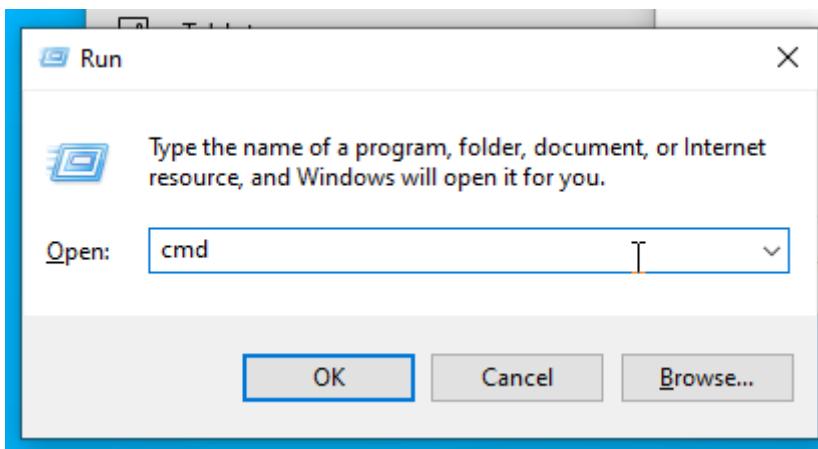
- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

W + 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.

W + R



## Working in the File Explorer

Relevant screenshots **copy** command:

```
C:\Windows\System32\cmd.exe
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Saxion>copy Wave.png C:\Saxion\HBOICT\YEAR1\QUARTILE1\Programmeren
    1 file(s) copied.

C:\Saxion>copy Tumble.png C:\Saxion\HBOICT\YEAR1\QUARTILE1\Org-IT
    1 file(s) copied.

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

C:\Saxion>
```

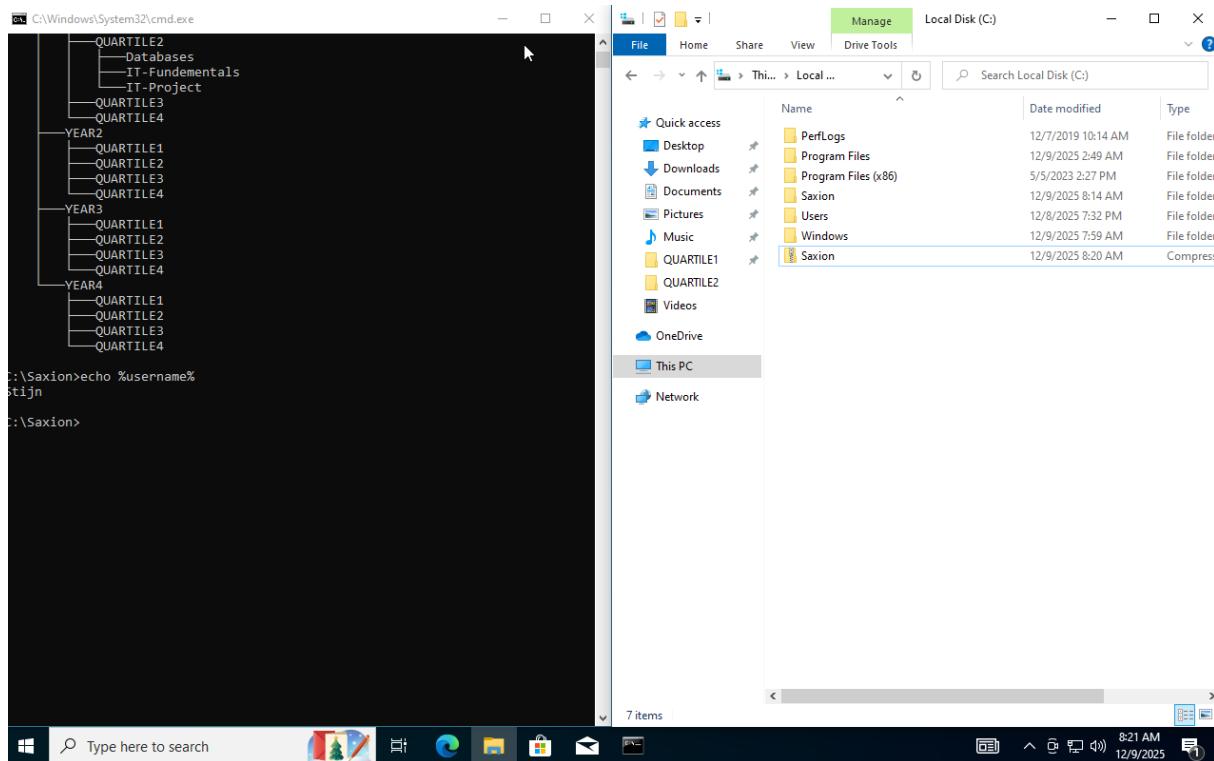
Relevant screenshots **tree** command:

```
C:\Saxion>tree
Folder PATH listing
Volume serial number is 8863-4DDD
C:.
└── HBOICT
    ├── YEAR1
    │   ├── QUARTILE1
    │   │   ├── Infrastructuren
    │   │   ├── Org-IT
    │   │   └── Programmeren
    │   ├── QUARTILE2
    │   │   ├── Databases
    │   │   ├── IT-Fundamentals
    │   │   └── IT-Project
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR2
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR3
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    └── YEAR4
        ├── QUARTILE1
        ├── QUARTILE2
        ├── QUARTILE3
        └── QUARTILE4

C:\Saxion>echo %username%
Stijn

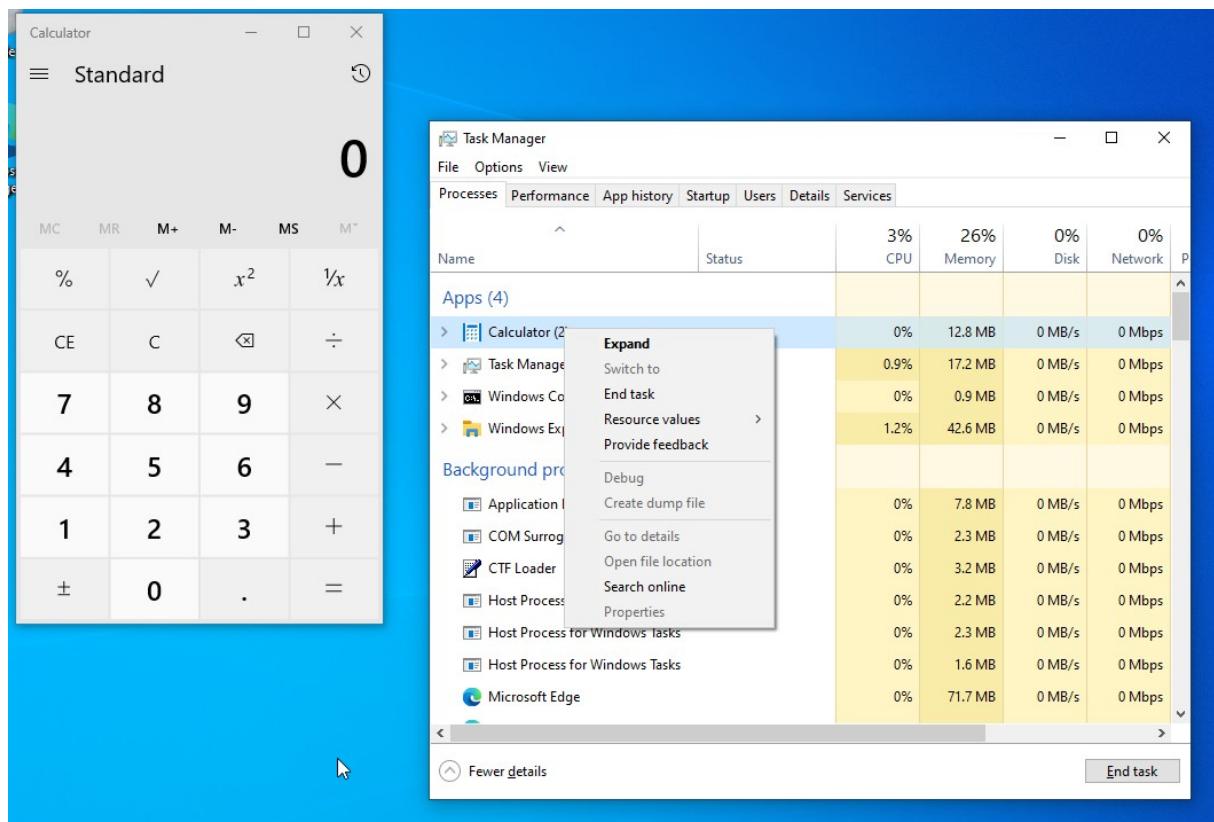
C:\Saxion>
```

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



## Terminating Processes

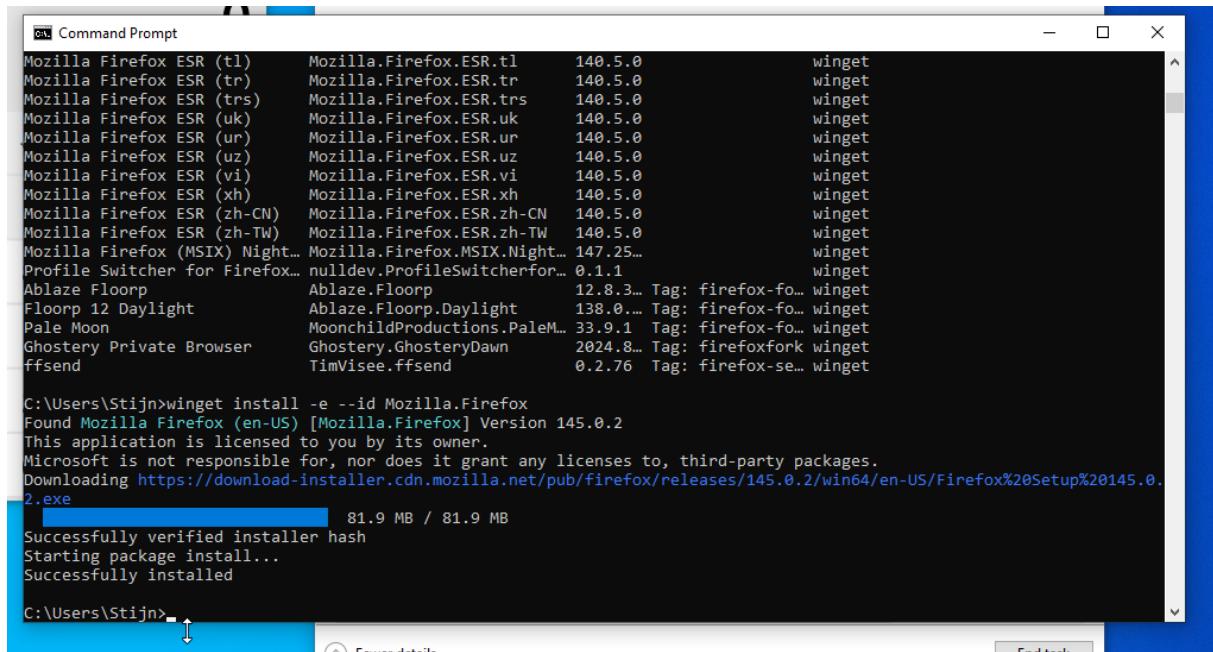
Relevant Screenshots Task Manager Window:



## Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip



```
Command Prompt
Mozilla Firefox ESR (tl) Mozilla.Firefox.ESR.tl 140.5.0 winget
Mozilla Firefox ESR (tr) Mozilla.Firefox.ESR.tr 140.5.0 winget
Mozilla Firefox ESR (trs) Mozilla.Firefox.ESR.trs 140.5.0 winget
Mozilla Firefox ESR (uk) Mozilla.Firefox.ESR.uk 140.5.0 winget
Mozilla Firefox ESR (ur) Mozilla.Firefox.ESR.ur 140.5.0 winget
Mozilla Firefox ESR (uz) Mozilla.Firefox.ESR.uz 140.5.0 winget
Mozilla Firefox ESR (vi) Mozilla.Firefox.ESR.vi 140.5.0 winget
Mozilla Firefox ESR (xh) Mozilla.Firefox.ESR.xh 140.5.0 winget
Mozilla Firefox ESR (zh-CN) Mozilla.Firefox.ESR.zh-CN 140.5.0 winget
Mozilla Firefox ESR (zh-TW) Mozilla.Firefox.ESR.zh-TW 140.5.0 winget
Mozilla Firefox (MSIX) Night... Mozilla.Firefox.MSIX.Night... 147.25... winget
Profile Switcher for Firefox... nulldev.ProfileSwitcherfor... 0.1.1 winget
Ablaze Floorp Ablaze.Floorp 12.8.3... Tag: firefox-fo... winget
Floorp 12 Daylight Ablaze.Floorp.Daylight 138.0... Tag: firefox-fo... winget
Pale Moon MoonchildProductions.PaleM... 33.9.1 Tag: firefox-fo... winget
Ghostery Private Browser Ghostery.GhosteryDawn 2024.8... Tag: firefoxfork winget
ffsend TimVisee.ffsend 0.2.76 Tag: firefox-se... winget

C:\Users\Stijn>winget install -e --id Mozilla.Firefox
Found Mozilla Firefox (en-US) [Mozilla.Firefox] Version 145.0.2
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/145.0.2/win64/en-US/Firefox%20Setup%20145.0.2.exe
[██████████] 81.9 MB / 81.9 MB
Successfully verified installer hash
Starting package install...
Successfully installed

C:\Users\Stijn>
```

**-e betekend 'Exact'**

**Het is een flag die je kan gebruiken om aan te geven dat je een exact match van de identifier wilt in de commando hierna.**

**--id betekend 'Identifier'**

**Dit is een flag die je kan gebruiken in Winget om aan te geven dat je de specifieke ID van de package wilt opgeven die je wilt installeren. Zo voorkom je de installatie van het verkeerde programma. Het is de meest specifieke manier om een package te installeren.**

```
C:\Users\Stijn>winget install -e --id Mozilla.Firefox
Found Mozilla Firefox (en-US) [Mozilla.Firefox] Version 145.0.2
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.mozilla.net/pub/firefox/releases/145.0.2/win64/en-US/Firefox%20Setup%20145.0.2.exe
[██████████] 81.9 MB / 81.9 MB
Successfully verified installer hash
Starting package install...
Successfully installed

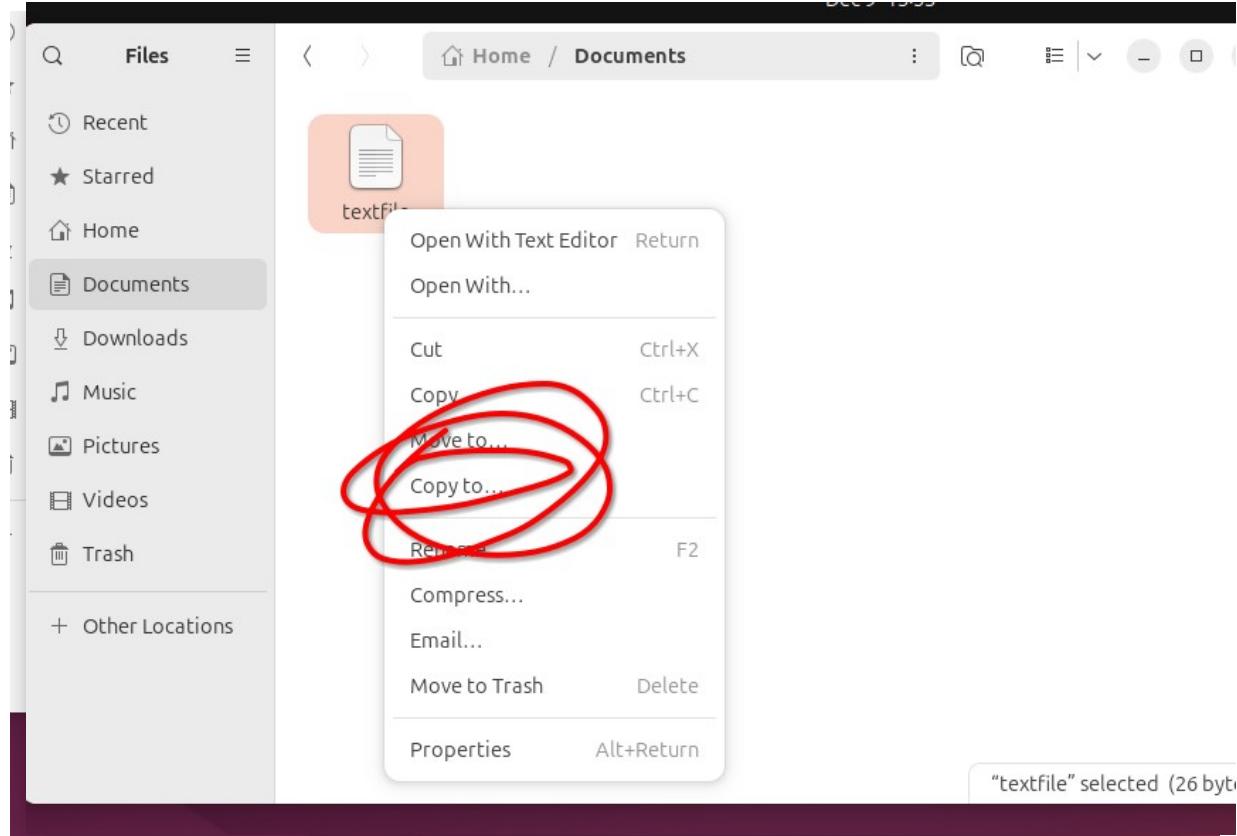
C:\Users\Stijn>winget install 7Zip
Found 7-Zip [7zip.7zip] Version 25.01
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://7-zip.org/a/7z2501-x64.exe
[██████████] 1.56 MB / 1.56 MB
Successfully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

C:\Users\Stijn>winget install notepad++
Found Notepad++ [Notepad++.Notepad++] Version 8.8.8
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/v8.8.8/npp.8.8.8.Installer.x64.exe
[██████████] 6.61 MB / 6.61 MB
Successfully verified installer hash
Starting package install...
The installer will request to run as administrator. Expect a prompt.
Successfully installed

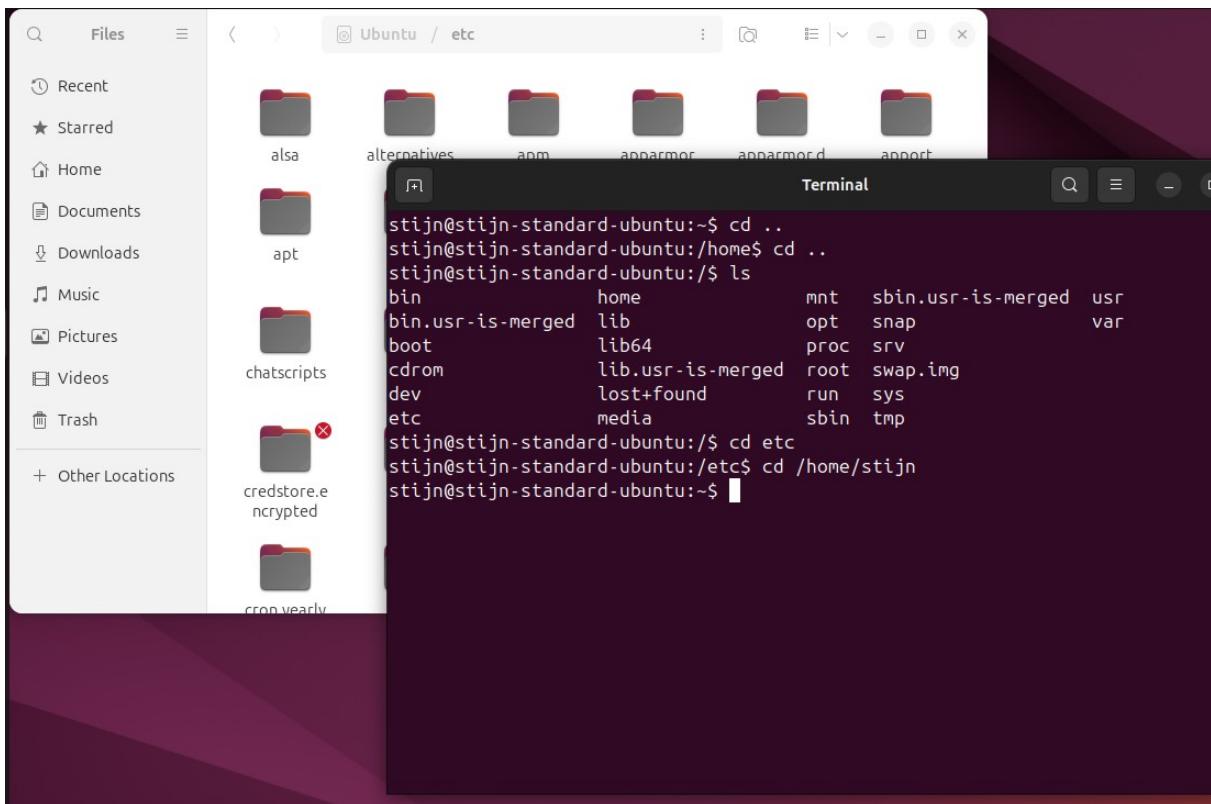
C:\Users\Stijn>winget install winscp
Found WinSCP [WinSCP.WinSCP] Version 6.5.5
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.5.5/WinSCP-6.5.5-Setup.exe/download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

C:\Users\Stijn>
```

## Assignment 5.4: Working with Linux



#### Relevant screenshots + motivation



Major Difference:

Windows uses [C:\](#)

Linux uses /

In de /etc map staat configuratie van systeemmodules / programma's. Hier kan je bijvoorbeeld apt, ssh, of ftp configureren.

You would use the 'tar' command to place files in a tar compressed archive.

```
stijn@stijn-standard-ubuntu:~$ sudo tar -cvf TAR myfile.txt
```

This makes a new .tar file named TAR from the myfile.txt

Dit is een applicatie waarin je data van diverse processen kan inzien.

Ook kan je processen beeindigen via dit programma.

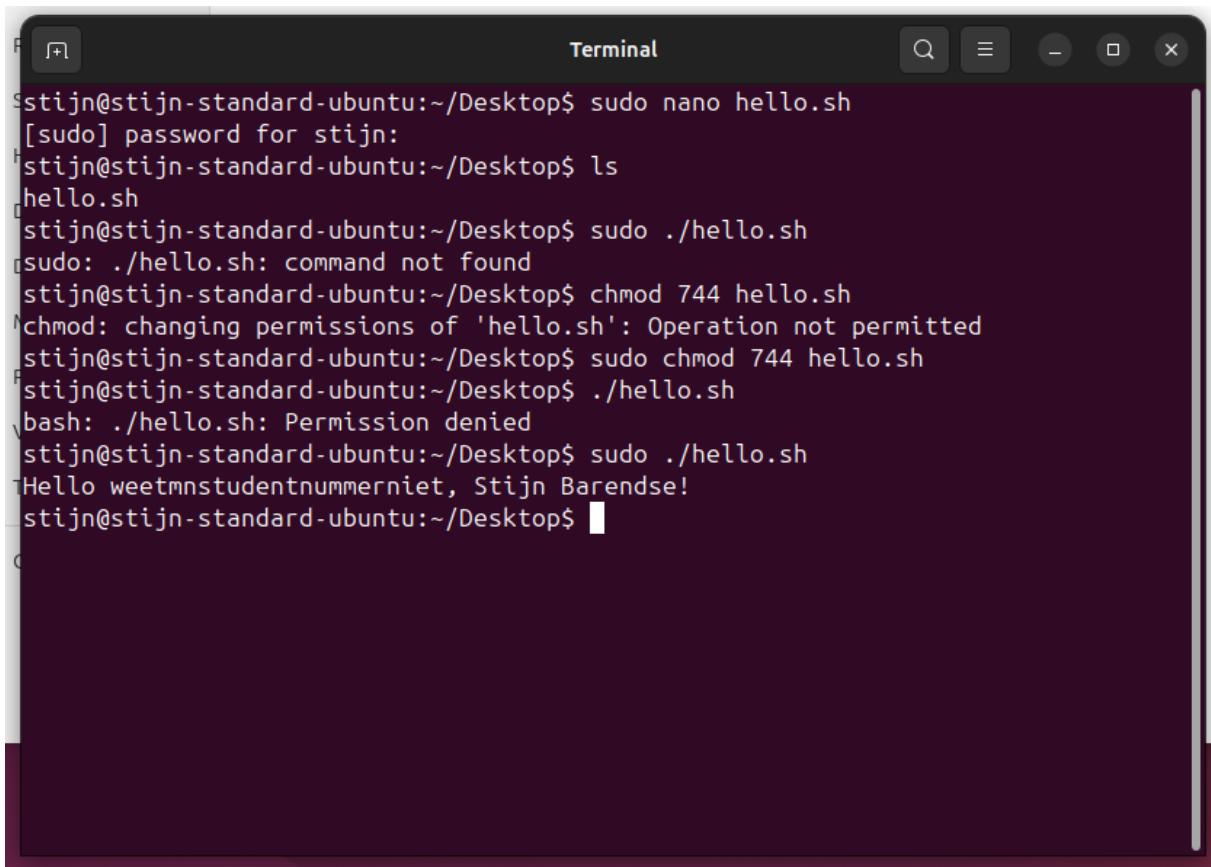
Het lijkt een beetje op de Windows Task Manager, maar dan voor Ubuntu.

```
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 (2.39-0ubuntu8.6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for desktop-file-utils (0.27-2build1) ...
stijn@stijn-standard-ubuntu:~$ neofetch
  .-+o0sssssoo+-.
   `:+ssssssssssssssssssss+:' 
  +-+ssssssssssssssssssssyyssss+-+
  .osssssssssssssssssdMMMyssssso.
  /sssssssssssshdmmNNmnyNMNMNhssssss/
  +sssssssssssshmymdMMMMMMMdddyssssss+ 
  /sssssssssssshnMMMyhyyyhmNNMNhssssss/
  .ssssssssssdMMMNhssssssssshNMMDssssss.
  +sssshhhyNMMNyssssssssssyNMMMyssssss+
  osyNMMMNyMhsssssssssssshmnmhssssssso
  osyNMMMNyMhsssssssssssshmnmhssssssso
  +sssshhhyNMMNyssssssssssyNMMMyssssss+
  .ssssssssssdMMNhsssssssssshNMMDssssss.
  /ssssssssssbhNMMyhyyyhdNMMNhssssssss/
  +ssssssssssdmymdMMMMMMMdddyssssss+ 
  /sssssssssssshdmNNNnnyNMNMNhssssss/
  .osssssssssssssssssdMMMyssssso.
  +ssssssssssssssssssyyssss+-+
   `:+ssssssssssssssssss+:' 
    .-+o0sssssoo+-.

stijn@stijn-standard-ubuntu
-----
OS: Ubuntu 24.04.3 LTS x86_64
Host: KVM/QEMU (Standard PC (Q35 + I
Kernel: 6.14.0-36-generic
Uptime: 1 hour, 1 min
Packages: 1526 (dpkg), 12 (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 i5-11400H (2) @
GPU: 00:01.0 Red Hat, Inc. Virtio 1.
Memory: 1177MiB / 3916MiB

stijn@stijn-standard-ubuntu:~$ █
```

## Assignment 5.5: Users and permissions on Linux



```
stijn@stijn-standard-ubuntu:~/Desktop$ sudo nano hello.sh
[sudo] password for stijn:
stijn@stijn-standard-ubuntu:~/Desktop$ ls
hello.sh
stijn@stijn-standard-ubuntu:~/Desktop$ sudo ./hello.sh
sudo: ./hello.sh: command not found
stijn@stijn-standard-ubuntu:~/Desktop$ chmod 744 hello.sh
chmod: changing permissions of 'hello.sh': Operation not permitted
stijn@stijn-standard-ubuntu:~/Desktop$ sudo chmod 744 hello.sh
stijn@stijn-standard-ubuntu:~/Desktop$ ./hello.sh
bash: ./hello.sh: Permission denied
stijn@stijn-standard-ubuntu:~/Desktop$ sudo ./hello.sh
Hello weetmnstudentnummerniet, Stijn Barendse!
stijn@stijn-standard-ubuntu:~/Desktop$
```

Relevant screenshots + motivation

## Assignment 5.6: View the contents of files

Relevant screenshots + motivation

cat:

Leest snel bestanden en print de inhoud van deze bestanden direct in de terminal.  
Handig om snel kleine tekstbestanden uit te lezen.

Wc:

Geeft de hoeveelheid woorden, zinnen of karakters in tekstbestanden.

Less:

Hiermee kan je snel grotere bestanden uitlezen in de terminal. Dit gaat pagina per pagina.

Tail:

Laat het eind van een bestand zien in de terminal, standaard is dit 10 lines.

Head:

Het omgekeerde van tail. Laat standaard de eerste 10 lines zien.

Grep:

Een soort control+F, maar dan in Linux. Kan specifiek zoeken op patronen.

## Assignment 5.7: Digital forensics

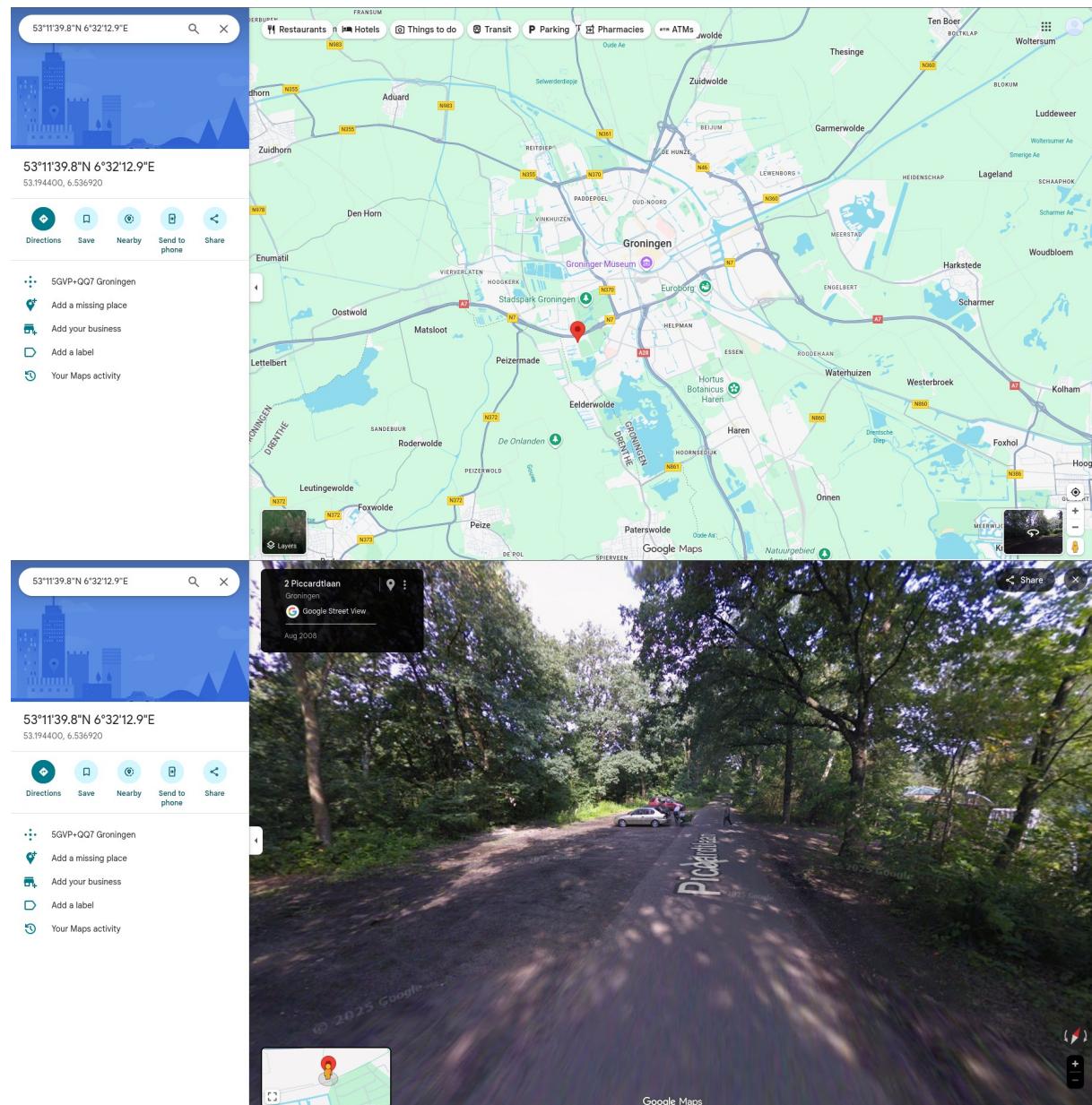
Relevant screenshots + motivation

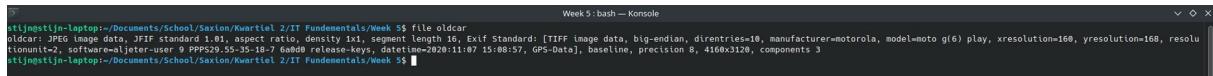
Phone brand:

Motorola G6 Play

Location:

[53,1944°N 6,53692°E](#)





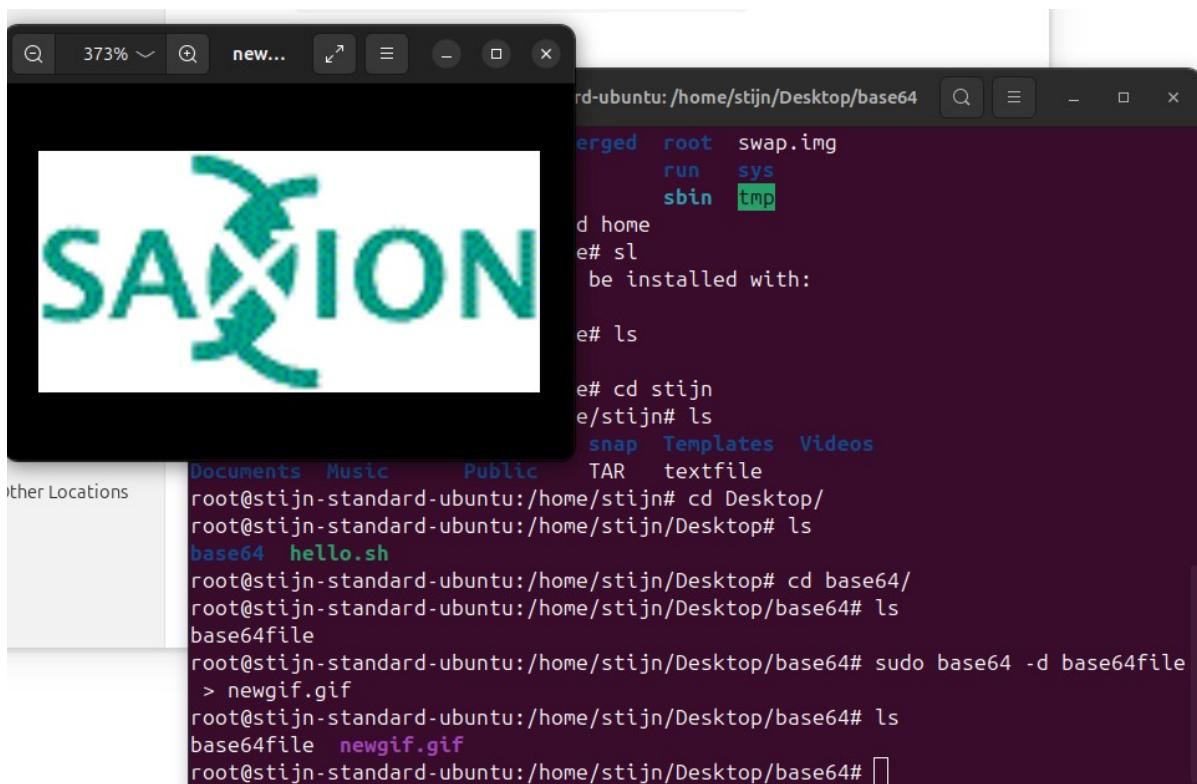
```
stijn@stijn-laptop:~/Documents/School/Saxion/Kwartiel 2/IT Fundamentals/Week 5$ file oldcar
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1, segment length 16, Exit Standard: [TIFF image data, big-endian, directr...]
stijn@stijn-laptop:~/Documents/School/Saxion/Kwartiel 2/IT Fundamentals/Week 5$
```

Deze screenshot toont aan dat er in de metadata nog steeds staat dat het een .jpeg bestand is.

Hierdoor kan Ubuntu het nog steeds openen als een JPEG.

```
root@stijn-standard-ubuntu:/home/stijn/Desktop/base64# sudo base64 -d base64file
> newgif.gif
root@stijn-standard-ubuntu:/home/stijn/Desktop/base64# ls
base64file newgif.gif
root@stijn-standard-ubuntu:/home/stijn/Desktop/base64#
```

Ik heb de base64 tekst in een bestand geplaatst en met bovenstaande command omgetoverd in een .gif bestand. Onderstaand het resultaat:



## Assignment 5.8: Steganography

Relevant screenshots + motivation

The screenshot shows a Linux desktop environment with a terminal window and a file editor window.

The terminal window, titled "Week 5 : bash — Konsole", displays the following command-line session:

```
stijn@stijn-laptop:~/Documents/Saxion/Kwartiel 2/IT Fundamentals/Week 5$ steghide -sf apple2.jpg
steghide: unknown command "-sf".
steghide: type "steghide --help" for help.
stijn@stijn-laptop:~/Documents/Saxion/Kwartiel 2/IT Fundamentals/Week 5$ steghide apple2.jpg
steghide: unknown command "apple2.jpg".
steghide: type "steghide --help" for help.
stijn@stijn-laptop:~/Documents/Saxion/Kwartiel 2/IT Fundamentals/Week 5$ steghide -sf
steghide: unknown command "-sf".
steghide: type "steghide --help" for help.
stijn@stijn-laptop:~/Documents/Saxion/Kwartiel 2/IT Fundamentals/Week 5$ steghide extract -sf apple2.jp
g
Enter passphrase:
Wrote extracted data to "message.txt".
stijn@stijn-laptop:~/Documents/Saxion/Kwartiel 2/IT Fundamentals/Week 5$
```

The file editor window, titled "message.txt \* — Kate", shows the contents of the extracted file:

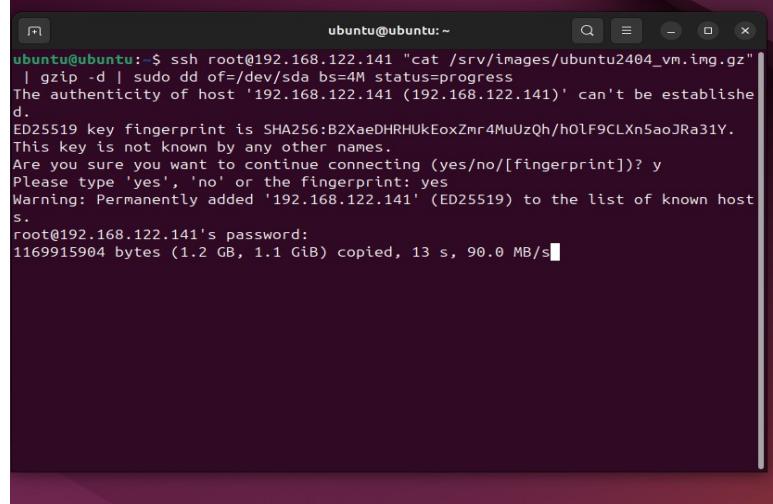
```
1 Hello class.
2 You have almost completed Week 5.]
```

## 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.

```
images
root@debian:/srv# cd images
root@debian:/srv/images# ls
ubuntu2404_vm.img.gz
root@debian:/srv/images#
```



The screenshot shows a terminal window titled "ubuntu@ubuntu:~". The command being run is:

```
ubuntu@ubuntu:~$ ssh root@192.168.122.141 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
```

The terminal displays the progress of the disk capture:

```
The authenticity of host '192.168.122.141 (192.168.122.141)' can't be established.
ED25519 key fingerprint is SHA256:B2XaeDHRHUKExZmr4MuUzQh/h0LF9CLXn5aoJRa31Y.
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 '192.168.122.141' (ED25519) to the list of known hosts.
root@192.168.122.141's password:
1169915904 bytes (1.2 GB, 1.1 GiB) copied, 13 s, 90.0 MB/s
```

Ready? Save this file and export it as a pdf file with the name: [week5.pdf](#)