

Template Week 5 – Operating Systems

Student number: 591007

Assignment 5.1: Unix-like

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

UNIX is het originele besturingssysteem met officiële certificering.

Unix-like zijn systemen die gedragen als UNIX maar geen officiële certificering hebben.

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 de medeoprichter van UNIX.

Dennis Ritchie heeft de programmeertaal C gemaakt en herschreef UNIX in C.

Bill Joy ontwikkelde BSD UNIX, vi editor en TCP/IP implementatie.

c) What is the philosophy of the GNU movement?

Deze movement gaat om vrije software

Hier valt dus onder dat je:

1. Het programma kan uitvoeren.
2. Bekijken hoe het programma werkt en eventuele wijzigingen toepassen.
3. Exacte kopieën kan verspreiden.
4. Aangepast versies verspreiden.

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

Ja, Ubuntu volgt de standaarden grotendeels maar het bevat ook proprietary drivers en firmware.

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

De Windows Subsystem for Linux is WSL. Hiermee kan je een volledige Linux omgeving runnen zonder een losse virtuele machine zoals vmware.

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

Android en ChromeOS zijn gemaakt met Linux

iOS is gemaakt met UNIX

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>

Dit zijn alle manieren waarvoor supercomputers werden gebruikt:

- Wetenschappelijk onderzoek
- Medicijnontwikkeling
- Kernwapentests simuleren
- Olie en gasexploratie
- Aerodynamica en vliegtuigontwerp
- Kunstmatige intelligentie onderzoek

- 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?

Een PlayStation 3 cluster is een supercomputer gemaakt van meerdere PS3 consoles. De PS3 processor was namelijk krachtig en goedkoop.

Het werd gebruikt voor:

- Satellietbeelden verwerken
- Patroonherkenning
- AI onderzoek
- Zwarte gaten onderzoek
- Astrofysica
- Medicijnonderzoek

- 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

- 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/>

Nee. De cluster is veel te zwak. Het was namelijk meer een publiciteitsstunt niet echt een supercomputer.

- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?

Ze gebruiken beide de AMD Zen 2 x86-64 architectuur

What operating systems run on these consoles?

Xbox Series X runt op een aangepast versie van Windows en is meer geoptimaliseerd in DirectX functies.


De PS5 runt op Orbis OS dit is een Unix like systeem.




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


Moderne game consoles gebruiken dezelfde x86-64 architectuur net als PC's. Hierdoor zijn ze eigenlijk gewoon gespecialiseerde computers gemaakt voor gamen in plaats van volledige unieke hardware.



Assignment 5.3: Working with Windows

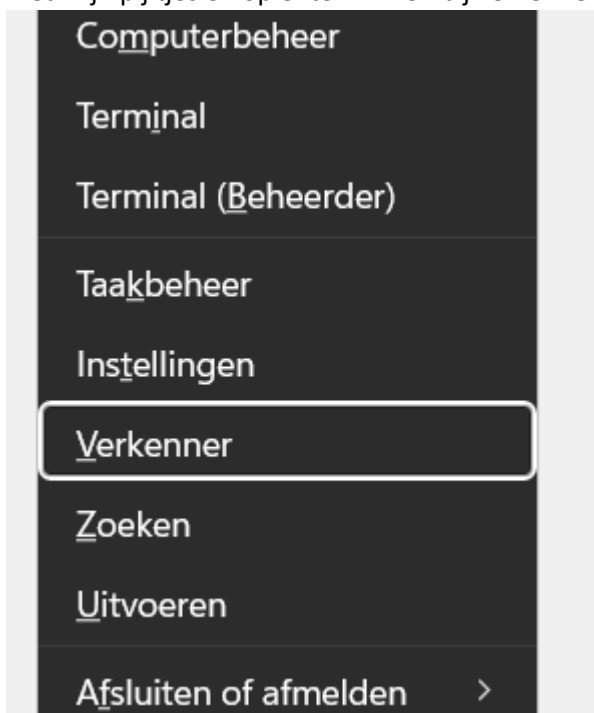
Take relevant screenshots of the assignments below


- 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.

Er word een verkenner geopend via  + E. Er word ook een instellingen venster geopend op de algemene instellingen pagina als je  + I doet en op de toegankelijkheid instellingen pagina wanneer je  + U

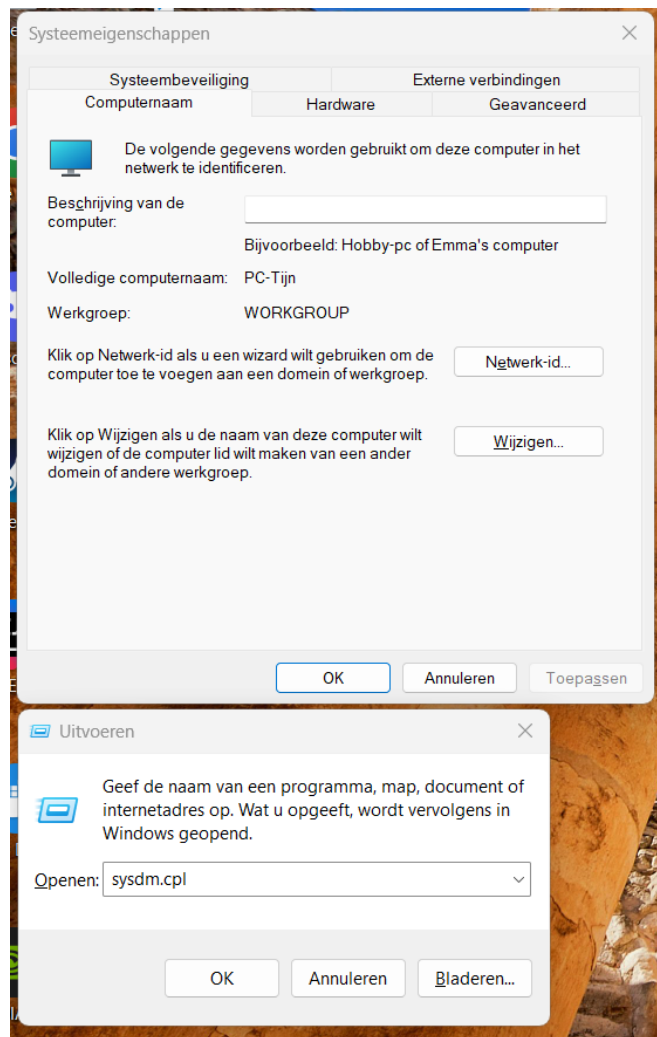
- b) The file explorer can be opened with  + E, Which key combination could you also use?


Met  + 1 kan ik mijn verkenner openen omdat mijn verkenner gepind is op de eerste plek van mijn taakbalk. Ook kan ik via  + X het short cut menu openen en dan navigeren naar benden met mijn pijltjes en op enter klikken bij verkenner.

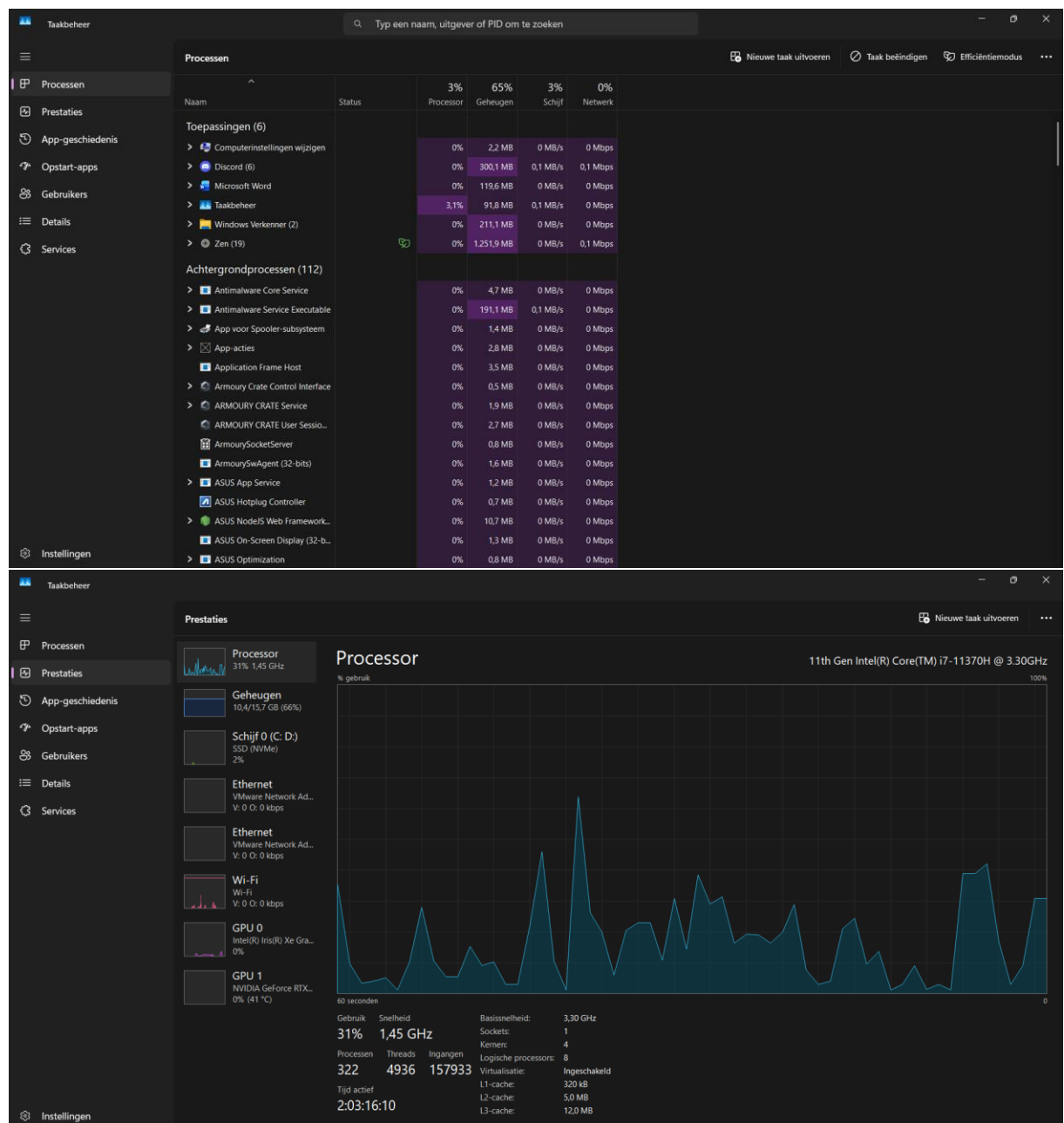


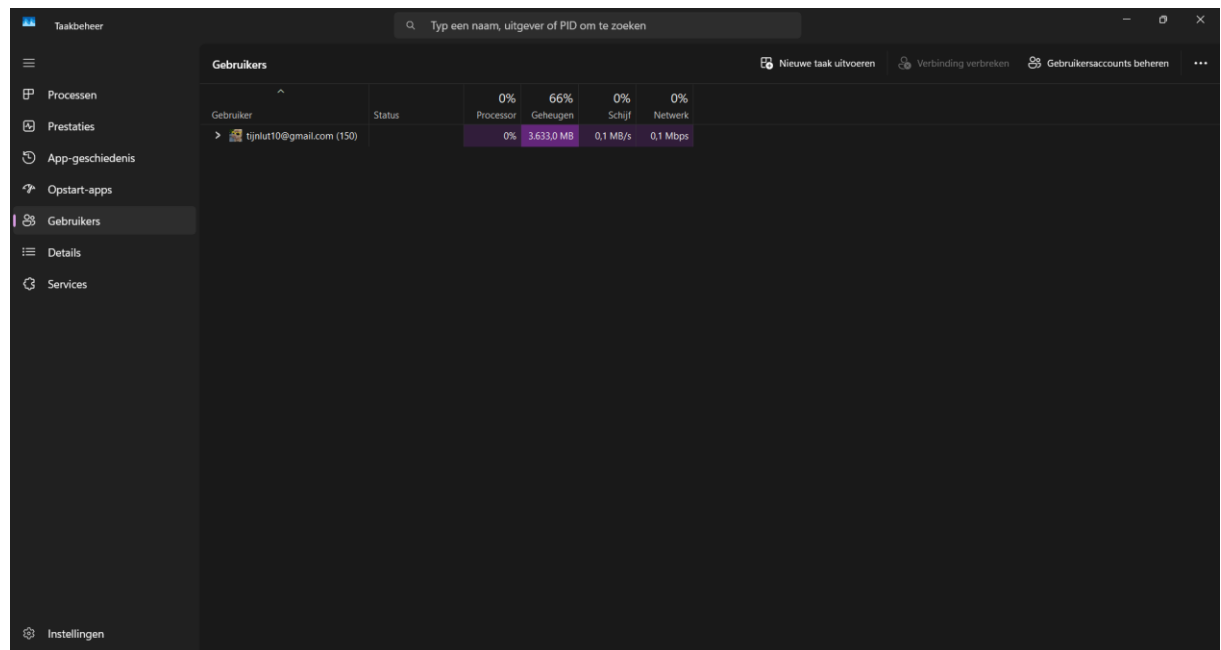
- c) Open the system properties with a  key combination, take a screenshot of the open screen. Paste this screenshot into this template.

Ik kan via  + R en dan sysdm.cpl invoeren mijn systeemeigenschappen openen.



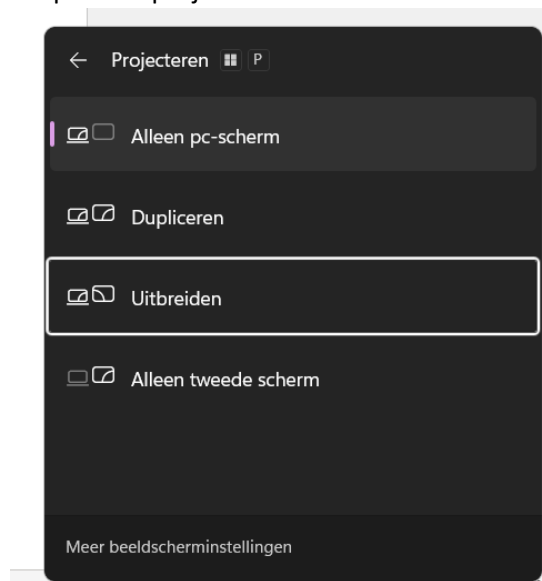
- d) **Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.**
- Met CTRL + SHIFT + ESC kan ik taakbeheer openen. Of  + R en dan naar beneden navigeren naar taakbeheer. Of CTRL + ALT + DELETE en dan naar beneden navigeren naar taakbeheer.





- 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?

Ik open het projecteren menu via **Windows + R** en dan selecteer ik uitbreiden.



- 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?

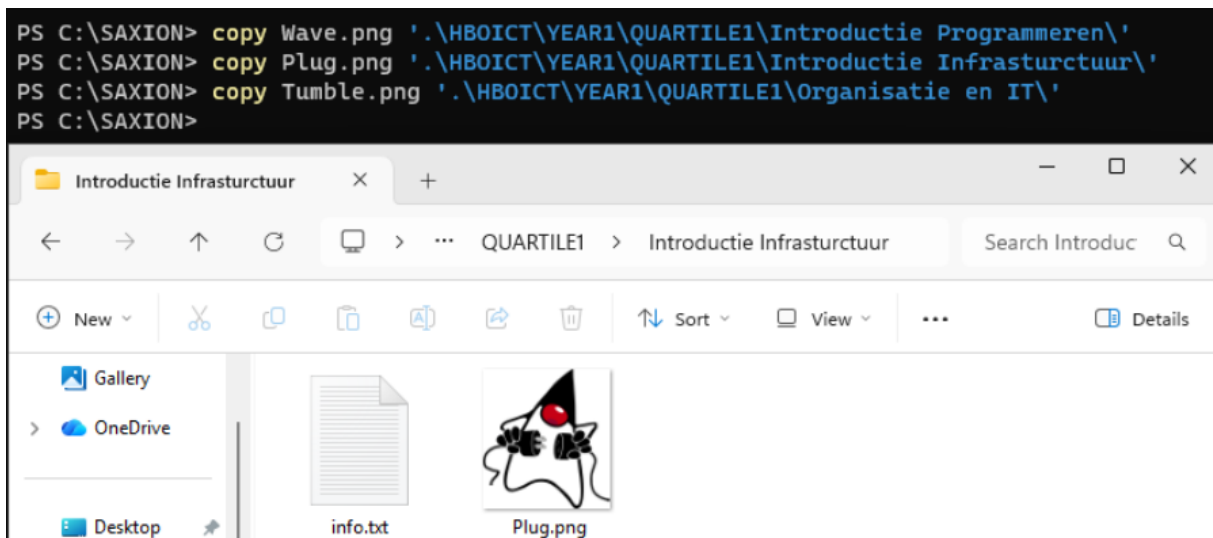
Dan gebruik ik **Windows + R**. Dit doe ik altijd al want anders zou ik een desktop goose krijgen op mijn computer.

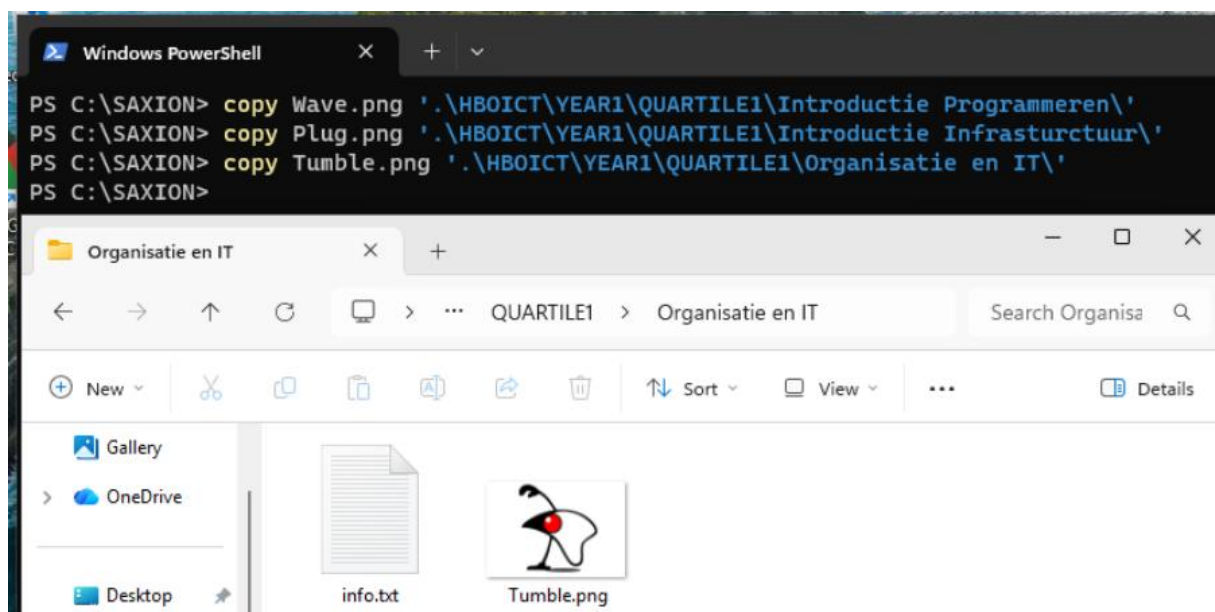
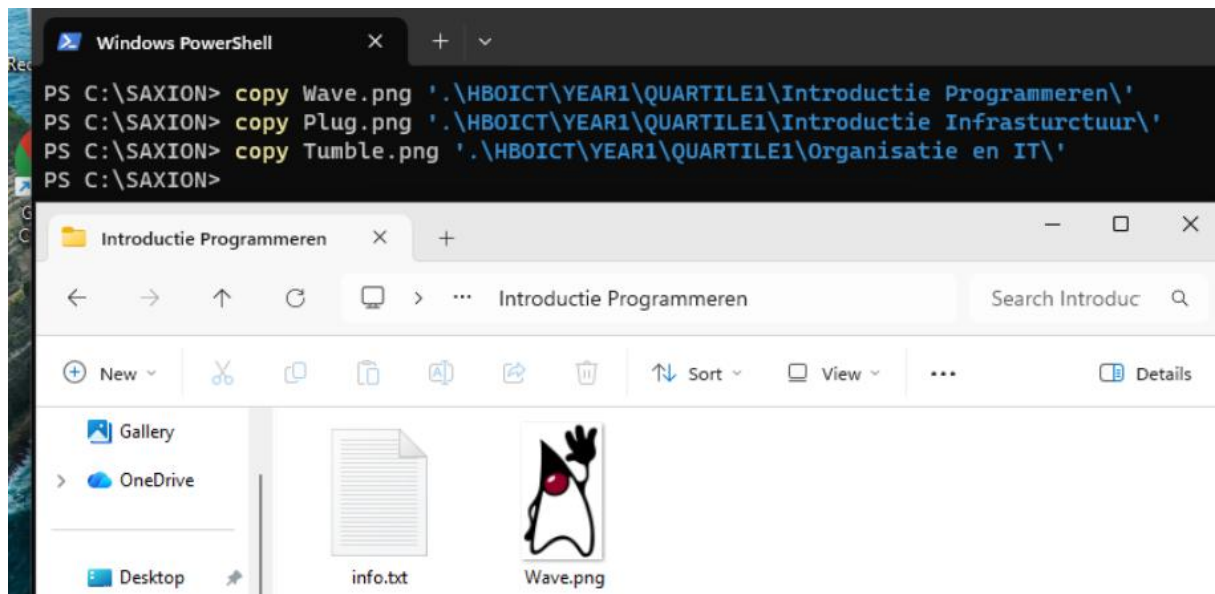
- g) Open the Run screen with a key combination. On this screen, type CMD and press <enter>. Take a screenshot of this result and paste it into this template. Zoals verwacht opent dit een terminal.



Working in the File Explorer

Relevant screenshots **copy** command:

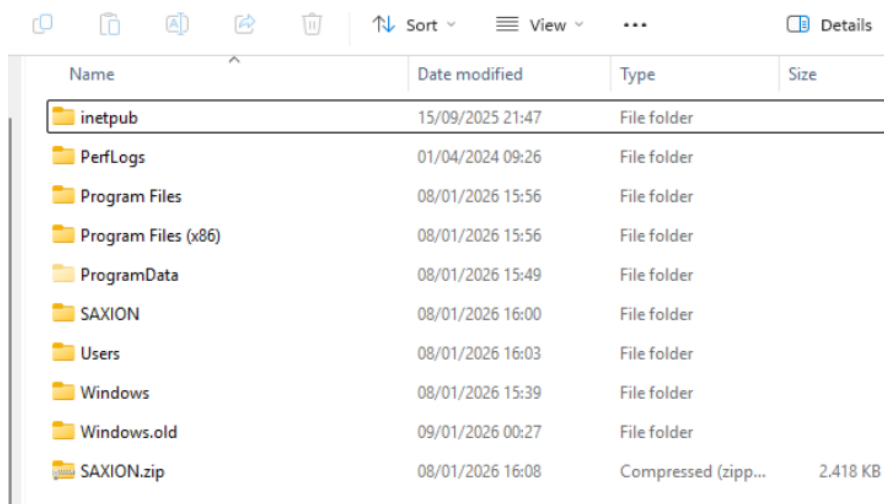




Relevant screenshots **tree** command:

```
Windows PowerShell
PS C:\SAXION> tree
Folder PATH listing
Volume serial number is DC12-CDA3
C:.
├── HBOICT
│   ├── YEAR1
│   │   ├── QUARTILE1
│   │   │   ├── Introductie Infrastructuur
│   │   │   ├── Introductie Programmeren
│   │   │   └── Organisatie en IT
│   │   ├── QUARTILE2
│   │   │   ├── Databases
│   │   │   ├── IT Fundamentals
│   │   │   └── Project ITs in the Game
│   │   ├── QUARTILE3
│   │   └── QUARTILE4
│   ├── YEAR2
│   │   ├── QUARTILE1
│   │   ├── QUARTILE2
│   │   ├── QUARTILE3
│   │   └── QUARTILE4
│   ├── YEAR3
│   │   ├── QUARTILE1
│   │   ├── QUARTILE2
│   │   ├── QUARTILE3
│   │   └── QUARTILE4
│   └── YEAR4
│       ├── QUARTILE1
│       ├── QUARTILE2
│       ├── QUARTILE3
│       └── QUARTILE4
PS C:\SAXION> echo Tijn
Tijn
PS C:\SAXION> |
```

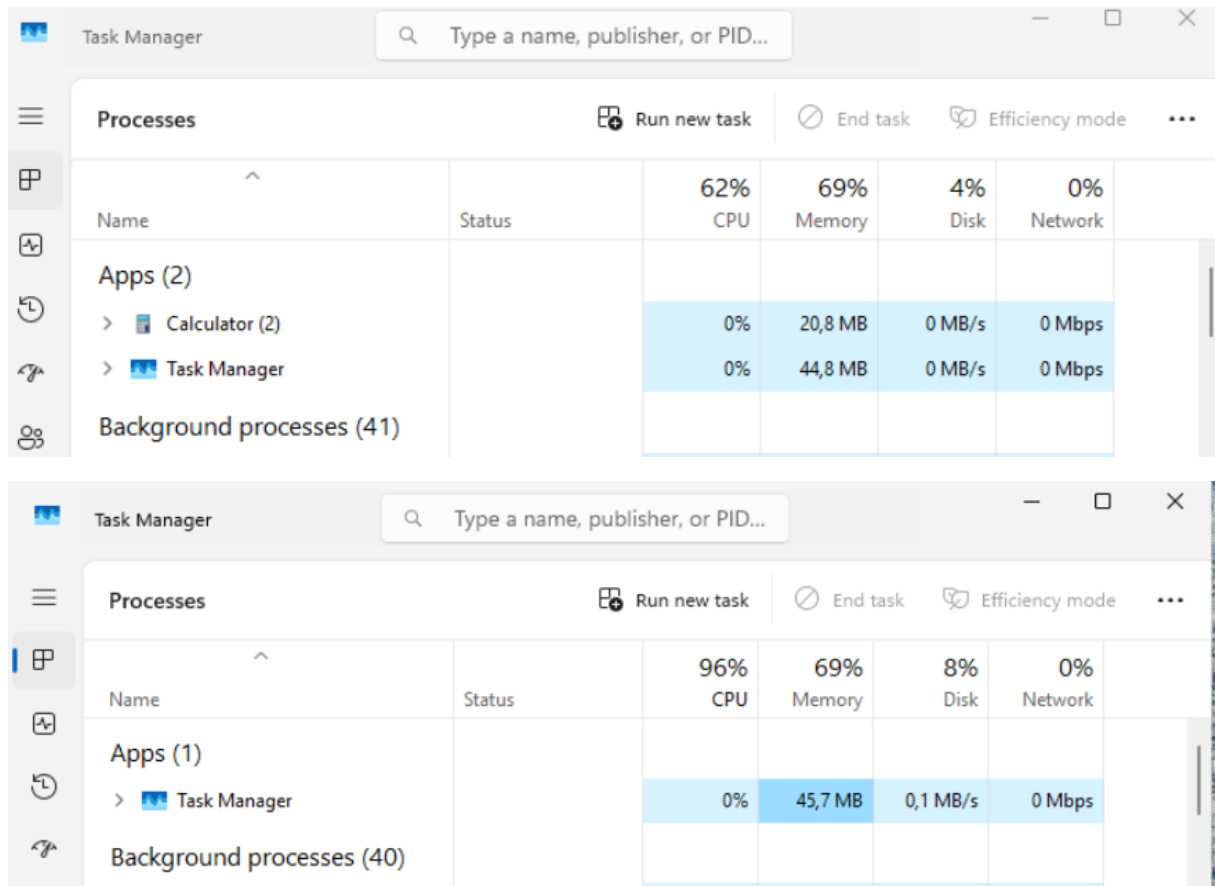
Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.



Name	Date modified	Type	Size
inetpub	15/09/2025 21:47	File folder	
PerfLogs	01/04/2024 09:26	File folder	
Program Files	08/01/2026 15:56	File folder	
Program Files (x86)	08/01/2026 15:56	File folder	
ProgramData	08/01/2026 15:49	File folder	
SAXION	08/01/2026 16:00	File folder	
Users	08/01/2026 16:03	File folder	
Windows	08/01/2026 15:39	File folder	
Windows.old	09/01/2026 00:27	File folder	
SAXION.zip	08/01/2026 16:08	Compressed (zipp...	2.418 KB

Terminating Processes

Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip

```
C:\Users\Tijn>winget install 7zip.7zip --source winget
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\Tijn>
```

```
C:\Users\Tijn>winget install Notepad++.Notepad++ --source winget
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...
The installer will request to run as administrator, expect a prompt.
Successfully installed

C:\Users\Tijn>
```

```
C:\Users\Tijn>winget install WinSCP.WinSCP --source winget
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\Tijn>
```

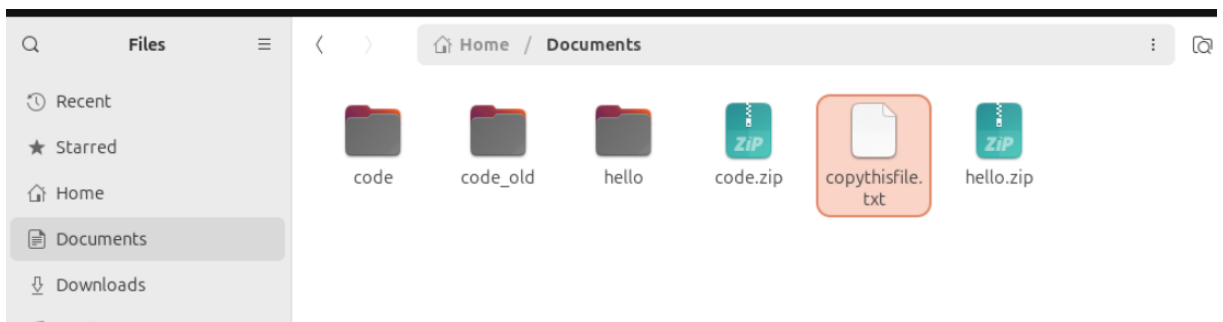
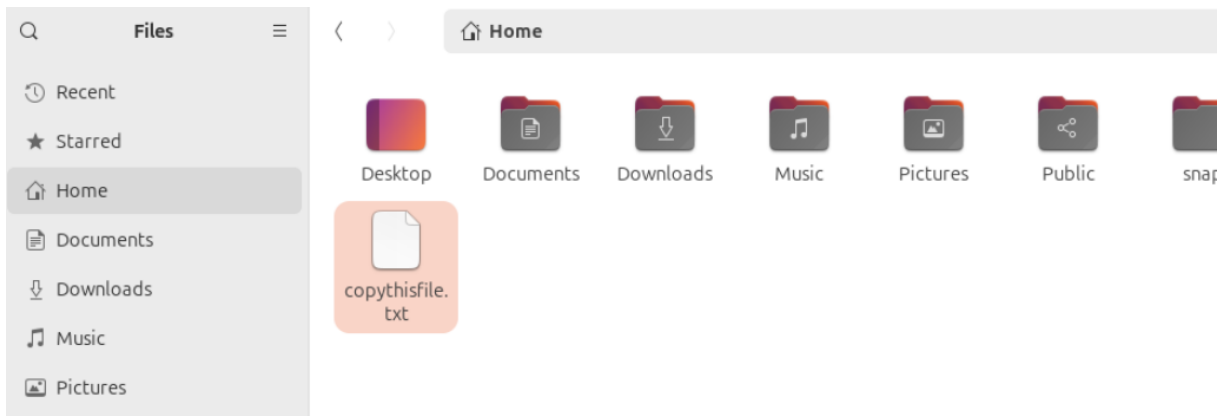
Assignment 5.4: Working with Linux

Relevant screenshots + motivation

Copying files:

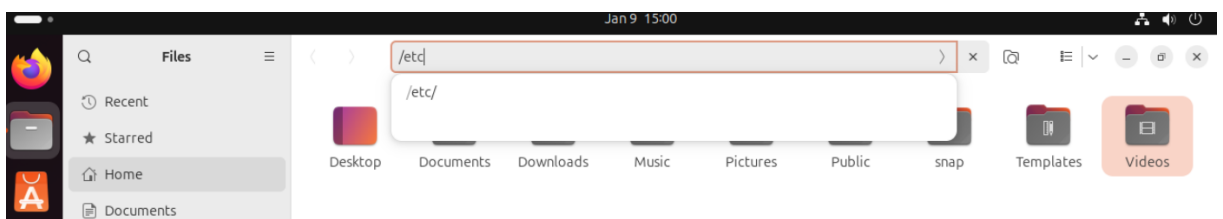
```
Terminal
tijn@tijn-VMware-Virtual-Platform:~$ touch copythisfile.txt
tijn@tijn-VMware-Virtual-Platform:~$ cp copythisfile.txt ./Documents/
tijn@tijn-VMware-Virtual-Platform:~$ ls
copythisfile.txt  Documents  Music      Public  Templates
Desktop           Downloads  Pictures   snap    Videos
tijn@tijn-VMware-Virtual-Platform:~$ cd Documents/
tijn@tijn-VMware-Virtual-Platform:~/Documents$ ls
code  code_old  code.zip  copythisfile.txt  hello  hello.zip
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

Ik doe CTRL + C om het bestand te kopiëren en dan navigeer ik naar Documents en doe daar CTRL + V om het gekopieerde bestand te plakken.

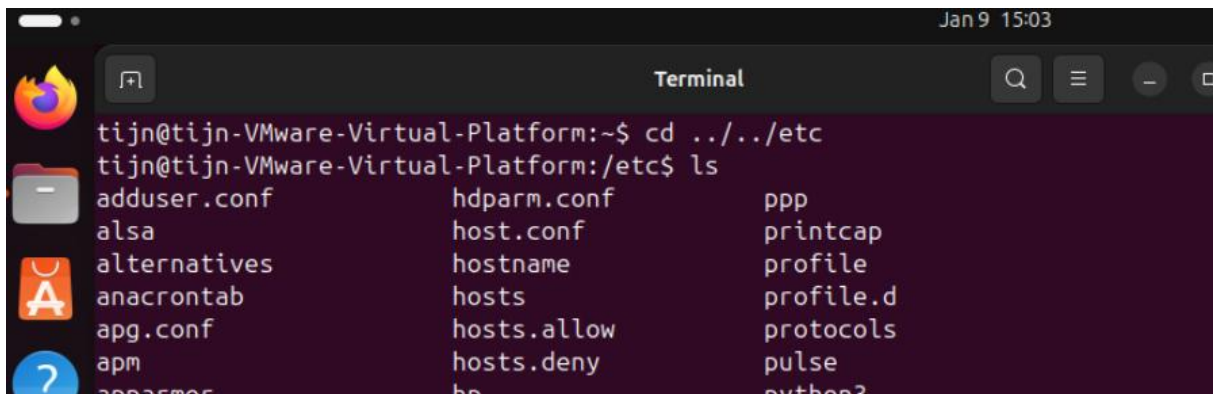


Navigating the file structure:

Om te navigeren naar de /etc folder via de file explorer open ik de file explorer en dan voer ik bovenin /etc in en druk op enter.

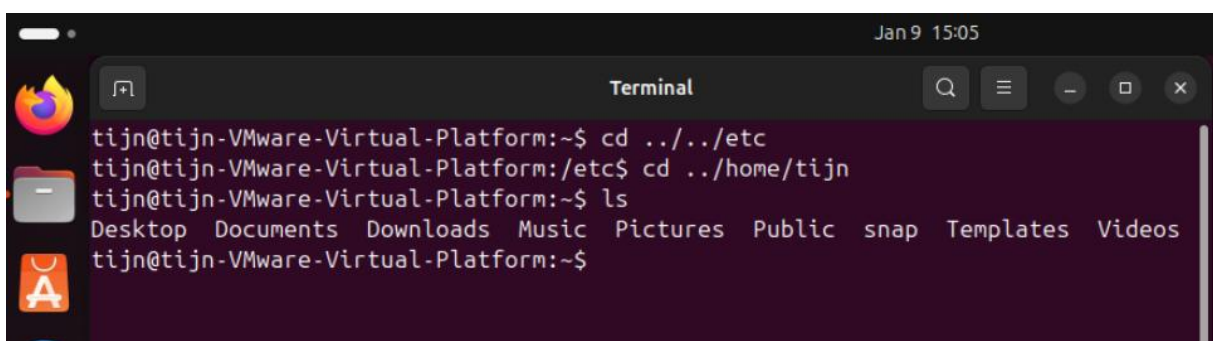


Om te navigeren naar de /etc folder via de terminal open ik een nieuwe terminal en doe ik **cd ../../etc**

A terminal window titled 'Terminal' with a search icon, a menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~\$'. The user enters 'cd ../../etc' and the prompt changes to 'tijn@tijn-VMware-Virtual-Platform:/etc\$'. Then the user enters 'ls' and the terminal lists files: adduser.conf, alsa, alternatives, anacrontab, apg.conf, apm, apparmor, hdparm.conf, host.conf, hostname, hosts, hosts.allow, hosts.deny, hp, ppp, printcap, profile, profile.d, protocols, pulse, and python3.

```
tijn@tijn-VMware-Virtual-Platform:~$ cd ../../etc
tijn@tijn-VMware-Virtual-Platform:/etc$ ls
adduser.conf      hdparm.conf      ppp
alsa              host.conf        printcap
alternatives      hostname         profile
anacrontab        hosts            profile.d
apg.conf          hosts.allow      protocols
apm               hosts.deny       pulse
apparmor          hp               python3
```

Om terug te gaan naar mijn homefolder waar ik hiervoor eerst was run ik **cd ../home/tijn**

A terminal window titled 'Terminal' with a search icon, a menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~\$'. The user enters 'cd ../../etc' and the prompt changes to 'tijn@tijn-VMware-Virtual-Platform:/etc\$'. Then the user enters 'cd ../home/tijn' and the prompt changes back to 'tijn@tijn-VMware-Virtual-Platform:~\$'. Finally, the user enters 'ls' and the terminal lists directories: Desktop, Documents, Downloads, Music, Pictures, Public, snap, Templates, and Videos.

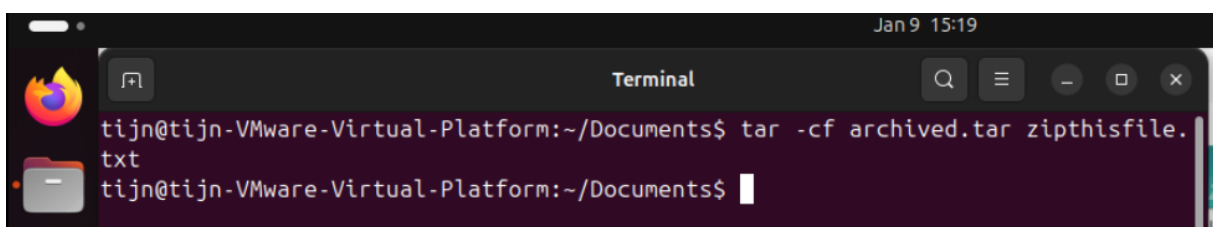
```
tijn@tijn-VMware-Virtual-Platform:~$ cd ../../etc
tijn@tijn-VMware-Virtual-Platform:/etc$ cd ../home/tijn
tijn@tijn-VMware-Virtual-Platform:~$ ls
Desktop Documents Downloads Music Pictures Public snap Templates Videos
tijn@tijn-VMware-Virtual-Platform:~$
```

Het grote verschil tussen Linux en Windows mappenstructuur is dat in Linux alles in een mappenstructuur zit beginnend met /. Hierdoor komen dus alle verschillende schijven in dezelfde structuur. In Windows worden de schijven wel apart gehouden. Je hebt meestal C: als hoofdschijf en dan kan je misschien nog een andere schijf erbij hebben dit kan dan bijvoorbeeld D: zijn. Dit zorgt ervoor dat in Windows niet alles in dezelfde mappenstructuur komt te staan.

De /etc map word gebruikt voor systeemconfiguratie bestanden. Hierin kan je dus instellingen van het besturingssysteem en geïnstalleerde programma's vinden.

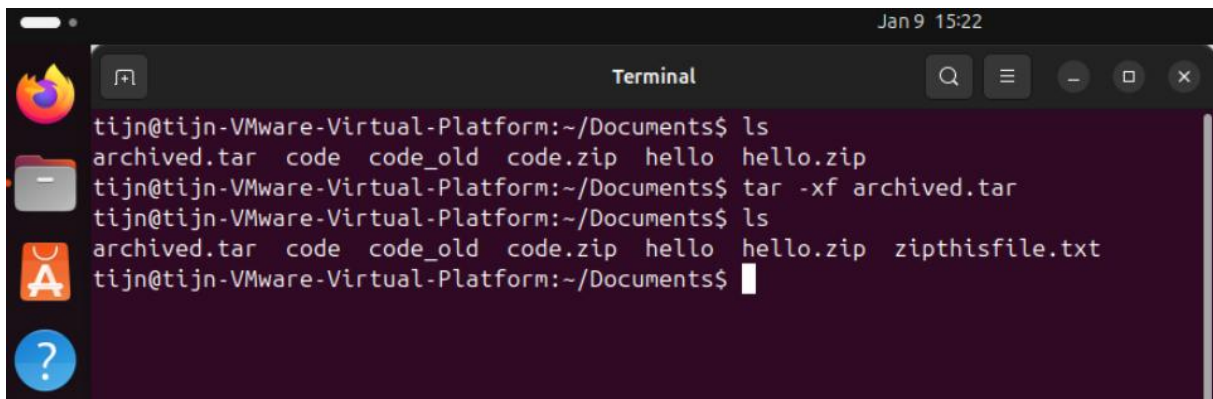
Compress files:

Om een tekst bestand te comprimeren naar een archief bestand run ik **tar -cf archived.tar zipthisfile.zipthisfile.txt**

A terminal window titled 'Terminal' with a search icon, a menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~/Documents\$'. The user enters 'tar -cf archived.tar zipthisfile.txt' and the prompt changes to 'tijn@tijn-VMware-Virtual-Platform:~/Documents\$' with a cursor.

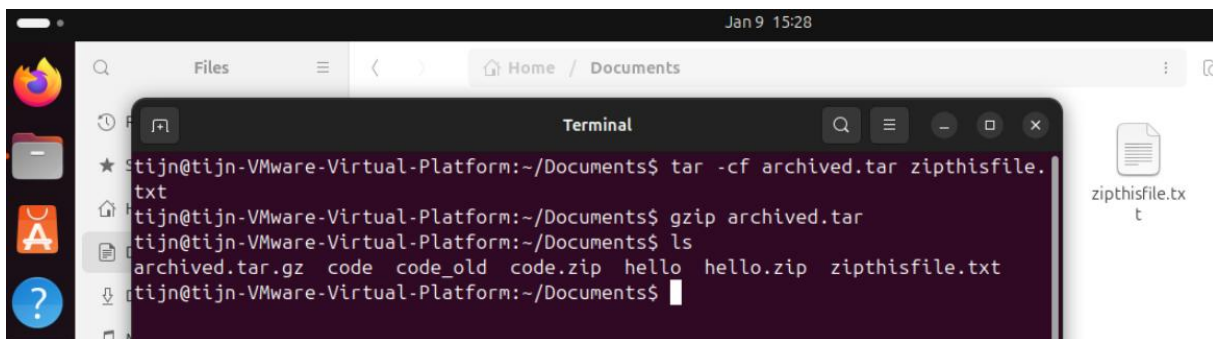
```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ tar -cf archived.tar zipthisfile.txt
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

Via **tar -xf archived.tar** extract ik het bestand weer naar een tekst bestand

A terminal window titled 'Terminal' with a search icon, menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~/Documents\$'. The first command is 'ls', showing files: 'archived.tar code code_old code.zip hello hello.zip'. The second command is 'tar -xf archived.tar'. The third command is 'ls', showing files: 'archived.tar code code_old code.zip hello hello.zip zipthisfile.txt'.

```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ ls
archived.tar code code_old code.zip hello hello.zip
tijn@tijn-VMware-Virtual-Platform:~/Documents$ tar -xf archived.tar
tijn@tijn-VMware-Virtual-Platform:~/Documents$ ls
archived.tar code code_old code.zip hello hello.zip zipthisfile.txt
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

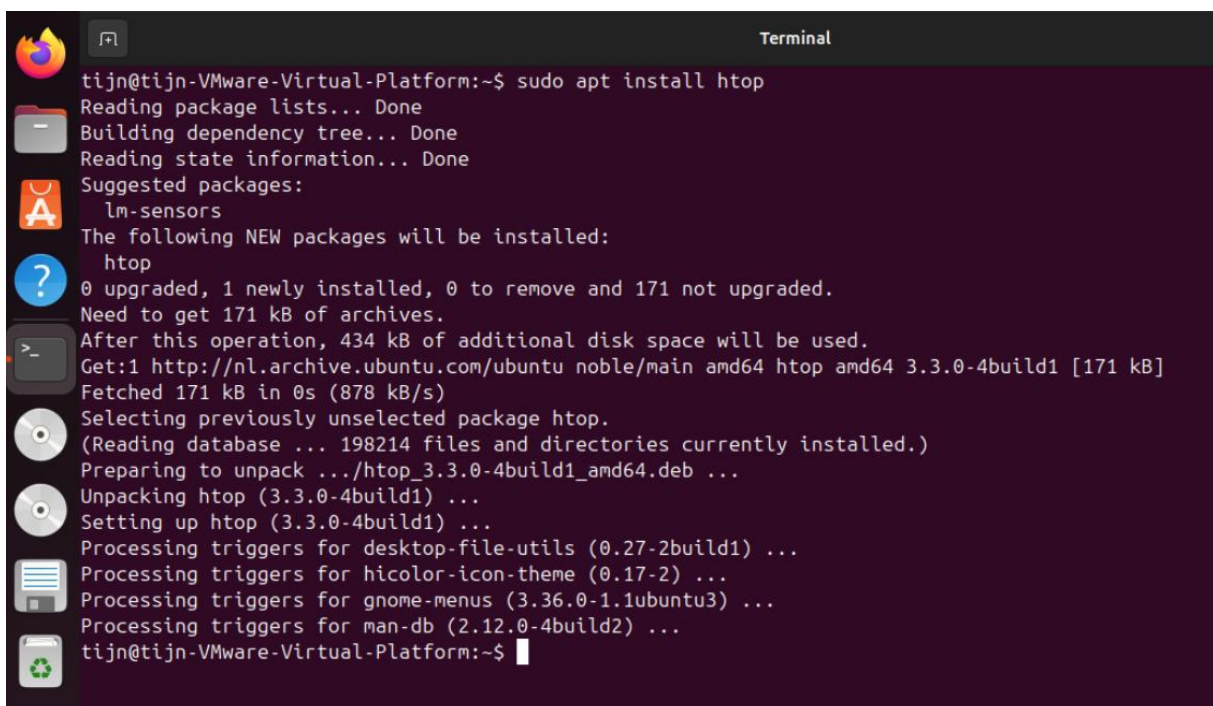
Om het bestand te compressen naar een archive en daarna weer compressen met gzip run ik eerst **tar -cf archived.tar bestand.txt** en daarna **gzip archived.tar**

A terminal window titled 'Terminal' with a search icon, menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~/Documents\$'. The first command is 'tar -cf archived.tar zipthisfile.txt'. The second command is 'gzip archived.tar'. The third command is 'ls', showing files: 'archived.tar.gz code code_old code.zip hello hello.zip zipthisfile.txt'.

```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ tar -cf archived.tar zipthisfile.txt
tijn@tijn-VMware-Virtual-Platform:~/Documents$ gzip archived.tar
tijn@tijn-VMware-Virtual-Platform:~/Documents$ ls
archived.tar.gz code code_old code.zip hello hello.zip zipthisfile.txt
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

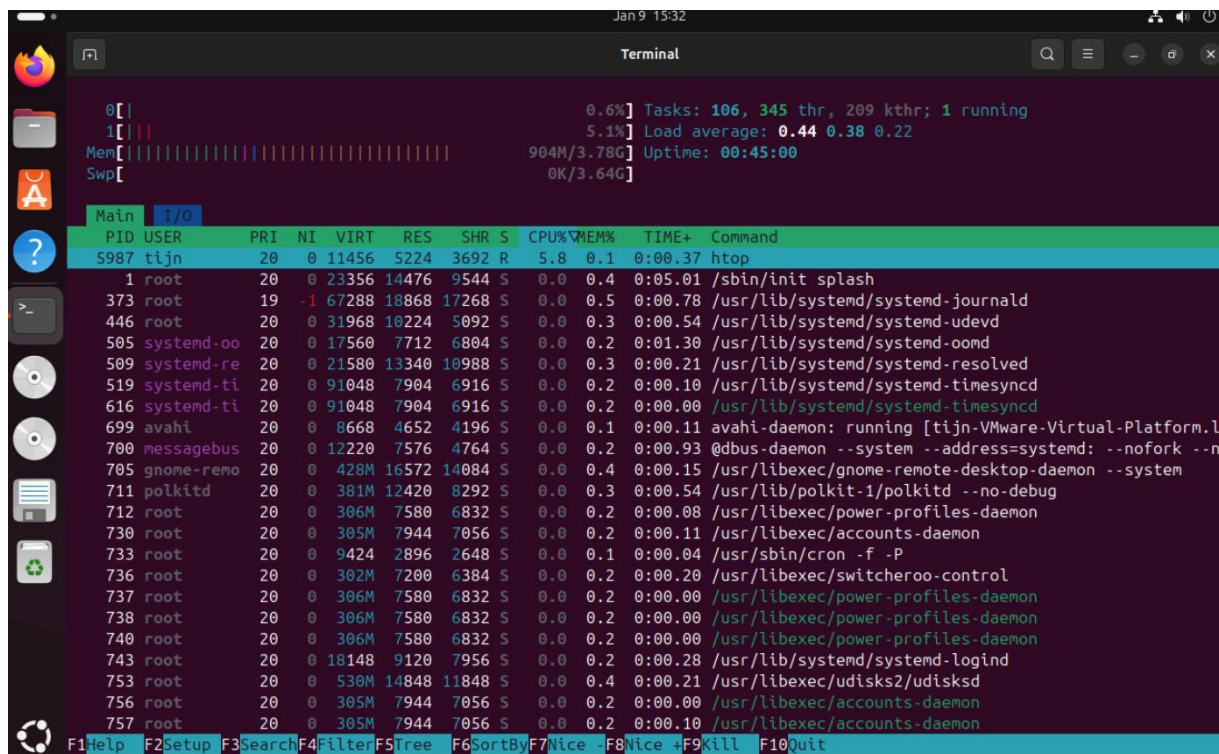
View processes:

Om htop te installeren via de command line run ik **sudo apt install htop**

A terminal window titled 'Terminal' with a search icon, menu icon, and window control buttons. The prompt is 'tijn@tijn-VMware-Virtual-Platform:~\$'. The command is 'sudo apt install htop'. The output shows the package lists being read, dependency tree being built, and state information being read. It suggests 'lm-sensors' but indicates that 'htop' will be installed. It shows the disk space requirements and the source of the package. Finally, it shows the package being selected, unpacked, and set up, along with processing triggers for other installed packages.

```
tijn@tijn-VMware-Virtual-Platform:~$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Suggested packages:
  lm-sensors
The following NEW packages will be installed:
  htop
0 upgraded, 1 newly installed, 0 to remove and 171 not upgraded.
Need to get 171 kB of archives.
After this operation, 434 kB of additional disk space will be used.
Get:1 http://nl.archive.ubuntu.com/ubuntu noble/main amd64 htop amd64 3.3.0-4build1 [171 kB]
Fetched 171 kB in 0s (878 kB/s)
Selecting previously unselected package htop.
(Reading database ... 198214 files and directories currently installed.)
Preparing to unpack .../htop_3.3.0-4build1_amd64.deb ...
Unpacking htop (3.3.0-4build1) ...
Setting up htop (3.3.0-4build1) ...
Processing triggers for desktop-file-utils (0.27-2build1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for gnome-menus (3.36.0-1.1ubuntu3) ...
Processing triggers for man-db (2.12.0-4build2) ...
tijn@tijn-VMware-Virtual-Platform:~$
```

Om htop op te starten run ik gewoon **htop** in de command line.



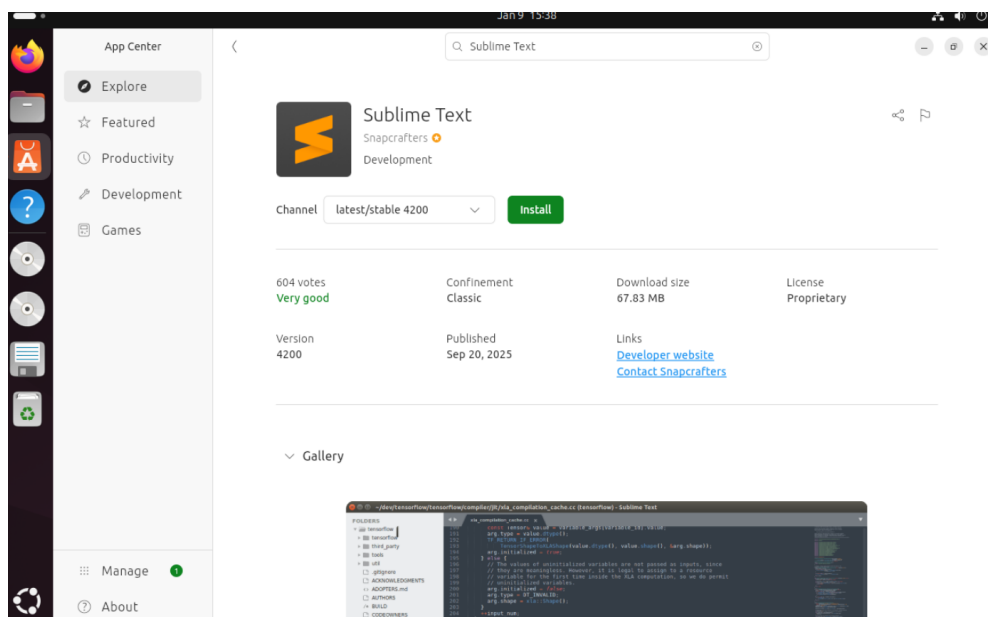
The screenshot shows a terminal window with the htop interface. At the top, system statistics are displayed: Tasks: 106, 345 thr, 209 kthr; 1 running; Load average: 0.44 0.38 0.22; Memory: 904M/3.78G; Uptime: 00:45:00; Swap: 0K/3.64G. Below this, a table of running processes is shown. The table has columns for PID, USER, PRI, NI, VIRT, RES, SHR, S, CPU%, MEM%, TIME+, and Command. The process list includes various system daemons and user processes, with the htop process itself at the top of the list.

PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
5987	tijn	20	0	11456	5224	3692	R	5.8	0.1	0:00.37	htop
1	root	20	0	23356	14476	9544	S	0.0	0.4	0:05.01	/sbin/init splash
373	root	19	-1	67288	18868	17268	S	0.0	0.5	0:00.78	/usr/lib/systemd/systemd-journald
446	root	20	0	31968	10224	5092	S	0.0	0.3	0:00.54	/usr/lib/systemd/systemd-udev
505	systemd-oo	20	0	17560	7712	6804	S	0.0	0.2	0:01.30	/usr/lib/systemd/systemd-oomd
509	systemd-re	20	0	21580	13340	10988	S	0.0	0.3	0:00.21	/usr/lib/systemd/systemd-resolved
519	systemd-ti	20	0	91048	7904	6916	S	0.0	0.2	0:00.10	/usr/lib/systemd/systemd-timesyncd
616	systemd-ti	20	0	91048	7904	6916	S	0.0	0.2	0:00.00	/usr/lib/systemd/systemd-timesyncd
699	avahi	20	0	8668	4652	4196	S	0.0	0.1	0:00.11	avahi-daemon: running [tijn-VMware-Virtual-Platform.l
700	messagebus	20	0	12220	7576	4764	S	0.0	0.2	0:00.93	dbus-daemon --system --address=systemd: --nofork --n
705	gnome-remo	20	0	428M	16572	14084	S	0.0	0.4	0:00.15	/usr/libexec/gnome-remote-desktop-daemon --system
711	polkitd	20	0	381M	12420	8292	S	0.0	0.3	0:00.54	/usr/lib/polkit-1/polkitd --no-debug
712	root	20	0	306M	7580	6832	S	0.0	0.2	0:00.08	/usr/libexec/power-profiles-daemon
730	root	20	0	305M	7944	7056	S	0.0	0.2	0:00.11	/usr/libexec/accounts-daemon
733	root	20	0	9424	2896	2648	S	0.0	0.1	0:00.04	/usr/sbin/cron -f -P
736	root	20	0	302M	7200	6384	S	0.0	0.2	0:00.20	/usr/libexec/switcheroo-control
737	root	20	0	306M	7580	6832	S	0.0	0.2	0:00.00	/usr/libexec/power-profiles-daemon
738	root	20	0	306M	7580	6832	S	0.0	0.2	0:00.00	/usr/libexec/power-profiles-daemon
740	root	20	0	306M	7580	6832	S	0.0	0.2	0:00.00	/usr/libexec/power-profiles-daemon
743	root	20	0	18148	9120	7956	S	0.0	0.2	0:00.28	/usr/lib/systemd/systemd-logind
753	root	20	0	530M	14848	11848	S	0.0	0.4	0:00.21	/usr/libexec/udisks2/udisksd
756	root	20	0	305M	7944	7056	S	0.0	0.2	0:00.00	/usr/libexec/accounts-daemon
757	root	20	0	305M	7944	7056	S	0.0	0.2	0:00.10	/usr/libexec/accounts-daemon

Htop doet mij denken aan taakbeheer in Windows alleen met veel meer data. Het laat namelijk alle processen die runnen zien en hoe lang deze al runnen. Je kan ook zien hoeveel het van je CPU of RAM gebruikt.

Install software:

Om software te installeren zonder de command line open ik eerst de App Center. In de App Center zoek ik dan voor de Sublime Text applicatie.



```
Terminal
tijn@tijn-VMware-Virtual-Platform:~$ sudo apt install neofetch
[sudo] password for tijn:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  caca-utils chafa imagemagick imagemagick-6-common imagemagick-6.q16 jp2a
  libavif16 libcaca0 libchafa0t64 libdavid7 libfftw3-double3 libgav1-1 libgc1
  libhwy1t64 libid3tag0 libimath-3-1-29t64 libimlib2t64 libjxl0.7 libjxr-tools
  libjxr0t64 liblqr-1-0 libmagickcore-6.q16-7-extra libmagickcore-6.q16-7t64
  libmagickwand-6.q16-7t64 libnetpbm11t64 libopenexr-3-1-30 librav1e0
  libraw23t64 libsixel-bin libsixel1 libsvtav1enc1d1 libyuv0 netpbm toilet
  toilet-fonts w3m w3m-img
Suggested packages:
  imagemagick-6-doc autotrace curl enscript ffmpeg gimp gnuplot grads graphviz
  hp2xx html2ps libwmf-bin mplayer povray radiance texlive-base-bin transfig
  libraw-bin libfftw3-bin libfftw3-dev inkscape figlet brotli bzip2 cmigemo
  compface dict dict-wn dictd mailcap w3m-el xsel
The following NEW packages will be installed:
  caca-utils chafa imagemagick imagemagick-6-common imagemagick-6.q16 jp2a
  libavif16 libchafa0t64 libdavid7 libfftw3-double3 libgav1-1 libgc1
  libhwy1t64 libid3tag0 libimath-3-1-29t64 libimlib2t64 libjxl0.7 libjxr-tools
  libjxr0t64 liblqr-1-0 libmagickcore-6.q16-7-extra libmagickcore-6.q16-7t64
  libmagickwand-6.q16-7t64 libnetpbm11t64 libopenexr-3-1-30 librav1e0
```

```
Terminal
tijn@tijn-VMware-Virtual-Platform:~$ neofetch
      .-/+00SSSS00+/- .
      `:+SSSSSSSSSSSSSSSSSS+:`
      +SSSSSSSSSSSSSSSSSSyySSSS+-
      .oSSSSSSSSSSSSSSSSSSdMMMMySSSSo.
      /SSSSSSSSSSShdmmNNmyNMMMMhSSSSS/
      +SSSSSSSSShmydMMMMMMMNdddySSSSSSSS+
      /SSSSSSShNMMMyhhyyyhNMMMNhSSSSSSS/
      .SSSSSSSSdMMMNhSSSSSSSSShNMMMdSSSSSSS.
      +SSSSShhhyNMMMySSSSSSSSSSyNMMMySSSSSS+
      oSSyNMMMNyMMhSSSSSSSSSSShmmnhSSSSSSo
      oSSyNMMMNyMMhSSSSSSSSSSShmmnhSSSSSSo
      +SSSSShhhyNMMMySSSSSSSSSSyNMMMySSSSSS+
      .SSSSSSSSdMMMNhSSSSSSSSShNMMMdSSSSSSS.
      /SSSSSSShNMMMyhhyyyhNMMMNhSSSSSSS/
      +SSSSSSSSdmydMMMMMMMNdddySSSSSSSS+
      /SSSSSSSSShdmmNNmyNMMMMhSSSSS/
      .oSSSSSSSSSSSSSSSSSSdMMMMySSSSo.
      -+SSSSSSSSSSSSSSSSSSyySSSS+-
      `:+SSSSSSSSSSSSSSSSSS+:`
      .-/+00SSSS00+/- .

tijn@tijn-VMware-Virtual-Platform
-----
OS: Ubuntu 24.04.3 LTS x86_64
Host: VMware Virtual Platform None
Kernel: 6.14.0-37-generic
Uptime: 54 mins
Packages: 1730 (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 i7-11370H (2) @ 3.302GHz
GPU: 00:0f.0 VMware SVGA II Adapter
Memory: 1307MiB / 3867MiB
```

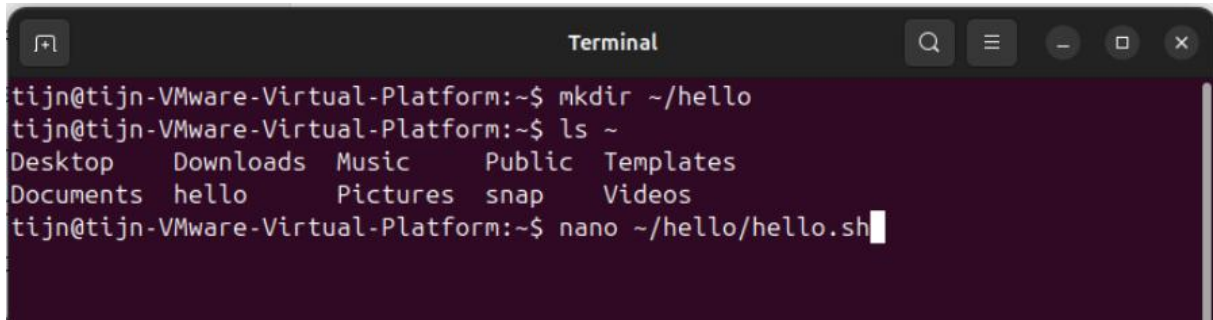
Neofetch laat alle informatie over mijn systeem zien.

Assignment 5.5: Users and permissions on Linux

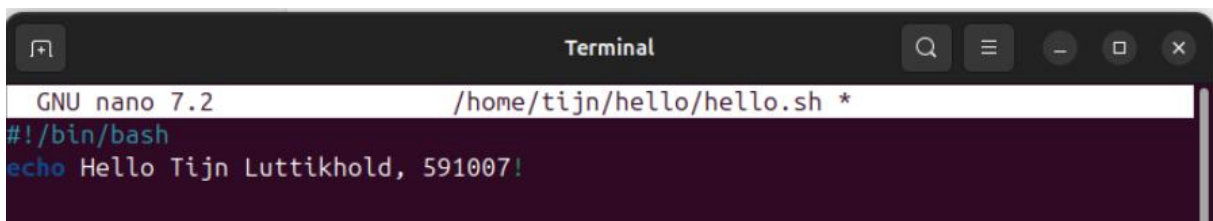
Relevant screenshots + motivation

Eerst maak ik de nieuwe directory hello aan via: **mkdir hello**

Daarna ga ik via het commando: **nano hello/hello.sh** een nieuw bestand maken genaamd hello.sh en dan kan ik het ook meteen de code erin stoppen.

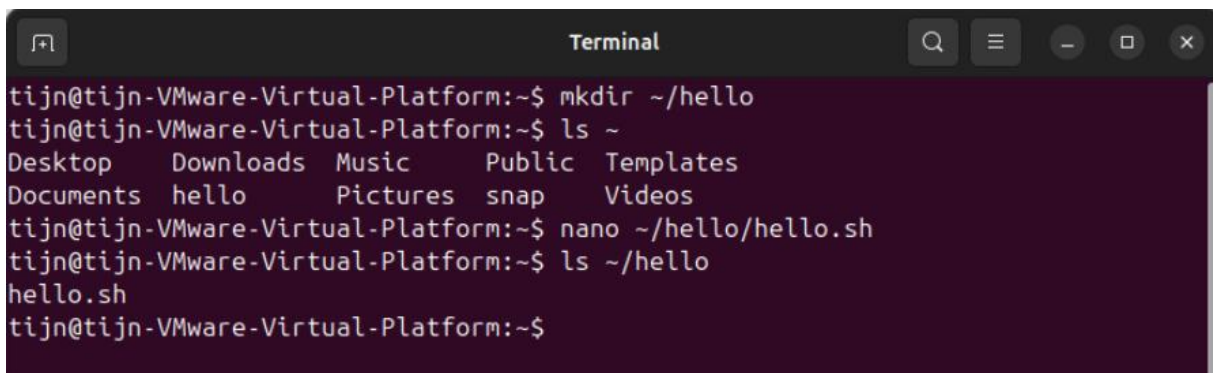


```
tijn@tijn-VMware-Virtual-Platform:~$ mkdir ~/hello
tijn@tijn-VMware-Virtual-Platform:~$ ls ~
Desktop  Downloads  Music      Public    Templates
Documents hello      Pictures   snap      Videos
tijn@tijn-VMware-Virtual-Platform:~$ nano ~/hello/hello.sh
```



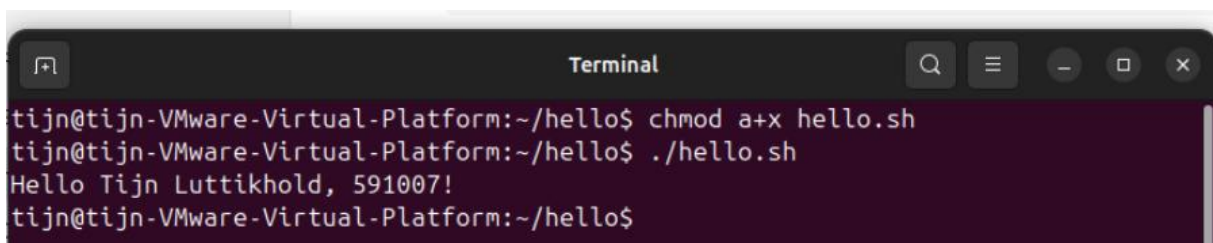
```
GNU nano 7.2 /home/tijn/hello/hello.sh *
#!/bin/bash
echo Hello Tijn Luttikhold, 591007!
```

En dan sla ik dit op met **CTRL + S** en dan is het bestand aangemaakt in de hello folder



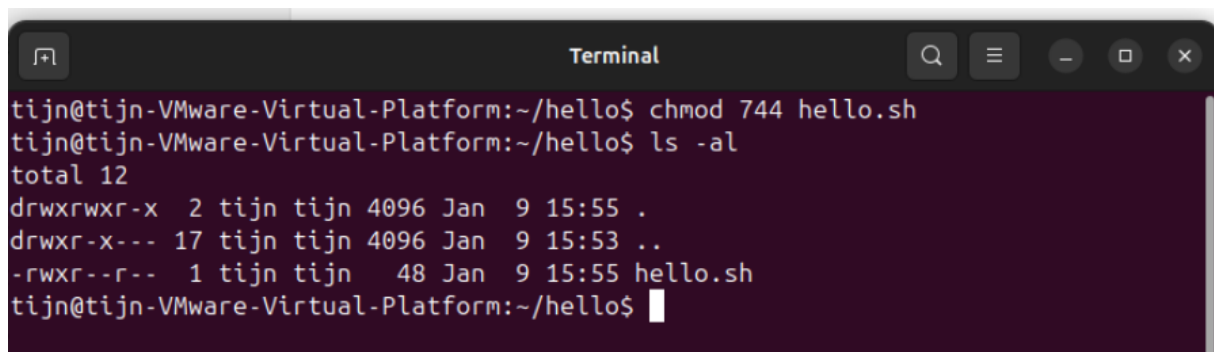
```
tijn@tijn-VMware-Virtual-Platform:~$ mkdir ~/hello
tijn@tijn-VMware-Virtual-Platform:~$ ls ~
Desktop  Downloads  Music      Public    Templates
Documents hello      Pictures   snap      Videos
tijn@tijn-VMware-Virtual-Platform:~$ nano ~/hello/hello.sh
tijn@tijn-VMware-Virtual-Platform:~$ ls ~/hello
hello.sh
tijn@tijn-VMware-Virtual-Platform:~$
```

Met het commando **chmod a+x hello.sh** maak ik het bestand uitvoerbaar. En voer het uit via **./hello.sh**



```
tijn@tijn-VMware-Virtual-Platform:~/hello$ chmod a+x hello.sh
tijn@tijn-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello Tijn Luttikhold, 591007!
tijn@tijn-VMware-Virtual-Platform:~/hello$
```

Met **chmod 744 hello.sh** kan ik er voor zorgen dan alleen ik toegang heb om het uit te voeren.

A terminal window titled "Terminal" with a dark background. The user is in the directory ~/hello. The command 'chmod 744 hello.sh' is entered and executed. Then, the command 'ls -al' is entered and executed, showing the permissions for the current directory and the 'hello.sh' file.

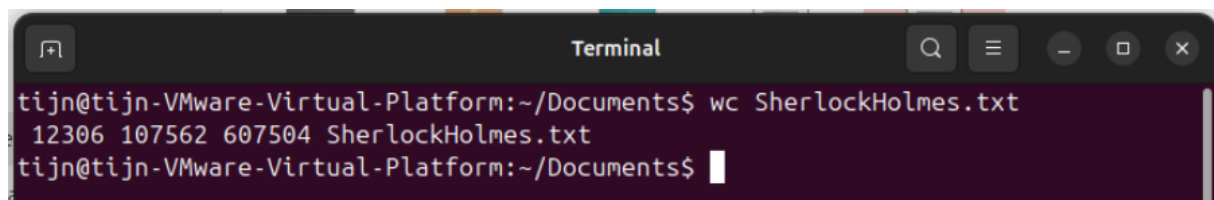
```
tijn@tijn-VMware-Virtual-Platform:~/hello$ chmod 744 hello.sh
tijn@tijn-VMware-Virtual-Platform:~/hello$ ls -al
total 12
drwxrwxr-x  2 tijn tijn 4096 Jan  9 15:55 .
drwxr-x--- 17 tijn tijn 4096 Jan  9 15:53 ..
-rwxr--r--  1 tijn tijn   48 Jan  9 15:55 hello.sh
tijn@tijn-VMware-Virtual-Platform:~/hello$
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

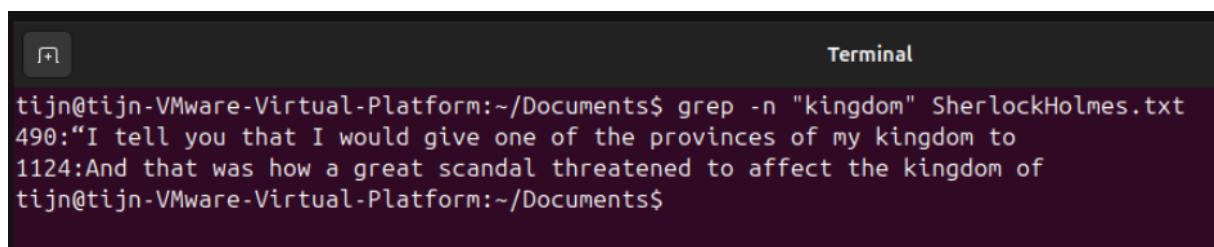
- **cat**: Dit toont het volledige inhoud van het bestand in de terminal.
- **wc**: Telt alle regels, woorden en karakters van het hele bestand.
- **less**: Hiermee kan je een bestand pagina voor pagina navigeren in plaats van alles meteen laten zien.
- **tail**: Toont de laatste regels van het bestand. Dit zijn er standaard 10
- **head**: Toont de eerste regels van het bestand. Dit zijn er standaard 10
- **grep**: Zoekt voor tekstpatronen in het bestand.

Het bestand heeft 12306 regels, 107562 woorden en 607504 karakters.

A terminal window titled "Terminal" with a dark background. The user is in the directory ~/Documents. The command 'wc SherlockHolmes.txt' is entered and executed, showing the line, word, and character counts for the file.

```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

Het woord kingdom staat op lijn 490 en 1124.

A terminal window titled "Terminal" with a dark background. The user is in the directory ~/Documents. The command 'grep -n "kingdom" SherlockHolmes.txt' is entered and executed, showing the line numbers where the word 'kingdom' appears in the file.

```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ grep -n "kingdom" SherlockHolmes.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
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

Ik gebruik -C 10 zodat ik 10 regels voor en na het woord krijg te zien.

```
Terminal
tijn@tijn-VMware-Virtual-Platform:~/Documents$ grep -n -C 10 "kingdom" SherlockHolmes.txt
480-"Then I shall drop you a line to let you know how we progress."
481-
482-"Pray do so. I shall be all anxiety."
483-
484-"Then, as to money?"
485-
486-"You have _carte blanche_."
487-
488-"Absolutely?"
489-
490:"I tell you that I would give one of the provinces of my kingdom to
491-have that photograph."
492-
493-"And for present expenses?"
494-
495-The King took a heavy chamois leather bag from under his cloak and laid
496-it on the table.
497-
498-"There are three hundred pounds in gold and seven hundred in notes," he
499-said.
500-
--
1114-
1115-The King stared at him in amazement.
1116-
1117-"Irene's photograph!" he cried. "Certainly, if you wish it."
1118-
1119-"I thank your Majesty. Then there is no more to be done in the matter.
1120-I have the honour to wish you a very good morning." He bowed, and,
1121-turning away without observing the hand which the King had stretched
1122-out to him, he set off in my company for his chambers.
1123-
1124:And that was how a great scandal threatened to affect the kingdom of
1125-Bohemia, and how the best plans of Mr. Sherlock Holmes were beaten by a
1126-woman's wit. He used to make merry over the cleverness of women, but I
1127-have not heard him do it of late. And when he speaks of Irene Adler, or
1128-when he refers to her photograph, it is always under the honourable
1129-title of _the_ woman.
1130-
1131-
1132-
1133-
1134-II. THE RED-HEADED LEAGUE
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

```
tijn@tijn-VMware-Virtual-Platform:~/Documents$ exiftool oldcar.jpg
ExifTool Version Number      : 12.76
File Name                    : oldcar.jpg
Directory                   : .
File Size                    : 2.4 MB
File Modification Date/Time  : 2026:01:09 19:16:00+01:00
File Access Date/Time       : 2026:01:09 19:19:12+01:00
File Inode Change Date/Time  : 2026:01:09 19:19:07+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
Camera Model Name            : moto g(6) play
X Resolution                 : 72
Y Resolution                 : 72
```

Het merk van het toestel is Motorola.

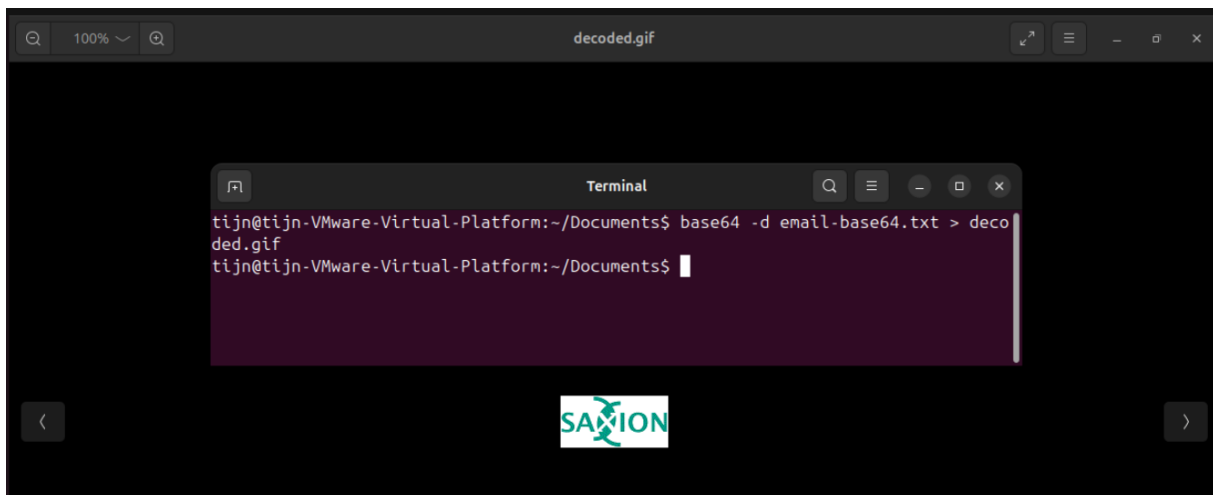
Er is een locatie hierin te vinden. Na het opzoeken op google maps hiervan is deze foto genomen in Groningen.

```
Thumbnail Image             : (Binary data 59453 bytes, use -b option to extract)
GPS Altitude                 : 42 m Above Sea Level
GPS Date/Time                : 2020:11:07 14:08:57Z
GPS Latitude                 : 53 deg 11' 39.68" N
GPS Longitude                : 6 deg 32' 12.90" E
Focal Length                 : 3.5 mm
GPS Position                 : 53 deg 11' 39.68" N, 6 deg 32' 12.90" E
Light Value                  : 7.7
```

Na het hernoemen van het bestand naar oldcar vind het nog steeds dat het een JPEG is:

```
Terminal
tijn@tijn-VMware-Virtual-Platform:~/Documents$ mv oldcar.jpg oldcar
tijn@tijn-VMware-Virtual-Platform:~/Documents$ 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=aljetter-user 9 PPS29.55-35-18-7 6a0d0 release-keys, datetime=2020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
tijn@tijn-VMware-Virtual-Platform:~/Documents$
```

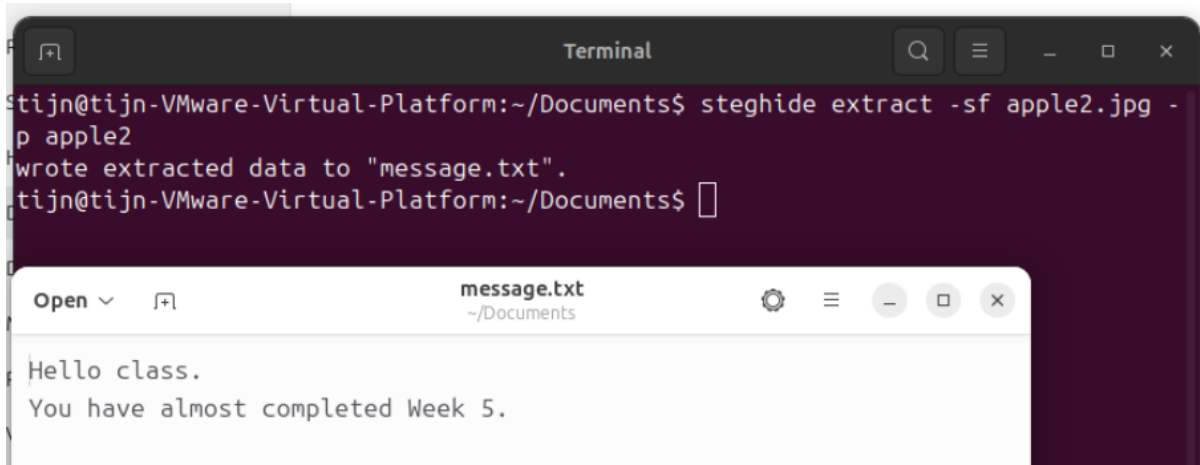
Het decoden van de gif is ook gelukt



Assignment 5.8: Steganography

Relevant screenshots + motivation

Met **steghide extract** kan ik de tekst uit de jpg halen.



Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:

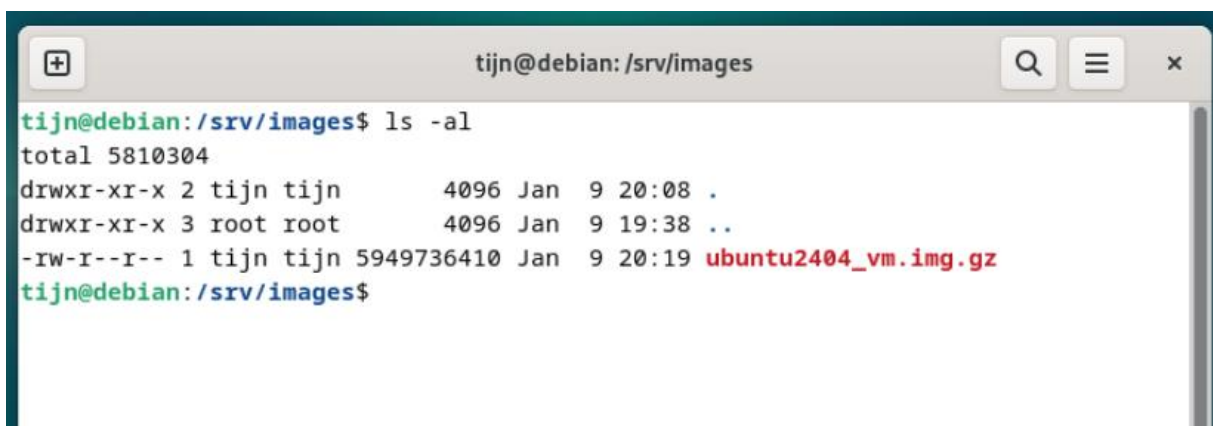
- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.
- Proof that you can restore the back-up image into an empty VM.

De backup is succesvol van ubuntu naar de debian server gestuurd:



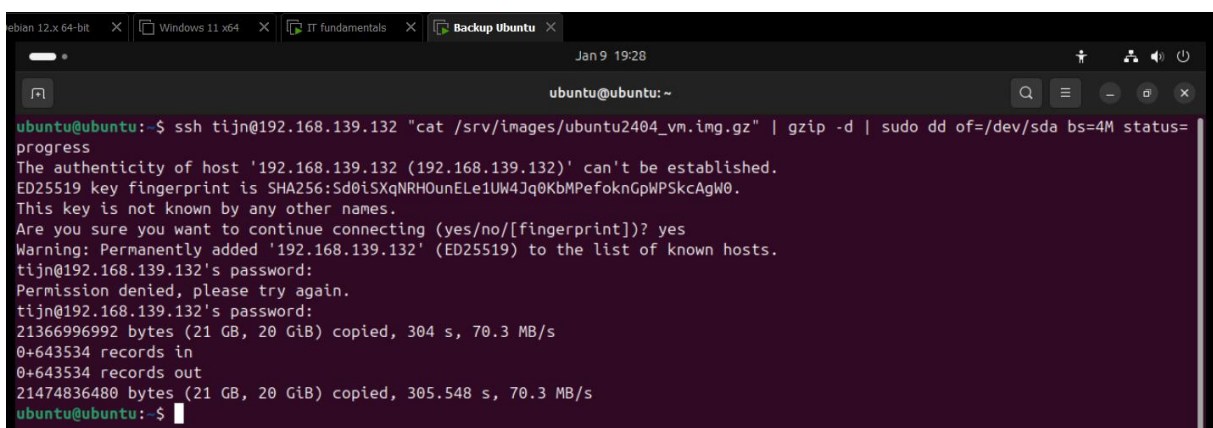
```
tijn@tijn-VMware-Virtual-Platform:~$ sudo dd if=/dev/sda bs=4M status=progress | gzip | ssh tij@192.168.139.132 "cat > /srv/images/ubuntu2404_vm.img.gz"
tijn@192.168.139.132's password:
21437087744 bytes (21 GB, 20 GiB) copied, 625 s, 34.3 MB/s
5120+0 records in
5120+0 records out
21474836480 bytes (21 GB, 20 GiB) copied, 625.243 s, 34.3 MB/s
tijn@tijn-VMware-Virtual-Platform:~$
```

Zoals hier te zien:



```
tijn@debian: /srv/images
tijn@debian:/srv/images$ ls -al
total 5810304
drwxr-xr-x 2 tij@tij 4096 Jan 9 20:08 .
drwxr-xr-x 3 root root 4096 Jan 9 19:38 ..
-rw-r--r-- 1 tij@tij 5949736410 Jan 9 20:19 ubuntu2404_vm.img.gz
tijn@debian:/srv/images$
```

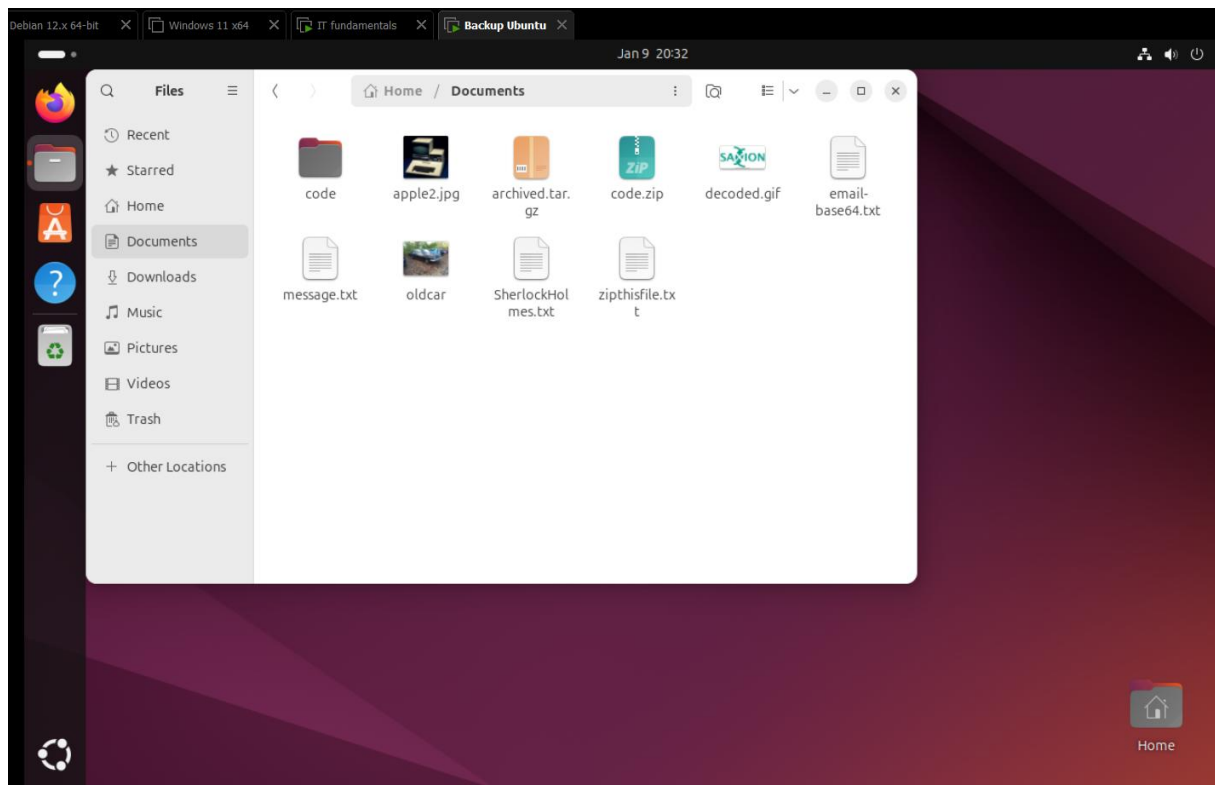
Het transferen van de backup naar de Ubuntu omgeving is ook gelukt:



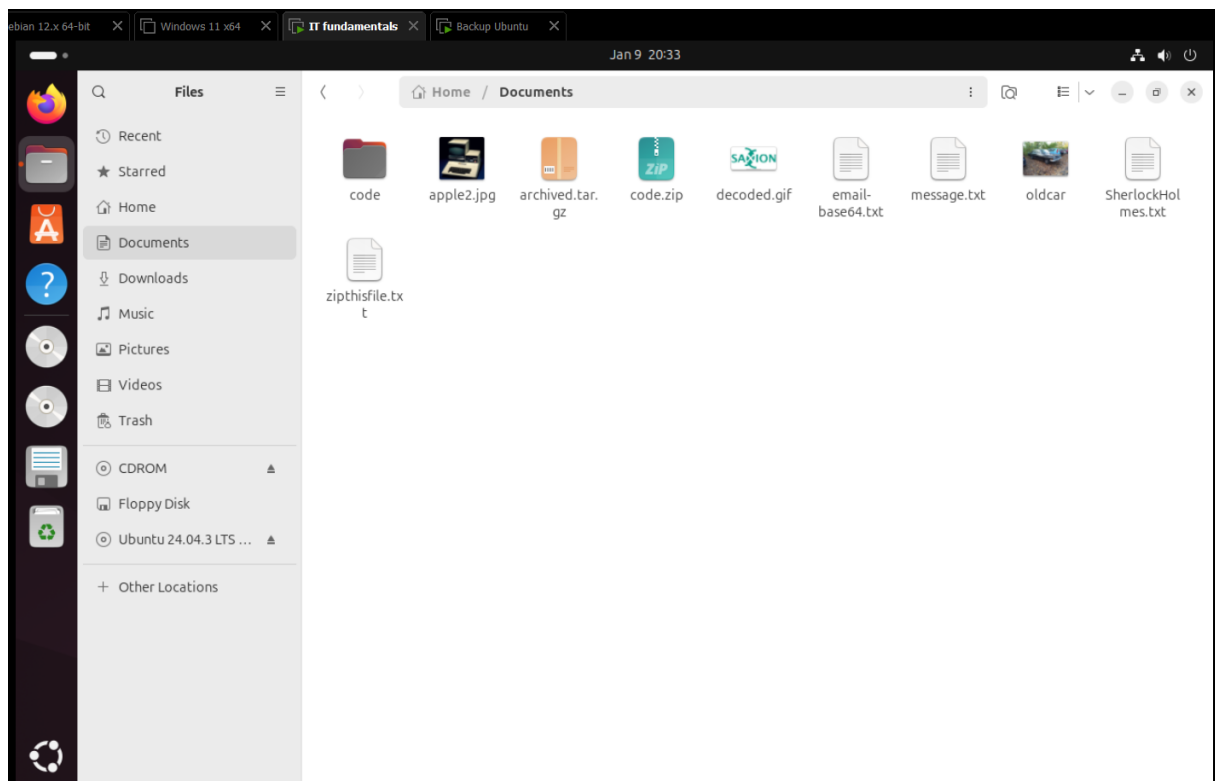
```
ubuntu@ubuntu:~$ ssh tij@192.168.139.132 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
The authenticity of host '192.168.139.132 (192.168.139.132)' can't be established.
ED25519 key fingerprint is SHA256:Sd0iSXqNRH0unELe1UW4Jq0KbMPefoknGpWPSkcAgW0.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.139.132' (ED25519) to the list of known hosts.
tijn@192.168.139.132's password:
Permission denied, please try again.
tijn@192.168.139.132's password:
21366996992 bytes (21 GB, 20 GiB) copied, 304 s, 70.3 MB/s
0+643534 records in
0+643534 records out
21474836480 bytes (21 GB, 20 GiB) copied, 305.548 s, 70.3 MB/s
ubuntu@ubuntu:~$
```

Na het opnieuw opstarten van de vm via de disk is de backup helemaal gelukt. Alle data wat op mijn andere omgeving stond staat nu ook op mijn nieuwe vm

Backup:



Orginele:



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