

Week 5 – Operating Systems

Student number: 499193

Assignment 5.1

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

Unix-like operating systems zijn ontworpen en gedragen zich als een UNIX systeem, maar zijn niet een officieel onderdeel van de UNIX systemen.

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 & Dennis Ritchie ontworpen de eerste UNIX versie.

Bill Joy is de originele auteur van de vi tekst-editor.

Richard Stallman: GNU Project, Free Software Foundation, GNU Compiler Collection, GNU Emacs, GNU General Public License

Linus Torvalds: Ontwikkelaar Linux kernel en Git

c) What is the philosophy of the GNU movement?

Gebruikers vrijheid geven over het bestuur van hun eigen computers door gezamenlijk software te ontwikkelen waar iedereen het recht heeft om dit te bewerken, kopiëren en verspreiden.

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

Grotendeels wel, maar niet volledig. Ubuntu biedt namelijk ook betaalde distributies aan met extra ondersteuning en functionaliteit.

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

Windows Subsystem for Linux (WSL) is een Linux omgeving die in Windows draait, zonder dat je een virtual machine nodig hebt. Je hebt wel een Linux distribution nodig

om hier gebruik van te maken.

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

Android draait op een bewerkte versie van de Linux kernel.

iOS is gebaseerd op macOS, wat een UNIX-like operating system is.

ChromeOS is afgeleid van ChromiumOS, wat weer afgeleid is van Gentoo 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>

Supercomputers worden gebruikt om zeer complexe berekeningen en simulaties uit te voeren. Deze worden veelal gebruikt voor onderzoek naar wetenschappelijke onderwerpen waar een grote hoeveelheid berekeningen voor nodig is. Denk aan voorspellingen en simulaties van dingen die voor een normaal mens vrijwel onmogelijk zijn.

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 distributed system computer die bestaat uit meerdere Playstation 3 consoles. Hier wordt de rekenkracht van de Playstation 3 consoles gecombineerd om berekeningen uit te voeren. Dit was mogelijk omdat de CPU's in de Playstation 3 zeer goede prestaties leverden voor hun prijs, en omdat Sony het toestond om andere operating systems te gebruiken.

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, in plaats van Raspbian (wat standaard op de Raspberry Pi draait).

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. Ondanks dat er een grote hoeveelheid Pi's in de supercomputer zitten, hebben ze samen lang niet genoeg rekenkracht om op deze lijst te komen.


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?

Beide consoles CPU architectuur zijn gebaseerd op AMD's Zen 2. Xbox's OS is "Xbox system software" en die van Playstation 5 is "Orbis OS". Een conclusie die je hier uit zou kunnen halen is dat beide consoles een unieke operating system hebben die ontwikkeld is speciaal voor de console.


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?

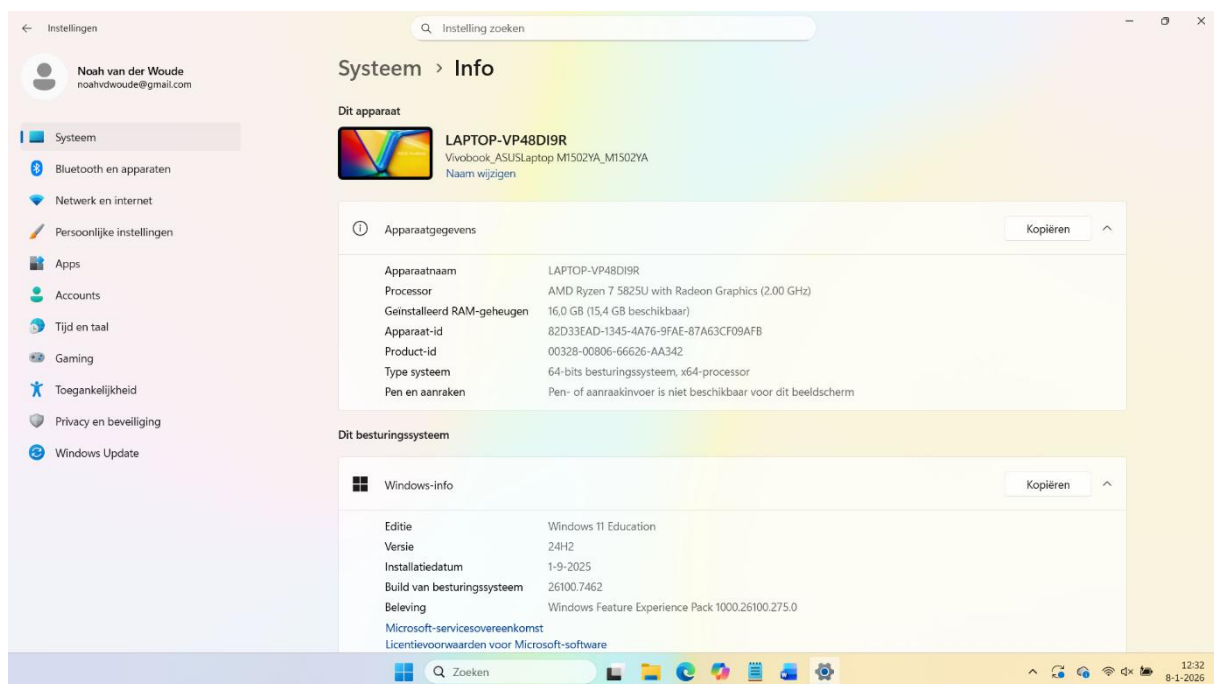
Windows + X, en daarna V (voor verkenner). Ik neem aan dat deze shortcut afhankelijk is van de taal van je systeem.

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

Windows + (FN + P)

of

Windows + X, en daarna Y.



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

Windows + X, daarna K

of

Ctrl + Alt+ Delete, dan taakbeheer.

Naam	Status	Processor	Geheugen	Schijf	Netwerk
Toepassingen (7)					
Instellingen		0%	43,4 MB	0 MB/s	0 Mbps
Microsoft Copilot (2)		3,3%	249,6 MB	0 MB/s	0,1 Mbps
Microsoft Edge (25)		0%	1.195,3 MB	0,1 MB/s	0,1 Mbps
Microsoft Word (2)		0%	132,6 MB	0 MB/s	0 Mbps
Notepad.exe		0%	10,6 MB	0 MB/s	0 Mbps
Taakbeheer		0%	68,4 MB	0 MB/s	0 Mbps
Windows Verkenner		0%	153,1 MB	0 MB/s	0 Mbps
Achtergrondprocessen (84)					
Account voor werk of school (2)		0%	3,2 MB	0 MB/s	0 Mbps
adb (32-bits)		0%	0,8 MB	0 MB/s	0 Mbps
AMD Crash Defender Service		0%	0,6 MB	0 MB/s	0 Mbps
AMD External Events Client M...		0%	1,9 MB	0 MB/s	0 Mbps
AMD External Events Service ...		0%	0,7 MB	0 MB/s	0 Mbps
AMD Software (4)		0%	16,4 MB	0 MB/s	0 Mbps
Antimalware Core Service		0%	4,9 MB	0 MB/s	0 Mbps
Antimalware Service Executable		0%	144,4 MB	0 MB/s	0 Mbps
App voor Spooler-subsysteem		0%	2,0 MB	0 MB/s	0 Mbps
App-acties		0%	3,6 MB	0 MB/s	0 Mbps
Application Frame Host		0%	6,0 MB	0 MB/s	0 Mbps
ASUS App Service		0%	1,3 MB	0 MB/s	0 Mbps
ASUS On-Screen Display (32-b...		0%	0,8 MB	0 MB/s	0 Mbps
ASUS Optimization		0%	1,1 MB	0 MB/s	0 Mbps

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

Windows + 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?

Windows + 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.

Windows + R, cmd

```
C:\Windows\system32\cmd.e: x + v
Microsoft Windows [Version 10.0.26100.7462]
(c) Microsoft Corporation. Alle rechten voorbehouden.
C:\Users\noahv>
```

Working in the File Explorer

Relevant screenshots **copy** command:

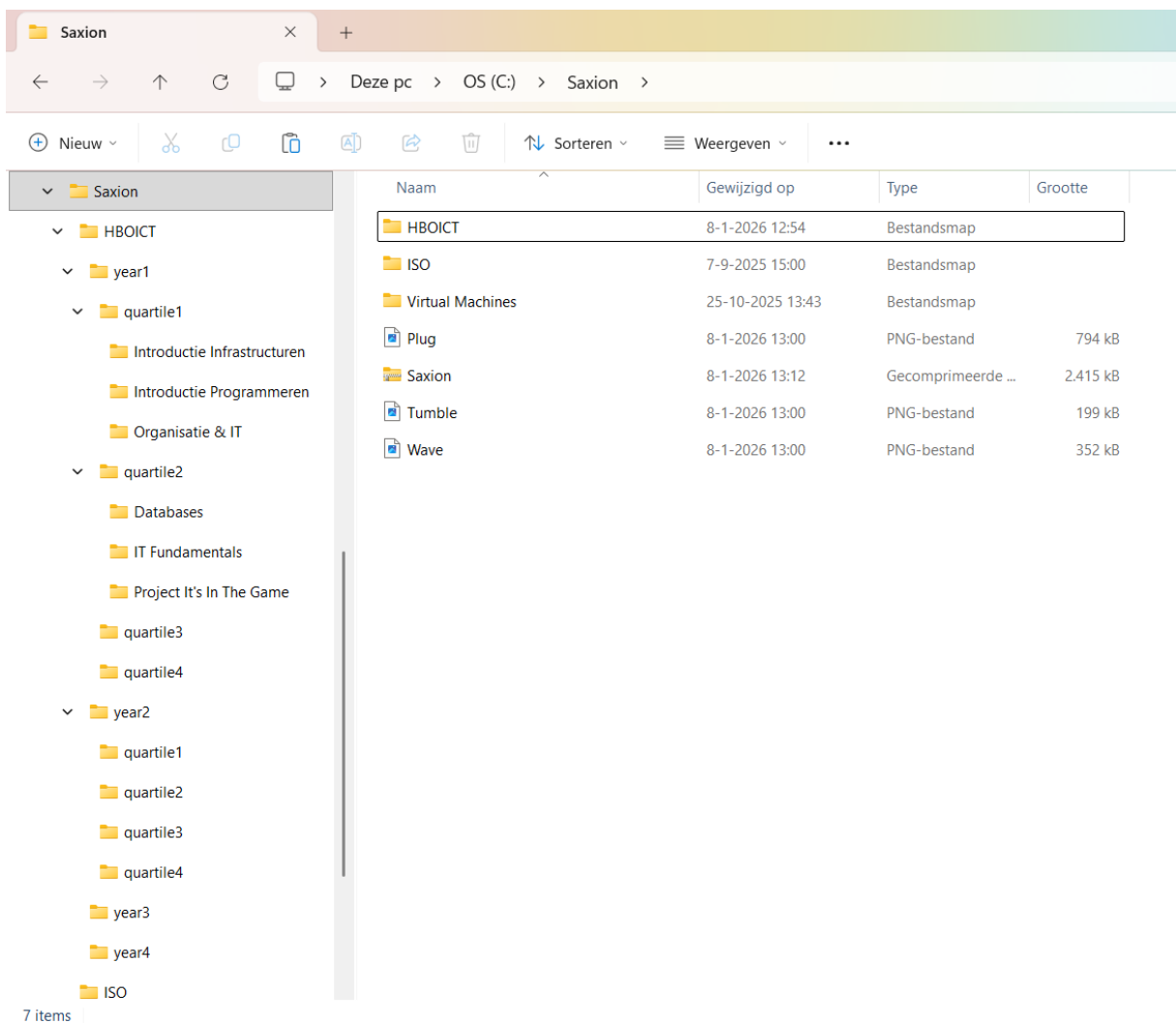
```
C:\Windows\System32\cmd.e x + v
Microsoft Windows [Version 10.0.26100.7462]
(c) Microsoft Corporation. Alle rechten voorbehouden.
C:\Saxion>copy Wave.png "HBOICT\year1\quartile1\Introductie Programmeren"
1 file(s) copied.
C:\Saxion>copy Plug.png "HBOICT\year1\quartile1\Introductie Infrastructuren"
1 file(s) copied.
C:\Saxion>copy Tumble.png "HBOICT\year1\quartile1\Organisatie & IT"
1 file(s) copied.
C:\Saxion>
```

Relevant screenshots **tree** command:

```
C:\Windows\System32\cmd.exe x + v
C:\Saxion>tree
Folder PATH listing for volume OS
Volume serial number is BAB8-BCCB
C:..
├── HBOICT
│   ├── year1
│   │   ├── quartile1
│   │   │   ├── Introductie Infrastructuren
│   │   │   ├── Introductie Programmeren
│   │   │   └── Organisatie & IT
│   │   ├── quartile2
│   │   │   ├── Databases
│   │   │   ├── IT Fundamentals
│   │   │   └── Project It's In The Game
│   │   ├── quartile3
│   │   └── quartile4
│   ├── year2
│   │   ├── quartile1
│   │   ├── quartile2
│   │   ├── quartile3
│   │   └── quartile4
│   ├── year3
│   └── year4
├── ISO
└── Virtual Machines
    ├── Debian 12.x 64-bit
    ├── Ubuntu 64-bit
    └── Windows Server 2022

C:\Saxion>echo %username%
noahv
```

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



Terminating Processes

Relevant Screenshots Task Manager Window:

The image displays two screenshots of the Windows Task Manager window, showing the 'Processen' (Processes) tab. The top screenshot shows the process list with 'Rekenmachine (2)' highlighted. The bottom screenshot shows the process list with 'Microsoft Edge (29)' highlighted. Both screenshots show the resource usage for each process, including Processor, Geheugen (Memory), Schijf (Disk), and Netwerk (Network).

Top Screenshot: Processen (10)

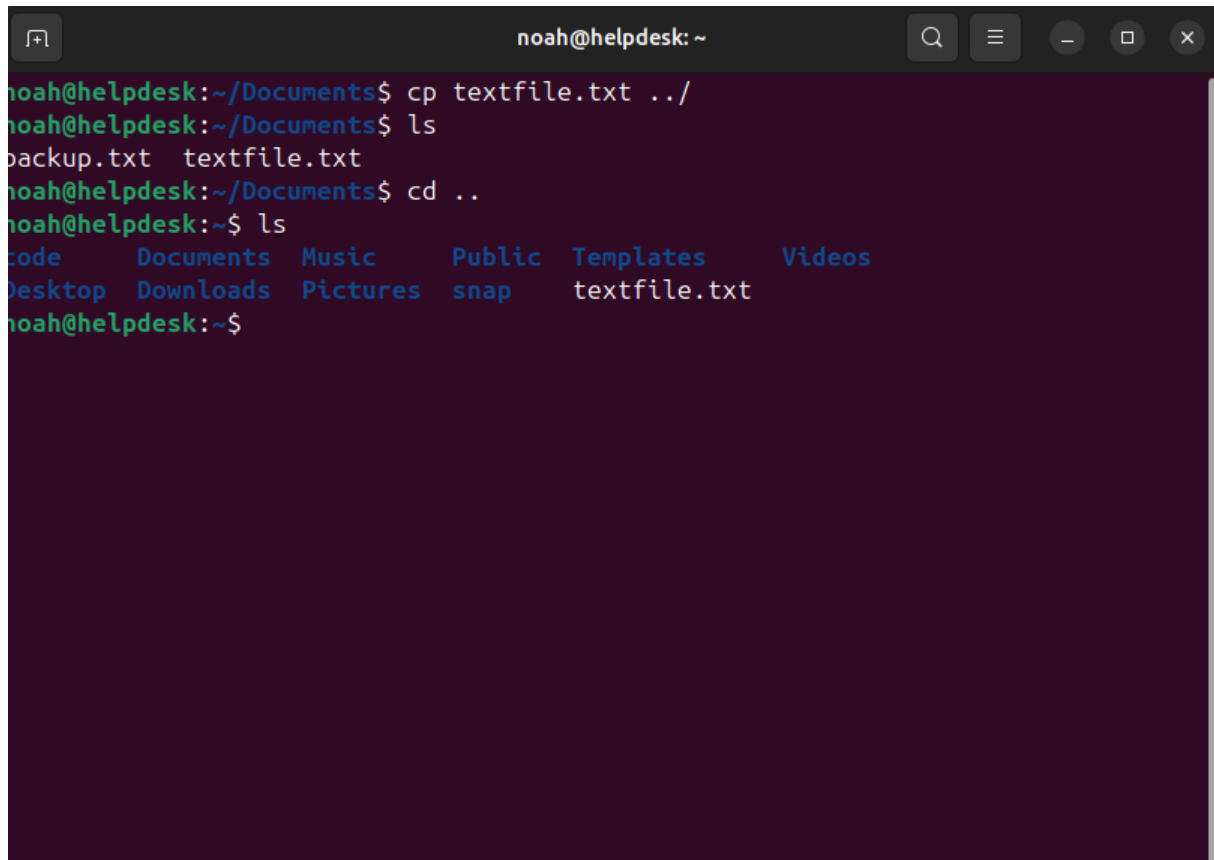
Naam	Status	Processor	Geheugen	Schijf	Netwerk
Toepassingen (10)					
> Instellingen		0%	15,2 MB	0 MB/s	0 Mbps
> Microsoft Copilot (3)		0%	58,2 MB	0 MB/s	0 Mbps
> Microsoft Edge (29)		0%	1.055,0 MB	0 MB/s	0,1 Mbps
> Microsoft Word (2)		0%	114,9 MB	0 MB/s	0 Mbps
> Notepad.exe		0%	38,1 MB	0 MB/s	0 Mbps
> Rekenmachine (2)		0%	26,5 MB	0 MB/s	0 Mbps
> Taakbeheer		0%	65,3 MB	0 MB/s	0 Mbps
> Terminal (2)		0%	24,1 MB	0 MB/s	0 Mbps
> VMware Workstation (32-bits)		0%	24,5 MB	0 MB/s	0 Mbps
> Windows Verkenner		0%	160,8 MB	0 MB/s	0 Mbps
Achtergrondprocessen (85)					
> Account voor werk of school (2)		0%	3,1 MB	0 MB/s	0 Mbps
> adb (32-bits)		0%	0,8 MB	0 MB/s	0 Mbps

Bottom Screenshot: Processen (9)

Naam	Status	Processor	Geheugen	Schijf	Netwerk
Toepassingen (9)					
> Instellingen		0%	15,2 MB	0 MB/s	0 Mbps
> Microsoft Copilot (3)		0%	58,2 MB	0 MB/s	0 Mbps
> Microsoft Edge (29)		0%	1.033,7 MB	0,1 MB/s	0,1 Mbps
> Microsoft Word (2)		0%	118,8 MB	0 MB/s	0 Mbps
> Notepad.exe		0%	38,1 MB	0 MB/s	0 Mbps
> Taakbeheer		0%	66,4 MB	0 MB/s	0 Mbps
> Terminal (2)		0%	24,1 MB	0 MB/s	0 Mbps
> VMware Workstation (32-bits)		0%	24,5 MB	0 MB/s	0 Mbps
> Windows Verkenner		0%	152,4 MB	0 MB/s	0 Mbps
Achtergrondprocessen (88)					
> Account voor werk of school (2)		0%	2,9 MB	0 MB/s	0 Mbps
> adb (32-bits)		0%	0,8 MB	0 MB/s	0 Mbps
> AMD Crash Defender Service		0%	0,1 MB	0 MB/s	0 Mbps

Assignment 5.4: Working with Linux

Relevant screenshots + motivation

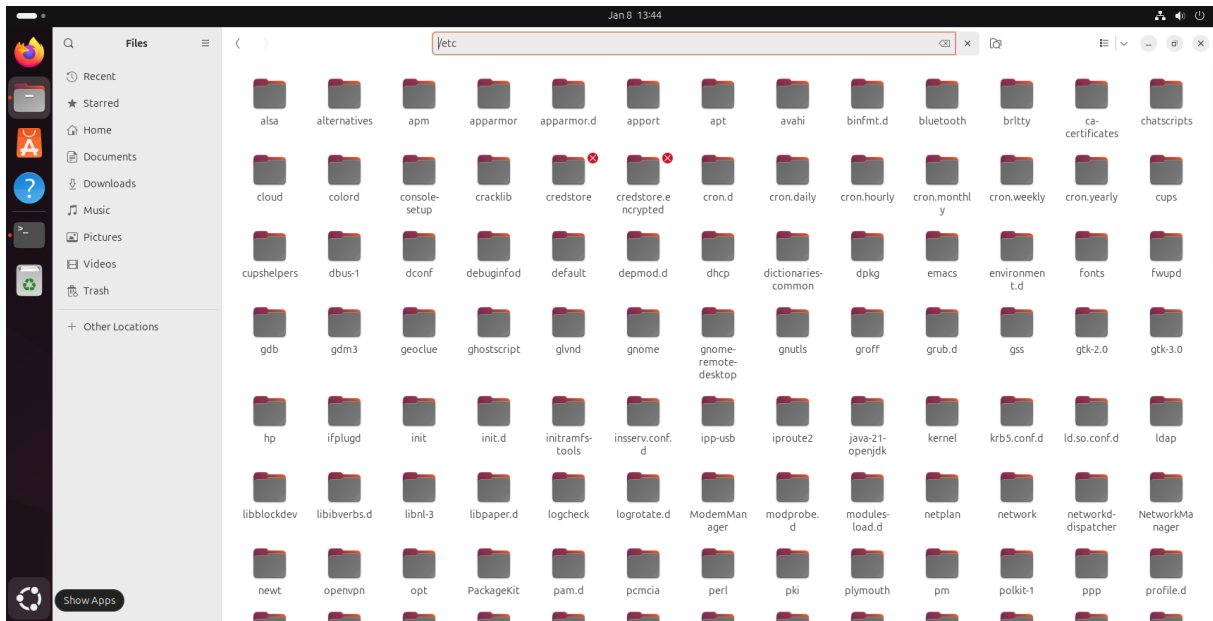


```
noah@helpdesk: ~/Documents$ cp textfile.txt ../
noah@helpdesk: ~/Documents$ ls
backup.txt  textfile.txt
noah@helpdesk: ~/Documents$ cd ..
noah@helpdesk: ~$ ls
code      Documents  Music      Public    Templates  Videos
Desktop  Downloads  Pictures   snap      textfile.txt
```

The screenshot shows a terminal window titled "noah@helpdesk: ~". The user is in the ~/Documents directory. They execute the command `cp textfile.txt ../` to copy a file to the parent directory. Then they run `ls` in the current directory, showing `backup.txt` and `textfile.txt`. Next, they run `cd ..` to move to the home directory. Finally, they run `ls` in the home directory, showing a list of folders and files including `code`, `Documents`, `Music`, `Public`, `Templates`, `Videos`, `Desktop`, `Downloads`, `Pictures`, `snap`, and `textfile.txt`.

```
noah@helpdesk: /etc
noah@helpdesk: /home$ cd ..
noah@helpdesk: /$ cd etc/
noah@helpdesk: /etc$ ls
adduser.conf      hostname          profile.d
alsa              hosts            protocols
alternatives     hosts.allow      pulse
anacrontab       hosts.deny       python3
apg.conf         hp               python3.12
apm              ifplugd          rc0.d
apparmor         init             rc1.d
apparmor.d       init.d           rc2.d
appport          initramfs-tools  rc3.d
apt              inputrc          rc4.d
avahi            insserv.conf.d   rc5.d
bash.bashrc      inxi.conf        rc6.d
bash_completion  ipp-usb          rcS.d
bindresvport.blacklist  iproute2         resolv.conf
binfmt.d         issue            rmt
bluetooth        issue.net        rpc
brlapi.key       java-21-openjdk  rsyslog.conf
brlty            kernel           rsyslog.d
brlty.conf       kerneloops.conf  rygel.conf
ca-certificates  krb5.conf.d      sane.d
ca-certificates.conf  ldap             security
```

```
noah@helpdesk: ~
gnome             pam.conf         vdpau_wrapper.cfg
gnome-remote-desktop  pam.d           vim
gnutls           papersize        vmware-tools
gprofng.rc       passwd           vtrgb
groff            passwd-          vulkan
group            pcmcia           wgetrc
group-           perl             whoopsie
grub.d           pki              wpa_supplicant
gshadow          plymouth         X11
gshadow-         pm               xattr.conf
gss              pnm2ppa.conf    xdg
gtk-2.0          polkit-1         xml
gtk-3.0          ppp             zsh_command_not_found
hdparm.conf      printcap
host.conf        profile
noah@helpdesk: /etc$ cd ..
noah@helpdesk: /$ cd home/
noah@helpdesk: /home$ ls
noah
noah@helpdesk: /home$ cd noah/
noah@helpdesk: ~$ ls
code  Documents  Music      Public  Templates  Videos
Desktop  Downloads  Pictures  snap    textfile.txt
noah@helpdesk: ~$
```



In de /etc/ folder staan voornamelijk configuratiebestanden.

- 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`

- Compress a text file in a tar archive and compress it with gzip.

```
noah@helpdesk:~$ tar -czvf archive.tar.gz textfile.txt
textfile.txt
noah@helpdesk:~$ ls
archive.tar.gz Desktop Downloads Pictures snap textfile.txt
code Documents Music Public Templates Videos
noah@helpdesk:~$
```

```
Terminal
0.6%] Tasks: 115, 380 thr, 196 kthr; 1 running
4.5%] Load average: 0.69 0.23 0.10
0.0%] Uptime: 00:32:11
0.0%]
Mem[|||||] 1.19G/3.78G]
Swp[|] 4.74M/3.78G]

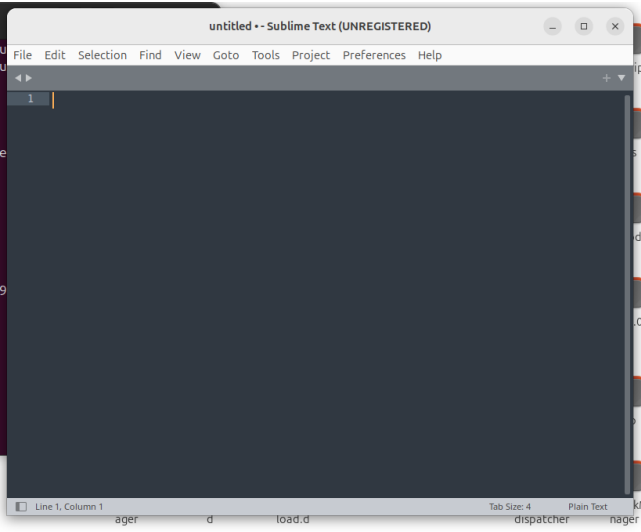
Main I/O
PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
6211 noah 20 0 11904 5376 3584 R 3.9 0.1 0:01.37 htop
2523 noah 20 0 4203M 253M 99168 S 1.3 6.6 0:37.03 /usr/bin/gnome-shell
2803 noah 20 0 212M 39476 29064 S 1.3 1.0 0:06.14 /usr/bin/vmtoolsd -n vmusr --blockFd 3 --uinputFd 4
2992 noah 20 0 269M 71072 42528 S 1.3 1.8 0:00.47 /usr/bin/Xwayland :0 -rootless -noreset -accessx -core -auth /run/user/1000/.mutter-Xwaylandauth
2565 noah 20 0 4203M 253M 99168 S 0.7 6.6 0:01.02 /usr/bin/gnome-shell
3880 noah 20 0 691M 58460 44852 S 0.7 1.5 0:04.58 /usr/libexec/gnome-terminal-server
1 root 20 0 23264 13924 9188 S 0.0 0.4 0:05.01 /sbin/init splash
383 root 19 -1 50848 16216 14680 S 0.0 0.4 0:00.55 /usr/lib/systemd/systemd-journald
419 root 20 0 148M 1660 1392 S 0.0 0.0 0:00.00 vmware-vmblock-fuse /run/vmblock-fuse -o rw,subtype=vmware-vmblock,default_permissions,allow_oth
420 root 20 0 148M 1660 1392 S 0.0 0.0 0:00.00 vmware-vmblock-fuse /run/vmblock-fuse -o rw,subtype=vmware-vmblock,default_permissions,allow_oth
421 root 20 0 148M 1660 1392 S 0.0 0.0 0:00.00 vmware-vmblock-fuse /run/vmblock-fuse -o rw,subtype=vmware-vmblock,default_permissions,allow_oth
439 root 20 0 32468 10128 4880 S 0.0 0.3 0:00.50 /usr/lib/systemd/systemd-udev
700 systemd-oo 20 0 17560 7636 6740 S 0.0 0.2 0:00.84 /usr/lib/systemd/systemd-oomd
703 systemd-re 20 0 21584 12860 10684 S 0.0 0.3 0:00.14 /usr/lib/systemd/systemd-resolved
706 systemd-tl 20 0 91048 7620 6852 S 0.0 0.2 0:00.06 /usr/lib/systemd/systemd-timesyncd
729 root 20 0 56064 11640 10232 S 0.0 0.3 0:00.04 /usr/bin/VCAuthService
732 root 20 0 239M 8840 7560 S 0.0 0.2 0:06.12 /usr/bin/vmtoolsd
820 root 20 0 239M 8840 7560 S 0.0 0.2 0:00.00 /usr/bin/vmtoolsd
866 systemd-tl 20 0 91048 7620 6852 S 0.0 0.2 0:00.00 /usr/lib/systemd/systemd-timesyncd
886 root 20 0 239M 8840 7560 S 0.0 0.2 0:00.26 /usr/bin/vmtoolsd
887 root 20 0 239M 8840 7560 S 0.0 0.2 0:00.00 /usr/bin/vmtoolsd
1079 avahi 20 0 8672 4148 4020 S 0.0 0.1 0:00.12 avahi-daemon: running [helpdesk.local]
1081 messagebus 20 0 12200 7260 4572 S 0.0 0.2 0:00.83 @dbus-daemon --system --address=systemd: --nofork --nopidfile --systemd-activation --syslog-only
1098 gnome-remo 20 0 420M 16384 13952 S 0.0 0.4 0:00.08 /usr/libexec/gnome-remote-desktop-daemon --system
1144 polkitd 20 0 381M 12108 8112 S 0.0 0.3 0:00.42 /usr/lib/polkit-1/polkitd --no-debug

F1 Help F2 Setup F3 Search F4 Filter F5 Tree F6 Sort By F7 Nice F8 Nice F9 All F10 Quit
```

Htop laat net als Task Manager de taken zien en hoeveel resources ze gebruiken.

```
noah@helpdesk:~$ sudo apt install sublime-text
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  libllvm19
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  sublime-text
0 upgraded, 1 newly installed, 0 to remove and 235 not upgraded.
Need to get 15.9 MB of archives.
After this operation, 54.3 MB of additional disk space will be used.
Get:1 https://download.sublimetext.com apt/stable/ sublime-text 4200 [15.9 MB]
debconf: delaying package configuration, since apt-utils is not installed
Fetched 15.9 MB in 3s (5,785 kB/s)
Selecting previously unselected package sublime-text.
Reading database ... 200740 files and directories currently installed.)
Preparing to unpack .../sublime-text_4200_and64.deb ...
Unpacking sublime-text (4200) ...
Setting up sublime-text (4200) ...
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) ...

libblockdev libverbs.d libnl-3 libpaperd logcheck
```



```
noah@helpdesk:~$ neofetch
      .-/+00ssss00+/- .
      `:+ssssssssssssss+:`
      --+ssssssssssssssyyssss+--
      .ossssssssssssssdMMMMNyssso.
      /ssssssssshdmmNNmnyNMMMMhsssss/
      +ssssssshnydMMMMMMNdddyssssss+
      /ssssssshNMMMyhhyyyhNMMMMhsssss/
      .ssssssdMMMNhssssssshNMMMdssssss.
      +ssshhhyNMMNysssssssyNMMMyssssss+
      ossyNMMNyMMhssssssssshmmhssssssso
      ossyNMMNyMMhssssssssshmmhssssssso
      +ssshhhyNMMNysssssssyNMMMyssssss+
      .ssssssdMMMNhssssssshNMMMdssssss.
      /ssssssshNMMMyhhyyyhNMMMMhsssss/
      +sssssssdnydMMMMMMNdddyssssss+
      /ssssssshdmmNNmnyNMMMMhsssss/
      .ossssssssssssssdMMMMNyssso.
      --+ssssssssssssssyyssss+--
      `:+ssssssssssssss+:`
      .-/+00ssss00+/- .

noah@helpdesk
-----
OS: Ubuntu 24.04.3 LTS x86_64
Host: VMware Virtual Platform None
Kernel: 6.14.0-33-generic
Uptime: 40 mins
Packages: 1845 (dpkg), 10 (snap)
Shell: bash 5.2.21
Resolution: 1718x878
DE: GNOME 46.0
WM: Mutter
WM Theme: Adwaita
Theme: Yaru [GTK2/3]
Icons: Yaru [GTK2/3]
Terminal: gnome-terminal
CPU: AMD Ryzen 7 5825U with Radeon Graphics (4) @ 1.996GHz
GPU: 00:0f:0 VMware SVGA II Adapter
Memory: 1300MiB / 3867MiB
```

Hardware en system informatie.

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

- Use the chmod command to make the file executable only for the logged-in user. Other users are only allowed to view the file via a text edit command such as cat or less. See the man pages of chmod how you could do this.

```
noah@helpdesk:~/hello$ man chmod
noah@helpdesk:~/hello$ chmod 744 script.sh
noah@helpdesk:~/hello$ ./script.sh
Hello, Noah! 499193
noah@helpdesk:~/hello$
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

```
noah@helpdesk:~/Downloads$ wc 1661-0.txt
12306 107562 607504 1661-0.txt
```

```
noah@helpdesk:~/Downloads$ wc -m 1661-0.txt
593731 1661-0.txt
```

12306 lines, 107562 words, 593731 characters.

```
noah@helpdesk:~/Downloads$ grep -n kingdom 1661-0.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
noah@helpdesk:~/Downloads$
```

“Kingdom” op line 490 & 1124.

```
noah@helpdesk:~/Downloads$ grep -n -C 10 "kingdom" 1661-0.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
```

```
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
noah@helpdesk:~/Downloads$
```

```
grep -n -C 10 "kingdom" 1661-0.txt
```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

```

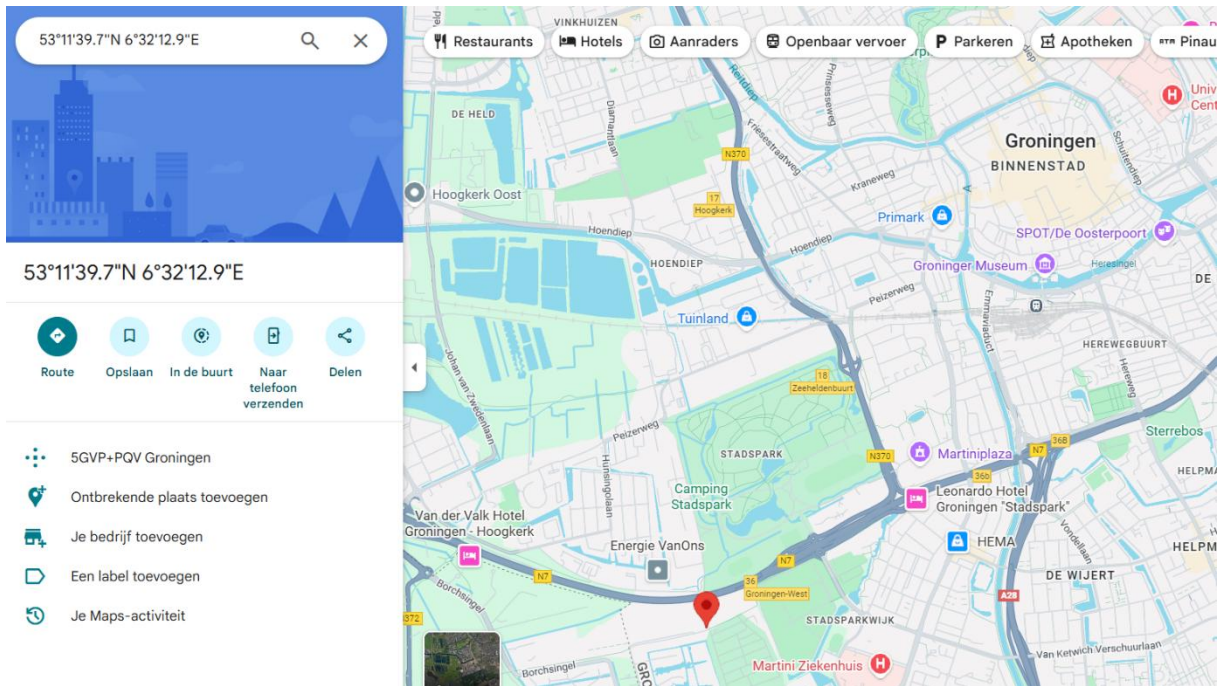
noah@helpdesk:~/Downloads$ exif oldcar.jpg
EXIF tags in 'oldcar.jpg' ('Motorola' byte order):
-----+-----
Tag                |Value
-----+-----
Manufacturer       |motorola
Model              |moto g(6) play
X-Resolution       |72
Y-Resolution       |72
Resolution Unit    |Inch
Software           |aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys
Date and Time      |2020:11:07 15:08:57
YCbCr Positioning |Centered
Compression        |JPEG compression
X-Resolution       |72
Y-Resolution       |72
Resolution Unit    |Inch
Exposure Time      |1/33 sec.
F-Number           |f/2.0
Exposure Program   |Normal program
ISO Speed Ratings  |64
Exif Version       |Exif Version 2.2
Date and Time (Original) |2020:11:07 15:08:57
Date and Time (Digitized) |2020:11:07 15:08:57
Components Configured |Y Cb Cr -
Shutter Speed      |5.05 EV (1/33 sec.)
Aperture           |2.00 EV (f/2.0)
Brightness         |-1.00 EV (1.71 cd/m^2)
Exposure Bias      |0.00 EV
Maximum Aperture Value |2.00 EV (f/2.0)
Metering Mode      |Center-weighted average
Flash              |Flash did not fire, auto mode
Focal Length       |3.5 mm
Maker Note         |1719 bytes undefined data
FlashPixVersion    |FlashPix Version 1.0
Color Space        |sRGB

```

Motorola Moto G6 Play

Lat: 53, 11, 39.6794 N

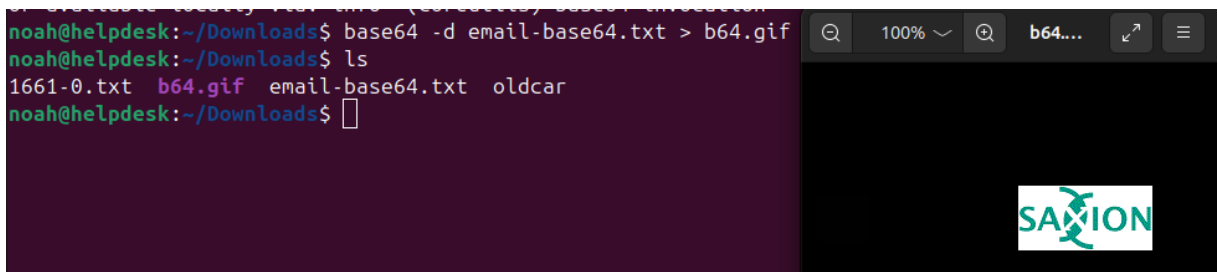
Lon: 6, 32, 12.9018 E



Deze foto is genomen in Groningen.

```
noah@helpdesk:~/Downloads$ file oldcar
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1,
=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resol
:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
```

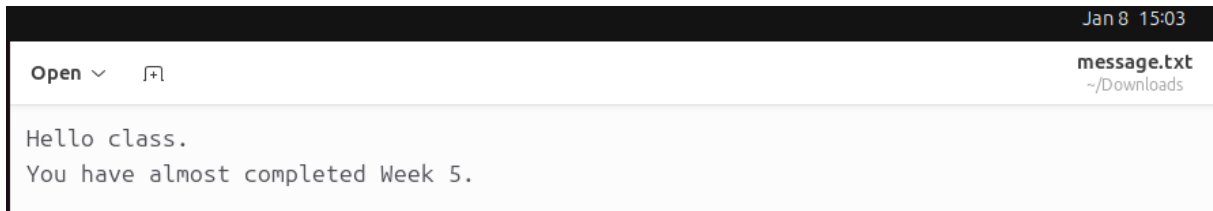
Zelfs na het verwijderen van de .jpg blijft het een jpg.



Assignment 5.8: Steganography

Relevant screenshots + motivation

```
noah@helpdesk:~/Downloads$ steghide extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
noah@helpdesk:~/Downloads$
```



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.

