

Template Week 5 – Operating Systems

Student number: 589768

Assignment 5.1: Unix-like

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

UNIX is een besturingssysteem met een officiële certificering. Unix-like besturingssystemen zijn geen officieel UNIX-besturingssysteem, maar ze lijken en voelen wel hetzelfde aan als UNIX-besturingssystemen.

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.

Linus Torvalds:

Hij heeft de originele Linux-kernel ontwikkeld.

Ken Thompson:

Hij is één van de bedenkers van UNIX. Hij ontwikkelde één van de eerste UNIX-besturingssystemen.

Dennis Ritchie:

Hij werkte samen met Ken Thompson. Hij ontwikkelde de programmeertaal C en herschreef UNIX in C. Daardoor werd UNIX draagbaar naar verschillende computers.

Bill Joy:

Hij was één van de belangrijkste personen achter BSD UNIX.

Richard Stallman:

Hij startte het GNU-project.

c) What is the philosophy of the GNU movement?

Het doel van de GNU-beweging is het ontwikkelen van een vrij besturingssysteem dat lijkt op UNIX, maar geen UNIX is.

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

Ja, dit is zo, omdat Ubuntu veel van de principes van GNU volgt.

Ubuntu is gratis te gebruiken

Ubuntu is Unix-like

Ubuntu is gebaseerd op GNU-software en de Linux-kernel

Gebruikers mogen de software gebruiken, aanpassen en verspreiden

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

Linux binnen Windows.

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

Unix-like.

Assignment 5.2: Supercomputers and gameconsoles

a) Research on this site what supercomputers are used for and write a short summary of it:

Supercomputers worden gebruikt voor zeer complexe en zware berekeningen die gewone computers niet aankunnen. Ze kunnen enorme hoeveelheden gegevens tegelijk verwerken en worden ingezet voor wetenschappelijk onderzoek, weers- en klimaatvoorspellingen, medisch onderzoek, ruimteonderzoek en grote simulaties in de industrie.

b) What is a PlayStation 3 cluster and what was it used for?

Een PlayStation 3-cluster is een netwerk van PS3-consoles die met elkaar verbonden waren en samen als supercomputer werden gebruikt voor wetenschappelijk en militair onderzoek. Onder andere het Amerikaanse leger gebruikte dit vanwege de hoge rekenkracht en relatief lage kosten.

c) What specific operating system is running on this cluster?

Het is een Linux-besturingssysteem dat door Oracle is aangepast, wat Oracle Linux is geworden.

d) Does Oracle's Raspberry Pi supercomputer appear in the list of the 500 fastest supercomputers in the world?

Nee, dat denk ik niet, omdat de rekenkracht van Raspberry Pi's veel te laag is vergeleken met echte supercomputers in deze ranglijst. Het maakt daarbij weinig uit of je er 1050 gebruikt, de totale rekenkracht blijft te beperkt.

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?

Welke CPU-architectuur wordt gebruikt:

PlayStation 5 gebruikt een x86-64-architectuur

Xbox Series X gebruikt ook een x86-64-architectuur

Welke besturingssystemen draaien erop:

PlayStation 5 draait een aangepast PlayStation OS, gebaseerd op BSD en dus Unix-achtig

Xbox Series X draait een aangepaste versie van Windows, gebaseerd op de Windows NT-kernel

Conclusie:

Ik heb gezocht in de lijst van de top 500 snelste supercomputers, maar kon daar niets vinden over de Raspberry Pi-supercomputer. Uiteindelijk heb ik aan ChatGPT gevraagd hoeveel keer langzamer de Raspberry Pi-supercomputer is vergeleken met de snelste computer in de lijst. Het antwoord dat ik kreeg was ongeveer 200.000 keer langzamer, wat ik niet had verwacht.

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 E

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

Windows + Pause/Break

- 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 + pause break

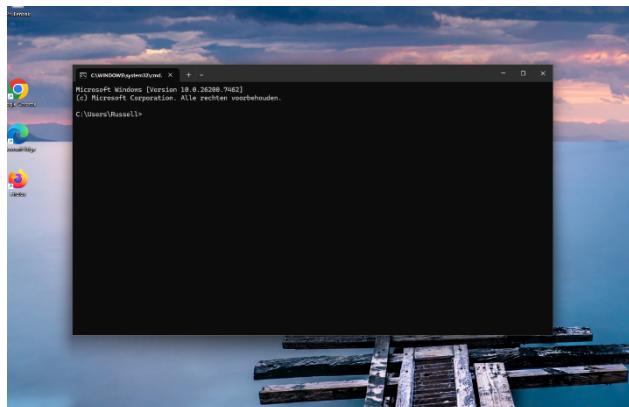
- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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



Working in the File Explorer

Relevant screenshots **copy** command:

```
C:\Windows\System32\cmd.exe + 
Microsoft Windows [Version 10.0.26200.6586]
(c) Microsoft Corporation. Alle rechten voorbehouden.

C:\Saxion>copy wave.png "Saxion\HBOICT\YEAR1\QUARTILE1\IP"
Het systeem kan het opgegeven pad niet vinden.
    0 file(s) copied.

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

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

C:\Saxion>
```


Naam	Gewijzigd op	Type	Grootte
info.txt	7-1-2026 22:15	Tekstdocument	1 kB
Wave	7-1-2026 22:22	PNG-bestand	352 kB

Relevant screenshots **tree** command:

```
C:\Windows\System32\cmd.exe + 
C:.

HBOICT
└──YEAR1
    ├──QUARTILE1
    │   ├──Infrastructure
    │   ├──IP
    │   └──Org IT
    ├──QUARTILE2
    │   ├──Databases
    │   │   ├──Fundamentals
    │   │   └──IT game
    │   ├──QUARTILE3
    │   └──QUARTILE4
    └──YEAR2
        ├──QUARTILE1
        ├──QUARTILE2
        ├──QUARTILE3
        └──QUARTILE4
    └──YEAR3
        ├──QUARTILE1
        ├──QUARTILE2
        ├──QUARTILE3
        └──QUARTILE4
    └──YEAR4
        ├──QUARTILE1
        ├──QUARTILE2
        ├──QUARTILE3
        └──QUARTILE4

C:\Saxion>echo %RussellVerver%
```

Relevant

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

The image shows two screenshots of the Windows File Explorer interface.

Screenshot 1: 'Org IT' Folder

The address bar shows the path: Org IT > ... > Saxion > HBOICT > YEAR1 > QUARTILE1 > Org IT. The search bar says 'Zoeken in Org IT'. The left sidebar shows standard folder categories like Bureaublad, Downloads, Documenten, etc. The main area lists three items:

Naam	Gewijzigd op	Type	Grootte
info.txt	7-1-2026 22:15	Tekstdocument	1 kB
Wave	7-1-2026 22:22	PNG-bestand	352 kB

Screenshot 2: 'Lokale schijf (C:)' Folder

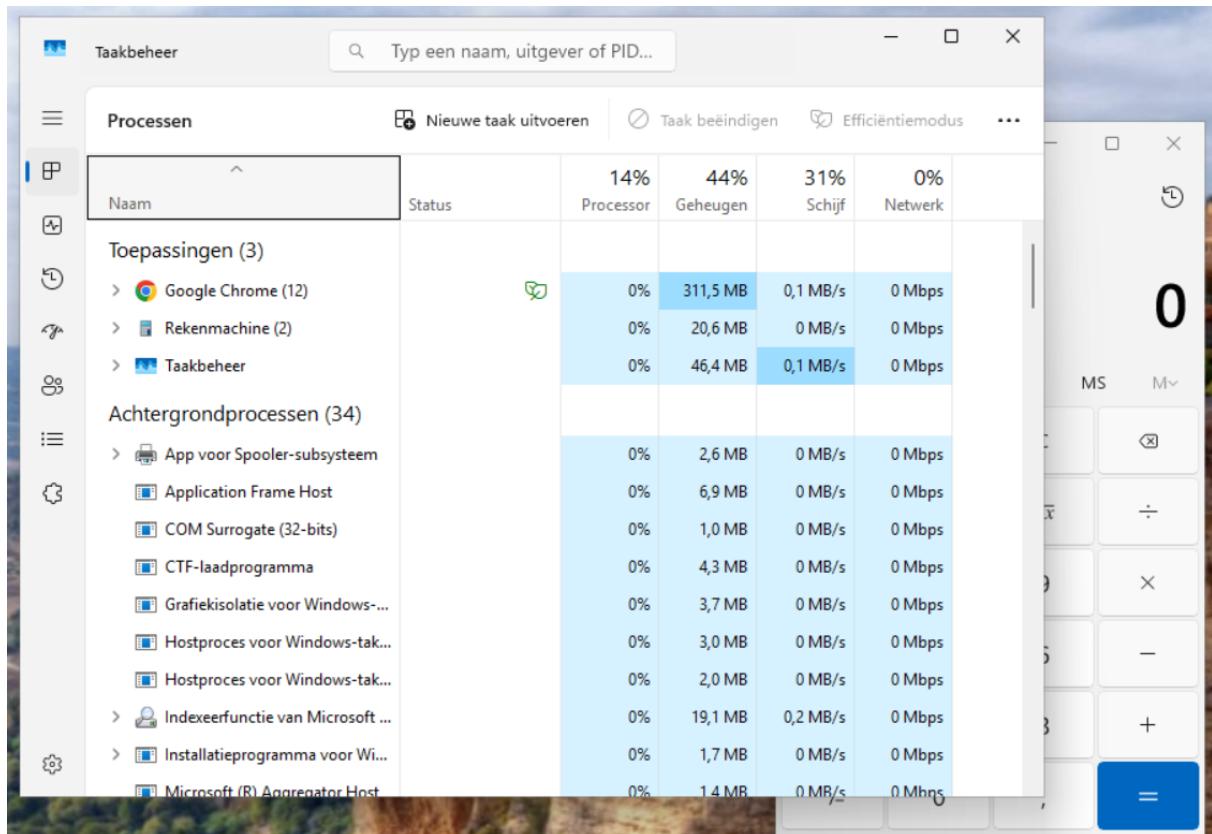
The address bar shows the path: Deze pc > Lokale schijf (C:) >. The search bar says 'Zoeken in Lokale schijf (C:)'. The left sidebar shows standard folder categories. The main area lists several folders, with one item selected:

Naam	Gewijzigd op	Type	Grootte
Gebruikers	7-1-2026 22:10	Bestandsmap	
inetpub	15-9-2025 21:52	Bestandsmap	
PerfLogs	1-4-2024 09:26	Bestandsmap	
Program Files	7-1-2026 22:18	Bestandsmap	
Program Files (x86)	7-1-2026 22:18	Bestandsmap	
Sexion	7-1-2026 22:23	Bestandsmap	
Windows	7-1-2026 22:27	Bestandsmap	
Windows.old	7-1-2026 21:46	Bestandsmap	
Sexion	7-1-2026 22:31	Gecomprimeerde...	2.142 kB

At the bottom, it says '9 items 1 item geselecteerd 2,09 MB'.

Terminating Processes

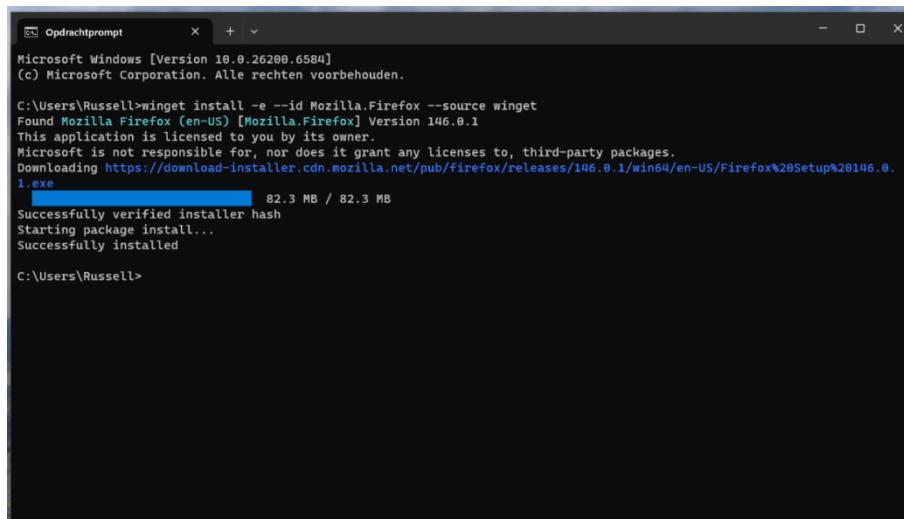
Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:

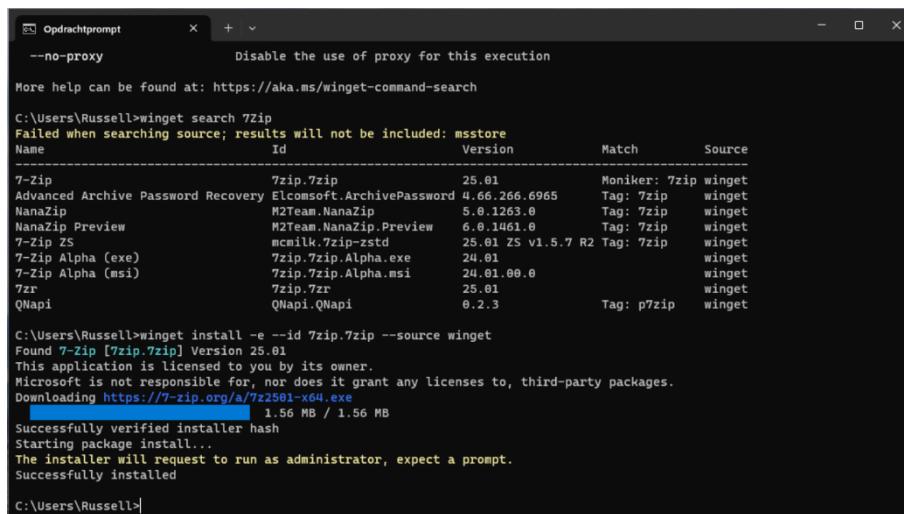
- WinSCP
- Notepad++
- 7zip



```
Opdrachtprompt
Microsoft Windows [Version 10.0.26200.6584]
(c) Microsoft Corporation. Alle rechten voorbehouden.

C:\Users\Russell>winget install -e --id Mozilla.Firefox --source winget
Found Mozilla Firefox [Mozilla.Firefox] Version 146.0.1
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/146.0.1/win64/en-US/Firefox%20Setup%20146.0.
1.exe
[redacted] 82.3 MB / 82.3 MB
Successfully verified installer hash
Starting package install...
Successfully installed

C:\Users\Russell>
```



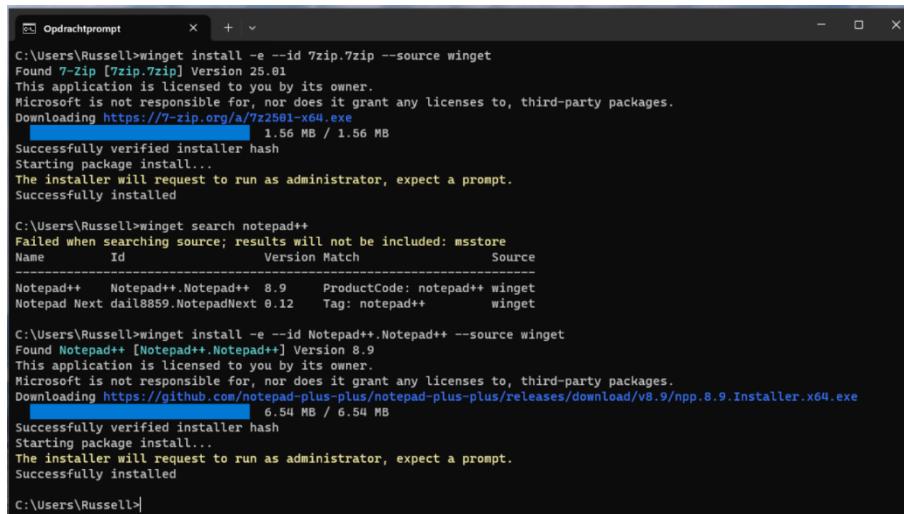
```
Opdrachtprompt
--no-proxy Disable the use of proxy for this execution

More help can be found at: https://aka.ms/winget-command-search

C:\Users\Russell>winget search 7Zip
Failed when searching source; results will not be included: msstore
Name           Id          Version      Match      Source
-----
7-Zip          7zip.7zip    25.01       Moniker: 7zip winget
Advanced Archive Password Recovery Elcomsoft.ArchivePassword 4.66.266.6965 Tag: 7zip winget
NanZip         M2Team.NanZip 5.0.1263.0  Tag: 7zip winget
NanZip Preview M2Team.NanZip.Preview 6.0.1461.8 Tag: 7zip winget
7-Zip ZS      mcmilk.7zip-zstd 25.01 ZS v1.5.7 R2 Tag: 7zip winget
7-Zip Alpha (exe) 7zip.7zip.Alpha.exe 24.01   winget
7-Zip Alpha (msi) 7zip.7zip.Alpha.msi 24.01   winget
7zr            7zip.7zr      25.01       winget
QNapi          QNapi.QNapi   0.2.3       Tag: p7zip winget

C:\Users\Russell>winget install -e --id 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
[redacted] 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\Russell>
```



```
Opdrachtprompt
C:\Users\Russell>winget install -e --id 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
[redacted] 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\Russell>winget search notepad++
Failed when searching source; results will not be included: msstore
Name           Id          Version      Match      Source
-----
Notepad++     Notepad++.Notepad++ 8.9       ProductCode: notepad++ winget
Notepad Next  dail8859.NotepadNext 0.12      Tag: notepad++ winget

C:\Users\Russell>winget install -e --id 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
[redacted] 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\Russell>
```

Assignment 5.4: Working with Linux

Relevant screenshots + motivation

Een groot verschil in mappen structuur windows en linux

Een groot verschil in mappenstructuur is dat bij linux alles in een boom staat terwijl dat windows allemaal verschillende schijven gebruikt.

Waar word de het /etc pad voor gebruikt?

Hierin staan bestanden in over de configuratie en de instellingen voor het operating system en voor geïnstalleerde apps.

Wat is htop?

Htop is een programma in de terminal waarop je kunt zien wat er allemaal met je computer gebeurd. Je kunt zien wat het gebruik is van je geheugen en processor ook zie je welke programma's actief zijn. Eigenlijk kun je kijken of je computer zwaar belast wordt.

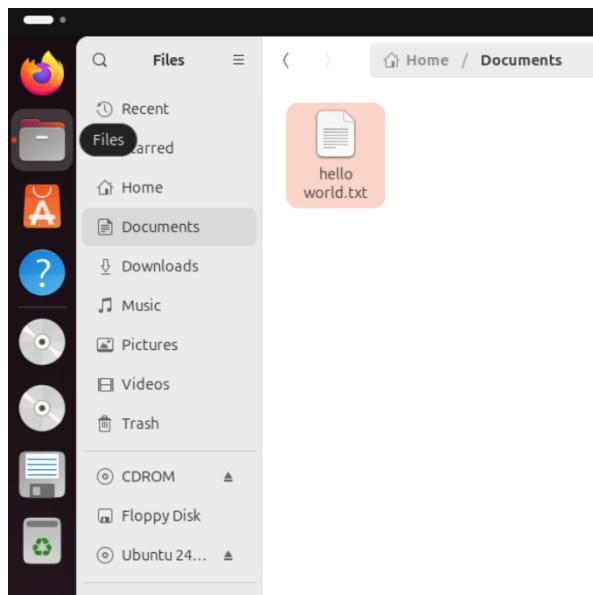
Wat is neofetch?

Neofetch is een applicatie die je opstart in de terminal en waar je gegevens kunt vinden over je systeem denk hierbij aan de hardware die je gebruikt, welke os je gebruikt , welke kernel versie je gebruikt en nog veel meer.

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

Bestand gekopieerd van home naar Documents via de optie copy to



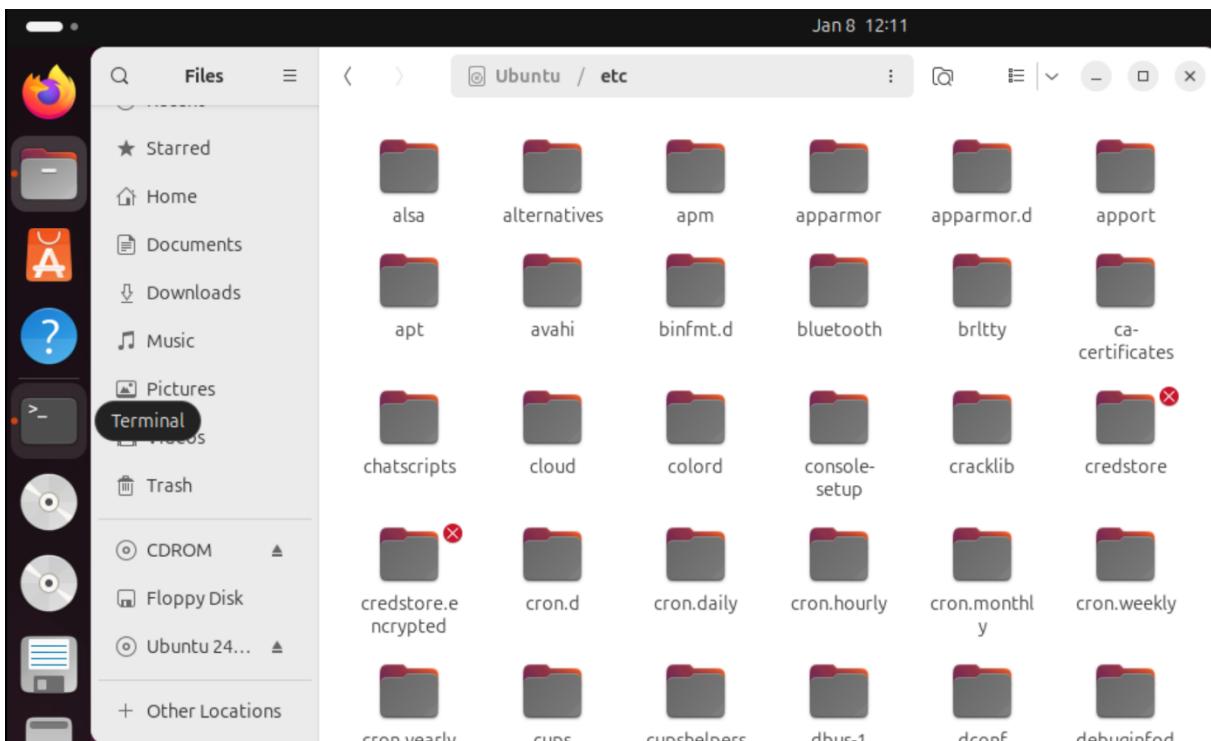
Een bestand gekopieerd via de terminal.

A screenshot of a Linux terminal window titled 'russell-verver@russell-verver-VMware-Virtual-Platform: ~'. The terminal shows the following command and its execution:

```
Preparing to unpack .../steghide_0.5.1-15_amd64.deb ...
Unpacking steghide (0.5.1-15) ...
Setting up libmhash2:amd64 (0.9.9.9-9build3) ...
Setting up libmcrypt4 (2.5.8-7) ...
Setting up steghide (0.5.1-15) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ cp hello world.txt/Documents
cp: cannot stat 'hello': No such file or directory
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ cp hello world.txt/Home/Documents
cp: cannot stat 'hello': No such file or directory
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ cp test.txt/Home/Documents
cp: missing destination file operand after 'test.txt/Home/Documents'
Try 'cp --help' for more information.
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ cp ~/test.txt ~/Documents/
cp: cannot create regular file '/home/russell-verver/Documenten/': Not a directory
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ cp ~/test.txt ~/Documents
russell-verver@russell-verver-VMware-Virtual-Platform: ~$ $
```

The terminal shows several errors due to incorrect paths, but it also successfully moves the 'hello' file to the 'Documents' directory.

De etc map gevonden.



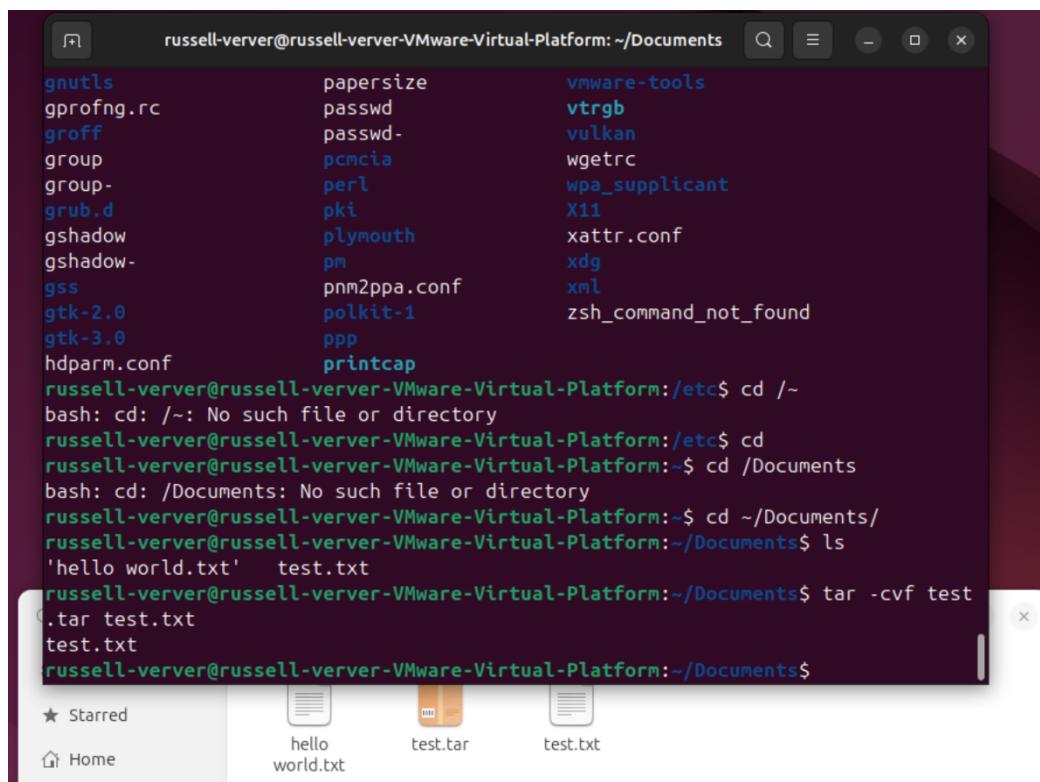
De etc map bereikt via de terminal.

```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ cd /etc
russell-verver@russell-verver-VMware-Virtual-Platform:/etc$ cd /etc
russell-verver@russell-verver-VMware-Virtual-Platform:/etc$ pwd
/etc
russell-verver@russell-verver-VMware-Virtual-Platform:/etc$
```

Terug naar de Home map gegaan.

```
russell-verver@russell-verver-VMware-Virtual-Platform:/etc$ cd
russell-verver@russell-verver-VMware-Virtual-Platform:~$
```

Een bestand kleiner gemaakt via de terminal.



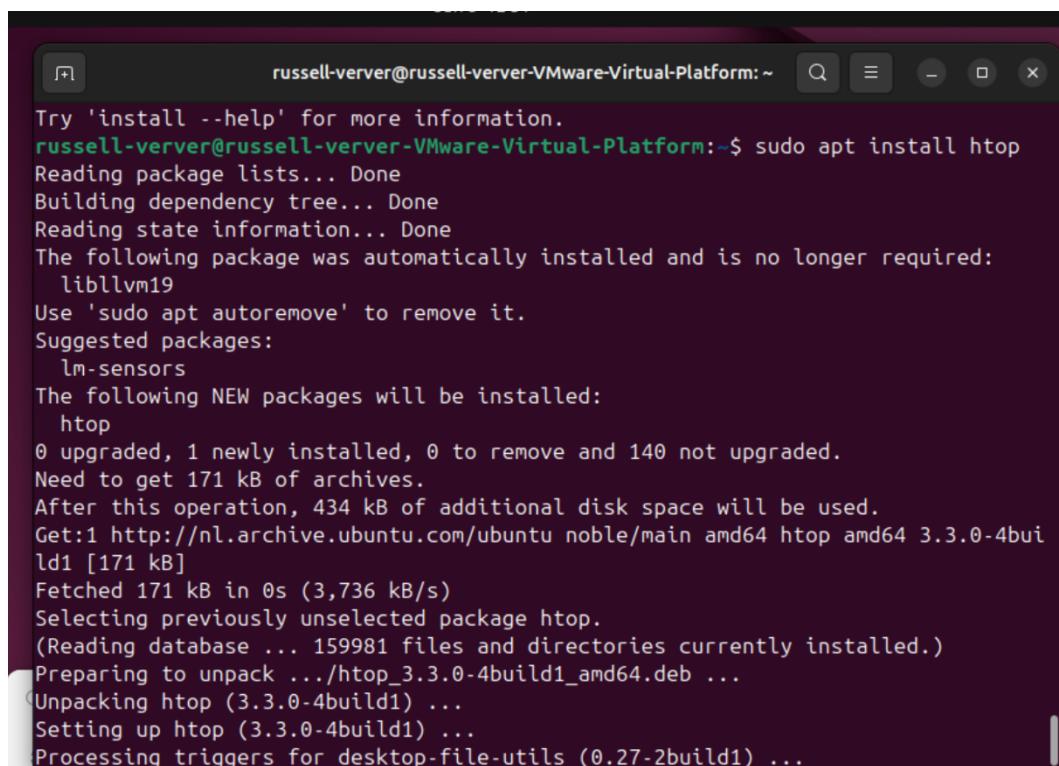
The screenshot shows a terminal window titled "russell-verver@russell-verver-VMware-Virtual-Platform: ~/Documents". The user runs several commands to navigate to the home directory, then to the Documents folder, lists files, and creates a tar archive named "test". The terminal then exits. Below the terminal, a file manager interface shows the "test.tar" file.

```
gnutls      papersize      vmware-tools
gprofng.rc  passwd        vtrgb
groff       passwd-       vulkan
group       pcmcia        wgetrc
group-      perl          wpa_supplicant
grub.d      pki           X11
gshadow     plymouth       xattr.conf
gshadow-    pm            xdg
gss         pmn2ppa.conf   xml
gtk-2.0    polkit-1      zsh_command_not_found
gtk-3.0    ppp           printcap
hdparm.conf
russell-verver@russell-verver-VMware-Virtual-Platform:~/etc$ cd ~
bash: cd: /: No such file or directory
russell-verver@russell-verver-VMware-Virtual-Platform:~/etc$ cd
russell-verver@russell-verver-VMware-Virtual-Platform:~$ cd /Documents
bash: cd: /Documents: No such file or directory
russell-verver@russell-verver-VMware-Virtual-Platform:~$ cd ~/Documents/
russell-verver@russell-verver-VMware-Virtual-Platform:~/Documents$ ls
'hello world.txt'  test.txt
russell-verver@russell-verver-VMware-Virtual-Platform:~/Documents$ tar -cvf test
.tar test.txt
test.txt
russell-verver@russell-verver-VMware-Virtual-Platform:~/Documents$
```

★ Starred hello world.txt test.tar test.txt

Home

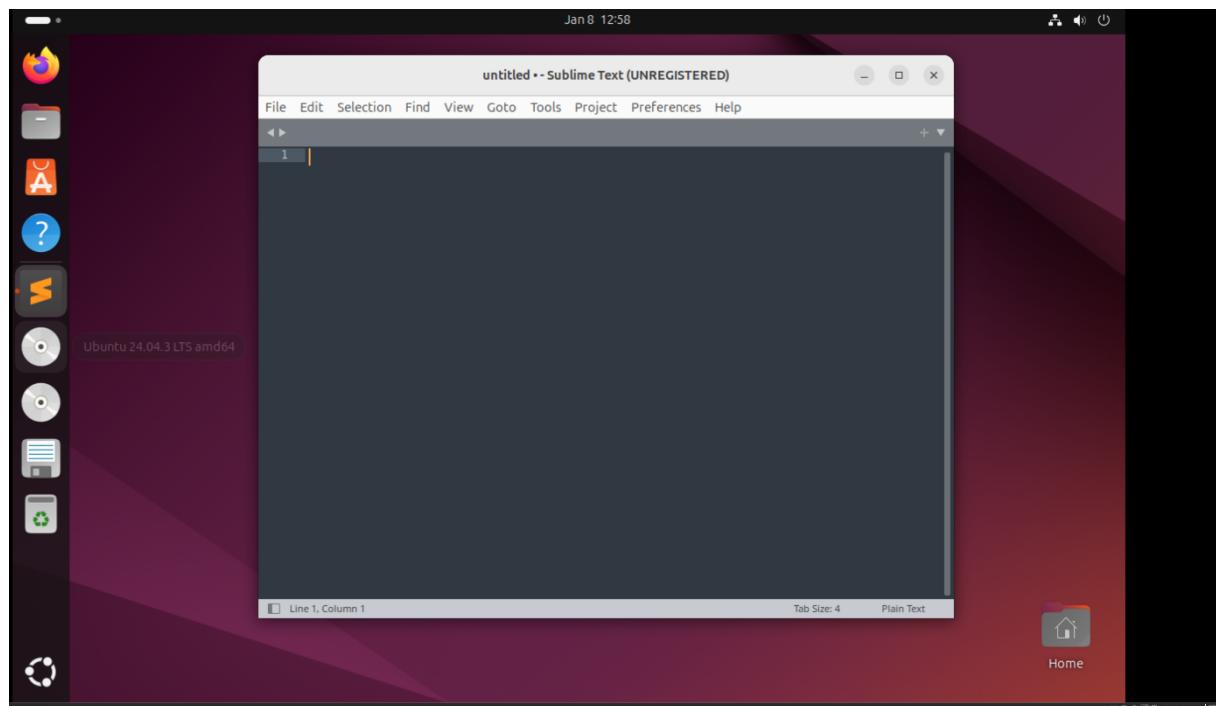
Htop geïnstalleerd.



The screenshot shows a terminal window titled "russell-verver@russell-verver-VMware-Virtual-Platform: ~". The user runs "sudo apt install htop", which outputs a detailed list of package dependencies, upgrades, and installations. It shows the download of the "htop_3.3.0-4build1_amd64.deb" file from "http://nl.archive.ubuntu.com/ubuntu/noble/main amd64 htop amd64 3.3.0-4bui". The process continues with unpacking, setting up, and processing triggers for desktop-file-utils.

```
Try 'install --help' for more information.
russell-verver@russell-verver-VMware-Virtual-Platform:~$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
 liblvm19
Use 'sudo apt autoremove' to remove it.
Suggested packages:
 lm-sensors
The following NEW packages will be installed:
 htop
0 upgraded, 1 newly installed, 0 to remove and 140 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 3.3.0-4bui
ld1 [171 kB]
Fetched 171 kB in 0s (3,736 kB/s)
Selecting previously unselected package htop.
(Reading database ... 159981 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) ...
```

subline text geinstaleerd.



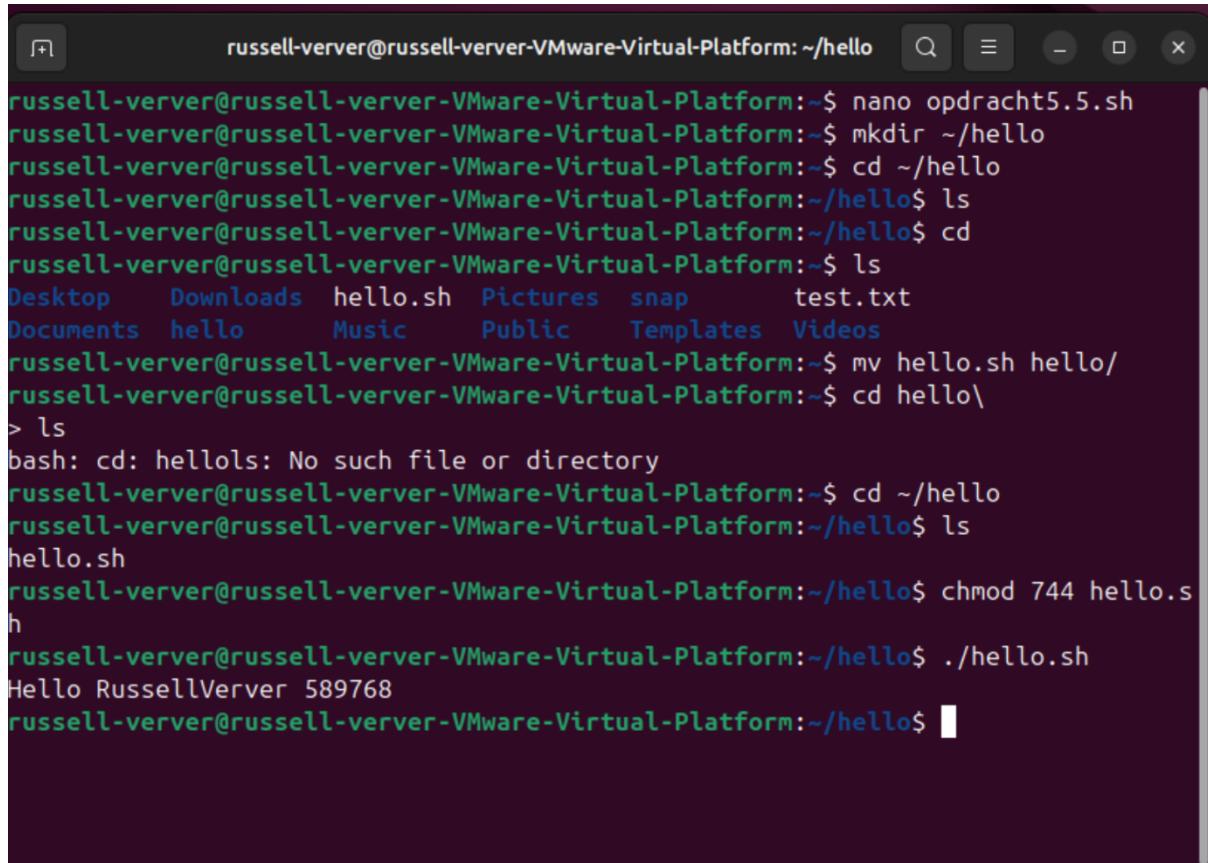
```
russell-verver@russell-verver-VMware-Virtual-Platform:~
```

0[| |] 3.2%] Tasks: 114, 366 thr, 246 kthr; 1 running
1[| |] 3.3%] Load average: 1.88 0.58 0.20
2[| |] 0.0%] Uptime: 00:00:41
3[| |] 0.7%]
Mem[|||||] 994M/8.26G
Swp[0K/4.00G]

Main	I/O										
PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
1417	root	20	0	305M	7924	7048	S	0.0	0.1	0:00.00	/usr/libexec/
1418	root	20	0	305M	7924	7048	S	0.0	0.1	0:00.00	/usr/libexec/
1421	root	20	0	305M	7924	7048	S	0.0	0.1	0:00.00	/usr/libexec/
1422	root	20	0	530M	14980	11880	S	0.0	0.2	0:00.00	/usr/libexec/
Ubuntu 24.04.3 LTS amd64		20	0	530M	14980	11880	S	0.0	0.2	0:00.00	/usr/libexec/
1425	root	20	0	17380	6604	5724	S	0.0	0.1	0:00.02	/usr/sbin/wpa
1427	root	20	0	530M	14980	11880	S	0.0	0.2	0:00.00	/usr/libexec/
1431	syslog	20	0	217M	6656	4596	S	0.0	0.1	0:00.01	/usr/sbin/rsy
1432	syslog	20	0	217M	6656	4596	S	0.0	0.1	0:00.00	/usr/sbin/rsy
1433	syslog	20	0	217M	6656	4596	S	0.0	0.1	0:00.02	/usr/sbin/rsy
1440	polkitd	20	0	375M	11236	7900	S	0.0	0.1	0:00.00	/usr/lib/polk
1441	polkitd	20	0	375M	11236	7900	S	0.0	0.1	0:00.00	/usr/lib/polk
1442	polkitd	20	0	375M	11236	7900	S	0.0	0.1	0:00.04	/usr/lib/polk

F1Help F2Setup F3Search F4Filter F5Tree F6SortByF7Nice -F8Nice +F9Kill F10Quit

5.5 assignment



```
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ nano opdracht5.5.sh
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ mkdir ~/hello
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ cd ~/hello
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ ls
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ cd
russell-verver@russell-verver-VMware-Virtual-Platform:~/ls
Desktop  Downloads  hello.sh  Pictures  snap      test.txt
Documents  hello   Music    Public    Templates  Videos
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ mv hello.sh hello/
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ cd hello\
> ls
bash: cd: hellols: No such file or directory
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ cd ~/hello
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ ls
hello.sh
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ chmod 744 hello.s
h
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello RussellVerver 589768
russell-verver@russell-verver-VMware-Virtual-Platform:~/hello$
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

What does each of these commands do ?

Cat : Toont de volledige inhoud van een bestand direct in de terminal

Wc : telt de regels,woorden en tekens in een bestand

Less: met less kun je pagina voor pagina in een bestand kijken

Tail : tail laat de laatste regels van een bestand zien

Grep: met grep kun je naar specifieke tekst zoeken in een document

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

Regels : 12306

Woorden : 107562

Tekens : 607504

On which lines is the word “kingdom” in the file?

Regel 490 en regel 1124

Bovenste 10 regels en de onderste 10 regels

```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ tail -n 10 Sherlock.txt

Most people start at our website which has the main PG search
facility: www.gutenberg.org.

This website includes information about Project Gutenberg™,
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.

russell-verver@russell-verver-VMware-Virtual-Platform:~$
```

```
The Project Gutenberg eBook of The Adventures of Sherlock Holmes,  
by Arthur Conan Doyle
```

```
This eBook is for the use of anyone anywhere in the United States and  
most other parts of the world at no cost and with almost no restrictions  
whatsoever. You may copy it, give it away or re-use it under the terms  
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.
```

```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ S
```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

Information oldcar.jpg

Merk : mototola

Stad : Groningen

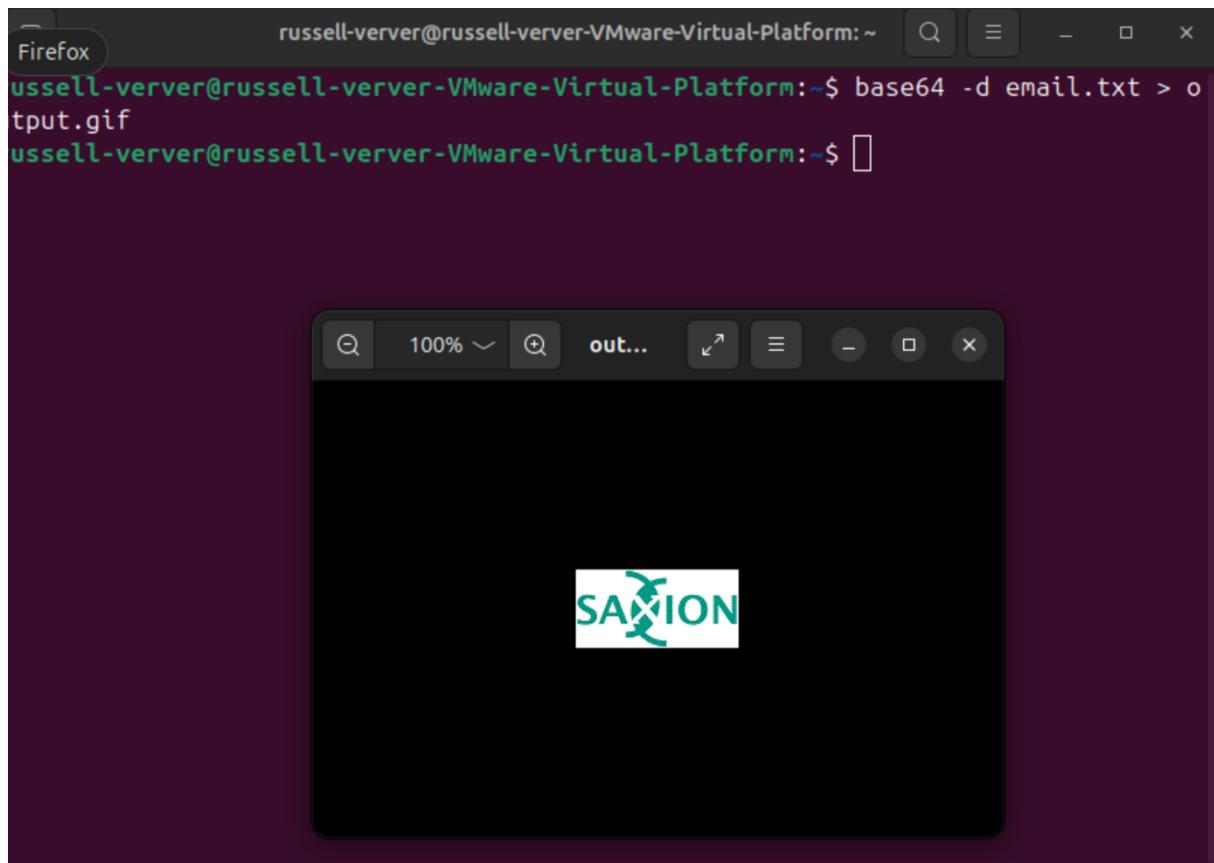
```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ file oldcar  
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1, segment  
length 16, Exif Standard: [TIFF image data, big-endian, direntries=10, manufac-  
turer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolution  
unit=2, software=aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys, datetime=2  
020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3  
russell-verver@russell-verver-VMware-Virtual-Platform:~$
```

Ja ubuntu ziet het nog steeds als een jpg afbeelding.

Gif afbeelding

Firefox russell-verver@russell-verver-VMware-Virtual-Platform:~

```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ base64 -d email.txt > output.gif
russell-verver@russell-verver-VMware-Virtual-Platform:~$ 
```



The image shows a terminal window at the top with the command `base64 -d email.txt > output.gif` being run. Below it is a screenshot of a browser window titled "out..." which displays the SAXION logo.

Assignment 5.8: Steganography

Relevant screenshots + motivation

```
russell-verver@russell-verver-VMware-Virtual-Platform: ~
-v, --verbose           display detailed information

extracting options:
-sf, --stegofile        select stego file
-sf <filename>          extract data from <filename>
-p, --passphrase         specify passphrase
-p <passphrase>         use <passphrase> to extract data
-xf, --extractfile      select file name for extracted data
-xf <filename>          write the extracted data to <filename>
-f, --force              overwrite existing files
-q, --quiet              suppress information messages
-v, --verbose            display detailed information

options for the info command:
-p, --passphrase         specify passphrase
-p <passphrases>        use <passphrase> to get info about embedded data

To embed emb.txt in cvr.jpg: steghide embed -cf cvr.jpg -ef emb.txt
To extract embedded data from stg.jpg: steghide extract -sf stg.jpg
russell-verver@russell-verver-VMware-Virtual-Platform:~$ steghide extract -sf ap
ple.jpg
Enter passphrase:
wrote extracted data to "message.txt".
russell-verver@russell-verver-VMware-Virtual-Platform:~$ 
```



The terminal window shows the following output:

```
Open ~
• message.txt
email.txt
● message.txt
```

Message content:

```
Hello class.  
You have almost completed Week 5.
```

Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:

Debian server setup, ssh server running.

```
:56 SHA256:SbiWrnzSW4ZsUhwkDexDzkz/zVUexqP03yu4oWcrLQY root@debian (ED25519)
:creating user 'sshd' (ssh user) with UID 986 and GID 65534.
:created symlink '/etc/systemd/system/sshd.service' → '/usr/lib/systemd/system/ssh.service'.
:created symlink '/etc/systemd/system/user.target.wants/ssh.service' → '/usr/lib/systemd/system/ssh.service'.
:sshd.socket is a template for a static unit, not staninig it.
:created symlink '/etc/systemd/system/ssh.service.wants/sshd-keygen.service' → '/usr/lib/systemd/system/sshd-keygen.service'.
:created symlink '/etc/systemd/system/sshd@.service.wants/sshd-keygen.service' → '/usr/lib/systemd/system/sshd-keygen.service'.
:created symlink '/etc/systemd/system/ssh.socket.wants/sshd-keygen.service' → '/usr/lib/systemd/system/sshd-keygen.service'.
:processing triggers for man-db (2.13.1-1)
root@debian:/home/russell# systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
  Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: enabled)
  Active: active (running) since Thu 2026-01-08 18:47:14 EST; 24s ago
Invocation-ID: 65e675c6141c467f86f50e7ba7589572
  Docs: man:sshd(8)
        man:sshd config(5)
 Main PID: 3445 (sshd)
   Tasks: 1 (limit: 4589)
     Memory: 1.3M (peak: 2M)
       CPU: 59ms
      CGroup: /system.slice/ssh.service
              └─3445 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups

Jan 08 18:47:14 debian systemd[1]: Starting ssh.service - OpenBSD Secure Shell server...
Jan 08 18:47:14 debian sshd[3445]: Server listening on 0.0.0.0 port 22.
Jan 08 18:47:14 debian sshd[3445]: Server listening on :: port 22.
Jan 08 18:47:14 debian systemd[1]: Started ssh.service - OpenBSD Secure Shell server.
root@debian:/home/russell# █
```

Map aangemaakt voor de images.

```
Jan 08 18:47:14 debian systemd[1]: Starting ssh.service - OpenBSD Secure Shell server...
Jan 08 18:47:14 debian sshd[3445]: Server listening on 0.0.0.0 port 22.
Jan 08 18:47:14 debian sshd[3445]: Server listening on :: port 22.
Jan 08 18:47:14 debian systemd[1]: Started ssh.service - OpenBSD Secure Shell server.
root@debian:/home/russell# sudo mkdir -p /srv/images
root@debian:/home/russell# sudo chown russell:rUSER /srv/images
root@debian:/home/russell# ls -ld /srv/images
drwxr-xr-x 2 russell russell 4096 Jan 8 18:48 /srv/images
root@debian:/home/russell# █
```

ip adres van de debian 13 server.

```
root@debian:/home/russell# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 brd 127.0.0.1 scope host lo
            valid_lft forever preferred_lft forever
            inet6 ::1/128 brd 00:00:00:00:00:00 scope host noprefixroute
                valid_lft forever preferred_lft forever
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:58:ea:97 brd ff:ff:ff:ff:ff:ff
        altname enp2s1
        altname enp2s1
        altname enx000c2958ea97
        inet 192.168.154.130/24 brd 192.168.154.255 scope global dynamic noprefixroute ens3
            valid_lft 1367sec preferred_lft 1367sec
            inet6 fe80::20c:29ff:fe58:ea97%ens3 brd ff:ff:ff:ff:ff:ff scope link noprefixroute
                valid_lft forever preferred_lft forever
root@debian:/home/russell# █
```

De debian 13 server is te bereiken via ubuntu.

```
russell-verver@russell-verver-VMware-Virtual-Platform:~$ ssh russell@192.168.154.130
The authenticity of host '192.168.154.130 (192.168.154.130)' can't be established.
ED25519 key fingerprint is SHA256:SbiWrnzSW4ZsUhwkDexDzkz/zVUexqP03yu4oWcrLQY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.154.130' (ED25519) to the list of known hosts.
russell@192.168.154.130's password:
Linux debian 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-1-05) x86_64

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

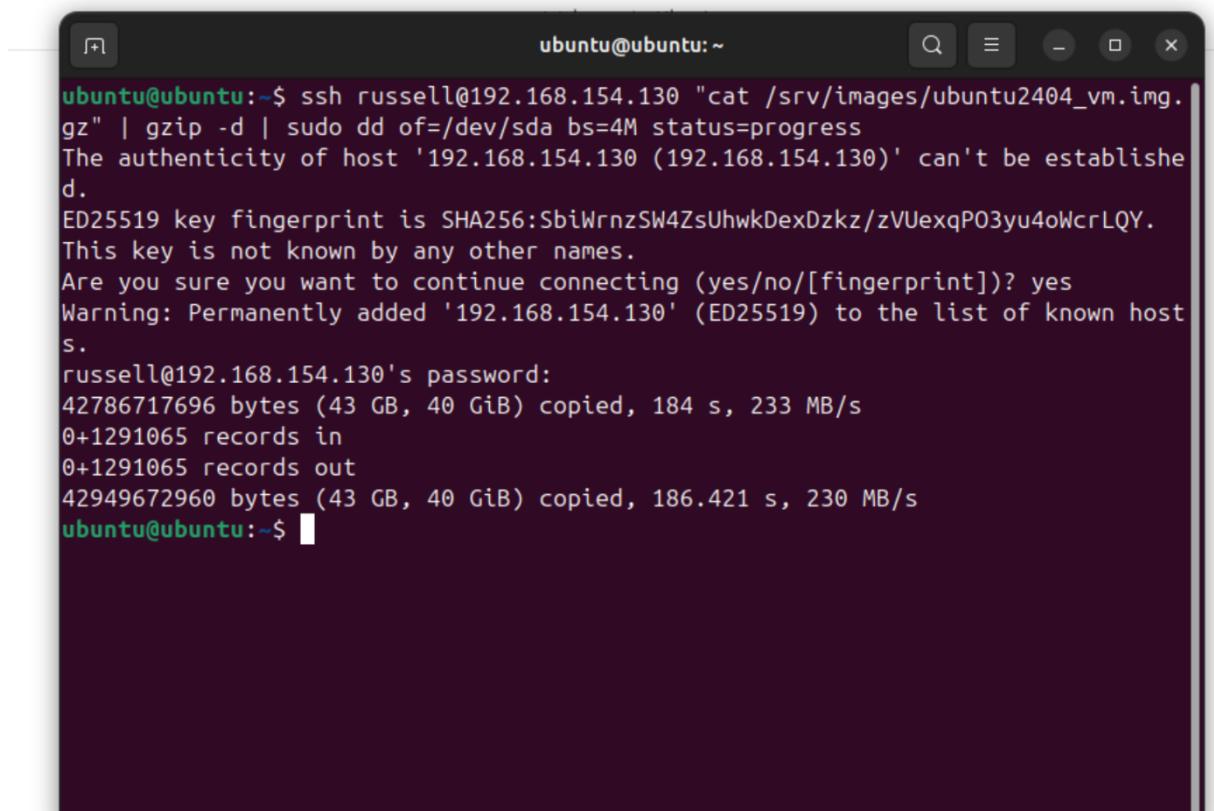
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
russell@debian:~$ █
```

Images van ubuntu opgeslagen op de debian 13 server.



```
russell@debian:~$ ls -lh /srv/images
total 4.8G
-rw-rw-r-- 1 russell russell 8 Jan 8 20:01 test_ok.txt
-rw-rw-r-- 1 russell russell 4.8G Jan 8 20:11 ubuntu2404_vm.img.gz
russell@debian:~$ █
```

Images terug gehaald van de debian 13 server en terug gezet op een nieuwe ubuntu.



```
ubuntu@ubuntu:~$ ssh russell@192.168.154.130 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
The authenticity of host '192.168.154.130 (192.168.154.130)' can't be established.
ED25519 key fingerprint is SHA256:SbiWrnzSW4ZsUhwkDexDzkz/zVUexqP03yu4oWcrLQY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.154.130' (ED25519) to the list of known hosts.
russell@192.168.154.130's password:
42786717696 bytes (43 GB, 40 GiB) copied, 184 s, 233 MB/s
0+1291065 records in
0+1291065 records out
42949672960 bytes (43 GB, 40 GiB) copied, 186.421 s, 230 MB/s
ubuntu@ubuntu:~$ █
```

een volledig herstelde ubuntu.



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