# Template Week 5 – Operating Systems

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**Assignment 5.1: Unix-like**

a)  Find out what the difference is between UNIX and unix-like operating systems?
    Unix-like operating systems behave like UNIX but they are not UNIX, examples are Linux, BSD,
    macOS which behave like UNIX but aren't the original.

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:**
    He co-created UNIX together with Dennis Ritchie and he developed the B programming language
    **Dennis Rithcie:**
    He co-created UNIX together with Ken Thompson and he developed the C programming language
    in which UNIX is written
    **Bill joy:**
    Is a co-founder of Sun Microsystems and contributed to the development of Berkeley Software
    Distribution of UNIX. And also he led to the development of the Java Platform.
    **Richard Stallman:**
    He is the founder of the GNU Project which is a Unix-like operating system. And he created The
    General Public License which ensured Software freedom and it's the foundation of linux.
    **Linus Torvalds:**
    He is the founder of Linux kernel which is the core, central program of the Linux OS.

c)  What is the philosophy of the GNU movement?
    These are the main things behind the GNU movement:
    Free software: They wanted to give users the freedom to run, modify and share the software.
    Software freedom: They didn't want software restricting users
    Collaboration: Open-source collaboration for community improvement

d)  Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement?
    Please explain your answer.
    Yes, Ubuntu is based on Linux kernel and GNU software. So therefore conforming to the
    philosophy of the GNU movement.

e)  Find out what is the Windows Subsystem for Linux?
    A WSL is a feature of that allows you to run a Linux environment on a Windows operating
    system. Without the need for a VM or dual booting.

f)  Find out, which operating system family belongs to Android, iOS and ChromeOS?
    Android: Linux-based
    iOS: Unix-like
    ChromeOS: Linux-based

**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 are very powerful computers with massive processing power made and used for complex calculations. They are essentially used for weather forecasting, scientific research, artificial intelligence etc. A supercomputer can do certain tasks up to a million times faster than a regular computer. We rely on supercomputers day to day and they are the foundation of scientific research and solving complex problems

b)  IBM is a company that has already built a number of supercomputers. One of them is IBM's Roadrunner. The CPU developed for this supercomputer was further developed at a later stage as the CPU for the PlayStation 3 console. Find out what a **PlayStation 3 cluster** is and what it was used for?

    A PlayStation 3 cluster is basically just as the name says a 'cluster' of PlayStations. They are connected to each other and the performance is stacked making a single high performance computer.

c)  You can build a supercomputer by putting a few computers together in a cluster. Here's what Oracle did with a collection of Raspberry Pi's, for example:
    https://blogs.oracle.com/developers/post/building-the-worlds-largest-raspberry-pi-cluster
    What specific operating system is running on this cluster?

    Oracle Linux for ARM

d)  Does Oracle's Raspberry Pi supercomputer appear in the list of the 500 fastest supercomputers in the world? Make a logical decision for this, without going through the entire list.
    https://www.top500.org/lists/top500/list/2023/06/

    No, the Oracle's Raspberry Pi supercomputer is impressive but it doesn't come close to the top 500 list of supercomputers since these supercomputers are way faster than Oracle's Raspberry Pi supercomputer.

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?
    The CPU architecture used for the PlayStation 5 and Xbox Series X is x86-64.
    PlayStation is using an Sony OS (Unix-Like) and Xbox is using an Microsoft OS (Windows kernel)
    Conclusion: Consoles use the same OS foundation as computers

**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?
   ⊞ +S → f → enter

c) Open the system properties with a ⊞ key combination, take a screenshot of the open screen. Paste this screenshot into this template.
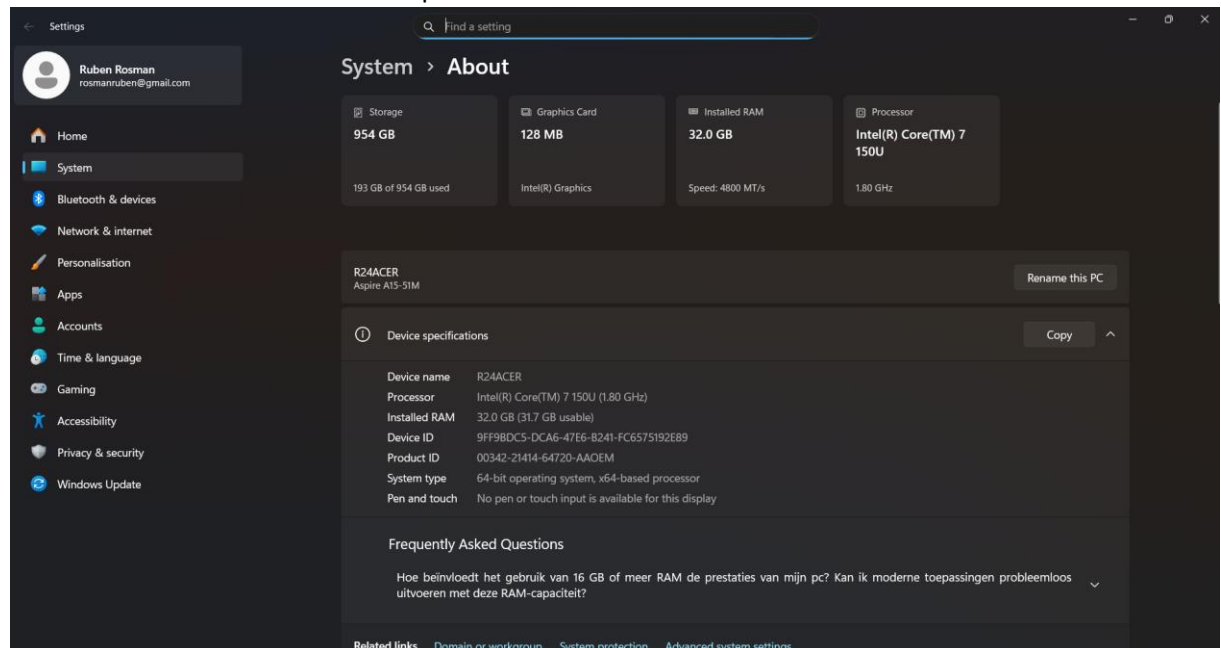
d) Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.
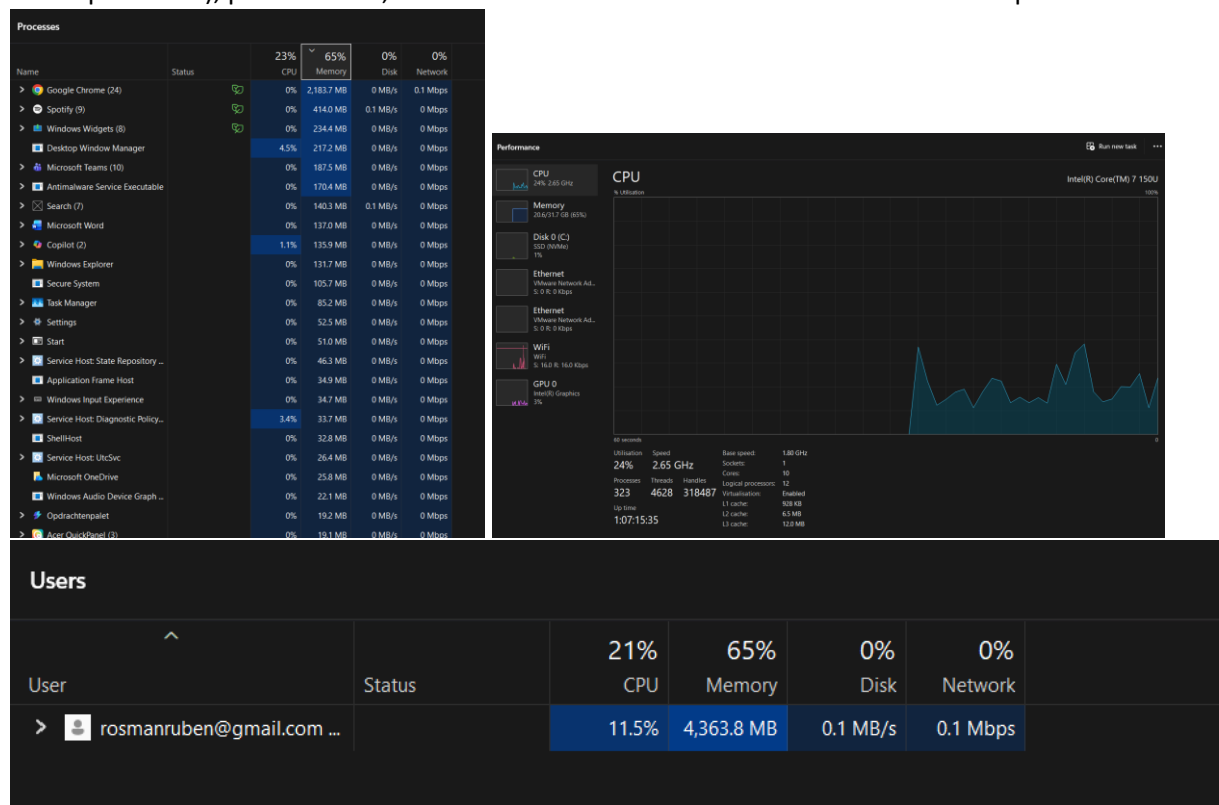






e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

⊞ + 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?

⊞ + 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.
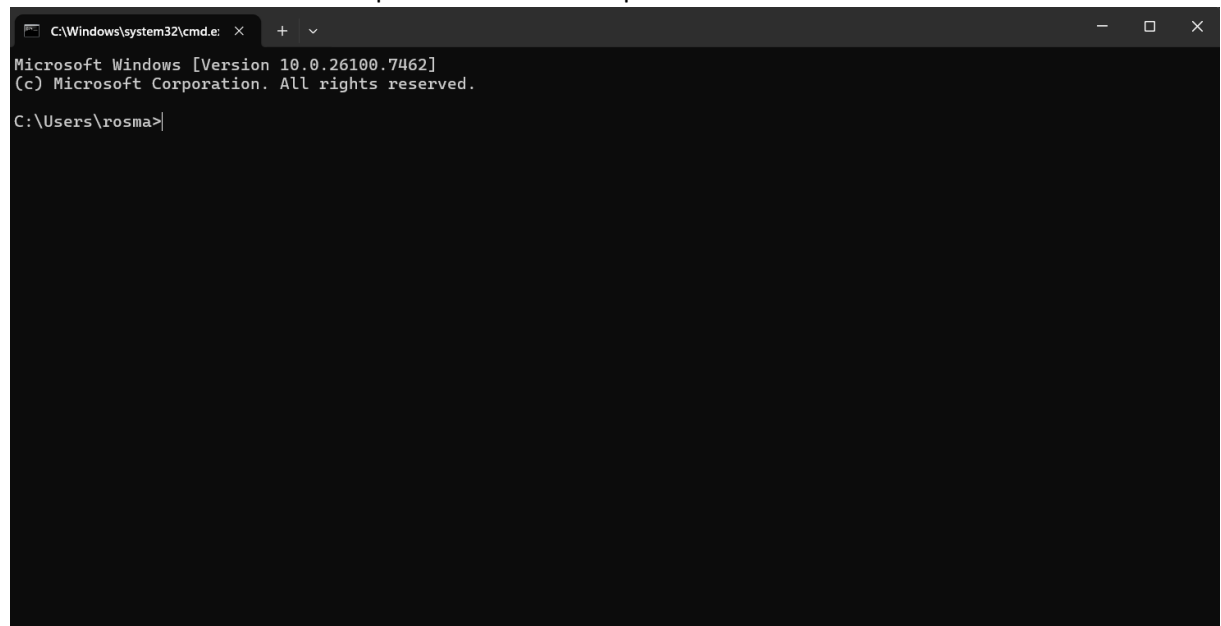


**Working in the File Explorer**

Relevant screenshots **copy** command:
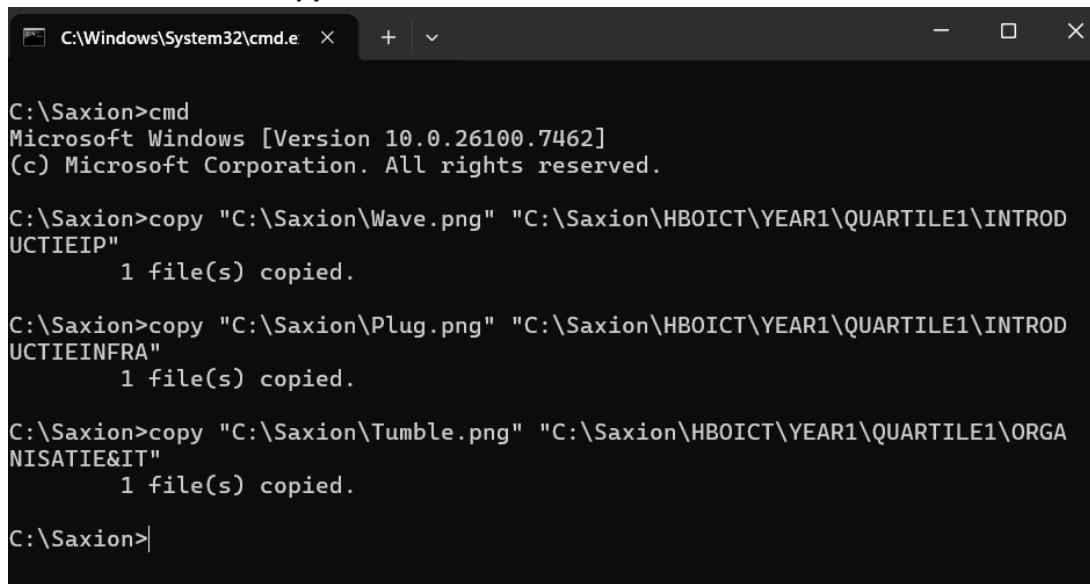


Absolute Path: The complete path to a certain file. (Absolute Path of HBOICT "C:\Saxion\HBOICT"
Relative Path: The Relative Path to a file depending on what file you're currently in. (Relative path to DATABASES from C:\Saxion\HBOICT "YEAR1\QUARTILE2\DATABASES"

Relevant screenshots **tree** command:



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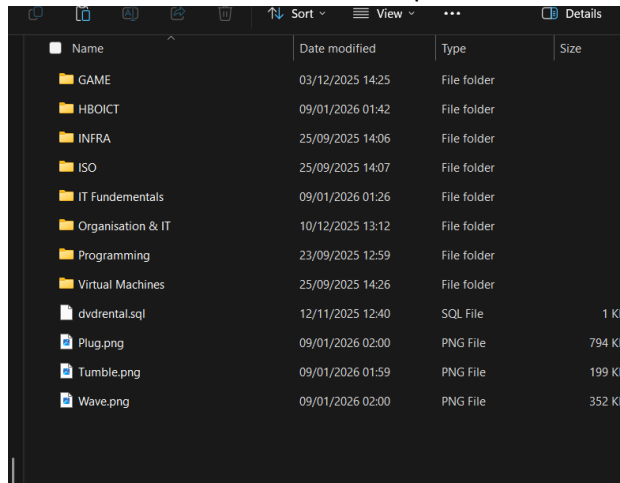
## Terminating Processes

Relevant Screenshots Task Manager Window:
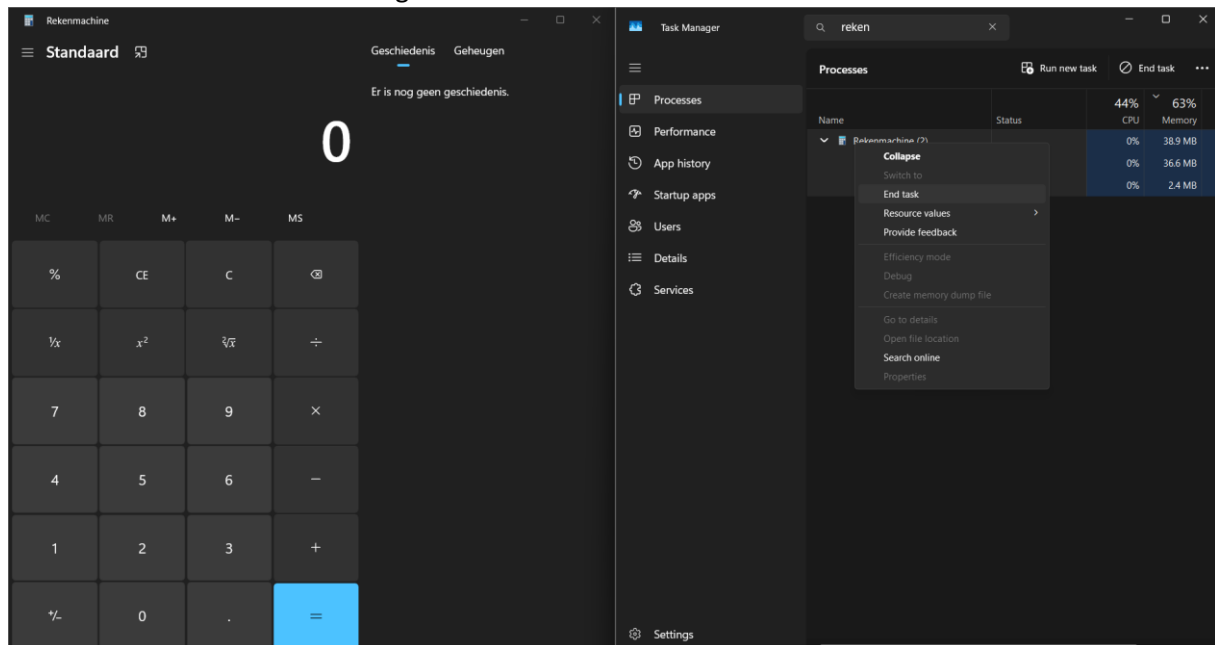


## Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip
- Firefox

### Firefox:

b) winget is a Windows package manager, a tool that can be used to install, upgrade and manage software from cmd line.

-e means –exact and this makes sure it only installs the exact program that I write and

--id mozilla.firefox is the ID of the program which gets installed

**WinSCP:**

**Notepad++:**

```
Administrator: Command Prompt                                                    —

C:\Windows\System32>winget search notepad++
Name         Id                    Version Match                    Source
--------------------------------------------------------------------------
Notepad++    Notepad++.Notepad++   8.9     ProductCode: notepad++   winget
Notepad Next dail8859.NotepadNext  0.12    Tag: notepad++           winget

C:\Windows\System32>winget install -e --id Notepad++.Notepad++
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...
Successfully installed

C:\Windows\System32>
```

**7zip:**

```
Ruben Ubuntu    X    Windows 11 x64    X    My Computer    X

Administrator: Command Prompt

C:\Windows\System32>winget search 7zip
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
NanaZip                           M2Team.NanaZip        5.0.1263.0         Tag: 7zip       winget
NanaZip Preview                   M2Team.NanaZip.Preview 6.0.1461.0        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   24.01.00.0                         winget
7zr                               7zip.7zr              25.01                              winget
QNapi                             QNapi.QNapi           0.2.3              Tag: p7zip      winget

C:\Windows\System32>winget install -e --id 7zip.7zip
Found 7-Zip [7zip.7zip] Version 25.01
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://7-zip.org/a/7z2501-x64.exe
                              1.56 MB / 1.56 MB
Successfully verified installer hash
Starting package install...
Successfully installed

C:\Windows\System32>
```
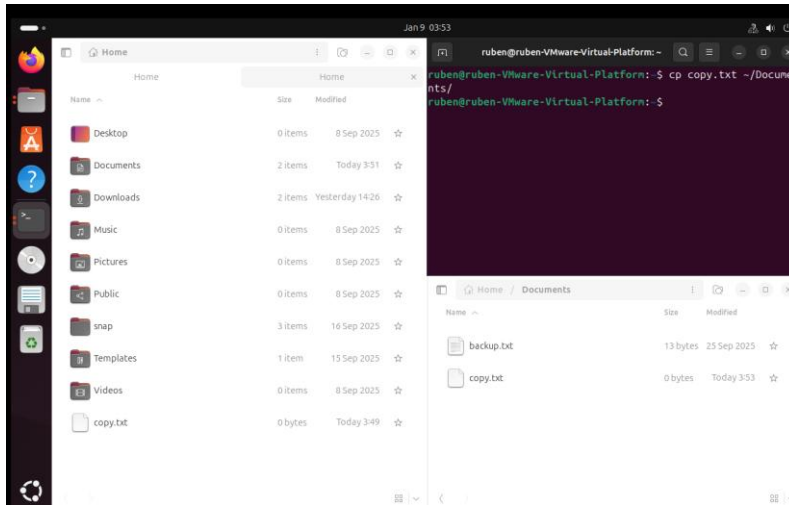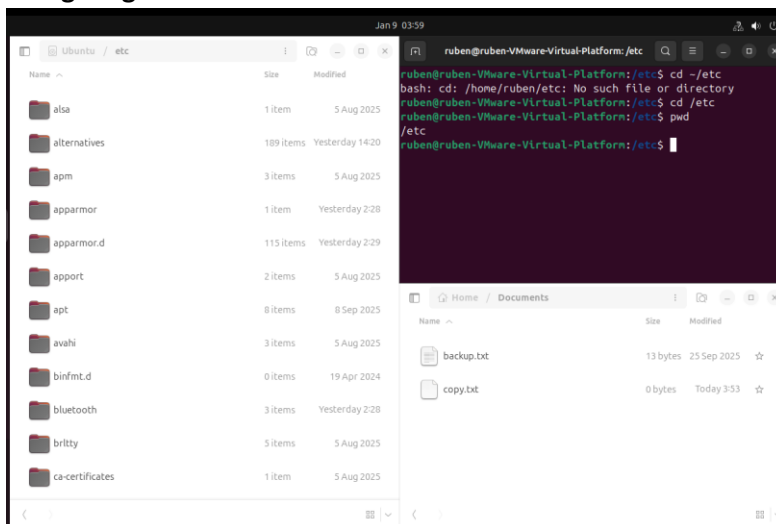
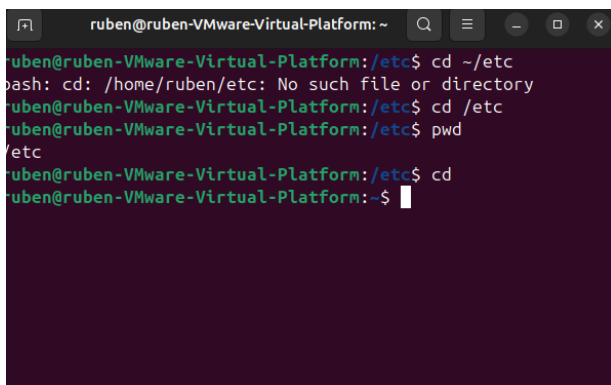## Assignment 5.4: Working with Linux

Relevant screenshots + motivation

**Copying:**



**Navigating the file structure:**



Screenshot of the /etc in the terminal and the file in the file explorer



Screenshot of going back to the home directory

Differences between windows and linux:

Linux uses a single root / for all directories while windows uses separate drives

The /etc directory contains system configuration information

**Compress files:**

Command to compress txt into tar: tar -cvf 'file'.tar 'file'.txt

Command to extract tar: tar -xvf 'file'.tar



**View processes:**

**htop install:**



Htop shows all running processes and CPU usage/Memory usage, it's the task manager of ubuntu.

**Neofetch:**

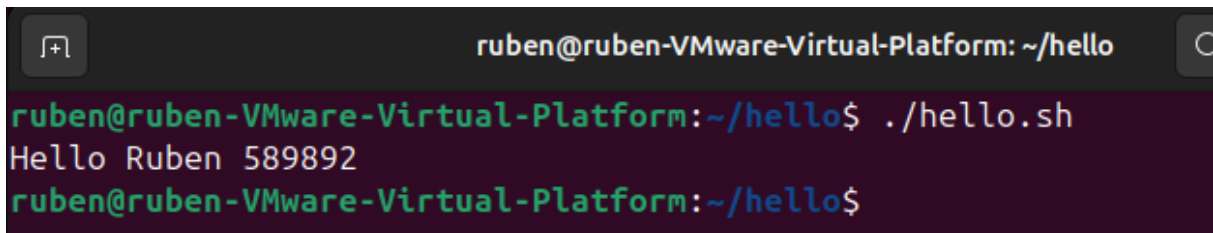**Assignment 5.5: Users and permissions on Linux**

Relevant screenshots + motivation
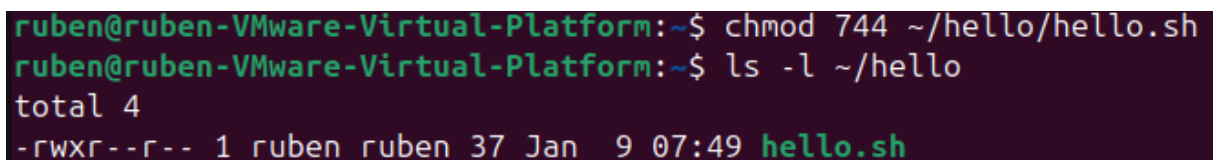


```
ruben@ruben-VMware-Virtual-Platform:~$ mkdir -p ~/hello
ruben@ruben-VMware-Virtual-Platform:~$ nano ~/hello/hello.sh
ruben@ruben-VMware-Virtual-Platform:~$ chmod +x ~/hello/hello.sh
```

Made the file executable



```
ruben@ruben-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello Ruben 589892
ruben@ruben-VMware-Virtual-Platform:~/hello$
```

Ran the file



```
ruben@ruben-VMware-Virtual-Platform:~$ chmod 744 ~/hello/hello.sh
ruben@ruben-VMware-Virtual-Platform:~$ ls -l ~/hello
total 4
-rwxr--r-- 1 ruben ruben 37 Jan  9 07:49 hello.sh
```

Made the file executable and writeable for user and readable for others

**Assignment 5.6: View the contents of files**

Relevant screenshots + motivation
cat: Displays the whole file in the terminal and can combine files
wc: word count is for counting lines, words and characters in a file
less: with less you can view a file page by page
tail: shows the last lines of a file so if you type tail -n 20 'file'.txt it shows the last 20 lines. (the tail)
head: shows the first lines of a file so if you type head -n 20 'file'.txt it shows the first 20 lines
grep: is a search tool and with it you can search for certain characters, words, sentences in a file

```
ruben@ruben-VMware-Virtual-Platform: ~/Documents                    Q  ≡  –

ruben@ruben-VMware-Virtual-Platform:~/Documents$ wc SherlockHolmes.txt
 12305 107560 595124 SherlockHolmes.txt
```

Sherlock Holmes got 12305 lines, 107560 words and 595124 characters

```
ruben@ruben-VMware-Virtual-Platform:~/Documents$ grep -n "kingdom" SherlockHolme
s.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
```

kingdom is on line 490 and 1124

```
ruben@ruben-VMware-Virtual-Platform:~/Documents$ grep -n -A 10 -B 10 "kingdom" S
herlockHolmes.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.
```

**Assignment 5.7: Digital forensics**

Relevant screenshots + motivation



Make                               : motorola
Camera Model Name                  : moto g(6) play
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

**Photo taken in: Almelo**



ruben@ruben-VMware-Virtual-Platform:~/Downloads$ 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=aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys, datetime=2020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3

Yes, its still considered a jpg image

## Assignment 5.8: Steganography

Relevant screenshots + motivation



## Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:



Connectivity test

- 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.

Terminal opened on try ubuntu


lsblk command

```
 Static hostname: debian
       Icon name: computer-vm
         Chassis: vm ♦
      Machine ID: a41323b936b84c47b3b7d73715ede03f
         Boot ID: 9cde8ab71a224991a0011a62f79a2e59
     AF_VSOCK CID: 2371138475
  Virtualization: vmware
Operating System: Debian GNU/Linux 13 (trixie)
          Kernel: Linux 6.12.57+deb13-amd64
    Architecture: x86-64
 Hardware Vendor: VMware, Inc.
  Hardware Model: VMware20,1
Firmware Version: VMW201.00V.24006586.B64.2406042154
   Firmware Date: Tue 2024-06-04
    Firmware Age: 1y 7month 6d
ruben@debian:~$ lsb_release -a
No LSB modules are available.
Distributor ID: Debian
Description:    Debian GNU/Linux 13 (trixie)
Release:        13
Codename:       trixie
ruben@debian:~$ 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 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default ql
    link/ether 00:0c:29:54:b3:ab brd ff:ff:ff:ff:ff:ff
    altname enp3s0
    altname enx000c2954b3ab
    inet 192.168.68.107/24 brd 192.168.68.255 scope global dynamic noprefixroute ens160
       valid_lft 6639sec preferred_lft 5739sec
    inet6 fe80::12b:4826:ba2d:d9e9/64 scope link
       valid_lft forever preferred_lft forever
```

Debian server setup

```
ubuntu@ubuntu:~$ sudo dd if=/dev/sda bs=4M status=progress | gzip | ssh ruben@19
2.168.68.107 "cat > /srv/images/ubuntu2404_vm.img.gz"
The authenticity of host '192.168.68.107 (192.168.68.107)' can't be established.
ED25519 key fingerprint is SHA256:+aev3Qv51ggh6R/Z9lqY4qMsiaAKQ3cEzbFDDf/uHjc.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.68.107' (ED25519) to the list of known hosts
.
ruben@192.168.68.107's password:
34347155456 bytes (34 GB, 32 GiB) copied, 767 s, 44.8 MB/s
8192+0 records in
8192+0 records out
34359738368 bytes (34 GB, 32 GiB) copied, 767.488 s, 44.8 MB/s
ubuntu@ubuntu:~$
```

Disk Capture

```
ruben@debian:~$ ls -lh /srv/images
total 15G
-rw-rw-r-- 1 ruben ruben 15G Jan  9 13:33 ubuntu2404_vm.img.gz
```

Image Storage

```
ubuntu@ubuntu:~$ ssh ruben@192.168.68.107 "cat /srv/images/ubuntu2404_vm.img.gz"
 | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
ruben@192.168.68.107's password:
34349481984 bytes (34 GB, 32 GiB) copied, 412 s, 83.4 MB/s
0+1030457 records in
0+1030457 records out
34359738368 bytes (34 GB, 32 GiB) copied, 412.479 s, 83.3 MB/s
```

Restore Process
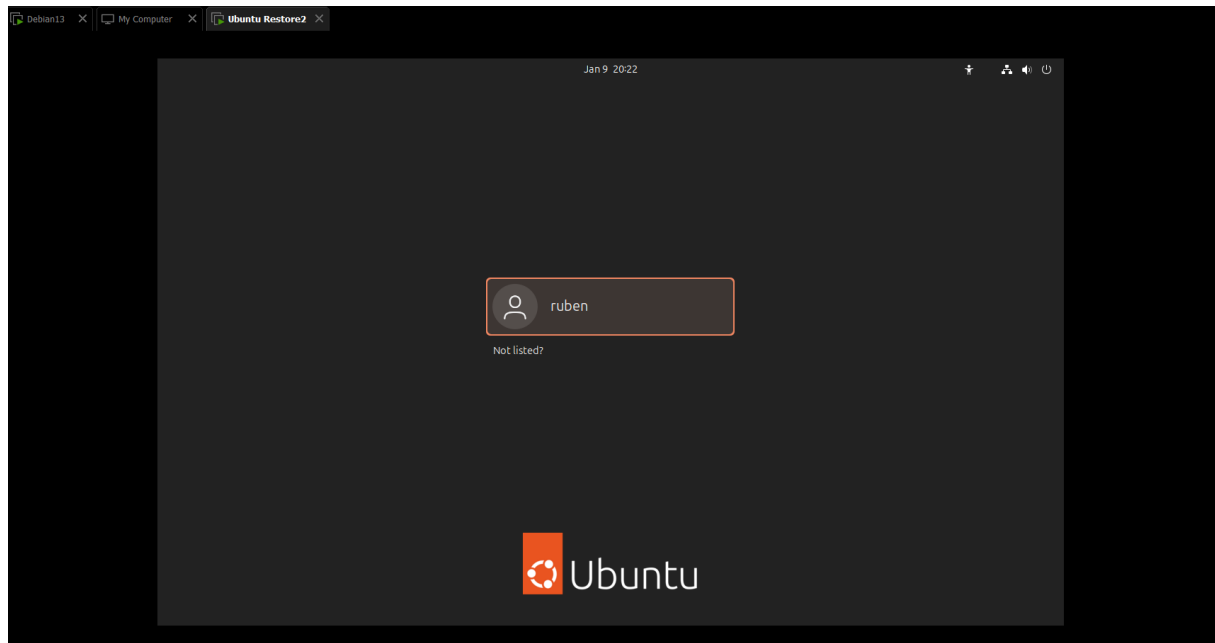


Ubuntu Restored booted from hard disk

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