

Template Week 5 – Operating Systems

Student number:

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Assignment 5.1: Unix-like


- a) Find out what the difference is between UNIX and unix-like operating systems?
- 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.
- c) What is the philosophy of the GNU movement?
- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement? Please explain your answer.
- e) Find out what is the Windows Subsystem for Linux?
- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?


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>
- 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?
- 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?
- 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/>
- 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?


Assignment 5.3: Working with Windows

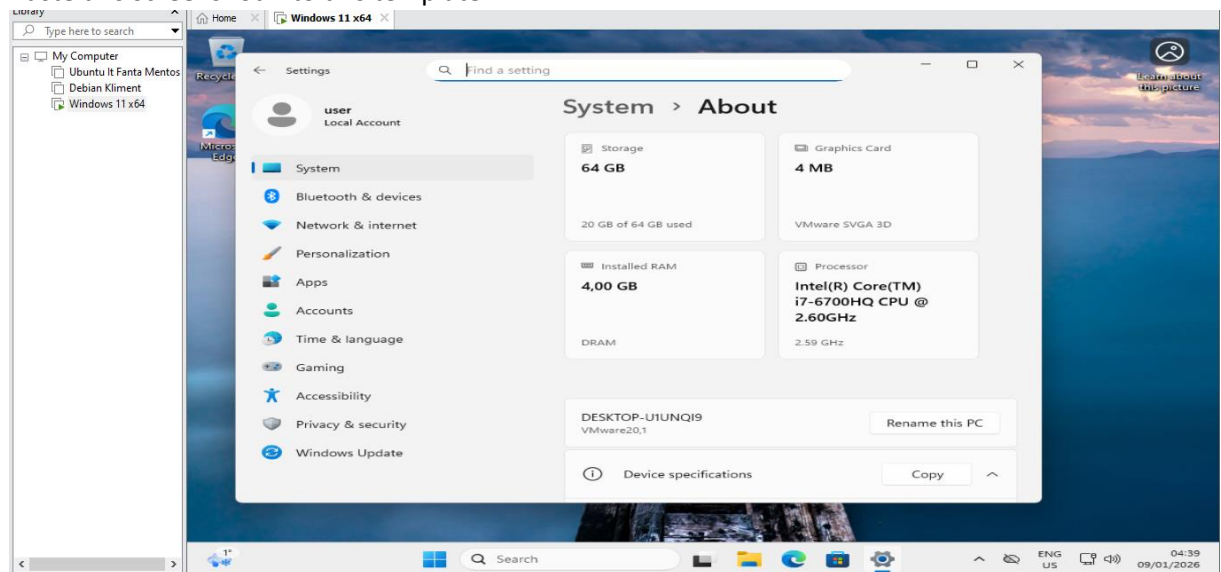
Take relevant screenshots of the assignments below

- 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.

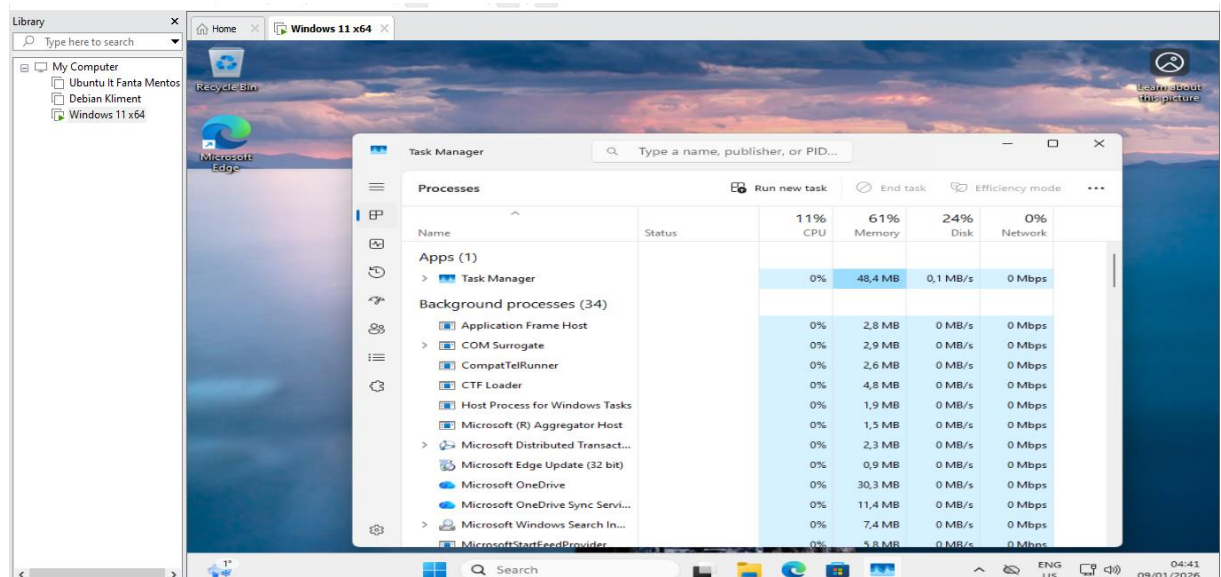
- b) The file explorer can be opened with  + E, Which key combination could you also use?

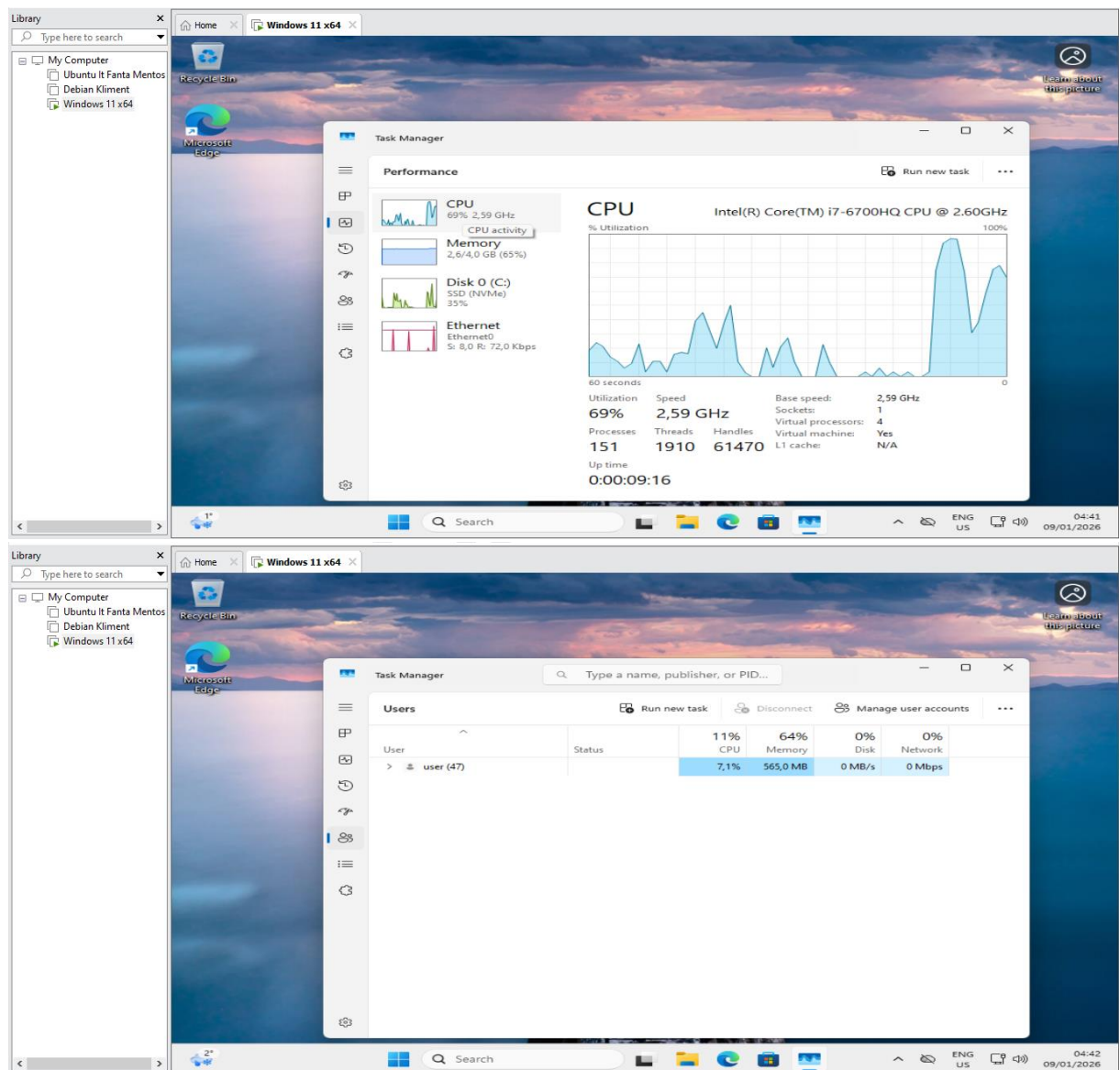
The  + number could also be used if the file explorer is pinned in the task bar

- 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.





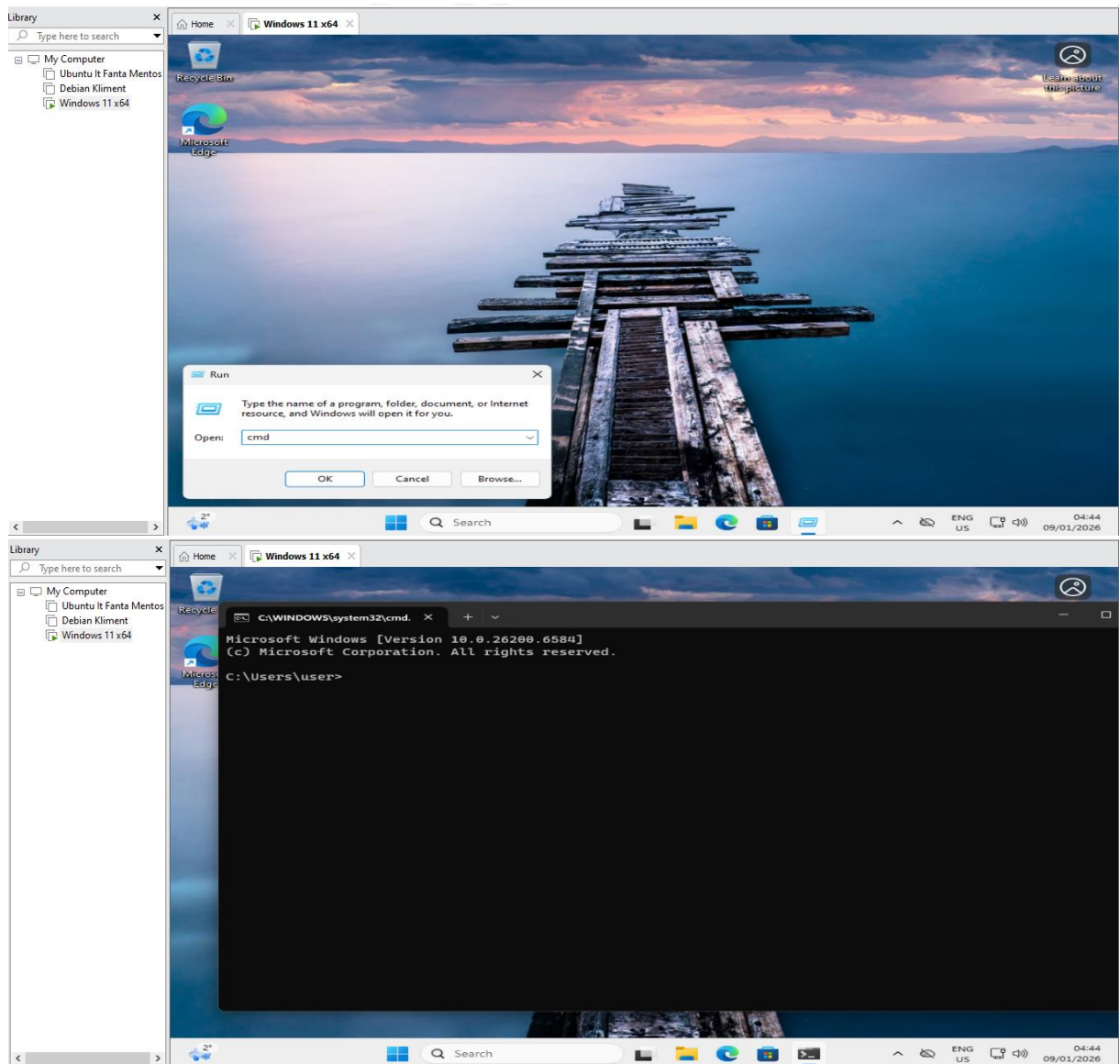
- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

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?

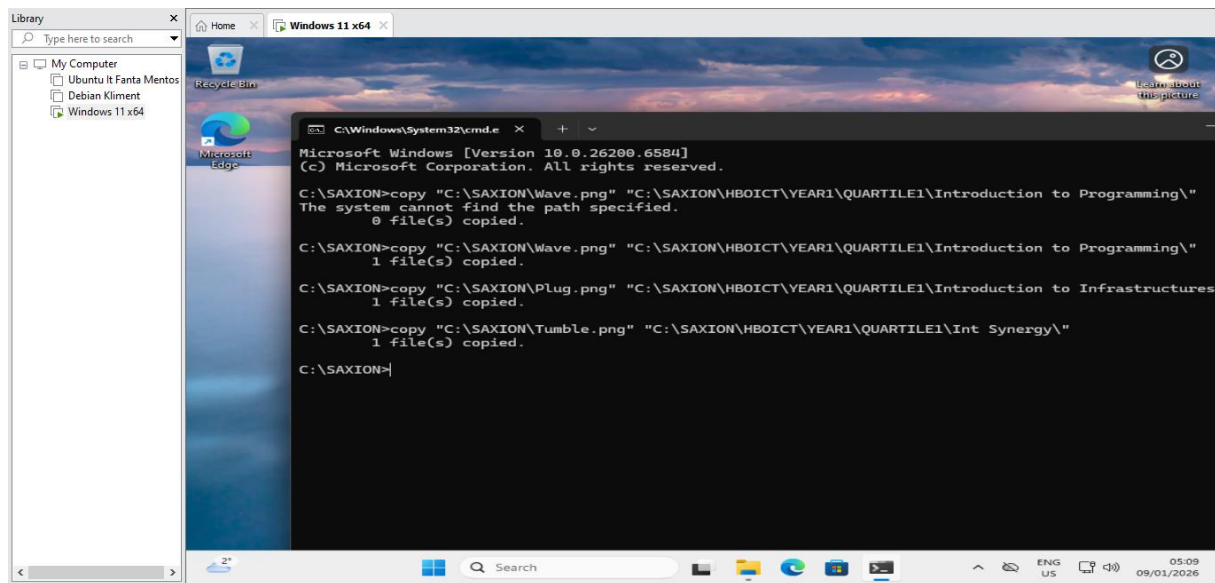
Windows + L

- 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.

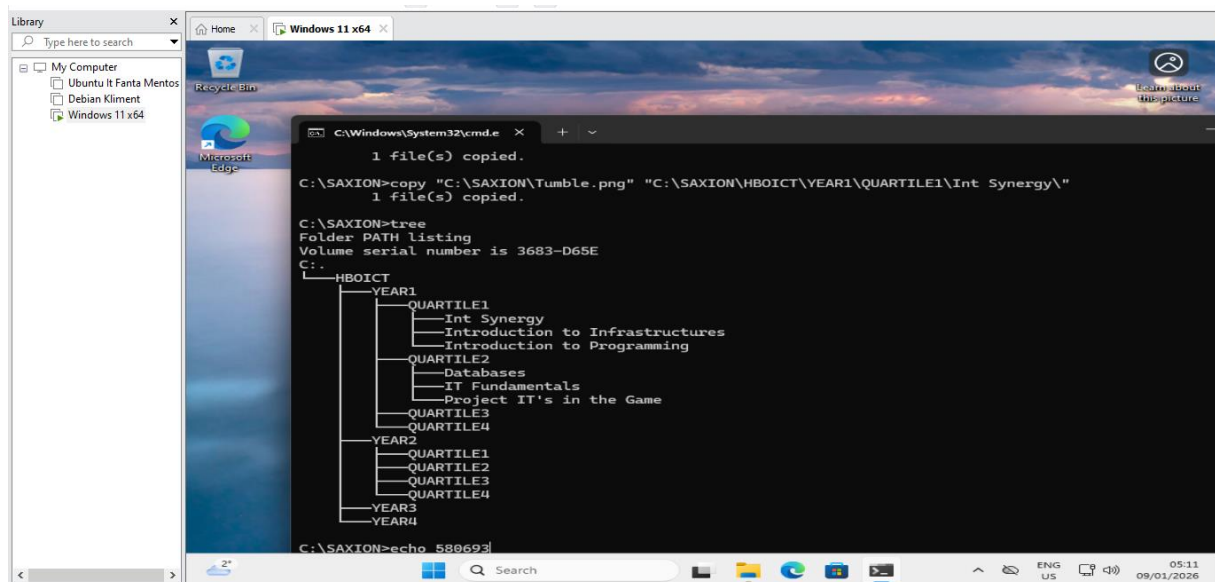


Working in the File Explorer

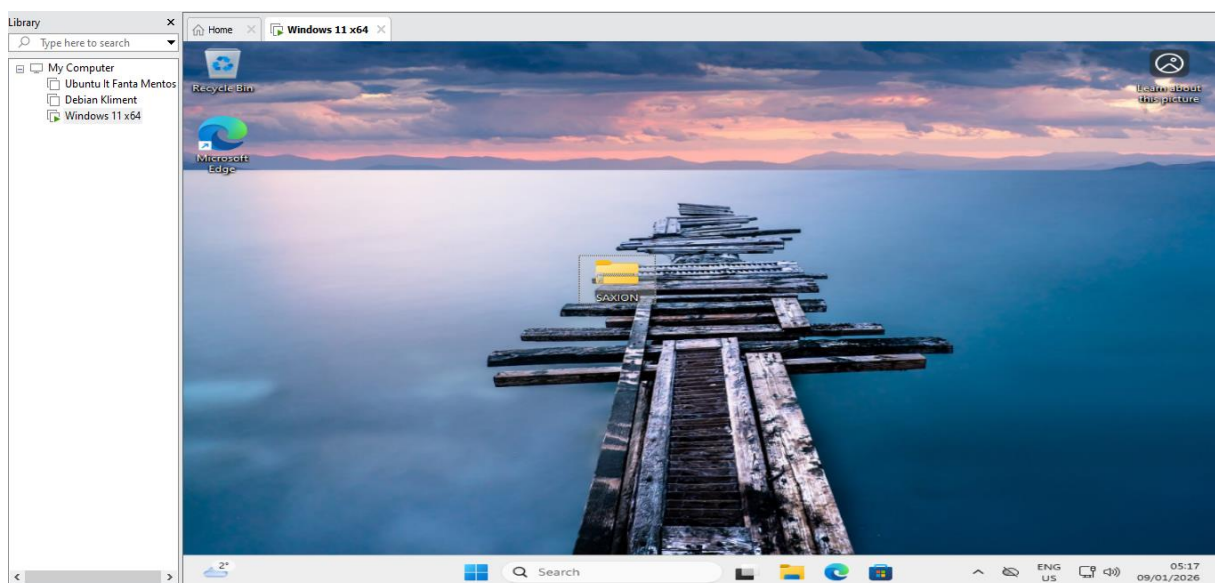
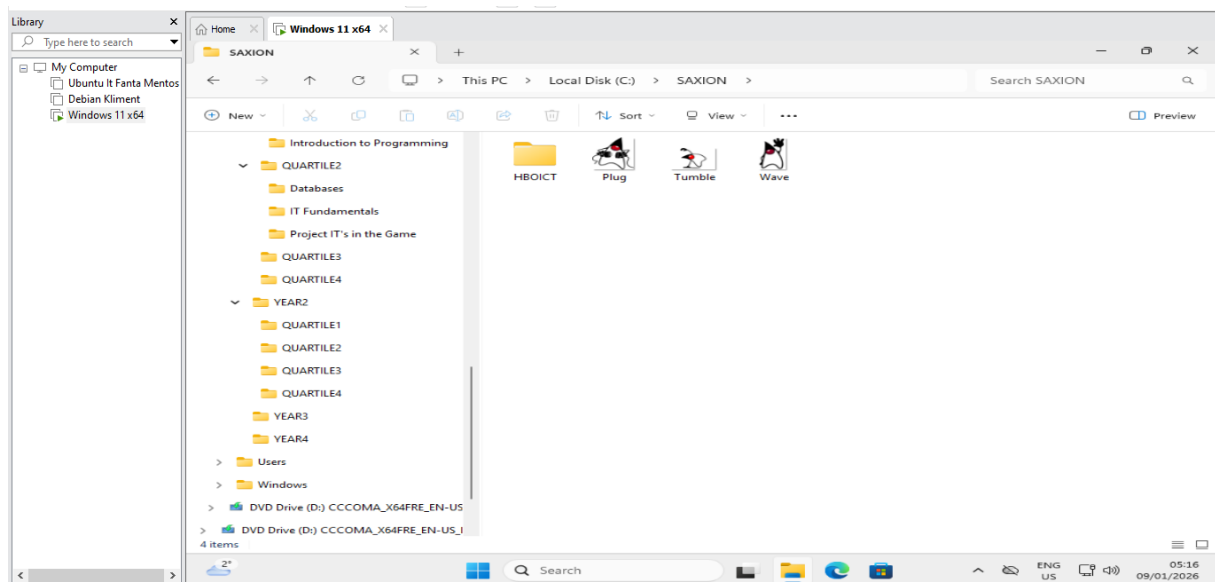
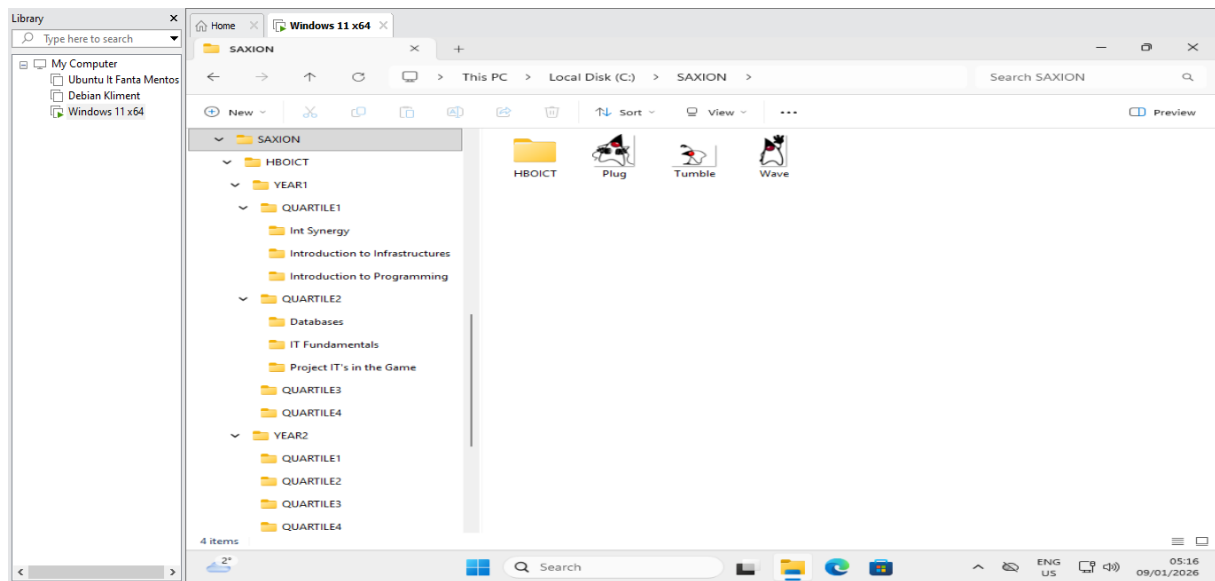
Relevant screenshots **copy** command:



Relevant screenshots **tree** command:

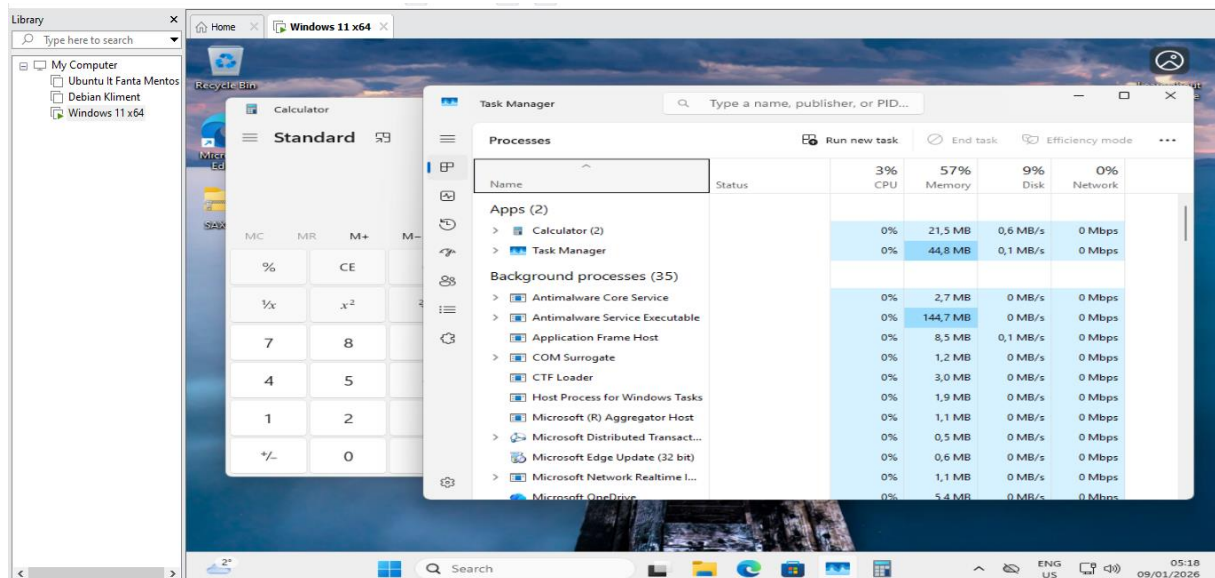


Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.



Terminating Processes

Relevant Screenshots Task Manager Window:



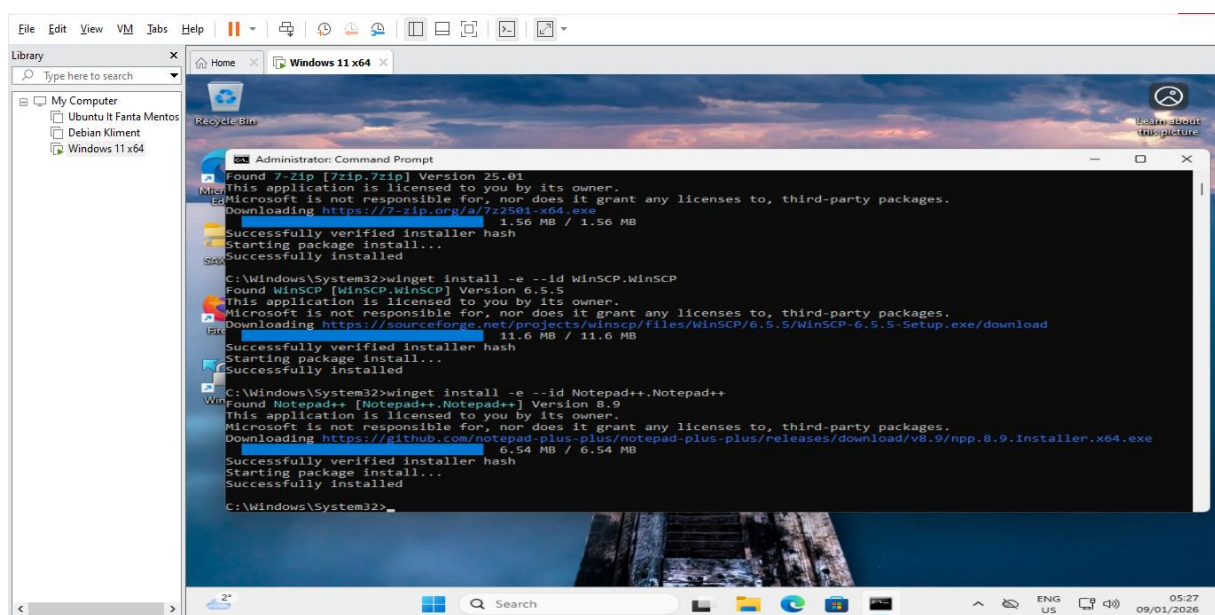
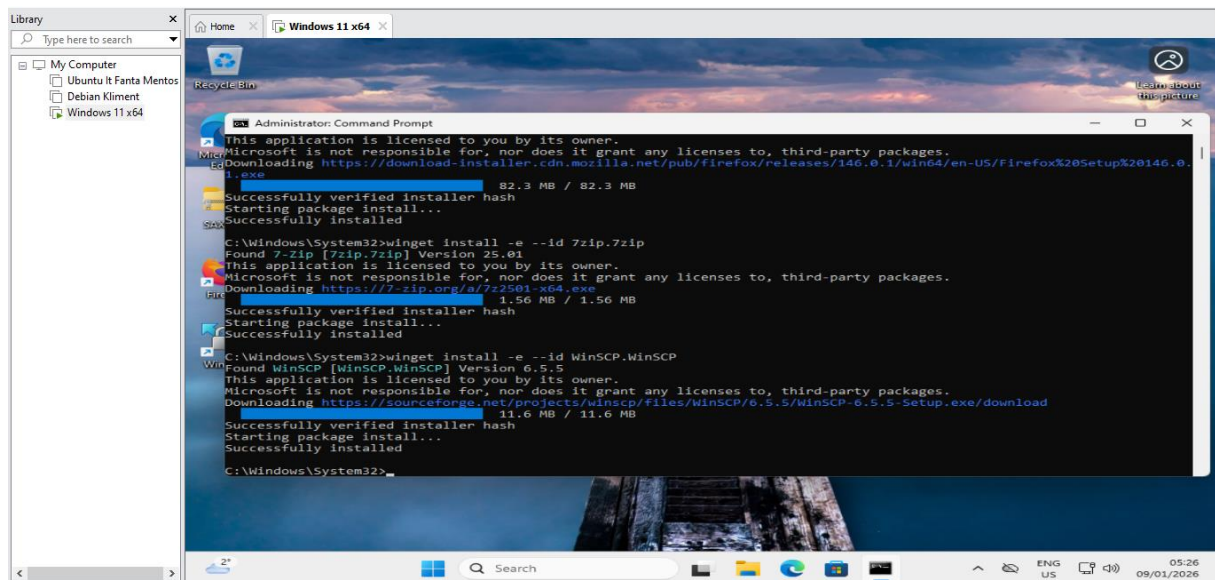
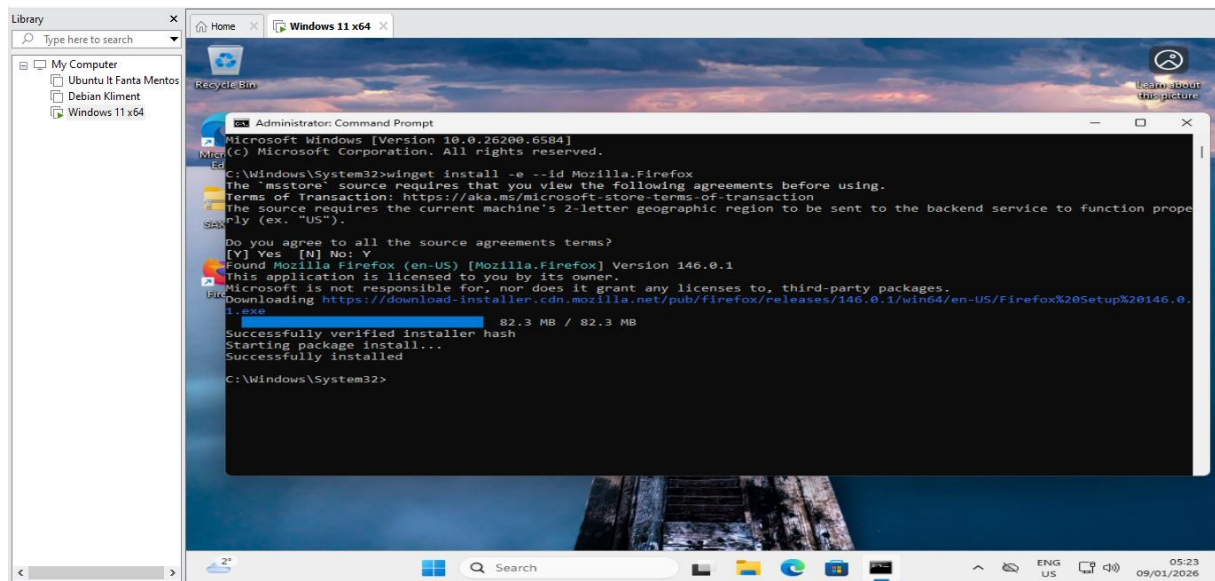
Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip

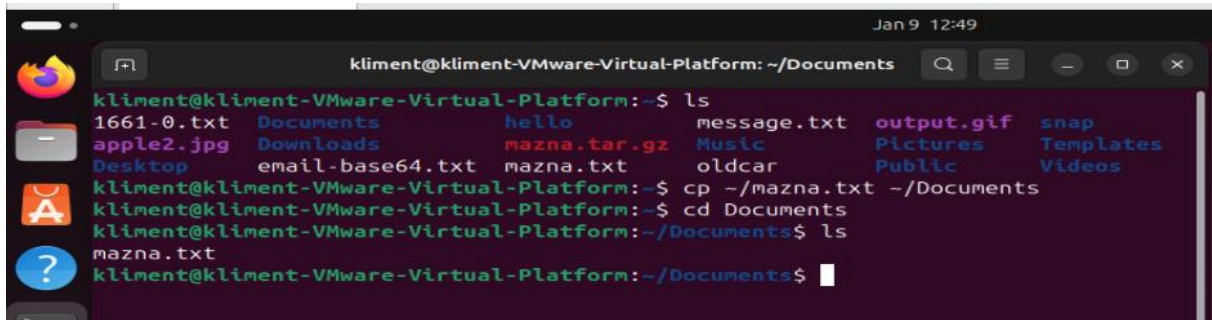
--id is used to specify that the application installed should have this id

--e means exact, which means that it checks the exact string in the query, including a casesensitivity check

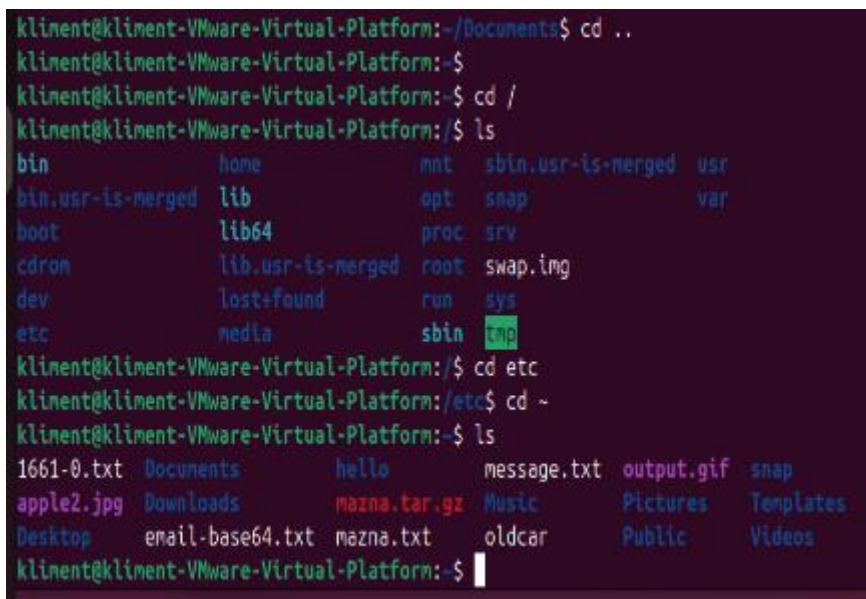


Assignment 5.4: Working with Linux

Relevant screenshots + motivation



```
kliment@kliment-VMware-Virtual-Platform: ~/Documents
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Documents  hello      message.txt  output.gif  snap
apple2.jpg  Downloads  mazna.tar.gz  Music        Pictures     Templates
Desktop    email-base64.txt  mazna.txt  oldcar       Public       Videos
kliment@kliment-VMware-Virtual-Platform:~$ cp ~/mazna.txt ~/Documents
kliment@kliment-VMware-Virtual-Platform:~$ cd Documents
kliment@kliment-VMware-Virtual-Platform:~/Documents$ ls
mazna.txt
kliment@kliment-VMware-Virtual-Platform:~/Documents$
```



```
kliment@kliment-VMware-Virtual-Platform:~/Documents$ cd ..
kliment@kliment-VMware-Virtual-Platform:~$
kliment@kliment-VMware-Virtual-Platform:~$ cd /
kliment@kliment-VMware-Virtual-Platform:/$ ls
bin          home          mnt          sbin.usr-is-merged  usr
bin.usr-is-merged  lib          opt          snap              var
boot         lib64         proc         srv
cdrom        lib.usr-is-merged  root        swap.img
dev          lost+found    run          sys
etc          media        sbin        tmp
kliment@kliment-VMware-Virtual-Platform:/$ cd etc
kliment@kliment-VMware-Virtual-Platform:/etc$ cd ~
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Documents  hello      message.txt  output.gif  snap
apple2.jpg  Downloads  mazna.tar.gz  Music        Pictures     Templates
Desktop    email-base64.txt  mazna.txt  oldcar       Public       Videos
kliment@kliment-VMware-Virtual-Platform:~$
```



```
kliment@kliment-VMware-Virtual-Platform:~$ tar -cvf mazna.tar mazna.txt
mazna.txt
kliment@kliment-VMware-Virtual-Platform:~$ tar -z mazna.tar.gz
tar: You must specify one of the '-Acddrux', '--delete' or '--test-label' options
Try 'tar --help' or 'tar --usage' for more information.
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop    Downloads  mazna.txt  Pictures  snap      Videos
Documents  mazna.tar  Music      Public    Templates
kliment@kliment-VMware-Virtual-Platform:~$ tar cvzf mazna.tar.gz mazna.txt
mazna.txt
```



```

kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  mazna.txt  Pictures  snap      Videos
Documents  mazna.tar  Music      Public    Templates
kliment@kliment-VMware-Virtual-Platform:~$ tar cvzf mazna.tar.gz mazna.txt
mazna.txt
kliment@kliment-VMware-Virtual-Platform:~$ ls -l
total 56
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Desktop
drwxr-xr-x 2 kliment kliment 4096 Dec 11 09:57 Documents
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Downloads
-rw-rw-r-- 1 kliment kliment 10240 Dec 11 10:19 mazna.tar
-rw-rw-r-- 1 kliment kliment 143 Dec 11 10:22 mazna.tar.gz
-rw-rw-r-- 1 kliment kliment 18 Dec 11 09:56 mazna.txt
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Music
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Pictures
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Public
drwx----- 4 kliment kliment 4096 Dec  9 18:14 snap
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Templates
drwxr-xr-x 2 kliment kliment 4096 Dec  9 16:48 Videos
kliment@kliment-VMware-Virtual-Platform:~$ rm mazna.tar
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  mazna.txt  Pictures  snap      Videos
Documents  mazna.tar.gz  Music      Public    Templates
kliment@kliment-VMware-Virtual-Platform:~$ S

```

```

kliment@kliment-VMware-Virtual-Platform: ~
0[|] 0.6%] Tasks: 107, 358 thr, 191 kthr; 2 runni
1[||] 6.2%] Load average: 0.11 0.07 0.09
2[|] 0.6%] Uptime: 00:33:40
3[||] 1.3%]
Mem[|||||||||||||||||||||1008M/3.78G]
Swp[|||||0K/3.78G]

Main 1/0
PID USER PRI NI VIRT RES SHR S CPU% MEM% TIME+ Command
4859 kliment 20 0 11304 5004 3612 R 6.9 0.1 0:00.45 htop
2398 kliment 20 0 379M 12208 7036 S 1.3 0.3 0:02.18 /usr/bin/ibus
544 systemd-oo 20 0 17560 7656 6724 S 0.6 0.2 0:00.48 /usr/lib/syst
2561 kliment 20 0 231M 7588 6784 S 0.6 0.2 0:00.81 /usr/libexec/
3021 kliment 20 0 542M 54360 42756 S 0.6 1.4 0:03.91 /usr/libexec/
1 root 20 0 23308 14452 9568 S 0.0 0.4 0:04.77 /sbin/init sp
387 root 19 -1 67292 18376 16804 S 0.0 0.5 0:00.84 /usr/lib/syst
425 root 20 0 31916 10104 4992 S 0.0 0.3 0:00.70 /usr/lib/syst
549 systemd-re 20 0 21580 13256 10884 S 0.0 0.3 0:00.22 /usr/lib/syst
554 systemd-ti 20 0 91048 7860 6876 S 0.0 0.2 0:00.11 /usr/lib/syst
658 systemd-ti 20 0 91048 7860 6876 S 0.0 0.2 0:00.00 /usr/lib/syst
697 avahi 20 0 8672 4560 4104 S 0.0 0.1 0:00.10 avahi-daemon:
698 messagebus 20 0 12212 7308 4560 S 0.0 0.2 0:01.23 @dbus-daemon
F1Help F2Setup F3Search F4Filter F5Tree F6SortBy F7Nice -F8Nice +F9Kill F10Quit

```

```
kliment@kliment-VMware-Virtual-Platform: ~
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for desktop-file-utils (0.27-2build1) ...
kliment@kliment-VMware-Virtual-Platform:~$ neofetch
      .-/+00SSSS00+/- .
      |:SSSSSSSSSSSSSSSSSS+:
      +-SSSSSSSSSSSSSSSSSSyySSSS+-
      .OSSSSSSSSSSSSSSSSSSdMMMNySSSSO.
      /SSSSSSSSSSshdmNNmmyNMMMMhSSSSS/
      +SSSSSSSSshmydMMMMMMNdddySSSSSSS+
      /SSSSSSSSshNNMMYhhyyyhNMMMMNhSSSSSSS/
      .SSSSSSSSdMMMNHSSSSSSSSShNNMMdSSSSSSSS.
      +SSSSshhyNNMMNySSSSSSSSSSyNNMMYSSSSSSS+
      OSSyNNMMNyMMhSSSSSSSSSSShmmhSSSSSSSO
      OSSyNNMMNyMMhSSSSSSSSSSShmmhSSSSSSSO
      +SSSSshhyNNMMNySSSSSSSSSSyNNMMYSSSSSSS+
      .SSSSSSSSdMMMNHSSSSSSSSShNNMMdSSSSSSSS.
      /SSSSSSSSshNNMMYhhyyyhdNMMMMNhSSSSSSS/
      +SSSSSSSSdmydMMMMMMMMdddySSSSSSS+
      /SSSSSSSSshdmNNNNmmyNMMMMhSSSSS/
      .OSSSSSSSSSSSSSSSSSSdMMMNySSSSO.
      +-SSSSSSSSSSSSSSSSSSyySSSS+-
      |:SSSSSSSSSSSSSSSSSS+:
      .-/+00SSSS00+/- .

kliment@kliment-VMware-Virtual-Platform:~$
OS: Ubuntu 24.04.3 LTS x86_64
Host: VMware Virtual Platform None
Kernel: 6.14.0-36-generic
Uptime: 1 hour, 6 mins
Packages: 1526 (dpkg), 12 (snap)
Shell: bash 5.2.21
Resolution: 1280x800
DE: GNOME 46.0
WM: Mutter
WM Theme: Adwaita
Theme: Yaru [GTK2/3]
Icons: Yaru [GTK2/3]
Terminal: gnome-terminal
CPU: Intel i7-6700HQ (4) @ 2.592GHz
GPU: 00:0f.0 VMware SVGA II Adapter
Memory: 988MiB / 3867MiB
```

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

```
kliment@kliment-VMware-Virtual-Platform:~$ pwd
/home/kliment
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  mazna.txt  Pictures  snap  Videos
Documents  mazna.tar.gz  Music  Public  Templates
kliment@kliment-VMware-Virtual-Platform:~$ nano 5to.txt
kliment@kliment-VMware-Virtual-Platform:~$ mv 5to.txt hello.sh
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  mazna.tar.gz  Music  Public  Templates
Documents  hello.sh  mazna.txt  Pictures  snap  Videos
kliment@kliment-VMware-Virtual-Platform:~$ mkdir hello
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  hello.sh  mazna.txt  Pictures  snap  Videos
Documents  hello  mazna.tar.gz  Music  Public  Templates
kliment@kliment-VMware-Virtual-Platform:~$ mv hello.sh hello/
kliment@kliment-VMware-Virtual-Platform:~$ ls
Desktop  Downloads  mazna.tar.gz  Music  Public  Templates
Documents  hello  mazna.txt  Pictures  snap  Videos
kliment@kliment-VMware-Virtual-Platform:~$ ls hello
hello.sh
kliment@kliment-VMware-Virtual-Platform:~$
```

```
kliment@kliment-VMware-Virtual-Platform:~$ ls hello
hello.sh
kliment@kliment-VMware-Virtual-Platform:~$ chmod 744 /hello/hello.sh
chmod: cannot access '/hello/hello.sh': No such file or directory
kliment@kliment-VMware-Virtual-Platform:~$ cd hello
kliment@kliment-VMware-Virtual-Platform:~/hello$ chmod 744 hello.sh
kliment@kliment-VMware-Virtual-Platform:~/hello$
```

```
kliment@kliment-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello Kliment, 580693!
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

cat – displays the content of a file

wc – used to count lines, words and bytes of the content in the file

less – used to view the content of a file one page at a time

tail – prints the last couple of lines of a file

head – prints the first few lines of a file

grep – allows the user to search for specific patterns in the content

```
kliment@kliment-VMware-Virtual-Platform:~/hello$ mv 1661-0.txt ~/ 1661-0.txt
mv: target '1661-0.txt': Not a directory
kliment@kliment-VMware-Virtual-Platform:~/hello$ mv 1661-0.txt ~/
kliment@kliment-VMware-Virtual-Platform:~/hello$ ls
hello.sh
kliment@kliment-VMware-Virtual-Platform:~/hello$ cd ..
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Documents  hello      mazna.txt  Pictures  snap      Videos
Desktop    Downloads  mazna.tar.gz  Music      Public    Templates
```

```
kliment@kliment-VMware-Virtual-Platform:~$ wc 1661-0.txt
12306 107562 607504 1661-0.txt
```

```
kliment@kliment-VMware-Virtual-Platform:~$ 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
```

```
kliment@kliment-VMware-Virtual-Platform:~$ head -n 508 1661-0.txt | tail -30
"Then I shall drop you a line to let you know how we progress."
"Pray do so. I shall be all anxiety."
"Then, as to money?"
"You have _carte blanche_."
"Absolutely?"
"I tell you that I would give one of the provinces of my kingdom to
have that photograph."
"And for present expenses?"
```

```
kliment@kliment-VMware-Virtual-Platform:~$ head -n 1141 1661-0.txt | tail -36
held it out upon the palm of his hand.
"Your Majesty has something which I should value even more highly,"
said Holmes.
"You have but to name it."
"This photograph!"
The King stared at him in amazement.
"Irene's photograph!" he cried. "Certainly, if you wish it."
"I thank your Majesty. Then there is no more to be done in the matter.
I have the honour to wish you a very good morning." He bowed, and,
turning away without observing the hand which the King had stretched
```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

Camera Brand
motorola

Camera Model
moto g(6) play

Coordinates
53.194355° N 6.536917° E (42 m)

```
kliment@kliment-VMware-Virtual-Platform:~$ mv oldcar.jpg oldcard
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Documents  hello      mazna.txt  oldcard    Public     Templates
Desktop    Downloads  mazna.tar.gz Music      Pictures   snap       Videos
kliment@kliment-VMware-Virtual-Platform:~$ mv oldcard oldcar
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Documents  hello      mazna.txt  oldcar     Public     Templates
Desktop    Downloads  mazna.tar.gz Music      Pictures   snap       Videos
kliment@kliment-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, manufactu
rer=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
kliment@kliment-VMware-Virtual-Platform:~$
```



```

kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Downloads  mazna.tar.gz  oldcar  snap
Desktop    email-base64.txt  mazna.txt    Pictures  Templates
Documents  hello        Music        Public    Videos
kliment@kliment-VMware-Virtual-Platform:~$ base64 -d email-base64.txt > output.gif
kliment@kliment-VMware-Virtual-Platform:~$ ls
1661-0.txt  Downloads  mazna.tar.gz  oldcar  Public  Videos
Desktop    email-base64.txt  mazna.txt    output.gif  snap
Documents  hello        Music        Pictures    Templates
kliment@kliment-VMware-Virtual-Platform:~$

```

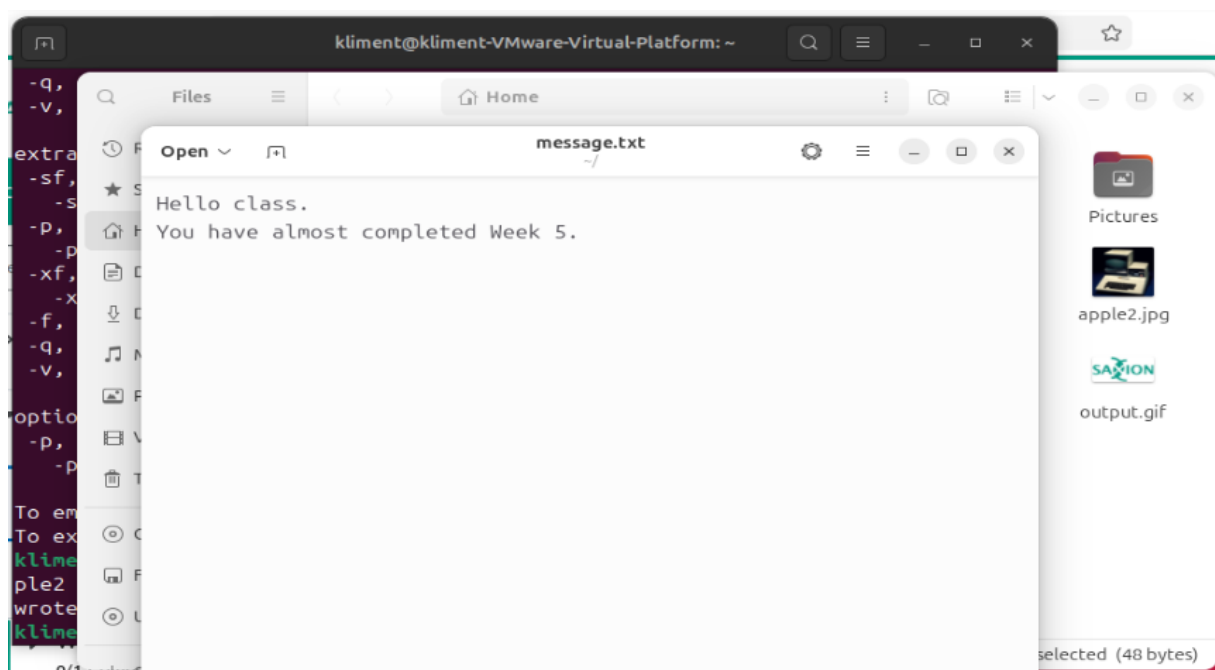
Assignment 5.8: Steganography

Relevant screenshots + motivation

```

kliment@kliment-VMware-Virtual-Platform:~$ steghide extract -sf apple2.jpg -p apple2
wrote extracted data to "message.txt".
kliment@kliment-VMware-Virtual-Platform:~$

```



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.

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