Template Week 5 – Operating Systems

Student number:

Assignment 5.1: Unix-like

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

UNIX is the original operating system developed at Bell Labs and is a licensed and certified system. Unix-like operating systems behave like UNIX but are not officially certified. Examples of Unix-like systems are Linux, BSD, and macOS.

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 – Co-creator of UNIX
Dennis Ritchie – Co-creator of UNIX and creator of the C programming language
Bill Joy – Major contributor to BSD UNIX and co-founder of Sun Microsystems
Richard Stallman – Founder of the GNU Project and Free Software Foundation
Linus Torvalds – Creator of the Linux kernel

c) What is the philosophy of the GNU movement?

The GNU philosophy promotes free software, meaning users should have the freedom to run, study, modify, and share software.

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

Yes. Ubuntu uses GNU tools, is open-source, and allows users to freely use, modify, and distribute the operating system.

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

WSL allows users to run a Linux environment directly inside Windows without needing a virtual machine.

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

Android → Linux

iOS → Unix (Darwin)

ChromeOS → 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 are used for complex calculations such as weather forecasting, climate research, scientific simulations, AI research, and cryptography.

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 a group of PS3 consoles connected together and used for scientific research due to their powerful Cell processors.

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?

The Oracle Raspberry Pi cluster runs Linux.

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

No. The Raspberry Pi cluster is mainly for educational purposes and does not have the performance required for the TOP500 list.

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?

CPU architecture: x86-64
Operating systems: Custom Unix-like / Windows-based OS
Conclusion: Modern game consoles use PC-like hardware and operating systems.

Assignment 5.3: Working with Windows

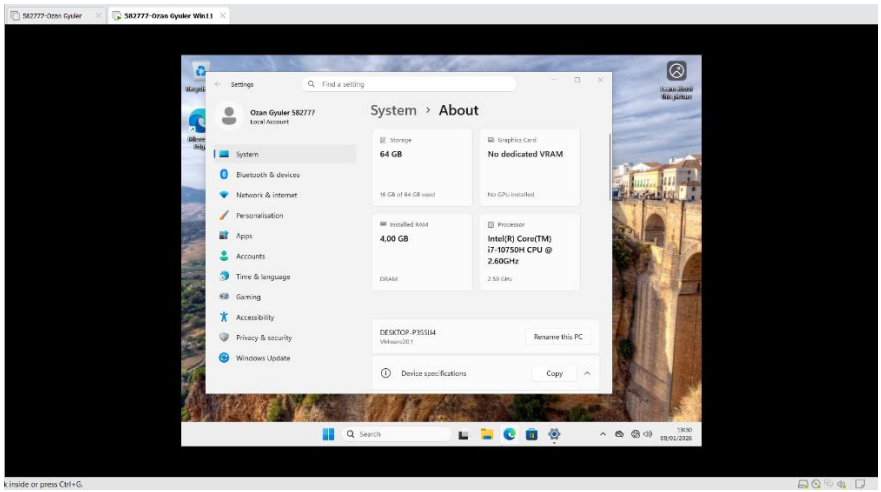
Take relevant screenshots of the assignments below

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.

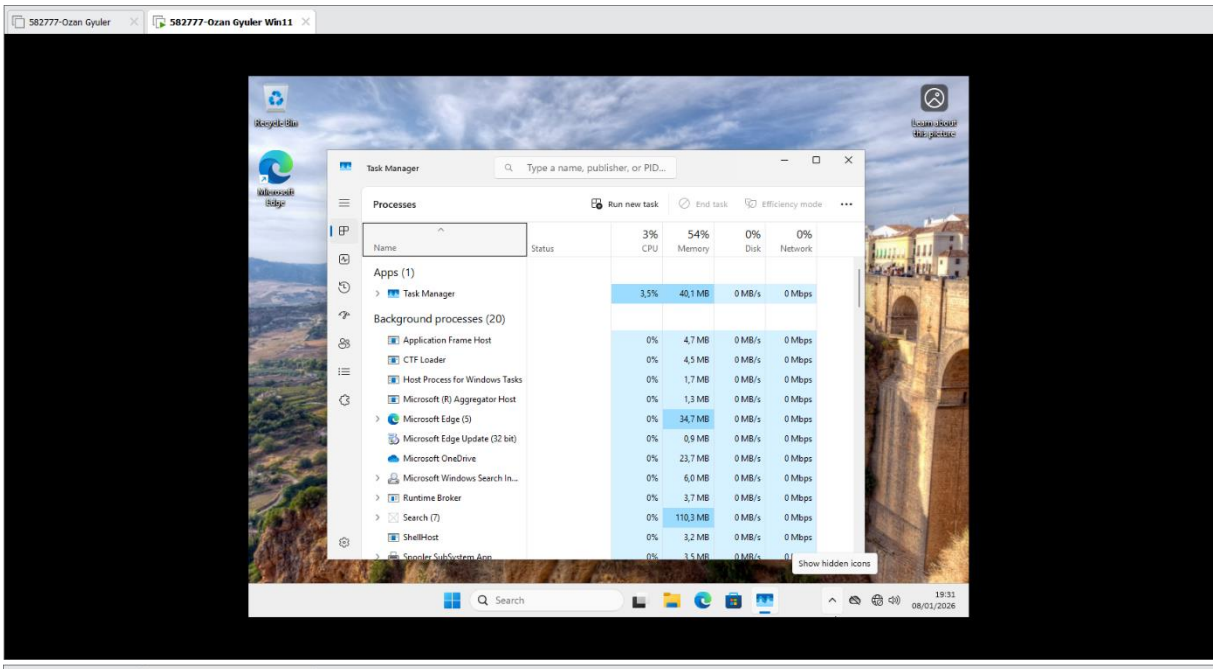
b) The file explorer can be opened with ⊞ + E, Which key combination could you also use?

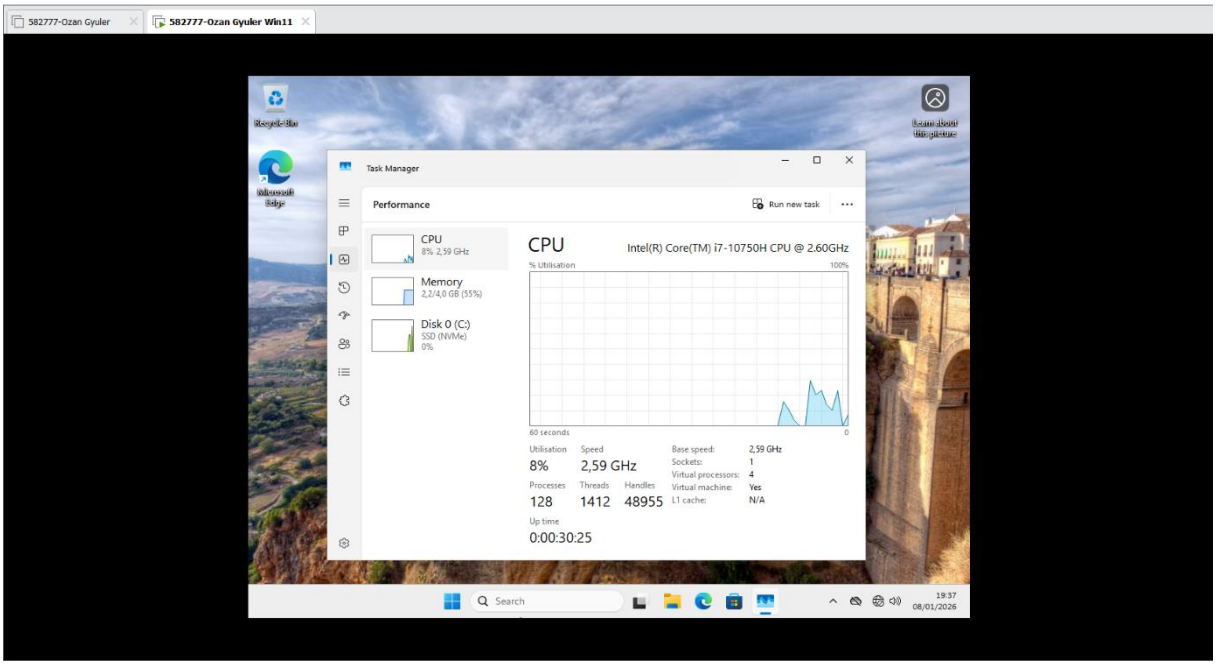
⊞ **+** R**,** then type **"**explorer**".**

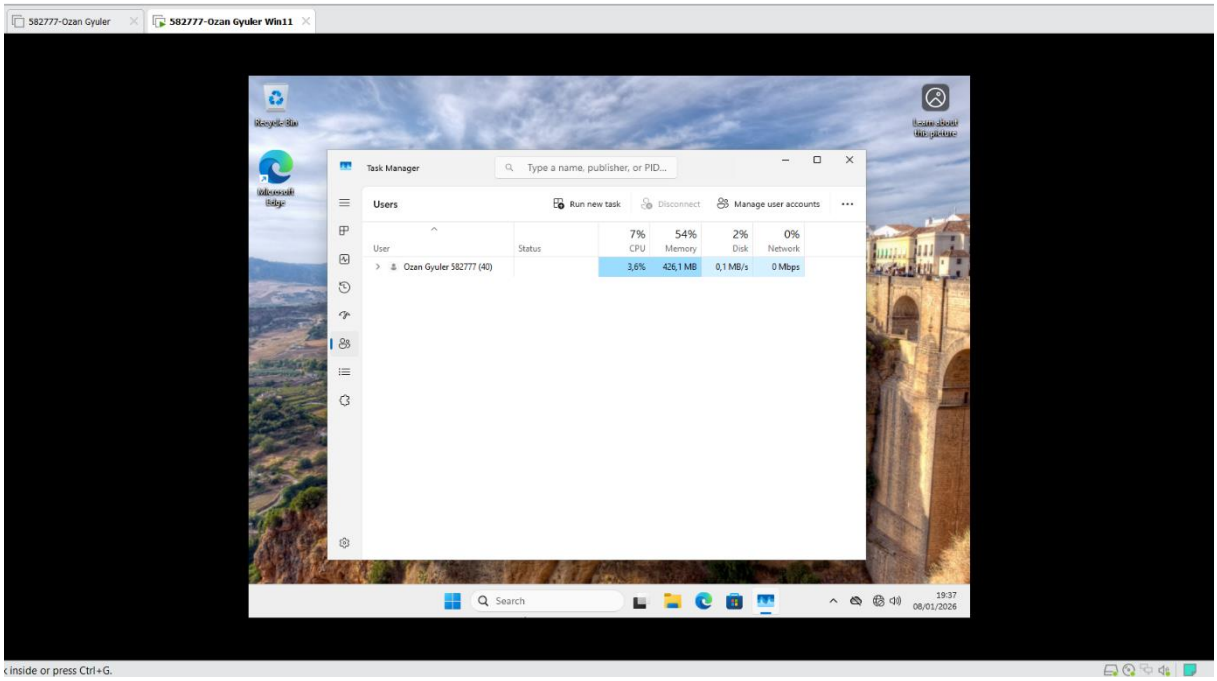
c) Open the system properties with a ⊞ key combination, take a screenshot of the open screen. Paste this screenshot into this template.



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.


582777-Ozan Gyuler
582777-Ozan Gyuler Win11
Task Manager
Type a name, publisher, or PID...
Processes
Run new task
End task
Efficiency mode
Name
Status
3% CPU
54% Memory
0% Disk
0% Network
Apps (1)
Task Manager
3,5%
40,1 MB
0 MB/s
0 Mbps
Background processes (20)
Application Frame Host
CTF Loader
Host Process for Windows Tasks
Microsoft (R) Aggregator Host
Microsoft Edge (5)
Microsoft Edge Update (32 bit)
Microsoft OneDrive
Microsoft Windows Search In...
Runtime Broker
Search (7)
ShellHost
Show hidden icons
Search
19:31
08/01/2026


582777-Ozan Gyuler
582777-Ozan Gyuler Win11
Task Manager
Performance
Run new task
CPU
8% 2,59 GHz
Memory
2,2/4,0 GB (55%)
Disk 0 (C:)
SSD (NVMe)
0%
CPU
Intel(R) Core(TM) i7-10750H CPU @ 2.60GHz
% Utilisation
100%
60 seconds
0
Utilisation
8%
Speed
2,59 GHz
Processes
128
Threads
1412
Handles
48955
Up time
0:00:30:25
Base speed: 2,59 GHz
Sockets: 1
Virtual processors: 4
Virtual machine: Yes
L1 cache: N/A
Search
19:37
08/01/2026



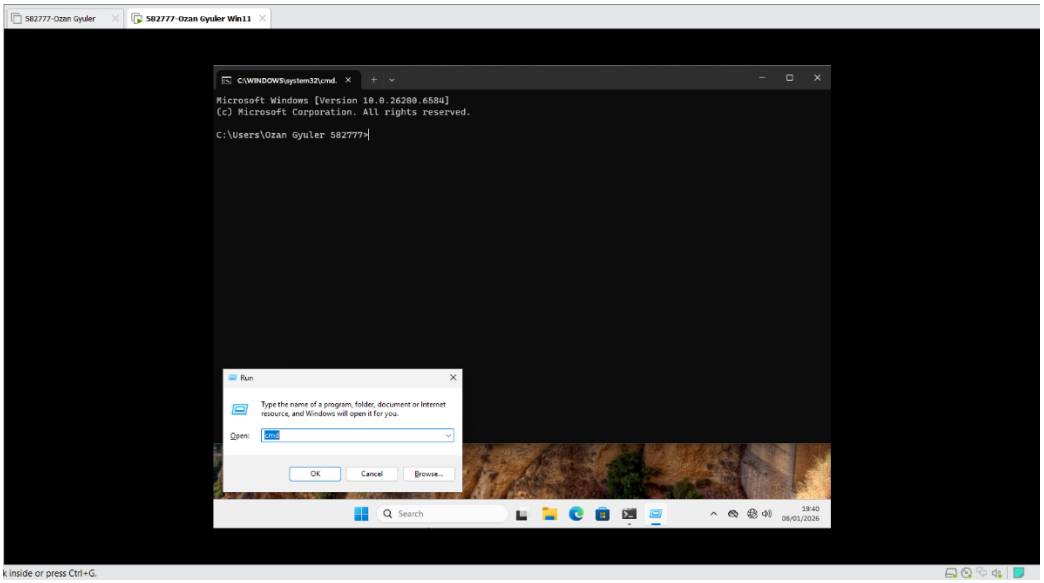
e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

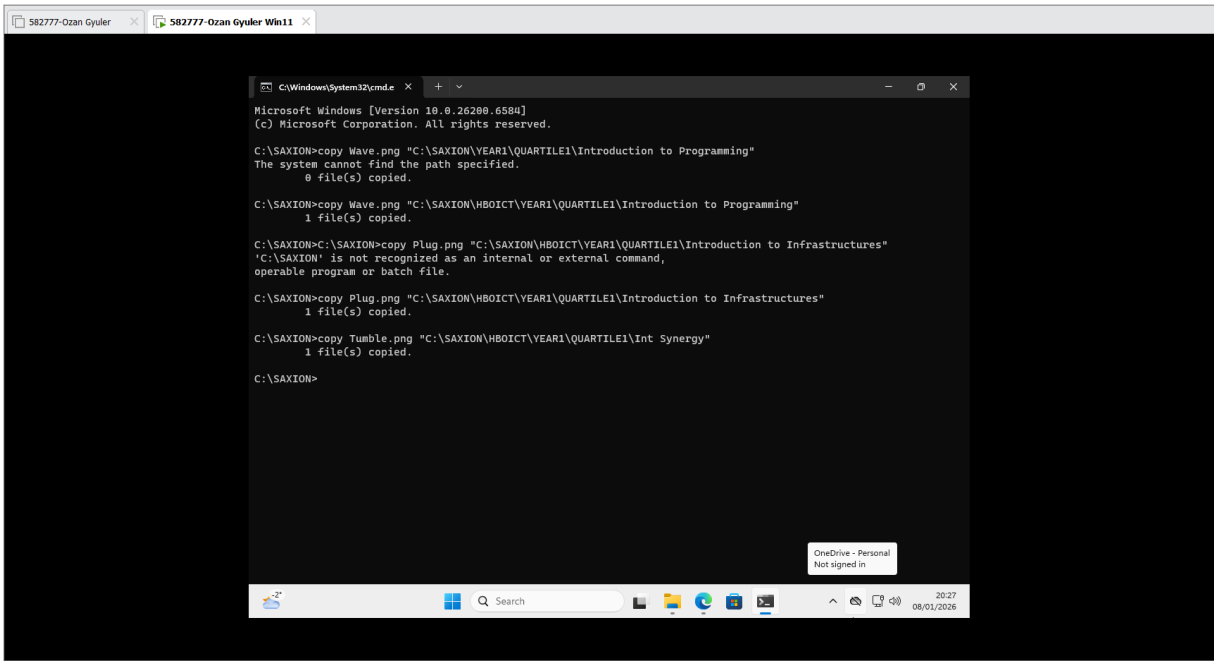
⊞ + L

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.

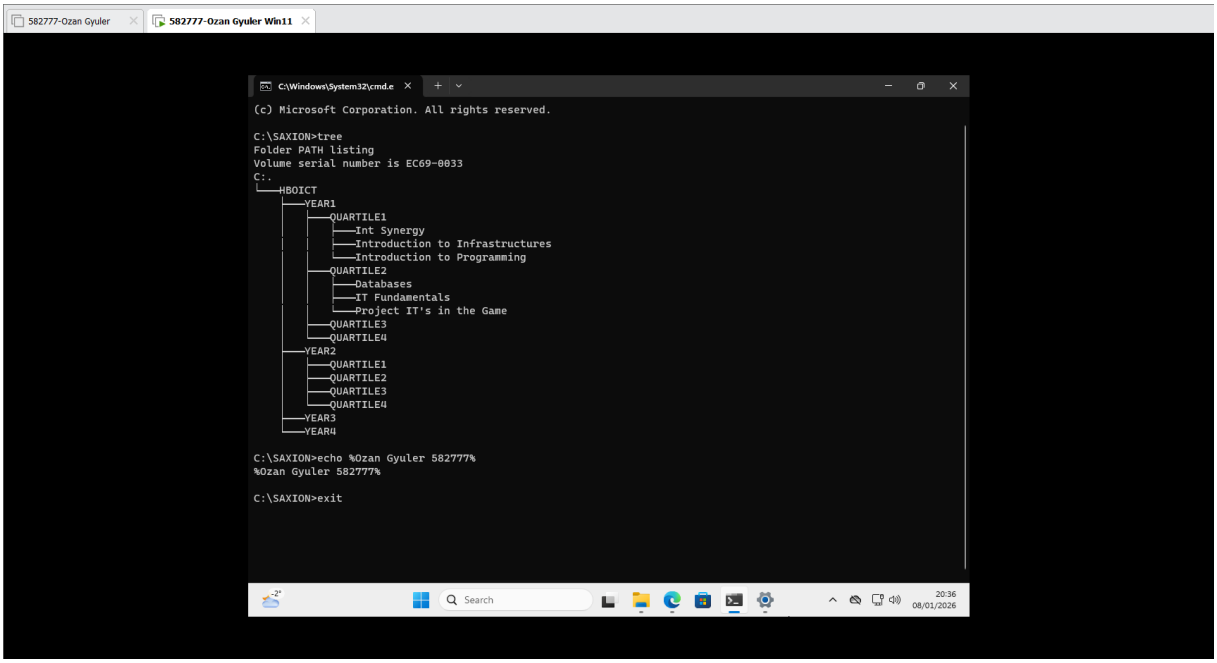


Working in the File Explorer

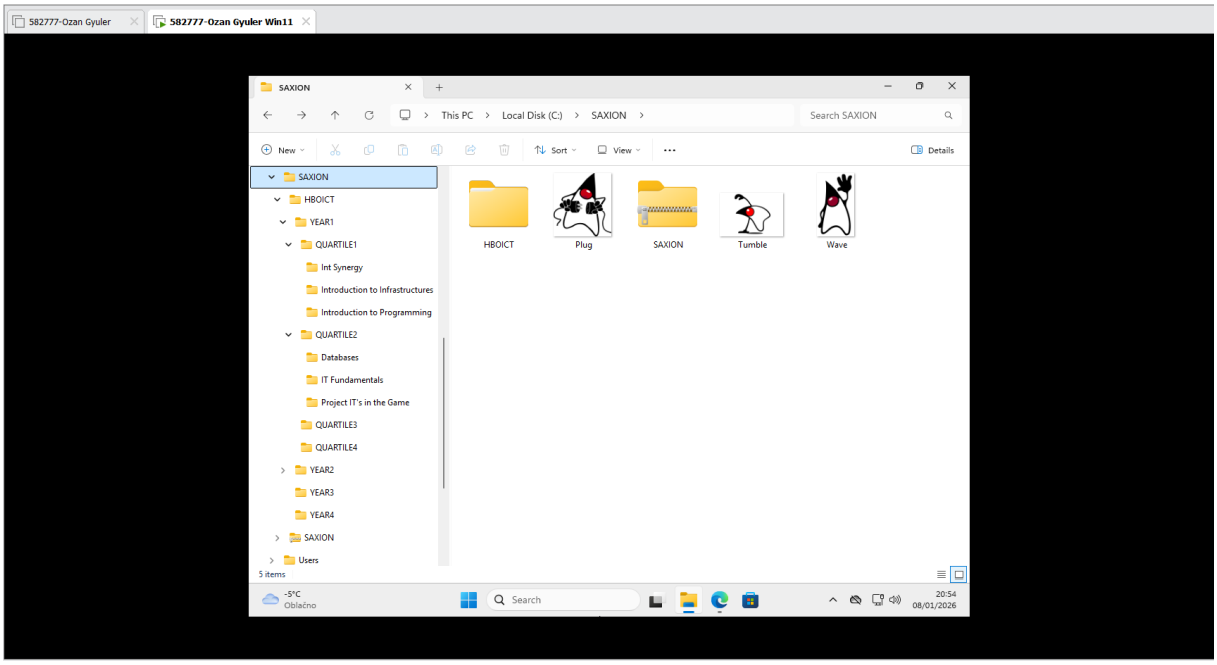
Relevant screenshots **copy** command:



Relevant screenshots **tree** command:

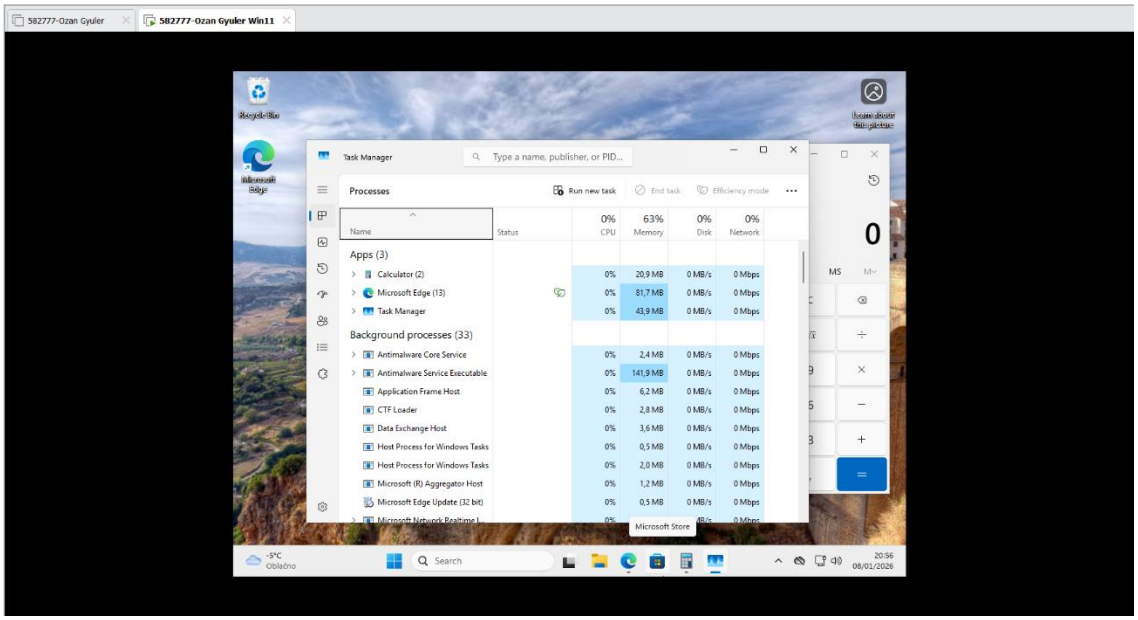


Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.



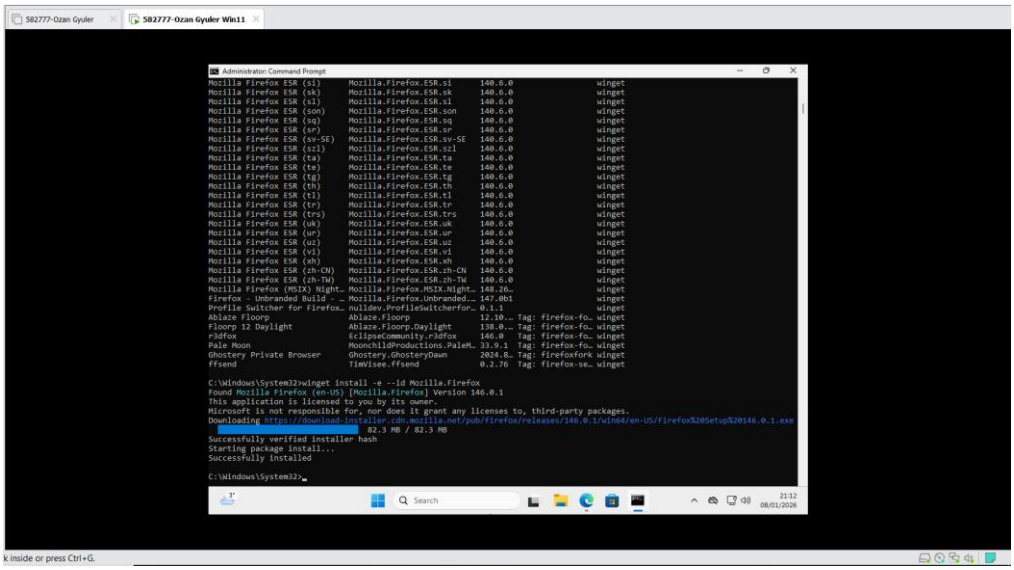
Terminating Processes

Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:



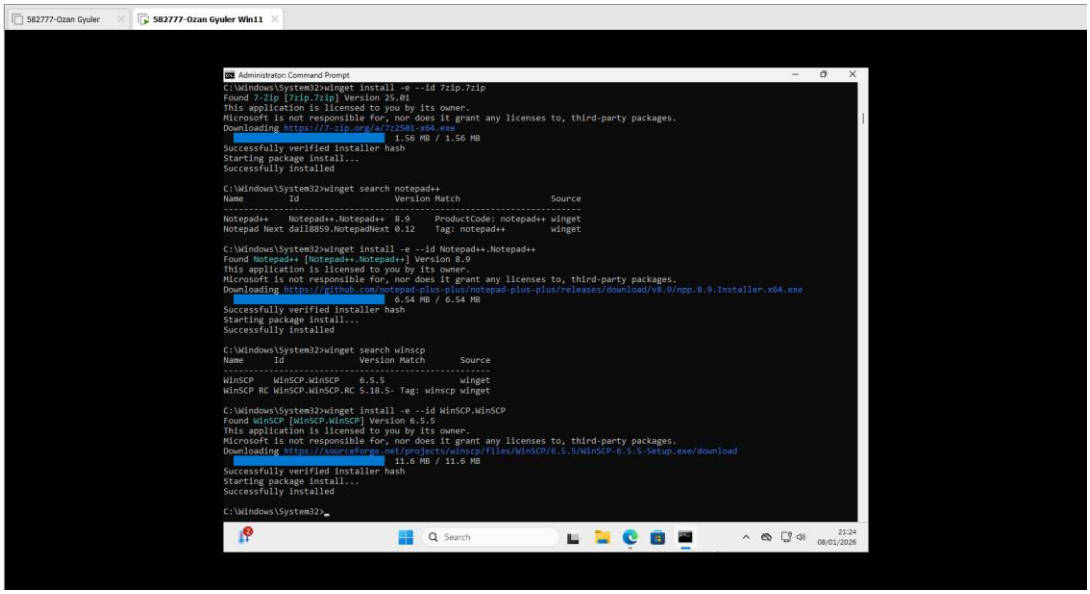
winget :It connects to Windows package manager

install : installs the software

-e :exact match

--id :uses the unique package identifier to adress

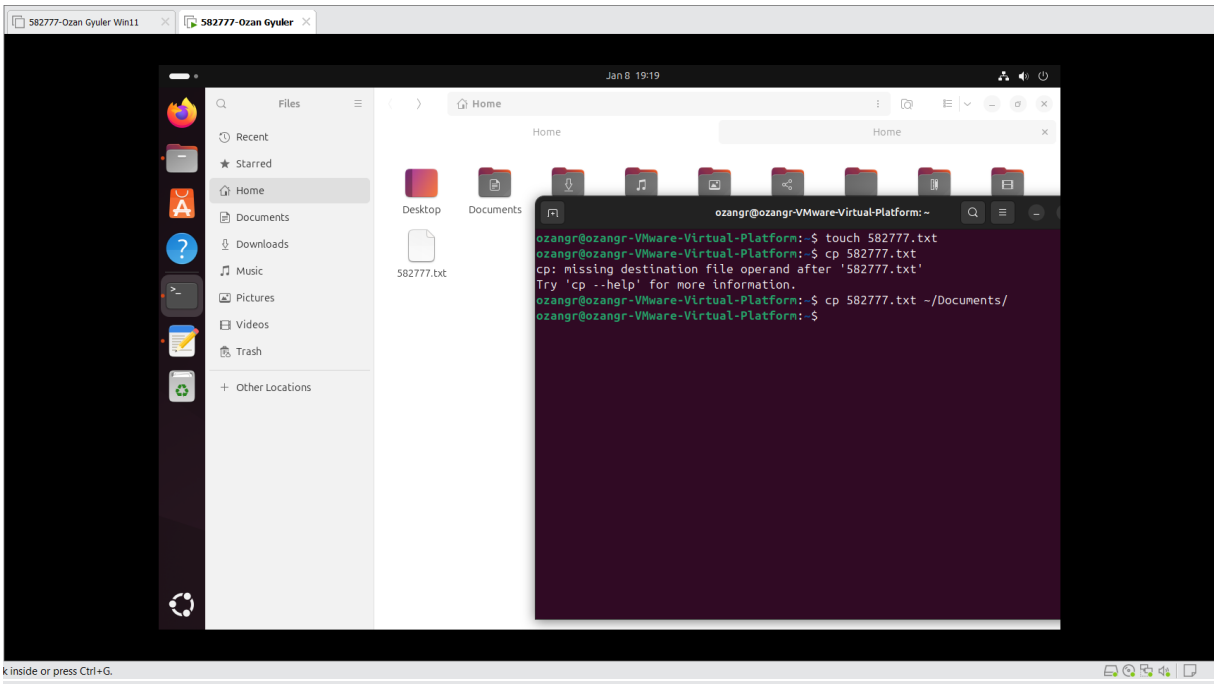
- WinSCP
- Notepad++
- 7zip

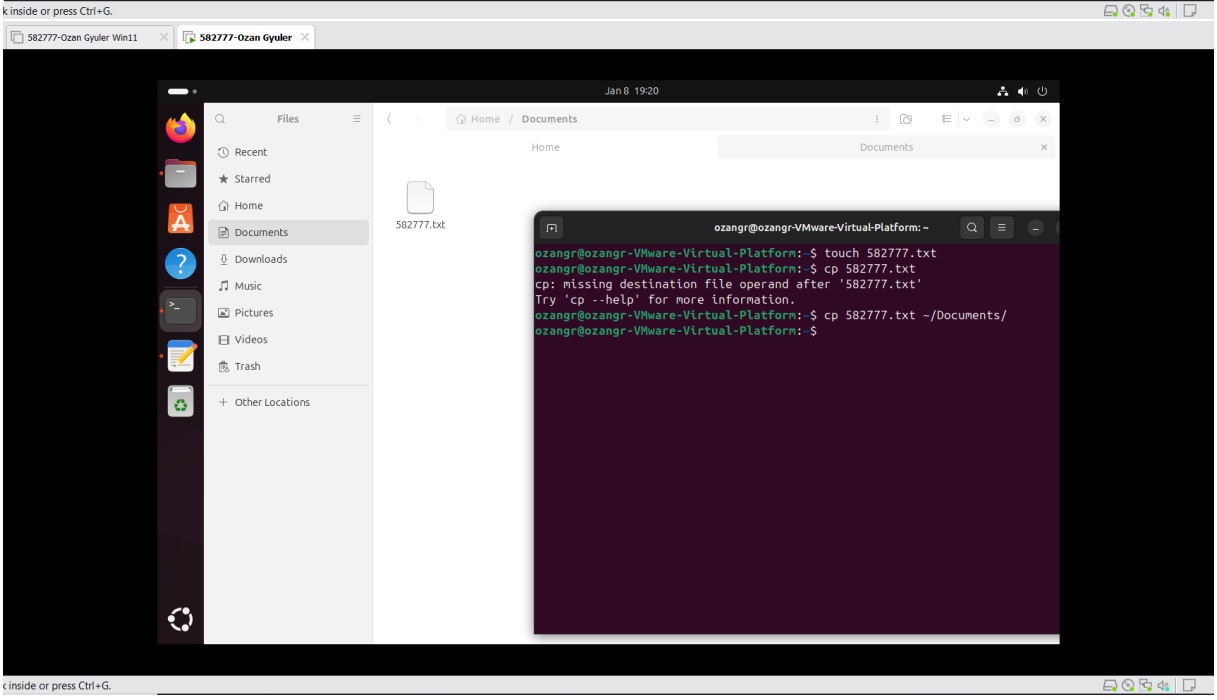


Assignment 5.4: Working with Linux

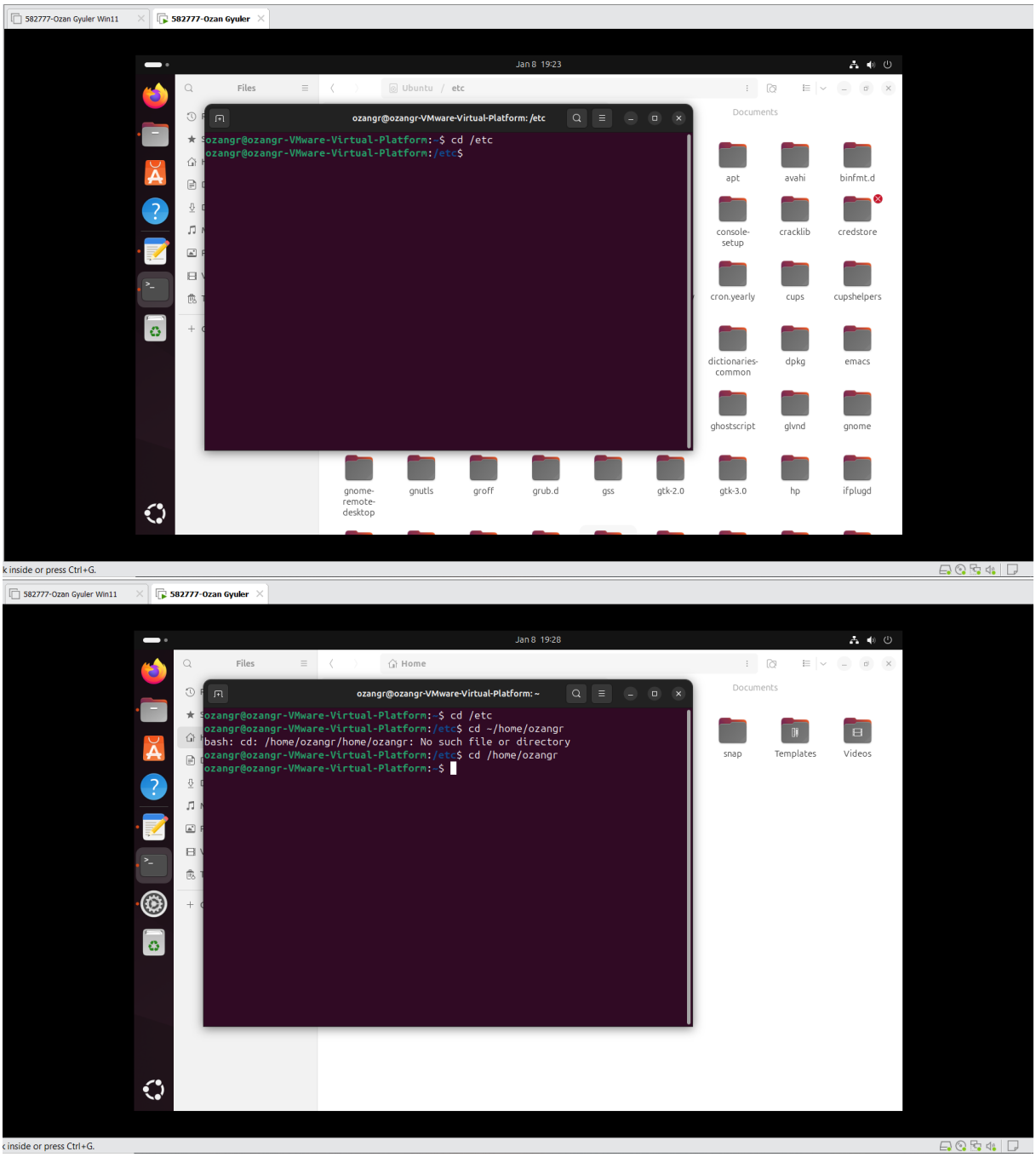
Relevant screenshots + motivation

Copying files





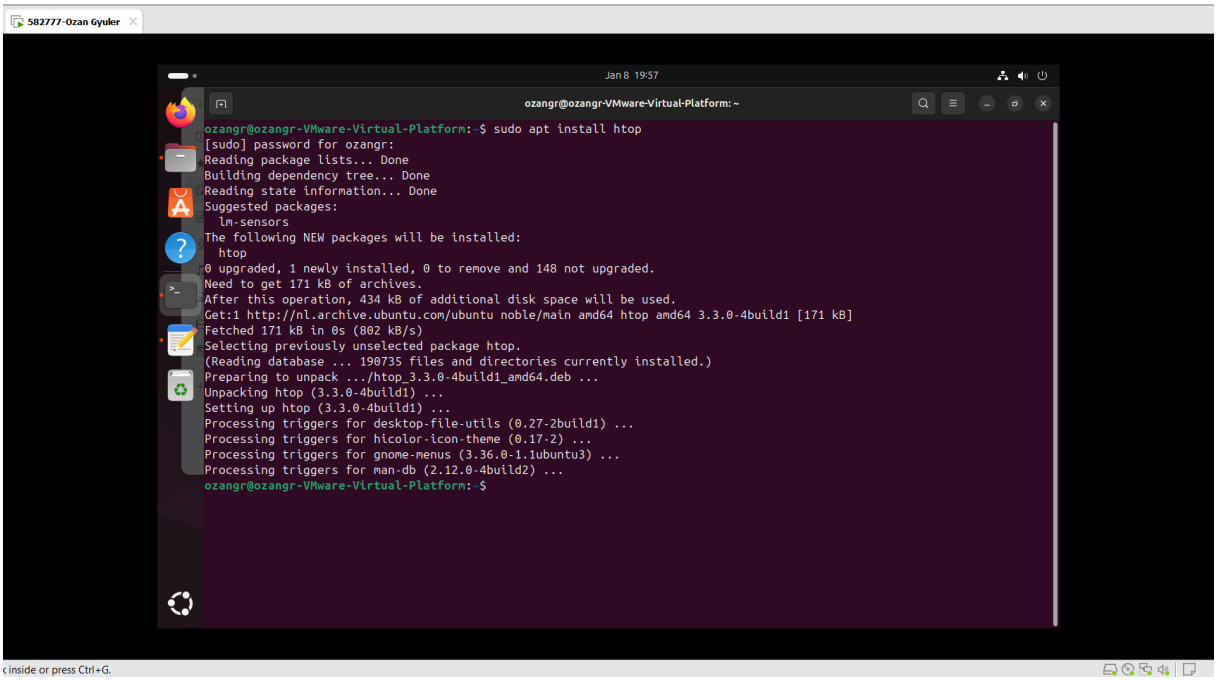
Etc file directory

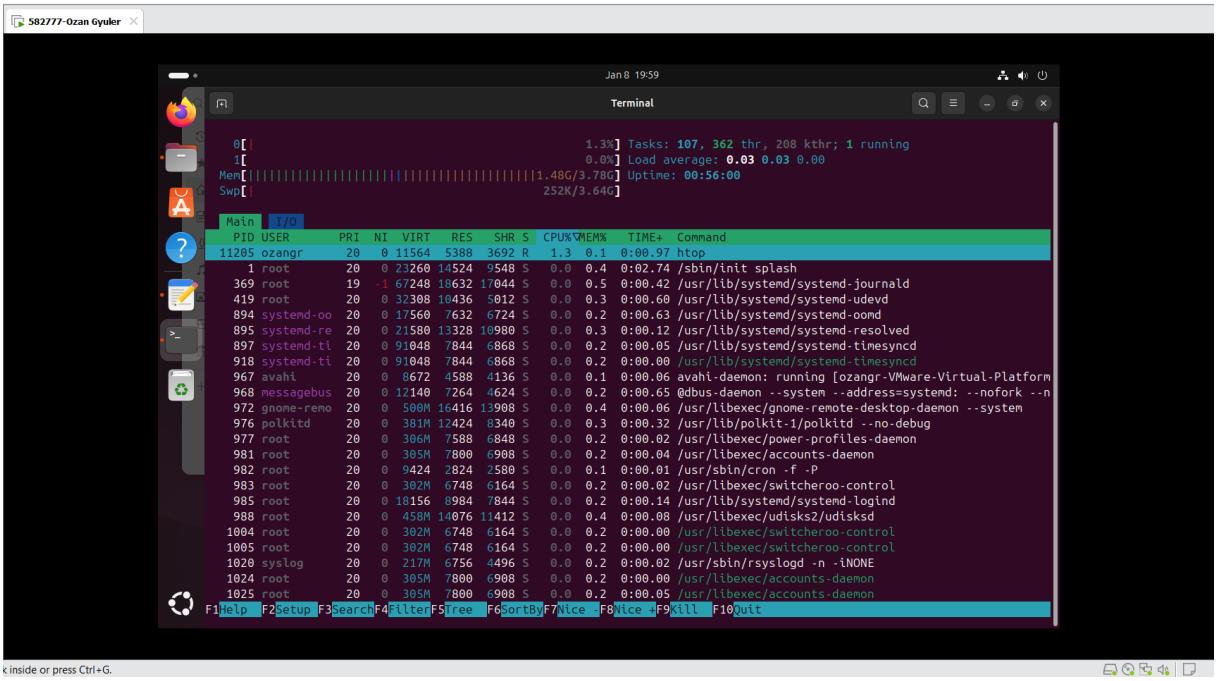


File Structure Difference: Unlike Windows, which uses separate drive letters (C:, D:), Linux organizes everything into a single unified hierarchy starting from the Root directory (/).

The /etc Directory: This folder is used to store system configuration files that control how the operating system and installed programs behave.

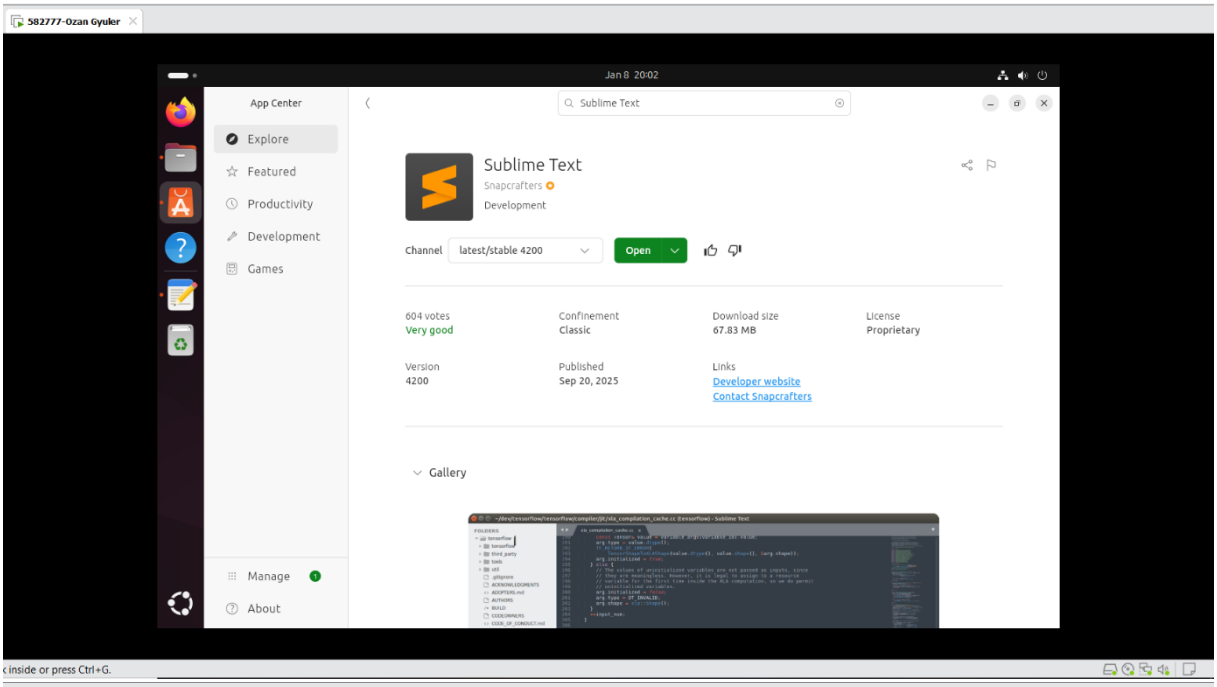
Installing htop

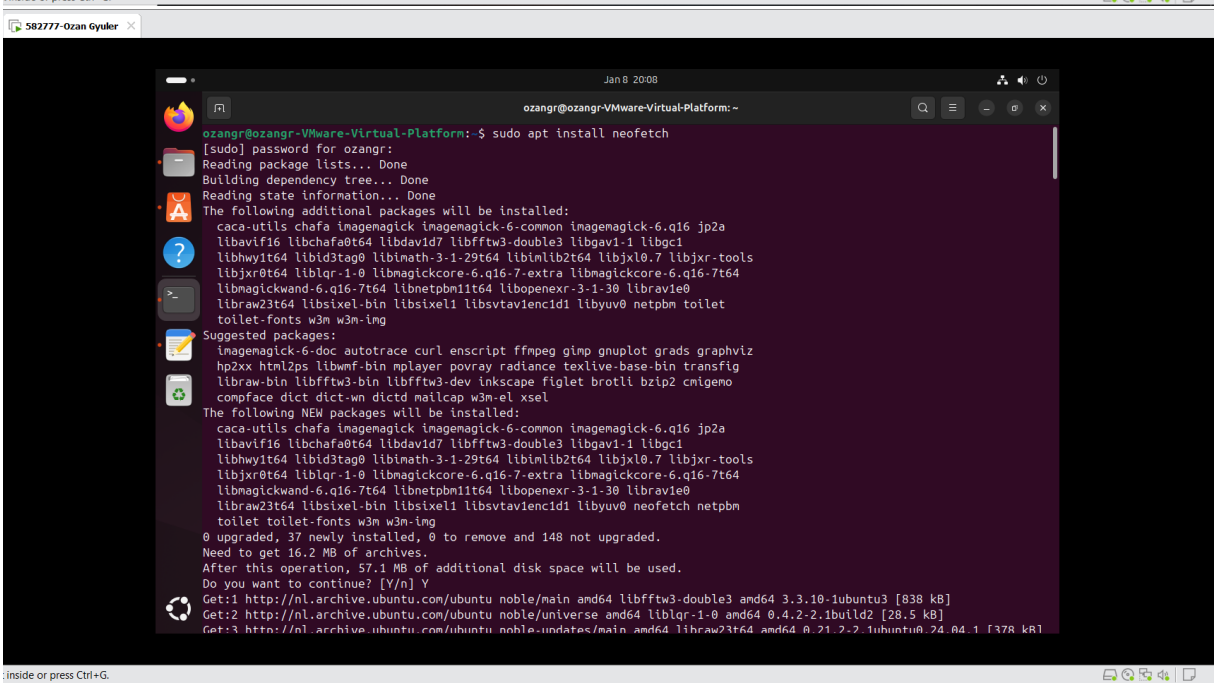


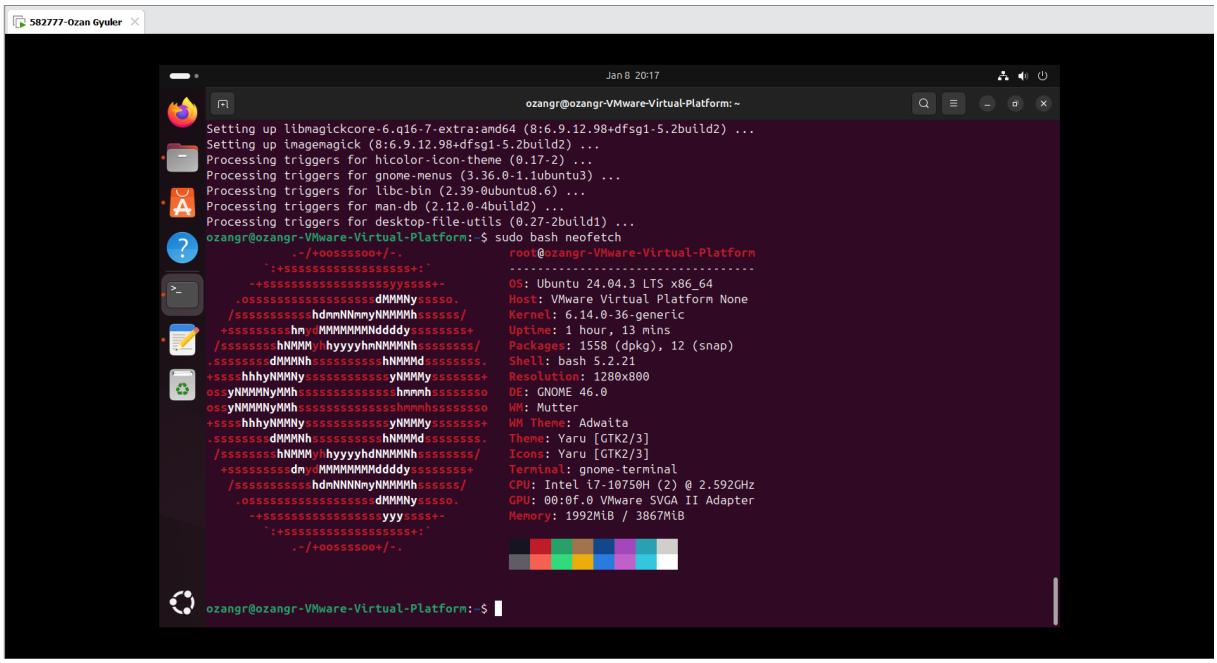


htop shows running processes, CPU usage, memory usage, and system load in real time.

Installing sublime and neofetch


582777-Ozan Gyuler
Jan 8 20:02
App Center
Explore
Featured
Productivity
Development
Games
Manage
About
Sublime Text
Sublime Text
Snapcrafters
Development
Channel
latest/stable 4200
Open
604 votes
Very good
Confinement
Classic
Download size
67.83 MB
License
Proprietary
Version
4200
Published
Sep 20, 2025
Links
Developer website
Contact Snapcrafters
Gallery
inside or press Ctrl+G.

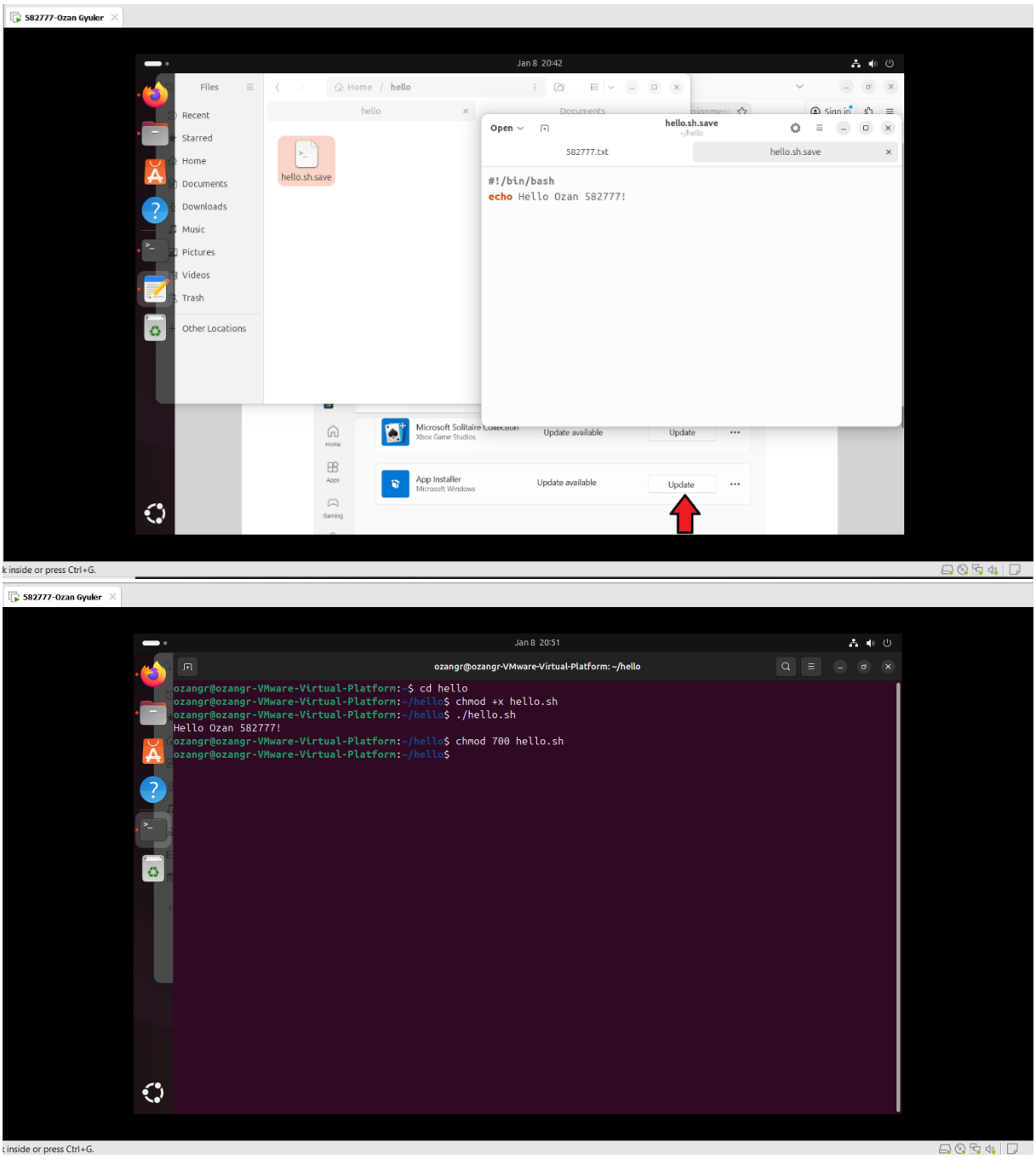

582777-Ozan Gyuler
Jan 8 20:08
ozangr@ozangr-VMware-Virtual-Platform: ~
ozangr@ozangr-VMware-Virtual-Platform:~$ sudo apt install neofetch
[sudo] password for ozangr:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
caca-utils chafa imagemagick imagemagick-6-common imagemagick-6.q16 jp2a
libavif16 libchafa0t64 libdav1d7 libfftw3-double3 libgav1-1 libgc1
libhwy1t64 libid3tag0 libimath-3-1-29t64 libimlib2t64 libjxl0.7 libjxr-tools
libjxr0t64 liblqr-1-0 libmagickcore-6.q16-7-extra libmagickcore-6.q16-7t64
libmagickwand-6.q16-7t64 libnetpbm11t64 libopenexr-3-1-30 librav1e0
libraw23t64 libsixel-bin libsixel1 libsvtav1enc1d1 libyuv0 netpbm toilet
toilet-fonts w3m w3m-img
Suggested packages:
imagemagick-6-doc autotrace curl enscript ffmpeg gimp gnuplot grads graphviz
hp2xx html2ps libwmf-bin mplayer povray radiance texlive-base-bin transfig
libraw-bin libfftw3-bin libfftw3-dev inkscape figlet brotli bzip2 cmigemo
compface dict dict-wn dictd mailcap w3m-el xsel
The following NEW packages will be installed:
caca-utils chafa imagemagick imagemagick-6-common imagemagick-6.q16 jp2a
libavif16 libchafa0t64 libdav1d7 libfftw3-double3 libgav1-1 libgc1
libhwy1t64 libid3tag0 libimath-3-1-29t64 libimlib2t64 libjxl0.7 libjxr-tools
libjxr0t64 liblqr-1-0 libmagickcore-6.q16-7-extra libmagickcore-6.q16-7t64
libmagickwand-6.q16-7t64 libnetpbm11t64 libopenexr-3-1-30 librav1e0
libraw23t64 libsixel-bin libsixel1 libsvtav1enc1d1 libyuv0 neofetch netpbm
toilet toilet-fonts w3m w3m-img
0 upgraded, 37 newly installed, 0 to remove and 148 not upgraded.
Need to get 16.2 MB of archives.
After this operation, 57.1 MB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://nl.archive.ubuntu.com/ubuntu noble/main amd64 libfftw3-double3 amd64 3.3.10-1ubuntu3 [838 kB]
Get:2 http://nl.archive.ubuntu.com/ubuntu noble/universe amd64 liblqr-1-0 amd64 0.4.2-2.1build2 [28.5 kB]
inside or press Ctrl+G.



neofetch displays system information such as OS version, kernel, CPU, RAM, and hostname.

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation



Assignment 5.6: View the contents of files

Relevant screenshots + motivation

cat: Reads a file from start to finish and prints it to the terminal.

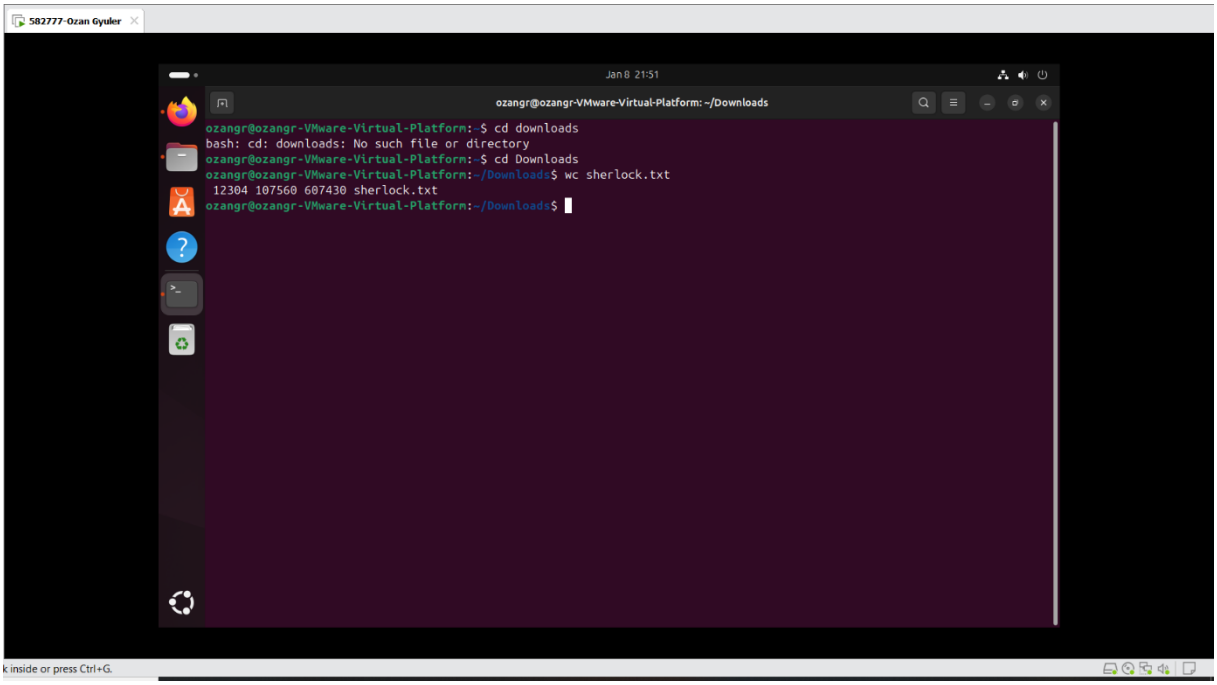
less: Opens the file in an interactive mode where you can scroll up and down.

head: Shows the first 10 lines of a file (by default).

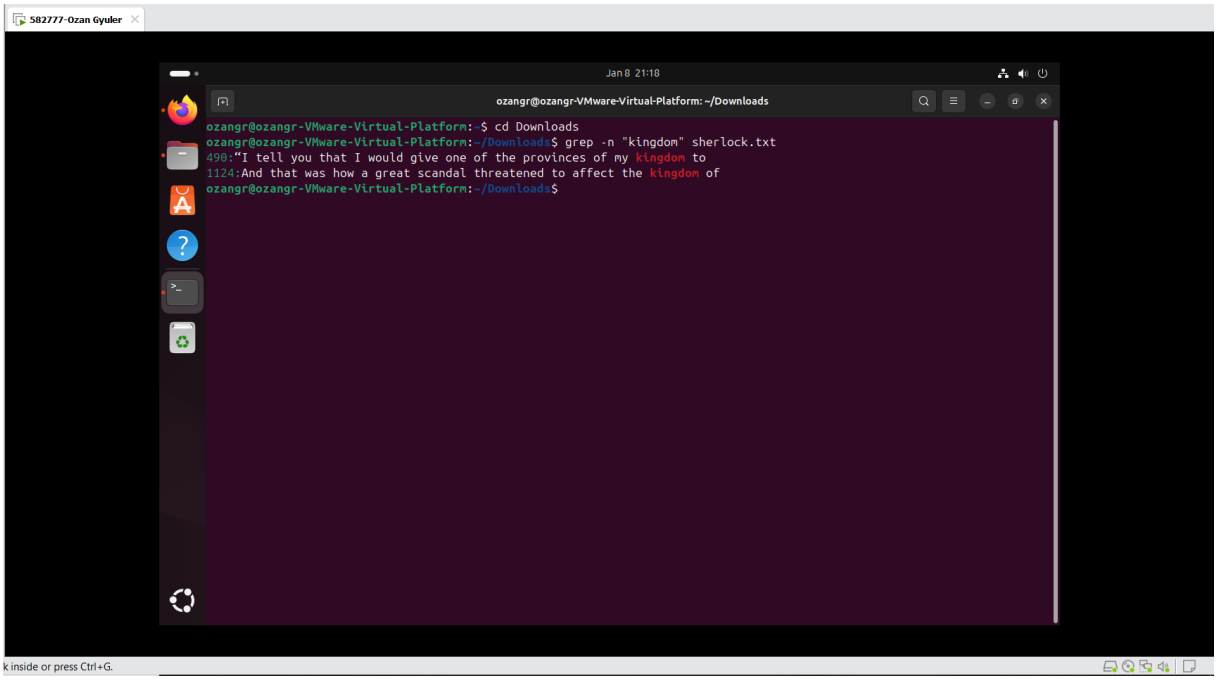
tail: Shows the last 10 lines of a file (by default).

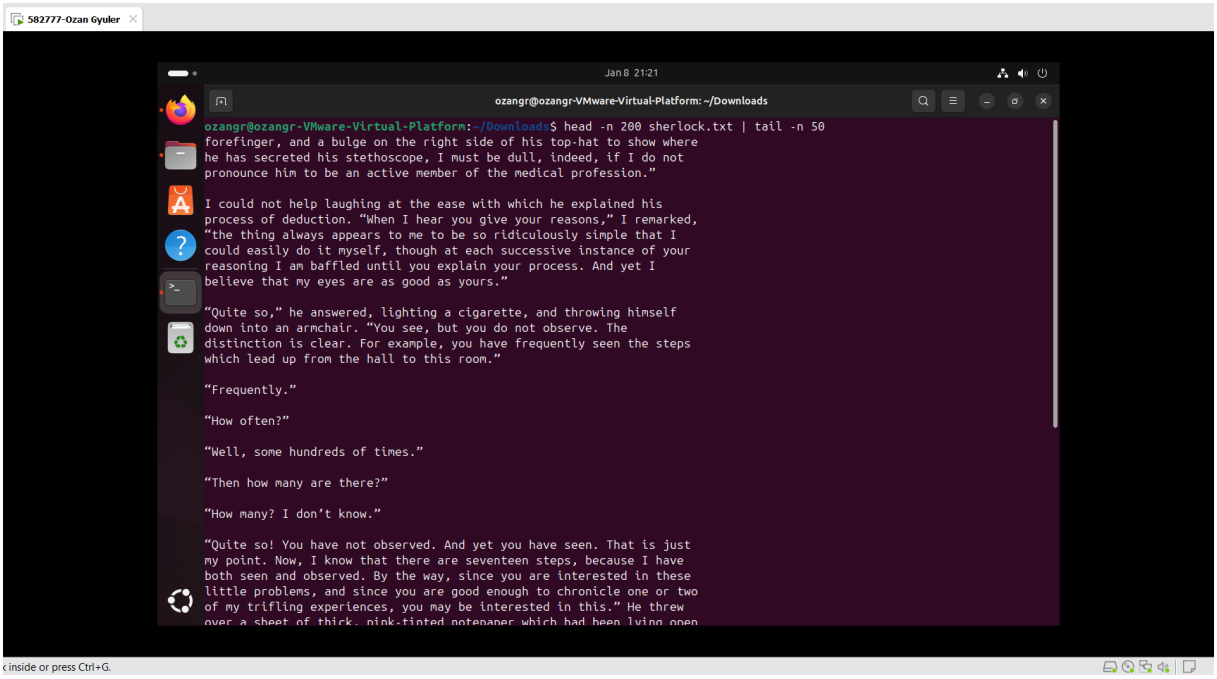
wc: Counts the words, bytes and files.

grep: It searches for a specific patterns within a file and prints every line that contains it.



12304 lines,107564 words,607430 character

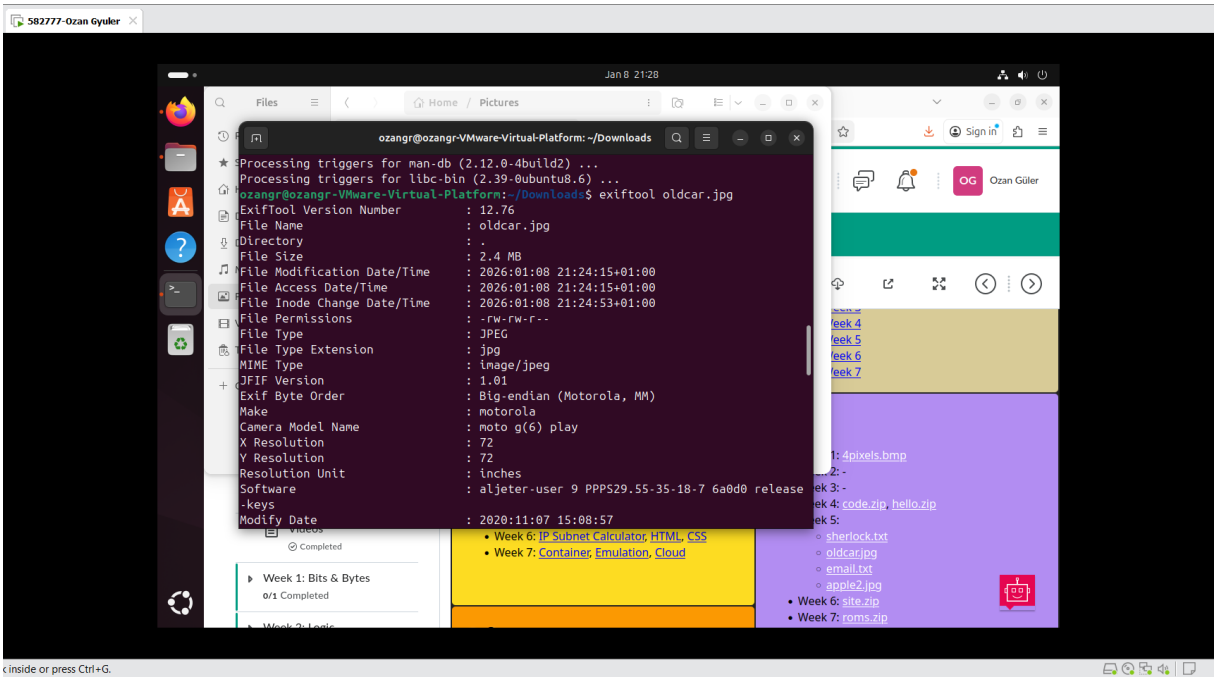




Assignment 5.7: Digital forensics

Relevant screenshots + motivation

Exiftool

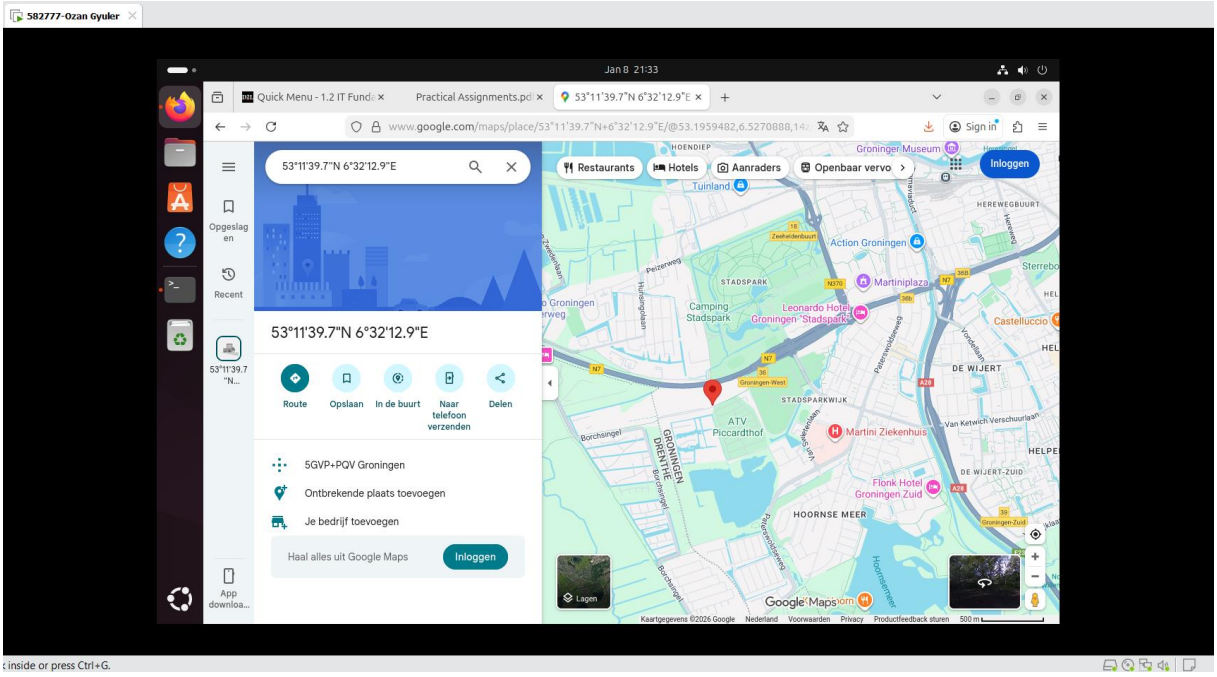


Phone model is Motorola

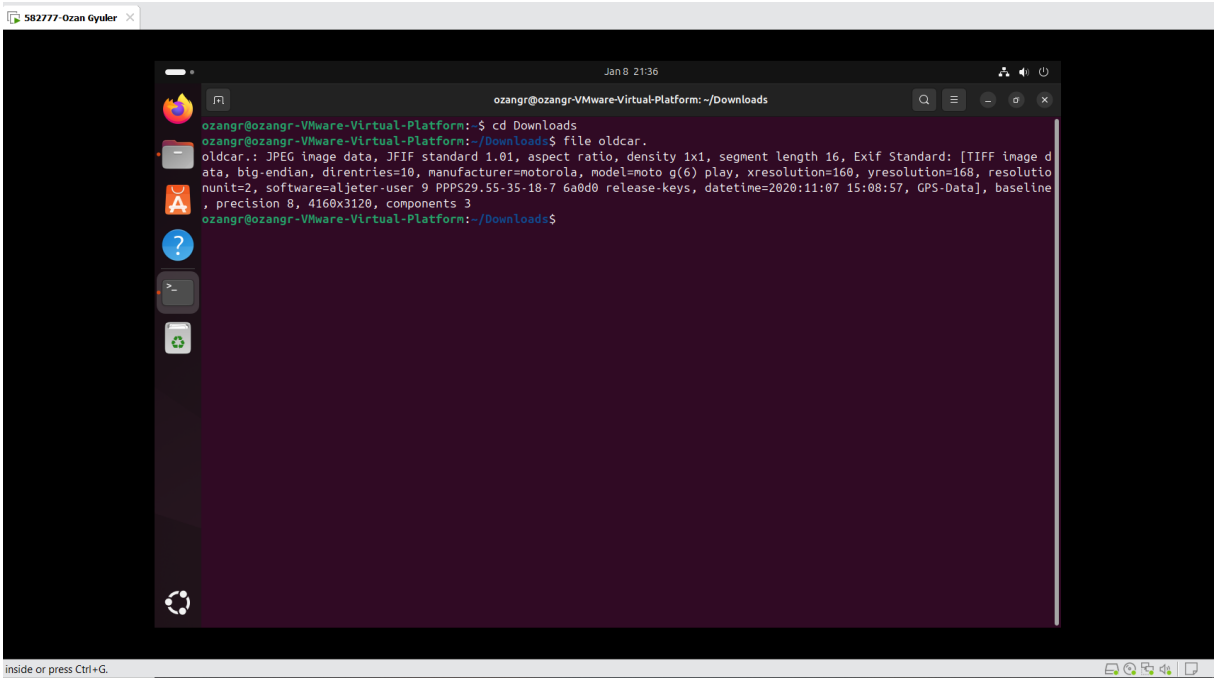
```
Make                            : motorola
Camera Model Name               : moto g(6) play
X Resolution                    : 72
Y Resolution                    : 72
Resolution Unit                 : inches
Software                        : aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release
-keys
Modify Date                     : 2020:11:07 15:08:57
```

GPS Location shows it was taken in Groningen

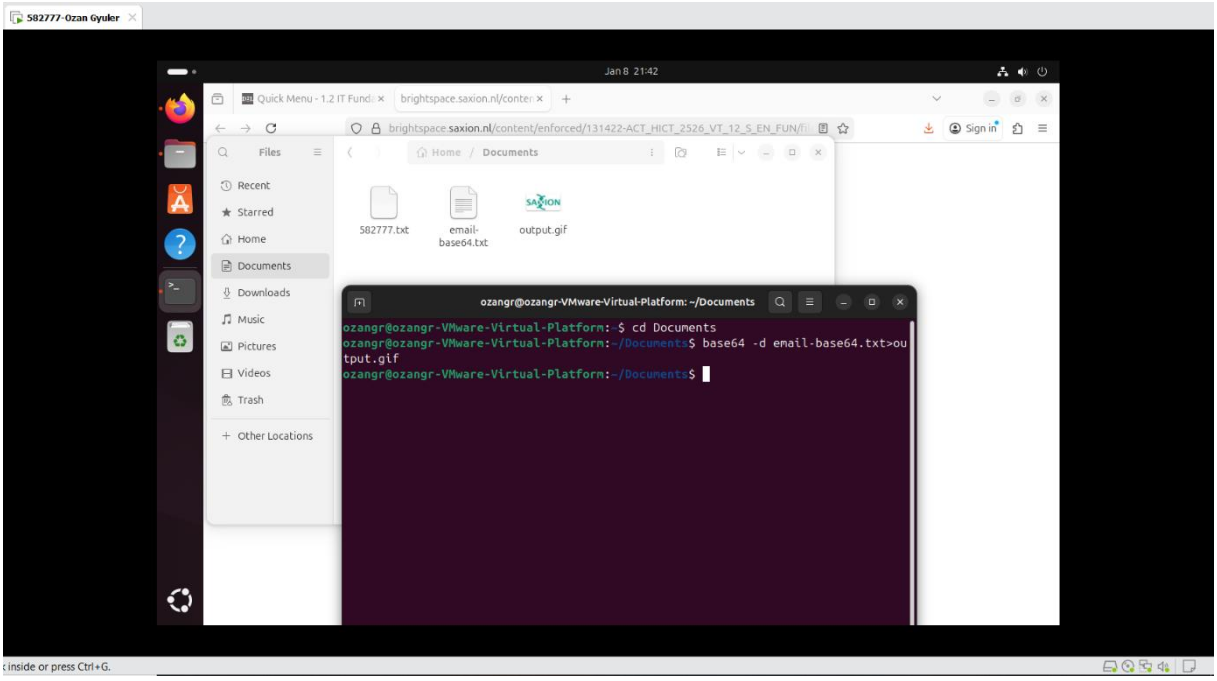
```
GPS Altitude                    : 42 m Above Sea Level
GPS Date/Time                   : 2020:11:07 14:08:57Z
GPS Latitude                    : 53 deg 11' 39.68" N
GPS Longitude                   : 6 deg 32' 12.90" E
Focal Length                    : 3.5 mm
GPS Position                    : 53 deg 11' 39.68" N, 6 deg 32' 12.90" E
Light Value                     : 7.7
ozangr@ozangr-VMware-Virtual-Platform:~/Downloads$
```



File oldcar.

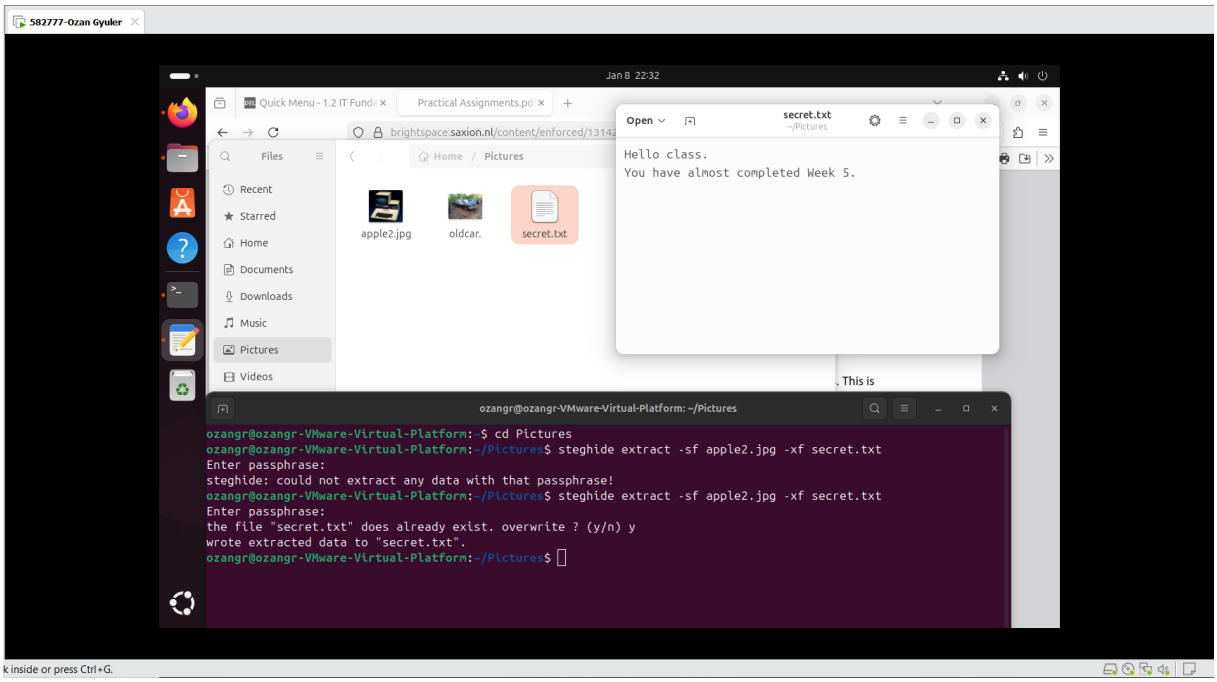


Decode BASE64



Assignment 5.8: Steganography

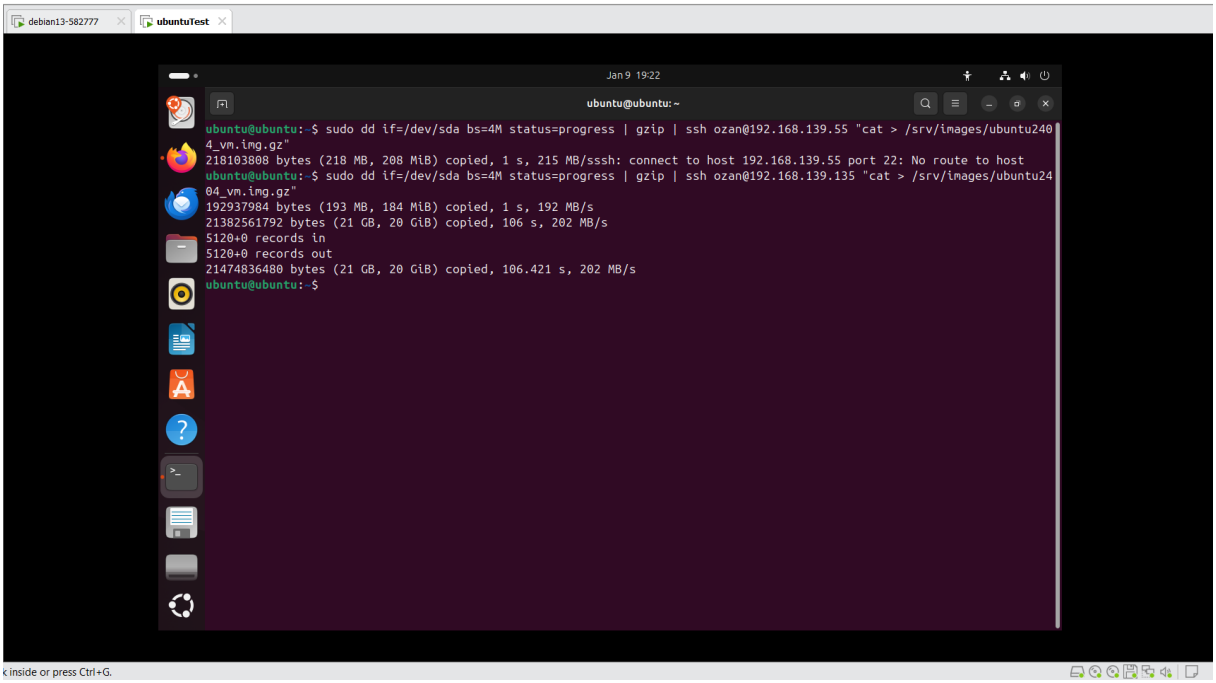
Relevant screenshots + motivation

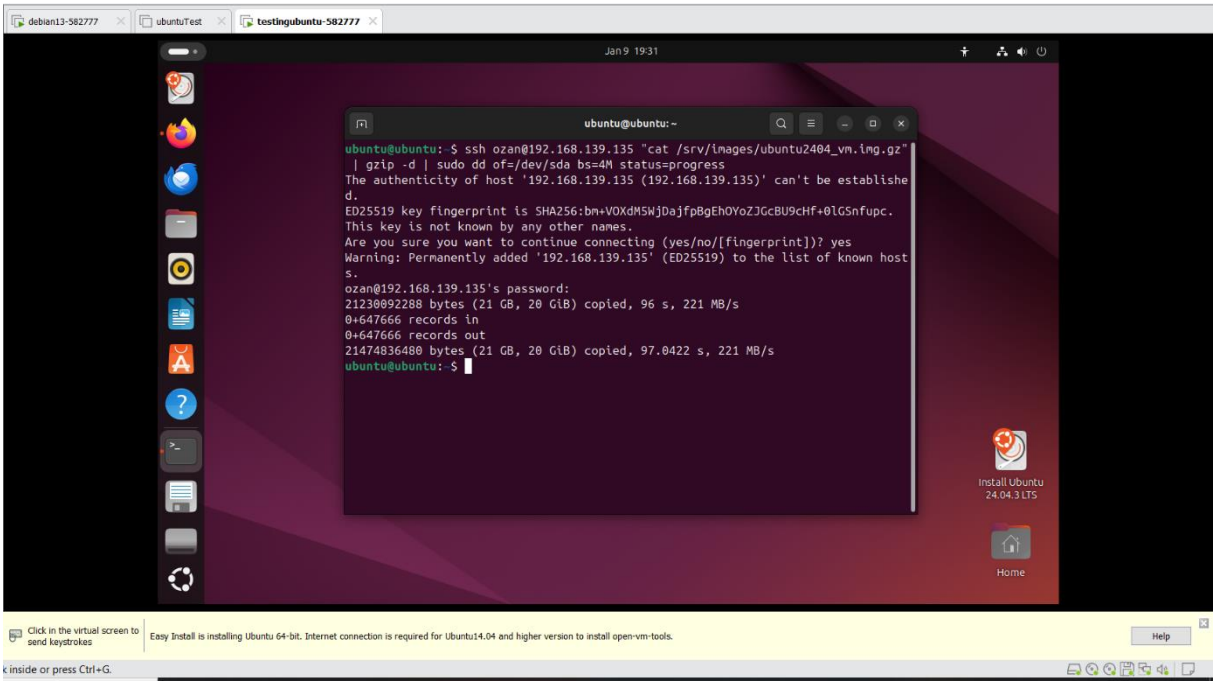


Assignment 5.9: Capture disk images

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.





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