

Template Week 5 – Operating Systems

Student number: 578634

Assignment 5.1: Unix-like

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

Unix is an operating system, developed in the 1970s, known for its modular design, hierarchical file system and a command-line interface. It supports execution of multiple tasks/processes simultaneously. Unix-like systems are those that behave similarly to Unix (same design, interfaces, and tools) but do not use the original code or do not carry the official UNIX trademark, such as GNU/Linux, BSDs, 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-created the original Unix at Bell Labs in 1969 and wrote the first Unix kernel and many early tools, also co-designed the B programming language that led to C.
- Dennis Ritchie: Co-inventor of Unix with Thompson and creator of the C programming language, which made Unix portable and strongly influenced most later systems and languages.
- Bill Joy: Co-founder of Sun Microsystems, was a major developer of BSD Unix at Berkeley, and created the vi editor and the C shell, shaping many features of modern Unix systems.
- Richard Stallman: Founded the GNU Project and the Free Software Foundation, launched key free tools (such as the GNU compiler and utilities), and defined the Free Software/GNU philosophy.
- Linus Torvalds: Created the Linux kernel in 1991 and released it as free software, which, combined with GNU components, forms most GNU/Linux systems used today.

- c) What is the philosophy of the GNU movement?

The main goal of the GNU philosophy is that the user must have freedom over the software they use by four freedoms: run the program for any purpose, study and change its source, redistribute copies, and distribute modified versions. The movement also focuses that these freedoms are an ethical requirement, so software serves users and communities rather than restricting them.

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

Ubuntu is built mainly from GNU and Linux components and is distributed under free and open-source licenses which grant the four freedoms, so in general it aligns with the GNU movement's software-freedom goals. However, Ubuntu's default installation has sometimes included proprietary drivers or optional non-free software, such as some firmware or codecs, which strict GNU advocates view as a partial departure from the pure GNU ideal of only free software.

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

Windows Subsystem for Linux (WSL) is a feature of the Windows Operating System that enables you to run a GNU/Linux environment directly on Windows without the overhead of a traditional virtual machine or dual-boot setup. WSL 1 used a compatibility layer to translate Linux system calls, while WSL 2 uses a lightweight virtual machine with a full Linux kernel for better compatibility and performance.

- f) Find out, which operating system family belongs to Android, iOS and ChromeOS?
- Android: A mobile OS is an open-source OS, using the Linux kernel, developed by Google, and targeting touch devices, so it falls under the category of Linux/Unix-like operating systems.
 - iOS: Apple's mobile operating system built upon the Darwin foundation which in turn is derived from BSD Unix and other technologies, placing it in the Unix-like/BSD family.
 - ChromeOS: Developed by Google, it is a Linux-based operating system whose main interface is the Chrome browser; therefore, it falls under the category of Linux/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:

<https://www.computerhistory.org/timeline/search/?q=Supercomputer>

Supercomputers solve very large and complex problems that would take normal computers an inordinate amount of time. On the Computer History Museum timeline, supercomputers are repeatedly linked to tasks such as simulating nuclear reactions, modeling the Earth's climate, and supporting advanced aerospace and weapons research. They are also used for scientific simulations in physics, chemistry, and astronomy, for example to study fluid dynamics, materials, and the behaviour of galaxies. Over time, the museum's entries show supercomputers being applied to weather prediction, cryptography, and large-scale data analysis as computing power increases.

- 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?

The PlayStation 3 cluster is a high-performance computing cluster that is developed by connecting many PS3 consoles in a distributed system, thereby exploiting the parallelism in the Cell processor at low cost.

These types of clusters have been used in various research and government projects for scientific computation, gravity research grids, and in the case of the U.S. Air Force "Condor Cluster, for pattern recognition, satellite image processing, and radar enhancement.

- 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's 1,050-node Raspberry Pi supercomputer boots all the Pis over the network from a central x86 server using Oracle Linux for ARM instead of the default Raspberry Pi OS/Raspbian. A single network-boot image simplifies deployment, updates, and management across the 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/>

Oracle's Raspberry Pi "supercomputer" is not among the TOP500 list of the 500 fastest supercomputers in the world. It is an educational or demonstration cluster of about a thousand Raspberry Pi computers, not for supercomputing performance. All Raspberry Pi computers in this cluster have minimal floating-point capability relative to the computers found in current supercomputers. TOP500-listed supercomputers are ranked for their Linpack performance, which is tens of petaflops to multi exaflops levels nowadays, many orders of magnitude more powerful than a Raspberry Pi supercomputer could ever hope to be. Additionally, it does not appear that there is any record of Oracle or Raspberry Pi contributing their Linpack performance to the TOP500 list, so both points logically indicate that it is not on the 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?

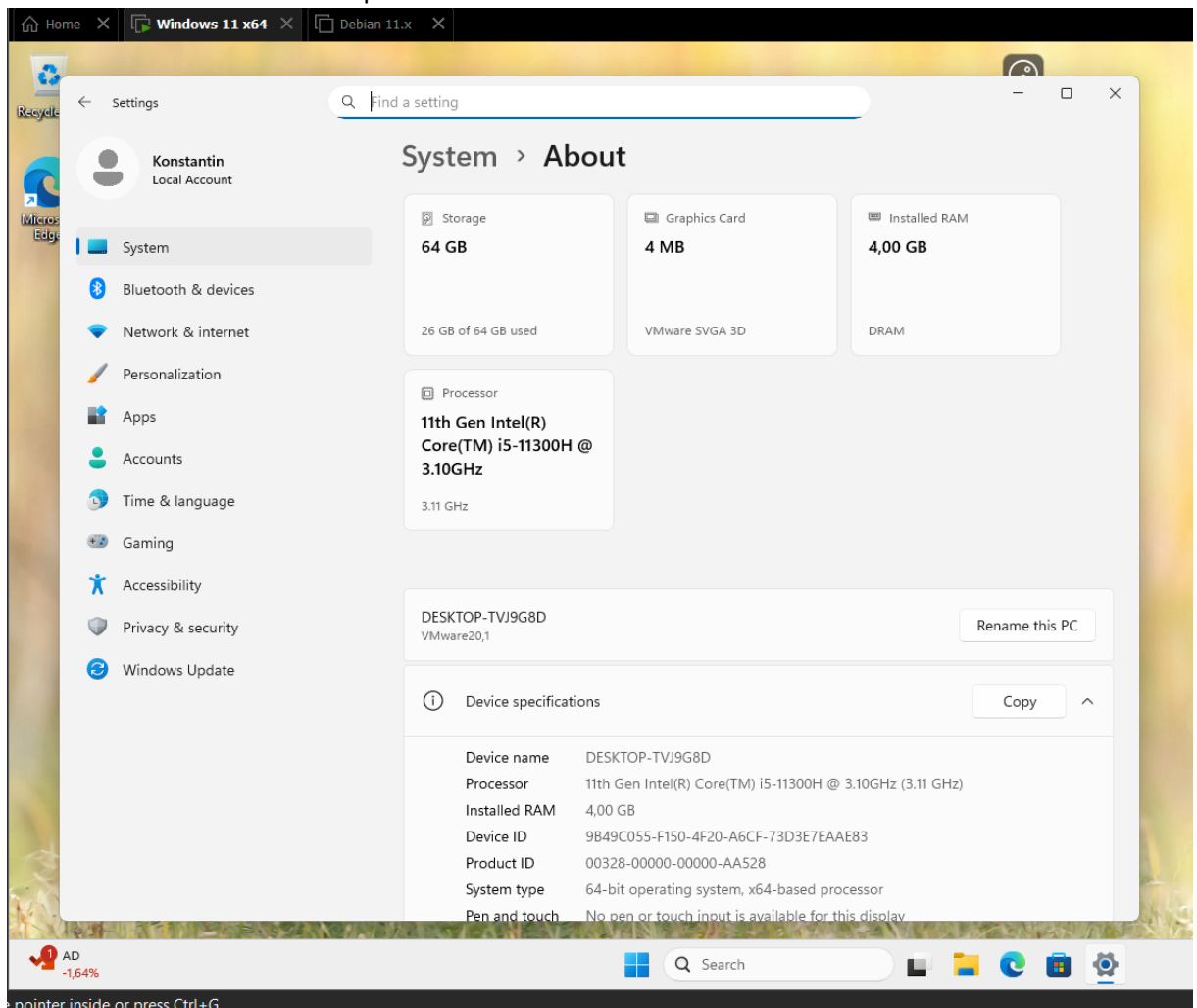
PlayStation 5 and Xbox Series X both are powered by custom AMD system-on-chips, with an 8-core Zen 2 CPU combined in a chip with RDNA 2-based GPUs. PS5 runs Sony's custom PlayStation 5 system software, which is a proprietary OS derived from earlier PlayStation OS designs, while Xbox Series X runs Microsoft's Xbox system software, based on a customized Windows/Hyper-V-based environment.

There is a clear takeaway from this: the modern console has converged on very similar PC-like AMD architectures and OS stacks, much closer to specialized gaming PCs than the exotic architectures such as Cell used in earlier generations, which makes them easier to target for game and potentially HPC-style workloads.

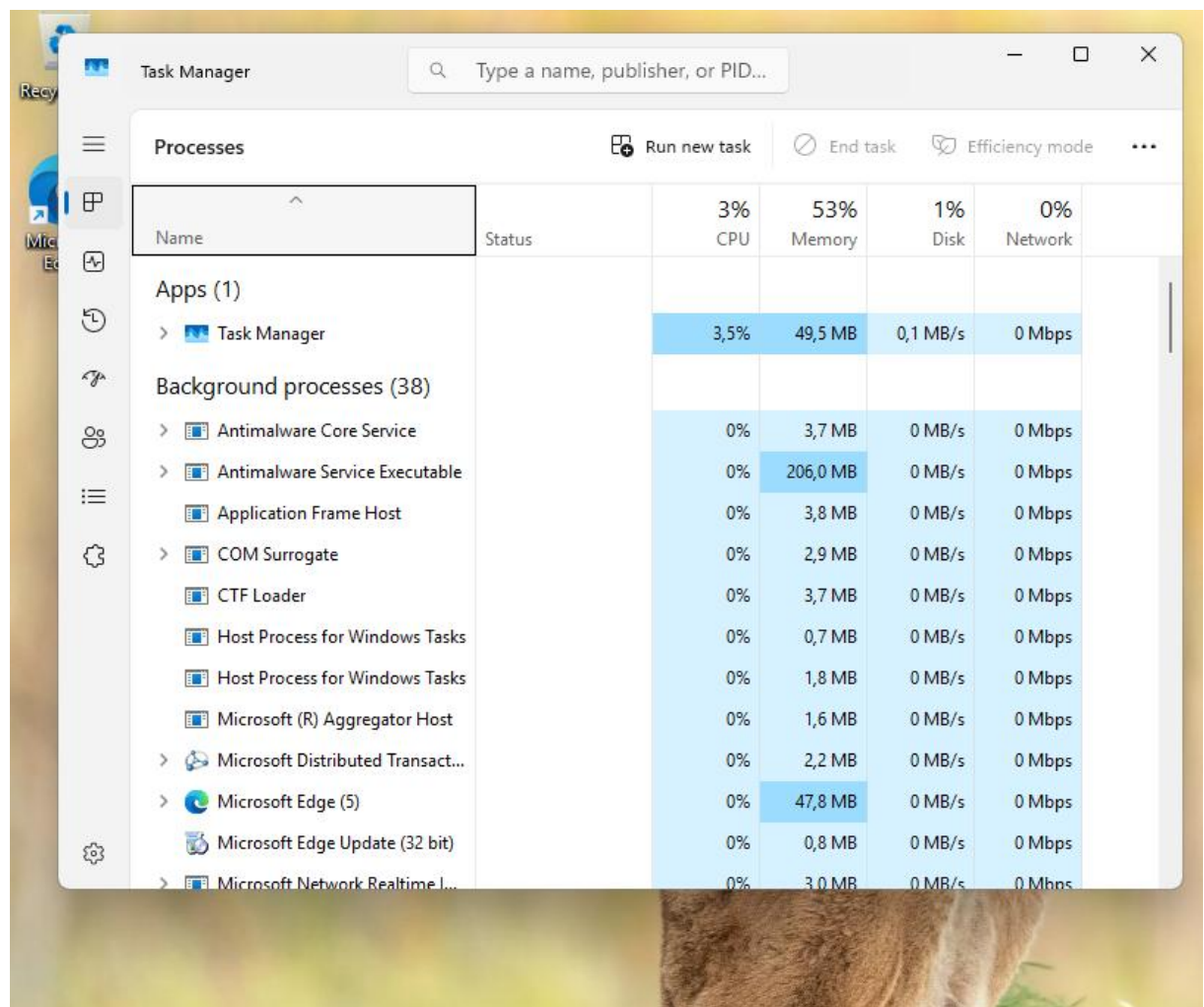
Assignment 5.3: Working with Windows

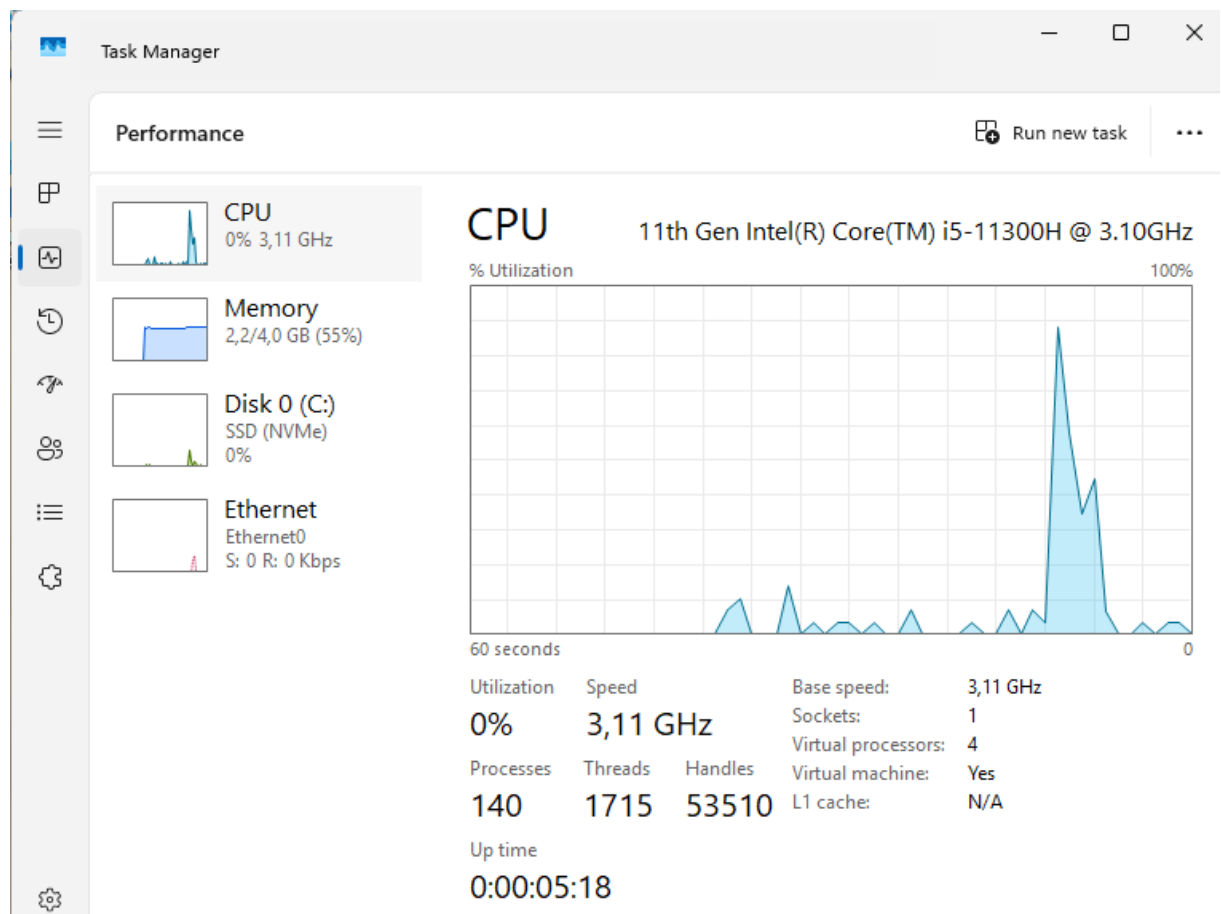
Take relevant screenshots of the assignments below

- Practice for about 10 minutes with the W keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.
- The file explorer can be opened with W + E, Which key combination could you also use?
 - CTRL + ESC to open the start panel and there to type "file explorer" and press Enter.
- Open the system properties with a W key combination, take a screenshot of the open screen. Paste this screenshot into this template.



- 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.





Task Manager

Type a name, publisher, or PID...

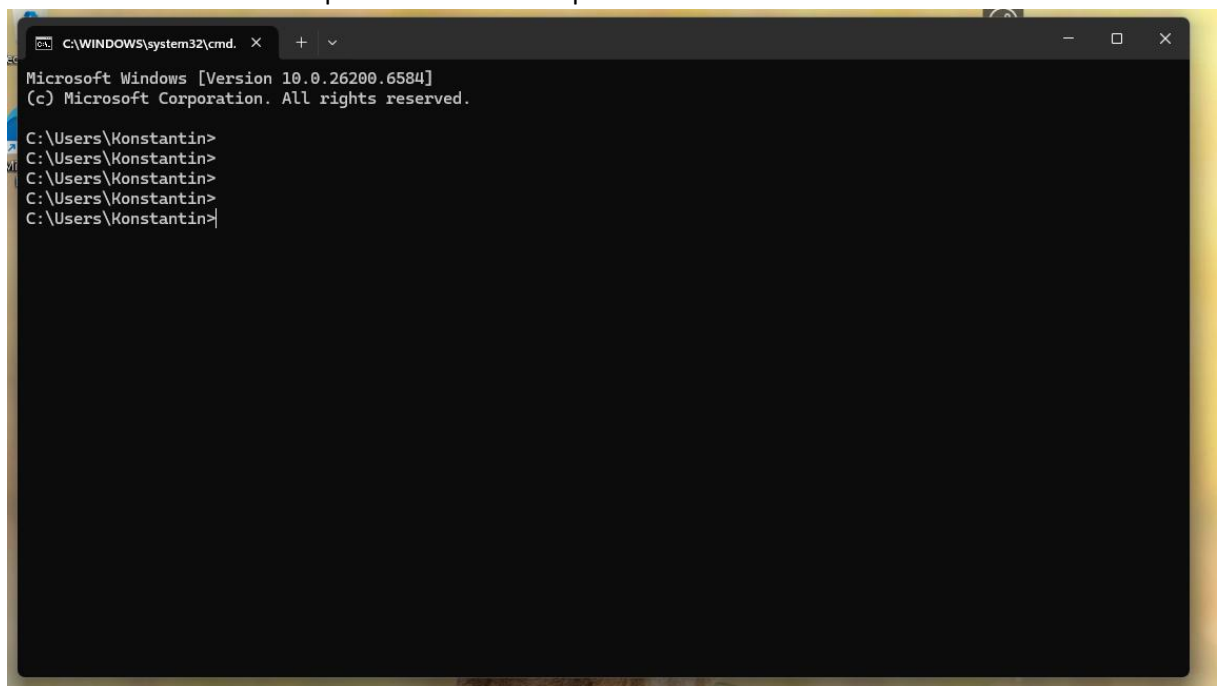
Users

Run new task Disconnect Manage user accounts

User	Status	7% CPU	54% Memory	1% Disk	0% Network
> Konstantin (48)		6,8%	396,2 MB	0,1 MB/s	0 Mbps

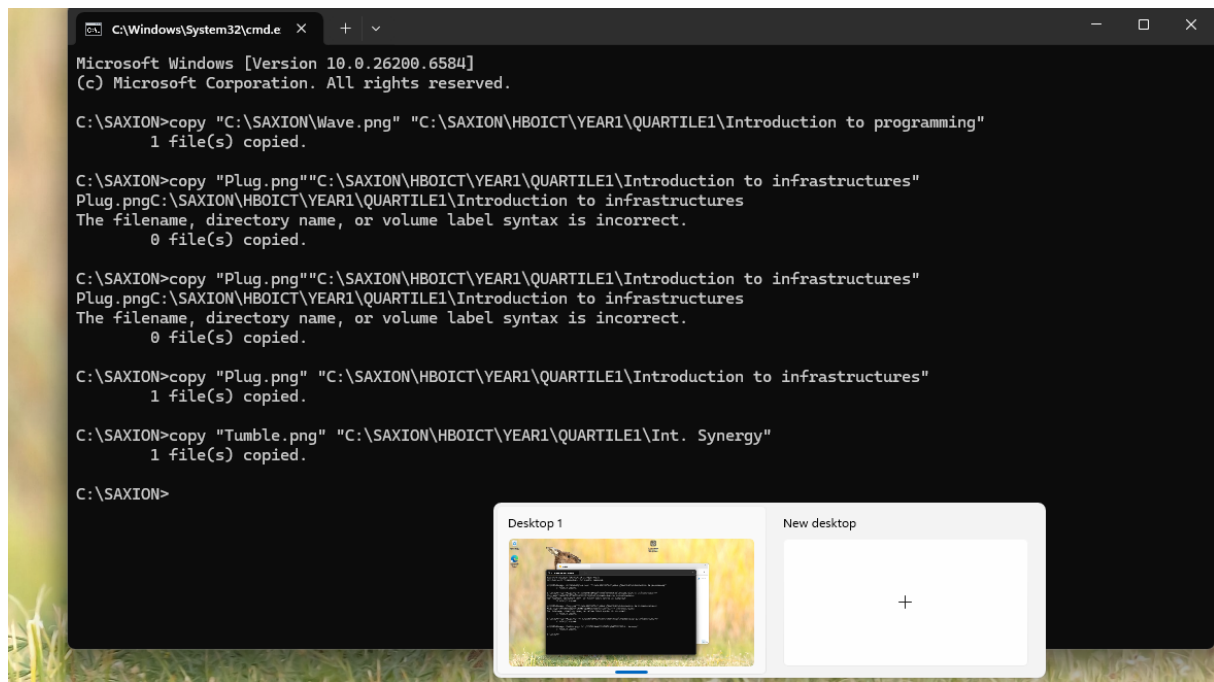
The screenshot shows the Windows Task Manager Users tab. It displays a table of active users. The user 'Konstantin (48)' is listed with the following resource usage: 7% CPU, 54% Memory, 1% Disk, and 0% Network. The table is expanded to show more details for this user.

- 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?
- Win + P -> Select the option "Extend"
- 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?
- Win + 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.

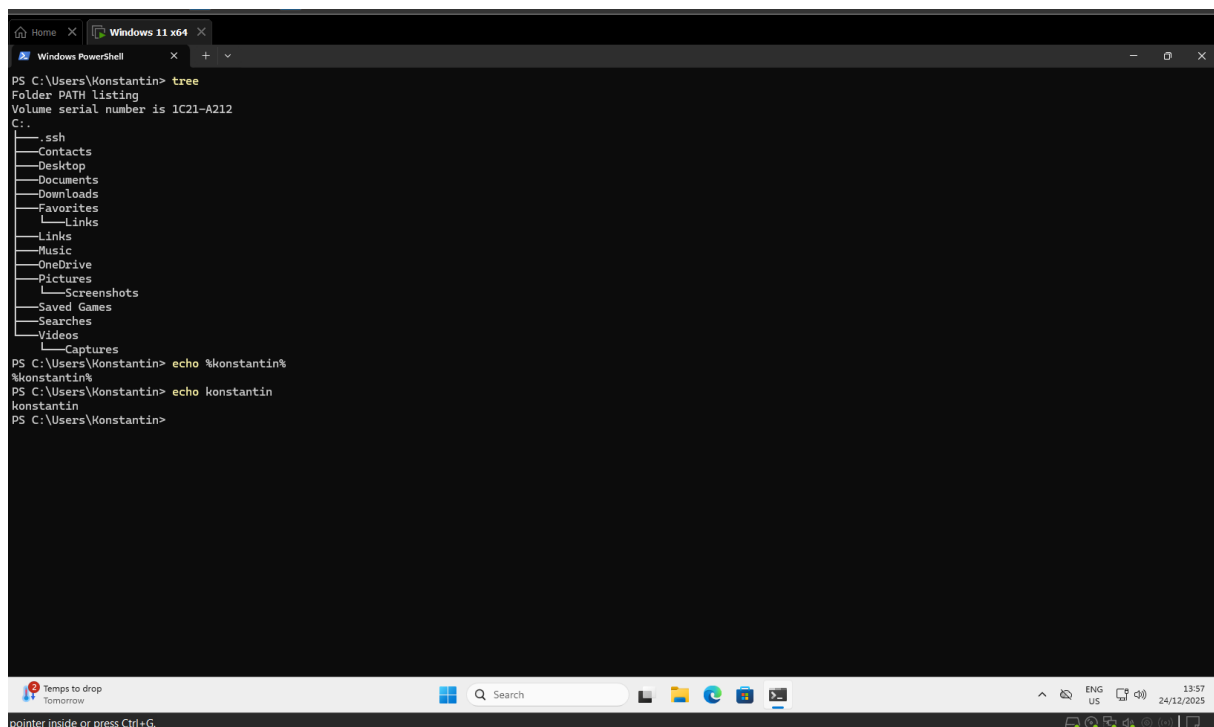


Working in the File Explorer

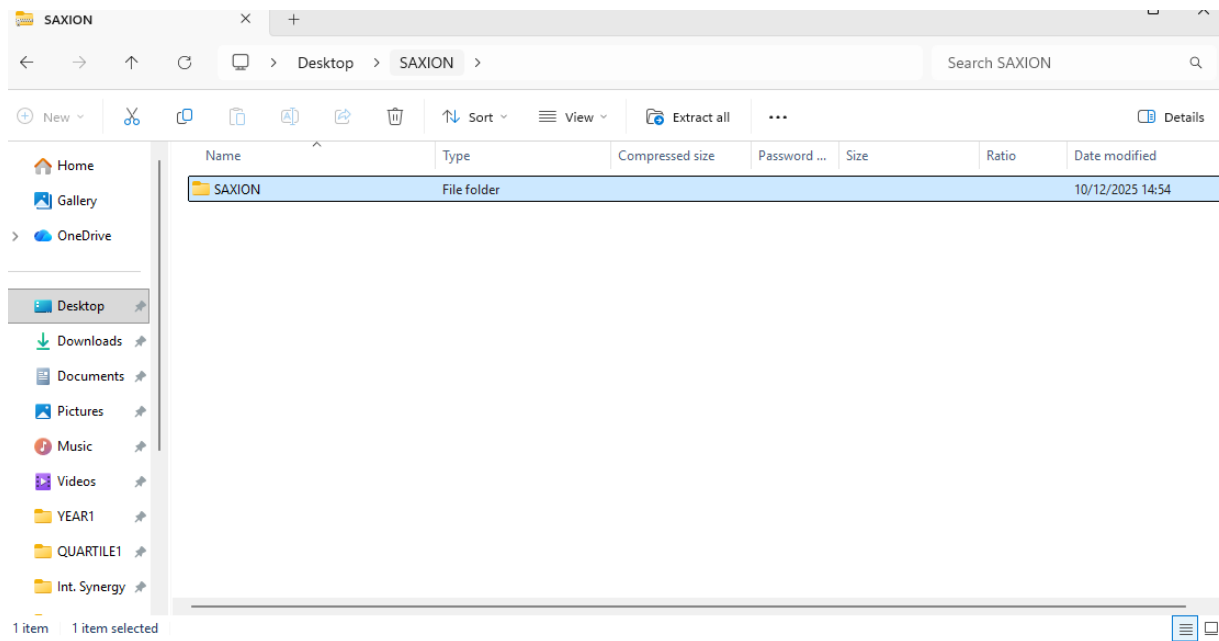
Relevant screenshots **copy** command:

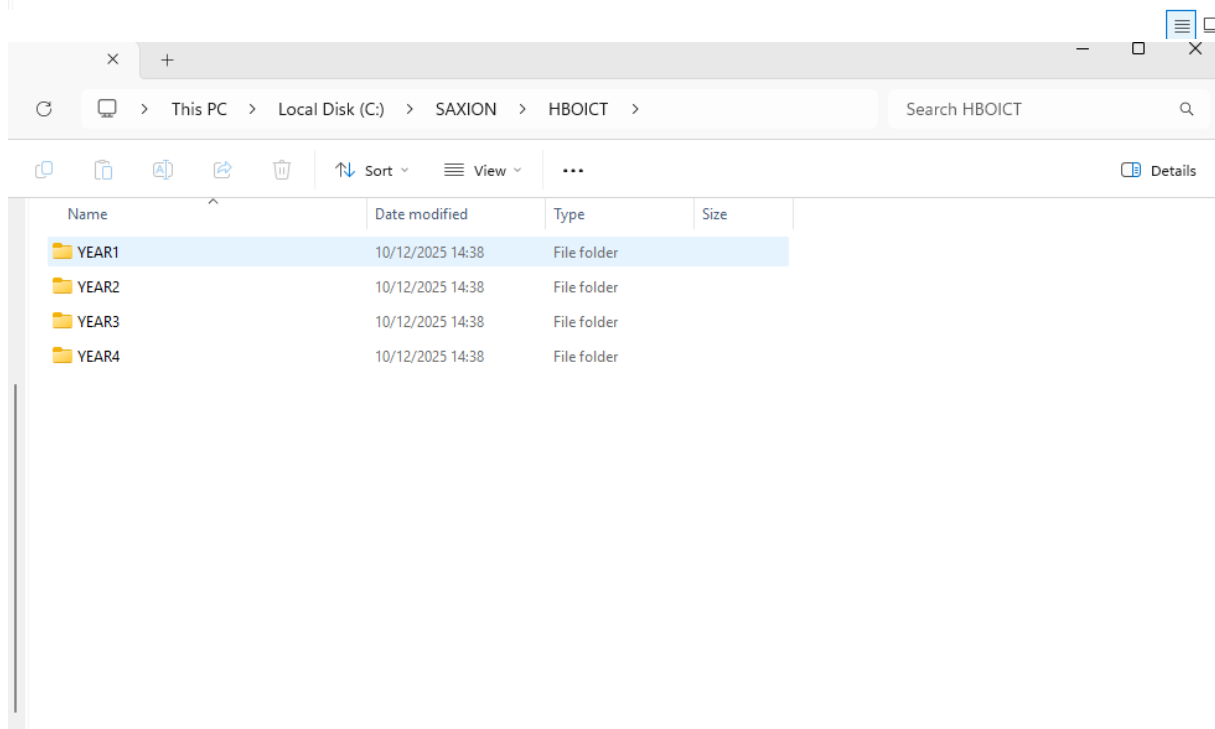
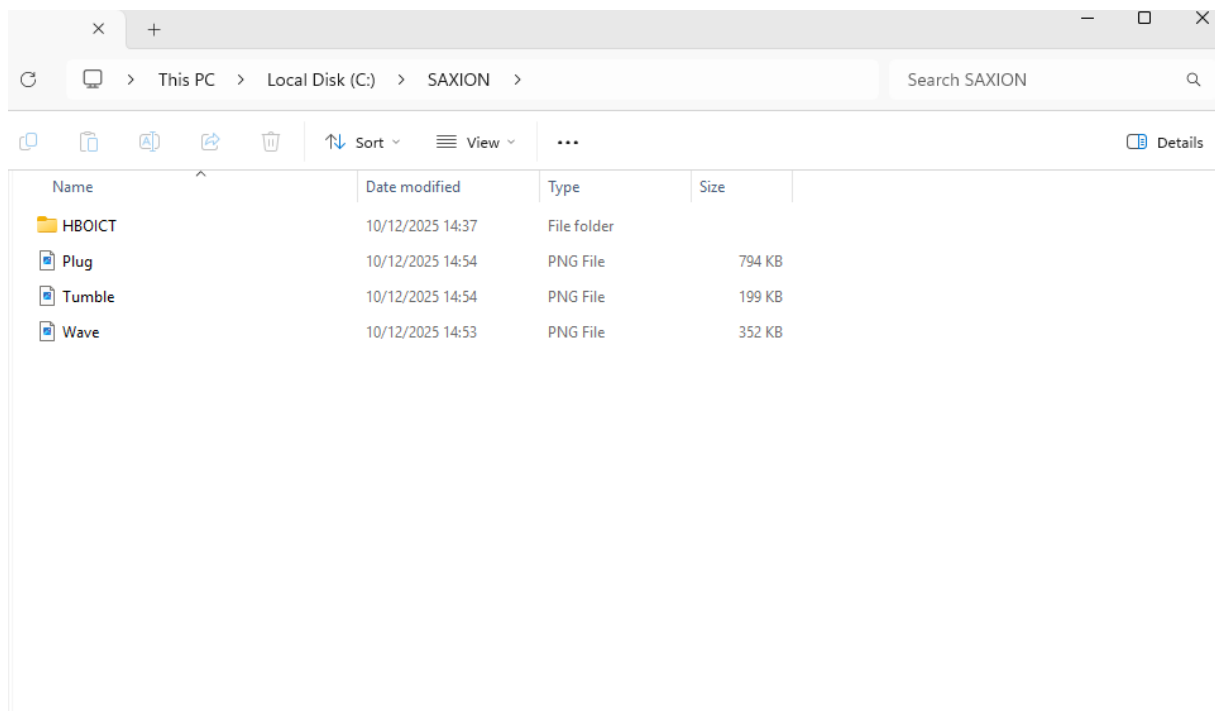


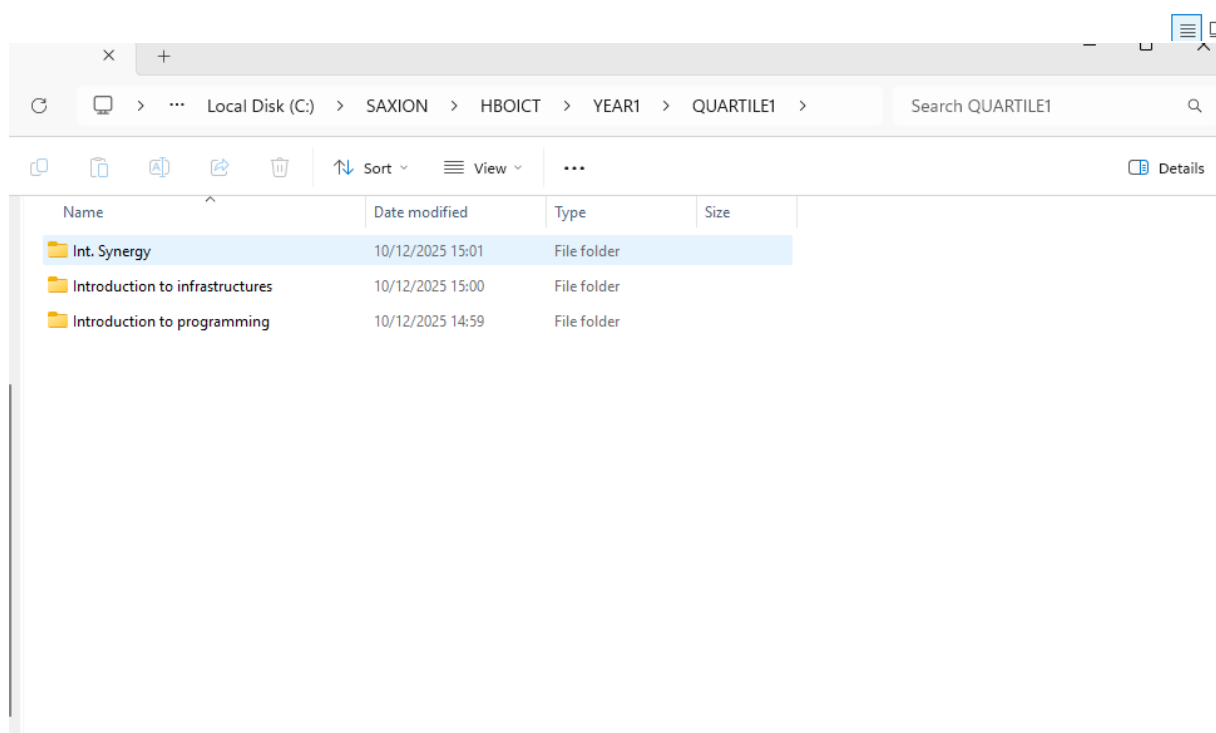
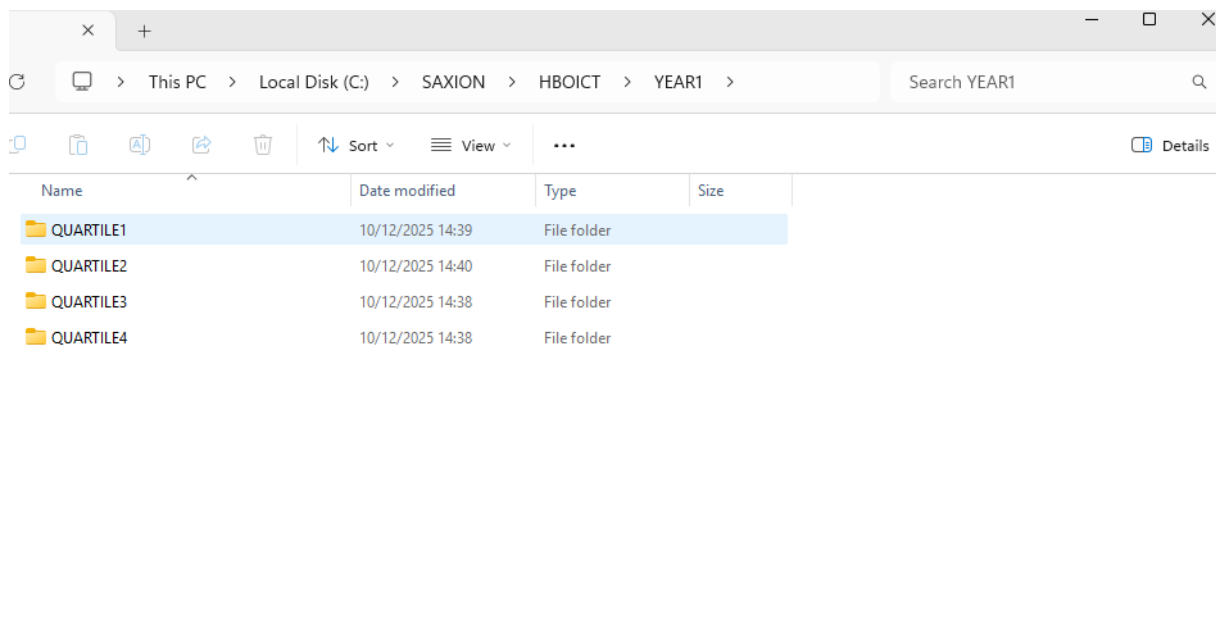
Relevant screenshots **tree** command:

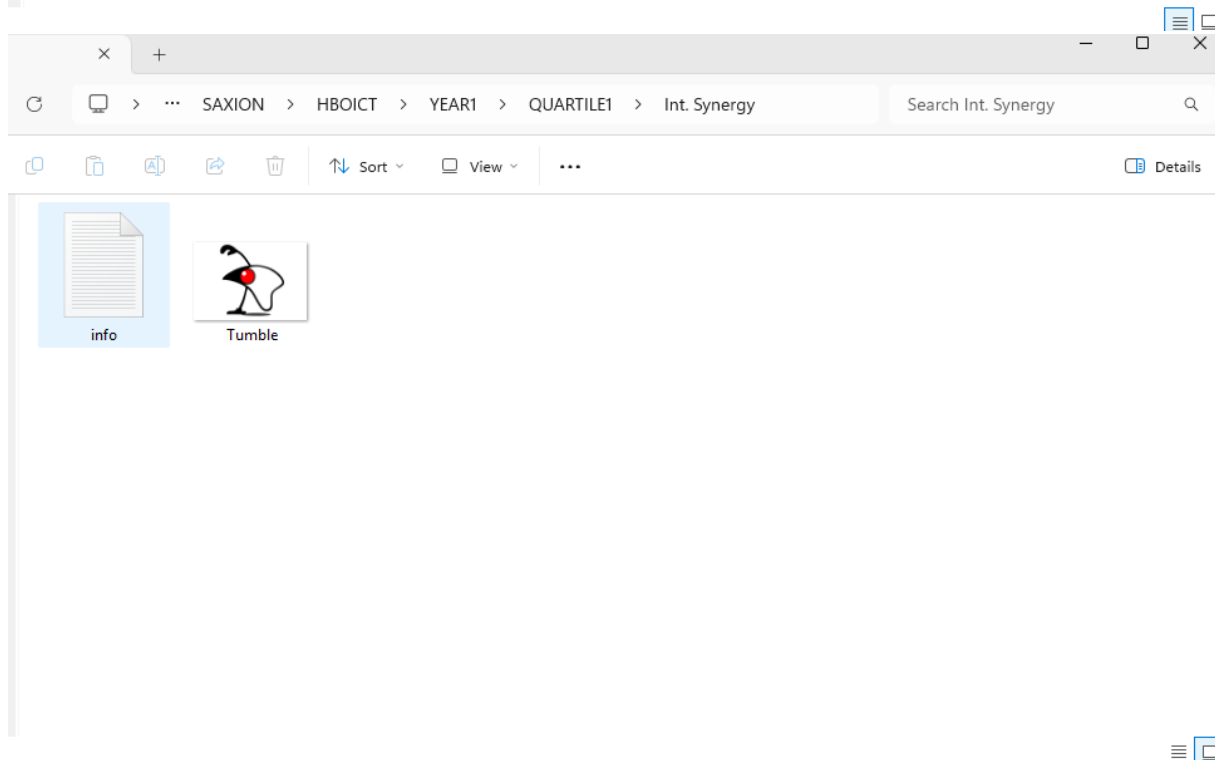
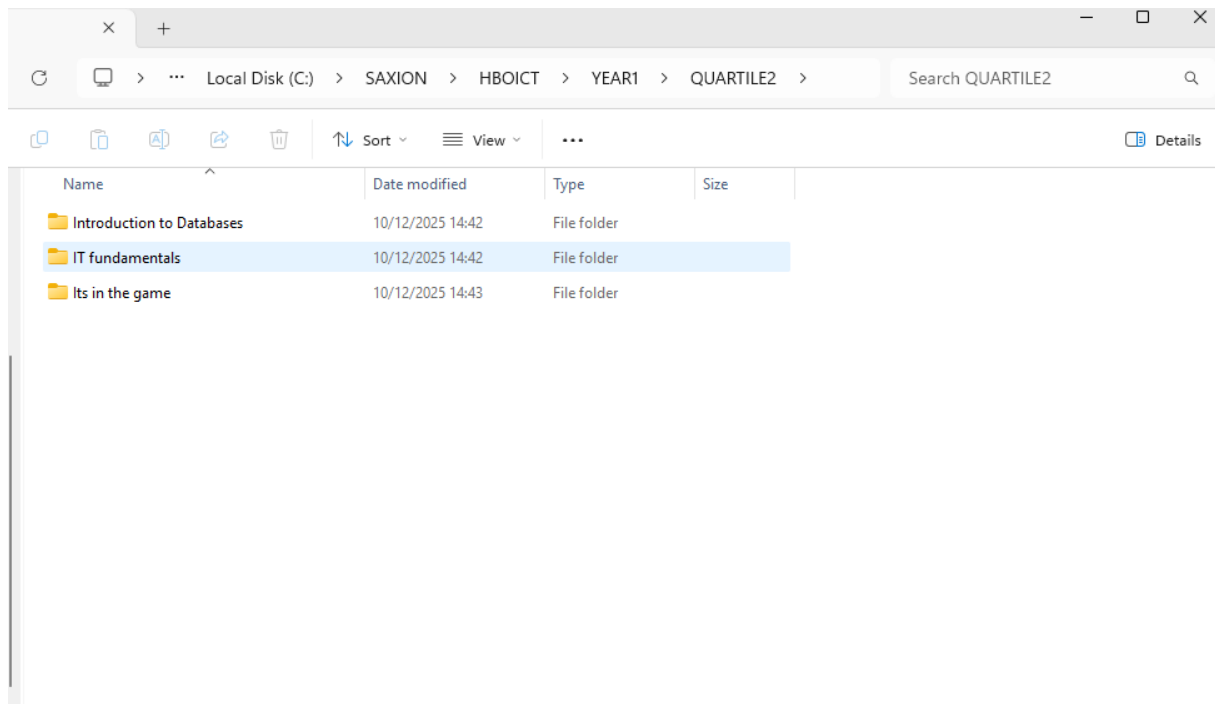


Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.









Terminating Processes

Relevant Screenshots Task Manager Window:

Task Manager						
Type a name, publisher, or PID...						
Processes						
Run new task End task Efficiency mode ...						
Name	Status	61% CPU	60% Memory	1% Disk	0% Network	
Apps (2)						
> Calculator (2)		0%	21,9 MB	0 MB/s	0 Mbps	
> Task Manager		26,9%	41,8 MB	0,1 MB/s	0 Mbps	
Background processes (45)						
> Antimalware Core Service		0%	2,1 MB	0 MB/s	0 Mbps	
> Antimalware Service Executable		0%	158,4 MB	0 MB/s	0 Mbps	
Application Frame Host		0%	6,5 MB	0 MB/s	0 Mbps	
COM Surrogate		0%	1,3 MB	0 MB/s	0 Mbps	
> COM Surrogate		0%	0,7 MB	0 MB/s	0 Mbps	
CTF Loader		0%	3,1 MB	0 MB/s	0 Mbps	
Host Process for Windows Tasks		0%	1,7 MB	0 MB/s	0 Mbps	
Microsoft (R) Aggregator Host		0%	1,3 MB	0 MB/s	0 Mbps	
> Microsoft Distributed Transact...		0%	0,5 MB	0 MB/s	0 Mbps	
> Microsoft Edge (5)		0%	53,7 MB	0 MB/s	0 Mbps	
Microsoft Edge Update (32 bit)		0%	0,7 MB	0 MB/s	0 Mbps	

Task Manager						
Type a name, publisher, or PID...						
Processes						
Run new task End task Efficiency mode ...						
Name	Status	3% CPU	59% Memory	0% Disk	0% Network	
Apps (1)						
> Task Manager		0%	47,0 MB	0 MB/s	0 Mbps	
Background processes (45)						
> Antimalware Core Service		0%	2,0 MB	0 MB/s	0 Mbps	
> Antimalware Service Executable		0%	130,3 MB	0 MB/s	0 Mbps	
Application Frame Host		0%	4,4 MB	0 MB/s	0 Mbps	
COM Surrogate		0%	1,3 MB	0 MB/s	0 Mbps	
> COM Surrogate		0%	0,6 MB	0 MB/s	0 Mbps	
CTF Loader		0%	3,0 MB	0 MB/s	0 Mbps	
Host Process for Windows Tasks		0%	1,7 MB	0 MB/s	0 Mbps	
Microsoft (R) Aggregator Host		0%	1,2 MB	0 MB/s	0 Mbps	
> Microsoft Distributed Transact...		0%	0,5 MB	0 MB/s	0 Mbps	
> Microsoft Edge (5)		0%	53,6 MB	0 MB/s	0 Mbps	
Microsoft Edge Update (32 bit)		0%	0,6 MB	0 MB/s	0 Mbps	

Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip

```
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
/
```

```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.26200.6584]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\System32>winget install --id=Notepad++.Notepad++ -e
Found Notepad++ [Notepad++.Notepad++] Version 8.8.8
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/v8.8.8/npp.8.8.8.Installer.x64.exe
6.61 MB / 6.61 MB
Successfully verified installer hash
Starting package install...
Successfully installed

C:\Windows\System32>
```

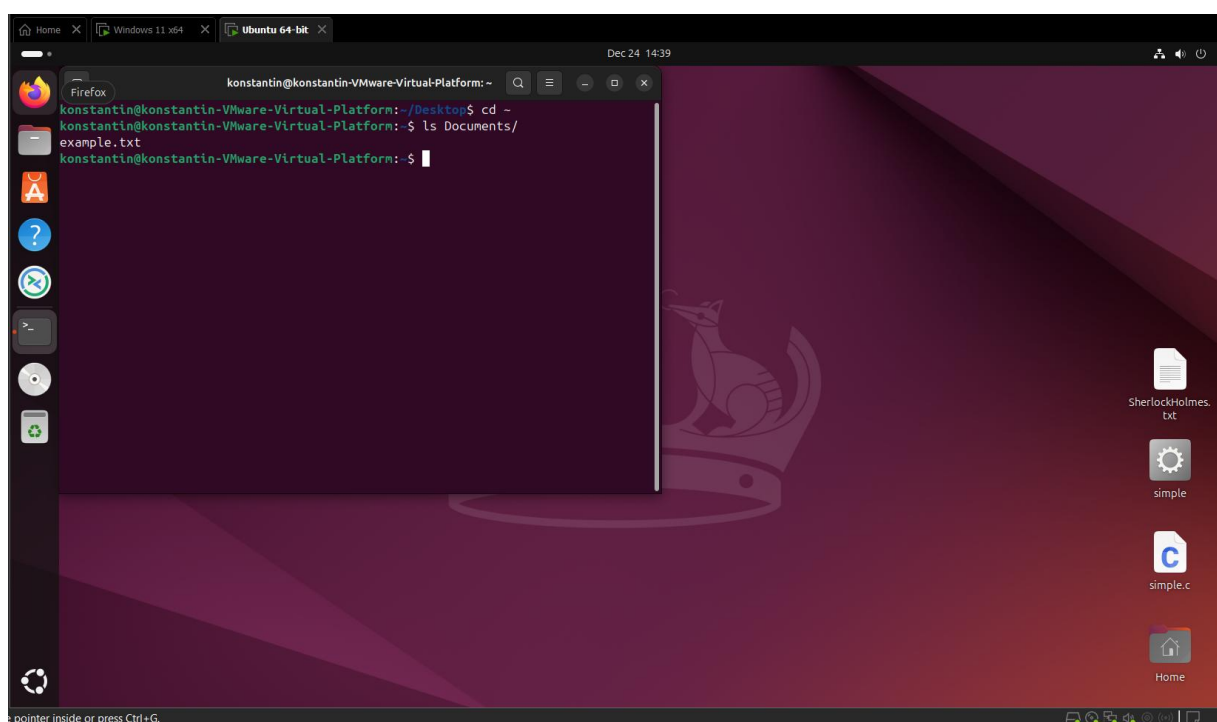
```
C:\Windows\System32>winget install --id=WinSCP.WinSCP -e
Found WinSCP [WinSCP.WinSCP] Version 6.5.5
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.5.5/WinSCP-6.5.5-Setup.exe/download
11.6 MB / 11.6 MB
Successfully verified installer hash
Starting package install...
Successfully installed

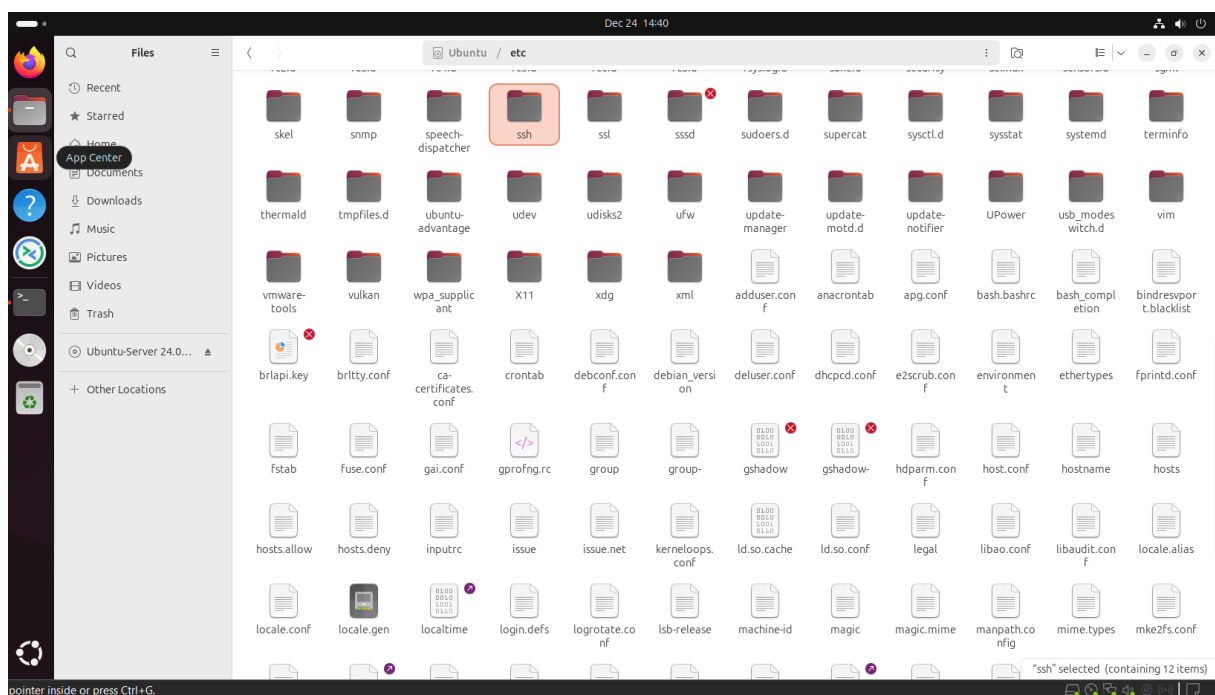
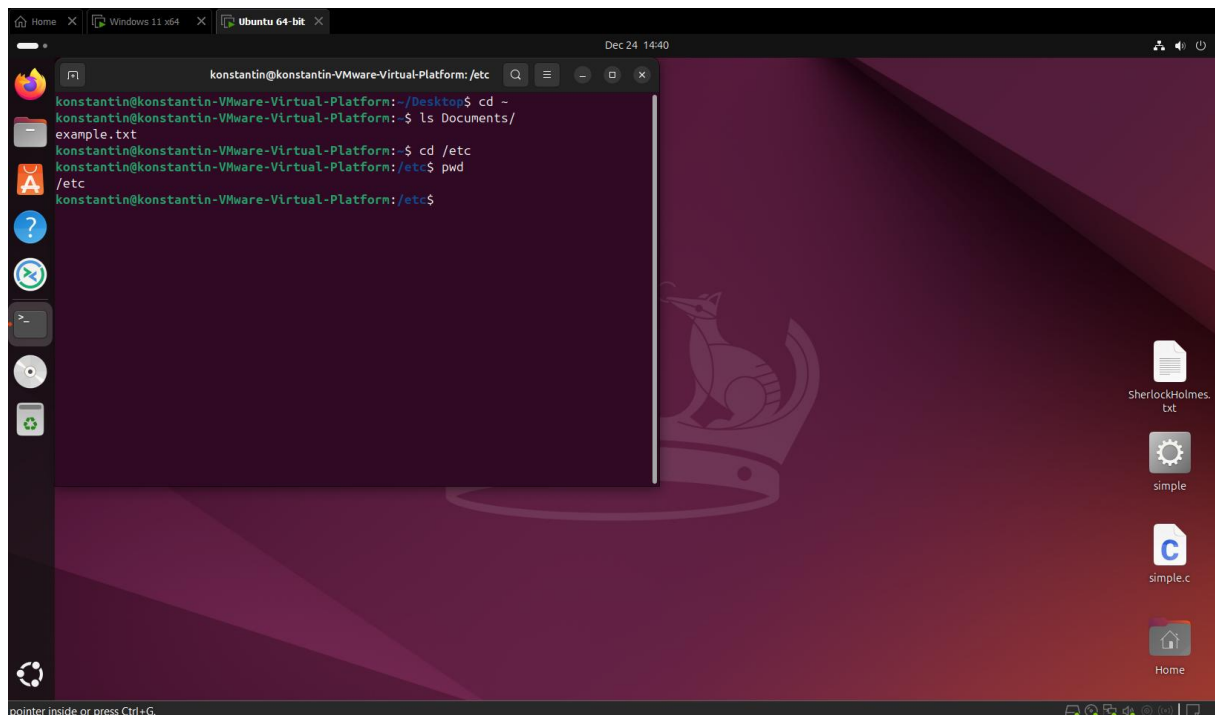
C:\Windows\System32>
```

Assignment 5.4: Working with Linux

Relevant screenshots + motivation

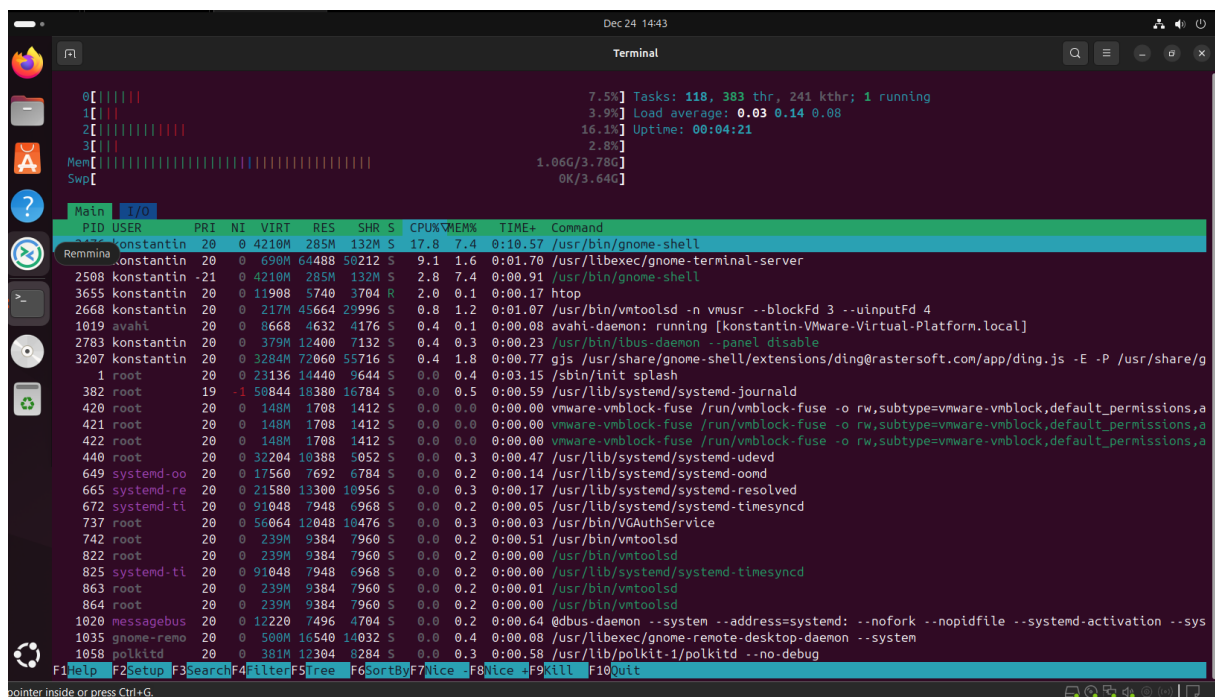
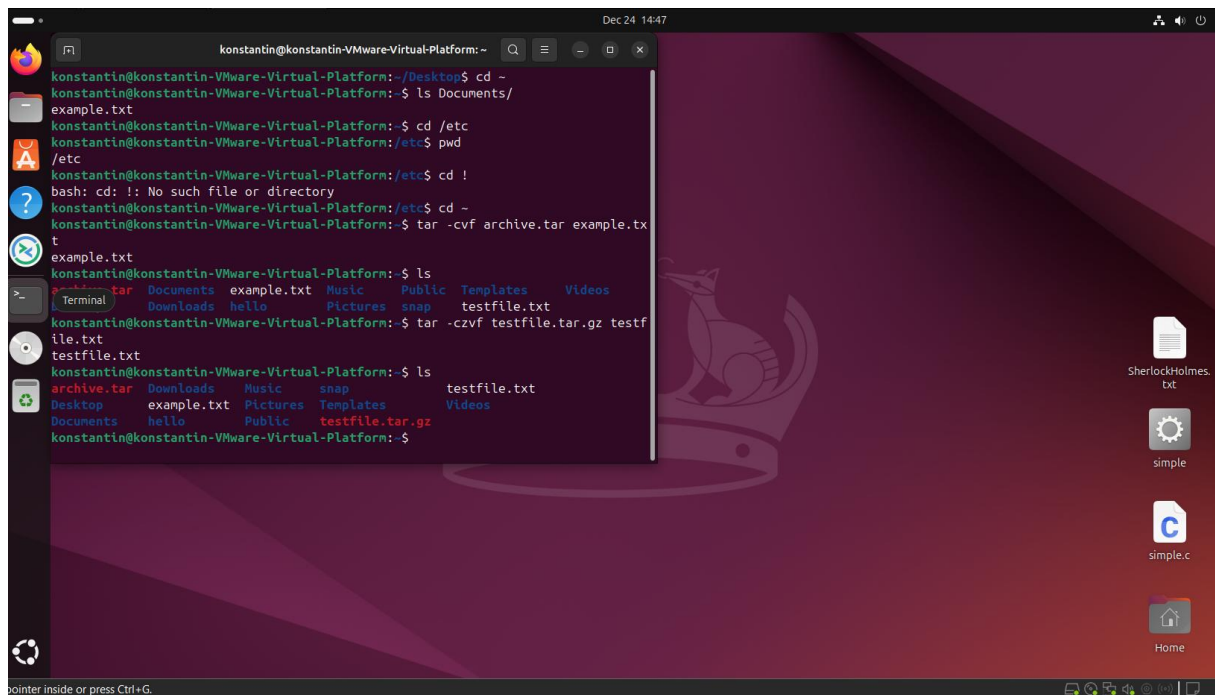
```
konstantin@konstantin-VMware-Virtual-Platform: ~  
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ cd ~  
konstantin@konstantin-VMware-Virtual-Platform:~$ nano example.txt  
konstantin@konstantin-VMware-Virtual-Platform:~$ ^[[200~cp ~/myfile.txt ~/Documents/  
p: command not found  
konstantin@konstantin-VMware-Virtual-Platform:~$ cp ~/example.txt ~/Documents/  
konstantin@konstantin-VMware-Virtual-Platform:~$ S
```

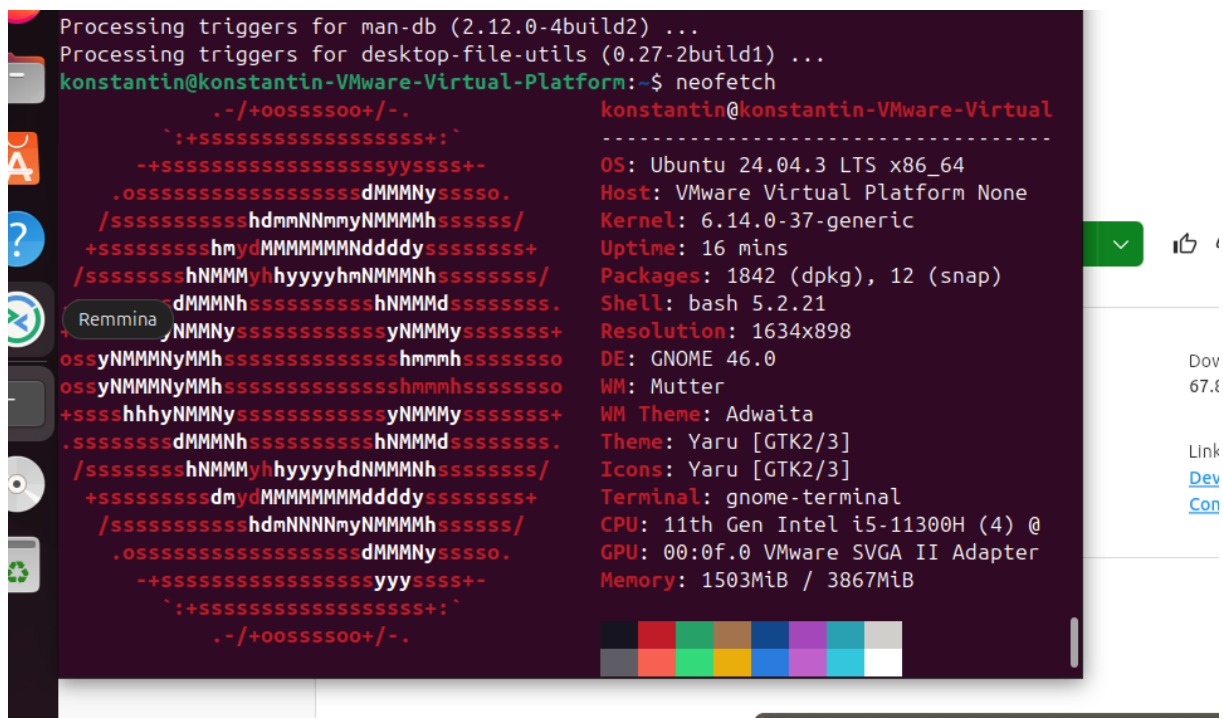
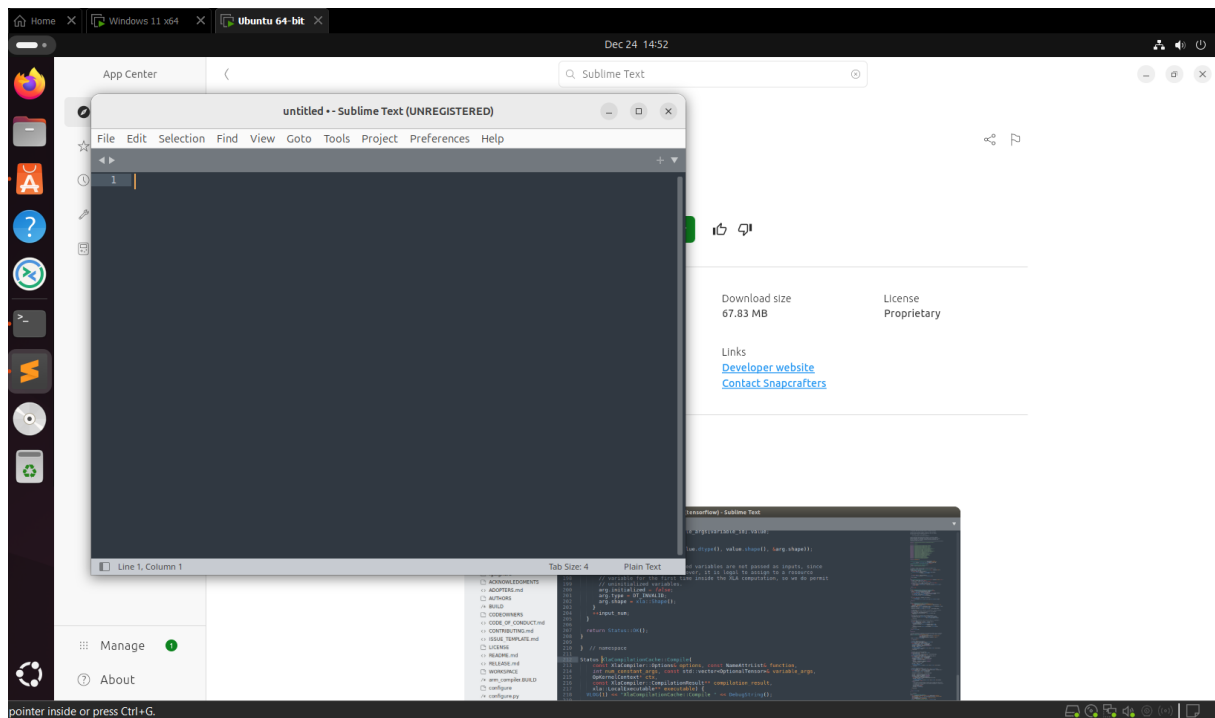




Linux uses a single root directory /, while Windows uses drive letters like C:\.

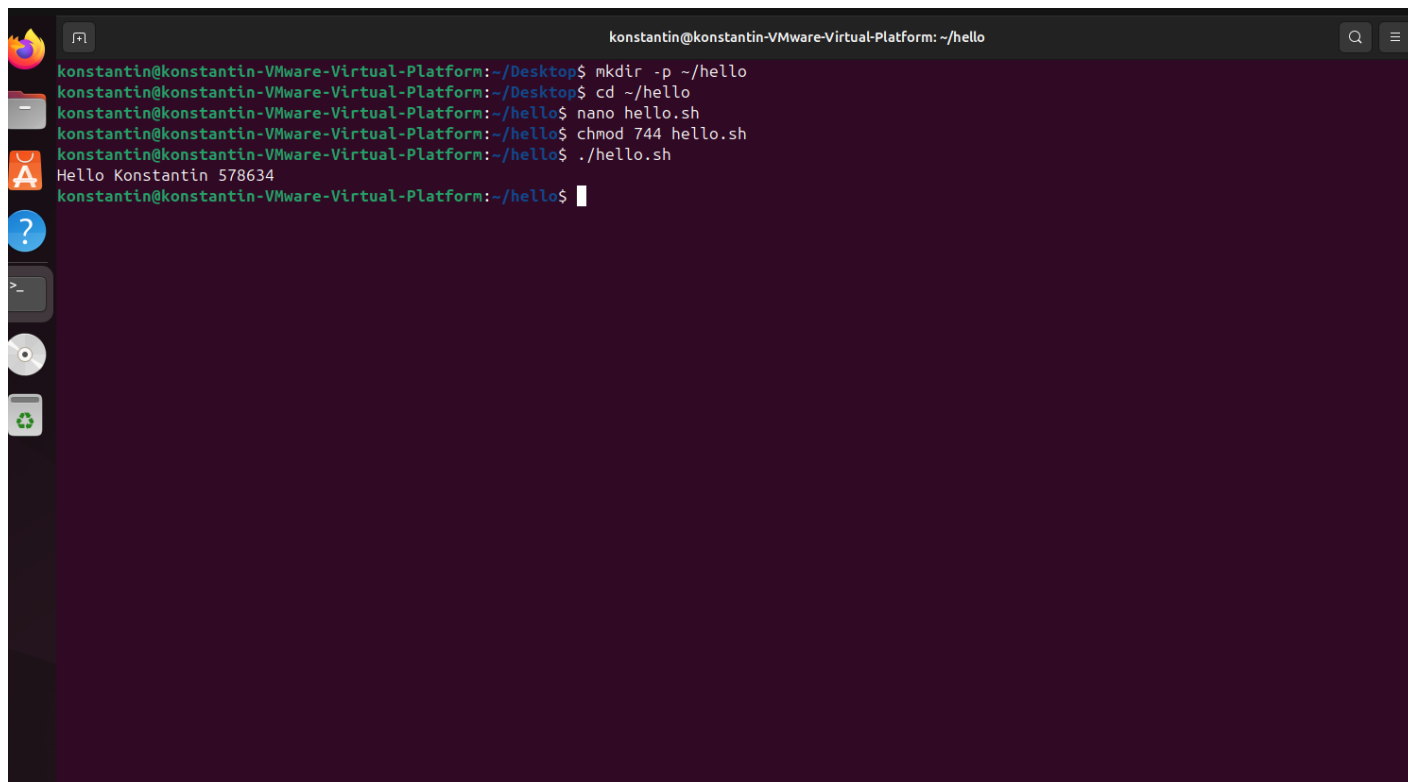
The /etc directory contains system-wide configuration files.





Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

A terminal window titled 'konstantin@konstantin-VMware-Virtual-Platform: ~/hello'. The terminal shows a series of commands: 'mkdir -p ~/hello', 'cd ~/hello', 'nano hello.sh', 'chmod 744 hello.sh', and './hello.sh'. The output of the last command is 'Hello Konstantin 578634'. The terminal has a dark purple background and a sidebar on the left with various icons.

```
konstantin@konstantin-VMware-Virtual-Platform: ~/hello
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ mkdir -p ~/hello
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ cd ~/hello
konstantin@konstantin-VMware-Virtual-Platform:~/hello$ nano hello.sh
konstantin@konstantin-VMware-Virtual-Platform:~/hello$ chmod 744 hello.sh
konstantin@konstantin-VMware-Virtual-Platform:~/hello$ ./hello.sh
Hello Konstantin 578634
konstantin@konstantin-VMware-Virtual-Platform:~/hello$
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

Commands' usage:

- **cat**: used for displaying the contents of files, combine multiple files into one, and create new files directly from the terminal.
- **wc**: counts the number of lines, words, characters, and bytes in a file or input.
- **less**: allows users to view the contents of a file one page at a time, enabling both forward and backward navigation without loading the entire file into memory.
- **tail**: display the last part of a file, typically showing the last 10 lines by default.
- **head**: display the first few lines of a text file or piped data, with the default being the first 10 lines.
- **grep**: search for specific words, phrases, or patterns inside text files, and shows the matching lines

```

konstantin@konstantin-VMware-Virtual-Platform: ~/Desktop
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$

    grep -n 'kingdom' SherlockHolmes.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
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ grep -n -C 3 'kingdom' SherlockHolmes.txt
487-
488-"Absolutely?"
489-
490:"I tell you that I would give one of the provinces of my kingdom to
491-have that photograph."
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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
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ head -n 1254 SherlockHolmes.txt | tail -n 40
Altogether, look as I would, there was nothing remarkable about the man
save his blazing red head, and the expression of extreme chagrin and
discontent upon his features.

Sherlock Holmes' quick eye took in my occupation, and he shook his head
with a smile as he noticed my questioning glances. "Beyond the obvious
facts that he has at some time done manual labour, that he takes snuff,
that he is a Freemason, that he has been in China, and that he has done
a considerable amount of writing lately, I can deduce nothing else."

Mr. Jabez Wilson started up in his chair, with his forefinger upon the
paper, but his eyes upon my companion.

```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation

```

Exif Byte Order          : Big-endian (Motorola, MM)
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
Focal Length              : 3.5 mm
GPS Position              : 53 deg 11' 39.68" N, 6 deg 32' 12.90" E
Light Value               : 7.7

```

The address is: D G van der Keesselstraat 42, 7412 ZR Deventer, Netherlands

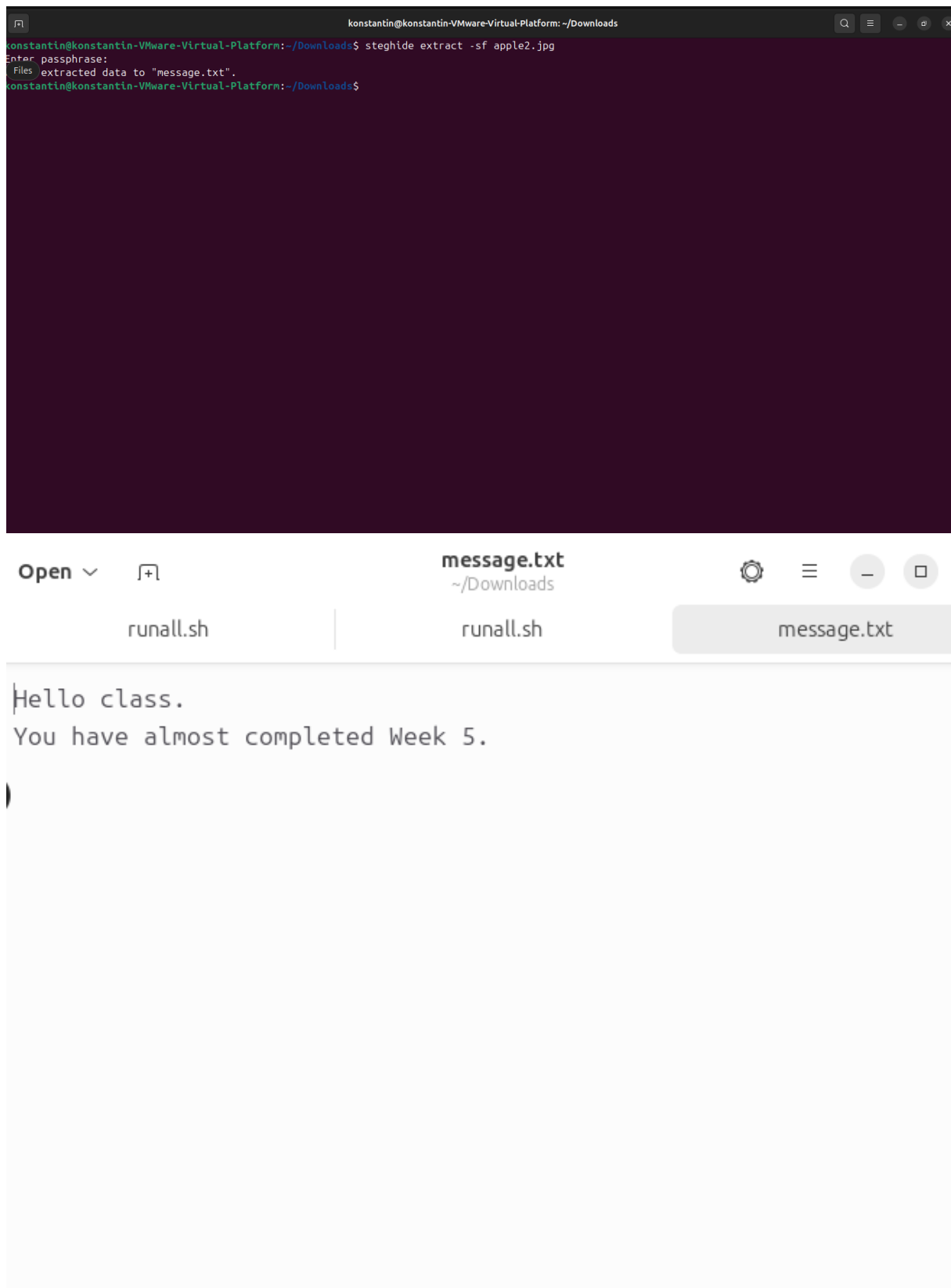
```
konstantin@konstantin-VMware-Virtual-Platform: ~/Downloads
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$ file oldcar
oldcar: JPEG image data, JFIF standard 1.01, aspect ratio, density 1x1, segment length 16, Exif Standard: [TIFF image data, big-endian, direntries=10, manu
facturer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolutionunit=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
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$
```

It is still considered an image file.

```
konstantin@konstantin-VMware-Virtual-Platform: ~/Downloads
konstantin@konstantin-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, manu
facturer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolutionunit=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
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$ nano email-base64.txt
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$ base64 --decode email-base64.txt > email.gif
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$ file email.gid
email.gid: cannot open 'email.gid' (No such file or directory)
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$ file email.gif
email.gif: GIF image data, version 89a, 108 x 52
konstantin@konstantin-VMware-Virtual-Platform:~/Downloads$
```

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.

```

konstantin578634@konstantin:~$ sudo systemctl enable --now ssh
[sudo] password for konstantin578634:
Synchronizing state of ssh.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable ssh
konstantin578634@konstantin:~$ ls -ld /srv/images
drwxr-xr-x 2 konstantin578634 konstantin578634 4096 Dec 14 16:12 /srv/images
konstantin578634@konstantin:~$ 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 00:0c:29:fa:d1:db brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    altname enx00c29fad1db
    inet 192.168.139.139/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 1744sec preferred_lft 1519sec
    inet6 fe80::3548:60dd:c2d6:e085/64 scope link
        valid_lft forever preferred_lft forever
konstantin578634@konstantin:~$ _

```

-


```

konstantin@konstantin-VMware-Virtual-Platform:~$ lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
loop0        7:0      0    4K  1 loop /snap/bare/5
loop1        7:1      0   73.9M 1 loop /snap/core22/2045
loop2        7:2      0    74M  1 loop /snap/core22/2163
loop3        7:3      0   18.5M 1 loop /snap/firmware-updater/210
loop4        7:4      0  250.6M 1 loop /snap/firefox/7423
loop5        7:5      0  516.2M 1 loop /snap/gnome-42-2204/226
loop6        7:6      0   516M  1 loop /snap/gnome-42-2204/202
loop7        7:7      0   11.1M 1 loop /snap/firmware-updater/167
loop8        7:8      0  250.4M 1 loop /snap/firefox/7477
loop9        7:9      0   91.7M 1 loop /snap/gtk-common-themes/1535
loop10       7:10     0   10.8M 1 loop /snap/snap-store/1270
loop11       7:11     0   49.3M 1 loop /snap/snapd/24792
loop12       7:12     0   50.9M 1 loop /snap/snapd/25577
loop13       7:13     0   576K  1 loop /snap/snapd-desktop-integration/315
sr0         11:0     1    3.1G  0 rom  /media/konstantin/Ubuntu-Server 24.04.3 LTS amd64
nvme0n1     259:0    0    20G  0 disk
├─nvme0n1p1 259:1    0     1M  0 part
└─nvme0n1p2 259:2    0    20G  0 part /

konstantin@konstantin-VMware-Virtual-Platform:~$ sudo dd if=/dev/nvme0n1 bs=4M status=progress | gzip | ssh konstantin578634@192.168.139.139 'cat /srv/images/ubuntu2404_vm.img.gz'
konstantin578634@192.168.139.139's password:

Permission denied, please try again.
konstantin578634@192.168.139.139's password:
21311258624 bytes (21 GB, 20 GiB) copied, 493 s, 43.2 MB/s
5120+0 records in
5120+0 records out
21474836480 bytes (21 GB, 20 GiB) copied, 493.716 s, 43.5 MB/s
konstantin@konstantin-VMware-Virtual-Platform:~$

```

- e pointer inside or press Ctrl+G.

```

NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sr0         11:0     1    3.1G  0 rom  /
nvme0n1     259:0    0    20G  0 disk
├─nvme0n1p1 259:1    0     1M  0 part
├─nvme0n1p2 259:2    0    1.0G  0 part /boot
└─nvme0n1p3 259:3    0   18.2G  0 part
    └─ubuntu--vg-ubuntu--lv 252:0    0    10G  0 lvm /

konstantin@local:~$ ssh youruser@SERVER_IP "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
[sudo] password for konstantin: ssh: Could not resolve hostname server_ip: Temporary failure in name resolution

gzip: stdin: unexpected end of file

^[[A^[[ASorry, try again.
[sudo] password for konstantin:
Sorry, try again.
[sudo] password for konstantin:
sudo: 3 incorrect password attempts
konstantin@local:~$ ssh konstantin578634@192.168.139.139 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/nvme0n1 bs=4M status=progress
The authenticity of host '192.168.139.139 (192.168.139.139)' can't be established.
ED25519 key fingerprint is SHA256:B/dQ99b2wekgu95Tf7dNRx6b2CTQmkh0e+UqakIrtS.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
Sorry, try again.
[sudo] password for konstantin:
Please type 'yes', 'no' or the fingerprint:
yes

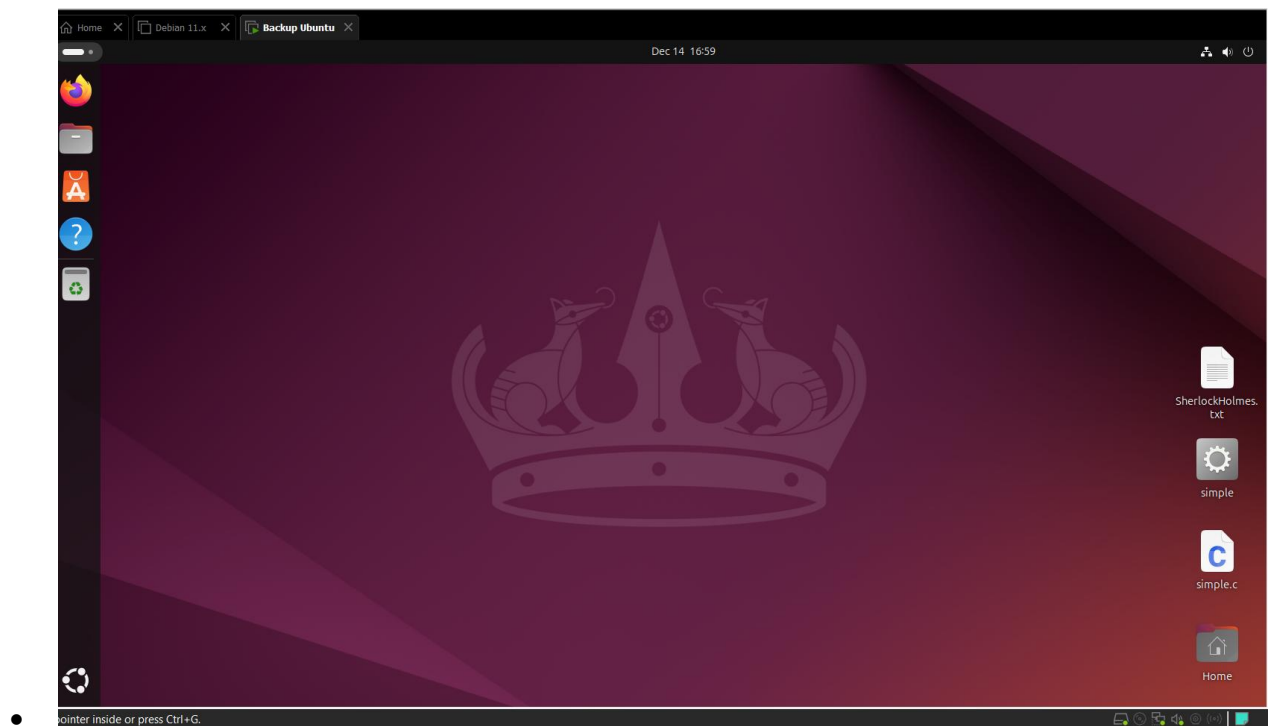
Warning: Permanently added '192.168.139.139' (ED25519) to the list of known hosts.
konstantin578634@192.168.139.139's password: Sorry, try again.
[sudo] password for konstantin:
Permission denied, please try again.
konstantin578634@192.168.139.139's password:

Connection closed by 192.168.139.139 port 22

gzip: stdin: unexpected end of file
0+0 records in
0+0 records out
0 bytes copied, 87.3813 s, 0.0 kB/s
konstantin@local:~$ ssh konstantin578634@192.168.139.139 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/nvme0n1 bs=4M status=progress
konstantin578634@192.168.139.139's password:
21370044416 bytes (21 GB, 20 GiB) copied, 209 s, 102 MB/s
0+642920 records in
0+642920 records out
21474836480 bytes (21 GB, 20 GiB) copied, 209.456 s, 103 MB/s
konstantin@local:~$ _

```

-
- Proof that you can restore the back-up image into an empty VM.



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