

# 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 is een beschermende merknaam. Een operating systeem mag zichzelf alleen zo noemen als het gekeurd is. macOS is voorbeeld gecertificeerd als UNIX.

Unix-like zijn systemen die zich net als UNIX gedragen en ongeveer dezelfde structuur hebben, maar niet de merknaam dragen of betaald hebben. Een voorbeeld is linux wat vanaf de grond is gebouwd.

### 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** schreef de allereerste versie van UNIX en bedacht programmeertaal B. Later bij google bedacht hij de moderne taal go.

**Dennis Ritchie** was de collega van Thompson en hij bedacht de programmeertaal C. Dat is misschien wel de belangrijkste taal, omdat bijna alle moderne systemen erin geschreven zijn. Hij herschreef later ook UNIX in C waardoor het op elke computer kon werken.

**Bill Joy** is de oprichter van Sun Microsystems. Hij leverde bijdrage in BSD UNIX en schreef later ook programma's zoals de teksteditor vi en de basis voor het protocol TCP/IP

**Richard Stallman** is de oprichter van Free Software Foundation. Hij startte het GNU project om een gratis versie van UNIX te maken. Ook bedacht hij regels voor de licenties om open-source software te beschermen.

**Linus Torvalds** schreef in 1991 als hobby de Linux kernel omdat het GNU project nog geen werkende kernel had. Hij bedacht ook Git, een tool die programmeurs over de hele wereld nu dagelijks gebruiken om code te bewaren.

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

De filosofie van GNU draait om vrijheid.

De kern bestaat uit 4 vrijheden die elke gebruiker moet hebben:

1. De vrijheid om het programma te gebruiken voor elke doel.
2. De vrijheid om te bestuderen hoe het programma werkt.
3. De vrijheid om het programma te verspreiden en te delen.
4. De vrijheid om het programma te verbeteren en jouw versie weer te delen

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

Nee, de software is niet 100 procent vrij. Ubuntu focust om gebruikersvriendelijk zijn. Er zitten dus vaak gesloten software (drivers) in het systeem die je niet kan lezen.

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

Met WSL heb je een functie in windows 10 en 11 waarmee je Linux binnenin windows kunt draaien. Je hoeft dan geen aparte virtuele machine te draaien en kun je Linux en windows programma's naast elkaar gebruiken.

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

Android hoort bij Linux, IOS hoort bij BSD/Unix, ChromeOs hoort bij 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 zijn sterke computers, ontworpen om hoge calculaties uit te voeren per seconden, meer dan een normale pc. Ze worden gebruikt voor complexe en rekenintensieve op gebieden waar veel data snel verwerkt moet worden. Denk aan weervoorspellingen, wetenschappelijke simulaties, analyses etc.

- 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?

Een playstation 3 cluster is een groep ps3 consoles die met elkaar verbonden zijn en samenwerken als een computer. Dit was mogelijk omdat de ps3 beschikte over een cpu, die oorspronkelijk was ontwikkeld voor een supercomputer.

- 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 voor 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/>

Een raspberry Pi heeft een zeer beperkte rekenkracht per apparaat. De top 500 lijst is gemeten in rekenprestaties (petaflops).

- 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?

Ps5: AMD Zen 2 – gebruikt een os van Sony




Xbox series X: AMD Zen 2 – gebruikt een custom van windows.

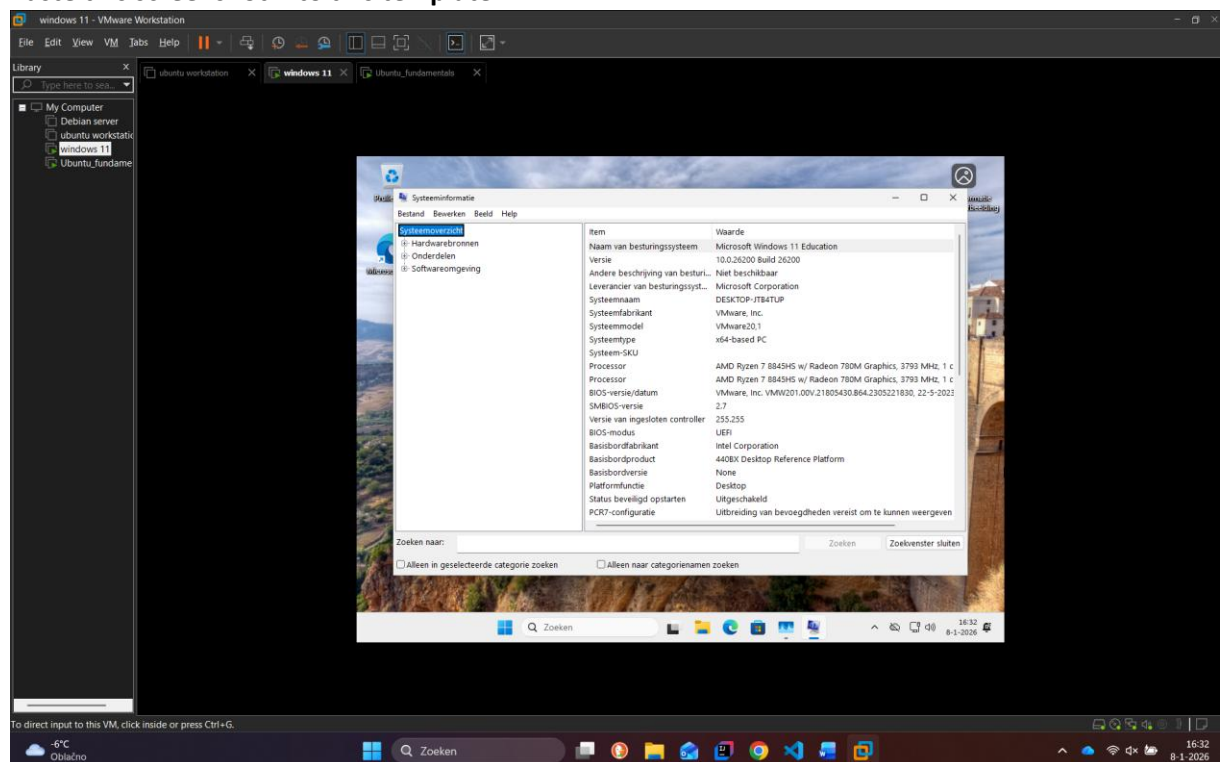
Beiden consoles hebben 8 core, 16 thread cpu.

Moderne gameconsoles gebruiken dezelfde cpu architectuur als pc's. Dit toont aan dat het verschil vooral in de software en optimalisatie zit.

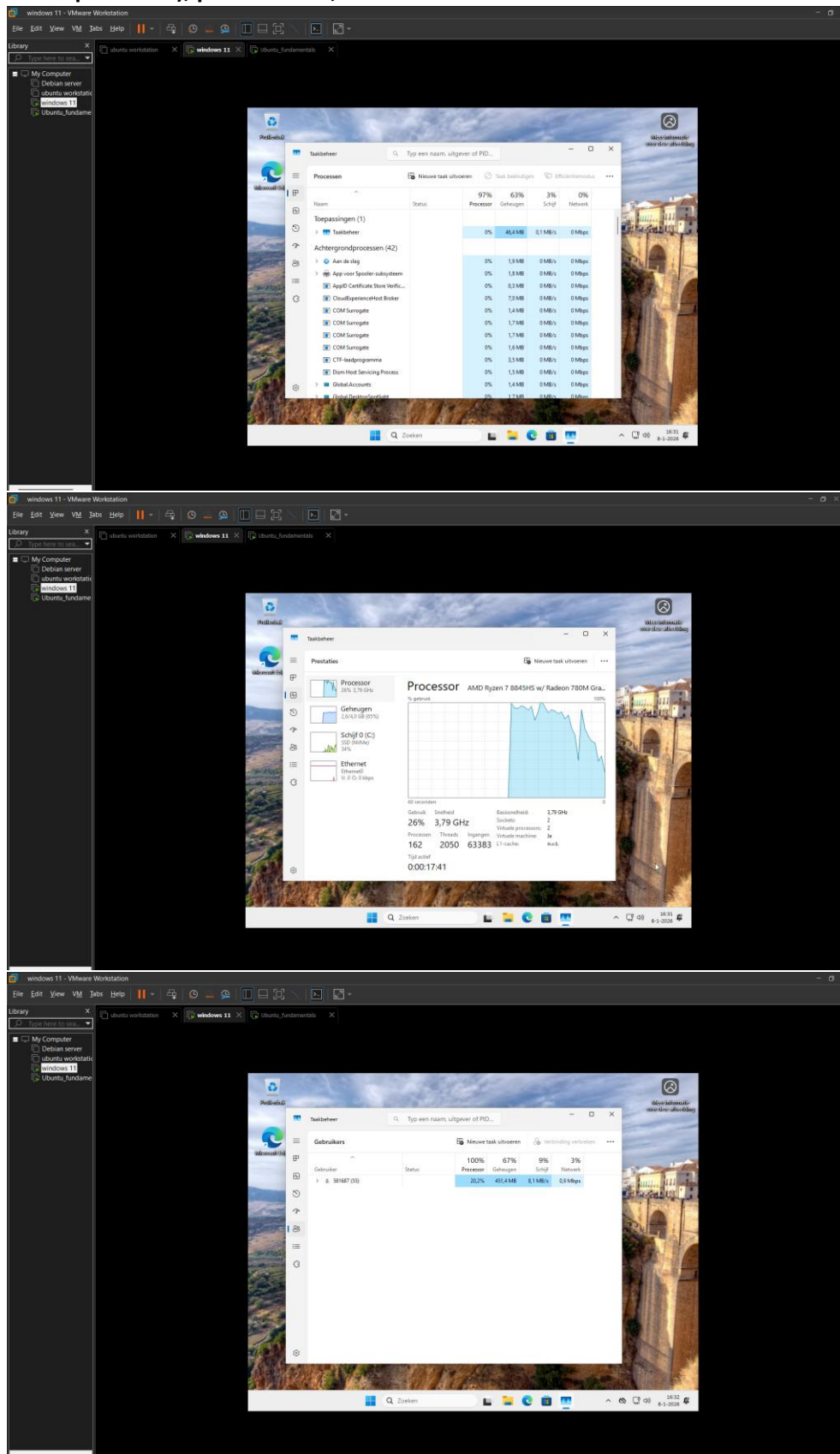
### Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

- 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.
- The file explorer can be opened with  + E, Which key combination could you also use? Windows + x en dan 'e'. Dit opent eerst de power user menu en dan de file explorer
- 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



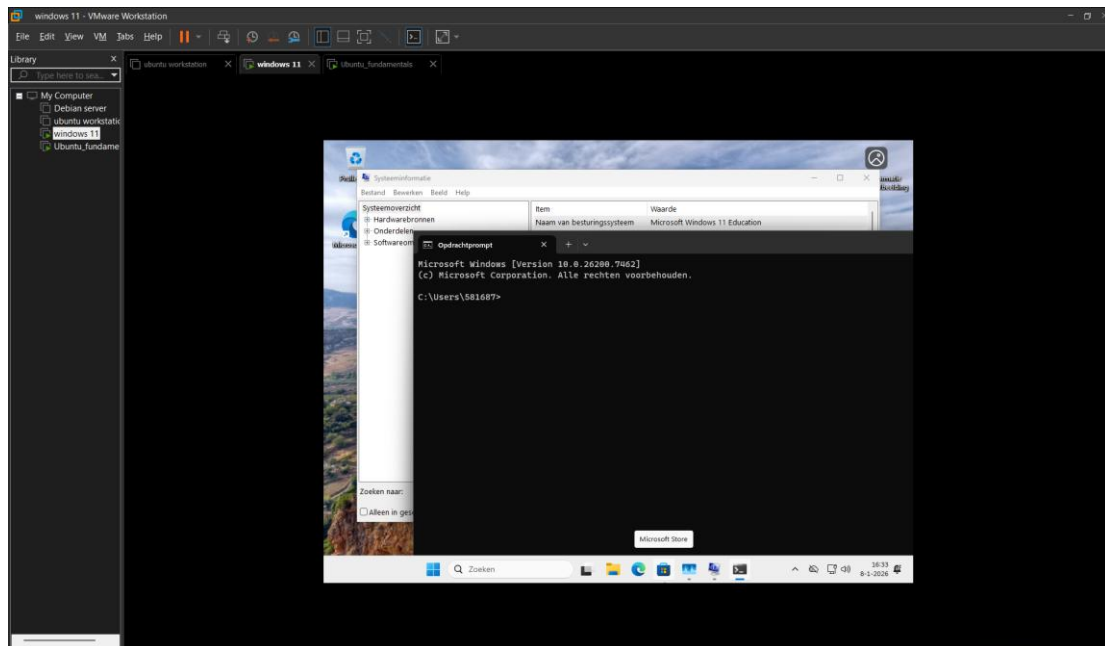
- e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

//voor de duidelijkheid, ik had al een directory genaamd Saxion. Ik kon dat niet zomaar aanpassen omdat een paar programma's dat directory gebruikt. Ik heb de directory voor deze opdracht dus 'SAXIONN' genoemd.

```
C:\SAXIONN>copy Wave.png "C:\SAXIONN\HBOICT\YEAR1\QUARTILE1\Introductie programmeren"  
1 file(s) copied.
```

```
C:\SAXIONN>|
```

```
C:\SAXIONN>copy Plug.png "C:\SAXIONN\HBOICT\YEAR1\QUARTILE1\Introductie infrastructuur"  
1 file(s) copied.
```

```
C:\SAXIONN>|
```

```
C:\SAXIONN>copy Tumble.png "C:\SAXIONN\HBOICT\YEAR1\QUARTILE1\Introductie organisatie en it"  
1 file(s) copied.
```

```
C:\SAXIONN>|
```

Relevant screenshots **tree** command:

```
C:\SAXIONN>tree  
Folder PATH listing for volume Windows-SSD  
Volume serial number is B6A9-8B7C  
C:.  
├──HBOICT  
│   ├──YEAR1  
│   │   ├──QUARTILE1  
│   │   │   ├──Introductie infrastructuur  
│   │   │   ├──Introductie organisatie en it  
│   │   │   └──Introductie programmeren  
│   │   ├──QUARTILE2  
│   │   ├──QUARTILE3  
│   │   └──QUARTILE4  
│   ├──YEAR2  
│   │   ├──QUARTILE1  
│   │   ├──QUARTILE2  
│   │   ├──QUARTILE3  
│   │   └──QUARTILE4  
│   ├──YEAR3  
│   └──YEAR4
```

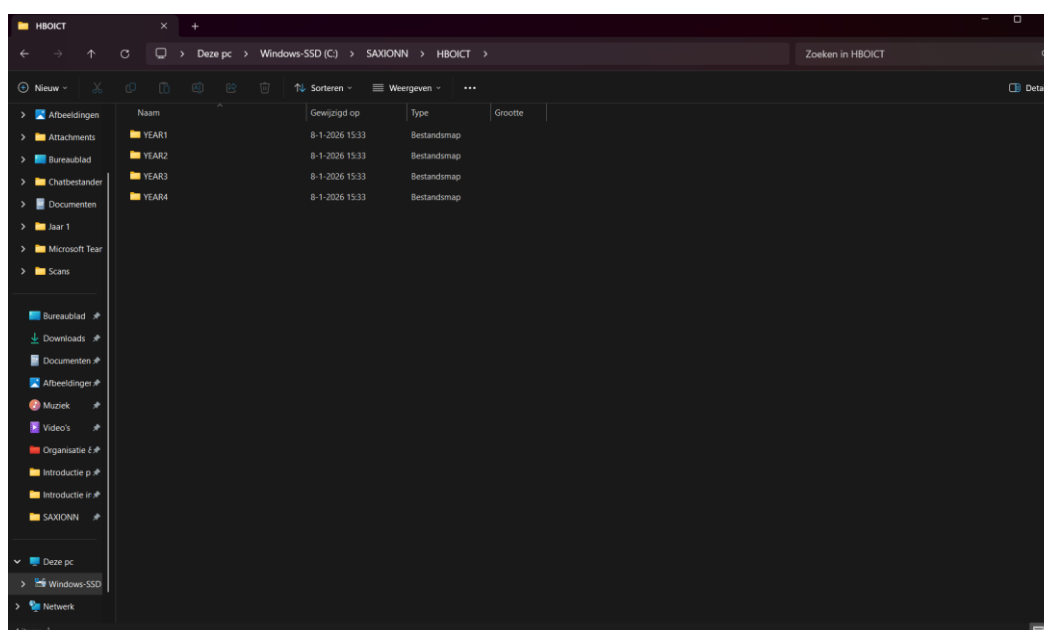
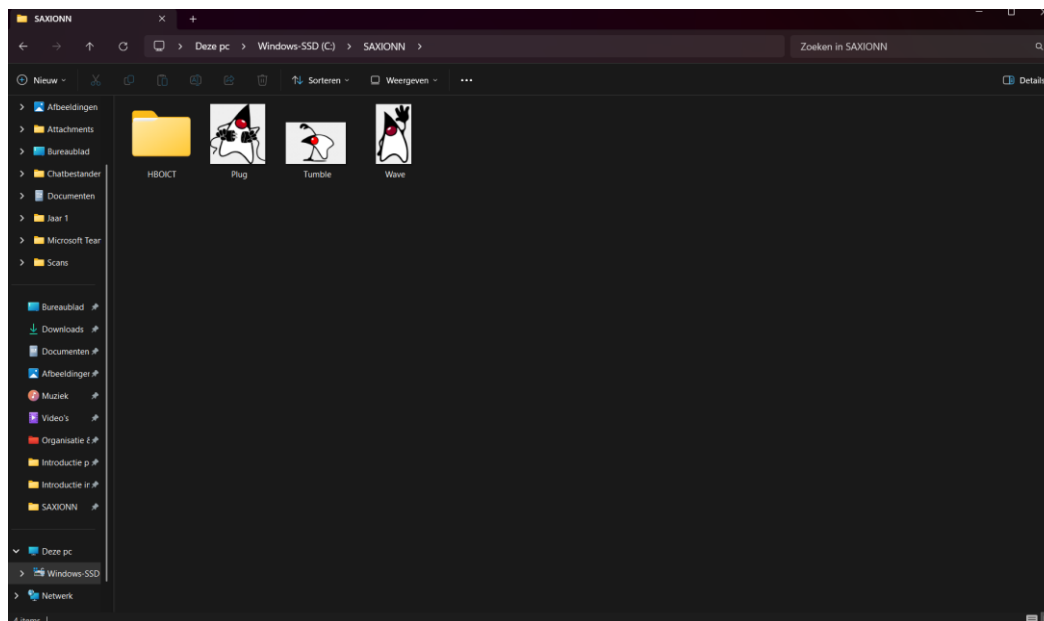
```
C:\SAXIONN>|
```

```
C:\SAXIONN> echo %username%
bananagood

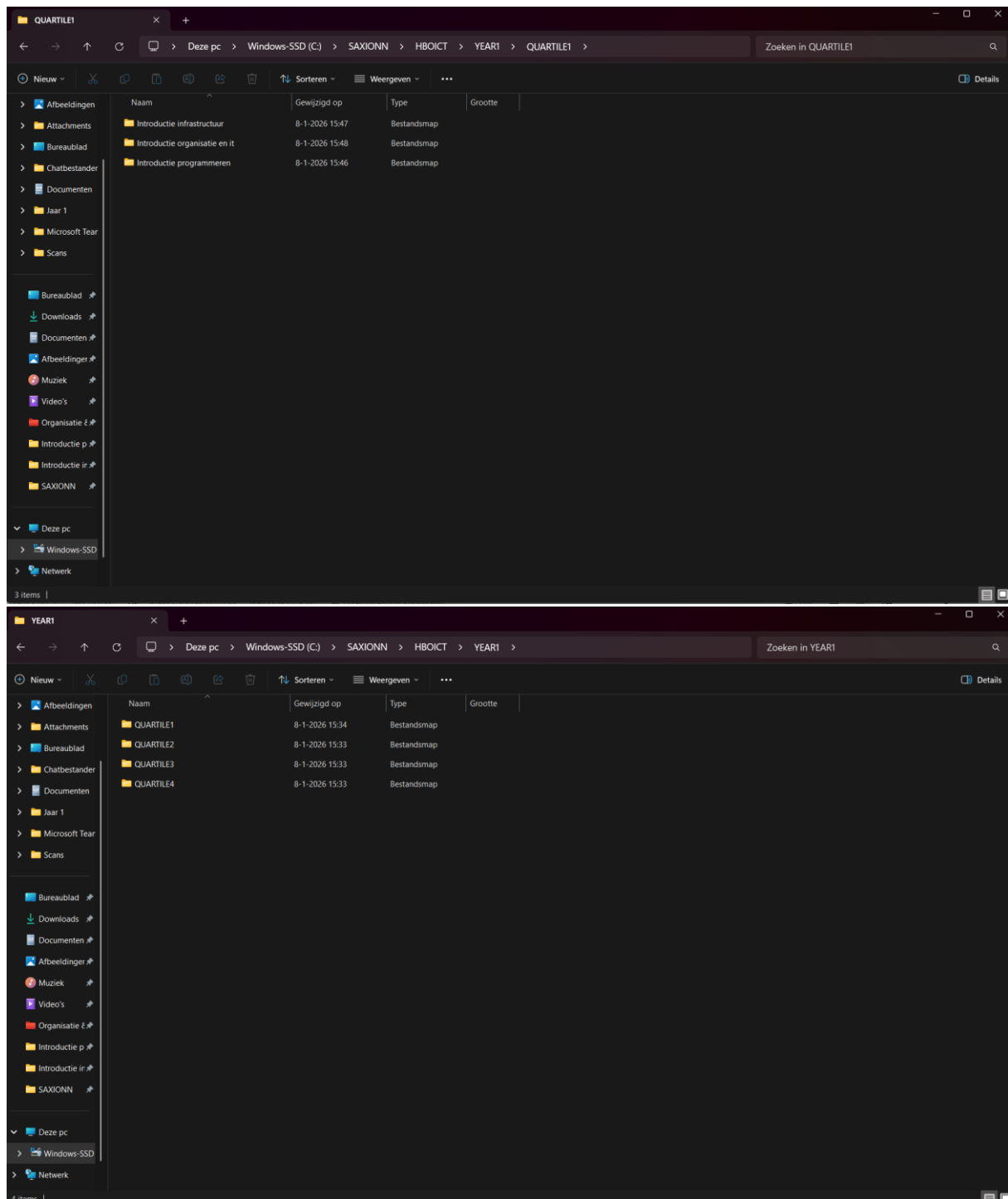
C:\SAXIONN>|
```

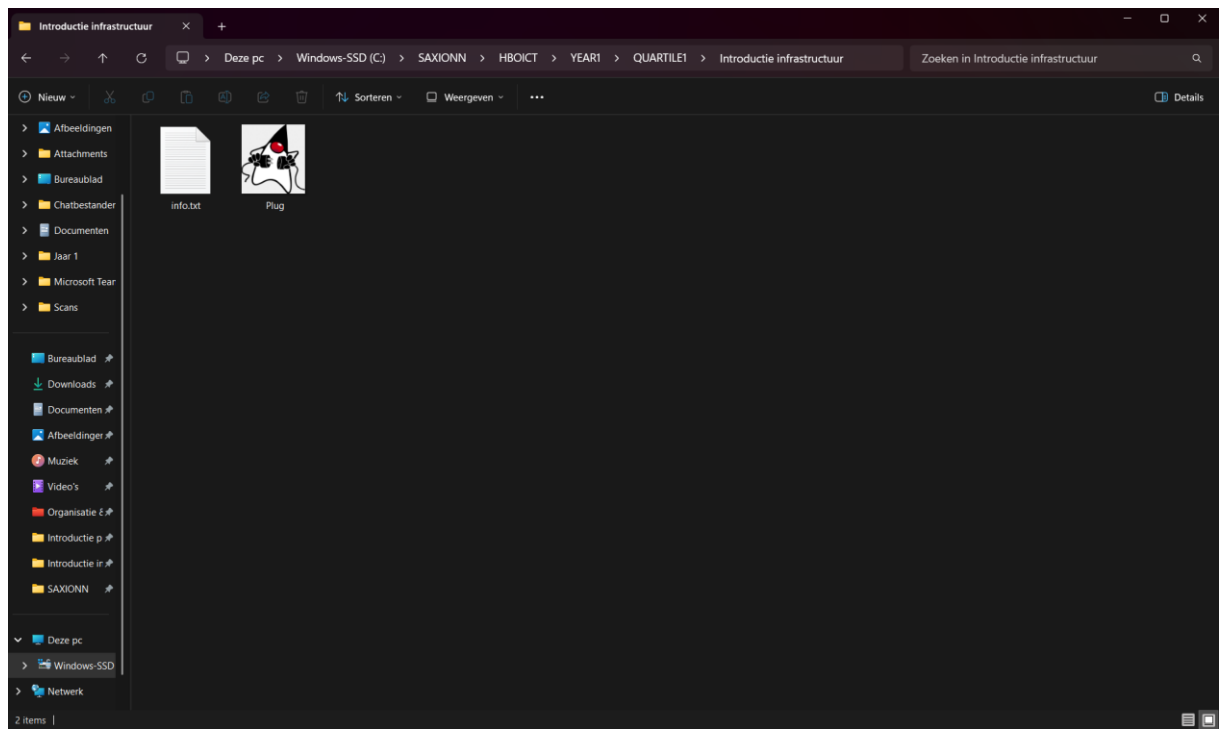
//Met de commando 'exit' heb ik de terminal afgesloten

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



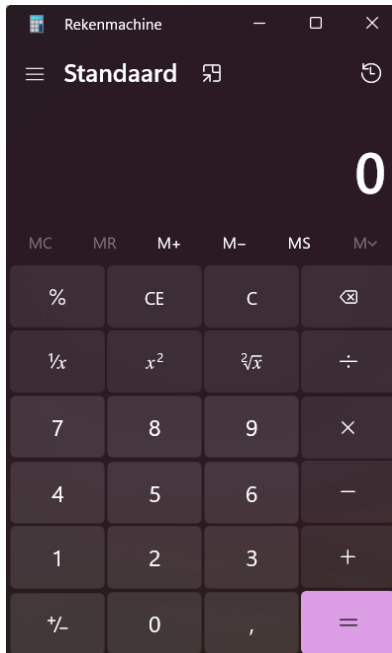






## Terminating Processes

Relevant Screenshots Task Manager Window:



Processen

Nieuwe taak uitvoeren

Ta

Naam	Status	7% Processor	64% Geheugen	1% Schijf	0% Netwerk
Toepassingen (6)					
> Google Chrome (17)		0%	737,5 MB	0 MB/s	0 Mbps
> Microsoft Word (2)		0,9%	192,9 MB	0,5 MB/s	0 Mbps
▼ Rekenmachine (2)		0%	37,3 MB	0,1 MB/s	0 Mbps
Rekenmachine		0%	35,0 MB	0,1 MB/s	0 Mbps
Runtime Broker		0%	2,4 MB	0 MB/s	0 Mbps

▼ Rekenmachine (2)

Rekenmach

Runtime Br

Samenvouwen

Activeren

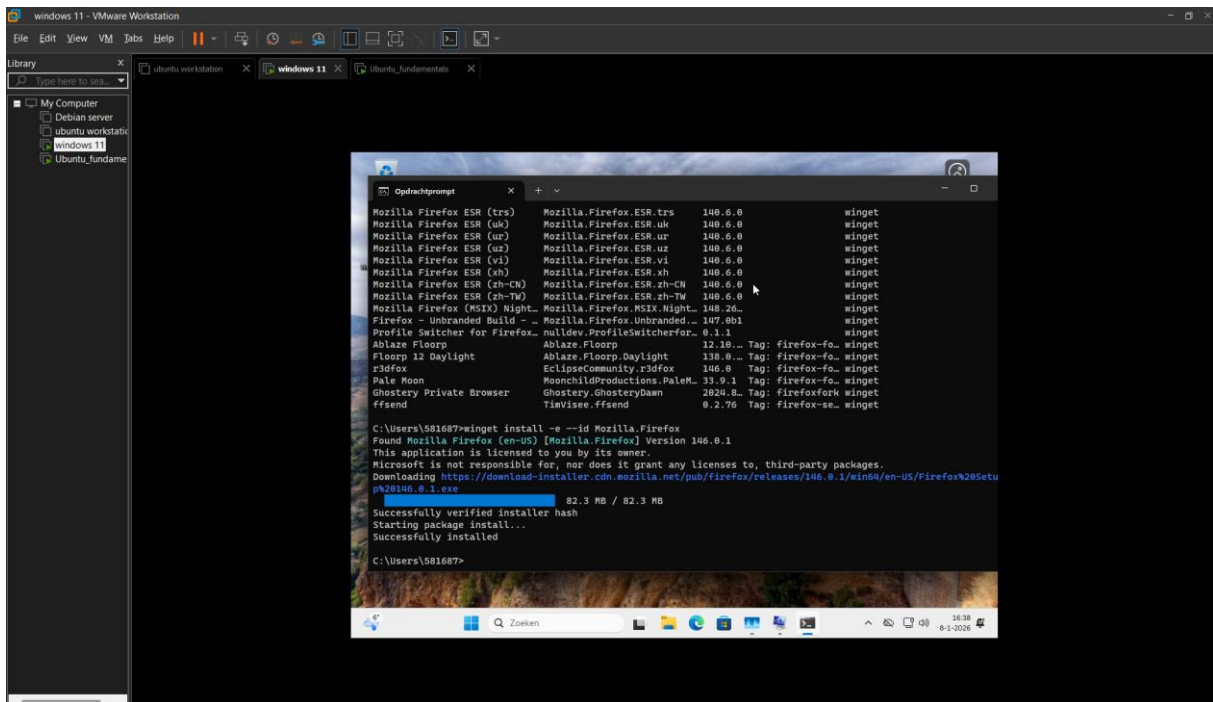
Beëindigen

37,3 MB	0 MB/s	0 Mbps
35,0 MB	0 MB/s	0 Mbps
2,4 MB	0 MB/s	0 Mbps

## Install Software

Relevant screenshots that the following software is installed with winget:

- a) Firefox geïnstalleerd vanuit de terminal met winget



- b) Winget install roept de commando om iets te installeren, -e betekent 'exact match' wat aanwijst op de --id. Dus je zoekt het exacte id.

c)

```
C:\Users\S81687>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:\Users\S81687>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...
The installer will request to run as administrator. Expect a prompt.
Successfully installed
```

```
C:\Users\581687>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...  
The installer will request to run as administrator. Expect a prompt.  
Successfully installed
```

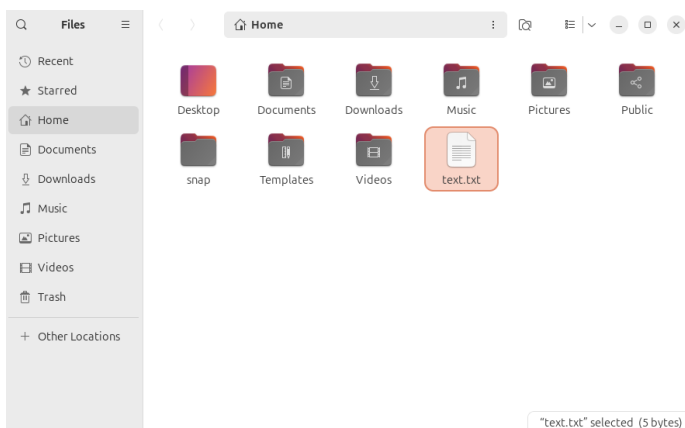
```
C:\Users\581687>winget install -e --id WinSCP.WinSCP
Found WinSCP [WinSCP.WinSCP] Version 6.5.5
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://sourceforge.net/projects/winscp/files/WinSCP/6.5.5/WinSCP-6.5.5-Setup.exe/download
██████████ 11.6 MB / 11.6 MB
Successfully verified installer hash
Starting package install...
The installer will request to run as administrator. Expect a prompt.
Successfully installed
```

## Assignment 5.4: Working with Linux

### Copying files:

```
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/code$ cd
student-581687@student-581687-VMware-Virtual-Platform:~$ ls
Desktop Documents Downloads Music Pictures Public snap Templates Videos
student-581687@student-581687-VMware-Virtual-Platform:~$ nano text.txt
student-581687@student-581687-VMware-Virtual-Platform:~$ ls
Desktop Documents Downloads Music Pictures Public snap Templates text.txt Videos
student-581687@student-581687-VMware-Virtual-Platform:~$ cp text.txt Documents/
student-581687@student-581687-VMware-Virtual-Platform:~$ cd Documents/
Documents/ Downloads/
student-581687@student-581687-VMware-Virtual-Platform:~$ cd Documents/
student-581687@student-581687-VMware-Virtual-Platform:~/Documents$ ls
code text.txt
student-581687@student-581687-VMware-Virtual-Platform:~/Documents$
```

Je kan de txt bestand ook slepen naar Documents.



### Navigating the file structure:

```
cd /etc
cd ~
```

linux gebruikt / als mappenstructuur. Windows gebruikt schijfletters  
/etc wordt voor system en configuratie bestanden gebruikt.

### Compress files:

```
tar -cvf bestand.tar bestand.txt
tar -xvf bestand.tar
tar -czvf bestand.tar.gz bestand.txt
```

### view processes:

htop toont actieve processen, en hardware gebruik. Net als task manager van windows.

### Install software:

Neofetch toont systeeminformatie

## Assignment 5.5: Users and permissions on Linux

```
student-581687@student-581687-VMware-Virtual-Platform:~/Documents$ mkdir hello
student-581687@student-581687-VMware-Virtual-Platform:~/Documents$ ls
code  hello  text.txt
student-581687@student-581687-VMware-Virtual-Platform:~/Documents$ cd hello
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ nano hello.sh
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ sudo chmod +x hello.sh
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ sudo ./hello.sh
Hello halil, 581687!
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ ls -l
total 4
-rwxrwxr-x 1 student-581687 student-581687 40 Jan  8 20:52 hello.sh
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ chmod 744 hello.sh
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$ ls -l
total 4
-rwxr--r-- 1 student-581687 student-581687 40 Jan  8 20:52 hello.sh
student-581687@student-581687-VMware-Virtual-Platform:~/Documents/hello$
```

## Assignment 5.6: View the contents of files

Commando betekenissen:

cat - toont de volledige inhoud

wc – telt regels, woorden etc

less – bekijkt een bestand page voor page

head – toont de eerste regel

tail – toont de laatste regel

grep – zoekt tekst in een bestand

```
student-581687@student-581687-VMware-Virtual-Platform:~$ wc 1661-0.txt
12306 107562 607504 1661-0.txt
student-581687@student-581687-VMware-Virtual-Platform:~$
student-581687@student-581687-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
student-581687@student-581687-VMware-Virtual-Platform:~$
student-581687@student-581687-VMware-Virtual-Platform:~$ head -n 490 1661-0.txt | tail -n 20

"Oh, then we have three days yet," said Holmes with a yawn. "That is
very fortunate, as I have one or two matters of importance to look into
just at present. Your Majesty will, of course, stay in London for the
present?"

"Certainly. You will find me at the Langham under the name of the Count
Von Kramm."

"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
student-581687@student-581687-VMware-Virtual-Platform:~$
```

Camera Model Name: moto g(6) play  
DEG32 6, 94486 Osterhofen, Duitsland

## Assignment 5.8: Steganography

[illegible]



## Assignment 5.9: Capture disk images

### Debian setup/image storage

```
halil@s581687:~$ sudo mkdir -p /srv/images
halil@s581687:~$ sudo chown $USER:$USER /srv/images
halil@s581687:~$ 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 UP group default qlen 1000
    link/ether 00:0c:29:ae:fd:9b brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    altname enx000c29aefd9b
    inet 192.168.139.134/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 962sec preferred_lft 737sec
    inet6 fe80::be32:9ab6:c4df:b8cf/64 scope link
        valid_lft forever preferred_lft forever
halil@s581687:~$ ls
halil@s581687:~$ cd /srv/images
halil@s581687:/srv/images$ ls
ubuntu2404_vm.img.gz
halil@s581687:/srv/images$
```

### ssh verbinding

```
student-581687@student-581687-VMware-Virtual-Platform:~$ ssh halil@192.168.139.134
halil@192.168.139.134's password:
Linux s581687 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) 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.

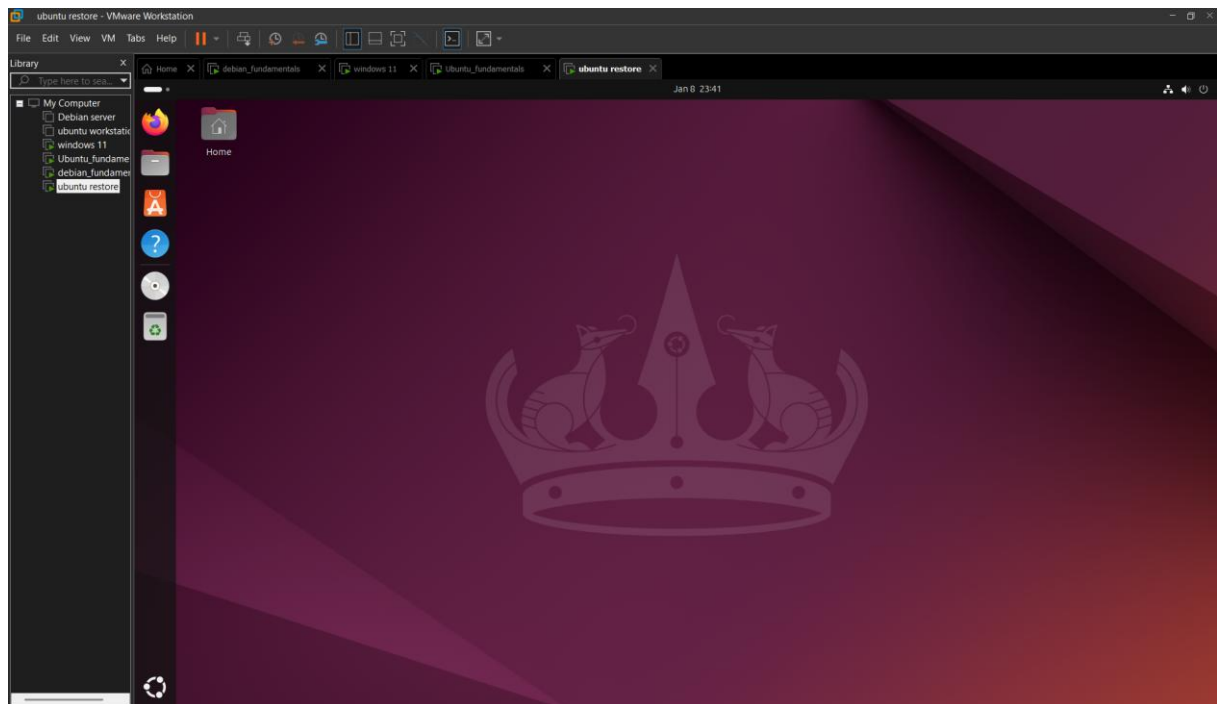
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Jan  8 22:49:48 2026 from 192.168.139.132
halil@s581687:~$
```

### Capture process

```
ubuntu@ubuntu:~$ sudo dd if=/dev/sda bs=4m status=progress | gzip | ssh halil@192.168.139.134 "cat > /srv/images/ubuntu2404_vm.img.gz"
dd: invalid number: '4m'
halil@192.168.139.134's password:
ubuntu@ubuntu:~$ sudo dd if=/dev/sda bs=4M status=progress | gzip | ssh halil@192.168.139.134 "cat > /srv/images/ubuntu2404_vm.img.gz"
halil@192.168.139.134's password:
14994636800 bytes (15 GB, 14 GiB) copied, 273 s, 54.9 MB/s
```

### restore process

```
ubuntu@ubuntu:~$ ssh halil@192.168.139.134 "cat /srv/images/ubuntu2404_vm.img.gz"
" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
halil@192.168.139.134's password:
21432107008 bytes (21 GB, 20 GiB) copied, 146 s, 147 MB/s
0+630983 records in
0+630983 records out
21474836480 bytes (21 GB, 20 GiB) copied, 146.918 s, 146 MB/s
ubuntu@ubuntu:~$
```



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