

Template Week 5 – Operating Systems

Student number: 569073

Assignment 5.1: Unix-like

- a) Find out what the difference is between UNIX and unix-like operating systems?
UNIX and unix-like operating systems follow the same philosophy but UNIX operating systems are Singe UNIX Specification certified (SUS) and unix-like operating systems are not SUS certiefied
- 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: Ken is a Co-creator of UNIX, He made the B programming language, he researched operating systems and new OS concepts and he is the co-inventor of UTF-8. His design philosophy shaped modern software engineering and operating systems.

Dennis Ritchie: Dennis is also a Co-creator of UNIX he helped Ken Thompson make UNIX into a portable, multiuse OS. He made the C programming language. He made UNIX more portable by rewriting it to the C programming language. He had a big impact on the IT world cause the C programming language that formed the foundation for modern programming languages like C++, Java and Go

Bill Joy: Bill is one of the major developers of the Berkeley Software Distribution (BSD), a major UNIX variant. He integrated TCP/IP into BSD to make the internet more accessible. He also created the vi text editor. He also helped develop Solaris and helped promote UNIX workstations. BSD Unix heavily influenced modern system such as macOS and a lot of today's networking infrastructure.

Richard Stallman: Richard contributed to founding GNU to create free Unix-compatible operating systems. He also established the Free Software Foundation (FSF) , The FSF promotes software freedom. He created tools like GCC, GND Emacs and GNU. He also developed the General Public License (GPL) a free software license. Richard laid the groundwork for free and open source software.

Linus Torvalds: Linus created the Linux kernel. He combined Linux with GNU tools to make a complete Unix-like operating system. He also created the Git version control system. He had a big impact on IT because Most servers, supercomputers, android smartphones and cloud infrastructure run on Linux. And Git it the most used version control system.

- c) What is the philosophy of the GNU movement?
The core philosophy of GNU movement is that users should have control over software they use. The 4 biggest point for that freedom are: You should be able to run the program for any purpose, accessible source code so people can study the program and change it. Redistribute copies to help others. Sharing updated versions to help other people in the community.

- d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement?

Please explain your answer.

Not completely because Ubuntu is focused on practical usability and hardware support and GNU is more focused on software freedom. Ubuntu follows most things in GNU philosophy, It uses GNU tools and most of its software is free and open source. It does not follow the GNU philosophy by including proprietary software options like(drivers and firmware) and makes it easy to install payed software.

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

The Windows Subsystem for Linux (WSL) allows you to run Linux command-line, Linux tools and allows you to install full Linux distributions on windows. There are 2 versions of WSL: WSL1 translates Linux system calls to windows System calls. WSL2 Uses the Linex kernel inside of a Virtual machine. WSL allows windows and Linux to cooperate.

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

Android: Android uses the Linux kernal with an Android specific user space.

iOS: iOS is built on Apple's Darwin OS which is a version BSD UNIX.

ChromeOS: ChromeOS uses the Linux kernal and Gentoo 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 mainly used for: research in field such as physics, Chemistry and biology they help in these field with for example: quantum simulations(physics), protein folding(biology) and molecular dynamics(chemistry). Supercomputers are also used for nuclear weapon simulations and designs. Supercomputers can also run other complex simulation such as aerodynamic modelling or climate change. They are also used to predict weather because weather patterns are have a lot of variables and data. Supercomputers are also used for problem with a huge amount of solutions like breaking codes 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?

The Playstation 3 cluster where a cluster of ps3 connected to each other the first cluster used 8 ps3's and was used to simulate large supermassive black holes. Later there were clusters of way more ps3's which were used for to analyse high definition satellite images and protein folding

- 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/>

It doesn't make the top 500 list because that list full of supercomputers made out of high end CPU's and GPU's Not raspberry pi's

- e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?

PS5 uses a custom AMD CPU based on x86-64 architecture specifically the Zen 2

Xbox Series X uses a custom AMD CPU based on x86-64 architecture specifically the Zen 2

What operating systems run on these consoles?

PS5 runs on a custom Sony operating system based on the UNIX-like FreeBSD operating system

Xbox Series X uses a custom version of windows with an optimized windows NT kernel for video games.

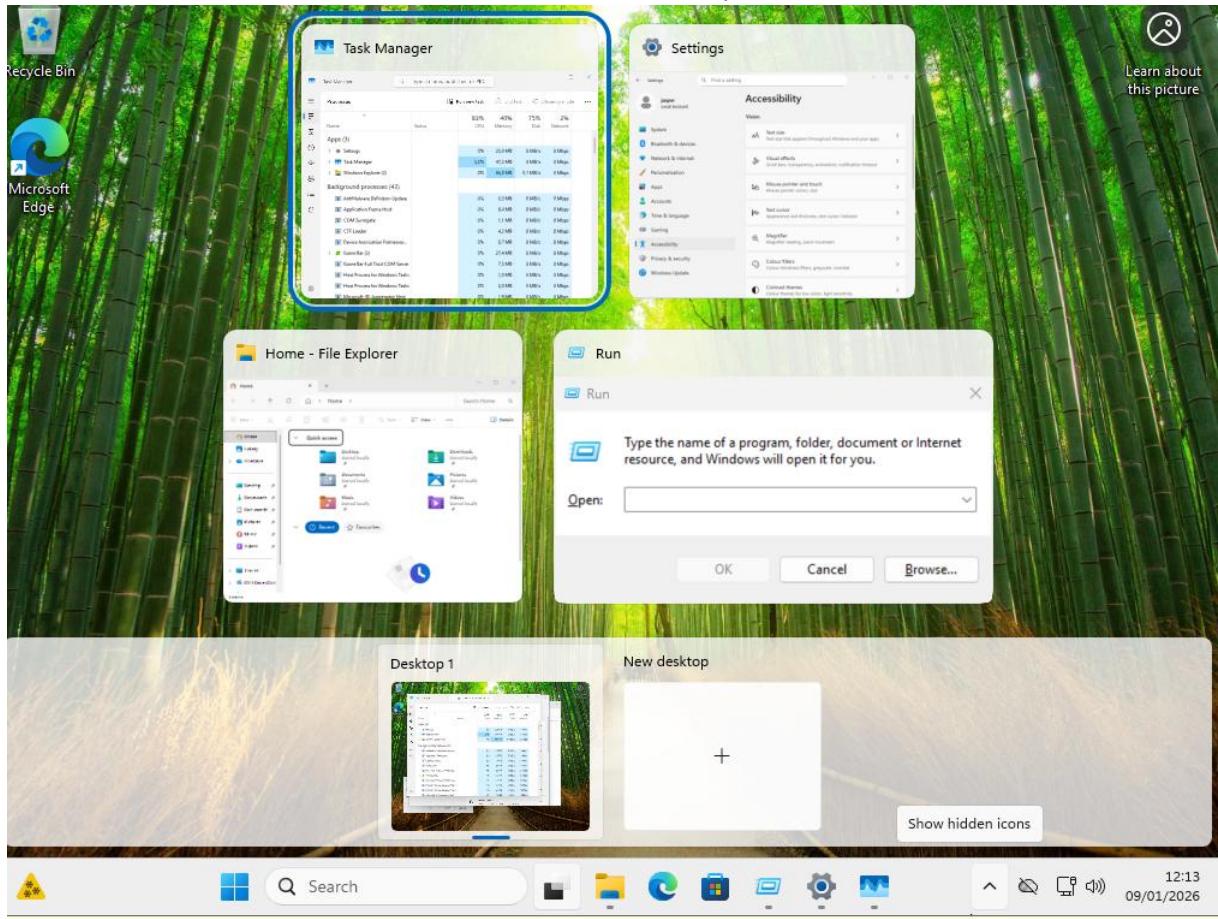
What conclusion can you draw from the answer to the previous question?

They use the same architecture as pc's and their operating system are customized version of general purpose OS systems for PS5 its UNIX/BSD and for Xbox Series X its Windows/NT the common architecture's make easier for developers to port games and develop tools.

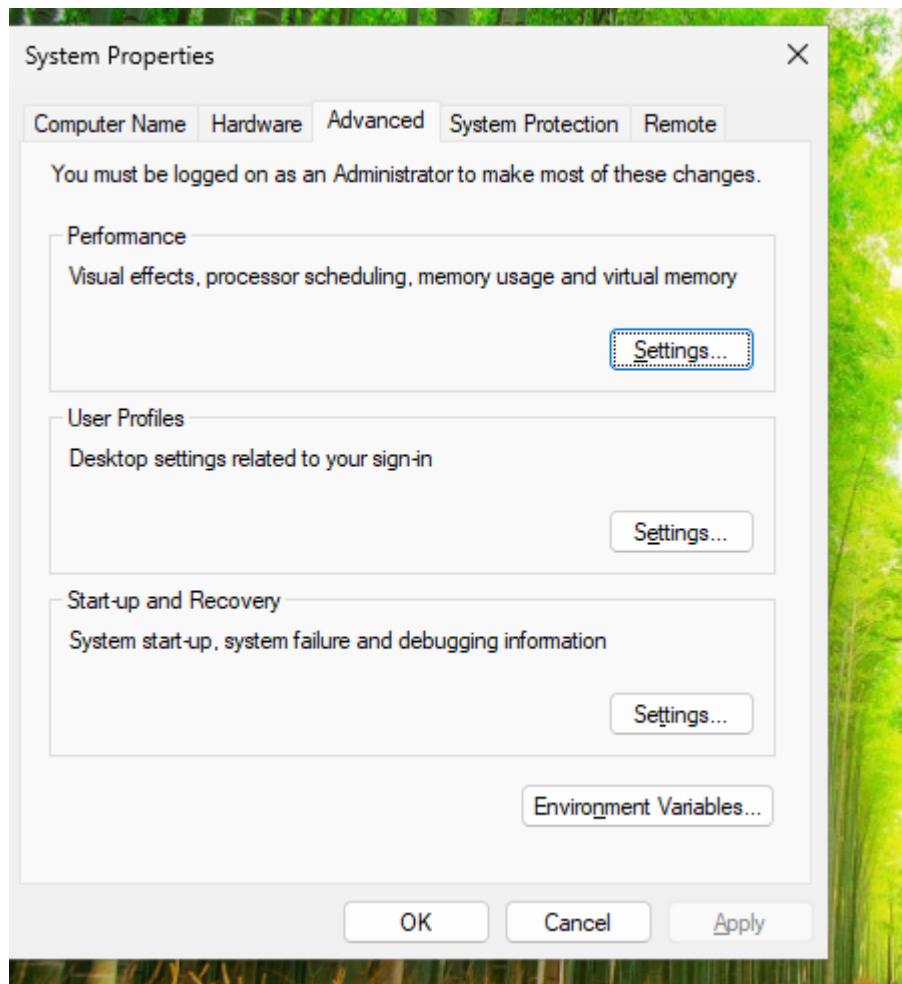
Assignment 5.3: Working with Windows

Take relevant screenshots of the assignments below

- a) Practice for about 10 minutes with the **Windows** keyboard shortcuts combinations, skip the general shortcuts in this exercise. Take a look at which screens are opened.

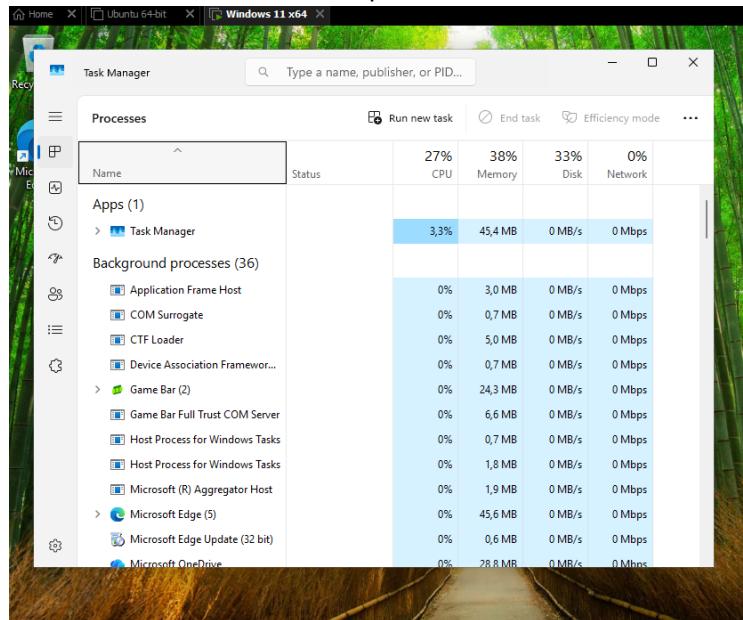


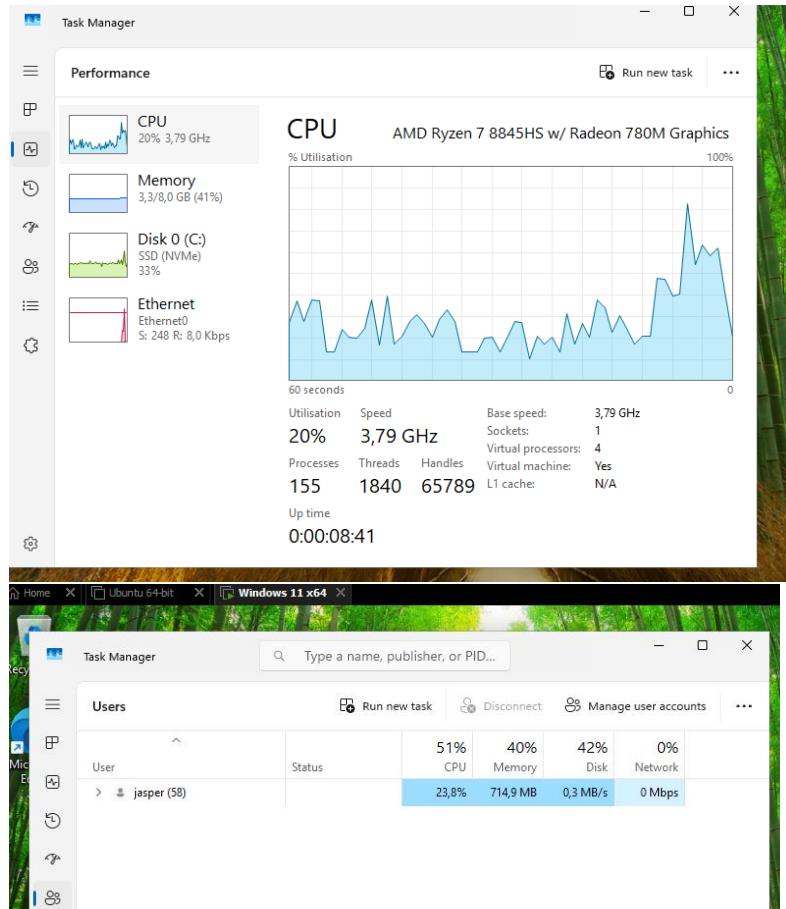
- b) The file explorer can be opened with **Windows + E**, Which key combination could you also use? Windows key + R and they type explorer then ENTER
c) Open the system properties with a **Windows** key combination, take a screenshot of the open screen. Paste this screenshot into this template.



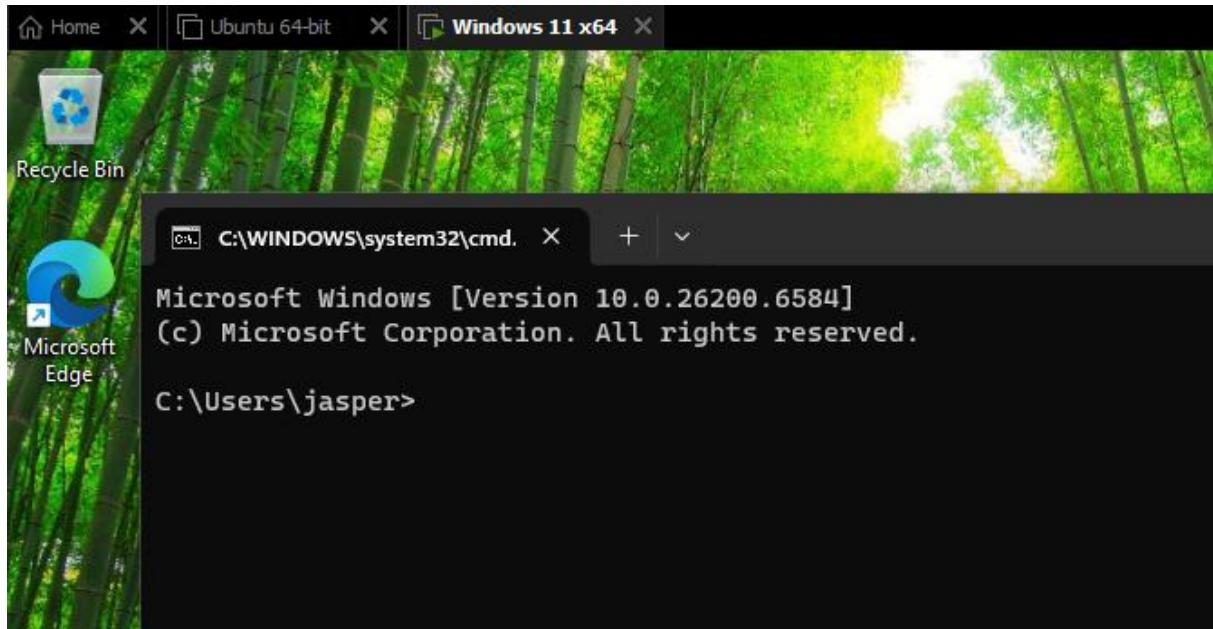
I do not have a pause button on the keyboard of my laptop so cannot use that keybind so i opened it by searching for it in the taskbar

- 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.
I used CTRL SHIFT ESCAPE to open the taskbar





- 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 key + 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 key + 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:

```
PS C:\SAXION> copy wave.png HBOICT\YEAR1\QUARTILE1\introsprog  
PS C:\SAXION> |
```

```
PS C:\SAXION> copy C:\SAXION\Plug.png C:\SAXION\HBOICT\YEAR1\QUARTILE1\introinfra  
PS C:\SAXION> |
```

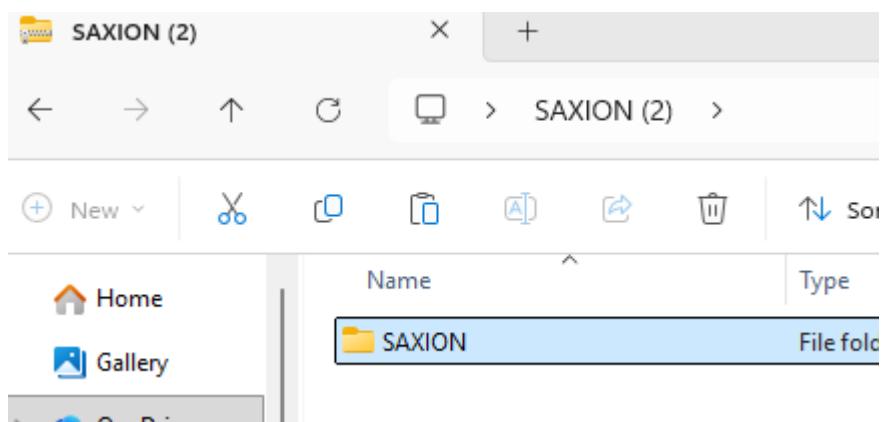
```
PS C:\SAXION> copy Tumble.png C:\SAXION\HBOICT\YEAR1\QUARTILE1\bussiness  
PS C:\SAXION> |
```

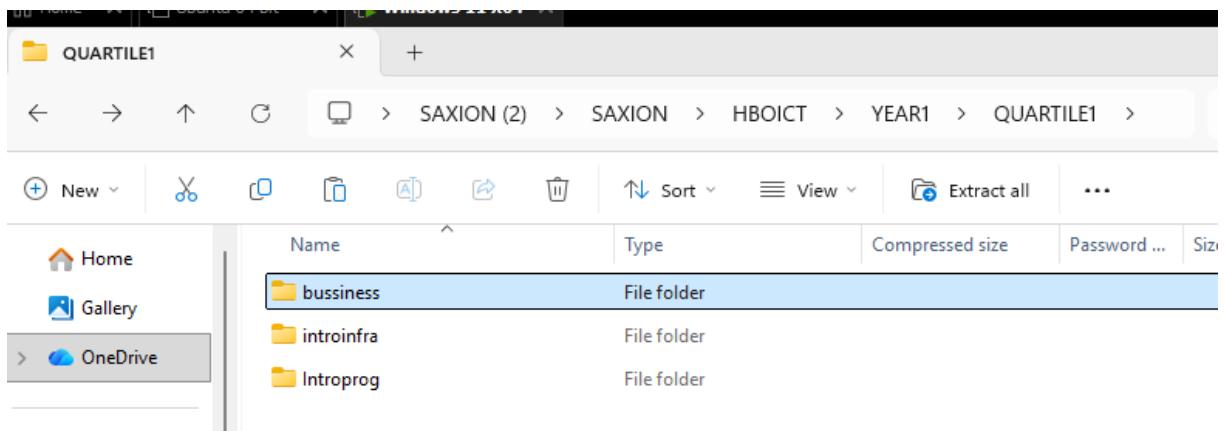
Relevant screenshots **tree** command:

A screenshot of a Windows PowerShell window titled "Windows PowerShell". The window displays a hierarchical file structure under the path "HBOICT". The structure includes four main years (YEAR1, YEAR2, YEAR3, YEAR4) each containing four quartiles (QUARTILE1 to QUARTILE4). Some specific folder names are visible, such as "bussiness", "introinfra", "Introprog", "Databases", "It fundematalts", and "Project it its in the ga". At the bottom of the window, the command "PS C:\SAXION> echo %jasper%" is entered, followed by the output "%jasper%" and the prompt "PS C:\SAXION>".

```
PS C:\SAXION> echo %jasper%
%jasper%
PS C:\SAXION>
```

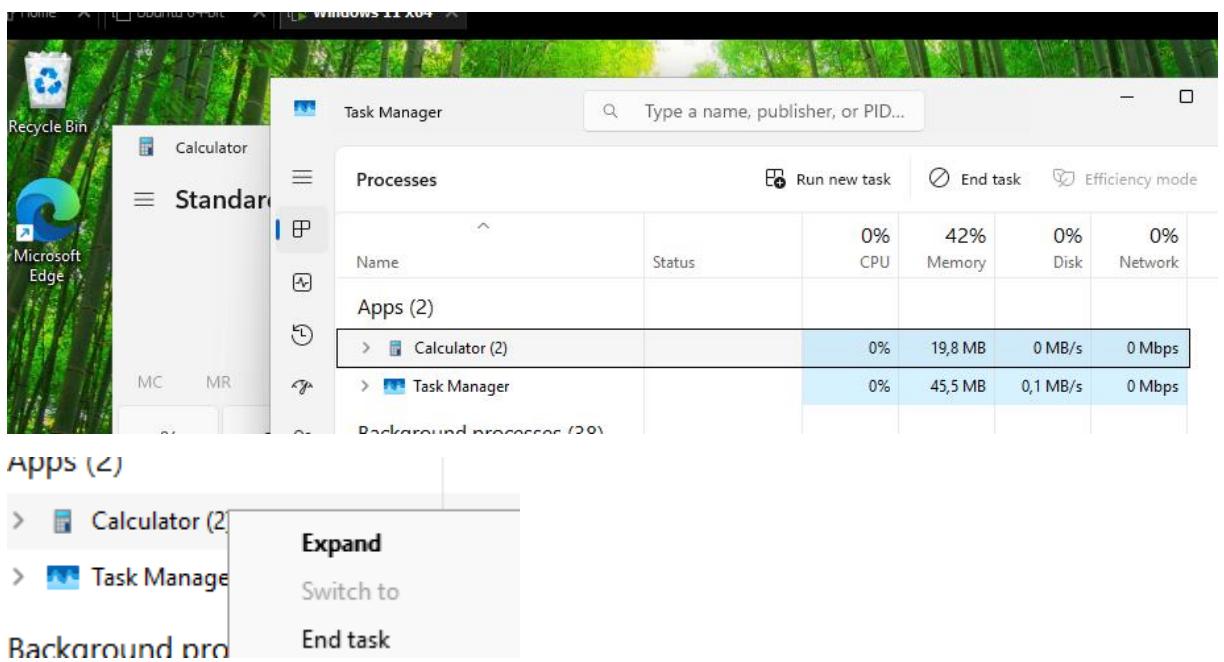
Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.





Terminating Processes

Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:

```

Administrator: Command Prompt - winget install -e --id Mozilla.Firefox
Mozilla Firefox ESR (tl) Mozilla.Firefox.ESR.tl 140.6.0 winget
Mozilla Firefox ESR (tr) Mozilla.Firefox.ESR.tr 140.6.0 winget
Mozilla Firefox ESR (trs) Mozilla.Firefox.ESR.trs 140.6.0 winget
Mozilla Firefox ESR (uk) Mozilla.Firefox.ESR.uk 140.6.0 winget
Mozilla Firefox ESR (ur) Mozilla.Firefox.ESR.ur 140.6.0 winget
Mozilla Firefox ESR (uz) Mozilla.Firefox.ESR.uz 140.6.0 winget
Mozilla Firefox ESR (vi) Mozilla.Firefox.ESR.vi 140.6.0 winget
Mozilla Firefox ESR (xh) Mozilla.Firefox.ESR.xh 140.6.0 winget
Mozilla Firefox ESR (zh-CN) Mozilla.Firefox.ESR.zh-CN 140.6.0 winget
Mozilla Firefox ESR (zh-TW) Mozilla.Firefox.ESR.zh-TW 140.6.0 winget
Mozilla Firefox (MSIX) Night... Mozilla.Firefox.MSIX.Night... 148.26... winget
Firefox - Unbranded Build - ... Mozilla.Firefox.Unbranded... 147.0b1 winget
Profile Switcher for Firefox... nulldev.ProfileSwitcherfor... 0.1.1 winget
Ablaze Floorp Ablaze.Floorp 12.10.... Tag: firefox-fo... winget
Floorp 12 Daylight Ablaze.Floorp.Daylight 138.0.... Tag: firefox-fo... winget
r3dfox EclipseCommunity.r3dfox 146.0 Tag: firefox-fo... winget
Pale Moon MoonchildProductions.PaleM... 33.9.1 Tag: firefox-fo... winget
Ghostery Private Browser Ghostery.GhosteryDawn 2024.8... Tag: firefoxfork winget
ffsend TimVisee.ffsend 0.2.76 Tag: firefox-se... winget

C:\Windows\System32>winget install -e --id Mozilla.Firefox
Found Mozilla Firefox (en-US) [Mozilla.Firefox] Version 146.0.1
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://download-installer.cdn.mozilla.net/pub/firefox/releases/146.0.1/win64/en-US/Firefox%20Setup%20146.0.1.exe
[██████████] 82.3 MB / 82.3 MB
Successfully verified installer hash
Starting package install...
\
```

-e means –exact, it check the exact string in query including case sensitivity and doesn't use the default behaviour of a substring

--id is used to limit the instal to the ID of the application

So what the command winget install -e --id Mozilla.Firefox does is: it calls winget to install the exact ID "Mozilla.Firefox"

- WinSCP

```

C:\Windows\System32>winget search winscp
Name      Id          Version Match      Source
-----
WinSCP    WinSCP.WinSCP  6.5.5      winget
WinSCP RC WinSCP.WinSCP.RC 5.18.5- Tag: winscp winget

C:\Windows\System32>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...
successfully installed

C:\Windows\System32>
```

- Notepad++

```
successfully installed
: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
[redacted] 6.54 MB / 6.54 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

- 7zip

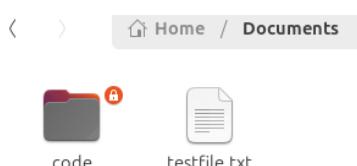
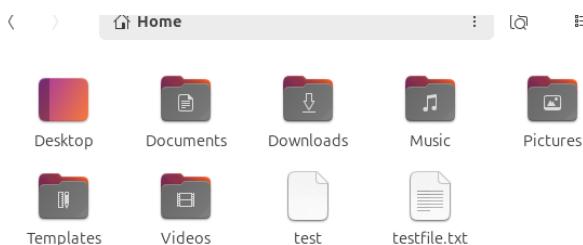
```
C:\Windows\System32>winget search 7zip
Name           Id             Version
7-Zip          7zip.7zip      25.01
Advanced Archive Password Recovery Elcomsoft.ArchivePassword 4.66.266.690
NanaZip        M2Team.NanaZip 5.0.1263.0
NanaZip Preview M2Team.NanaZip.Preview 6.0.1461.0
7-Zip ZS       mcmilk.7zip-zstd 25.01 ZS v1
7-Zip Alpha (exe) 7zip.7zip.Alpha.exe 24.01
7-Zip Alpha (msi) 7zip.7zip.Alpha.msi 24.01.00.0
7zr            7zip.7zr       25.01
QNapi          QNapi.QNapi    0.2.3

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
[redacted] 1.56 MB / 1.56 MB
Successfully verified installer hash
Starting package install...
Successfully installed
```

Assignment 5.4: Working with Linux

Relevant screenshots + motivation

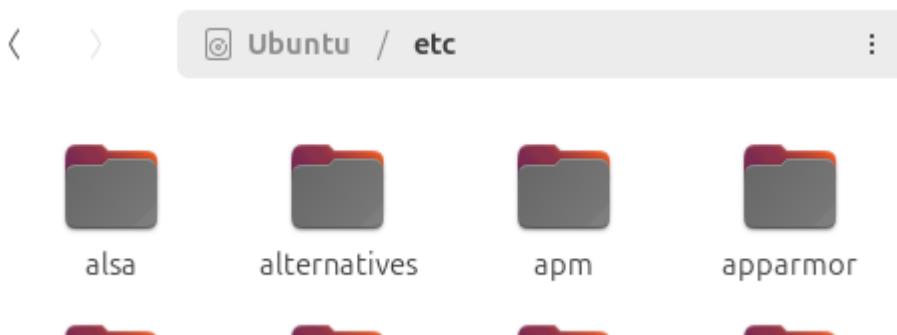
Made a file called testfile.txt and copied it using the copy function in the file explorer into documents



Copied the file using the terminal

```
jasper569073@jasperserver:~$ sudo cp ~/testfile.txt ~/Documents/  
jasper569073@jasperserver:~$
```

Etc folder in file explorer



Etc folder in terminal

```
jasper569073@jasperserver:~$ cd /etc  
jasper569073@jasperserver:~/Desktop$ cd ~
```

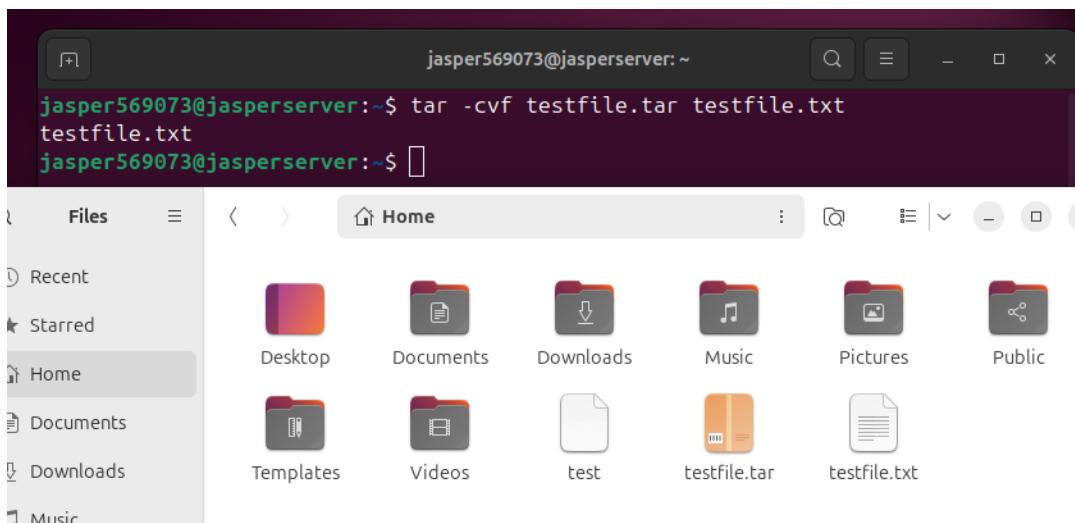
Going back to home folder in terminal

```
jasper569073@jasperserver:/etc$ cd ~
```

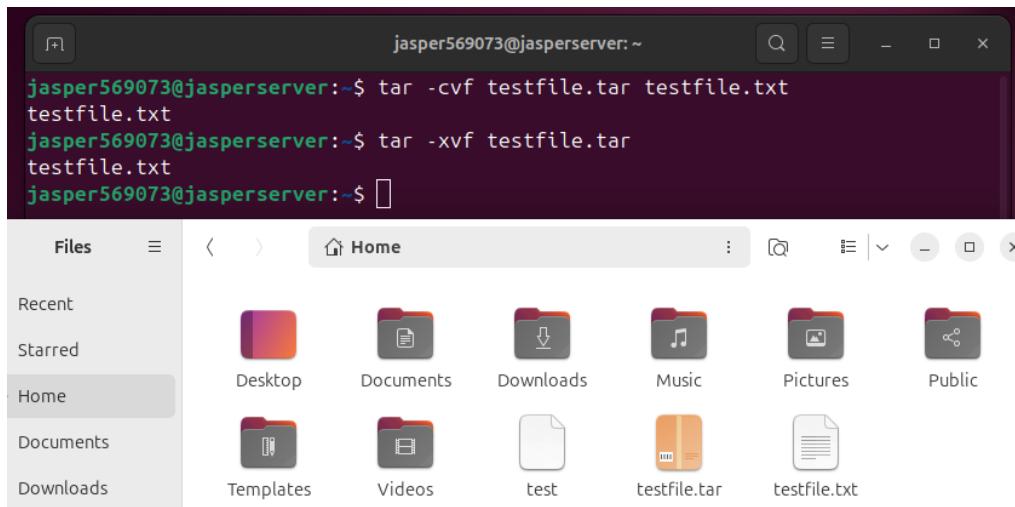
The main difference is that in windows the directory starts with a letter like C and then a :\ and in linux its starts with an /

/etc contains configuration files for linux and other software

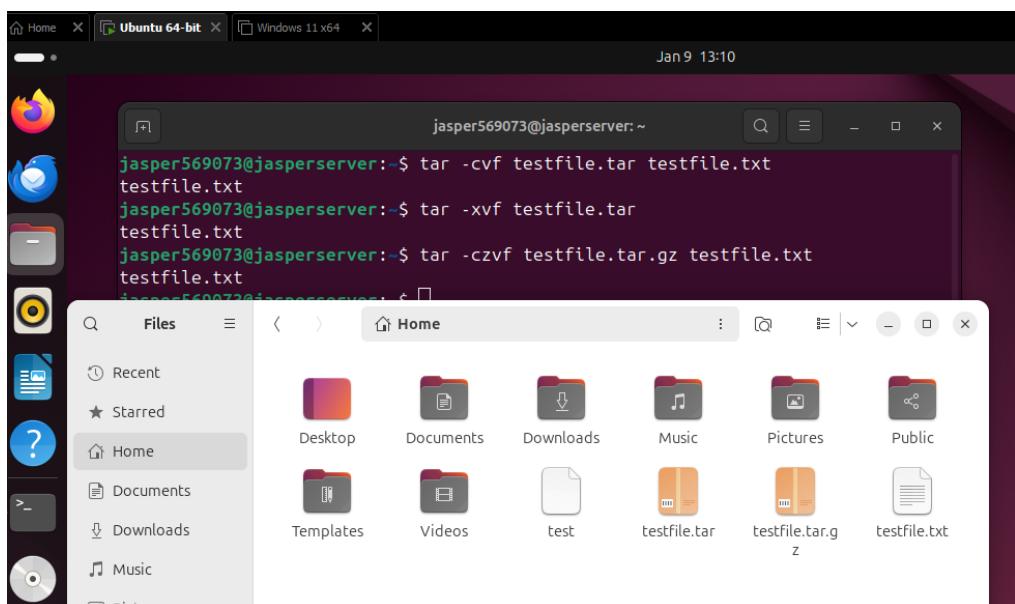
Which command in the terminal would you use to compress a text file into a tar archive?



With which command in the terminal would you be able to extract a tar file?



Compress a text file in a tar archive and compress it with gzip

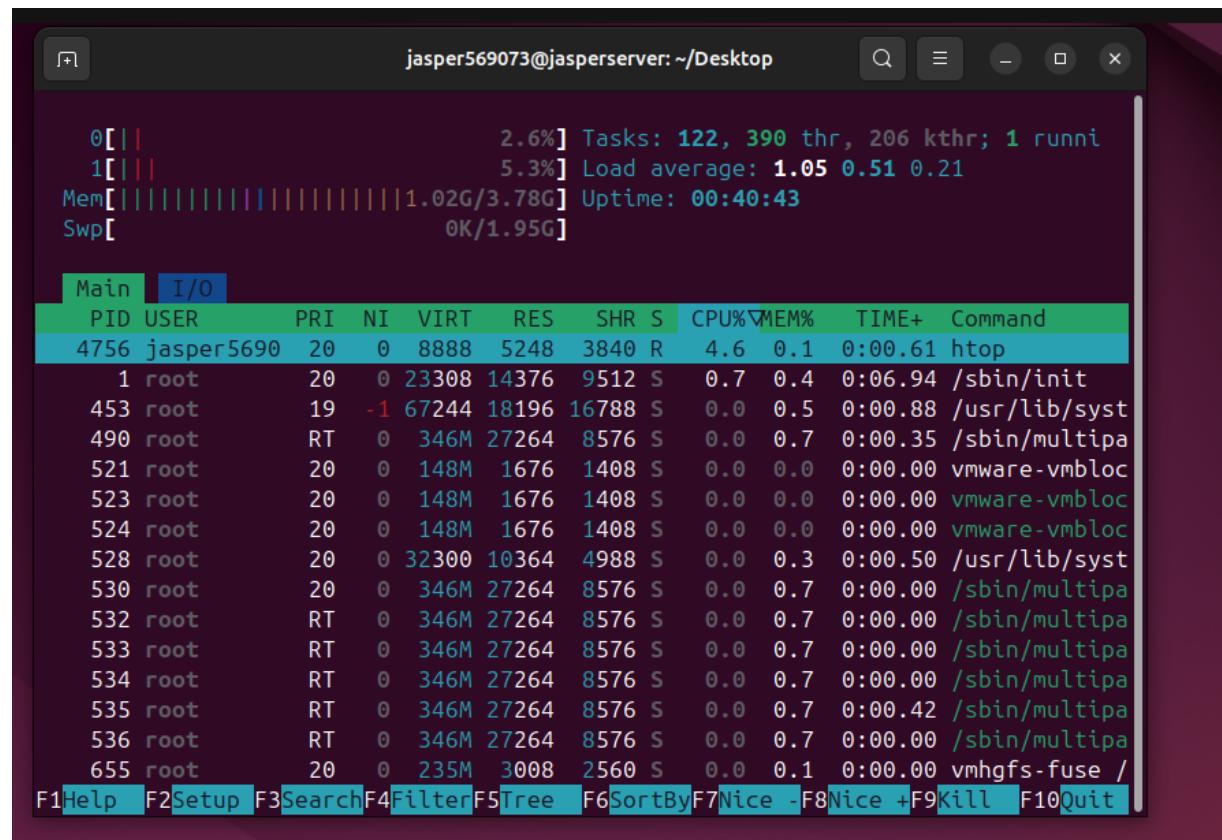


Install the application htop via a terminal command

```
jasper569073@jasperserver:~/Desktop$ sudo apt update
[sudo] password for jasper569073:
222 packages can be upgraded. Run apt list --upgradable to see what's available.

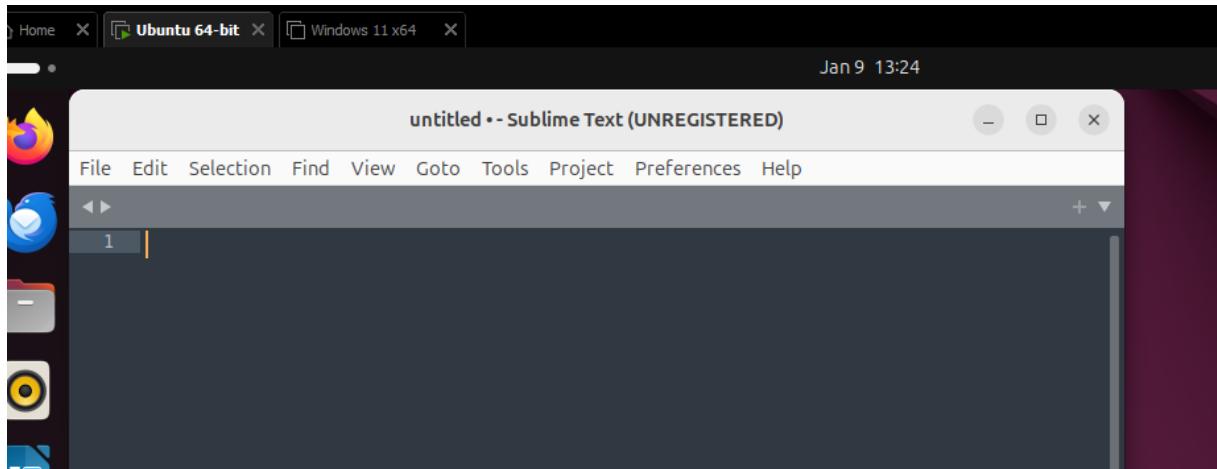
jasper569073@jasperserver:~/Desktop$ sudo apt install htop
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
htop is already the newest version (3.3.0-4build1).
htop set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 222 not upgraded.
```

Running htop

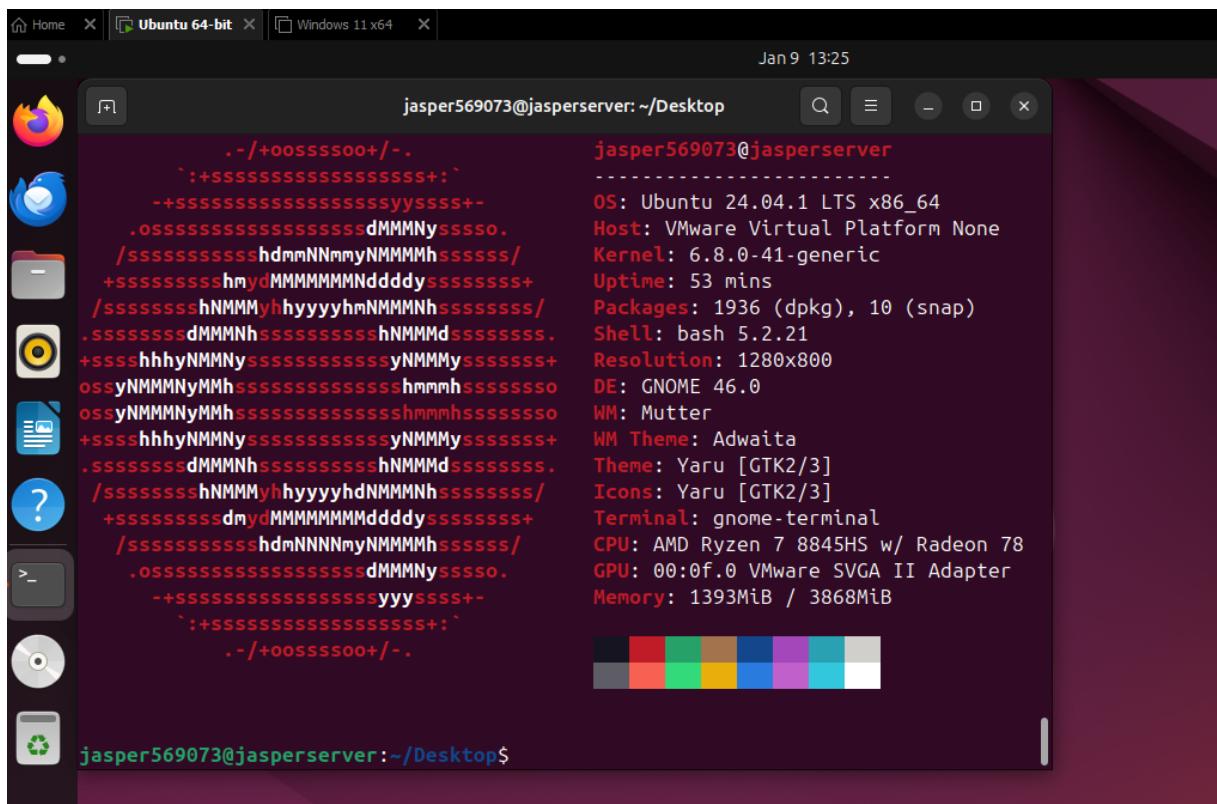


Downloading sublime tekst app via ubuntu software





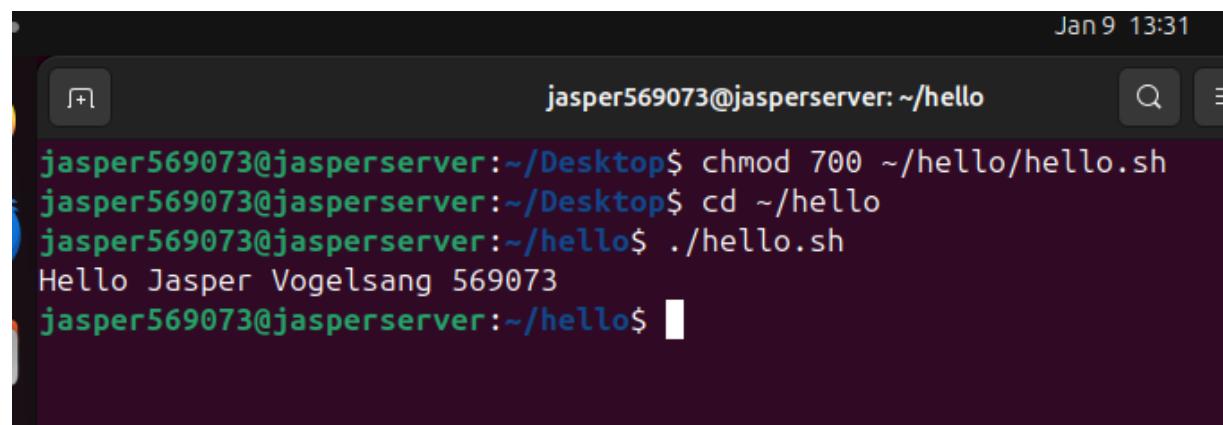
Install the neofetch application



Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

```
jasper569073@jasperserver:~/Desktop$ cd ~/hello
jasper569073@jasperserver:~/hello$ ./hello.sh
Hello Jasper Vogelsang 569073
jasper569073@jasperserver:~/hello$
```



A screenshot of a terminal window titled "jasper569073@jasperserver: ~/hello". The terminal shows the following command sequence:

```
jasper569073@jasperserver:~/Desktop$ chmod 700 ~/hello/hello.sh
jasper569073@jasperserver:~/Desktop$ cd ~/hello
jasper569073@jasperserver:~/hello$ ./hello.sh
Hello Jasper Vogelsang 569073
jasper569073@jasperserver:~/hello$
```

Assignment 5.6: View the contents of files

Relevant screenshots + motivation

cat: prints the contents of a file to the screen

wc: can be used to count number of lines. Words and characters in a file

less: is a terminal pager that a file's contents one screen at a time for faster loading in large files

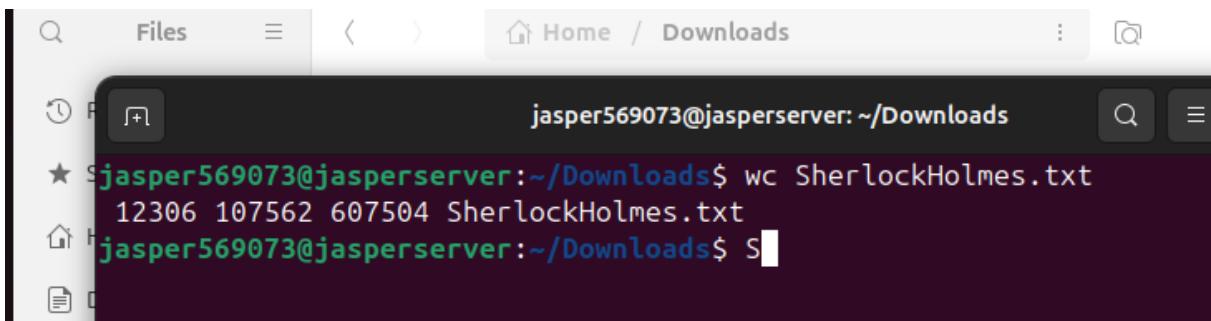
head: allows you to see the top of the file by default it prints the top 10 lines

tail: allows you to see the bottom of the file by default it prints the top 10 lines

you can specify head and tail by using -n and then a number

grep: stands for global regular expression print it allows you search for a string of characters in a file and print the lines containing that said string

How many lines does the file have? How many words? And how many characters?



A screenshot of a terminal window titled "Files" showing the path "Home / Downloads". The terminal prompt is "jasper569073@jasperserver: ~/Downloads\$". The user has run the command "wc SherlockHolmes.txt", which outputs the line count (12306), word count (107562), and character count (607504). The terminal window has a dark background with light-colored text.

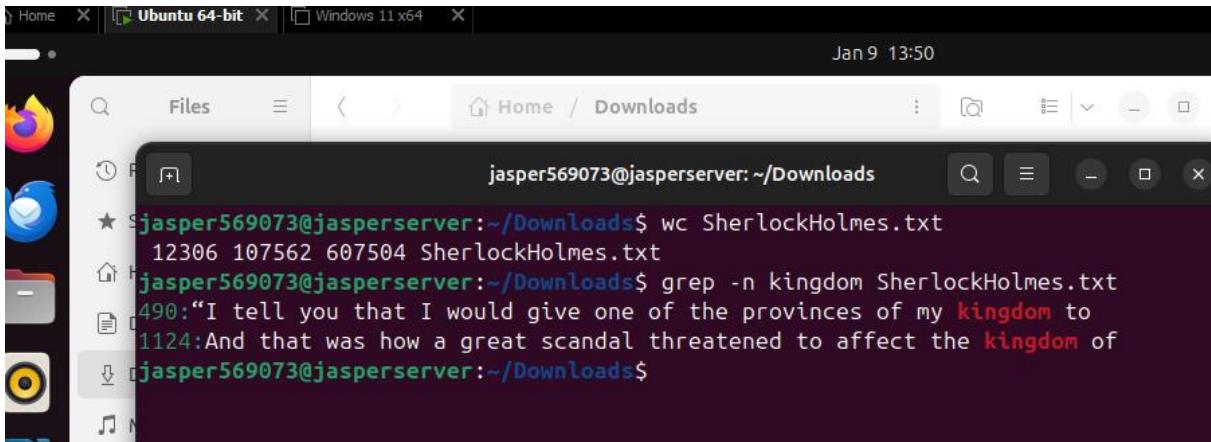
```
jasper569073@jasperserver:~/Downloads$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
jasper569073@jasperserver:~/Downloads$ S
```

12306 lines

107562 words

607504 characters

On which lines is the word "kingdom" in the file?



A screenshot of a terminal window titled "Files" showing the path "Home / Downloads". The terminal prompt is "jasper569073@jasperserver: ~/Downloads\$". The user has run the command "grep -n kingdom SherlockHolmes.txt", which outputs the line numbers where the word "kingdom" appears. Lines 490 and 1124 are shown, both containing the word in red. The terminal window has a dark background with light-colored text.

```
jasper569073@jasperserver:~/Downloads$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
jasper569073@jasperserver:~/Downloads$ 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
jasper569073@jasperserver:~/Downloads$
```

Use the head and/or tail commands to see the 10 lines above and below the word "kingdom" on the screen.

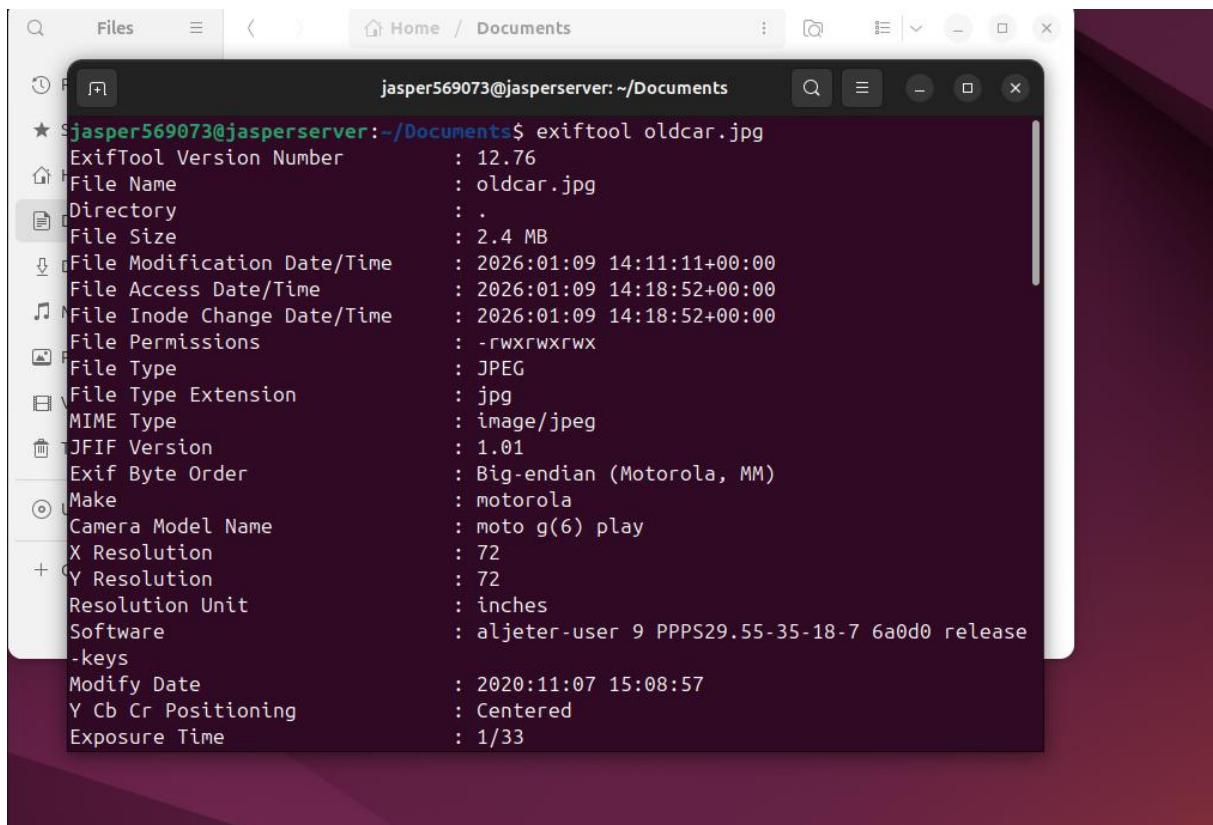
```
jasper569073@jasperserver:~/Downloads$ tail -n +480 SherlockHolmes.txt | head -n 20
    himself up onto the roof. "Ah, yes," he cried, "here's the end of a
[jasper569073@jasperserver:~/Downloads$ tail -n +480 SherlockHolmes.txt | head -
H 20
    "Then I shall drop you a line to let you know how we 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?"
The King took a heavy chamois leather bag from under his cloak and laid
it on the table.
    "There are three hundred pounds in gold and seven hundred in notes," he
said.
[jasper569073@jasperserver:~/Downloads$
```

```
    said.
[jasper569073@jasperserver:~/Downloads$ tail -n +1114 SherlockHolmes.txt | head -n 20
    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
out to him, he set off in my company for his chambers.
    And that was how a great scandal threatened to affect the kingdom of
Bohemia, and how the best plans of Mr. Sherlock Holmes were beaten by a
woman's wit. He used to make merry over the cleverness of women, but I
have not heard him do it of late. And when he speaks of Irene Adler, or
when he refers to her photograph, it is always under the honourable
title of _the_ woman.

[jasper569073@jasperserver:~/Downloads$
```

Assignment 5.7: Digital forensics

Relevant screenshots + motivation



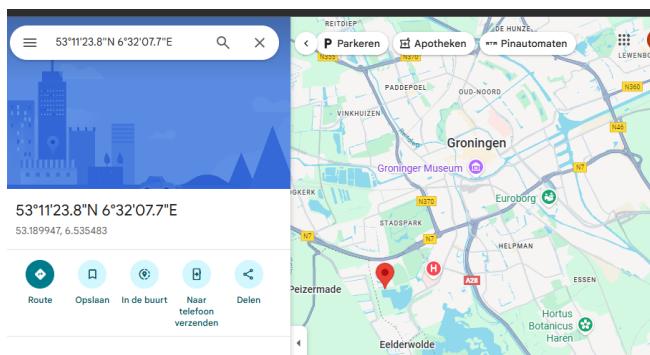
```
jasper569073@jasperserver:~/Documents$ exiftool oldcar.jpg
ExifTool Version Number      : 12.76
File Name                   : oldcar.jpg
Directory                  : .
File Size                   : 2.4 MB
File Modification Date/Time : 2026:01:09 14:11:11+00:00
File Access Date/Time       : 2026:01:09 14:18:52+00:00
File Inode Change Date/Time: 2026:01:09 14:18:52+00:00
File Permissions            : -rwxrwxrwx
File Type                  : JPEG
File Type Extension         : jpg
MIME Type                  : image/jpeg
JFIF Version               : 1.01
Exif Byte Order             : Big-endian (Motorola, MM)
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
YCbCr Positioning          : Centered
Exposure Time               : 1/33
```

The phone is a Motorola

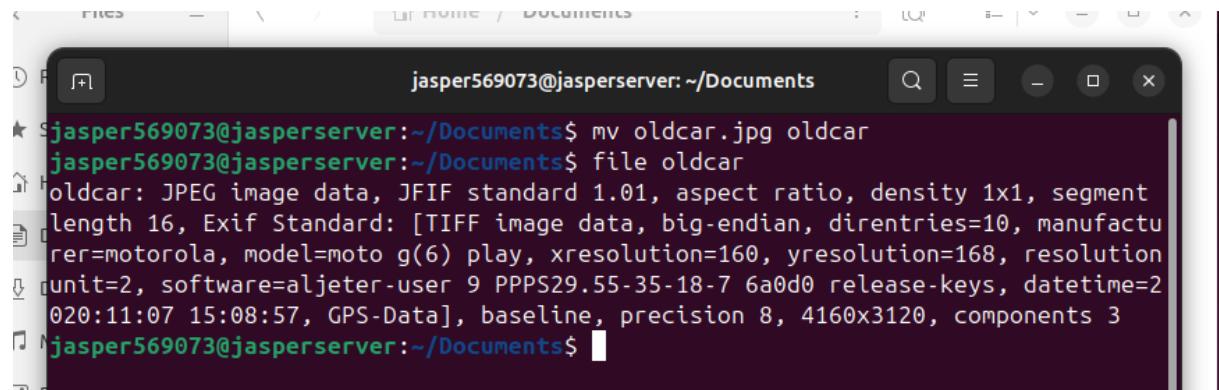
Gps cords:

```
fact)
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
jasper569073@jasperserver:~/Documents$
```

City: Groningen



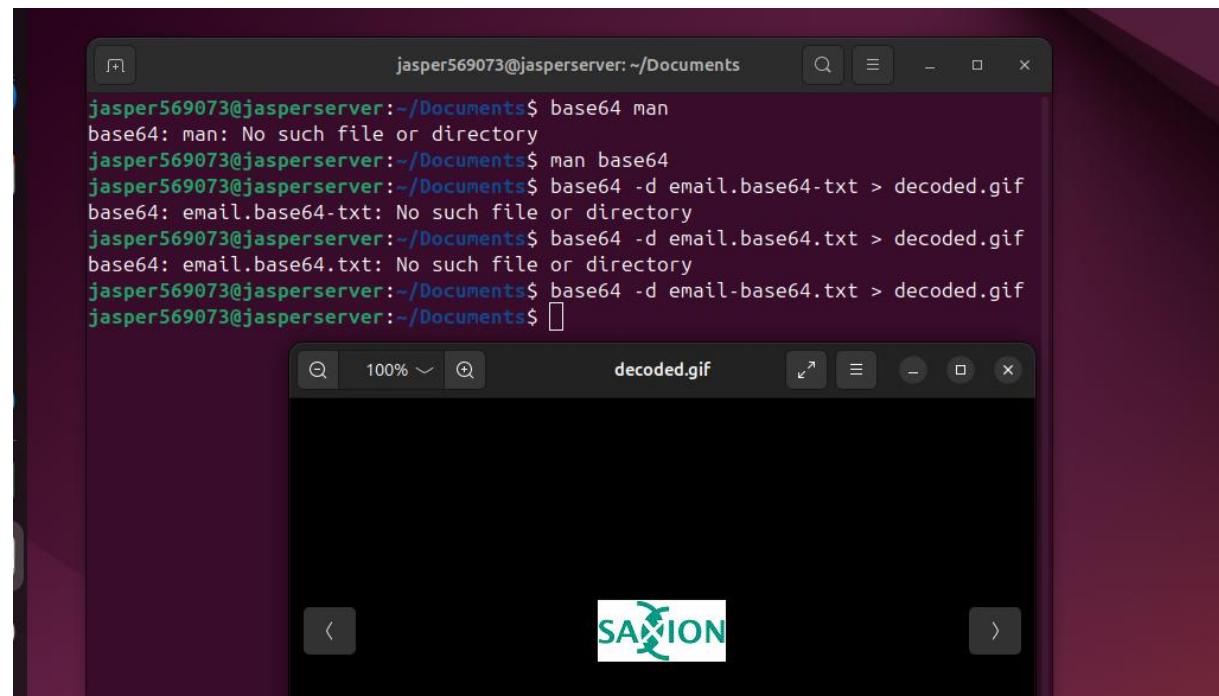
Renaming file to oldcar



```
jasper569073@jasperserver:~/Documents$ mv oldcar.jpg oldcar
jasper569073@jasperserver:~/Documents$ 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, manufac-
turer=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, datetim
e=2020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
jasper569073@jasperserver:~/Documents$
```

Ubuntu considers it a JPEG file

Decoded email



```
jasper569073@jasperserver:~/Documents$ base64 man
base64: man: No such file or directory
jasper569073@jasperserver:~/Documents$ man base64
jasper569073@jasperserver:~/Documents$ base64 -d email.base64-txt > decoded.gif
base64: email.base64-txt: No such file or directory
jasper569073@jasperserver:~/Documents$ base64 -d email.base64.txt > decoded.gif
base64: email.base64.txt: No such file or directory
jasper569073@jasperserver:~/Documents$ base64 -d email-base64.txt > decoded.gif
jasper569073@jasperserver:~/Documents$
```

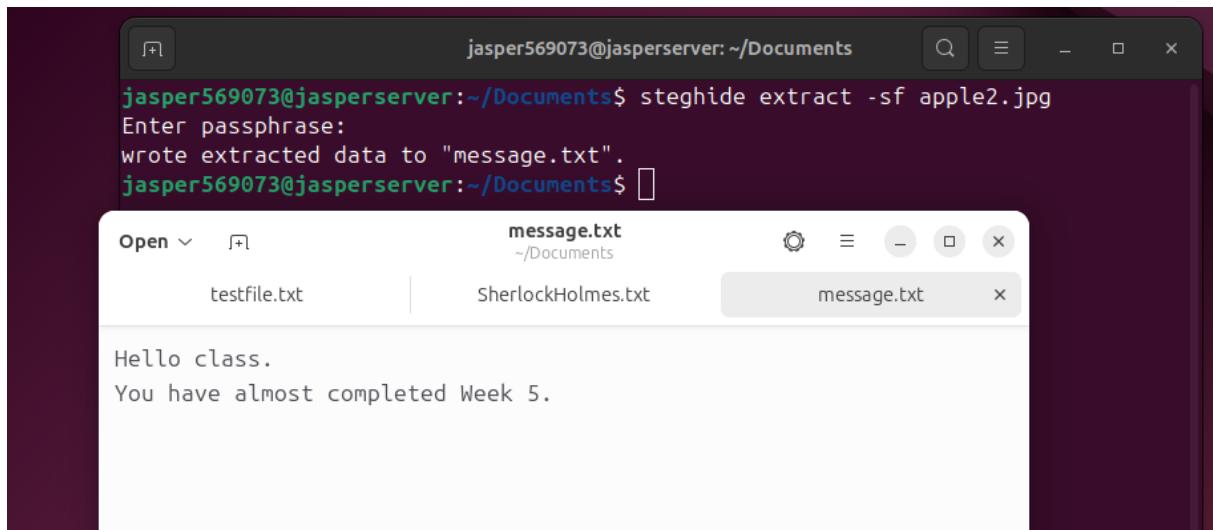
The terminal window shows the command `base64` being used to decode three different files: `man`, `email.base64-txt`, and `email-base64.txt`. The first two commands result in errors because the files do not exist. The third command succeeds and creates a file named `decoded.gif`.

Below the terminal, a file viewer window titled "decoded.gif" displays a green logo for "SAXION".

Assignment 5.8: Steganography

Relevant screenshots + motivation

Extracting data from photo



Terminal output:

```
jasper569073@jasperserver:~/Documents$ steghide extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
jasper569073@jasperserver:~/Documents$
```

File browser window showing the extracted message.txt file:

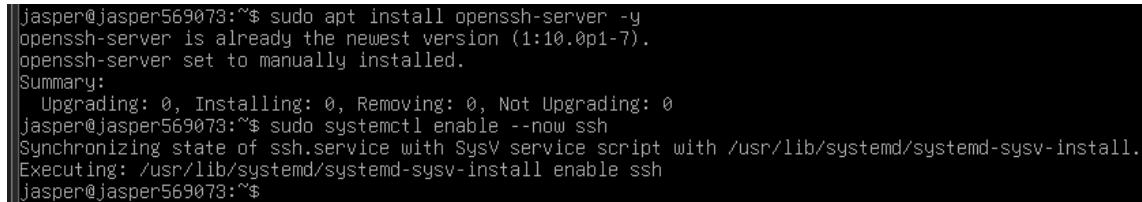
Open	message.txt	~Documents
testfile.txt	SherlockHolmes.txt	message.txt

Content of message.txt:

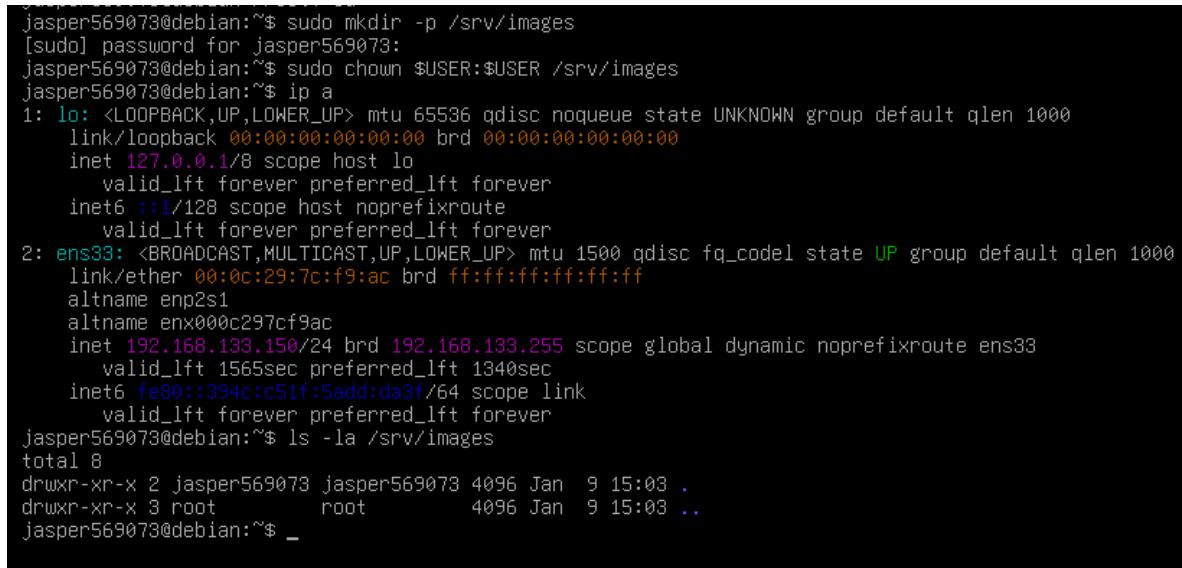
```
Hello class.  
You have almost completed Week 5.
```

Assignment 5.9: Capture disk images

Make relevant screenshots + motivation:



```
jasper@jasper569073:~$ sudo apt install openssh-server -y
openssh-server is already the newest version (1:10.0p1-7).
openssh-server set to manually installed.
Summary:
  Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
jasper@jasper569073:~$ sudo systemctl enable --now ssh
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
jasper@jasper569073:~$
```



```
Jasper569073@debian:~$ sudo mkdir -p /srv/images
[sudo] password for jasper569073:
jasper569073@debian:~$ sudo chown $USER:$USER /srv/images
jasper569073@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 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: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:7c:f9:ac brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    altname enx000c297cf9ac
    inet 192.168.133.150/24 brd 192.168.133.255 scope global dynamic noprefixroute ens3
        valid_lft 1565sec preferred_lft 1340sec
    inet6 fe80::894c:c51f:5add:da8f/64 scope link
        valid_lft forever preferred_lft forever
jasper569073@debian:~$ ls -la /srv/images
total 8
drwxr-xr-x 2 jasper569073 jasper569073 4096 Jan  9 15:03 .
drwxr-xr-x 3 root         root       4096 Jan  9 15:03 ..
jasper569073@debian:~$
```

Ip = 192.168.133.150

```
jasper569073@debian:~
```

```
ubuntu@ubuntu:~/Desktop$ ssh jasper569073@192.168.133.150
jasper569073@192.168.133.150's password:
Linux debian 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-1-05) 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.

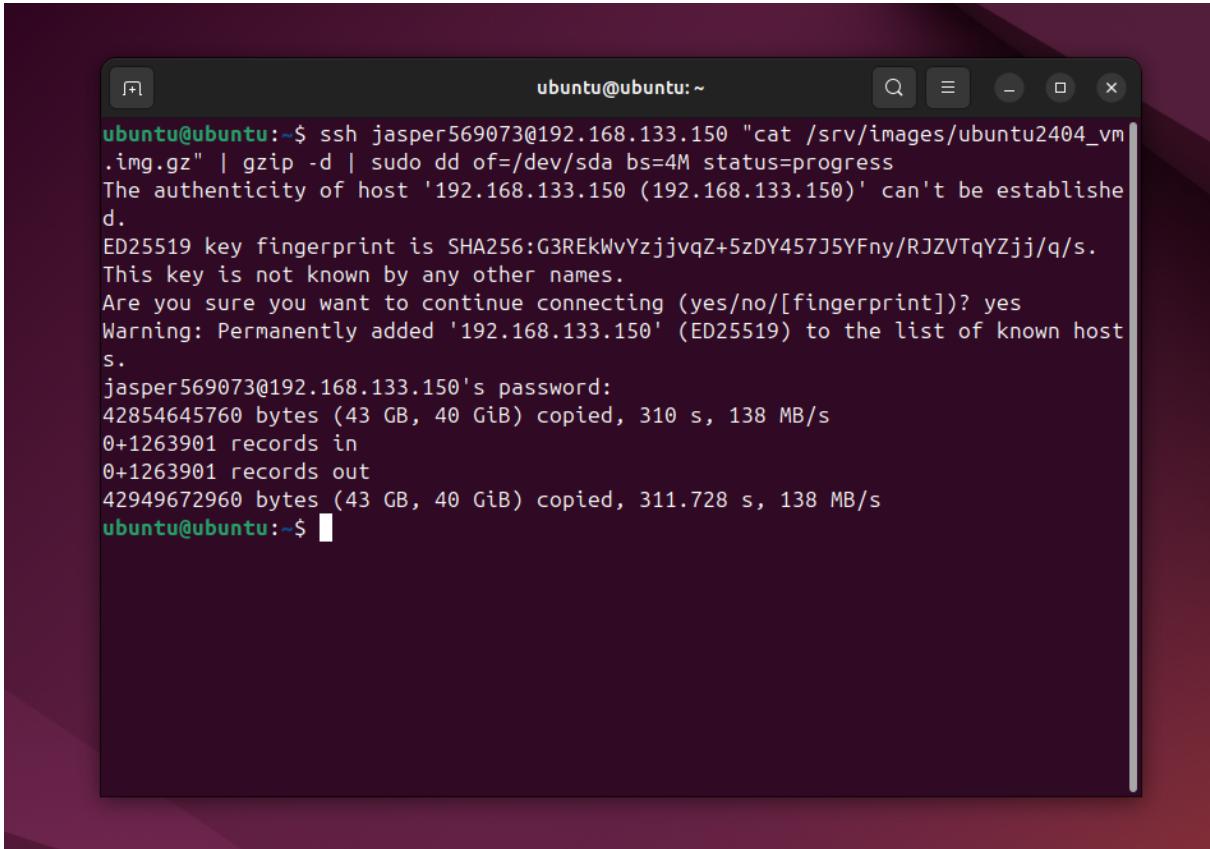
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
jasper569073@debian:~$
```

```
ubuntu@ubuntu:~/Desktop$ lsblk
NAME   MAJ:MIN RM    SIZE RO TYPE MOUNTPOINTS
loop0    7:0      0  1.7G  1 loop /rofs
loop1    7:1      0 523.3M  1 loop
loop2    7:2      0 925.9M  1 loop
loop3    7:3      0     4K  1 loop /snap/bare/5
loop4    7:4      0 245.1M  1 loop /snap/firefox/6565
loop5    7:5      0  73.9M  1 loop /snap/core22/2045
loop6    7:6      0 11.1M  1 loop /snap/firmware-updater/167
loop7    7:7      0  516M  1 loop /snap/gnome-42-2204/202
loop8    7:8      0  576K  1 loop /snap/snapd-desktop-integration/315
loop9    7:9      0 49.3M  1 loop /snap/snapd/24792
loop10   7:10     0 10.8M  1 loop /snap/snap-store/1270
loop11   7:11     0 91.7M  1 loop /snap/gtk-common-themes/1535
loop12   7:12     0  210M  1 loop /snap/thunderbird/769
loop13   7:13     0 112.6M 1 loop /snap/ubuntu-desktop-bootstrap/413
sda      8:0      0   40G  0 disk
└─sda1   8:1      0     1M  0 part
└─sda2   8:2      0   40G  0 part
sr0     11:0     1   5.9G  0 rom  /cdrom
ubuntu@ubuntu:~/Desktop$
```

```
pro       11.0      1   5.9G  0 rom  /cdrom
ubuntu@ubuntu:~/Desktop$ sudo dd if=/dev/sda bs=4M status=progress | gzip | ssh
jasper569073@192.168.133.150 "cat > /srv/images/ubuntu2404_vm.img.gz"
jasper569073@192.168.133.150's password:
42895147008 bytes (43 GB, 40 GiB) copied, 578 s, 74.2 MB/s
10240+0 records in
10240+0 records out
42949672960 bytes (43 GB, 40 GiB) copied, 579.203 s, 74.2 MB/s
ubuntu@ubuntu:~/Desktop$
```

```
valid_ift forever preferred_ift forever
jasper569073@debian:~$ ls -la /srv/images
total 8
drwxr-xr-x 2 jasper569073 jasper569073 4096 Jan  9 15:03 .
drwxr-xr-x 3 root      root      4096 Jan  9 15:03 ..
jasper569073@debian:~$ ls -la /srv/images
total 3460492
drwxr-xr-x 2 jasper569073 jasper569073 4096 Jan  9 15:13 .
drwxr-xr-x 3 root      root      4096 Jan  9 15:03 ..
-rw-rw-r-- 1 jasper569073 jasper569073 3543530794 Jan  9 15:23 ubuntu2404_vm.img.gz
jasper569073@debian:~$ _
```

- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.



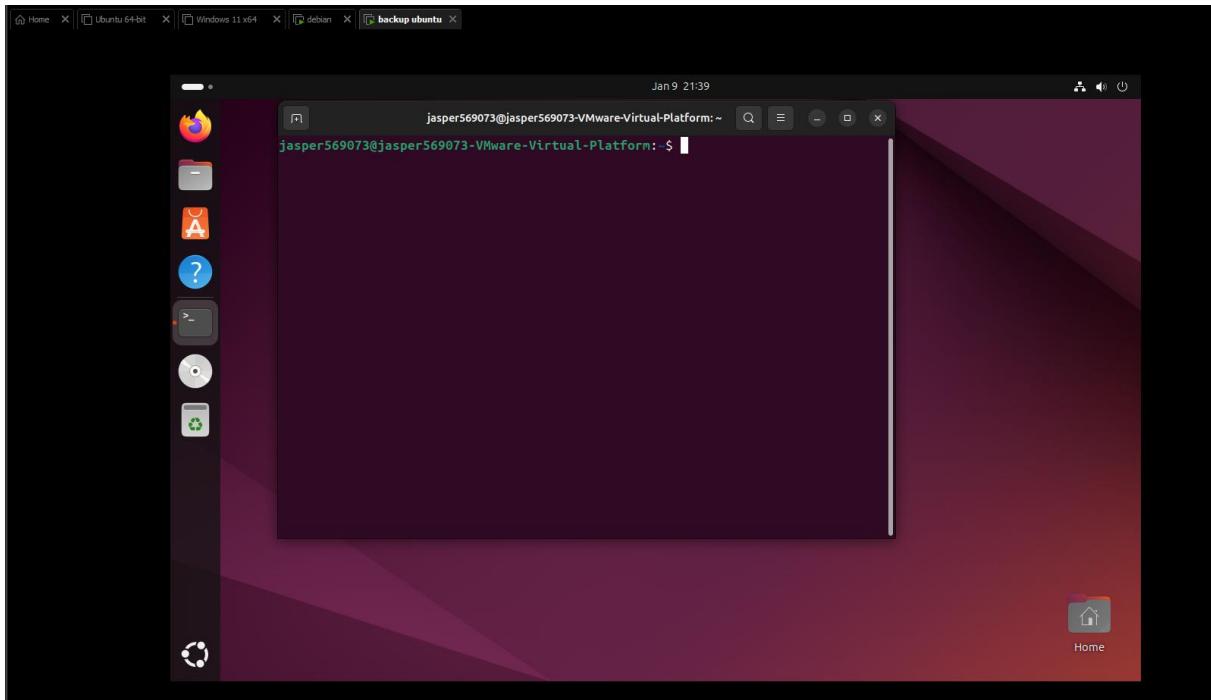
The screenshot shows a terminal window titled "ubuntu@ubuntu:~". The command being run is:

```
ubuntu@ubuntu:~$ ssh jasper569073@192.168.133.150 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
```

The terminal output shows the progress of the restore operation:

```
The authenticity of host '192.168.133.150 (192.168.133.150)' can't be established.
ED25519 key fingerprint is SHA256:G3REkWvYzjjvqZ+5zDY457J5YFny/RJZVTqYZjj/q/s.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.133.150' (ED25519) to the list of known hosts.
jasper569073@192.168.133.150's password:
42854645760 bytes (43 GB, 40 GiB) copied, 310 s, 138 MB/s
0+1263901 records in
0+1263901 records out
42949672960 bytes (43 GB, 40 GiB) copied, 311.728 s, 138 MB/s
ubuntu@ubuntu:~$
```

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



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