Template Week 5 – Operating Systems

Student number: 580521

Assignment 5.1: Unix-like

a) Find out what the difference is between UNIX and unix-like operating systems?
   * An UNIX system is an operating system that is capable of multitasking and multi-user. (Delivered from the original UNIX)
   * An unix-like operating system is a systems that is inspired by UNIX and behaves in a similar way as the original UNIX system (Linux)

b) Study the image above named UNIX timeline. Find out who Ken Thompson, Dennis Ritchie, Bill Joy, Richard Stallman, and Linus Torvalds are and what they have contributed to the development of UNIX or unix-like systems and to IT in general. **TIP!** English-language sources often contain more detailed information about these individuals.

c) What is the philosophy of the GNU movement?
   * The philosophy is build around software freedom – meaning that users should have full control over the software they use.

d) Does Ubuntu as a Linux operating system conform to the philosophy of the GNU movement? Please explain your answer.
   * After some research, Ubuntu partly follows the GNU philosophy because it uses mostly free software. But it does not fully conform because it includes and recommands some proprietary drivers, firmware and software

e) Find out what is the Windows Subsystem for Linux?
   * WSL is a feature in Windows that allows you to run a real Linux environment inside Windows.

f) Find out, which operating system family belongs to Android, iOS and ChromeOS? * They all belong to Unix-like operating systems family

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
   * After going through a few articles, supercomputers are used for huge calculations and very complex alorithms, or processing masive datasets.
   They are used in order to predict the weather, some medical analyses, huge simulations, and so on and so far

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?

* Plyastation 3 cluster is a distributed computer system assembled from multiple Sony PS3 interconnected together, designed to operate as a supercomputer.
* The reason people used this, is that it was cheaper than a traditional supercomputer but still could offer a decent power

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/

* No it does not because its performance is too low

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

* AMD ZEN 2

What operating systems run on these consoles?

* Orbis OS for PS5
* Xbox OS (Windows based)

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

* Consoles are highly optimized “PC’s” for gaming

Assignment 5.3: Working with Windows

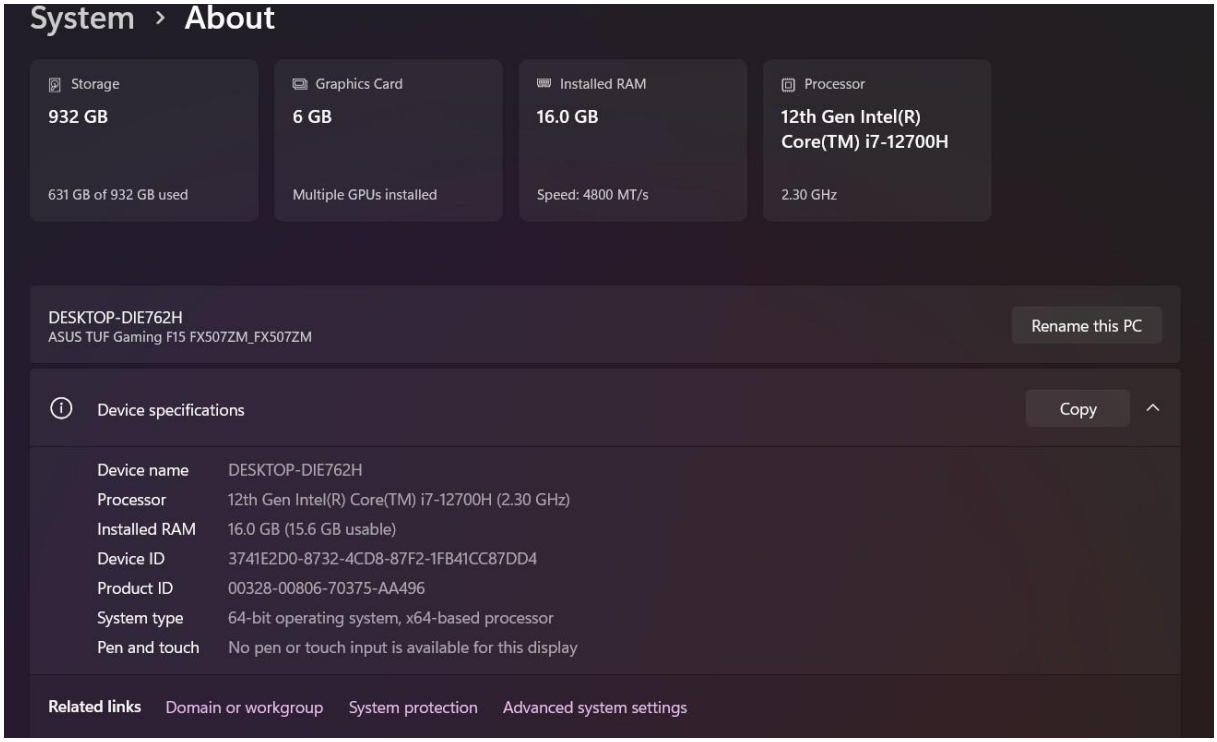
Take relevant screenshots of the assignments below

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.

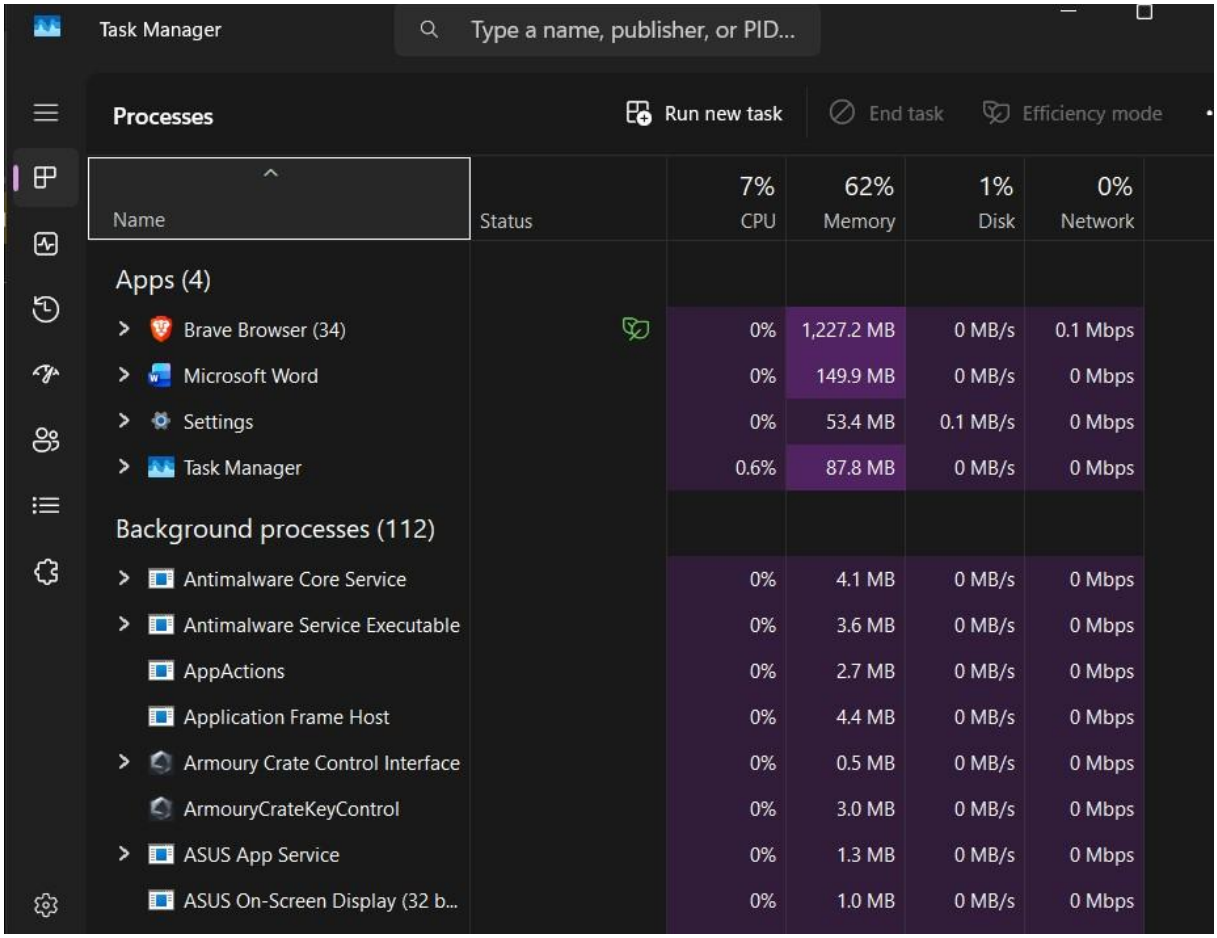
b) The file explorer can be opened with ⊞ + E, Which key combination could you also use? ⊞ + X, then press E

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

* ⊞ + Pause/Break



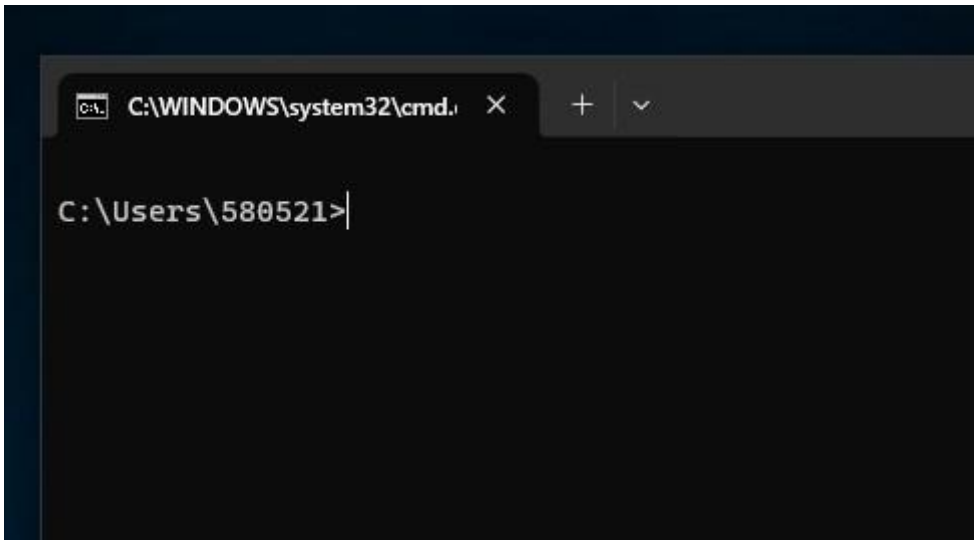
d) Open task manager with a key combination. Take screenshots of the tabs: processes (shows active processes), performance, and users. Place these three screenshots in this template.
* CTRL + SHIFT + ESC
* WIN + X, then press T



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

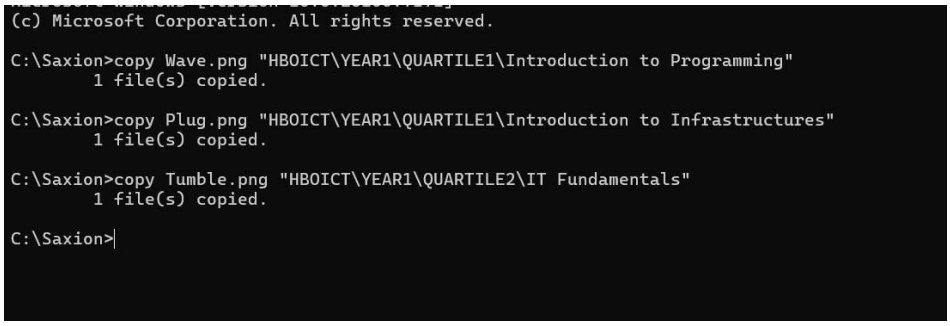
f) If you leave the classroom for a while and you leave your laptop behind, it is wise to lock the screen. Your Apps will continue to run in the background. So, for example, if you're waiting for a download that takes a while, lock the screen and get a cup of coffee. Which key combination do you use 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.
* WIN + R

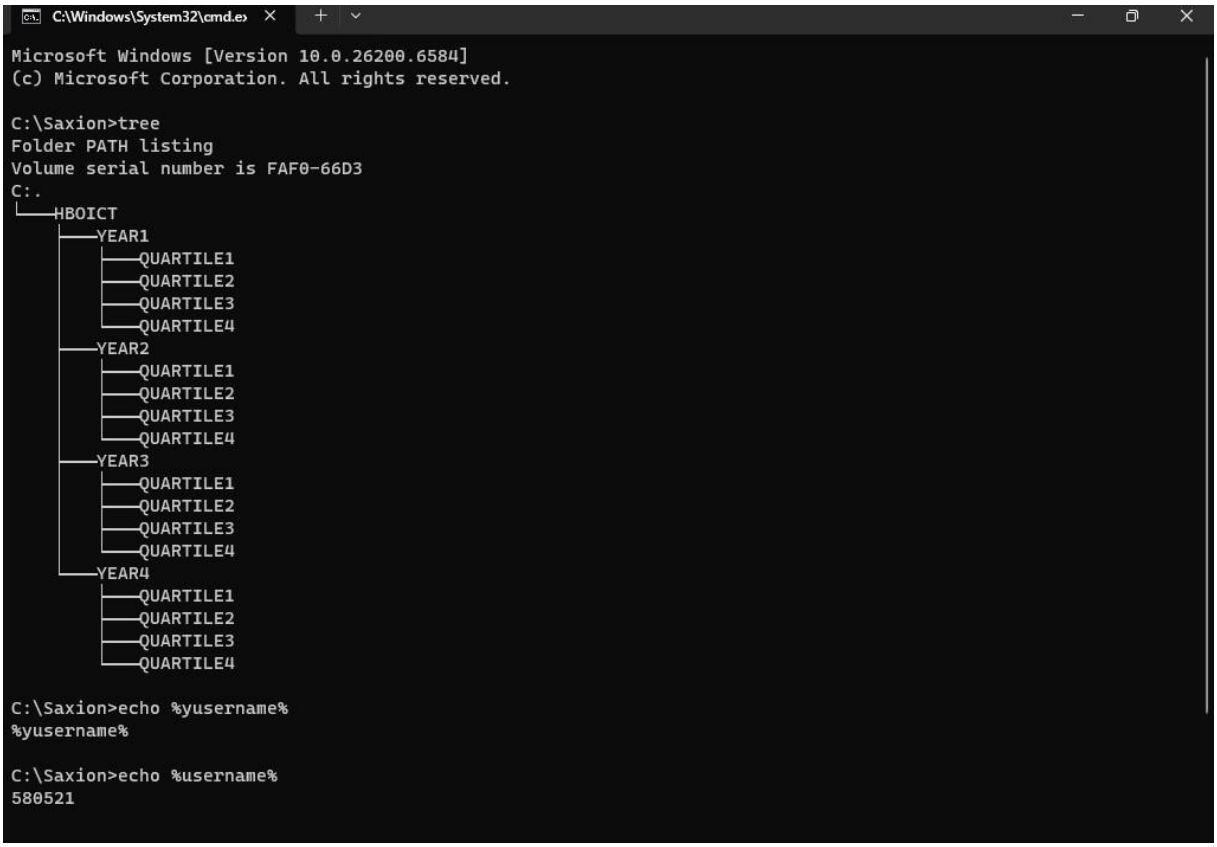


Working in the File Explorer

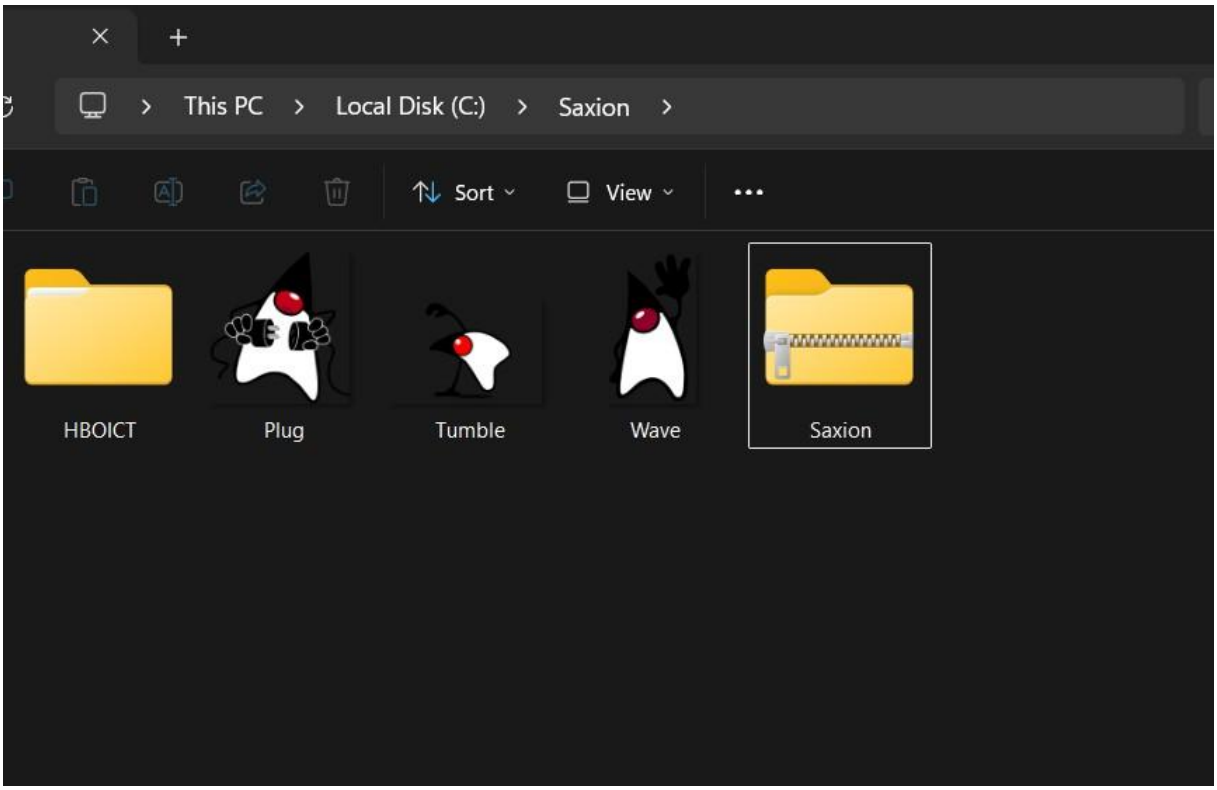
Relevant screenshots **copy** command:



Relevant screenshots **tree** command:

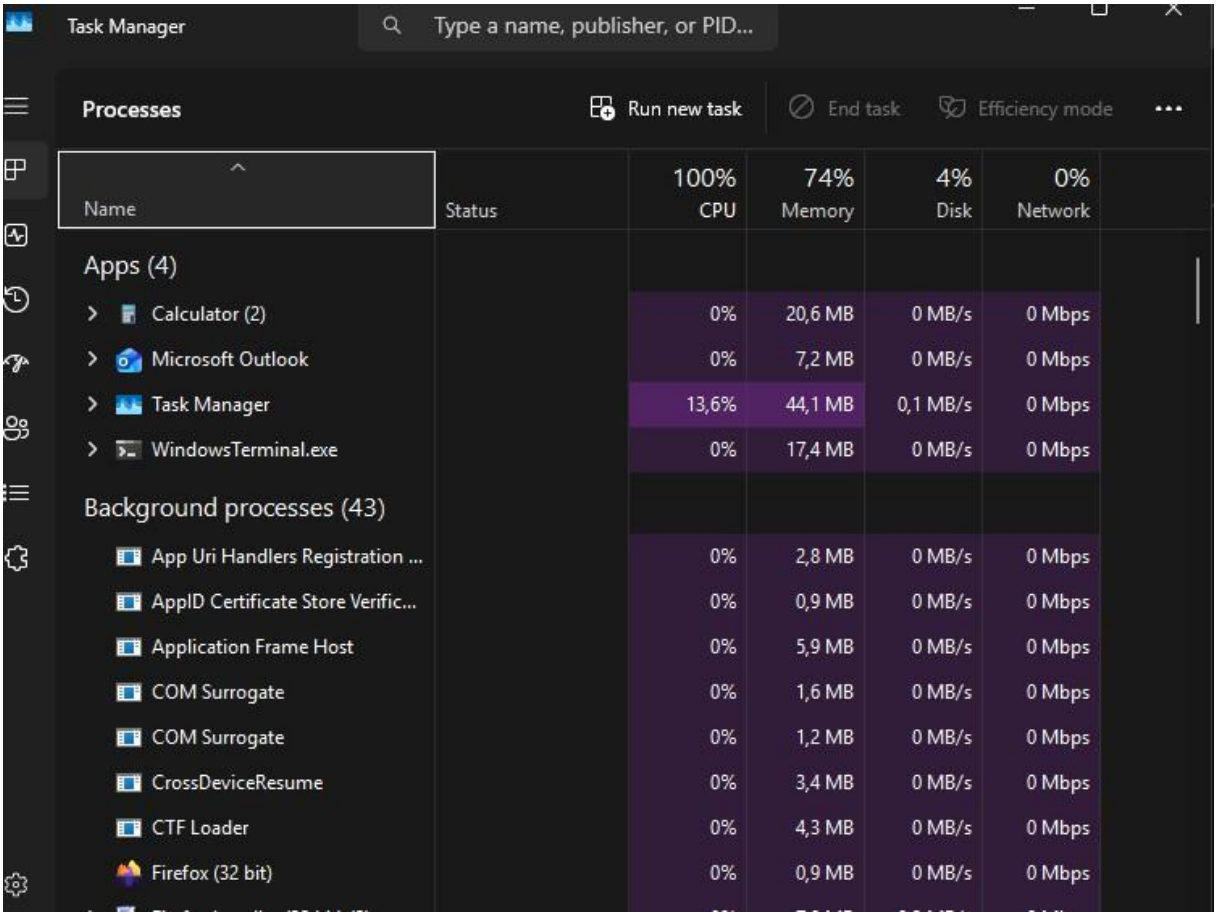


Relevant screenshots in the file explorer of the folder c:\Saxion + created zip file.



Terminating Processes

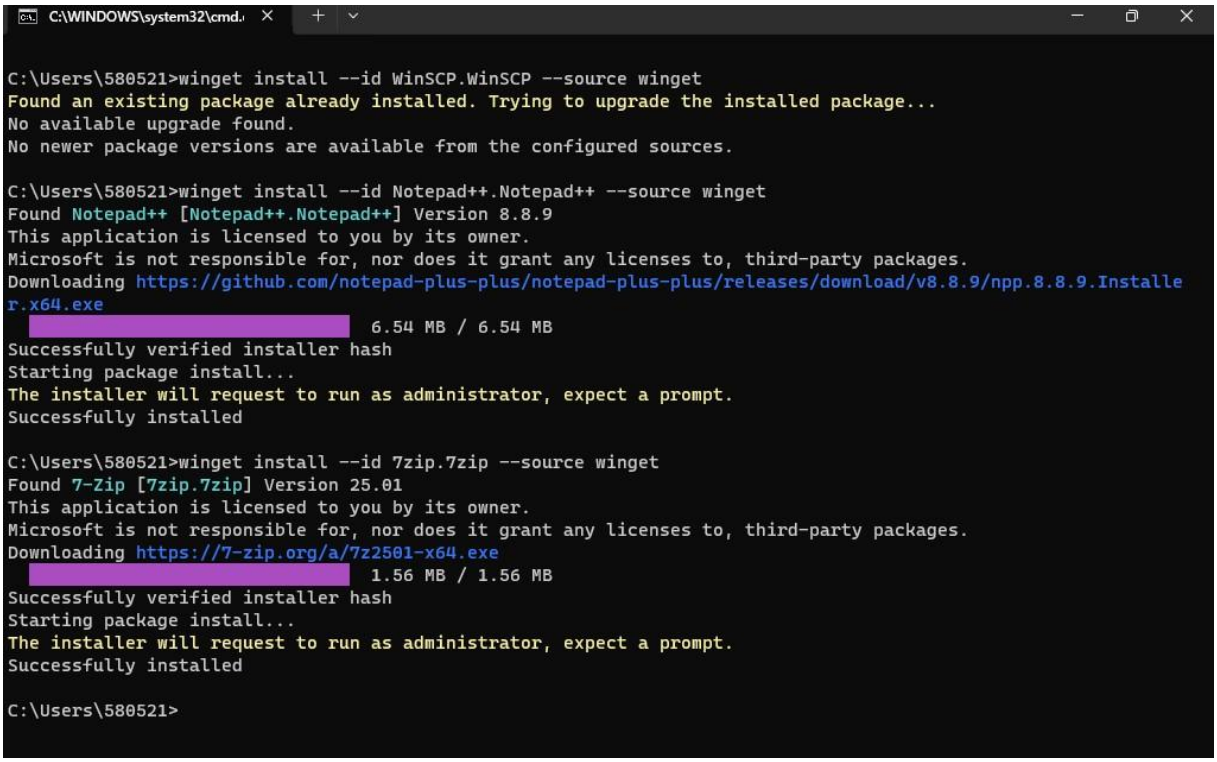
Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:

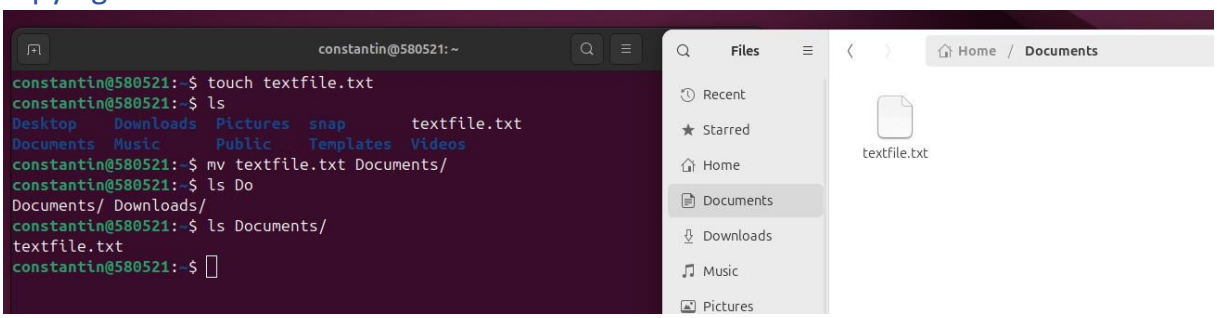
- WinSCP
- Notepad++
- 7zip



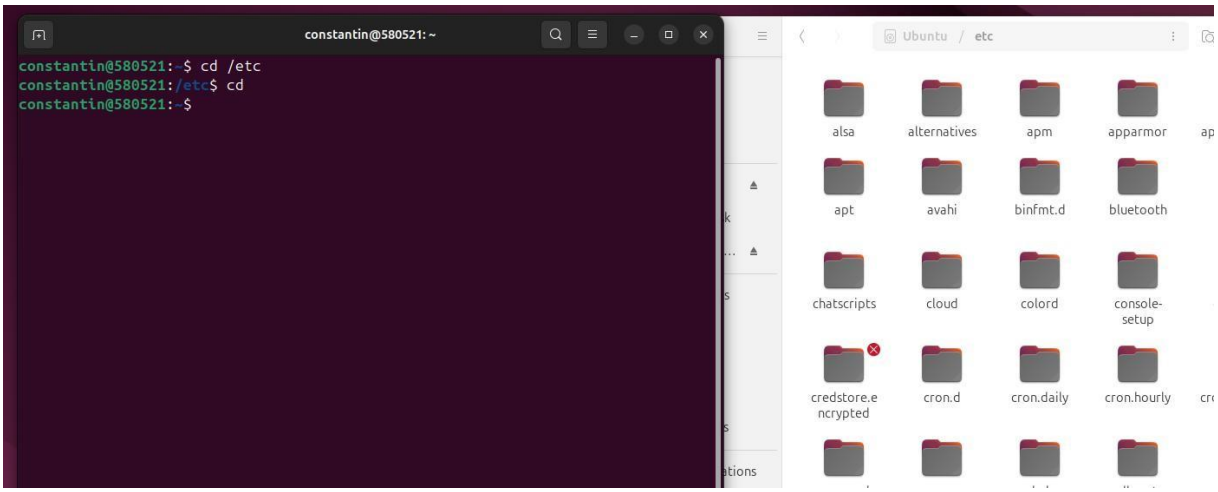
Assignment 5.4: Working with Linux

Relevant screenshots + motivation

Copying files



Navigating the file structure



How to get back to your home folder in the terminal?

- cd

Name one significant difference in Linux's file structure when comparing it to Windows.

- Linux files and folders are all part of a single root directory
- Windows files and folders are divided into multiple driver letters C:\ D:\ and each has its own root

What is the /etc directory usually used for?

- Contains settings and configuration files for the OS and installed apps

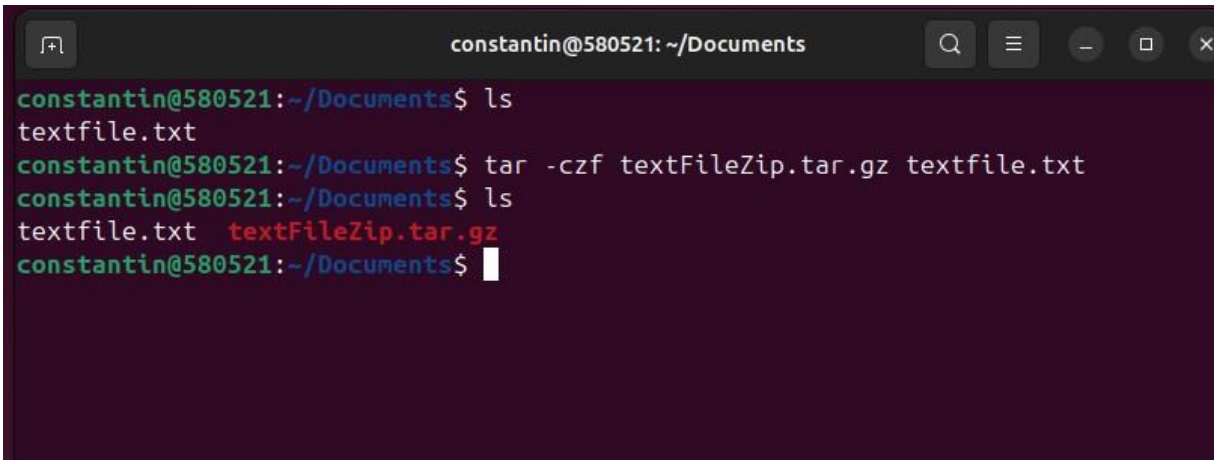
Compress files

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

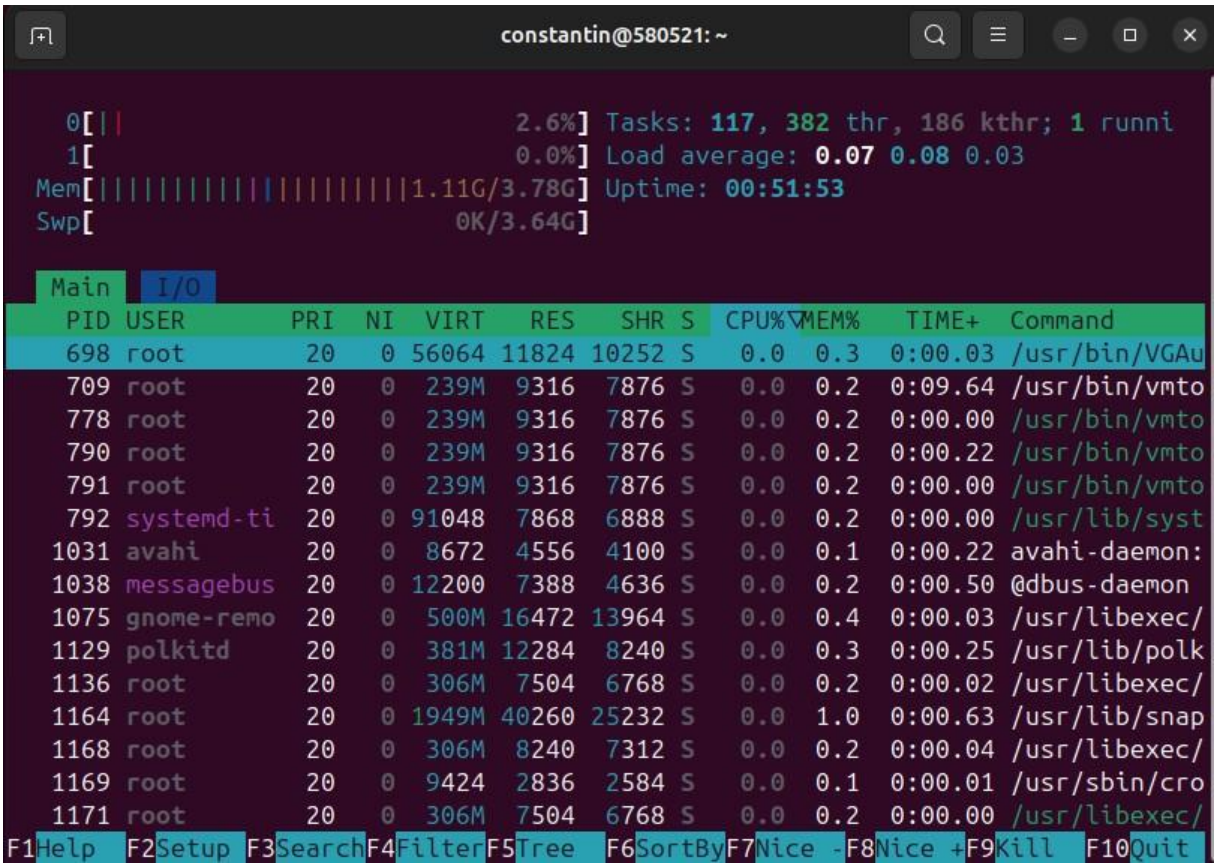
- tar -cf

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

Tar -xf

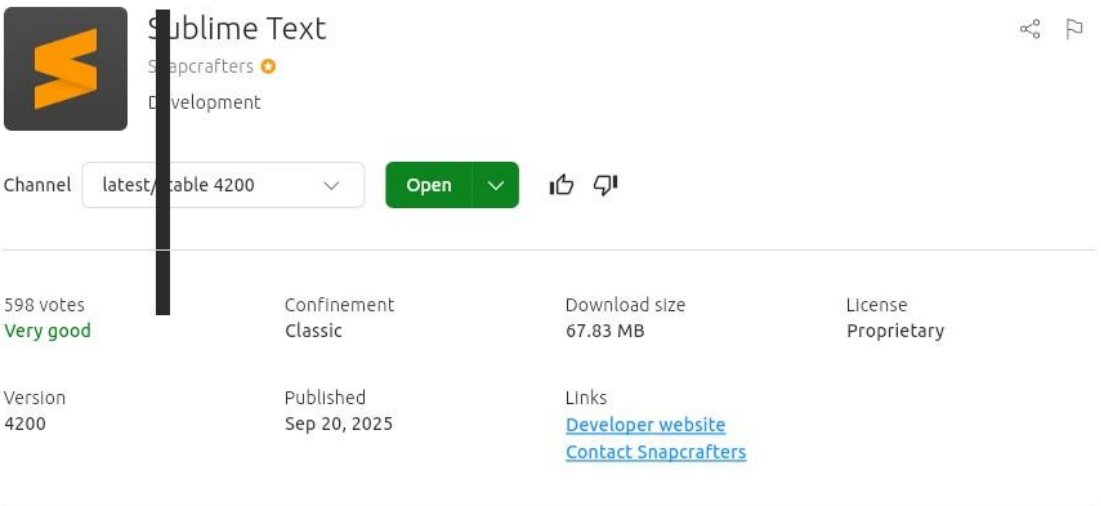


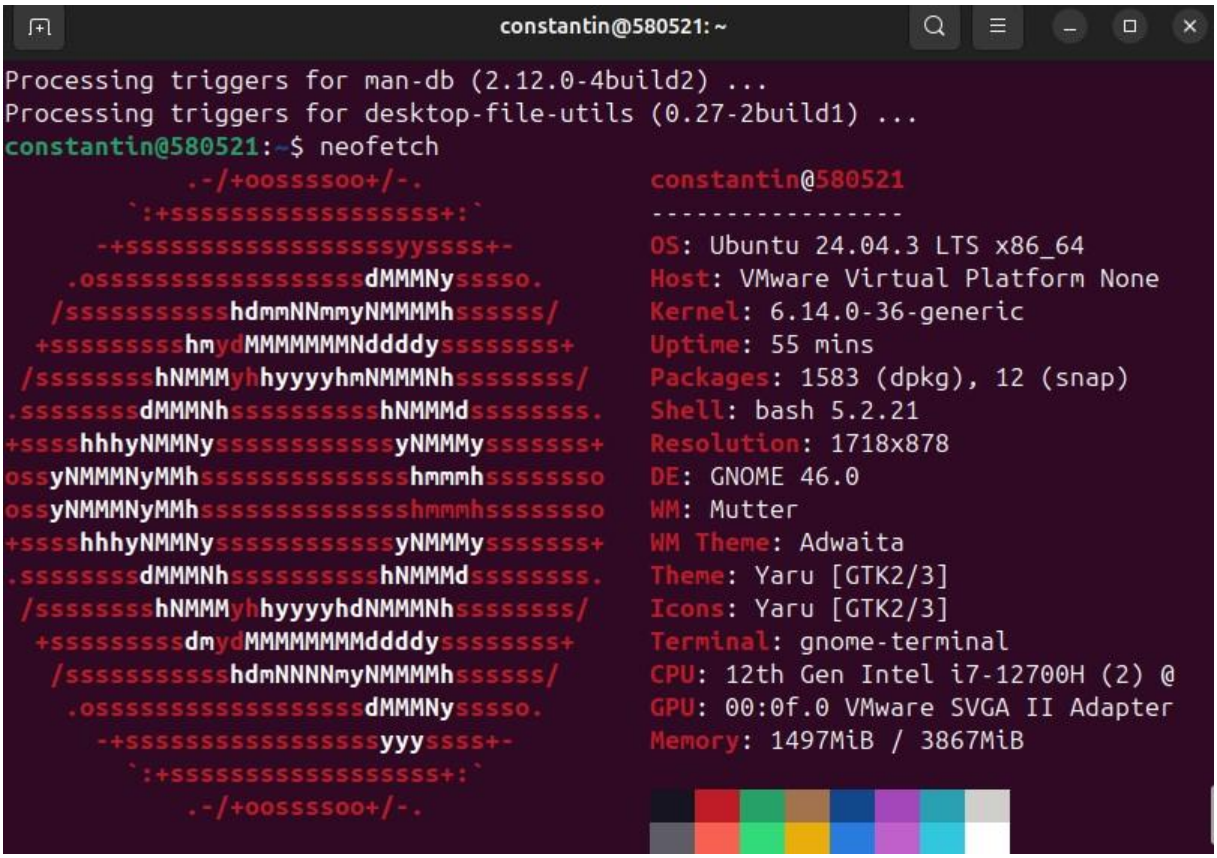
View processes



The htop app seems like a process viewer and a monitoring app with some vibrant colors and data about memory, processes, swap usage

Install Software

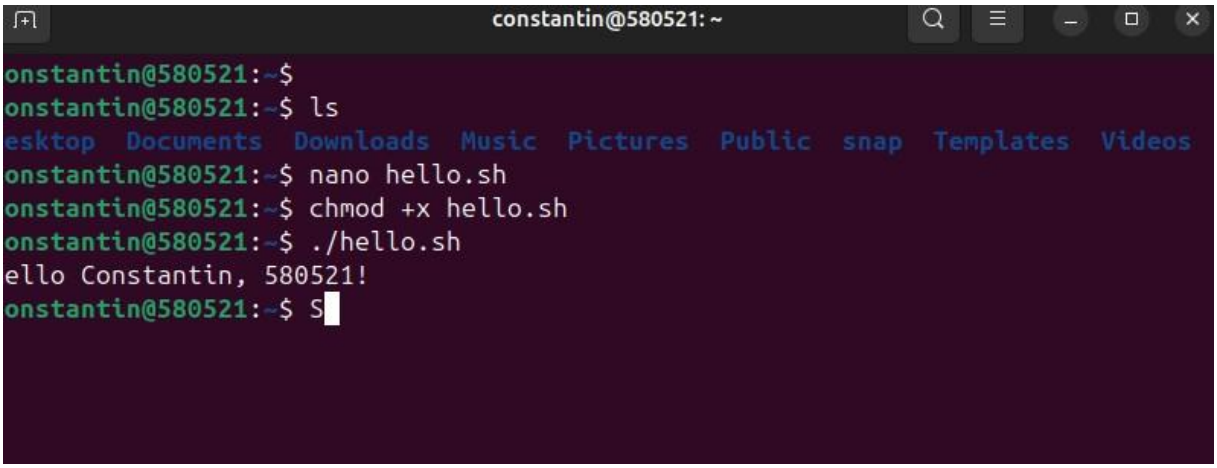




The neofetch is a command line app that disdplays the information about the system

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation



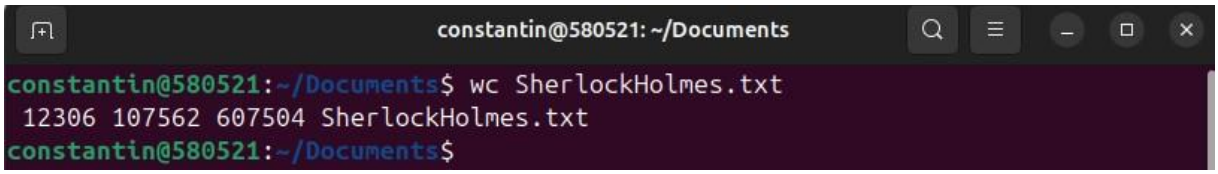
Assignment 5.6: View the contents of files

Relevant screenshots + motivation

What does each of these commands do? (cat, wc, less, tail, head & grep)

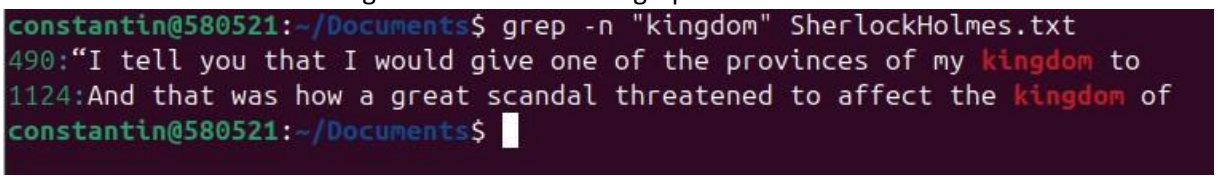
- **cat** – prints the standard output of a file
- **wc** – counts the lines, words, letter for a file
- **less** – prints the output of a file in a special “terminal”
- **more** – prints the output of a file in the terminal
- **tail** – prints last 10 rows
- **head** – prints first 10 rows
- **grep** – its like a CTRL + F

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

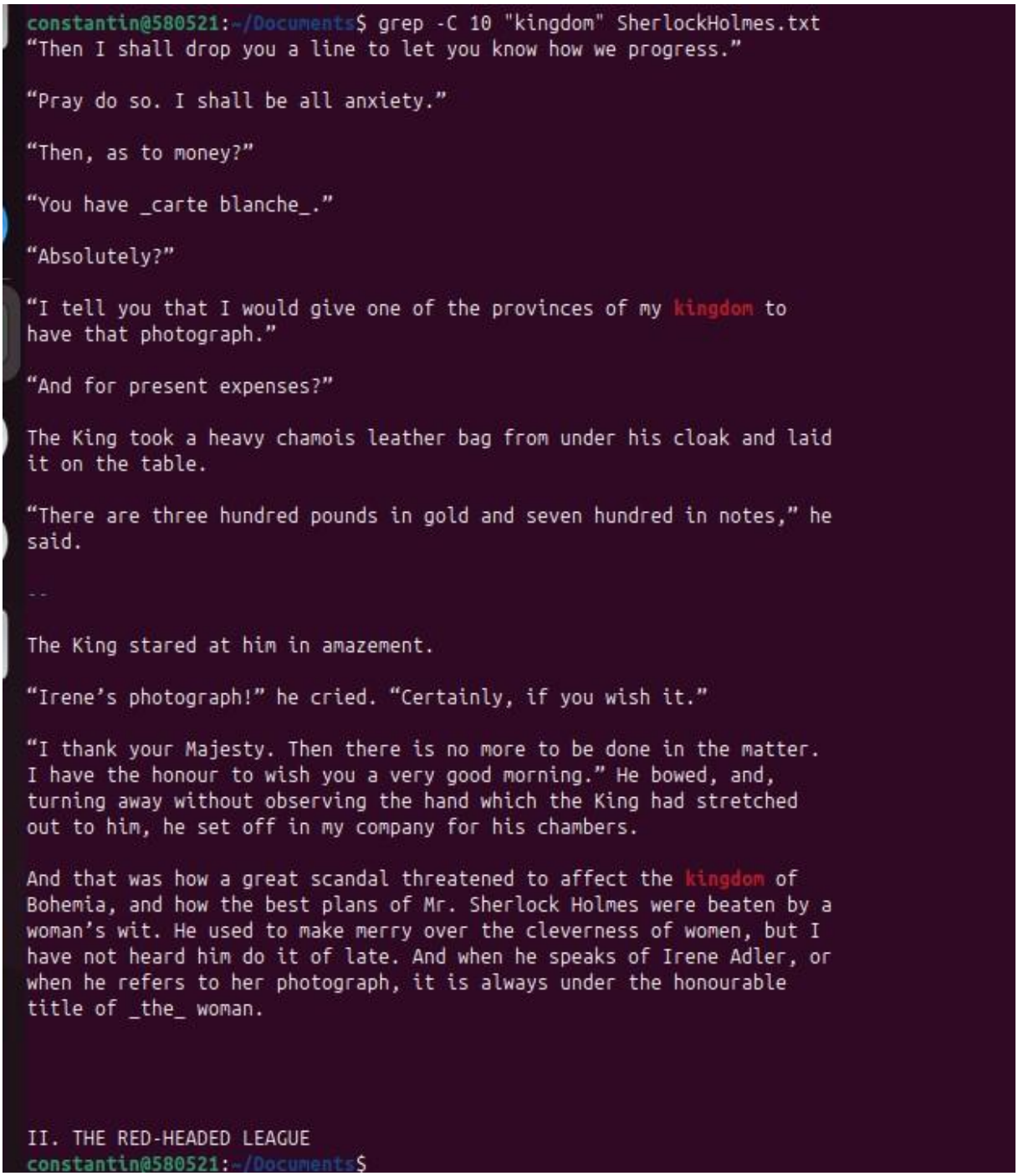


Lines – 12306
Words – 107562
Words – 607504

On which lines is the word "kingdom" in the file? TIP! grep -n



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



Assignment 5.7: Digital forensics

Relevant screenshots + motivation

- Identify phone brand/type ||| **Motorola Moto G6 Play**
- Are there GPS coordinates known? **YES, Groningen, Netherlands**

Filename extensions

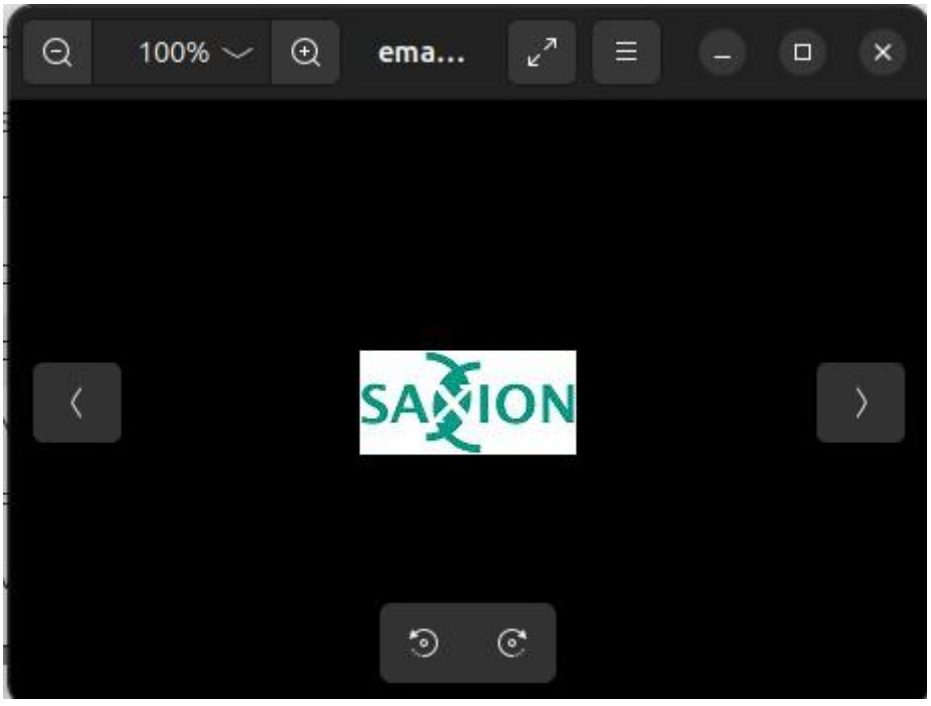
In Windows, the file extensions are important because they determine the file type. Windows only looks at the extension and then tries to open that file with the default application that is suitable for it. While in the Ubuntu VM we could remove the extension of the oldcar.jpg file and it will still be opened as a jpg file by an image viewer.

- Rename the file to oldcar. (So you've removed the file extension) • In the terminal, type the command file oldcar.
- Does Ubuntu still consider it to be a jpg file? **YES**

```
constantin@580521:~/Downloads$ ls
oldcar.jpg
constantin@580521:~/Downloads$ mv oldcar.jpg oldcar
constantin@580521:~/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, manufactu
rer=motorola, model=moto g(6) play, xresolution=160, yresolution=168, resolution
unit=2, software=aljeter-user 9 PPPS29.55-35-18-7 6a0d0 release-keys, datetime=2
020:11:07 15:08:57, GPS-Data], baseline, precision 8, 4160x3120, components 3
constantin@580521:~/Downloads$
```

Decode this BASE64 String, and save the output as a binary gif file. To do this, use the base64 command on the Ubuntu VM. Read the man pages of the base64 command on your Ubuntu VM and find out how to do this. **TIP!** Figure out how to send output to a file instead of the screen on Linux.

```
constantin@580521:~/Downloads$ man base64
constantin@580521:~/Downloads$ base64 -d email-base64.txt > emai-gif.gif
constantin@580521:~/Downloads$ ls
emai-gif.gif  email-base64.txt  oldcar
constantin@580521:~/Downloads$ S
```



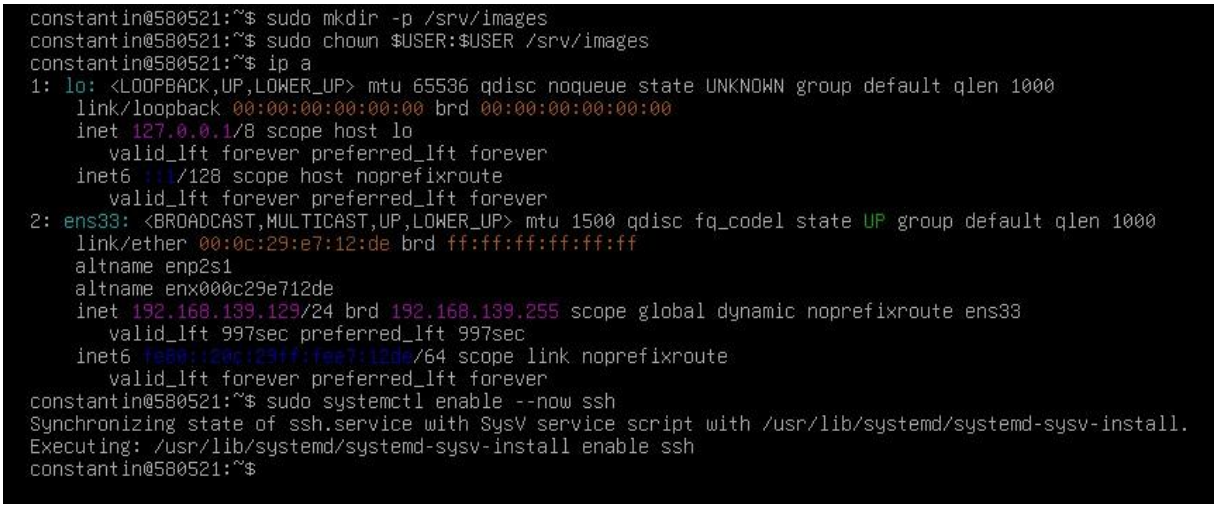
Assignment 5.8: Steganography

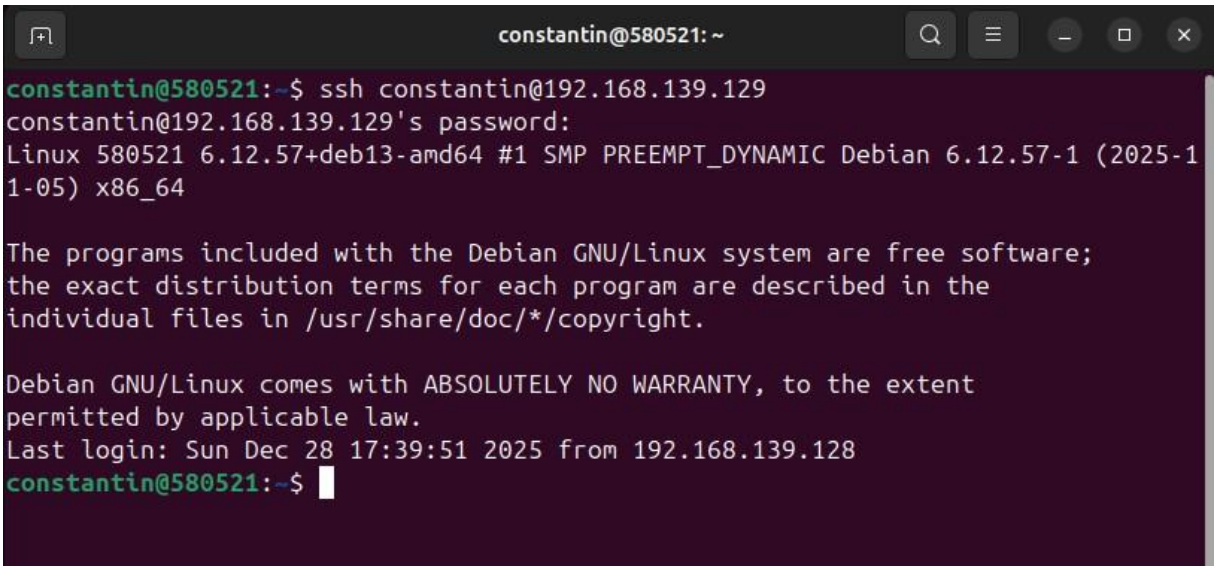
Relevant screenshots + motivation

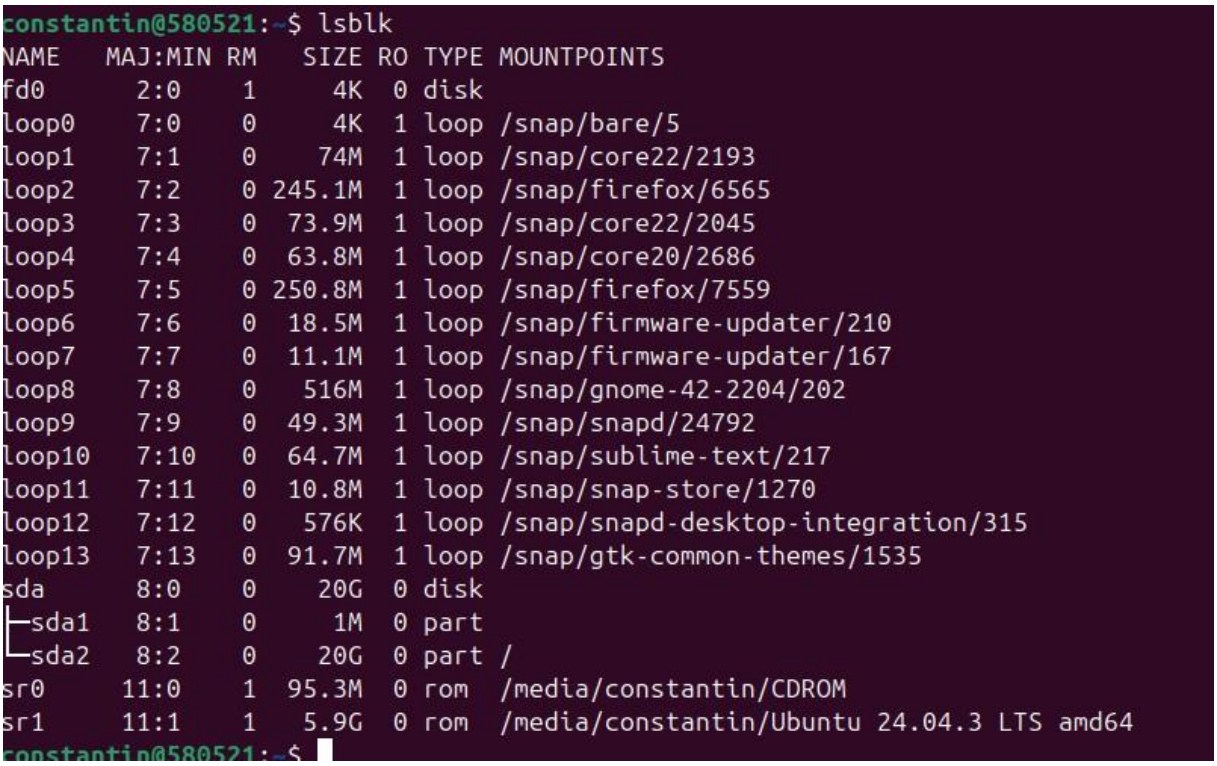
Assignment 5.9: Capture disk images

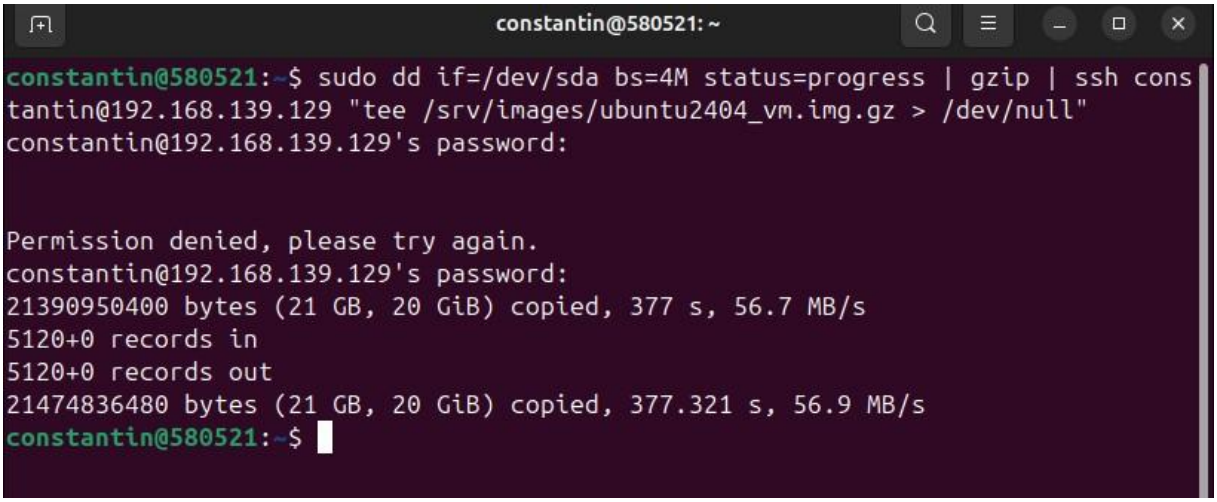
Make relevant screenshots + motivation:

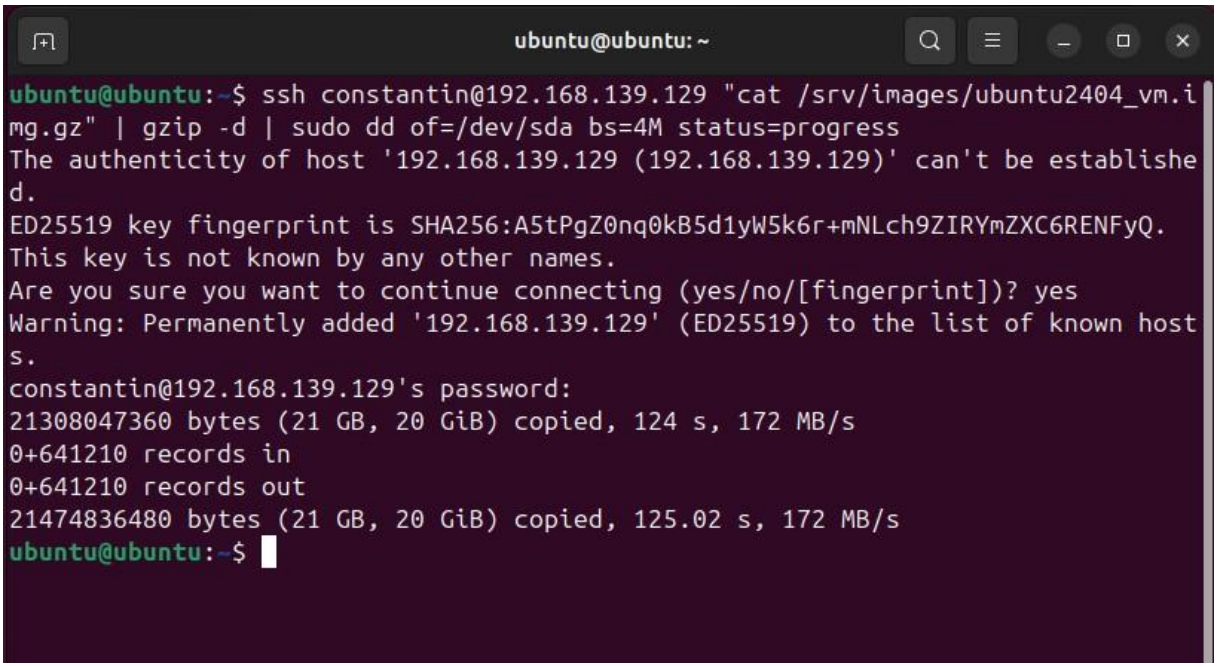
- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.
- Proof that you can restore the back-up image into an empty VM.

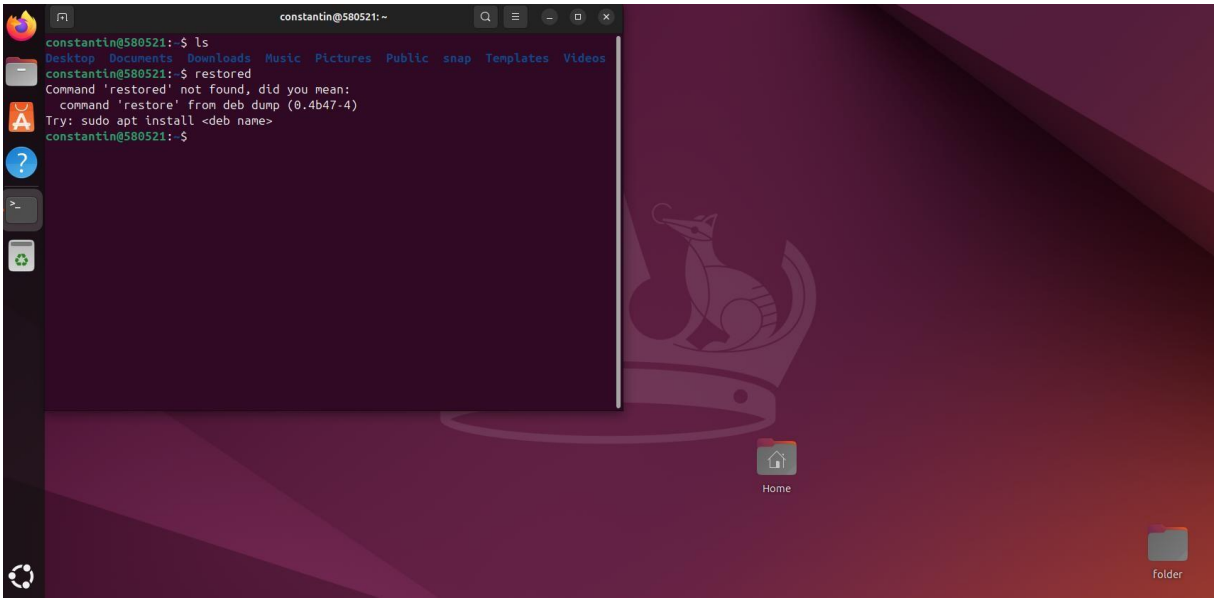



constantin@580521: ~
constantin@580521:~$ ssh constantin@192.168.139.129
constantin@192.168.139.129's password:
Linux 580521 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) x86_64
The programs included with the Debian GNU/Linux system are free software;
the exact distribution 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: Sun Dec 28 17:39:51 2025 from 192.168.139.128
constantin@580521:~$


constantin@580521:~$ lsblk
NAME MAJ:MIN RM SIZE RO TYPE MOUNTPOINTS
fd0 2:0 1 4K 0 disk
loop0 7:0 0 4K 1 loop /snap/bare/5
loop1 7:1 0 74M 1 loop /snap/core22/2193
loop2 7:2 0 245.1M 1 loop /snap/firefox/6565
loop3 7:3 0 73.9M 1 loop /snap/core22/2045
loop4 7:4 0 63.8M 1 loop /snap/core20/2686
loop5 7:5 0 250.8M 1 loop /snap/firefox/7559
loop6 7:6 0 18.5M 1 loop /snap/firmware-updater/210
loop7 7:7 0 11.1M 1 loop /snap/firmware-updater/167
loop8 7:8 0 516M 1 loop /snap/gnome-42-2204/202
loop9 7:9 0 49.3M 1 loop /snap/snapd/24792
loop10 7:10 0 64.7M 1 loop /snap/sublime-text/217
loop11 7:11 0 10.8M 1 loop /snap/snap-store/1270
loop12 7:12 0 576K 1 loop /snap/snapd-desktop-integration/315
loop13 7:13 0 91.7M 1 loop /snap/gtk-common-themes/1535
sda 8:0 0 20G 0 disk
├─sda1 8:1 0 1M 0 part
└─sda2 8:2 0 20G 0 part /
sr0 11:0 1 95.3M 0 rom /media/constantin/CDROM
sr1 11:1 1 5.9G 0 rom /media/constantin/Ubuntu 24.04.3 LTS amd64


constantin@580521: ~
constantin@580521:~$ sudo dd if=/dev/sda bs=4M status=progress | gzip | ssh constantin@192.168.139.129 "tee /srv/images/ubuntu2404_vm.img.gz > /dev/null"
constantin@192.168.139.129's password:
Permission denied, please try again.
constantin@192.168.139.129's password:
21390950400 bytes (21 GB, 20 GiB) copied, 377 s, 56.7 MB/s
5120+0 records in
5120+0 records out
21474836480 bytes (21 GB, 20 GiB) copied, 377.321 s, 56.9 MB/s
constantin@580521:~$





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