

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 recommends 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 algorithms, or processing massive 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?

- * Playstation 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

System > About

The screenshot shows the Windows System About page. At the top, there are four cards: Storage (932 GB, 631 GB used), Graphics Card (6 GB, Multiple GPUs installed), Installed RAM (16.0 GB, Speed: 4800 MT/s), and Processor (12th Gen Intel(R) Core(TM) i7-12700H, 2.30 GHz). Below these is a section titled "Device specifications" for the device "DESKTOP-DIE762H" (ASUS TUF Gaming F15 FX507ZM_FX507ZM). It lists the following details:

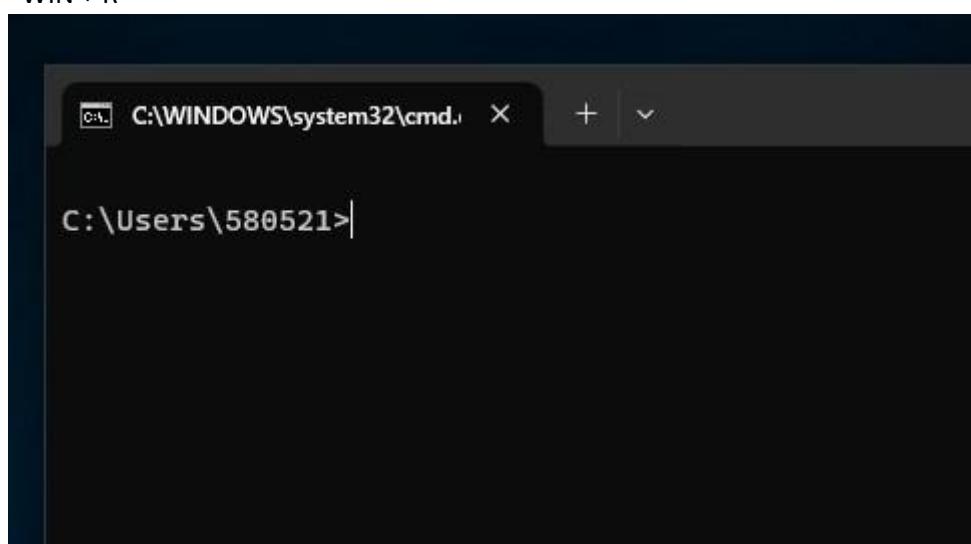
Device name	DESKTOP-DIE762H
Processor	12th Gen Intel(R) Core(TM) i7-12700H (2.30 GHz)
Installed RAM	16.0 GB (15.6 GB usable)
Device ID	3741E2D0-8732-4CD8-87F2-1FB41CC87DD4
Product ID	00328-00806-70375-AA496
System type	64-bit operating system, x64-based processor
Pen and touch	No pen or touch input is available for this display

At the bottom of this section are "Related links": Domain or workgroup, System protection, and Advanced system settings.

- 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**

Processes		Run new task	End task	Efficiency mode		
	Name	Status	CPU	Memory	Disk	Network
APPS	Apps (4)					
⌚	> 🚗 Brave Browser (34)	⚡	0%	1,227.2 MB	0 MB/s	0.1 Mbps
⏻	> 💾 Microsoft Word	⚡	0%	149.9 MB	0 MB/s	0 Mbps
ଓ	> 🔍 Settings	⚡	0%	53.4 MB	0.1 MB/s	0 Mbps
⋮	> 💬 Task Manager	⚡	0.6%	87.8 MB	0 MB/s	0 Mbps
☰	Background processes (112)					
⚙️	> 🛡️ Antimalware Core Service		0%	4.1 MB	0 MB/s	0 Mbps
⚙️	> 🛡️ Antimalware Service Executable		0%	3.6 MB	0 MB/s	0 Mbps
⚙️	/AppActions		0%	2.7 MB	0 MB/s	0 Mbps
⚙️	/Application Frame Host		0%	4.4 MB	0 MB/s	0 Mbps
⚙️	> 🎮 Armour Crate Control Interface		0%	0.5 MB	0 MB/s	0 Mbps
⚙️	/ArmourCrateKeyControl		0%	3.0 MB	0 MB/s	0 Mbps
⚙️	> 💻 ASUS App Service		0%	1.3 MB	0 MB/s	0 Mbps
⚙️	/ASUS On-Screen Display (32 b...		0%	1.0 MB	0 MB/s	0 Mbps

- 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:

```
(c) Microsoft Corporation. All rights reserved.  
C:\Saxion>copy Wave.png "HBOICT\YEAR1\QUARTILE1\Introduction to Programming"  
    1 file(s) copied.  
  
C:\Saxion>copy Plug.png "HBOICT\YEAR1\QUARTILE1\Introduction to Infrastructures"  
    1 file(s) copied.  
  
C:\Saxion>copy Tumble.png "HBOICT\YEAR1\QUARTILE2\IT Fundamentals"  
    1 file(s) copied.  
  
C:\Saxion>
```

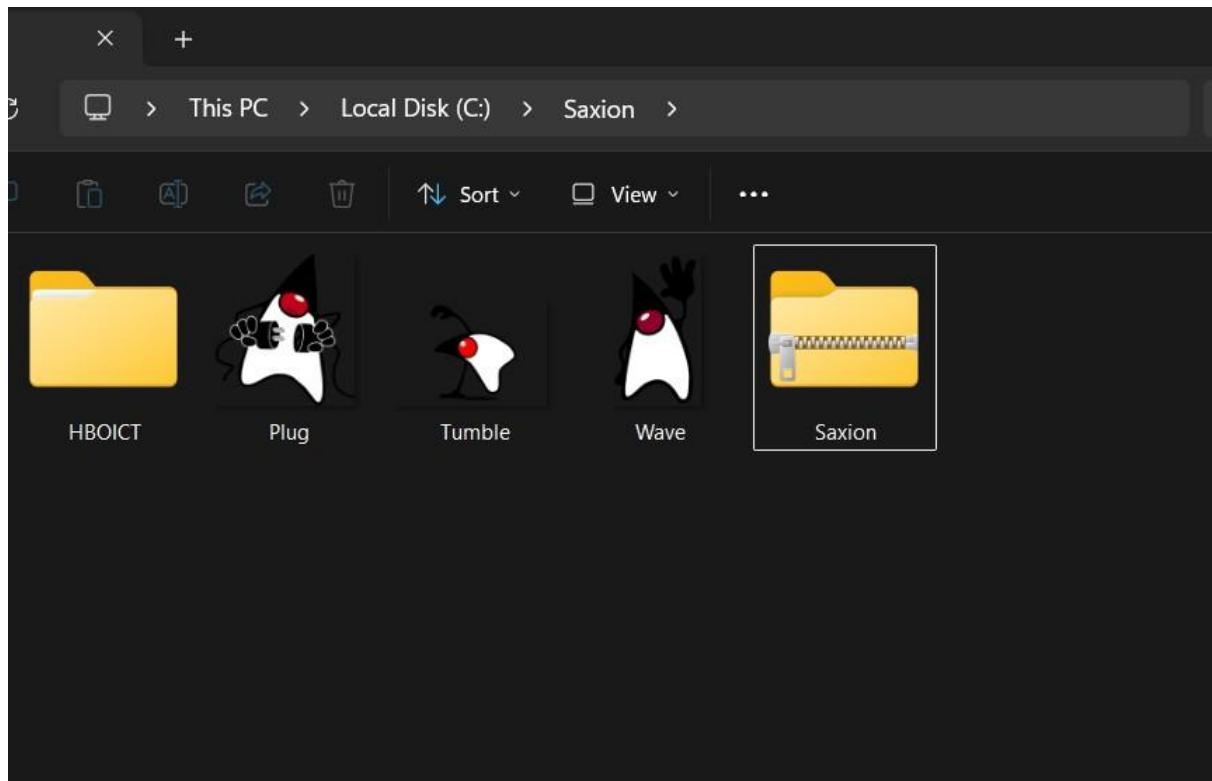
Relevant screenshots **tree** command:

```
C:\Windows\System32\cmd.exe + - Microsoft Windows [Version 10.0.26200.6584]
(c) Microsoft Corporation. All rights reserved.

C:\Saxion>tree
Folder PATH listing
Volume serial number is FAF0-66D3
C:.
└── HBOICT
    ├── YEAR1
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR2
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    ├── YEAR3
    │   ├── QUARTILE1
    │   ├── QUARTILE2
    │   ├── QUARTILE3
    │   └── QUARTILE4
    └── YEAR4
        ├── QUARTILE1
        ├── QUARTILE2
        ├── QUARTILE3
        └── QUARTILE4

C:\Saxion>echo %username%
%username%
C:\Saxion>echo %username%
580521
```

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



Terminating Processes

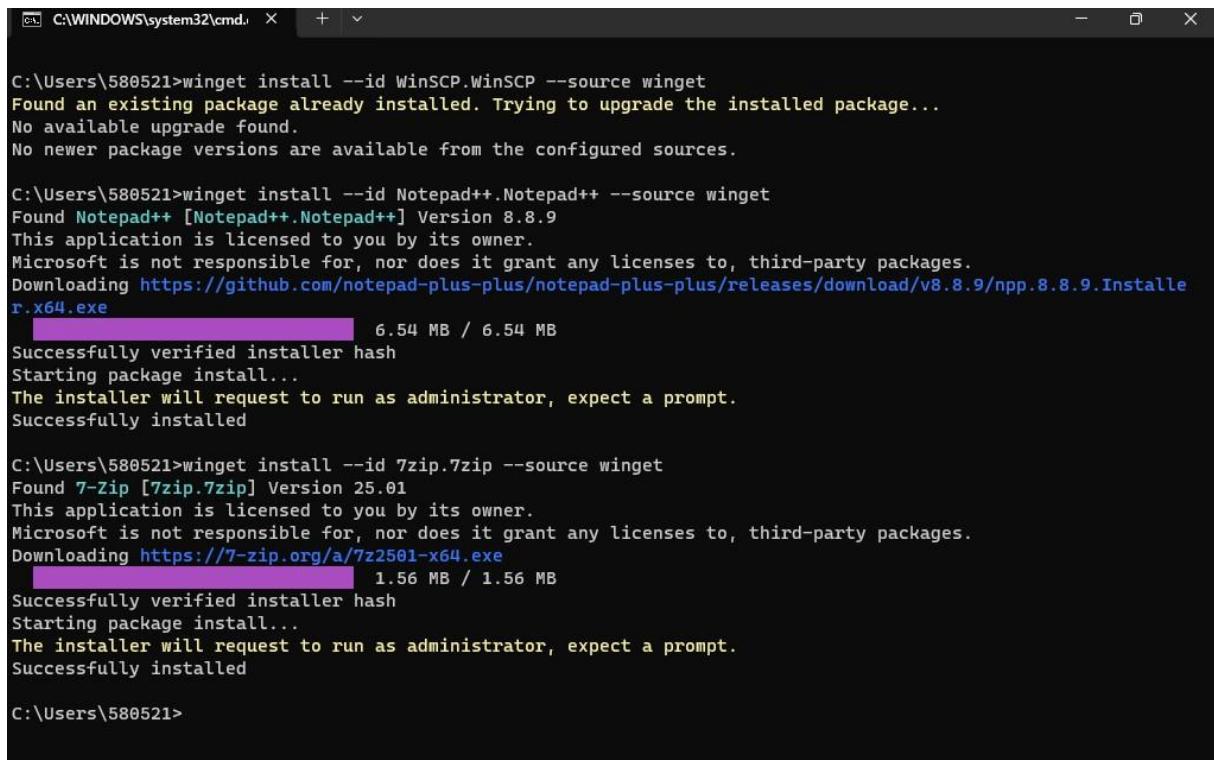
Relevant Screenshots Task Manager Window:

Name	Status	100% CPU	74% Memory	4% Disk	0% Network
Apps (4)					
> Calculator (2)		0%	20,6 MB	0 MB/s	0 Mbps
> Microsoft Outlook		0%	7,2 MB	0 MB/s	0 Mbps
> Task Manager		13,6%	44,1 MB	0,1 MB/s	0 Mbps
> WindowsTerminal.exe		0%	17,4 MB	0 MB/s	0 Mbps
Background processes (43)					
App Uri Handlers Registration ...		0%	2,8 MB	0 MB/s	0 Mbps
AppID Certificate Store Verific...		0%	0,9 MB	0 MB/s	0 Mbps
Application Frame Host		0%	5,9 MB	0 MB/s	0 Mbps
COM Surrogate		0%	1,6 MB	0 MB/s	0 Mbps
COM Surrogate		0%	1,2 MB	0 MB/s	0 Mbps
CrossDeviceResume		0%	3,4 MB	0 MB/s	0 Mbps
CTF Loader		0%	4,3 MB	0 MB/s	0 Mbps
Firefox (32 bit)		0%	0,9 MB	0 MB/s	0 Mbps

Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip



```

C:\Users\580521>winget install --id WinSCP.WinSCP --source winget
Found an existing package already installed. Trying to upgrade the installed package...
No available upgrade found.
No newer package versions are available from the configured sources.

C:\Users\580521>winget install --id Notepad++.Notepad++ --source winget
Found Notepad++ [Notepad++.Notepad++] Version 8.8.9
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/v8.8.9/npp.8.8.9.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\580521>winget install --id 7zip.7zip --source winget
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

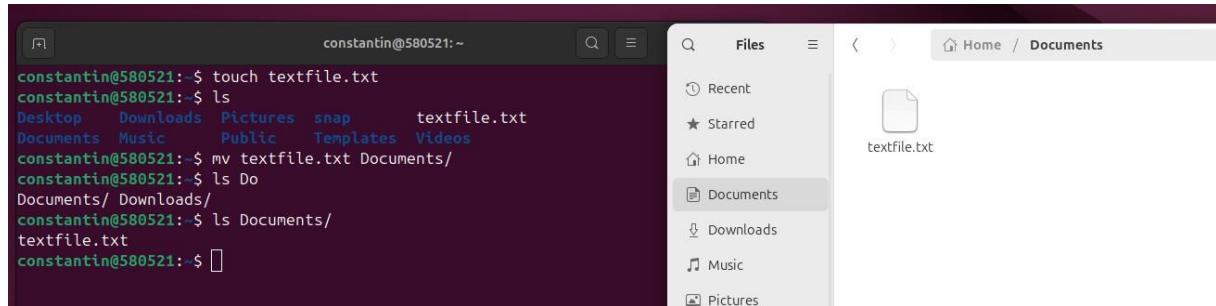
C:\Users\580521>

```

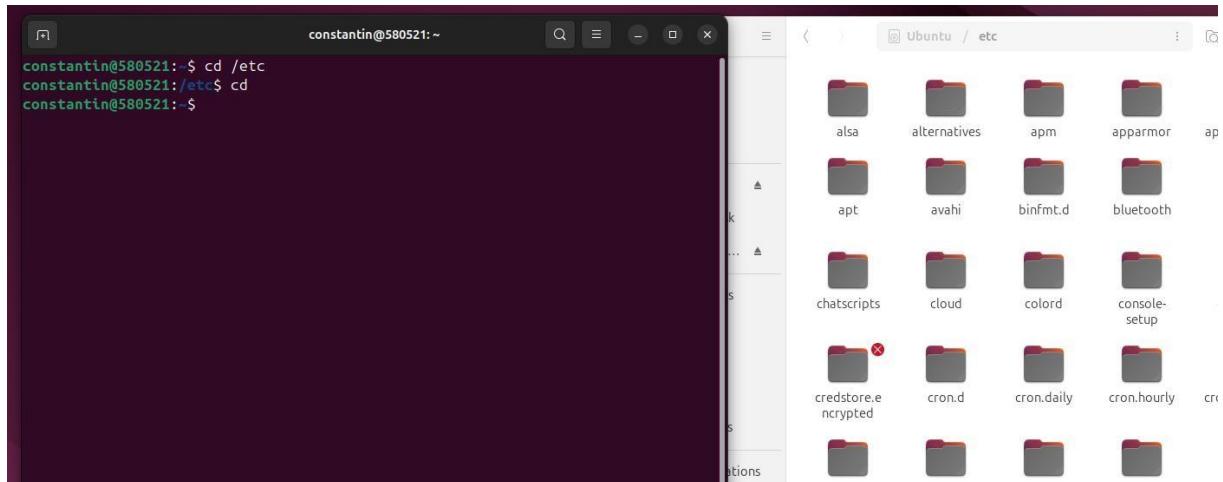
Assignment 5.4: Working with Linux

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

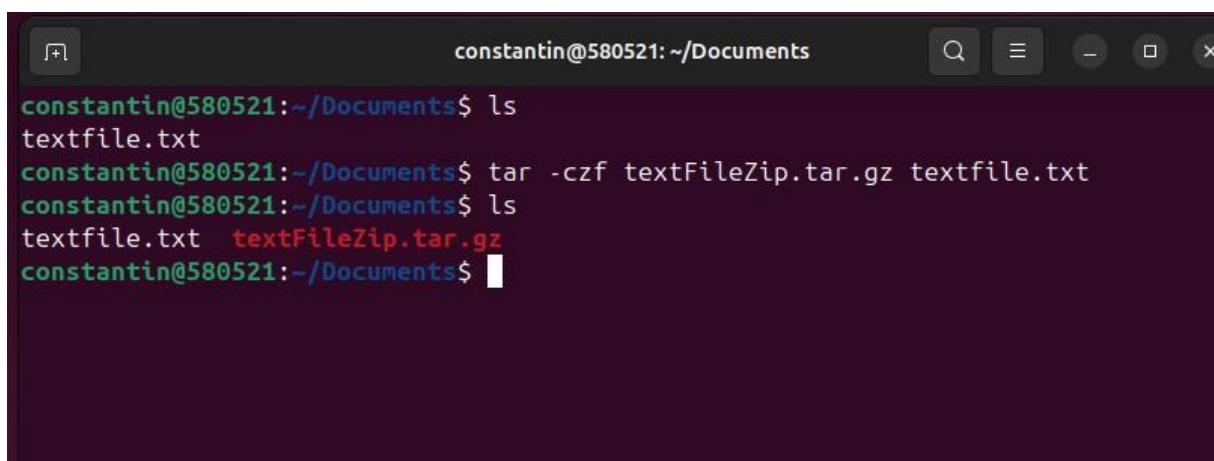
Compress files

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

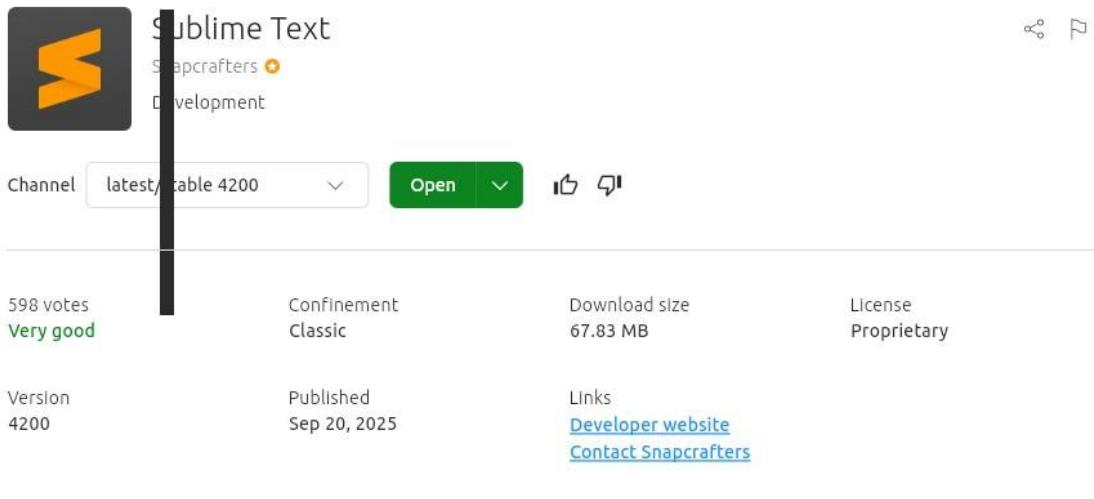
The screenshot shows the htop process viewer. At the top, it displays system statistics: CPU usage (2.6%), tasks (117, 382), load average (0.07, 0.08, 0.03), memory usage (Mem: 1.11G/3.78G), and swap usage (Swp: 0K/3.64G). Below this is a table of processes, with the first few rows shown:

Main	I/O	PID	USER	PRI	NI	VIRT	RES	SHR	S	CPU%	MEM%	TIME+	Command
698	root	20	0	56064	11824	10252	S	0.0	0.3	0:00.03	/usr/bin/VGAu		
709	root	20	0	239M	9316	7876	S	0.0	0.2	0:09.64	/usr/bin/vmto		
778	root	20	0	239M	9316	7876	S	0.0	0.2	0:00.00	/usr/bin/vmto		
790	root	20	0	239M	9316	7876	S	0.0	0.2	0:00.22	/usr/bin/vmto		
791	root	20	0	239M	9316	7876	S	0.0	0.2	0:00.00	/usr/bin/vmto		
792	systemd-ti	20	0	91048	7868	6888	S	0.0	0.2	0:00.00	/usr/lib/syst		
1031	avahi	20	0	8672	4556	4100	S	0.0	0.1	0:00.22	avahi-daemon:		
1038	messagebus	20	0	12200	7388	4636	S	0.0	0.2	0:00.50	@dbus-daemon		
1075	gnome-remo	20	0	500M	16472	13964	S	0.0	0.4	0:00.03	/usr/libexec/		
1129	polkitd	20	0	381M	12284	8240	S	0.0	0.3	0:00.25	/usr/lib/polk		
1136	root	20	0	306M	7504	6768	S	0.0	0.2	0:00.02	/usr/libexec/		
1164	root	20	0	1949M	40260	25232	S	0.0	1.0	0:00.63	/usr/lib/snap		
1168	root	20	0	306M	8240	7312	S	0.0	0.2	0:00.04	/usr/libexec/		
1169	root	20	0	9424	2836	2584	S	0.0	0.1	0:00.01	/usr/sbin/cro		
1171	root	20	0	306M	7504	6768	S	0.0	0.2	0:00.00	/usr/libexec/		

At the bottom, there is a menu bar with F1 through F10 keys and their corresponding functions: Help, Setup, Search, Filter, Tree, SortBy, Nice, and Kill.

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



```
constantin@580521:~ Processing triggers for man-db (2.12.0-4build2) ...  
constantin@580521:~ Processing triggers for desktop-file-utils (0.27-2build1) ...  
constantin@580521:~$ neofetch  
.-/+o0ssssoo+/-.  
`:+ssssssssssssssssssssssssss+:  
-+ssssssssssssssssssyyssss+-  
.osssssssssssssssssdMMMNyssso.  
/sssssssssshdmmNNmmyNMMMHhssssss/  
+ssssssssshmydMMMMMMNdddyssssssss+  
/ssssssssshNMMNyhyyyyhmNMMMNhssssssss/  
.ssssssssdMMMNhsssssssssshNMMMdssssssss.  
+sssshhhyNMMNyssssssssssyNMMMyssssssss+  
ossyNMMNyMMhsssssssssssssshmmhssssssso  
ossyNMMNyMMhsssssssssssssshmmhssssssso  
+sssshhhyNMMNyssssssssssyNMMMyssssssss+  
.ssssssssdMMMNhsssssssssshNMMMdssssssss.  
/ssssssssshNMMNyhyyyyhdNMMMNhssssssss/  
+sssssssssdmydMMMMMMMdddyssssssss+  
/sssssssssshdmNNNmyNMMMHhssssss/  
.osssssssssssssssssdMMMNyssso.  
-+ssssssssssssssssssyyssss+-  
`:+ssssssssssssssssssssssss+:  
.-/+o0ssssoo+/-.
```

constantin@580521

OS: Ubuntu 24.04.3 LTS x86_64
Host: VMware Virtual Platform None
Kernel: 6.14.0-36-generic
Uptime: 55 mins
Packages: 1583 (dpkg), 12 (snap)
Shell: bash 5.2.21
Resolution: 1718x878
DE: GNOME 46.0
WM: Mutter
WM Theme: Adwaita
Theme: Yaru [GTK2/3]
Icons: Yaru [GTK2/3]
Terminal: gnome-terminal
CPU: 12th Gen Intel i7-12700H (2) @
GPU: 00:0f.0 VMware SVGA II Adapter
Memory: 1497MiB / 3867MiB

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

Assignment 5.5: Users and permissions on Linux

Relevant screenshots + motivation

```
constantin@580521:~$  
constantin@580521:~$ ls  
Desktop Documents Downloads Music Pictures Public snap Templates Videos  
constantin@580521:~$ nano hello.sh  
constantin@580521:~$ chmod +x hello.sh  
constantin@580521:~$ ./hello.sh  
Hello Constantine, 580521!  
constantin@580521:~$ S
```

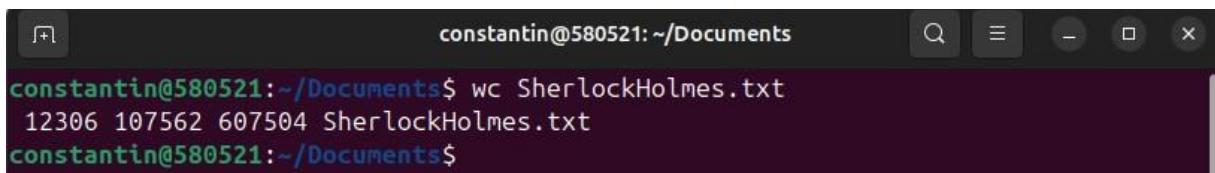
Assignment 5.6: View the contents of files

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?



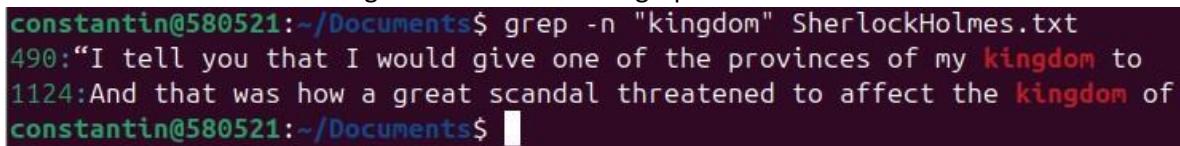
```
constantin@580521:~/Documents$ wc SherlockHolmes.txt
12306 107562 607504 SherlockHolmes.txt
constantin@580521:~/Documents$
```

Lines – 12306

Words – 107562

Words – 607504

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



```
constantin@580521:~/Documents$ 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
constantin@580521:~/Documents$
```

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

```
constantin@580521:~/Documents$ grep -C 10 "kingdom" SherlockHolmes.txt
"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.

--
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.

II. THE RED-HEADED LEAGUE

```
constantin@580521:~/Documents$
```

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

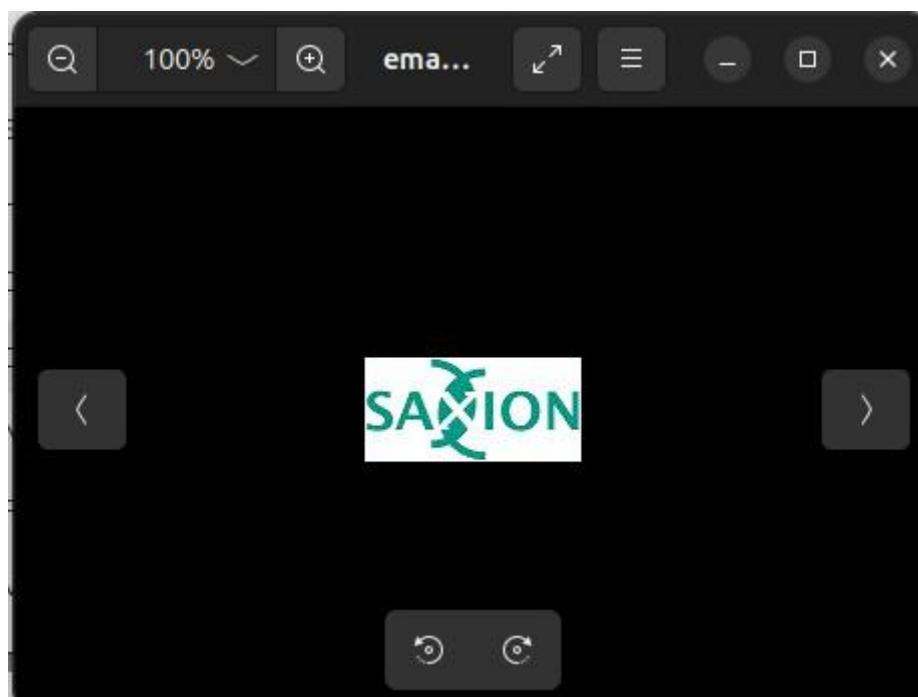
In Windows, the file extensions are important because they determine the file type. Windows only looks at the extension and then tries to open that file with the default application that is suitable for it. While in the Ubuntu VM we could remove the extension of the oldcar.jpg file and it will still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

```
to extract embedded data from steg.jpg. Steghide extract -sf steg.jpg
constantin@580521:~/Downloads$ steghide extract -sf apple2.jpg
Enter passphrase:
wrote extracted data to "message.txt".
constantin@580521:~/Downloads$ ls
apple2.jpg  emai-gif.gif  email-base64.txt  message.txt  oldcar
constantin@580521:~/Downloads$ cat message.txt
Hello class.
You have almost completed Week 5.

constantin@580521:~/Downloads$
```

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:~$ sudo mkdir -p /srv/images
constantin@580521:~$ sudo chown $USER:$USER /srv/images
constantin@580521:~$ 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:e7:12:de brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    altname enx000c29e712de
    inet 192.168.139.129/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 997sec preferred_lft 997sec
        inet6 fe80::c29e:12ff:fe71:12de/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
constantin@580521:~$ 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
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 (2025-1-05) 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.

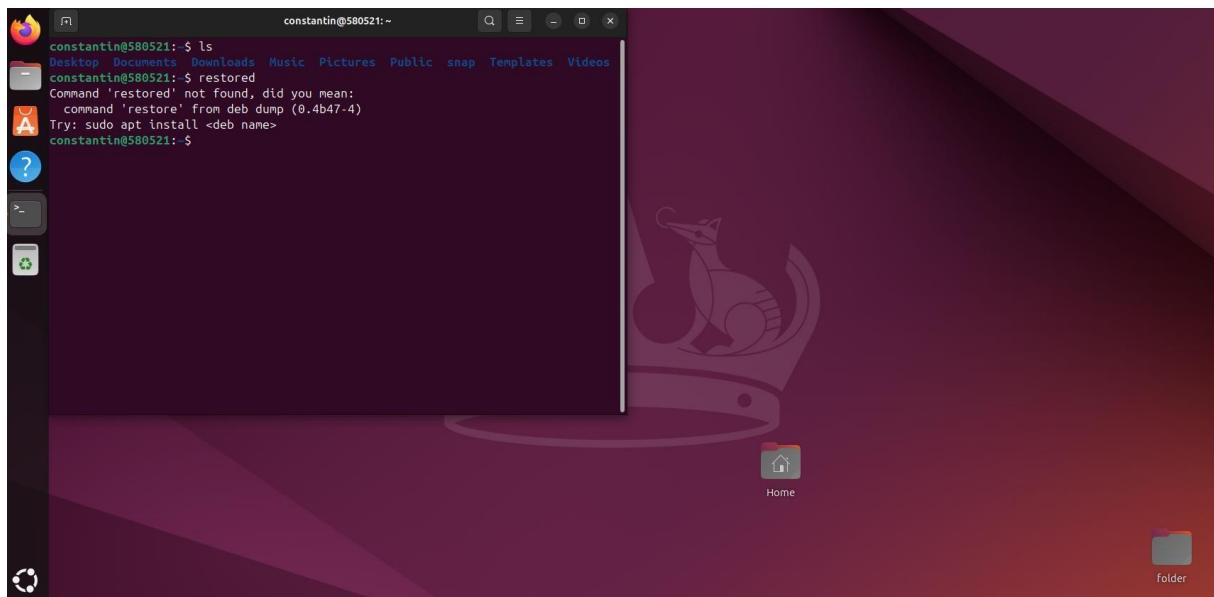
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Sun Dec 28 17:39:51 2025 from 192.168.139.128
constantin@580521:~$
```

```
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:~$
```

```
ubuntu@ubuntu:~$ ssh constantin@192.168.139.129 "cat /srv/images/ubuntu2404_vm.img.gz" | gzip -d | sudo dd of=/dev/sda bs=4M status=progress
The authenticity of host '192.168.139.129 (192.168.139.129)' can't be established.
ED25519 key fingerprint is SHA256:A5tPgZ0nq0kB5d1yW5k6r+mNLch9ZIRYmZXC6RENFyQ.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.139.129' (ED25519) to the list of known hosts.
constantin@192.168.139.129's password:
21308047360 bytes (21 GB, 20 GiB) copied, 124 s, 172 MB/s
0+641210 records in
0+641210 records out
21474836480 bytes (21 GB, 20 GiB) copied, 125.02 s, 172 MB/s
ubuntu@ubuntu:~$
```



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