Template Week 5 – Operating Systems

Student number: 583168

Assignment 5.1: Unix-like

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

UNIX is the original operating system developed at Bell Labs and today refers mainly to officially certified systems such as AIX or HP-UX.
Unix-like operating systems behave like UNIX but are not officially certified, for example Linux, BSD, and macOS.

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

kKen Thompson helped create UNIX and developed the first version of the operating system.
Dennis Ritchie co-created UNIX and invented the C programming language.
Bill Joy was a key developer of BSD UNIX and co-founded Sun Microsystems.
Richard Stallman founded the GNU Project and the Free Software Movement.
Linus Torvalds created the Linux kernel.

c) What is the philosophy of the GNU movement?

The GNU movement believes software should be free, meaning users can run, study, modify, and share it.
The focus is on user freedom, not price.

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

Ubuntu mostly follows the GNU philosophy because it uses GNU tools and Linux.
However, it also allows proprietary software, which does not fully follow GNU ideals.

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

Windows Subsystem for Linux allows users to run Linux command-line tools and environments directly on Windows without using a virtual machine.

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

Android belongs to the Linux family.
iOS belongs to the Unix family (BSD-based).
ChromeOS belongs to the Linux 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

Supercomputers are very powerful computers built to solve extremely large and calculation-intensive problems that ordinary computers cannot handle efficiently. They are used in scientific research, weather prediction, climate modeling, and engineering simulations. For example, they help simulate explosions, design new drugs, model complex physical systems like the atmosphere, and support national defense and intelligence work. Early supercomputers were expensive and mainly used by governments and large research institutions. Over time, supercomputing expanded to include systems based on parallel processing and today's high-performance clusters.

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?

A PlayStation 3 cluster is a group of PS3 consoles connected together to work as a single computer.
It was used for low-cost high-performance computing, such as scientific research, simulations, and image analysis, especially by universities and the military.

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?

The Oracle Raspberry Pi supercomputer cluster runs Oracle Linux for ARM (a version of Oracle Linux made for ARM processors) as its operating system. The Raspberry Pi nodes are network-booted from a central server using this OS.

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, Oracle's Raspberry Pi supercomputer is **not on the Top500 list**. Its performance is far too low compared to the petaflop-level supercomputers on the list.

e) What CPU architecture is used for the PlayStation 5 and Xbox Series X?
What operating systems run on these consoles?
What conclusion can you draw from the answer to the previous question?

CPU architecture: Both PlayStation 5 and Xbox Series X use AMD x86-64 (64-bit) processors.
Operating systems: PlayStation 5 runs Orbis OS (based on FreeBSD/Unix), and Xbox Series X runs Xbox OS (based on Windows NT).
Conclusion: Modern consoles use PC-like CPU architectures and custom OSes derived from standard desktop or server systems.

Assignment 5.3: Working with Windows

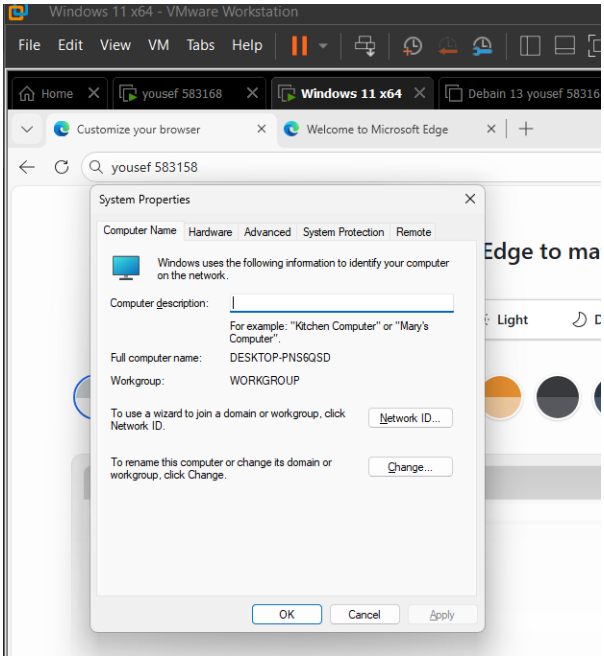
Take relevant screenshots of the assignments below

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.

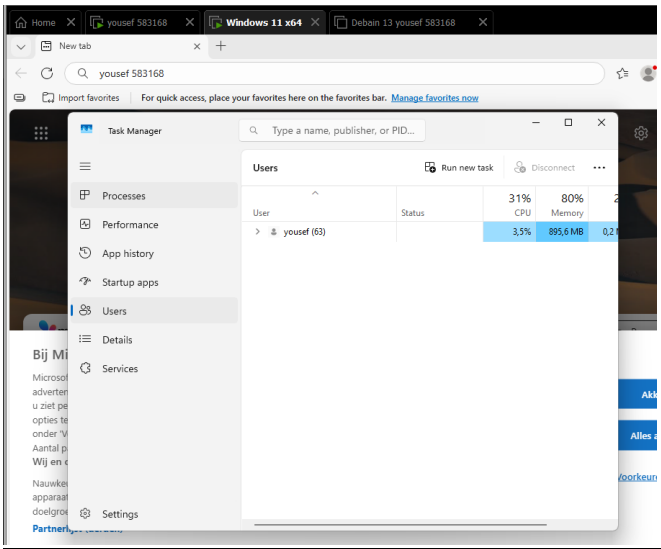
b) The file explorer can be opened with ⊞ + E, Which key combination could you also use?

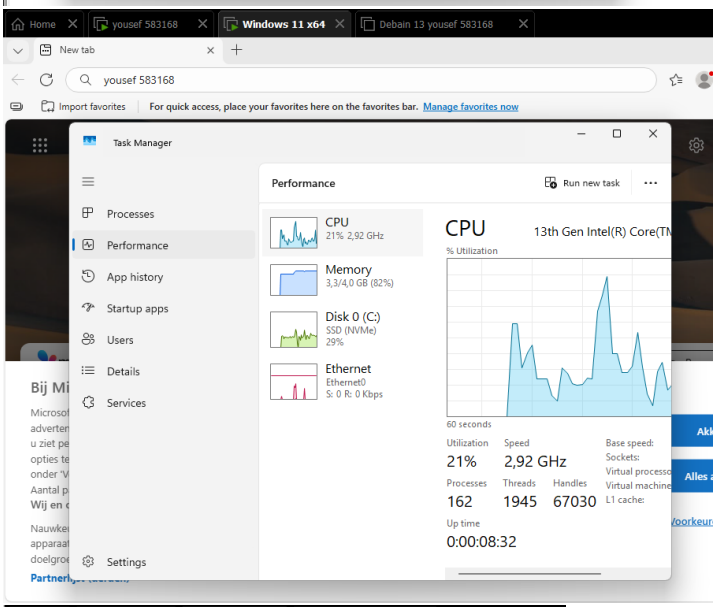
Windows + R, then type explorer and press enter

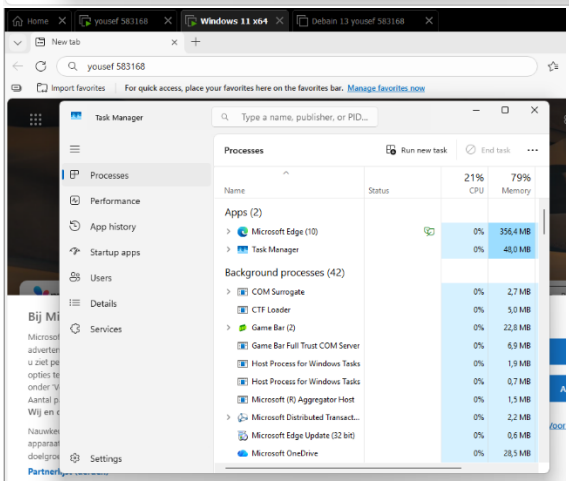
c) Open the system properties with a ⊞ key combination, take a screenshot of the open screen. Paste this screenshot into this template.



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.







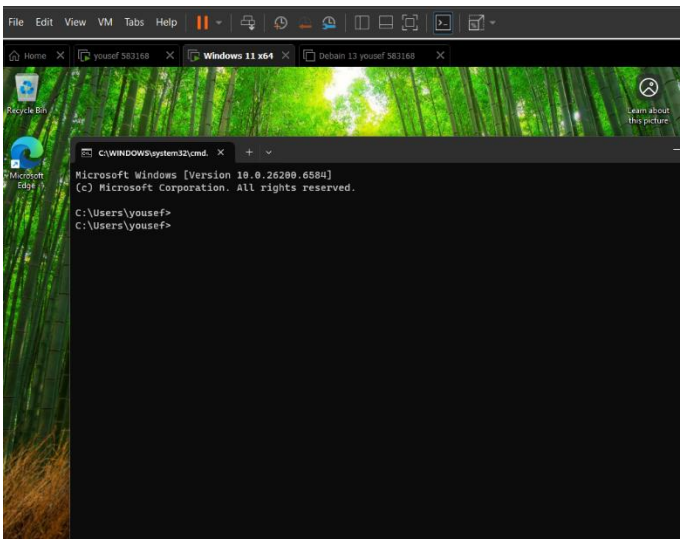
e) If you're giving a PowerPoint presentation and you connect your laptop to a projector, Windows can use the projector as a second screen. For example, you may have Outlook open on your first screen that you don't show over the projector, while the PowerPoint presentation is displayed on the projector,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

Windows + P to switch

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?

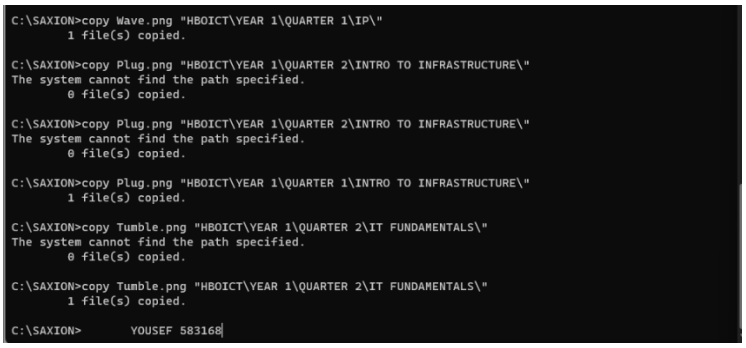
Windows + L to lock

g) Open the Run screen with a key combination. On this screen, type CMD and press <enter>. Take a screenshot of this result and paste it into this template.



Working in the File Explorer

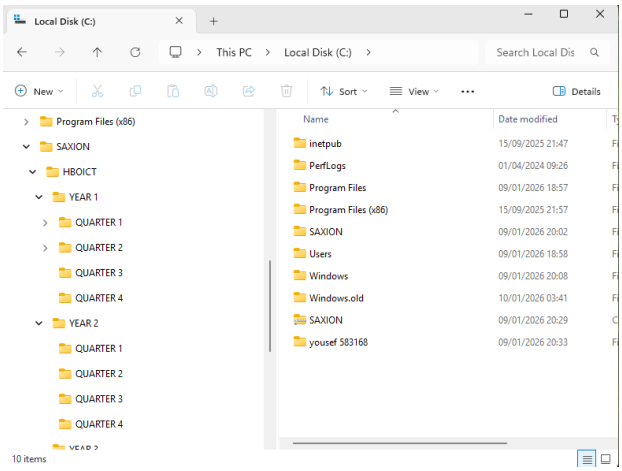
Relevant screenshots **copy** command:



Relevant screenshots **tree** command:

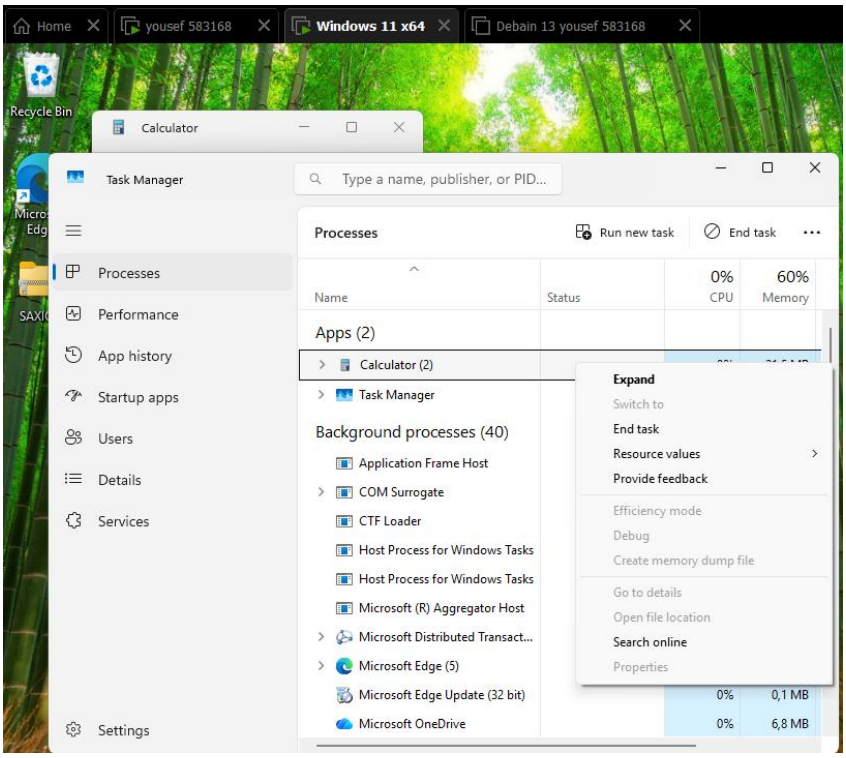
```
C:\Windows\System32\cmd.e
        1 file(s) copied.

C:\SAXION> tree
Folder PATH listing
Volume serial number is F001-E8BE
C:.
└───HBOICT
    ├───YEAR 1
    │   ├───QUARTER 1
    │   │   ├───INTRO TO INFRASTRUCTURE
    │   │   ├───IP
    │   │   └───SYNERGY
    │   ├───QUARTER 2
    │   │   ├───DATA BASES
    │   │   ├───IT FUNDAMENTALS
    │   │   └───IT ITS IN THE GAME
    │   ├───QUARTER 3
    │   └───QUARTER 4
    ├───YEAR 2
    │   ├───QUARTER 1
    │   ├───QUARTER 2
    │   ├───QUARTER 3
    │   └───QUARTER 4
    ├───YEAR 3
    └───YEAR 4

C:\SAXION>echo %username%
yousef

C:\SAXION>
```

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



Terminating Processes

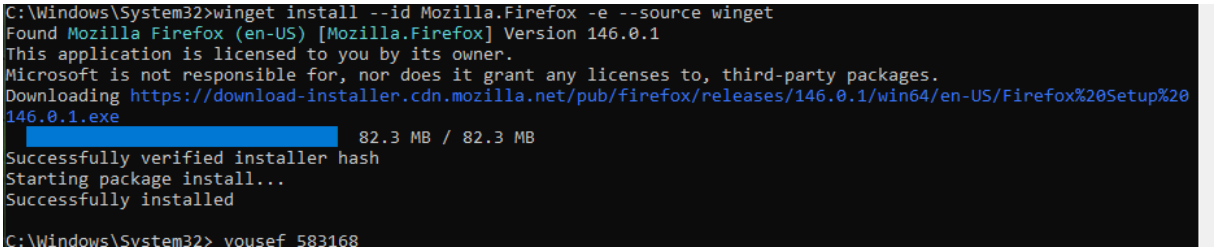
Relevant Screenshots Task Manager Window:



Install Software

Relevant screenshots that the following software is installed with winget:

- WinSCP
- Notepad++
- 7zip



B) explaination

winget install ---- tells Windows to install a program.

--id Mozilla.Firefox --- installs the exact Firefox package.

-e -- exact match, ensures no similar package is chosen.

--source winget --- uses only the winget repository, avoids Microsoft Store errors.

(I added something because I had an error)

- WinSCP

```
C:\Windows\System32>winget install --id WinSCP.WinSCP -e --source winget
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>yousef 583168
```

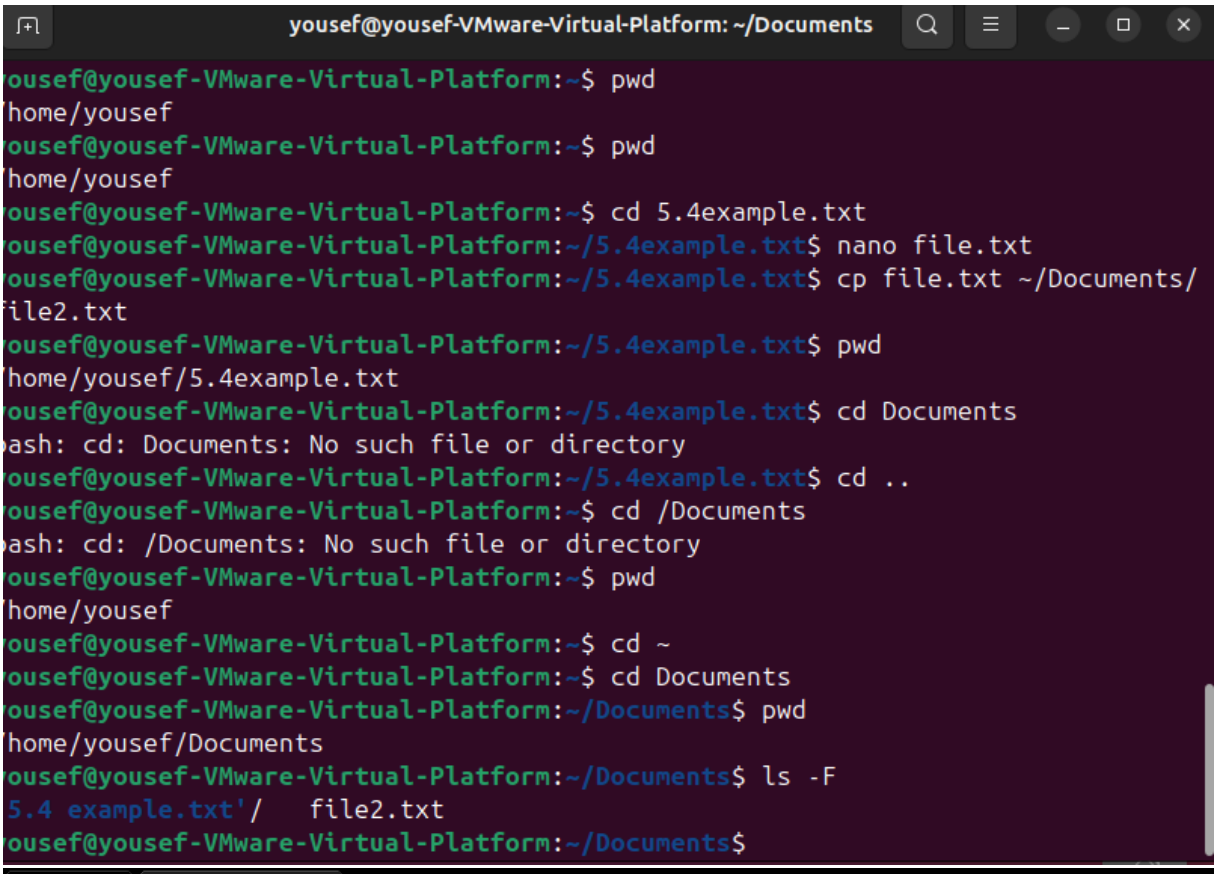
- Notepad++

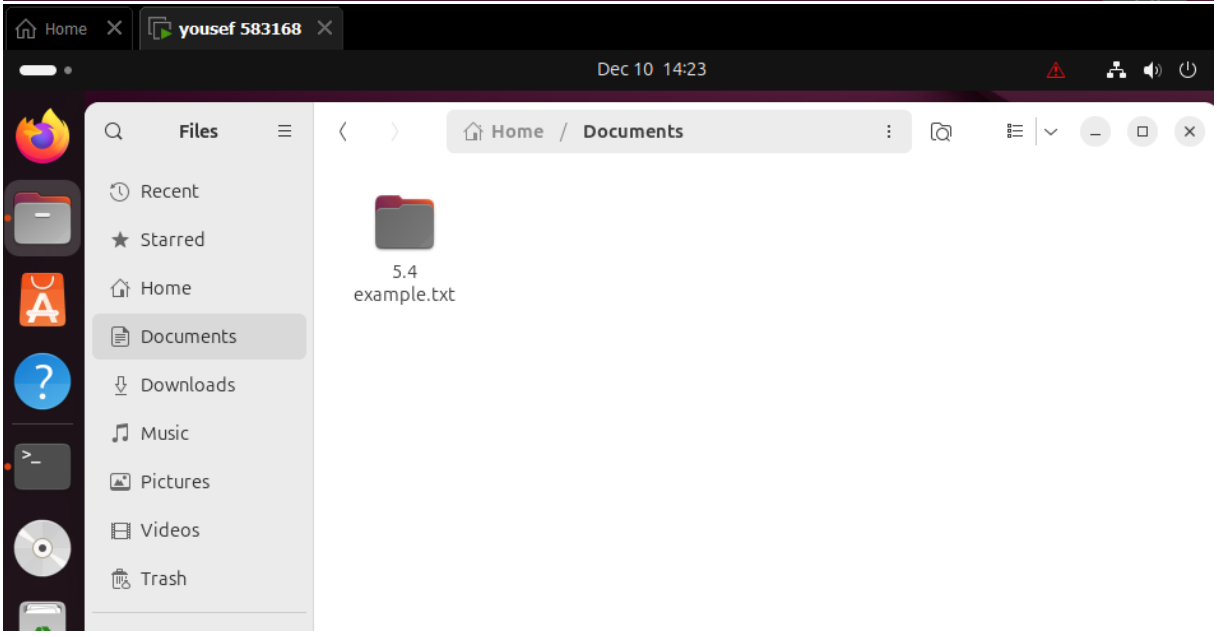
```
C:\Windows\System32>winget install --id Notepad++.Notepad++ -e --source winget
Found Notepad++ [Notepad++.Notepad++] Version 8.9
This application is licensed to you by its owner.
Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.
Downloading https://github.com/notepad-plus-plus/notepad-plus-plus/releases/download/v8.9/npp.8.9.Installer.x64.exe
  ██████████████████████████████  6.54 MB / 6.54 MB
Successfully verified installer hash
Starting package install...
Successfully installed

C:\Windows\System32>
C:\Windows\System32>yousef 583168
```

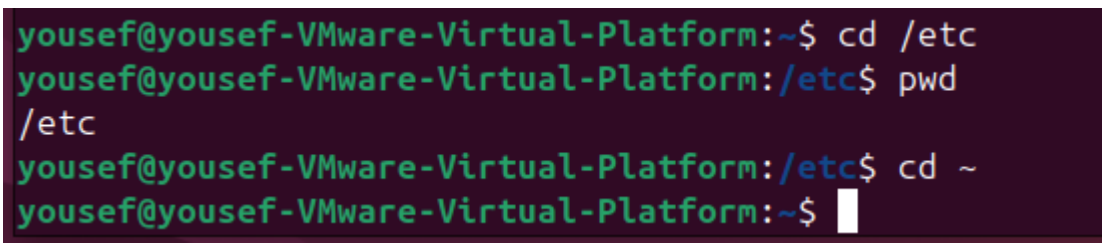
- 7zip

```
C:\Windows\System32>
C:\Windows\System32>winget install --id 7zip.7zip -e --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...
Successfully installed

C:\Windows\System32>yousef 583168
```

Assignment 5.4: Working with Linux







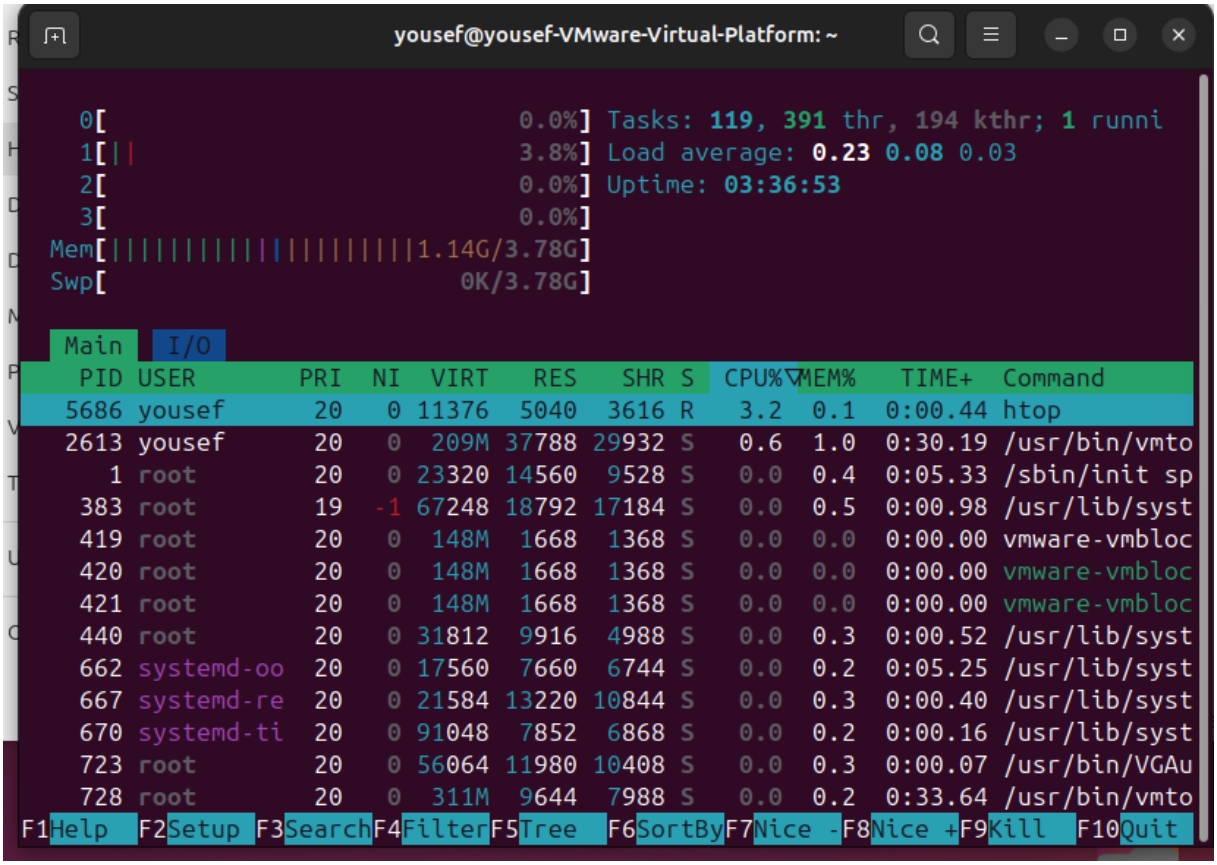
One significant difference between Linux and Windows file structure

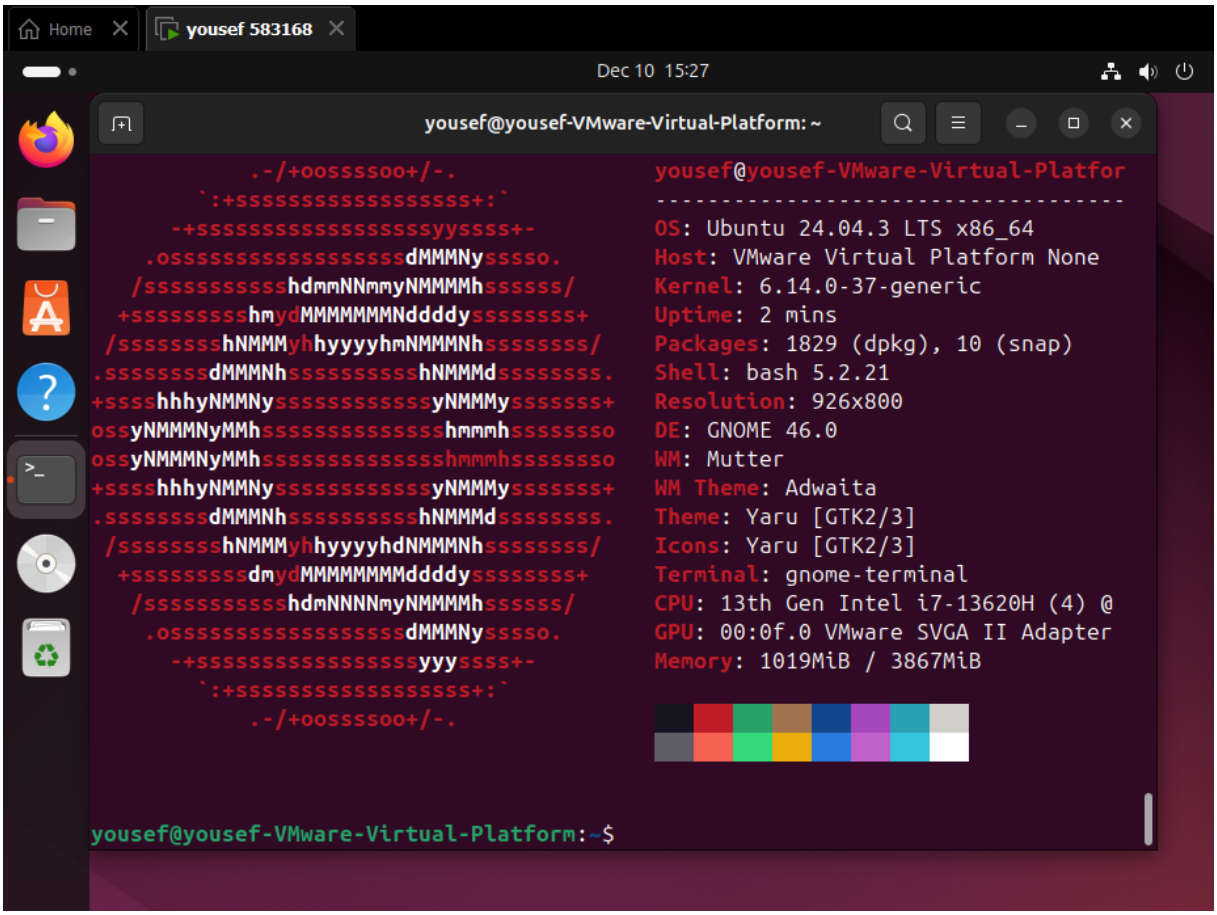
Linux has a single root directory "/", while Windows uses multiple drive letters (C:, D:).

What is the /etc directory usually used for?

/etc stores system-wide configuration files for the operating system and installed services.

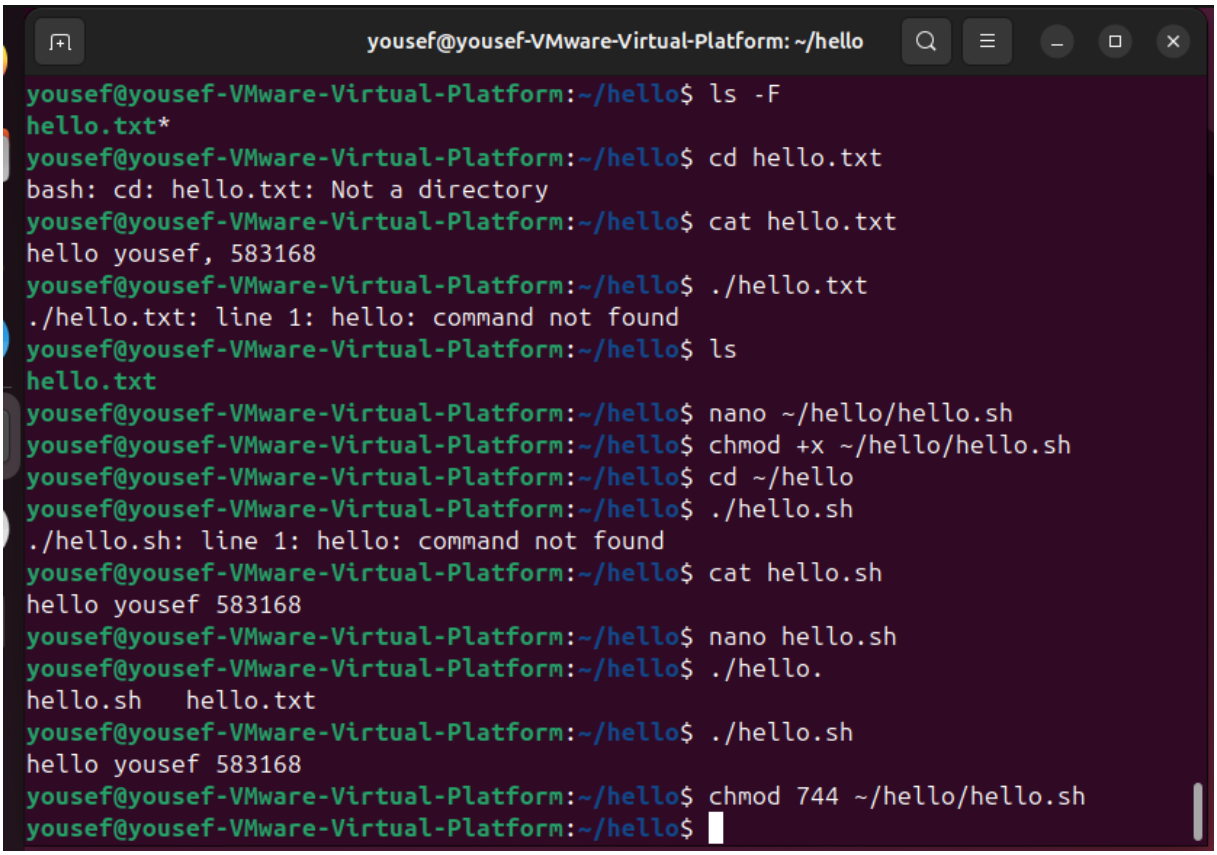
```
yousef@yousef-VMware-Virtual-Platform:/etc$ cd ~
yousef@yousef-VMware-Virtual-Platform:~$ tar -cvf archive.tar filename.txt
tar: filename.txt: Cannot stat: No such file or directory
tar: Exiting with failure status due to previous errors
yousef@yousef-VMware-Virtual-Platform:~$ tar -cvf archive.tar ~/file.txt
tar: Removing leading `/' from member names
/home/yousef/file.txt
yousef@yousef-VMware-Virtual-Platform:~$ tar -xvf archive.tar
home/yousef/file.txt
yousef@yousef-VMware-Virtual-Platform:~$ tar -cvzf archive.tar.gz ~/file.txt
tar: Removing leading `/' from member names
/home/yousef/file.txt
yousef@yousef-VMware-Virtual-Platform:~$
```



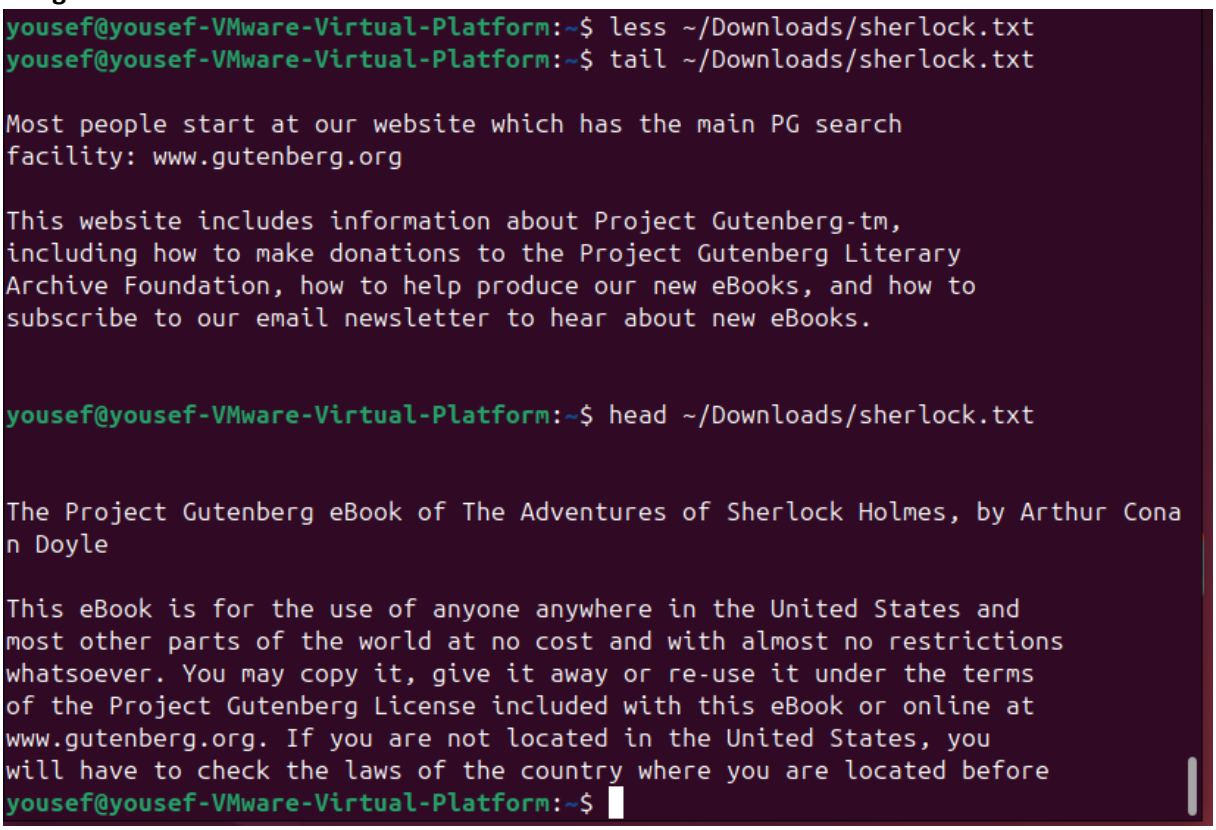


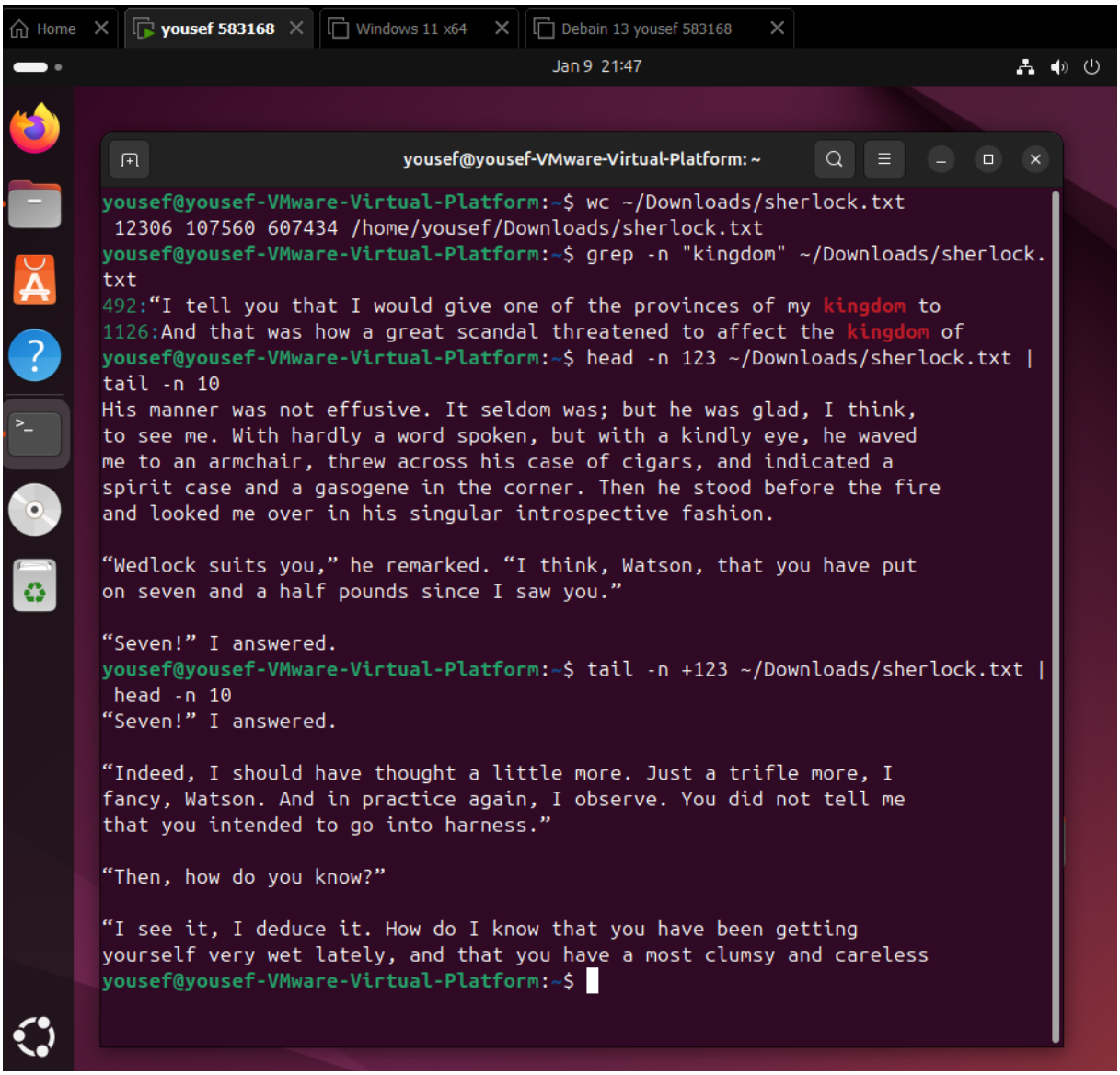
It shows system information like OS, kernel, CPU, RAM, uptime, and more in a formatted display.

Assignment 5.5: Users and permissions on Linux

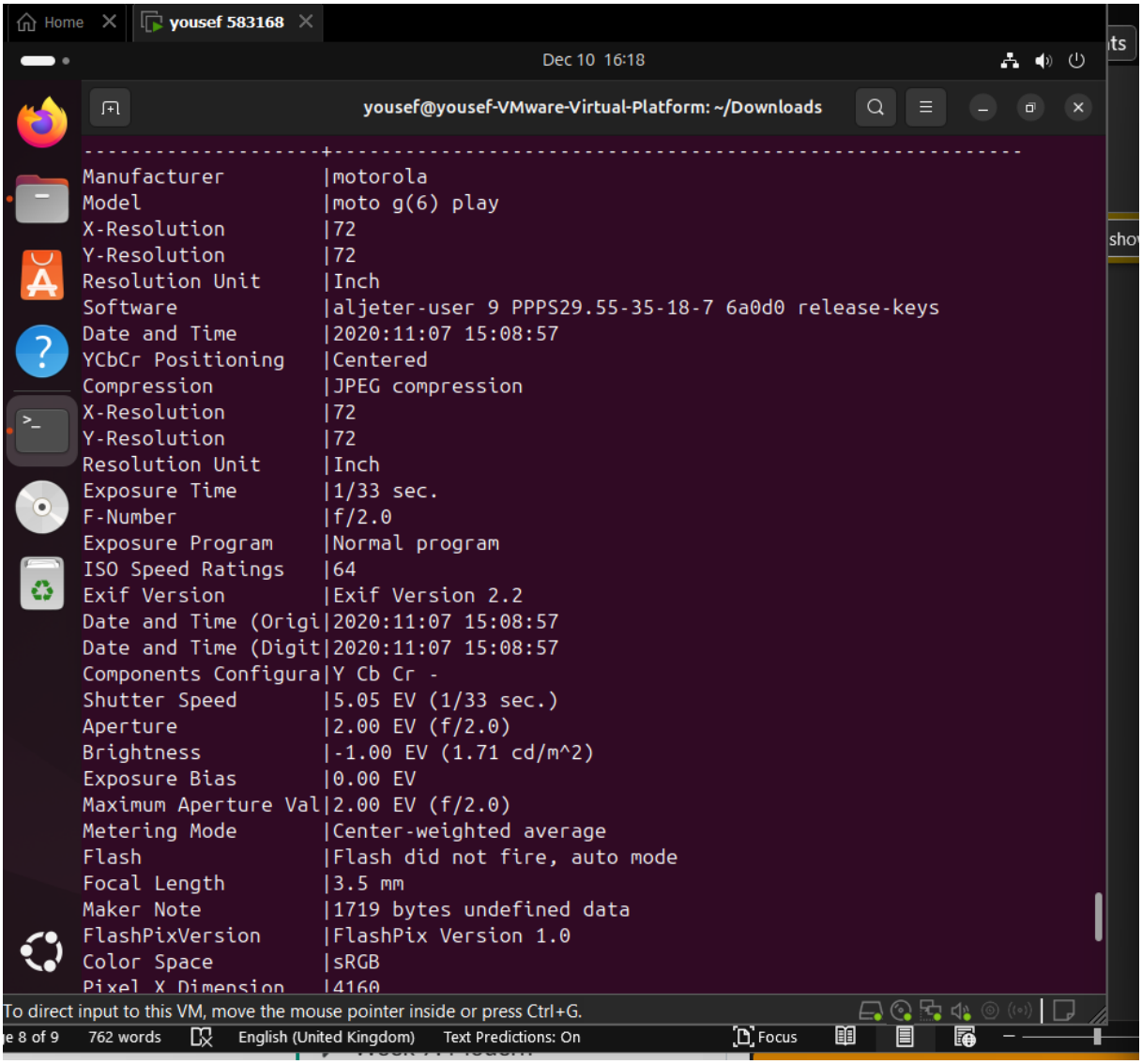


Assignment 5.6: View the contents of files




Home
yousef 583168
Windows 11 x64
Debain 13 yousef 583168
Jan 9 21:47
yousef@yousef-VMware-Virtual-Platform: ~
yousef@yousef-VMware-Virtual-Platform:~$ wc ~/Downloads/sherlock.txt
12306 107560 607434 /home/yousef/Downloads/sherlock.txt
yousef@yousef-VMware-Virtual-Platform:~$ grep -n "kingdom" ~/Downloads/sherlock.txt
492:“I tell you that I would give one of the provinces of my kingdom to
1126:And that was how a great scandal threatened to affect the kingdom of
yousef@yousef-VMware-Virtual-Platform:~$ head -n 123 ~/Downloads/sherlock.txt | tail -n 10
His manner was not effusive. It seldom was; but he was glad, I think,
to see me. With hardly a word spoken, but with a kindly eye, he waved
me to an armchair, threw across his case of cigars, and indicated a
spirit case and a gasogene in the corner. Then he stood before the fire
and looked me over in his singular introspective fashion.
“Wedlock suits you,” he remarked. “I think, Watson, that you have put
on seven and a half pounds since I saw you.”
“Seven!” I answered.
yousef@yousef-VMware-Virtual-Platform:~$ tail -n +123 ~/Downloads/sherlock.txt | head -n 10
“Seven!” I answered.
“Indeed, I should have thought a little more. Just a trifle more, I
fancy, Watson. And in practice again, I observe. You did not tell me
that you intended to go into harness.”
“Then, how do you know?”
“I see it, I deduce it. How do I know that you have been getting
yourself very wet lately, and that you have a most clumsy and careless
yousef@yousef-VMware-Virtual-Platform:~$

Assignment 5.7: Digital forensics



• Phone brand/type

Motorola – Moto G6 Play

• Are there GPS coordinates known?

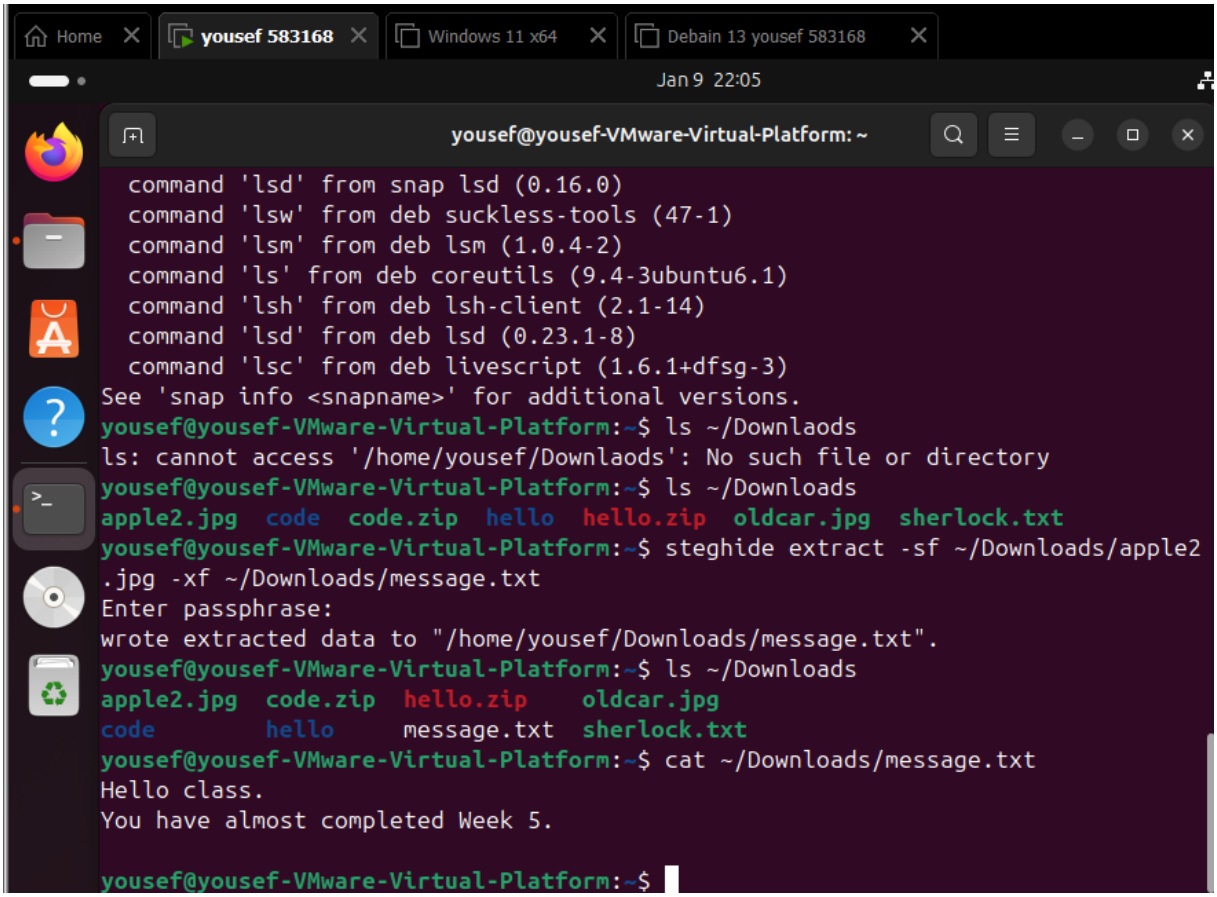
Yes

Latitude: 53° 11' 39.6794" N
Longitude: 6° 32' 12.9018" E

• City where the photo was taken

These coordinates point to Groningen, Netherlands.

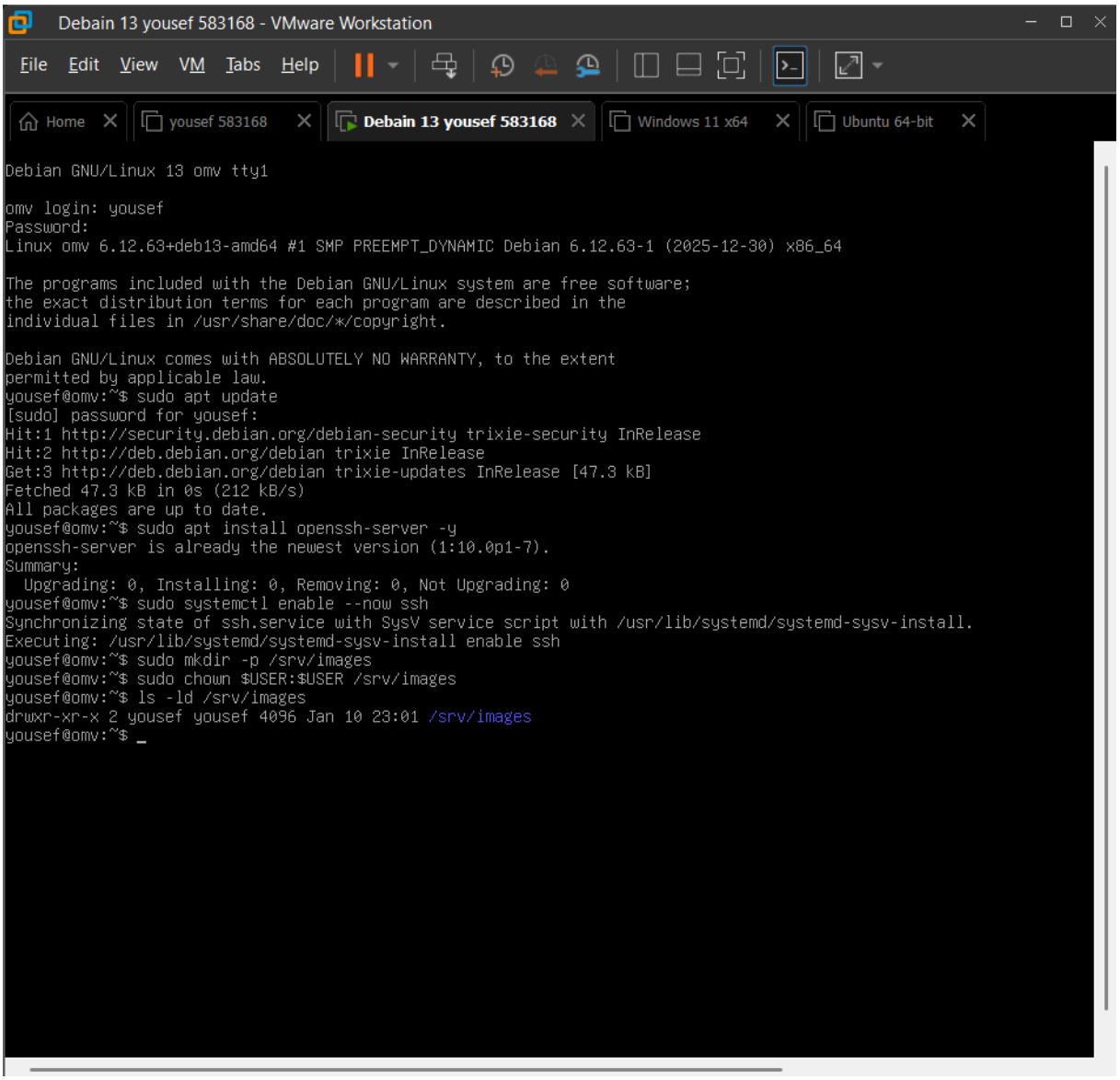
Assignment 5.8: Steganography

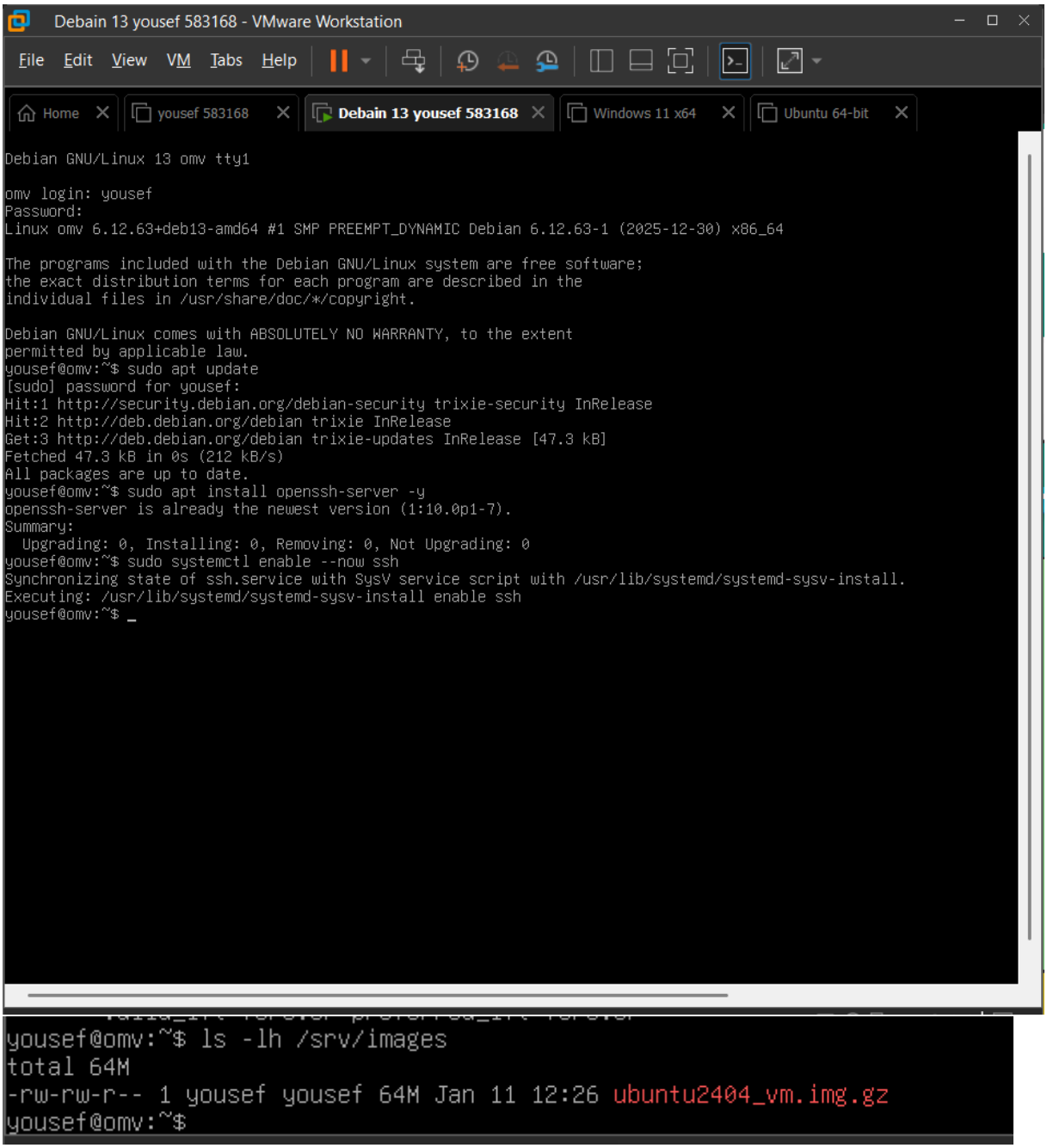


Assignment 5.9: Capture disk images

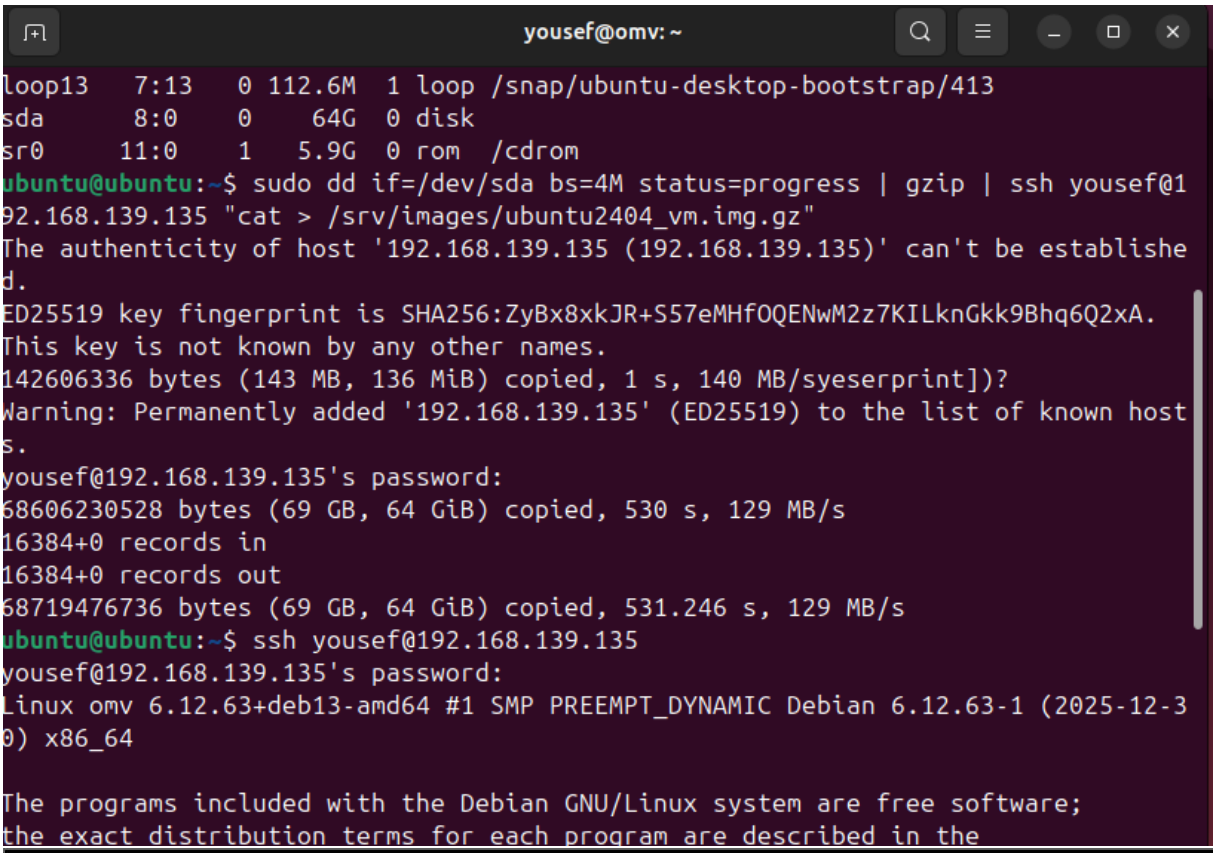
Make relevant screenshots + motivation:

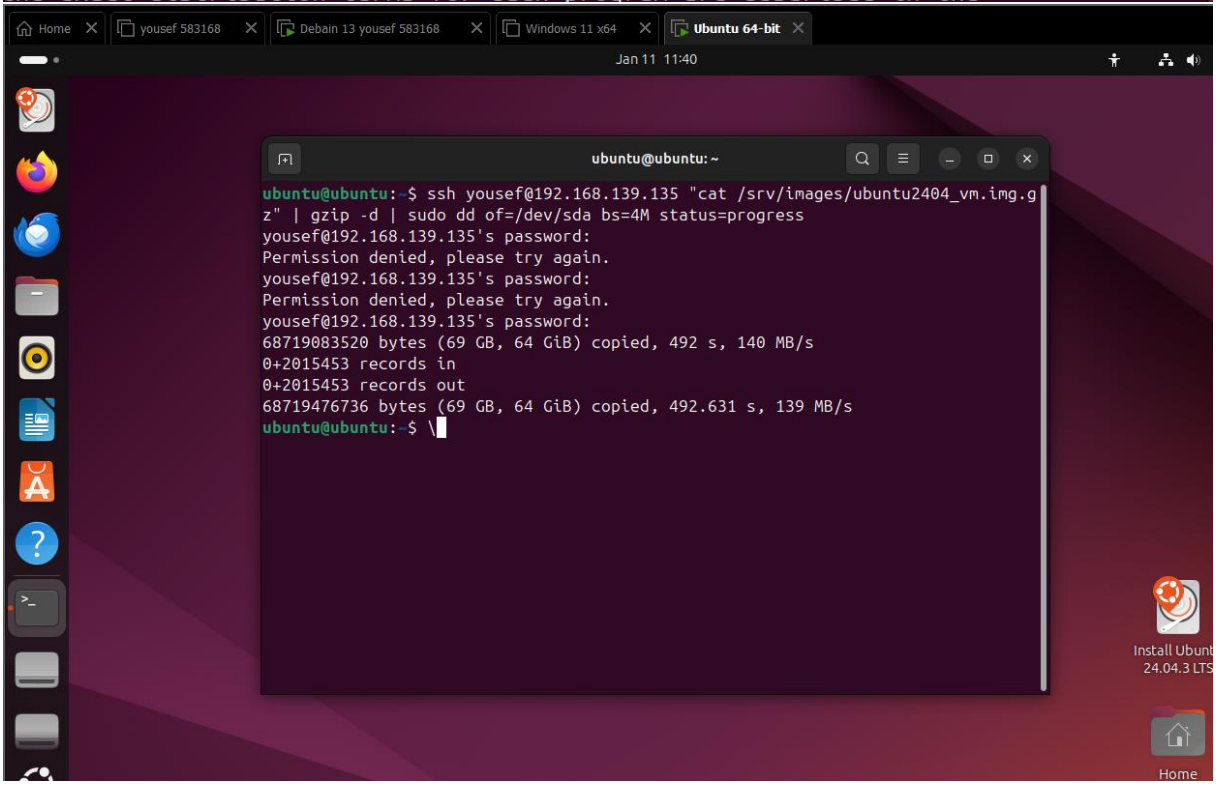
- Proof that the Debian 13 server stored a back-up image of the Ubuntu 24.04 Desktop VM.
- Proof that you can restore the back-up image into an empty VM.


Debain 13 yousef 583168 - VMware Workstation
File Edit View VM Tabs Help
Home
yousef 583168
Debain 13 yousef 583168
Windows 11 x64
Ubuntu 64-bit
Debian GNU/Linux 13 omv tty1
omv login: yousef
Password:
Linux omv 6.12.63+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.63-1 (2025-12-30) 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.
yousef@omv:~$ sudo apt update
[sudo] password for yousef:
Hit:1 http://security.debian.org/debian-security trixie-security InRelease
Hit:2 http://deb.debian.org/debian trixie InRelease
Get:3 http://deb.debian.org/debian trixie-updates InRelease [47.3 kB]
Fetched 47.3 kB in 0s (212 kB/s)
All packages are up to date.
yousef@omv:~$ sudo apt install openssh-server -y
openssh-server is already the newest version (1:10.0p1-7).
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
yousef@omv:~$ 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
yousef@omv:~$ sudo mkdir -p /srv/images
yousef@omv:~$ sudo chown $USER:$USER /srv/images
yousef@omv:~$ ls -ld /srv/images
drwxr-xr-x 2 yousef yousef 4096 Jan 10 23:01 /srv/images
yousef@omv:~$


Debain 13 yousef 583168 - VMware Workstation
File Edit View VM Tabs Help
Home
yousef 583168
Debain 13 yousef 583168
Windows 11 x64
Ubuntu 64-bit
Debian GNU/Linux 13 omv tty1
omv login: yousef
Password:
Linux omv 6.12.63+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.63-1 (2025-12-30) 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.
yousef@omv:~$ sudo apt update
[sudo] password for yousef:
Hit:1 http://security.debian.org/debian-security trixie-security InRelease
Hit:2 http://deb.debian.org/debian trixie InRelease
Get:3 http://deb.debian.org/debian trixie-updates InRelease [47.3 kB]
Fetched 47.3 kB in 0s (212 kB/s)
All packages are up to date.
yousef@omv:~$ sudo apt install openssh-server -y
openssh-server is already the newest version (1:10.0p1-7).
Summary:
Upgrading: 0, Installing: 0, Removing: 0, Not Upgrading: 0
yousef@omv:~$ 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
yousef@omv:~$ _

yousef@omv:~$ ls -lh /srv/images
total 64M
-rw-rw-r-- 1 yousef yousef 64M Jan 11 12:26 ubuntu2404_vm.img.gz
yousef@omv:~$





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