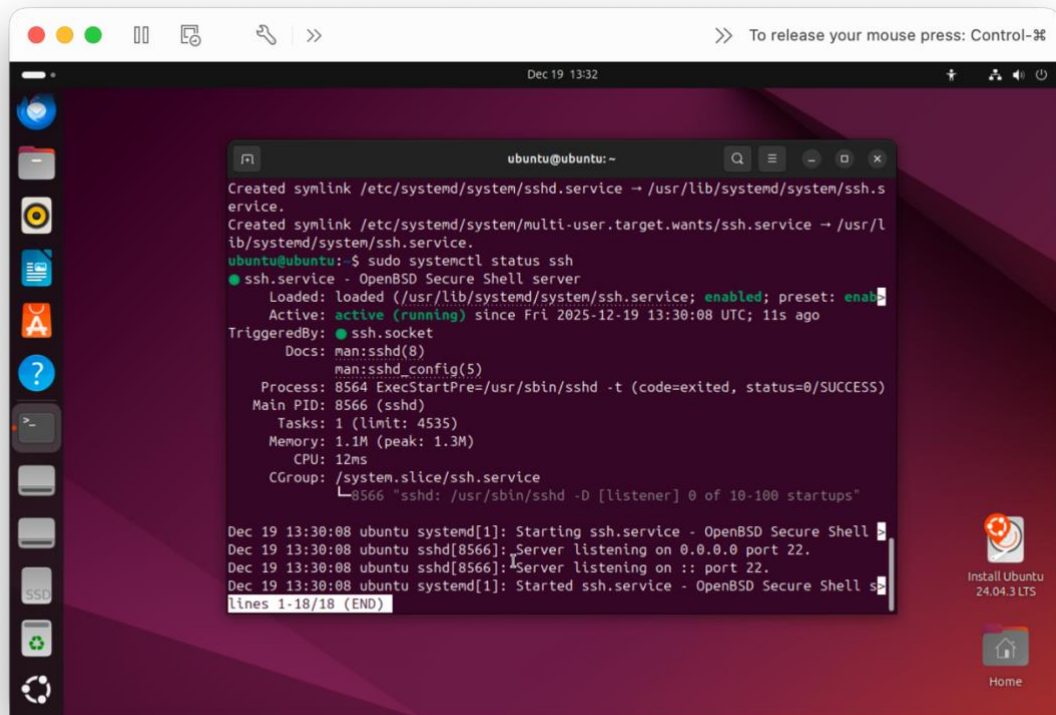


# Week 6 – Networking

Student number: 588406

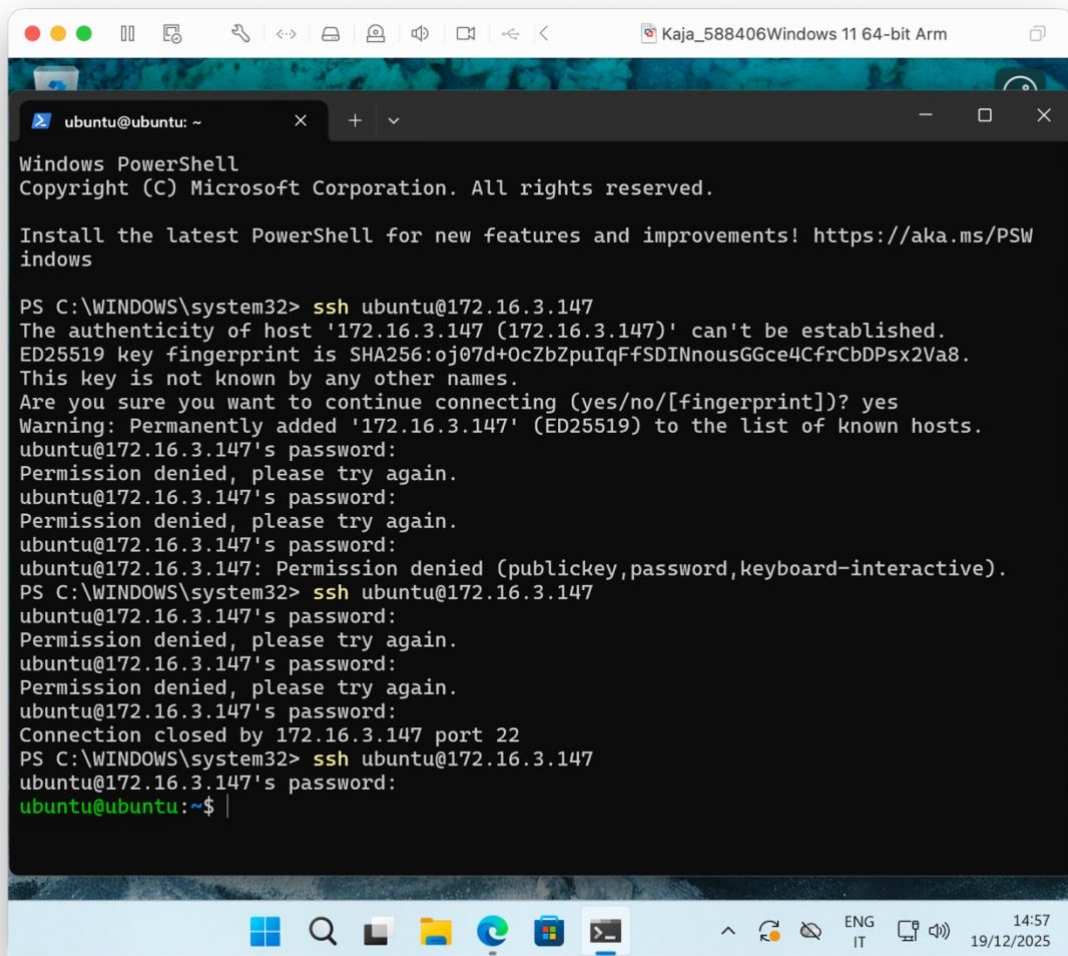
## Assignment 6.1: Working from home

Screenshot installation openssh-server:



```
ubuntu@ubuntu: ~  
Created symlink /etc/systemd/system/ssh.service → /usr/lib/systemd/system/ssh.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /usr/lib/systemd/system/ssh.service.  
ubuntu@ubuntu: ~$ sudo systemctl status ssh  
● ssh.service - OpenBSD Secure Shell server  
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: enabled)  
   Active: active (running) since Fri 2025-12-19 13:30:08 UTC; 11s ago  
 TriggeredBy: ● ssh.socket  
    Docs: man:sshd(8)  
          man:sshd_config(5)  
   Process: 8564 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS)  
   Main PID: 8566 (sshd)  
     Tasks: 1 (limit: 4535)  
    Memory: 1.1M (peak: 1.3M)  
       CPU: 12ms  
    CGroup: /system.slice/ssh.service  
            └─8566 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"  
  
Dec 19 13:30:08 ubuntu systemd[1]: Starting ssh.service - OpenBSD Secure Shell  
Dec 19 13:30:08 ubuntu sshd[8566]: Server listening on 0.0.0.0 port 22.  
Dec 19 13:30:08 ubuntu sshd[8566]: Server listening on :: port 22.  
Dec 19 13:30:08 ubuntu systemd[1]: Started ssh.service - OpenBSD Secure Shell  
lines 1-18/18 (END)
```

Screenshot successful SSH command execution:



The screenshot shows a Windows 11 desktop with a terminal window titled 'ubuntu@ubuntu: ~'. The terminal displays the Windows PowerShell prompt and several SSH connection attempts to the IP address 172.16.3.147. The first attempt shows a warning about the host's authenticity and a successful connection after accepting the fingerprint. Subsequent attempts show 'Permission denied' messages. The terminal window is overlaid on a Windows 11 taskbar showing the Start button, search icon, and several application icons. The system tray at the bottom right shows the date and time as 19/12/2025, 14:57.

```
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

Install the latest PowerShell for new features and improvements! https://aka.ms/PSW
indows

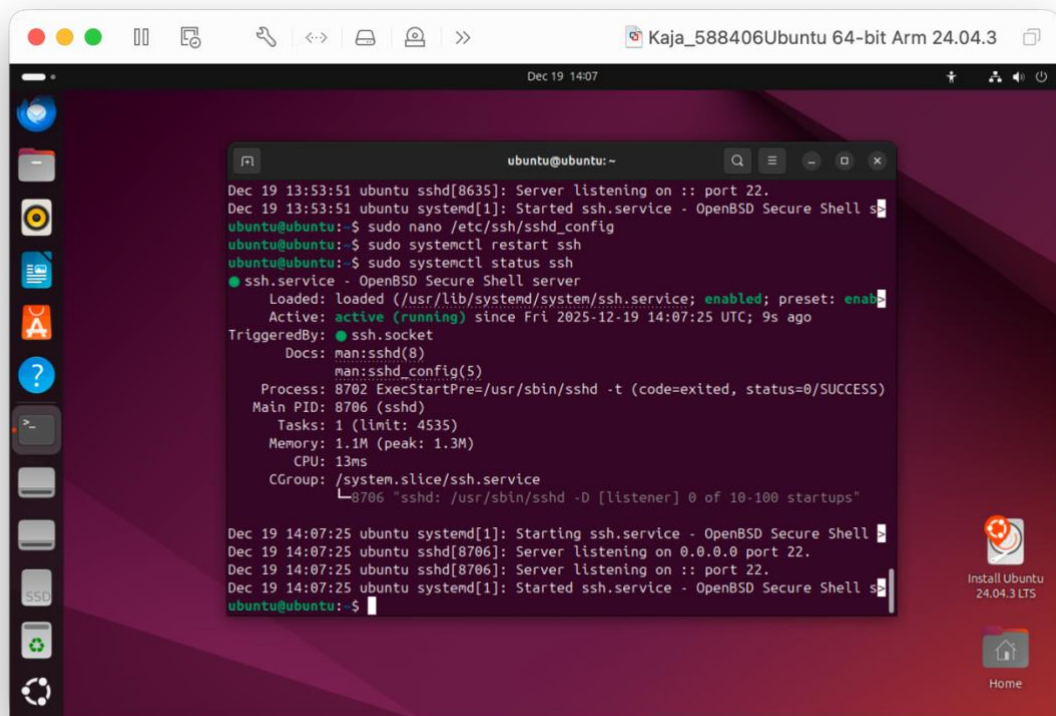
PS C:\WINDOWS\system32> ssh ubuntu@172.16.3.147
The authenticity of host '172.16.3.147 (172.16.3.147)' can't be established.
ED25519 key fingerprint is SHA256:oj07d+0cZbZpuIqFfSDINnousGGce4CfrCbDPsx2Va8.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.16.3.147' (ED25519) to the list of known hosts.
ubuntu@172.16.3.147's password:
Permission denied, please try again.
ubuntu@172.16.3.147's password:
Permission denied, please try again.
ubuntu@172.16.3.147's password:
ubuntu@172.16.3.147: Permission denied (publickey,password,keyboard-interactive).
PS C:\WINDOWS\system32> ssh ubuntu@172.16.3.147
ubuntu@172.16.3.147's password:
Permission denied, please try again.
ubuntu@172.16.3.147's password:
Permission denied, please try again.
ubuntu@172.16.3.147's password:
Connection closed by 172.16.3.147 port 22
PS C:\WINDOWS\system32> ssh ubuntu@172.16.3.147
ubuntu@172.16.3.147's password:
ubuntu@ubuntu:~$
```

```
PS C:\WINDOWS\system32> cd
PS C:\WINDOWS\system32> cd ~
PS C:\Users\kaja588406> echo scp test > scp.txt
PS C:\Users\kaja588406> dir scp.txt
```

Directory: C:\Users\kaja588406

Mode	LastWriteTime	Length	Name
-a----	12/19/2025 3:02 PM	24	scp.txt

```
PS C:\Users\kaja588406>
```



A screenshot of a Windows PowerShell terminal window. The window title is 'Windows PowerShell'. The terminal shows the following commands and output:

```
At line:1 char:1
+ dir scp.txt
+ ~~~~~
+ CategoryInfo          : ObjectNotFound: (C:\WINDOWS\system32\scp.txt:String) [Get-ChildItem], ItemNotFoundException
+ FullyQualifiedErrorId : PathNotFound,Microsoft.PowerShell.Commands.GetChildItemCommand

PS C:\WINDOWS\system32> cd
PS C:\WINDOWS\system32> cd ~
PS C:\Users\kaja588406> echo scp test > scp.txt
PS C:\Users\kaja588406> dir scp.txt

Directory: C:\Users\kaja588406

Mode                LastWriteTime         Length Name
----                -
-a-----         12/19/2025   3:02 PM             24 scp.txt

PS C:\Users\kaja588406> scp scp.txt ubuntu@172.16.3.147:/home/ubuntu/
ubuntu@172.16.3.147's password:
Subsystem request failed on channel 0
C:\WINDOWS\System32\OpenSSH\scp.exe: Connection closed
PS C:\Users\kaja588406> scp scp.txt ubuntu@172.16.3.147:/home/ubuntu/
ubuntu@172.16.3.147's password:
scp.txt                                100% 24      0.0KB/s   00:00
PS C:\Users\kaja588406> |
```

The taskbar at the bottom shows the Start button, search icon, and several application icons. The system tray on the right shows 'ENG IT' and the date '19/12/2025'.

A screenshot of an Ubuntu terminal window. The terminal shows the following commands and output:

```
Dec 19 14:07:25 ubuntu systemd[1]: Started ssh.service - OpenBSD Secure Shell s
ubuntu@ubuntu:~$ sudo apt install remmina-plugin-rdp
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
remmina-plugin-rdp is already the newest version (1.4.35+dfsg-0ubuntu5.1).
remmina-plugin-rdp set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 61 not upgraded.
ubuntu@ubuntu:~$
```

Screenshot successful execution SCP command:

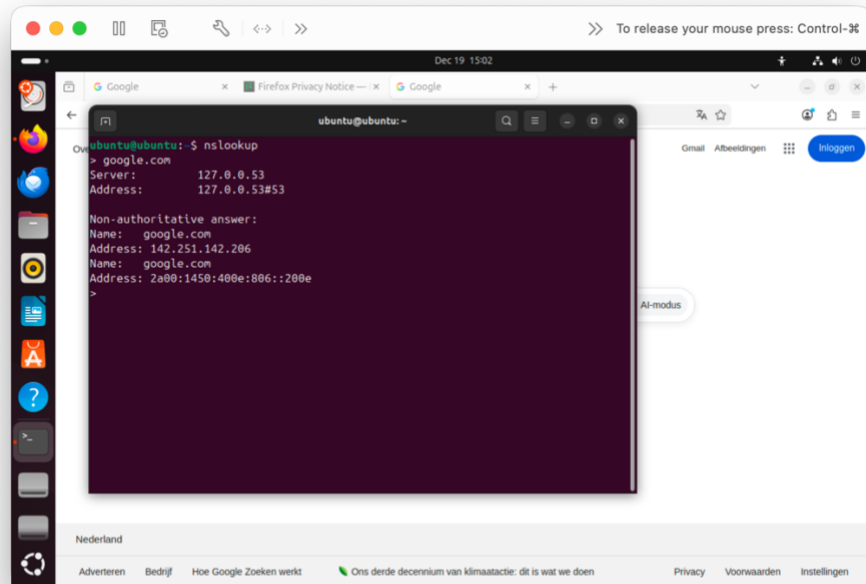
Screenshot remmina:

## Assignment 6.2: IP addresses websites

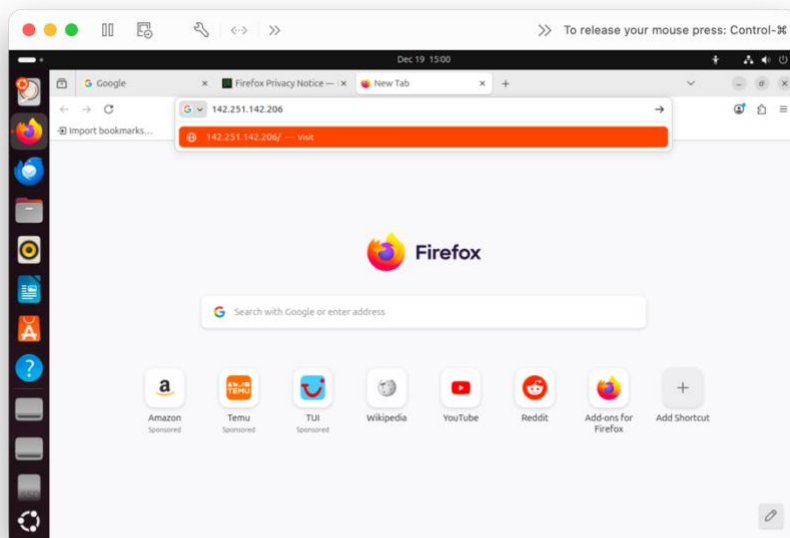
Relevant screenshots nslookup command:

Investigation IP addresses with nslookup command:

- amazon.com - 98.87.170.71, 98.87.170.74, 98.82.161.185
- google.com – 142.251.142.206, 2a00:1450:400e:806::200e
- one.one.one.one – 1.1.1.1, 1.0.0.1, 2606:4700:4700::1001, 2606:4700:4700::1111
- dns.google.com – 8.8.8.8, 8.8.4.4, 2001:4860:4860::8844, 2001:4860:4860:8888
- bol.com – 79.170.100.42
- w3schools.com – 76.223.115.82, 13.248.240.135



Screenshot website visit via IP address:





### Assignment 6.3: subnetting

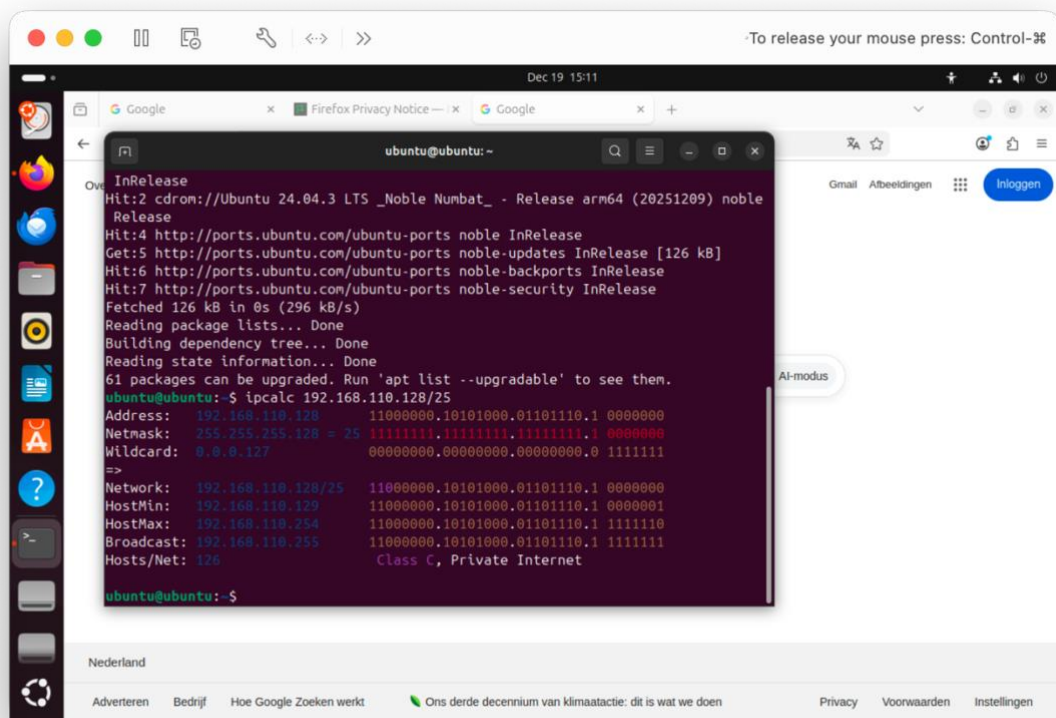
How many IP addresses are in this network configuration 192.168.110.128/25?

- The network 192.168.110.128/25 contains 128 IP addresses in total.

What is the usable IP range to hand out to the connected computers?

- The usable IP range that can be connected to computers runs from 192.168.110.129 to 192.168.110.254.

Check your two previous answers with this Linux command: `ipcalc 192.168.110.128/25`



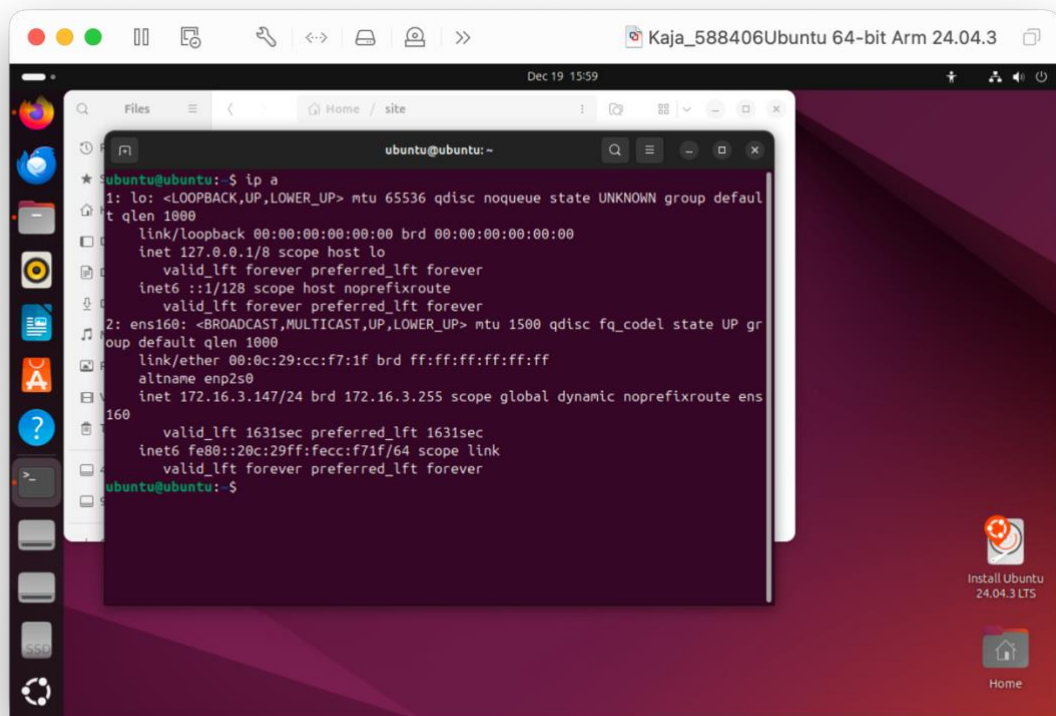
```
ubuntu@ubuntu: ~  
InRelease  
Hit:2 cdrom://Ubuntu 24.04.3 LTS _Noble Numbat_ - Release arm64 (20251209) noble  
Release  
Hit:4 http://ports.ubuntu.com/ubuntu-ports noble InRelease  
Get:5 http://ports.ubuntu.com/ubuntu-ports noble-updates InRelease [126 kB]  
Hit:6 http://ports.ubuntu.com/ubuntu-ports noble-backports InRelease  
Hit:7 http://ports.ubuntu.com/ubuntu-ports noble-security InRelease  
Fetched 126 kB in 0s (296 kB/s)  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
61 packages can be upgraded. Run 'apt list --upgradable' to see them.  
ubuntu@ubuntu:~$ ipcalc 192.168.110.128/25  
Address: 192.168.110.128      11000000.10101000.01101110.1 0000000  
Netmask: 255.255.255.128 = 25 11111111.11111111.11111111.1 00000000  
Wildcard: 0.0.0.127          00000000.00000000.00000000.0 11111111  
=>  
Network: 192.168.110.128/25  11000000.10101000.01101110.1 00000000  
HostMin: 192.168.110.129    11000000.10101000.01101110.1 00000001  
HostMax: 192.168.110.254    11000000.10101000.01101110.1 11111110  
Broadcast: 192.168.110.255  11000000.10101000.01101110.1 11111111  
Hosts/Net: 126              Class C, Private Internet  
ubuntu@ubuntu:~$
```

Explain the above calculation in your own words.

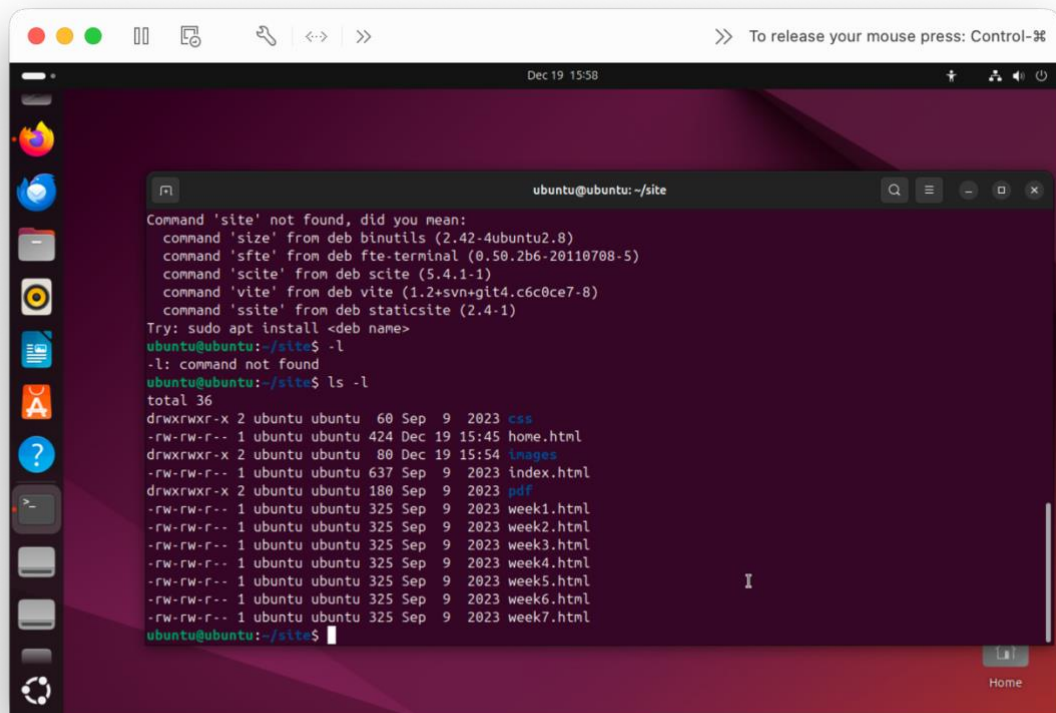
- This output confirms the calculation: with a /25 subnet there are 128 total addresses, where 192.168.110.128 is the network address and 192.168.110.255 is the broadcast address, leaving the usable host range 192.168.110.129 - 192.168.110.254 (126 usable IPs).

### Assignment 6.4: HTML

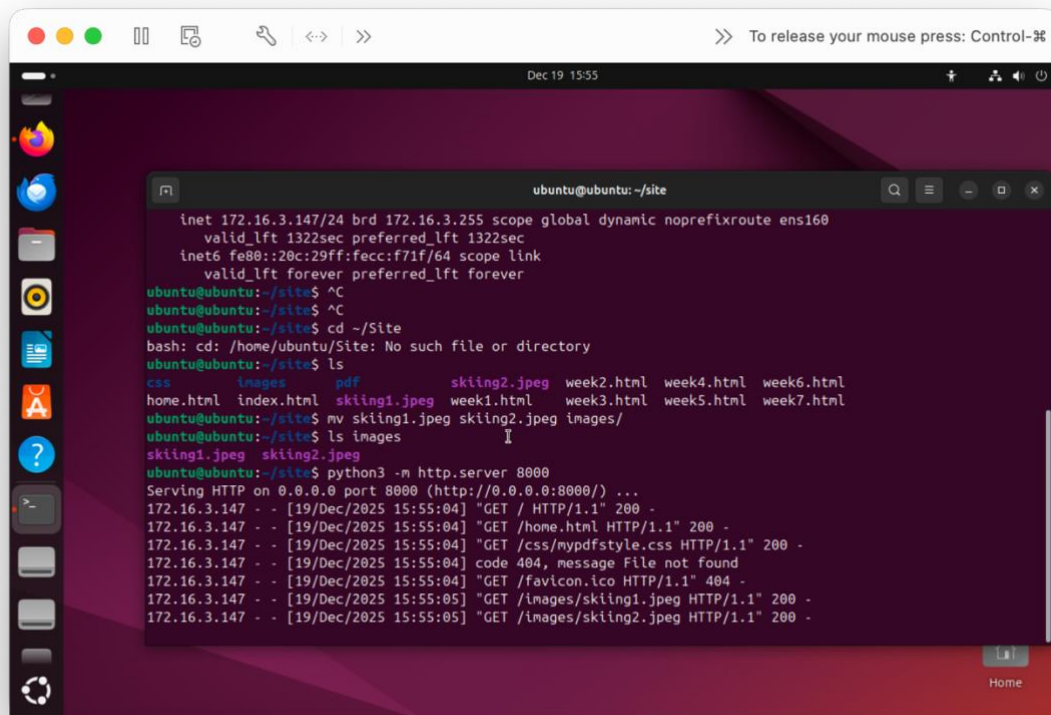
Screenshot IP address Ubuntu VM:



Screenshot of Site directory contents:



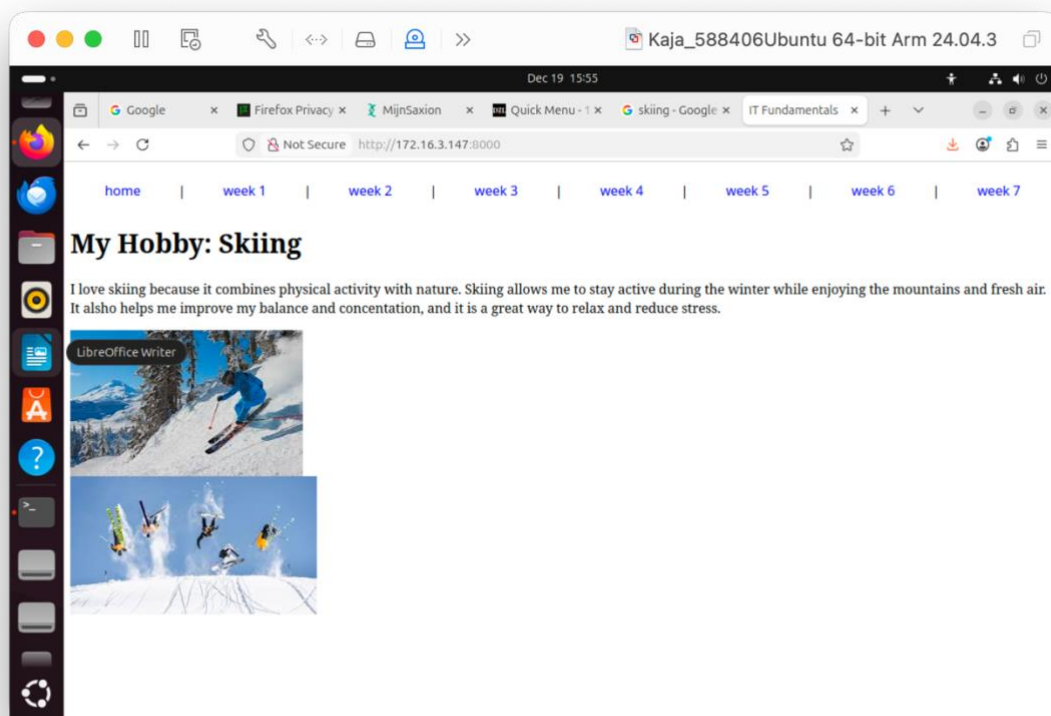
Screenshot python3 webserver command:



```
ubunt@ubuntu:~/site$ cat /etc/network/interfaces
inet 172.16.3.147/24 brd 172.16.3.255 scope global dynamic noprefixroute ens160
    valid_lft 1322sec preferred_lft 1322sec
inet6 fe80::20c:29ff:fecc:f71f/64 scope link
    valid_lft forever preferred_lft forever
ubunt@ubuntu:~/site$ ^C
ubunt@ubuntu:~/site$ ^C
ubunt@ubuntu:~/site$ cd ~/Site
bash: cd: /home/ubunt/Site: No such file or directory
ubunt@ubuntu:~/site$ ls
css      images      pdf          skiing2.jpeg  week2.html  week4.html  week6.html
home.html index.html  skiing1.jpeg  week1.html   week3.html  week5.html  week7.html
ubunt@ubuntu:~/site$ mv skiing1.jpeg skiing2.jpeg images/
ubunt@ubuntu:~/site$ ls images
skiing1.jpeg  skiing2.jpeg
ubunt@ubuntu:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
172.16.3.147 - - [19/Dec/2025 15:55:04] "GET / HTTP/1.1" 200 -
172.16.3.147 - - [19/Dec/2025 15:55:04] "GET /home.html HTTP/1.1" 200 -
172.16.3.147 - - [19/Dec/2025 15:55:04] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
172.16.3.147 - - [19/Dec/2025 15:55:04] code 404, message File not found
172.16.3.147 - - [19/Dec/2025 15:55:04] "GET /favicon.ico HTTP/1.1" 404 -
172.16.3.147 - - [19/Dec/2025 15:55:05] "GET /images/skiing1.jpeg HTTP/1.1" 200 -
172.16.3.147 - - [19/Dec/2025 15:55:05] "GET /images/skiing2.jpeg HTTP/1.1" 200 -
```

Screenshot web browser visits your site





## Assignment 6.5: Network segment

Remember that bitwise java application you've made in week 2? Expand that application so that you can also calculate a network segment as explained in the PowerPoint slides of week 6. Use the bitwise & AND operator. You need to be able to input two Strings. An IP address and a subnet.

IP: 192.168.1.100 and subnet: 255.255.255.224 for /27

Example: 192.168.1.100/27

Calculate the network segment

IP Address: 11000000.10101000.00000001.01100100

Subnet Mask: 11111111.11111111.11111111.11100000

-----  
Network Addr: 11000000.10101000.00000001.01100000

This gives 192.168.1.96 in decimal as the network address.

For a /27 subnet, each segment (or subnet) has 32 IP addresses ( $2^5$ ).

The range of this network segment is from 192.168.1.96 to 192.168.1.127.

Paste source code here, with a screenshot of a working application.

The screenshot shows an IDE window with a dark theme. The top bar includes tabs for 'Sandbox7', 'Sandbox8', and 'Sandbox9', all containing 'Application.java'. The 'Sandbox9' tab is active. The editor displays the following Java code:

```
5 public class Application implements Runnable {
10
11     public void run() {
12         // IP address: 192.168.1.100
13         int[] ip = {192, 168, 1, 100};
14
15         // Subnet mask for /27: 255.255.255.224
16         int[] mask = {255, 255, 255, 224};
17
18         int[] network = new int[4];
19
20         for (int i = 0; i < 4; i++) {...}
21
22         System.out.println("Network address:");
23         System.out.println(
24             network[0] + "." +
25             network[1] + "." +
26             network[2] + "." +
27             network[3]
28         );
29     }
30 }
31
32 }
```

Below the editor is a 'Run' panel with a tab for 'Application'. It shows the command used to run the application:

```
-Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath
/Users/kajacingerla/Downloads/Sandbox/out/production/Sandbox9:/Users/kajacingerla/Downloads/Sandbox
/resources/SaxionApp.jar Application
```

The output of the application is displayed below the command:

```
= SaxionApp version: 1.0.1 =
Network address:
192.168.1.96
```

At the bottom of the Run panel, it states: 'Process finished with exit code 0'.

The status bar at the bottom of the IDE shows the file path: 'irs > kajacingerla > Downloads > Sandbox > Sandbox9 > src > Application > run', the time '30:11', the line format 'LF', the encoding 'UTF-8', and the indentation '4 spaces'.

Ready? Save this file and export it as a pdf file with the name: [week6.pdf](#)