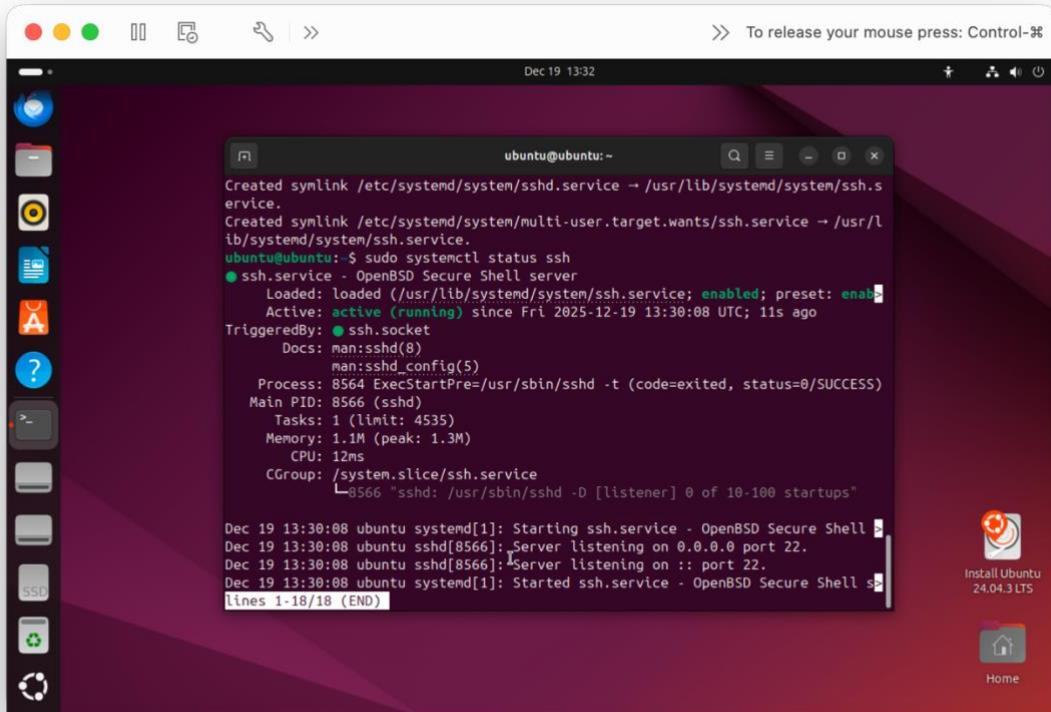


Week 6 – Networking

Student number: 588406

Assignment 6.1: Working from home

Screenshot installation openssh-server:



The screenshot shows a terminal window on a dark-themed desktop environment. The terminal title is "ubuntu@ubuntu:~". The user has run the command "sudo systemctl status ssh" and is viewing the output. The output shows the ssh service is active and running, with a process ID of 8566. The terminal also displays log messages from the system log at the bottom.

```
Created symlink /etc/systemd/system/sshd.service → /usr/lib/systemd/system/sshd.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:

A screenshot of a Windows PowerShell window titled "ubuntu@ubuntu: ~". The window shows the following command and its output:

```
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:~$ |
```

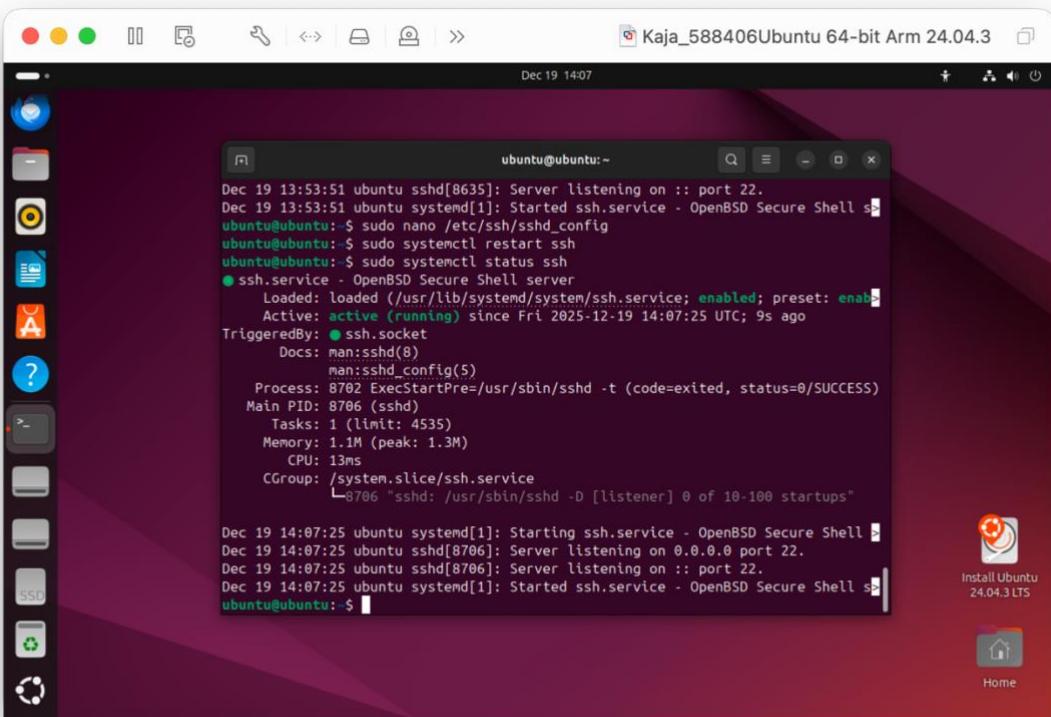
A screenshot of a Windows PowerShell window showing the following commands and their results:

```
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>
```



```
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> |
```

```
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:

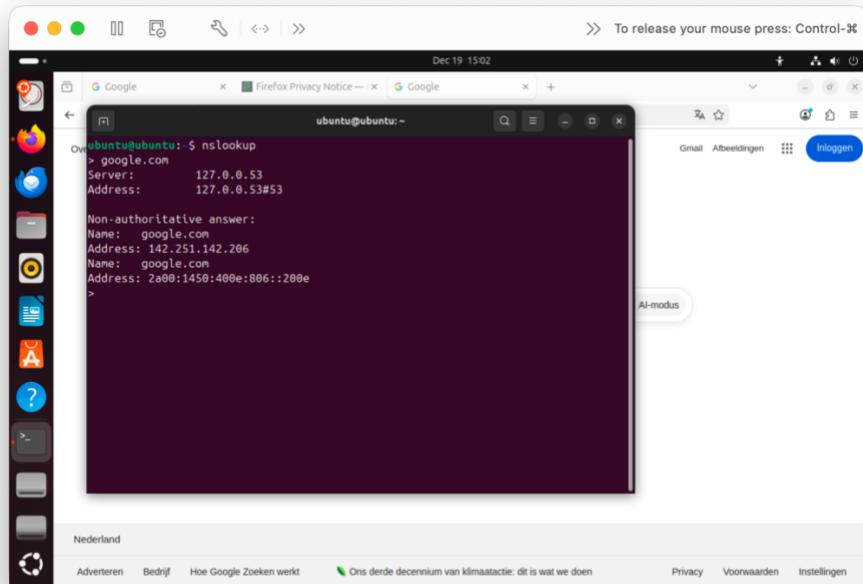
Screenshot remmina:

Assignment 6.2: IP addresses websites

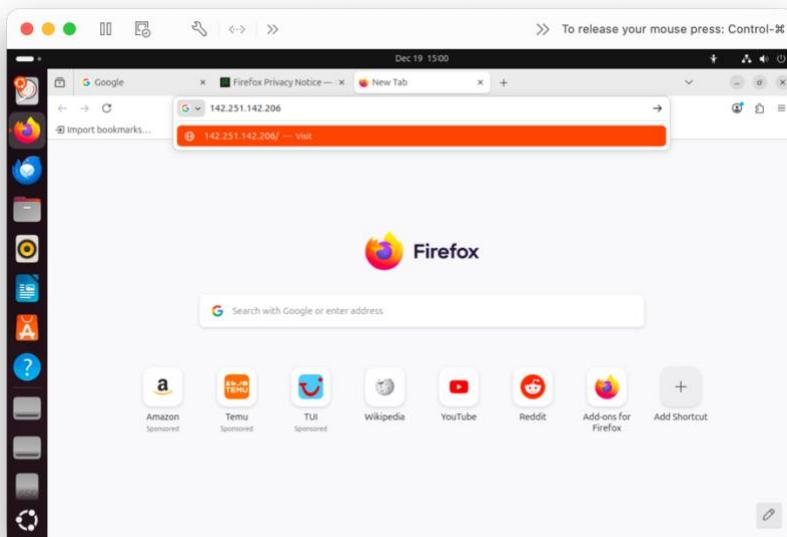
Relevant screenshots nslookup command:

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, 8.8.4.4, 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`

The screenshot shows a Linux desktop environment with a terminal window open. The terminal window title is "ubuntu@ubuntu:~". The terminal displays the following output of the ipcalc command:

```
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  00000000
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

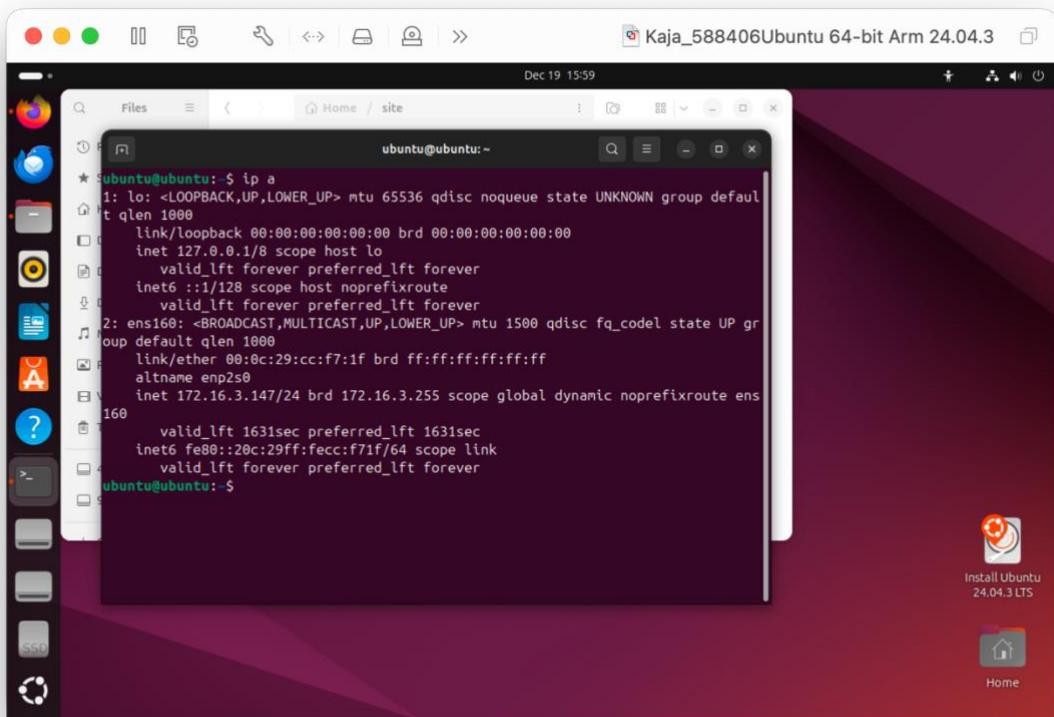
ubuntu@ubuntu: ~$
```

Explain the above calculation in your own words.

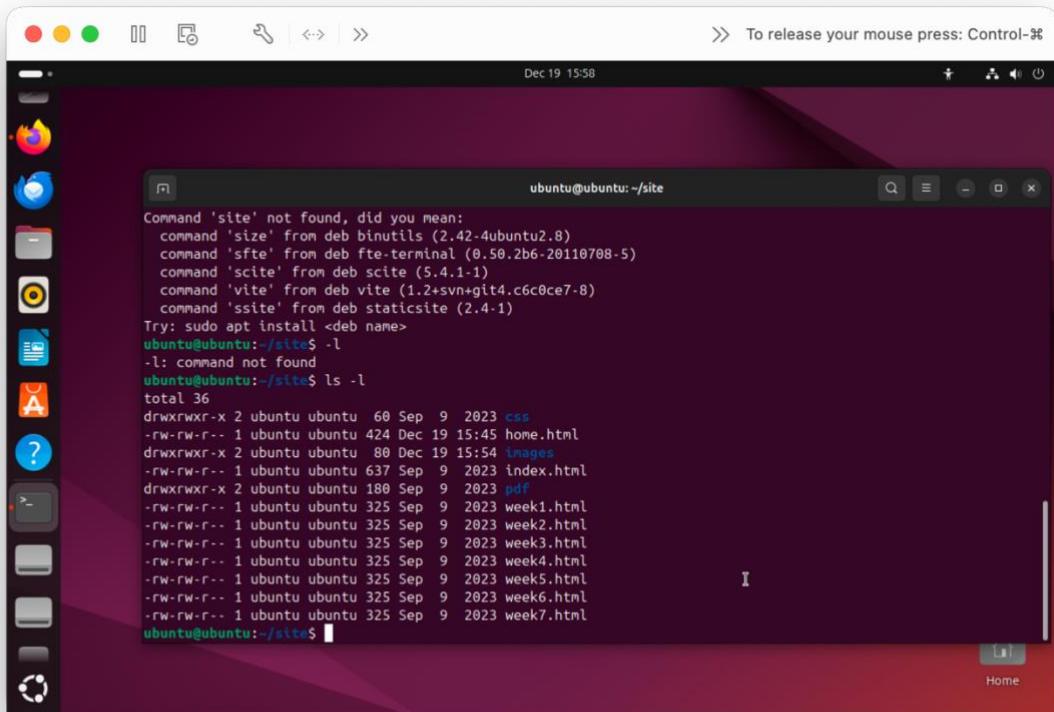
- This output confirms the calculation: with a /25 subnet there are 128 total addresses, where 192.168.110.128 is the network address and 192.168.110.255 is the broadcast address, leaving the usable host range 192.168.110.129 - 192.168.110.254 (126 usable IPs).

Assignment 6.4: HTML

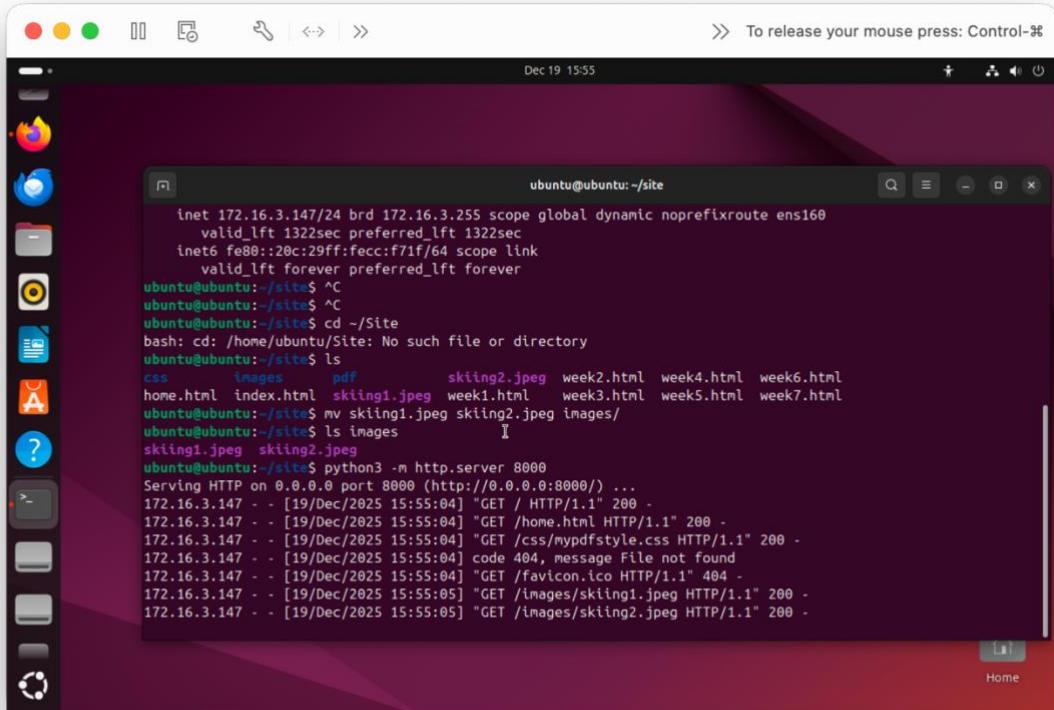
Screenshot IP address Ubuntu VM:



Screenshot of Site directory contents:



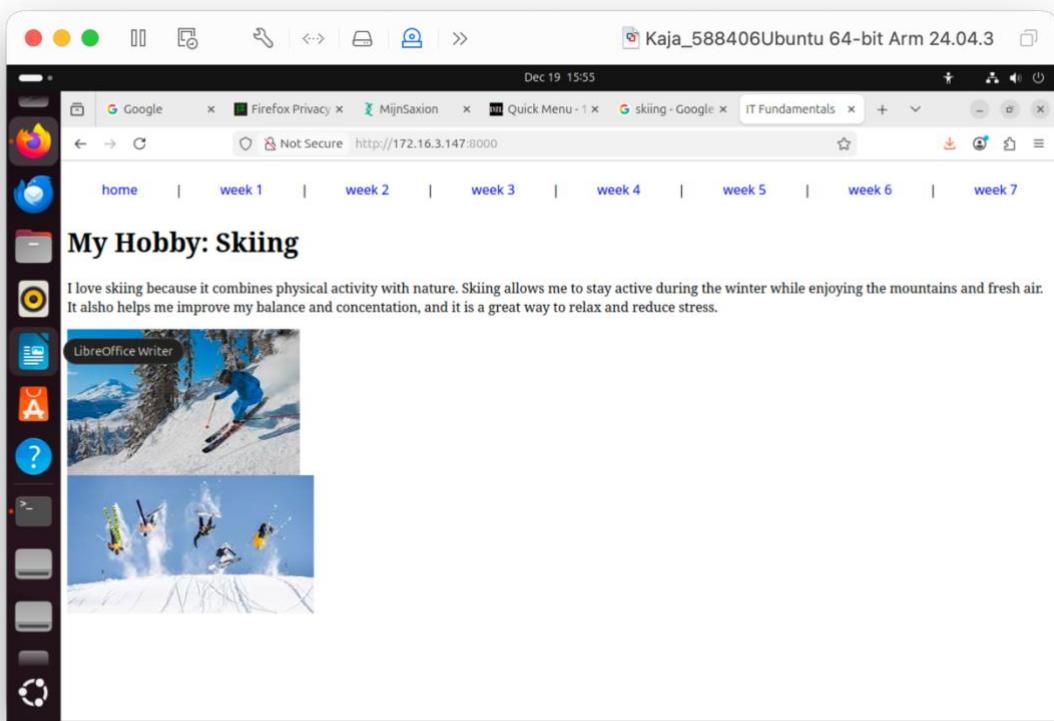
Screenshot python3 webserver command:



A screenshot of a terminal window titled "ubuntu@ubuntu: ~/site". The window shows a command-line session where the user runs "python3 -m http.server 8000". The terminal output displays the server's log, showing various HTTP requests from the IP address 172.16.3.147, such as "GET / HTTP/1.1" and "GET /css/mypdfstyle.css HTTP/1.1". The terminal is part of a desktop environment with a dock containing icons for various applications like a browser, file manager, and terminal.

```
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
ubuntu@ubuntu:~/site$ ^C
ubuntu@ubuntu:~/site$ ^C
ubuntu@ubuntu:~/site$ cd ~/Site
bash: cd: /home/ubuntu/Site: No such file or directory
ubuntu@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
ubuntu@ubuntu:~/site$ mv skiing1.jpeg skiing2.jpeg images/
ubuntu@ubuntu:~/site$ ls images
skiing1.jpeg  skiing2.jpeg
ubuntu@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.

A screenshot of a Java application running in a terminal window. The terminal shows the command used to run the application and its output. The output includes the application's version, the network address, and the process finishing with exit code 0.

```
-Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath /Users/kajacingera/Downloads/Sandbox/out/production/Sandbox9:/Users/kajacingera/Downloads/Sandbox/resources/SaxionApp.jar Application  
= SaxionApp version: 1.0.1 =  
Network address:  
192.168.1.96  
Process finished with exit code 0
```

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