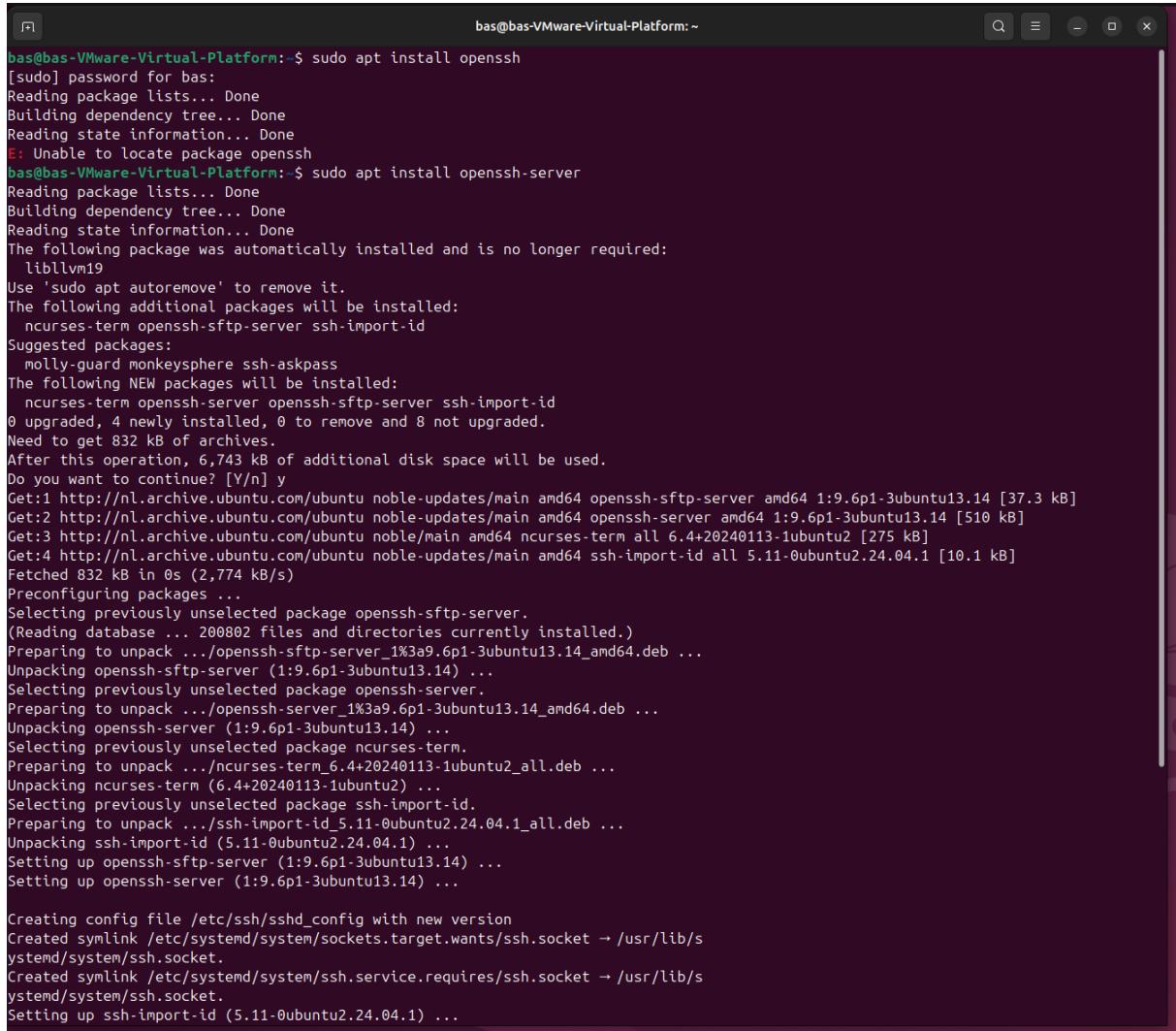


Template Week 6 - Networking

Student number:582840

Assignment 6.1: Working from home

Screenshot installation openssh-server:



```
bas@bas-VMware-Virtual-Platform:~$ sudo apt install openssh
[sudo] password for bas:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package openssh
bas@bas-VMware-Virtual-Platform:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  liblvm19
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
0 upgraded, 4 newly installed, 0 to remove and 8 not upgraded.
Need to get 832 kB of archives.
After this operation, 6,743 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-sftp-server amd64 1:9.6p1-3ubuntu13.14 [37.3 kB]
Get:2 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-server amd64 1:9.6p1-3ubuntu13.14 [510 kB]
Get:3 http://nl.archive.ubuntu.com/ubuntu noble/main amd64 ncurses-term all 6.4+20240113-1ubuntu2 [275 kB]
Get:4 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 ssh-import-id all 5.11-0ubuntu2.24.04.1 [10.1 kB]
Fetched 832 kB in 0s (2,774 kB/s)
Preconfiguring packages ...
Selecting previously unselected package openssh-sftp-server.
(Reading database ... 200802 files and directories currently installed.)
Preparing to unpack .../openssh-sftp-server_1%3a9.6p1-3ubuntu13.14_amd64.deb ...
Unpacking openssh-sftp-server (1:9.6p1-3ubuntu13.14) ...
Selecting previously unselected package openssh-server.
Preparing to unpack .../openssh-server_1%3a9.6p1-3ubuntu13.14_amd64.deb ...
Unpacking openssh-server (1:9.6p1-3ubuntu13.14) ...
Selecting previously unselected package ncurses-term.
Preparing to unpack .../ncurses-term_6.4+20240113-1ubuntu2_all.deb ...
Unpacking ncurses-term (6.4+20240113-1ubuntu2) ...
Selecting previously unselected package ssh-import-id.
Preparing to unpack .../ssh-import-id_5.11-0ubuntu2.24.04.1_all.deb ...
Unpacking ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up openssh-sftp-server (1:9.6p1-3ubuntu13.14) ...
Setting up openssh-server (1:9.6p1-3ubuntu13.14) ...

Creating config file /etc/ssh/sshd_config with new version
Created symlink /etc/systemd/system/sockets.target.wants/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
```

Screenshot successful SSH command execution:

```

C:\Users\Bas>ssh 192.168.213.129
The authenticity of host '192.168.213.129 (192.168.213.129)' can't be established.
ED25519 key fingerprint is SHA256:YXtfRGgUhmmaMfAqb56AGEAldYnEjOuljDV7TNC/Wf8.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.213.129' (ED25519) to the list of known hosts.
bas@192.168.213.129's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-37-generic x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

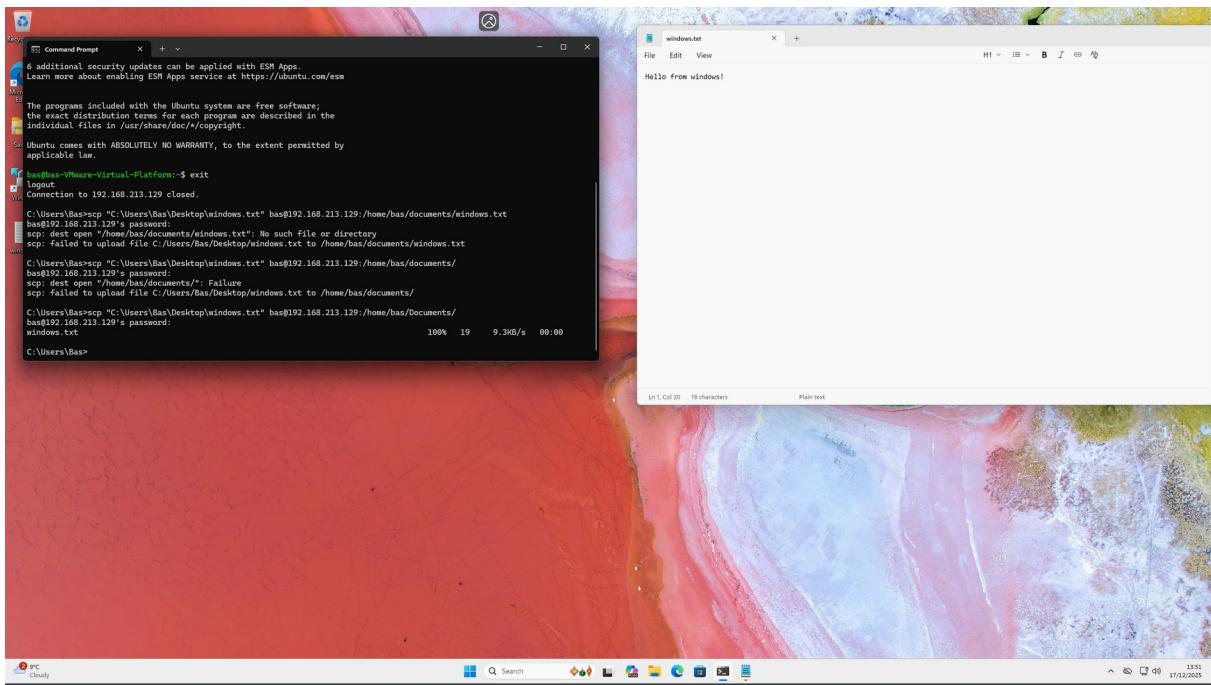
6 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

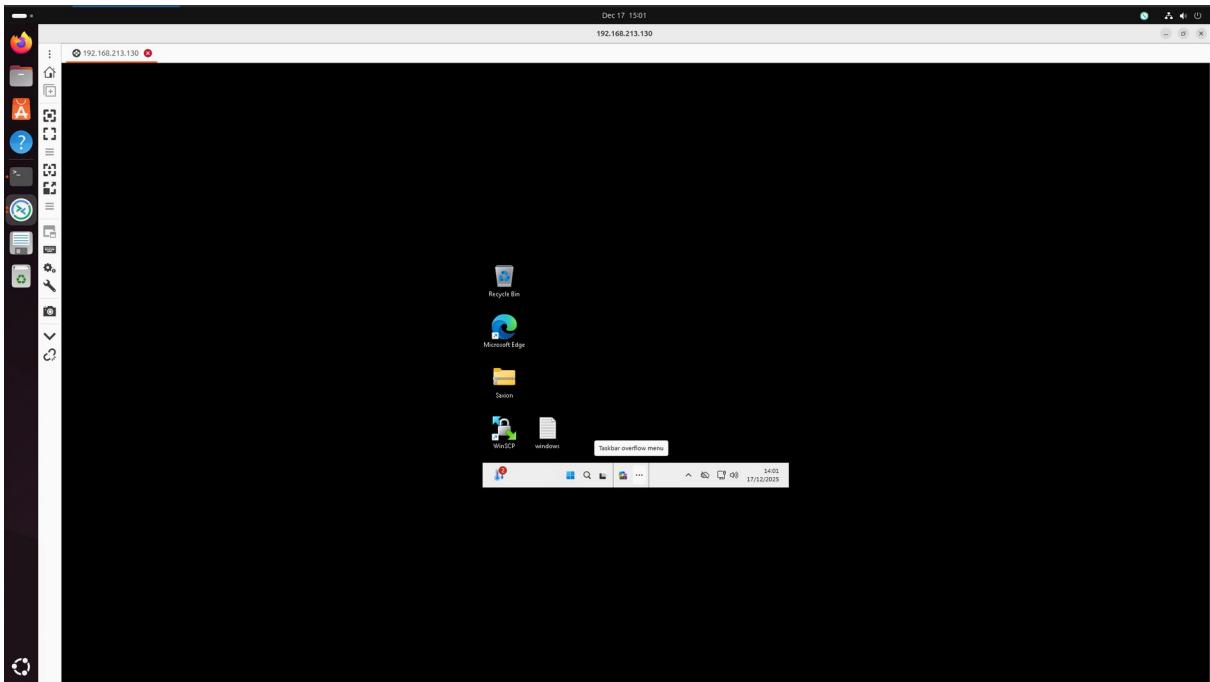
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

bas@bas-VMware-Virtual-Platform:~$
```

Screenshot successful execution SCP command:



Screenshot remmina:



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

```
Dec 17 15:06 bas@bas:~$ nslookup
> amazon.com
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: amazon.com
Address: 98.82.161.185
Name: amazon.com
Address: 98.87.170.74
Name: amazon.com
Address: 98.87.170.71
> google.com
Server: 127.0.0.53
Address: 127.0.0.53#53

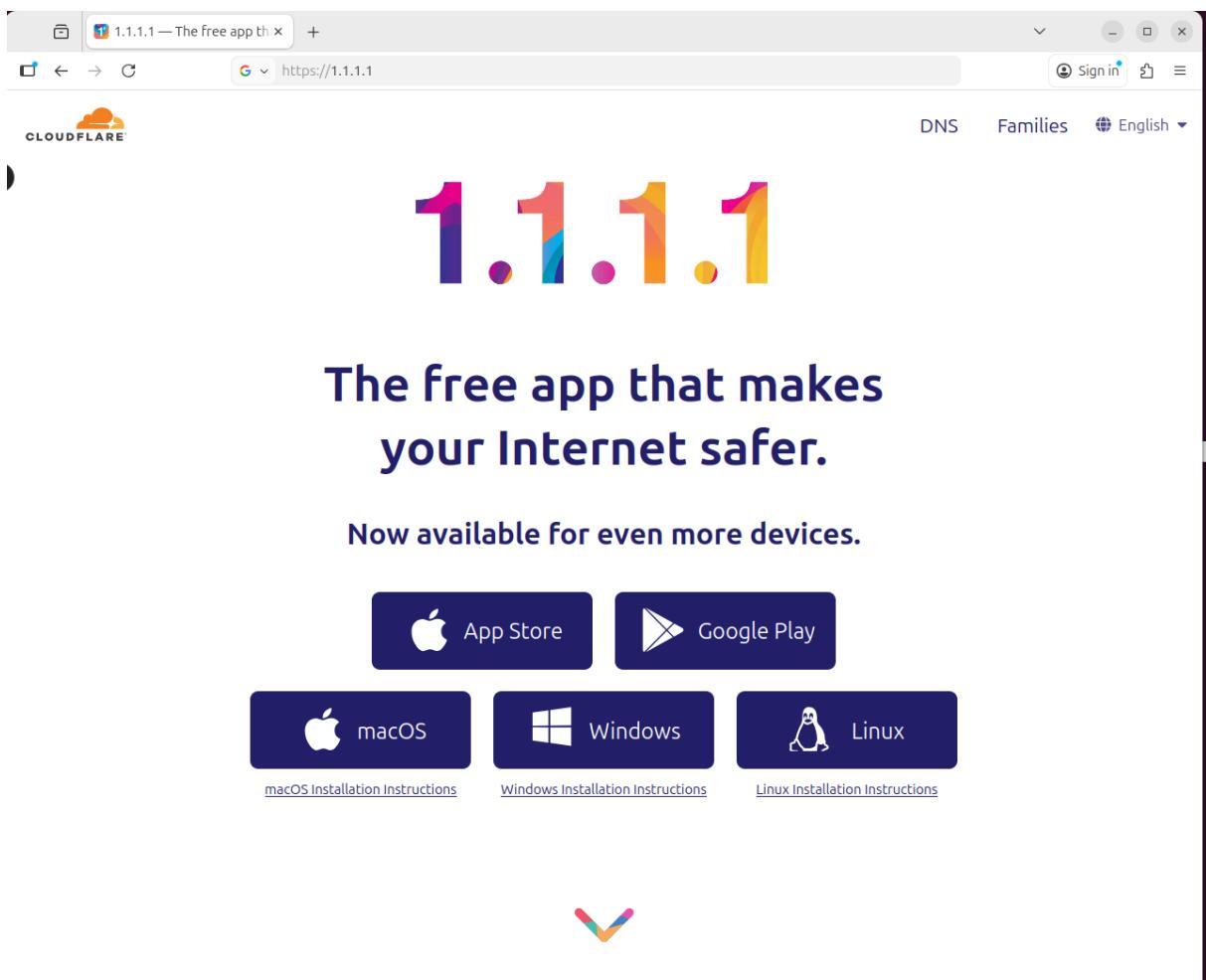
Non-authoritative answer:
Name: google.com
Address: 142.25.179.174
Name: google.com
Address: 2a00:1450:400e:804::200e
> one.one.one.one
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: one.one.one.one
Address: 1.1.1.1
Name: one.one.one.one
Address: 1.0.0.1
Name: one.one.one.one
Address: 2a00:1450:400e:1001
Name: one.one.one.one
Address: 2606:4700:4700::1111
> dns.google.com
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: dns.google.com
Address: 8.8.4.4
Name: dns.google.com
Address: 8.8.8.8
Name: dns.google.com
Address: 2001:4860:4860::8844
Name: dns.google.com
Address: 2001:4860:4860::8888
```

```
Dec 17 15:00  
bas@bas-VMware-Virtual-Platform:~  
  
Address: 98.87.170.74  
Name: amazon.com  
Address: 98.87.170.71  
> www.amazon.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: google.com  
Address: 142.258.179.174  
Name: google.com  
Address: 2a00:1450:40e0::804::200e  
> one.one.one.one  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: one.one.one.one  
Address: 1.1.1.1  
Name: cloudflare.dns  
Address: 1.0.0.1  
Name: one.one.one.one  
Address: 2606:4700:4700::1001  
Name: one.one.one.one  
Address: 2606:4700:4700::1111  
> dns.google.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: dns.google.com  
Address: 8.8.4.4  
Name: dns.google.com  
Address: 8.8.8.8  
Name: dns.google.com  
Address: 2001:4800:4860::8B44  
Name: dns.google.com  
Address: 2001:4800:4860::8B88  
> bol.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: w3schools.com  
Address: 79.177.177.188.42  
> w3schools.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
  
Non-authoritative answer:  
Name: w3schools.com  
Address: 13.248.248.135  
Name: w3schools.com  
Address: 76.223.115.82
```

Screenshot website visit via IP address:



Assignment 6.3: subnetting

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

128 in totaal.

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

Waarvan 126 bruikbaar.

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

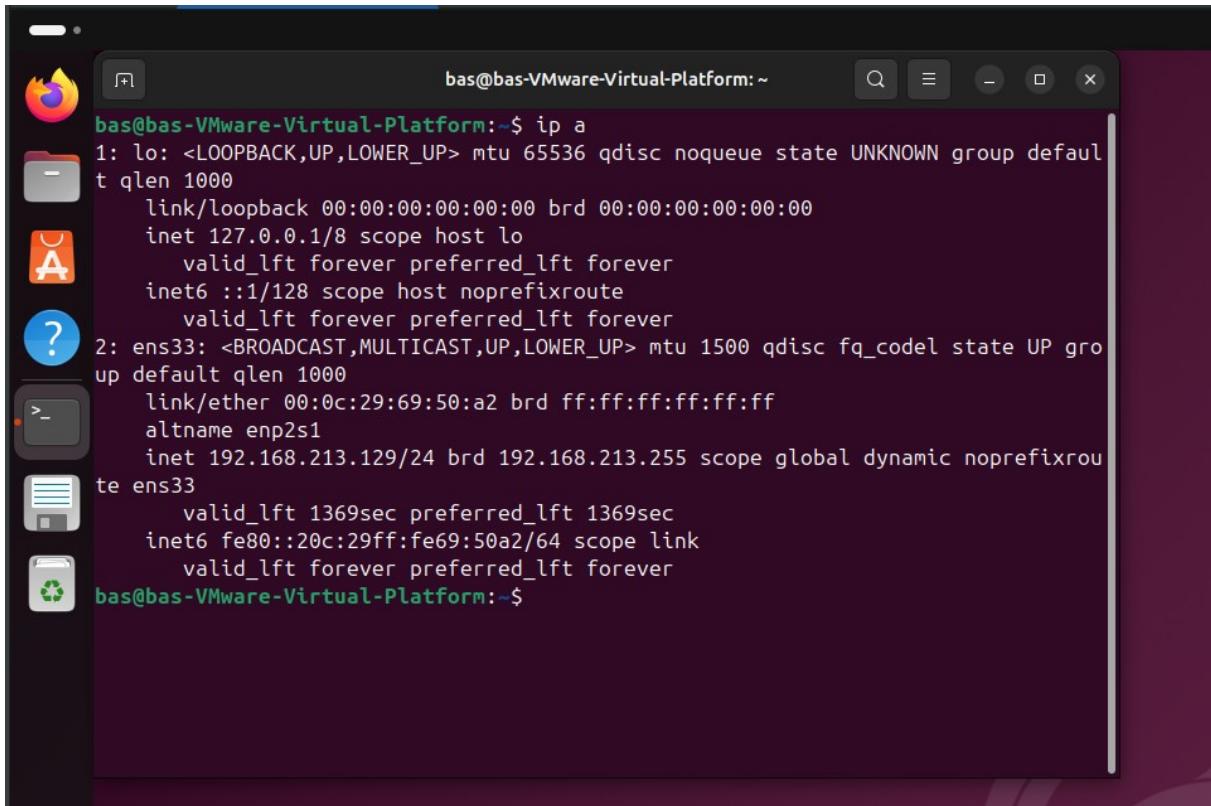
```
bas@bas-VMware-Virtual-Platform:~$ ipcalc 192.168.110.128/25
Address: 192.168.110.128      11000000.10101001.01101110.1 00000000
Netmask: 255.255.255.128 = 25 11111111.11111111.11111111.1 00000000
Wildcard: 0.0.0.127          00000000.00000000.00000000.0 11111111
=>
Network: 192.168.110.128/25  11000000.10101001.01101110.1 00000000
HostMin: 192.168.110.129    11000000.10101001.01101110.1 00000001
HostMax: 192.168.110.254    11000000.10101001.01101110.1 11111110
Broadcast: 192.168.110.255   11000000.10101001.01101110.1 11111111
Hosts/Net: 126              Class C
```

Explain the above calculation in your own words.

Er zijn 7 bits beschikbaar voor de IP range. $2^0+2^1+2^2+2^3+2^4+2^5+2^6=127$ dus je hebt 128 IPs in totaal. Hiervan is de eerste en laatste gereserveerd. De eerste voor de netwerk name en de laatste als broadcast IP. Hierdoor zijn er nog 126 IPs beschikbaar.

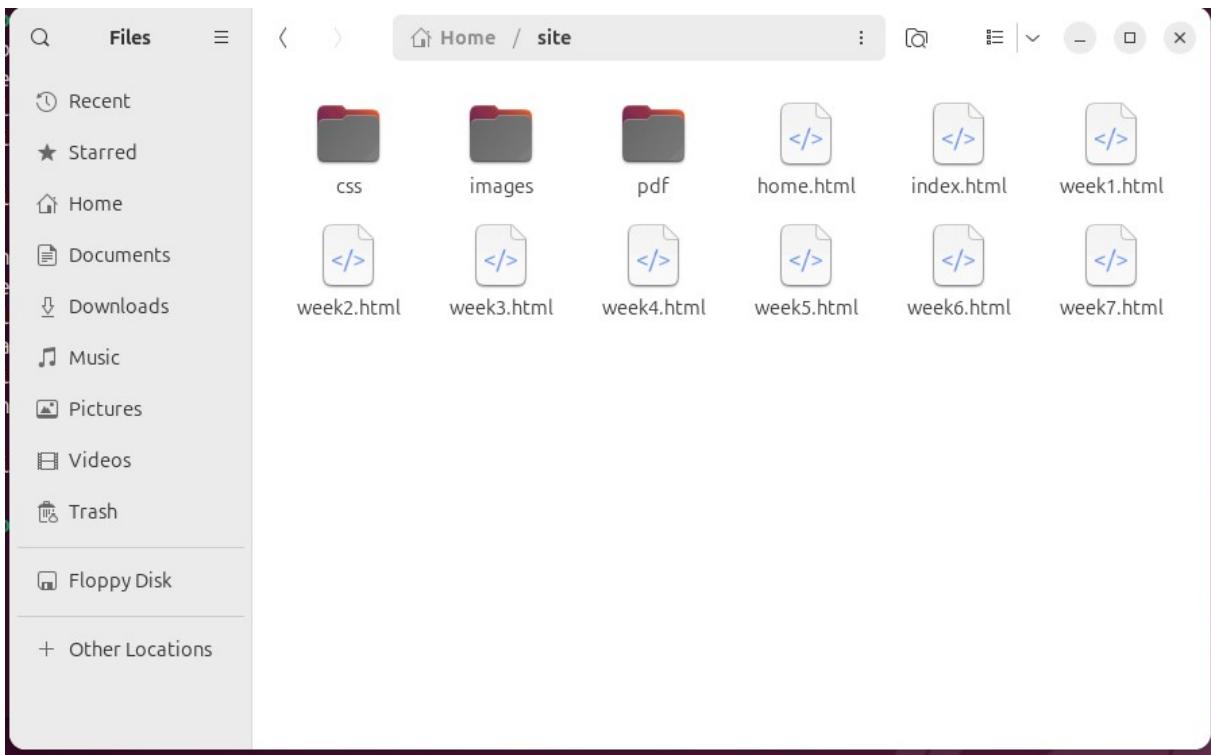
Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

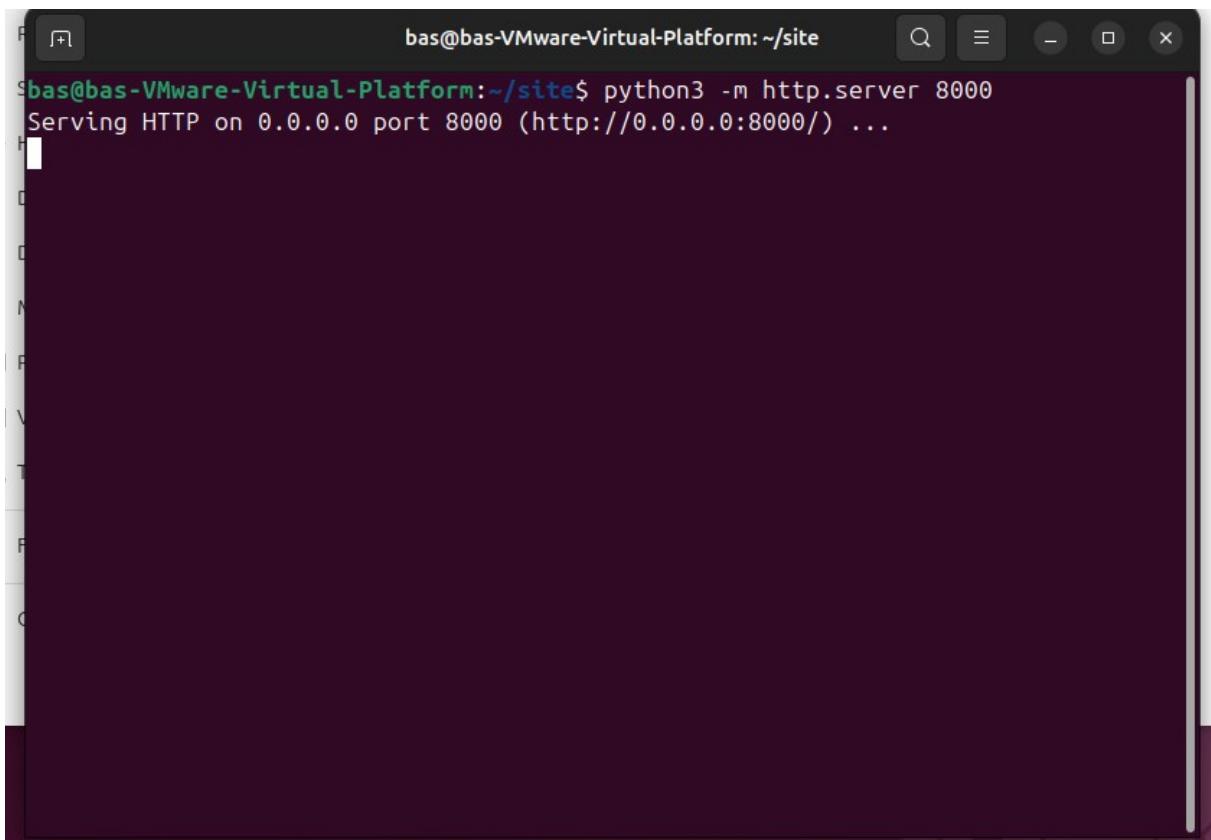


```
bas@bas-VMware-Virtual-Platform:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope 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:29:69:50:a2 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.213.129/24 brd 192.168.213.255 scope global dynamic noprefixroute
        valid_lft 1369sec preferred_lft 1369sec
        inet6 fe80::20c:29ff:fe69:50a2/64 scope link
            valid_lft forever preferred_lft forever
bas@bas-VMware-Virtual-Platform:~$
```

Screenshot of Site directory contents:

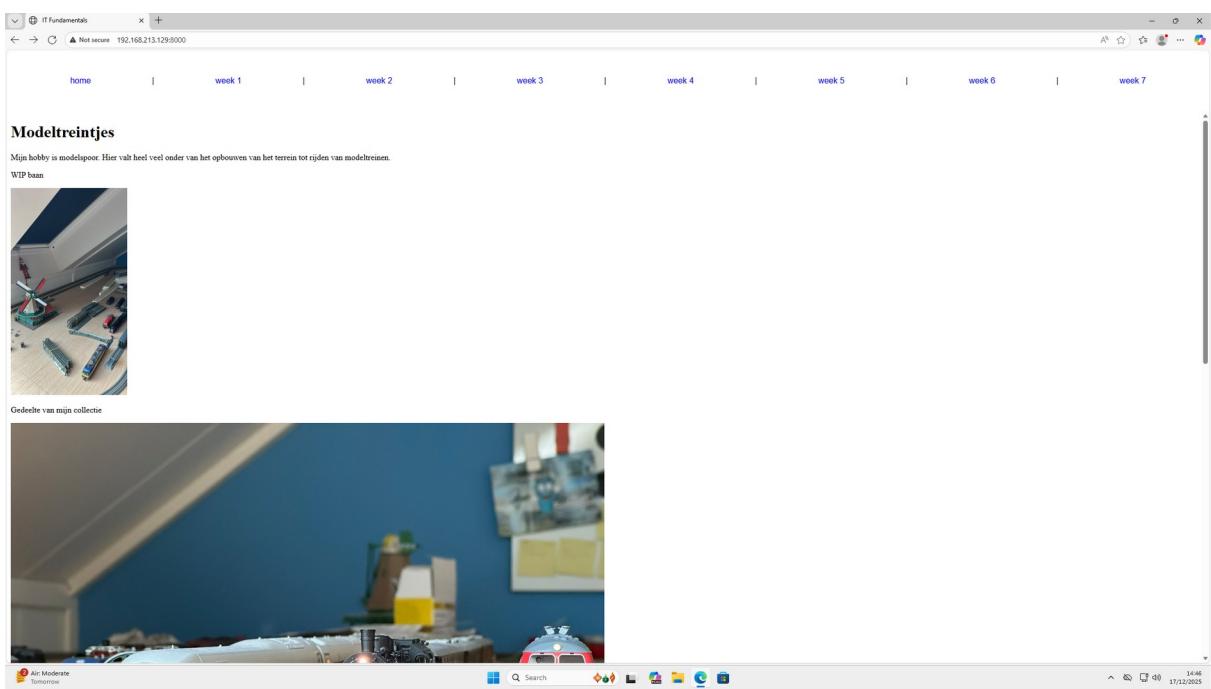


Screenshot python3 webserver command:



```
bas@bas-VMware-Virtual-Platform:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

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.

```

import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        // Vraag IP en subnetmasker
        System.out.print("Voer IP-adres in: ");
        String ipStr = sc.nextLine();
        System.out.print("Voer subnetmasker in:: ");
        String maskStr = sc.nextLine();

        // Zet IP en masker om naar int
        int ip = ipToInt(ipStr);
        int mask = ipToInt(maskStr);

        // Bereken network address met bitwise AND
        int network = ip & mask;

        // Print binaire weergave
        System.out.println("IP Address: " + toBinary(ip));
        System.out.println("Subnet Mask: " + toBinary(mask));
        System.out.println("-----");
        System.out.println("Network Addr: " + toBinary(network));

        sc.close();
    }

    // Zet IP string naar int
    private static int ipToInt(String ip) {
        String[] parts = ip.split("\\.");
        int result = 0;
        for (int i = 0; i < 4; i++) {
            result = (result << 8) | Integer.parseInt(parts[i]);
        }
        return result;
    }

    // Zet int naar binaire dotted string
    private static String toBinary(int value) {
        StringBuilder sb = new StringBuilder();
        for (int i = 3; i >= 0; i--) {
            int octet = (value >> (i * 8)) & 0xFF;
            String bin = String.format("%8s", Integer.toBinaryString(octet)).replace(' ', '0');
            sb.append(bin);
            if (i > 0) sb.append(".");
        }
    }
}

```

```
        return sb.toString();
    }
}
```

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