

# Template Week 6 – Networking

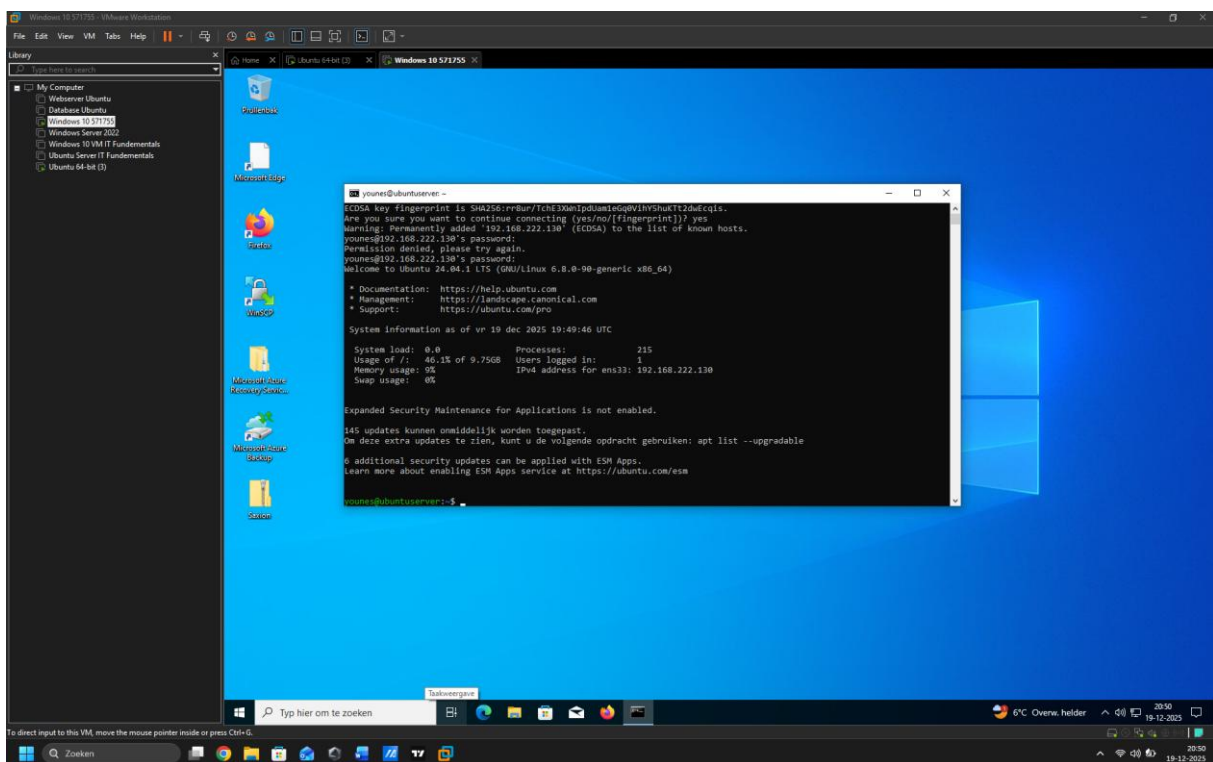
Student number: 571755

## Assignment 6.1: Working from home

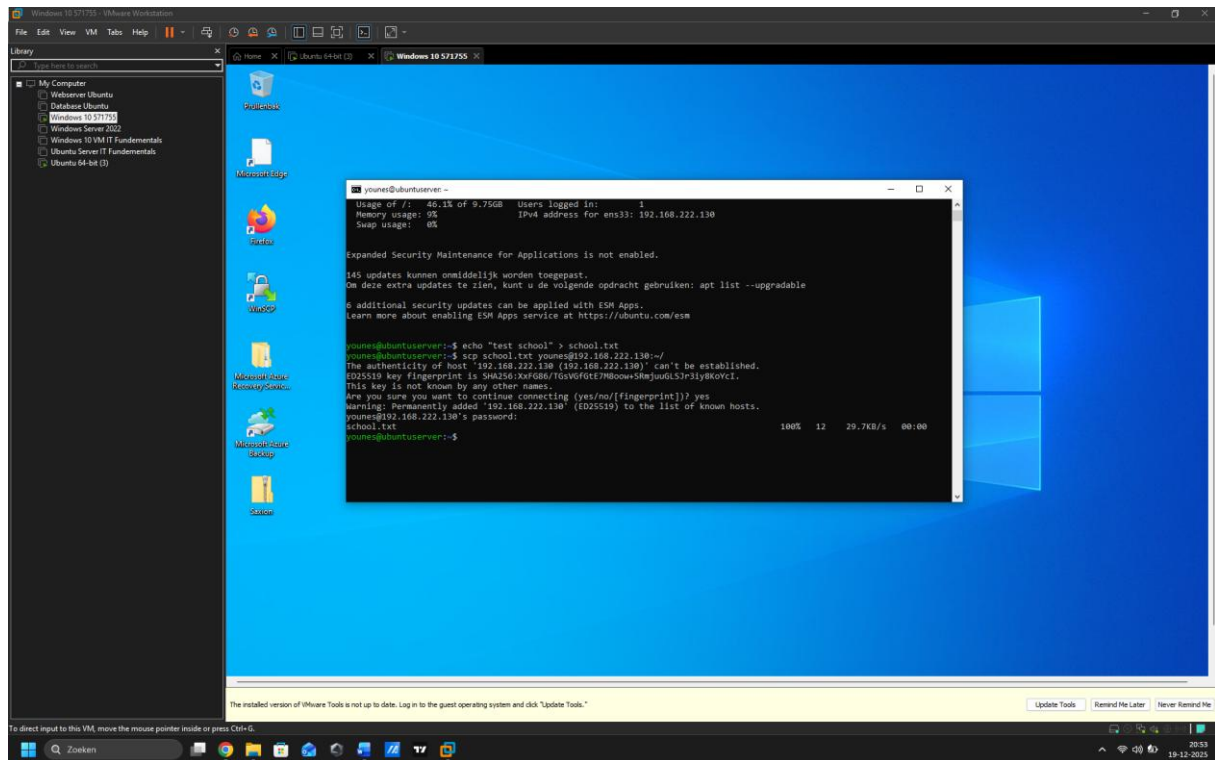
Screenshot installation openssh-server:

```
younes@ubuntu:~$ sudo apt update && sudo apt install openssh-server -y
[sudo] password for younes:
Geraakt:1 http://nl.archive.ubuntu.com/ubuntu noble InRelease [126 kB]
Geraakt:2 http://nl.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Geraakt:3 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Geraakt:4 http://nl.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Geraakt:5 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1.684 kB]
Geraakt:6 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21,5 kB]
Geraakt:7 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Geraakt:8 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [71,5 kB]
Geraakt:9 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 B]
Geraakt:10 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Geraakt:11 http://nl.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [2.443 kB]
Geraakt:12 http://nl.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Geraakt:13 http://nl.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1.506 kB]
Geraakt:14 http://nl.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [378 kB]
Geraakt:15 http://nl.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [30,3 kB]
Geraakt:16 http://nl.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Geraakt:17 http://nl.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7.284 B]
Geraakt:18 http://nl.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Geraakt:19 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [33,0 kB]
Geraakt:20 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [17,9 kB]
Geraakt:21 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [10,5 kB]
Geraakt:22 http://nl.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
6.728 kB opgehaald in 1s (4.727 kB/s)
Pakketlijsten worden ingelezen... Klaar
Boom van vereisten wordt opgebouwd... Klaar
De statusinformatie wordt gelezen... Klaar
139 pakketten kunnen opgewaardeerd worden. Voer 'apt list --upgradable' uit om ze te zien.
Pakketlijsten worden ingelezen... Klaar
Boom van vereisten wordt opgebouwd... Klaar
De statusinformatie wordt gelezen... Klaar
openssh-server is reeds de nieuwste versie (1:9.6p1-3ubuntu13.14).
0 opgewaardeerd, 0 nieuw geïnstalleerd, 0 te verwijderen en 139 niet opgewaardeerd.
younes@ubuntu:~$ _
```

Screenshot successful SSH command execution:



Screenshot successful execution SCP command:



Screenshot remmina:

Deze kreeg ik niet aan de praat, ik weet precies hoe het moest, dit is wat ik had gedaan.

Windows VM -> Instellingen -> Systeem -> Extern bureaublad aan

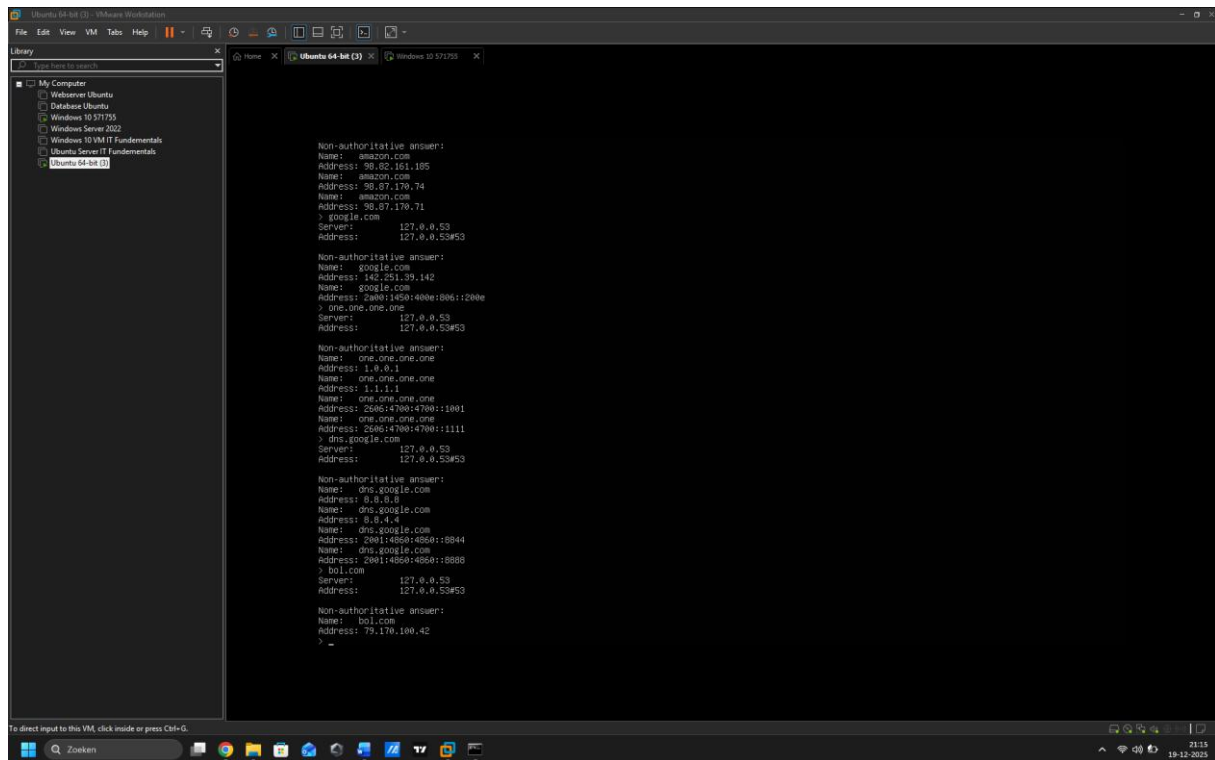
Ubuntu VM. **Remmina** openen

Windows VM in (zoek dit op Windows op met ipconfig) en klik op verbinden.

Via daar ben je dan connected, maar kreeg steeds error terwijl ik alle ip adres goed had

## Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:



```
Non-authoritative answer:
Name:   amazon.com
Address: 98.82.161.185
Name:   amazon.com
Address: 98.87.178.74
Name:   amazon.com
Address: 98.87.178.71
> google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.251.39.142
Name:   google.com
Address: 2a00:1450:400e:806::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: 1.1.1.1
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: 8.8.8.8
Name:   dns.google.com
Address: 8.8.4.4
Name:   dns.google.com
Address: 2001:4860:4860::8844
Name:   dns.google.com
Address: 2001:4860:4860::8888
> bol.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   bol.com
Address: 79.170.160.42
> _
```

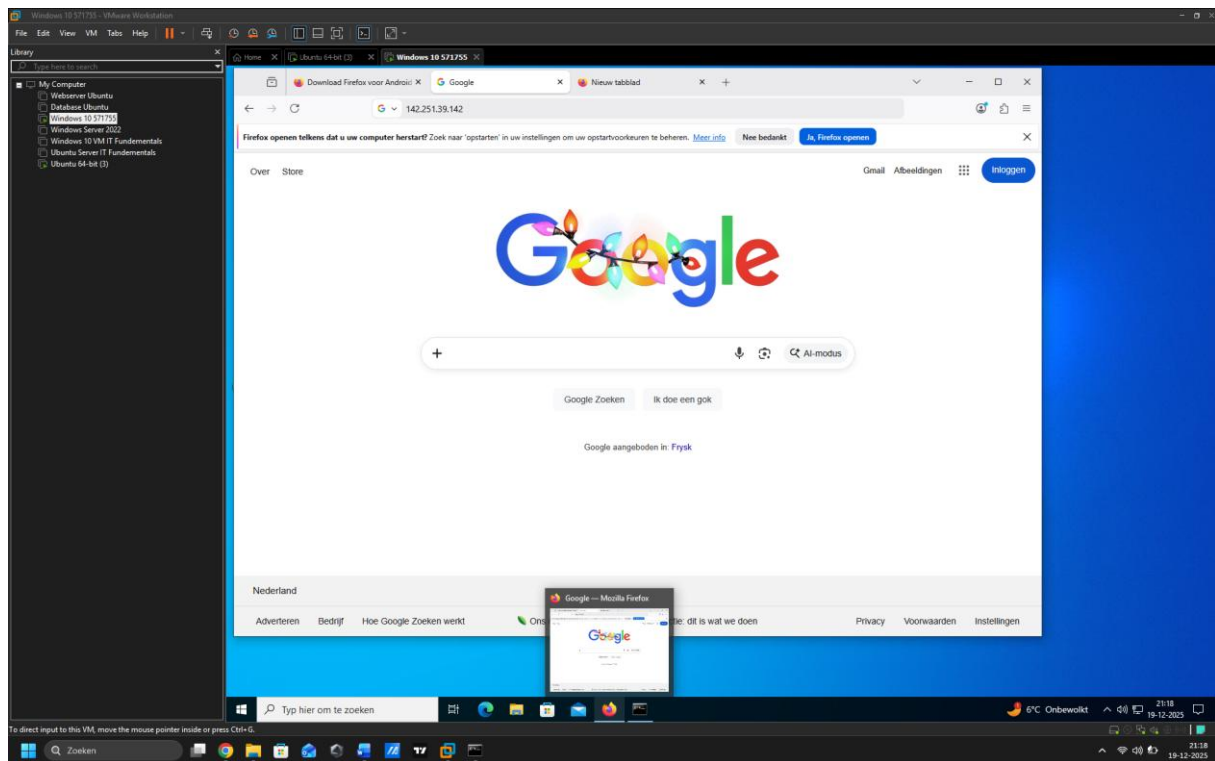
```
Name:  dns.google.com
Address: 8.8.8.8
Name:  dns.google.com
Address: 8.8.4.4
Name:  dns.google.com
Address: 2001:4860:4860::8844
Name:  dns.google.com
Address: 2001:4860:4860::8888
> bol.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:  bol.com
Address: 79.170.100.42
> w3schools.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:  w3schools.com
Address: 13.248.240.135
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?

Een /25 subnet betekent dat er 128 adressen in het netwerk zitten, want

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

Het bereik is **192.168.110.129 t/m 192.168.110.254**

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

```
younes@ubuntuserver:~$ sudo apt update && sudo apt install ipcalc -y
[sudo] password for younes:
Geraakt:1 http://nl.archive.ubuntu.com/ubuntu noble InRelease
Geraakt:2 http://nl.archive.ubuntu.com/ubuntu noble-updates InRelease
Geraakt:3 http://nl.archive.ubuntu.com/ubuntu noble-backports InRelease
Geraakt:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Pakketlijsten worden ingelezen... Klaar
Boom van vereisten wordt opgebouwd... Klaar
De statusinformatie wordt gelezen... Klaar
139 pakketten kunnen opgewaardeerd worden. Voer 'apt list --upgradable' uit om ze te zien.
Pakketlijsten worden ingelezen... Klaar
Boom van vereisten wordt opgebouwd... Klaar
De statusinformatie wordt gelezen... Klaar
De volgende NIEUWE pakketten zullen geïnstalleerd worden:
  ipcalc
0 opgewaardeerd, 1 nieuw geïnstalleerd, 0 te verwijderen en 139 niet opgewaardeerd.
Er moeten 24,5 kB aan archieven opgehaald worden.
Na deze bewerking zal er 72,7 kB extra schijfruimte gebruikt worden.
Ophalen:1 http://nl.archive.ubuntu.com/ubuntu noble/universe amd64 ipcalc all 0.51-1 [24,5
24,5 kB opgehaald in 0s (348 kB/s)
Voorheen niet geselecteerd pakket ipcalc wordt geselecteerd.
(Database wordt ingelezen ... 88834 bestanden en mappen momenteel geïnstalleerd.)
Uitpakken van .../archives/ipcalc_0.51-1_all.deb wordt voorbereid...
Bezig met uitpakken van ipcalc (0.51-1) ...
Instellen van ipcalc (0.51-1) ...
Bezig met afhandelen van triggers voor man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
younes@ubuntuserver:~$ 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 0000000
Wildcard:  0.0.0.127           00000000.00000000.00000000.0 1111111
=>
Network:   192.168.110.128/25   11000000.10101000.01101110.1 0000000
HostMin:   192.168.110.129      11000000.10101000.01101110.1 0000001
HostMax:   192.168.110.254      11000000.10101000.01101110.1 1111110
Broadcast: 192.168.110.255      11000000.10101000.01101110.1 1111111
Hosts/Net: 126                  Class C, Private Internet

younes@ubuntuserver:~$
```

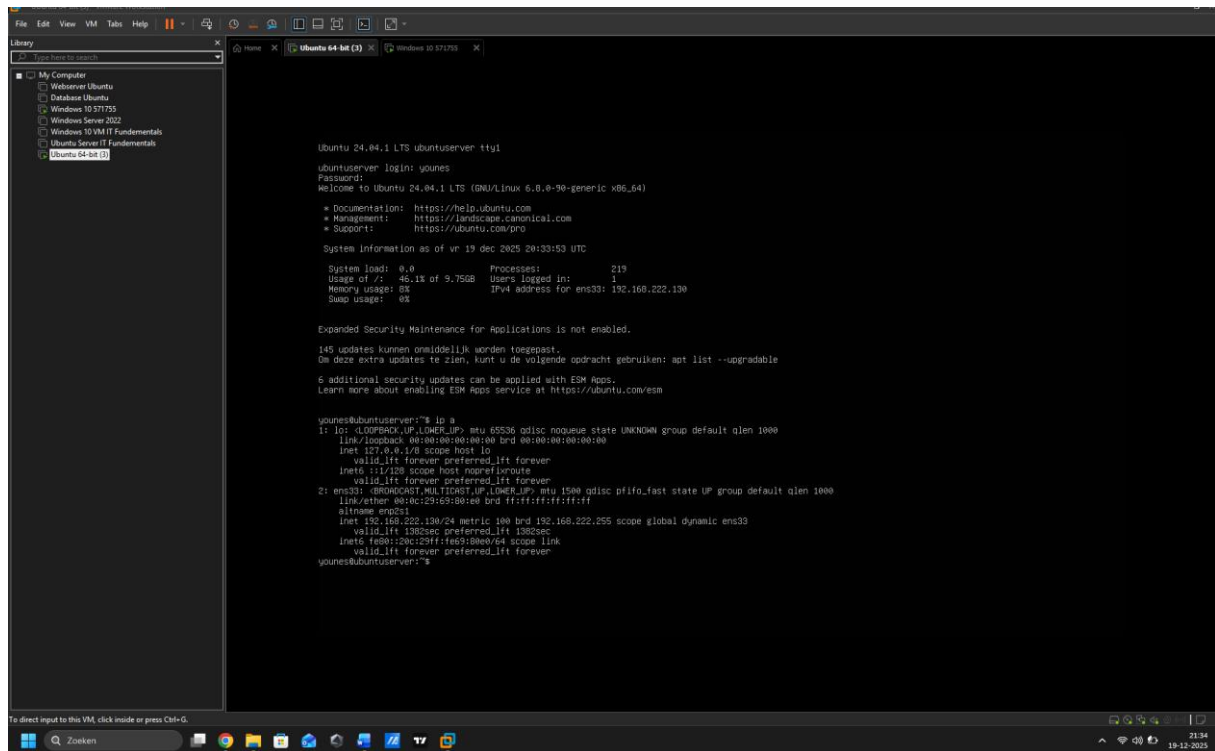


Explain the above calculation in your own words.

Het getal /25 geeft het subnetmasker aan. Dit betekent dat de eerste 25 bits van het 32-bits IP-adres gereserveerd zijn voor het netwerkgedeelte, waardoor er 7 bits overblijven voor de hosts ( $2^7 = 128$  adressen). De laatste en de eerste zijn al gereserveerd voor de broadcast en netwerk zelf. Dus blijven er 126 over.

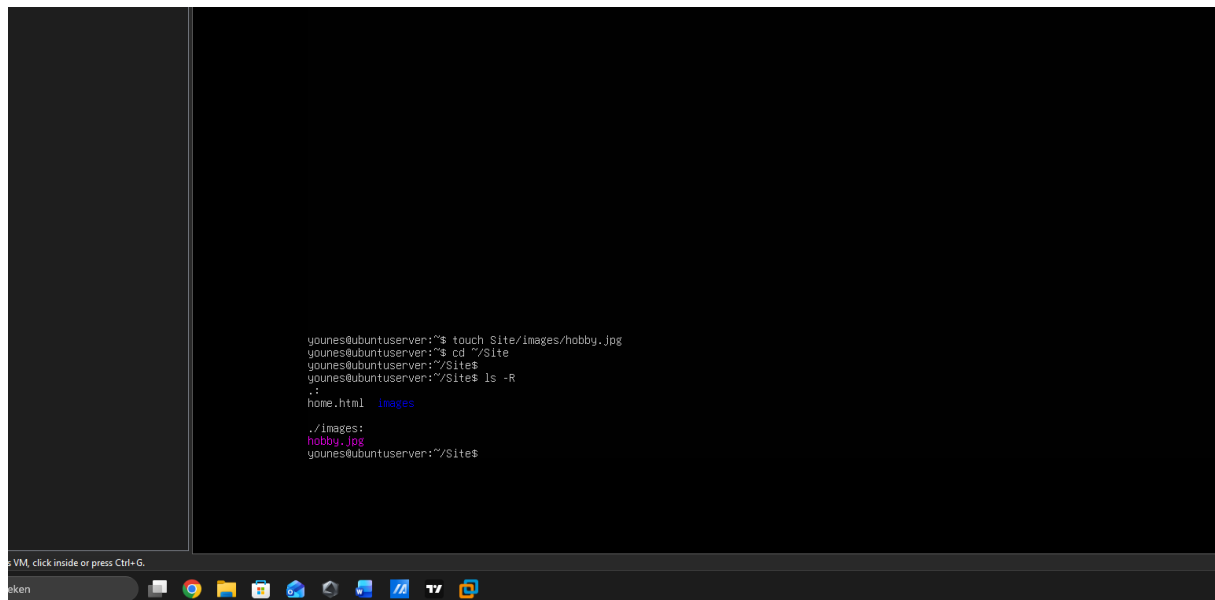
## Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:



```
Ubuntu 24.04.1 LTS ubuntu@server:~$  
ubuntu@server login: younes  
Password:  
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-90-generic x86_64)  
  
 * Documentation:  https://help.ubuntu.com  
 * Management:    https://landscape.canonical.com  
 * Support:        https://ubuntu.com/pro  
  
System information as of vr 19 dec 2025 20:33:53 UTC  
  
System load:  0.0          Processes:    219  
Usage of /:   46.1% of 9.75GB   Users logged in:  1  
Memory usage: 3%            IPv4 address for ens3: 192.168.222.130  
Swap usage:   0%  
  
Expanded Security Maintenance for Applications is not enabled.  
  
145 updates kunnen onmiddellijk worden toegepast.  
Om deze extra updates te zien, kunt u de volgende opdracht gebruiken: apt list --upgradable  
  
6 additional security updates can be applied with ESM Apps.  
Learn more about enabling ESM Apps service at https://ubuntu.com/esm  
  
younes@ubuntu@server:~$ 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: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000  
    link/ether 08:00:c2:96:5d:0e brd ff:ff:ff:ff:ff:ff  
    altname ens3s1  
    inet 192.168.222.130/24 metric 100 brd 192.168.222.255 scope global dynamic ens3  
        valid_lft 1800sec preferred_lft 1800sec  
    inet6 fe80::29c:29ff:fe69:b0e0/64 scope link  
        valid_lft forever preferred_lft forever  
younes@ubuntu@server:~$
```

Screenshot of Site directory contents:



```
younes@ubuntu@server:~$ touch Site/Images/hobby.jpg  
younes@ubuntu@server:~$ cd ~/Site  
younes@ubuntu@server:~/Site$  
younes@ubuntu@server:~/Site$ ls -R  
.:  
home.html  Images  
  
./Images:  
hobby.jpg  
younes@ubuntu@server:~/Site$
```



## Screenshot python3 webserver command:

```
System load: 0.0          Processes:      219
Usage of /:  46.1% of 9.75GB Users logged in: 1
Memory usage: 8%         IPv4 address for ens33: 192.168.222.130
Swap usage: 0%

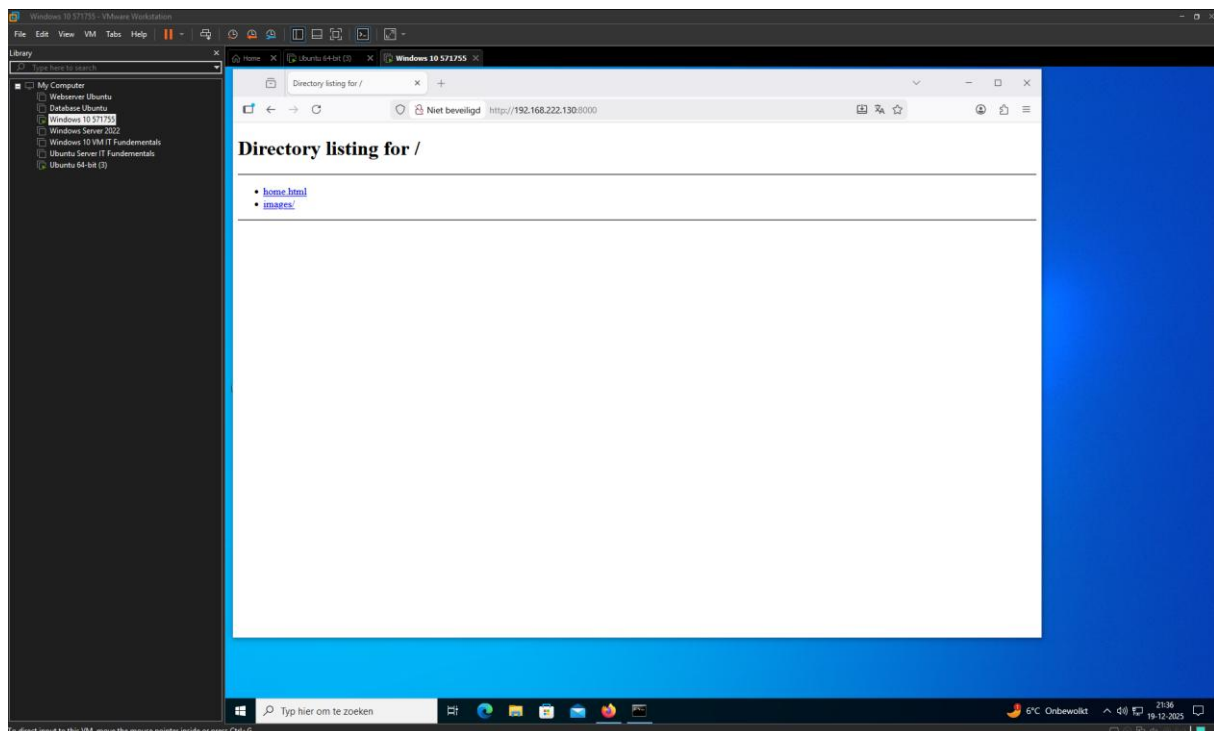
Expanded Security Maintenance for Applications is not enabled.

145 updates kunnen onmiddellijk worden toegepast.
Om deze extra updates te zien, kunt u de volgende opdracht gebruiken: apt list --upgradable

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

younes@ubuntu:~$ 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 pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:69:00:e0 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.222.130/24 metric 100 brd 192.168.222.255 scope global dynamic ens33
        valid_lft 1382sec preferred_lft 1382sec
    inet6 fe80::20c:29ff:fe69:80e0/64 scope link
        valid_lft forever preferred_lft forever
younes@ubuntu:~$ cd ~/Site
younes@ubuntu:~/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.

DE CODE :

```
package part2;

import nl.saxion.app.SaxionApp;

import java.util.ArrayList;

public class Application2 implements Runnable {
    public static void main(String[] args) {
        SaxionApp.start(new Application2(), 500, 500);
    }

    public void run() {
        // CODE YOUNES
        SaxionApp.println("Enter IP address (e.g., 192.168.1.100");
        SaxionApp.println("Enter subnet mask (e.g., 255.255.255.224");
        String ipAddress = SaxionApp.readString();
        String subnetMask = SaxionApp.readString();

        int[] ip = convertToBinaryArray(ipAddress);
        int[] subnet = convertToBinaryArray(subnetMask);

        if (ip == null || subnet == null) {
            SaxionApp.println("Invalid input. Please ensure IP address and subnet mask are in the correct format.");
        }
    }
}
```

```

        return;
    }

    int[] network = calculateNetworkAddress(ip, subnet);

    SaxionApp.printLine("\nResults:");
    SaxionApp.printLine("IP Address: " + formatBinaryArray(ip));
    SaxionApp.printLine("Subnet Mask: " + formatBinaryArray(subnet));
    SaxionApp.printLine("Network Addr: " + formatBinaryArray(network));

    String networkAddressDecimal = convertToDecimal(network);
    SaxionApp.printLine("Network Address in Decimal: " + networkAddressDecimal);

    calculateAndDisplayRange(network, subnet);
}

private static int[] convertToBinaryArray(String dottedDecimal) {
    String[] parts = dottedDecimal.split("\\.");
    if (parts.length != 4) return null;

    int[] binaryArray = new int[32];
    for (int i = 0; i < 4; i++) {
        int octet;
        try {
            octet = Integer.parseInt(parts[i]);
        } catch (NumberFormatException e) {
            return null;
        }

        if (octet < 0 || octet > 255) return null;

        for (int j = 7; j >= 0; j--) {
            binaryArray[i * 8 + j] = (octet & 1);
            octet >>= 1;
        }
    }
    return binaryArray;
}

private static int[] calculateNetworkAddress(int[] ip, int[] subnet) {
    int[] network = new int[32];
    for (int i = 0; i < 32; i++) {
        network[i] = ip[i] & subnet[i];
    }
    return network;
}

private static String formatBinaryArray(int[] binaryArray) {

```

```

        StringBuilder formatted = new StringBuilder();
        for (int i = 0; i < binaryArray.length; i++) {
            formatted.append(binaryArray[i]);
            if ((i + 1) % 8 == 0 && i != binaryArray.length - 1) {
                formatted.append(".");
            }
        }
        return formatted.toString();
    }

    private static String convertToDecimal(int[] binaryArray) {
        StringBuilder decimal = new StringBuilder();
        for (int i = 0; i < 4; i++) {
            int value = 0;
            for (int j = 0; j < 8; j++) {
                value = (value << 1) | binaryArray[i * 8 + j];
            }
            decimal.append(value);
            if (i != 3) {
                decimal.append(".");
            }
        }
        return decimal.toString();
    }

    private static void calculateAndDisplayRange(int[] network, int[] subnet) {
        int hostBits = 0;
        for (int bit : subnet) {
            if (bit == 0) hostBits++;
        }

        int totalHosts = (int) Math.pow(2, hostBits);

        int[] broadcast = network.clone();
        for (int i = 31; i >= 32 - hostBits; i--) {
            broadcast[i] = 1;
        }

        String networkAddress = convertToDecimal(network);
        String broadcastAddress = convertToDecimal(broadcast);

        SaxionApp.println("IP Range: " + networkAddress + " - " + broadcastAddress);
    }
}

```

SCREENSHOT DAT HET WERKT :

```
Enter IP address (e.g., 192.168.1.100)
Enter subnet mask (e.g., 255.255.255.224)
192.168.1.102
255.255.255.224
Results:
IP Address: 11000000.10101000.00000001.01100110
Subnet Mask: 11111111.11111111.11111111.11011100
Network Address: 11000000.10101000.00000001.01000100
Network Address in Decimal: 192.168.1.68
IP Range: 192.168.1.68 - 192.168.1.71

APPLICATION EXITED NORMALLY
```

```
package part2;

import nl.saxion.app.SaxionApp;

import java.util.ArrayList;

public class Application2 implements Runnable {

    public static void main(String[] args) {
        SaxionApp.start(new Application2(), width: 500, height: 500);
    }

    public void run() {
        // code begins
        SaxionApp.println(text: "Enter IP address (e.g., 192.168.1.100");
        SaxionApp.println(text: "Enter subnet mask (e.g., 255.255.255.224");
        String ipAddress = SaxionApp.readString();
        String subnetMask = SaxionApp.readString();

        int[] ip = convertToBinaryArray(ipAddress);
        int[] subnet = convertToBinaryArray(subnetMask);

        if (ip == null || subnet == null) {
            SaxionApp.println(text: "Invalid input. Please ensure IP address and subnet mask are in the correct format.");
            return;
        }

        int[] network = calculateNetworkAddress(ip, subnet);

        SaxionApp.println(text: "\nResults:");
        SaxionApp.println(text: "IP Address: " + formatBinaryArray(ip));
```

```
*S:\Programmeren - Jaar 1\jdk-21.0.1\bin\java.exe" "-javaagent:S:\Programmeren - Jaar 1\IntelliJ IDEA 2024.2.1\lib\idea_rt.jar=44868:S:\Programmeren - Jaar 1\IntelliJ IDEA 2024.2.1\bin" -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8
```

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