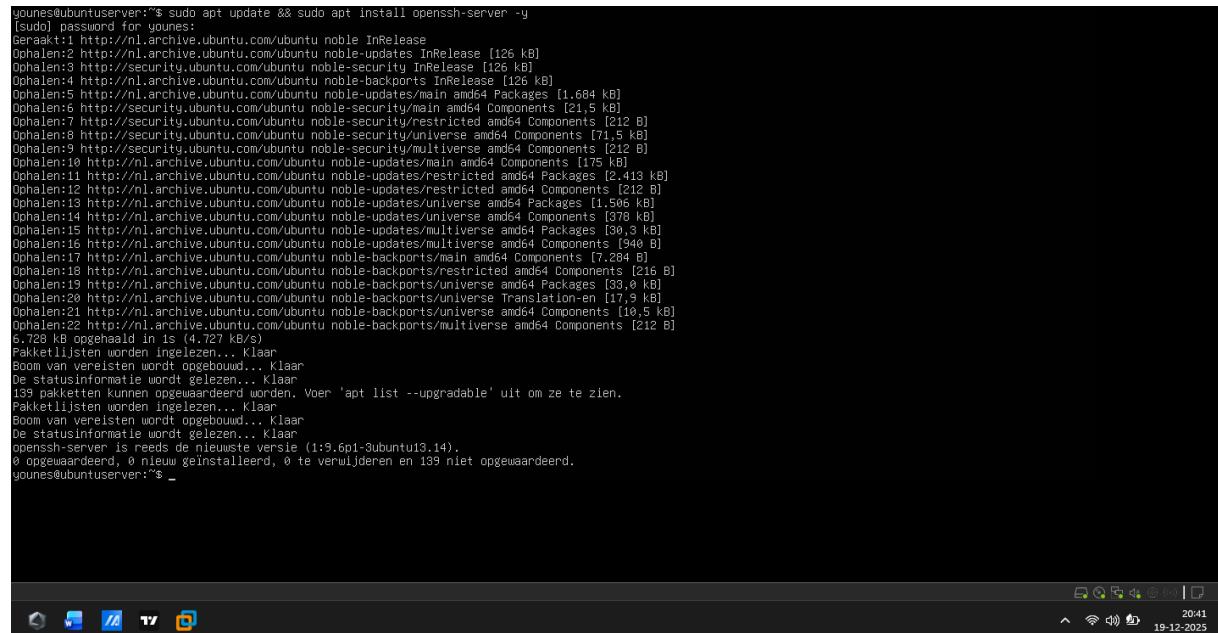


Template Week 6 – Networking

Student number: 571755

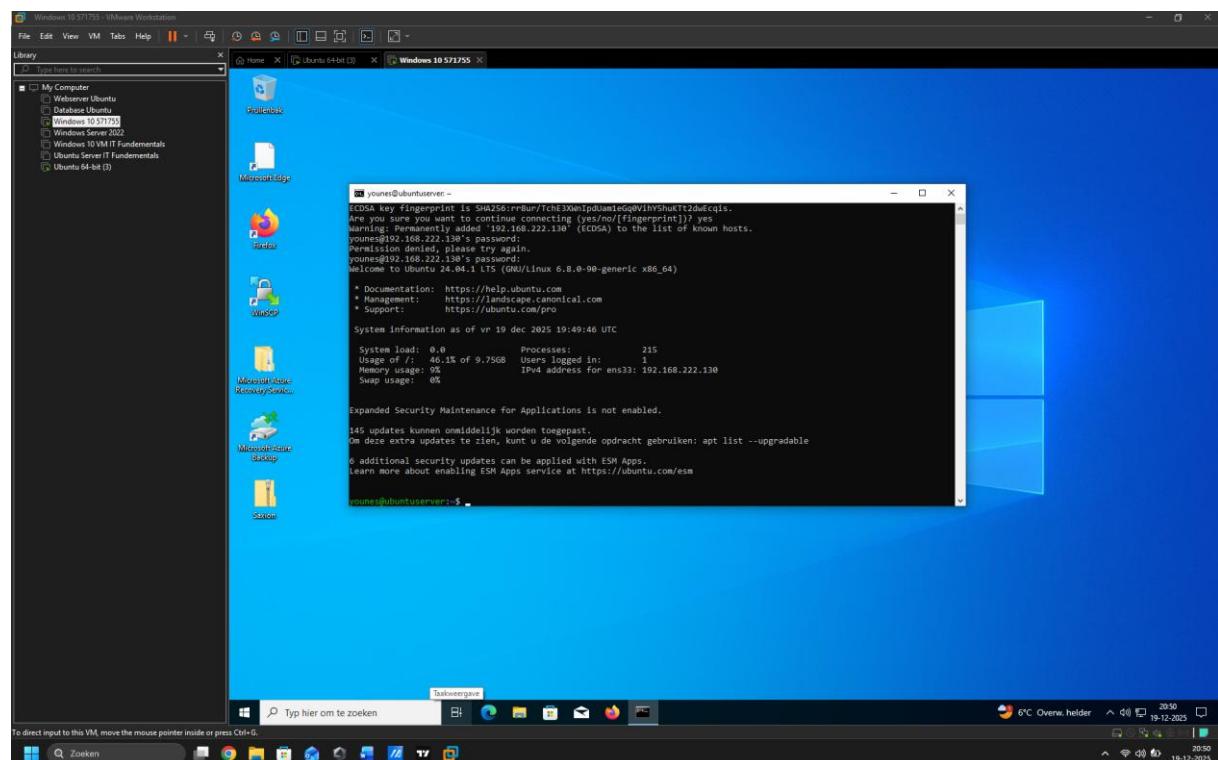
Assignment 6.1: Working from home

Screenshot installation openssh-server:

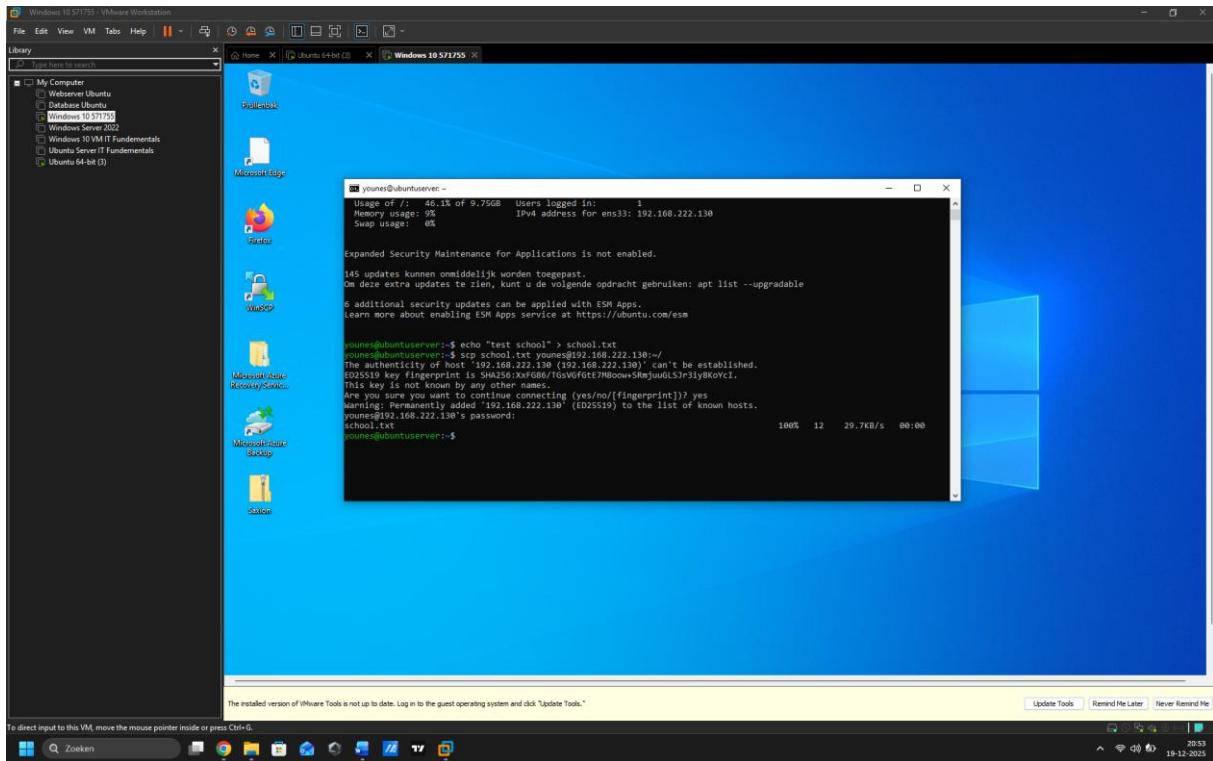


```
younes@ubuntuserver:~$ sudo apt update && sudo apt install openssh-server -y
[sudo] password for younes:
Geraakt:1 http://nl.archive.ubuntu.com/ubuntu noble InRelease [126 kB]
Ophalen:2 http://nl.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Ophalen:3 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Ophalen:4 http://nl.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Ophalen:5 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1.664 kB]
Ophalen:6 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21,5 kB]
Ophalen:7 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 kB]
Ophalen:8 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [71,5 kB]
Ophalen:9 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 kB]
Ophalen:10 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Ophalen:11 http://nl.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [2.413 kB]
Ophalen:12 http://nl.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [212 kB]
Ophalen:13 http://nl.archive.ubuntu.com/ubuntu noble-backports/main amd64 Packages [506 kB]
Ophalen:14 http://nl.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [301 kB]
Ophalen:15 http://nl.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [90,3 kB]
Ophalen:16 http://nl.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Component [940 kB]
Ophalen:17 http://nl.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,284 kB]
Ophalen:18 http://nl.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 kB]
Ophalen:19 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [33,9 kB]
Ophalen:20 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe Translation-en [17,9 kB]
Ophalen:21 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [10,5 kB]
Ophalen:22 http://nl.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 kB]
5,728 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@ubuntuserver:~$ -
```

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

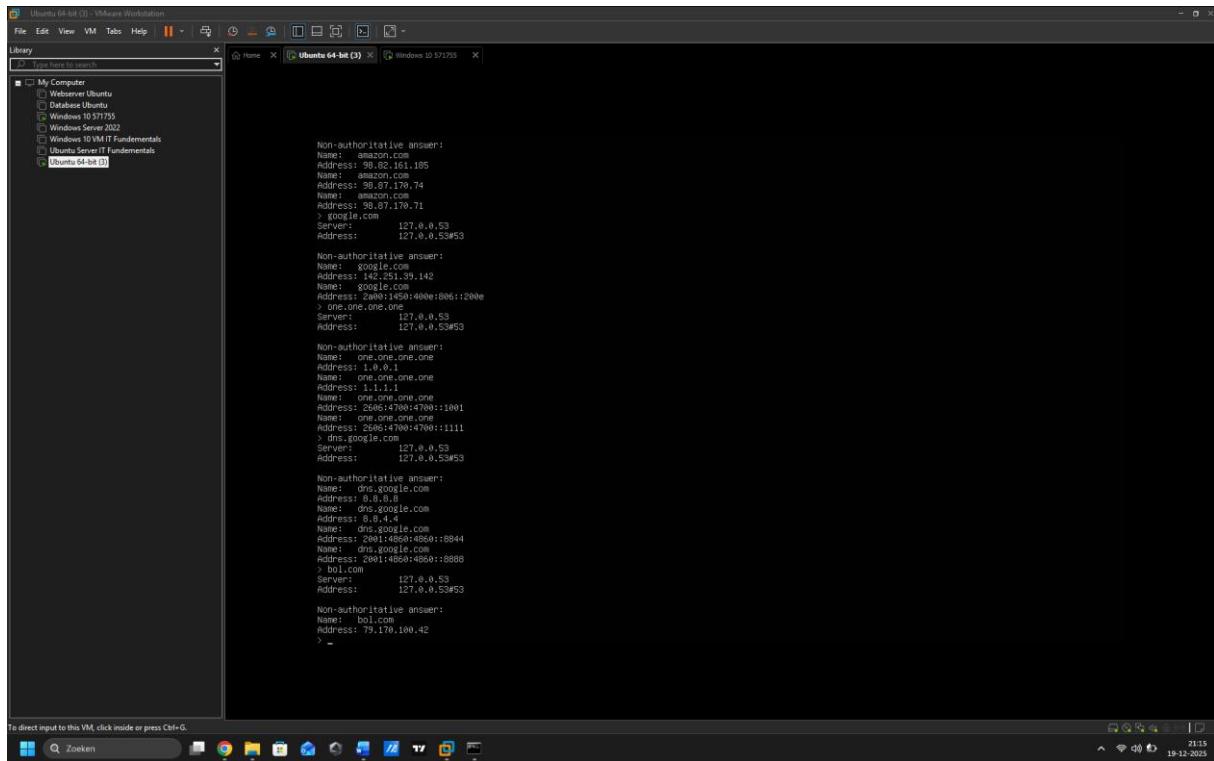
Ubuntu VM. **Remmina** openen

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:



```
Ubuntu 64-bit (3) - VMware Workstation
File Edit View VM Help ||| Type here to search
Library Home Ubuntu 64-bit (3) Windows 10 571759

Non-authoritative answer:
Name: amazon.com
Address: 98.82.161.105
Name: amazon.com
Address: 98.87.179.74
Name: amazon.com
Address: 98.87.170.71
> amazon.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:8061::200e
> one.one.one.one
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: one.one.one
Address: 1.1.1.1
Name: one.one.one
Address: 2606:4700:5700::1001
Name: one.one.one
Address: 2606:4700:5700::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: 8.8.4.4
Name: dns.google.com
Address: 2a00:1450:400e:8050::8844
Name: dns.google.com
Address: 2a01:4650:4050::8888
> hol.com
Server: 127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name: hol.com
Address: 79.176.100.42
> -
```

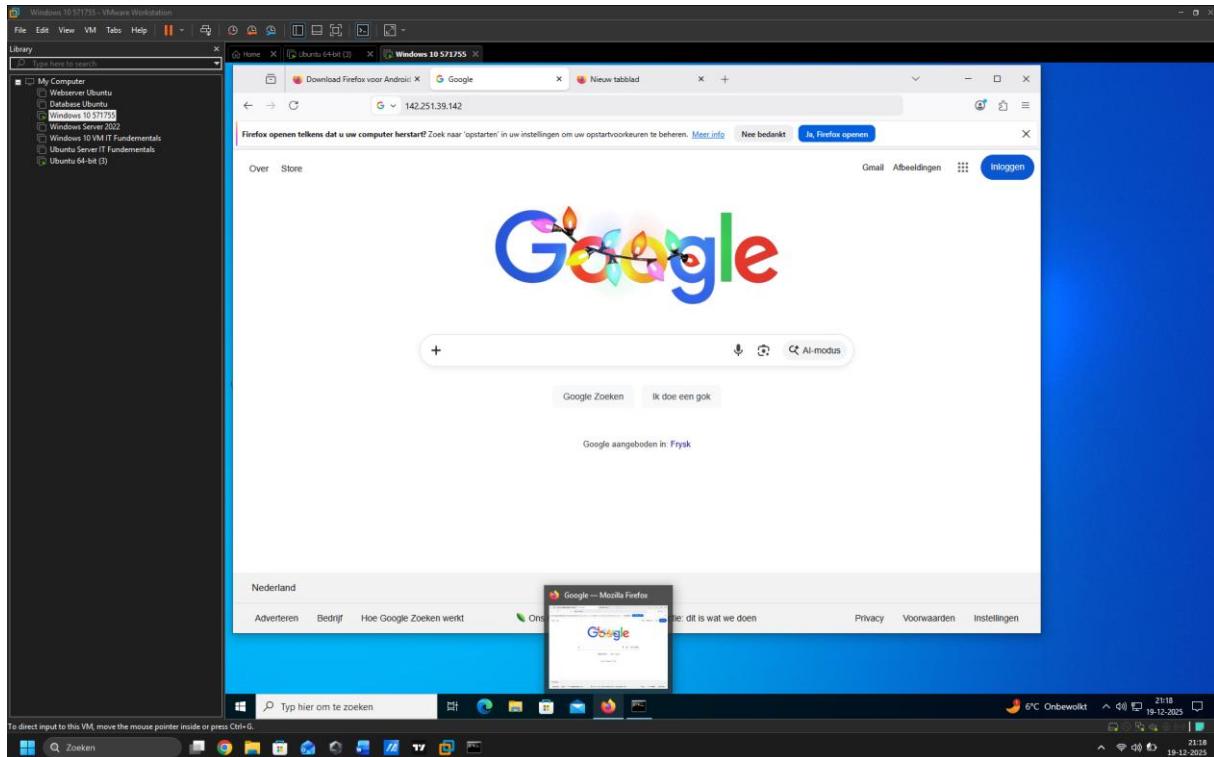
```
Name: dns.google.com
Address: 8.8.8.8
Name: dns.google.com
Address: 8.8.4.4
Name: dns.google.com
Address: 2001:4860:4860::8844
Name: dns.google.com
Address: 2001:4860:4860::8888
> bol.com
Server: 127.0.0.53
Address: 127.0.0.53#53

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 geselecteerde 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 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

younes@ubuntuserver:~$
```

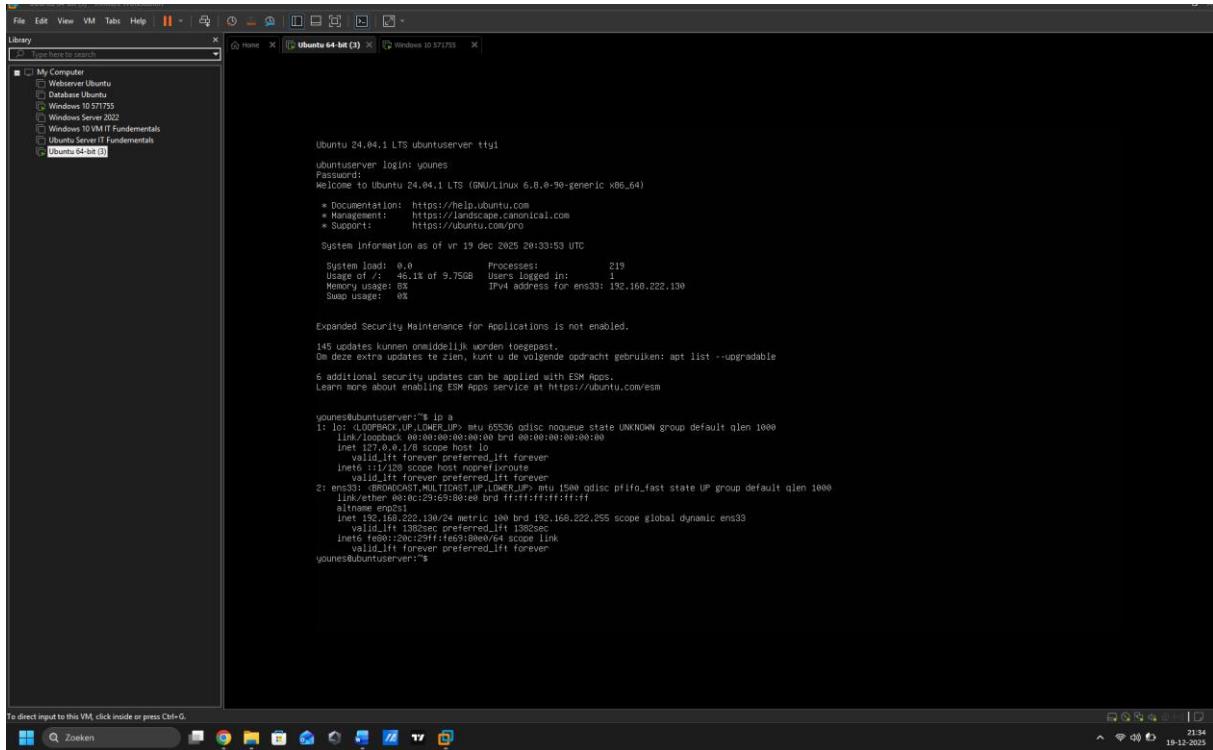


Explain the above calculation in your own words.

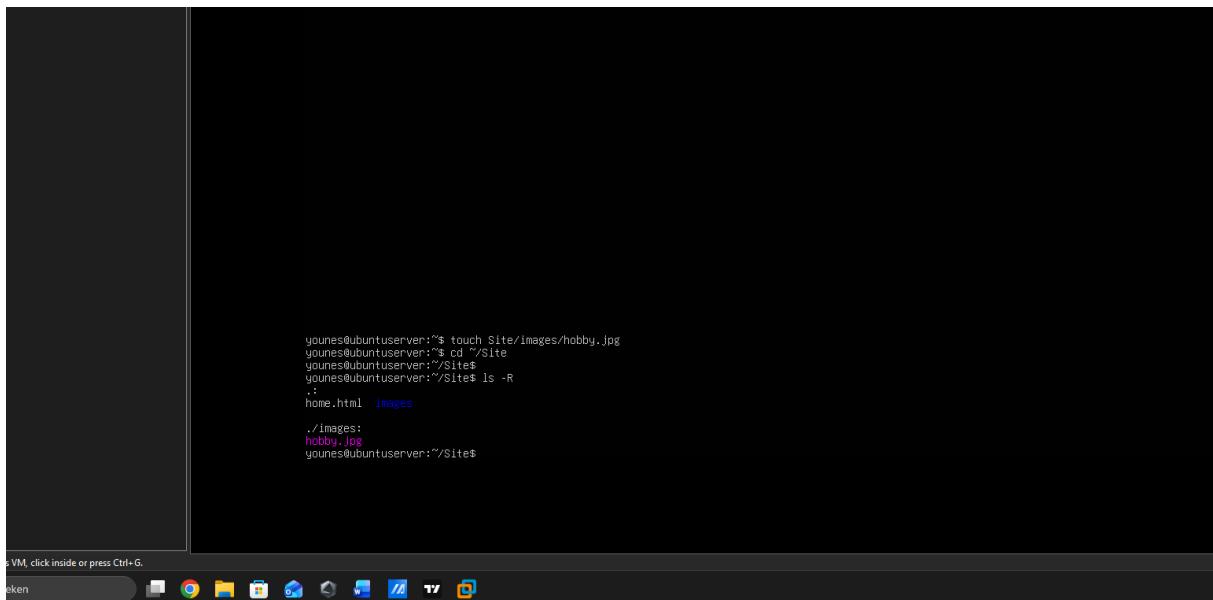
Het getal /25 geeft het subnetmasker aan. Dit betekent dat de eerste 25 bits van het 32-bits IP-adres gereserveerd zijn voor het netwerkgedeelte, waardoor er 7 bits overblijven voor de hosts ($2^7 = 128$ adressen) De laatste en de eerste zijn al gereserveerd voor de broadcast en netwerk zelf. Dus blijven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

Assignment 6.4: HTML

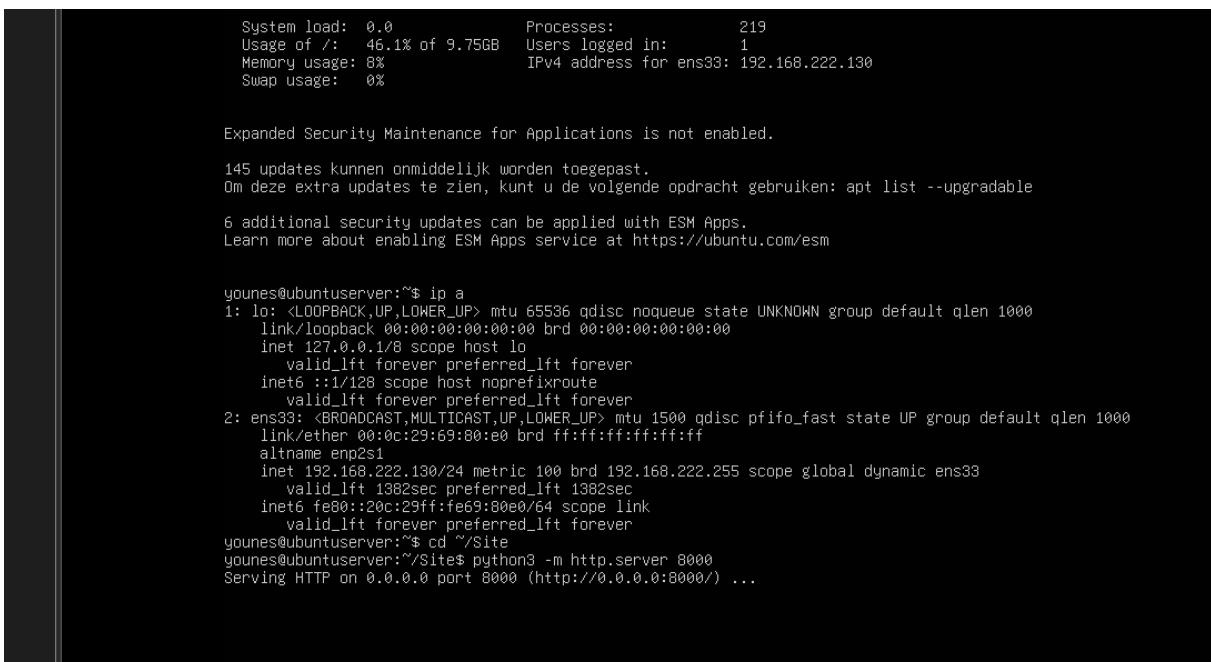
Screenshot IP address Ubuntu VM:



Screenshot of Site directory contents:



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%          

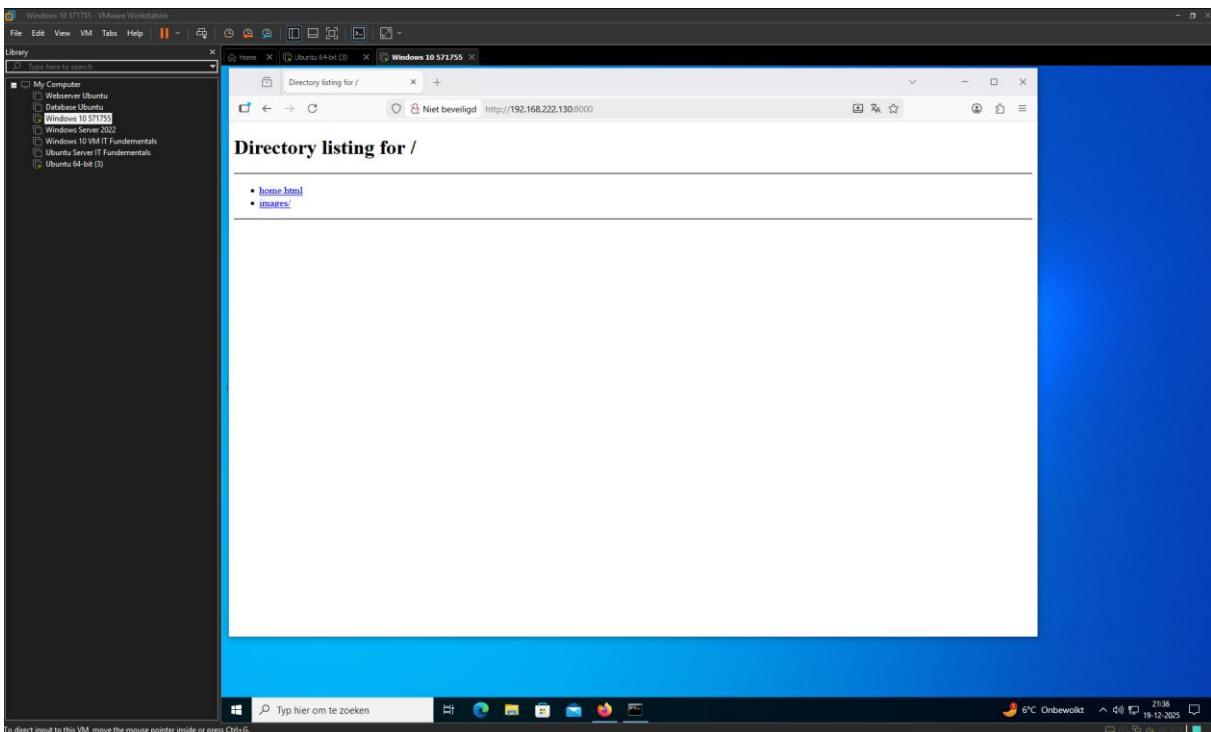
Expanded Security Maintenance for Applications is not enabled.

145 updates kunnen onmiddelijk 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@ubuntuserver:~$ 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:29:69:80: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@ubuntuserver:~$ cd ~/Site
younes@ubuntuserver:~/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.printLine("Enter IP address (e.g., 192.168.1.100");
        SaxionApp.printLine("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.printLine("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.printLine("IP Range: " + networkAddress + " - " + broadcastAddress);
}
}

```

SCREENSHOT DAT HET WERKT :

The screenshot shows the IntelliJ IDEA interface with the following details:

- Terminal Output:** Shows the application's console output:

```
Enter IP address (e.g., 192.168.1.100)
Enter subnet mask (e.g., 255.255.255.224
192.168.1.102
255.255.255.220
Results:
IP Address: 11000000.10101000.00000001.01100110
Subnet Mask: 11111111.11111111.11111111.11011100
Network Addr: 11000000.10101000.00000001.01000100
Network Address in Decimal: 192.168.1.68
IP Range: 192.168.1.68 - 192.168.1.71
```
- Code Editor:** The Application2.java file is open, showing the following 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(), width: 500, height: 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.println("\nResults:");
        SaxionApp.println("IP Address: " + formatBinaryArray(ip));
    }
}
```
- Run Tab:** Shows the selected configuration is "Application2".
- File Explorer:** Shows the project structure with files like Application2.java, Application1.java, and pizza_sales.csv.

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