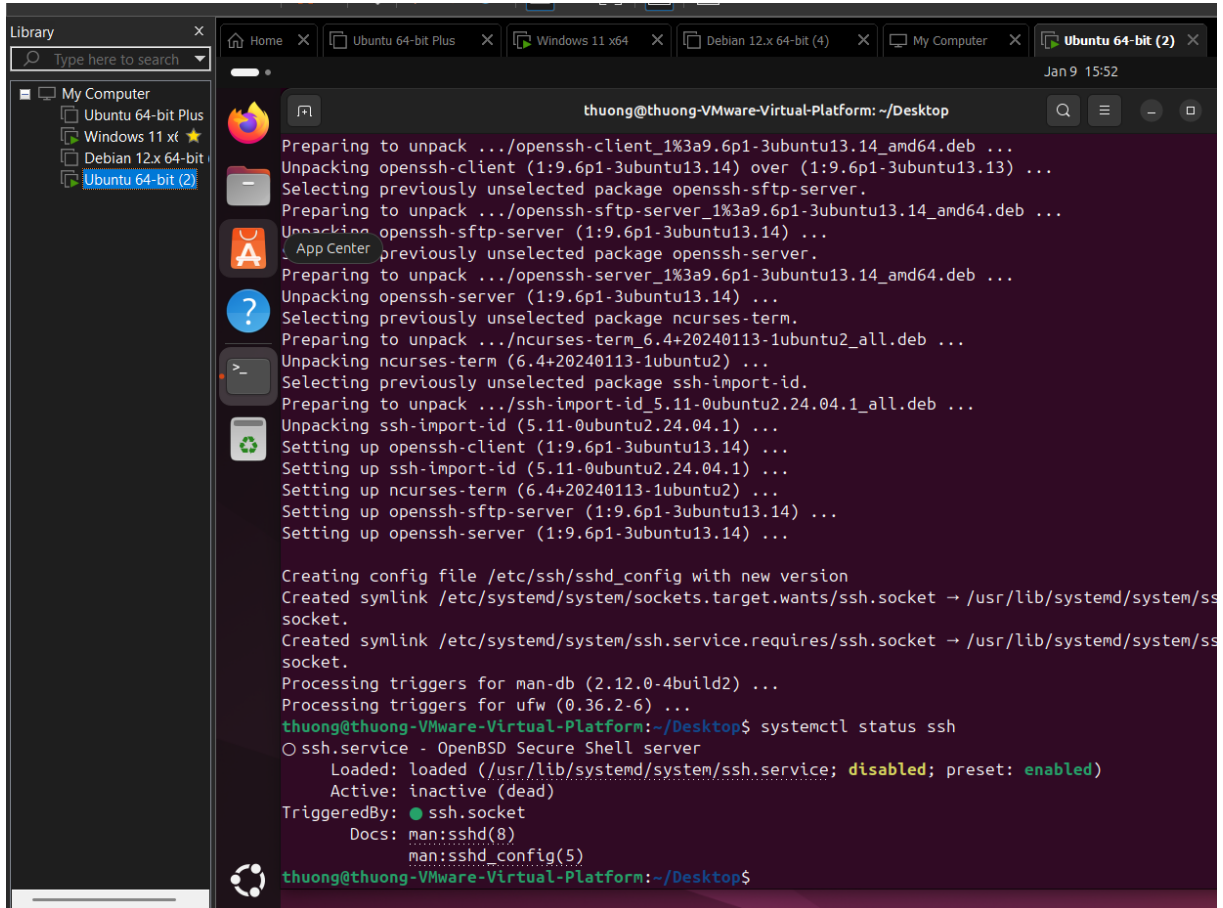


Week 6 – Networking

Student number: 589932

Assignment 6.1: Working from home

Screenshot installation openssh-server:



```
thuong@thuong-VMware-Virtual-Platform: ~/Desktop
Preparing to unpack .../openssh-client_1%3a9.6p1-3ubuntu13.14_amd64.deb ...
Unpacking openssh-client (1:9.6p1-3ubuntu13.14) over (1:9.6p1-3ubuntu13.13) ...
Selecting previously unselected package openssh-sftp-server.
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-client (1:9.6p1-3ubuntu13.14) ...
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
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/ss
socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ss
socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
thuong@thuong-VMware-Virtual-Platform: ~/Desktop$ systemctl status ssh
O ssh.service - OpenBSD Secure Shell server
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; disabled; preset: enabled)
   Active: inactive (dead)
TriggeredBy: ● ssh.socket
           Docs: man:sshd(8)
                man:sshd_config(5)
thuong@thuong-VMware-Virtual-Platform: ~/Desktop$
```

Screenshot successful SSH command execution:

Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

```
C:\WINDOWS\system32\cmd. X + v

Microsoft Windows [Version 10.0.26100.6584]
(c) Microsoft Corporation. All rights reserved.

C:\Users\LEGION>nslookup
Default Server:  RZ-DC01.Personeel.local
Address:  10.171.92.1

> amazon.com
Server:  RZ-DC01.Personeel.local
Address:  10.171.92.1

Non-authoritative answer:
Name:    amazon.com
Addresses:  98.87.170.71
            98.82.161.185
            98.87.170.74

> google.com
Server:  RZ-DC01.Personeel.local
Address:  10.171.92.1

Non-authoritative answer:
Name:    google.com
Addresses:  2a00:1450:400e:804::200e
            142.251.39.142

> one.one.one.one
Server:  RZ-DC01.Personeel.local
Address:  10.171.92.1

Non-authoritative answer:
Name:    one.one.one.one
Addresses:  2606:4700:4700::1111
            2606:4700:4700::1001
            1.1.1.1
            1.0.0.1

> dns.google.com
Server:  RZ-DC01.Personeel.local
Address:  10.171.92.1
```

```
C:\WINDOWS\system32\cmd. X + v

> dns.google.com
Server: RZ-DC01.Personeel.local
Address: 10.171.92.1

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

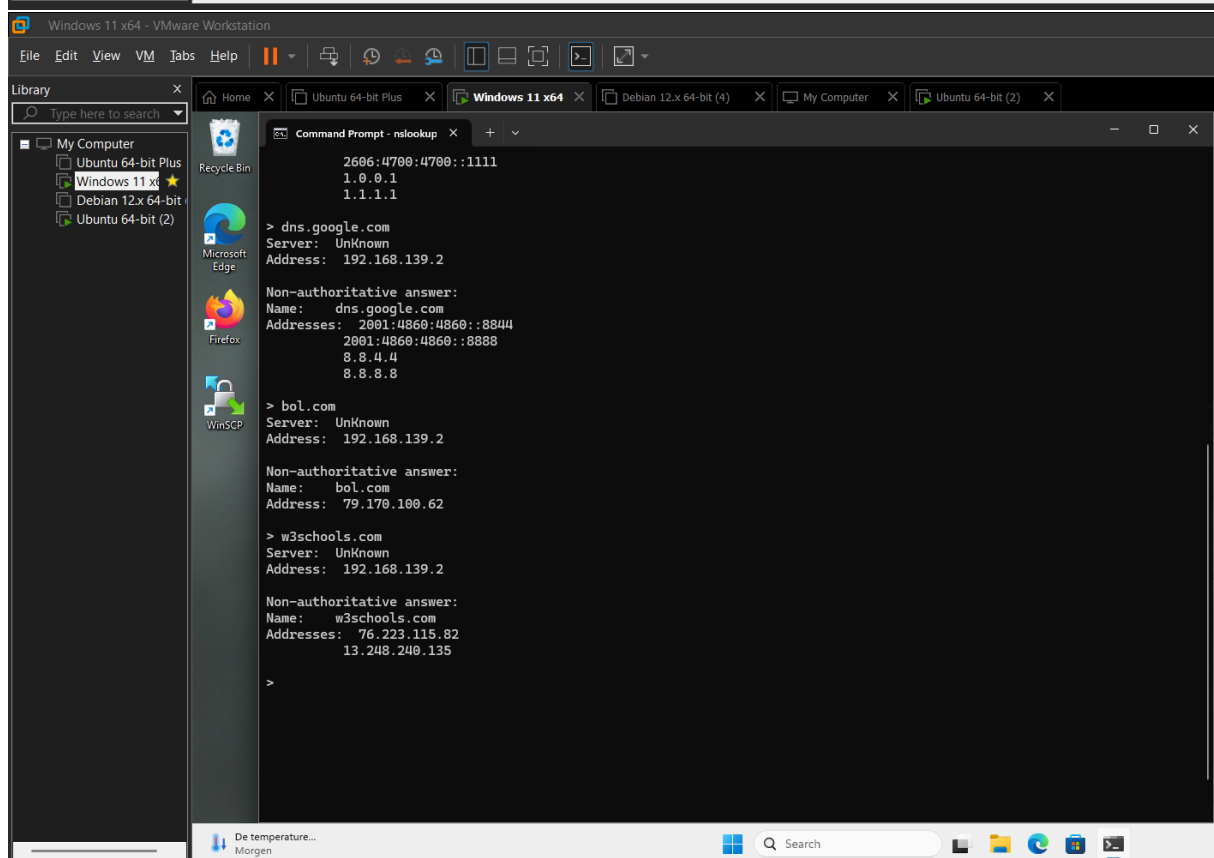
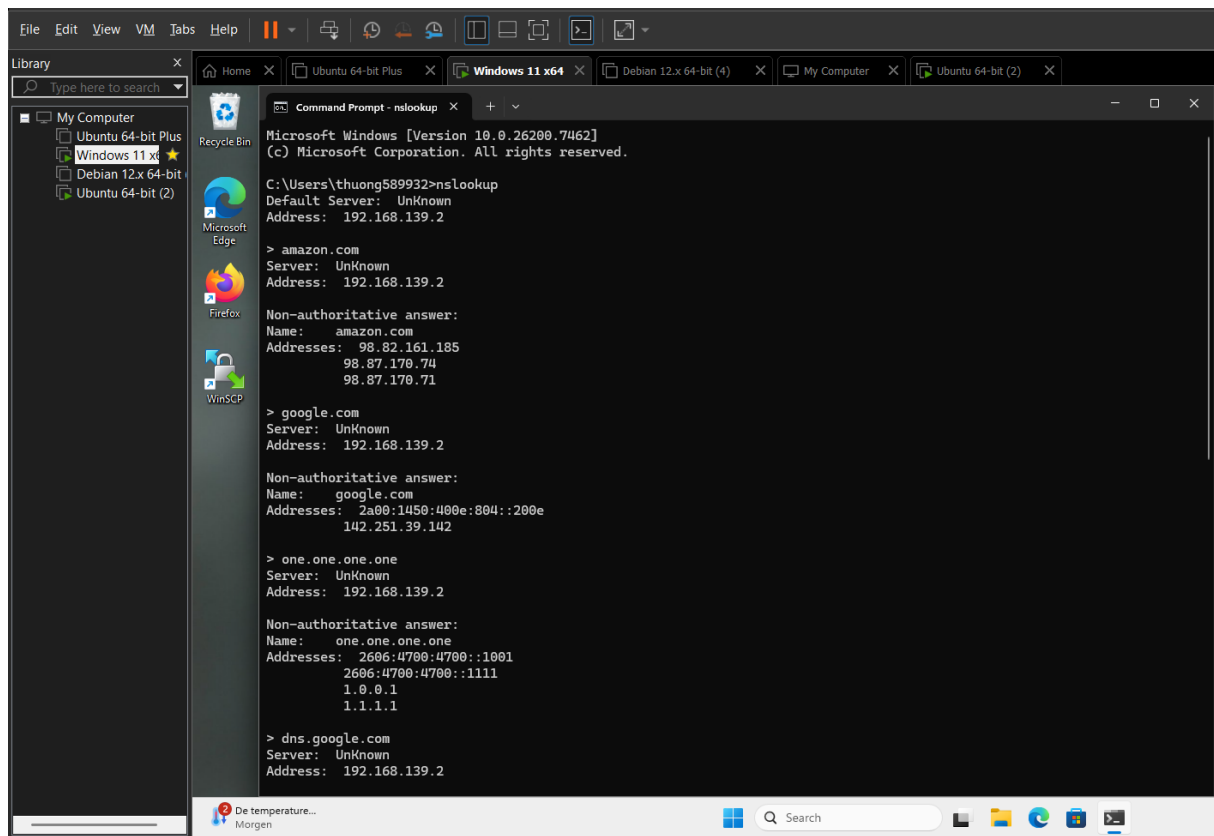
> bol.com
Server: RZ-DC01.Personeel.local
Address: 10.171.92.1

Non-authoritative answer:
Name: bol.com
Address: 79.170.100.62

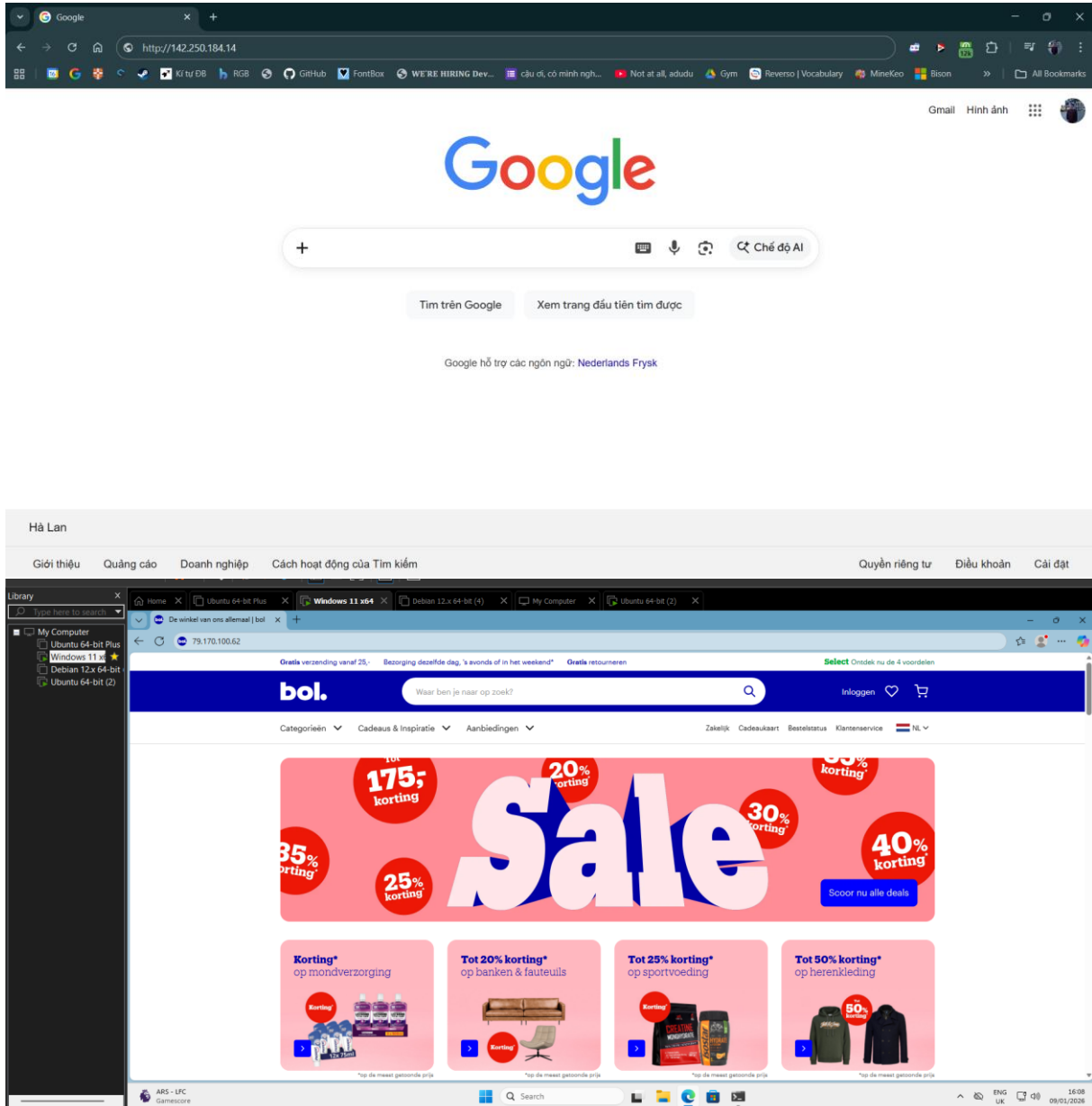
> w3schools.com
Server: RZ-DC01.Personeel.local
Address: 10.171.92.1

Non-authoritative answer:
Name: w3schools.com
Addresses: 76.223.115.82
           13.248.240.135

>
```



Screenshot website visit via IP address:



Assignment 6.3: subnetting

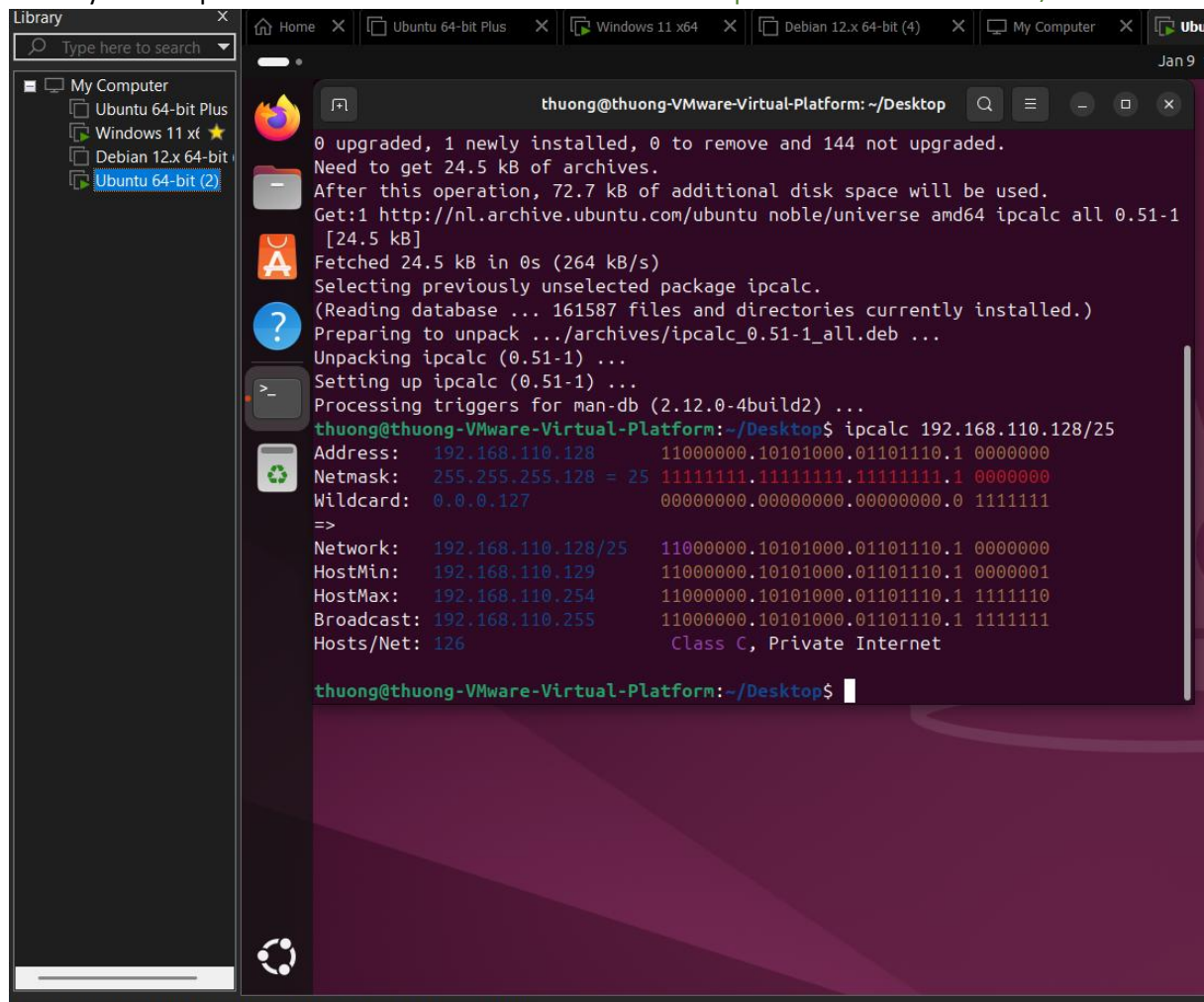
How many IP addresses are in this network configuration 192.168.110.128/25?

There are **128 IP addresses**

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

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`



```
thuong@thuong-VMware-Virtual-Platform: ~/Desktop
0 upgraded, 1 newly installed, 0 to remove and 144 not upgraded.
Need to get 24.5 kB of archives.
After this operation, 72.7 kB of additional disk space will be used.
Get:1 http://nl.archive.ubuntu.com/ubuntu noble/universe amd64 ipcalc all 0.51-1
[24.5 kB]
Fetched 24.5 kB in 0s (264 kB/s)
Selecting previously unselected package ipcalc.
(Reading database ... 161587 files and directories currently installed.)
Preparing to unpack .../archives/ipcalc_0.51-1_all.deb ...
Unpacking ipcalc (0.51-1) ...
Setting up ipcalc (0.51-1) ...
Processing triggers for man-db (2.12.0-4build2) ...
thuong@thuong-VMware-Virtual-Platform:~/Desktop$ ipcalc 192.168.110.128/25
Address: 192.168.110.128      11000000.10101000.01101110.1 0000000
Netmask: 255.255.255.128 = 25 11111111.11111111.11111111.0 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

thuong@thuong-VMware-Virtual-Platform:~/Desktop$
```

Explain the above calculation in your own words.

A /25 subnet means that 25 bits are used for the network part of the IP address, leaving 7 bits for host addresses.

With 7 host bits, the total number of IP addresses is 2^7 , which equals 128.

The first address of the subnet is reserved as the network address, and the last address is reserved as the

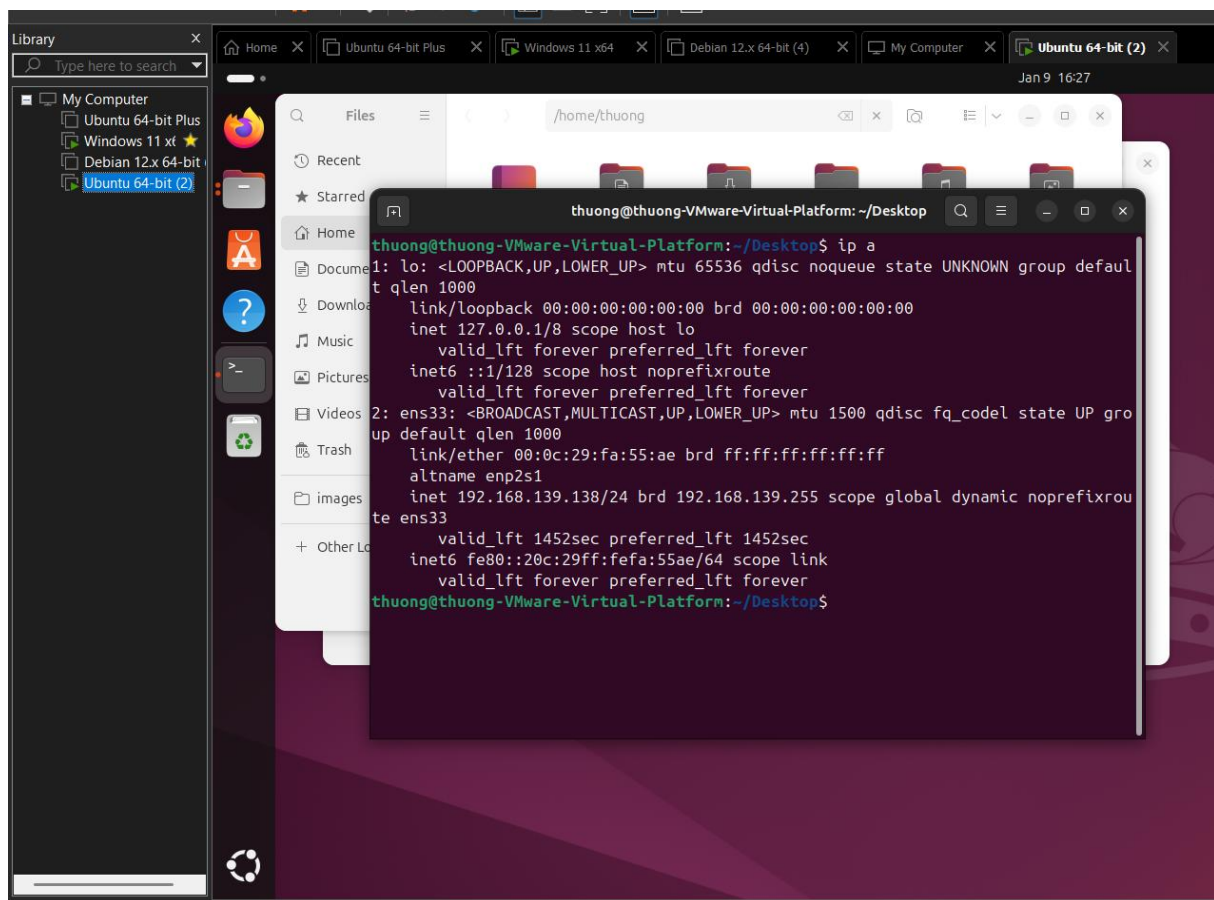
broadcast address.

Because these two addresses cannot be assigned to computers, only 126 IP addresses are usable.

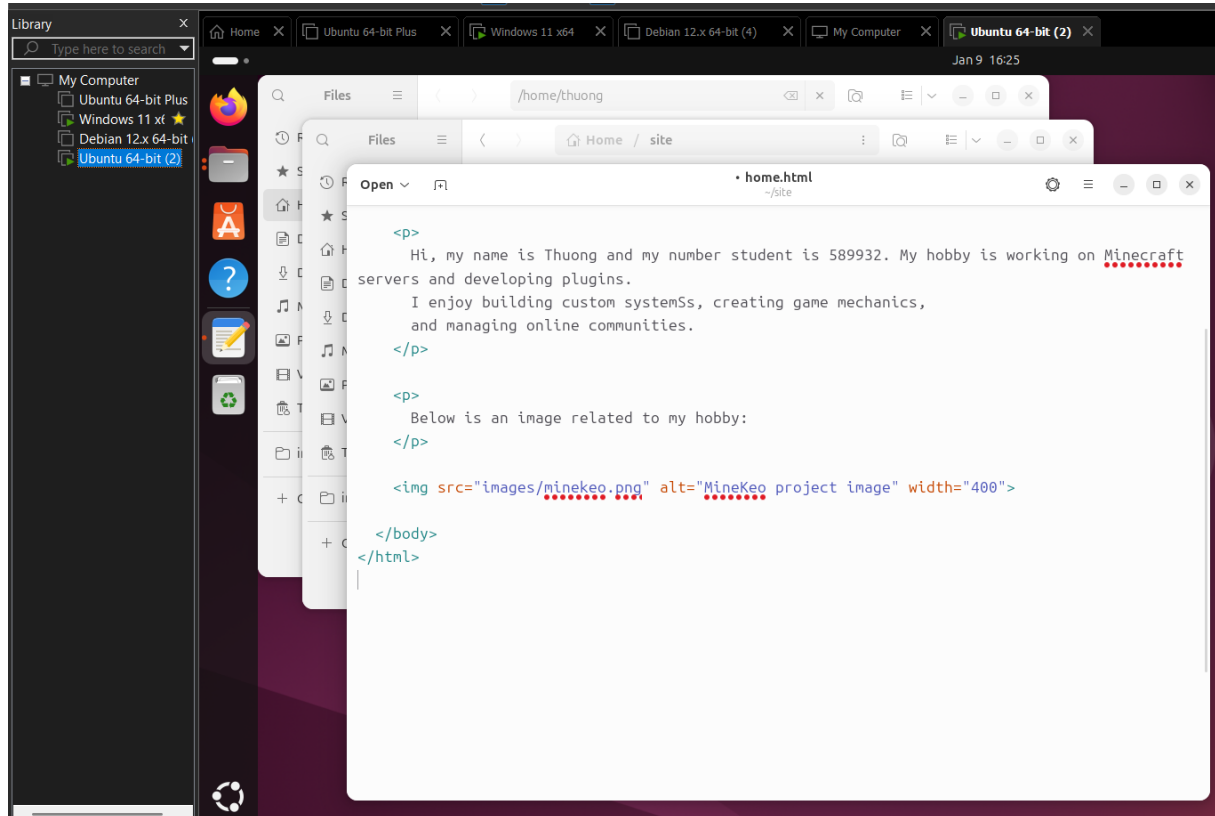
Therefore, the usable IP range for connected computers is from 192.168.110.129 to 192.168.110.254.

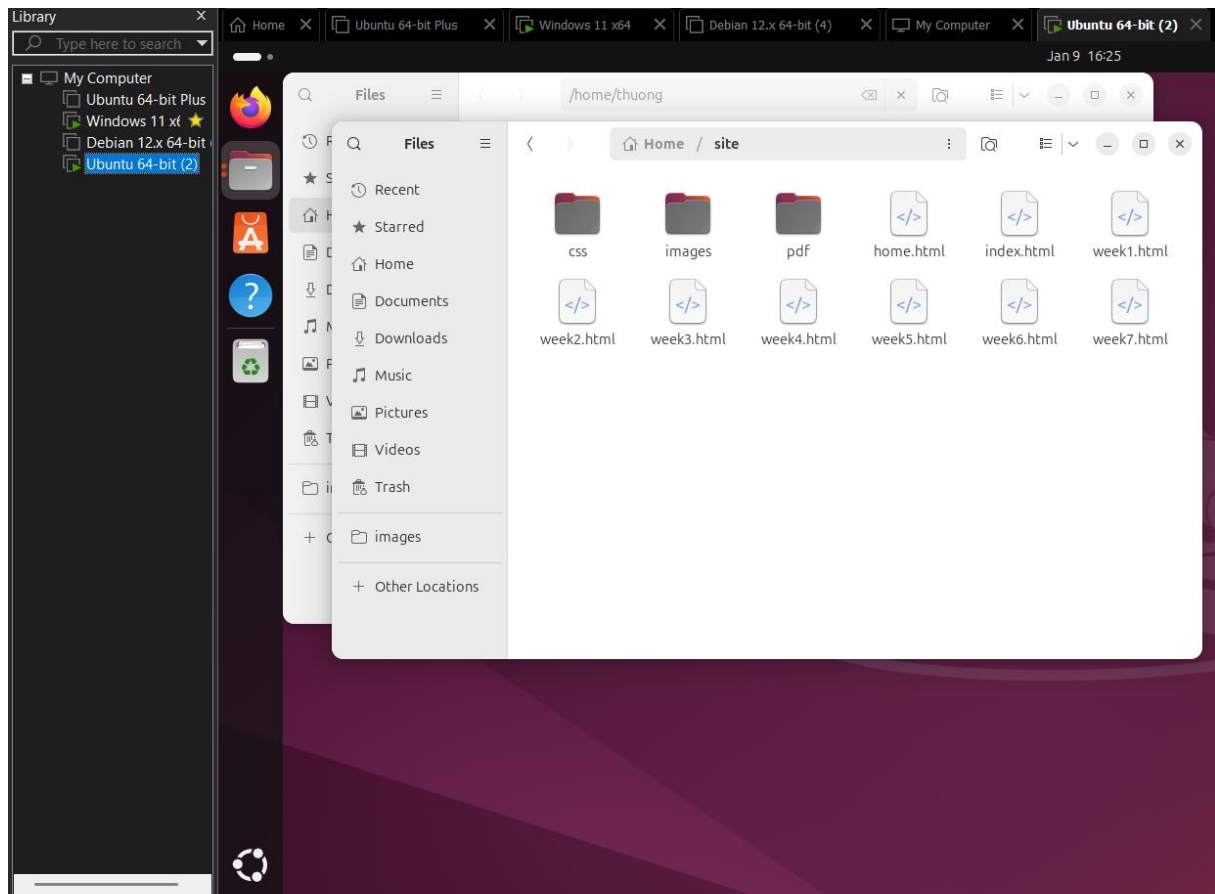
Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

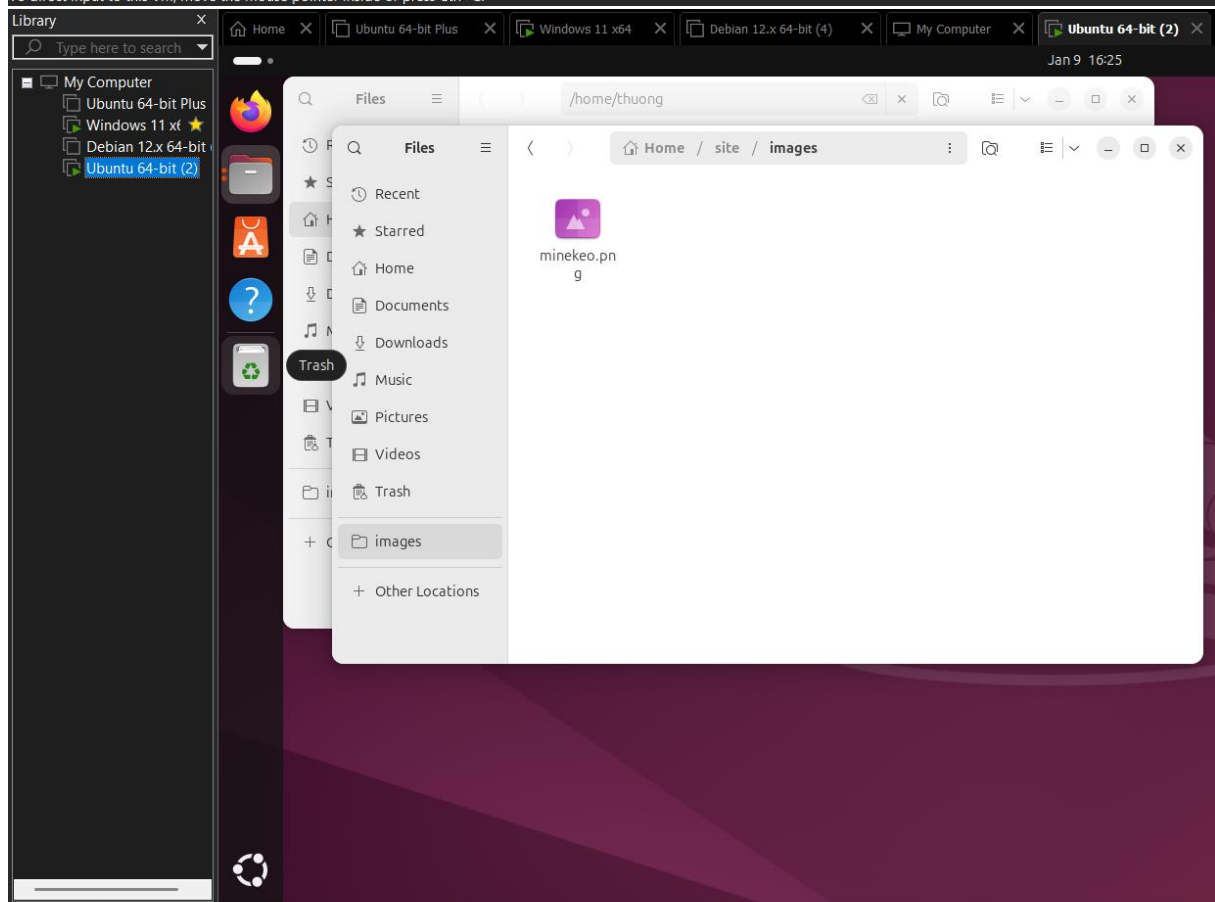


Screenshot of Site directory contents:



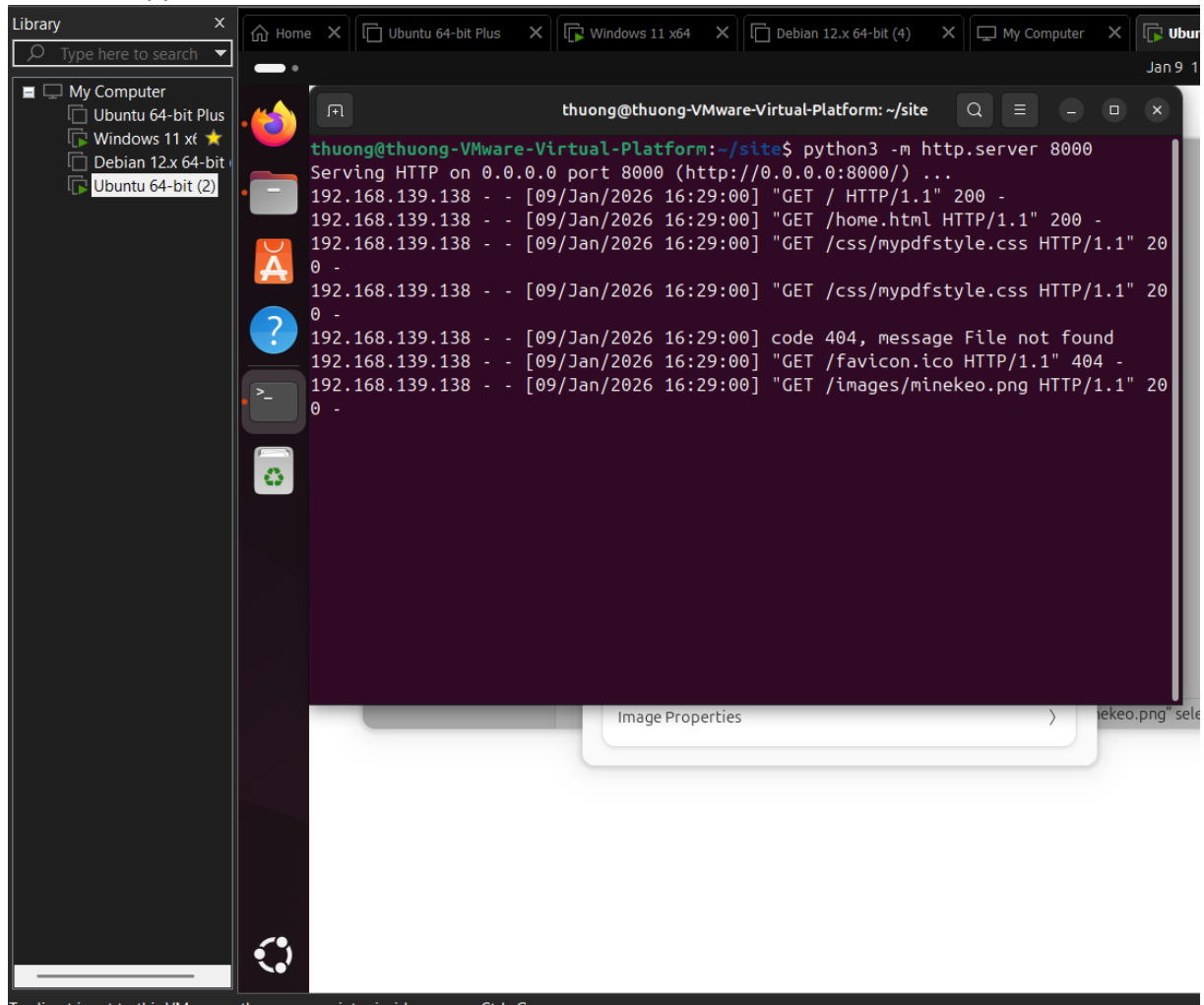


To direct input to this VM, move the mouse pointer inside or press Ctrl+G.



To direct input to this VM, move the mouse pointer inside or press Ctrl+G.

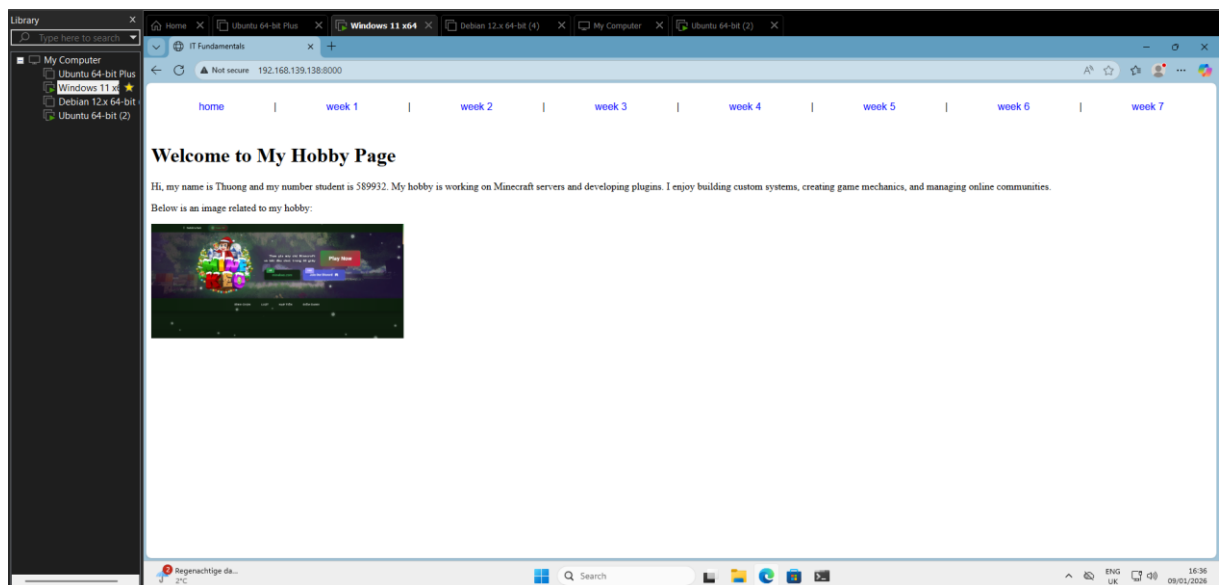
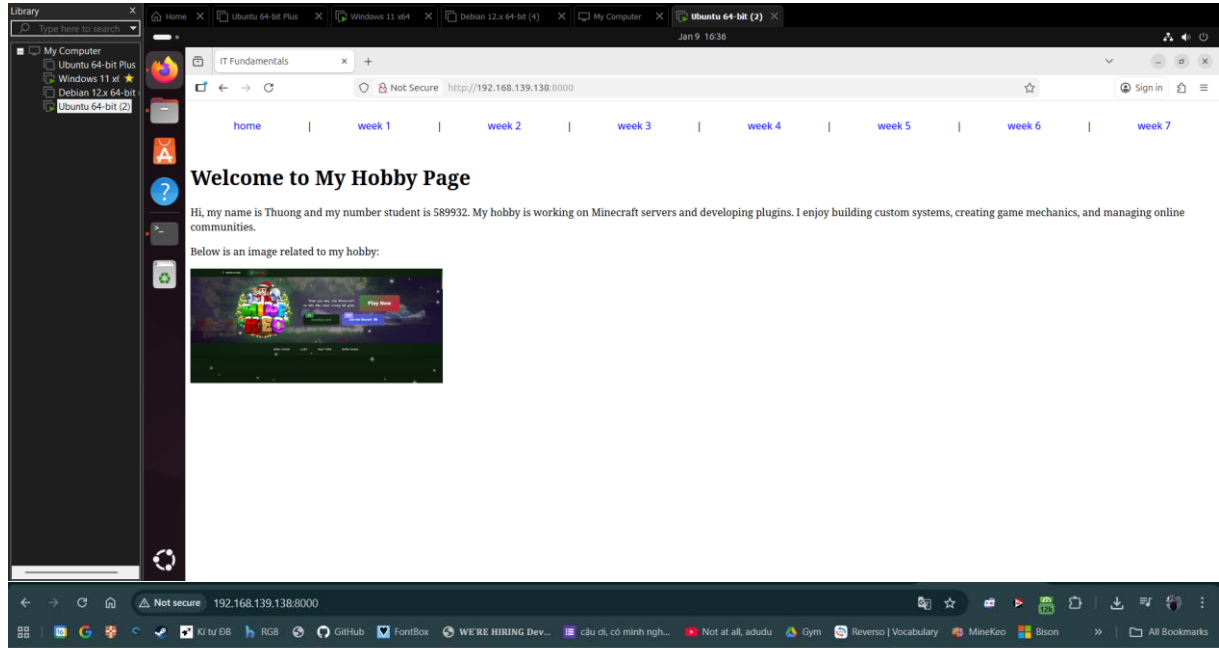
Screenshot python3 webserver command:



The screenshot shows a VMware Workstation interface with a virtual machine named 'thuong@thuong-VMware-Virtual-Platform'. The terminal window is open, displaying the command `python3 -m http.server 8000` and its output. The output shows the server serving HTTP on 0.0.0.0 port 8000. It receives several requests from 192.168.139.138: a successful GET request for the root directory, a successful GET request for /home.html, a successful GET request for /css/mypdfstyle.css, a 404 error for /favicon.ico, and a successful GET request for /images/minekeo.png. The terminal window is titled 'thuong@thuong-VMware-Virtual-Platform: ~/site'. The VMware interface also shows a library of virtual machines on the left and a taskbar at the bottom.

```
thuong@thuong-VMware-Virtual-Platform: ~/site
thuong@thuong-VMware-Virtual-Platform:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET / HTTP/1.1" 200 -
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET /home.html HTTP/1.1" 200 -
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
192.168.139.138 - - [09/Jan/2026 16:29:00] code 404, message File not found
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET /favicon.ico HTTP/1.1" 404 -
192.168.139.138 - - [09/Jan/2026 16:29:00] "GET /images/minekeo.png 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.

```
import java.util.Scanner;

public class NetworkSegmentCalculator {

    // Convert decimal octet to 8-bit binary string
    private static String toBinary(int value) {
        return String.format("%8s", Integer.toBinaryString(value))
            .replace(' ', '0');
    }

    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);
```

```

// Input
System.out.print("Enter IP address (e.g. 192.168.1.100): ");
String ipInput = scanner.nextLine();

System.out.print("Enter subnet mask (e.g. 255.255.255.224): ");
String subnetInput = scanner.nextLine();

String[] ipParts = ipInput.split("\\.");
String[] subnetParts = subnetInput.split("\\.");

int[] ip = new int[4];
int[] subnet = new int[4];
int[] network = new int[4];

// Parse input and calculate network address using bitwise AND
for (int i = 0; i < 4; i++) {
    ip[i] = Integer.parseInt(ipParts[i]);
    subnet[i] = Integer.parseInt(subnetParts[i]);
    network[i] = ip[i] & subnet[i];
}

// Output binary values
System.out.println("\nCalculate the network segment");
System.out.print("IP Address:  ");
for (int i = 0; i < 4; i++) {
    System.out.print(toBinary(ip[i]));
    if (i < 3) System.out.print(".");
}

System.out.print("\nSubnet Mask:  ");
for (int i = 0; i < 4; i++) {
    System.out.print(toBinary(subnet[i]));

```



```

        if (i < 3) System.out.print(".");
    }

    System.out.println("\n-----");

    System.out.print("Network Addr: ");
    for (int i = 0; i < 4; i++) {
        System.out.print(toBinary(network[i]));
        if (i < 3) System.out.print(".");
    }

    // Decimal network address
    System.out.println("\n\nNetwork address (decimal): "
        + network[0] + "." + network[1] + "." + network[2] + "." +
network[3]);

    // Calculate range (for /27 example)
    int blockSize = 256 - subnet[3];
    int firstIP = network[3];
    int lastIP = firstIP + blockSize - 1;

    System.out.println("Range of this network segment: "
        + network[0] + "." + network[1] + "." + network[2] + "." +
firstIP
        + " to "
        + network[0] + "." + network[1] + "." + network[2] + "." +
lastIP);

    scanner.close();
}
}

```

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

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

PS D:\Thuong589932\Jaar 1 - Saxion\Kwartiel 2\IT Fundamentals\Week 6> javac NetworkSegmentCalculator.java
error: file not found: NetworkSegmentCalculator.java
Usage: javac <options> <source files>
use --help for a list of possible options
PS D:\Thuong589932\Jaar 1 - Saxion\Kwartiel 2\IT Fundamentals\Week 6> javac NetworkSegmentCalculator.java
PS D:\Thuong589932\Jaar 1 - Saxion\Kwartiel 2\IT Fundamentals\Week 6> java NetworkSegmentCalculator
Enter IP address (e.g. 192.168.1.100): 192.168.1.100
Enter subnet mask (e.g. 255.255.255.224): 255.255.255.224

Calculate the network segment
IP Address: 11000000.10101000.00000001.01100100
Subnet Mask: 11111111.11111111.11111111.11100000
-----
Network Addr: 11000000.10101000.00000001.01100000

Network address (decimal): 192.168.1.96
Range of this network segment: 192.168.1.96 to 192.168.1.127
PS D:\Thuong589932\Jaar 1 - Saxion\Kwartiel 2\IT Fundamentals\Week 6> |
```

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