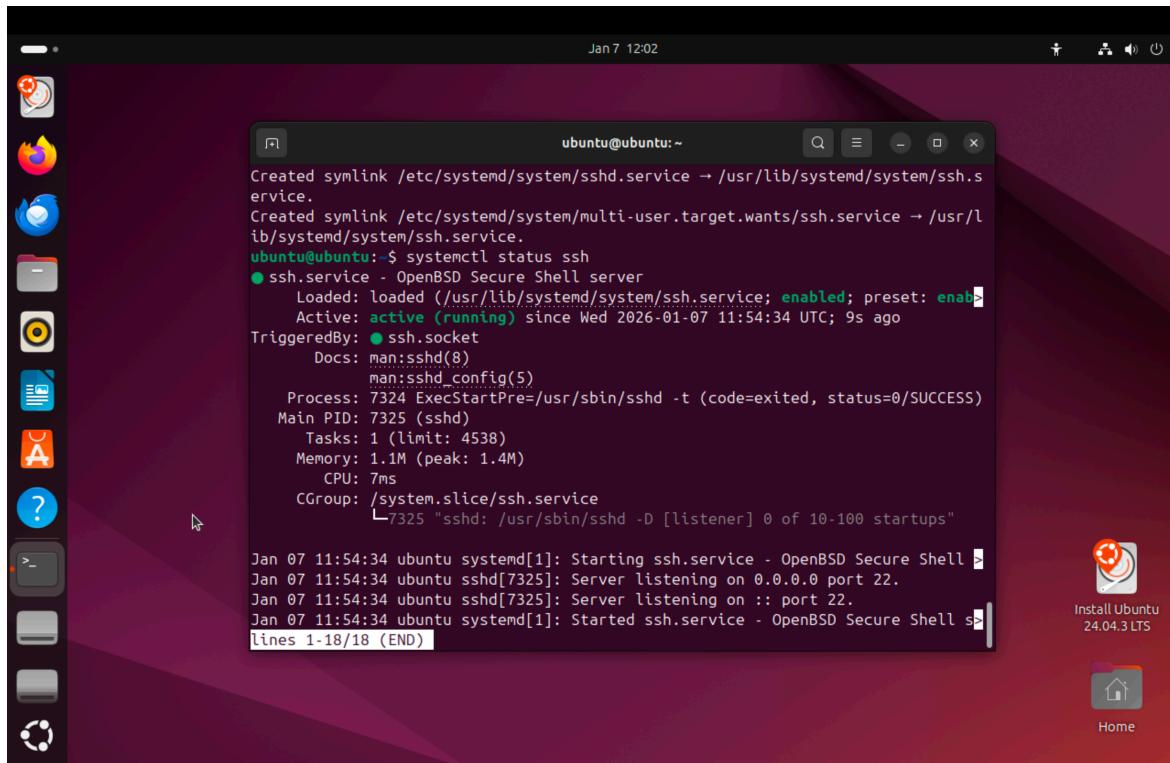


Week 6 – Networking

Student number: 585732

Assignment 6.1: Working from home

Screenshot installation openssh-server:



Screenshot successful SSH command execution:

```
Last login: Thu Dec 18 13:10:13 on ttys019
[macbookpro@mac ~ % ssh ubuntu@192.168.229.136
The authenticity of host '192.168.229.136 (192.168.229.136)' can't be established.
ED25519 key fingerprint is SHA256:WaBVxexuMLBZzU/icbLKn+oL9A2Y0uTrQ95S3iVC94.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.229.136' (ED25519) to the list of known hosts.
ubuntu@192.168.229.136's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-29-generic aarch64)

[

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

Last login: Wed Jan  7 12:18:32 2026 from 192.168.229.136
ubuntu@ubuntu:~$
```

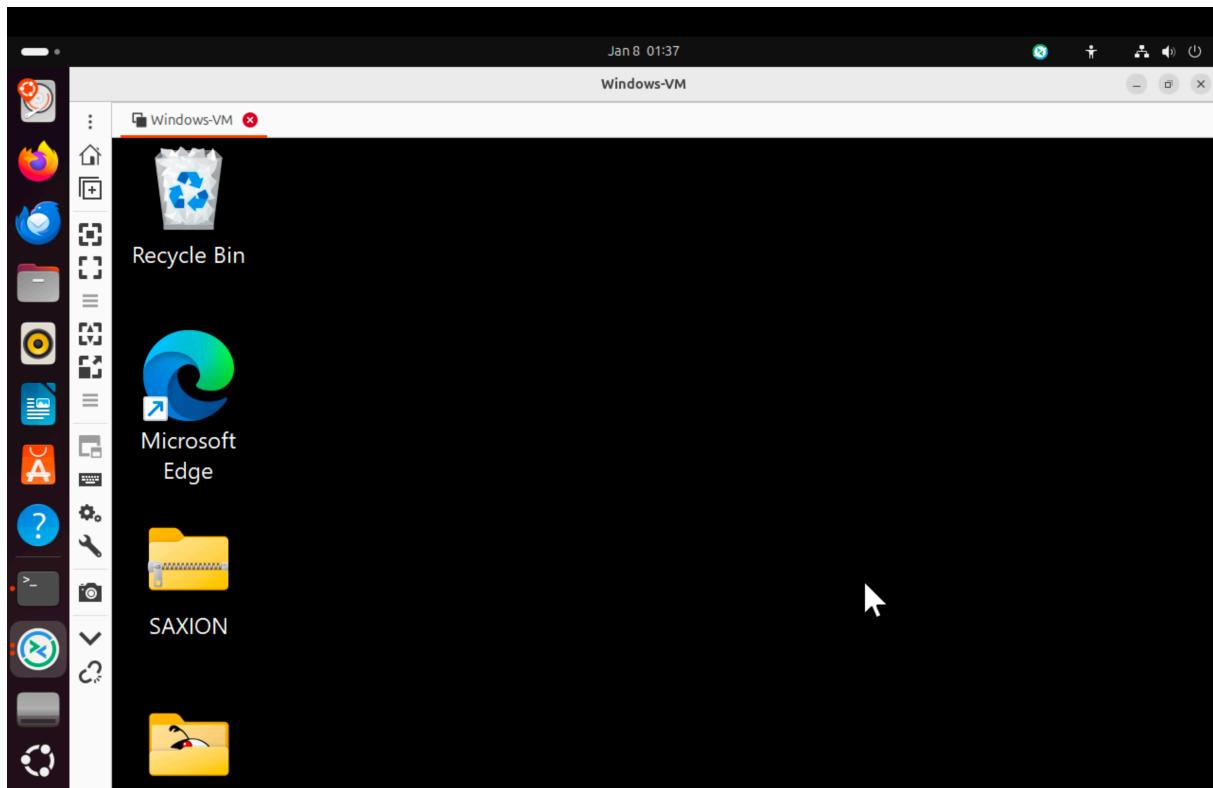
Screenshot successful execution SCP command:

```
Last login: Thu Dec 18 13:10:13 on ttys019
[macbookpro@mac ~ % ssh ubuntu@192.168.229.136
The authenticity of host '192.168.229.136 (192.168.229.136)' can't be established.
ED25519 key fingerprint is SHA256:WaBVxexuMVLBZzU/icbLKn+oL9A2Y0uTrQ95S3iVC94.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.229.136' (ED25519) to the list of known hosts.
ubuntu@192.168.229.136's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-29-generic aarch64)

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

Last login: Wed Jan  7 12:18:32 2026 from 192.168.229.136
ubuntu@ubuntu:~$ echo "Hello from Mac" > test.txt
ubuntu@ubuntu:~$ scp test.txt ubuntu@192.168.229.136:/home/ubuntu/
[ubuntu@192.168.229.136's password:
[test.txt          100%   15    52.0KB/s   00:00
[ubuntu@ubuntu:~$
```

Screenshot remmina:



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

```
test.txt          100% 15  52.0KB/s  00:00
ubuntu@ubuntu:~$ 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:  www.amazon.com
Address: 98.87.178.71
Name:  amazon.com
Address: 98.87.178.74
> google.com
Server:  127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name:  google.com
Address: 209.85.123.142
Name:  google.com
Address: 2a0e:1458:400e:801::200e
> one.one.one.one
Server:  127.0.0.53
Address: 127.0.0.53#53

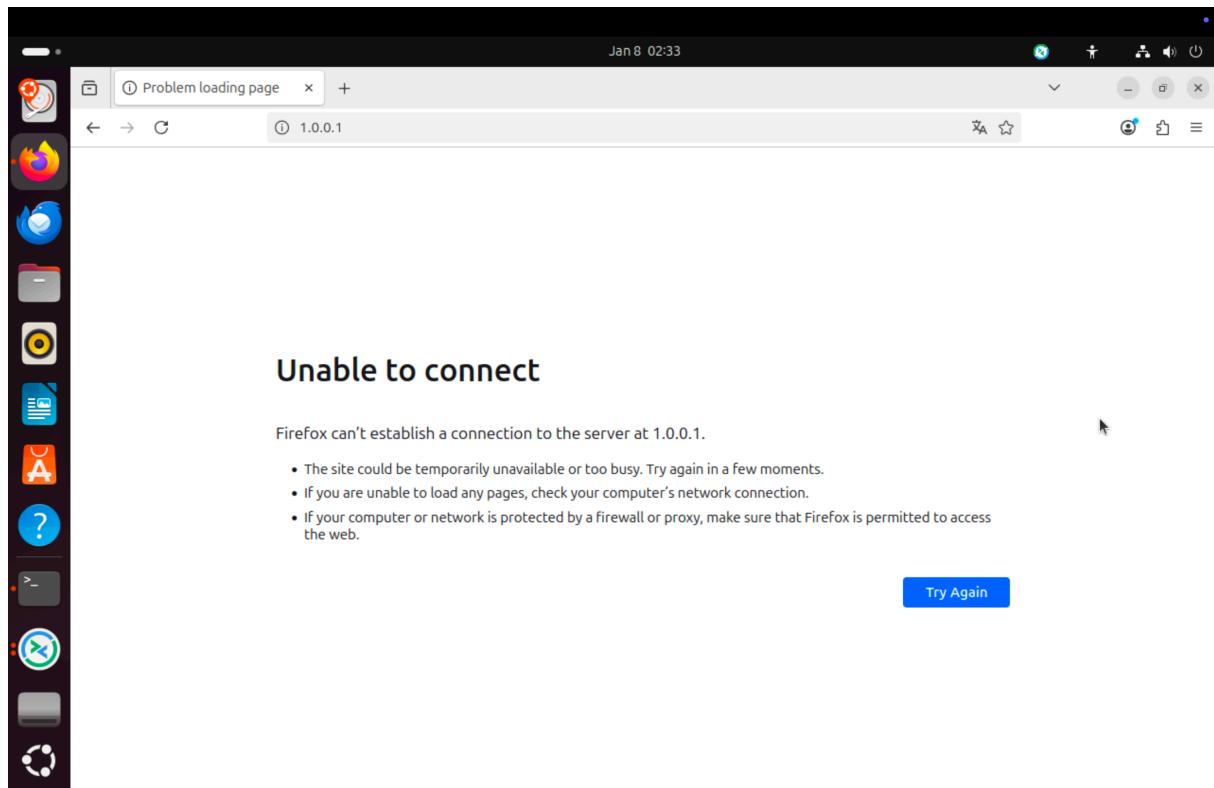
Non-authoritative answer:
Name:  one.one.one.one
Address: 1.0.0.1
Name:  1.0.0.1
Address: 2a0e:4700:4700::1111
Name:  one.one.one.one
Address: 2a0e:4700:4700::1001
> dns.google.com
Server:  127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name:  dns.google.com
Address: 8.8.8
Name:  dns.google.com
Address: 8.8.4
Name:  dns.google.com
Address: 208.67.222.221
Name:  dns.google.com
Address: 2001:4868:4868::8888
Name:  dns.google.com
Address: 2001:4868:4868::8844
> bol.com
Server:  127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name:  bol.com
Address: 1.1.1.1
> w3schools.com
Server:  127.0.0.53
Address: 127.0.0.53#53

Non-authoritative answer:
Name:  w3schools.com
Address: 75.232.115.82
Name:  w3schools.com
Address: 13.248.240.139
> exit
ubuntu@ubuntu:~$
```

Screenshot website visit via IP address:



I Tried to visit <http://1.0.0.1> (from nslookup one.one.one.one). The server did not respond, so Firefox shows ‘Unable to connect’, but the IP address is used instead of a domain name.

Assignment 6.3: subnetting

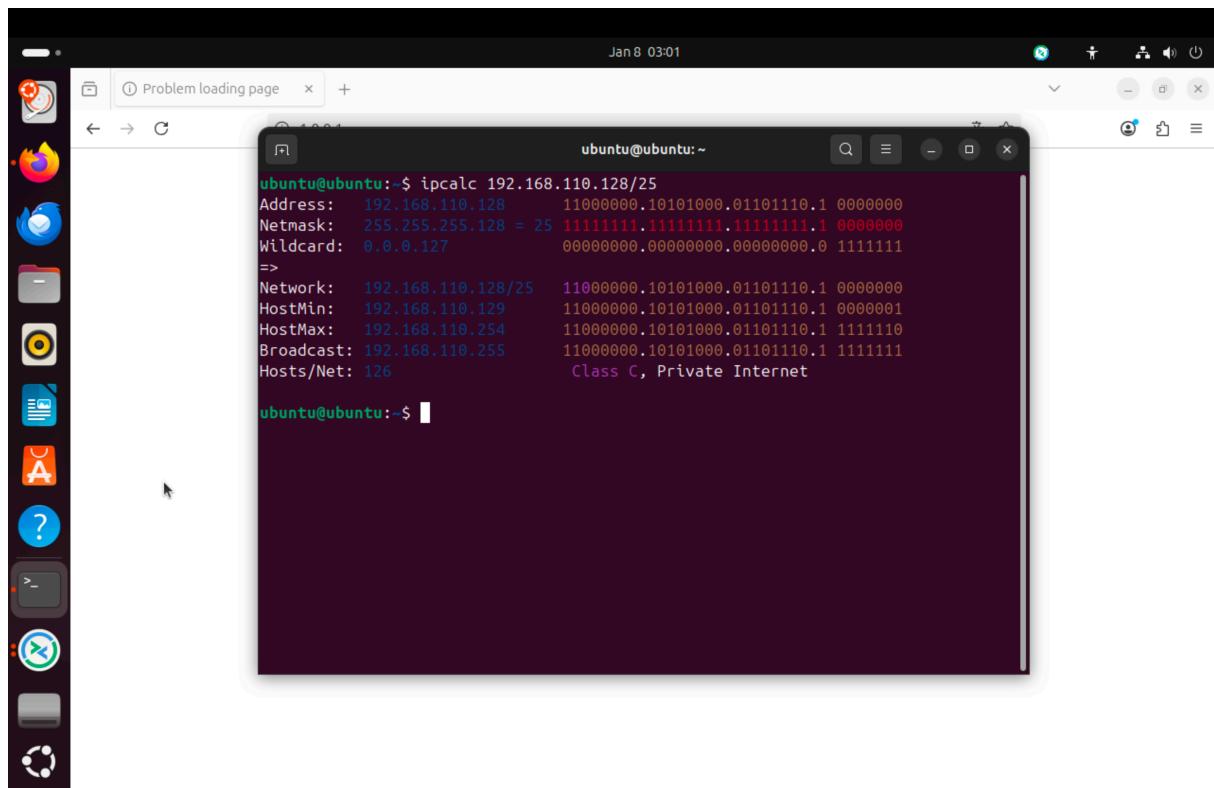
How many IP addresses are in this network configuration 192.168.110.128/25?

= There are **128 IP addresses** in the network 192.168.110.128/25.

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

= The usable host range is **192.168.110.129 up to 192.168.110.254**, which gives **126 usable IP addresses**.

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



The screenshot shows a terminal window on a dark-themed desktop environment. The terminal title is "ubuntu@ubuntu:~". The command entered is `ipcalc 192.168.110.128/25`. The output provides detailed information about the subnet:

```
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
```

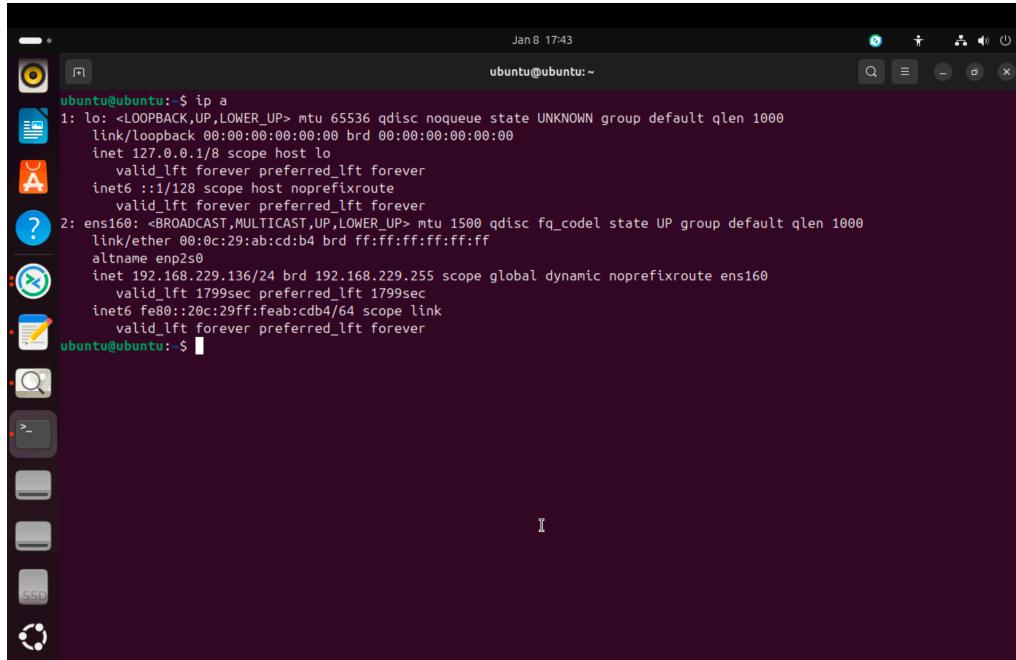
Running `ipcalc 192.168.110.128/25` confirms my answers: it shows Network 192.168.110.128, HostMin 192.168.110.129, HostMax 192.168.110.254 and Hosts/Net 126.

Explain the above calculation in your own words.

The “/25” means 25 bits are used for the network and the remaining 7 bits are for hosts. With 7 host bits there are $2^7 = 128$ total addresses in the subnet. Because the subnet runs from 192.168.110.128 to 192.168.110.255, the first address is the network address and the last is the broadcast address, so I can't use those. The addresses in between (192.168.110.129–192.168.110.254) are usable for devices, which leaves 126 usable host addresses.

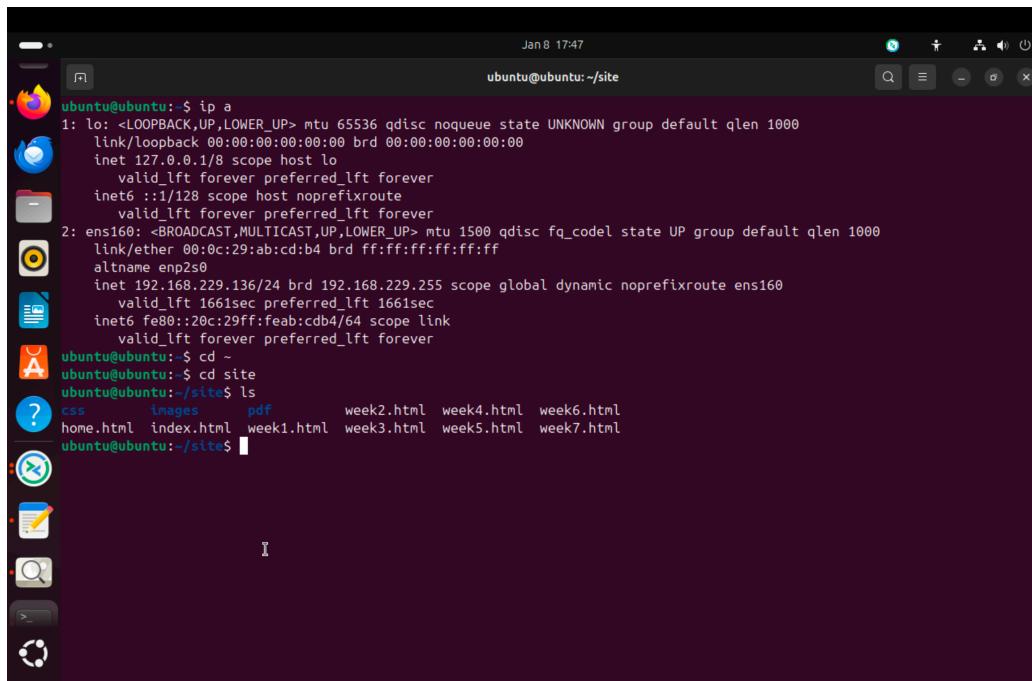
Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:



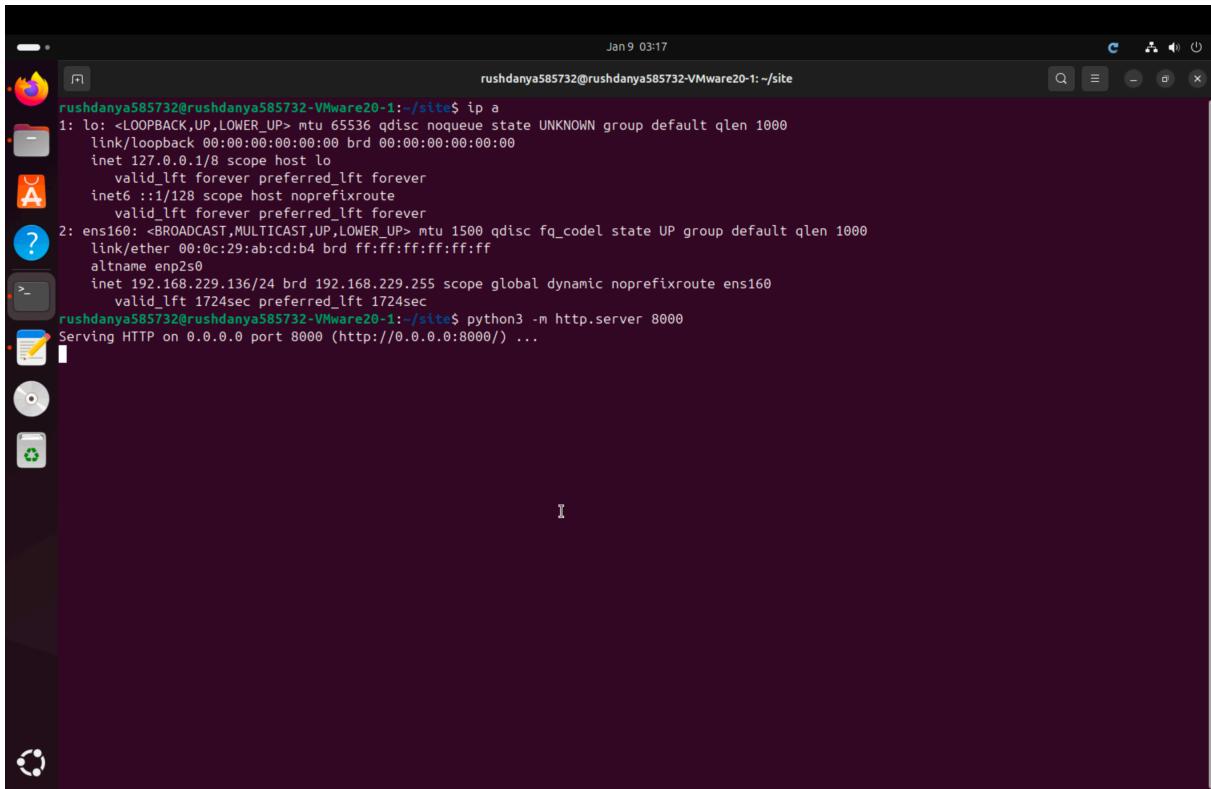
```
ubuntu@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
            inet6 ::1/128 scope host noprefixroute
                valid_lft forever preferred_lft forever
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:ab:cdb4 brd ff:ff:ff:ff:ff:ff
        altname enp2s0
        inet 192.168.229.136/24 brd 192.168.229.255 scope global dynamic noprefixroute ens160
            valid_lft 1799sec preferred_lft 1799sec
            inet6 fe80::20c:29ff:feab:cdb4/64 scope link
                valid_lft forever preferred_lft forever
ubuntu@ubuntu:~$
```

Screenshot of Site directory contents:



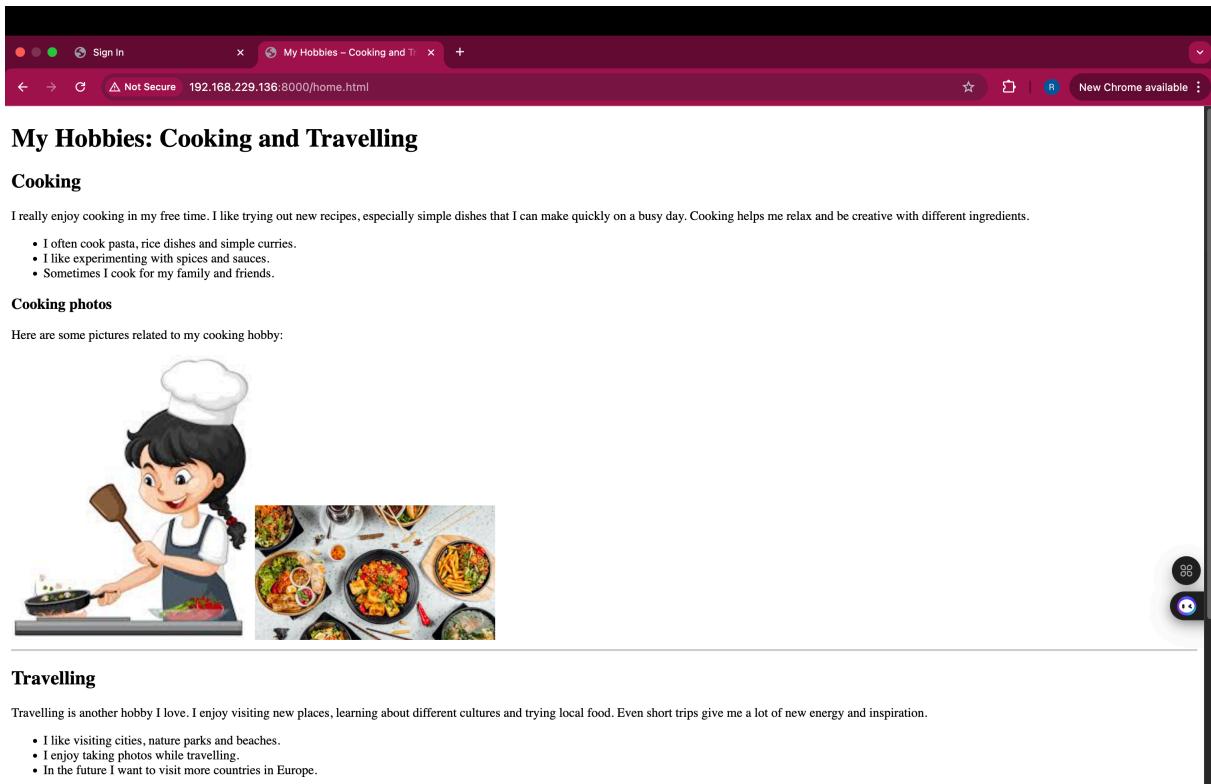
```
ubuntu@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
        inet 127.0.0.1/8 scope host lo
            valid_lft forever preferred_lft forever
            inet6 ::1/128 scope host noprefixroute
                valid_lft forever preferred_lft forever
2: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:ab:cdb4 brd ff:ff:ff:ff:ff:ff
        altname enp2s0
        inet 192.168.229.136/24 brd 192.168.229.255 scope global dynamic noprefixroute ens160
            valid_lft 1661sec preferred_lft 1661sec
            inet6 fe80::20c:29ff:feab:cdb4/64 scope link
                valid_lft forever preferred_lft forever
ubuntu@ubuntu:~$ cd ~
ubuntu@ubuntu:~$ cd site
ubuntu@ubuntu:~/site$ ls
css      images      pdf      week2.html  week4.html  week6.html
home.html index.html week1.html  week3.html  week5.html  week7.html
ubuntu@ubuntu:~/site$
```

Screenshot python3 webserver command:



```
Jan 9 03:17
rushdanya585732@rushdanya585732-VMware20-1:~/site$ 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: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:ab:cd:b4 brd ff:ff:ff:ff:ff:ff
        altname enp2s0
        inet 192.168.229.136/24 brd 192.168.229.255 scope global dynamic noprefixroute ens160
            valid_lft 1724sec preferred_lft 1724sec
rushdanya585732@rushdanya585732-VMware20-1:~/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



My Hobbies – Cooking and Travelling

Cooking

I really enjoy cooking in my free time. I like trying out new recipes, especially simple dishes that I can make quickly on a busy day. Cooking helps me relax and be creative with different ingredients.

- I often cook pasta, rice dishes and simple curries.
- I like experimenting with spices and sauces.
- Sometimes I cook for my family and friends.

Cooking photos

Here are some pictures related to my cooking hobby:



Travelling

Travelling is another hobby I love. I enjoy visiting new places, learning about different cultures and trying local food. Even short trips give me a lot of new energy and inspiration.

- I like visiting cities, nature parks and beaches.
- I enjoy taking photos while travelling.
- In the future I want to visit more countries in Europe.

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 NetworkSegment {

    // Parse dotted-decimal address (e.g. "192.168.1.100") to 4 octets

    private static int[] parseAddress(String address) {
        String[] parts = address.trim().split("\\.");
        if (parts.length != 4) {
            return null;
        }

        int[] octets = new int[4];
        try {
            for (int i = 0; i < 4; i++) {
                octets[i] = Integer.parseInt(parts[i]);
                if (octets[i] < 0 || octets[i] > 255) {
                    return null;
                }
            }
        } catch (NumberFormatException e) {
            return null;
        }

        return octets;
    }
}
```

```

}

// Format 4 octets back to dotted-decimal

private static String format(int[] octets) {
    return octets[0] + "." + octets[1] + "." + octets[2] + "." + octets[3];
}

// Convert one octet to 8-bit binary string (e.g. 192 -> 11000000)

private static String toBinary8(int value) {
    String bin = Integer.toBinaryString(value);
    return String.format("%8s", bin).replace(' ', '0');
}

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

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

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

    int[] ip = parseAddress(ipString);
    int[] mask = parseAddress(maskString);

    if (ip == null || mask == null) {
        System.out.println("Invalid IP address or subnet mask.");
        return;
    }

    // Calculate network address with bitwise AND

    int[] network = new int[4];
    for (int i = 0; i < 4; i++) {
        network[i] = ip[i] & mask[i];
    }

    // Print decimal result

    System.out.println();
    System.out.println("IP address: " + format(ip));
    System.out.println("Subnet mask: " + format(mask));
    System.out.println("Network address: " + format(network));

    // Print binary result
}

```

```

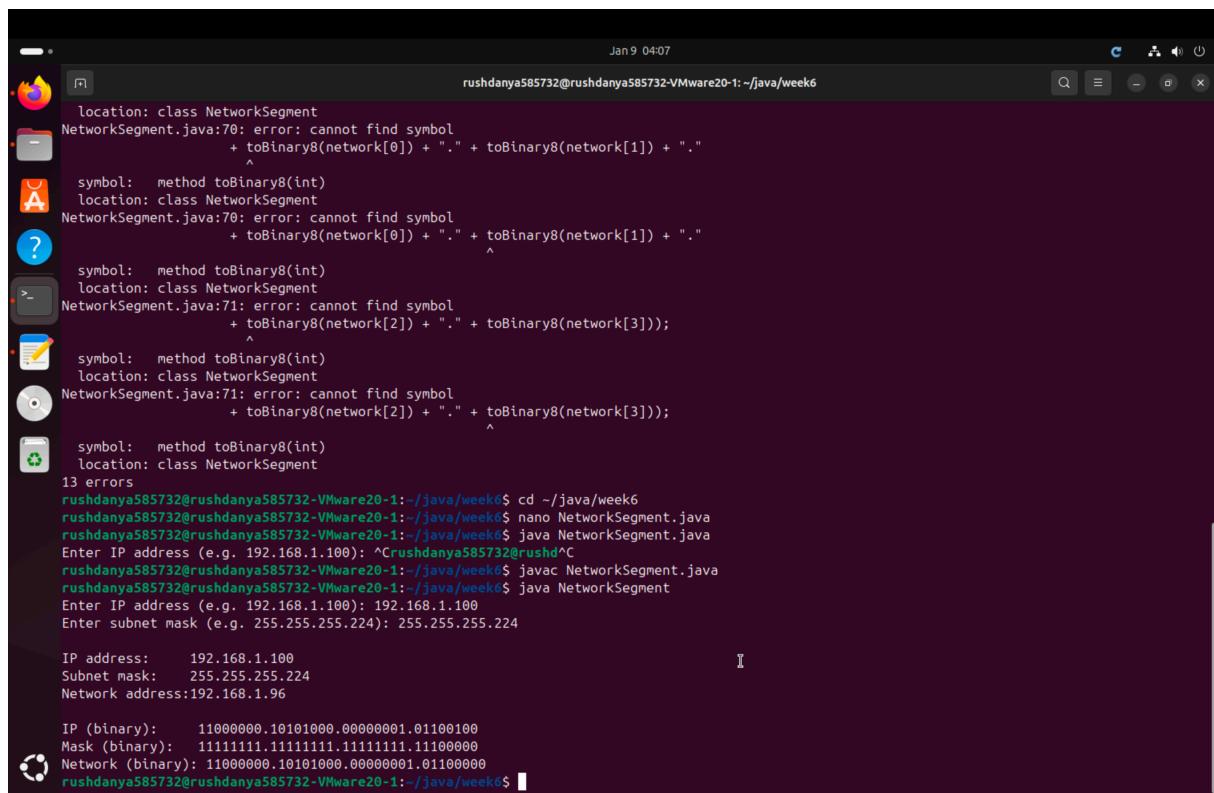
System.out.println();
System.out.println("IP (binary):    "
+ toBinary8(ip[0]) + "." + toBinary8(ip[1]) + "."
+ toBinary8(ip[2]) + "." + toBinary8(ip[3]));

System.out.println("Mask (binary):   "
+ toBinary8(mask[0]) + "." + toBinary8(mask[1]) + "."
+ toBinary8(mask[2]) + "." + toBinary8(mask[3]));

System.out.println("Network (binary): "
+ toBinary8(network[0]) + "." + toBinary8(network[1]) + "."
+ toBinary8(network[2]) + "." + toBinary8(network[3]));
}

}

```



The screenshot shows a terminal window with the following content:

```

location: class NetworkSegment
NetworkSegment.java:70: error: cannot find symbol
        + toBinary8(network[0]) + "." + toBinary8(network[1]) + "."
               ^
symbol:   method toBinary8(int)
location: class NetworkSegment
NetworkSegment.java:70: error: cannot find symbol
        + toBinary8(network[0]) + "." + toBinary8(network[1]) + "."
               ^
symbol:   method toBinary8(int)
location: class NetworkSegment
NetworkSegment.java:71: error: cannot find symbol
        + toBinary8(network[2]) + "." + toBinary8(network[3]));
               ^
symbol:   method toBinary8(int)
location: class NetworkSegment
NetworkSegment.java:71: error: cannot find symbol
        + toBinary8(network[2]) + "." + toBinary8(network[3]));
               ^
symbol:   method toBinary8(int)
location: class NetworkSegment
13 errors
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ cd ~/java/week6
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ nano NetworkSegment.java
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ java NetworkSegment.java
Enter IP address (e.g. 192.168.1.100): ^Crushdanya585732@rushd^C
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ javac NetworkSegment.java
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ java NetworkSegment
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
IP address:      192.168.1.100
Subnet mask:    255.255.255.224
Network address:192.168.1.96
IP (binary):      11000000.10101000.00000001.01100100
Mask (binary):    11111111.11111111.11111111.11100000
Network (binary): 11000000.10101000.00000001.01100100
rushdanya585732@rushdanya585732-VMware20-1:~/java/week6$ 

```