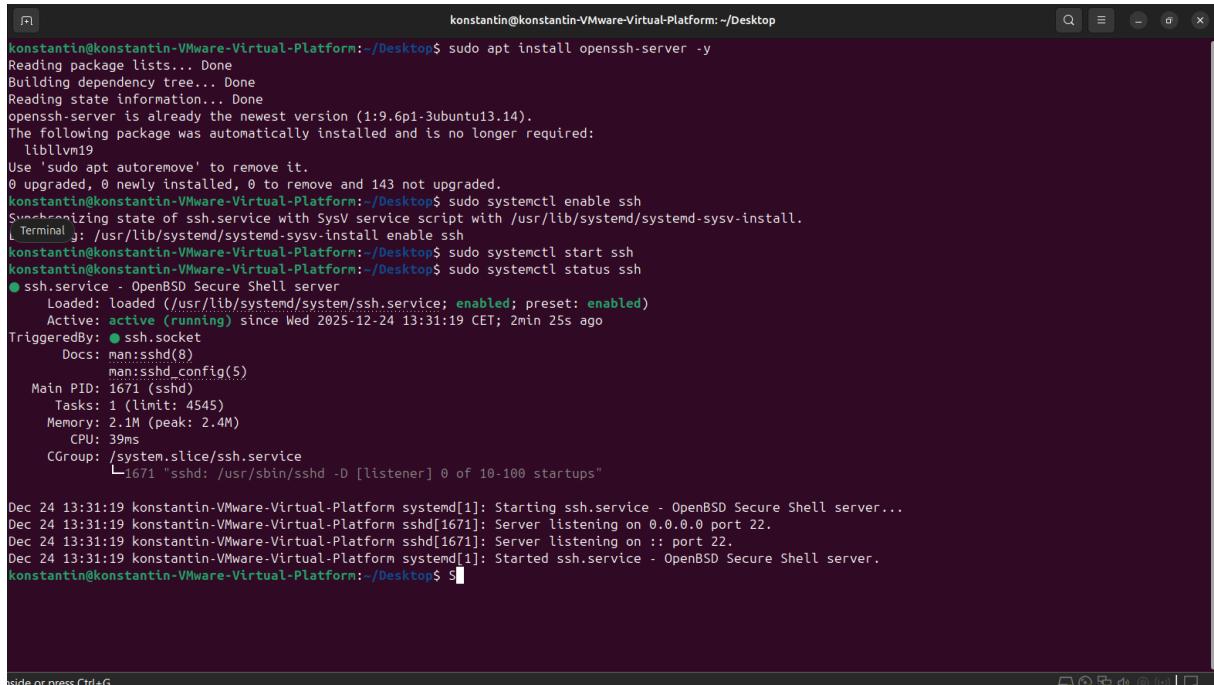


# Template Week 6 – Networking

Student number: 578634

## Assignment 6.1: Working from home

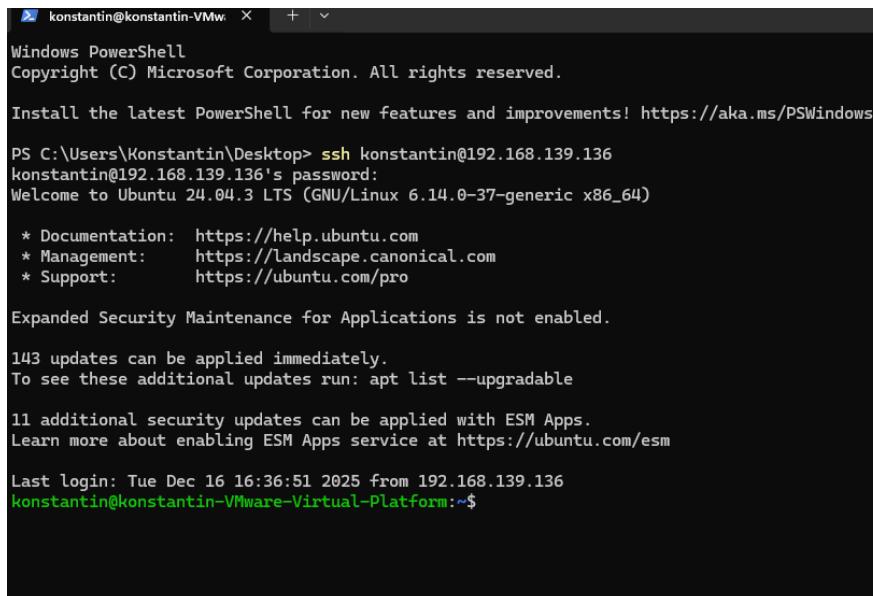
Screenshot installation openssh-server:



```
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ sudo apt install openssh-server -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:9.6p1-3ubuntu13.14).
The following package was automatically installed and is no longer required:
  liblvm19
Use 'sudo apt autoremove' to remove it.
0 upgraded, 0 newly installed, 0 to remove and 143 not upgraded.
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ sudo systemctl enable ssh
Synchronizing state of ssh.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
[Terminal 1: /usr/lib/systemd/systemd-sysv-install enable ssh]
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ sudo systemctl start ssh
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
  Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: enabled)
  Active: active (running) since Wed 2025-12-24 13:31:19 CET; 2min 25s ago
TriggeredBy: ● ssh.socket
  Docs: man:sshd(8)
         man:sshd_config(5)
    Main PID: 1671 (sshd)
       Tasks: 1 (limit: 4545)
      Memory: 2.1M (peak: 2.4M)
        CPU: 39ms
       CGroup: /system.slice/ssh.service
               └─1671 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Dec 24 13:31:19 konstantin-VMware-Virtual-Platform systemd[1]: Starting ssh.service - OpenBSD Secure Shell server...
Dec 24 13:31:19 konstantin-VMware-Virtual-Platform sshd[1671]: Server listening on 0.0.0.0 port 22.
Dec 24 13:31:19 konstantin-VMware-Virtual-Platform sshd[1671]: Server listening on :: port 22.
Dec 24 13:31:19 konstantin-VMware-Virtual-Platform systemd[1]: Started ssh.service - OpenBSD Secure Shell server.
konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$
```

Screenshot successful SSH command execution:



```
konstantin@konstantin-VMw. X + 
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.

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

PS C:\Users\Konstantin\Desktop> ssh konstantin@192.168.139.136
konstantin@192.168.139.136'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

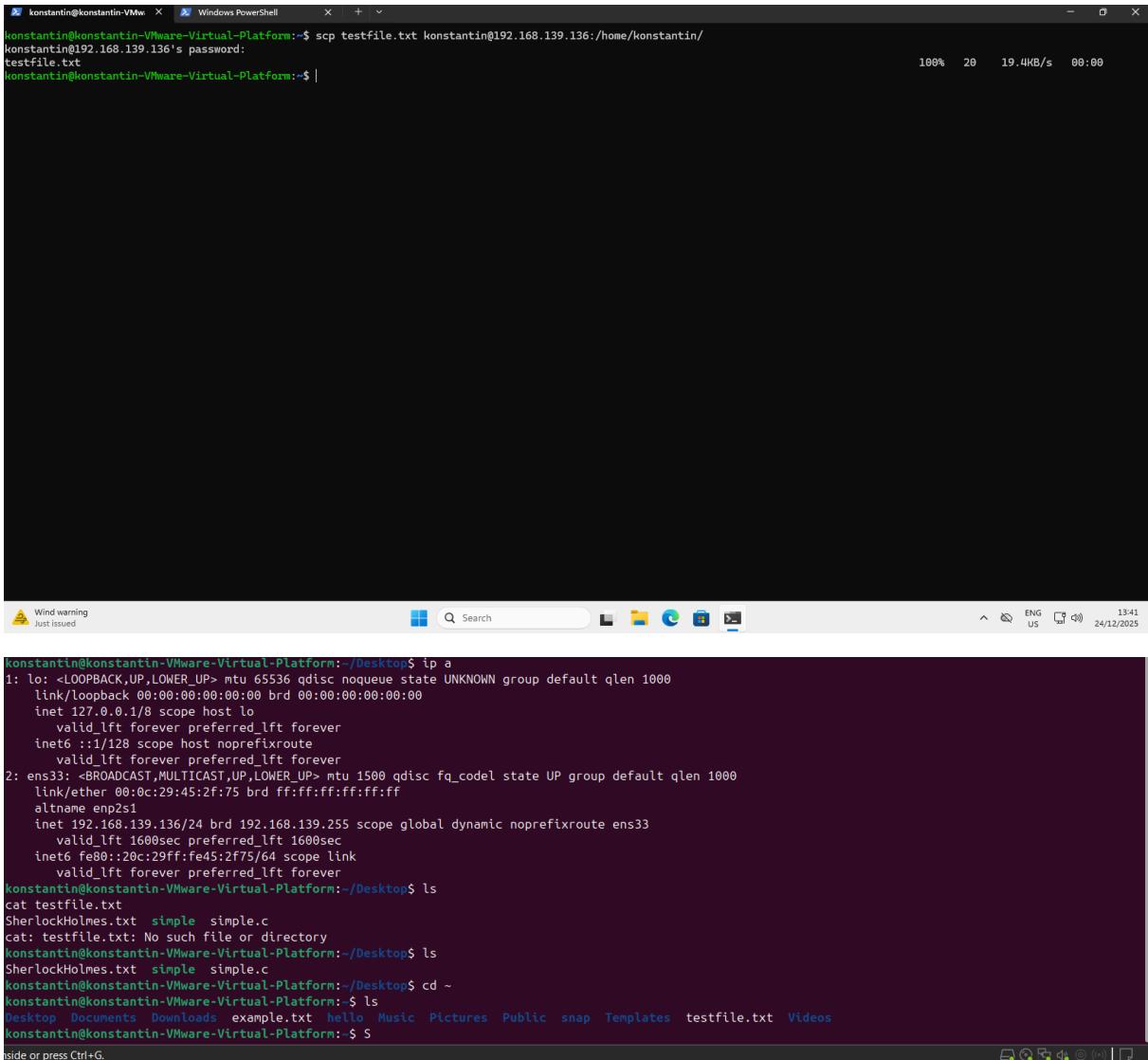
Expanded Security Maintenance for Applications is not enabled.

143 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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

Last login: Tue Dec 16 16:36:51 2025 from 192.168.139.136
konstantin@konstantin-VMware-Virtual-Platform:~$
```

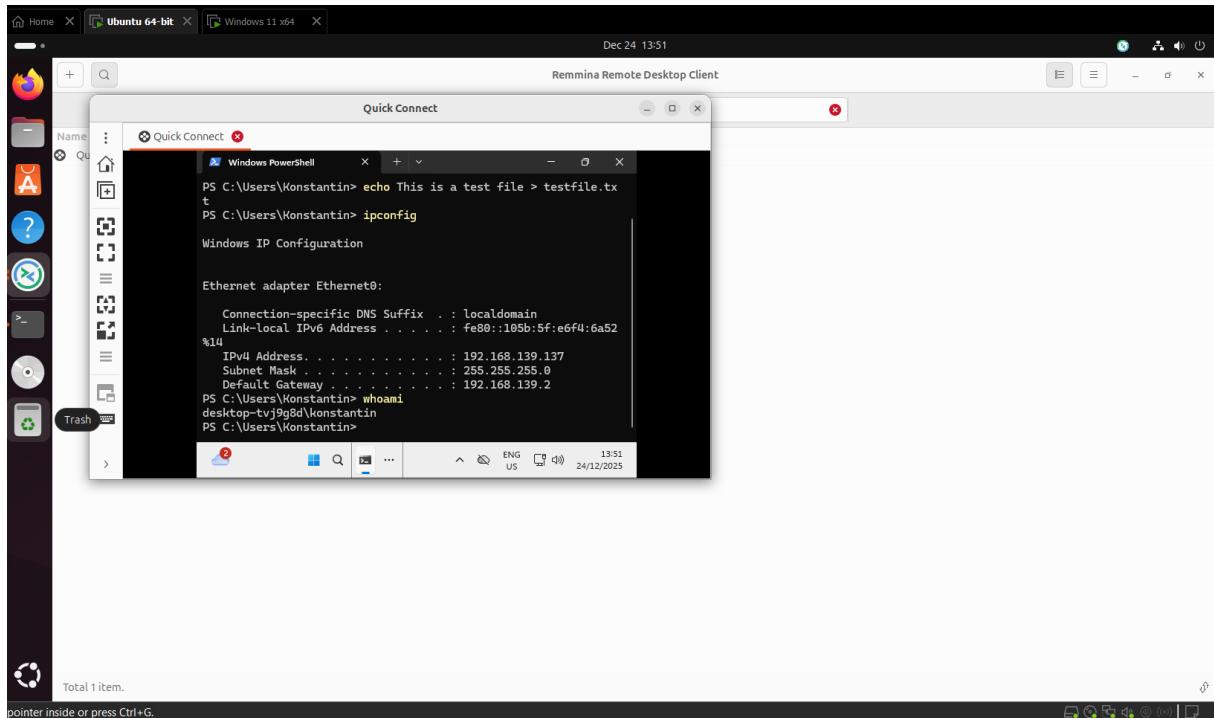
Screenshot successful execution SCP command:



```
konstantin@konstantin-VMware-Virtual-Platform:~$ scp testfile.txt konstantin@192.168.139.136:/home/konstantin/
konstantin@192.168.139.136's password:
testfile.txt
konstantin@konstantin-VMware-Virtual-Platform:~$ |
```

```
Wind warning
Just issued
Konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ 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 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 fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:45:2f:75 brd ff:ff:ff:ff:ff:ff
        altname enp2s1
        inet 192.168.139.136/24 brd 192.168.139.255 scope global dynamic noprefixroute ens3
            valid_lft 1600sec preferred_lft 1600sec
            inet6 fe80::20c:29ff:fe45:2f75/64 scope link
                valid_lft forever preferred_lft forever
Konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ ls
cat testfile.txt
SherlockHolmes.txt  simple  simple.c
cat: testfile.txt: No such file or directory
Konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ ls
SherlockHolmes.txt  simple  simple.c
Konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ cd ~
Konstantin@konstantin-VMware-Virtual-Platform:~$ ls
Desktop  Documents  Downloads  example.txt  hello  Music  Pictures  Public  snap  Templates  testfile.txt  Videos
Konstantin@konstantin-VMware-Virtual-Platform:~$ $
```

Screenshot remmina:



## Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

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

konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.179.142
Name:   google.com
Address: 2a00:1450:400e:801::200e

konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ nslookup 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:   one.one.one.one
Address: 1.1.1.1
Name:   one.one.one.one
Address: 2606:4700:4700::1111
Name:   one.one.one.one
Address: 2606:4700:4700::1001
```

```

konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ nslookup 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::8888
Name:   dns.google.com
Address: 2001:4860:4860::8844

konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ nslookup bol.com
Server:      127.0.0.53
Address:     127.0.0.53#53

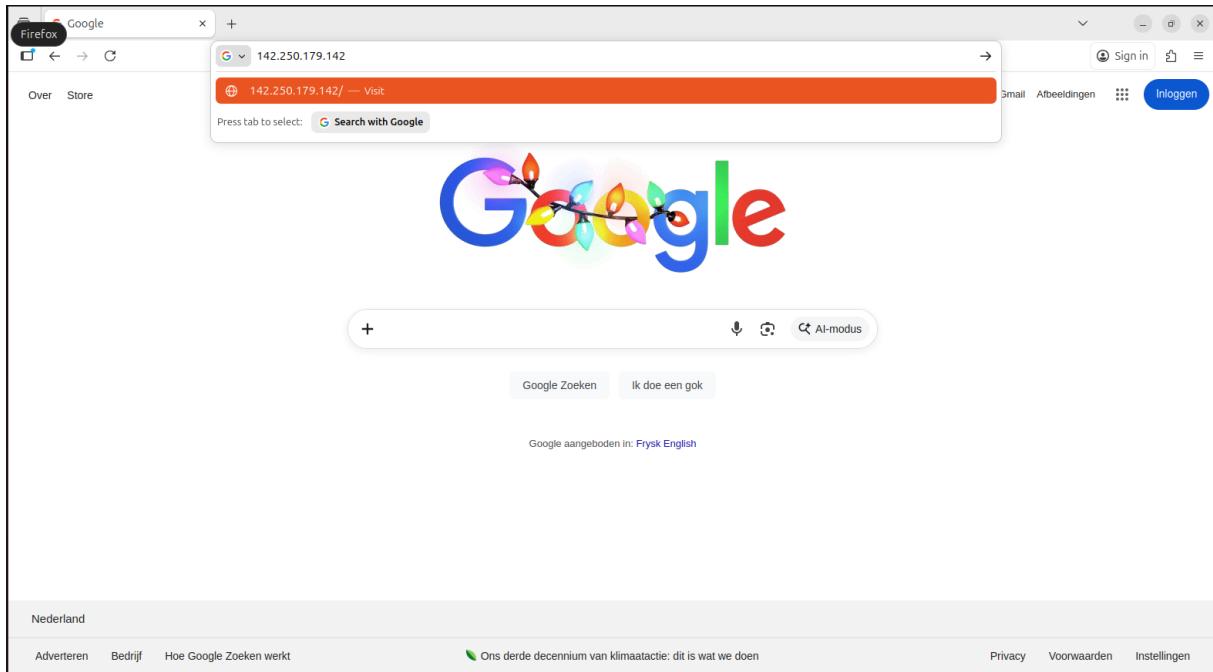
Non-authoritative answer:
Name:   bol.com
Address: 79.170.100.42

konstantin@konstantin-VMware-Virtual-Platform:~/Desktop$ nslookup 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?

Available addresses: 128

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

IP range: 192.168.110.129 – 192.168.110.254

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

Explain the above calculation in your own words.

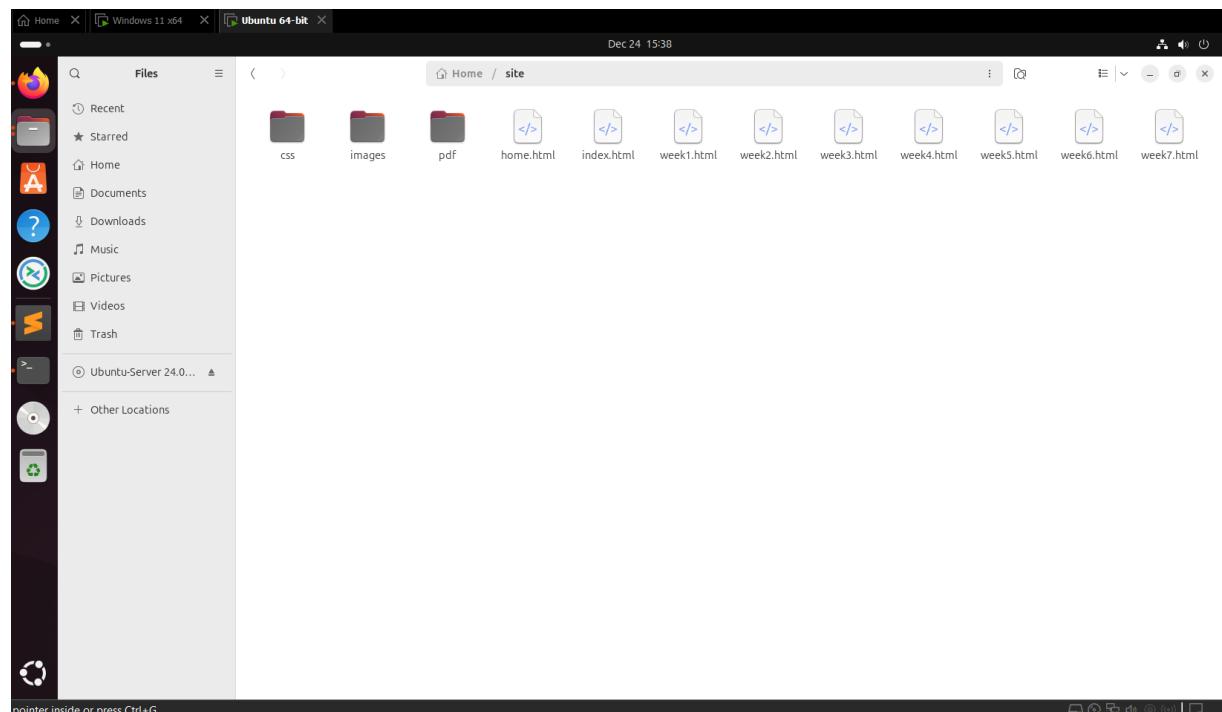
/25 means 25 of the 32 IPv4 bits are for the network, leaving 7 bits for hosts;  $2^7 = 128$  total addresses, and subtracting 2 reserved addresses (network and broadcast) gives **126 usable host IPs from .129 to .254**

#### Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

```
konstantin@konstantin-VMware-Virtual-Platform:~/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: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:45:2f:75 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.136/24 brd 192.168.139.255 scope global dynamic noprefixroute ens3
        valid_lft 1050sec preferred_lft 1050sec
    inet6 fe80::20c:29ff:fe45:2f75/64 scope link
        valid_lft forever preferred_lft forever
```

Screenshot of Site directory contents:

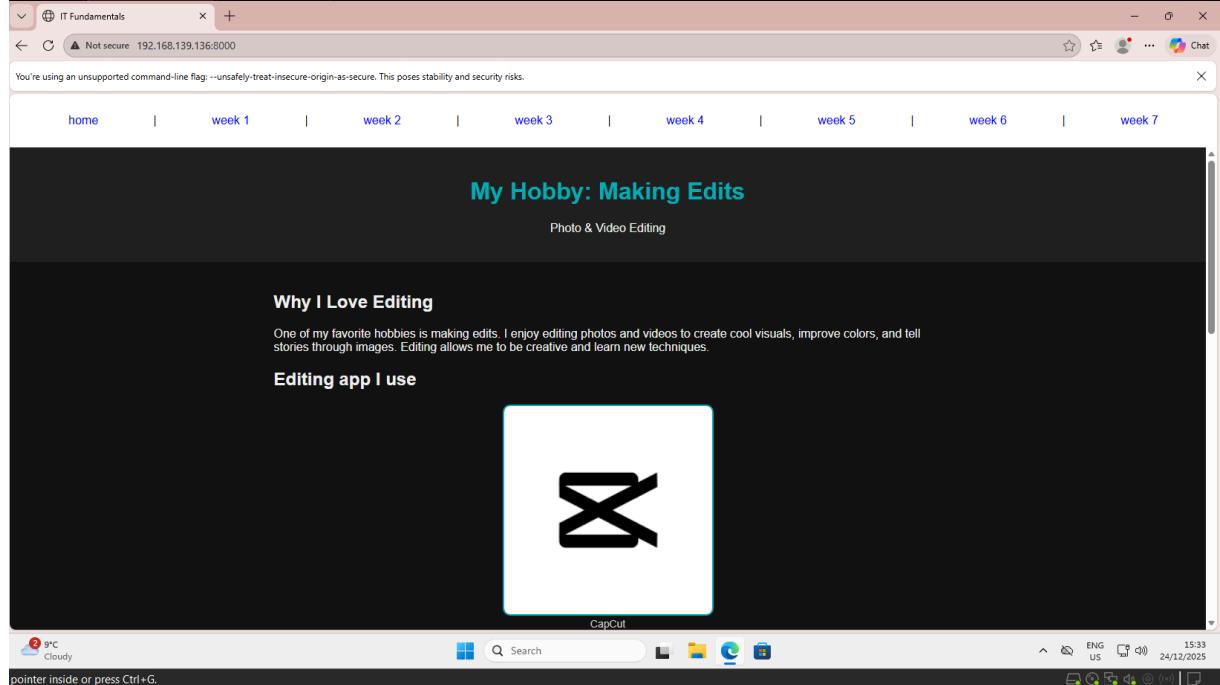


Screenshot python3 webserver command:

```
konstantin@konstantin-Virtual-Platform:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
127.0.0.1 - - [24/Dec/2025 15:18:07] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:18:07] "GET /home.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:18:07] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:18:07] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:18:07] "GET /favicon.ico HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:18:09] "GET /week1.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:18:09] "GET /pdf/week1.pdf HTTP/1.1" 200 -
Sublime Text - - [24/Dec/2025 15:18:11] "GET /week2.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:18:11] "GET /pdf/week2.pdf HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:20:53] "GET / HTTP/1.1" 304 -
127.0.0.1 - - [24/Dec/2025 15:20:53] "GET /week2.html HTTP/1.1" 304 -
127.0.0.1 - - [24/Dec/2025 15:20:56] "GET / HTTP/1.1" 304 -
127.0.0.1 - - [24/Dec/2025 15:20:56] "GET /home.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:20:56] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:20:56] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:20:56] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:20:56] "GET /images/editing.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:20:56] "GET /images/camera.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:20:56] "GET /images/timeline.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:23:02] "GET / HTTP/1.1" 304 -
127.0.0.1 - - [24/Dec/2025 15:23:02] "GET /home.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:23:02] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:23:02] "GET /images/edit1.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:23:02] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:23:02] "GET /images/edit2.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:23:02] code 404, message File not found
127.0.0.1 - - [24/Dec/2025 15:23:02] "GET /images/edit3.jpg HTTP/1.1" 404 -
127.0.0.1 - - [24/Dec/2025 15:24:15] "GET / HTTP/1.1" 304 -
127.0.0.1 - - [24/Dec/2025 15:24:15] "GET /home.html HTTP/1.1" 200 -
127.0.0.1 - - [24/Dec/2025 15:24:15] code 404, message File not found
```

pointer inside or press Ctrl+G.

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 scanner = new Scanner(System.in);
        printOptionMenu();
        int option = Integer.parseInt(scanner.nextLine());
        switch (option) {
            case 1: {
                System.out.println("Input a number: ");
                int number = Integer.parseInt(scanner.nextLine());
                isEven(number);
                break;
            }
            case 2: {
                System.out.println("Input a number: ");
                int number = Integer.parseInt(scanner.nextLine());
                isAPowerOfTwo(number);
                break;
            }
            case 3: {
                System.out.println("Input a number: ");
                int number = Integer.parseInt(scanner.nextLine());
                System.out.println(~number + 1);
                break;
            }
            case 4: {
                System.out.print("Input IP address (e.g. 192.168.1.100): ");
                String ipStr = scanner.nextLine();
```

```

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

        int ip = ipToInt(ipStr);
        int mask = ipToInt(maskStr);

        int network = ip & mask;

        String networkStr = intToIp(network);
        System.out.println("Network address: " + networkStr);
        break;
    }
}
}

public static void isEven(int number) {
    if ((number & 1) == 0) {
        System.out.println("even");
    } else {
        System.out.println("odd");
    }
}

public static void isAPowerOfTwo(int number) {
    if ((number & -number) == number) {
        System.out.println("Number is a power of 2");
    } else {
        System.out.println("Number is not a power of 2");
    }
}

public static int ipToInt(String ip) {
    String[] parts = ip.split("\\.");
    int result = 0;
    for (int i = 0; i < 4; i++) {
        int part = Integer.parseInt(parts[i]);
        result = (result << 8) | (part & 255);
    }
    return result;
}

public static String intToIp(int value) {
    int b1 = (value >> 24) & 255;
    int b2 = (value >> 16) & 255;
    int b3 = (value >> 8) & 255;
    int b4 = value & 255;
    return b1 + "." + b2 + "." + b3 + "." + b4;
}

```

```

public static void printOptionsMenu() {
    System.out.println("List of options: ");
    System.out.println("1. Is number odd?");
    System.out.println("2. Is number a power of 2?");
    System.out.println("3. Two's complement of number?");
    System.out.println("4. Calculate network segment?");
    System.out.print("Select an option: ");
}
}

```

The screenshot shows the IntelliJ IDEA run window for a Java application named 'Main'. The console output is as follows:

```

Run Main ×
C:\Program Files\Java\jdk-21\bin\java.exe" "-javaagent:D:\IntelliJ IDEA Ultimate\lib\idea_rt.jar=55530" -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8
List of options:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
4. Calculate network segment?
Select an option: 4
Input IP address (e.g. 192.168.1.100): 192.168.139.136
Input subnet mask (e.g. 255.255.255.224): 255.255.255.0
Network address: 192.168.139.0
Process finished with exit code 0

```

The status bar at the bottom indicates the file is 2.7 > src > Main > main, with 18:39 (2872 chars, 86 line breaks), LF, UTF-8, 4 spaces, and a save icon.

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