

Template Week 6 – Networking

Student number:

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Assignment 6.1: Working from home

Screenshot installation openssh-server:

```
viktoria@viktoria-VMware-Virtual-Platform:~$ sudo apt update
[sudo] password for viktoria:
Hit:1 http://nl.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://nl.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:4 http://nl.archive.ubuntu.com/ubuntu noble-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
250 packages can be upgraded. Run 'apt list --upgradable' to see them.
viktoria@viktoria-VMware-Virtual-Platform:~$ sudo apt install openssh-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-client openssh-sftp-server ssh-import-id
Suggested packages:
  keychain libpam-ssh monkeysphere ssh-askpass molly-guard
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
The following packages will be upgraded:
```

Screenshot successful SSH command execution:

```
viktoria@viktoria-VMware-Virtual-Platform:~$ ssh viktoria@192.168.139.135
viktoria@192.168.139.135'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.

250 updates can be applied immediately.
103 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

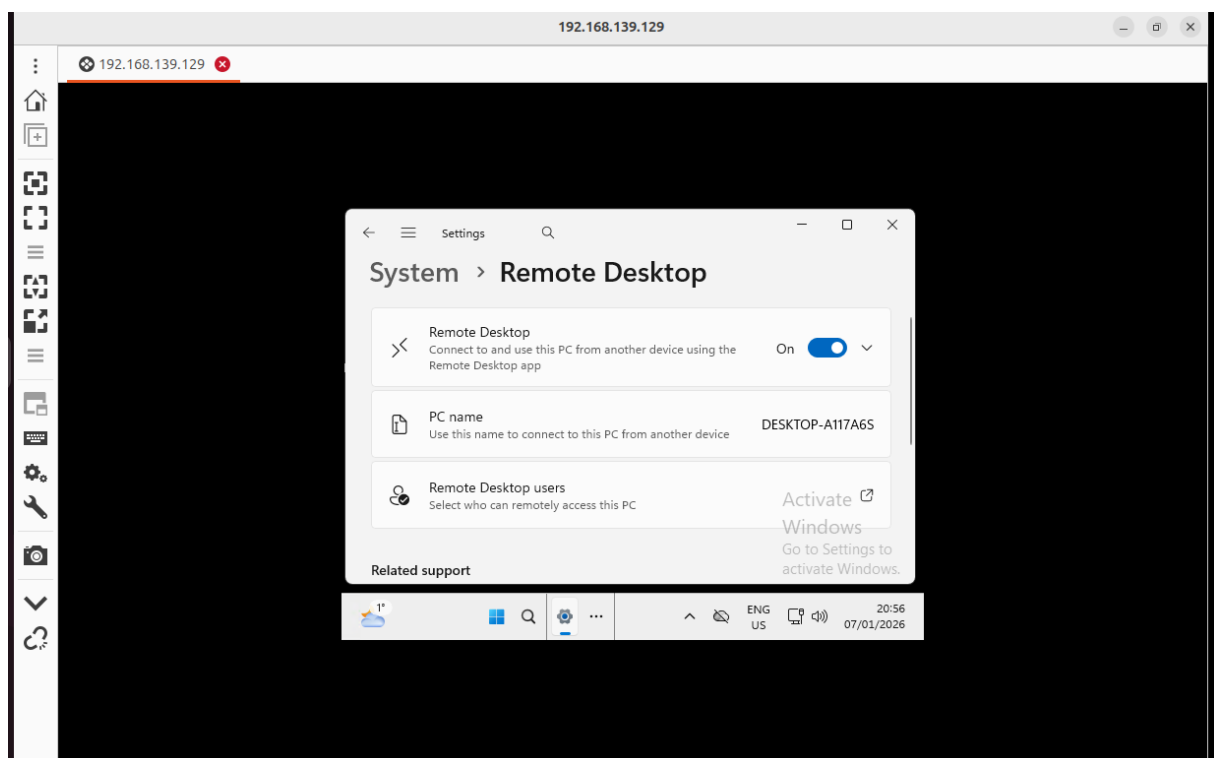
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Wed Jan  7 15:21:49 2026 from 192.168.139.135
```

Screenshot successful execution SCP command:

```
viktoria@viktoria-VMware-Virtual-Platform: ~  
viktoria@viktoria-VMware-Virtual-Platform:~$ echo "This is a test file for assignment 6.1" > testfile.txt  
viktoria@viktoria-VMware-Virtual-Platform:~$ scp testfile.txt viktoria@192.168.139.135:/home/viktoria/  
viktoria@192.168.139.135's password:  
testfile.txt 100% 39 66.8KB/s 00:00  
viktoria@viktoria-VMware-Virtual-Platform:~$ ls  
Desktop Documents Downloads Music Pictures Public snap Templates testfile.txt Videos  
viktoria@viktoria-VMware-Virtual-Platform:~$
```

Screenshot remmina:



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

Google:

```
viktoria@viktoria-VMware-Virtual-Platform:~$ nslookup  
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:803::200e
```

One one one one:

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

Developers google:

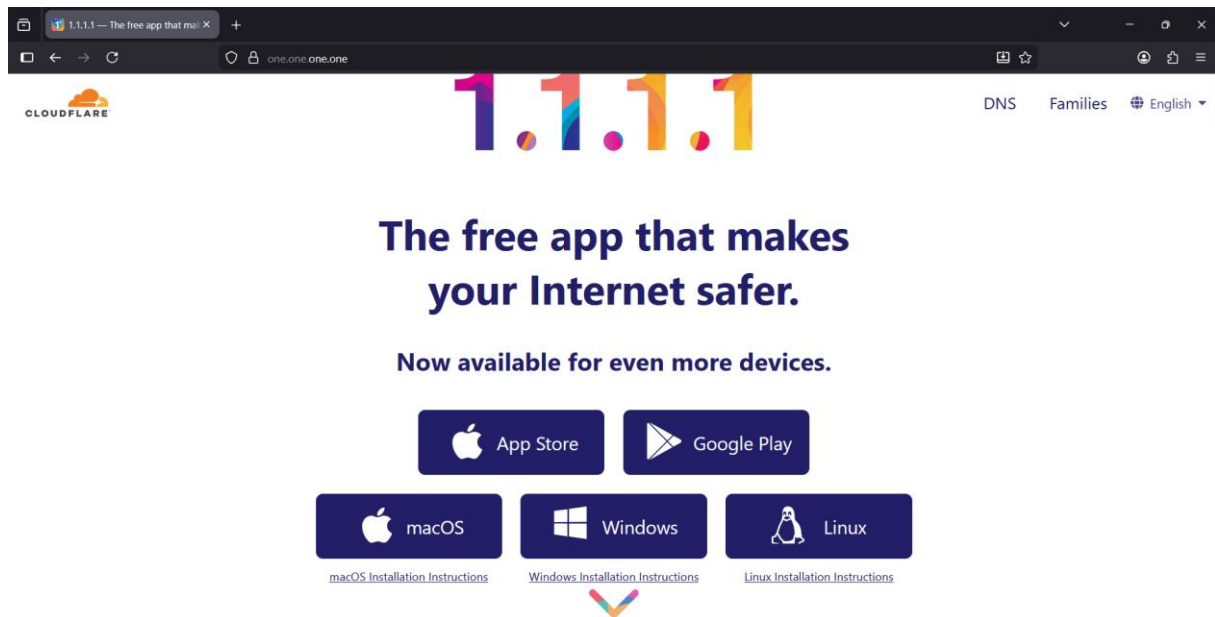
```
Non-authoritative answer:
Name:   dns.google.com
Address: 8.8.8.8
Name:   dns.google.com
Address: 8.8.4.4
Name:   dns.google.com
Address: 2001:4860:4860::8888
Name:   dns.google.com
Address: 2001:4860:4860::8844
```

Bol and w3schools:

```
Non-authoritative answer:
Name:   bol.com
Address: 79.170.100.62
> 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?

To calculate the amount of IP addresses I will need to first know that in every IP address there is 32 bits.

So looking at the subnet mask, that is 25, it shows us that 25 of the 32 bits, are in the IP addresses. The rest 7 belong to some devices.

To see how many IPs fit in the 7 bits for devices, we need to use the power of two.

2 power of 7 = $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$ max IP Addresses

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

The usable IP range to hand out to the connected computers is 192.168.110.129 to 192.168.110.254.

This range excludes the first address, 192.168.110.128, which is the network address, and the last address, 192.168.110.255, which is the broadcast address. The remaining 126 addresses in between are available for devices to use.

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

```

viktoria@viktoria-VMware-Virtual-Platform:~$ 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 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

```

Explain the above calculation in your own words.

The screenshot just confirms, that what I said previously is right. The max Ip address are 126.

Because an IP address has 32 bits in total, subtracting those 25 network bits leaves you with 7 bits to assign to specific computers or devices. With 7 bits, there are 128 total possible combinations, but as I explained, the first and last are made for that, but 1st is for the system to identify the network, last to talk to every pc on that network.

Assignment 6.4: HTML

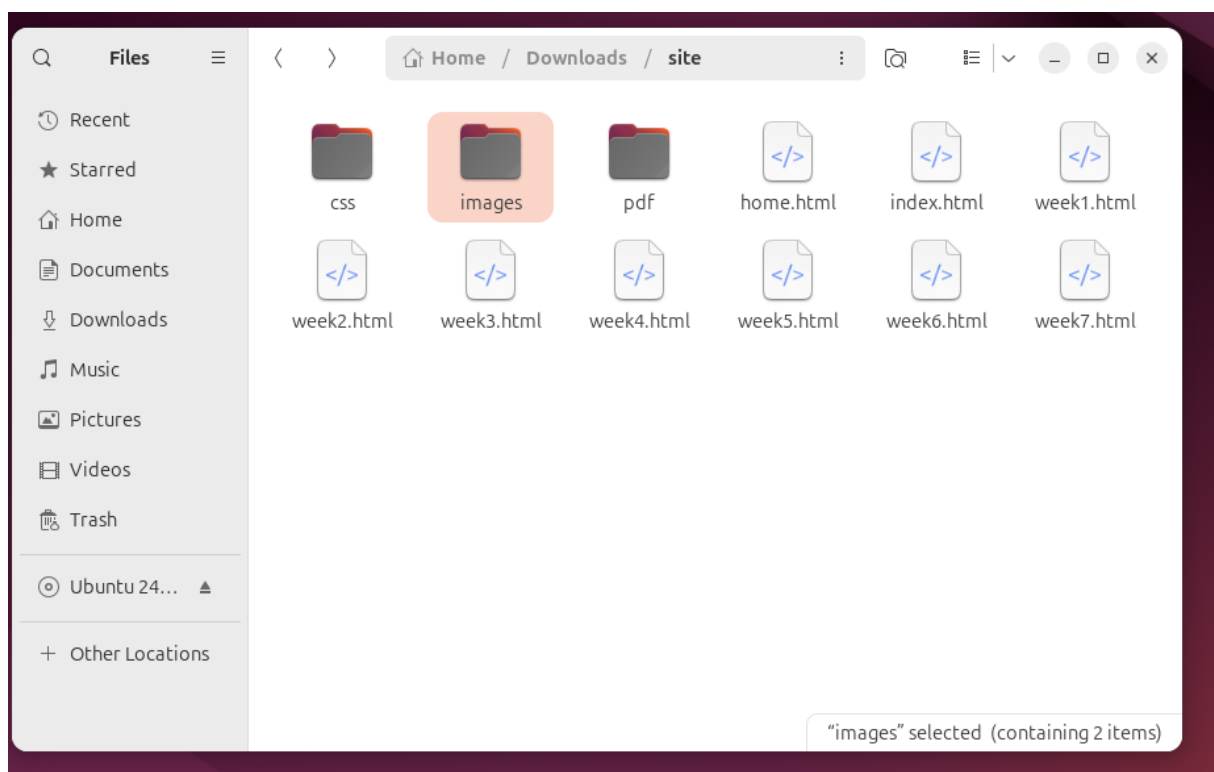
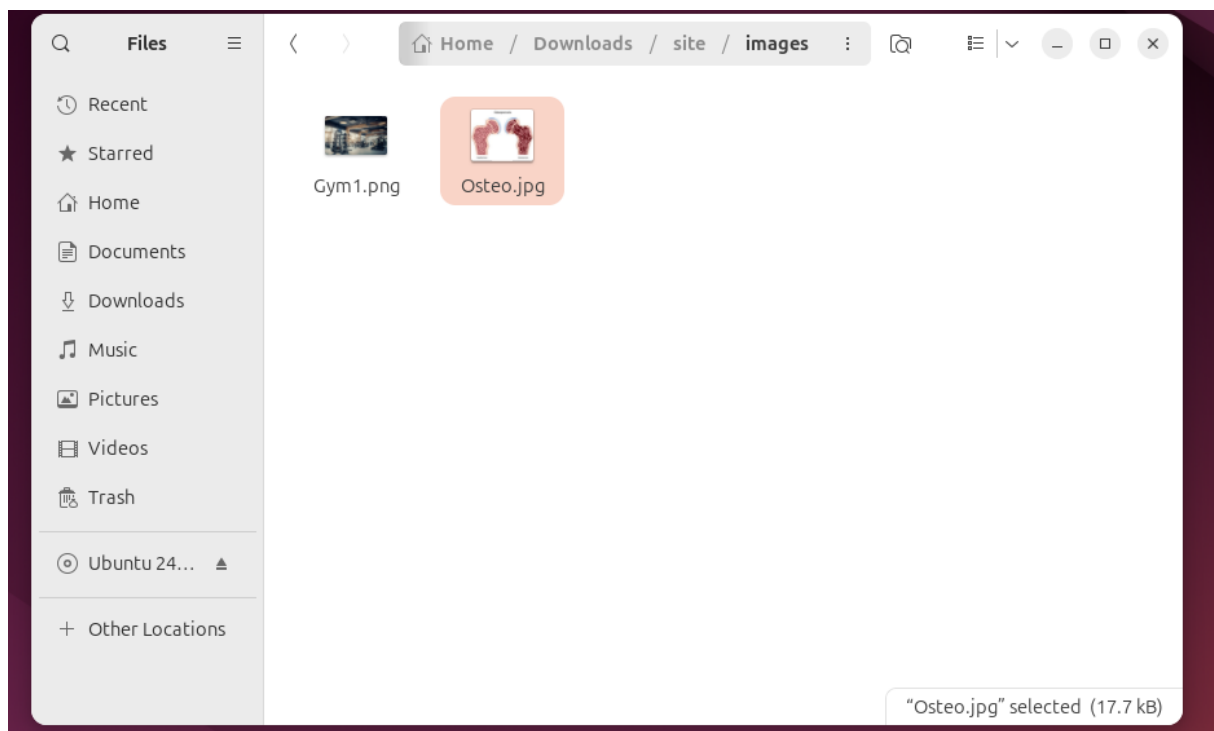
Screenshot IP address Ubuntu VM:

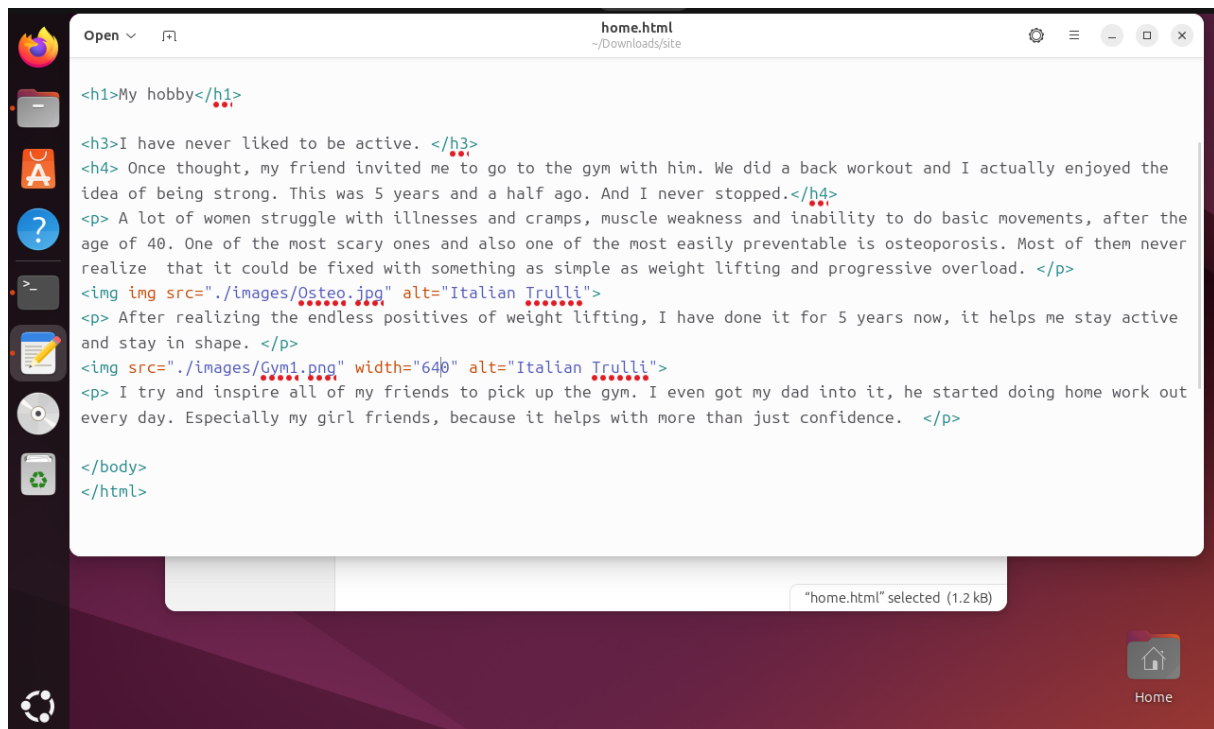
```

viktoria@viktoria-VMware-Virtual-Platform:~/Downloads/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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:7a:4f:a6 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.135/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 1160sec preferred_lft 1160sec
    inet6 fe80::20c:29ff:fe7a:4fa6/64 scope link
        valid_lft forever preferred_lft forever

```

Screenshot python3 webserver command:

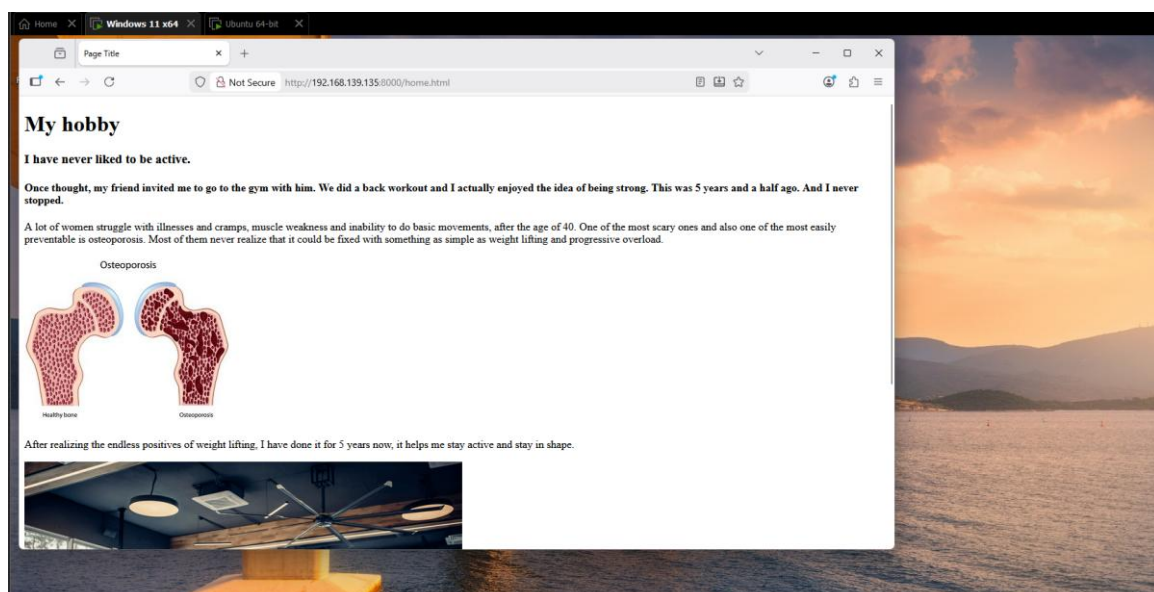




Screenshot of Site directory contents:

```
viktoria@viktoria-VMware-Virtual-Platform:~/Downloads/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.139.129 - - [08/Jan/2026 14:24:32] "GET /home.html HTTP/1.1" 200 -
192.168.139.129 - - [08/Jan/2026 14:24:32] "GET /images/Osteo.jpg HTTP/1.1" 200 -
192.168.139.129 - - [08/Jan/2026 14:24:32] "GET /images/Gym1.png HTTP/1.1" 200 -
192.168.139.129 - - [08/Jan/2026 14:24:32] code 404, message File not found
192.168.139.129 - - [08/Jan/2026 14:24:32] "GET /favicon.ico HTTP/1.1" 404 -
```

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;
```

```
//TIP To <b>Run</b> code, press <shortcut actionId="Run"/> or
```

```
// click the <icon src="AllIcons.Actions.Execute"/> icon in the gutter.
```

```
public class Main {
```

```
    public static void main(String[] args) {
```

```
        System.out.println("1. Check if number is odd");
```

```
        System.out.println("2. Check if number is a power of 2");
```

```
        System.out.println("3. Check two's complement of a number");
```

```
        System.out.println("4. Calculate Network Segment (IP & Subnet)"); // Added this line
```

```
        System.out.println("Choose an operation: ");
```

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

```
        int choice = scanner.nextInt();
```

```
        int num;
```

```
        switch (choice) {
```

```
            case 1:
```

```
                System.out.println("Choose a number: ");
```

```
                num = scanner.nextInt();
```

```
                isNumOdd(num);
```

```
                break;
```

```
            case 2:
```

```
                System.out.println("Choose a number: ");
```

```
                num = scanner.nextInt();
```

```
                isNumPowerOf2(num);
```



```

        break;

    case 3:
        System.out.println("Choose a number: ");
        num = scanner.nextInt();
        twoComplement(num);
        break;

    // --- THIS IS THE NEW PART ---
    case 4:
        scanner.nextLine(); // Fix to stop it from skipping input

        System.out.println("Enter IP Address (e.g. 192.168.1.100): ");
        String ip = scanner.nextLine();

        System.out.println("Enter Subnet Mask (e.g. 255.255.255.224): ");
        String subnet = scanner.nextLine();

        calculateNetworkSegment(ip, subnet);
        break;
    }
}

public static void isNumOdd(int num) {
    if (num % 2 == 0) {
        System.out.println("The number " + num + " is not odd!");
    }
    else {
        System.out.println("The number " + num + " is odd!");
    }
}

public static void isNumPowerOf2 (int num) {
    if ((num & num - 1) == 0) {
        System.out.println("The number " + num + " is a power of 2!");
    }
    else {
        System.out.println("The number " + num + " is not a power of 2!");
    }
}

public static void twoComplement (int num) {
    num = ~num;
    System.out.println("This is the negative version of your number: " + (num + 1));
    num = ~num;
    System.out.println("And now it's back to a positive: " + num);
}

```

```
// --- NEW SIMPLE METHODS BELOW ---

public static void calculateNetworkSegment(String ip, String subnet) {
    // Split the text by the dot "."
    String[] ipParts = ip.split("\\.");
    String[] maskParts = subnet.split("\\.");

    String ipBinary = "";
    String maskBinary = "";
    String netBinary = "";
    String netDecimal = "";

    for (int i = 0; i < 4; i++) {
        int p = Integer.parseInt(ipParts[i]);
        int m = Integer.parseInt(maskParts[i]);

        // The bitwise AND logic required
        int n = p & m;

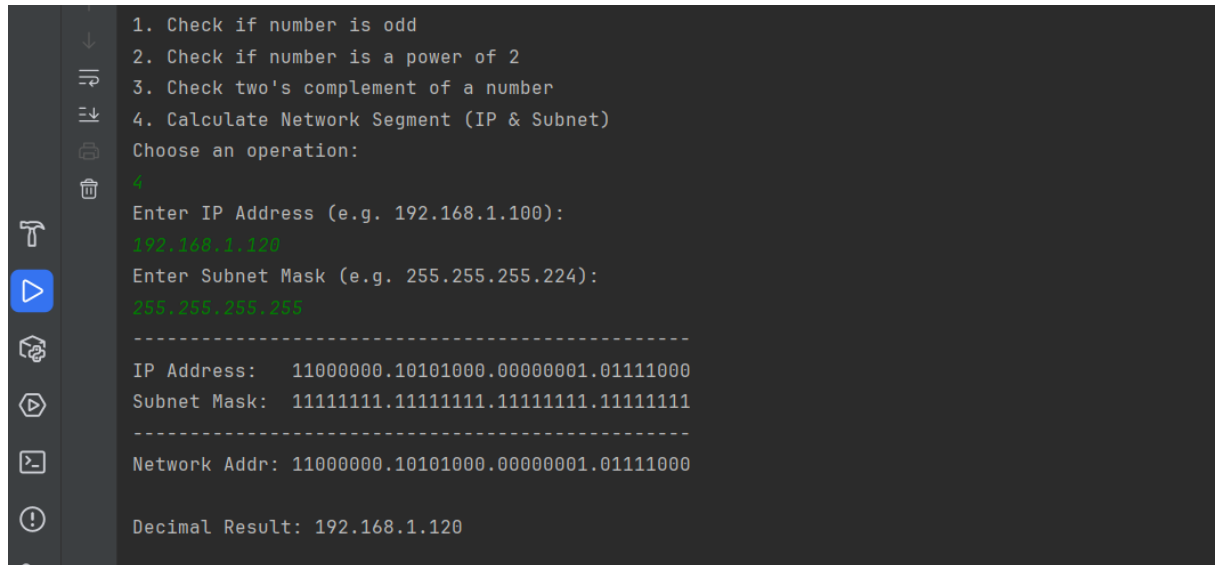
        // Add the binary versions to our string
        ipBinary += toBinary(p);
        maskBinary += toBinary(m);
        netBinary += toBinary(n);
        netDecimal += n;

        // Add dots between the parts (but not after the last one)
        if (i < 3) {
            ipBinary += ".";
            maskBinary += ".";
            netBinary += ".";
            netDecimal += ".";
        }
    }

    System.out.println("-----");
    System.out.println("IP Address: " + ipBinary);
    System.out.println("Subnet Mask: " + maskBinary);
    System.out.println("-----");
    System.out.println("Network Addr: " + netBinary);
    System.out.println("\nDecimal Result: " + netDecimal);
}

// Helper to make sure binary is always 8 bits (e.g. 00000001)
public static String toBinary(int num) {
    String binary = Integer.toBinaryString(num);
    while (binary.length() < 8) {
        binary = "0" + binary;
    }
}
```

```
    return binary;  
  }  
}
```



```
1. Check if number is odd  
2. Check if number is a power of 2  
3. Check two's complement of a number  
4. Calculate Network Segment (IP & Subnet)  
Choose an operation:  
4  
Enter IP Address (e.g. 192.168.1.100):  
192.168.1.120  
Enter Subnet Mask (e.g. 255.255.255.224):  
255.255.255.255  
-----  
IP Address:  11000000.10101000.00000001.01111000  
Subnet Mask: 11111111.11111111.11111111.11111111  
-----  
Network Addr: 11000000.10101000.00000001.01111000  
  
Decimal Result: 192.168.1.120
```

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