

Template Week 6 – Networking

Student number:

Assignment 6.1: Working from home

Screenshot installation openssh-server:

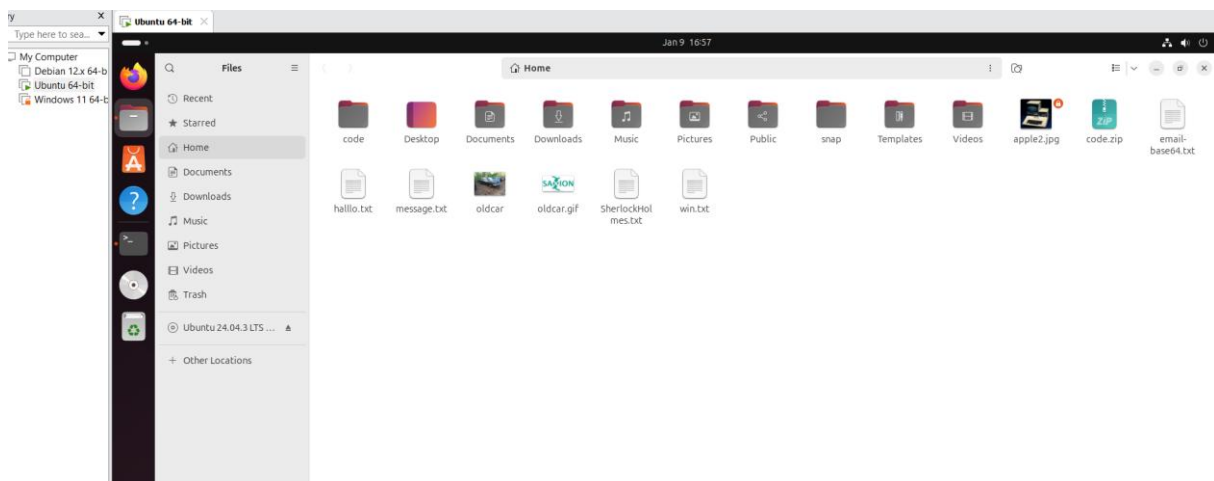
```
wessel@helpdesk:~$ sudo apt install openssh-server -y
[sudo] password for wessel:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere ssh-askpass
The following NEW packages will be installed:
  ncurses-term openssh-server openssh-sftp-server ssh-import-id
0 upgraded, 4 newly installed, 0 to remove and 5 not upgraded.
Need to get 832 kB of archives.
After this operation, 6,743 kB of additional disk space will be used.
Get:1 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-sftp-server amd64 1:9.6p1-3ubuntu13.14 [37.3 kB]
Get:2 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-server amd64 1:9.6p1-3ubuntu13.14 [510 kB]
Get:3 http://nl.archive.ubuntu.com/ubuntu noble/main amd64 ncurses-term all 6.4+20240113-1ubuntu2 [275 kB]
Get:4 http://nl.archive.ubuntu.com/ubuntu noble-updates/main amd64 ssh-import-id all 5.11-0ubuntu2.24.04.1 [10.1 kB]
Fetched 832 kB in 0s (2,658 kB/s)
Preconfiguring packages ...
Selecting previously unselected package openssh-sftp-server.
(Reading database ... 195977 files and directories currently installed.)
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) ...
Processing triggers for man-db (2:12.10-4ubuntu2) ...
Processing triggers for ufw (0.36.2-6) ...
wessel@helpdesk:~$ sudo systemctl enable --now ssh
Synchronizing state of ssh.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable ssh
Created symlink /etc/systemd/system/ssh.service → /usr/lib/systemd/system/ssh.service.
Created symlink /etc/systemd/system/multi-user.target.wants/ssh.service → /usr/lib/systemd/system/ssh.service.
wessel@helpdesk:~$ 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:29:9e:31:15 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.130/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 1772sec preferred_lft 1772sec
wessel@helpdesk:~$
```

Screenshot successful SSH command execution:

```
wessel@helpdesk: ~  
C:\Users\wesse>ssh wessel@192.168.139.130  
The authenticity of host '192.168.139.130 (192.168.139.130)' can't be established.  
ED25519 key fingerprint is SHA256:J3AgTBckUHzi5efe4oTLXVHAu0qufHEMADc7CgCsaiU.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.139.130' (ED25519) to the list of known hosts.  
wessel@192.168.139.130's password:  
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-33-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.  
  
0 updates can be applied immediately.  
  
17 additional security updates can be applied with ESM Apps.  
Learn more about enabling ESM Apps service at https://ubuntu.com/esm  
  
*** System restart required ***  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
  
wessel@helpdesk:~$ |
```

Screenshot successful execution SCP command:

```
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
  
wessel@helpdesk:~$ echo Hello from Windows > win.txt  
wessel@helpdesk:~$ scp win.txt wessel@192.168.139.130:/home/wessel/  
The authenticity of host '192.168.139.130 (192.168.139.130)' can't be established.  
ED25519 key fingerprint is SHA256:J3AgTBckUHzi5efe4oTLXVHAu0qufHEMADc7CgCsaiU.  
This key is not known by any other names.  
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes  
Warning: Permanently added '192.168.139.130' (ED25519) to the list of known hosts.  
wessel@192.168.139.130's password:  
win.txt  
wessel@helpdesk:~$
```



Screenshot remmina:

Hij kom mijn ip niet vinden

Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

```
wessel@helpdesk:~$ exit
logout
Connection to 192.168.139.130 closed.

C:\Users\wesse>nslookup amazon.com
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

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

C:\Users\wesse>nslookup google.com
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

Non-authoritative answer:
Name: google.com
Addresses: 2a00:1450:400e:806::200e
          142.251.142.206

C:\Users\wesse>
```

```
C:\Users\wesse>nslookup one.one.one.one
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

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

C:\Users\wesse>dns.google.com
'dns.google.com' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\wesse>nslookup dns.google.com
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

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

```
C:\Users\wesse>nslookup bol.com
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

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

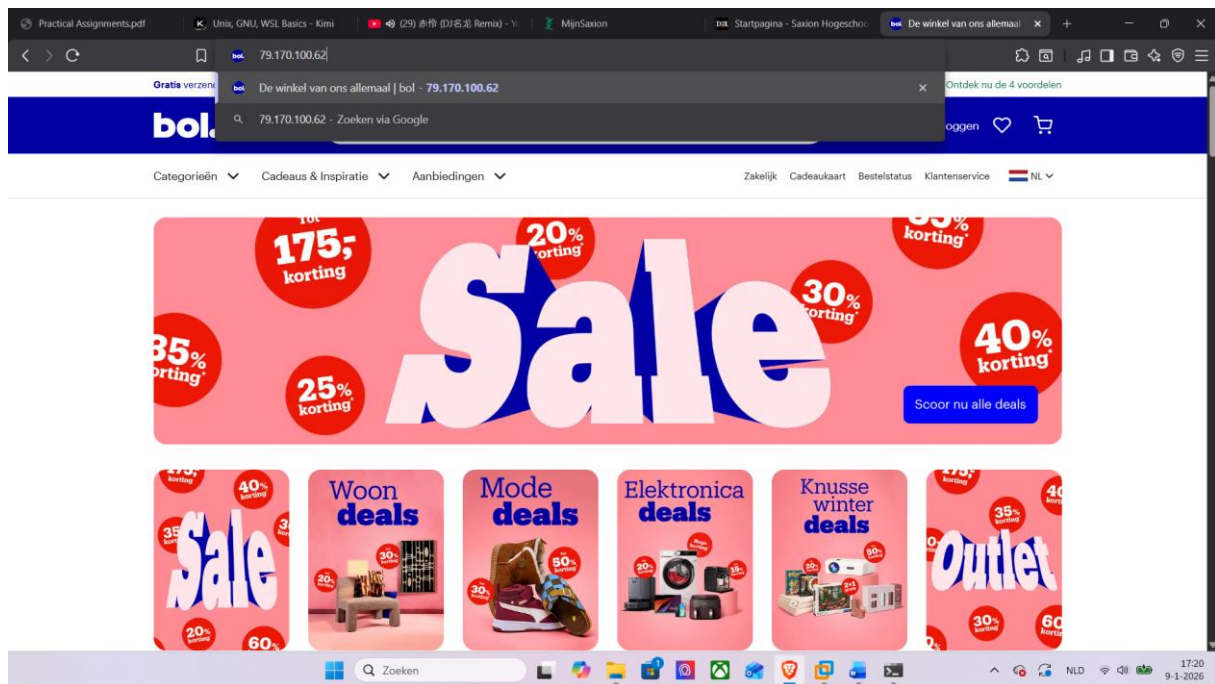
C:\Users\wesse>

C:\Users\wesse>

C:\Users\wesse>nslookup w3schools.com
Server: mijnmodem.kpn
Address: 2a02:a46f:3878:0:46fb:5aff:feeb:f5d3

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

128

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

192.168.110.129 t/m 192.168.110.254 (126 bruikbare adressen)

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

```
wessel@helpdesk:~$ 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
```

Explain the above calculation in your own words.

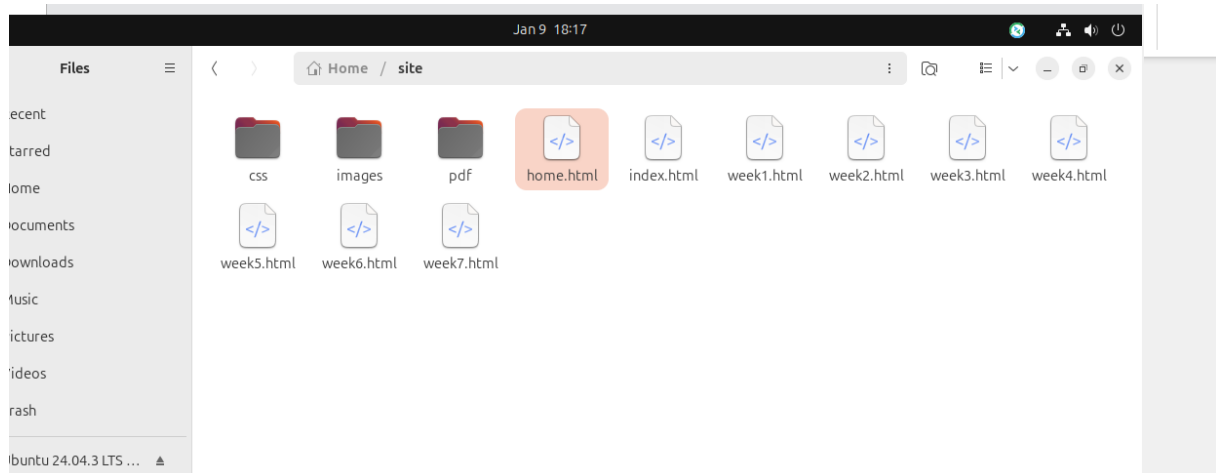
het subnet begint op 128, de eerste 129 is de gateway/printer enz., 254 is de laatste pc; 128 én 255 zijn 'gereserveerd' dus die mag je niet uitdelen

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

```
wessel@helpdesk:~$ 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:29:9e:31:15 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.130/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 928sec preferred_lft 928sec
```

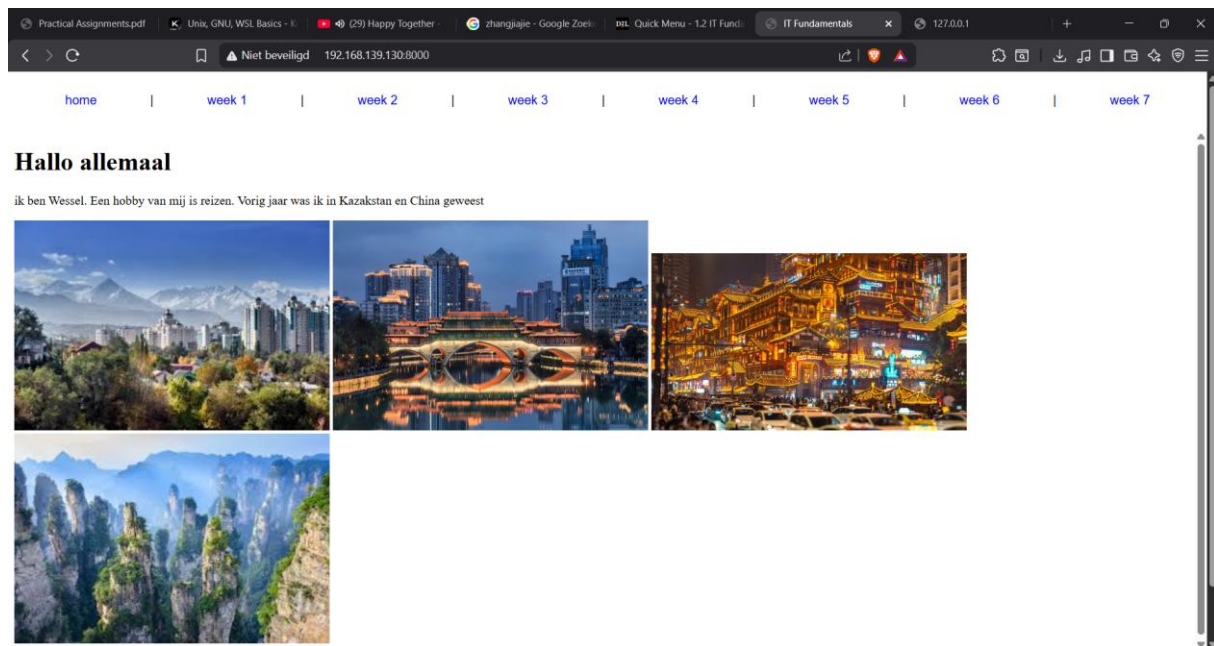
Screenshot of Site directory contents:



Screenshot python3 webserver command:

```
wessel@helpdesk:~$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
127.0.0.1 - - [09/Jan/2026 18:14:26] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:27] code 404, message File not found
127.0.0.1 - - [09/Jan/2026 18:14:27] "GET /favicon.ico HTTP/1.1" 404 -
127.0.0.1 - - [09/Jan/2026 18:14:34] "GET /code/ HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/ HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/home.html HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/css/mypdfstyle.css HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/css/mypdfstyle.css HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/images/almaty.png HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/images/chengdu.png HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/images/chongqing.png HTTP/1.1" 200 -
127.0.0.1 - - [09/Jan/2026 18:14:41] "GET /site/images/zhangjiajie.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 Main {
    private static final Scanner sc = new Scanner(System.in);

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

```

        System.out.println("\n1. 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. Network-segment ");
        System.out.print("Keuze: ");
        switch (sc.nextLine()) {
            case "1" -> oddDemo();
            case "2" -> powerOf2Demo();
            case "3" -> twosComplementDemo();
            case "4" -> netSegmentDemo();
            case "0" -> { return; }
            default -> System.out.println("Ongeldige keuze");
        }
    }
}

private static void oddDemo() {
    System.out.print("number: ");
    int n = Integer.parseInt(sc.nextLine());
    System.out.println((n & 1) == 1 ? "oneven" : "even");
}

private static void powerOf2Demo() {
    System.out.print("number : ");
    int n = Integer.parseInt(sc.nextLine());
    boolean ok = n > 0 && (n & (n - 1)) == 0;
    System.out.println(ok ? "macht van 2" : "geen macht van 2");
}

private static void twosComplementDemo() {
    System.out.print("Number: ");
    int n = Integer.parseInt(sc.nextLine());
    System.out.println("Two's complement: " + (~n + 1));
}

private static void netSegmentDemo() {
    System.out.print("IP : ");
    String input = sc.nextLine();
    String[] parts = input.split("/");
    String ip = parts[0];
    int cidr = Integer.parseInt(parts[1]);

    int[] net = calcNet(ip, cidr);
    System.out.printf("Netwerkadres: %d.%d.%d.%d/%d%n",
        net[0], net[1], net[2], net[3], cidr);
}

private static int[] calcNet(String ip, int cidr) {

```



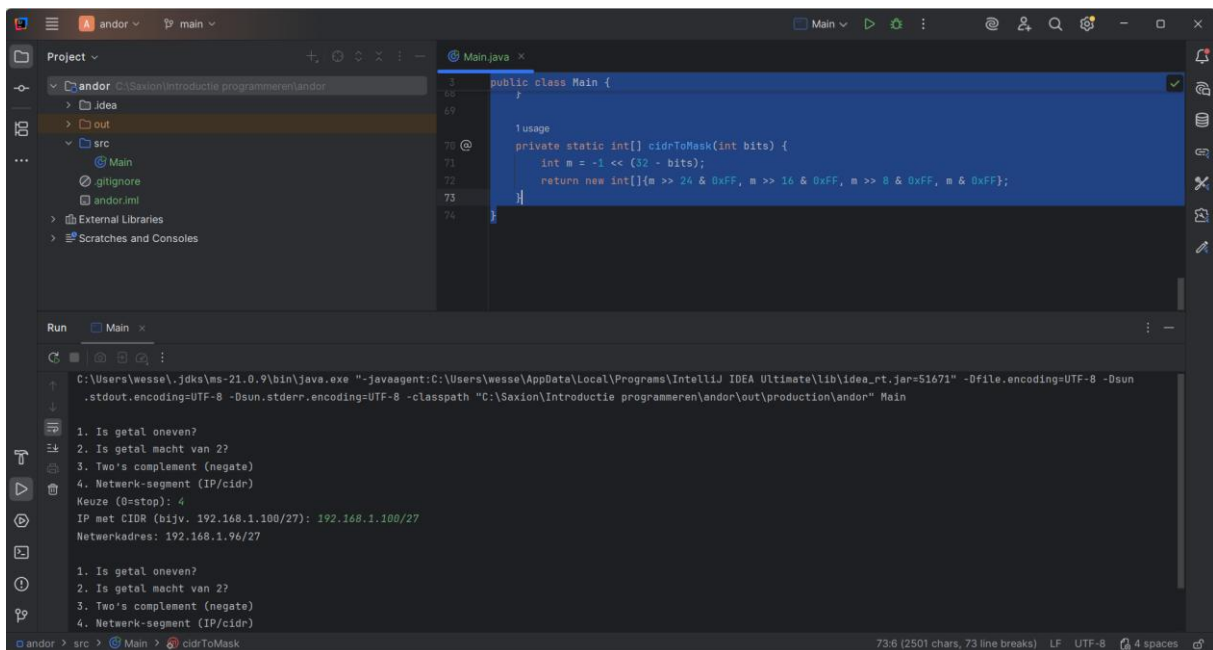
```

int[] ipOct = toInts(ip);
int[] maskOct = cidrToMask(cidr);
int[] netOct = new int[4];
for (int i = 0; i < 4; i++) netOct[i] = ipOct[i] & maskOct[i];
return netOct;
}

private static int[] toInts(String s) {
    String[] p = s.split("\\.");
    int[] a = new int[4];
    for (int i = 0; i < 4; i++) a[i] = Integer.parseInt(p[i]);
    return a;
}

private static int[] cidrToMask(int bits) {
    int m = -1 << (32 - bits);
    return new int[]{m >> 24 & 0xFF, m >> 16 & 0xFF, m >> 8 & 0xFF, m & 0xFF};
}
}

```



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