

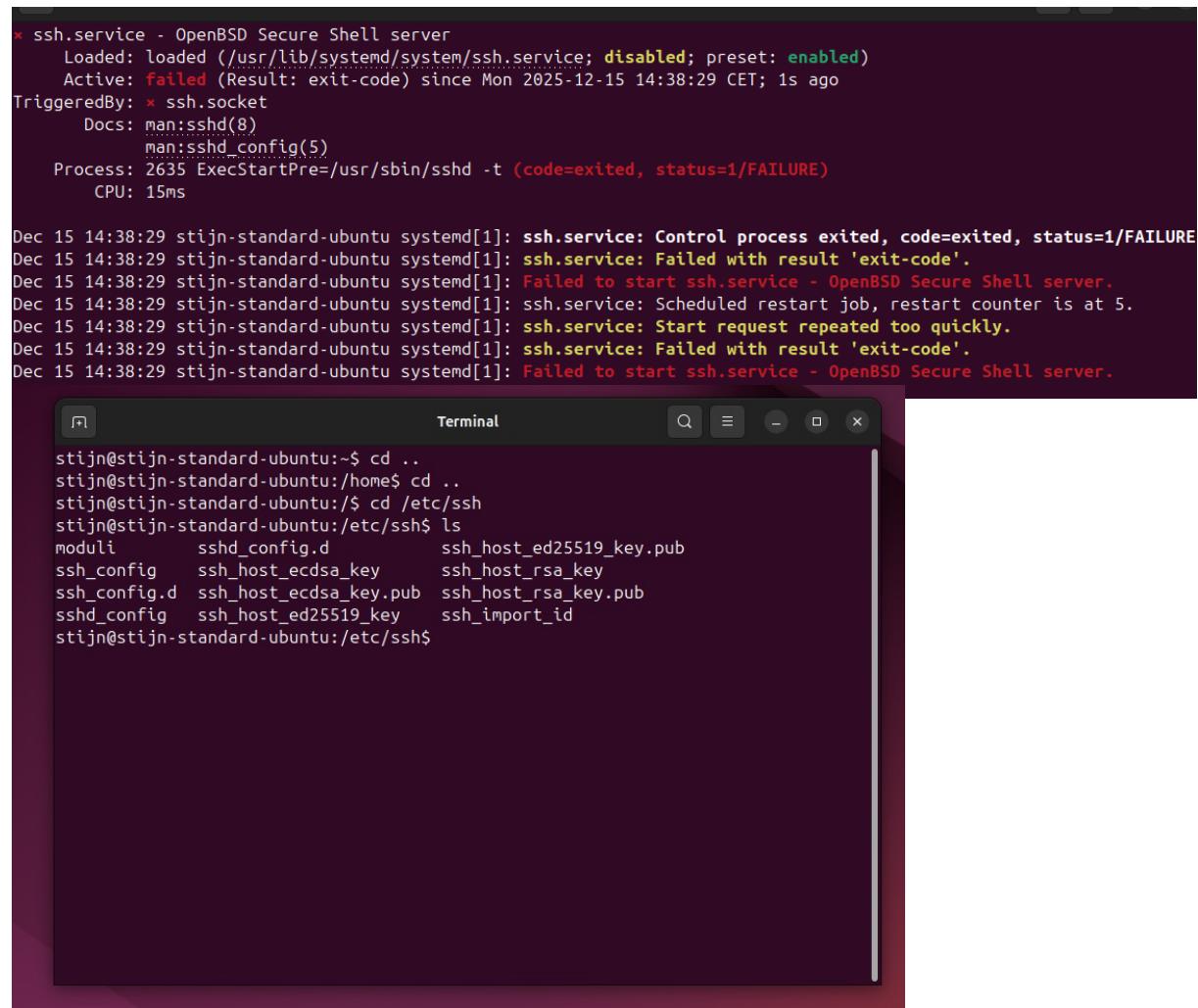
# Template Week 6 – Networking

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## Assignment 6.1: Working from home

Screenshot installation openssh-server:

Ik kan helaas geen succesvolle verbinding krijgen met mijn Ubuntu Workstation aangezien de SSH service niet wilt starten. (Zie onderstaand screenshot). Ik ga daarom verbinding maken met de Debian Server machine. Dit is ondanks de succesvolle installatie van Openssh-server.



The terminal window shows the status of the ssh.service and its logs. The logs indicate multiple failed attempts to start the service due to exit codes.

```
* ssh.service - OpenBSD Secure Shell server
  Loaded: loaded (/usr/lib/systemd/system/ssh.service; disabled; preset: enabled)
  Active: failed (Result: exit-code) since Mon 2025-12-15 14:38:29 CET; 1s ago
TriggeredBy: × ssh.socket
  Docs: man:sshd(8)
        man:sshd_config(5)
 Process: 2635 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=1/FAILURE)
  CPU: 15ms

Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: ssh.service: Control process exited, code=exited, status=1/FAILURE
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: ssh.service: Failed with result 'exit-code'.
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: Failed to start ssh.service - OpenBSD Secure Shell server.
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: ssh.service: Scheduled restart job, restart counter is at 5.
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: ssh.service: Start request repeated too quickly.
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: ssh.service: Failed with result 'exit-code'.
Dec 15 14:38:29 stijn-standard-ubuntu systemd[1]: Failed to start ssh.service - OpenBSD Secure Shell server.
```

In the terminal window below, the user is navigating through the /etc/ssh directory to view the generated host keys.

```
stijn@stijn-standard-ubuntu:~$ cd ..
stijn@stijn-standard-ubuntu:/home$ cd ..
stijn@stijn-standard-ubuntu:/etc$ cd ssh
stijn@stijn-standard-ubuntu:/etc/ssh$ ls
moduli      sshd_config.d          ssh_host_ed25519_key.pub
ssh_config   ssh_host_ecdsa_key    ssh_host_rsa_key
ssh_config.d ssh_host_ecdsa_key.pub ssh_host_rsa_key.pub
sshd_config  ssh_host_ed25519_key  ssh_import_id
stijn@stijn-standard-ubuntu:/etc/ssh$
```

## Screenshot successful SSH command execution:

```
st 192.168.122.109 port 22: connection refused
OpenSSH SSH client
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Stijn>ssh root@192.168.122.141
root@192.168.122.141's password:
Linux debian 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec 11 12:39:11 2025 from 192.168.122.169
root@debian:~# sudo apt install neofetch
-bash: sudo: command not found
root@debian:~# apt install neofetch
Error: Unable to locate package neofetch
root@debian:~#
```

## Screenshot successful execution SCP command:

```
st 192.168.122.109 port 22: connection refused
OpenSSH SSH client
Microsoft Windows [Version 10.0.19045.2965]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Stijn>ssh root@192.168.122.141
root@192.168.122.141's password:
Linux debian 6.12.57+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.57-1 (2025-11-05) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

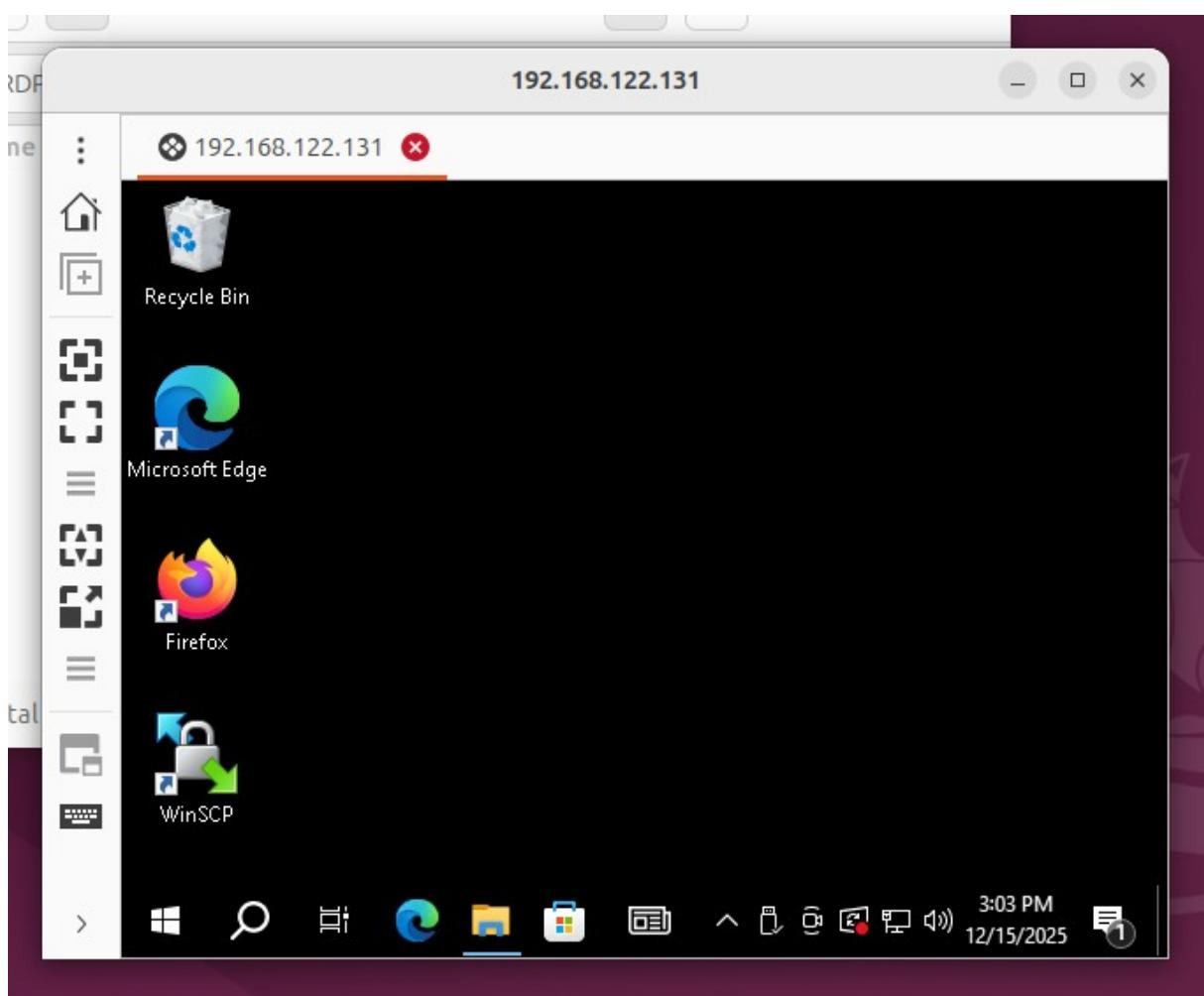
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Dec 15 07:42:53 2025 from 192.168.122.131
root@debian:~# cd ..
root@debian:~# cd ..
root@debian:~# ls
bin dev home initrd.img.old lib64 media opt root sbin sys usr vmlinuz
boot etc initrd.img lib lost+found mnt proc run srv tmp var vmlinuz.old
root@debian:~# cd home
root@debian:/home# cd stijn
root@debian:/home/stijn# ls
opstuurbestand.txt
root@debian:/home/stijn#
```

```
C:\Users\Stijn>scp C:\Users\Stijn\Documents\opstuurbestand.txt root@192.168.122.141:/home/stijn
root@192.168.122.141's password: opstuurbestand.txt          100%   0    0.0KB/s  00:00
```

```
C:\Users\Stijn>
```

Screenshot remmina:



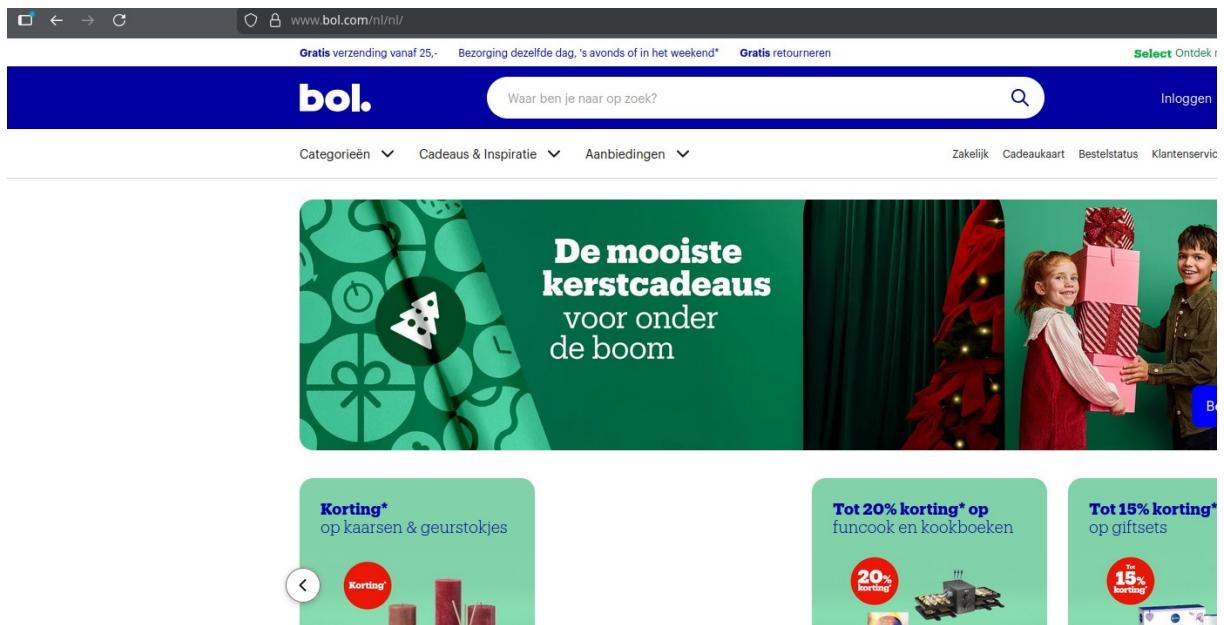
## Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

The image shows five separate terminal windows, each displaying the output of the nslookup command for a specific website. The windows are arranged in a grid-like fashion.

- Top Left Window:** Shows nslookup results for `amazon.com`. The server is 127.0.0.53 and the address is 127.0.0.53#53. Non-authoritative answers show multiple IP addresses for the domain, including 98.87.170.74, 98.87.170.71, and 98.82.161.185.
- Top Right Window:** Shows nslookup results for `google.com`. The server is 127.0.0.53 and the address is 127.0.0.53#53. Non-authoritative answers show multiple IP addresses for the domain, including 142.251.39.142 and 2a00:1450:400e:804::200e.
- Middle Left Window:** Shows nslookup results for `bol.com`. The server is 127.0.0.53 and the address is 127.0.0.53#53. Non-authoritative answers show the IP address 79.170.100.42.
- Middle Right Window:** Shows nslookup results for `w3schools.com`. The server is 127.0.0.53 and the address is 127.0.0.53#53. Non-authoritative answers show multiple IP addresses for the domain, including 13.248.240.135 and 76.223.115.82.
- Bottom Left Window:** Shows nslookup results for `stijnbarendse.nl`. The server is 127.0.0.53 and the address is 127.0.0.53#53. Non-authoritative answers show the IP address 209.42.255.5.

Screenshot website visit via IP address:



Als je met een grote website verbinding maakt via het IP adres, word je automatisch geredirect naar de site met DNS naam. Kan dus niet tonen.

### Assignment 6.3: subnetting

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

Je hebt in totaal 128 IP adressen, maar aangezien er 1 gereserveerd is voor network, en er ook 1 is gereserveerd voor het broadcast adres zijn er 126 bruikbare adressen.

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

Dat is dus 126 ;)

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

```
Setting up update (0.51-1) ...
Processing triggers for man-db (2.12.0-4build2) ...
stijn@stijn-laptop:~$ 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 1111111
=>
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 1111110
Broadcast: 192.168.110.255    11000000.10101000.01101110.1 1111111
Hosts/Net: 126                  Class C, Private Internet

stijn@stijn-laptop:~$
```

Explain the above calculation in your own words.

Oke. /25 betekend dat de eerste 25 bits van het adres zijn gereserveerd voor het netwerk.

Een IPV4 adres bestaat uit 32 bits. Je doet dus  $32-25=7$ .

Je doet vervolgens deze 7 tot de macht 2, dit is 128. Je hebt dus in totaal 128 adressen in het netwerk.

Maar aangezien er twee adressen zijn gereserveerd voor het netwerk en broadcastgedeelte, zijn er 126 bruikbare adressen.

#### Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group def
t 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: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP
oup default qlen 1000
    link/ether 52:54:00:ec:d5:d4 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.169/24 brd 192.168.122.255 scope global dynamic noprefix
te enp1s0
        valid_lft 3241sec preferred_lft 3241sec
    inet6 fe80::5054:ff:feec:d5d4/64 scope link
        valid_lft forever preferred_lft forever
```

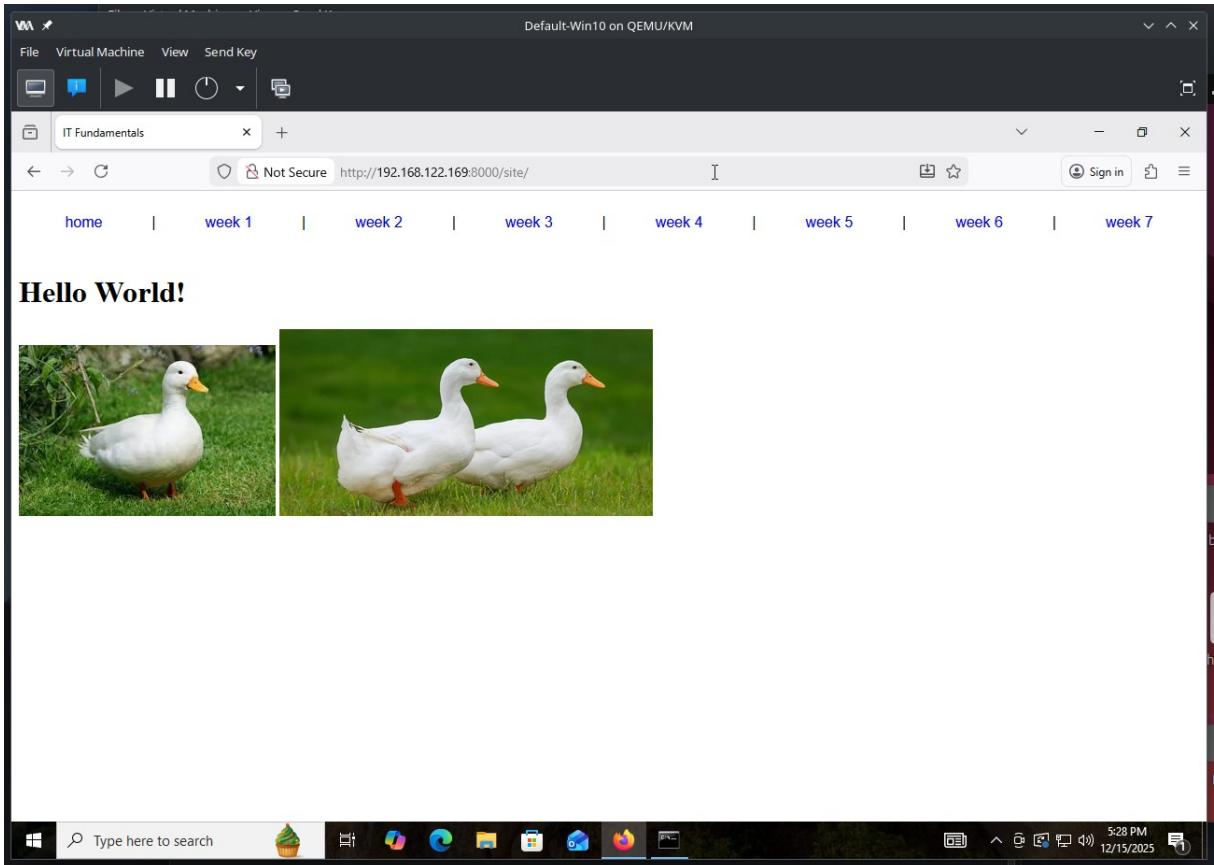
Screenshot of Site directory contents:

```
inet6 fe80::5054:ff:feec:d5d4/64 scope link
    valid_lft forever preferred_lft forever
stijn@stijn-standard-ubuntu:~$ cd /home/stijn/Documents
stijn@stijn-standard-ubuntu:~/Documents$ cd site
stijn@stijn-standard-ubuntu:~/Documents/site$ ls
css      images      pdf      week2.html  week4.html  week6.html
home.html  index.html  week1.html  week3.html  week5.html  week7.html
stijn@stijn-standard-ubuntu:~/Documents/site$ █
```

## Screenshot python3 webserver command:

```
File Virtual Machine View Send Key
VM Terminal Dec 15 17:28
etc      media      sbin      tmp
stijn@stijn-standard-ubuntu:~$ cd hom
bash: cd: hom: No such file or directory
stijn@stijn-standard-ubuntu:~/home$ cd home
stijn@stijn-standard-ubuntu:~/home$ cd stijn
stijn@stijn-standard-ubuntu:~/Documents$ ls
site site.zip myfile
stijn@stijn-standard-ubuntu:~/Documents$ python3 -m http.server 8000
/usr/bin/python3: No module named http.server
stijn@stijn-standard-ubuntu:~/Documents$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.122.131 - - [15/Dec/2025 17:28:04] "GET / HTTP/1.1" 200 -
192.168.122.131 - - [15/Dec/2025 17:28:04] "GET /favicon.ico HTTP/1.1" 404 -
192.168.122.131 - - [15/Dec/2025 17:28:11] "GET /site/ HTTP/1.1" 200 -
192.168.122.131 - - [15/Dec/2025 17:28:11] "GET /site/css/mypdfstyle.css HTTP/1.1" 200 -
192.168.122.131 - - [15/Dec/2025 17:28:11] "GET /site/home.html HTTP/1.1" 200 -
192.168.122.131 - - [15/Dec/2025 17:28:11] "GET /site/images/duck.jpeg HTTP/1.1" 200 -
192.168.122.131 - - [15/Dec/2025 17:28:11] "GET /site/images/duck2.webp 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 {

    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        boolean programmaDraait = true;

        while (programmaDraait) {
            System.out.println("\n--- MENU ---");
            System.out.println("1. Is nummer oneven?");
            System.out.println("2. Is nummer een macht van 2?");
            System.out.println("3. Two's complement berekenen");
            System.out.println("4. Netwerk segment berekenen (IP & Subnet)");
            System.out.println("5. Stoppen");

            System.out.print("Kies een optie: ");

            int keuze = input.nextInt();

            if (keuze == 5) {
                System.out.println("Doei!");
                programmaDraait = false;
            } else if (keuze == 4) {
                // Nieuwe optie voor netwerk
                System.out.print("Voer IP in (bijv. 192.168.1.100): ");
                String ip = input.next();
            }
        }
    }
}
```

```

System.out.print("Voer Subnet in (bijv. 255.255.255.224): ");

String subnet = input.next();

berekenNetwerk(ip, subnet);

} else {

System.out.print("Voer een getal in: ");

int getal = input.nextInt();

if (keuze == 1) {

checkOneven(getal);

} else if (keuze == 2) {

checkMachtVanTwee(getal);

} else if (keuze == 3) {

berekenTwosComplement(getal);

}

}

}

}

}

```

```

// --- Bestaande methodes ---

public static void checkOneven(int n) {

if ((n & 1) == 1) System.out.println("Oneven!");

else System.out.println("Even!");

}

public static void checkMachtVanTwee(int n) {

if (n > 0 && (n & (n - 1)) == 0) System.out.println("Macht van 2!");

else System.out.println("Geen macht van 2.");

}

public static void berekenTwosComplement(int n) {

```

```

        System.out.println("Resultaat: " + (~n + 1));
    }

    // --- Nieuwe methode voor Netwerk Segment ---

    public static void berekenNetwerk(String ipStr, String subStr) {
        // Splits de strings op de punten
        String[] ipDelen = ipStr.split("\\.");
        String[] subDelen = subStr.split("\\.");

        // We maken arrays om de resultaten in op te slaan
        int[] netwerkAdres = new int[4];

        for (int i = 0; i < 4; i++) {
            int ipNummer = Integer.parseInt(ipDelen[i]);
            int subNummer = Integer.parseInt(subDelen[i]);

            // Gebruik de bitwise AND (&)
            netwerkAdres[i] = ipNummer & subNummer;
        }

        // Print het resultaat
        System.out.println("Netwerk Adres: " +
                           netwerkAdres[0] + "." + netwerkAdres[1] + "." +
                           netwerkAdres[2] + "." + netwerkAdres[3]);
    }

    // Voor een /27 subnet (255.255.255.224) kun je de range ook laten zien
    // Dit is een simpele extra berekening:

    int segmentGrootte = 256 - Integer.parseInt(subDelen[3]);
    int start = netwerkAdres[3];
    int eind = start + (segmentGrootte - 1);

```

```
        System.out.println("Range: " + netwerkAdres[0] + "." + netwerkAdres[1] + "." +  
                           netwerkAdres[2] + "." + start + " t/m " +  
                           netwerkAdres[0] + "." + netwerkAdres[1] + "." +  
                           netwerkAdres[2] + "." + eind);  
  
    }  
  
}
```

```
==== BITWISE OPERATIES MENU ====  
1. Is getal oneven?  
2. Is getal een macht van 2?  
3. Two's complement van getal?  
4. Bereken netwerksegment  
5. Afsluiten  
=====  
Voer je keuze in (1-5): 4  
  
Voer IP-adres in (bijv. 192.168.1.100): 10.0.0.1  
Voer subnetmasker in (bijv. 255.255.255.224): 255.255.255.128  
  
==== NETWERKSEGMENT BEREKENING ====  
IP-adres:      00001010.00000000.00000000.00000001  
                10.0.0.1  
  
Subnetmasker:   11111111.11111111.11111111.10000000  
                255.255.255.128 (/25)  
  
-----  
Netwerkadres:  00001010.00000000.00000000.00000000  
                10.0.0.0  
  
Netwerkbereik: 10.0.0.0 tot 10.0.0.127  
Totaal Adressen: 128  
Bruikbare Hosts: 126 (exclusief netwerk en broadcast)  
  
Druk op Enter om door te gaan...  
[]
```

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