

Template Week 6 – Networking

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Assignment 6.1: Working from home

Screenshot installation openssh-server:

```
nurses-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 29 not upgraded.
Need to get 832 kB of archives.
After this operation, 6,743 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
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 (1,713 kB/s)
Preconfiguring packages ...
Selecting previously unselected package openssh-sftp-server.
(Reading database ... 199157 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) ...
Selecting previously unselected package ssh-import-id.
Preparing to unpack .../ssh-import-id_5.11-0ubuntu2.24.04.1_all.deb ...
Unpacking ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up openssh-sftp-server (1:9.6p1-3ubuntu13.14) ...
Setting up openssh-server (1:9.6p1-3ubuntu13.14) ...

Creating config file /etc/ssh/sshd_config with new version
Created symlink /etc/systemd/system/sockets.target.wants/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Created symlink /etc/systemd/system/ssh.service.requires/ssh.socket → /usr/lib/systemd/system/ssh.socket.
Setting up ssh-import-id (5.11-0ubuntu2.24.04.1) ...
Setting up ncurses-term (6.4+20240113-1ubuntu2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for ufw (0.36.2-6) ...
nhi@nhi-VMware-Virtual-Platform: ~
```

Screenshot successful SSH command execution:

```
nhi@nhi-VMware-Virtual-Platform:~$ C:\Users\nhi>ssh nhi@192.168.151.130
The authenticity of host '192.168.151.130 (192.168.151.130)' can't be established.
ED25519 key fingerprint is SHA256:0Aub/5SEewD0IxgvaXecm3/3tCKgZtAOsRLjRKn6iXk.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.151.130' (ED25519) to the list of known hosts.
nhi@192.168.151.130'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.

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

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

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.

nhi@nhi-VMware-Virtual-Platform:~$
```

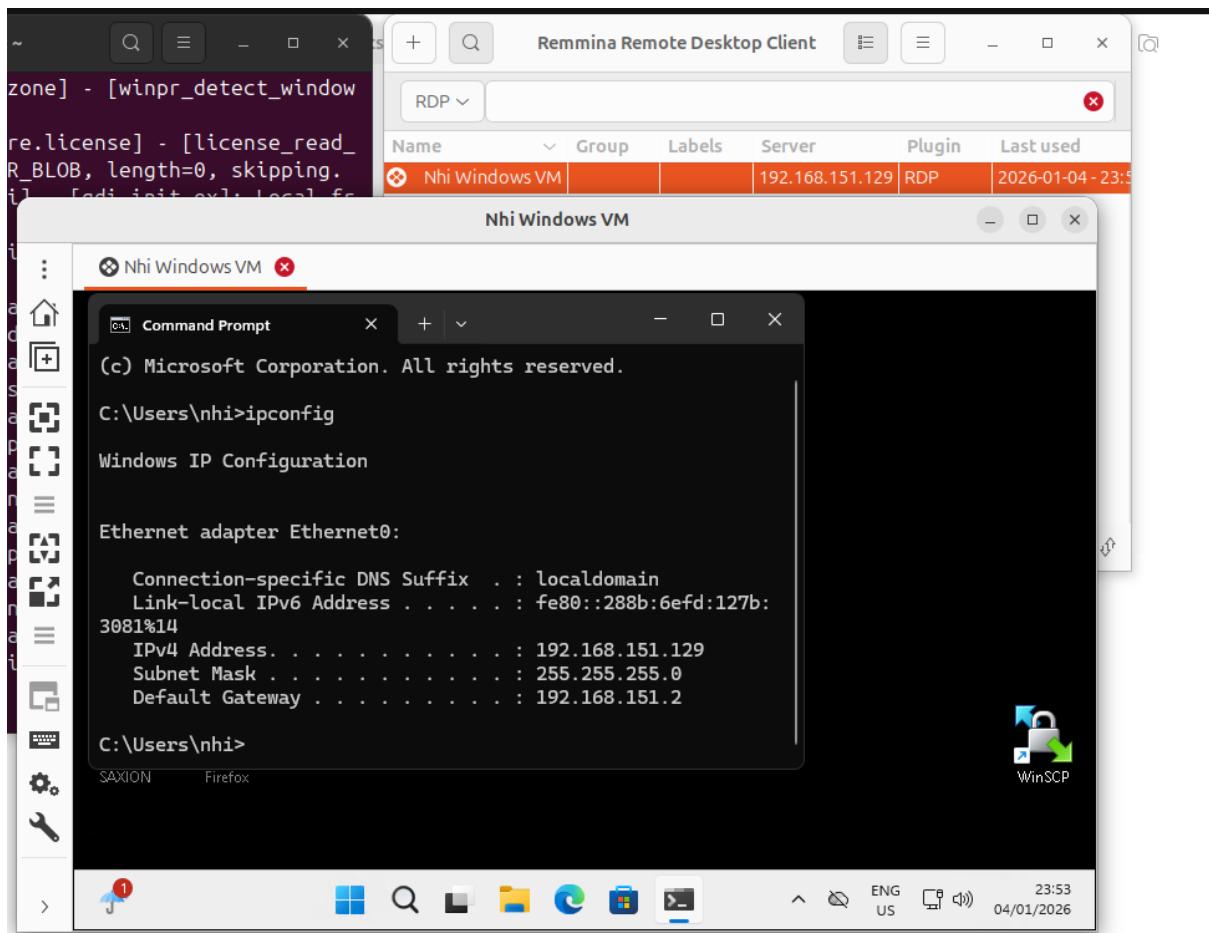
Screenshot successful execution SCP command:

```
Nhi - Ubuntu 64-bit X | Nhi - Windows 11 x64 X
C:\WINDOWS\system32\cmd. X + v

C:\Users\nhi>scp C:\Users\nhi\nhitransfer.txt nhi@192.168.151.130 /home/nhi/Documents
/home/nhi/Documents: No such file or directory

C:\Users\nhi>scp C:\Users\nhi\nhitransfer.txt nhi@192.168.151.130:/home/nhi/Documents
nhi@192.168.151.130's password:
nhitransfer.txt          100%   3      0.7KB/s  00:00
```

Screenshot remmina:



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

- amazon.com

```
nhi@nhi-VMware-Virtual-Platform:~$ 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
```

- google.com

```
nhi@nhi-VMware-Virtual-Platform:~$ nslookup google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.179.206
Name:   google.com
Address: 2a00:1450:400e:802::200e
```

- one.one.one.one

```
nhi@nhi-VMware-Virtual-Platform:~$ 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: 1.1.1.1
Name:   one.one.one.one
Address: 1.0.0.1
Name:   one.one.one.one
Address: 2606:4700:4700::1111
Name:   one.one.one.one
Address: 2606:4700:4700::1001
```

- dns.google.com

```
nhi@nhi-VMware-Virtual-Platform:~$ 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
```

- bol.com

```
nhi@nhi-VMware-Virtual-Platform:~$ nslookup bol.com
Server:      127.0.0.53
Address:     127.0.0.53#53

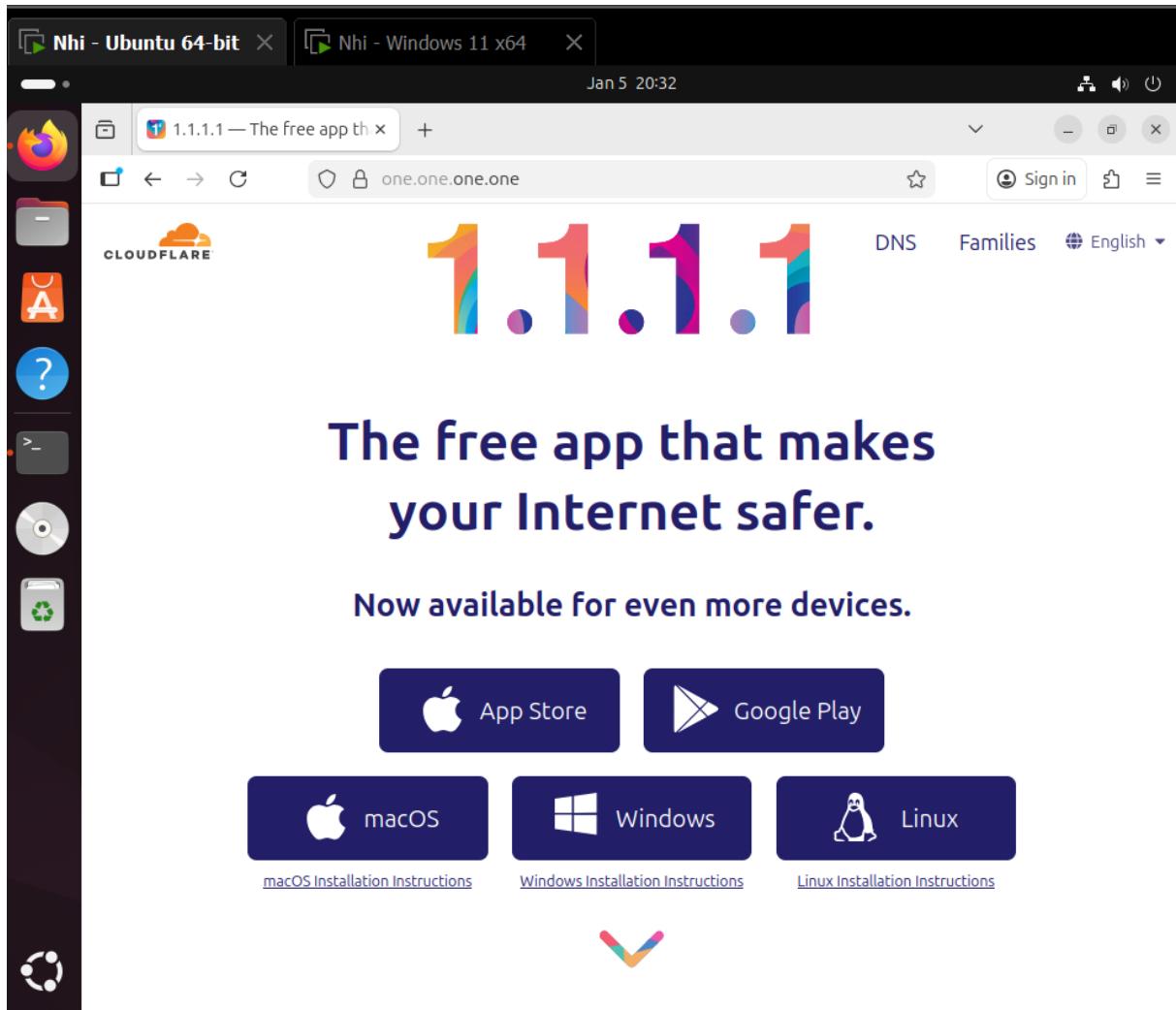
Non-authoritative answer:
Name:   bol.com
Address: 79.170.100.62
```

- w3schools.com

```
nhi@nhi-VMware-Virtual-Platform:~$ nslookup w3schools.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   w3schools.com
Address: 76.223.115.82
Name:   w3schools.com
Address: 13.248.240.135
```

Screenshot website visit via IP address:



Assignment 6.3: subnetting

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

/25 subnet => 25 bits are used for the network address.

=> $32 - 25 = 7$ bits for host addresses.

Number of IP addresses = $2^7 = 128$

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

Usable host addresses: 128 total – 1 network address – 1 broadcast address = 126

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

```

nhi@nhi-VMware-Virtual-Platform:~$ 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.

Subnet/25 => 32-25 = 7 bits are used for host addresses

⇒ Subnet mask = 255.255.255.128
 $128 = 2^7$

Wildcard mask is the invert of subnet mask. Wildcard mask tells the range of possible IP host addresses by listing the bits that can be used for IP host address as 1.

Wildcard mask 0000.0000.0000.0 1111111 => 7 number 1 => 7 bits are used

127 is not the actual range, but the decimal octet of binary 0111 1111

Network address is the first in the range: 192.168.110.128

Broadcast address is the last in the range: 192.168.110.255

The available range for host address = 128 -2 = 126, starting from 192.168.110.129 to 192.168.110.254

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

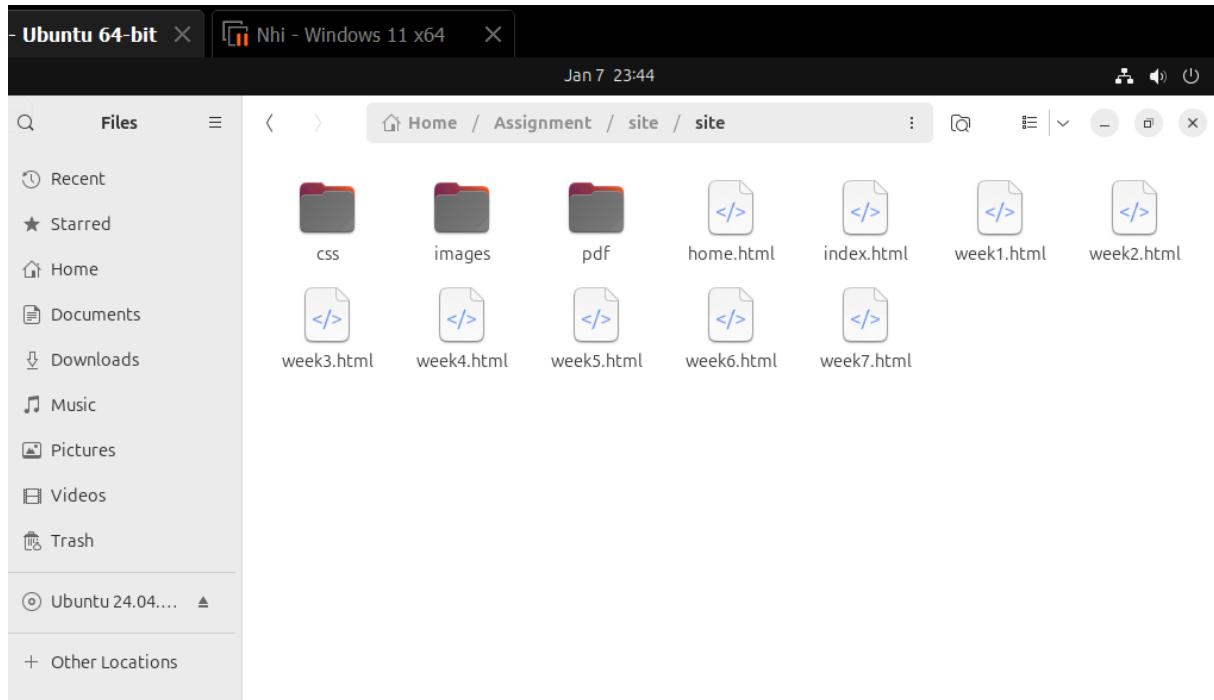
```

nhi@nhi-VMware-Virtual-Platform:~/Assignment/site/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:29:46:46:41 brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.151.130/24 brd 192.168.151.255 scope global dynamic noprefixroute ens3
3
    valid_lft 956sec preferred_lft 956sec
    inet6 fe80::20c:29ff:fe46:4641/64 scope link
        valid_lft forever preferred_lft forever

```

Screenshot of Site directory contents:

```
nhi@nhi-VMware-Virtual-Platform:~/Assignment/site/site$ ls
css           images      pdf          week2.html  week4.html  week6.html
home.html     index.html  week1.html  week3.html  week5.html  week7.html
```

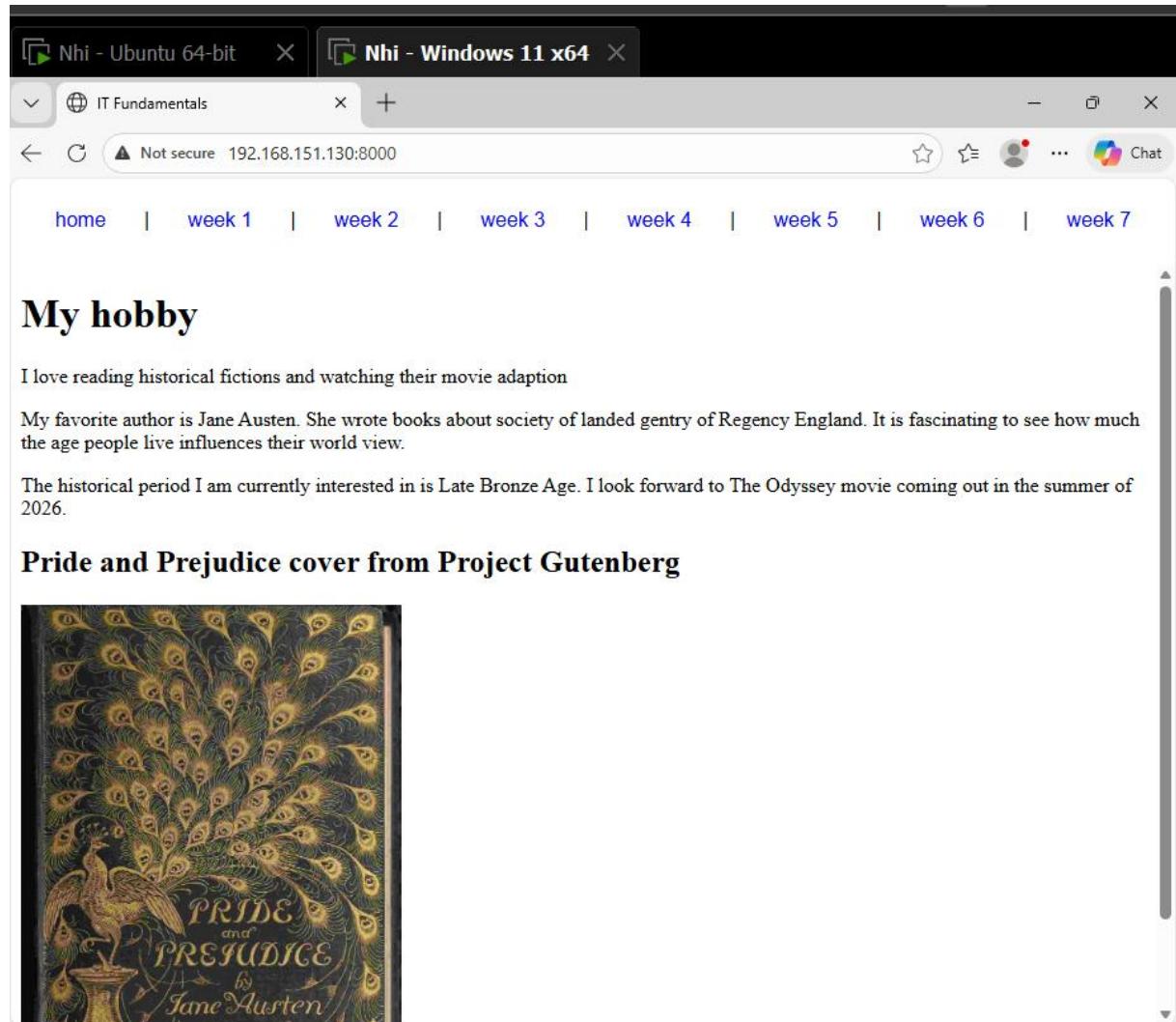


```
nhi@nhi-VMware-Virtual-Platform:~/Assignment$ zip -r site.zip site
adding: site/ (stored 0%)
adding: site/site/ (stored 0%)
adding: site/site/home.html (deflated 42%)
adding: site/site/week3.html (deflated 37%)
adding: site/site/week1.html (deflated 37%)
adding: site/site/week5.html (deflated 37%)
adding: site/site/pdf/ (stored 0%)
adding: site/site/pdf/week7.pdf (deflated 11%)
adding: site/site/pdf/week3.pdf (deflated 11%)
adding: site/site/pdf/week4.pdf (deflated 11%)
adding: site/site/pdf/week2.pdf (deflated 11%)
adding: site/site/pdf/week1.pdf (deflated 10%)
adding: site/site/pdf/week6.pdf (deflated 10%)
adding: site/site/pdf/week5.pdf (deflated 11%)
adding: site/site/css/ (stored 0%)
adding: site/site/css/mypdfstyle.css (deflated 59%)
adding: site/site/images/ (stored 0%)
adding: site/site/images/Pride and Prejudice cover.jpg (deflated 1%)
adding: site/site/week7.html (deflated 37%)
adding: site/site/week2.html (deflated 37%)
adding: site/site/week4.html (deflated 37%)
adding: site/site/week6.html (deflated 37%)
adding: site/site/index.html (deflated 62%)
nhi@nhi-VMware-Virtual-Platform:~/Assignment$ ls
apple2.jpg   email-base64.txt  message.txt  site       site.zip
blank.txt    email.gif        oldcar       'site 00'
```

Screenshot python3 webserver command:

```
nhi@nhi-Virtual-Platform:~/Assignment/site/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.151.129 - - [07/Jan/2026 23:24:33] "GET / HTTP/1.1" 200 -
192.168.151.129 - - [07/Jan/2026 23:24:33] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
192.168.151.129 - - [07/Jan/2026 23:24:33] "GET /home.html HTTP/1.1" 200 -
192.168.151.129 - - [07/Jan/2026 23:24:33] "GET /images/Pride%20and%20Prejudice%20cover.jpg HTTP/1.1" 200 -
192.168.151.129 - - [07/Jan/2026 23:24:33] code 404, message File not found
192.168.151.129 - - [07/Jan/2026 23:24:33] "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;

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

        System.out.println("Enter IP address : ");
        String ipAddress = scanner.nextLine();
        System.out.println("Enter subnet mask : ");
        String subnetMask = scanner.nextLine();

        String[] ipParts = ipAddress.split("\\.");
        String[] subnetParts = subnetMask.split("\\.");

        int[] network = new int[4];

        for (int i = 0; i < 4; i++) {
            int ip = Integer.parseInt(ipParts[i]);
            int subnet = Integer.parseInt(subnetParts[i]);
            network[i] = ip & subnet;
        }

        String networkAddress = network[0] + "." + network[1] + "." + network[2] + "." + network[3];

        System.out.println("This gives " + networkAddress + " in decimal as the network address");
    }
}
```

The screenshot shows the IntelliJ IDEA interface with a Java file named Main.java open. The code prompts the user for an IP address and a subnet mask, then calculates the network address. The run output shows the input and output of the program.

```
import java.util.Scanner;
...
class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        System.out.println("Enter IP address : ");
        String ipAddress = scanner.nextLine();
        System.out.println("Enter subnet mask : ");
        String subnetMask = scanner.nextLine();
        int ipDec = Integer.parseInt(ipAddress);
        int subnetDec = Integer.parseInt(subnetMask);
        int networkDec = ipDec & subnetDec;
        System.out.println("This gives " + networkDec + " in decimal as the network address");
    }
}
```

Run Main

```
C:\Users\ThaoN\.jdks\ms-21.0.9\bin\java.exe "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2025.2.2\lib\idea_rt.jar=5012
Enter IP address :
192.168.1.100
Enter subnet mask :
255.255.255.224
This gives 192.168.1.96 in decimal as the network address
Process finished with exit code 0
```

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