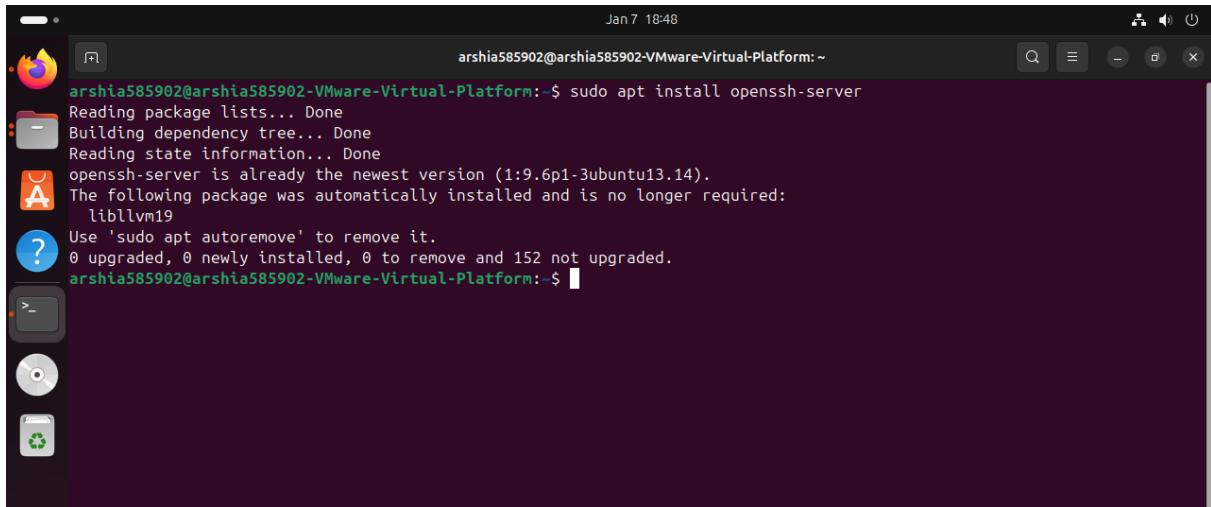


Template Week 6 – Networking

Student number: 585902

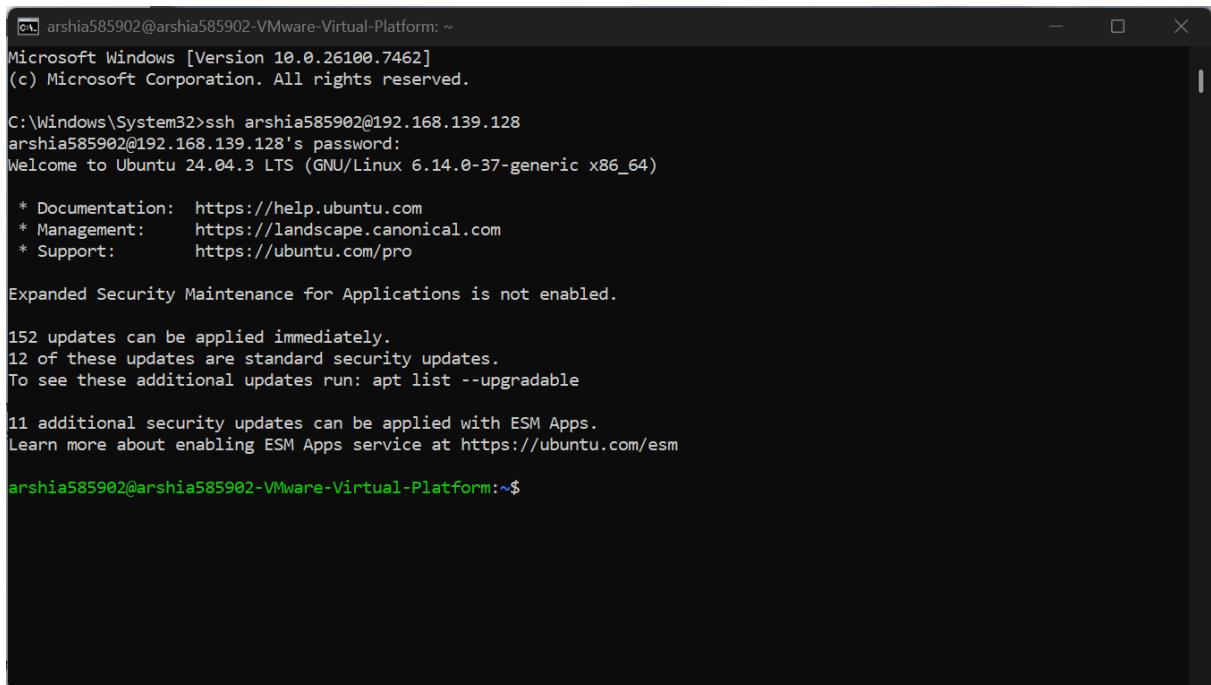
Assignment 6.1: Working from home

Screenshot installation openssh-server:



```
Jan 7 18:48 arshia585902@arshia585902-VMware-Virtual-Platform:~$ sudo apt install openssh-server
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 152 not upgraded.
arshia585902@arshia585902-VMware-Virtual-Platform:~$
```

Screenshot successful SSH command execution:



```
arshia585902@arshia585902-VMware-Virtual-Platform: ~
Microsoft Windows [Version 10.0.26100.7462]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\System32>ssh arshia585902@192.168.139.128
arshia585902@192.168.139.128'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

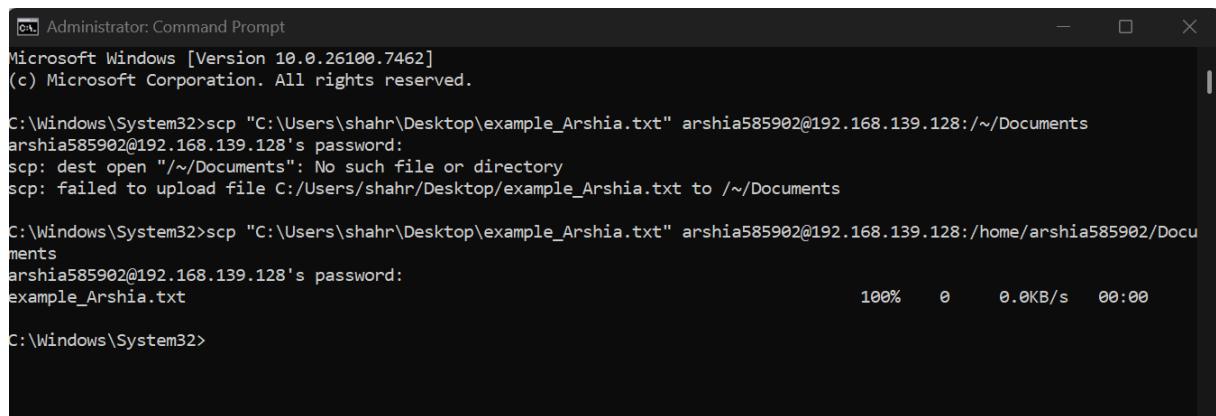
Expanded Security Maintenance for Applications is not enabled.

152 updates can be applied immediately.
12 of these updates are standard security updates.
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

arshia585902@arshia585902-VMware-Virtual-Platform:~$
```

Screenshot successful execution SCP command:



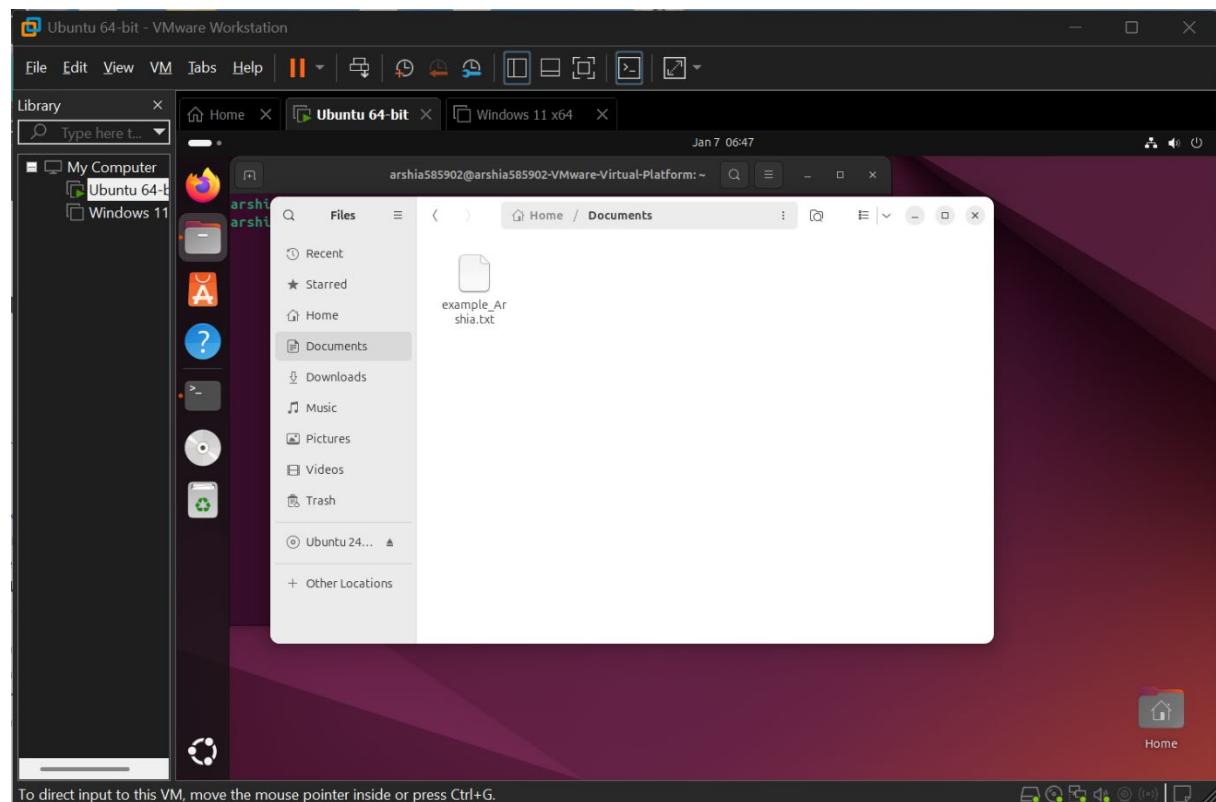
```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.26100.7462]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\System32>scp "C:\Users\shahr\Desktop\example_Arshia.txt" arshia585902@192.168.139.128:~/Documents
arshia585902@192.168.139.128's password:
scp: dest open "/~/Documents": No such file or directory
scp: failed to upload file C:/Users/shahr/Desktop/example_Arshia.txt to ~/Documents

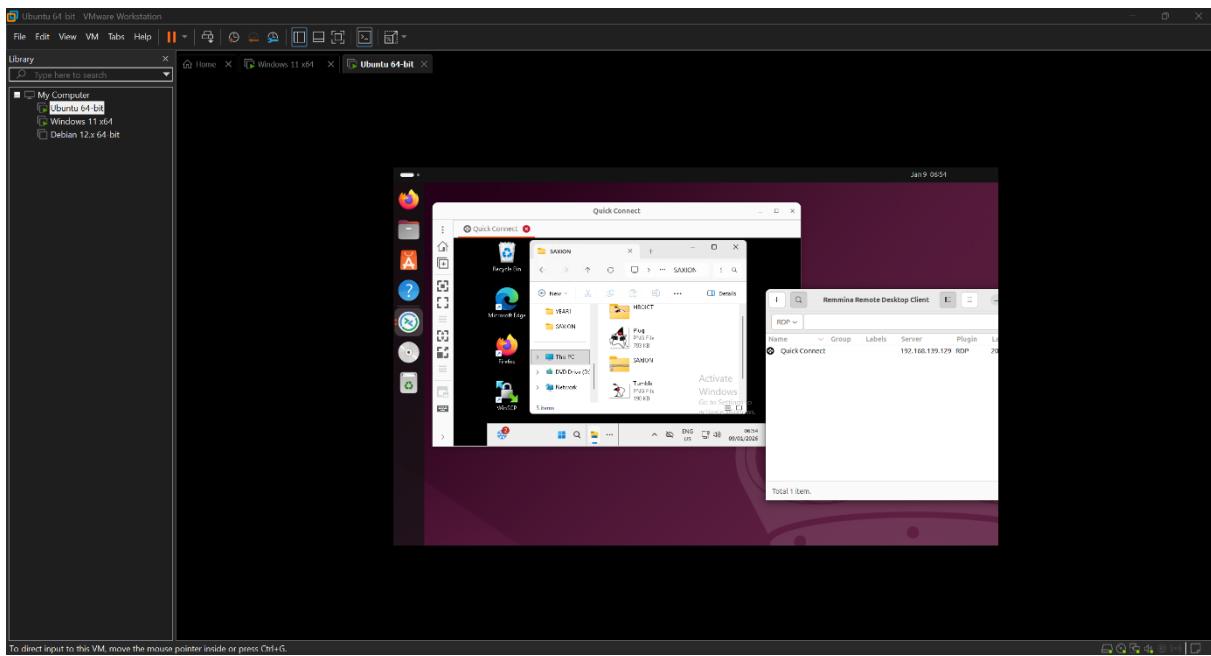
C:\Windows\System32>scp "C:\Users\shahr\Desktop\example_Arshia.txt" arshia585902@192.168.139.128:/home/arshia585902/Documents
arshia585902@192.168.139.128's password:
example_Arshia.txt                                         100%   0     0.0KB/s  00:00

C:\Windows\System32>
```

Proof that the file was transferred successfully:



Screenshot remmina:



With some research I found out that these steps should be followed in order of a successful connection:

On windows I went to settings > system > remote desktop and enabled that which resulted in RDP server being enabled on Windows

In the same section there was a place where I could add accounts that I wanted to grant access but since im using admin on Ubuntu, I didn't need to add anything in there; because admins are allowed by default

Then I went to the command prompt on windows and inquired its IP address using "ipconfig" command; which gave : 192.168.139.129

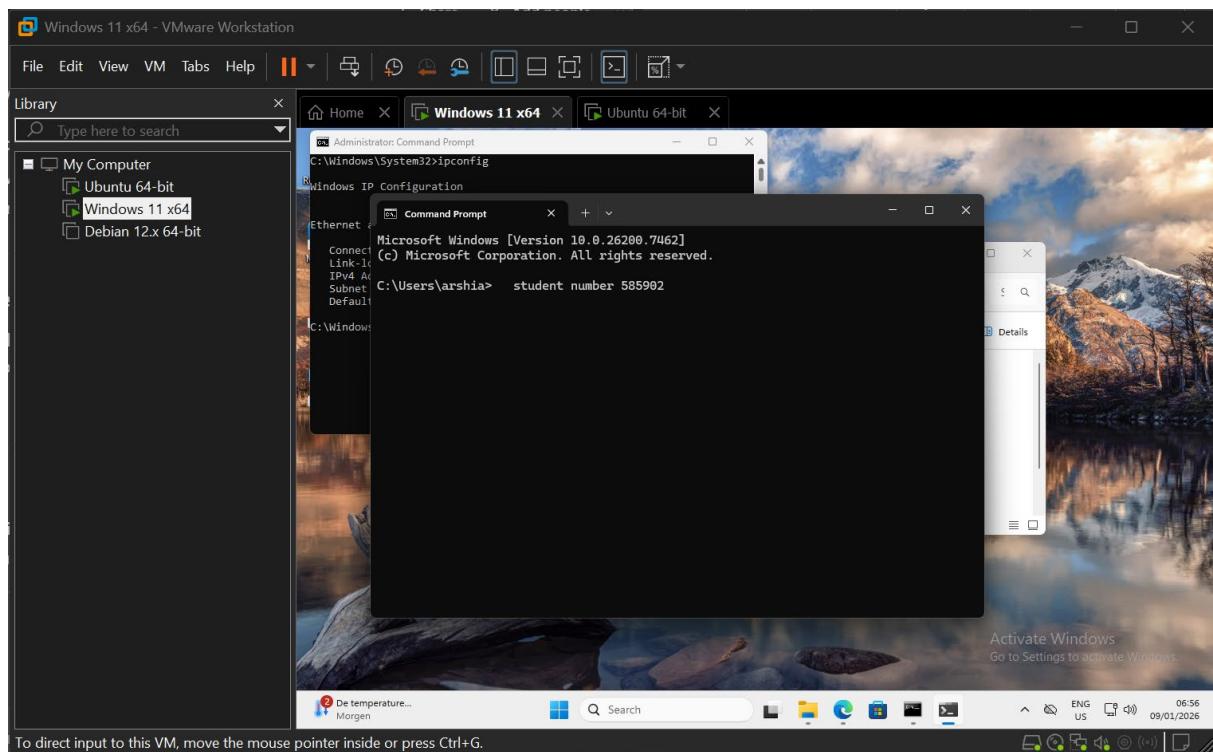
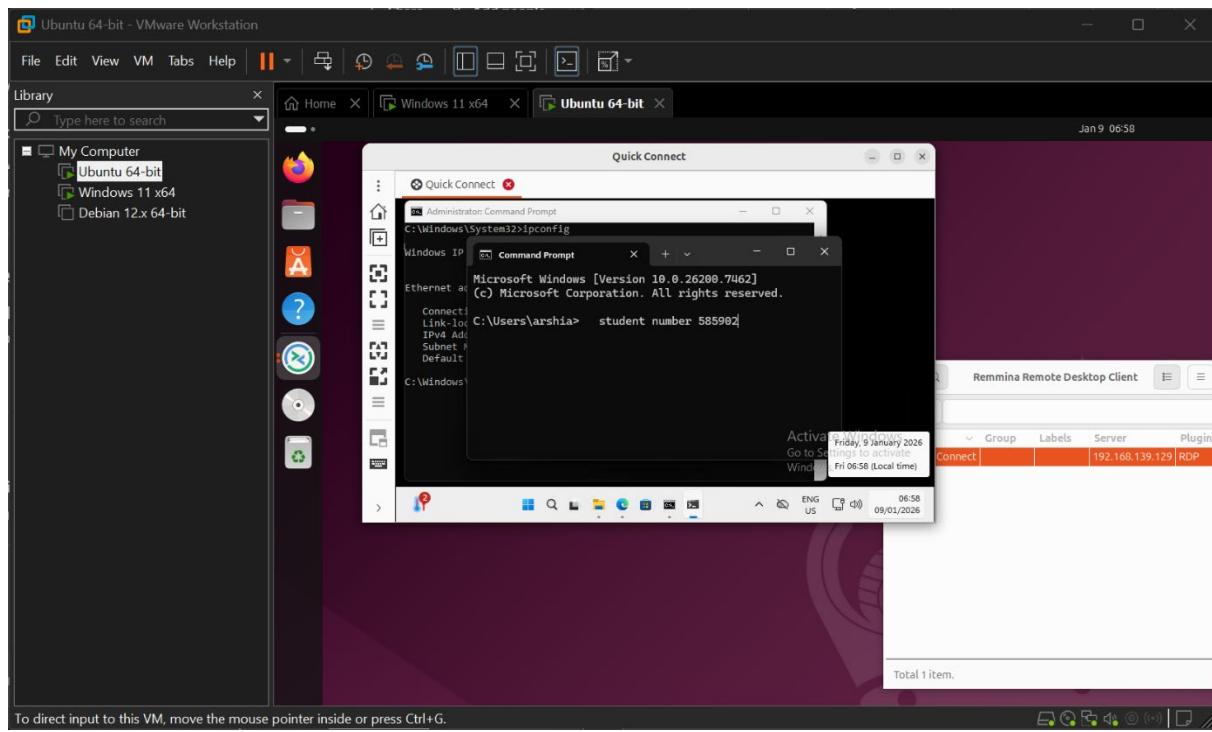
I then proceeded to enter that IP address in Remmina On Ubuntu where it applied

In the configurations of Remmina I entered my Windows password and username(which was the same as ubuntu)

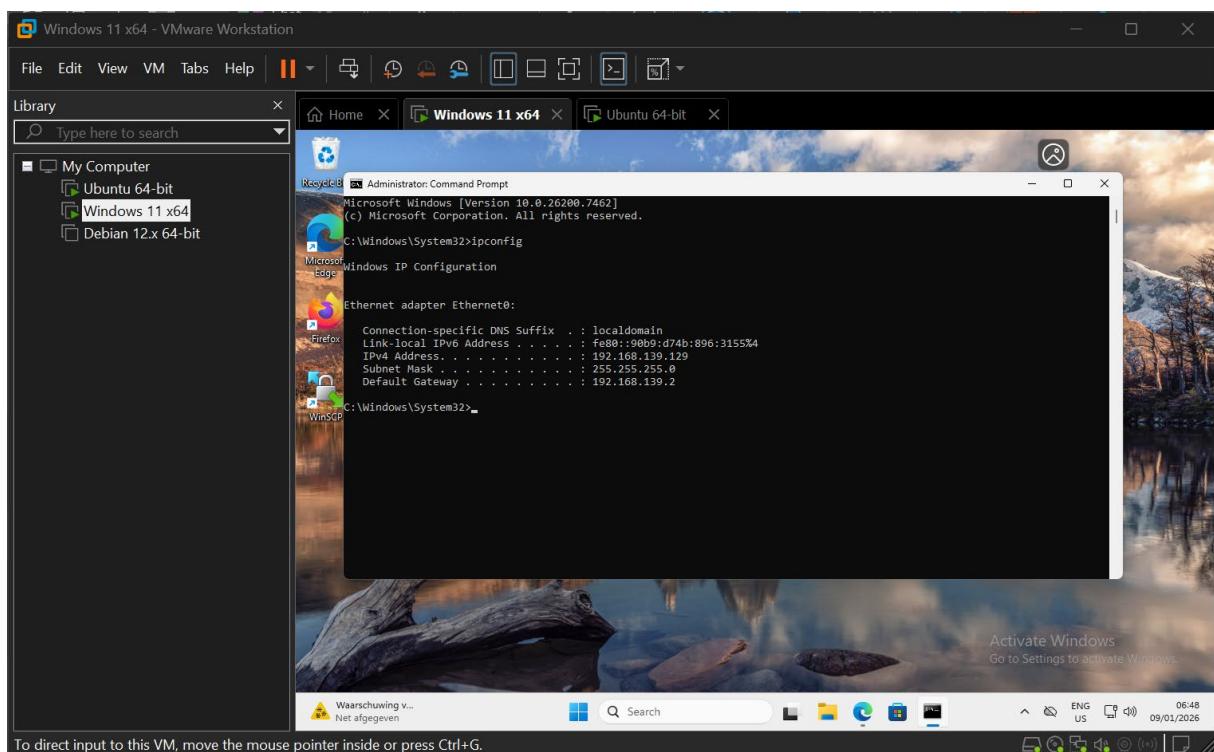
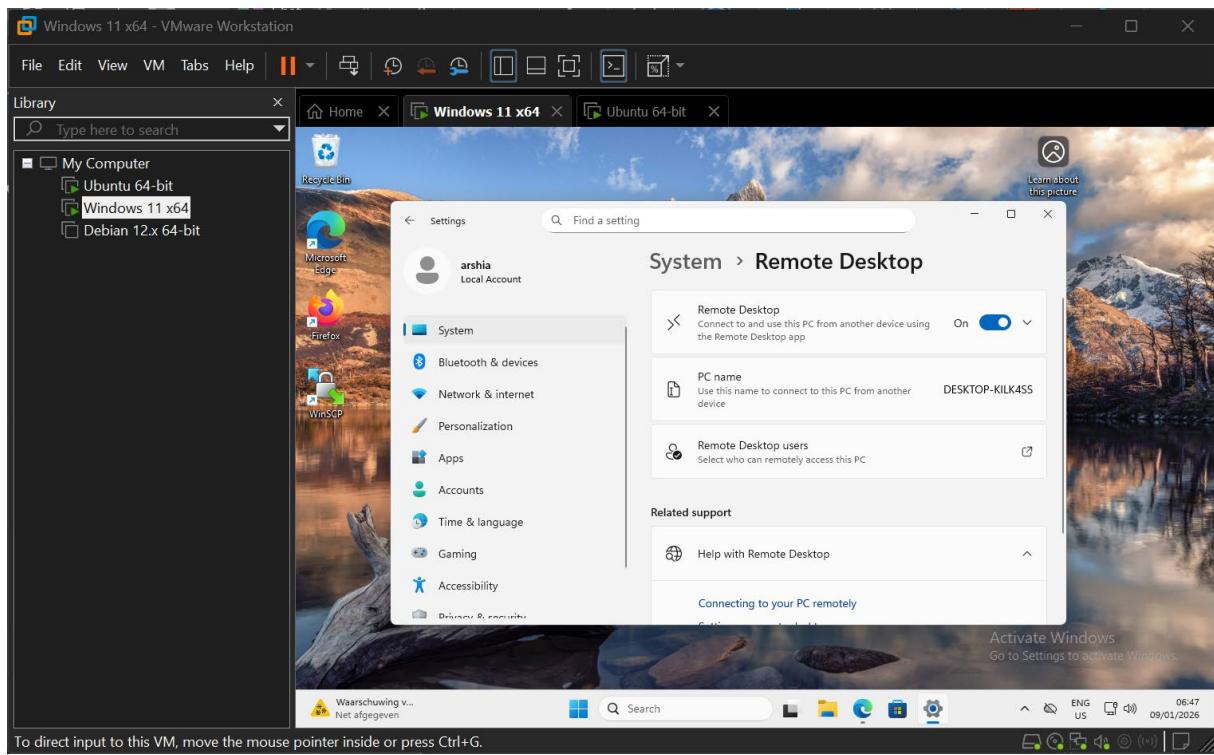
As primary proof, I took screen shots of the configurations I set both on Ubuntu and windows, The setup that resulted in successfully accessing the Windows VM

As more proof I tried showing common contents both on the windows VM and ubuntu VM (when connected to the windows). For example, I wrote down my student number in the command prompt on Windows and then showed the same thing on ubuntu. Additionally, I showed the contents of SAXION folder on windows (made in week 5) accessed through ubuntu, using remmina

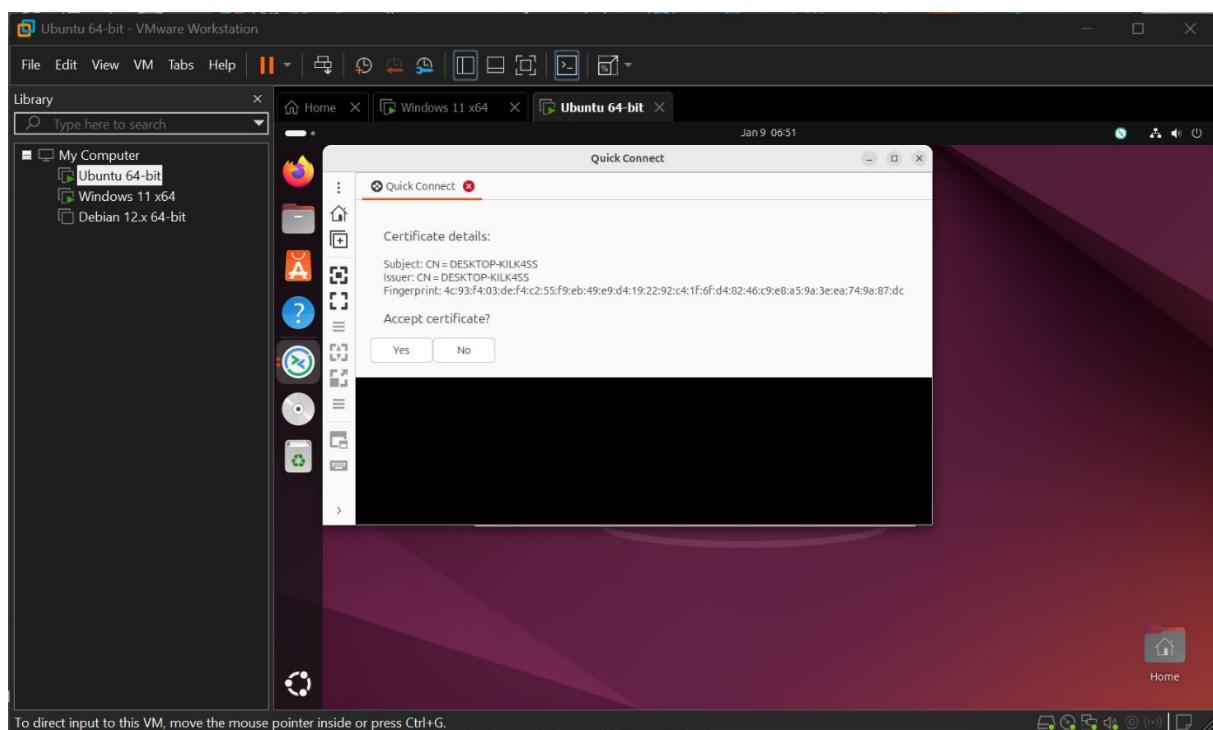
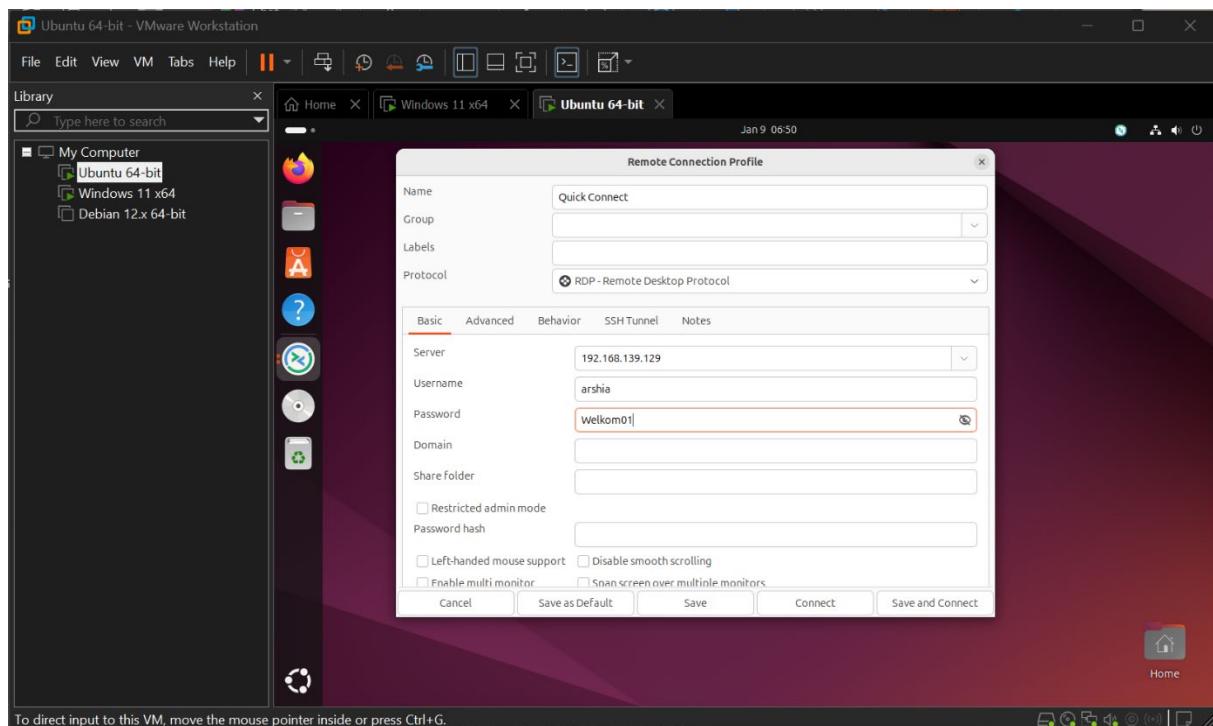
Generally the concept is as follows: remote desktop must be enabled on Windows and both VMs should be connected to the same network. Remmina must connect with RDP protocol, using the IP address of the Windows VM



Applied settings :



Remmina configuration:



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

```
C:\> Administrator: Command Prompt - nslookup
Microsoft Windows [Version 10.0.26100.7462]
(c) Microsoft Corporation. All rights reserved.

C:\> C:\Windows\System32>nslookup
Default Server: UnKnown
Address: 10.40.66.177

> amazon.com
Server: UnKnown
Address: 10.40.66.177

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

> google.com
Server: UnKnown
Address: 10.40.66.177

Non-authoritative answer:
Name: google.com
Addresses: 2a00:1450:400e:80f::200e
         142.251.39.142

> one.one.one.one
Server: UnKnown
Address: 10.40.66.177

Administrator: Command Prompt - nslookup
Non-authoritative answer:
Name: one.one.one.one
Addresses: 2606:4700:4700::1001
          2606:4700:4700::1111
          1.0.0.1
          1.1.1.1

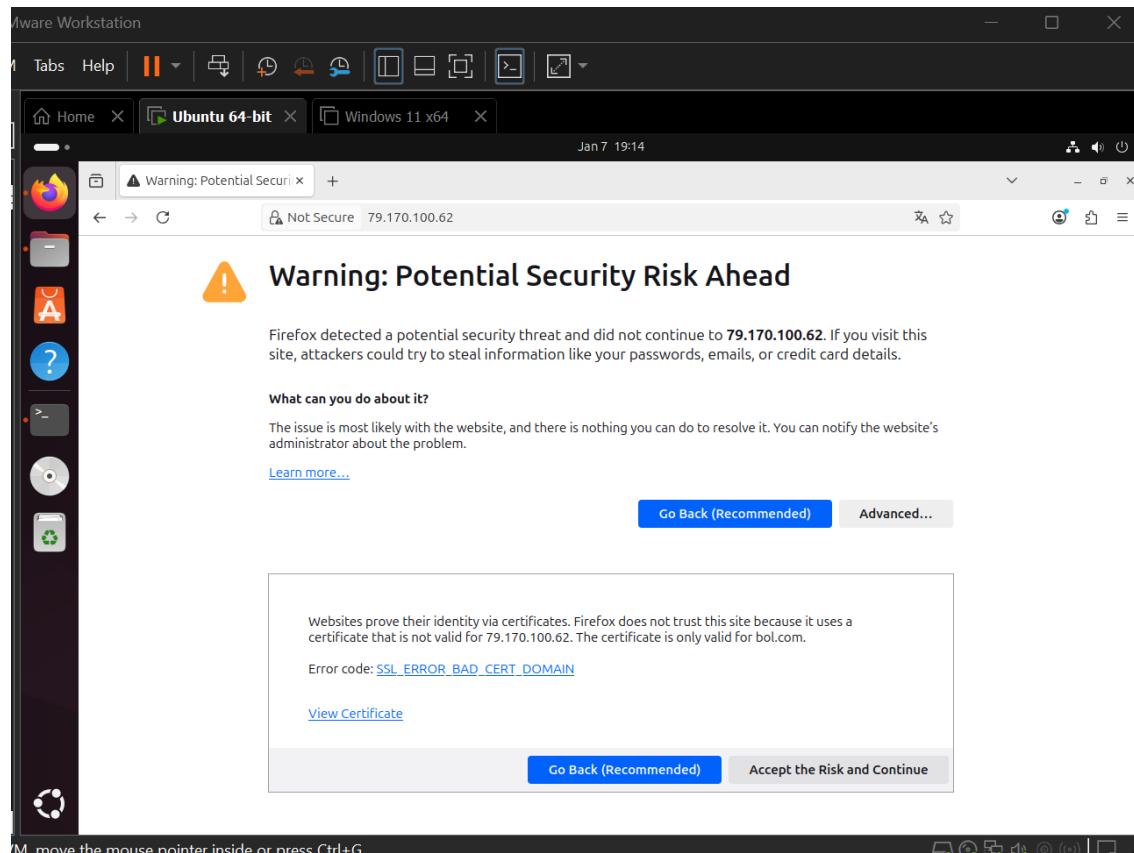
> dns.google.com
Server: UnKnown
Address: 10.40.66.177

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

> bol.com
Server: UnKnown
Address: 10.40.66.177

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

Screenshot website visit via IP address:



Assignment 6.3: subnetting

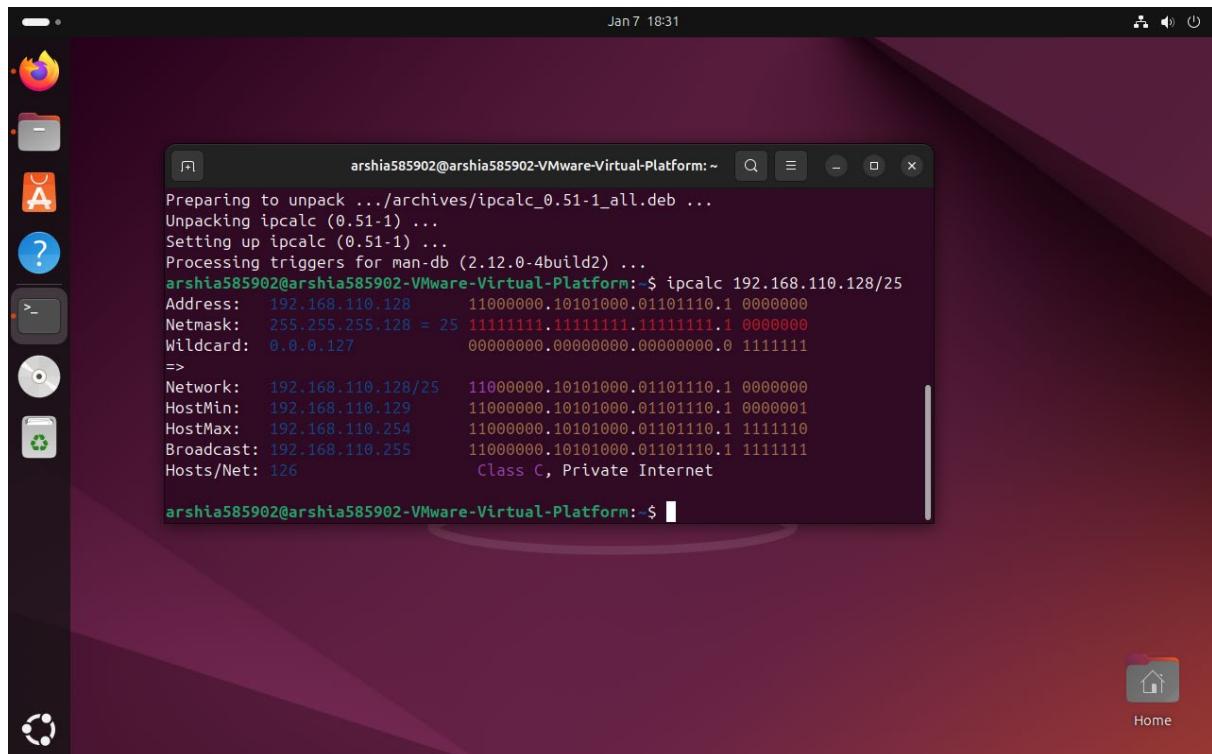
How many IP addresses are in this network configuration 192.168.110.128/25?

128 addresses, 126 of which usable for hosts because the first one (being network ip) and the last one (being broadcast ip) are not usable for that – [calculation explained bellow]

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

From 192.168.110.129/25 to 192.168.110.254/25

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



The screenshot shows a terminal window on a dark-themed desktop environment. The terminal title is "arshia585902@arshia585902-VMware-Virtual-Platform: ~". The output of the command `ipcalc 192.168.110.128/25` is displayed:

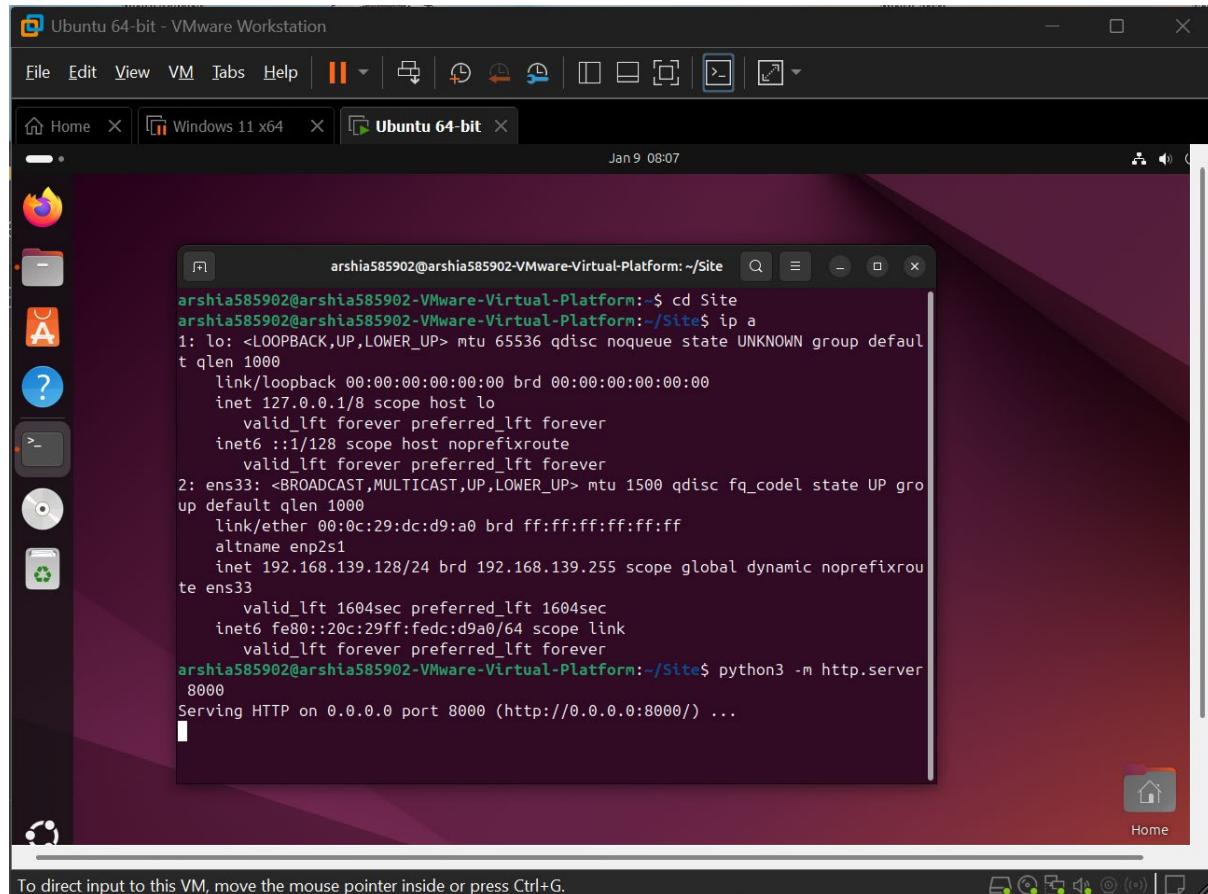
```
Preparing to unpack .../archives/ipcalc_0.51-1_all.deb ...
Unpacking ipcalc (0.51-1) ...
Setting up ipcalc (0.51-1) ...
Processing triggers for man-db (2.12.0-4build2) ...
arshia585902@arshia585902-VMware-Virtual-Platform: $ ipcalc 192.168.110.128/25
Address: 192.168.110.128      11000000.10101000.01101110.1 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 11111100
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.

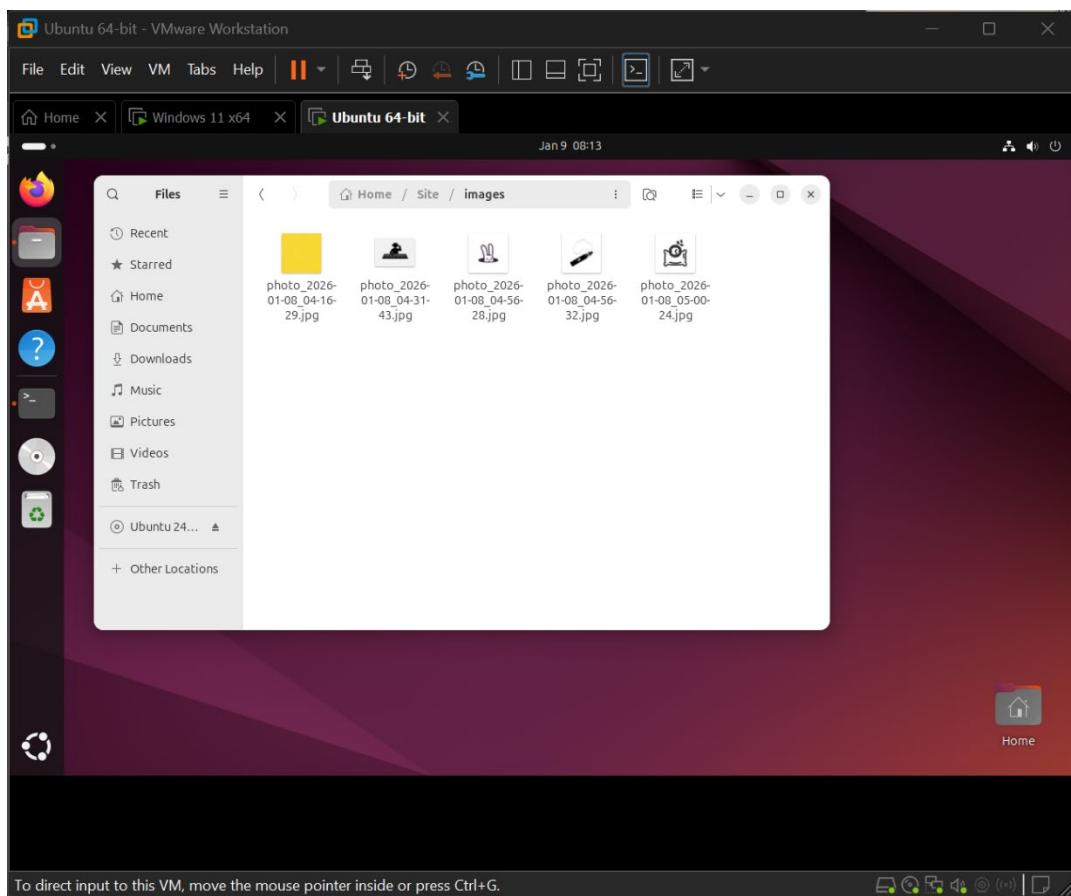
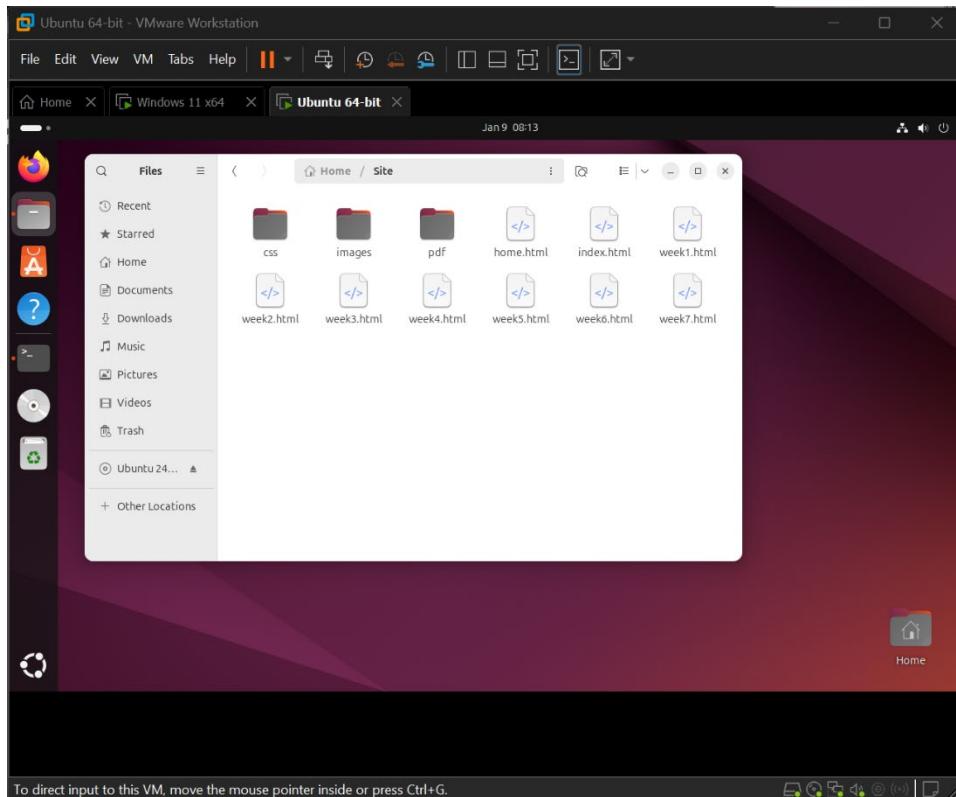
If it wasn't a '/25' subnet, there would have been four octets or groups of 8 bits which together would have formed 32 bits which would have been 2^{32} addresses. But now, 25 bit is subtracted from 32 since those 2^{25} addresses are reserved for the network and can't be given to hosts. that leaves us with 7 bits or 2^7 addresses to be given to hosts; (two of which are reduced again, for network and broadcast). That '/25' subnet mask makes the block size 128 (or 2^7) and the boundaries of that subnet should be multiples of the block size which gives us two possible subnets per last octet, 0-127 and 128-255. the last octet determines the network address and that address is the beginning of the range. Since that says 128 then it means that the range should be from 128 to 255 but the first one and the last one cant be used; therefore what actually goes to hosts are from ~.129/25 to ~.254/25

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:



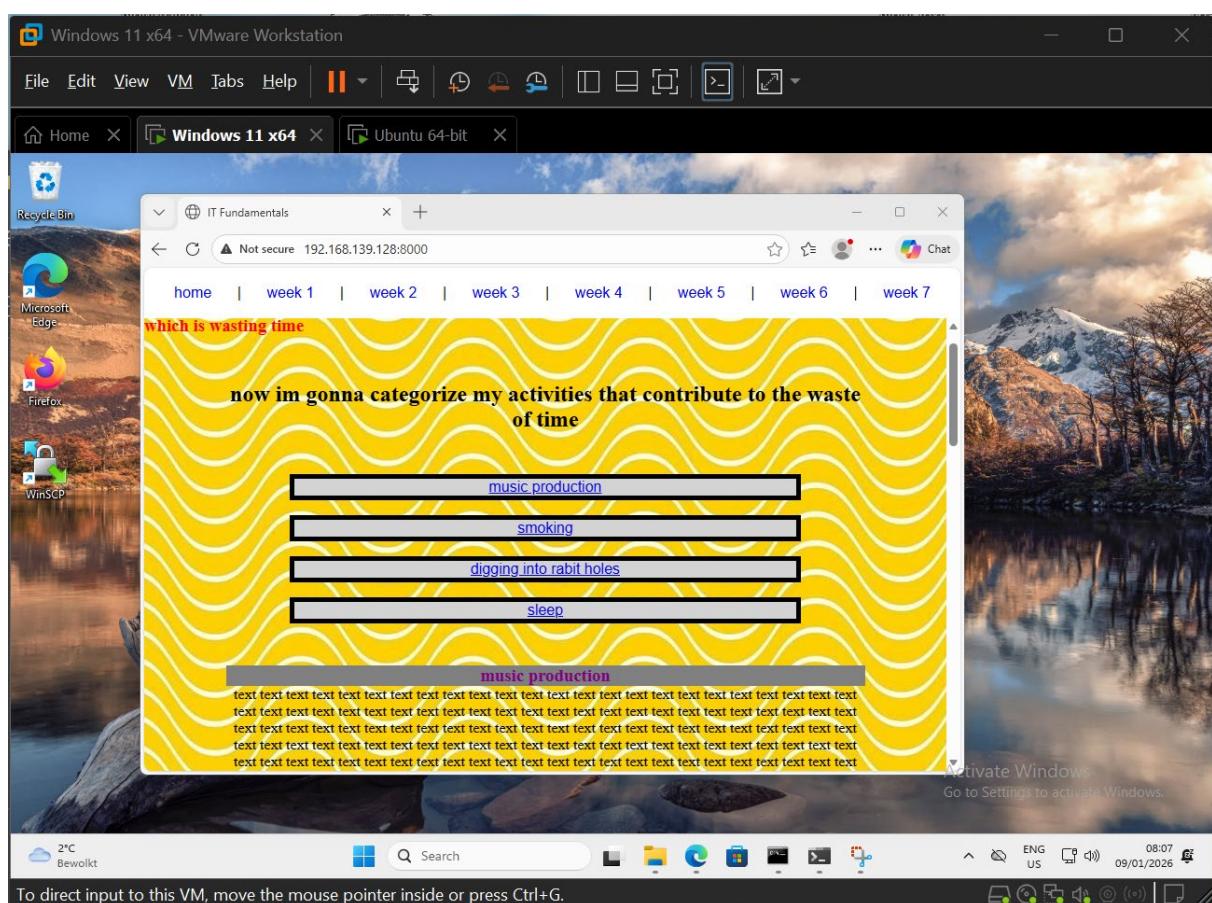
Screenshot of Site directory contents:



Screenshot python3 webserver command:

```
arshia585902@arshia585902-VMware-Virtual-Platform:~/Site$ python3 -m http.server  
8000  
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

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.

```
C:\Users\shahr\.jdks\ms-21.0.8\bin\java
enter 32bit ip address
192.168.139.24
enter subnet mask:
255.255.255.240
network address:
192.168.139.16
broadcast address:
192.168.139.31
range of this network is from
192.168.139.16
to:
192.168.139.31

Process finished with exit code 0

C:\Users\shahr\.jdks\ms-21.0.8\bin\java
enter 32bit ip address
192.168.139.188
enter subnet mask:
255.255.255.192
network address:
192.168.139.128
broadcast address:
192.168.139.191
range of this network is from
192.168.139.128
to:
192.168.139.191

Process finished with exit code 0
```

- ```

import java.util.ArrayList;
import java.util.Scanner;
public class Main {
 static Scanner scanner = new Scanner(System.in);
 public static void main(String[] args){
 System.out.println("enter 32bit ip address");
 String ipString = scanner.nextLine().trim();
 int[] ip = addressToArray(ipString);
 System.out.println("enter subnet mask: ");
 String sMask = scanner.nextLine().trim();
 int[] subnetMask = addressToArray(sMask);
 int[] network = new int[4];
 int[] broadcast = new int[4];
 for(int i = 0; i<4; i++){
 network[i] = subnetMask[i] & ip[i];
 broadcast[i] = (~subnetMask[i] & 255) | network[i];
 }
 System.out.println("network address: ");
 System.out.println(arrayToString(network));
 System.out.println("broadcast address: ");
 System.out.println(arrayToString(broadcast));
 System.out.println("range of this network is from ");
 System.out.println(arrayToString(network));
 System.out.println("to: ");
 System.out.println(arrayToString(broadcast));
 }

 static int[] addressToArray(String addressString){
 int[] temp = new int[]{4,4,4,4};
 int j =0;
 int begin = 0;
 for (int i = 0; i < addressString.length(); i++) {
 if (addressString.charAt(i) == '.'){
 temp[j] =
 Integer.parseInt(addressString.substring(begin, i));
 j++;
 begin = i+1;
 }
 }
 temp[j] = Integer.parseInt(addressString.substring(begin));
 return temp;
 }

 static String arrayToString(int[] address){
 String addressString = "";
 for(int i = 0; i < address.length; i++){
 addressString = addressString + address[i] + ".";
 }
 addressString = addressString.substring(0,
addressString.length()-1);
 return addressString;
 }
}

```
- 

Ready? Save this file and export it as a pdf file with the name: **week6.pdf**