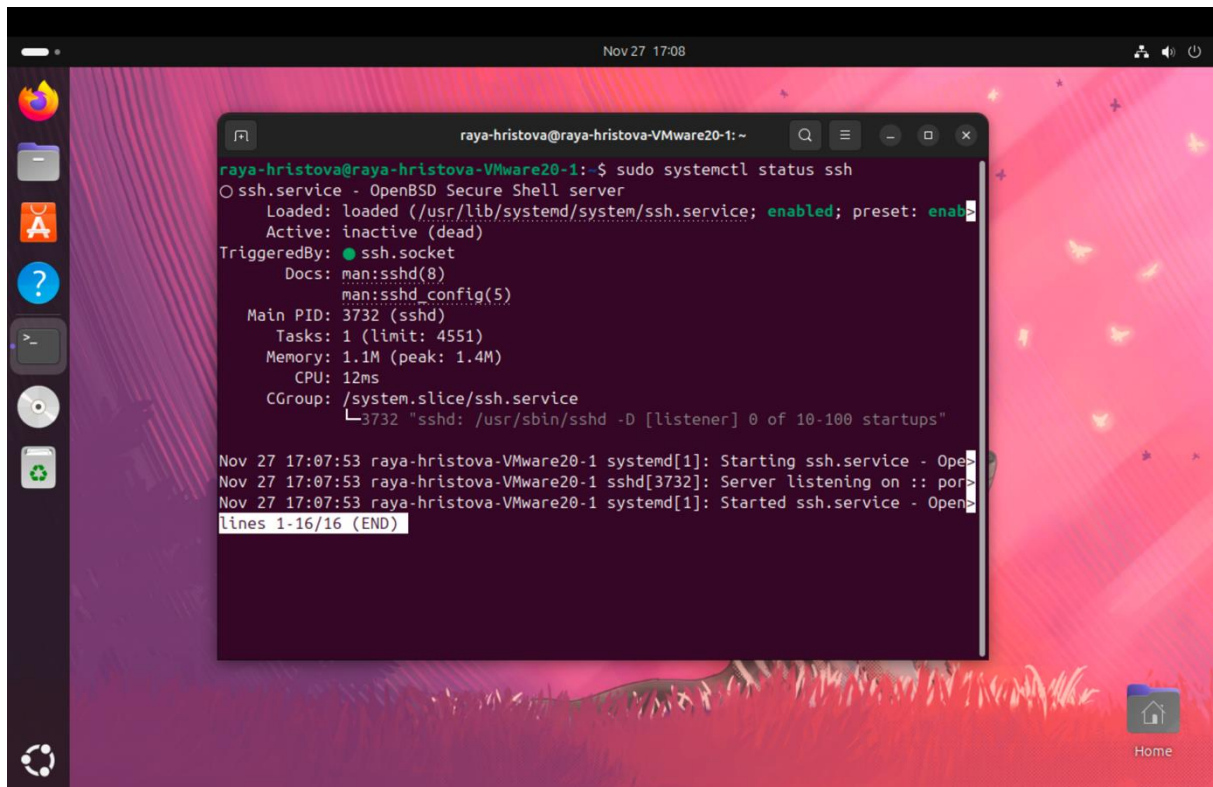


Template Week 6 – Networking

Student number: 561004

Assignment 6.1: Working from home

Screenshot installation openssh-server:



The screenshot shows a Linux desktop environment with a pink and purple background. A terminal window is open, displaying the output of the command `sudo systemctl status ssh`. The output shows that the `ssh.service` is loaded and enabled, but it is currently inactive (dead). The terminal also shows the logs for the service starting and listening on port 22.

```
raya-hristova@raya-hristova-VMware20-1: ~  
raya-hristova@raya-hristova-VMware20-1:~$ sudo systemctl status ssh  
○ ssh.service - OpenBSD Secure Shell server  
   Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: enab>  
   Active: inactive (dead)  
TriggeredBy: ● ssh.socket  
   Docs: man:sshd(8)  
         man:sshd_config(5)  
   Main PID: 3732 (sshd)  
     Tasks: 1 (limit: 4551)  
    Memory: 1.1M (peak: 1.4M)  
       CPU: 12ms  
    CGroup: /system.slice/ssh.service  
            └─3732 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"  
  
Nov 27 17:07:53 raya-hristova-VMware20-1 systemd[1]: Starting ssh.service - Open>  
Nov 27 17:07:53 raya-hristova-VMware20-1 sshd[3732]: Server listening on :: port>  
Nov 27 17:07:53 raya-hristova-VMware20-1 systemd[1]: Started ssh.service - Open>  
lines 1-16/16 (END)
```

Screenshot successful SSH command execution:

```
root id 0:0:0:0:0:0 priority 0 ifcost 0 port 0
ipfilter disabled flags 0x0
member: vmemet1 flags=3<LEARNING,DISCOVER>
ifmaxaddr 0 port 23 priority 0 path cost 0
member: vmemet2 flags=3<LEARNING,DISCOVER>
ifmaxaddr 0 port 25 priority 0 path cost 0
member: vmemet4 flags=3<LEARNING,DISCOVER>
ifmaxaddr 0 port 27 priority 0 path cost 0
nd6 options=201<PERFORMNUD,DAD>
media: autoselect
status: active
vmenet2: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
ether 46:86:f7:38:e7:9b
media: autoselect
status: active
vmenet4: flags=8963<UP,BROADCAST,SMART,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
ether 6a:68:97:bb:19:e3
media: autoselect
status: active
rayathristova@rayas-mbp ~ % clear

[rayathristova@rayas-mbp ~ % ssh raya-hristova@172.16.194.135
The authenticity of host '172.16.194.135 (172.16.194.135)' can't be established.
ED25519 key fingerprint is SHA256:ppU7uVjAKQ0/1rdqEakzS7FdEcho1Q4v4s2hxb1f44.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.16.194.135' (ED25519) to the list of known hosts.
raya-hristova@172.16.194.135's password:
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-49-generic aarch64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

203 updates can be applied immediately.
7 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

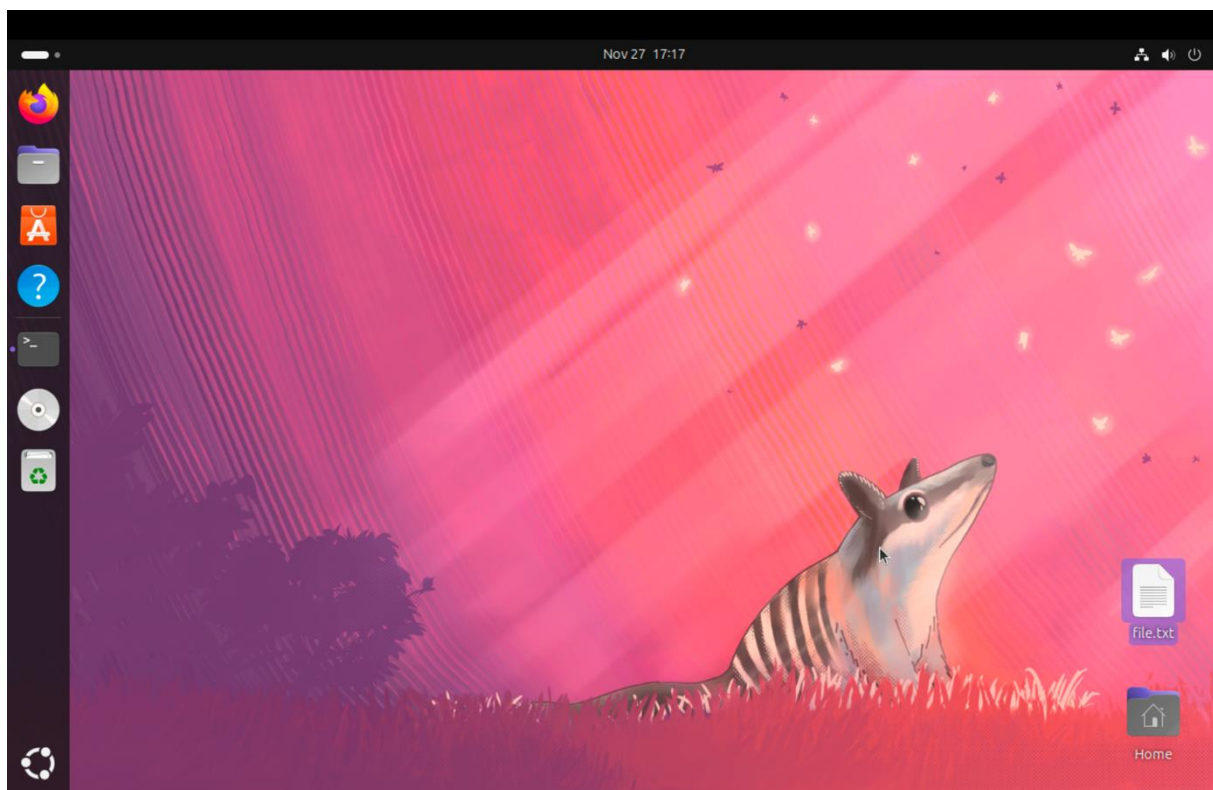
16 updates could not be installed automatically. For more details,
see /var/log/unattended-upgrades/unattended-upgrades.log

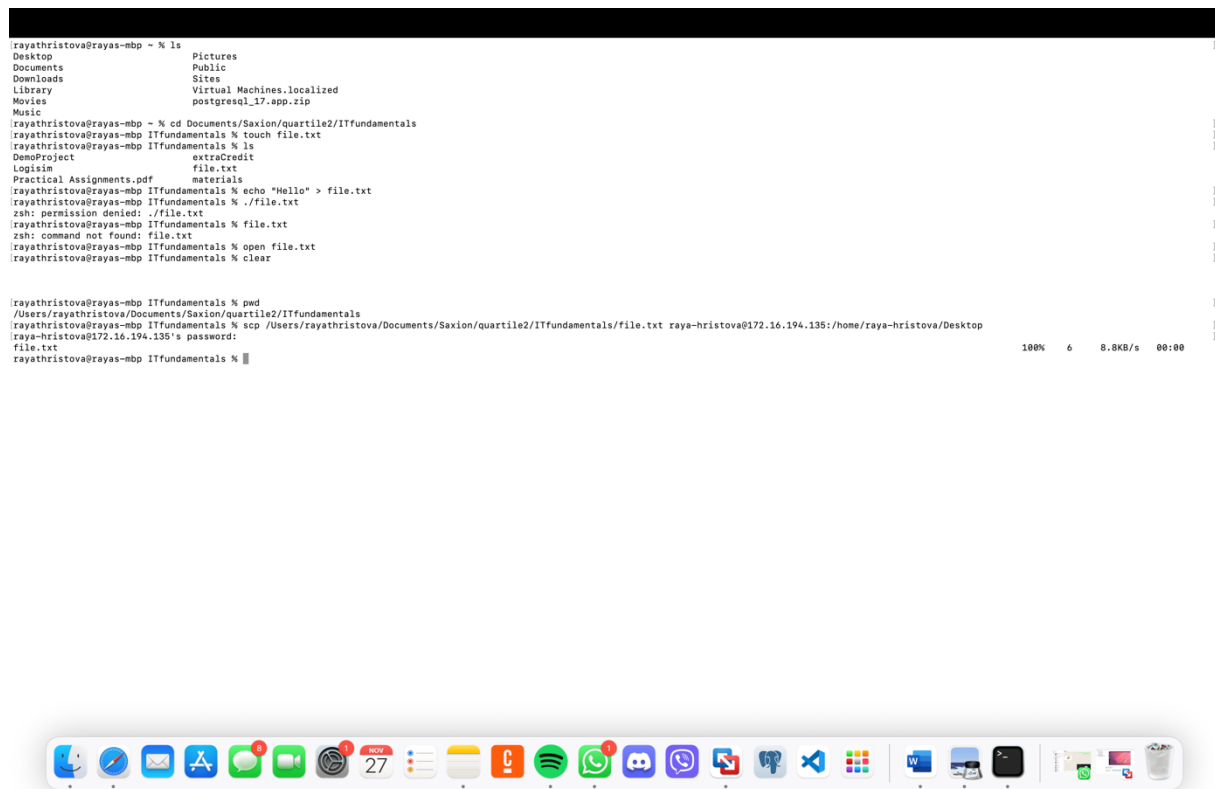
The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

raya-hristova@raya-hristova-VNware20-1:~$
```

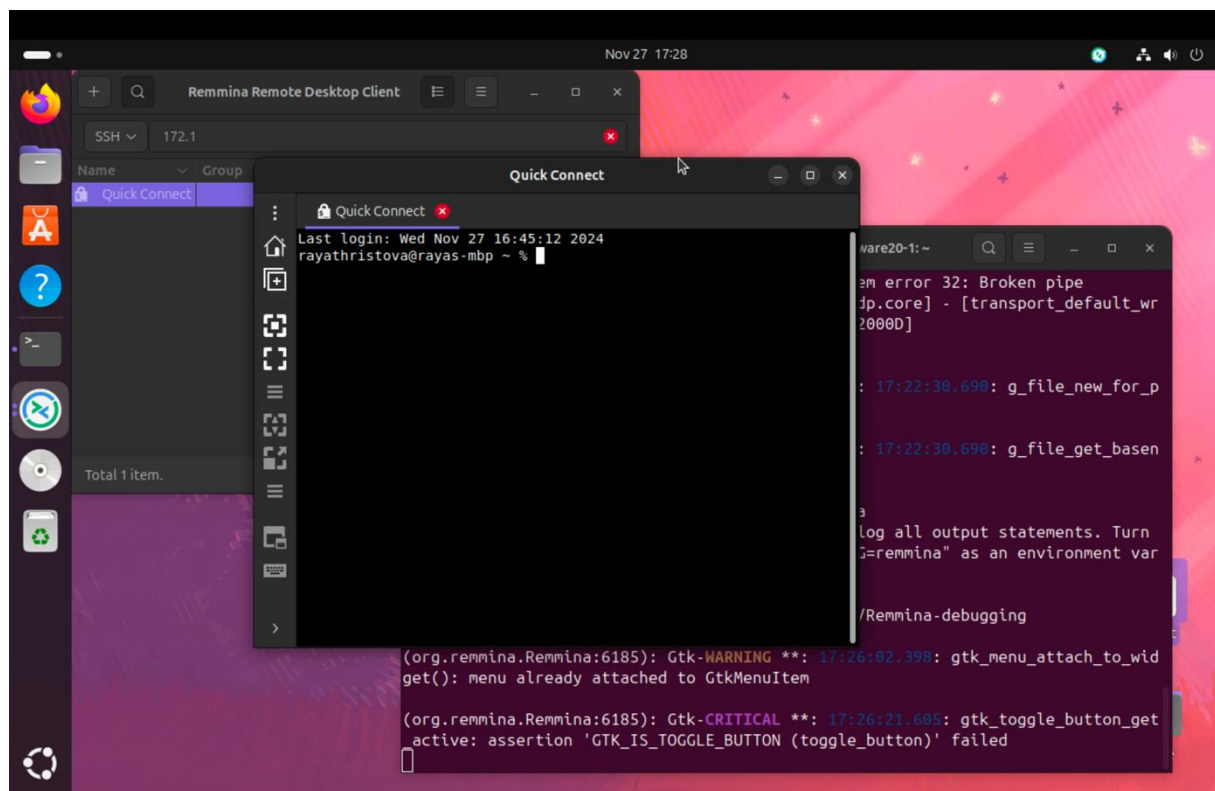
Screenshot successful execution SCP command:





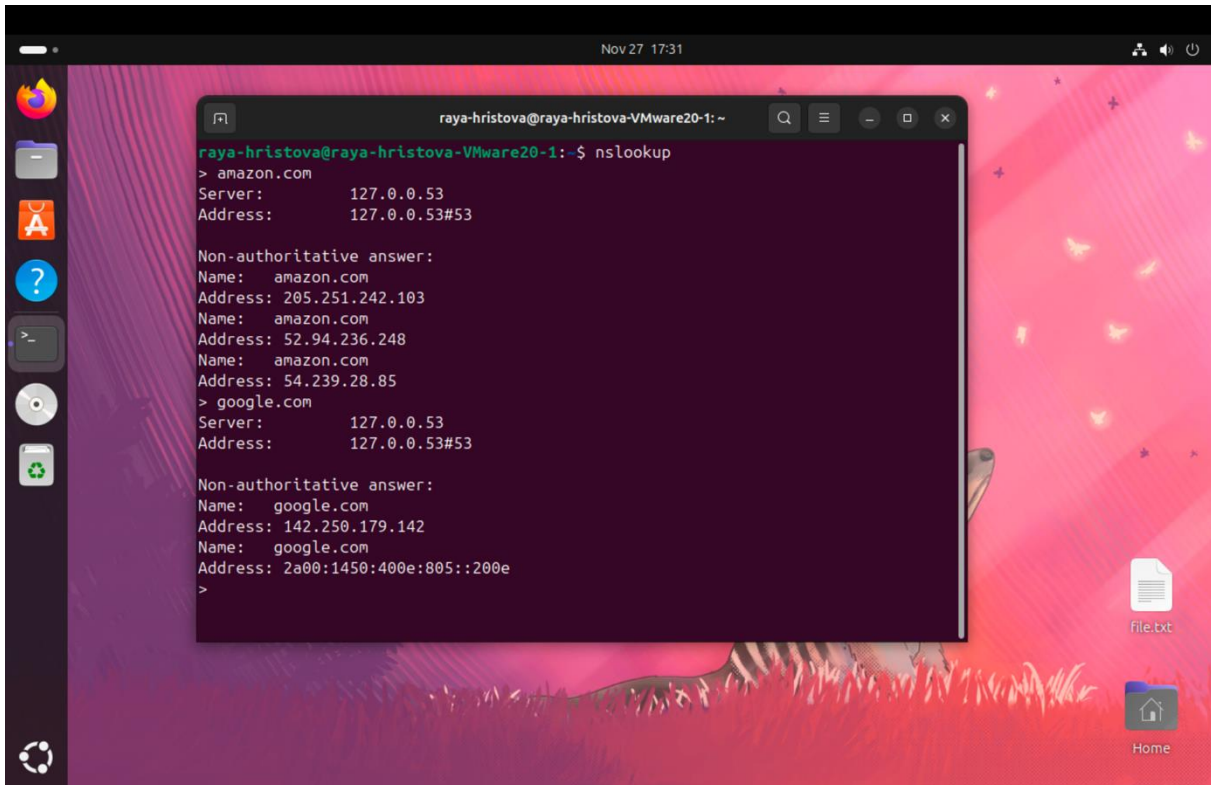
Screenshot remmina:

Connecting Ubuntu to my laptop



Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:

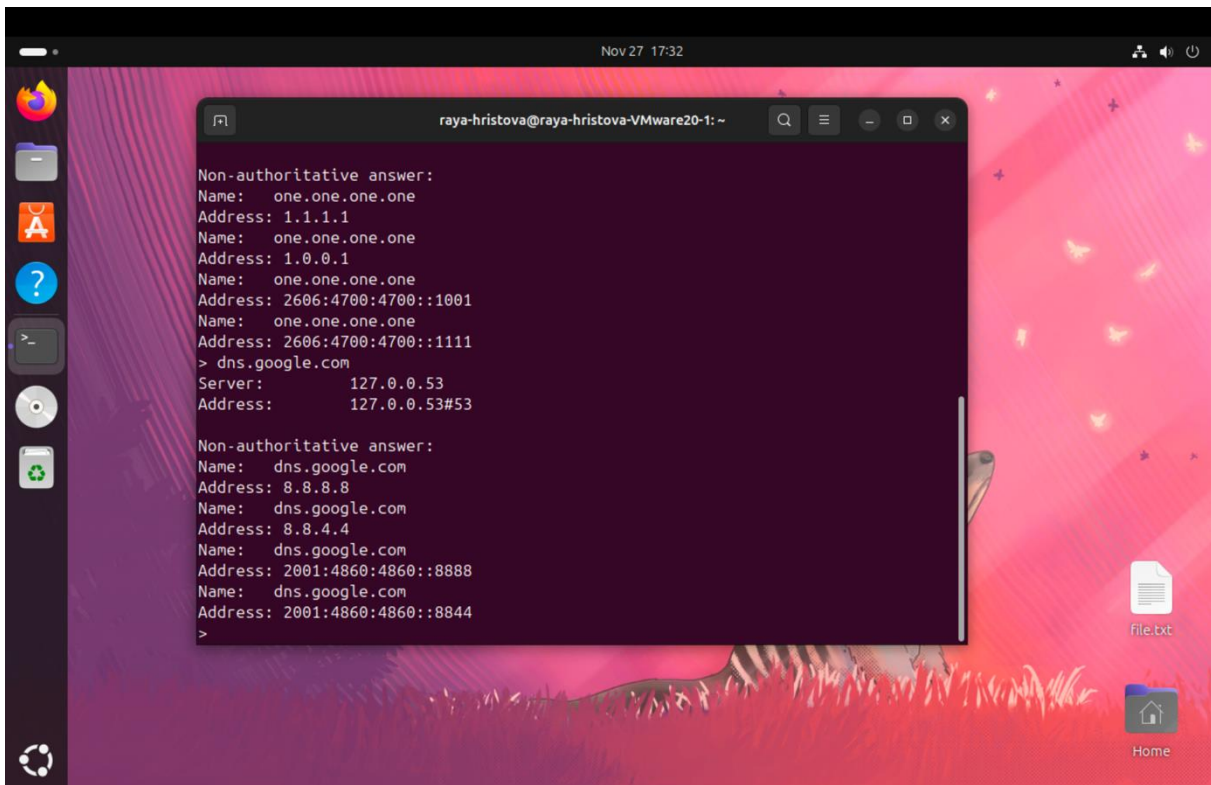


The screenshot shows a terminal window titled 'raya-hristova@raya-hristova-VMware20-1: ~' with the following output:

```
raya-hristova@raya-hristova-VMware20-1:~$ nslookup
> amazon.com
Server:      127.0.0.53
Address:     127.0.0.53#53

Non-authoritative answer:
Name:   amazon.com
Address: 205.251.242.103
Name:   amazon.com
Address: 52.94.236.248
Name:   amazon.com
Address: 54.239.28.85
> google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

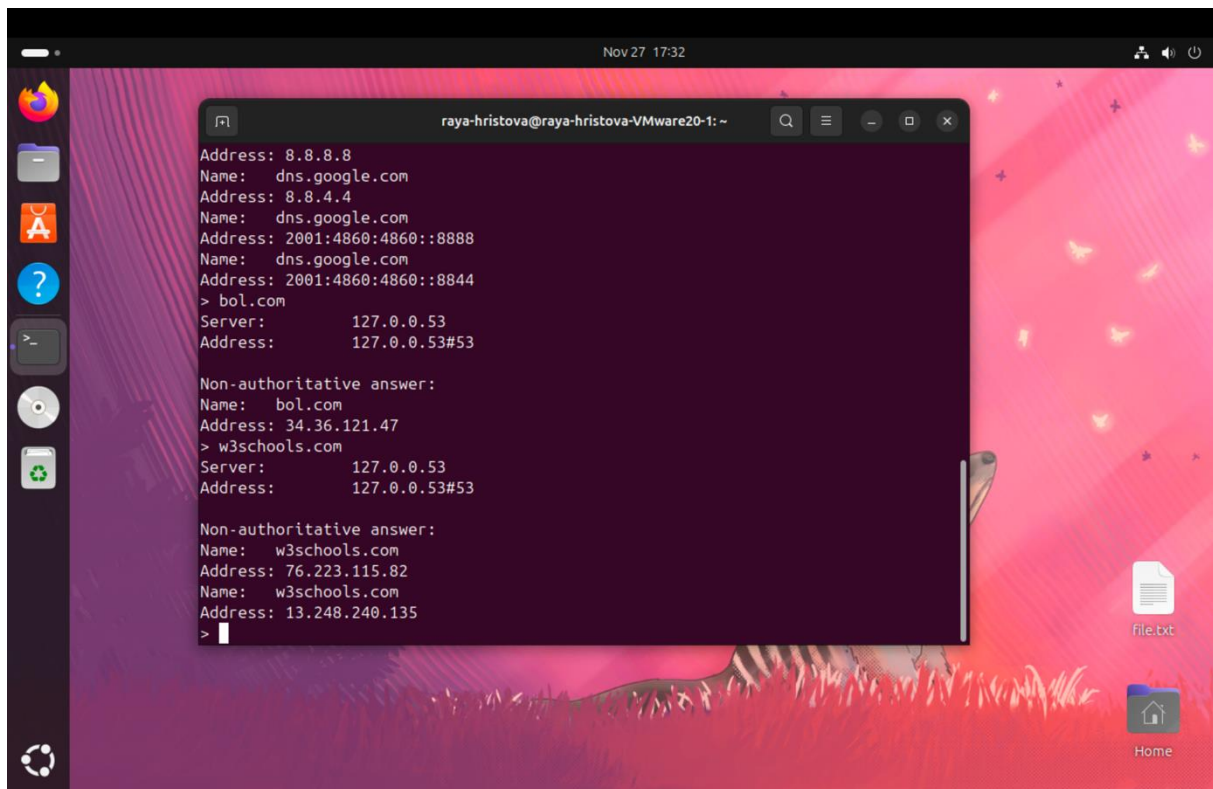
Non-authoritative answer:
Name:   google.com
Address: 142.250.179.142
Name:   google.com
Address: 2a00:1450:400e:805::200e
>
```



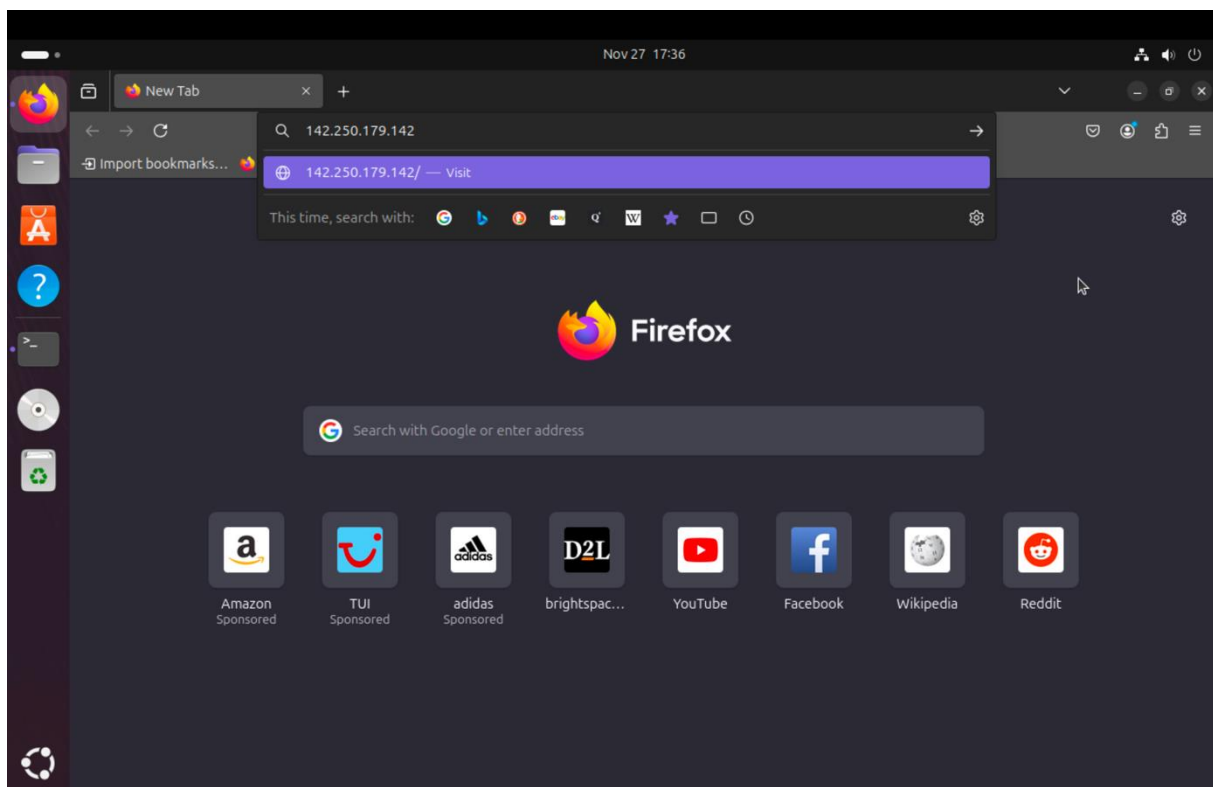
The screenshot shows a terminal window titled 'raya-hristova@raya-hristova-VMware20-1: ~' with the following output:

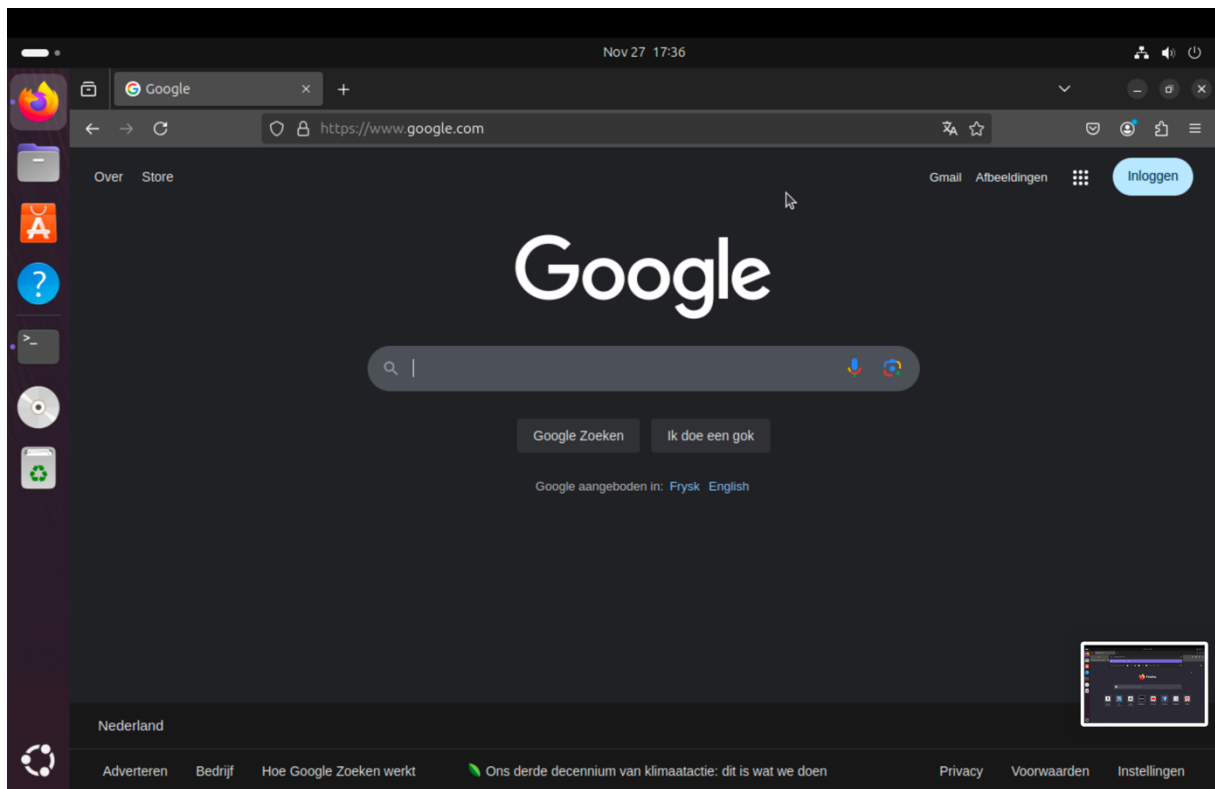
```
Non-authoritative answer:
Name:   one.one.one.one
Address: 1.1.1.1
Name:   one.one.one.one
Address: 1.0.0.1
Name:   one.one.one.one
Address: 2606:4700:4700::1001
Name:   one.one.one.one
Address: 2606:4700:4700::1111
> dns.google.com
Server:      127.0.0.53
Address:     127.0.0.53#53

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
>
```

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?

From 192.168.100.129 to 192.168.100.255

Check your two previous answers with this calculator:

<https://www.calculator.net/ip-subnet-calculator.html>

1. Port is 25, IP addresses are 32-bit, meaning there are only 25 bits used and 7 more for hosting.

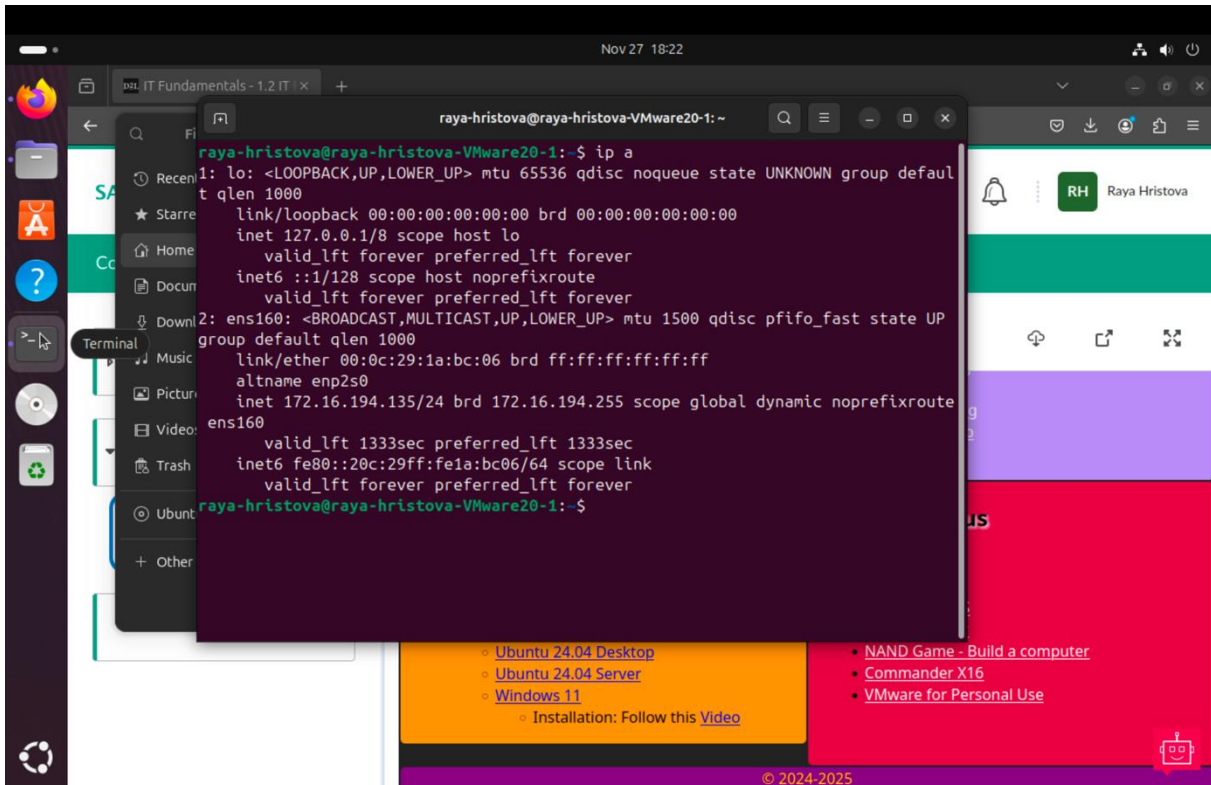
The number of possible IP addresses is calculated like: $2^7 = 128$.

2. The number of the usable IP range is determined from the last number from the IP address (128), so that means there is usable space from 192.168.100.129 to 192.168.100.255

Explain the above calculation in your own words.

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

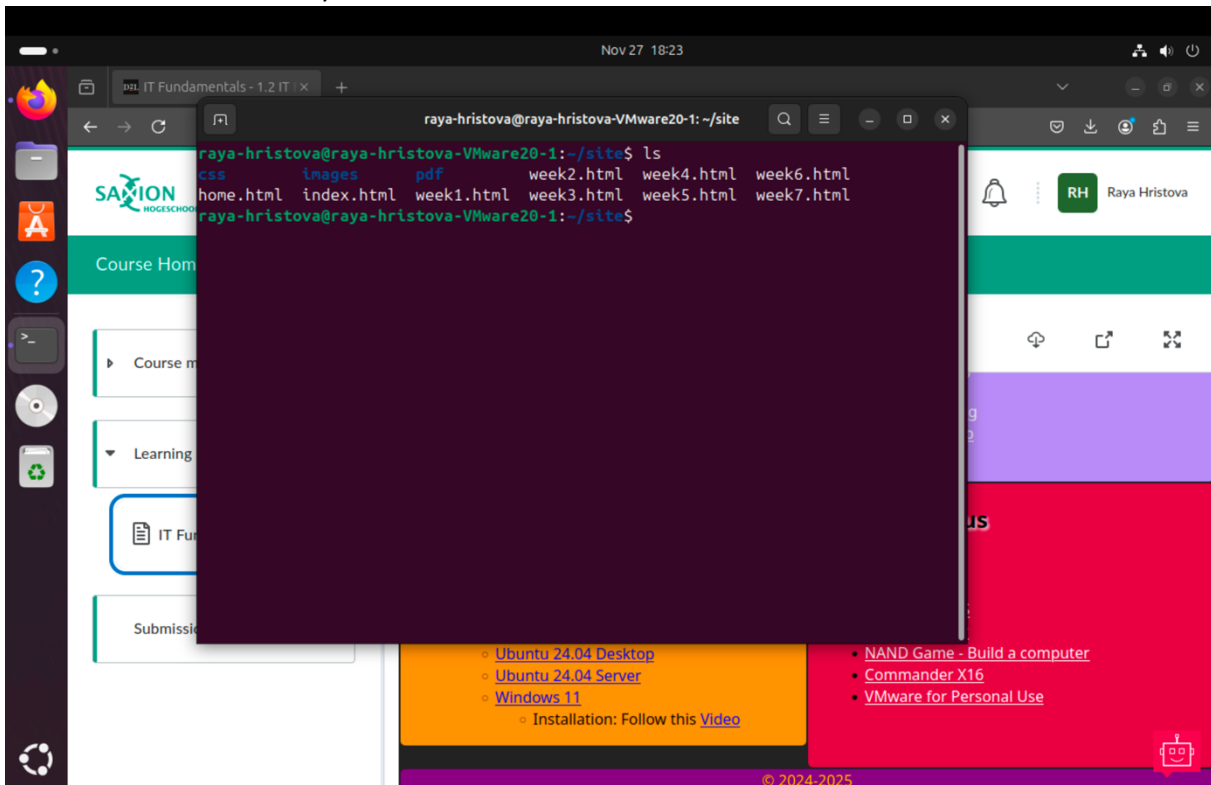


The screenshot shows a terminal window titled 'raya-hristova@raya-hristova-VMware20-1: ~' with the following output for the 'ip a' command:

```
raya-hristova@raya-hristova-VMware20-1:~$ 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: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:1a:bc:06 brd ff:ff:ff:ff:ff:ff
    altname enp2s0
    inet 172.16.194.135/24 brd 172.16.194.255 scope global dynamic noprefixroute ens160
        valid_lft 1333sec preferred_lft 1333sec
    inet6 fe80::20c:29ff:fe1a:bc06/64 scope link
        valid_lft forever preferred_lft forever
raya-hristova@raya-hristova-VMware20-1:~$
```

The terminal window is overlaid on a desktop environment. The desktop background is a purple and pink gradient. On the left, there is a sidebar with icons for applications like Firefox, Files, and the Dash. At the bottom, there is a footer with copyright information '© 2024-2025' and a small robot icon.

Screenshot of Site directory contents:

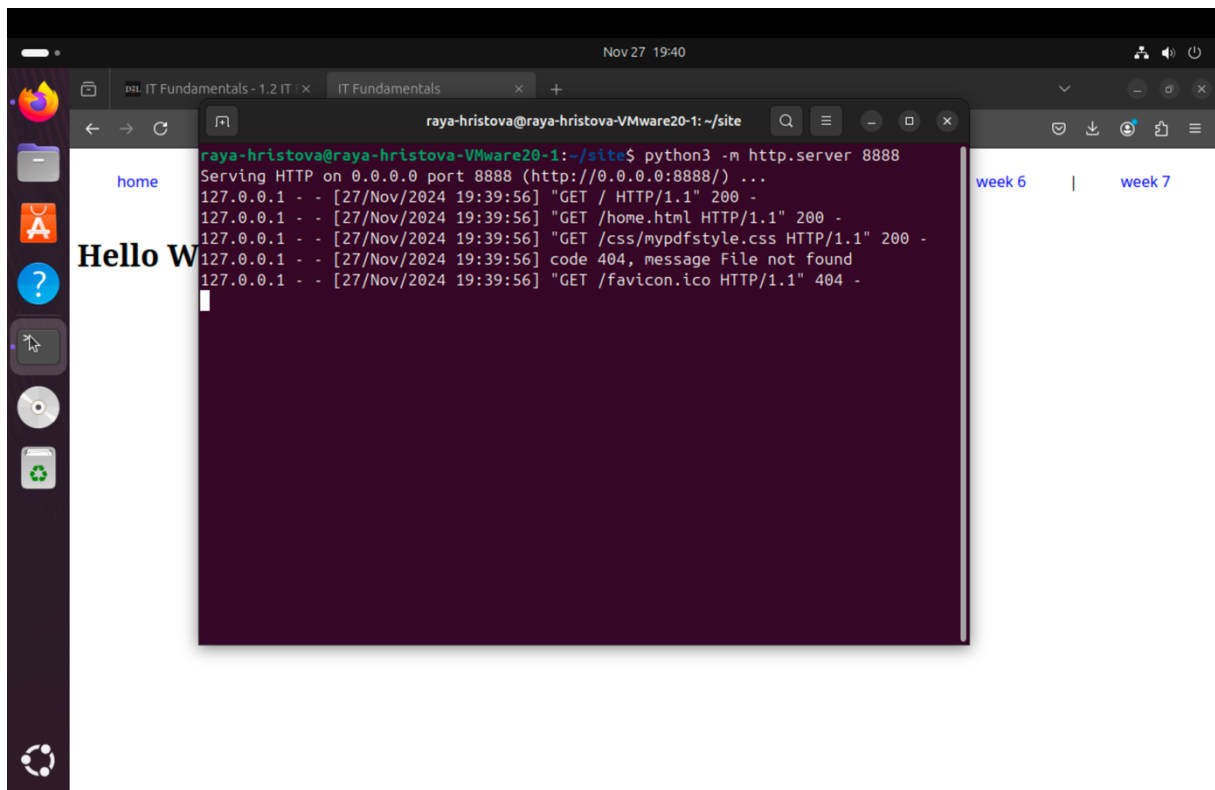


The screenshot shows a terminal window titled 'raya-hristova@raya-hristova-VMware20-1: ~/site' with the following output for the 'ls' command:

```
raya-hristova@raya-hristova-VMware20-1:~/site$ ls
css      images  pdf      week2.html  week4.html  week6.html
home.html index.html week1.html  week3.html  week5.html  week7.html
raya-hristova@raya-hristova-VMware20-1:~/site$
```

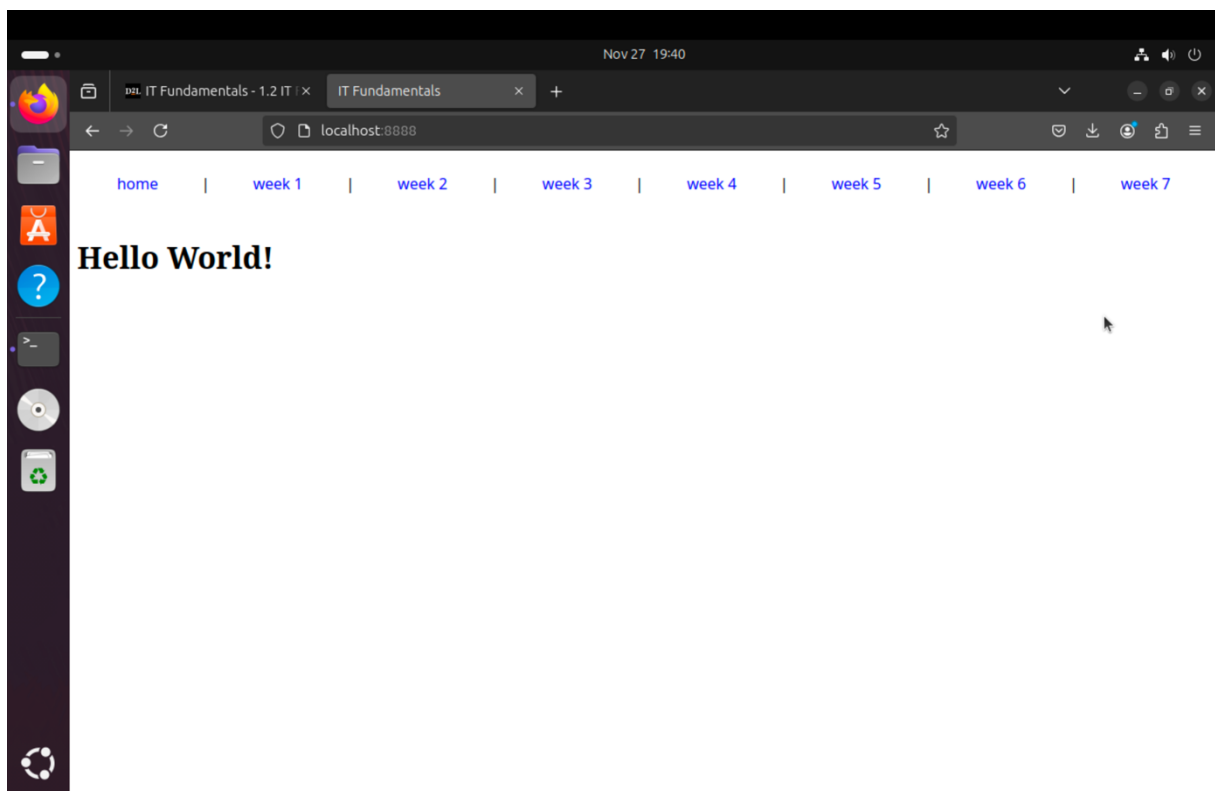
The terminal window is overlaid on a desktop environment. The desktop background is a purple and pink gradient. On the left, there is a sidebar with icons for applications like Firefox, Files, and the Dash. At the bottom, there is a footer with copyright information '© 2024-2025' and a small robot icon.

Screenshot python3 webserver command:

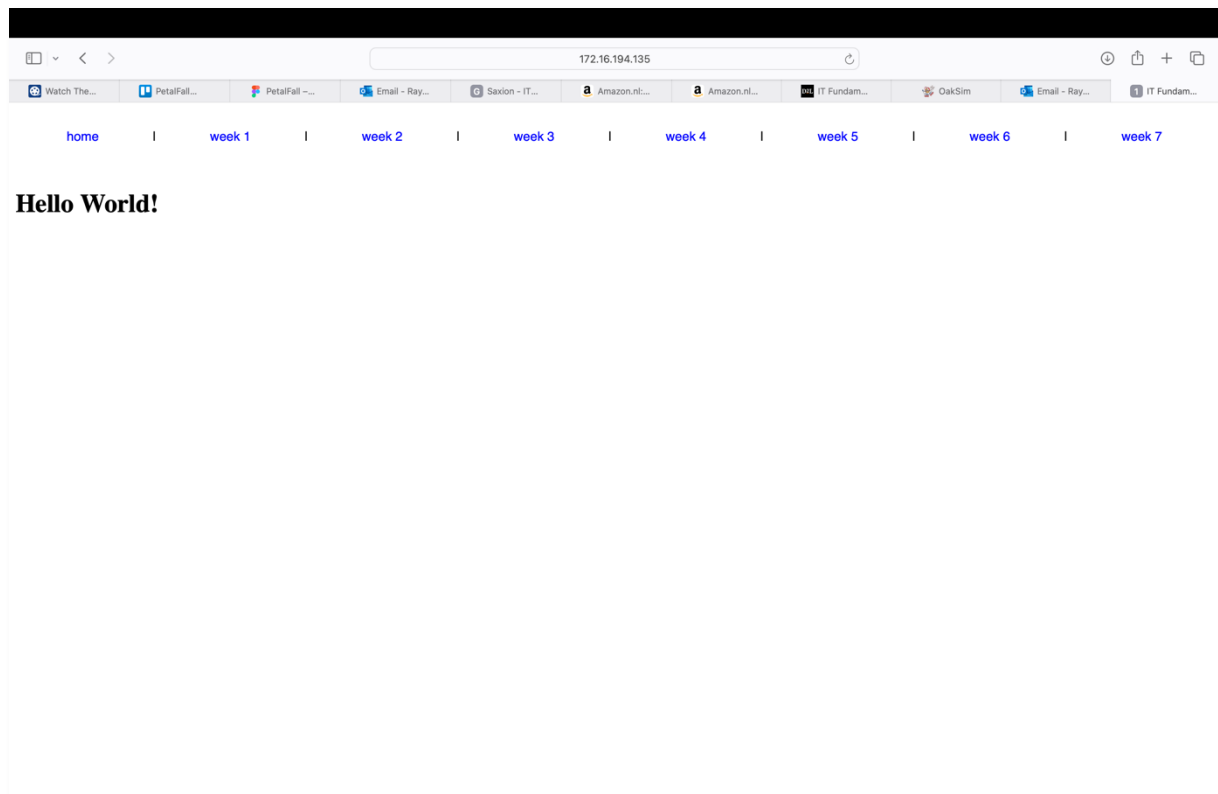


Screenshot web browser visits your site

Ubuntu:



My own laptop:



Bonus point assignment – week 6

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

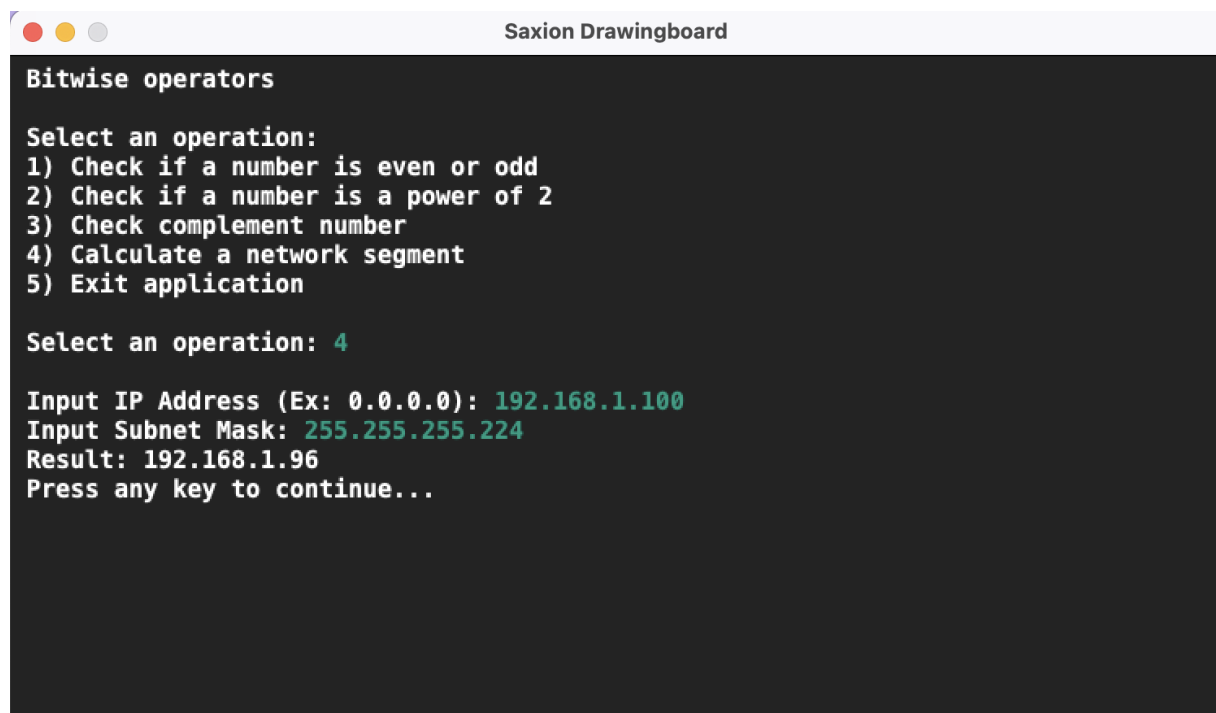
Subnet Mask: 11111111.11111111.11111111.11100000

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.



```
Bitwise operators

Select an operation:
1) Check if a number is even or odd
2) Check if a number is a power of 2
3) Check complement number
4) Calculate a network segment
5) Exit application

Select an operation: 4

Input IP Address (Ex: 0.0.0.0): 192.168.1.100
Input Subnet Mask: 255.255.255.224
Result: 192.168.1.96
Press any key to continue...
```

Paste source code here, with a screenshot of a working application.

```
public void NetworkSegment() {
    SaxionApp.print("Input IP Address (Ex: 0.0.0.0): ");
    String inputIP = SaxionApp.readString();

    SaxionApp.print("Input Subnet Mask: ");
    String inputMask = SaxionApp.readString();

    String[] ip = inputIP.split("\\.");
    String[] mask = inputMask.split("\\.");

    int[] res = new int[4];

    for (int i = 0; i < ip.length; i++) {
        int ipInt = Integer.parseInt(ip[i]);
        int maskInt = Integer.parseInt(mask[i]);

        int resInt = ipInt & maskInt;
        res[i] = resInt;
    }

    SaxionApp.print("Result: ");
    for(int i = 0; i < res.length; i++) {
        if(i < res.length - 1)
            SaxionApp.print(res[i] + ".");
        else
            SaxionApp.print(res[i]);
    }
}
```