

Network Server and Peripheral

Project Reports

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Abstract

Network Server and Peripheral is an introductory course that focuses on virtual networking between multi-OS systems, mainly Fedora (Linux) and Windows. The course explores fundamental concepts applicable to sophisticated systems in data centers and servers worldwide. Topics include virtualized operating system environments, designing network architectures for many clients, creating failover plans and backup services, setting up printers and network storage for sharing and centralized management, and implementing the best industry-standard security practices and tools. These topics aim to equip students with essential skills to become proficient Linux administrators and network consultants for small and medium-sized businesses.

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1. Introduction

As an IT technician, the ability to design, configure, and manage a network in a robust environment is an essential skill. This report outlines the process of implementing a networked system. With VMware for emulation, this project provides hands-on experience with key network services such as DHCP, DNS, Samba, NFS, and email.

The primary goal of this report is to demonstrate the procedures an administrator must follow to ensure that critical network services are properly configured and operational. Moreover, this project emphasizes the importance of professional documentation, including clear descriptions of configuration files, system commands, and graphical interfaces. By providing detailed explanations, this report reduces the time required for new employees or team members to familiarize themselves with the current settings and configurations.

The result of this work aims to contribute to the development of skills necessary for managing Linux-based network infrastructures, serving as a valuable reference for both academic and professional purposes. The concluding sections offer a critical evaluation of the results, reflecting on lessons learned and potential improvements for future projects.

2. VM INSTALLATION FOR LINUX SERVER/LINUX CLIENT & NETWORK CONFIGURATION OF LINUX SERVER AND LINUX CLIENT SYSTEM

This section aims specifically at virtualization and system configuration for a virtual machine.

Configuring a correct specification for a virtual machine will allow the system to perform effortlessly and minimize many errors related to mismatch in configuration and capacity.

2.1 Create and Configure Fedora 38 VMs

I was required to use VMware Workstation to set up 2 machines running Linux with Fedora. A server and name “Projserver.nspdom45.local” and a client namely “Projclient.nspdom45.local”. For every one of them:

- Uses Fedora 38 Live-x86 ISO with 20 GB in storage and 4 memory storage as Figure 1.

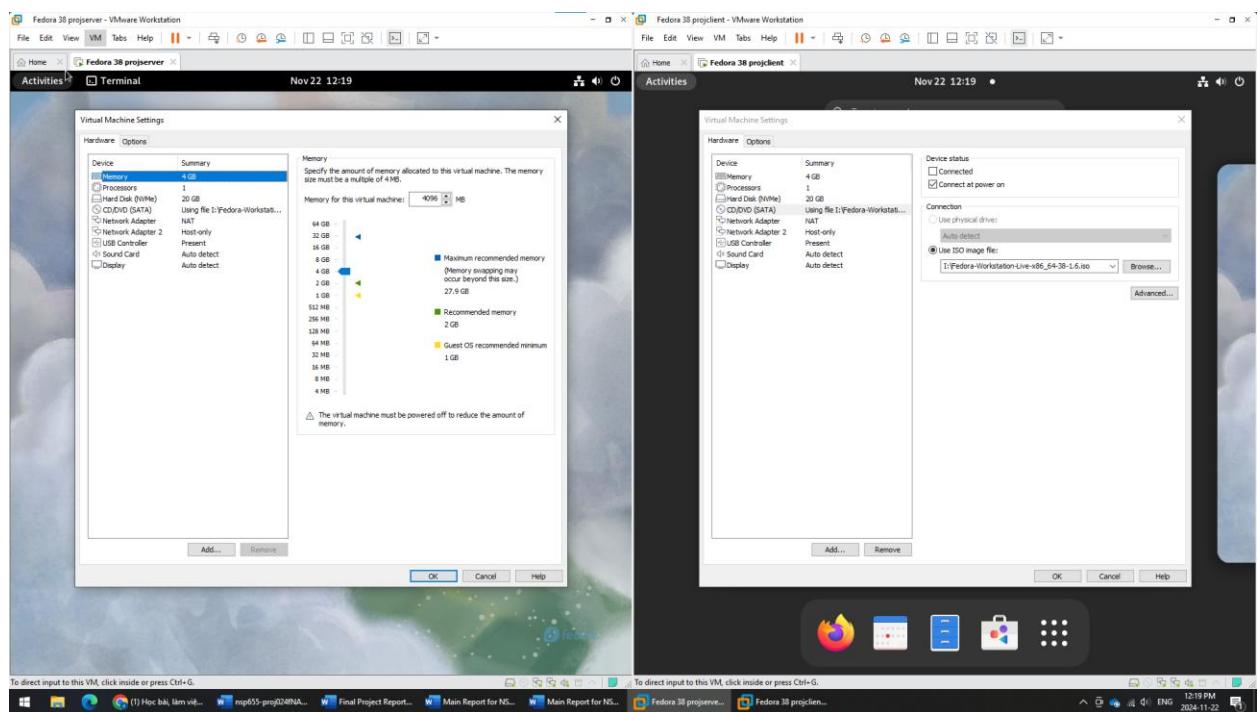


Figure 1. The picture demonstrates the settings for both the VM with 4GB in memory and 20 GB for storage and running Linux Fedora.

- Configured 2 virtual NICs provided by VMware's networking functionality as Figure 2:
 - Ens160 (NAT) for internet accessibility
 - Ens240 (Host-only) with static IP address of 192.168.55.1/24

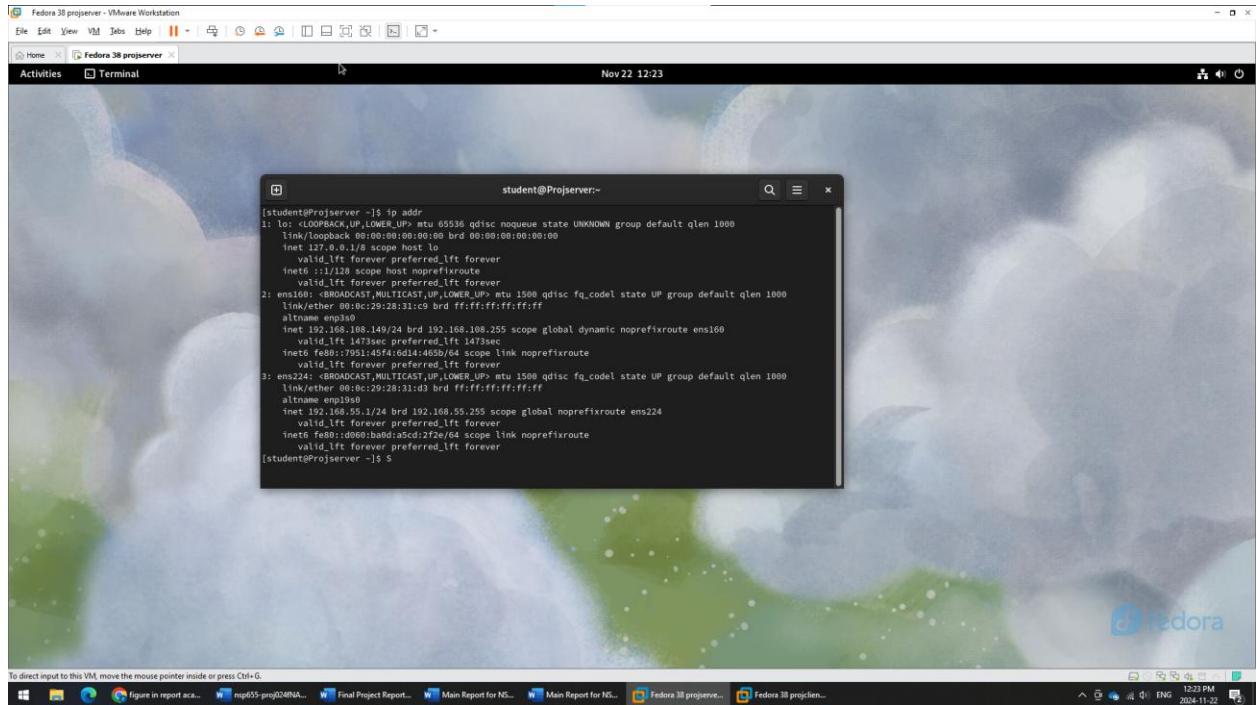


Figure 2. The picture shows the settings for IP address of 2 VNIC as well as the subnet mask and MAC address. Ens180 is the one connect to external network will ens224 is host-only network.

- SElinux and system firewall is disable as required.

2.2 Virtual Network Editor

In order to isolate Vnet1 and stimulate of host-only network, it turned off DHCP server functionality built-in VMware through Virtual Network Editor so that Linux Client will receive IP address assigned by the server and ultimately using that VNIC interface to communicate with Internet.

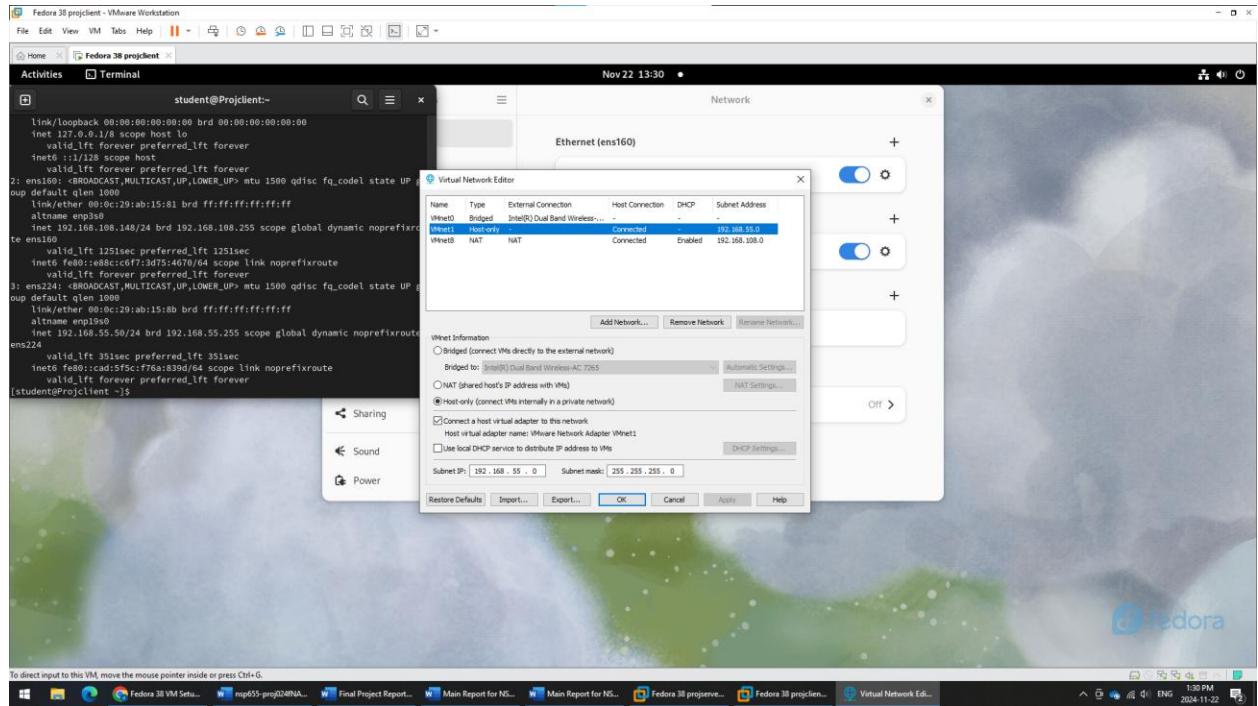


Figure 3. The picture shows the settings for Virtual Network Editor where the VMnet1 is set to Host-only with DHCP is disable and VMnet8 is configured to allow external traffic, necessary for installation package and dependencies.

2.3 Hostname and ifconfig

Setting a correct and pre-define hostname for each device in a network is essential because it helps administrator or system admin easily distinguish in the network. It serves as human-identifier, in a larger network, it will become more hierarchical and convenient. So that in this project, I labeled my server as Projserver.nspdom45.local and the client as Projclient.nspdom45.local.

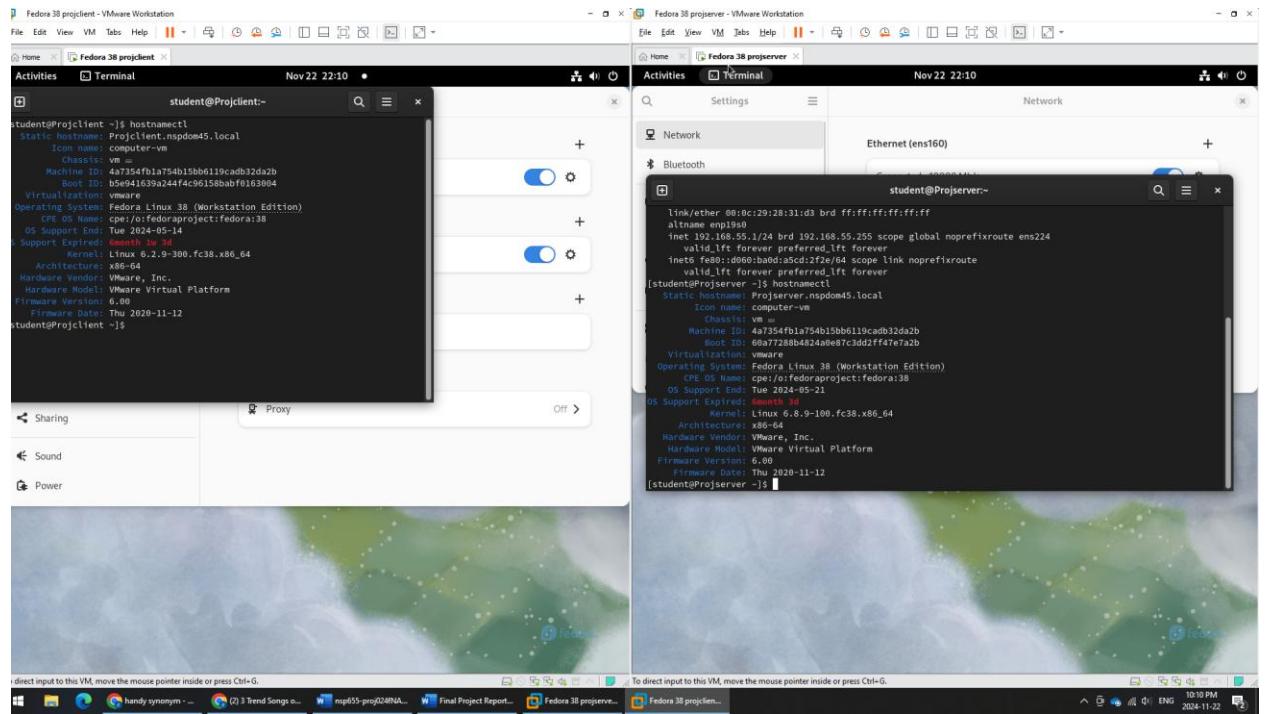


Figure 4. The image indicates the hostname for each machine as described above.

Like the `hostname` command, the `ipconfig` utility provides a detailed view of network interface configurations, including the IP address, subnet mask, MAC address, and many other key parameters. It offers a concise snapshot of the system's networking setup. Organizing and planning these details in advance can significantly save time and reduce effort when dealing with more complex configurations in the future.

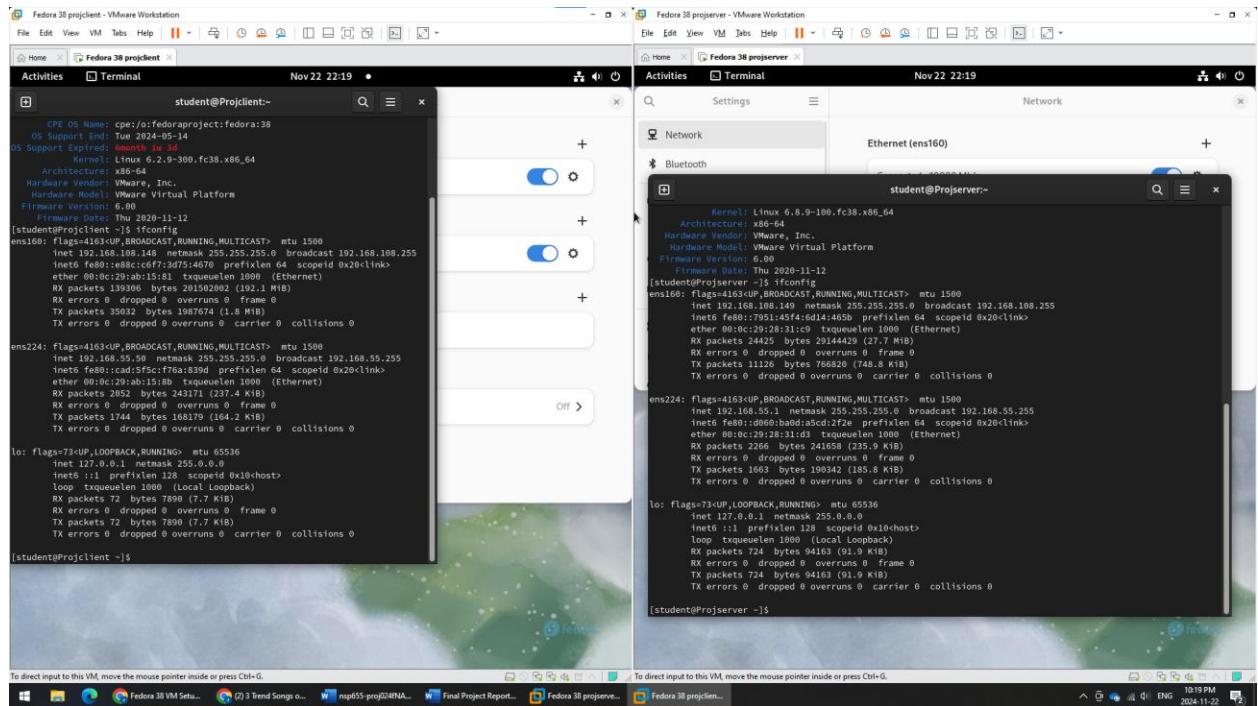


Figure 5. The picture shows the ifconfig for each machine, the ens160 is the Network

Interface Card will receive external connection and ens224 will have the static IP range of 192.168.55.0/24.

2. LINUX SERVER SYSTEM GENERAL CONFIGURATION REQUIREMENT

This portion of the report focuses heavily on general configurations requirements for a traditional Linux servers' system. These are crucial services for servers. Key tasks include setting up DHCP, NFS and Samba, DNS, mail, web service, while practicing user and security policies management.

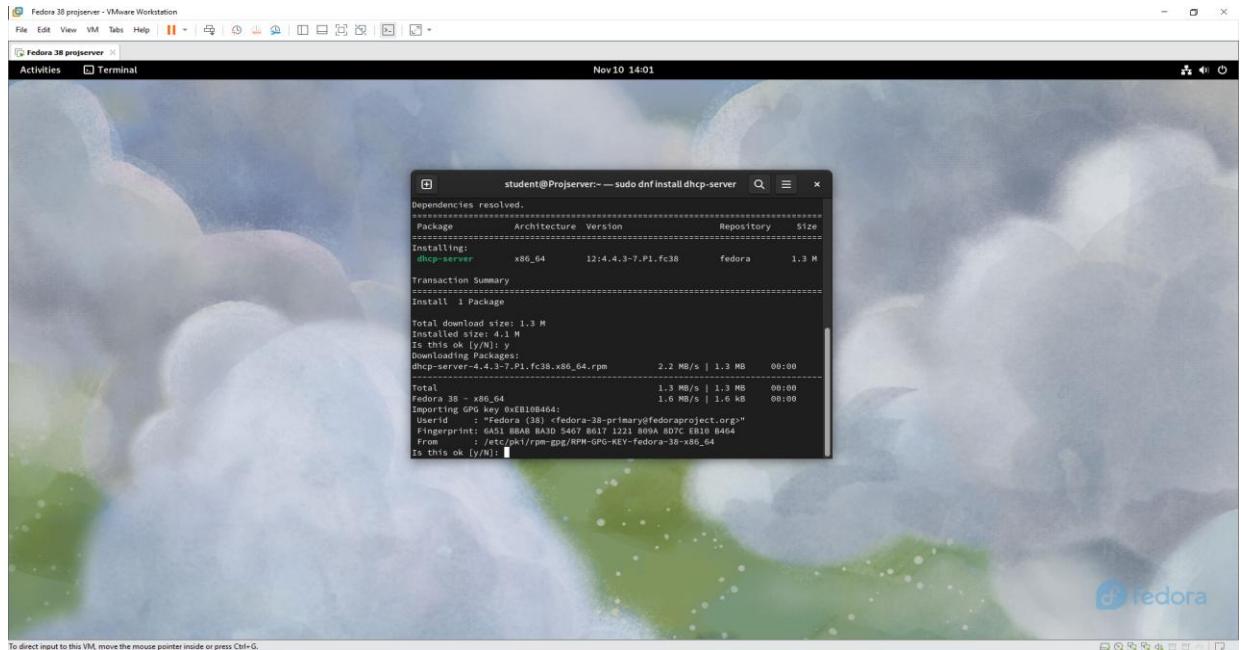
3.1 DHCP Services

In a network environment, manually configuring IP addresses for every device is inefficient and error prone. A DHCP server automates this process by dynamically assigning IP addresses and other network parameters (e.g., subnet mask, DNS servers) to devices as they first connect and check their least. This process reduces administrative overhead and ensures consistent IP management. The configuration file `/etc/dhcp/dhcpd.conf` was customized with the following settings to meet project requirements:

- **Subnet:** Defined as 192.168.55.0/24 to represent the host-only network.
- **IP Range:** Allocated from 192.168.55.50 to 192.168.55.100.
- **Gateway:** Specified as 192.168.55.1.
- **Domain Name:** Set as nspdom45.local to integrate with DNS services.

First, I installed some packages for the server so that they can function properly. On Fedora, I installed `dhcp-server` so that the system can get what its needs from the Internet and compose many files system that necessary for the services.

Figure 6. The picture shows the installation process for some dependencies and libraries.



By configuring the `dhcpd.conf` located at `/etc/dhcp`, I can set number of parameters such as IP range, subnet-mask and domain name pre-configured. Therefore, I arranged as follows:

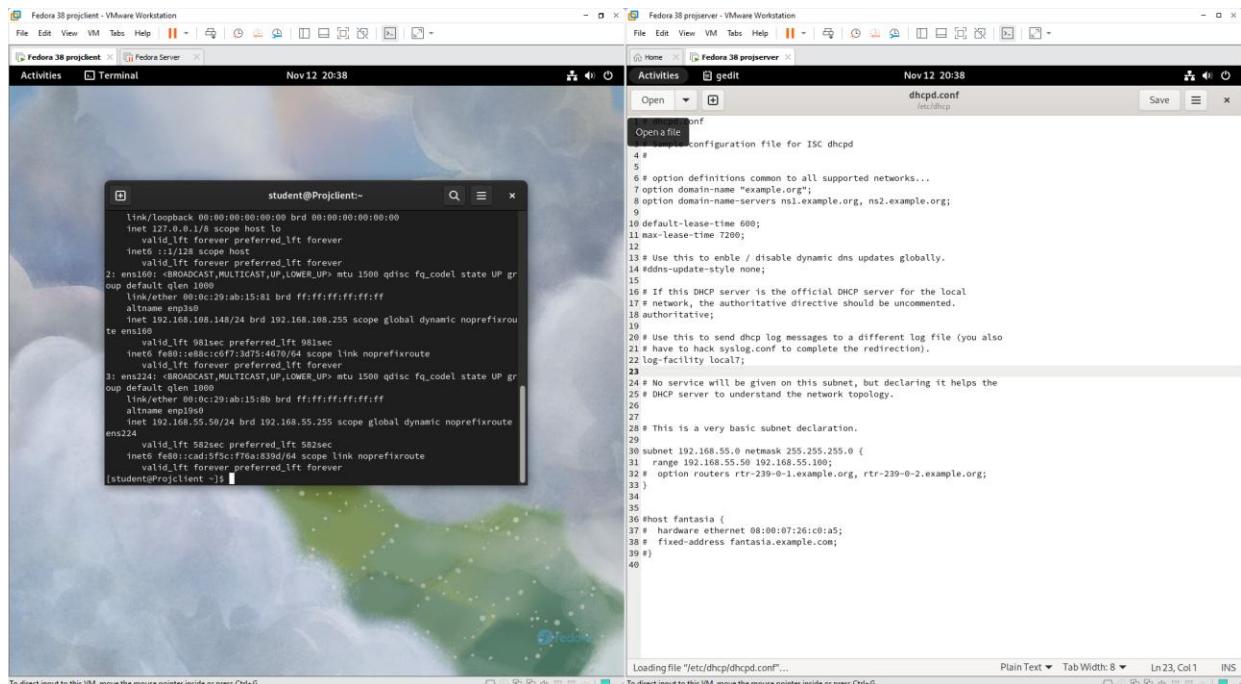


Figure 7. The picture shows the setting in /etc/dhcp/dhcpd.conf file.

After enabling the services, which will always enable every time the system restarts, I started dhcpcd and then the services should provided the client with explicitly, pre-defined configuration.

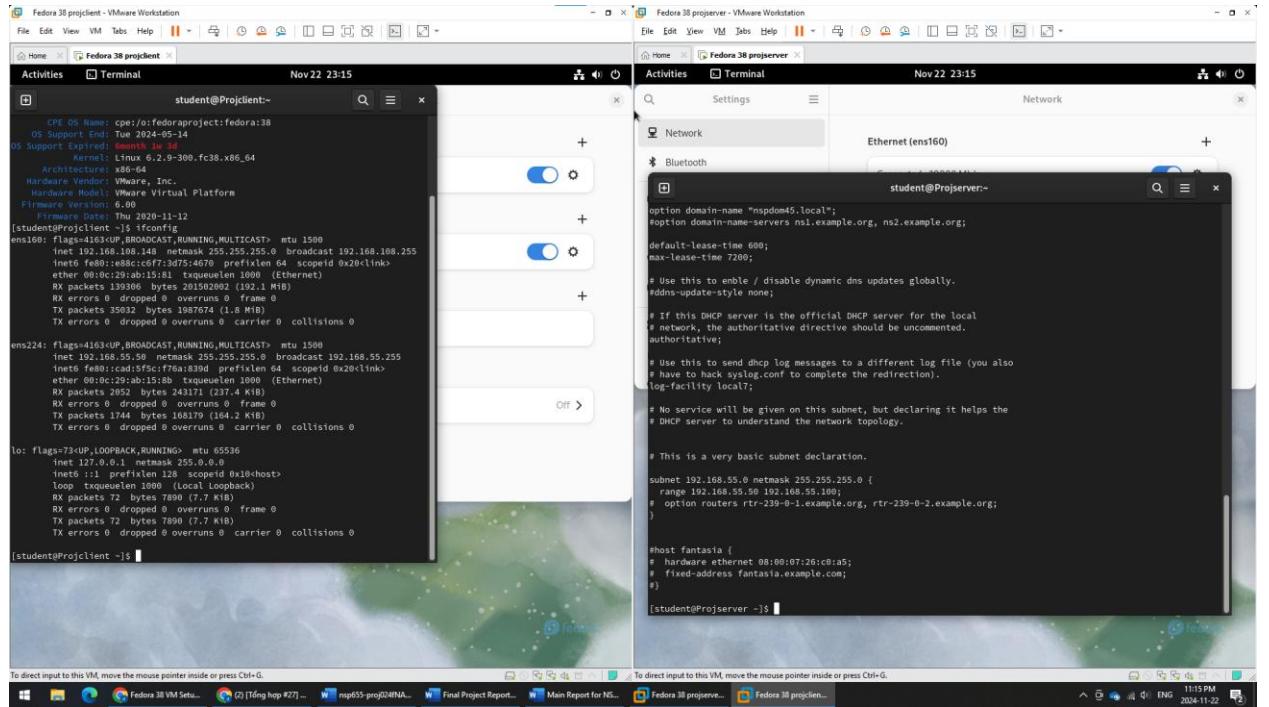


Figure 7. The picture shows dhcp service running and providing the IP for the client.

3.2 NFS Services (Network File System Services)

Network File System (NFS) allows computers on a local area network (LAN) to access files and directories stored on a remote system as if they were local. Having such a service is essential for efficient file sharing in any type of network. Overall, it enhances the productivity and centralize permission management. However, this protocol is primarily used for Linux and Unix OS. Therefore, I implemented an NFS share on my LAN to share a backup directory with read and write permissions.

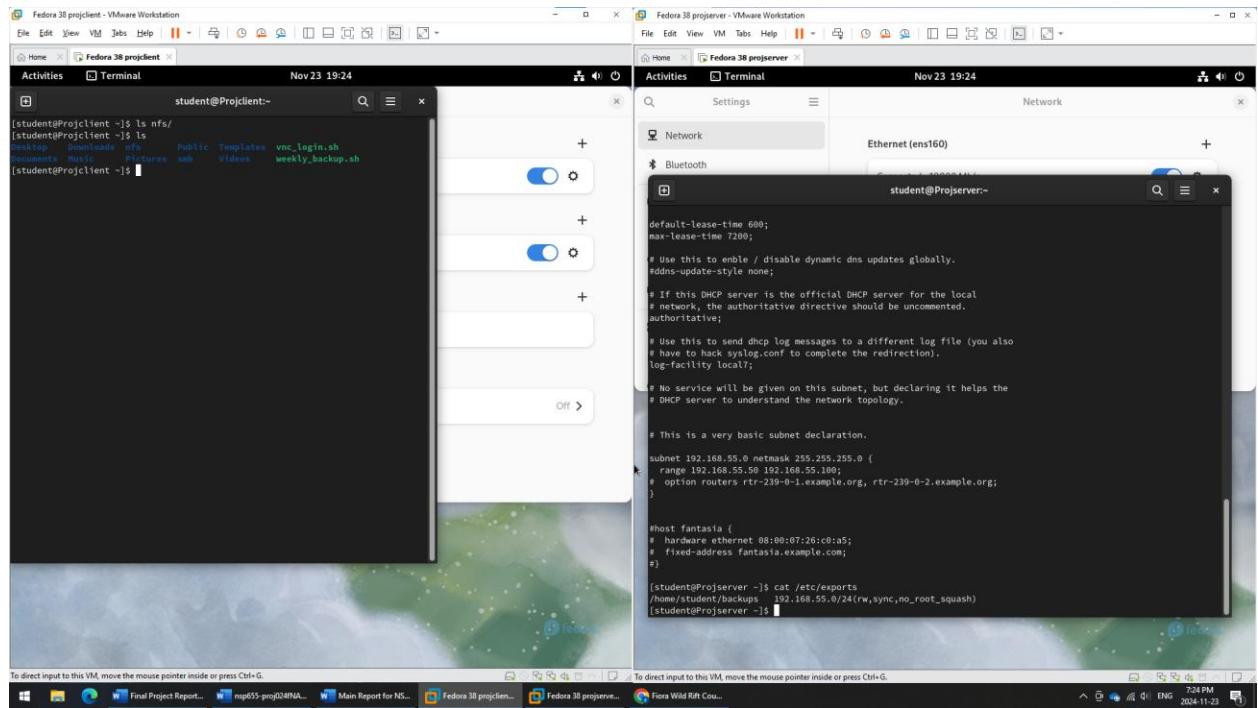


Figure 8. The picture shows the local folder created inside the client and the configure for the NFS file exports. So that every device on the same network can mount to this endpoint.

After enabling the rpcbind.service and nfs-server.service to run as daemons, the next step is to mount the NFS share on the client. Using the mount command, the client establishes a connection to the shared directory on the server, making it accessible as part of the client's file system.

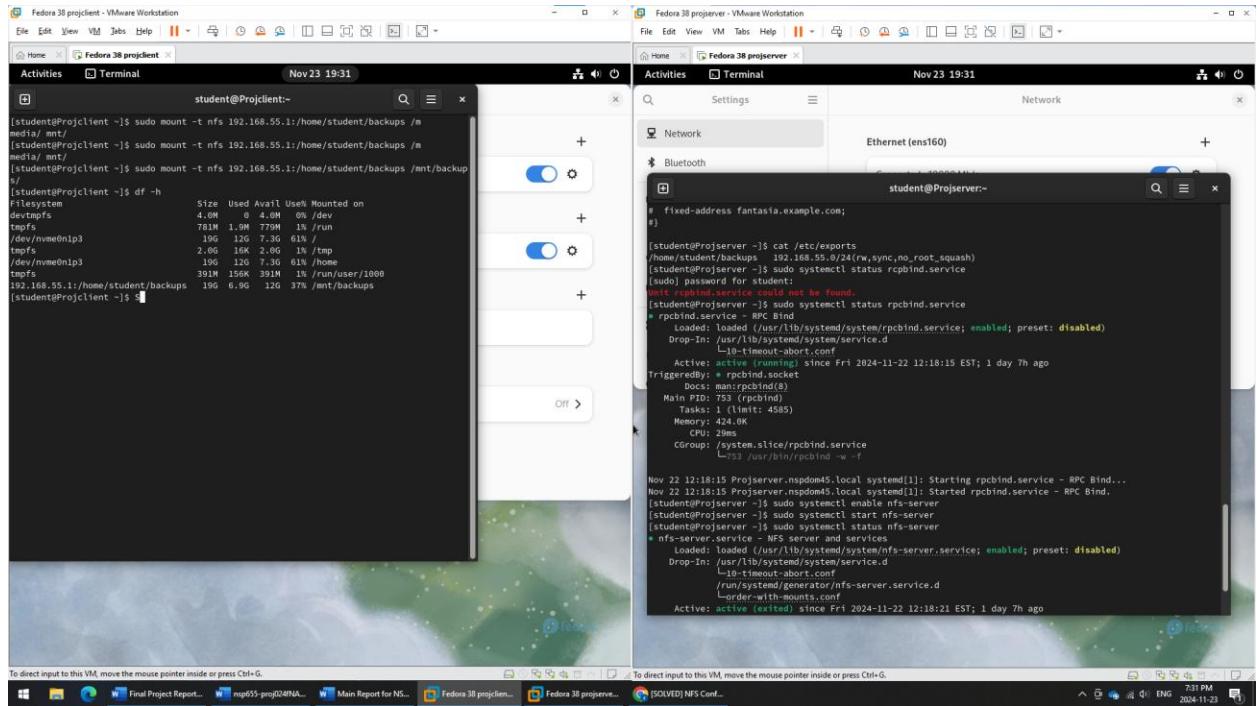


Figure 9. The picture shows success connects between client and server via NFS service.

3.3 SMB Services (Samba Services)

Similar to NFS, SMB (or Samba) is a protocol used for network file sharing. While NFS is optimized for Unix/Linux environments, Samba stands out for its ability for sharing across multiple platforms, including Windows. Configuring both protocols ensures file accessibility in mixed operating system environments.

Setting up SMB services is straightforward. For SMB, the `/etc/samba/smb.conf` file is used to create an endpoint named "docs," which allows read-only access for anyone on the system. This is ideal for storing publicly accessible files, such as monthly announcements or employee contact information (e.g., phone numbers or emails).

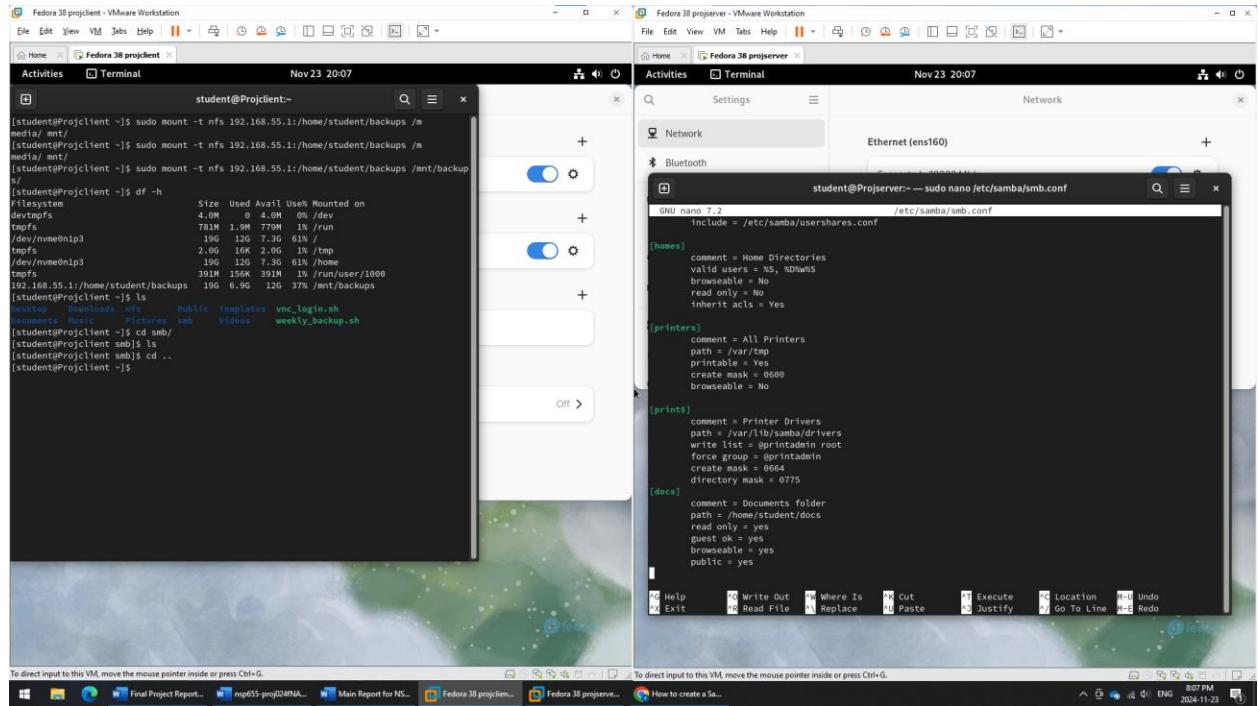


Figure 10. The image shows the configuration of the `/etc/samba/smb.conf` file, which allows guest access and public sharing, with the share mounted to `/home/student/docs` on the main server.

And after configuring I could check wherever the service is detectable and ready to mount via `smbclient -L //<IP-address>`. Then I could mount through terminal or using GUI, by accessing File > Other Location > Connection to Server. Then type `smb://<IP-address>/path/to/folder`. Then it should be like the figure 11.

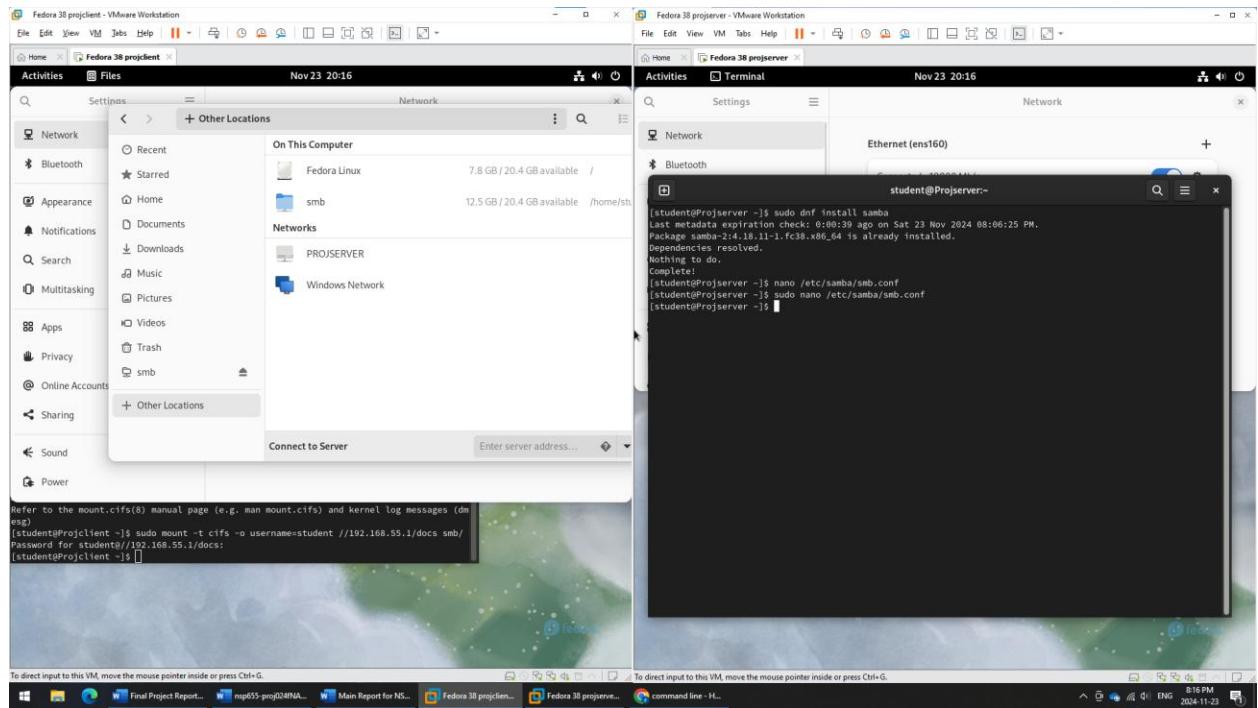


Figure 11. The figure displays the SMB connection is successful.

3.4. DNS Services (Domain Name System Services)

DNS, or Domain Name System uses to translate domain names which are human-friendly into IP addresses which are simple to store and work with as a computer. Implementing this service enhances user experience while working with different servers or websites. This is a crucial service that any network needs to have. In addition, it can be used to block website access or preventing users from accessing websites based on pre-define rule.

Starting by downloading package for server, bind and bind-utils, these are crucial for the resolve domain name. After that, I modified `/etc/named.conf` file because this file is responsible for looking at the translation between IP address and domain name.

```

28     attacks. Implementing BCP38 within your network would greatly
29     reduce such attack surface
30   */
31   recursion yes;
32
33   dnssec-validation yes;
34
35   managed-keys-directory "/var/named/dynamic";
36   geoip-directory "/usr/share/GeoIP";
37
38   pid-file "/run/named/named.pid";
39   session-keyfile "/run/named/session.key";
40
41 /* https://fedoraproject.org/wiki/Changes/CryptoPolicy */
42 include "/etc/crypto-policies/back-ends/bind.config";
43 };
44
45 logging {
46   channel default_debug {
47     file "data/named.run";
48     severity dynamic;
49   };
50 };
51
52 zone "." IN {
53   type hint;
54   file "named.ca";
55 };
56
57 zone "nsdom45.local" IN {
58   type master;
59   file "nsdom45.local.db";
60   notify NO;
61 };
62
63 zone "55.168.192.in-addr.arpa" IN {
64   type master;
65   file "192.168.55.db";
66   notify NO;
67 };
68
69
70
71 include "/etc/named.rfc1912.zones";
72 include "/etc/named.root.key";
73

```

Figure 12. The figures show my configuration of the file /etc/named.conf.

Next, I created two files: one for the forward lookup zone and the other for the reverse lookup zone. The forward lookup zone file uses the domain nsdom45.local, while the reverse lookup zone file is configured for the IP range 192.168.55.0/24, represented as 55.168.192.in-addr.arpa.. Each file includes the necessary Start of Authority (SOA) records to define the authoritative DNS server for the respective zones.

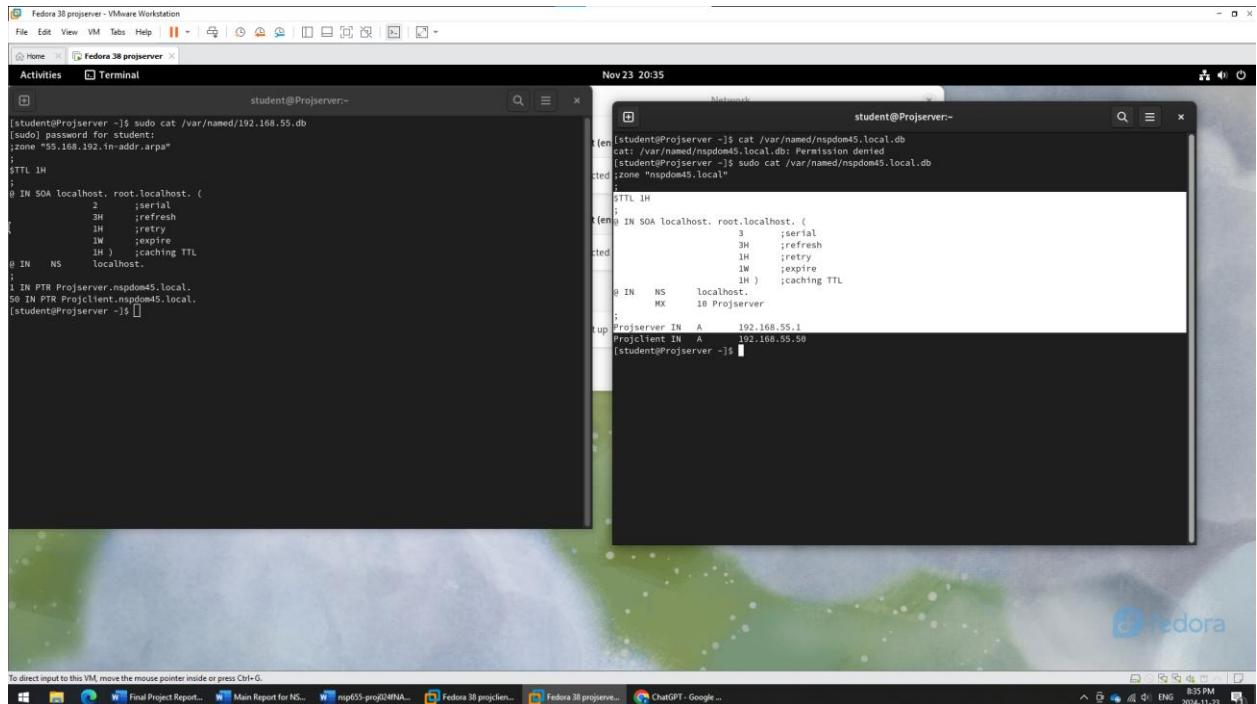


Figure 13. The figures show my configuration of the file both nspdom45.local.db and 192.168.55.db which contains an A records point to my server and client.

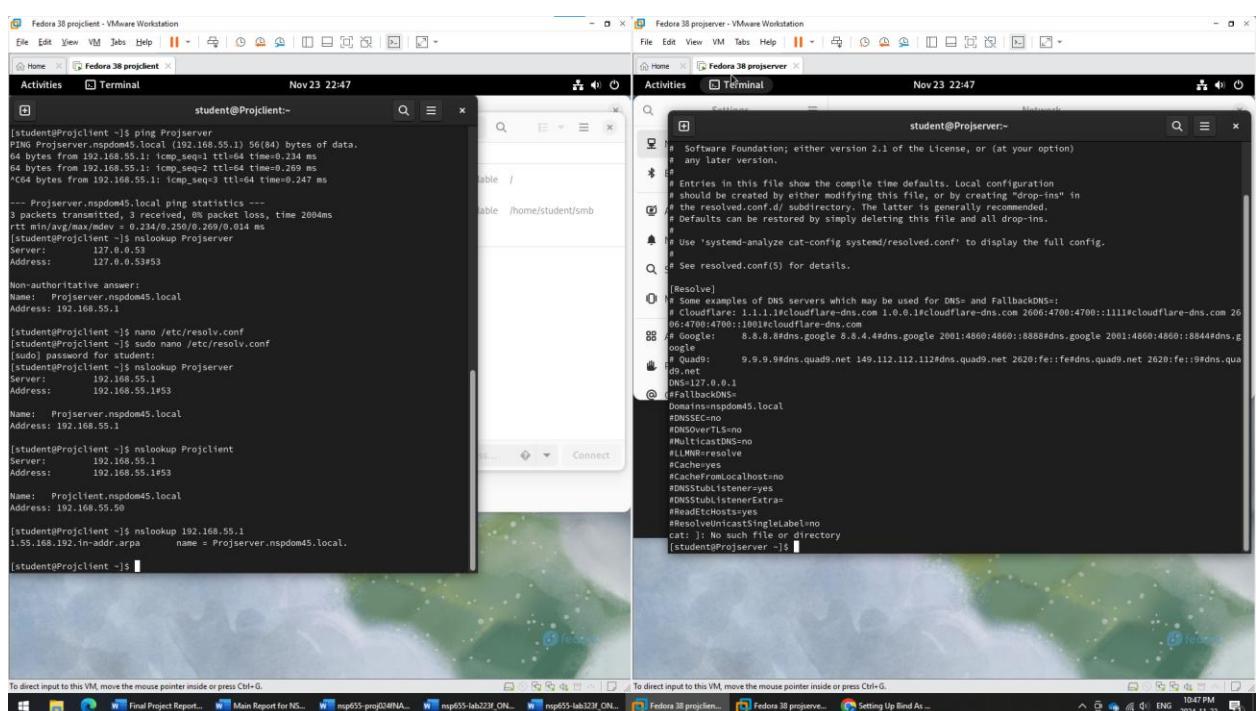
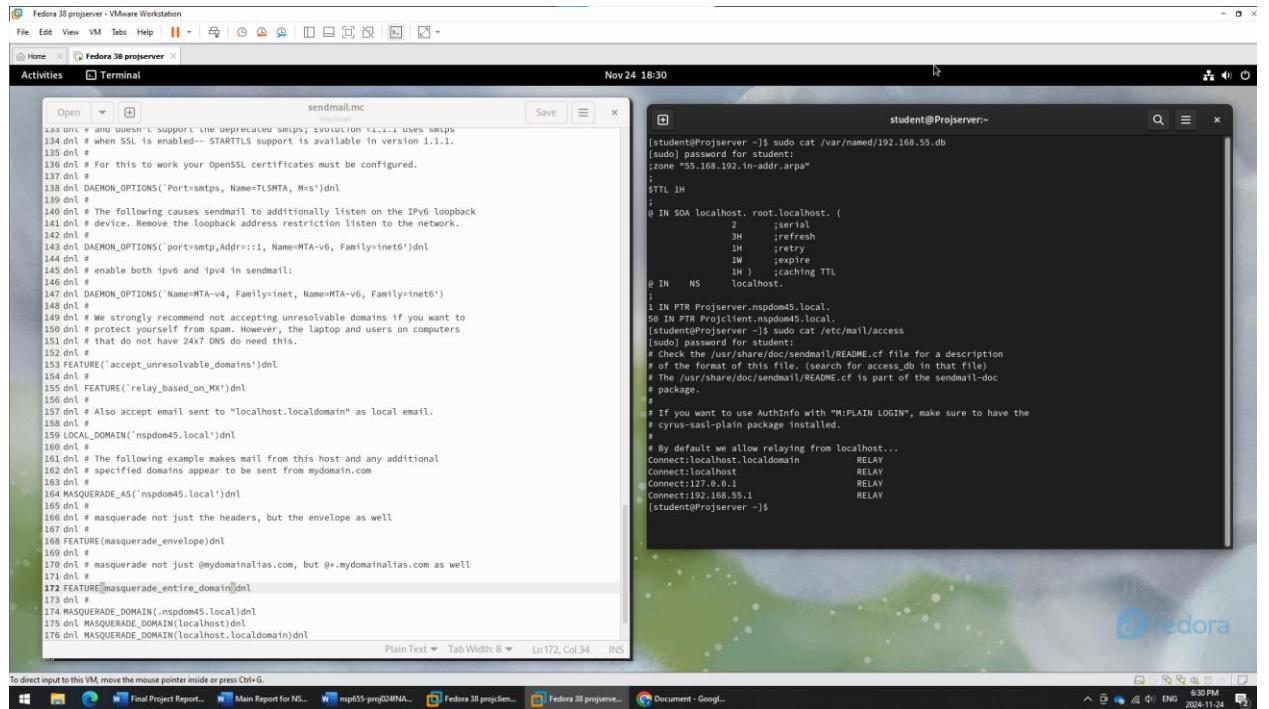


Figure 14. The figures illustrate the successful ping between client and server.

3.5.1 Mail Server

Having a dedicated mail server is important for a business, it is the main method of communication between the business and customers. A dedicated mail server allows you to enhance the customization of mail, scalability of the operation. In addition, it creates a centralized system for sending, receiving and storing emails, allowing easy access when needed.

Unlike the previous setting up, this takes more time and effort for these services. I started by installing and copying files for backup before making any change. Then opened the file nspdom45.local to add the records for mail server MX 10 Projserver. Then edited /etc/mail/sendmail.mc and /etc/mail/access by adding Connection:192.168.55.1 RELAY.



```
sendmail.mc
-----[Content of sendmail.mc]-----
lxx:unl: amr:openssl: support: unprecached: ssl�; evolution: v1.1.1: uses: smp�
134 dnl # when SSL is enabled--- STARTTLS support is available in version 1.1.1.
135 dnl #
136 dnl # For this to work your OpenSSL certificates must be configured.
137 dnl #
138 dnl DAEMON_OPTIONS(`Port=smtp, Name=TLSMTA, Msa')dnl
139 dnl #
140 dnl # The following causes sendmail to additionally listen on the IPv6 loopback
141 dnl # device. Remove the loopback address restriction listen to the network.
142 dnl #
143 dnl DAEMON_OPTIONS(`port=smtp, Addr=:1, Name=MTA-v6, Family=inet6')dnl
144 dnl #
145 dnl # enable both ipv6 and ip4 in sendmail:
146 dnl #
147 dnl DAEMON_OPTIONS(`Name=MTA-v4, Family=inet, Name=MTA-v6, Family=inet6')
148 dnl #
149 dnl # We strongly recommend not accepting unresolvable domains if you want to
150 dnl # protect yourself from spam. However, the laptop and users on computers
151 dnl # that do not have 24x7 DNS do need this.
152 dnl #
153 FEATURE(`accept_unresolvable_domains')dnl
154 dnl #
155 dnl FEATURE(`relay_based_on_MX')dnl
156 dnl #
157 dnl # Also accept email sent to "localhost.localdomain" as local email.
158 dnl #
159 LOCAL_DOMAIN(`nspdom45.local')dnl
160 dnl #
161 dnl # The following example makes mail from this host and any additional
162 dnl # specified domains appear to be sent from mydomain.com
163 dnl #
164 MASQUERADE_AS(`nspdom45.local')dnl
165 dnl #
166 dnl # masquerade not just the headers, but the envelope as well
167 dnl #
168 FEATURE(`masquerade_envelope')dnl
169 dnl #
170 dnl # masquerade not just @mydomainalias.com, but @.mydomainalias.com as well
171 dnl #
172 FEATURE(`masquerade_entire_domain')dnl
173 dnl #
174 MASQUERADE_DOMAIN(`nspdom45.local')dnl
175 dnl MASQUERADE_DOMAIN(`localhost.localdomain')dnl
176 dnl MASQUERADE_DOMAIN(`localhost.localdomain')dnl

-----[Content of /etc/mail/access]-----
student@Projserver:~$ sudo cat /var/named/192.168.55.db
;zone "55.168.192.in-addr.arpa" {
    TTL 1H
    IN SOA localhost. root.localhost. (
        1          ; serial
        3H         ; refresh
        1H         ; retry
        1W         ; expire
        1H      ) ; caching TTL
    IN NS      localhost.
}
IN PTR Projserver.nspdom45.local.
50 IN PTR Projclient.nspdom45.local.

[student@Projserver ~]$ sudo cat /etc/mail/access
[sudo] password for student:
;zone "55.168.192.in-addr.arpa" {
    TTL 1H
    IN SOA localhost. root.localhost. (
        1          ; serial
        3H         ; refresh
        1H         ; retry
        1W         ; expire
        1H      ) ; caching TTL
    IN NS      localhost.
}
IN PTR Projserver.nspdom45.local.
50 IN PTR Projclient.nspdom45.local.

[student@Projserver ~]$ cat /etc/mail/sendmail/README.cf
# Check the /usr/share/doc/sendmail/README.cf file for a description
# of the format of this file. (search for access.db in that file)
# The /usr/share/doc/sendmail/README.cf is part of the sendmail-doc
# package.
#
# If you want to use AuthInfo with "M:PLAIN LOGIN", make sure to have the
# cyrus-sasl-plain package installed.

# By default we allow relaying from localhost...
Connect:localhost.localdomain      RELAY
Connect:localhost                  RELAY
Connect:127.0.0.1                 RELAY
Connect:192.168.55.1              RELAY
[student@Projserver ~]$
```

Figure 15. The figures show the configuration you need to before enable and start send mail.

Then I sent test message to </sbin/sendmail/student@nspdom45.local> then I saw my message there.

3.5.2 Dovecot and POP, IMAP services

This is an open source mail delivery agent that is lightweight and secure. So, I implemented this in projserver machine. In order to use Dovecot, I need to config dovecot.conf by adding protocols and mail location as well as disabled plaintext used for authentication and use plain login authentication. However, this is only for learning purposes. In production, it is recommended to use a more sophisticated authentication method because with the current setting, it is vulnerable to intruders. Now I granted it with read, write permission while denied other permissions.

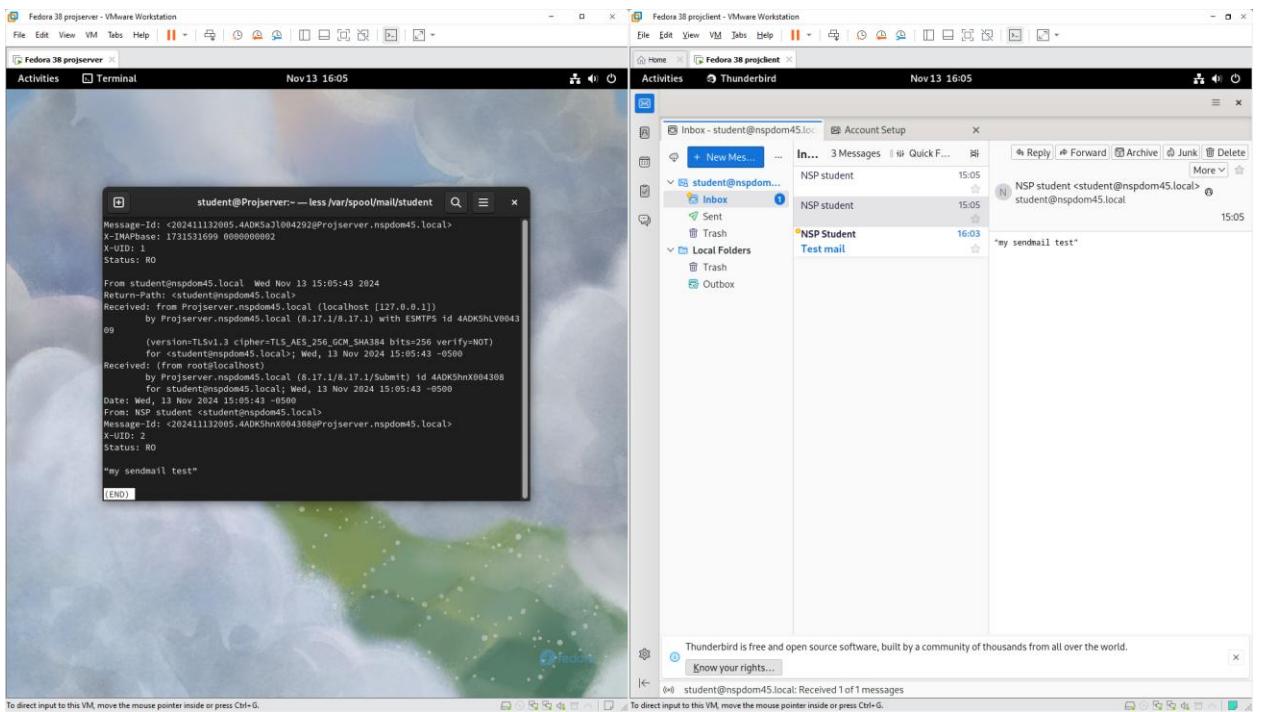


Figure 16. The figures demonstrates the success of sending mail via thunderbird with POP/IMAP.

3.5.3 Apache Web Server

The most common use of the internet is accessing websites, which are typically hosted using servers like Apache or Nginx. For this project, I designed a simple website accessible through HTTP on port 80. To achieve this, I installed Apache, which includes a default configuration that displays the Fedora

Webserver Test page. For the purposes of this project, I customized the page by modifying the HTML to display my name and course code.

```
[root@Projserver student]# cat /var/www/html/website/index.html
<html>
<head>
<title>Welcome to Apache Web Server</title>
</head>
<body>
<h3>My name is Tan Dat, Ta, NSP655</h3>
<h3>The domain name for this LAN is nsdom45.local</h3>
<h3>Success! Apache server on Fedora is working!</h3>
</body>
</html>

[root@Projserver student]#
```

The code editor window shows the following content:

```
169 dn1 #
170 dn1 # masquerade not just @mydomainalias.com, but @+.mydomainalias.com as well
171 dn1 #
172 FEATURE.masquerade_entire_domain|dn1
173 dn1 #
174 MASQUERADE_DOMAIN(.nsdom45.local)dn1
175 dn1 MASQUERADE_DOMAIN(localhost)dn1
176 dn1 MASQUERADE_DOMAIN(localhost.localdomain)dn1
```

Figure 17. It shows that the simple HTML code for the page will be display on apache.

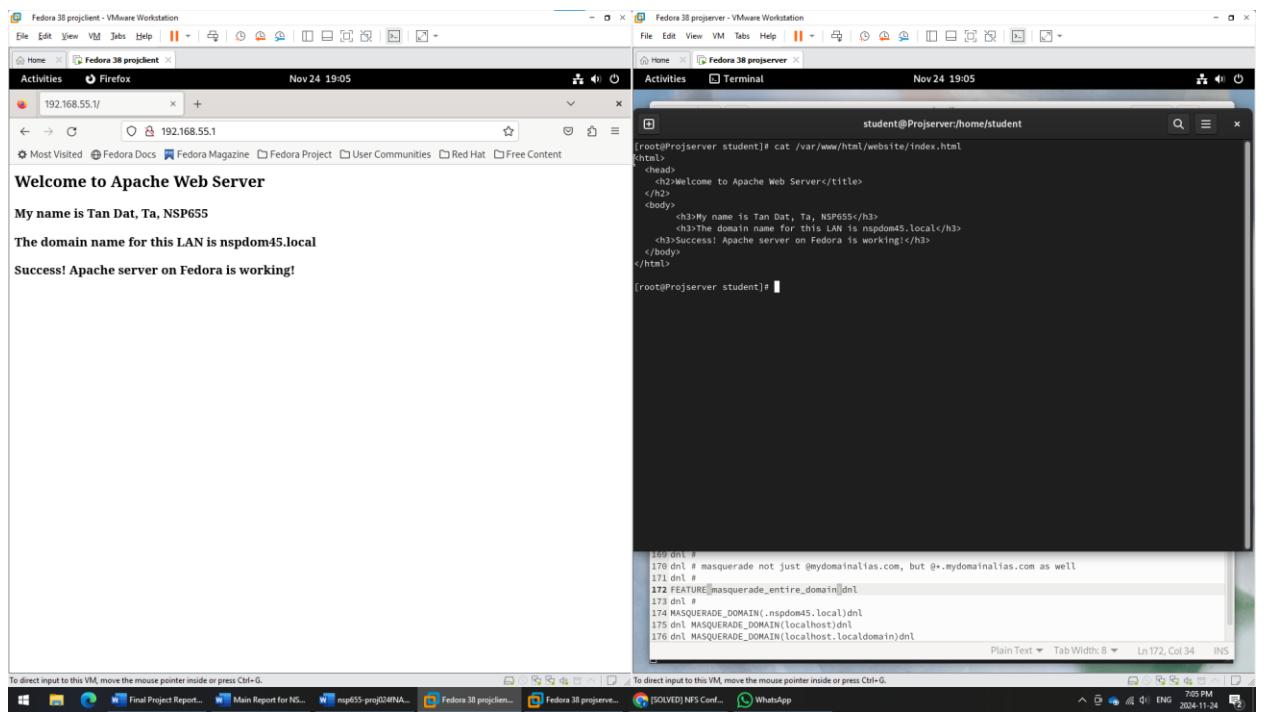


Figure 18. It indicates that apache engine is running.

3.6 User Account

Creating user accounts is one of the most requested tasks in IT services. Proficiency in this process can save significant time and effort. On a Linux system, user accounts can be created using basic commands. For instance, the command sudo useradd -m engineer creates a new user named 'engineer' with a home directory, and sudo passwd engineer sets the user's password. A similar process was followed to create the 'manager' account. After completing these steps, two new home directories were successfully created for the 'engineer' and 'manager' users.

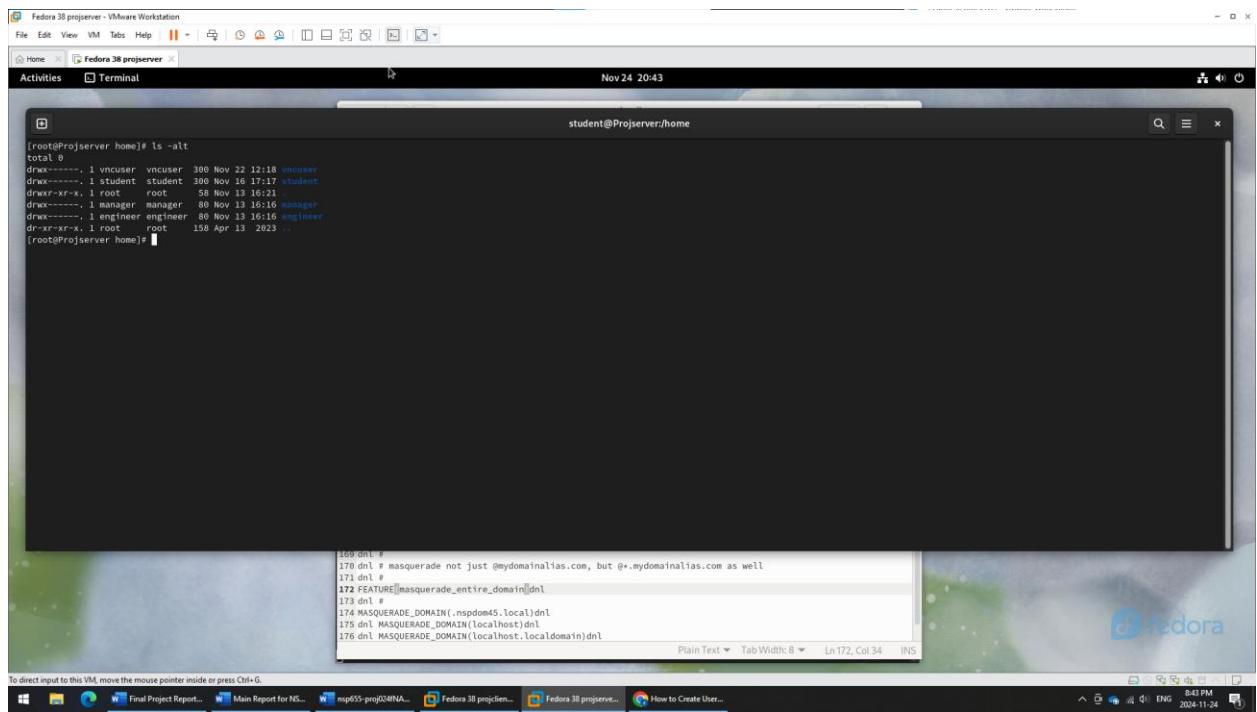
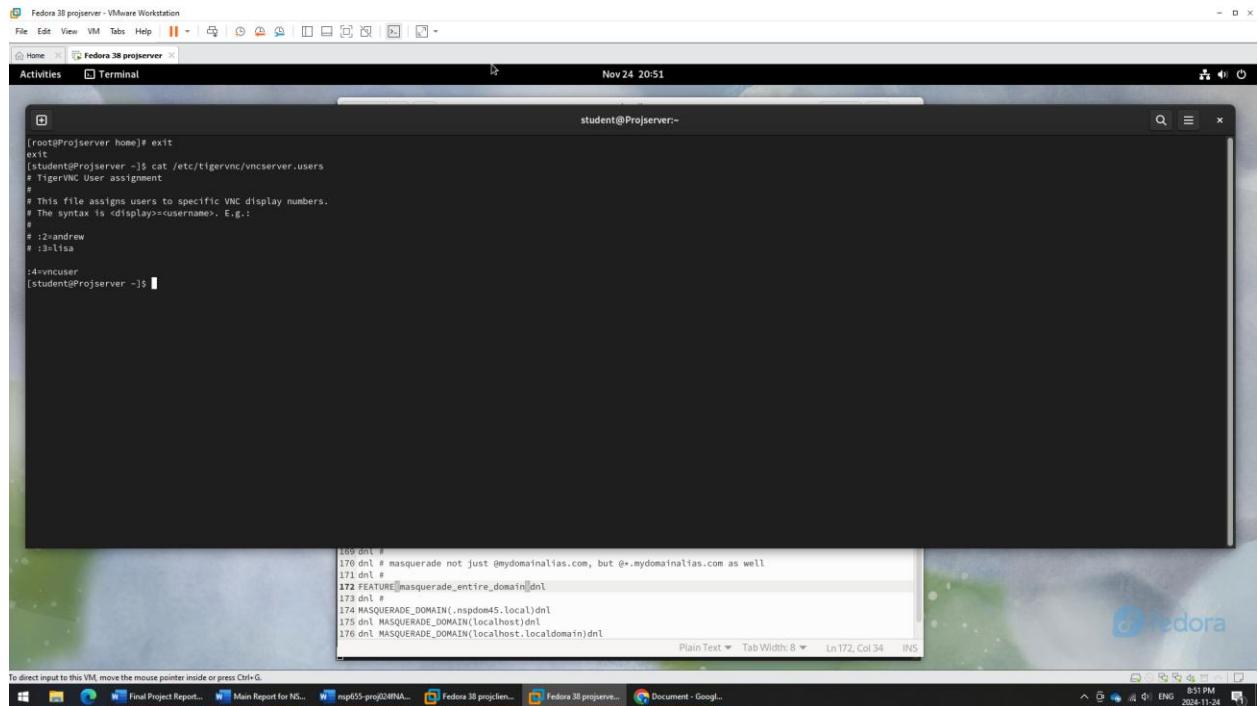


Figure 18. It shows that I created 2 new username manager and engineer.

3.6 VNC

Having the capability of controlling remote machines gives the administrator power to automate and monitor. While this project needs to be performed on one machine, we can do this automatically with dozens, even hundreds of machines make it facile in configuring or troubleshooting any problems may

occur in the future without physically present in front of the computer. For this section, I will create a new user called ‘vncuser’ with the password ‘vncpass’. Similar with other, I started by installed dependencies and set up vnc servers. Then modify the file vncserver.users that will allow vncuser to connect. Then enable the services and you should be able to interact with Projserver similar like you accessing from the local machine.



The screenshot shows a terminal window titled 'Terminal' on a Fedora 38 desktop environment. The terminal displays the following command and its output:

```
[root@Projserver home]# exit
exit
[student@Projserver ~]$ cat /etc/tigervnc/vncserver.users
# TigerVNC User assignment
#
# This file assigns users to specific VNC display numbers.
# The syntax is <display>=<username>. E.g.:
#
# :2=andrew
# :3=lisa
:4=vncuser
[student@Projserver ~]$
```

A tooltip is visible at the bottom of the terminal window, showing configuration details for the 'masquerade_entire_domain' directive in the vncserver.conf file. The tooltip content is as follows:

```
169 dn1 #
170 dn1 # masquerade not just @mydomainalias.com, but @*.mydomainalias.com as well
171 dn1 #
172 FEEDURE@masquerade_entire_domain|dn1
173 dn1 #
174 dn1 #
175 MASQUERADE_DOMAIN(@nspdm45.local)dn1
176 dn1 MASQUERADE_DOMAIN(@localhost.local)dn1
177 dn1 MASQUERADE_DOMAIN(@localhost.localdomain)dn1
```

The terminal window has a status bar at the bottom with the text 'Plain Text' and 'Tab Width: 8'. The desktop background features the Fedora logo.

Figure 19. It reveal my settings for vncuser.users on the server.

And you should be able to connect via connection.

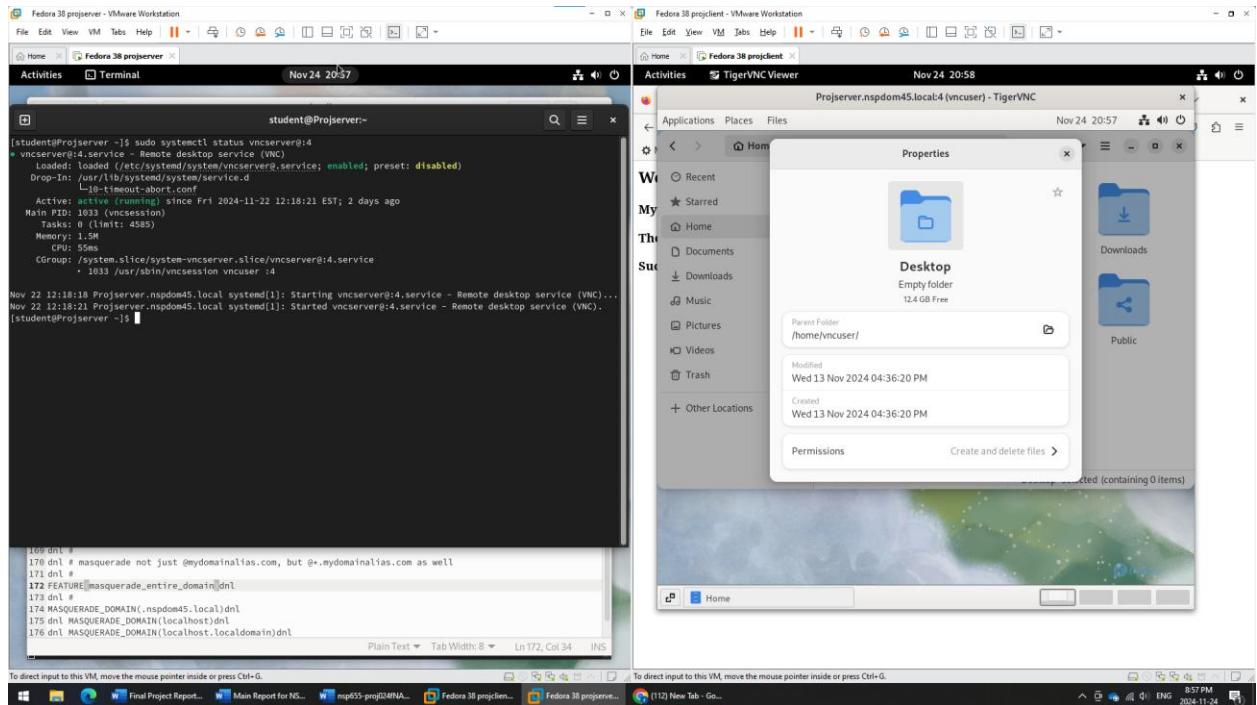


Figure 20. It shows that vnc is successfully set up.

3.7 Printer

Configuring a printer in Linux is a straightforward task and can be done using a graphical user interface (GUI). First, I installed the necessary package and launched the printer configuration tool using the `system-config-printer` command in the terminal. I then added the printer by selecting 'Add Printer' and chose the serial printer option since the printer model used is an HP device.

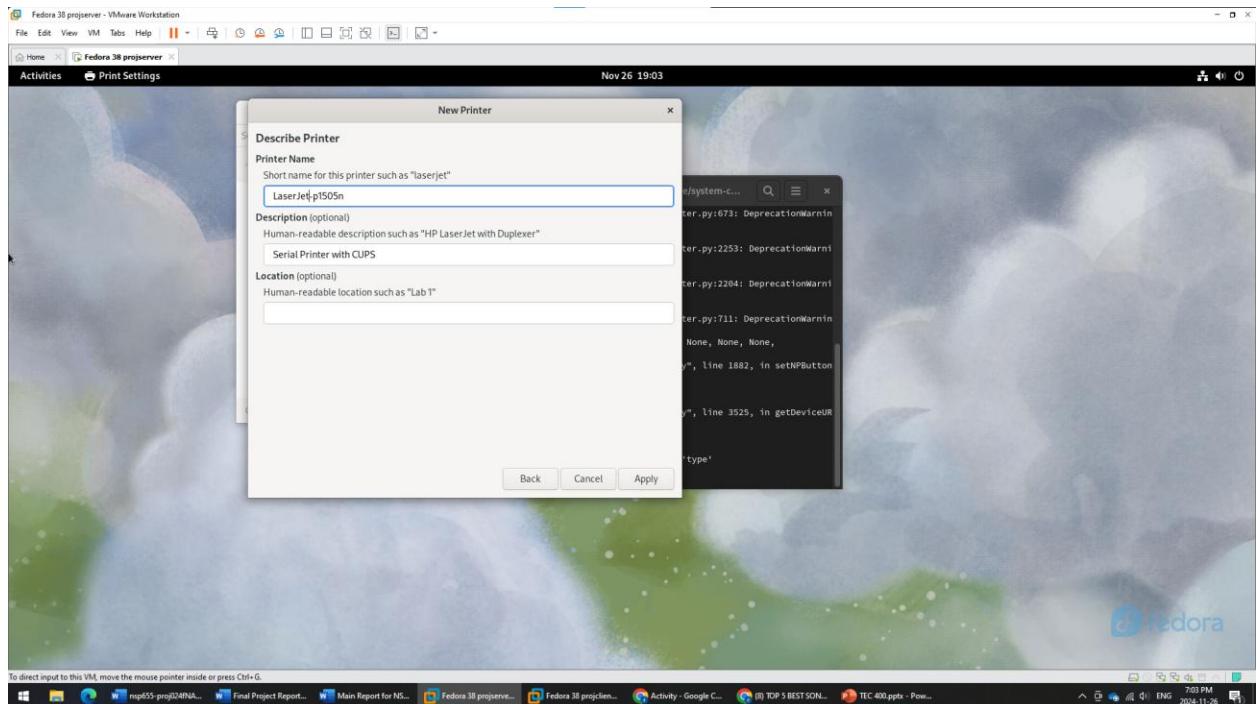


Figure 21. It demonstrates the setting for the printer.

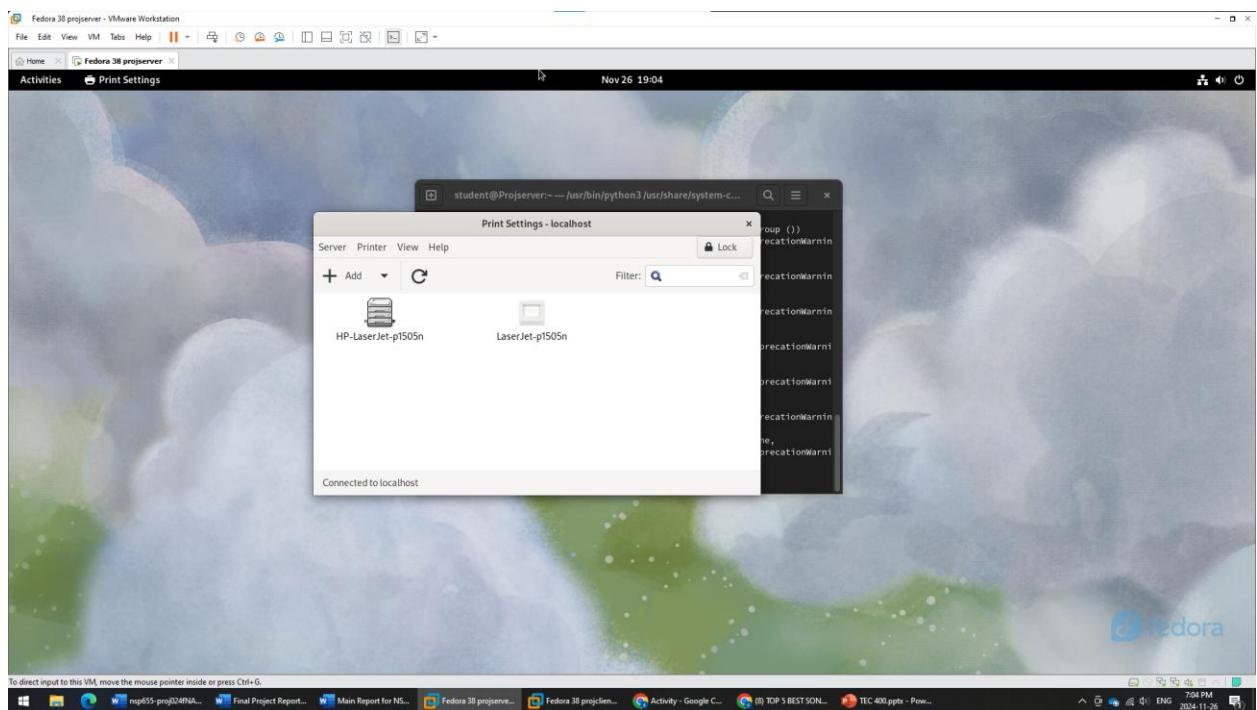


Figure 22. It shows my setup for CUPS printer.

3.8 Firewall

Configure firewall for any system is the most basic and most sufficient method to protect your servers and network without any heavy investment or deep understanding about network. Firewall rules were configured to restrict access to only necessary services such as SSH, Samba, and DNS. This minimizes the attack surface and ensures authorized traffic allows. In this case, I opened number of port for SSH, HTTPS, POP3S, SMTP, DNS, NFSv4, IPP, VNC and Samba services. In addition, allowing network for the client to connect to the Internet by enable masquerading.

First, I configured it so that the firewall will allow the services that need port to work with.

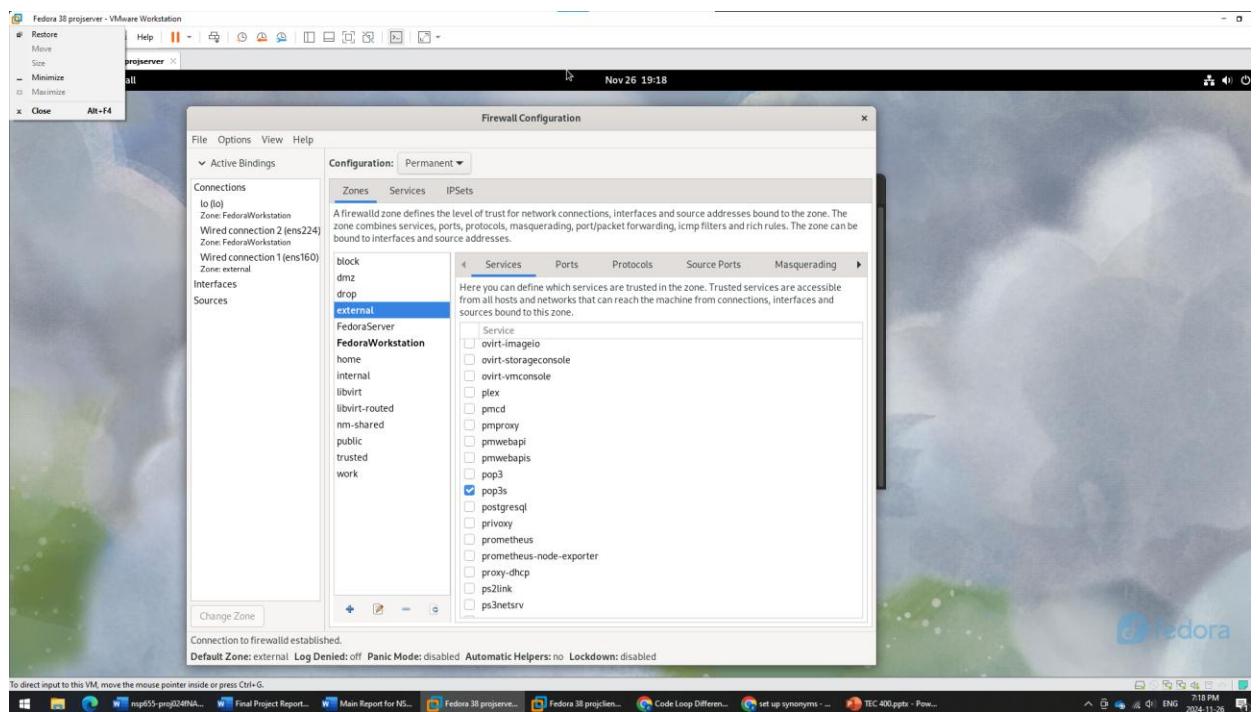


Figure 23. It illustrates how port can be allowed or denied by checking the box.

Now repeat for all the services and that is how we can allow services to run through certain ports.

Next to set up a host that connects to local networks, we need enabling masquerading in the servers.

Figure 24. It shows how we can enable masquerade zone.

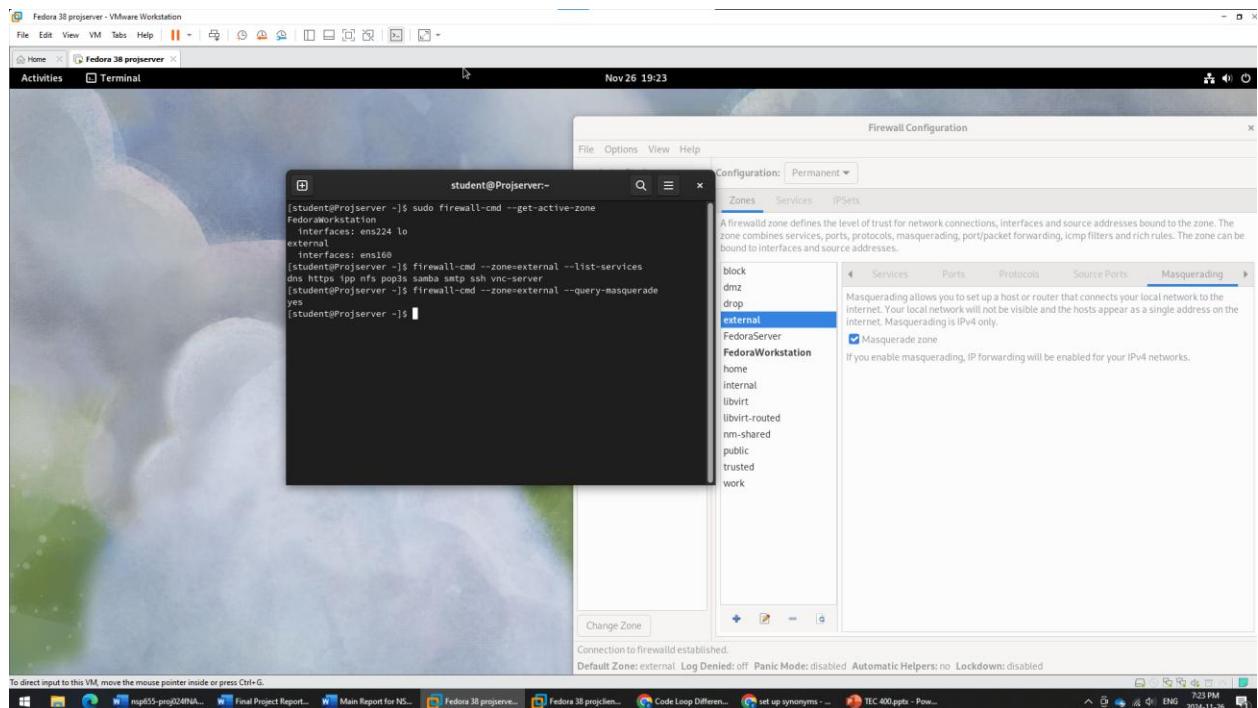
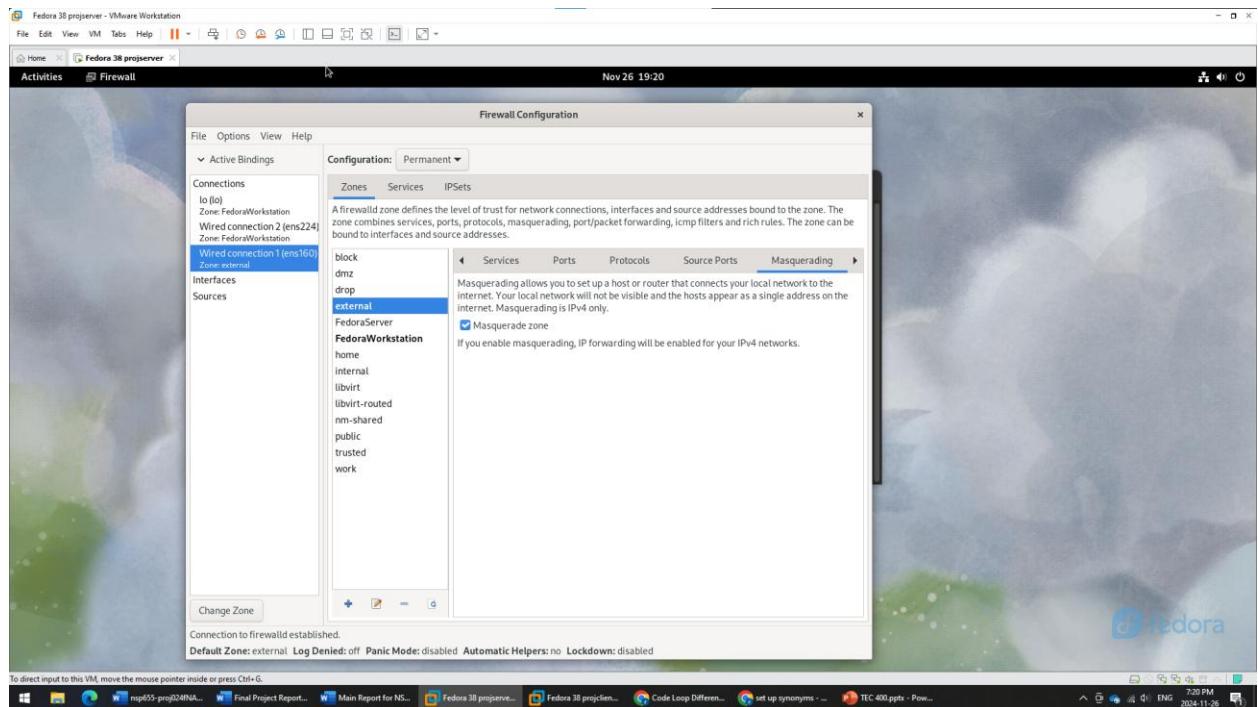


Figure 25. It reveals all the configurations on my firewall GUI.

3. SYSTEM CLIENT SYSTEM GENERAL CONFIGURATION REQUIREMENT

In these sections, we concentrate on communication between clients and servers. This process involves setting up file sharing through Samba and NFS, automating backups and remote access, and configuring essential client utilities such as email and printing services. This process was created to access and ensure the effectiveness of file sharing, system administration and user interaction. It is important for students to understand these processes so that they leverage and utilize the tools provided in Linux.

4.1 Gnome Graphical Access

The process of mounting Samba directory via graphical user interfaces aims to improve user experiences whilst, the mechanism remains the same for both methods. First, it located “Files” I selected “Other Location” directory. There will be a search bar with “Connect to Server” on the side and then I typed as follows: smb://192.168.55.1/docs/. Then It requested my password for authentication purpose.

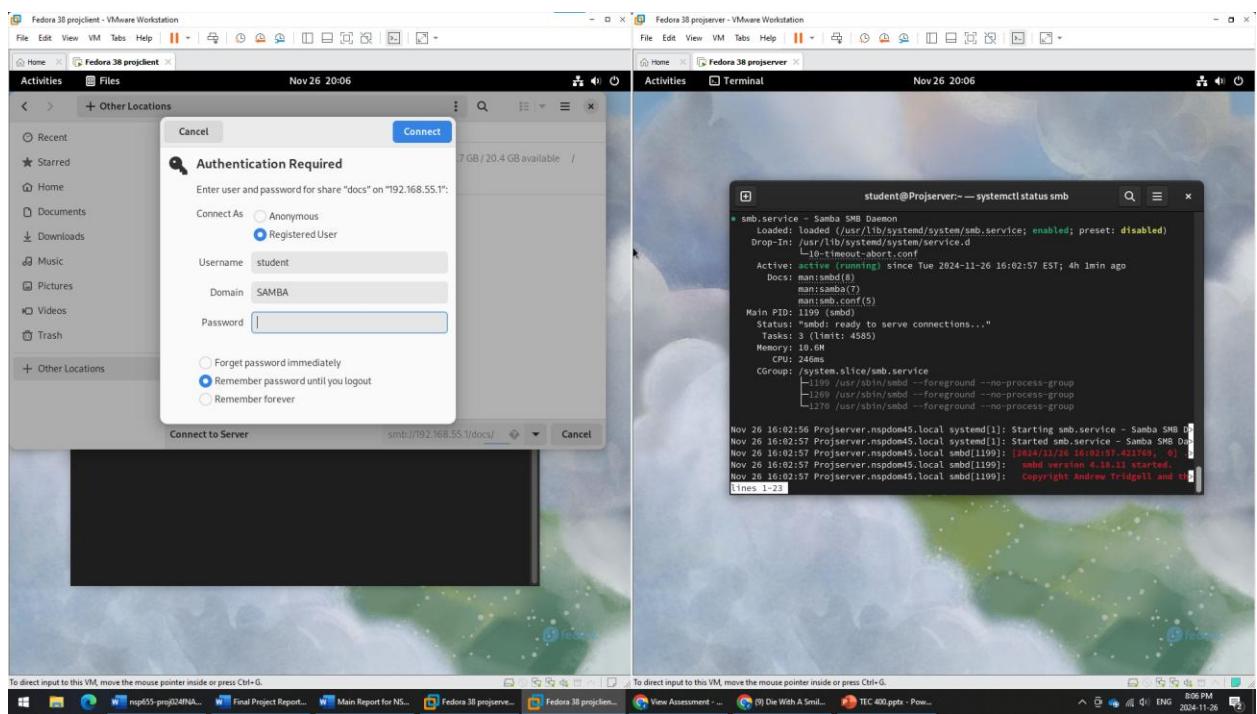


Figure 26. It shows the login screen required password before continue.

Then type the password and I able to use a share folder like I mounted via terminal.

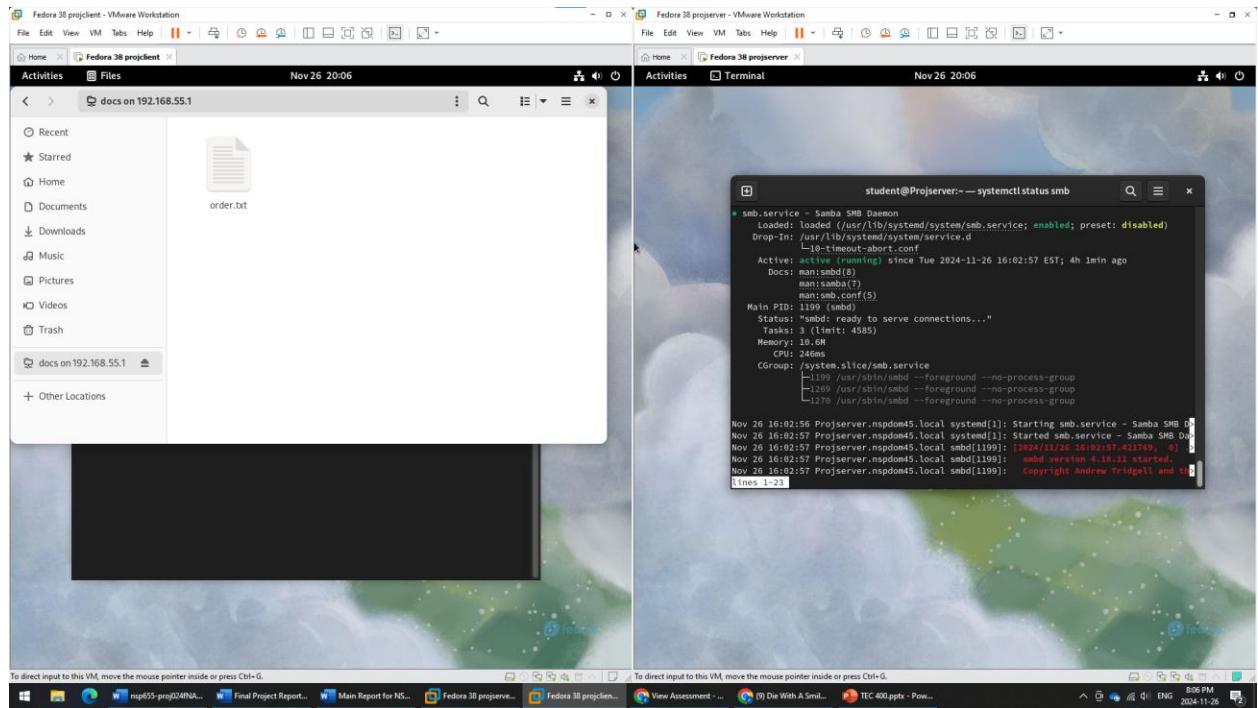


Figure 27. It displays all the files I have inside my servers in docs directory.

4.2.1 Automate mount via fstab

These features allow the system to automatically mount one or more directories during the boot process, which is especially convenient in large corporate environments. To achieve this, I modified the /etc/fstab file by adding the following line: `192.168.55.1:/home/student/backups /mnt/backups nfs defaults 0 0`.

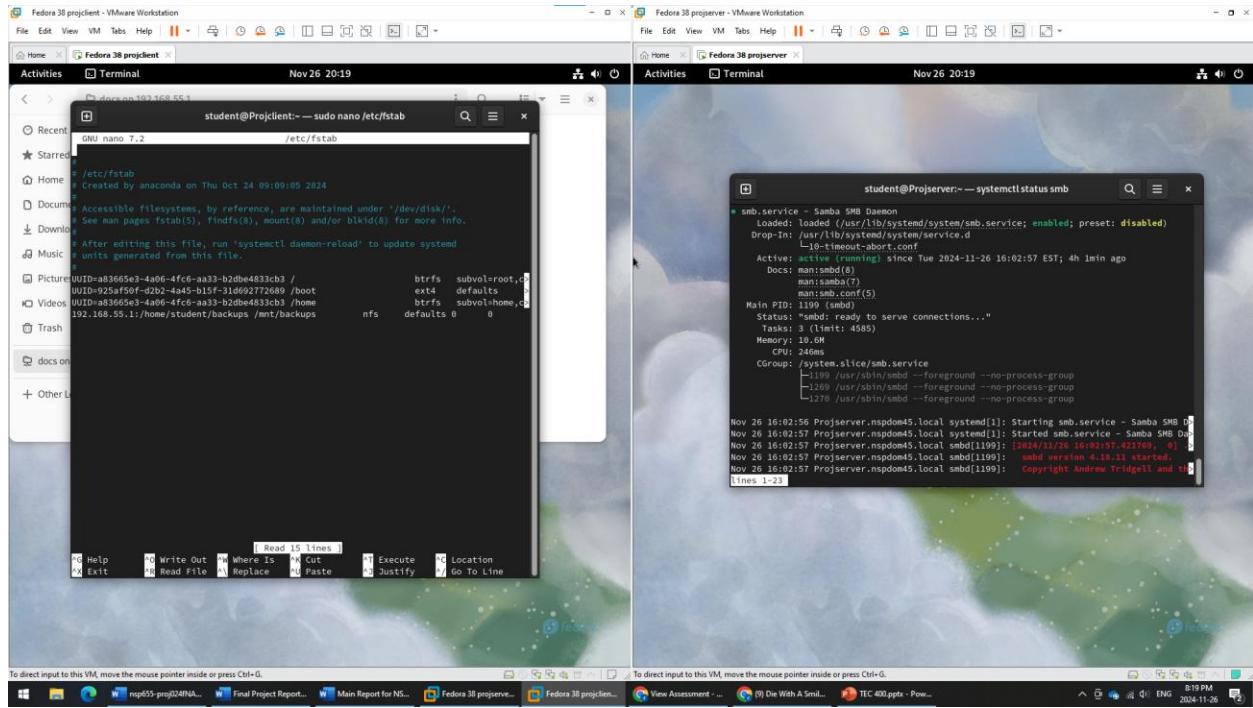


Figure 28. The picture shows the adding part of fstab file so that I will automatically mount.

Then remember to apply the change so that it will take effect on the next boot.

4.2.2 Weekly backups via cron using bash script file

Cron is a job scheduler built-in Linux operating system. It aims to automate execute code based on time with the help of bash scripts, it can perform various tasks from backup, monitoring to writing log and code executive. In this example, I used bash to weekly backup my entire /etc folder with rsync command.

First, I wrote the bash file as follows:

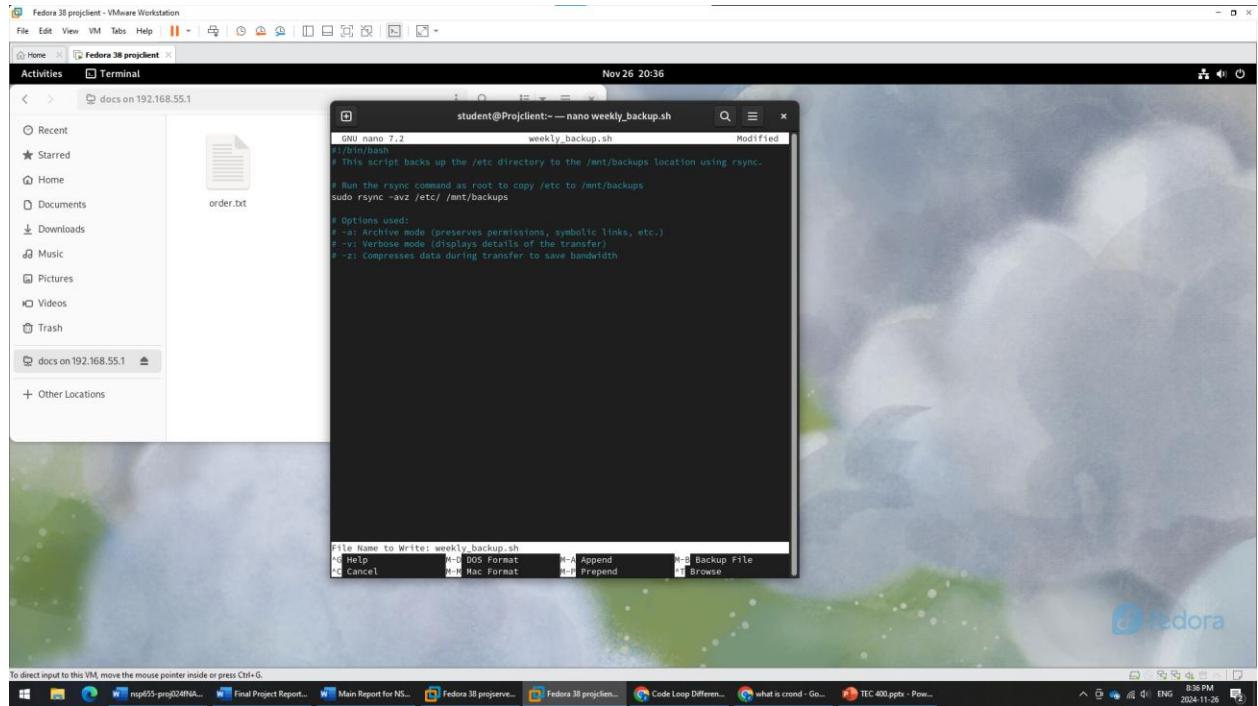


Figure 29: it shows my bash file with comment explain the flag or rsync

Then I configure the crontab as follows:

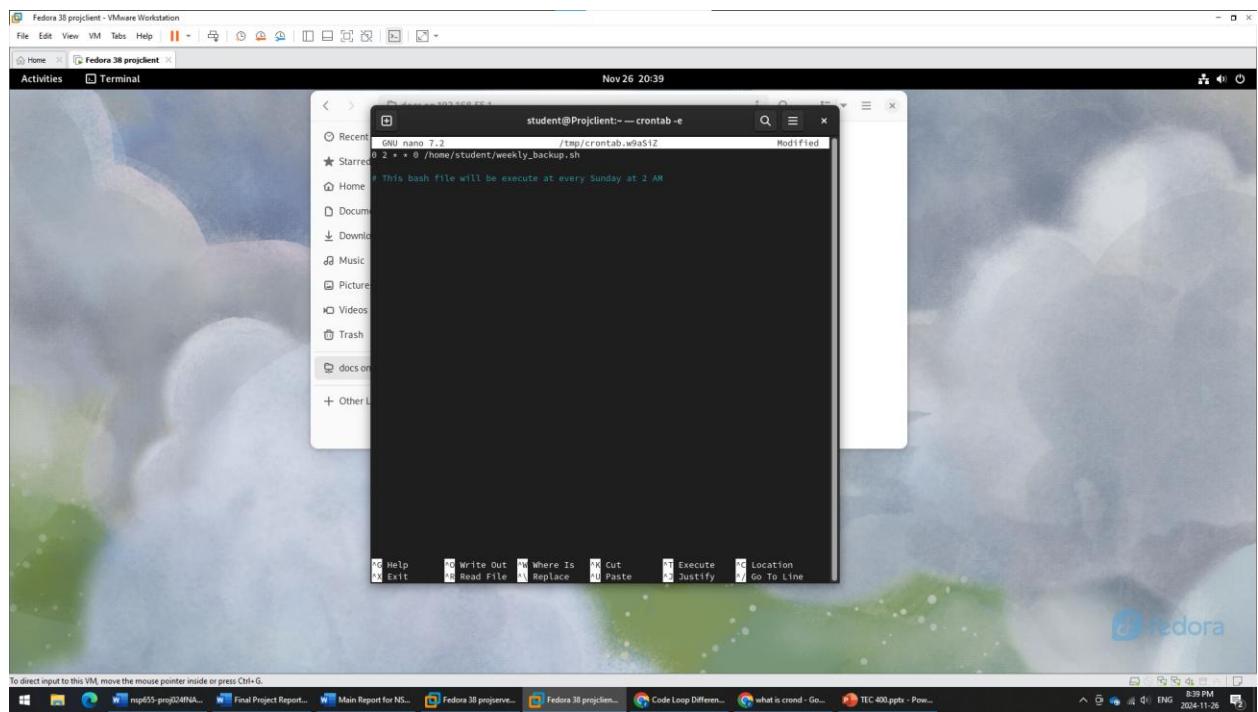
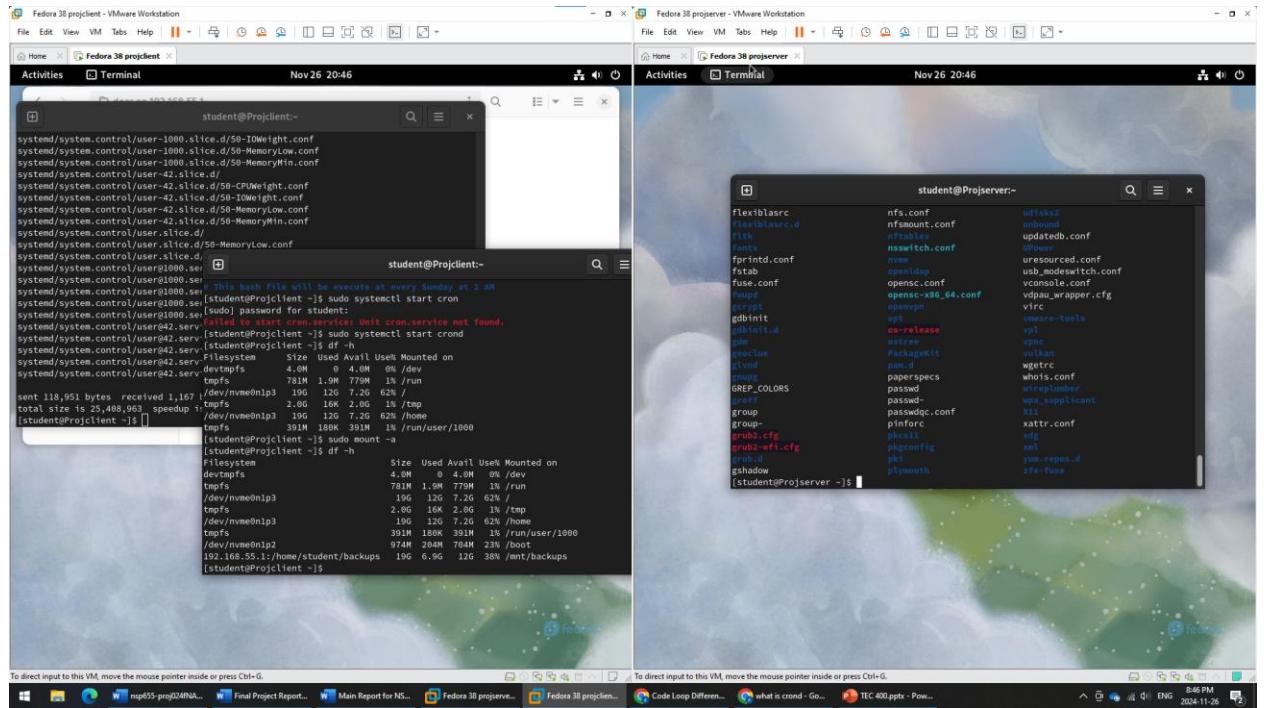


Figure 30: it displays my crontab that it will execute every Sunday at 2 AM.

Then don't forget to give the executive permission for the bash file and check for the status of the crond. Sometimes it was disable by default or other service. Finally, the output should be something like this.

Figure 31: it shows my scripts is working and there is mount folder in my client.



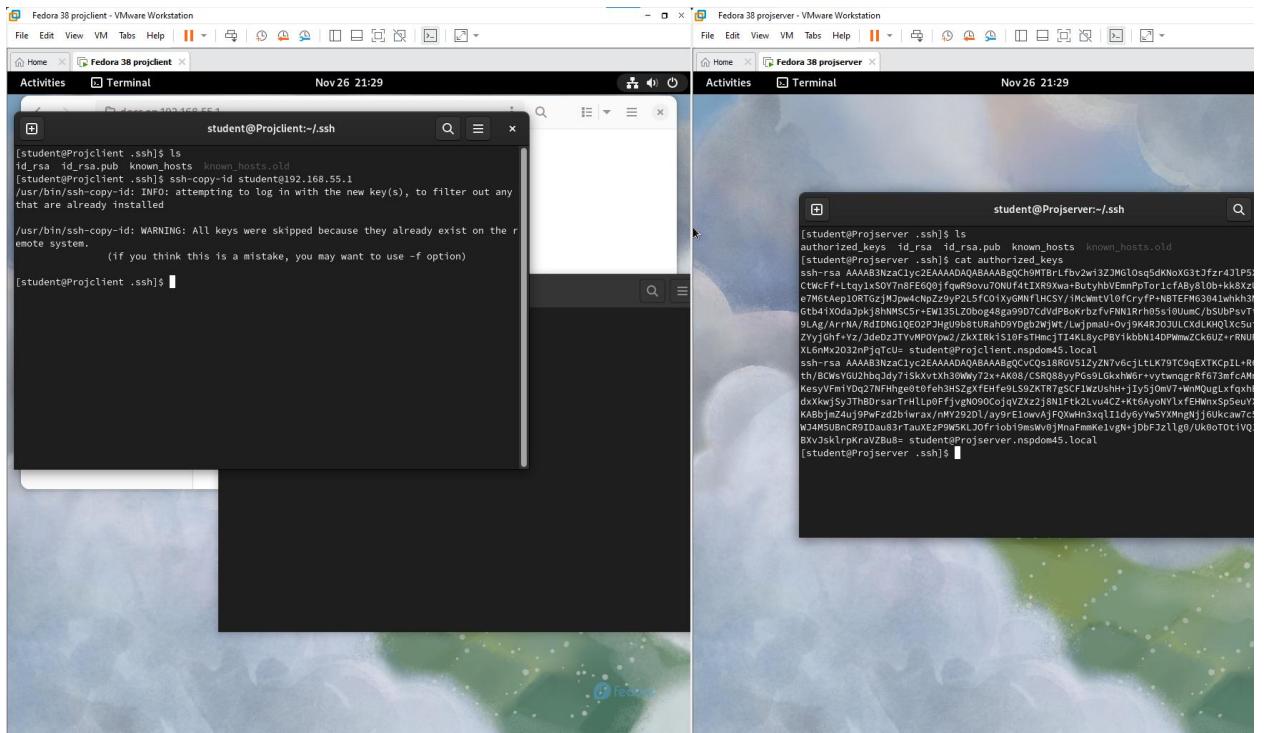
4.3 Automate Login

The ability to quickly switch between different clients is a significant advantage for technicians, enabling fast troubleshooting and maintenance. However, it is important to ensure that the environment remains secure. This method uses public and private keys to establish a secure, passwordless connection between the server and the client.

To begin, I generated an RSA key pair on the client using the command `ssh-keygen -t rsa`. It is recommended to include a passphrase for the private key to enhance local security. Once the key pair was created, I propagated the public key to the server using the command `ssh-copy-id student@192.168.55.1`, authorizing the client for passwordless access. Additionally, for VNC access, I

configured a VNC password using the `vncpasswd` command to further secure the remote desktop connection.

Figure 32: it shows that I copied the key to the server generated by the client.



For VNC Viewer, I need to configure a password file to enable direct login without requiring manual password entry. According to linux.die.net, VNC Viewer provides an option to specify the password using a file. To achieve this, I switched to the VNC user account and copied the `~/.vnc/passwd` file from the server to the client. This file stores the authentication password required for connecting to the VNC service. The password file is automatically generated when the VNC user account is created.

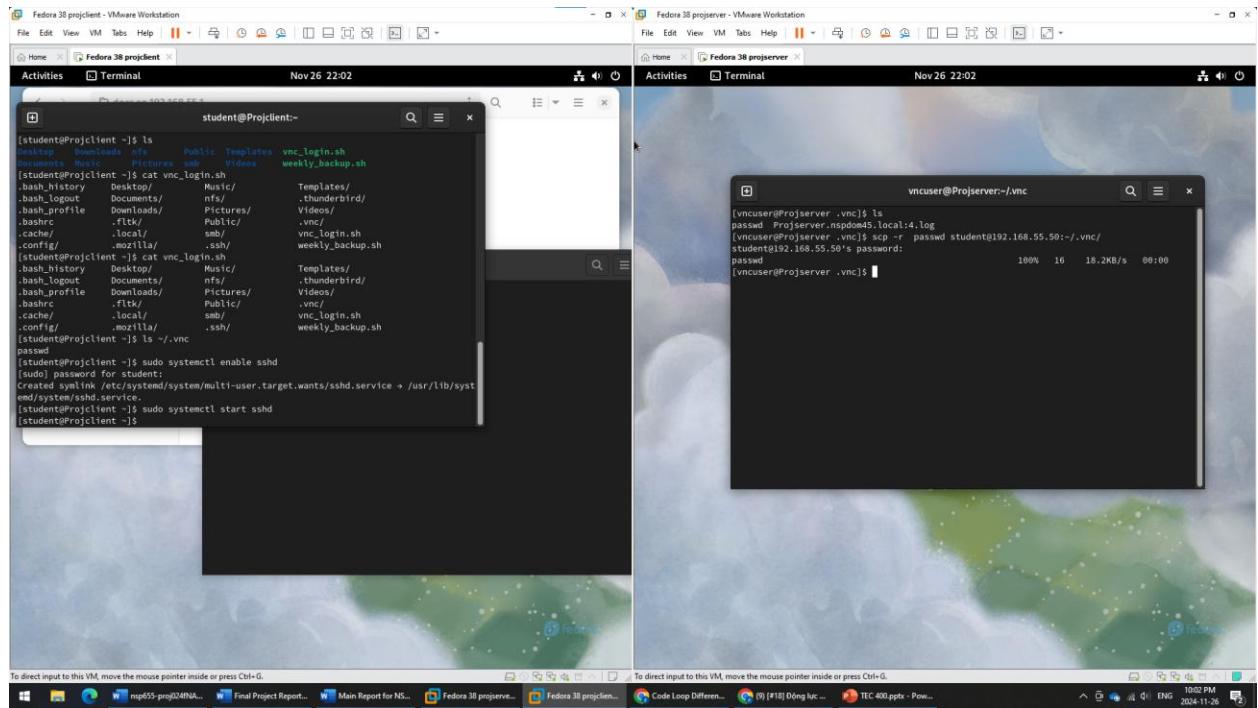
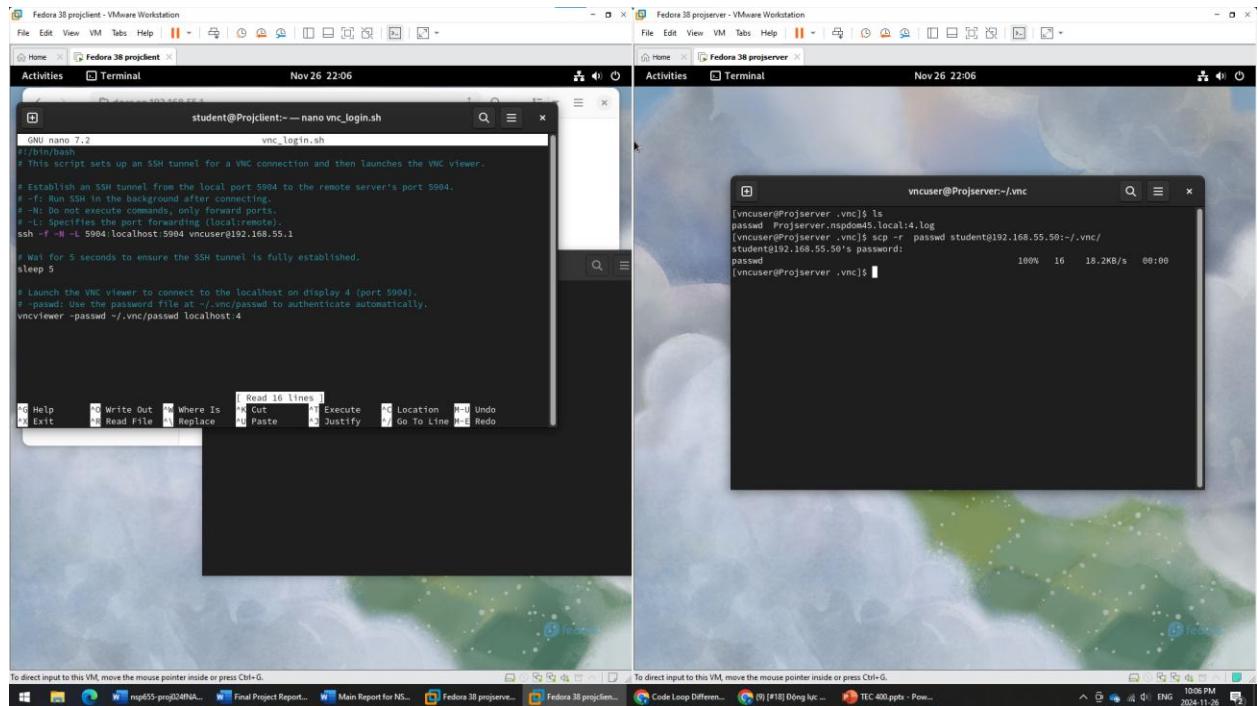


Figure 33: I copied the password of the vnc viewer account to the client using scp.

Now we just need to write a script to automatically run.



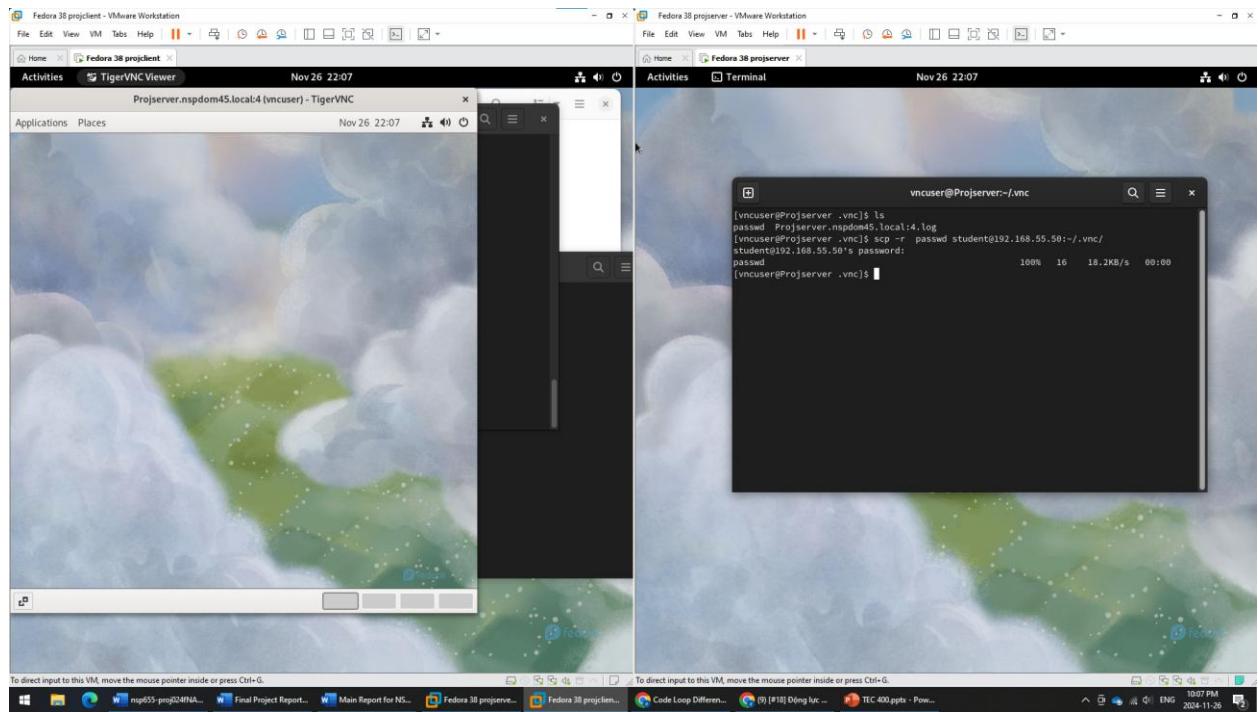


Figure 34: it shows that I logged without a password using scripts.

4.4 Evolution email

Evolution is an open-source email client for Linux that includes integrated features like calendars, contacts, tasks, and memos. Known for its user-friendly interface, it is available in many Linux distributions. To begin the setup, the necessary dependencies must be installed using the dnf package manager.

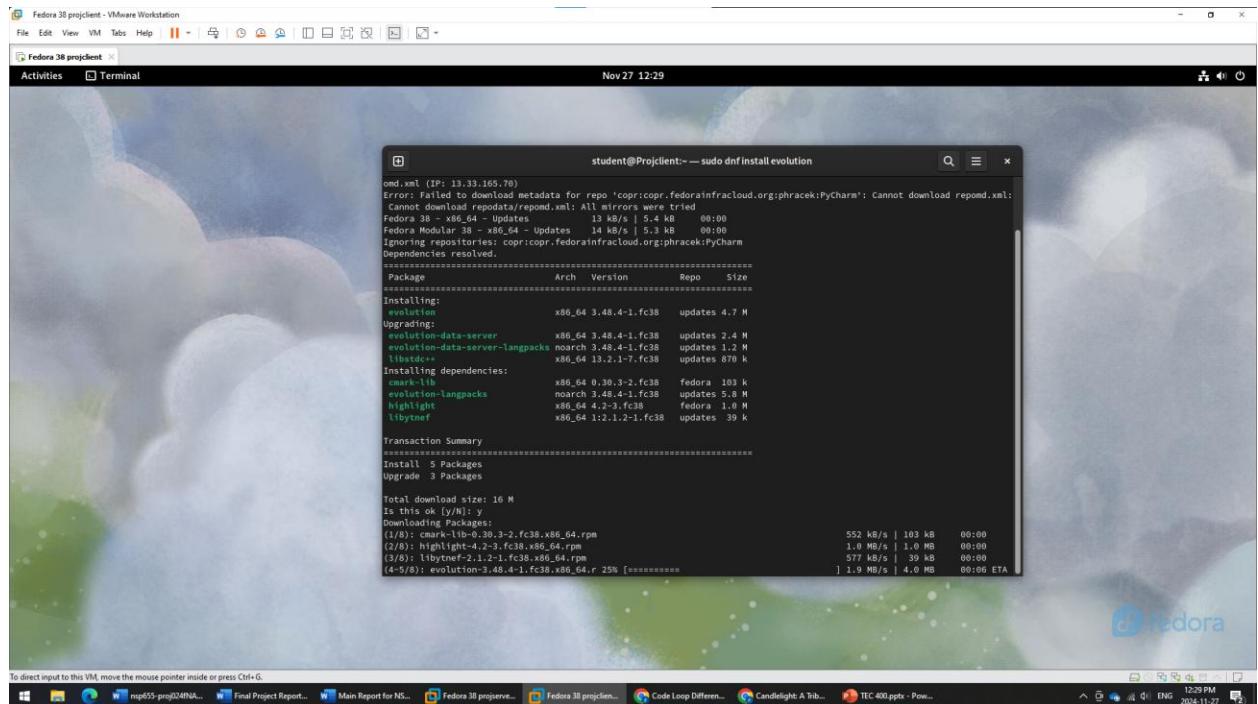


Figure 35: it shows the required dependencies for evolution.

Then access the application by searching for the evolution in the search bar. Then it will greet with the wizard windows to help new user to familiarize themselves with the application.

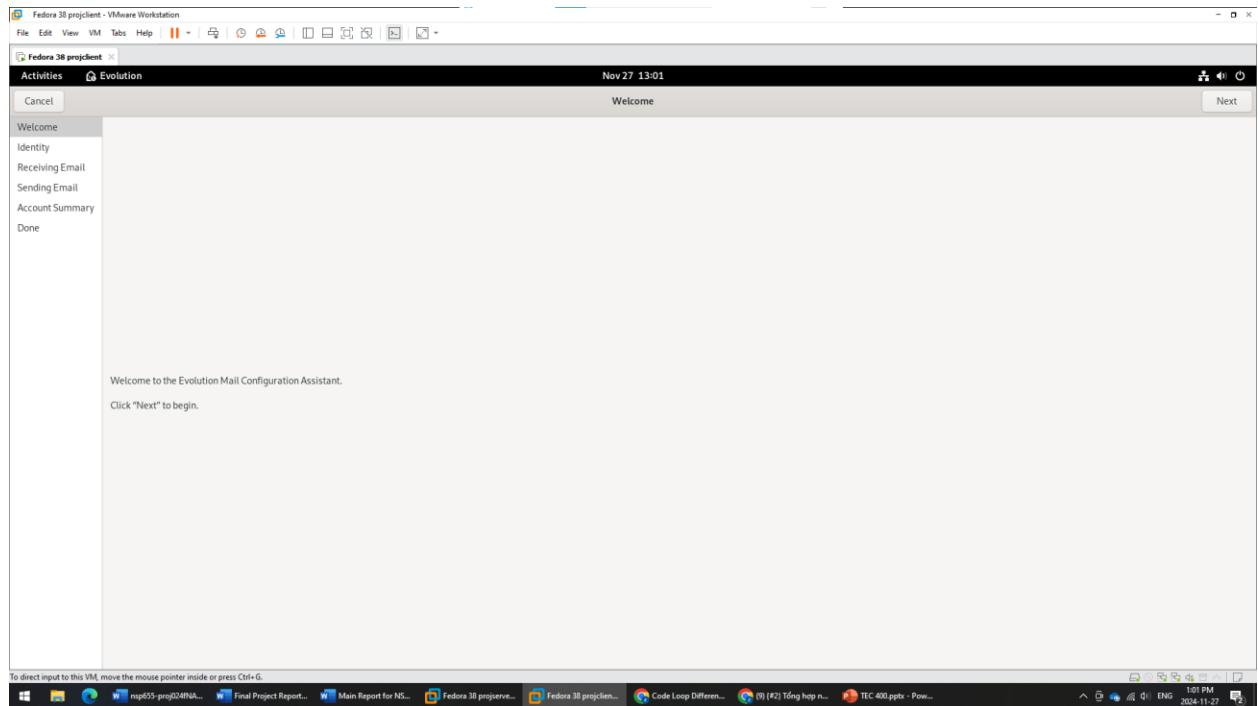


Figure 36: This is a wizard windows for set up account.

Then I provided the name of the account and the email address. For identity section, I putted it as manager and manager@nspdom45.local. It will take a while to lookup the account. Then I need to provide the hostname or the ip of the server and server type.

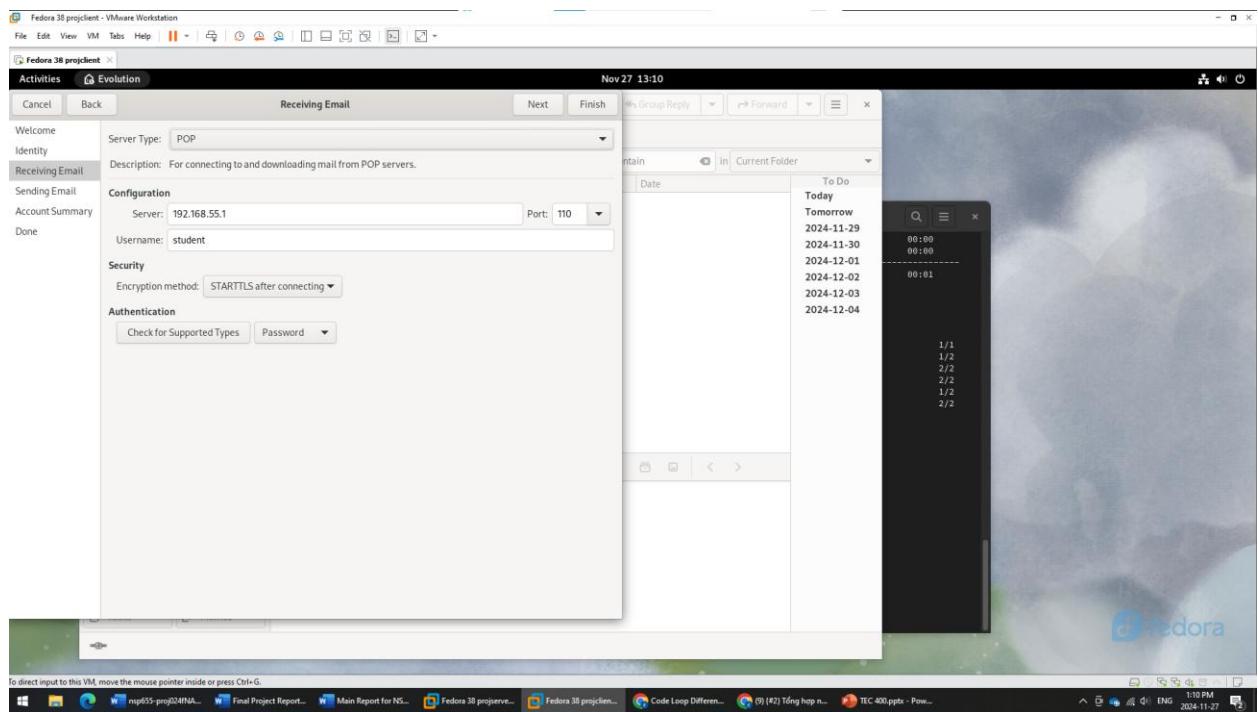


Figure 37: This is a section where settings receiving email address.

Follow that I need to configure the server IP address and selected encryption methods as STARTTLS.

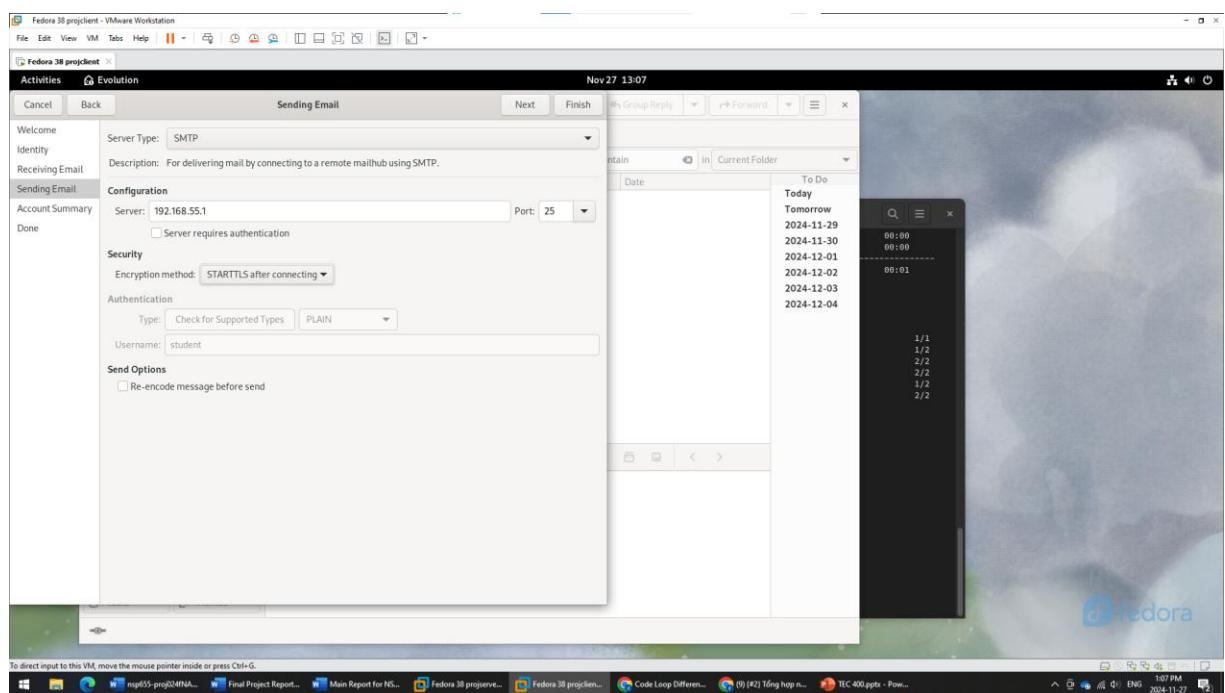
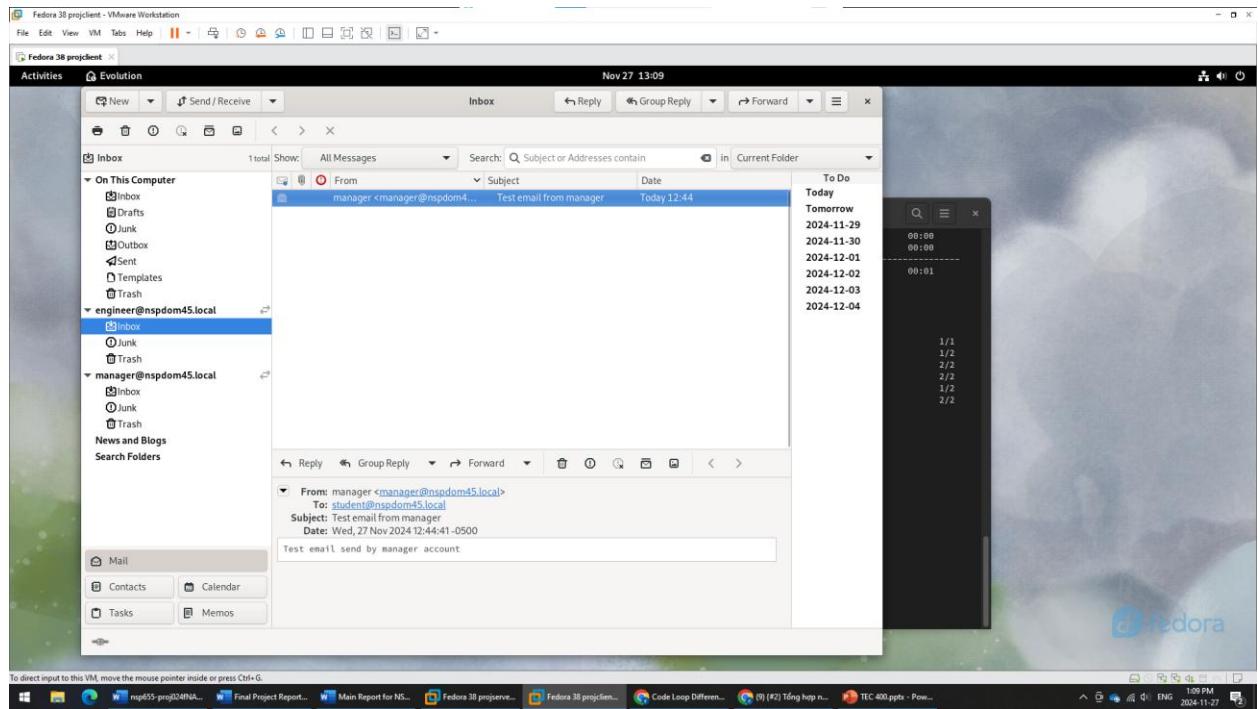


Figure 38: This is a section where settings sending email address.

And I repeated the same process for the engineer account and finally I will have the result similar to figure 39.

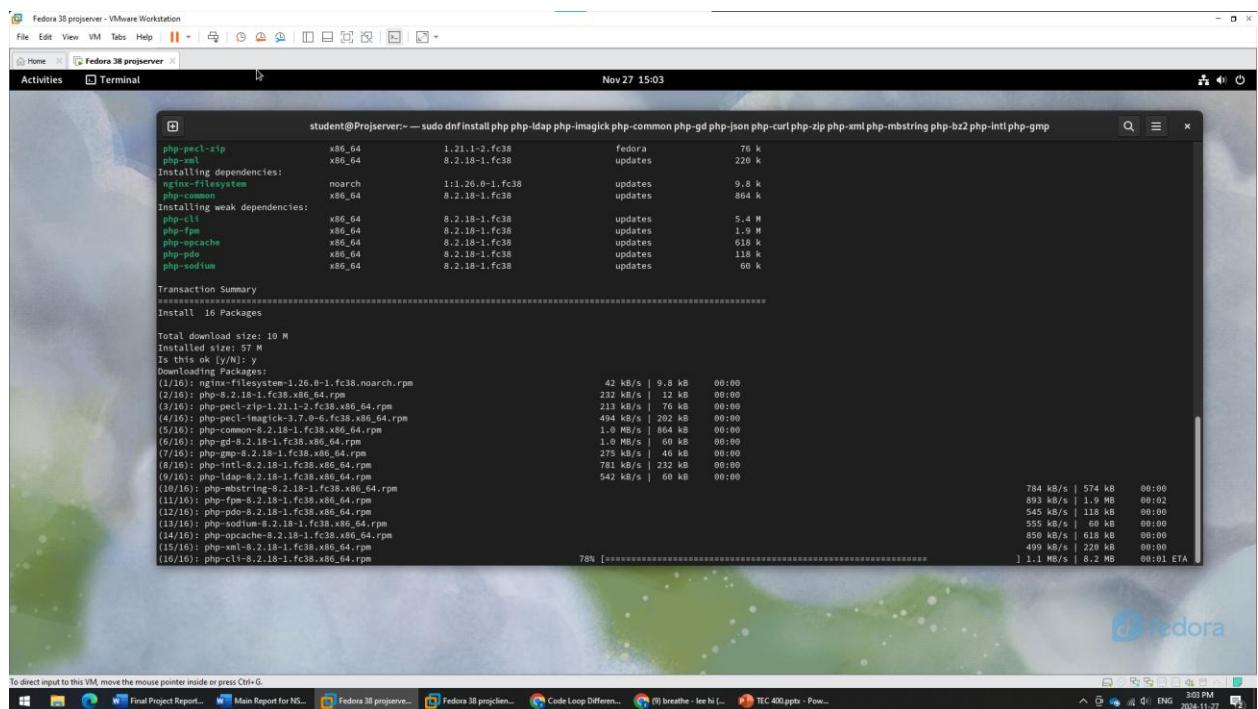
**Figure 39: It shows the configuration of evolution is successes.**

5. BONUS CHALLENGE CONFIGURATION FOR LINUX SERVER/CLIENT

This is an advanced section for configure roundcube, a browser-based email application which allows users to send mail, manage messages, etc.... This is an open source project supported by relational database engines like MySQL, SQLite or MariaDB.

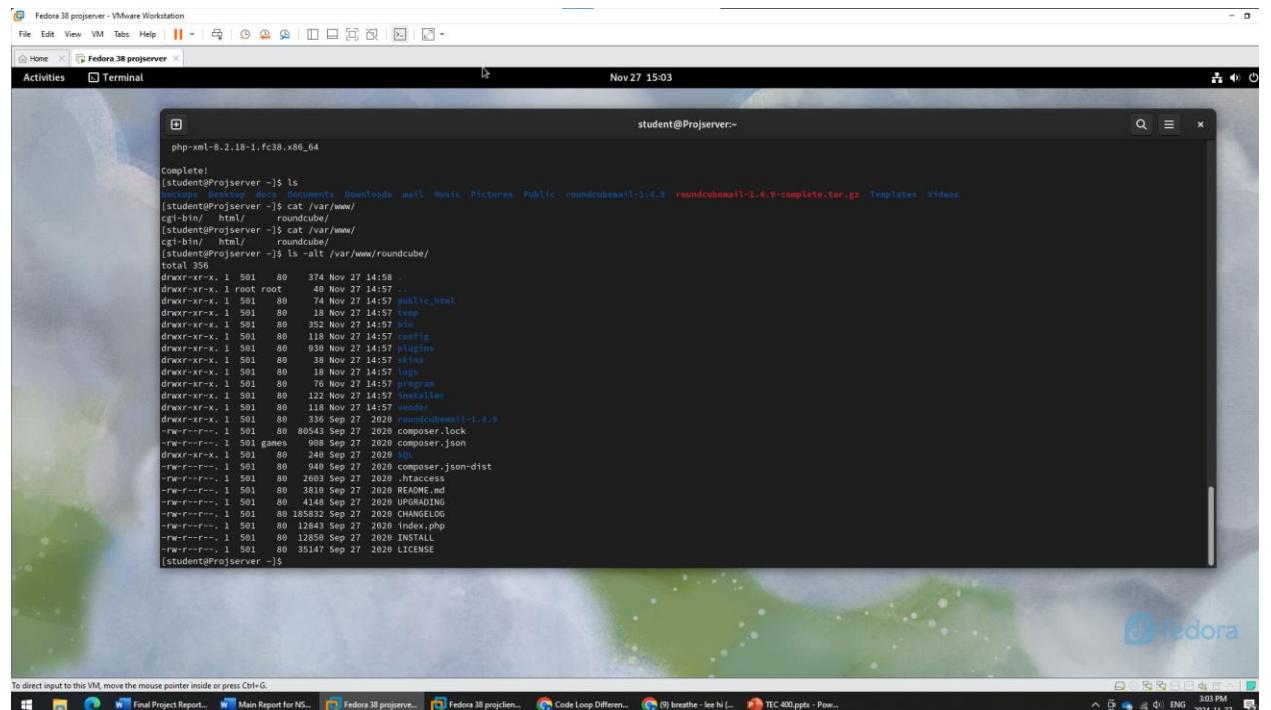
5.1 Roundcube Webmail

First, I installed package and some dependencies that Roundcube need using dnf.



```
student@ProjServer:~ -- sudo dnf install php php-ldap php-imap php-common php-gd php-json php-curl php-zip php-xml php-mbstring php-bz2 php-intl php-gmp
Transaction Summary
=====
Install  16 Packages

Total download size: 10 M
Is this ok [y/N]: y
Downloading Packages:
(1/16): nginx-filesystem-1.26.0-1.fc38.noarch.rpm          42 kB/s |  9.8 kB   00:00
(2/16): php-8.2.18-1.fc38.x86_64.rpm                      232 kB/s |  12 kB   00:00
(3/16): php-pecl-zip-1.20.1-2.fc38.x86_64.rpm            213 kB/s |  76 kB   00:00
(4/16): php-pecl-imap-2.0.1-2.fc38.x86_64.rpm            494 kB/s |  20 kB   00:00
(5/16): php-pecl-xml-0.2.18-1.fc38.x86_64.rpm            1.0 MB/s |  664 kB   00:00
(6/16): php-gd-8.2.18-1.fc38.x86_64.rpm                  1.0 MB/s |  60 kB   00:00
(7/16): php-gmp-8.2.18-1.fc38.x86_64.rpm                 275 kB/s |  46 kB   00:00
(8/16): php-intl-8.2.18-1.fc38.x86_64.rpm                781 kB/s |  232 kB   00:00
(9/16): php-ldap-8.2.18-1.fc38.x86_64.rpm                542 kB/s |  60 kB   00:00
(10/16): php-mbstring-8.2.18-1.fc38.x86_64.rpm           784 kB/s |  572 kB   00:00
(11/16): php-xml-8.2.18-1.fc38.x86_64.rpm                893 kB/s |  1.9 MB   00:00
(12/16): php-pdo-8.2.18-1.fc38.x86_64.rpm                545 kB/s |  118 kB   00:00
(13/16): php-sodium-8.2.18-1.fc38.x86_64.rpm              555 kB/s |  60 kB   00:00
(14/16): php-opcache-8.2.18-1.fc38.x86_64.rpm             850 kB/s |  618 kB   00:00
(15/16): php-xml-8.2.18-1.fc38.x86_64.rpm                499 kB/s |  220 kB   00:00
(16/16): php-curl-8.2.18-1.fc38.x86_64.rpm               1.1 MB/s |  8.2 MB   00:01 ETA
```



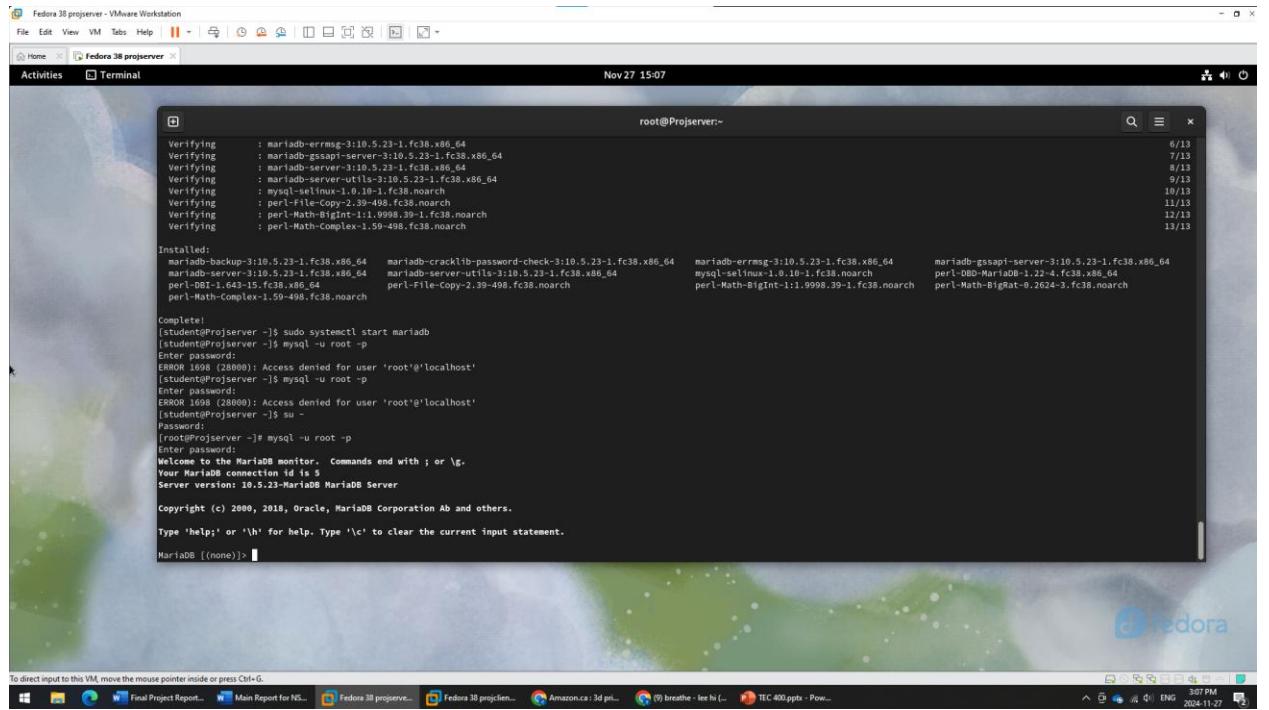
The screenshot shows a terminal window titled "Fedora 38 projserver" running on a Fedora 38 VM. The terminal displays a command-line session where the user is navigating through a directory structure. The user runs "ls" to list files, which includes "roundcubemail-1.4.9" and "roundcubemail-1.4.9-complete.tar.gz". The terminal window has a dark theme and is titled "student@Projserver:~". The background of the desktop shows a green and blue abstract pattern.

```
student@Projserver:~$ php-xml-8.2.18-1.fc38.x86_64
Complete!
(student@Projserver ~)$ ls
student@Projserver ~]$ cat /var/www/
(student@Projserver ~]$ cat /var/www/
(student@Projserver ~]$ cat /var/www/
(student@Projserver ~]$ cat /var/www/roundcube/
total 356
drwxr-xr-x. 1 501 80 374 Nov 27 14:58 .
drwxr-xr-x. 1 root root 40 Nov 27 14:57 ..
drwxr-xr-x. 1 501 80 74 Nov 27 14:57 public_html
drwxr-xr-x. 1 501 80 88 Nov 27 14:57 temp
drwxr-xr-x. 1 501 80 32 Nov 27 14:57 www
drwxr-xr-x. 1 501 80 118 Nov 27 14:57 roundcube
drwxr-xr-x. 1 501 80 930 Nov 27 14:57 plugins
drwxr-xr-x. 1 501 80 38 Nov 27 14:57 skins
drwxr-xr-x. 1 501 80 18 Nov 27 14:57 logs
drwxr-xr-x. 1 501 80 76 Nov 27 14:57 program
drwxr-xr-x. 1 501 80 128 Nov 27 14:57 installer
drwxr-xr-x. 1 501 80 118 Nov 27 14:57 ...
drwxr-xr-x. 1 501 80 336 Sep 27 2020 roundcubemail-1.4.9
-rw-r--r--. 1 501 80 80543 Sep 27 2020 composer.lock
-rw-r--r--. 1 501 games 908 Sep 27 2020 composer.json
drwxr-xr-x. 1 501 80 249 Sep 27 2020 ...
-rw-r--r--. 1 501 80 603 Sep 27 2020 composer.json-dist
-rw-r--r--. 1 501 80 2603 Sep 27 2020 .htaccess
-rw-r--r--. 1 501 80 3810 Sep 27 2020 README.md
-rw-r--r--. 1 501 80 4148 Sep 27 2020 UPGRADING
-rw-r--r--. 1 501 80 185832 Sep 27 2020 CHANGELOG
-rw-r--r--. 1 501 80 12843 Sep 27 2020 index.php
-rw-r--r--. 1 501 80 12858 Sep 27 2020 INSTALL
-rw-r--r--. 1 501 80 35147 Sep 27 2020 LICENSE
(student@Projserver ~)$
```

Figure 40 & 41: This is a section where roundcube , php packages are installed.

Then I configured the user for MariaDB so that it allows round cube to access the MariaDB for authentication. By creating a new username roudcubeuser and give it all permission that necessary.

Figure 42: This is how I configure MariaDB for roundcube.



The screenshot shows a terminal window titled "Fedora 38 projserver" running on a Fedora 38 desktop environment. The terminal displays the output of a command, likely a script or configuration file, related to setting up MariaDB for the Roundcube webmail application. The output includes several "Verifying" messages for various packages, followed by an "Installed:" section listing packages like mariadb-backup, mariadb-cracklib-password-check, mariadb-errmsg, mariadb-gssapi-server, mariadb-server, mariadb-server-utils, perl-DBD-MariaDB, perl-File-Copy, perl-Math-BigInt, perl-Math-BigRat, perl-Math-Complex, mysql-selinux, and perl-Math-BigInt. The "Complete!" section shows the user attempting to start the mariadb service and log in as root via MySQL, but both attempts fail with "Access denied for user 'root'@'localhost'". Finally, the user logs in as root using the su command and runs the MySQL command "status", which shows the connection information and server version.

```

root@Projserver:~#
Verifying : mariadb-errmsg-3:10.5.23-1.fc38.x86_64
Verifying : mariadb-gssapi-server-3:10.5.23-1.fc38.x86_64
Verifying : mariadb-server-3:10.5.23-1.fc38.x86_64
Verifying : mariadb-server-utils-3:10.5.23-1.fc38.x86_64
Verifying : mysql-selinux-1.0.10-1.fc38.noarch
Verifying : perl-file-copy-2.39-498.fc38.noarch
Verifying : perl-Math-BigInt-1:1.9998-39-1.fc38.noarch
Verifying : perl-Math-Complex-1.59-498.fc38.noarch

Installed:
mariadb-backup-3:10.5.23-1.fc38.x86_64      mariadb-cracklib-password-check-3:10.5.23-1.fc38.x86_64      mariadb-errmsg-3:10.5.23-1.fc38.x86_64      mariadb-gssapi-server-3:10.5.23-1.fc38.x86_64
mariadb-server-3:10.5.23-1.fc38.x86_64      mariadb-server-utils-3:10.5.23-1.fc38.x86_64      mysql-selinux-1.0.10-1.fc38.noarch      perl-DBD-MariaDB-1.22-4.fc38.x86_64
perl-DBI-1.643-15.fc38.x86_64              perl-File-Copy-2.39-498.fc38.noarch      perl-Math-BigInt-1:1.9998-39-1.fc38.noarch  perl-Math-BigRat-0.2624-3.fc38.noarch

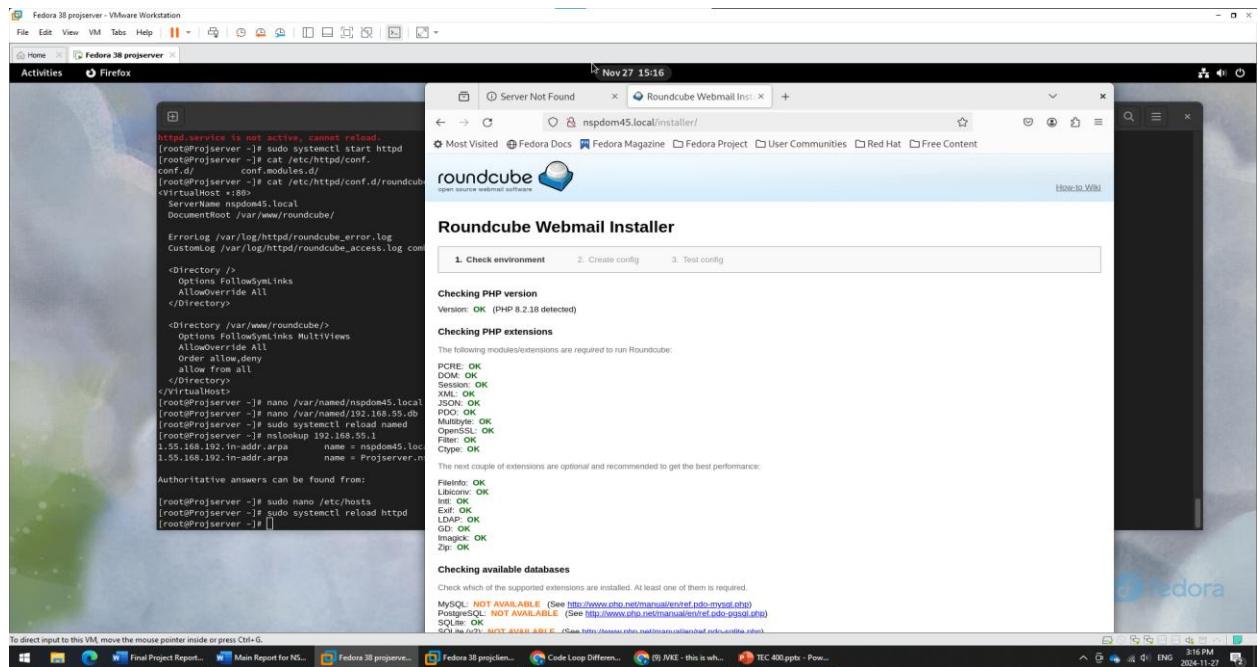
Complete!
[student@Projserver ~]$ sudo systemctl start mariadb
[student@Projserver ~]$ mysql -u root -p
Enter password:
ERROR 1698 (28000): Access denied for user 'root'@'localhost'
[student@Projserver ~]$ mysql -u root -p
Enter password:
ERROR 1698 (28000): Access denied for user 'root'@'localhost'
[student@Projserver ~]$ su -
Password:
[root@Projserver ~]# mysql -u root -p
Enter password:
Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 5
Server version: 10.5.23-MariaDB MariaDB Server

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

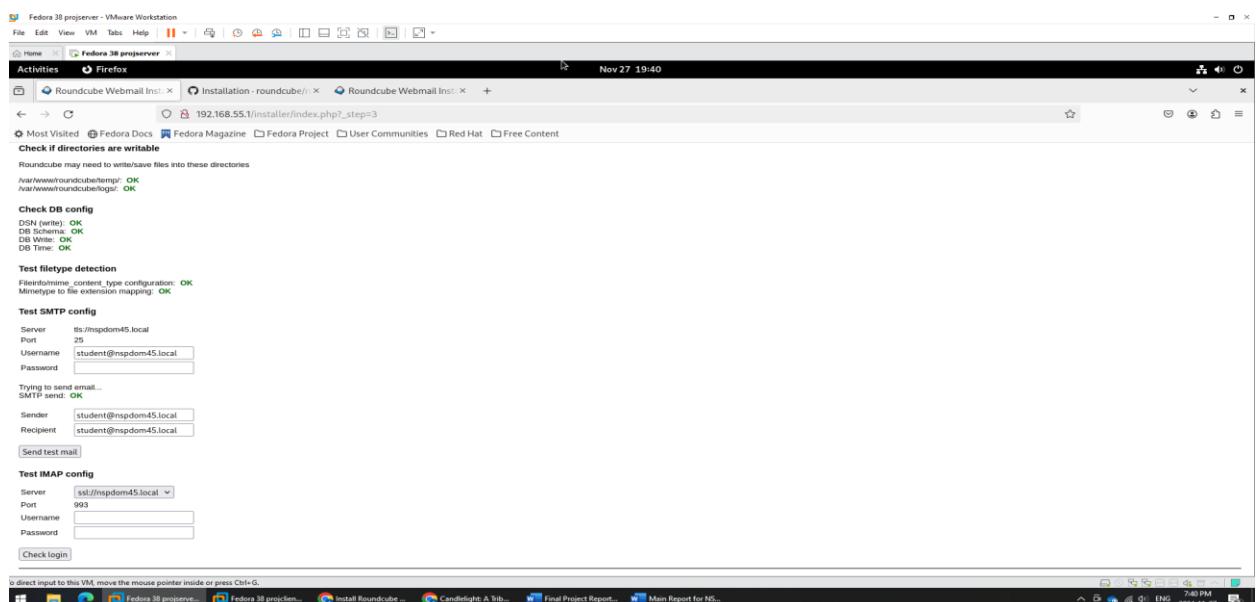
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> 
```

Then by adding file into Apache engine so every time it will query, it will know which file to return. So, after configuring the .conf file and restarting the services I accessed via Firefox but it should be available on any web browser.

Figure 43: This is the installer endpoint of roundcube.

The installer verifies that all necessary requirements are met before proceeding. Once confirmed, the next step is to configure the IMAP and SMTP settings. For this project, the assigned ports were 993 for IMAP and 25 for SMTP. These configurations ensure secure and efficient email communication within the network.

Figure 44: It shows that my configuration is correct.

FinallyFinally, I could connect to the page and I removed the installer because it have many sensitive settings such as encryption keys and username as well as password to access your database.

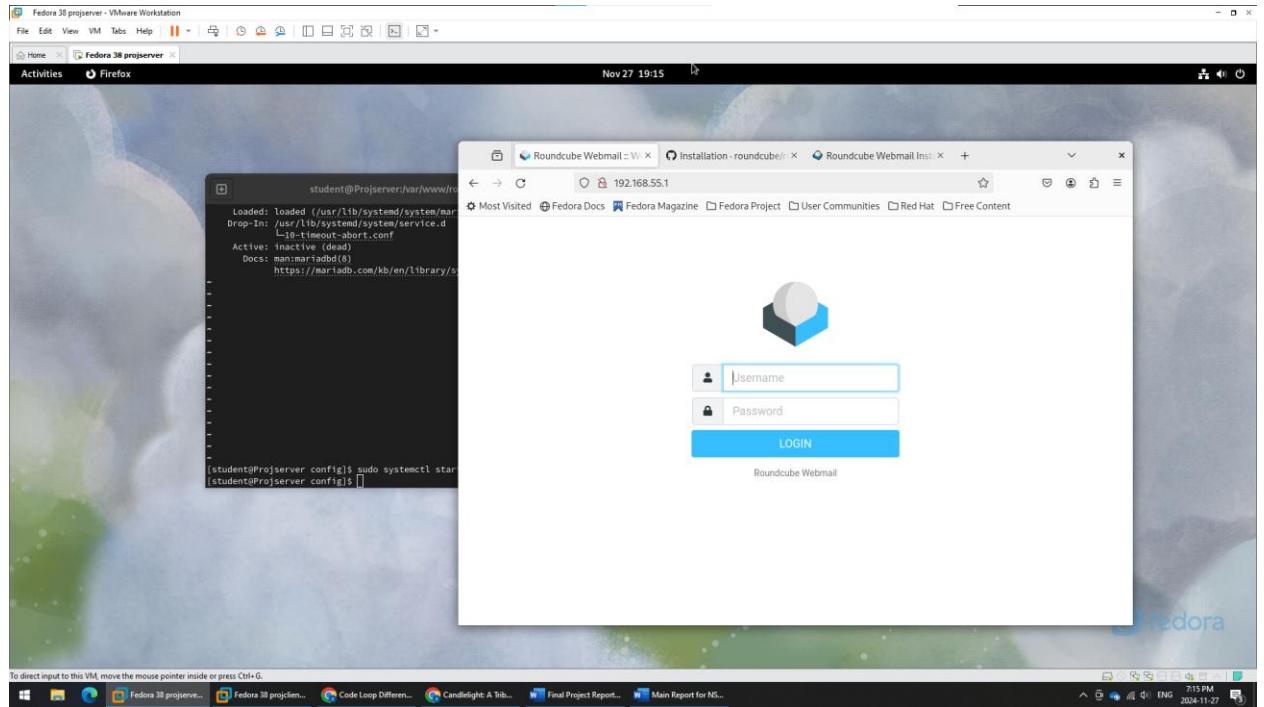


Figure 45: It shows that I successfully configure the roundcube.

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