CISN-34-01-21309

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Key Features

Fedora 35

Client Workstation
- Thunderbird
- Libre Word

Virtualized Server
- Containerized programs using Linux Containers
  - Apache
  - Samba and FTP

Linux Container - LXD/LXC

LXD with Snap

Install snap

- sudo dnf install snapd -y

Install lxd

- sudo snap install lxd
- sudo snap start lxd

```
[mc@fedora ~]$ sudo snap install lxd
2021-12-01T19:26:34-08:00 INFO Waiting for automatic snapd restart...
lxd 4.20 from Canonical installed
[mc@fedora ~]$
```

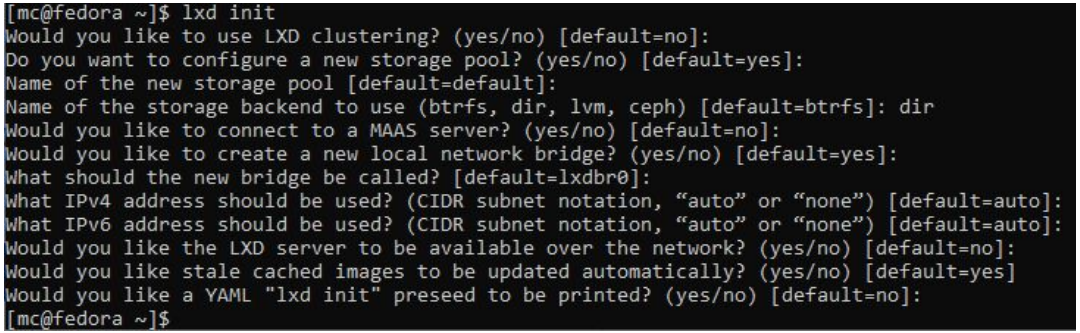
Add user to lxd

- sudo usermod -aG lxd *username*
- newgrp lxd

```
[mc@fedora ~]$ sudo usermod -aG lxd mc
[mc@fedora ~]$ newgrp lxd
```

lxc init

Name of storage backend changed to “dir” everything else was left as default.



Internet access for containers

- sudo firewall-cmd --permanent --add-interface=lxdbr0 --zone=trusted
- sudo firewall-cmd --reload

```
[mc@fedora ~]$ sudo firewall-cmd --permanent --add-interface=lxdbr0 --zone=trusted
[sudo] password for mc:
success
[mc@fedora ~]$ sudo firewall-cmd --reload
success
```

Common LXC command

List images by alias

- lxc image alias list images: | grep -i fedora

Test network

- lxc exec *instancename* ping 1.1.1.1

How to login as different user

- lxc exec *instancename* -- su -- login *username*

Enters bash of container

- lxc exec *instancename* -- bash

APACHE

Apache Installation – Creating the Container

Create the container

- lxc launch images:fedora/35/amd64 web

```
[gl@fedora ~]$ lxc launch images:fedora/35/amd64 web
Creating web
Starting web
[gl@fedora ~]$ _
```

Check for container

- lxc list

```
[gl@fedora ~]$ lxc list
+------+---------+----------------------+-----------------------------------------------+-----------+
| NAME |  STATE  |         IPV4         |                     IPV6                      |   TYPE    |
| SNAPSHOTS |
+------+---------+----------------------+-----------------------------------------------+-----------+
| smb  | RUNNING | 10.83.180.159 (eth0) | fd42:9b49:fae9:4260:216:3eff:fed6:6572 (eth0) | CONTAINER |
| 0         |
+------+---------+----------------------+-----------------------------------------------+-----------+
| web  | RUNNING | 10.83.180.9 (eth0)   | fd42:9b49:fae9:4260:216:3eff:fefd:c80e (eth0) | CONTAINER |
| 0         |
+------+---------+----------------------+-----------------------------------------------+-----------+
[gl@fedora ~]$
```

Enter the container

- lxc exec web – bash

Apache Installation

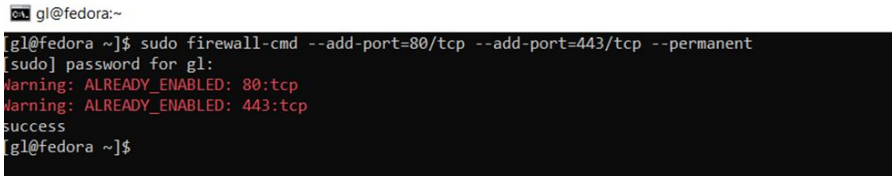
Install Apache

- sudo dnf install httpd -y
- systemctl enable httpd --now

```
[root@web ~]# systemctl enable httpd --now
Created symlink /etc/systemd/system/multi-user.target.wants/httpd.service → /usr/lib/systemd/system/
httpd.service.
[root@web ~]# _
```

Adjust the Firewalls

- sudo firewall-cmd --add-port=80/tcp --add-port=443/tcp --permanent

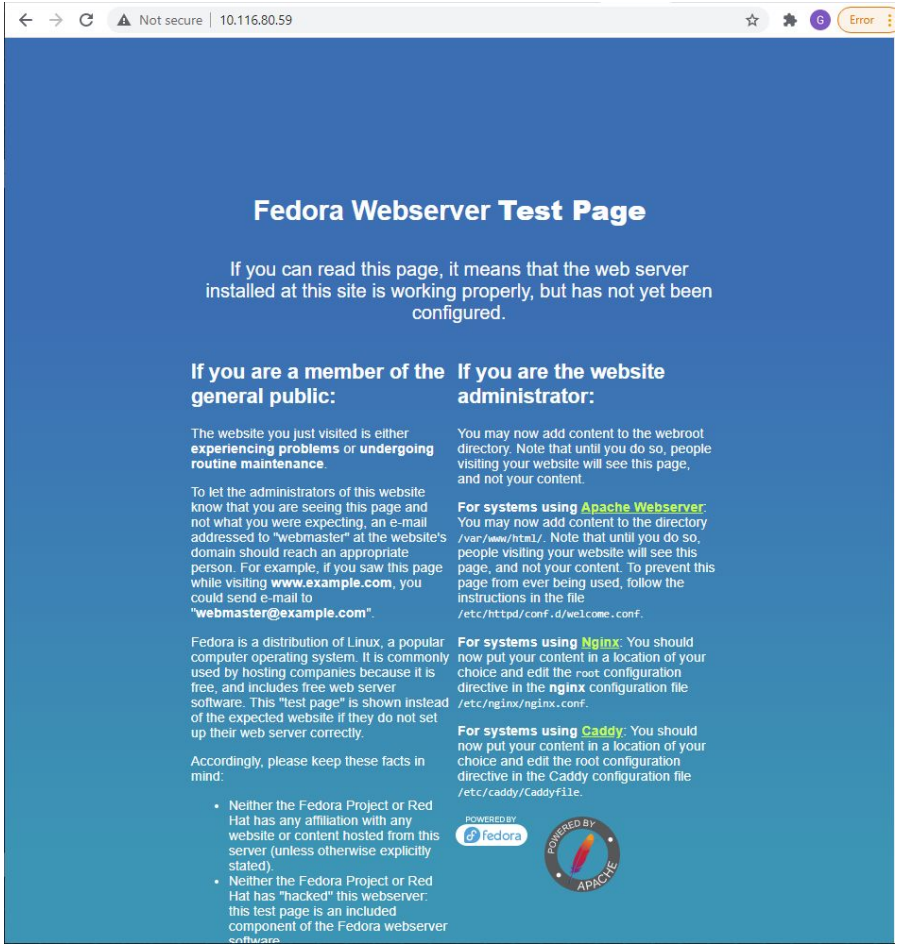


Port Forwarding

- sudo firewall-cmd --permanent --add-forward-port=port=80:proto=tcp:toport=80:toaddr=10.212.121.40

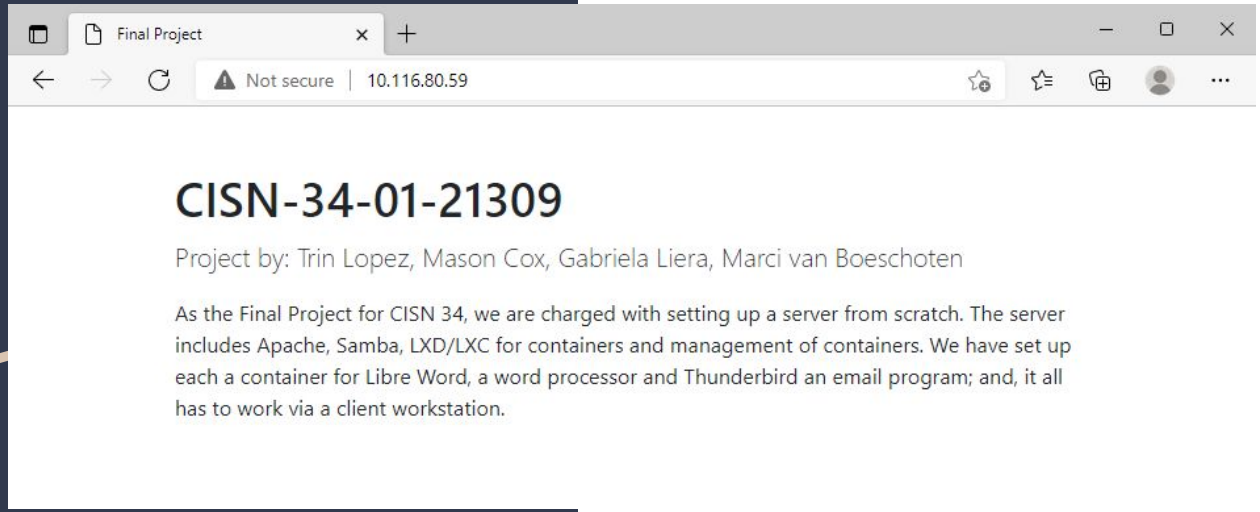
Accessing the Web page

We are accessing the web server by typing the IP address of the host machine on an internet browser



Customizing the web page

We used a basic HTML boilerplate and imported Bootstrap 5 for the basic CSS styling.



SAMBA

Creating container

Create the container

- lxc launch images:fedora/35/amd64 smb

```
[gl@test ~]$ [gl@test ~]$ lxc launch images:fedora/35/amd64 smb
Creating smb
Starting smb
[gl@test ~]$
```

Check for container

- Lxc list

```
[gl@test ~]$ lxc list
+------+---------+---------------------+----------------------------------------------+-----------+-----------+
| NAME |  STATE  |        IPV4         |                     IPV6                     |   TYPE    | SNAPSHOTS |
+------+---------+---------------------+----------------------------------------------+-----------+-----------+
| smb  | RUNNING | 10.83.180.159 (eth0) | fd42:9b49:fae9:4260:216:3eff:fed6:6572 (eth0) | CONTAINER | 0         |
+------+---------+---------------------+----------------------------------------------+-----------+-----------+
[gl@test ~]$
```

Enter the container

- lxc exec smb -- bash

```
[gl@test ~]$ lxc exec smb -- bash
[root@smb ~]#
```

Installation

Install Samba

- sudo dnf install samba –y
- sudo systemctl enable smb nmb –now

Add user to container and Samba users

- useradd smb-user
- pdbedit -a smb-user

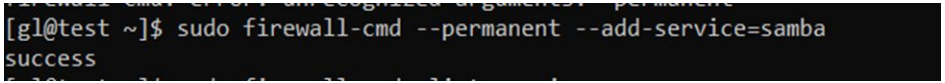
```
[root@smb ~]# dnf install samba -y
Fedora 35 - x86_64                                              5.9 MB/s |  61 MB     00:10
Fedora 35 openh264 (From Cisco) - x86_64                        2.6 kB/s | 2.5 kB     00:00
Fedora Modular 35 - x86_64                                      778 kB/s | 2.6 MB     00:03
Fedora 35 - x86_64 - Updates                                    3.5 MB/s |  14 MB     00:03
Fedora Modular 35 - x86_64 - Updates                            370 kB/s | 737 kB     00:01
Dependencies resolved.
================================================================================================
 Package                  Architecture          Version                   Repository        Size
================================================================================================
Installing:
 samba                    x86_64                2:4.15.2-3.fc35           updates          793 k
Installing dependencies:
 avahi-libs               x86_64                0.8-14.fc35               fedora            68 k
 cups-libs                x86_64                1:2.3.3op2-10.fc35        updates          265 k
 dbus-libs                x86_64                1:1.12.20-5.fc35          fedora           152 k
 jansson                  x86_64                2.13.1-3.fc35             fedora            44 k
 libevent                 x86_64                2.1.12-4.fc35             fedora           261 k
 libicu                   x86_64                69.1-2.fc35               fedora           9.8 M
 libkadm5                 x86_64                1.19.2-2.fc35             fedora            84 k
 libldb                   x86_64                2.4.1-1.fc35              updates          180 k
 libsmbclient             x86_64                2:4.15.2-3.fc35           updates           78 k
```

```
[root@smb ~]# pdbedit -a smb-user
new password:
retype new password:
Unix username:        smb-user
NT username:
Account Flags:        [U          ]
User SID:             S-1-5-21-3486622581-1329648384-1940557400-1000
Primary Group SID:    S-1-5-21-3486622581-1329648384-1940557400-513
Full Name:
Home Directory:       \\SMB\smb-user
HomeDir Drive:
Logon Script:
Profile Path:         \\SMB\smb-user\profile
Domain:               SMB
Account desc:
Workstations:
Munged dial:
Logon time:           0
Logoff time:          Wed, 06 Feb 2036 15:06:39 UTC
Kickoff time:         Wed, 06 Feb 2036 15:06:39 UTC
Password last set:    Fri, 26 Nov 2021 18:49:23 UTC
Password can change:  Fri, 26 Nov 2021 18:49:23 UTC
Password must change: never
Last bad password   : 0
Bad password count  : 0
Logon hours         : FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF
[root@smb ~]#
```

Adjust Firewall

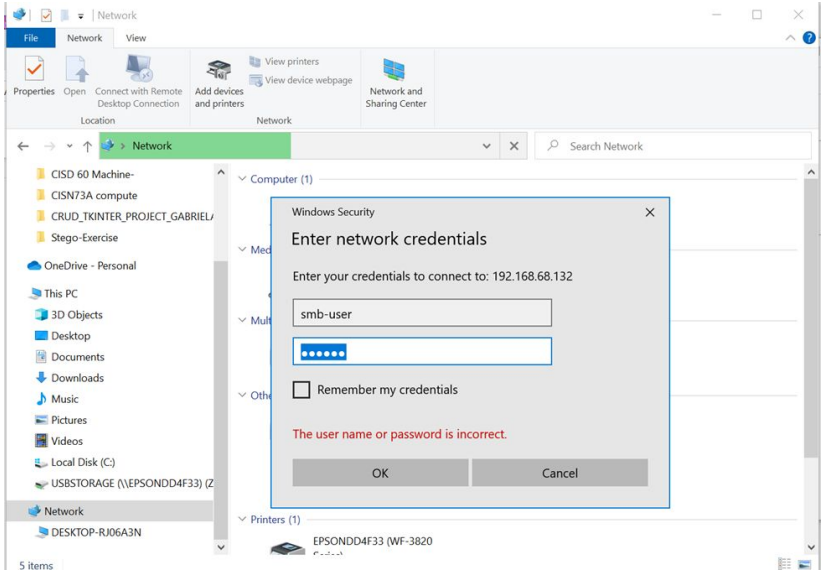
- sudo firewall-cmd --permanent --add-service=samba
- sudo firewall-cmd --permanent --add-forward-port=port=137:proto=udp:toport=137:toaddr=10.212.121.96 --add-forward-port=port=138:proto=udp:toport=138:toaddr=10.212.121.96 --add-forward-port=port=139:proto=tcp:toport=139:toaddr=10.212.121.96 --add-forward-port=port=445:proto=tcp:toport=445:toaddr=10.212.121.96

The toaddr IP address will be the IP address of the container.

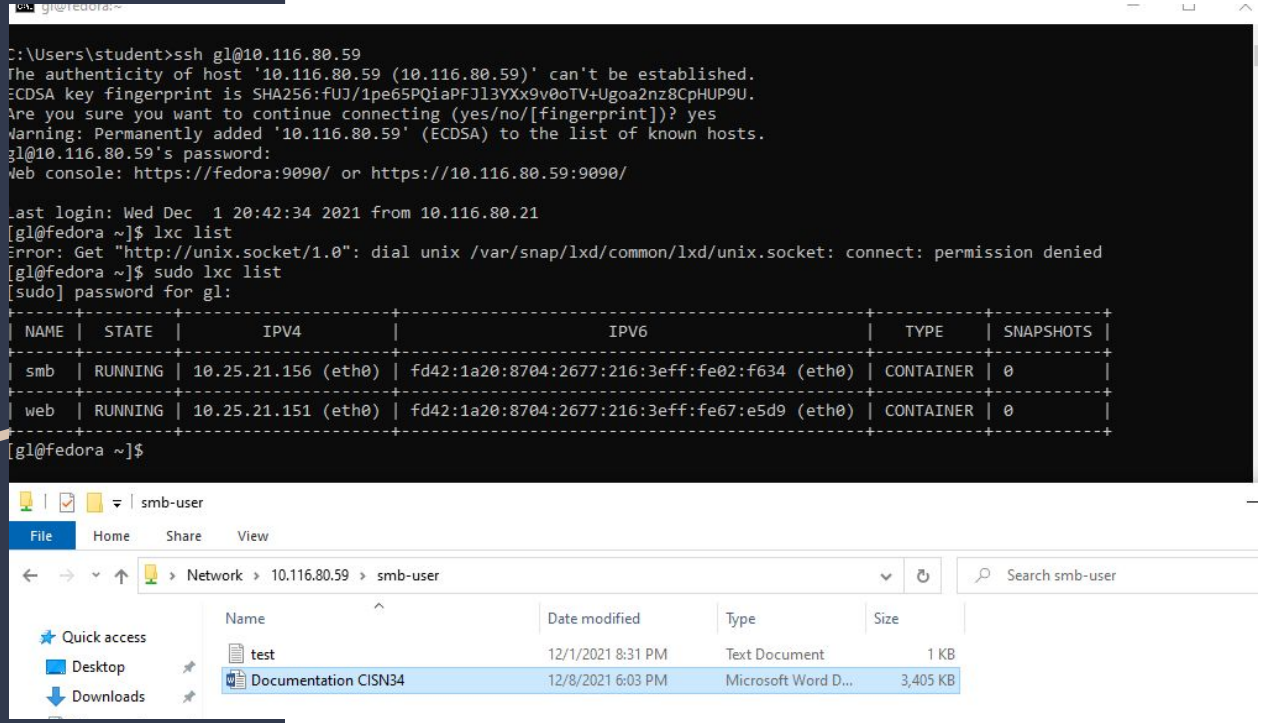


Accessing Samba Shared Folder

Use the IP address of the host server, not the container.



Accessing Samba Shared Folder



FTP – File Transfer Protocol

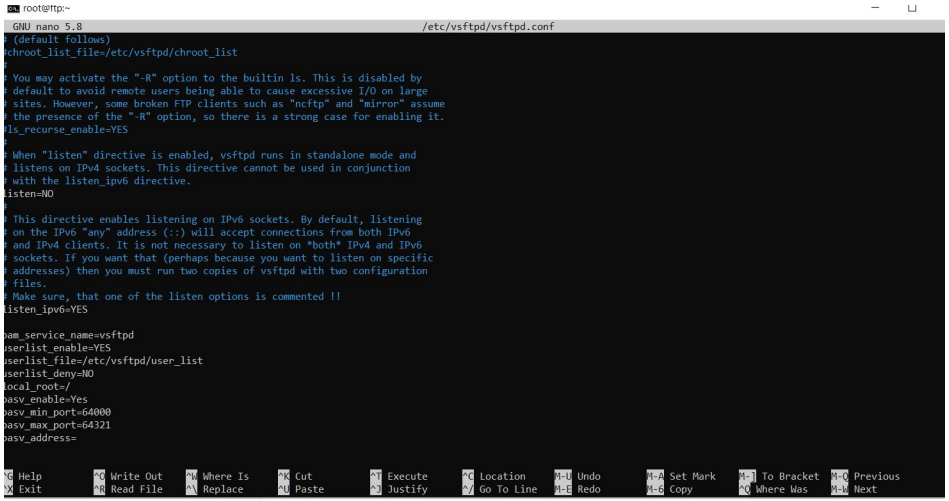
Installation

Install Ftp

- Dnf install vsftpd -y
- systemctl enable vsftpd --now

Install text editor for configuration file

- nano /etc/vsftpd/vsftp.conf
    - userlist_file=/etc/vsftpd/user_list
      userlist_deny=NO
      local_root=/
      pasv_enable=NO (Disabled = Active only. With it disabled we don't have to set range of ports to be enabled for passive mode)



Add ftp-user

Create user to access ftp server

- useradd ftp-user

Add user to ftp user_list

- echo "ftp-user" >> /etc/vsftpd/user_list

Restart vsftpd

- systemctl restart vsftpd

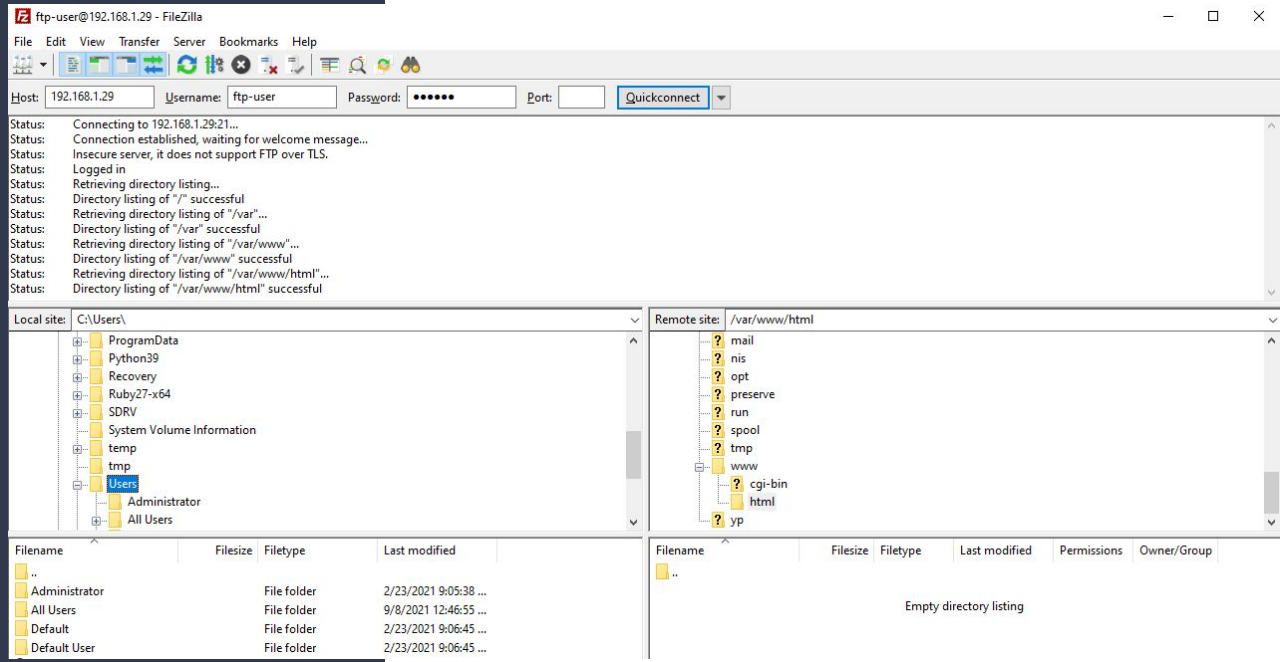
```
[root@ftp vsftpd]# ls
ftpusers  user_list  vsftpd.conf  vsftpd_conf_migrate.sh  vsftpd_copy.conf
[root@ftp vsftpd]# cat user_list
# vsftpd userlist
# If userlist_deny=NO, only allow users in this file
# If userlist_deny=YES (default), never allow users in this file, and
# do not even prompt for a password.
# Note that the default vsftpd pam config also checks /etc/vsftpd/ftpusers
# for users that are denied.
root
bin
daemon
adm
lp
sync
shutdown
halt
mail
news
uucp
operator
games
nobody
ftp-user
[root@ftp vsftpd]#
```

Firewalls and Port Forwarding

Use port-forwarding method similar to other services

sudo firewall-cmd --permanent
--add-forward-port=port=20:proto=tcp:toport=20:toaddr=10.25.21.151
--add-forward-port=port=21:proto=tcp:toport=21:toaddr=10.25.21.151

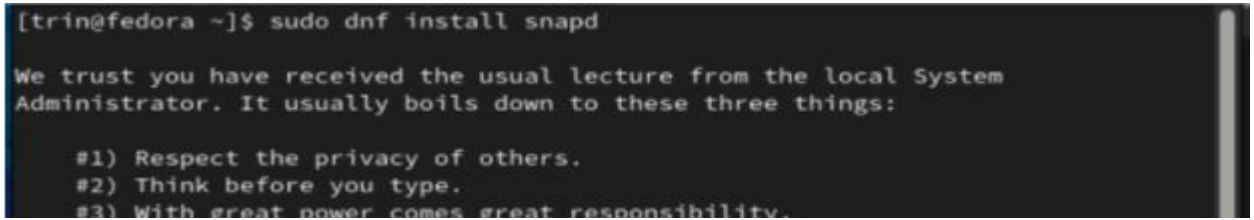
FTP Access

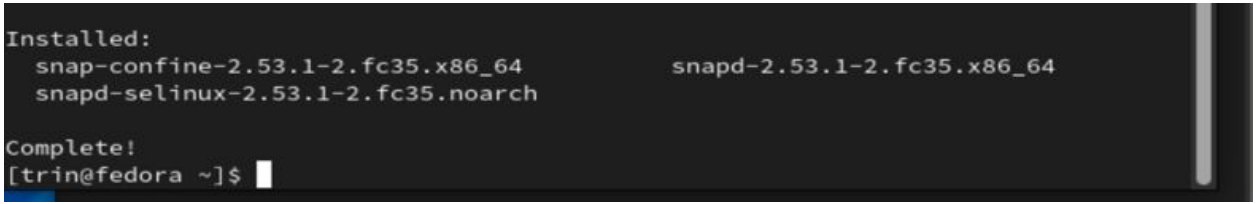

ftp-user@192.168.1.29 - FileZilla
File Edit View Transfer Server Bookmarks Help
Host: 192.168.1.29 Username: ftp-user Password: •••••• Port: Quickconnect
Status: Connecting to 192.168.1.29:21...
Status: Connection established, waiting for welcome message...
Status: Insecure server, it does not support FTP over TLS.
Status: Logged in
Status: Retrieving directory listing...
Status: Directory listing of "/" successful
Status: Retrieving directory listing of "/var"...
Status: Directory listing of "/var" successful
Status: Retrieving directory listing of "/var/www"...
Status: Directory listing of "/var/www" successful
Status: Retrieving directory listing of "/var/www/html"...
Status: Directory listing of "/var/www/html" successful
Local site: C:\Users\
ProgramData
Python39
Recovery
Ruby27-x64
SDRV
System Volume Information
temp
tmp
Users
Administrator
All Users
Remote site: /var/www/html
mail
nis
opt
preserve
run
spool
tmp
www
cgi-bin
html
yp
Filename Filesize Filetype Last modified
.. Administrator File folder 2/23/2021 9:05:38 ...
All Users File folder 9/8/2021 12:46:55 ...
Default File folder 2/23/2021 9:06:45 ...
Default User File folder 2/23/2021 9:06:45 ...
Filename Filesize Filetype Last modified Permissions Owner/Group
..
Empty directory listing

Thunderbird

Install ThunderBird container

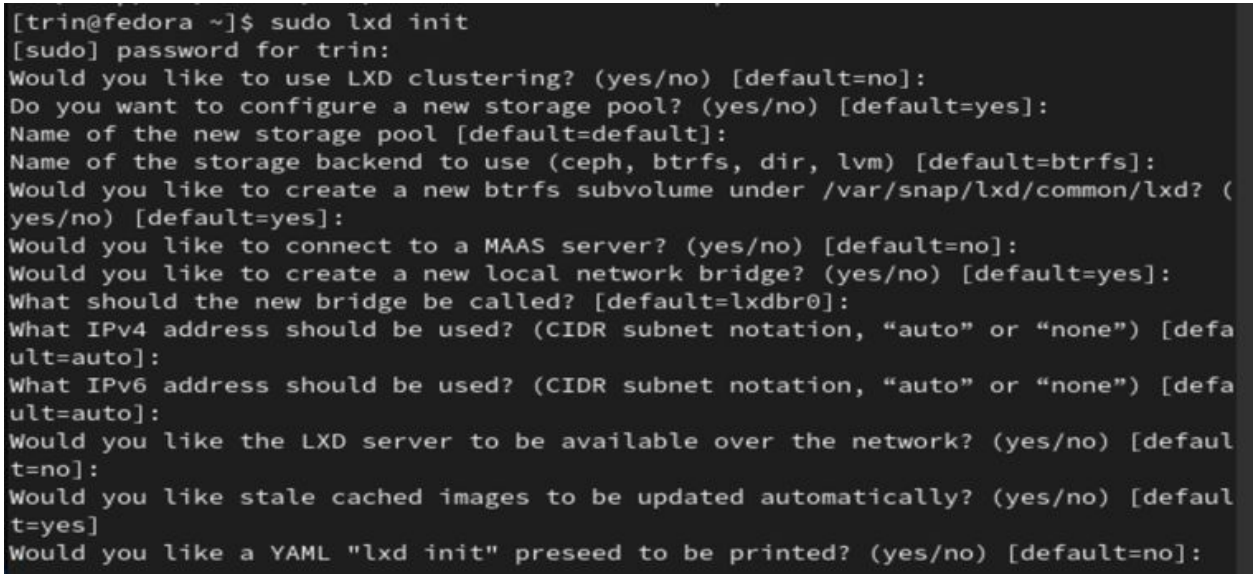
1. sudo dnf install snapd
   - Install *snapd* packaging/deployment tool onto newly built Fedora 35 workstation
2. Verify all *snapd* packages have downloaded and installed





Install/run basic configuration for LXD

- Install/run basic configuration for LXD



Create new ‘Thunderbird’ container using Fedora 35 image

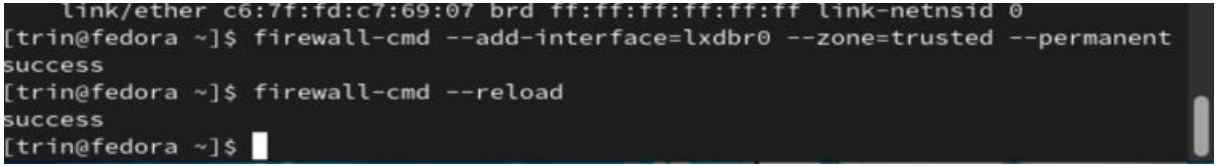
- ‘Voilá’! Thunderbird container

```
[trin@fedora ~]$ sudo lxc launch images:fedora/35/amd64 thunderbird
Creating thunderbird
Starting thunderbird
[trin@fedora ~]$ lxd list
```

```
[trin@fedora ~]$ sudo lxc list
+-------------+---------+------+-----------------------------------------------+
-----------+-----------+
|     NAME      |  STATE  | IPV4 |                     IPV6                      |
   TYPE    | SNAPSHOTS |
+-------------+---------+------+-----------------------------------------------+
-----------+-----------+
| thunderbird | RUNNING |      | fd42:ba40:2e8e:8898:216:3eff:fe6b:774a (eth0) |
 CONTAINER | 0         |
+-------------+---------+------+-----------------------------------------------+
-----------+-----------+
[trin@fedora ~]$
```

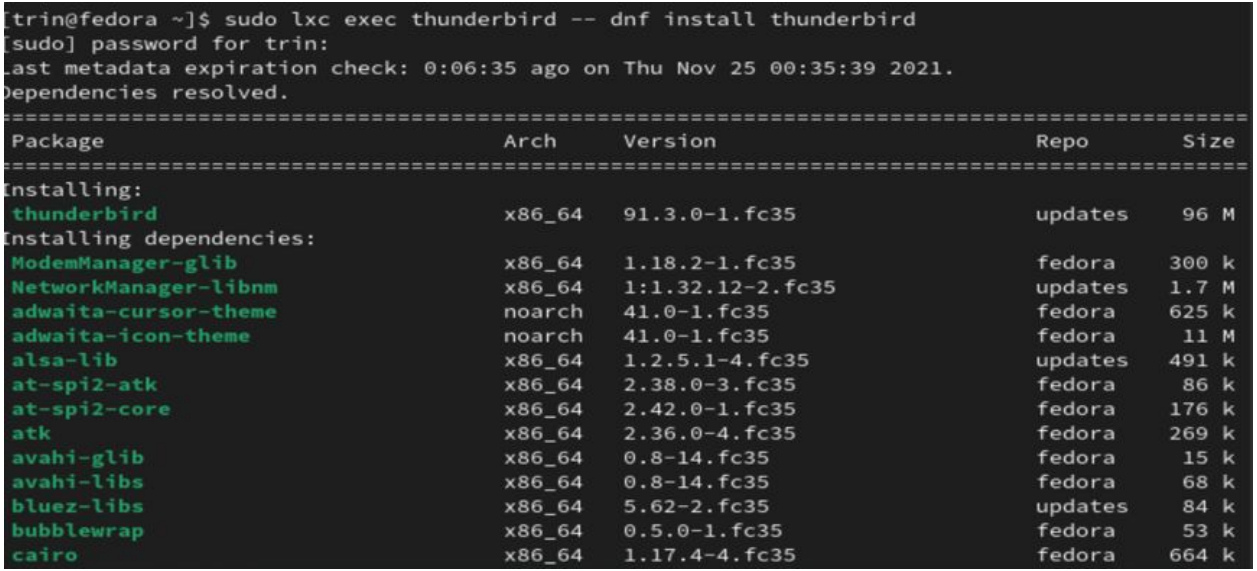
Disable and restart firewall

- Disable and restart firewall



Install Thunderbird app within ‘Thunderbird’ container

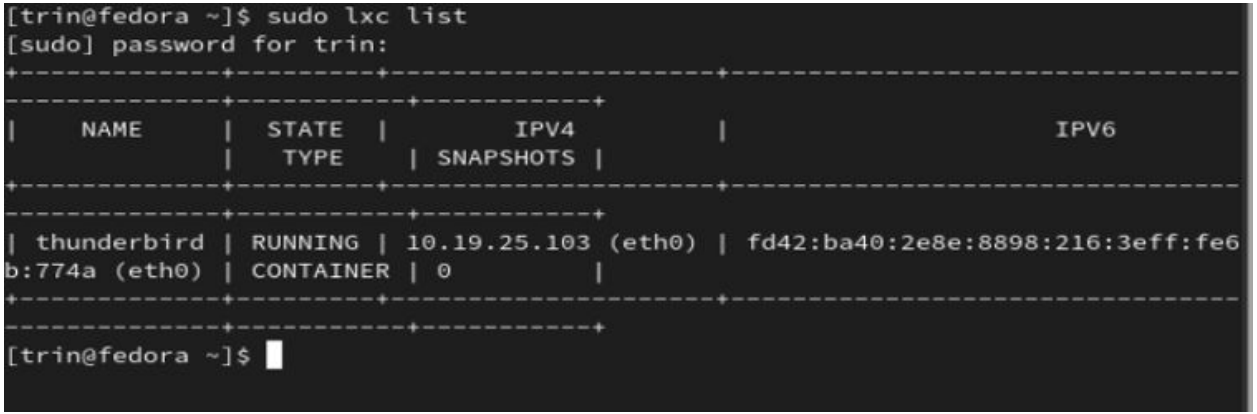
- sudo lxc exec thunderbird -- dnf install thunderbird



```
[trin@fedora ~]$ sudo lxc exec thunderbird -- dnf install thunderbird
[sudo] password for trin:
Last metadata expiration check: 0:06:35 ago on Thu Nov 25 00:35:39 2021.
Dependencies resolved.
================================================================================
 Package                    Arch      Version                  Repo        Size
================================================================================
Installing:
 thunderbird                x86_64    91.3.0-1.fc35            updates     96 M
Installing dependencies:
 ModemManager-glib          x86_64    1.18.2-1.fc35            fedora     300 k
 NetworkManager-libnm       x86_64    1:1.32.12-2.fc35         updates    1.7 M
 adwaita-cursor-theme       noarch    41.0-1.fc35              fedora     625 k
 adwaita-icon-theme         noarch    41.0-1.fc35              fedora      11 M
 alsa-lib                   x86_64    1.2.5.1-4.fc35           updates    491 k
 at-spi2-atk                x86_64    2.38.0-3.fc35            fedora      86 k
 at-spi2-core               x86_64    2.42.0-1.fc35            fedora     176 k
 atk                        x86_64    2.36.0-4.fc35            fedora     269 k
 avahi-glib                 x86_64    0.8-14.fc35              fedora      15 k
 avahi-libs                 x86_64    0.8-14.fc35              fedora      68 k
 bluez-libs                 x86_64    5.62-2.fc35              updates     84 k
 bubblewrap                 x86_64    0.5.0-1.fc35             fedora      53 k
 cairo                      x86_64    1.17.4-4.fc35            fedora     664 k
```

Re-verify status of Thunderbird container within LXD

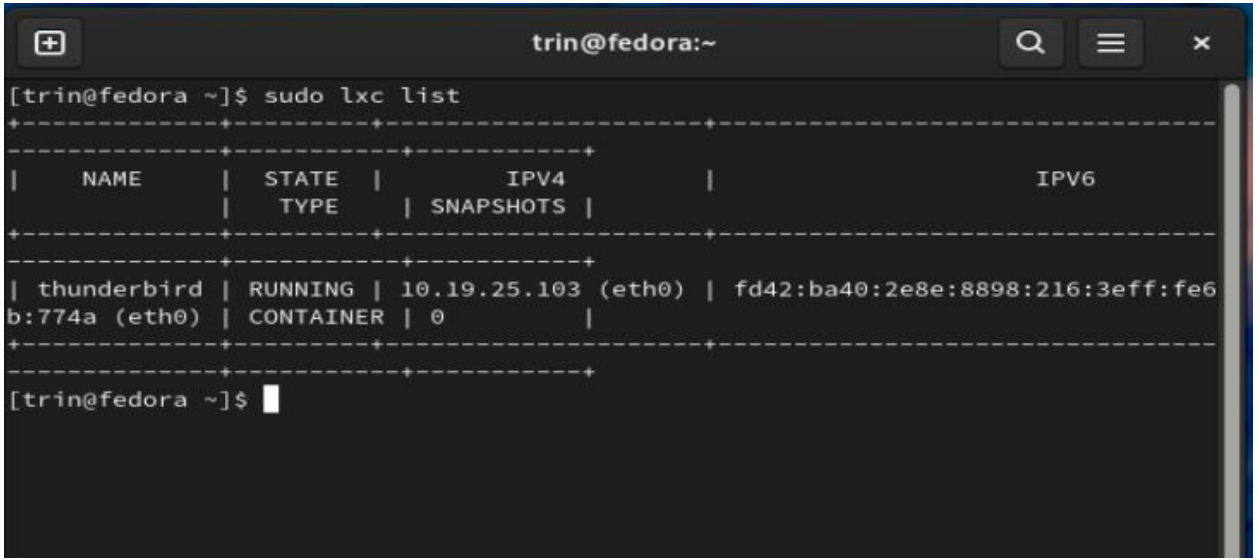
- Thunderbird container now up and running



Word processor

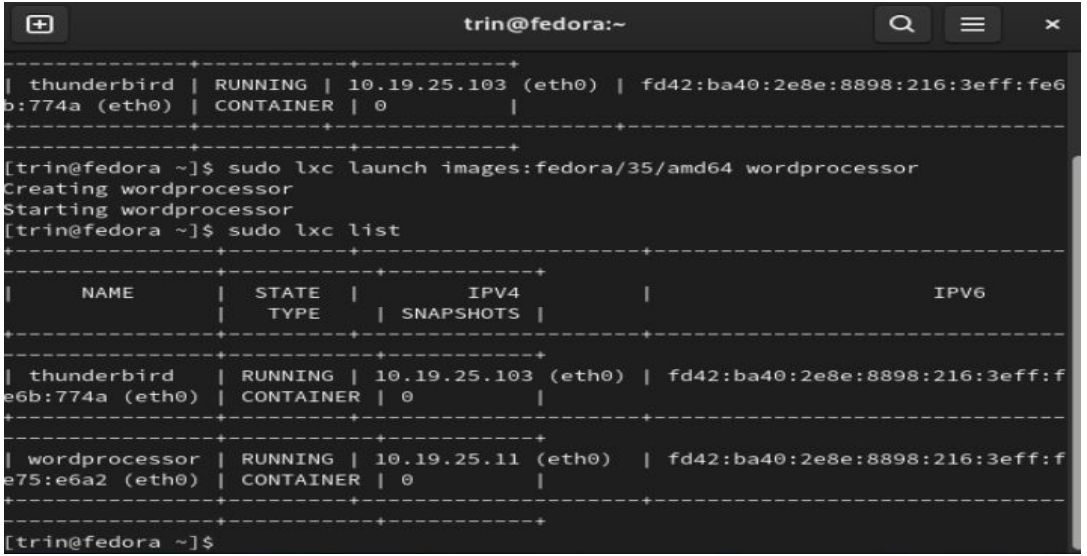
Verify LXC container list

- Show existing LXC container list
- LXD already installed



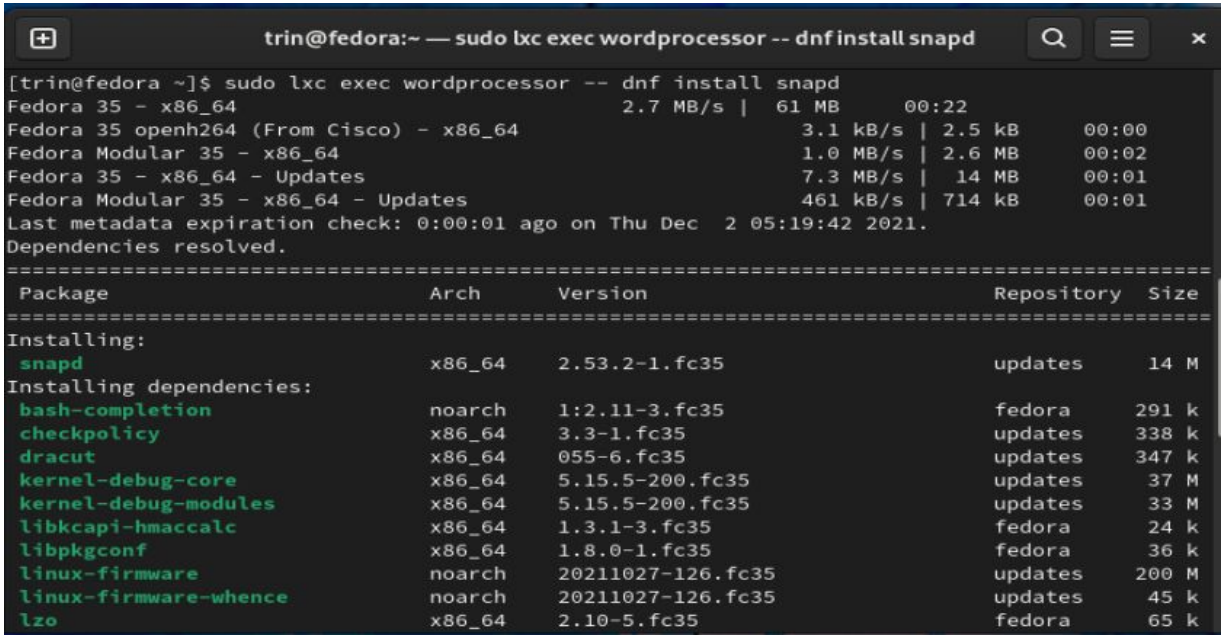
Create new container named ‘wordprocessor’

- sudo lxc launch images:fedora/35/amd64 wordprocessor
- Verify new container is built (sudo lxc list)



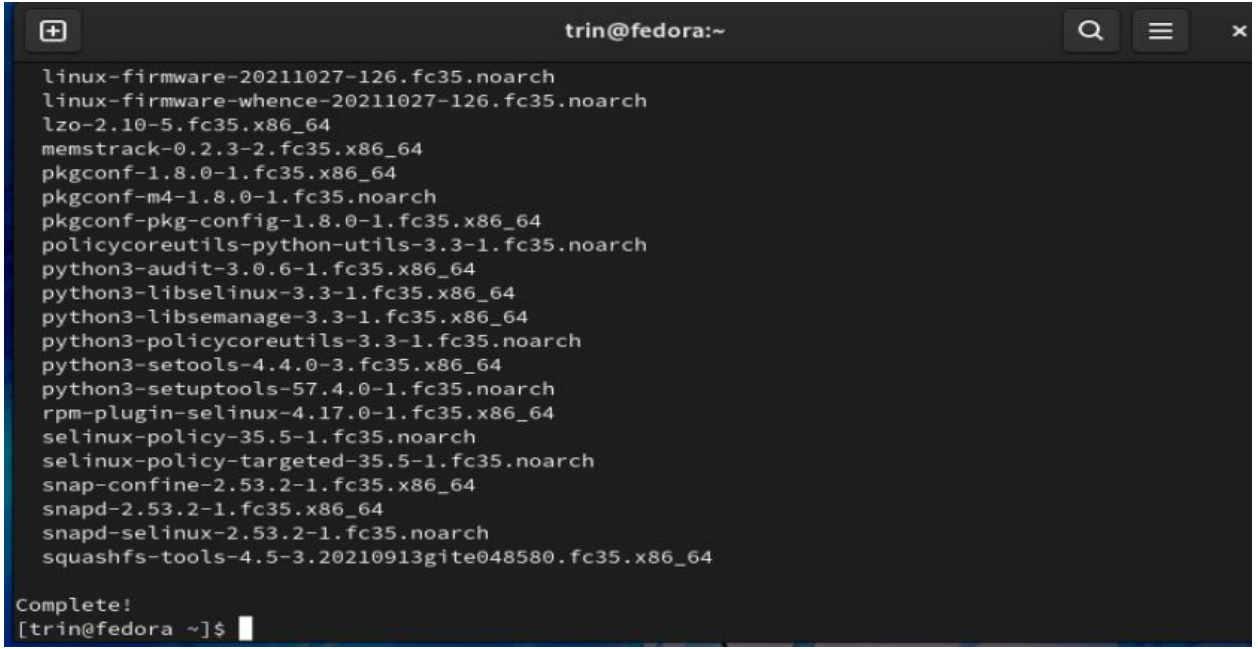
Install snapd into container

- Install snapd into container named “wordprocessor”:



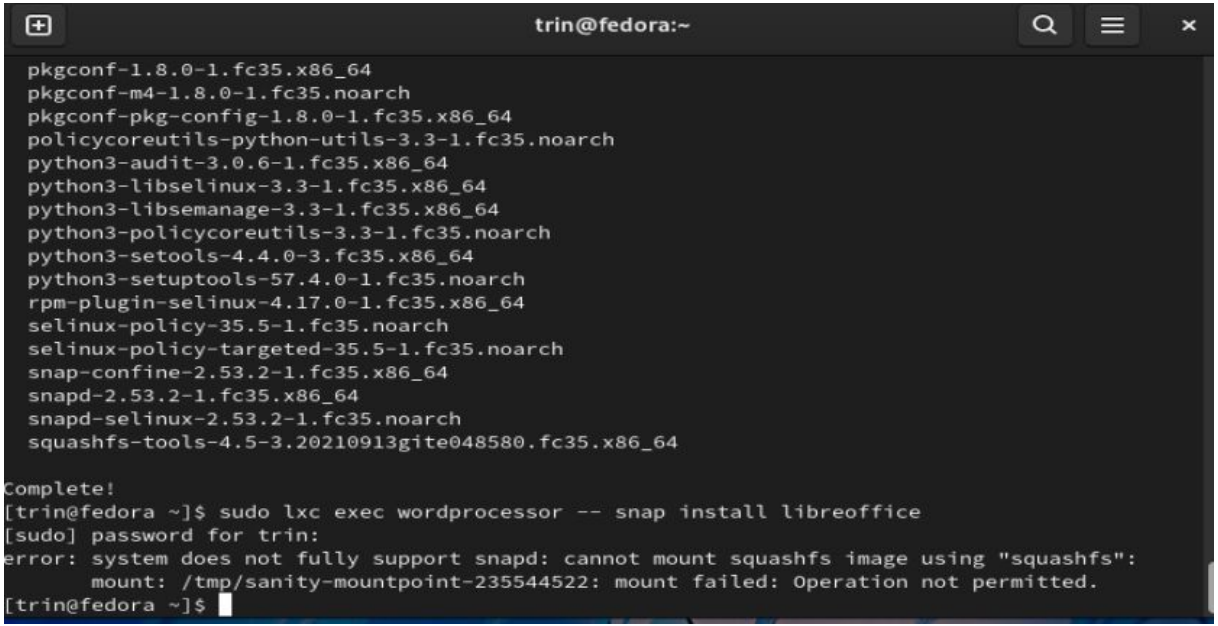
Verify snapd install is complete

- Verify snapd install is completed:



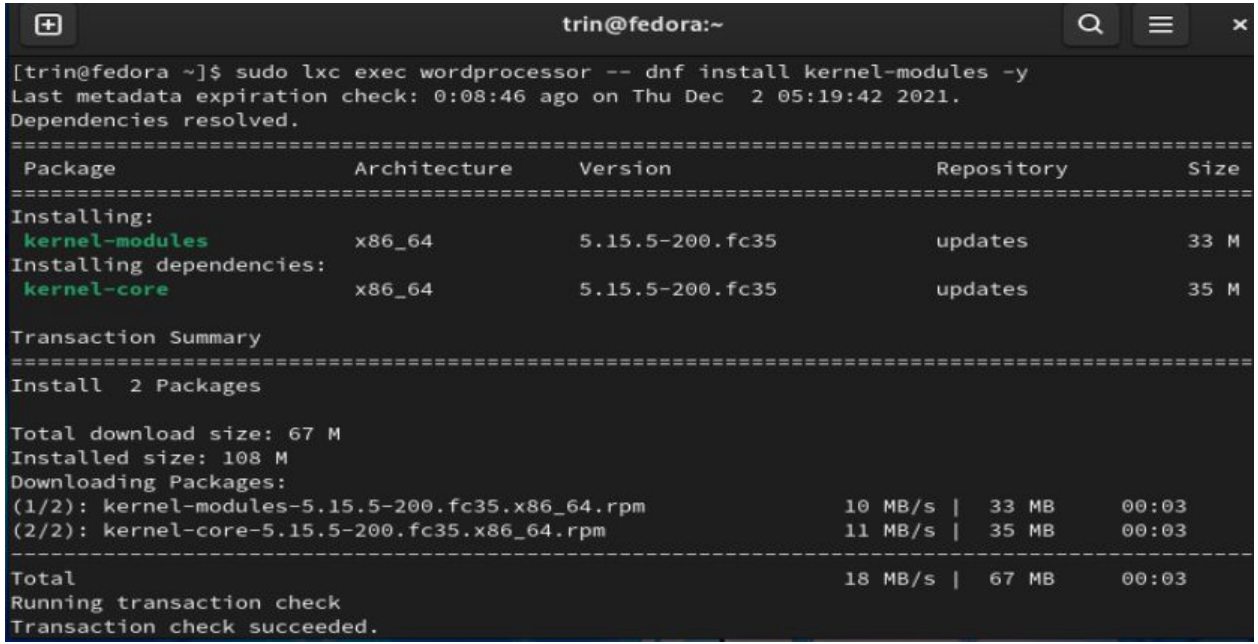
Install LibreOffice

- Attempt to install LibreOffice; encountered ‘squashfs’ error



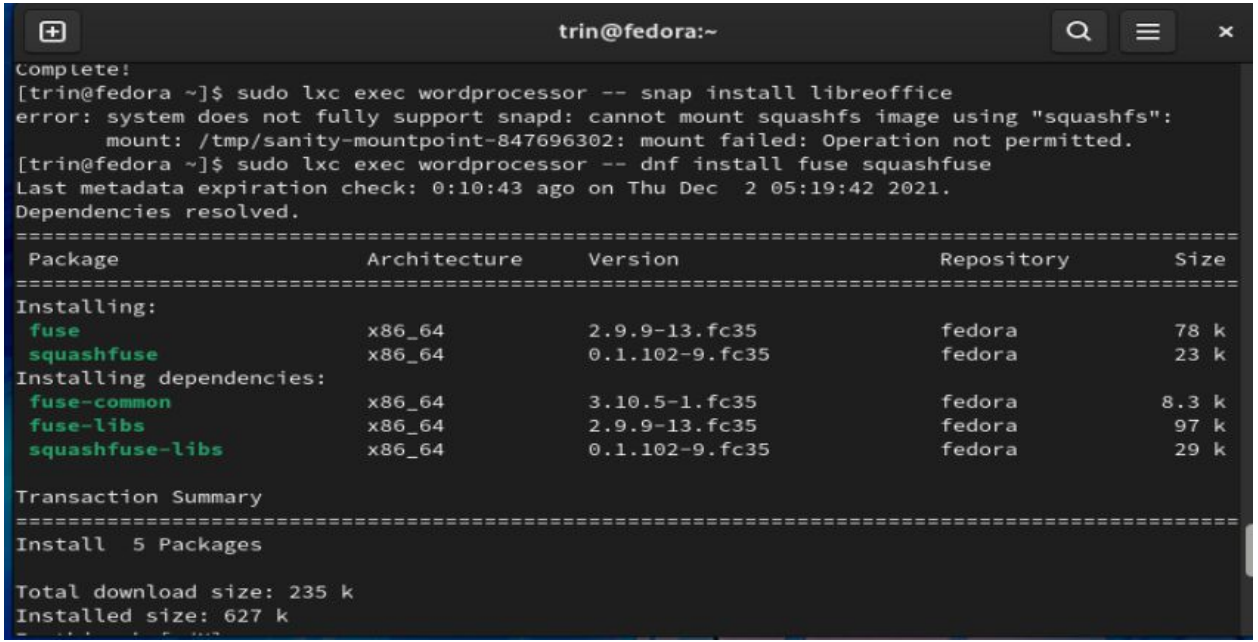
Install kernel modules

- Install kernel modules into ‘Wordprocessor’ module to fix ‘squashfs’ error:



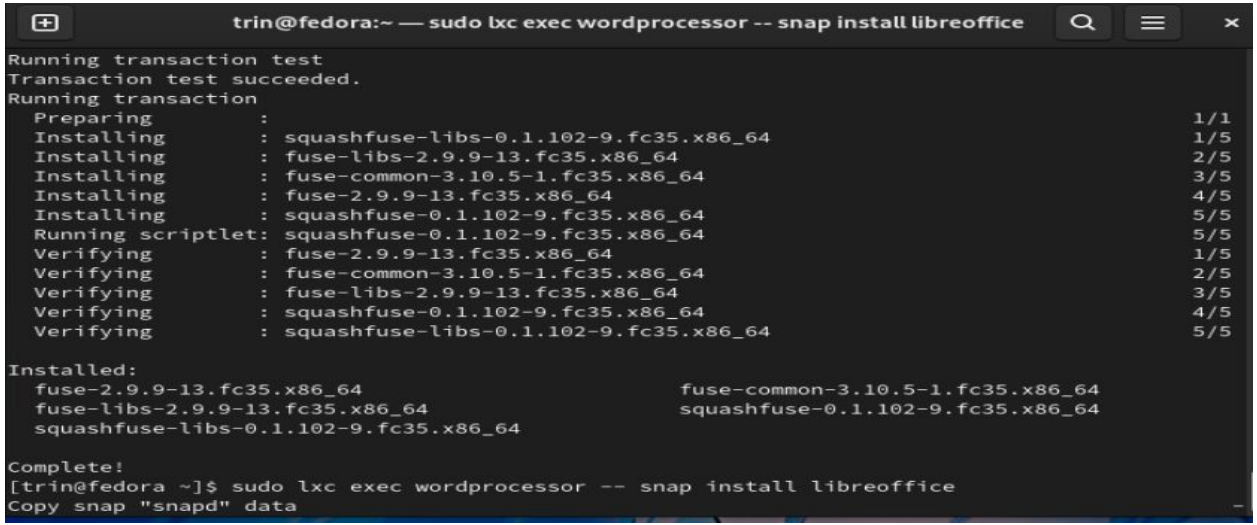
Fix ‘squashfs’ error encountered during snapd install

- Install squashfuse to fix ‘squashfs’ error encountered during snapd install:



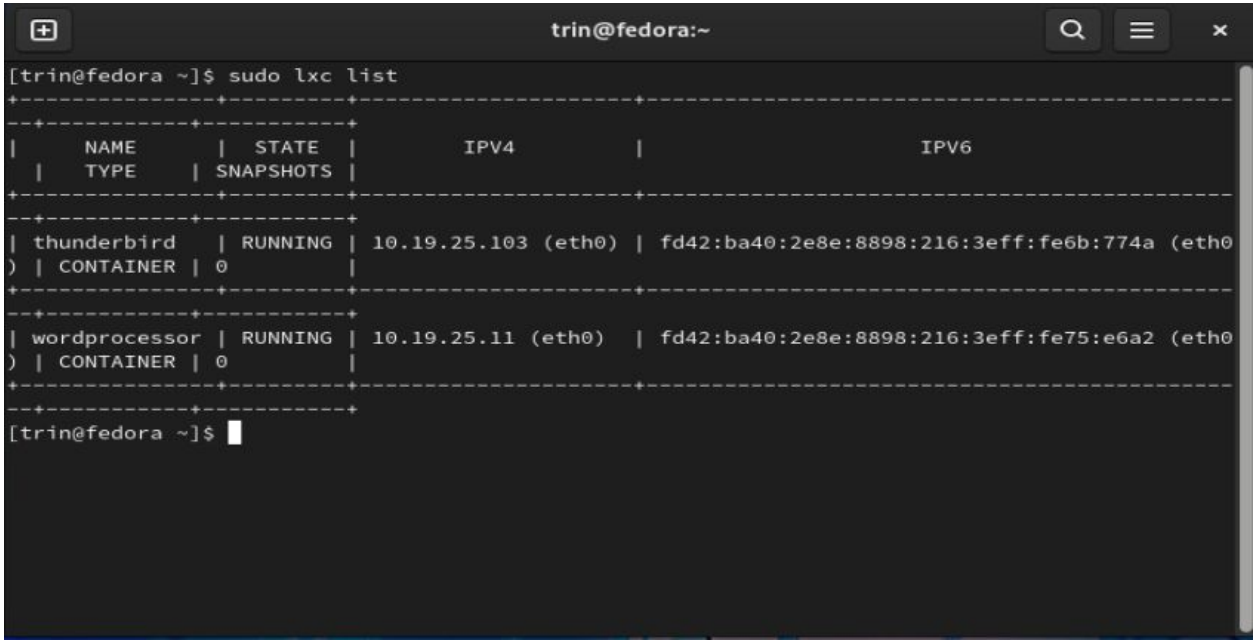
Install LibreOffice

- Install LibreOffice into container named ‘wordprocessor’
- sudo lxc exec wordprocessor -- snap install libreoffice



list of running containers

- Re-verify list of running containers:



Summary

Servers are a multi-directional and multi-configurable IT device. When planning for the use of a server, one of the first questions include what type or service does this server need to fulfill? There are multiple ways and configurations available to set up a server. Is this server going to be used for email, storage, remote access or something else? Will it be used for different purposes? This project is just one of the many different configurations that can be used on a server. The Left Team's server has been set up to transfer data using FTP. Apache has been installed and configured to be able to access the server from a workstation. We have created this server to be able to take advantage of container software. There are two container images on this server, an email program, Thunderbird in one container and a word processor, Libre Word in the other container.