

Linux Server Documentation

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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.

Although a system can consist of multiple workstations and multiple servers, it is more common to find more workstations than servers. This project is composed of 2 Linux systems: a workstation and a virtualized server. Both systems are using the latest Fedora 35 operating system along with taking advantage of the containerized software, Linux Containers. In addition, we are using VM Oracle to virtualize the workstation and server. This allows users to take the image of our systems and replicate them in their personal devices.

Because workstations usually contain a minimal amount of memory and rely upon servers for applications, storage and processing, it is common to keep some applications local. The client workstation has two containers. The first container is an email program, Thunderbird, and the second container is a word processor, Libre Word.

In the server, there are also 2 containers. The first container has Samba installed so a Windows client can access the server files. A user called "smb-user" was added to both the container and the Samba user list in order to access these files with a secure password. The shared Samba folder also contains this documentation. The second container has an Apache web server installed in order to create a group web page about this project. This second container also includes FTP to allow data transfer. The user "ftp-user" was created with a secure password and configured to the vsftp user list. Firewalls are configured to open all Samba, Apache and FTP ports. In addition, the firewall is configured to allow port forward requests to the appropriate container IP-address. Hence users outside this server can access applications within the container.

Our process has been a learning experience. We have encountered errors such as incorrectly configuring Linux Containers and learning to port forward using the firewall command. We were expecting certain results while following explicit directions. Unfortunately, IT devices only do what they are told. Any error, minute or large, can cause system failure but is still a lesson. On the other hand, success contains experience, support and teamwork

Client Workstation

Word Processor

1. lxc list
 - show existing list of containers already installed on workstation

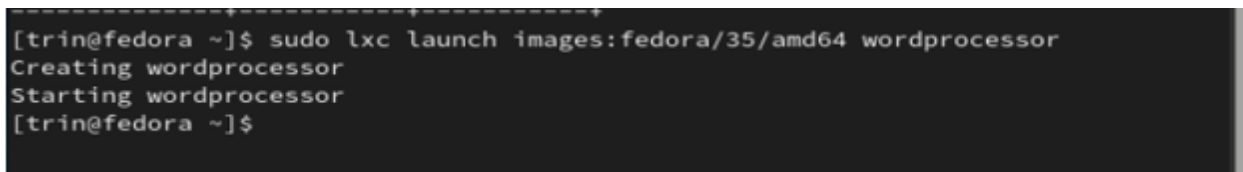


```
[trin@fedora ~]$ sudo lxc list
```

NAME	STATE	TYPE	IPV4	SNAPSHOTS	IPV6
thunderbird	RUNNING	CONTAINER	10.19.25.103 (eth0)	0	fd42:ba40:2e8e:8898:216:3eff:fe6b:774a (eth0)

```
[trin@fedora ~]$
```

2. sudo lxc launch images:fedora/35/amd64 wordprocessor
 - create new LXC container named 'wordprocessor'; LXD already installed with Thunderbird install



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

3. sudo lxc launch images:fedora/35/amd64 wordprocessor
 - Verify new container named 'wordprocessor' is built

```
[trin@fedora ~]$ sudo lxc list
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 |
|-----+-----+-----+-----+
| | | | |
+-----+-----+-----+-----+
| thunderbird | RUNNING | 10.19.25.103 (eth0) | fd42:ba40:2e8e:8898:216:3eff:f  
e6b:774a (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+
| wordprocessor | RUNNING | 10.19.25.11 (eth0) | fd42:ba40:2e8e:8898:216:3eff:f  
e75:e6a2 (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+
[trin@fedora ~]$
```

4. `sudo lxc exec wordprocessor -- dnf install snapd`
 - Install snapd into new container
 - Snap is a packaging/deployment system that utilizes the *snapd* tool

```
[trin@fedora ~]$ sudo lxc exec wordprocessor -- dnf install snapd
Fedora 35 - x86_64 2.7 MB/s | 61 MB 00:22
Fedora 35 openh264 (From Cisco) - x86_64 3.1 kB/s | 2.5 kB 00:00
Fedora Modular 35 - x86_64 1.0 MB/s | 2.6 MB 00:02
Fedora 35 - x86_64 - Updates 7.3 MB/s | 14 MB 00:01
Fedora Modular 35 - x86_64 - Updates 461 kB/s | 714 kB 00:01
Last metadata expiration check: 0:00:01 ago on Thu Dec 2 05:19:42 2021.
Dependencies resolved.
=====
Package Arch Version Repository Size
=====
Installing:
snapd x86_64 2.53.2-1.fc35 updates 14 M
Installing dependencies:
bash-completion noarch 1:2.11-3.fc35 fedora 291 k
checkpolicy x86_64 3.3-1.fc35 updates 338 k
dracut x86_64 055-6.fc35 updates 347 k
kernel-debug-core x86_64 5.15.5-200.fc35 updates 37 M
kernel-debug-modules x86_64 5.15.5-200.fc35 updates 33 M
libkcapi-hmacalc x86_64 1.3.1-3.fc35 fedora 24 k
libpkgconf x86_64 1.8.0-1.fc35 fedora 36 k
linux-firmware noarch 20211027-126.fc35 updates 200 M
linux-firmware-whence noarch 20211027-126.fc35 updates 45 k
lzo x86_64 2.10-5.fc35 fedora 65 k
```

5. Verify *snapd* install is completed

```
selinux-policy-35.5-1.fc35.noarch
selinux-policy-targeted-35.5-1.fc35.noarch
snap-confine-2.53.2-1.fc35.x86_64
snapd-2.53.2-1.fc35.x86_64
snapd-selinux-2.53.2-1.fc35.noarch
squashfs-tools-4.5-3.20210913gite048580.fc35.x86_64

Complete!
[trin@fedora ~]$
```

6. `sudo lxc exec wordprocessor -- snap install libreoffice`
 - Attempted to install LibreOffice application, but received 'squashfs' error

```
Complete!
[trin@fedora ~]$ sudo lxc exec wordprocessor -- snap install libreoffice
[sudo] password for trin:
error: system does not fully support snapd: cannot mount squashfs image using "squashfs":
       mount: /tmp/sanity-mountpoint-235544522: mount failed: Operation not permitted.
[trin@fedora ~]$
```

7. `sudo lxc exec wordprocessor -- dnf install kernel-modules -y`
 - Install kernel modules into 'wordprocessor' module to fix 'squashfs' error

```
[trin@fedora ~]$ sudo lxc exec wordprocessor -- dnf install kernel-modules -y
Last metadata expiration check: 0:08:46 ago on Thu Dec  2 05:19:42 2021.
Dependencies resolved.
=====
Package                        Architecture      Version           Repository        Size
=====
Installing:
kernel-modules                 x86_64            5.15.5-200.fc35   updates           33 M
Installing dependencies:
kernel-core                    x86_64            5.15.5-200.fc35   updates           35 M
=====
Transaction Summary
=====
Install 2 Packages
```

8. `sudo lxc exec wordprocessor -- dnf install fuse squashfuse`
 - Install *squashfuse* to fix 'squashfs' error encountered during snapd install:
 - *squashfuse* is used to mount the SquashFS filesystem archive on the directory mountpoint

```
       mount: /tmp/sanity-mountpoint-847696302: mount failed: Operation not permitted.
[trin@fedora ~]$ sudo lxc exec wordprocessor -- dnf install fuse squashfuse
Last metadata expiration check: 0:10:43 ago on Thu Dec  2 05:19:42 2021.
Dependencies resolved.
=====
Package                        Architecture      Version           Repository        Size
=====
Installing:
fuse                           x86_64            2.9.9-13.fc35     fedora            78 k
squashfuse                     x86_64            0.1.102-9.fc35    fedora            23 k
Installing dependencies:
fuse-common                    x86_64            3.10.5-1.fc35     fedora            8.3 k
fuse-libs                      x86_64            2.9.9-13.fc35     fedora            97 k
squashfuse-libs                x86_64            0.1.102-9.fc35    fedora            29 k
=====
Transaction Summary
```

9. `sudo lxc exec wordprocessor -- snap install libreoffice`
 - re-attempt to install the LibreOffice program

```
Installed:
fuse-2.9.9-13.fc35.x86_64          fuse-common-3.10.5-1.fc35.x86_64
fuse-libs-2.9.9-13.fc35.x86_64    squashfuse-0.1.102-9.fc35.x86_64
squashfuse-libs-0.1.102-9.fc35.x86_64

Complete!
[trin@fedora ~]$ sudo lxc exec wordprocessor -- snap install libreoffice
Copy snap "snapd" data
```

10. sudo lxc list

- Re-verify list of running containers

```
[trin@fedora ~]$ sudo lxc list
```

NAME	STATE	IPV4	IPV6
TYPE	SNAPSHOTS		
thunderbird	RUNNING	10.19.25.103 (eth0)	fd42:ba40:2e8e:8898:216:3eff:fe6b:774a (eth0)
CONTAINER	0		
wordprocessor	RUNNING	10.19.25.11 (eth0)	fd42:ba40:2e8e:8898:216:3eff:fe75:e6a2 (eth0)
CONTAINER	0		

Thunderbird email client

1. sudo dnf install snapd

- Install *snapd* packaging/deployment tool onto newly built Fedora 35 workstation

```
[trin@fedora ~]$ sudo dnf install snapd
```

We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:

- #1) Respect the privacy of others.
- #2) Think before you type.
- #3) With great power comes great responsibility.

[sudo] password for trin:

Copr repo for PyCharm owned by phracek	214 kB/s 194 kB	00:00
Fedora 35 - x86_64	5.7 MB/s 61 MB	00:10
Fedora 35 openh264 (From Cisco) - x86_64	3.5 kB/s 2.5 kB	00:00
Fedora Modular 35 - x86_64	1.5 MB/s 2.6 MB	00:01
Fedora 35 - x86_64 - Updates	4.3 MB/s 13 MB	00:03
Fedora Modular 35 - x86_64 - Updates	382 kB/s 715 kB	00:01
google-chrome	28 kB/s 3.5 kB	00:00
RPM Fusion for Fedora 35 - Nonfree - NVIDIA Dri	17 kB/s 14 kB	00:00
RPM Fusion for Fedora 35 - Nonfree - Steam	3.8 kB/s 2.1 kB	00:00

Last metadata expiration check: 0:00:01 ago on Wed 24 Nov 2021 03:26:15 PM PST.

2. Verify all *snapd* packages have downloaded and installed

```
Installed:
  snap-confine-2.53.1-2.fc35.x86_64          snapd-2.53.1-2.fc35.x86_64
  snapd-selinux-2.53.1-2.fc35.noarch

Complete!
[trin@fedora ~]$
```

3. `sudo ln -s /var/lib/snapd/snap /snap`
 - Install and enable classic *snapd* support and create symbolic link

```
Installed:
  snap-confine-2.53.1-2.fc35.x86_64      snapd-2.53.1-2.fc35.x86_64
  snapd-selinux-2.53.1-2.fc35.noarch

Complete!
[trin@fedora ~]$ sudo ln -s /var/lib/snapd/snap /snap
[sudo] password for trin:
[trin@fedora ~]$
```

4. `sudo snap install lxd`
 - Install LXD container system onto Fedora 35 workstation

```
[trin@fedora ~]$ sudo snap install lxd
[sudo] password for trin:
2021-11-24T15:41:45-08:00 INFO Waiting for automatic snapd restart...
lxd 4.20 from Canonical✓ installed
[trin@fedora ~]$
```

5. `sudo lxc init`
 - Run basic LXC configuration and start interactive configuration process

```
[trin@fedora ~]$ sudo lxd init
[sudo] password for trin:
Would you like to use LXD clustering? (yes/no) [default=no]:
Do you want to configure a new storage pool? (yes/no) [default=yes]:
Name of the new storage pool [default=default]:
Name of the storage backend to use (ceph, btrfs, dir, lvm) [default=btrfs]:
Would you like to create a new btrfs subvolume under /var/snap/lxd/common/lxd? (yes/no) [default=yes]:
Would you like to connect to a MAAS server? (yes/no) [default=no]:
Would you like to create a new local network bridge? (yes/no) [default=yes]:
What should the new bridge be called? [default=lxdbr0]:
What IPv4 address should be used? (CIDR subnet notation, "auto" or "none") [default=auto]:
What IPv6 address should be used? (CIDR subnet notation, "auto" or "none") [default=auto]:
Would you like the LXD server to be available over the network? (yes/no) [default=no]:
Would you like stale cached images to be updated automatically? (yes/no) [default=yes]:
Would you like a YAML "lxd init" preseed to be printed? (yes/no) [default=no]:
```

6. `lxc launch images:fedora/35/amd64 thunderbird`
 - Launch new container using Fedora 35 image and name new container 'thunderbird'

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

7. `sudo lxc list`
 - Show container list, now displaying newly-created 'thunderbird' container

```
ket: connect: permission denied
[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 ~]$
```

8. `firewall-cmd --add-interface=lxdbr0 --zone=trusted --permanent; firewall-cmd --reload`
 - modify & restart firewall settings to enable internet access for containers

```
link/ether c6:7f:fd:c7:69:07 brd ff:ff:ff:ff:ff:ff link-netnsid 0
[trin@fedora ~]$ firewall-cmd --add-interface=lxdbr0 --zone=trusted --permanent
success
[trin@fedora ~]$ firewall-cmd --reload
success
[trin@fedora ~]$
```

9. `sudo lxc exec thunderbird -- dnf install snapd`
 - Install *snapd* packaging/deployment tool into 'thunderbird' container


```
[trin@fedora ~]$ sudo lxc exec thunderbird -- dnf install snapd
Fedora 35 - x86_64 6.6 MB/s | 61 MB 00:09
Fedora 35 openh264 (From Cisco) - x86_64 2.0 kB/s | 2.5 kB 00:01
Fedora Modular 35 - x86_64 1.9 MB/s | 2.6 MB 00:01
Fedora 35 - x86_64 - Updates 4.3 MB/s | 13 MB 00:03
Fedora Modular 35 - x86_64 - Updates 522 kB/s | 718 kB 00:01
Dependencies resolved.
=====
Package Arch Version Repo Size
=====
Installing:
snapd x86_64 2.53.1-2.fc35 updates 14 M
Installing dependencies:
bash-completion noarch 1:2.11-3.fc35 fedora 291 k
checkpolicy x86_64 3.3-1.fc35 updates 338 k
dracut x86_64 055-6.fc35 updates 347 k
kernel-debug-core x86_64 5.14.18-300.fc35 updates 37 M
kernel-debug-modules x86_64 5.14.18-300.fc35 updates 33 M
libkcapi-hmaccalc x86_64 1.3.1-3.fc35 fedora 24 k
libpkgconf x86_64 1.8.0-1.fc35 fedora 36 k
linux-firmware noarch 20211027-126.fc35 updates 200 M
linux-firmware-whence noarch 20211027-126.fc35 updates 45 k
lzo x86_64 2.10-5.fc35 fedora 65 k
pkgconf x86_64 1.8.0-1.fc35 fedora 41 k
```

10. `sudo lxc exec thunderbird -- sudo ln -s /var/lib/snapd/snap /snap`
- Install and enable classic *snapd* support and create symbolic link within container

```
snapd-selinux-2.53.1-2.fc35.noarch
squashfs-tools-4.5-3.20210913gite048580.fc35.x86_64

Complete!
[trin@fedora ~]$ sudo lxc exec thunderbird -- sudo ln -s /var/lib/snapd/snap /snap
[trin@fedora ~]$
```

11. `sudo lxc exec thunderbird -- dnf install kernel-modules -y`
- Install kernel modules into 'thunderbird' module to fix 'squashfs' error encountered during snapd installation


```
[trin@fedora ~]$ sudo lxc exec thunderbird -- dnf install kernel-modules -y
Last metadata expiration check: 0:11:05 ago on Thu Nov 25 00:01:43 2021.
Dependencies resolved.
=====
Package                Architecture Version                Repository            Size
=====
Installing:
kernel-modules          x86_64          5.14.18-300.fc35      updates              32 M
Installing dependencies:
kernel-core             x86_64          5.14.18-300.fc35      updates              35 M

Transaction Summary
=====
Install 2 Packages

Total download size: 67 M
Installed size: 107 M
Downloading Packages:
(1/2): kernel-modules-5.14.18-300.fc35.x86_64.r 4.0 MB/s | 32 MB    00:08
(2/2): kernel-core-5.14.18-300.fc35.x86_64.rpm 4.3 MB/s | 35 MB    00:08
-----
Total                                7.1 MB/s | 67 MB    00:09
Running transaction check
Transaction check succeeded.
```

12. `sudo lxc exec thunderbird -- sudo dnf install fuse squashfuse`

- Install *squashfuse* to fix 'squashfs' error encountered during *snapped* install:
- *squashfuse* is used to mount the SquashFS filesystem archive on the directory mountpoint

```
error: system does not fully support snapd: cannot mount squashfs image using
"squashfs": mount: /tmp/sanity-mountpoint-536841405: mount failed:
Operation not permitted.
[trin@fedora ~]$ sudo lxc exec thunderbird -- sudo dnf install fuse squashfuse
Last metadata expiration check: 0:29:19 ago on Thu Nov 25 00:01:43 2021.
Dependencies resolved.
=====
Package                Architecture Version                Repository            Size
=====
Installing:
fuse                   x86_64          2.9.9-13.fc35         fedora                78 k
squashfuse             x86_64          0.1.102-9.fc35        fedora                23 k
Installing dependencies:
fuse-common            x86_64          3.10.5-1.fc35         fedora                8.3 k
fuse-libs              x86_64          2.9.9-13.fc35         fedora                97 k
squashfuse-libs        x86_64          0.1.102-9.fc35        fedora                29 k
```

13. `sudo lxc exec thunderbird -- dnf install thunderbird`

- *snapped* issues persisted; resorted to installing full thunderbird app package without using *snapped*

```
[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
=====
```

14. sudo lxc list

- Re-verify status of 'thunderbird' container after app installation

```
[trin@fedora ~]$ sudo lxc list
[sudo] password for trin:
+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 |
| TYPE | SNAPSHOTS | | |
+-----+-----+-----+-----+
| thunderbird | RUNNING | 10.19.25.103 (eth0) | fd42:ba40:2e8e:8898:216:3eff:fe6b:774a (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+
[trin@fedora ~]$
```

Server

Linux Containers (LXD/LXD)

1. `sudo dnf install snapd -y`

- Snapd makes installation much easier. For more information on snap, please visit: <https://snapcraft.io/docs/installing-snap-on-fedora>

```
Upgraded:
  selinux-policy-35.5-1.fc35.noarch                selinux-policy-targeted-35.5-1.fc35.noarch
Installed:
  snap-confine-2.53.2-1.fc35.x86_64      snapd-2.53.2-1.fc35.x86_64      snapd-selinux-2.53.2-1.fc35.noarch
Complete!
[mc@fedora ~]$
```

2. `sudo systemctl restart snapd`

3. `sudo snap install lxd`

- LXD is a system container and virtual machine manager. For more information on Linux Containers: <https://linuxcontainers.org/lxd/introduction/>

```
[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 ~]$
```

4. `sudo snap start lxd`

5. `sudo usermod -aG lxd username`

- usermod command modifies the system account files. The -aG option adds the user to a specified group. syntax: `usermod -aG group username`

6. `newgrp lxd`

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

7. `lxd init`

- lxd init begins the interactive configuration process. Use the default setting for each question except for *Name of storage backend to use*: `"dir"`
- For more information on lxd init, visit <https://linuxcontainers.org/lxd/getting-started-cli/>

```
[mc@fedora ~]$ lxd init
Would you like to use LXD clustering? (yes/no) [default=no]:
Do you want to configure a new storage pool? (yes/no) [default=yes]:
Name of the new storage pool [default=default]:
Name of the storage backend to use (btrfs, dir, lvm, ceph) [default=btrfs]: dir
Would you like to connect to a MAAS server? (yes/no) [default=no]:
Would you like to create a new local network bridge? (yes/no) [default=yes]:
What should the new bridge be called? [default=lxdbr0]:
What IPv4 address should be used? (CIDR subnet notation, "auto" or "none") [default=auto]:
What IPv6 address should be used? (CIDR subnet notation, "auto" or "none") [default=auto]:
Would you like the LXD server to be available over the network? (yes/no) [default=no]:
Would you like stale cached images to be updated automatically? (yes/no) [default=yes]:
Would you like a YAML "lxd init" preseed to be printed? (yes/no) [default=no]:
[mc@fedora ~]$
```

8. lxc list (Test)

- This step is to test that lxc is working correct. The command `lxc list` will list all containers installed in the system.

```
[mc@fedora ~]$ lxc list
To start your first container, try: lxc launch ubuntu:20.04
Or for a virtual machine: lxc launch ubuntu:20.04 --vm

+-----+-----+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
[mc@fedora ~]$
```

9. lxc image alias list images: | grep -i fedora (Not required: Shows list of available images by alias)

10. sudo firewall-cmd --permanent --add-interface=lxdbr0 --zone=trusted

- This command adds internet access to the containers

11. 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
```

LXC Commands

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 Installation

1. lxc launch images:fedora/35/amd64 web

- This command will create a LXC container using a Fedora 35 image- “fedora/35/amd64”. The name of the container is “web”.
- Syntax: *lxc launch imageserver:imagename instancename*

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

- To check if the container was properly created run lxc list. This command will display all the containers running in your system and provide information about these containers.

```
[mc@fedora ~]$ lxc list
+-----+-----+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| web | RUNNING | 10.72.8.136 (eth0) | fd42:2437:380f:7413:216:3eff:fe42:cc33 (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+-----+-----+
```

2. lxc exec web -- bash

- Whenever you want to run a command for a container, one can use the syntax: *lxc exec instancename command*
- The above command will open up a bash shell for the web container.

```
[gl@fedora ~]$ lxc exec web -- bash
[root@web ~]#
```

3. sudo dnf install httpd -y

- Once inside the container, you can run commands as if you were outside the container
- This command- *sudo dnf install httpd -y*- will install Apache using dnf. The -y option automatically answers yes for all questions. *sudo* is optional if you are not working in root.
- For more information on using dnf , please visit:
https://dnf.readthedocs.io/en/latest/command_ref.html#install-command-label

- Once the installation is finished, you should see “Complete!” at the end.

```
Verifying : apr-1.7.0-14.fc35.x86_64 1/13
Verifying : apr-util-1.6.1-17.fc35.x86_64 2/13
Verifying : apr-util-bdb-1.6.1-17.fc35.x86_64 3/13
Verifying : apr-util-openssl-1.6.1-17.fc35.x86_64 4/13
Verifying : fontsfilesystem-1:2.0.5-6.fc35.noarch 5/13
Verifying : httpd-2.4.51-2.fc35.x86_64 6/13
Verifying : httpd-filesystem-2.4.51-2.fc35.noarch 7/13
Verifying : httpd-tools-2.4.51-2.fc35.x86_64 8/13
Verifying : mailcap-2.1.53-2.fc35.noarch 9/13
Verifying : mod_lua-2.4.51-2.fc35.x86_64 10/13
Verifying : fedora-logos-httpd-35.0.0-2.fc35.noarch 11/13
Verifying : julietaula-montserrat-fonts-1:7.222-1.fc35.noarch 12/13
Verifying : mod_http2-1.15.24-1.fc35.x86_64 13/13

Installed:
apr-1.7.0-14.fc35.x86_64          apr-util-1.6.1-17.fc35.x86_64
apr-util-bdb-1.6.1-17.fc35.x86_64  apr-util-openssl-1.6.1-17.fc35.x86_64
fedora-logos-httpd-35.0.0-2.fc35.noarch  fontsfilesystem-1:2.0.5-6.fc35.noarch
httpd-2.4.51-2.fc35.x86_64        httpd-filesystem-2.4.51-2.fc35.noarch
httpd-tools-2.4.51-2.fc35.x86_64  julietaula-montserrat-fonts-1:7.222-1.fc35.noarch
mailcap-2.1.53-2.fc35.noarch      mod_http2-1.15.24-1.fc35.x86_64
mod_lua-2.4.51-2.fc35.x86_64

Complete!
[root@web ~]#
[root@web ~]# _
```

4. systemctl enable httpd --now

- This command both starts and enables Apache. Systemctl is a command used to control the systemd system and service manager. Enabling Apache/httpd will hook Apache/httpd into relevant places so that it will automatically start on boot. The --now option combines start and enable into one command.

```
[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 ~]# _
```

- To confirm that Apache/httpd is active and running, use the following command:
 - `sudo systemctl status httpd`
- If everything is correct, you should see “active (running)”

```
[root@web ~]# sudo systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Drop-In: /run/systemd/system/service.d
            └─zzz-lxc-service.conf

   Active: active (running) since Sat 2021-11-27 19:41:16 UTC; 3min 26s ago
     Docs: man:httpd.service(8)
   Main PID: 305 (httpd)
   Status: "Total requests: 0; Idle/Busy workers 100/0; Requests/sec: 0; Bytes served/sec: 0 B/sec"

   Tasks: 177 (limit: 1103)
   Memory: 14.0M
   CPU: 242ms
   CGroup: /system.slice/httpd.service
           └─305 /usr/sbin/httpd -DFOREGROUND
             └─306 /usr/sbin/httpd -DFOREGROUND
               └─307 /usr/sbin/httpd -DFOREGROUND
                 └─308 /usr/sbin/httpd -DFOREGROUND
                   └─309 /usr/sbin/httpd -DFOREGROUND

Nov 27 19:41:16 web systemd[1]: Starting The Apache HTTP Server...
Nov 27 19:41:16 web httpd[305]: AH00558: httpd: Could not reliably determine the server's fully qualified domain name, using 127.0.1.1. Set the 'ServerName' directive globally to suppress this message
Nov 27 19:41:16 web systemd[1]: Started The Apache HTTP Server.
Nov 27 19:41:16 web httpd[305]: Server configured, listening on: port 80
[root@web ~]#
[root@web ~]#
```

5. exit
6. sudo firewall-cmd --permanent
--add-forward-port=port=80:proto=tcp:toport=80:toaddr=10.25.21.151
 - o To find the IP address of your container, run `lxc list`

```
[gl@fedora ~]$ lxc list
```

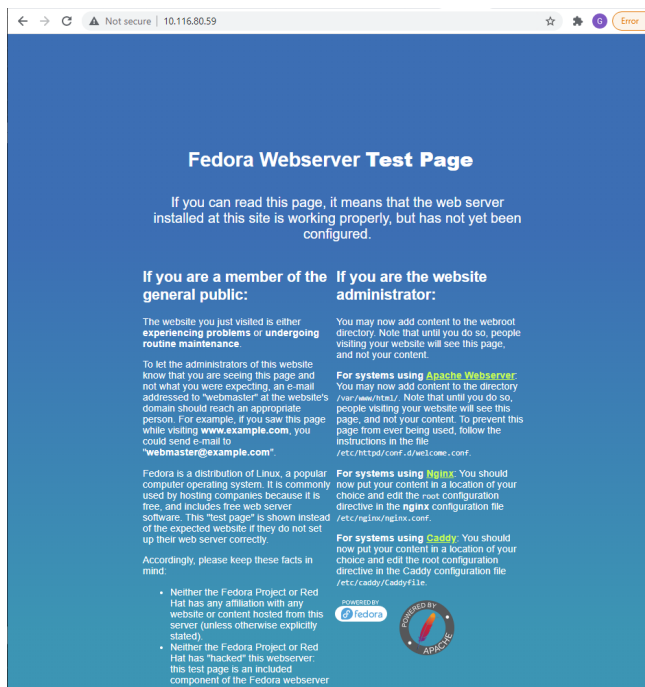
NAME	STATE	IPV4	IPV6	TYPE	SNAPSHOTS
smb	RUNNING	10.83.180.159 (eth0)	fd42:9b49:fae9:4260:216:3eff:fed6:6572 (eth0)	CONTAINER	0
web	RUNNING	10.83.180.9 (eth0)	fd42:9b49:fae9:4260:216:3eff:fed6:c80e (eth0)	CONTAINER	0

```
[gl@fedora ~]$
```

7. sudo firewall-cmd --reload
 - o This command reloads the firewall to save changes made.

```
success
[gl@fedora ~]$ sudo firewall-cmd --reload
success
[gl@fedora ~]$
```

8. Check if web server is running by typing the IP address of host machine on an internet browser. You should find a web page similar to the one below.



Getting to the website file directory.

- lxc exec web – bash

```
[gl@fedora ~]$ lxc exec web -- bash
[root@web ~]#
```

- cd /var/www/html

```
[root@web html]# cd /var/www
[root@web www]# ls
cgi-bin  html
[root@web www]#
```

Screenshot of containerized Apache while it is running.

← → ↻ ⚠ Not secure | 10.116.80.59

CISN-34-01-21309

Project by: Trin Lopez, Mason Cox, Gabriela Liera, Marci van Boeschoten

As the Final Project for CISN 34, we are charged with setting up a server from scratch. The server includes Apache, Samba, LXD/LXC for containers and management of containers. We have set up each a container for Libre Word, a word processor and Thunderbird an email program; and, it all has to work via a client workstation.

```
gl@fedora:~
Microsoft Windows [Version 10.0.19042.1348]
(c) Microsoft Corporation. All rights reserved.

C:\Users\student>ssh gl@10.116.80.59
The authenticity of host '10.116.80.59 (10.116.80.59)' can't be established.
ECDSA key fingerprint is SHA256:FUJ/1pe65PQiaPFJl3YXx9v0oTV+Ugoa2nz8CpHUP9U.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.116.80.59' (ECDSA) to the list of known hosts.
gl@10.116.80.59's password:
Web console: https://fedora:9090/ or https://10.116.80.59:9090/

Last login: Wed Dec 1 20:42:34 2021 from 10.116.80.21
[gl@fedora ~]$ lxc list
Error: Get "http://unix.socket/1.0": dial unix /var/snap/lxd/common/lxd/unix.socket: connect: permission denied
[gl@fedora ~]$ sudo lxc list
[sudo] password for gl:
+-----+-----+-----+-----+-----+-----+
| NAME | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| smb | RUNNING | 10.25.21.156 (eth0) | fd42:1a20:8704:2677:216:3eff:fe02:f634 (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+-----+-----+
| web | RUNNING | 10.25.21.151 (eth0) | fd42:1a20:8704:2677:216:3eff:fe67:e5d9 (eth0) | CONTAINER | 0 |
+-----+-----+-----+-----+-----+-----+
[gl@fedora ~]$
```

Samba Installation

1. lxc launch images:fedora/35/amd64 smb

- This command will create a LXC container using a Fedora 35 image- “fedora/35/amd64”. The name of the container is “smb”.
- Syntax: `lxc launch imageserver:imagename instancename`

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

- To check if the container was properly created run “lxc list”. This command will display all the containers running in your system and provide information about these containers.

```
[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 ~]$
```

2. lxc exec smb -- bash

- Whenever you want to run a command for a container, one can use the syntax: *lxc exec instancename command*
- The above command will open up a bash shell for the smb container.

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

3. sudo dnf install samba -y

- This command- `sudo dnf install samba -y`- will install samba using dnf. The `-y` option automatically answer yes for all questions.

```
[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
libwbclient x86_64 2:4.15.2-3.fc35 updates 78 k
=====
```

- Once the installation is finished, you should see “Complete!” at the end.

```
Verifying : samba-common-2:4.15.2-3.fc35.noarch 26/30
Verifying : samba-common-libs-2:4.15.2-3.fc35.x86_64 27/30
Verifying : samba-common-tools-2:4.15.2-3.fc35.x86_64 28/30
Verifying : samba-dc-libs-2:4.15.2-3.fc35.x86_64 29/30
Verifying : samba-libs-2:4.15.2-3.fc35.x86_64 30/30

Installed:
avahi-libs-0.8-14.fc35.x86_64 cups-libs-1:2.3.3op2-10.fc35.x86_64
dbus-libs-1:1.12.20-5.fc35.x86_64 jansson-2.13.1-3.fc35.x86_64
libevent-2.1.12-4.fc35.x86_64 libicu-69.1-2.fc35.x86_64
libkadm5-1.19.2-2.fc35.x86_64 libldb-2.4.1-1.fc35.x86_64
libsmbclient-2:4.15.2-3.fc35.x86_64 libtalloc-2.3.3-2.fc35.x86_64
libtdb-1.4.4-3.fc35.x86_64 libtevent-0.11.0-1.fc35.x86_64
libwbclient-2:4.15.2-3.fc35.x86_64 lmbd-0.9.29-2.fc35.x86_64
lmdb-libs-0.9.29-2.fc35.x86_64 logrotate-3.18.1-2.fc35.x86_64
python3-dns-2.1.0-5.fc35.noarch python3-ldb-2.4.1-1.fc35.x86_64
python3-samba-2:4.15.2-3.fc35.x86_64 python3-talloc-2.3.3-2.fc35.x86_64
python3-tdb-1.4.4-3.fc35.x86_64 python3-tevent-0.11.0-1.fc35.x86_64
samba-2:4.15.2-3.fc35.x86_64 samba-client-libs-2:4.15.2-3.fc35.x86_64
samba-common-2:4.15.2-3.fc35.noarch samba-common-libs-2:4.15.2-3.fc35.x86_64
samba-common-tools-2:4.15.2-3.fc35.x86_64 samba-dc-libs-2:4.15.2-3.fc35.x86_64
samba-libs-2:4.15.2-3.fc35.x86_64 tdb-tools-1.4.4-3.fc35.x86_64

Complete!
[root@smb ~]#
```

4. `sudo systemctl enable smb nmb --now`

- This command both starts and enables Samba/NetBIOS. Systemctl is a command used to control the systemd system and service manager. Enabling Samba will hook Samba into relevant places so that it will automatically start on boot. The `--now` option combines start and enable into one command.

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

- To confirm that Samba is active and running, use the following command:

- `sudo systemctl status smb`

- If everything is correct, you should see “active (running)”

```
Created symlink /etc/systemd/system/multi-user.target.wants/smb.service → /usr/lib/systemd/system/smb.service.
[root@smb ~]# sudo systemctl status smb
● smb.service - Samba SMB Daemon
   Loaded: loaded (/usr/lib/systemd/system/smb.service; enabled;
   vendor preset: disabled)
   Drop-In: /run/systemd/system/service.d
            └─zzz-lxc-service.conf
   Active: active (running) since Fri 2021-11-26 18:31:53 UTC; 9min ago
     Docs: man:smbd(8)
           man:samba(7)
           man:smb.conf(5)
  Main PID: 332 (smbd)
    Status: "smbd: ready to serve connections..."
     Tasks: 4 (limit: 1103)
    Memory: 10.2M
       CPU: 92ms
    CGroup: /system.slice/smb.service
            └─332 /usr/sbin/smbd --foreground --no-process-group
              334 /usr/sbin/smbd --foreground --no-process-group
              335 /usr/sbin/smbd --foreground --no-process-group
              336 /usr/libexec/samba/samba-bgqd --ready-signal-fd=47 --parent-watch-fd=13 --debuglevel=0 -F

Nov 26 18:31:53 smb systemd[1]: Starting Samba SMB Daemon...
Nov 26 18:31:53 smb smbd[332]: [2021/11/26 18:31:53.294438, 0] ../../source3/smbd/server.c:1739
(main)
Nov 26 18:31:53 smb smbd[332]:  smbd version 4.15.2 started.
Nov 26 18:31:53 smb smbd[332]:  Copyright Andrew Tridgell and the Samba Team 1992-2021
Nov 26 18:31:53 smb systemd[1]: Started Samba SMB Daemon.
Nov 26 18:31:53 smb systemd[1]: smb.service: Got notification message from PID 336,
```

5. useradd smb-user

- In order for Samba to configure correctly, both the container and Samba need to have a user created.
- This command will create a user in the container.

```
[root@smb ~]# useradd smb-user
[root@smb ~]#
```

6. pdbedit -a smb-user (password: cism34)

- pdbedit is a Samba command that will manage the SAM database. This command will add the user “smb-user” to the SAM. The -a option will create and add the user into the database.

```
[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 ~]#
```

- To confirm that a user is present in the user database, the command `pdbedit -L` will list all the user accounts present in the Samba user database. This user needs to match the user created for the container

7. `systemctl restart smb nmb`

- This step will restart Samba to complete the changes made to the user database and any other changes made.

```
[root@smb ~]# systemctl restart smb nmb
[root@smb ~]#
```

8. `exit`

9. `sudo firewall-cmd --permanent`

```
--add-forward-port=port=137:proto=udp:toport=137:toaddr=10.25.21.156
--add-forward-port=port=138:proto=udp:toport=138:toaddr=10.25.21.156
--add-forward-port=port=139:proto=tcp:toport=139:toaddr=10.25.21.156
--add-forward-port=port=445:proto=tcp:toport=445:toaddr=10.25.21.156
```

- Since the server is running on a virtual machine, we need to port forward requests to the container. Hence, we need to configure Samba port requests from the virtual machine to the appropriate container.
- To find the IP address of your container, run `lxc list`

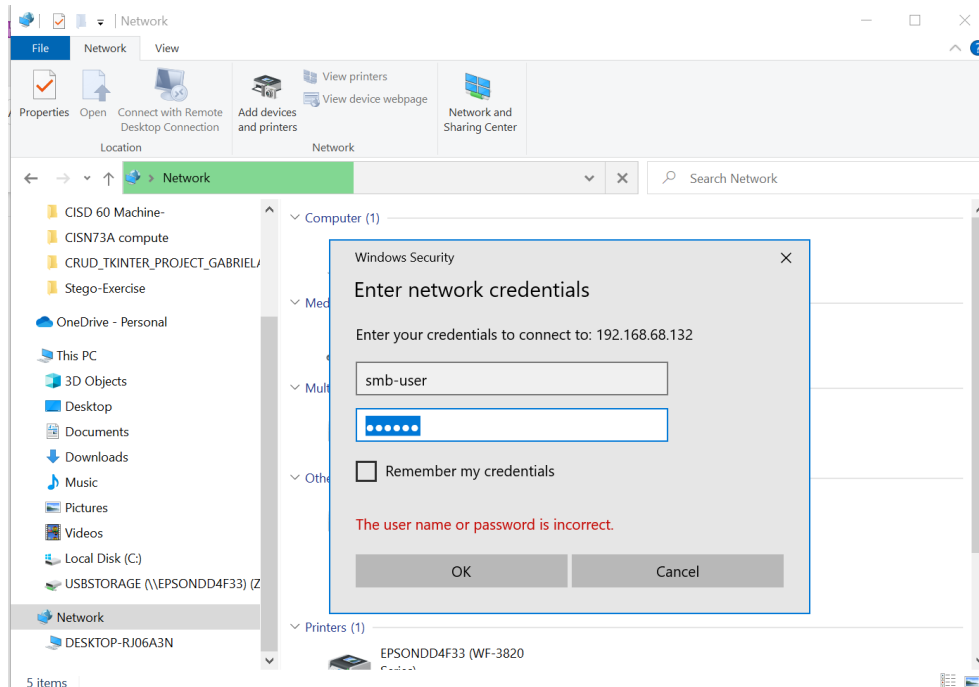
```
[mc@fedora ~]$ sudo firewall-cmd --permanent --add-forward-port=port=137:proto=udp:toport=137:toaddr=10.25.21.156 --add-forward-port=port=138:proto=udp:toport=138:toaddr=10.25.21.156 --add-forward-port=port=139:proto=tcp:toport=139:toaddr=10.25.21.156 --add-forward-port=port=445:proto=tcp:toport=445:toaddr=10.25.21.156
[sudo] password for mc:
success
[mc@fedora ~]$ sudo firewall-cmd --reload
success
[mc@fedora ~]$
```

10. `sudo firewall-cmd --reload`

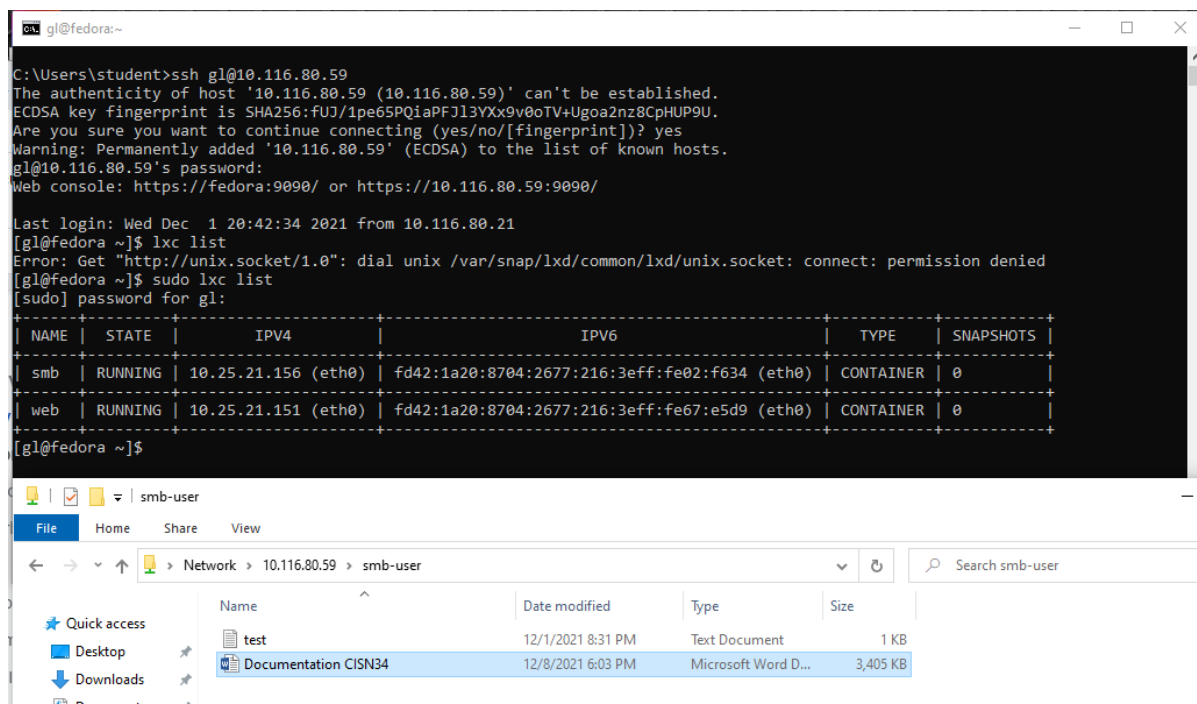
- This command reloads the firewall to save changes made.

Accessing Samba shared folders

Using the IP address of the host machine, add a new network on a different computer. Use the credentials of the user created for Samba.



Smb-user shared folder



FTP Installation (VSFTPD)

1. lxc exec web -- bash

- Enter the web container. We will include FTP inside our web container

2. dnf install vsftpd -y

- Download vsftpd with default settings

```
[gl@fedora ~]$ lxc exec ftp -- bash
[root@ftp ~]# dnf install vsftpd -y
Fedora 35 - x86_64                                8.4 MB/s | 61 MB    00:07
Fedora 35 openh264 (From Cisco) - x86_64         2.0 kB/s | 2.5 kB    00:01
Fedora Modular 35 - x86_64                       1.5 MB/s | 2.6 MB    00:01
Fedora 35 - x86_64 - Updates                     5.5 MB/s | 15 MB    00:02
```

```
Transaction Summary
-----
Install 2 Packages

Total download size: 233 k
Installed size: 501 k
Downloading Packages:
(1/2): logrotate-3.18.1-2.fc35.x86_64.rpm         210 kB/s | 75 kB    00:00
(2/2): vsftpd-3.0.3-46.fc35.x86_64.rpm           250 kB/s | 158 kB    00:00
-----
Total                                             169 kB/s | 233 kB    00:01
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing                                     : 1/1
  Running scriptlet: logrotate-3.18.1-2.fc35.x86_64 : 1/2
  Installing        : logrotate-3.18.1-2.fc35.x86_64 : 1/2
  Running scriptlet: logrotate-3.18.1-2.fc35.x86_64 : 1/2
Created symlink /etc/systemd/system/timers.target.wants/logrotate.timer → /usr/lib/systemd/system/logrotate.timer.

  Installing        : vsftpd-3.0.3-46.fc35.x86_64      : 2/2
  Running scriptlet: vsftpd-3.0.3-46.fc35.x86_64      : 2/2
  Verifying         : logrotate-3.18.1-2.fc35.x86_64   : 1/2
  Verifying         : vsftpd-3.0.3-46.fc35.x86_64     : 2/2

Installed:
  logrotate-3.18.1-2.fc35.x86_64                  vsftpd-3.0.3-46.fc35.x86_64

Complete!
[root@ftp ~]#
```

3. systemctl enable vsftpd --now

- This command both starts and enables vsftpd. Systemctl is a command used to control the systemd system and service manager. Enabling vsftpd will hook vsftpd into relevant places so that it will automatically start on boot. The - -now option combines start and enable into one command.

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


4. `dnf install nano -y`
 - We need a text editor to edit the vsftpd configuration file. Download any text editor. We will download nano.
5. `nano /etc/vsftpd/vsftpd.conf`
 - Using nano, open the vsftpd file and add the following lines:
 - `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)

```
root@http:~  
GNU nano 5.8 /etc/vsftpd/vsftpd.conf  
(default follows)  
chroot_list_file=/etc/vsftpd/chroot_list  
  
You may activate the "-R" option to the builtin ls. This is disabled by default to avoid remote users being able to cause excessive I/O on large sites. However, some broken FTP clients such as "ncftp" and "mirror" assume the presence of the "-R" option, so there is a strong case for enabling it.  
ls_recurse_enable=YES  
  
When "listen" directive is enabled, vsftpd runs in standalone mode and listens on IPv4 sockets. This directive cannot be used in conjunction with the listen_ipv6 directive.  
listen=NO  
  
This directive enables listening on IPv6 sockets. By default, listening on the IPv6 "any" address (::) will accept connections from both IPv6 and IPv4 clients. It is not necessary to listen on "both" IPv4 and IPv6 sockets. If you want that (perhaps because you want to listen on specific addresses) then you must run two copies of vsftpd with two configuration files.  
Make sure, that one of the listen options is commented !!  
listen_ipv6=YES  
  
#service_name=vsftpd  
userlist_enable=YES  
userlist_file=/etc/vsftpd/user_list  
userlist_deny=NO  
local_root=/  
pasv_enable=Yes  
pasv_min_port=64000  
pasv_max_port=64321  
pasv_address=  
  
G Help      ^O Write Out   ^W Where Is    ^K Cut         ^J Execute     ^L Location    ^U Undo        ^M Set Mark    ^I To Bracket  ^P Previous  
X Exit      ^R Read File   ^U Replace     ^N Paste       ^_ Justify     ^G Go To Line   ^E Redo        ^C Copy        ^O Where Was   ^N Next
```

6. `useradd ftp-user`
 - Add a user to create a more secure system
7. `echo "ftp-user" >> /etc/vsftpd/user_list`
 - This command append the vsftpd user_list with “ftp-user”

```
[root@ftp vsftpd]# useradd ftp-user
[root@ftp vsftpd]# echo "ftp-user" >> /etc/vsftpd/user_list
```

As you can see, the user was added to the end of the vsftpd userlist

```
[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]#
```

8. systemctl restart vsftpd

- Restart vsftpd to save changes

```
[root@ftp /]# systemctl restart vsftpd
[root@ftp /]#
```

9. exit

- Return to the server

10. sudo firewall-cmd --permanent

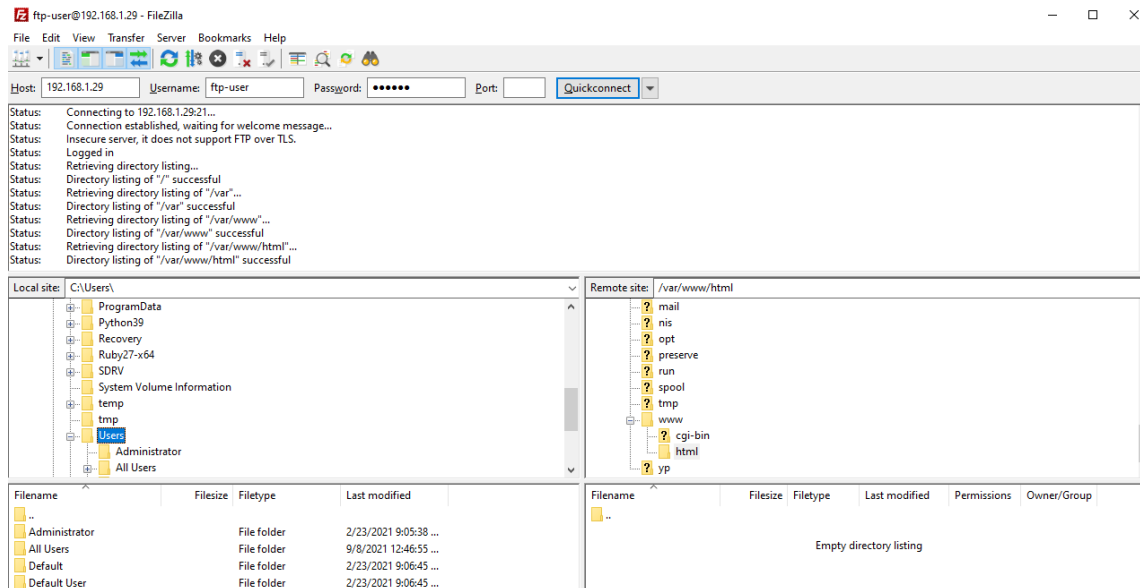
```
--add-forward-port=port=20:proto=tcp:toport=20:toaddr=10.25.21.151
--add-forward-port=port=21:proto=tcp:toport=21:toaddr=10.25.21.151
```

Port forward FTP request to the web container IP-address

```
[mc@fedora ~]$ 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
success
[mc@fedora ~]$ sudo firewall-cmd --reload
success
[mc@fedora ~]$
```

11. sudo firewall-cmd --reload

Using FileZilla to Access FTP



Accessing FTP from command line

1. ftp
2. open
3. To *ip-address*
4. Command prompt will ask for user and password

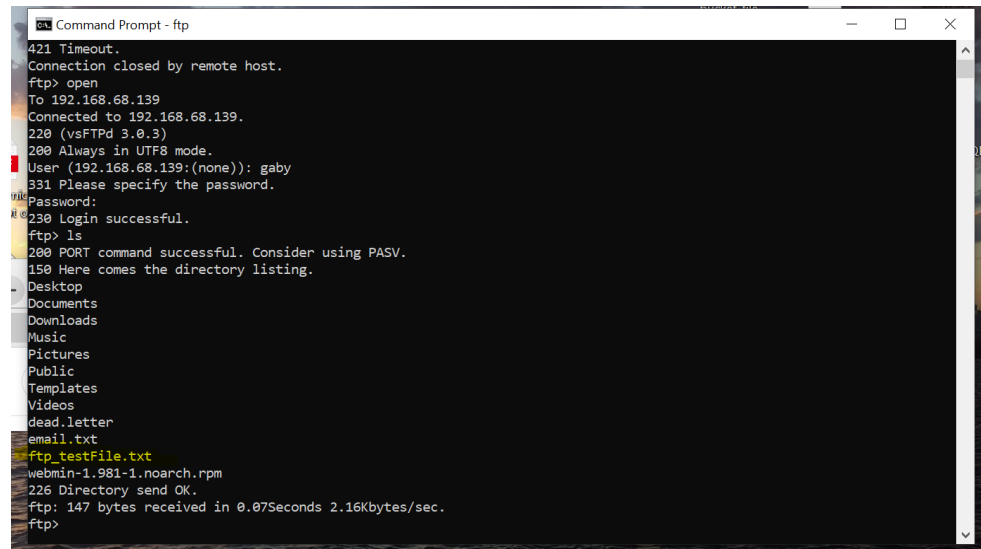
```
Command Prompt - ftp
C:\Users\Owner>ftp
ftp> 192.168.68.139
Invalid command.
ftp> open
To 192.168.68.139
Connected to 192.168.68.139.
220 (vsFTPD 3.0.3)
200 Always in UTF8 mode.
User (192.168.68.139:(none)): gaby
331 Please specify the password.
Password:
230 Login successful.
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
Desktop
Documents
Downloads
Music
Pictures
Public
Templates
Videos
dead.letter
email.txt
webmin-1.981-1.noarch.rpm
226 Directory send OK.
ftp: 129 bytes received in 0.01Seconds 10.75Kbytes/sec.
ftp>
```

5. echo "test file for ftp server" >> ftp_testfile.txt

```
gaby@fedora ~]$ ls
dead.letter Desktop Documents Downloads email.txt Music Pictures Public Templates Videos webmin-1.981-1.noarch.rpm
gaby@fedora ~]$ echo "test file for ftp server" >> ftp_testFile.txt
gaby@fedora ~]$ ls
dead.letter Desktop Documents Downloads email.txt ftp_testFile.txt Music Pictures Public Templates Videos webmin-1.981-1.noarch.rpm
gaby@fedora ~]$
```

6. ftp > get ftp_testfile.txt -p

a. This downloads file



```
Command Prompt - ftp
421 Timeout.
Connection closed by remote host.
ftp> open
To 192.168.68.139
Connected to 192.168.68.139.
220 (vsFTPd 3.0.3)
200 Always in UTF8 mode.
User (192.168.68.139:(none)): gaby
331 Please specify the password.
Password:
230 Login successful.
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
Desktop
Documents
Downloads
Music
Pictures
Public
Templates
Videos
dead.letter
email.txt
ftp_testFile.txt
webmin-1.981-1.noarch.rpm
226 Directory send OK.
ftp: 147 bytes received in 0.07Seconds 2.16Kbytes/sec.
ftp>
```

Adding User to Host Machine

1. `sudo useradd -c "Username comment" username`
 - Use this command to add a new user
 - `-c` option adds a description to the new user, for example full name
2. `sudo passwd username`
 - Use this command to change the password of a user
3. `sudo usermod -aG wheel username`
 - Add user to wheel group so they become are sudo user
4. `groups mvb`
 - Check what groups the user belongs too

```
[gl@fedora ~]$ sudo useradd -c 'Marci VB' mvb
[gl@fedora ~]$ sudo passwd mvb
Changing password for user mvb.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[gl@fedora ~]$ sudo usermod -aG wheel mvb
[gl@fedora ~]$ groups mvb
mvb : mvb wheel
[gl@fedora ~]$
```