How to Install and Configure NFS on Linux?

written by sysadmin | 11 June 2025

NFS or Network File Sharing is a protocol that allows you to share directories and files with other Linux clients over a network. Similar to locally created folders, an NFS file share is accessible when mounted on a client computer. When you have limited disk space and need to share public data between client machines, NFS is especially helpful.

Problem

How to install and configure NFS on Linux?

Solution

This article will explain how to install and configure NFS on 3 Linux distros: Rockylinux, Ubuntu, and OpenSuse and this article should work in each of their derivatives of the three distros.

A. On the server

Following are the steps to install and configure NFS:

1. Install NFS

I install NFS in the server with IP 192.168.56.2, and to install the NFS application on the Linux server, use the command below:

RockyLinux

```
sudo dnf install -y nfs-utils
```

Ubuntu

```
sudo apt update -y
```

```
sudo apt-get install -y nfs-kernel-server
```

OpenSUSE

```
sudo zypper install -y nfs-kernel-server nfs-utils
```

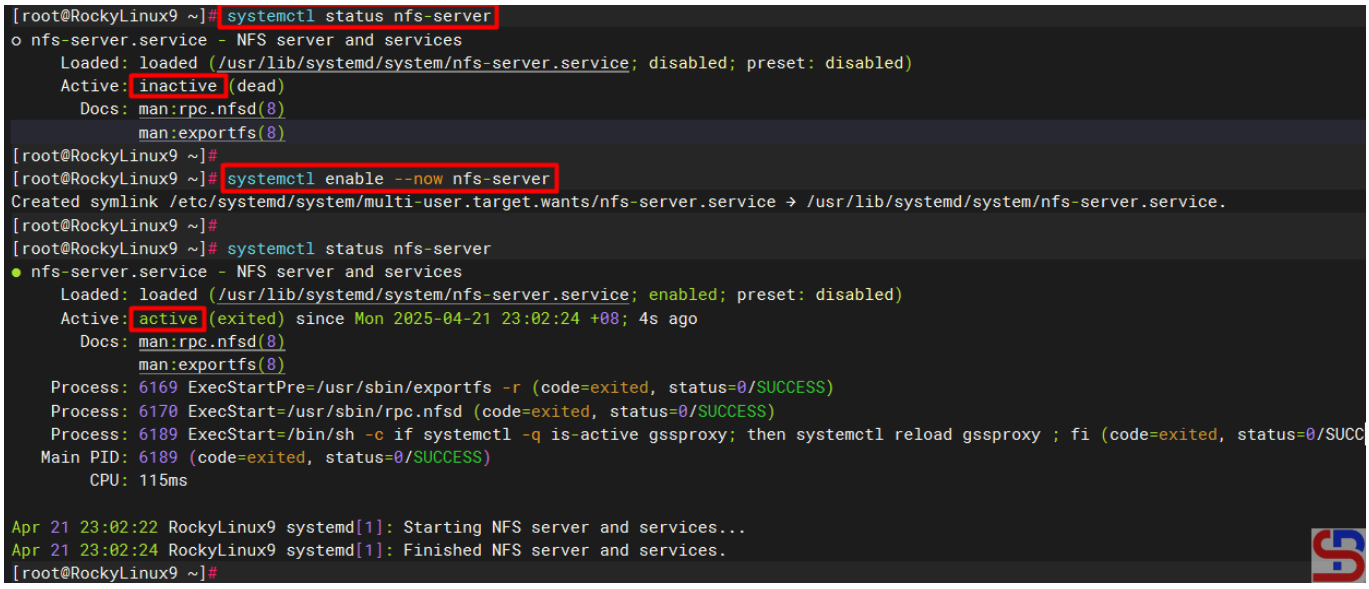
2. Check NFS status

Type the command below to check the NFS status:

```
systemctl status nfs-server
```

If you see the NFS status is still not on, use the command below to turn on the NFS service:

```
sudo systemctl enable --now nfs-server
```



Check the NFS service status

Sometimes you have to check the **nfs-mountd** service using the command below:

```
sudo systemctl status nfs-mountd
```

If the service is not on the server, then use the command

below to turn on the service:

```
sudo systemctl start nfs-mountd
```

3. Check the rpcbind status

Make sure that the **rpcbind** service is actively used by NFS for the mapping port. Use the command below to check the status of the service:

```
sudo systemctl status rpcbind
```

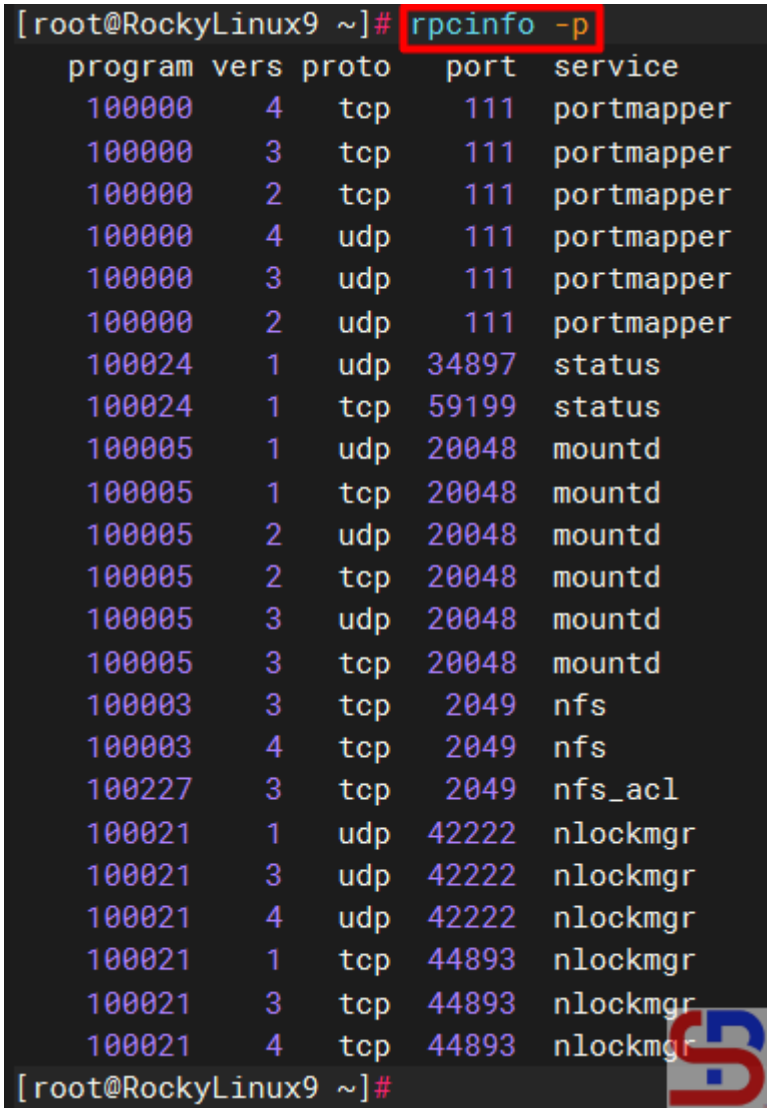
If the service is not active, use the command below to start the service:

```
sudo systemctl enable -now rpcbind
```

4. Check NFS and Portmap

To see if NFS and portmap (Portmap is a server that converts RPC program numbers into DARPA protocol port numbers. It must be running to make RPC calls) are running on the server, use the command below:

```
sudo rpcinfo -p
```



Check whether NFS and portmap run in the server or not

5. Configure firewall

If you still turn on the firewall on Linux, use the command below to open the NFS port (Port NFS is TCP Port 2049):

RockyLinux & OpenSUSE

```
firewall-cmd --add-service nfs --permanent
firewall-cmd --reload
firewall-cmd --list-services
```

```
[root@RockyLinux9 ~]# firewall-cmd --add-service nfs --permanent
success
[root@RockyLinux9 ~]#
[root@RockyLinux9 ~]# firewall-cmd --reload
success
[root@RockyLinux9 ~]#
[root@RockyLinux9 ~]# firewall-cmd --list-services
cockpit dhcpv6-client nfs ssh
[root@RockyLinux9 ~]#
```

Open the NFS port in RockyLinux

Ubuntu

```
sudo ufw allow nfs
sudo ufw status verbose
```

Use the command below to open the rpcbind port (rpcbind port is TCP Port 111):

Rockylinux & OpenSUSE

```
firewall-cmd --add-port=111/tcp --permanent
firewall-cmd --reload
firewall-cmd --list-ports
```

Ubuntu

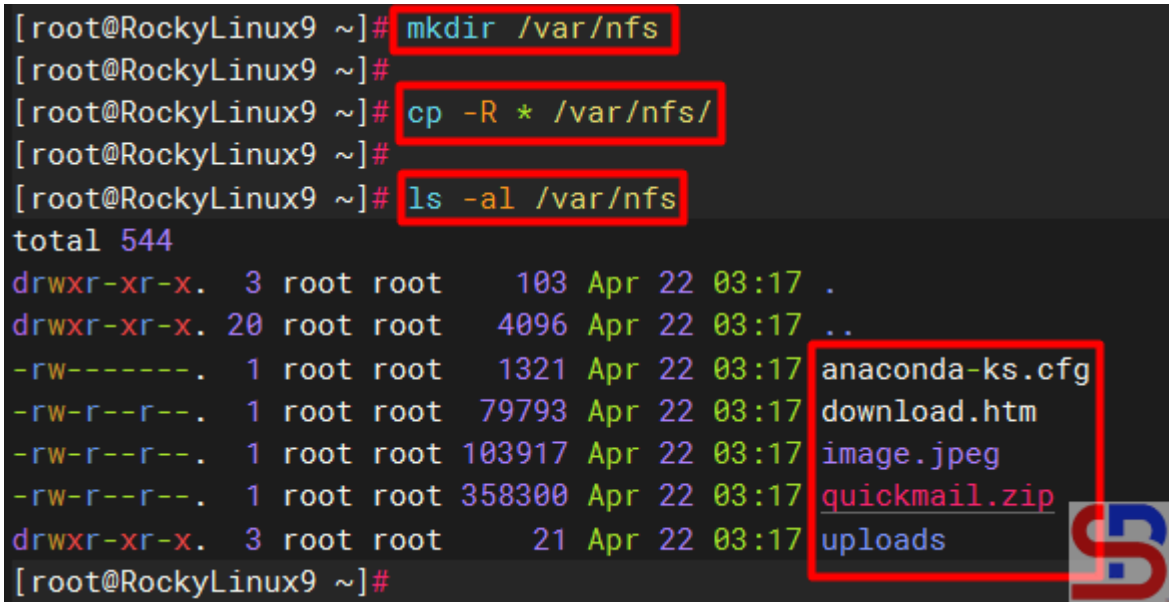
```
sudo ufw allow 111
sudo ufw status verbose
```

6. Make a folder sharing

Create a folder to collect NFS files and folders and I make it in the folder **/var/nfs** using the command below:

```
mkdir /var/nfs
```

After that, copy the file(s) and folder(s) that you want to share into the folder as shown below:



Copy the file(s) and folder(s) into the folder sharing

7. Define an Export File

To grant access to NFS clients, you need to define an export file and it is typically located at **/etc/exports**. Use the format below to define an export file:

```
/folder/path    accessible-host-ip-address(options)
```

The options you can use can be seen in the image below:

Option	Description
ro,rw	Read-only, Read-write (default)
rw=list	Hosts in the list can do rw, others ro only
root_squash	Maps UID 0 and GID 0 to the value of anonuid and anongid (default)
no_root_squash	Allow root access
all_squash	Maps all UID and GID to anonymous one
subtree_check	Check that the accessed file is in the appropriate filesystem and in the exported tree.
no_subtree_check	Disables subtree checking
anonuid=xxx	Related to root_squash
anongid=xxx	Related to root_squash
secure	Require remote access from privileged port
insecure	Allow remote access from any port
noaccess	Prevent access to this dir and it's subdir

Options in NFS (Image credit for slideplayer.com)

You can use more than one option like (rw,sync,no_subtree_check). By default, NFS uses the **ro** option where the client can only read the file or folder in the folder sharing. In this article, I only want the folder sharing can only be accessed by users who only use IP 192.168.56.0/24 and the folder can be changed by the users, then use the command below to enter the script into the exports file:

```
sudo echo "/var/nfs                192.168.56.0/24(rw)" > /etc/exports
```

Then change the permissions so that the files and folders in the folder sharing can be changed using the command below:

RockyLinux & OpenSUSE

```
chown -R nobody:nobody /var/nfs
sudo chmod -R 775 /var/nfs
```

Ubuntu

```
chown -R nobody:nogroup /var/nfs
sudo chmod -R 775 /var/nfs
```

8. Export exports file

Use the command below to make the folder sharing available to the clients:

```
sudo exportfs -r
```

Use the command below to view the exports file:

```
showmount -e
```

To see which hosts access file sharing, use the command below:

```
sudo netstat -an | grep 2049
```

B. On the client

Following are the steps to install and configure NFS:

1. Install NFS client

Use the command below to install the NFS client:

RockyLinux

```
sudo dnf install -y nfs-utils
```

Ubuntu

```
sudo apt-get install -y nfs-common
```

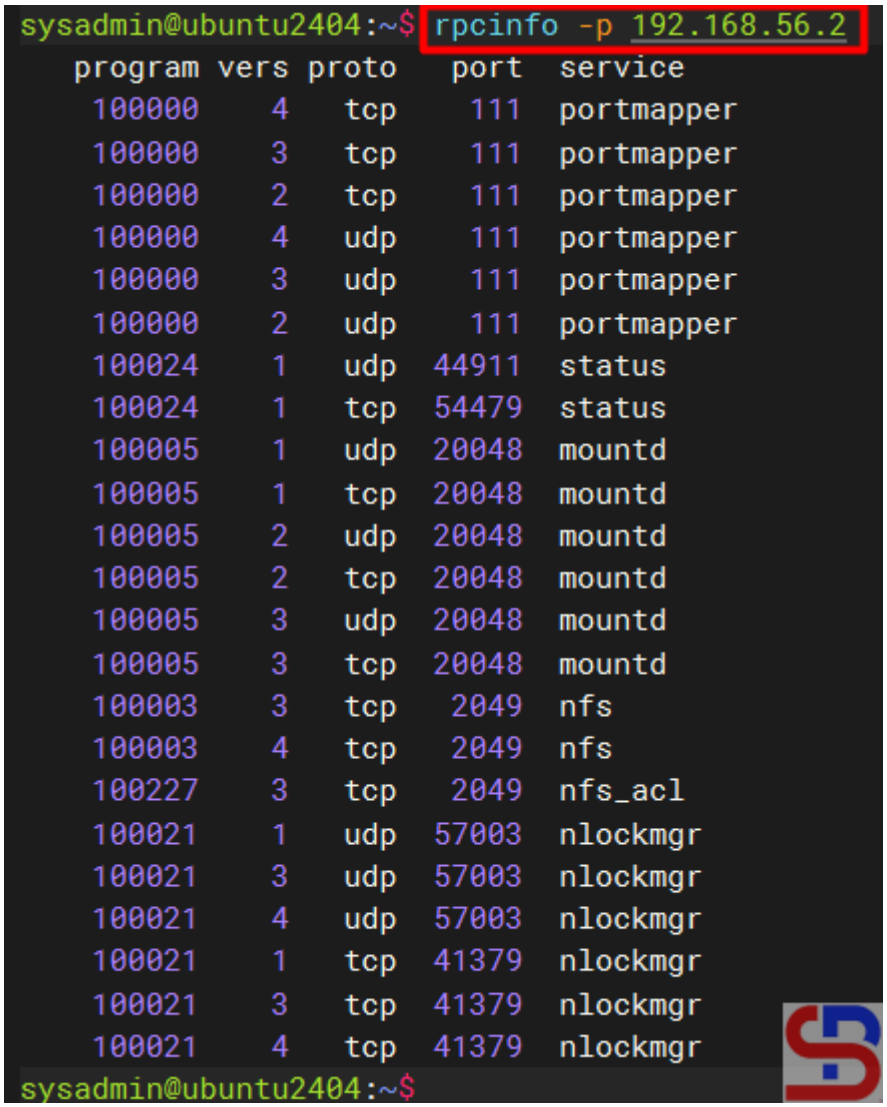
OpenSUSE

```
zypper install -y nfs-client*
```

2. Check the ports in the NFS server

Use the command below to check whether the client can access the ports (port 2049 and 111) in the NFS server or not (the IP server NFS is 192.168.56.2):

```
rpcinfo -p 192.168.56.2
```



Check the connection between the client to the NFS server

2. Make and mount a folder

Make the folder where we want to mount the NFS shares from the server, for example, I made a folder in **/tmp/nfs**:

```
mkdir /tmp/nfs
```

After that the mount folder with the NFS server using the format below:

```
sudo mount -t nfs 192.168.56.2:/var/nfs /tmp/nfs
```

```
sysadmin@ubuntu2404:~$ mkdir /tmp/nfs
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ sudo mount -t nfs 192.168.56.2:/var/nfs /tmp/nfs
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ df -h
Filesystem                         Size  Used Avail Use% Mounted on
tmpfs                               97M  1.1M   96M   2% /run
/dev/mapper/ubuntu--vg-ubuntu--lv  9.8G  4.8G  4.6G  52% /
tmpfs                              481M     0  481M   0% /dev/shm
tmpfs                              5.0M     0  5.0M   0% /run/lock
/dev/sda2                          1.7G   95M  1.5G   6% /boot
tmpfs                               97M   12K   97M   1% /run/user/1000
192.168.56.2:/var/nfs               17G  1.6G   16G  10% /tmp/nfs
sysadmin@ubuntu2404:~$
```

Mount the folder to the folder-sharing

INFO

You can use the **-v** option so that the above command becomes:
sudo mount -v -t nfs 192.168.56.2:/var/nfs /tmp/nfs
to display the logs when mounting so that you can know if there is an error when mounting.

You should access the folder sharing on the NFS server as shown below:

```
sysadmin@ubuntu2404:~$ sudo mount -t nfs 192.168.56.2:/var/nfs /tmp/nfs
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ df -h
Filesystem                         Size  Used Avail Use% Mounted on
tmpfs                               97M  1.1M   96M   2% /run
/dev/mapper/ubuntu--vg-ubuntu--lv  9.8G  4.3G  5.0G  47% /
tmpfs                              481M     0  481M   0% /dev/shm
tmpfs                              5.0M     0  5.0M   0% /run/lock
/dev/sda2                          1.7G   95M  1.5G   6% /boot
tmpfs                               97M   12K   97M   1% /run/user/1000
192.168.56.2:/var/nfs               17G  1.7G   16G  10% /tmp/nfs
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ ls /tmp/nfs
anaconda-ks.cfg  download.htm  image.jpg  quickmail.zip  uploads
sysadmin@ubuntu2404:~$
```

Access to the NFS server

You can use the command below to see the NFS client connection:

```
sudo mount | grep -i nfs
```

```
sysadmin@ubuntu2404:~$ sudo mount | grep -i nfs
192.168.56.2:/var/nfs on /tmp/nfs type nfs4 (rw,relatime,vers=4.2,rsize=131072,wsize=131072,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.56.100,local_lock=none,addr=192.168.56.2)
sysadmin@ubuntu2404:~$
```

Check the status of the NFS client

4. Simulation test

Try to do the simulation by changing the file name in the folder sharing. I try to rename the download.htm file to index.html using the command below:

```
sudo mv /tmp/nfs/download.htm /tmp/nfs/index.html
```

The file was successfully changed as shown below:

```
sysadmin@ubuntu2404:~$ ls /tmp/nfs
anaconda-ks.cfg  download.htm  image.jpeg  quickmail.zip  uploads
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ sudo mv /tmp/nfs/download.htm /tmp/nfs/index.html
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ ls /tmp/nfs
anaconda-ks.cfg  image.jpeg  index.html  quickmail.zip  uploads
sysadmin@ubuntu2404:~$
```

Rename the file in NFS

5. Configure the fstab file

To keep the folder sharing is still connected in the client after the client is rebooted, configure the **/etc/fstab** file using the command below:

```
echo '192.168.56.2:/var/nfs        /tmp/nfs        nfs        rw 0 0' | sudo tee -a /etc/fstab
```

```
[root@RockyLinux9 ~]# df -h
Filesystem                      Size  Used Avail Use% Mounted on
devtmpfs                        4.0M     0  4.0M   0% /dev
tmpfs                           385M     0  385M   0% /dev/shm
tmpfs                           154M  3.1M  151M   2% /run
/dev/mapper/rl_rockylinux9-root  17G  1.8G   16G  11% /
/dev/sda1                      1014M  395M  620M  39% /boot
192.168.56.12:/var/nfs           10G  3.4G  5.8G  37% /tmp/nfs
tmpfs                            77M     0   77M   0% /run/user/1000
[root@RockyLinux9 ~]#
[root@RockyLinux9 ~]# sudo echo '192.168.56.12:/var/nfs /tmp/nfs        nfs     rw 0 0' | sudo tee -a /etc/fstab
192.168.56.12:/var/nfs /tmp/nfs        nfs     rw 0 0
[root@RockyLinux9 ~]#
[root@RockyLinux9 ~]# cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Thu Sep 19 07:29:32 2024
#
# Accessible filesystems, by reference, are maintained under '/dev/disk/'.
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info.
#
# After editing this file, run 'systemctl daemon-reload' to update systemd
# units generated from this file.
#
/dev/mapper/rl_rockylinux9-root /                       xfs     defaults        0 0
UUID=066eb699-fd9c-45ae-bba8-6c220e767ed7 /boot                   xfs     defaults        0 0
/dev/mapper/rl_rockylinux9-swap none                    swap    defaults        0 0
192.168.56.12:/var/nfs /tmp/nfs        nfs     rw 0 0
[root@RockyLinux9 ~]#
```

Insert the script to fstab file

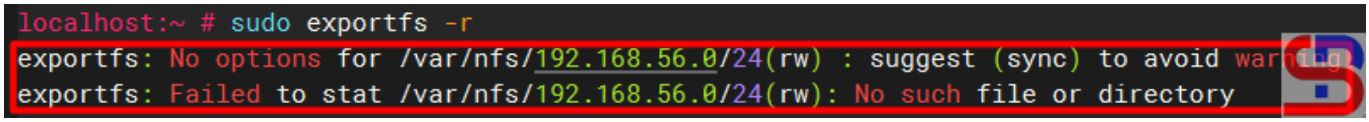
C. Errors and solutions

Below are errors that often appear and their solutions:

1. No options for /var/nfs

Sometimes when you run the **exportfs -r** command, there is an error as below:

```
exportfs: No options for /var/nfs/192.168.56.0/24(rw) : suggest (sync) to avoid warning
exportfs: Failed to stat /var/nfs/192.168.56.0/24(rw): No such file or directory
```



Error failed to stat

To eliminate the error, check in the **/etc/exports** file and you have to fix the writing in the file from:

/var/nfs/192.168.56.0/24(rw)

changed into

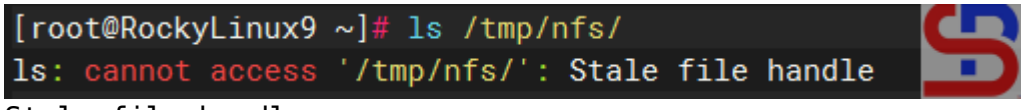
/var/nfs 192.168.56.0/24(rw)

After that, run the **exportfs -r** command again and the error should disappear.

2. Error Stale file handle

When you want to connect a client to the NFS server there is an error like the below (usually this happens if there is an error like number 1 or other causes on the NFS server):

```
Stale file handle
```



Stale file handle error

To solve this error you have to unmount on the side of the client and then mount back as shown below:

```
[root@RockyLinux9 ~]# ls /tmp/nfs/
ls: cannot access '/tmp/nfs/': Stale file handle
[root@RockyLinux9 ~]# sudo umount -f /tmp/nfs
[root@RockyLinux9 ~]# df -h
Filesystem                         Size  Used Avail Use% Mounted on
devtmpfs                           4.0M     0  4.0M   0% /dev
tmpfs                              385M     0  385M   0% /dev/shm
tmpfs                              154M  3.1M  151M   2% /run
/dev/mapper/rl_rockylinux9-root     17G  1.8G   16G  11% /
/dev/sda1                         1014M  395M  620M  39% /boot
tmpfs                               77M     0   77M   0% /run/user/1000
[root@RockyLinux9 ~]#
[root@RockyLinux9 ~]# sudo mount -t nfs 192.168.56.12:/var/nfs /tmp/nfs
[root@RockyLinux9 ~]# df -h
Filesystem                         Size  Used Avail Use% Mounted on
devtmpfs                           4.0M     0  4.0M   0% /dev
tmpfs                              385M     0  385M   0% /dev/shm
tmpfs                              154M  3.1M  151M   2% /run
/dev/mapper/rl_rockylinux9-root     17G  1.8G   16G  11% /
/dev/sda1                         1014M  395M  620M  39% /boot
tmpfs                               77M     0   77M   0% /run/user/1000
192.168.56.12:/var/nfs              10G  3.4G  5.8G  37% /tmp/nfs
[root@RockyLinux9 ~]# ls /tmp/nfs/
bin  get-docker.sh
[root@RockyLinux9 ~]#
```

Solve the stale file handle error

3. RPC: Program not registered

When typing the **showmount -e** command on the NFS server there is an error as below:

```
clnt_create: RPC: Program not registered
```

```
localhost:~ # showmount -e
clnt_create: RPC: Program not registered
```

Error Program Not Registered

The solution is that you have to run the command below so that the nfs-mountd service runs on the server:

```
systemctl start nfs-mountd
```

4. Permission denied

When you want to connect to the NFS server or when you want to change the file in the NFS, there is an error like this:

Permission denied

```
sysadmin@ubuntu2404:~$ cp /tmp/nfs/anaconda-ks.cfg /tmp/nfs/test.cfg
cp: cannot create regular file '/tmp/nfs/test.cfg': Permission denied
```

Error Permission denied

The solution is to check the exports file on the NFS server and make sure that the folder has been given permissions as in step 5 in the server section.

Note

If you want to block an IP address of a host so the host can't access the NFS server, use the command below to block the IP host:

```
sudo firewall-cmd --permanent --add-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="2049" protocol="tcp" reject'
sudo firewall-cmd --permanent --add-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="111" protocol="tcp" reject'
sudo firewall-cmd --permanent --add-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="2049" protocol="udp" reject'
sudo firewall-cmd --permanent --add-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="111" protocol="udp" reject'
sudo firewall-cmd --reload
sudo firewall-cmd --list-rich-rules
```

and should the client with IP 192.168.56.100 not be able to access the folder sharing as shown in the image below:

```
sysadmin@ubuntu2404:~$ ip a | grep 56
    inet 192.168.56.100/24 brd 192.168.56.255 scope global enp0s8
sysadmin@ubuntu2404:~$
sysadmin@ubuntu2404:~$ sudo mount -t nfs 192.168.56.2:/var/nfs /tmp/nfs
mount.nfs: Connection refused for 192.168.56.2:/var/nfs on /tmp/nfs
sysadmin@ubuntu2404:~$
```

Can not mount to NFS server

If you want to delete an IP address of a host then the option **--add-rich-rule** becomes **--remove-rich-rule** so that the command becomes as command below:

```
sudo firewall-cmd --permanent --remove-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="2049" protocol="tcp" reject'
sudo firewall-cmd --permanent --remove-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="111" protocol="tcp" reject'
sudo firewall-cmd --permanent --remove-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="2049" protocol="udp" reject'
sudo firewall-cmd --permanent --remove-rich-rule='rule family="ipv4" source
address="192.168.56.100" port port="111" protocol="udp" reject'
sudo firewall-cmd --reload
sudo firewall-cmd --list-rich-rules
```

WARNING
In my experience, you can’t immediately block a client to NFS if the client is still connected to the NFS. You have to wait until the client disconnects to the NFS server, either the host reboots or others.

References

bluexp.netapp.com
redhat.com
phoenixnap.com
howtoforge.com
youtube.com
docs.oracle.com
linux.die.net