

OPS535 Lab 2

Purpose

Network File System (NFS) allows you to access files on remote hosts in exactly the same way you would access local files. It was originally created by Sun Microsystems and the implementation on Linux is largely by Rick Sladkey, who wrote the NFS kernel code and large parts of the NFS server. For more information about NFS, please refer to [Chapter 14](#) of the online Network Administrator guide.

You should also study chapter 23 of the course text book on NFS for this Lab.
Designate vm2 as the NFS server.

Pre-Requisites

The pre-lab must be complete so that your virtual machines share access to a private network. Create a new user on each of your virtual machines using your own Seneca login.

Investigation 1: NFS Server Setup

Perform the following steps on vm2

1. Login to your machine as a regular user and enter the following command

```
su -
```

2. Enter the command

```
rpcinfo -p
```

Study the output and make notes of the first few lines. You should see two lines that end with the word "portmapper". If you don't, there is something wrong with your system, your system will not be able to provide NFS service. Ask for help if this is the case.

You should also see a line or two (or even more) that contains the word "nfs". If you don't, NFS is not running. If NFS is not running, you can start up NFS with the command:

```
systemctl start nfs-server
```

3. Create a directory named "/nfs-pub". Enter the command:

```
mkdir /nfs-pub
```

4. Change the file permission on "/nfs-pub" so everyone can read/write/list. Enter the command:

```
chmod 777 /nfs-pub
```

Double check the file permission with the `ls -l` command.

5. To set the sticky bit on the directory `"/nfs-pub"` , use the command

```
chmod +t /nfs-pub
```

(What is the purpose of setting the sticky bit?)

6. Edit your `/etc/exports` file and insert the following lines:

```
/nfs-pub          ip-of-vm1(rw,root_squash)
/nfs-pub          ip-of-vm3(rw,root_squash)
```

"ip-of-vm1" should be replaced by the actual IP address of vm1 (VM1),and "ip-of-vm3" should be replaced by the actual IP address of vm3 (VM3).

7. Enter the command

```
exportfs -a
```

to tell your NFS server to re-read the configuration file (`/etc/exports`) and take the appropriate action, i.e. to export the directory `/nfs-pub` to the specific host.

8. Enter the command

```
showmount -e
```

Make notes of the output and consult the man page of `showmount` to find out the purpose of this command.

9. **Use the command "exit"** to leave the super user shell and switch back to the regular user shell.

Enter the command

```
id
```

to confirm your user id. Write down your user name, user ID and group ID.

10. Copy the file `/etc/passwd` into directory `/nfs-pub` as `passwd.S`. Enter the command

```
cp /etc/passwd /nfs-pub/passwd.S
```

11. Finally, confirm the file copying with the `"ls -l"` command and make notes of the output.

12. Modify the firewall on your server to allow incoming nfs traffic in your internal zone. Make sure this change persists past reboot.

Investigation 2: File ownership of new files created on NFS shares

Perform the following steps on vm1 or vm3 after the NFS server has been configured properly:

1. Login as a regular user and enter the command

```
su -
```

2. Enter the command

```
cat /proc/filesystems
```

Make notes of the output. You should see a list of file systems supported on your system. If "nfs" is missing from this list, your Linux kernel does not have NFS support compiled in. However, it is possible that your kernel do support NFS via kernel module. Try the command

```
modprobe nfs
```

and make notes of the output from the above command. If it indicates that the nfs module has been loaded successfully, try the "cat /proc/filesystems" command again.

3. Create a top level directory named /nfs-mnt. Use the command

```
mkdir /nfs-mnt
```

4. Use the mount command to attach NFS server's /nfs-pub directory (remote directory) to the local directory /nfs-mnt:

```
mount -t nfs ip-of-nfs-server:/nfs-pub /nfs-mnt
```

5. To check if the mount command was executed successfully, use the "df" command.
6. Do a listing of the /nfs-mnt directory (on vm1 or vm3). You should see the NFSserver's password file passwd.S listed. Enter the command

```
ls -l /nfs-mnt
```

and make notes of the output. Determine the owner and the group owner of the file passwd.S.

7. While you are still running the super user shell, copy the file /etc/passwd on your local host to the nfs mount point /nfs-mnt using the following command

```
cp /etc/passwd /nfs-mnt/passwd.A.root (if you are on vm1)
cp /etc/passwd /nfs-mnt/passwd.B.root (if you are on vm3)
```

8. To confirm the copying of the password file, enter the command

```
ls -l /nfs-mnt/passwd.A.root (or ls -l /nfs-mnt/passwd.B.root, etc)
```

and make notes of the output. Determine the **owner** and **group** owner of the file.

9. Use the command "exit" to leave the super user shell. Under the regular user shell, enter the command

```
id
```

to confirm your user id. Write down your user name, user ID and group ID.

10. Now copy the file /etc/passwd on your local host again to the nfs mount point /nfs-mnt as a regular using the following command

```
cp /etc/passwd /nfs-mnt/passwd.A.user
(or cp /etc/passwd /nfs-mnt/passwd.B.user if you are on vm3)
```

11. To confirm the copying of the password file, enter the command

```
ls -l /nfs-mnt/passwd.A.user (or ls -l /nfs-mnt/passwd.B.user)
```

and make notes of the output. Determine the owner and group owner of the file.

Investigation 3: File creation permission and user name mapping on NFS shares

Create new users on the NFS server (vm2), vm1 (vm1), and vm3 (vm3) to study the user name mapping on NFS shares:

1. On the NFS server create two new users userS, and ops535 with the commands

```
useradd -u 5001 -m userS
useradd -u 5350 -m ops535
```

2. on vm1 (or vm3) create two new users userA (or userB), and ops535 with the commands

```
useradd -u 5001 -m userA (or userB on vm3)
useradd -u 5350 -m ops535 (on both vm1 and vm3)
```

and use the "passwd" command to set the password for userA (or userB) and ops535.

3. on vm1 (or vm3) login as userA (or userB) and copy the password file to /nfs-mnt with the command

```
cp /etc/passwd /nfs-mnt/passwd.A.map (if you are on vm1)
(or cp /etc/passwd /nfs-mnt/passwd.B.map, if your are on vm3)
```

use the command "ls -l" to confirm the copying of the file and make notes of the output.

4. on vm1 (or vm3) logout userA (or userB) and login as ops535. Copy the password file to /nfs-mnt with the command

```
cp /etc/passwd /nfs-mnt/passwd.A.ops
(or cp /etc/passwd /nfs-mnt/passwd.B.ops)
```

use the command "ls -l" to confirm the copying of the file and make notes of the output.

5. Login to the NFS server, and run the command

```
ls -l /nfs-pub/passwd.A.*
(or ls -l /nfs-pub/passwd.B.*)
```

to check the file created by the user "userA" and "ops535" on vm1, vm3. Who is the owner and the group owner of the respective files?

6. On vm1 and vm3, un-mount the remote directory nfs-server:/nfs-pub with the command

```
umount /nfs-mnt
```

Please note that this must be done by "root" and the directory /nfs-mnt is not being used by any process.

7. On the NFS server, make the following changes to the /etc/exports file:

```
change
/nfs-pub          ip-of-vm1(rw, root_squash)
to
/nfs-pub          ip-of-vm1(rw, no_root_squash)

change
/nfs-pub          ip-of-vm3(rw, root_squash)
to
/nfs-pub          ip-of-vm3(rw, no_root_squash)
```

and re-export the directory.

8. On vm1 and vm3, re-mount the share directory and repeat step 3 to step 6 under the super user account "root" and copy the file /etc/group to the share directory /nfs-mnt with the corresponding file name.
9. On vm1 and vm3, un-mount the remote directory.
10. On the NFS server, change the "rw" option in the /etc/exports file to "ro" and re-export the directory.
11. On vm1 and vm3, re-mount the share directory and repeat step 3 to step 6 under the super user account "root" and copy the file /etc/hosts to the share directory /nfs-mnt with the corresponding file name.

Completing the Lab

You should now have a common part of the filesystem available to all three vms. Files you store there on one machine will be accessible for the other machines too. Note that this should only be available when using your internal, statically assigned addresses.

You have also explored how access permissions are used between the machines, and since this service relies on UIDs accessed on each machine, keeping them synchronized between machines becomes vital. In a future lab we will explore a service that will manage that aspect of our networks.

Follow the instructions on blackboard to submit the lab.

Exploration Questions

1. What is the purpose of the "su -" command?
2. What is the purpose of the "rpcinfo -p" command?
3. What information is stored in the /etc/exports file?
4. What information is provided by the "showmount -e" command?
5. Did your Linux kernel has NFS support compiled in?
6. What is the full path name of the nfs module file? i.e. where is it on your hard drive?

7. Who is the owner of /nfs-mnt/passwd.A.root and /nfs-pub/passwd.A.root? Are they the same? Why?
8. Who is the owner of the file /nfs-mnt/passwd.A.user and /nfs-pub/passwd.A.user? Are they the same? Why?
9. Who is the owner of the file /nfs-mnt/passwd.A.map and /nfs-pub/passwd.A.map? Are they the same? Why and why not?
10. Who is the owner of the file /nfs-mnt/passwd.A.ops and /nfs-pub/passwd.A.ops? Are they the same? Why and why not?
11. Who is the owner of /nfs-mnt/group.A.root and /nfs-pub/group.A.root? Are they the same? Why?
12. Did the file /nfs-mnt/hosts.A.root get created? Why or why not?