

IT341 Introduction to System Administration

Project IV – Implementing NFS

After completing this project every box (both the server and the clients) will serve both as a server (in that they will serve up their own homes) and as a client (in that they will auto mount everyone else's homes).

Important: In this handout, we assume a few things:

1. The user names **abird**, **ajb** and **bj** are defined on **it20** and so are known to the network via NIS.
2. There is a home for **abird** on **it20**, i.e. at **it20:/home/abird**.
3. There is a home for **ajb** on **it20**, i.e. at **it20:/home/ajb**.
4. There is a home for **bj** on **itvm28-8a**, i.e. **itvm28-8a:/home/bj**.

These three homes will be moved. When you make the changes for your client host, you may follow the example for **bj** below, but instead of exporting and (auto-) mounting the home directory for **bj**, you will want to export and (auto-) mount the home directories for yourself and for your partner. You will want to (auto-) mount the home directories for **abird** and **ajb** as in the examples.

NB: The host **itvm28-8a** and its user, **bj** are only examples. Your client will be named **itvm2x-yz** (where you should *know* x, y and z) with two user names defined, one for you and one for your partner.

On the Server¹, it20

(This much, we have already done):

1. Download and install the required NFS packages:

```
sudo apt-get update
sudo apt-get install nfs-common
sudo apt-get install nfs-kernel-server
```

2. Download and install **autofs**

```
sudo apt-get install autofs
```

3. Move the homes to another dir, from the root / directory

```
sudo mv /home /home.it20
```

4. Create a directory to use as a mount point. Call it /home.

```
sudo mkdir /home
```

¹<https://help.ubuntu.com/community/SettingUpNFSTo>

<https://help.ubuntu.com/16.04/serverguide/network-file-system.html>

5. Edit `/etc/passwd` to say where user `sysadmin`'s home is:

```
...
landscape:x:104:109::/var/lib/landscape:/bin/false
sysadmin:x:1000:1000:sysadmin,,,:/home.it20/sysadmin:/bin/bash
dhcpd:x:105:113::/var/run:/bin/false
abird:x:1001:1001:Al Bird,,,:/home.it20/abird:/bin/bash
...
```

We want user `sysadmin`, on `it20` and on all the clients, to be *local* and so not part of NFS. Having `sysadmin` allows us access to any host, whether or not NFS is running properly. So we are *explicit* as to where its home is (its new location).

5. Edit `/etc/exports` so as to export these homes:

```
# /etc/exports: the access control list for filesystems,
# which may be exported
# to NFS clients. See exports(5).
#
# Example for NFSv2 and NFSv3:
# /srv/homes hostname1(rw,sync) hostname2(ro,sync)
#
# Example for NFSv4:
# /srv/nfs4 gss/krb5i(rw,sync,fsid=0,crossmnt)
# /srv/nfs4/homes gss/krb5i(rw,sync)
#
/home.it20 10.0.0.0/24(rw,sync,no_root_squash,no_subtree_check)
```

6. Edit `/etc/auto.master` to tell `autofs` about the map for `/home`. The directory `/home` must exist and must be empty. It must not have any files in it. Remember we moved the `/home` directory earlier in the project.

```
# $Id: auto.master,v 1.4 2005/01/04 14:36:54 raven Exp $
#
# Sample auto.master file
# This is an automounter map and it has the following format
# key [ -mount-options-separated-by-comma ] location
# For details of the format look at autofs(5).
#/misc /etc/auto.misc --timeout=60
#/smb /etc/auto.smb
#/misc /etc/auto.misc
#/net /etc/auto.net
/home /etc/auto.home
```

7. And, define the map: `/etc/auto.home`

```
# Ampersand in the RHS matches the key itself.
abird it20:/home.it20/&
ajb it20:/home.it20/&
it341 it20:/home.it20/&
bja itvm28-8a:/home.itvm28-8a/&
...
...
```

That is it for now. We will return to this file later to make sure homes on other boxes get mounted.

The Clients (e.g. `itvm2x-yz` here)

The task on the clients is similar. In fact, when it comes to NFS we are all both servers and clients. We are servers in that we serve up (or export) our local home directories to the network. We are clients in that we (auto) mount the local directories that are served up (exported) by other hosts on the network.

Of course in these examples, both `itvm28-8a` and user `bj` are just examples. You will want to use your `itvm2x-yz` and your user names.

1. Download and install the required NFS packages.:

```
sudo apt-get update
sudo apt-get install nfs-common
sudo apt-get install nfs-kernel-server
```

2. Download and install `autofs`

```
sudo apt-get install autofs
```

3. Move the homes to another dir, from the `root/` directory

```
sudo mv /home /home.itvm2x-yz
```

4. Create a directory to use as a mount point. Call it `/home`.

```
sudo mkdir /home
```

5. On every host (both the server and the clients) we want user `sysadmin` to be a truly local user and not part of NFS. Edit `/etc/passwd` to say where user `sysadmin`'s home is:

```
...
libuuid:x:100:101::/var/lib/libuuid:/bin/sh
landscape:x:102:108::/var/lib/landscape:/bin/f4lse
sysadmin:x:1000:1000:sysadmin,,,:/home.itvm2x-yz/sysadmin:/bin/bash
sshd:x:103:65534::/var/run/sshd:/usr/sbin/nologin
statd:x:104:65534::/var/lib/nfs:/bin/false
...
...
...
```

5. Depending on the editor you are using you may get an error message. Ignore it. At this point `sysadmin` does not have a home directory. **This will be Question #3 at the end of your lab report** You need to logout and log in again. Then `sysadmin` will again have a home directory.

6. Edit `/etc/exports` so as to export our homes:

```
# /etc/exports: the access control list for filesystems,
# which may be exported to NFS clients. See exports(5).
#
# Example for NFSv2 and NFSv3:
# /srv/homes hostname1(rw, sync) hostname2(ro, sync)
#
# Example for NFSv4:
# /srv/nfs4 gss/krb5i(rw, sync, fsid=0, crossmnt)
# /srv/nfs4/homes gss/krb5i(rw, sync)
#
/home.itvm2x-yz 10.0.0.0/24(rw, sync, no_root_squash, no_subtree_check)
```

6. Edit `/etc/auto.master` to tell `autofs` about the map for `/home`. The directory `/home` must exist and must be empty. It must not have any files in it. Remember we moved the `/home` directory earlier in the project.

```
#
# Sample auto.master file
# This is an automounter map and it has the following format
# key [ -mount-options-separated-by-comma ] location
# For details of the format look at autofs(5).
#
#/misc          /etc/auto.misc
#
# NOTE: mounts done from a hosts map will be mounted with the
#       "nosuid" and "nodev" options unless the "suid" and "dev"
#       options are explicitly given.
#
#/net -hosts
#
# Include central master map if it can be found using
# nsswitch sources.
#
# Note that if there are entries for /net or /misc (as
# above) in the included master map any keys that are the
# same will not be seen as the first read key seen takes
# precedence.
#
/home /etc/auto.home
```

7. Then, back to the server `it20`, edit `/etc/auto.home` to mount `bj`'s home:

```
# Ampersand in the RHS matches the key itself.
abird          it20:/home.it20/&
it341          it20:/home.it20/&
ajb           it20:/home.it20/&
bja           itvm28-8a:/home.itvm28-8a/&
...
...
...
```

(I will have done this.)

After all users home directory have been entered into the file on `it20`, we will copy the file `/etc/auto.home` from `it20` to all of the virtual machines.

Command:

(NOTE: The command is **deliberately** incomplete!

```
scp it341@it20.cs.umb.edu:/etc/auto.home /etc/auto.home
```

(You can do this right away, if you want. However, if the file is updated on it20, then you must do it again.)

8. Eventually, all clients will have exported all of their home directories. We will all (server and clients) want to auto mount all homes from all servers; indeed our `/etc/auto.home` will look the same on all hosts.
9. At this point restart your virtual machine.
10. Now we should be able to log on to any hosts (because NIS makes us known to our network) and we should see our home directories on each of these hosts (because NFS makes them available). Indeed NFS makes it look like there is just one common `/home` visible to all hosts. In reality, our own home directories reside on our own hosts (as `/home.itvm2x-yz`) but we export them to the network and each host auto mounts these under `/home`.
11. You may notice that if, on your client host, you `cd` to `/home`, you may not see all home directories; e.g.

```
abird@it20:~$ cd /home
abird@it20:/home$ ls
abird
abird@it20:/home$ ls bja
abird@it20:/home$ ls
bja abird
```

This is because the automounter mounts the directories on demand once you actually refer to the directory explicitly, as in

```
abird@it20:/home$ ls bja
```

12. If you like, you may configure the definition in `/etc/auto.master` to include the `--ghost` parameter:

```
# Sample auto.master file
# This is an automounter map and it has the following format
# key [ -mount-options-separated-by-comma ] location
# For details of the format look at autofs(5).
#
#/misc          /etc/auto.misc
#
# NOTE: mounts done from a hosts map will be mounted with the
#       "nosuid" and "nodev" options unless the "suid" and "dev"
#       options are explicitly given.
#
#/net -hosts
#
# Include central master map if it can be found using
# nsswitch sources.
#
# Note that if there are entries for /net or /misc (as
# above) in the included master map any keys that are the
# same will not be seen as the first read key seen takes
# precedence.
#
```

NOTE:
Don't do this
SIMPLY
because you can!

You should have
a **REASON** for
it, that you can
explain in your
admin log.

```
/home file:/etc/auto.home --ghost
```

After we restart the auto-mounter, an `ls` will show all (mounted and un-mounted) files:

```
sysadmin@itvm28-8a:/etc$ sudo service autofs restart
autofs start/running, process 15851
sysadmin@itvm28-8a:/etc$ ls /home
bja ajb it341 abird . . .
```