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High-Performance Computing System Administration

Introduction to Network File System (NFS)

Learning Objectives

After the course the students should be able to:

- Describe common usage of NFS
- Depoly NFS infrastructure on a server and a client
- Examine NFS deployments

Outline

1 Whats NFS

2 Recap Terminal Editors

3 Installation of an NFS server

4 Installation of an NFS client

What is NFS

NFS (either Network File System or Network File Service) is the most common protocol for sharing files between Unix systems over a network. NFS servers export directories from their local hard disks to NFS clients, which mount them so that they can be accessed like any other directory.

How is NFS structured

- Server / client architecture
- The server
  - Shares its filesystem and stores the data
  - Can be to grant access to several clients based of groups or users
- The client
  - Accesses and modifies the data on the server
  - Does not store data on their own
  - Folder is included as a mounted drive

Why even use NFS

- Pro
  - Reduce storage costs
  - Enables access on the same files by network for multiple parties
  - Supports heterogeneous environments, as NFS is compatible with Windows, Apple, and Linux
  - NFS service makes the physical location of the storage system irrelevant
- Con
  - Needs a fast network connection
  - No offline access to files

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Short reminder, Terminal Editors

- nano
  - open a file with " `nano %file` "
  - crtl + s - save file
  - crtl + o - save file as
  - crtl + x - exit nano
- vim
  - open a file with " `vim %file` "
  - to switch between edit and command mode press esc, in the command mode you start commands with :
  - :w - writes the file
  - :w !sudo tee % - writes into a file with sudo
  - to exit vim
    - :q! - closes vim without saving changes
    - :wq - exits vim saving the file

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Installing an NFS server

- Installation of NFS server on CentOS/Rocky/Fedora
  `yum -y install nfs-utils`
- Create Root NFS Directory
  `sudo mkdir /nfs2`
- Check your user and its group
  1. user: `whoami`
  2. group: `groups $(whoami)`
- Set the permissions for your user and his/her group
  `sudo chown $(whoami):$(id -gn $(whoami)) /nfs2`

The /etc/exports Configuration File

- This file controls
  - which file systems are exported
  - options on how they are exported
- Options
  - Blank lines are ignored
  - # starts a comment
  - \backslashes can wrap long lines\
  - for each exported item you use an individual line

Enabling access with /etc/exports

- Access to a single client
  - `/nfs2 {clientIP}(rw,sync,no_subtree_check)`
- Access to several clients
  - `/nfs2 {clientIP}(rw,sync,no_subtree_check)`
    `{clientIP-2}(...)`
    `{clientIP-3}(...)`
- Access to an entire subnet
  - `/nfs2 {subnetIP}/{subnetMask}(rw,sync,no_subtree_check)`

Make the NFS Share Available to Clients

- With exportfs we can now make the shared directory available
  - `sudo exportfs -a`
- We restart the server to reload its configuration
  - `sudo systemctl restart nfs-server`
- if you run a firewall you have to allow access
  - `sudo ufw allow`

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Setup on an NFS client

- We can install the NFS client on Rocky Linux and Fedora using the same command as the NFS server
  - `sudo yum install nfs-utils`
- We create a local directory as a mount point for the NFS share
  - `sudo mkdir /nfs2`

Mounting the NFS file system

- Now we mount the NFS share by running the mount command
  - `sudo mount -t nfs {ip of NFS server}:{path on server} /nfs2`
  - `sudo mount -t nfs 10.254.1.234:/nfs2 /nfs2`

  The mount point now acts as the root of the nfs-share, displaying all subfolders contained in the folder on the server
- To verify the correct mounting of the NFS share run either
  - `mount`
  - `df -h`

Mounting the NFS file permanently

- Remote NFS directories can be mounted on startup automatically. This is defined in the file /etc/fstab
- We edit the /etc/fstab, adding a line for every file share we want to include without intermediate line breaks, similar to etc/export when installing the server. Parameters are seperated by tabulator.
  - `nano /etc/fstab`
  - `vim /etc/fstab`

Parameters

- The last three parameters are NFS options, which we leave on default
  - `{ip of NFS server}:{path on server} /nfs2 nfs defaults 0 0`
- examples of NFS options would be
  - `timeo=n`
    - How long the client waits for a response before it retries an NFS request. Default is 60 seconds (600 * 1/10 second)
  - `rsize=n`
    - The maximum number of bytes in each network READ request. The largest read payload supported by the Linux NFS client is 1,048,576 bytes (one megabyte). The rsize value is a multiple of 1024 with a minimum of 4096 and maximum of 1048576 rounded down to the nearest multiple of 1024.

Try it!