

LAPORAN PRAKTIKUM VIRTUALISASI KOMPUTER

NETWORK ATTACHED STORAGE MENGUNAKAN NFS



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DIII TEKNOLOGI KOMPUTER

**INSTITUT TEKNOLOGI DEL
FAKULTAS VOKASI**

Judul Praktikum

Minggu/Sesi	:	VI/2
Kode Mata Kuliah	:	4332103
Nama Mata Kuliah	:	VIRTUALISASI KOMPUTER
Setoran	:	Jawaban dalam bentuk <i>softcopy</i>
Batas Waktu Setoran	:	11 Oktober 2024 jam 21:30
Tujuan	:	1. Mahasiswa mampu mengimplementasikan penyimpanan distribusi menggunakan NFS.

Petunjuk

Teori

A. Apa itu NFS?

NFS adalah singkatan dari **Network File System**, yang pertama kali dikembangkan oleh Sun Microsystems pada tahun 80-an, sebagai sarana untuk berbagi file pada lingkungan kerja diskless. NFS menyediakan sarana untuk berbagi file antar jaringan, sehingga suatu mesin dapat mengakses file-file di mesin lain seolah-olah mengakses file sistem lokal.

B. Protokol NFS

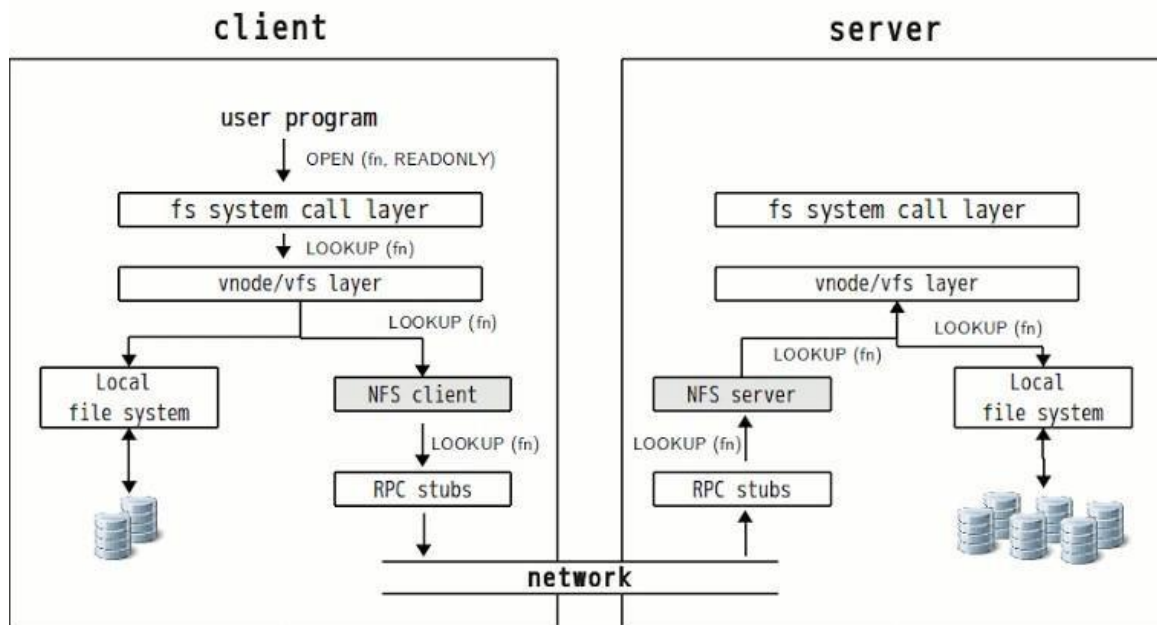
Protokol NFS adalah salah satu dari beberapa stkitar sistem file terdistribusi untuk penyimpanan yang terhubung dengan jaringan (network-attached storage — NAS). NFS umumnya menggunakan protokol Remote Procedure Call (RPC) yang berjalan di atas UDP dan membuka port UDP dengan port number 2049 untuk komunikasi antara client dan server di dalam jaringan.

Client NFS selanjutnya akan mengimpor sistem berkas remote dari server NFS, sementara server NFS mengeksport sistem berkas lokal kepada client.

C. Komponen NFS

- a. **File System Model dan Architecture:** suatu mekanisme yang mendefinisikan sumber daya dan berkas yang akan digunakan secara bersama-sama dalam jaringan
- b. **Resource Access Method:** tahapan-tahapan yang menggambarkan bagaimana pengguna melampirkan ataupun melepaskan sumber daya yang berasal dari tempat penyimpanan local mereka.
- c. **Operation Set:** untuk mengatur operasi apa yang akan digunakan dan diperlukan pada saat pengguna menggunakan sumber daya yang digunakan bersama pada tempat penyimpanan local pengguna lain
- d. **Messaging Protocols:** format pesan yang berisi operasi yang akan digunakan seperti informasi status dan protokol yang digunakan untuk bertukar pesan ini antar mesin pengguna
- e. **Administrative Tool:** kumpulan fungsi yang dibutuhkan untuk mendukung operasi protokol dan penggunaan komponen lain yang mendukung

D. Diagram Architecture NFS



E. Tujuan NFS

Memungkinkan terjadinya pertukaran berkas antara mesin mesin secara transparan. Hubungannya yang terjadi disini adalah hubungan client — server dengan menggunakan perangkat lunak NFS Server dan NFS client yang berjalan diatas workstation. NFS didesain untuk dapat berjalan di platform yang heterogen. Adapun operasi-operasi yang didukung oleh NFS adalah sebagai berikut:

- Mencari berkas didalam direktori
- Membaca kumpulan direktori
- Memanipulasi link dan direktori
- Mengakses atribut berkas
- Membaca dan menulis berkas

F. Manfaat NFS

- Memungkinkan beberapa komputer menggunakan file yang sama, sehingga semua orang dapat mengakses file data yang sama
- Mengurangi biaya penyimpanan. Memberikan konsistensi dan keketatan data karena semua pengguna dapat membaca file data yang sama
- Menjadikan sistem file secara transparan bagi pengguna
- Dapat mengakses file jarak jauh bagi pengguna
- Mendukung lingkungan yang heterogen
- Mengurangi overhead administrasi system

G. Keamanan NFS

NFS sangat cocok untuk berbagi seluruh sistem file dengan sejumlah besar host yang dikenal secara transparan. Namun, dengan kemudahan penggunaan muncul berbagai potensi masalah keamanan.

H. File Permissions

Setelah sistem file NFS di-mount baca/tulis oleh host jarak jauh, satu-satunya perlindungan yang dimiliki setiap file bersama adalah izinnya. Jika dua pengguna yang berbagi nilai ID pengguna yang sama memasang sistem file NFS yang sama, mereka dapat saling memodifikasi file lainnya. Selain itu, siapa pun yang masuk sebagai root pada sistem klien dapat menggunakan perintah `su-` untuk menjadi pengguna yang dapat mengakses file tertentu melalui share NFS.

I. Contoh Implementasi NFS

- a. FreeNFS
- b. ProNFS
- c. OpenTextNFS
- d. *Active Directory*

Praktikum

1. Konfigurasi NFS membutuhkan minimal 2 komputer, yaitu server dan client. Jadi, lakukan instalasi CentOS terlebih dahulu, setelah itu update CentOS yang kita instal. Kemudian, kita lakukan cloning CentOS dari VMware/Virtual Box, dengan metode **Full Clone**. Setelah itu, kita buat pembeda CentOS yang satu dengan yang lain.

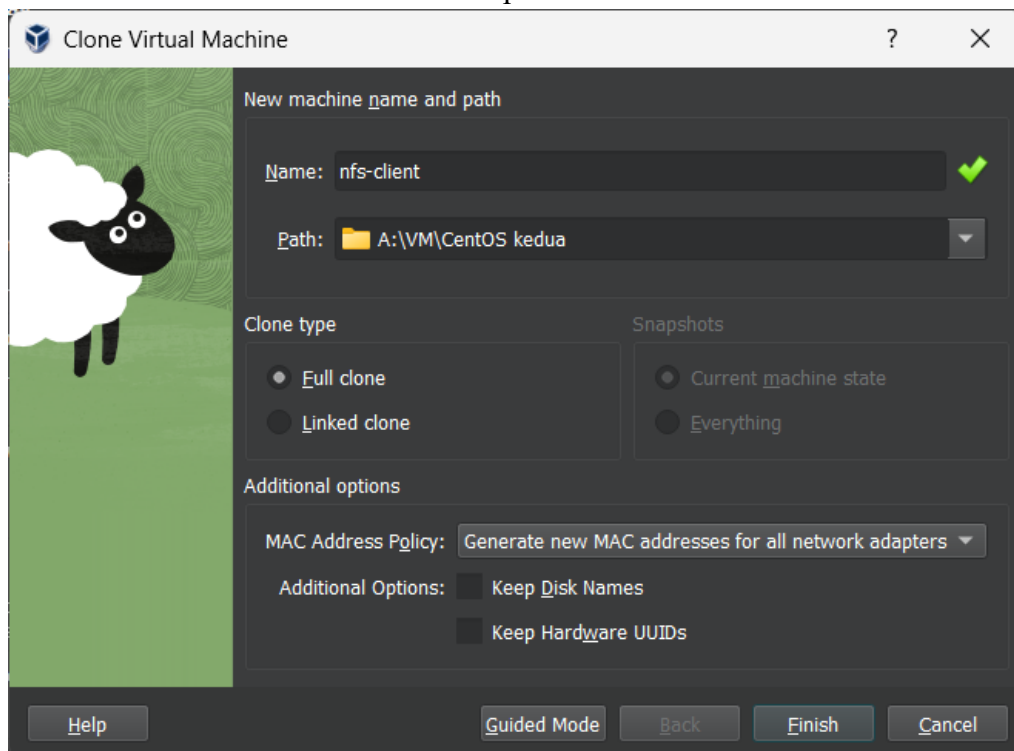
Jawab:

Centos Server VM

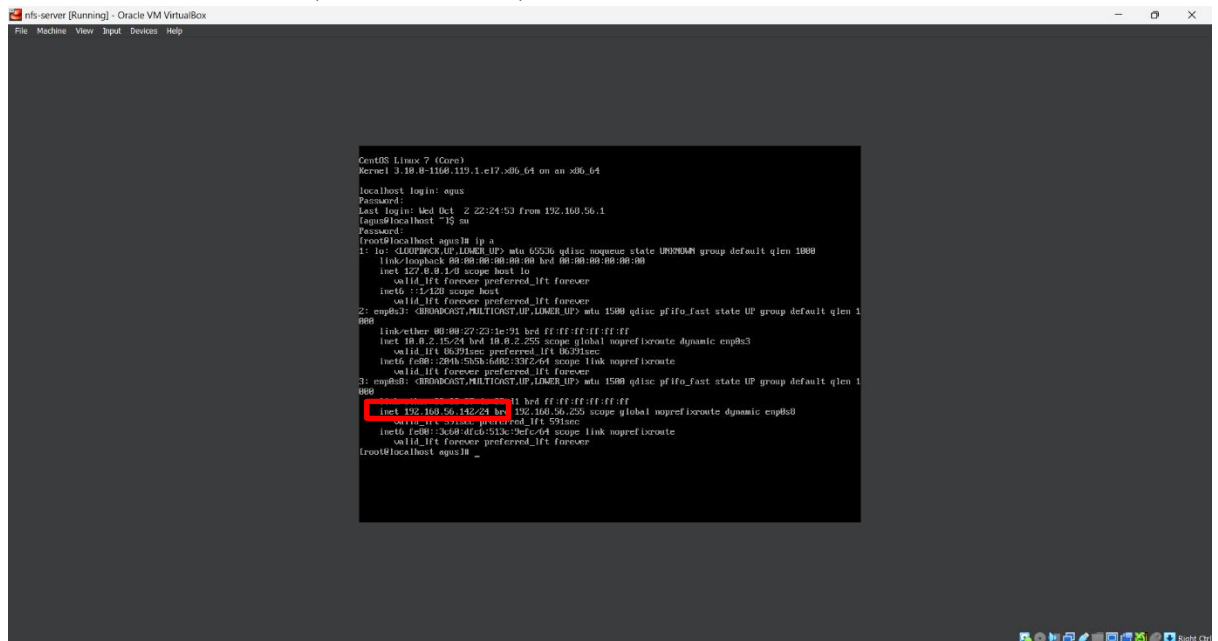


Clone VM dari CentOS Server menjadi CentOS Client

Karena memakai CentOS Server, jadi clone nya dipilih tipe full clone dan pilih Generate New MAC address for all network adapters.



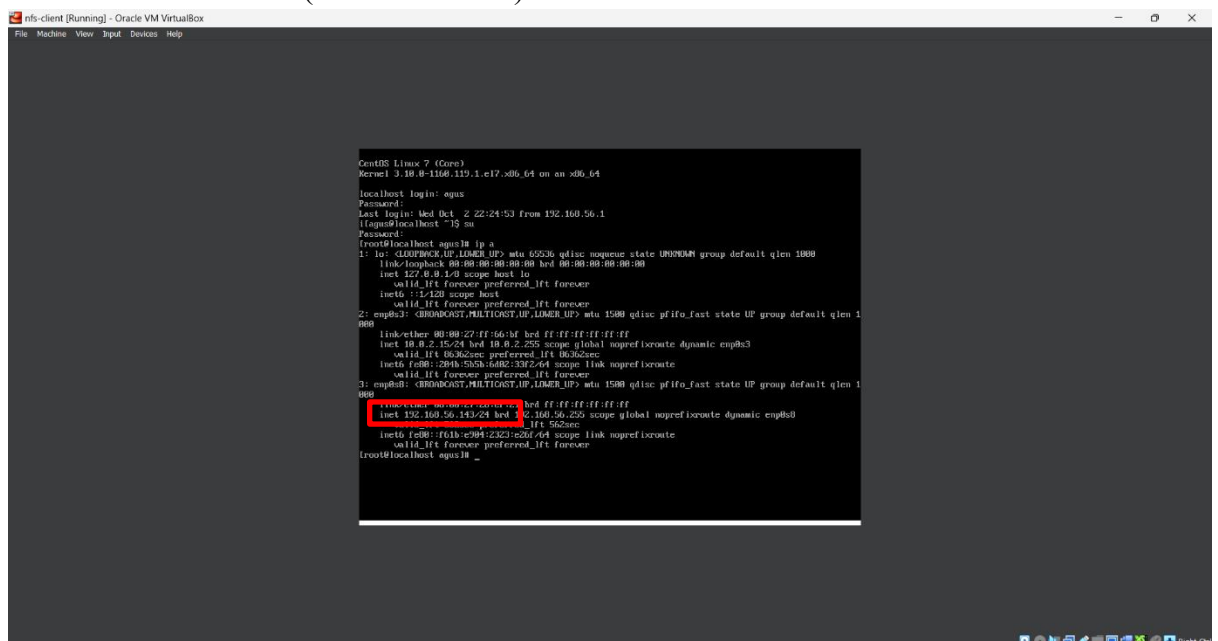
2. Setelah CentOS sudah terinstal di VMware/Virtual Box, jalankan server dan clientnya. Setelah itu kita lihat terlebih dahulu IP dari kedua CentOS tersebut.
 - a. IP address NFS-Server (192.168.56.142)



```
CentOS Linux 7 (Core)
Kernel 3.10.0-1160.119.1.el7.x86_64 on an x86_64

localhost login: egus
Password:
Last login: Wed Oct 2 22:24:53 from 192.168.56.1
[egus@localhost ~]$ su
Password:
[root@localhost ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: emph3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
    000
    link/ether 00:00:27:22:1e:91 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefroute dynamic emph3
        valid_lft 86391sec preferred_lft 86391sec
    inet6 fe80::29b:535b:64b2:3372:64 scope link noprefroute
        valid_lft forever preferred_lft forever
3: emph8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
    000
    link/ether 00:00:27:22:1e:91 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefroute dynamic emph8
        valid_lft 86391sec preferred_lft 86391sec
    inet6 fe80::3c58:d1cd:513c:2efc:64 scope link noprefroute
        valid_lft forever preferred_lft forever
[root@localhost ~]#
```

- b. IP address NFS-Client (192.168.56.143)



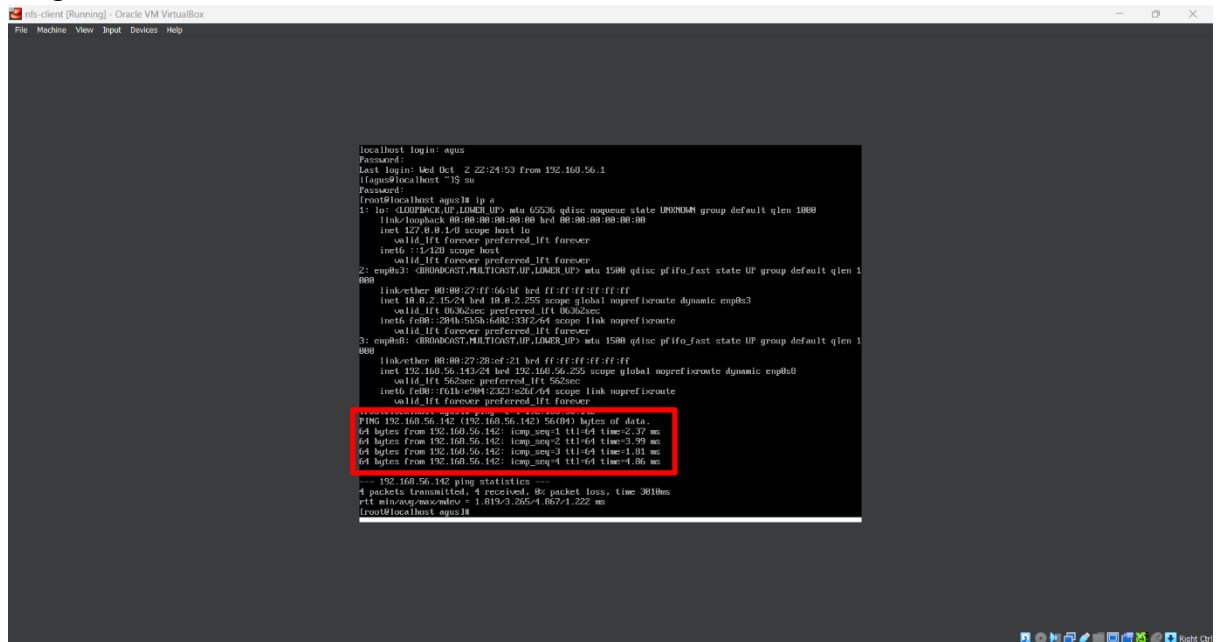
```
CentOS Linux 7 (Core)
Kernel 3.10.0-1160.119.1.el7.x86_64 on an x86_64

localhost login: egus
Password:
Last login: Wed Oct 2 22:24:53 from 192.168.56.1
[egus@localhost ~]$ su
Password:
[root@localhost ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: emph3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
    000
    link/ether 00:00:27:22:1e:91 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefroute dynamic emph3
        valid_lft 86362sec preferred_lft 86362sec
    inet6 fe80::29b:535b:64b2:3372:64 scope link noprefroute
        valid_lft forever preferred_lft forever
3: emph8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1
    000
    link/ether 00:00:27:22:1e:91 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.143/24 brd 192.168.56.255 scope global noprefroute dynamic emph8
        valid_lft 86362sec preferred_lft 86362sec
    inet6 fe80::f6b1:e994:2323:e2d7:64 scope link noprefroute
        valid_lft forever preferred_lft forever
[root@localhost ~]#
```

3. Kemudian pastikan server dan client bisa melakukan ping dengan menggunakan perintah berikut ini.

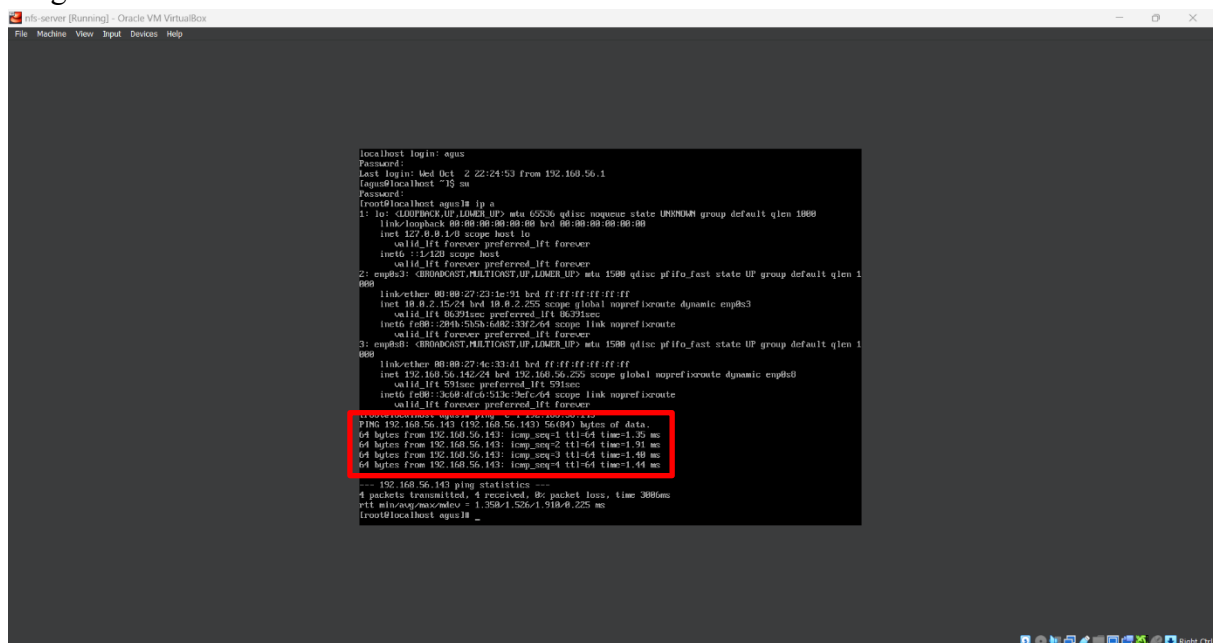
Jawab:

1. Ping Centos Client ke Centos Server



```
localhost login: agus
Password:
Last login: Wed Oct 2 22:24:53 from 192.168.56.1
[agus@localhost ~]$ su
Password:
[root@localhost agus#] ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 88:88:88:88:88:88 brd 88:88:88:88:88:88
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: emg0e3: <BRIDGE,MTU-CAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 88:88:27:ff:56:14 brd ff:ff:ff:ff:ff:ff
    inet 10.8.2.15/24 brd 10.8.2.255 scope global noprefroute dynamic emg0e3
        valid_lft 86362sec preferred_lft 86362sec
    inet6 fe80::294b:535b:6d82:3326/64 scope link noprefroute
        valid_lft forever preferred_lft forever
3: emg0e8: <BRIDGE,MTU-CAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 88:88:27:28:af:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.143/24 brd 192.168.56.255 scope global noprefroute dynamic emg0e8
        valid_lft 562sec preferred_lft 562sec
    inet6 fe80::f61b:c994:2323:c26f/64 scope link noprefroute
        valid_lft forever preferred_lft forever
[root@localhost agus#] ping -c 4 192.168.56.143
PING 192.168.56.143 (192.168.56.143) 56(84) bytes of data:
64 bytes from 192.168.56.143: icmp_seq=1 ttl=64 time=3.27 ms
64 bytes from 192.168.56.143: icmp_seq=2 ttl=64 time=3.99 ms
64 bytes from 192.168.56.143: icmp_seq=3 ttl=64 time=1.91 ms
64 bytes from 192.168.56.143: icmp_seq=4 ttl=64 time=4.56 ms
--- 192.168.56.143 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3010ms
rtt min/avg/max/mdev = 1.819/3.265/4.867/1.222 ms
[root@localhost agus#]
```

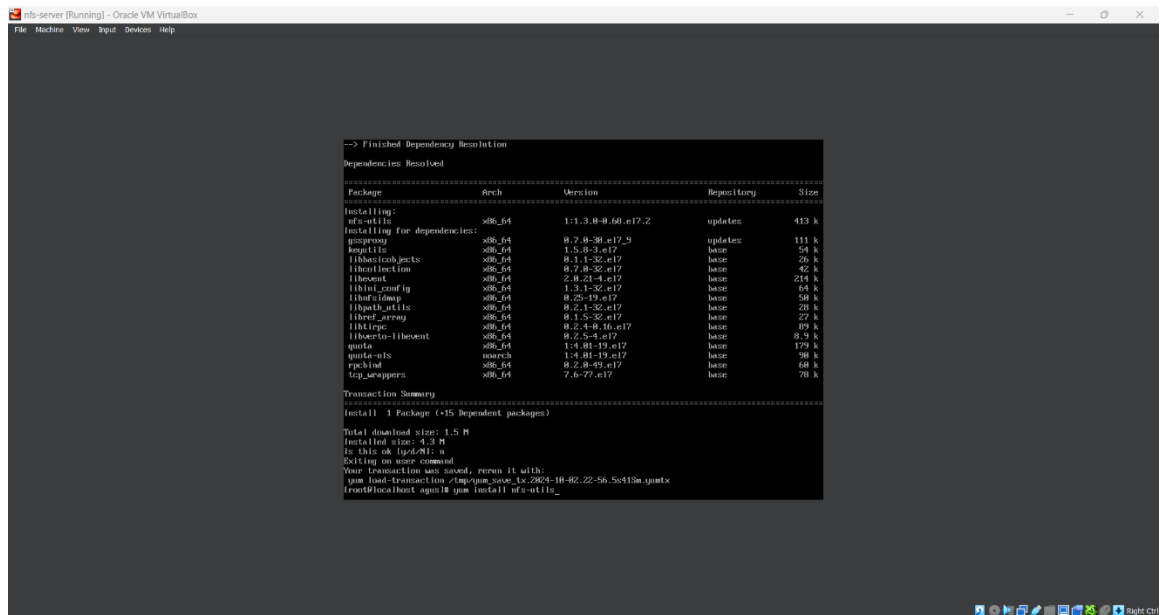
2. Ping Centos Server ke Centos Client



```
localhost login: agus
Password:
Last login: Wed Oct 2 22:24:53 from 192.168.56.1
[agus@localhost ~]$ su
Password:
[root@localhost agus#] ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 88:88:88:88:88:88 brd 88:88:88:88:88:88
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: emg0e3: <BRIDGE,MTU-CAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 88:88:27:23:1e:91 brd ff:ff:ff:ff:ff:ff
    inet 10.8.2.15/24 brd 10.8.2.255 scope global noprefroute dynamic emg0e3
        valid_lft 86291sec preferred_lft 86291sec
    inet6 fe80::294b:535b:6d82:3326/64 scope link noprefroute
        valid_lft forever preferred_lft forever
3: emg0e8: <BRIDGE,MTU-CAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 88:88:27:4c:33:a1 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefroute dynamic emg0e8
        valid_lft 591sec preferred_lft 591sec
    inet6 fe80::3c68:4fcd:513c:79fc/64 scope link noprefroute
        valid_lft forever preferred_lft forever
[root@localhost agus#] ping -c 4 192.168.56.143
PING 192.168.56.143 (192.168.56.143) 56(84) bytes of data:
64 bytes from 192.168.56.143: icmp_seq=1 ttl=64 time=1.32 ms
64 bytes from 192.168.56.143: icmp_seq=2 ttl=64 time=1.51 ms
64 bytes from 192.168.56.143: icmp_seq=3 ttl=64 time=1.48 ms
64 bytes from 192.168.56.143: icmp_seq=4 ttl=64 time=1.44 ms
--- 192.168.56.143 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3086ms
rtt min/avg/max/mdev = 1.358/1.526/1.918/0.225 ms
[root@localhost agus#]
```


4. Setelah itu, maka kita bisa menginstal package NFS pada server dengan perintah dibawah ini.

```
yum install nfs-utils
```



```
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package             Arch      Version              Repository           Size
=====
Installing:
nfs-utils            x86_64    1:1.3.0-0.68.el7.2   updates              413 k
Installing for dependencies:
gssproxy             x86_64    0.7.0-30.el7.9      updates              111 k
keyutils             x86_64    1.5.0-3.el7         base                  54 k
libbasicobjects      x86_64    0.1.1-32.el7        base                  26 k
libcollection         x86_64    0.7.0-32.el7        base                  42 k
libevent             x86_64    2.0.21-4.el7        base                  214 k
libini_conf          x86_64    1.3.1-32.el7        base                  64 k
libidnmap            x86_64    0.25-19.el7         base                  58 k
libpath_utils        x86_64    0.2.1-32.el7        base                  29 k
libref_array         x86_64    0.1.5-32.el7        base                  27 k
libtirpc             x86_64    0.2.4-8.16.el7      base                  89 k
libverto-libevent    x86_64    0.2.5-4.el7         base                  8.9 k
quota                x86_64    1:4.01-19.el7       base                  179 k
quota-nls            noarch    1:4.01-19.el7       base                  98 k
rpcbind              x86_64    0.2.0-49.el7        base                  68 k
tcp_wrappers         x86_64    7.6-77.el7          base                  70 k
=====

Transaction Summary
-----
Install 1 Package (+15 dependent packages)

Total download size: 1.5 M
Installed size: 4.3 M
Is this ok [y/d/A/?/]: y
Exiting on user command
Your transaction was saved, rerun it with:
yum load-transaction /tmp/yum_save_tx.2024-10-02.22:56:55/33m.yumtx
[root@localhost agent]# yum install nfs-utils_
```



```
--> Package quota-nls noarch 1:4.01-19.el7 will be installed
--> Package tcp_wrappers x86_64 7:6-77.el7 will be installed
--> Running transaction check
--> Package libpath_utils x86_64 0:0.2.1-32.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package             Arch      Version              Repository           Size
=====
Installing:
nfs-utils            x86_64    1:1.3.0-0.68.el7.2   updates              413 k
Installing for dependencies:
gssproxy             x86_64    0.7.0-30.el7.9      updates              111 k
keyutils             x86_64    1.5.0-3.el7         base                  54 k
libbasicobjects      x86_64    0.1.1-32.el7        base                  26 k
libcollection         x86_64    0.7.0-32.el7        base                  42 k
libevent             x86_64    2.0.21-4.el7        base                  214 k
libini_conf          x86_64    1.3.1-32.el7        base                  64 k
libidnmap            x86_64    0.25-19.el7         base                  58 k
libpath_utils        x86_64    0.2.1-32.el7        base                  29 k
libref_array         x86_64    0.1.5-32.el7        base                  27 k
libtirpc             x86_64    0.2.4-8.16.el7      base                  89 k
libverto-libevent    x86_64    0.2.5-4.el7         base                  8.9 k
quota                x86_64    1:4.01-19.el7       base                  179 k
quota-nls            noarch    1:4.01-19.el7       base                  98 k
rpcbind              x86_64    0.2.0-49.el7        base                  68 k
tcp_wrappers         x86_64    7:6-77.el7          base                  70 k
=====

Transaction Summary
-----
Install 1 Package (+15 dependent packages)

Total download size: 1.5 M
Installed size: 4.3 M
Is this ok [y/d/A/?/]: y
```

```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

Installing : libnfsidmap-0.25-19.el7.x86_64 12/16
Installing : libpath_utils-0.2.1-32.el7.x86_64 13/16
Installing : libini_conf-1.3.1-32.el7.x86_64 14/16
Installing : gssproxy-0.7.0-30.el7.x86_64 15/16
Installing : 1-nfs-utils-1.3.0-68.el7.2.x86_64 16/16
Verifying : libtirpc-0.2.4-8.el6.el7.x86_64 1/16
Verifying : gssproxy-0.7.0-30.el7.x86_64 2/16
Verifying : 1-quota-4.01-19.el7.x86_64 3/16
Verifying : libpath_utils-0.2.1-32.el7.x86_64 4/16
Verifying : libnfsidmap-0.25-19.el7.x86_64 5/16
Verifying : libevent-2.0.21-4.el7.x86_64 6/16
Verifying : keyutils-1.5.0-3.el7.x86_64 7/16
Verifying : libevent-2.0.21-4.el7.x86_64 8/16
Verifying : tcp_wrappers-7.6-77.el7.x86_64 9/16
Verifying : libcom_err-1.41-19.el7.x86_64 10/16
Verifying : 1-quota-nls-4.01-19.el7.noarch 11/16
Verifying : libdef_attrs-0.1.5-32.el7.x86_64 12/16
Verifying : libbasicobjects-0.1.1-32.el7.x86_64 13/16
Verifying : 1-nfs-utils-1.3.0-68.el7.2.x86_64 14/16
Verifying : libini_conf-1.3.1-32.el7.x86_64 15/16
Verifying : rpcbind-0.2.0-49.el7.x86_64 16/16

Installed:
nfs-utils.x86_64 1:1.3.0-68.el7.2

Dependency Installed:
gssproxy.x86_64 0:0.7.0-30.el7.2          keyutils.x86_64 0:1.5.0-3.el7
libbasicobjects.x86_64 0:0.1.1-32.el7      libcom_err.x86_64 0:1.41-19.el7
libevent.x86_64 0:2.0.21-4.el7             libini_conf.x86_64 0:1.3.1-32.el7
libpath_utils.x86_64 0:0.2.1-32.el7         libtirpc.x86_64 0:0.2.4-8.el6.el7
libdef_attrs.x86_64 0:0.1.5-32.el7         libevent.x86_64 0:2.0.21-4.el7
libevent-libs.x86_64 0:2.0.21-4.el7        quota-nls.noarch 1:4.01-19.el7
quota-nls.noarch 1:4.01-19.el7             tcp_wrappers.x86_64 0:7.6-77.el7

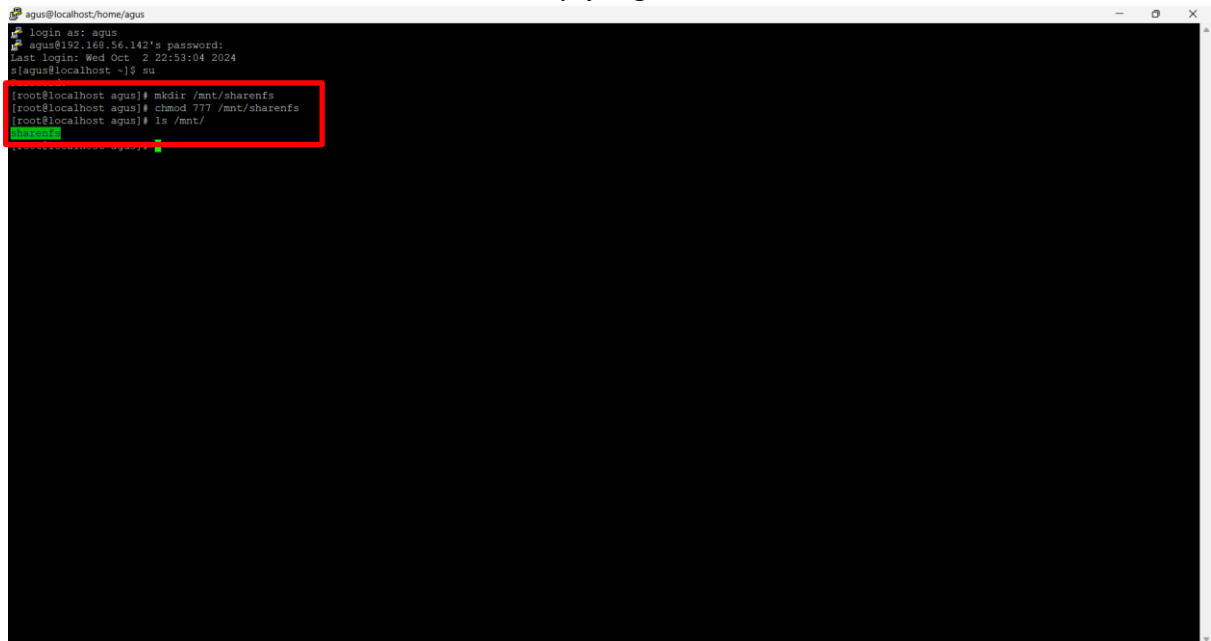
Complete!
[root@localhost agust]#
```

5. Aktifkan dan jalankan NFS service dengan menggunakan command berikut ini.

```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

[root@localhost agust]# systemctl enable rpcbind
[root@localhost agust]# systemctl enable nfs-server
Created symlink from /etc/systemd/system/user.target.wants/nfs-server.service to /usr/lib/systemd/system/nfs-server.service.
[root@localhost agust]# systemctl enable nfs-lock
[root@localhost agust]# systemctl enable nfs-idmap
[root@localhost agust]# systemctl start rpcbind
[root@localhost agust]# systemctl start nfs-server
[root@localhost agust]# systemctl start nfs-lock
[root@localhost agust]# systemctl start nfs-idmap
[root@localhost agust]#
```

6. Kemudian, buatlah *shared directory* dengan nama **/mnt/sharenfs** di server dan izinkan client untuk membaca dan menulis *directory* yang dibuat itu.

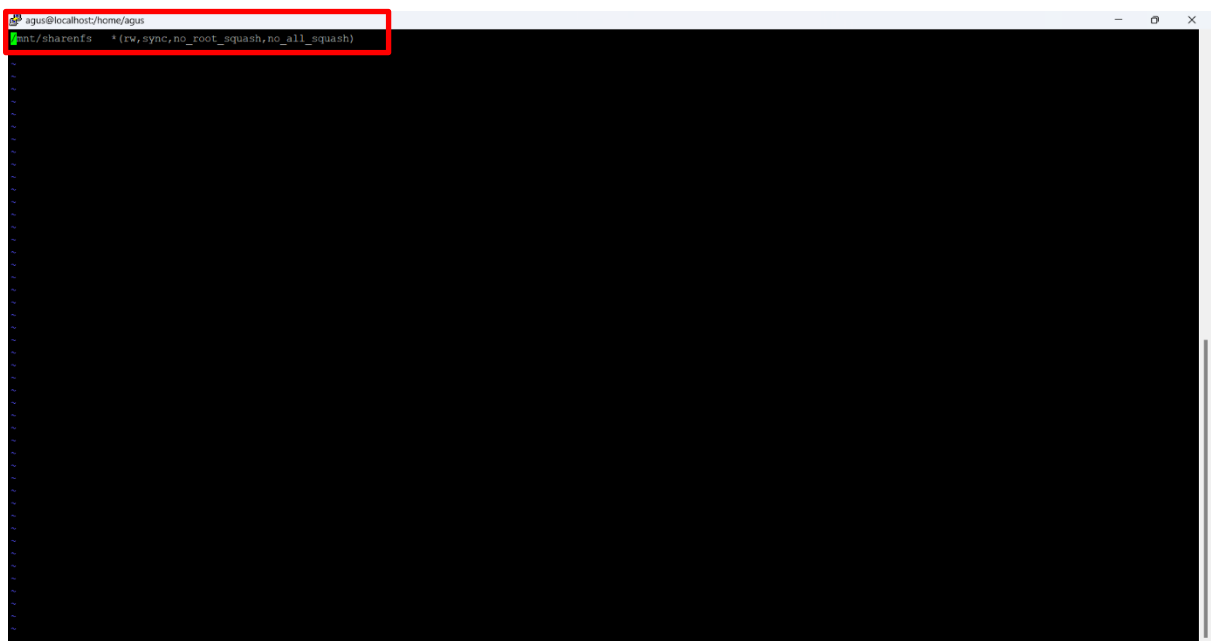


```
agus@localhost/home/agus
login as: agus
agus@192.168.56.142's password:
Last login: Wed Oct 2 22:53:04 2024
[agus@localhost ~]$ su
[root@localhost agus]# mkdir /mnt/sharenfs
[root@localhost agus]# chmod 777 /mnt/sharenfs
[root@localhost agus]# ls /mnt/
sharenfs
```

7. Modifikasi file **/etc/exports** untuk membuat entri *directory* yang mau dibagikan, yaitu **/mnt/sharenfs** dengan menjalankan perintah berikut ini.

```
vi /etc/exports
```

8. Kemudian tambahkan line berikut ini.



```
agus@localhost/home/agus
/mnt/sharenfs  *(rw,sync,no_root_squash,no_all_squash)
```

/mnt/sharenfs	: <i>Directory</i> yang dibagikan
192.168.56.143	:IP address client
rw	:Izin untuk menulis pada <i>directory</i> yang dibagikan
sync	:Sinkronisasi <i>directory</i> yang dibagikan
no_root_squash	:Mengaktifkan hak akses root
no_all_squash	:Mengaktifkan otoritas user

10. Setelah dimodifikasi, restart service **nfs-server** dengan perintah berikut ini.

```
File Machine View Input Devices Help

valid_if1 forever preferred_if1 forever
2: enph3: <BROADCOM, MULTICAST, UP, LOWER_UP> mtu 1500 qlisc pifo_fast state UP group default qlen 1
000
link/ether 08:00:27:23:1e:91 hrd ffff:ffff:ffff:ffff
inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefroute dynamic enph3
    valid_if1 0597aac preferred_if1 0597aac
    inet6 fe80::204b:5a53:b602:33f2::c4 scope link noprefroute
        valid_if1 forever preferred_if1 forever
3: enph3: <BROADCOM, MULTICAST, UP, LOWER_UP> mtu 1500 qlisc pifo_fast state UP group default qlen 1
000
link/ether 08:00:27:4c:33:41 hrd ffff:ffff:ffff:ffff
inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefroute dynamic enph3
    valid_if1 4203ac preferred_if1 4203ac
    inet6 fe80::3c68:4f6c:513c:9efc::c4 scope link noprefroute
        valid_if1 forever preferred_if1 forever
[root@localhost ~]# ip a
1: lo: <LOOPBACK, UP, LOWER_UP> mtu 65536 qlisc noqueue state UP0DOWN group default qlen 1000
link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
inet 127.0.0.1/8 scope host lo
    valid_if1 forever preferred_if1 forever
    inet6 ::1/128 scope host
        valid_if1 forever preferred_if1 forever
2: enph3: <OUI-CARRIER, BROADCAST, MULTICAST, UP> mtu 1500 qlisc pifo_fast state DOWN group default ql
en 1000
link/ether 08:00:27:23:1e:91 hrd ffff:ffff:ffff:ffff
inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefroute dynamic enph3
    valid_if1 05030ac preferred_if1 05030ac
    inet6 fe80::204b:5a53:b602:33f2::c4 scope link noprefroute
        valid_if1 forever preferred_if1 forever
3: enph3: <OUI-CARRIER, BROADCAST, MULTICAST, UP> mtu 1500 qlisc pifo_fast state DOWN group default ql
en 1000
link/ether 08:00:27:4c:33:41 hrd ffff:ffff:ffff:ffff
inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefroute dynamic enph3
    valid_if1 5703ac preferred_if1 5703ac
    inet6 fe80::3c68:4f6c:513c:9efc::c4 scope link noprefroute
        valid_if1 fore
[root@localhost ~]# systemctl restart nfs-server
```

11. Kemudian kita harus mengkonfigurasi firewall pada NFS-Server agar NFS-Client dapat mengakses NFS share dengan menjalankan perintah berikut di NFS-Server.

```
agus@localhost/home/agus
login as: agus
agus@192.168.56.142's password:
Last login: Wed Oct 2 23:02:23 2024 from 192.168.56.1
[agus@localhost ~]$ su
Password:
[root@localhost agus]# firewall-cmd --permanent --add-service mountd
success
[root@localhost agus]# firewall-cmd --permanent --add-service rpc-bind
success
[root@localhost agus]# firewall-cmd --permanent --add-service nfs
success
[root@localhost agus]# firewall-cmd --reload
success
[root@localhost agus]#
```

12. Pada sisi client, instal NFS packages dengan menggunakan perintah berikut ini.

```
yum install nfs-utils
```

```
agus@localhost/home/agus
login as: agus
agus@192.168.56.143's password:
Last login: Wed Oct 2 22:53:36 2024
[agus@localhost ~]$ su
Password:
[root@localhost agus]# yum install nfs-util
```

```
agus@localhost/home/agus
--> Package quota.x86_64 1:4.01-19.el7 will be installed
--> Processing Dependency: quota-nls = 1:4.01-19.el7 for package: lquota-4.01-19.el7.x86_64
--> Processing Dependency: tcp_wrappers for package: lquota-4.01-19.el7.x86_64
--> Package rpcbind.x86_64 0:0.2.0-49.el7 will be installed
--> Running transaction check
--> Package libbasicobjects.x86_64 0:0.1.1-32.el7 will be installed
--> Package libcollection.x86_64 0:0.7.0-32.el7 will be installed
--> Package libini_config.x86_64 0:1.3.1-32.el7 will be installed
--> Processing Dependency: libpath_utils.so.1 (X86_UTILS 0.2.1) (64bit) for package: libini_config-1.3.1-32.el7.x86_64
--> Processing Dependency: libpath_utils.so.1() (64bit) for package: libini_config-1.3.1-32.el7.x86_64
--> Package libref_array.x86_64 0:0.1.5-32.el7 will be installed
--> Package libverto-libevent.x86_64 0:0.2.5-4.el7 will be installed
--> Package quota-nls.noarch 1:4.01-19.el7 will be installed
--> Package tcp_wrappers.x86_64 0:7.6-77.el7 will be installed
--> Running transaction check
--> Package libpath_utils.x86_64 0:0.2.1-32.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

Package Arch Version Repository Size
-----
Installing:
nfs-utils x86_64 1:1.3.0-0.68.el7.2 updates 413 k
Installing for dependencies:
gssproxy x86_64 0:7.0-30.el7_9 updates 111 k
keyutils x86_64 1:5.8-3.el7_9 base 54 k
libbasicobjects x86_64 0:1.1-32.el7 base 26 k
libcollection x86_64 0:0.7.0-32.el7 base 42 k
libevent x86_64 2:0.21-4.el7 base 214 k
libini_config x86_64 1:3.1-32.el7 base 64 k
libnfsidmap x86_64 0:2.5-19.el7 base 50 k
libpath_utils x86_64 0:2.1-32.el7 base 28 k
libref_array x86_64 0:1.5-32.el7 base 27 k
libtirpc x86_64 0:2.4-0.16.el7 base 89 k
libverto-libevent x86_64 0:2.5-4.el7 base 8.9 k
quota x86_64 1:4.01-19.el7 base 179 k
quota-nls noarch 1:4.01-19.el7 base 90 k
rpcbind x86_64 0:2.0-49.el7 base 60 k
tcp_wrappers x86_64 0:7.6-77.el7 base 78 k

Transaction Summary
Install 1 Package (+15 Dependent packages)
Total download size: 1.5 M
Installed size: 4.3 M
Is this ok [y/d/N]: y

agus@localhost/home/agus
--> Package libref_array.x86_64 0:0.1.5-32.el7 will be installed
--> Package libverto-libevent.x86_64 0:0.2.5-4.el7 will be installed
--> Package quota-nls.noarch 1:4.01-19.el7 will be installed
--> Package tcp_wrappers.x86_64 0:7.6-77.el7 will be installed
--> Running transaction check
--> Package libpath_utils.x86_64 0:0.2.1-32.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

Package Arch Version Repository Size
-----
Installing:
nfs-utils x86_64 1:1.3.0-0.68.el7.2 updates 413 k
Installing for dependencies:
gssproxy x86_64 0:7.0-30.el7_9 updates 111 k
keyutils x86_64 1:5.8-3.el7_9 base 54 k
libbasicobjects x86_64 0:1.1-32.el7 base 26 k
libcollection x86_64 0:0.7.0-32.el7 base 42 k
libevent x86_64 2:0.21-4.el7 base 214 k
libini_config x86_64 1:3.1-32.el7 base 64 k
libnfsidmap x86_64 0:2.5-19.el7 base 50 k
libpath_utils x86_64 0:2.1-32.el7 base 28 k
libref_array x86_64 0:1.5-32.el7 base 27 k
libtirpc x86_64 0:2.4-0.16.el7 base 89 k
libverto-libevent x86_64 0:2.5-4.el7 base 8.9 k
quota x86_64 1:4.01-19.el7 base 179 k
quota-nls noarch 1:4.01-19.el7 base 90 k
rpcbind x86_64 0:2.0-49.el7 base 60 k
tcp_wrappers x86_64 0:7.6-77.el7 base 78 k

Transaction Summary
Install 1 Package (+15 Dependent packages)
Total download size: 1.5 M
Installed size: 4.3 M
Is this ok [y/d/N]: y
Downloading packages:
(1/16): libbasicobjects-0.1.1-32.el7.x86_64.rpm | 26 kB 00:00:01
(2/16): libcollection-0.7.0-32.el7.x86_64.rpm | 42 kB 00:00:00
(3/16): gssproxy-0.7.0-30.el7_9.x86_64.rpm | 111 kB 00:00:01
(4/16): libevent-2.0.21-4.el7.x86_64.rpm | 214 kB 00:00:00
(5/16): libini_config-1.3.1-32.el7.x86_64.rpm | 64 kB 00:00:00
(6/16): libnfsidmap-0.25-19.el7.x86_64.rpm | 50 kB 00:00:00
(7/16): keyutils-1.5.8-3.el7.x86_64.rpm | 54 kB 00:00:02
(8/16): libpath_utils-0.2.1-32.el7.x86_64.rpm | 28 kB 00:00:00
```

```
agus@localhost/home/agus
Total
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
Warning: RPMDBS altered outside of yum.
Installing : libbasicobjects-0.1.1-32.el7.x86_64 1/16
Installing : libref_array-0.1.5-32.el7.x86_64 2/16
Installing : libcollection-0.7.0-32.el7.x86_64 3/16
Installing : libevent-2.0.21-4.el7.x86_64 4/16
Installing : libtirpc-0.2.4-0.16.el7.x86_64 5/16
Installing : rpcbind-0.2.0-49.el7.x86_64 6/16
Installing : libverto-libevent-0.2.5-4.el7.x86_64 7/16
Installing : l1quota-nls-4.01-19.el7.noarch 8/16
Installing : tcp_wrappers-7.6-77.el7.x86_64 9/16
Installing : l1quota-4.01-19.el7.x86_64 10/16
Installing : keyutils-1.5.8-3.el7.x86_64 11/16
Installing : libnfsidmap-0.25-19.el7.x86_64 12/16
Installing : libpath_utils-0.2.1-32.el7.x86_64 13/16
Installing : libini_config-1.3.1-32.el7.x86_64 14/16
Installing : gssproxy-0.7.0-30.el7.x86_64 15/16
Installing : nfs-utils-1.3.0-0.68.el7.2.x86_64 16/16
Verifying : libtirpc-0.2.4-0.16.el7.x86_64 1/16
Verifying : gssproxy-0.7.0-30.el7.x86_64 2/16
Verifying : l1quota-4.01-19.el7.x86_64 3/16
Verifying : libpath_utils-0.2.1-32.el7.x86_64 4/16
Verifying : libnfsidmap-0.25-19.el7.x86_64 5/16
Verifying : libevent-2.0.21-4.el7.x86_64 6/16
Verifying : keyutils-1.5.8-3.el7.x86_64 7/16
Verifying : libverto-libevent-0.2.5-4.el7.x86_64 8/16
Verifying : tcp_wrappers-7.6-77.el7.x86_64 9/16
Verifying : libcollection-0.7.0-32.el7.x86_64 10/16
Verifying : l1quota-nls-4.01-19.el7.noarch 11/16
Verifying : libref_array-0.1.5-32.el7.x86_64 12/16
Verifying : libbasicobjects-0.1.1-32.el7.x86_64 13/16
Verifying : nfs-utils-1.3.0-0.68.el7.2.x86_64 14/16
Verifying : libini_config-1.3.1-32.el7.x86_64 15/16
Verifying : rpcbind-0.2.0-49.el7.x86_64 16/16

Installed:
nfs-utils.x86_64 1:1.3.0-0.68.el7.2

Dependency Installed:
gssproxy.x86_64 0:0.7.0-30.el7.9          keyutils.x86_64 0:1.5.8-3.el7          libbasicobjects.x86_64 0:0.1.1-32.el7          libcollection.x86_64 0:0.7.0-32.el7          libevent.x86_64 0:2.0.21-4.el7          libtirpc.x86_64 0:0.2.4-0.16.el7          libini_config.x86_64 0:1.3.1-32.el7          libnfsidmap.x86_64 0:0.25-19.el7          libpath_utils.x86_64 0:0.2.1-32.el7          libref_array.x86_64 0:0.1.5-32.el7          libverto-libevent.x86_64 0:0.2.5-4.el7          quota.x86_64 1:4.01-19.el7          rpcbind.x86_64 0:0.2.0-49.el7          tcp_wrappers.x86_64 0:7.6-77.el7

Complete!
[root@localhost agus]#
```

13. Aktifkan dan jalankan NFS service dengan menggunakan command berikut ini.

```
Complete!
[root@localhost agus]# systemctl enable rpcbind
[root@localhost agus]# systemctl enable nfs-server
Created symlink from /etc/systemd/system/multi-user.target.wants/nfs-server.service to /usr/lib/systemd/system/nfs-server.service.
[root@localhost agus]# systemctl enable nfs-lock
[root@localhost agus]# systemctl enable nfs-idmap
[root@localhost agus]# systemctl start rpcbind
[root@localhost agus]# systemctl start nfs-server
[root@localhost agus]# systemctl start nfs-lock
[root@localhost agus]# systemctl start nfs-idmap
[root@localhost agus]#
```

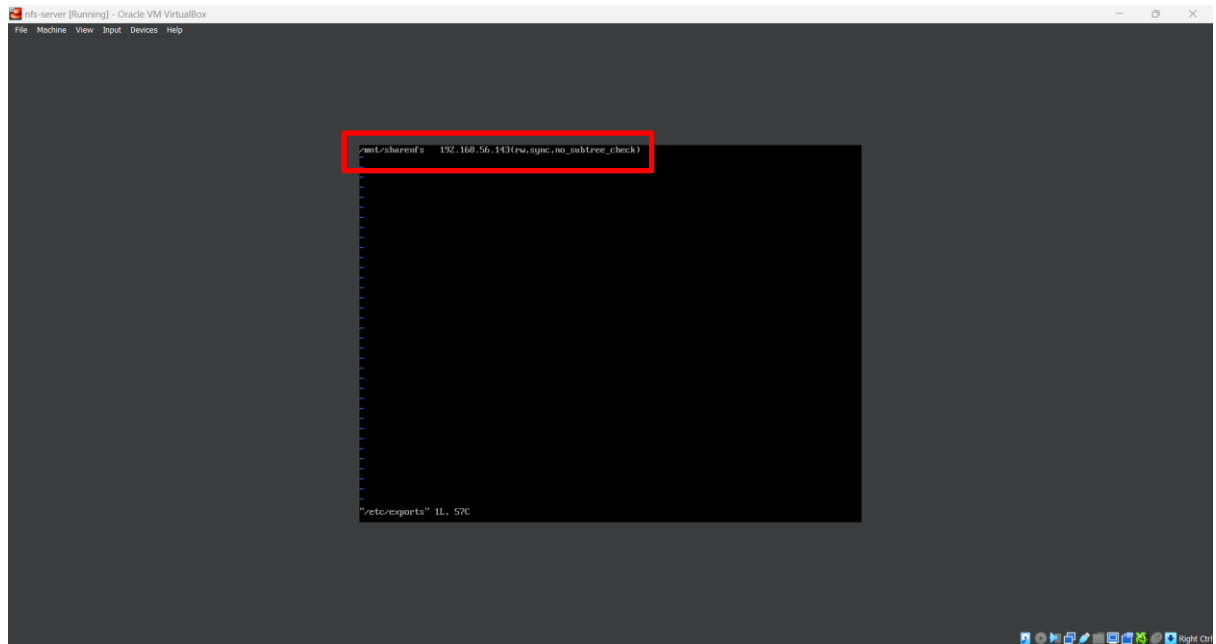
14. Sebelum mounting NFS, Kita harus memeriksa bagian NFS yang tersedia di NFS-Server dengan menjalankan perintah berikut pada NFS-Client.

```
agus@localhost/home/agus
login as: agus
agus@192.168.56.143's password:
Last login: Wed Oct 2 23:03:13 2024 from 192.168.56.1
[agus@localhost ~]$ su

[root@localhost agus]# showmount -e 192.168.56.142
clnt create: RPC: Port mapper failure - Unable to receive: errno 113 (No route to host)
[root@localhost agus]# showmount -e 192.168.56.142
Export list for 192.168.56.142:
/mnt/sharenfs 191.168.213.219
[root@localhost agus]# showmount -e 192.168.56.142
Export list for 192.168.56.142:
/mnt/sharenfs 191.168.213.219
[root@localhost agus]#
```

Sesuai output, **/mnt/sharenfs** tersedia di NFS-Server (192.168.56.142) untuk NFS Client (192.168.56.143)

15. Sekarang, buat *directory* pada NFS-Client untuk mount NFS share `/mnt/sharenfs/` yang telah kita buat di NFS-Server. Untuk *directory*-nya buat dengan nama `/mnt/nfs/share`.
16. Jalankan perintah dibawah ini untuk mount NFS share `/mnt/sharenfs` dari NFS-Server (192.168.56.142) di `/mnt/nfs/share` pada NFS-Client.



- Konfigurasi IP Address server di client

```
nfs-client [Running] - Oracle VM VirtualBox
```

```
File Machine View Input Devices Help
```

```
/mnt/nfs/share 192.168.56.142(rw,no_root_squash)
```

```
[root@localhost agusl]# sudo exportfs -ra
```

```
/etc/exportfs IL, 57c Written
```

```
[root@localhost agusl]# sudo systemctl status nfs-server
```

```
■ nfs-server.service - NFS server and services
```

```
Loaded: loaded (/usr/lib/systemd/system/nfs-server.service; enabled; vendor preset: disabled)
```

```
Active: active (exited) since Wed 2024-10-02 23:11:47 WIB; 44min ago
```

```
Process: 8861 ExecStopPost=/usr/sbin/exportfs -f (code=exited, status=0/SUCCESS)
```

```
Process: 8859 ExecStopPost=/usr/sbin/exportfs -au (code=exited, status=0/SUCCESS)
```

```
Process: 8858 ExecStop=/usr/sbin/rpc.nfsd 0 (code=exited, status=0/SUCCESS)
```

```
Process: 8888 ExecStartPost=/bin/sh -c if systemctl -q is-active gssproxy; then systemctl reload g
```

```
ssproxy ; fi (code=exited, status=0/SUCCESS)
```

```
Process: 8871 ExecStart=/usr/sbin/rpc.nfsd $RPCNFSDARGS (code=exited, status=0/SUCCESS)
```

```
Process: 8870 ExecStartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
```

```
Main PID: 8871 (code=exited, status=0/SUCCESS)
```

```
CGroup: /system.slice/nfs-server.service
```

```
Oct 02 23:11:47 localhost.localdomain systemd[1]: Starting NFS server and services...
```

```
Oct 02 23:11:47 localhost.localdomain systemd[1]: Started NFS server and services.
```

```
[root@localhost agusl]#
```

- Melakukan Mount dari IP Address server pada CentOS-Server

```
[root@localhost agus]# sudo mkdir -p /mnt/nfs/share
[root@localhost agus]# ls
[root@localhost agus]# dir
[root@localhost agus]# mkdir -p /mnt/nfs/share
[root@localhost agus]# ls
[root@localhost agus]# dir
[root@localhost agus]# mount 192.168.56.142:/mnt/sharenfs /mnt/nfs/share
[root@localhost agus]#
```

17. Verifikasi *directory* yang dishare pada NFS-Client menggunakan perintah **mount** dan juga bisa **df -hT**.

```
agus@localhost/home/agus
login as: agus
agus@192.168.56.143's password:
Last login: Wed Oct 2 23:12:23 2024 from 192.168.56.1
[agus@localhost ~]$ su
Password:
[root@localhost agus]# mount | grep nfs
sunrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw,relatime)
nfsd on /proc/fs/nfsd type nfsd (rw,relatime)
192.168.56.142:/mnt/sharenfs on /mnt/nfs/share type nfs4 (rw,relatime,vers=4.1,rsize=262144,wsize=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.56.143,local_lock=none,addr=192.168.56.142)
[root@localhost agus]# mount | grep nfs
nfsd on /proc/fs/nfsd type nfsd (rw,relatime)
192.168.56.142:/mnt/sharenfs on /mnt/nfs/share type nfs4 (rw,relatime,vers=4.1,rsize=262144,wsize=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.56.143,local_lock=none,addr=192.168.56.142)
[root@localhost agus]#
```

```
[root@localhost agus]# df -hT
Filesystem                Type      Size  Used Avail Use% Mounted on
devtmpfs                  devtmpfs  908M   0    908M   0% /dev
tmpfs                     tmpfs     919M   0    919M   0% /dev/shm
tmpfs                     tmpfs     919M  8.7M   911M   1% /run
tmpfs                     tmpfs     919M   0    919M   0% /sys/fs/cgroup
/dev/mapper/centos-root    xfs       17G   1.7G   16G   11% /
/dev/sda1                  xfs      1014M  195M   820M   20% /boot
tmpfs                     tmpfs     184M   0    184M   0% /run/user/1000
tmpfs                     tmpfs     184M   0    184M   0% /run/user/0
192.168.56.142:/mnt/sharenfs nfs4       17G   1.7G   16G   11% /mnt/nfs/share
[root@localhost agus]#
```

18. Setelah semua dilakukan, kita uji untuk membuat file di *directory* yang dishare untuk memverifikasi apakah client bisa memiliki hak akses membaca dan menulis pada NFS share.

```
[root@localhost agus]# touch /mnt/nfs/share/test
[root@localhost agus]# ls /mnt/nfs/share/
test
```

Disini terlihat outputnya tidak menampilkan error dan terdapat file test di *directory* yang dishare. Ini artinya NFS berhasil di konfigurasi.

19. Kemudian disini kita akan mount share secara otomatis setiap CentOS direboot, sehingga kita perlu memodifikasi file `/etc/fstab` pada NFS-Client kita dan menambahkan line berikut ini.

```
[root@localhost agus]# vi /etc/fstab
#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=5915bcd-0aa1-44a6-91db-27794042bebb /boot xfs defaults 0 0
/dev/centos/centos-root /usr xfs defaults 0 0
192.168.56.142:/mnt/sharenfs /mnt/nfs/share nfs defaults 0 0

"/etc/fstab" 12L, 526C
```

20. Kemudian lakukan reboot pada NFS-Client.

reboot

```
[root@localhost agus]# reboot
```

21. Verifikasi *directory* yang dishare pada NFS-Client menggunakan perintah mount.

```
[root@localhost agus]# mount | grep nfs
nfsd on /proc/fs/nfsd type nfsd (rw,relatime)
nfsrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw,relatime)
192.168.56.142:/mnt/sharenfs on /mnt/nfs/share type nfs4 (rw,relatime,vers=4.1,rsize=262144,wsiz=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.56.143,local_lock=none,addr=192.168.56.142)
```

Disini terlihat bahwa NFS bisa dipakai meskipun CentOS Client direstart karena sudah ditambahkan pada file `/etc/fstab`.

22. Selesai!

Tugas

1. Tambahkan sebuah file pada *directory* yang dishare dan cek pada NFS-Server dan ujlilah apakah file tersebut ada setelah berhasil ditambahkan dari NFS-Client kita.

Jawab:

1. Kita periksa apakah nfs nya sudah terinstall di server atau belum. Setelah itu, kita akan **start rpcbind** dan **nfs-server** kemudian kita akan cek status nfs-server apakah aktif atau tidak.

```
[root@localhost agus]# rpm -qa | grep nfs
libnfsioomap-0.25-19.el7.x86_64
nfs-utils-1.3.0-0.68.el7.2.x86_64
[root@localhost agus]# systemctl start rpcbind
[root@localhost agus]# systemctl start nfs-server
[root@localhost agus]# systemctl status nfs-server
● nfs-server.service - NFS server and services
   Loaded: loaded (/usr/lib/systemd/system/nfs-server.service; enabled; vendor preset: disabled)
   Drop-In: /run/systemd/generator/nfs-server.service.d
            └─order-with-mounts.conf
   Active: active (exited) since Thu 2024-10-03 01:16:09 WIB; 11min ago
   Process: 17884 ExecStopPost=/usr/sbin/exportfs -f (code=exited, status=0/SUCCESS)
   Process: 17880 ExecStopPost=/usr/sbin/exportfs -au (code=exited, status=0/SUCCESS)
   Process: 17879 ExecStop=/usr/sbin/rpc.nfsd 0 (code=exited, status=0/SUCCESS)
   Process: 17908 ExecStartPost=/bin/sh -c if systemctl -q is-active gssproxy; then systemctl reload gssproxy ; fi (code=exited, status=0/SUCCESS)
   Process: 17893 ExecStart=/usr/sbin/rpc.nfsd $RPCNFSDARGS (code=exited, status=0/SUCCESS)
   Process: 17892 ExecStartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
   Main PID: 17893 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 03 01:16:09 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 03 01:16:09 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]#
```

2. Kemudian, kita akan mengkonfigurasi *firewall*

```
[root@localhost agus]# firewall-cmd --add-service=nfs --permanent
Warning: ALREADY_ENABLED: nfs
success
[root@localhost agus]# firewall-cmd --reload
success
[root@localhost agus]#
```

3. Kemudian kita akan membuat file dengan nama gamma dan zeta. Jika sudah selesai tekan **ctrl + c** dan ketik :wq! Untuk keluar dan menyimpan nya.

```
[root@localhost agus]# vi /alpha/gamma
```

```
this is gamma
this is a line
```

```
[root@localhost agus]# vi /alpha/zeta
```

```
this is zeeta file
you may go ahead!!
```

4. Kemudian, edit file `/etc/exports` dan ketik file yang dibagikan dari server beserta dengan IP address dari CentOS-Client. Untuk keluar tekan `ctrl + c` dan ketik `:wq!`

[illegible]

5. Kemudian kita lakukan review pada file yang ada di /etc/exports

6. Kemudian kita akan lakukan restart pada rpcbind dan nfs-server

```
agus@localhost:/home/agus
Password:
[root@localhost agus]# vi /etc/export
[root@localhost agus]# cat /mnt/beta/gamma
cat: /mnt/beta/gamma: No such file or directory
[root@localhost agus]# ls /mnt
sharentfs
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vim /etc/exports/
bash: vim: command not found
[root@localhost agus]# vi /etc/exports/
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vi /etc/exports/
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# systemctl restart rpcbind
[root@localhost agus]# systemctl restart nfs-server
[root@localhost agus]# vim /etc/exports/
bash: vim: command not found
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# cat /etc/exports
/alpha 192.168.56.143(rw,no root squash)
[root@localhost agus]# systemctl restart rpcbind
[root@localhost agus]# systemctl restart nfs-server
[root@localhost agus]#
```

7. Setelah selesai, kita lakukan mount dari client dengan menggunakan IP Server dengan perintah yang ada dibawah.

```
[root@localhost agus]# mount -t nfs 192.168.56.142:/alpha /mnt/beta/
[root@localhost agus]#
```

8. Kemudian, kita lakukan pengecekan pada file yang sudah dimount dari server pada client.

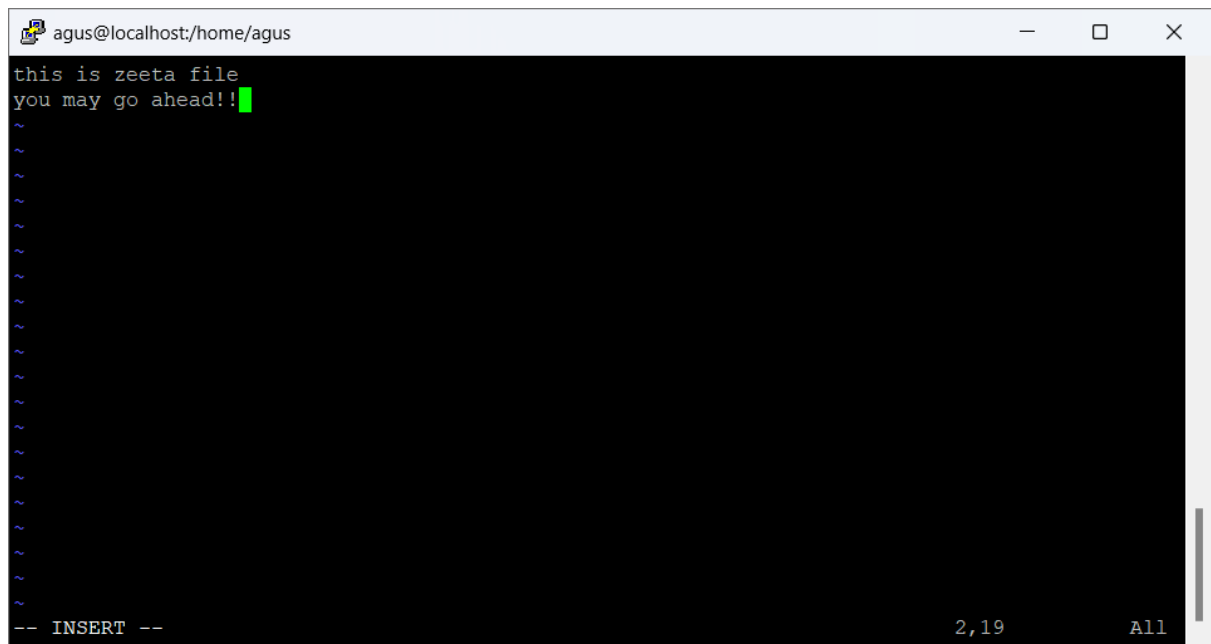
```
agus@localhost:/home/agus
this is a line
[root@localhost agus]# cat /mnt/beta/zeta
this is zeeta file
you may go ahead!!
[root@localhost agus]# vim /mnt/beta/zeta
[root@localhost agus]# vim /mnt/beta/zeta
[root@localhost agus]# cat /mnt/beta/zeta
this is zeeta file
you may go ahead!!
hev!
[root@localhost agus]# vim /mnt/beta/zeta
[root@localhost agus]# df
Filesystem            1K-blocks    Used Available Use% Mounted on
devtmpfs               929064         0   929064    0% /dev
tmpfs                  940932         0   940932    1% /dev/shm
tmpfs                  940932    8804   932128    1% /run
tmpfs                  940932         0   940932    0% /sys/fs/cgroup
/dev/mapper/centos-root 17811456 1857284 15954172  11% /
/dev/sda1              1038336  198796   839540   20% /boot
tmpfs                  188188         0   188188    0% /run/user/1000
192.168.56.142:/alpha  17811456 1785088 16026368  11% /mnt/beta
[root@localhost agus]#
```

9. Kemudian, kita akan lakukan listing pada direktori yang telah dibuat dan menampilkan file tersebut menggunakan cat.

```
[root@localhost agus]# ls /mnt/beta
gamma  zeta
[root@localhost agus]# cat /mnt/beta/gamma
this is gamma
this is a line
[root@localhost agus]# cat /mnt/beta/zetta
cat: /mnt/beta/zetta: No such file or directory
[root@localhost agus]# cat /mnt/beta/zeta
this is zeeta file
you may go ahead!!
```

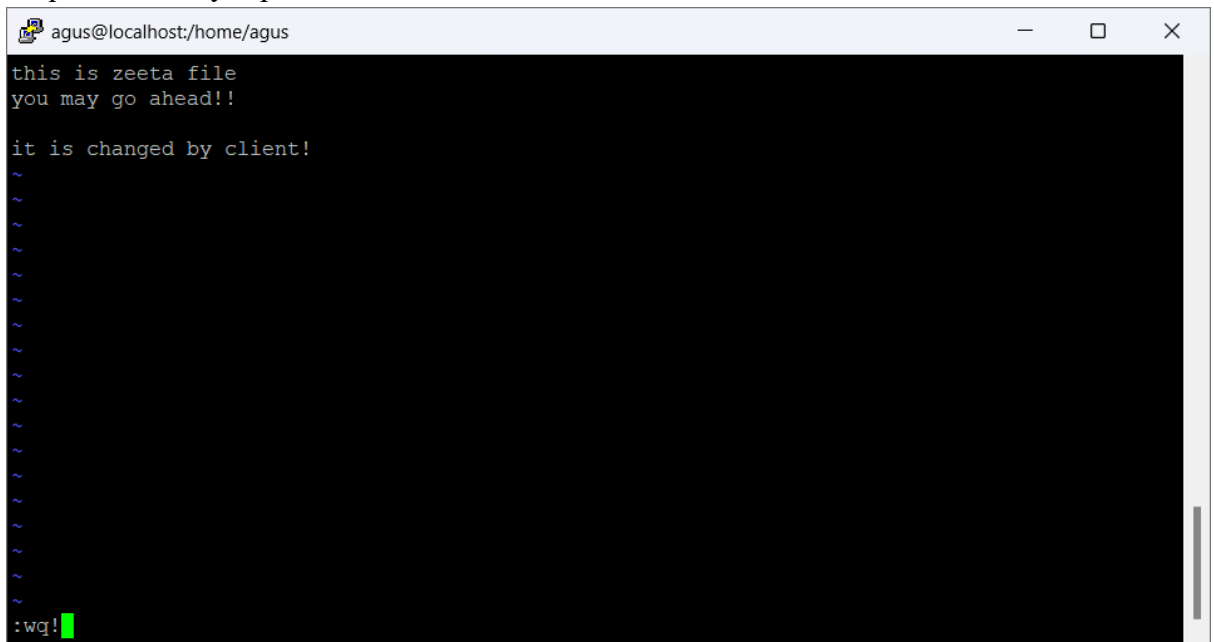
10. Berikut data sebelum diubah dari CentOS Server

Data sebelum diubah di CentOS Server



The screenshot shows a terminal window titled 'agus@localhost:/home/agus'. The terminal displays the contents of a file named 'zeeta', which are the lines 'this is zeeta file' and 'you may go ahead!!'. Below these lines, there are several tilde (~) characters representing a scrollable history of commands. At the bottom of the terminal, there is a status bar that reads '-- INSERT --' on the left, '2,19' in the center, and 'All' on the right.

11. Kemudian, kita edit file tersebut di CentOS-Client. Setelah itu, tekan `ctrl + c` dan ketik `:wq!` untuk menyimpan dan keluar.

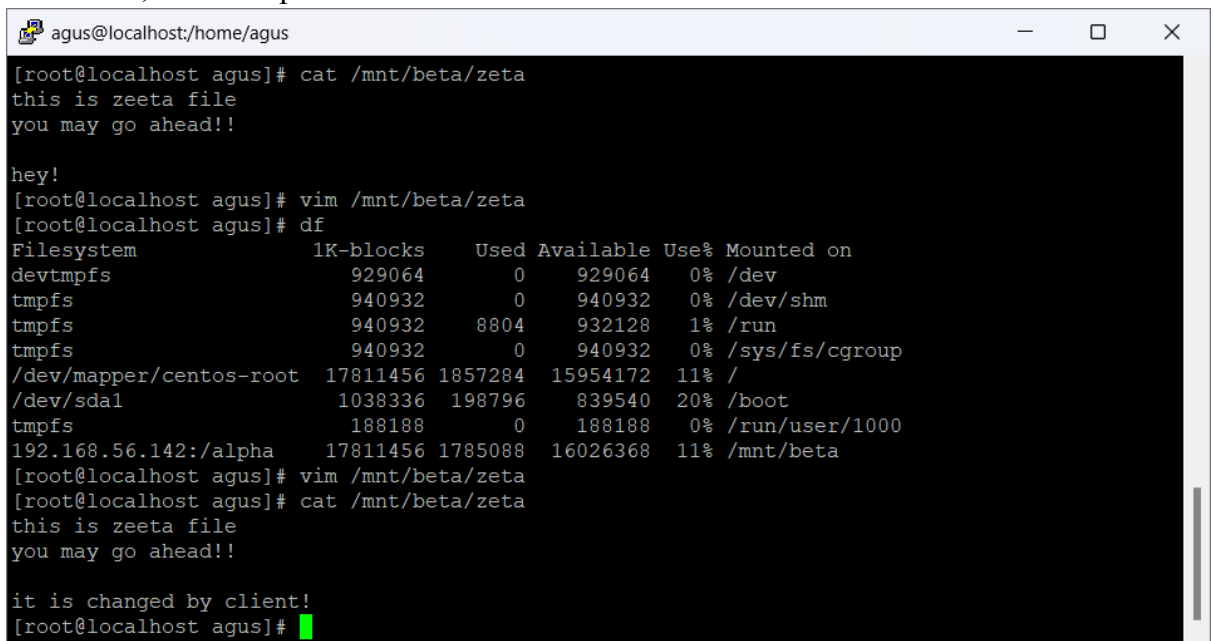


A terminal window titled 'agus@localhost:/home/agus' showing the contents of a file being edited in vim. The file contains the text 'this is zeeta file' and 'you may go ahead!!'. The user has pressed `ctrl + c` to exit insert mode, and the prompt is now `:wq!` with a green cursor.

```
agus@localhost:/home/agus
this is zeeta file
you may go ahead!!

it is changed by client!
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
:wq!
```

12. Kemudian, kita cek apakah isi file tersebut berubah.



A terminal window titled 'agus@localhost:/home/agus' showing the verification of the file's contents and a disk usage check. The user runs `cat /mnt/beta/zeta` and `vim /mnt/beta/zeta`. Then, they run `df` to display disk usage for various filesystems. The output of `df` is as follows:

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
devtmpfs	929064	0	929064	0%	/dev
tmpfs	940932	0	940932	0%	/dev/shm
tmpfs	940932	8804	932128	1%	/run
tmpfs	940932	0	940932	0%	/sys/fs/cgroup
/dev/mapper/centos-root	17811456	1857284	15954172	11%	/
/dev/sdal	1038336	198796	839540	20%	/boot
tmpfs	188188	0	188188	0%	/run/user/1000
192.168.56.142:/alpha	17811456	1785088	16026368	11%	/mnt/beta

After running `df`, the user runs `vim /mnt/beta/zeta` and `cat /mnt/beta/zeta` again. The output of `cat` shows the file's contents, which have been updated to 'this is zeeta file' and 'you may go ahead!!'. The prompt is now `[root@localhost agus]#` with a green cursor.

```
[root@localhost agus]# cat /mnt/beta/zeta
this is zeeta file
you may go ahead!!

hey!
[root@localhost agus]# vim /mnt/beta/zeta
[root@localhost agus]# df
Filesystem            1K-blocks    Used Available Use% Mounted on
devtmpfs                929064         0   929064   0% /dev
tmpfs                   940932         0   940932   0% /dev/shm
tmpfs                   940932    8804   932128   1% /run
tmpfs                   940932         0   940932   0% /sys/fs/cgroup
/dev/mapper/centos-root 17811456 1857284 15954172  11% /
/dev/sdal               1038336  198796   839540  20% /boot
tmpfs                   188188         0   188188   0% /run/user/1000
192.168.56.142:/alpha  17811456 1785088 16026368  11% /mnt/beta
[root@localhost agus]# vim /mnt/beta/zeta
[root@localhost agus]# cat /mnt/beta/zeta
this is zeeta file
you may go ahead!!

it is changed by client!
[root@localhost agus]#
```


13. Kemudian, kita konfigurasi IP Address server ke Client pada vi /etc/fstab

```
agus@localhost:/home/agus
#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default
ts 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
192.168.56.142:/alpha /mnt/beta nfs defaults 0 0
~
~
~
~
~
~
~
~
~
~
:wq!
```

14. Ketik perintah ini untuk mengkonfigurasi IP address pada server ke client

```
agus@localhost:/home/agus
mount.nfs: mount point /nfs-share/ does not exist
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# mount -t nfs 192.168.56.143:/mnt/nas-pool1/freenas1 /nfs-
share/
mount.nfs: mount point /nfs-share/ does not exist
[root@localhost agus]# ^C
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# cat /etc/fstab
#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default
ts 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
[root@localhost agus]# vi /etc/fstab
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vi /etc/exports
[root@localhost agus]#
```

15. Untuk menambahkan file, kita konfigurasi IP address pada server ke client. Setelah selesai, tekan ctrl + c dan ketik :wq lalu tekan enter.

A screenshot of a terminal window titled "agus@localhost:/home/agus". The terminal has a black background with green text. The first line shows a successful file transfer: `/alpha 192.168.56.143(rw,no_root_squash)`. Below this, there are several lines of tilde (~) characters, indicating a directory listing or similar output. At the bottom left, the prompt `" /etc/exports" 2L, 42C` is visible. The window includes standard Linux terminal icons (minimize, maximize, close) in the top right corner.

16. Kemudian, kita konfigurasi juga IP address di `/etc/fstab`

```

agus@localhost:/home/agus
mount.nfs: mount point /nfs-share/ does not exist
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# mount -t nfs 192.168.56.143:/mnt/nas-pool1/freenas1 /nfs-
share/
mount.nfs: mount point /nfs-share/ does not exist
[root@localhost agus]# ^C
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default
ts 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
[root@localhost agus]# vi /etc/fstab
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vi /etc/fstab

```

17. Kita input IP Address pada client ke server beserta dengan direktori nya. Setelah selesai tekan ctrl + c dan ketik :wq! lalu tekan enter.

[illegible]

18. Kemudian, kita lakukan login dari Client ke server untuk menambahkan filenya menggunakan ssh root server. Jika ada konfirmasi, ketik **yes** lalu tekan enter.

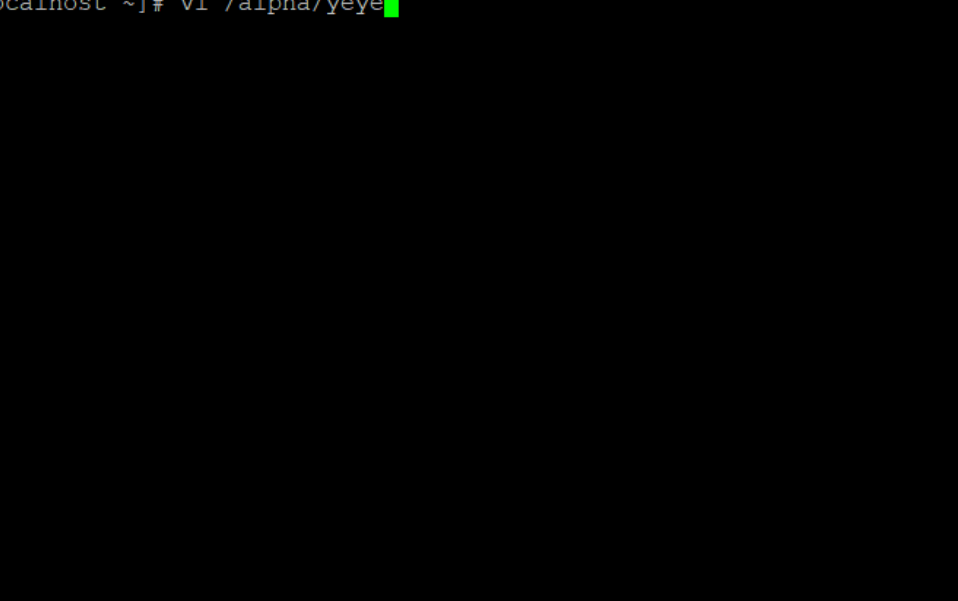
```

root@localhost:~
Password:
[root@localhost agus]# cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default
ts 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
192.168.56.142:/alpha /mnt/beta nfs defaults 0 0
[root@localhost agus]# ssh root@192.168.56.142
The authenticity of host '192.168.56.142 (192.168.56.142)' can't be established.
ECDSA key fingerprint is SHA256:dkawLPLfwuSSsT204vZ/RZ2LZmN62Es41ZIW5+tw7LY.
ECDSA key fingerprint is MD5:c4:aa:ed:41:d8:8d:55:17:86:98:fd:0b:a2:e7:35:17.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.56.142' (ECDSA) to the list of known hosts.
root@192.168.56.142's password:
Last login: Thu Oct  3 03:50:52 2024
[root@localhost ~]#

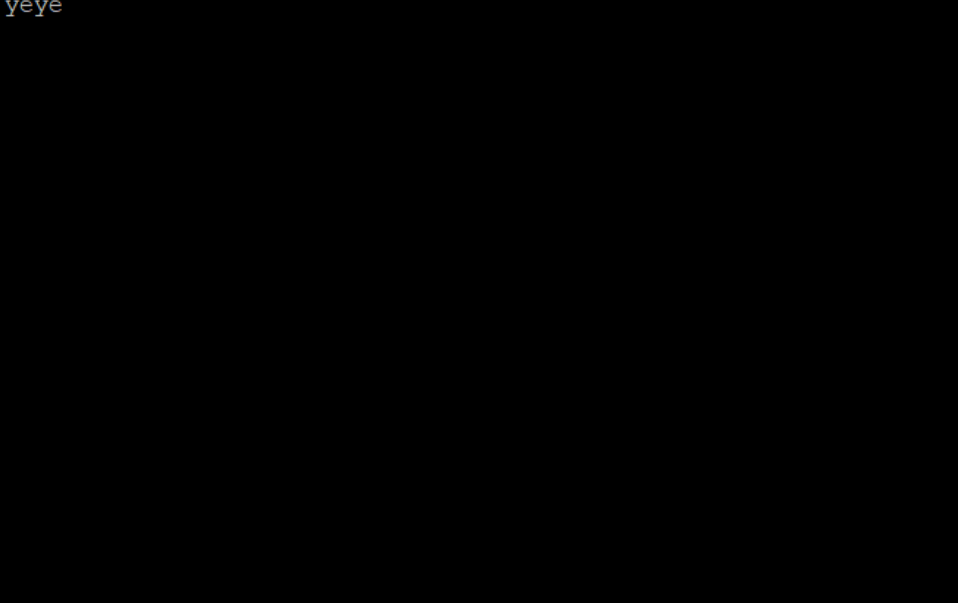
```

19. Kemudian, kita akan menambahkan suatu file dari client dan tekan enter.



A terminal window titled 'root@localhost:~' with standard window controls. The command prompt shows '[root@localhost ~]# vi /alpha/yeye' with a green cursor at the end of the line.

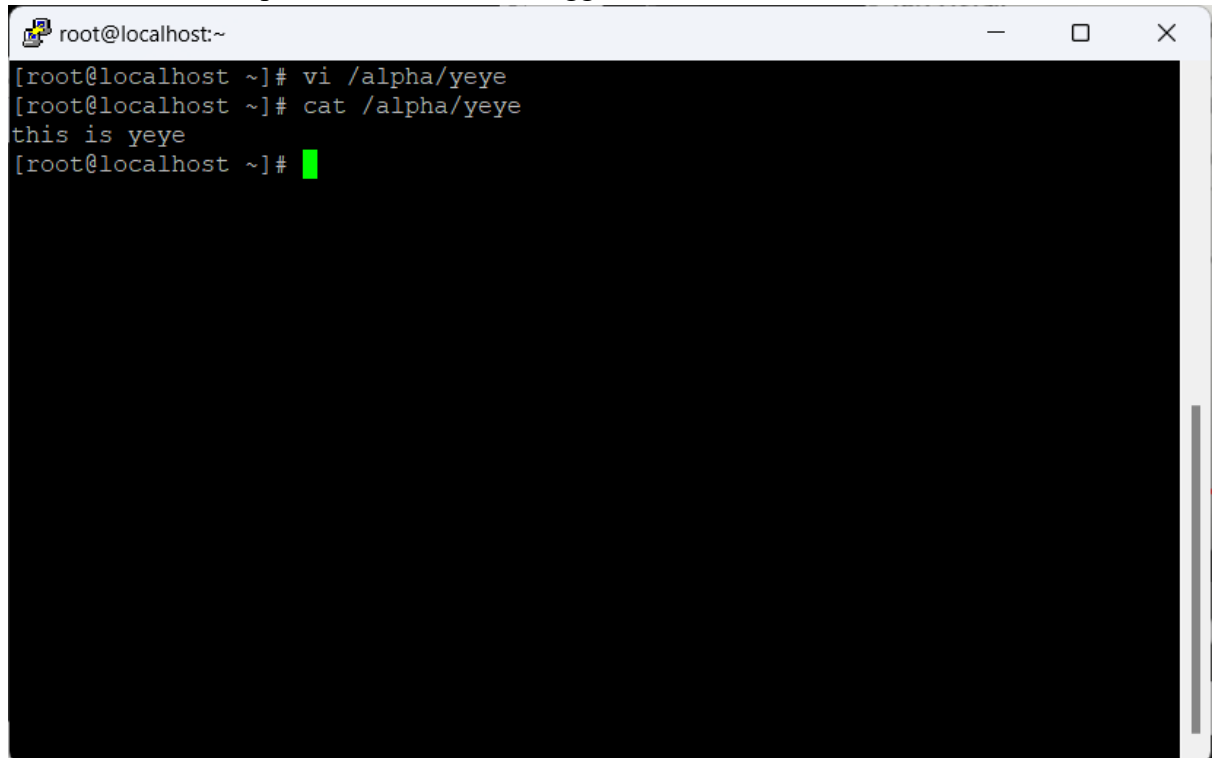
20. Kemudian, ketik isi file nya dan tekan ctrl + c dan ketik :wq! lalu tekan enter.



The screenshot shows a terminal window with a black background. The title bar at the top reads "root@localhost:~" and includes standard window control buttons (minimize, maximize, close). The terminal content shows the command "touch this is yeye" being entered on the first line. The second line shows the prompt "root@localhost:~" followed by a series of tilde characters (~) representing the output of the "ls" command, indicating that the file "this is yeye" has been successfully created. The third line shows the command "cat this is yeye" being entered. The bottom of the terminal shows the command "cat "/alpha/yeye" 1L, 13C" being entered, which appears to be a command to view the content of the file.

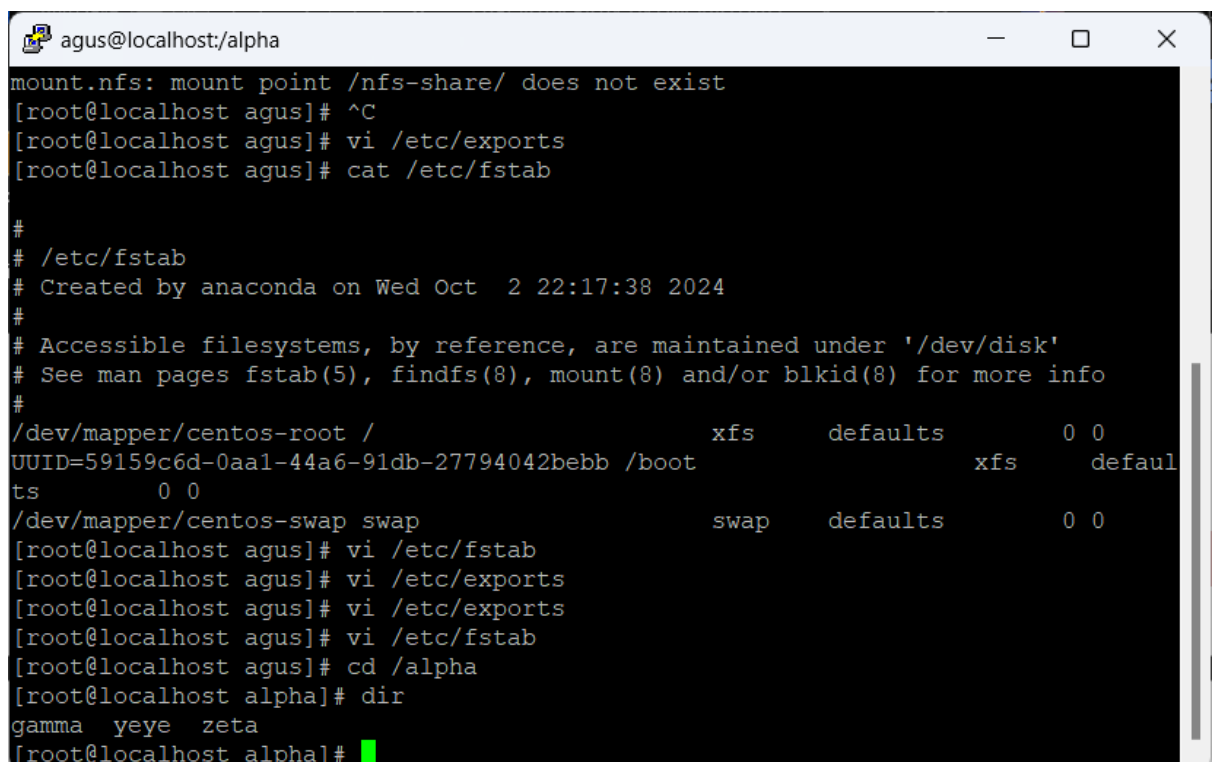
```
root@localhost:~  
touch this is yeye  
root@localhost:~  
ls  
this is yeye  
root@localhost:~  
cat this is yeye  
root@localhost:~  
cat "/alpha/yeye" 1L, 13C
```

21. Kemudian, kita tampilkan file tersebut menggunakan cat

A terminal window titled 'root@localhost:~' with standard window controls. It shows the execution of 'vi /alpha/yeye' followed by 'cat /alpha/yeye', which outputs 'this is yeye'. The prompt returns to '[root@localhost ~]#'.

```
root@localhost:~  
[root@localhost ~]# vi /alpha/yeye  
[root@localhost ~]# cat /alpha/yeye  
this is yeye  
[root@localhost ~]#
```

22. Setelah selesai menambahkan file, kita cek apakah file tersebut disimpan dalam server.

A terminal window titled 'agus@localhost:/alpha' with standard window controls. It shows several commands: 'mount.nfs: mount point /nfs-share/ does not exist', '^C', 'vi /etc/exports', 'cat /etc/fstab', and a series of 'vi' and 'cd' commands. Finally, 'dir' is executed in the '/alpha' directory, listing 'gamma', 'yeye', and 'zeta'.

```
agus@localhost:/alpha  
mount.nfs: mount point /nfs-share/ does not exist  
[root@localhost agus]# ^C  
[root@localhost agus]# vi /etc/exports  
[root@localhost agus]# cat /etc/fstab  
#  
# /etc/fstab  
# Created by anaconda on Wed Oct 2 22:17:38 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  
#  
/dev/mapper/centos-root / xfs defaults 0 0  
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default  
ts 0 0  
/dev/mapper/centos-swap swap swap defaults 0 0  
[root@localhost agus]# vi /etc/fstab  
[root@localhost agus]# vi /etc/exports  
[root@localhost agus]# vi /etc/exports  
[root@localhost agus]# vi /etc/fstab  
[root@localhost agus]# cd /alpha  
[root@localhost alpha]# dir  
gamma yeye zeta  
[root@localhost alpha]#
```

23. Kemudian, kita tampilkan file yang sudah ditambahkan dari client di server.

```
agus@localhost/alpha
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# cat /etc/fstab

#
# /etc/fstab
# Created by anaconda on Wed Oct  2 22:17:38 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
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=59159c6d-0aa1-44a6-91db-27794042bebb /boot xfs default
ts 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
[root@localhost agus]# vi /etc/fstab
[root@localhost agus]# vi /etc/exports
[root@localhost agus]# vi /etc/fstab
[root@localhost agus]# cd /alpha
[root@localhost alpha]# dir
gamma yeye zeta
[root@localhost alpha]# cat yeye
this is yeye
[root@localhost alpha]#
```