

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

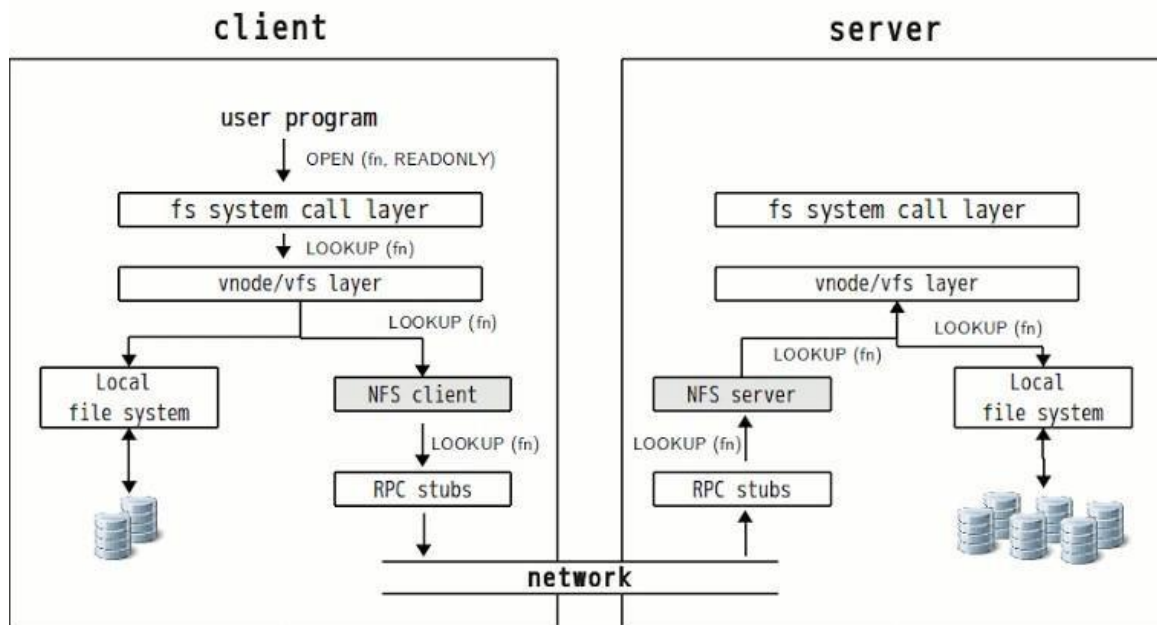
Protokol NFS adalah salah satu dari beberapa stkitar sistem file terdistribusi untuk penyimpanan yang terhubung dengan jaringan (network-attached storage — NAS). NFS umumnya menggunakan protokol Remote Procedure Call (RPC) yang berjalan di atas UDP dan membuka port UDP dengan port number 2049 untuk komunikasi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

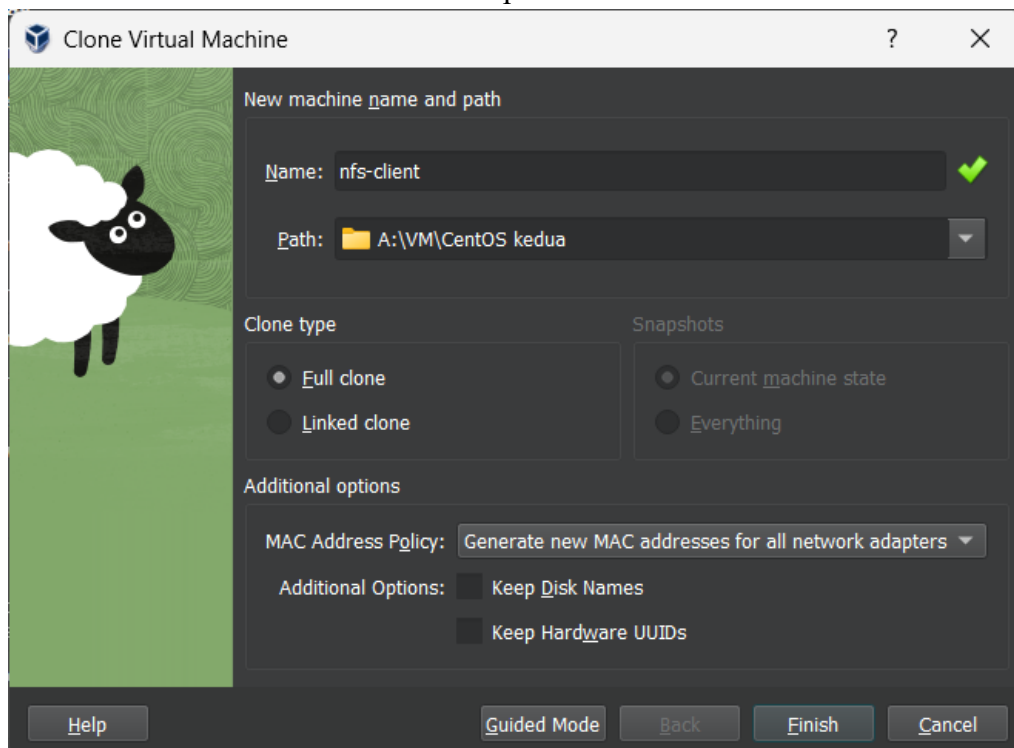
Jawab:

Centos Server VM

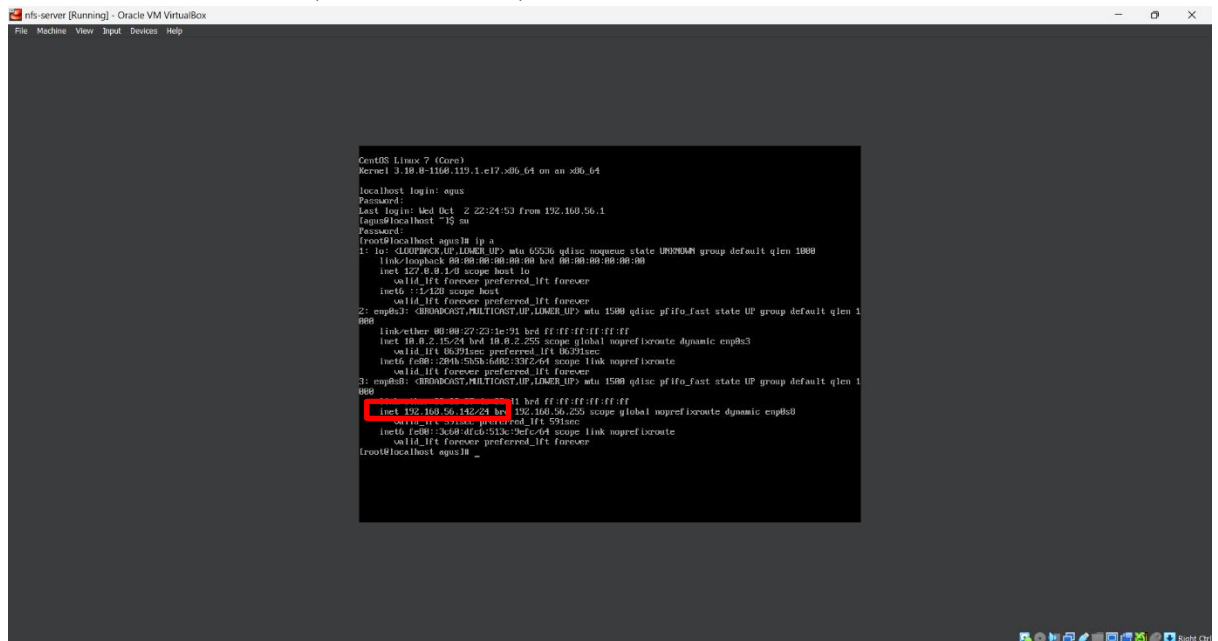


Clone VM dari CentOS Server menjadi CentOS Client

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



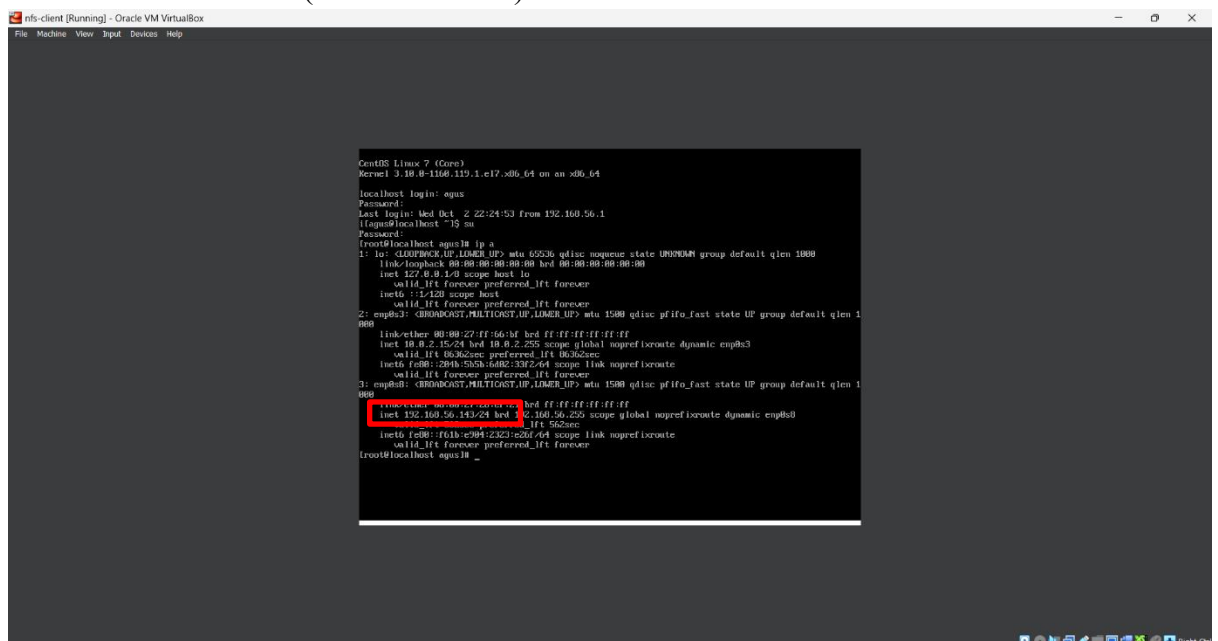
2. Setelah CentOS sudah terinstal di VMware/Virtual Box, jalankan server dan clientnya. Setelah itu kita lihat terlebih dahulu IP dari kedua CentOS tersebut.
 - a. IP address NFS-Server (192.168.56.142)



```
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)



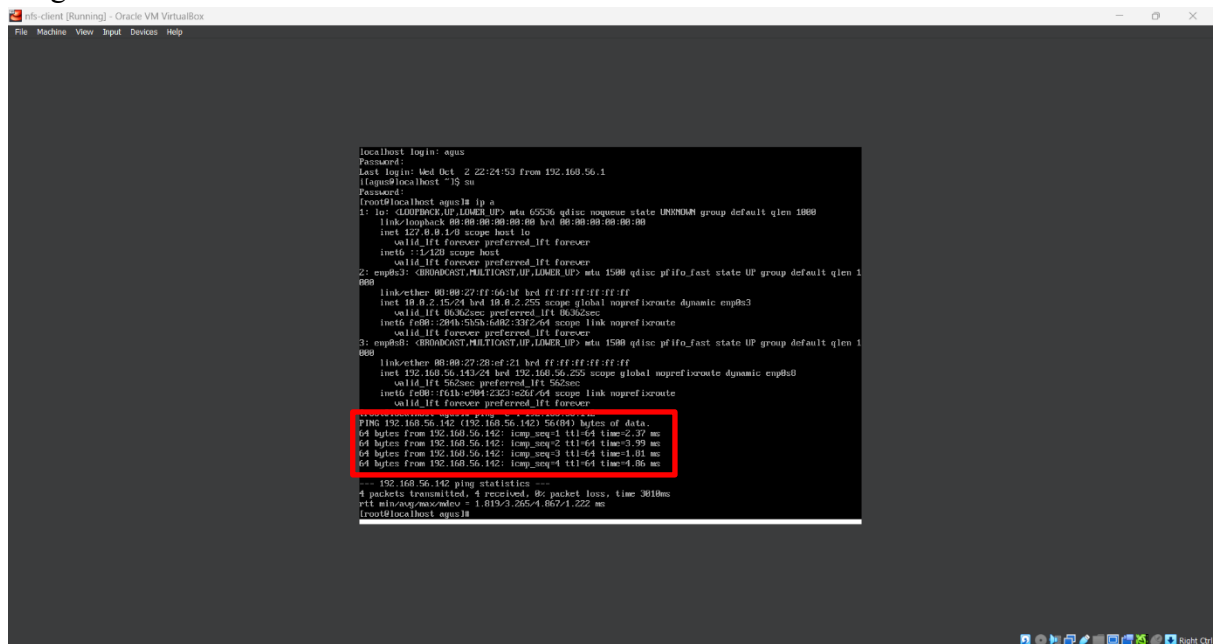
```
CentOS Linux 7 (Core)
Kernel 3.10.0-1160.119.1.el7.x86_64 on an x86_64

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::f6b:ee94:2323: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.

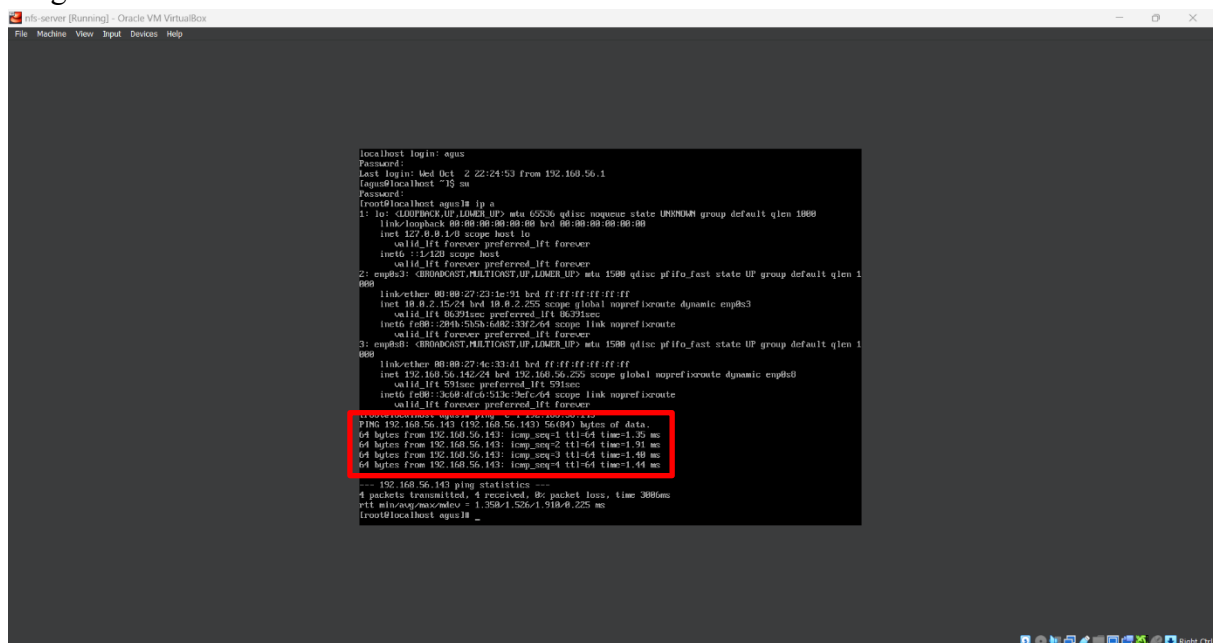
Jawab:

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: emphy3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 88:88:27:ff:66:34 brd ff:ff:ff:ff:ff:ff
    inet 10.8.2.15/24 brd 10.8.2.255 scope global noprefixroute dynamic emphy3
        valid_lft 86362sec preferred_lft 86362sec
    inet6 fe80::294b:5b5b:6d82:3326/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: emphy8: <BROADCAST,MULTICAST,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 noprefixroute dynamic emphy8
        valid_lft 562sec preferred_lft 562sec
    inet6 fe80::f61b:c994:2323:c26f/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
[root@localhost agus#] ip netns exec ns1 ip netns exec ns2 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#]
```

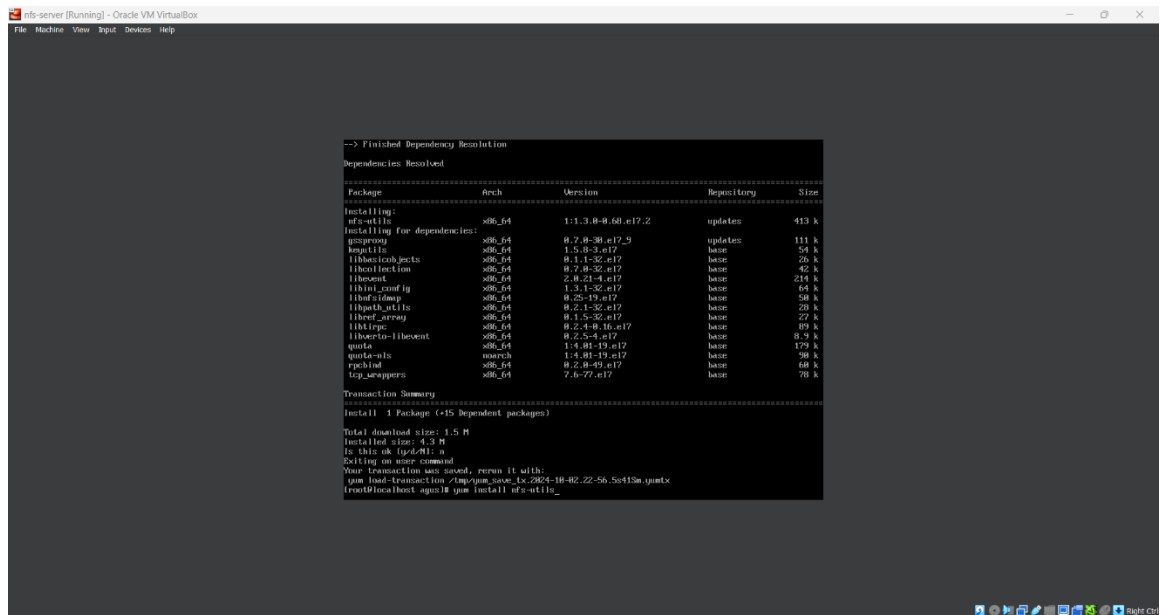
2. Ping Centos Server ke Centos Client



```
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: emphy3: <BROADCAST,MULTICAST,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 noprefixroute dynamic emphy3
        valid_lft 86291sec preferred_lft 86291sec
    inet6 fe80::294b:5b5b:6d82:3326/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: emphy8: <BROADCAST,MULTICAST,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 noprefixroute dynamic emphy8
        valid_lft 591sec preferred_lft 591sec
    inet6 fe80::3c68:4fcd:513c:79fc/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
[root@localhost agus#] ip netns exec ns1 ip netns exec ns2 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.py       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/N]: y
Exiting on user command
Your transaction was saved, rerun it with:
yum load-transaction /tmp/yum_save_tx.2024-10-02.22:56:5643m.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_64:0.2.1-32.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.py       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/N]: y
```

```
Installing : libnfsidmap-0.25-19.el7.x86_64 12/16
Installing : libpath_util-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.el7.9.x86_64 15/16
Installing : 1:nfs-utils-1.3.0-0.66.el7.2.x86_64 16/16
Verifying : libtirpc-0.2.4-8.el6.el7.x86_64 1/16
Verifying : gssproxy-0.7.0-30.el7.9.x86_64 2/16
Verifying : 1:quota-4.01-19.el7.x86_64 3/16
Verifying : libpath_util-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-1.3.0-0.66.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 1:1.3.0-0.66.el7.2

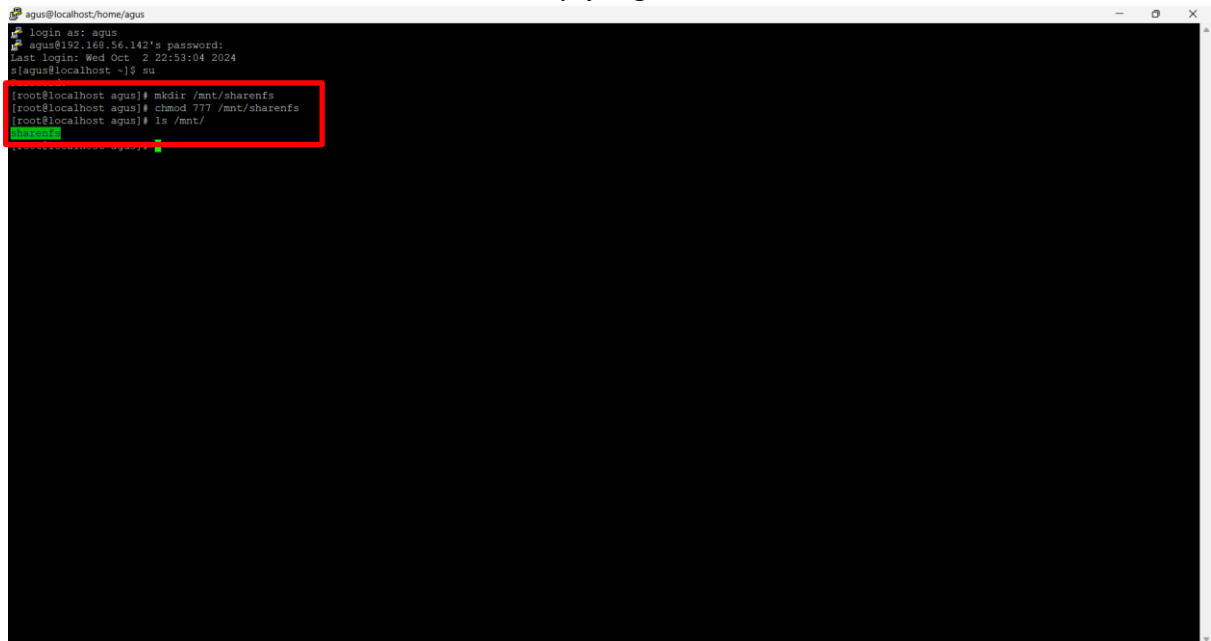
Dependency Installed:
gssproxy.x86_64 0:0.7.0-30.el7.9          keyutils.x86_64 0:1.5.0-3.el7
libbasicobjects.x86_64 0:0.1.1-32.el7      libcom_err.x86_64 0:1.41-19.el7
libevent.x86_64 0:2.0.21-4.el7             libini_config.x86_64 0:1.3.1-32.el7
libnfsidmap.x86_64 0:0.25-19.el7           libpath_util.x86_64 0:0.2.1-32.el7
libdef_attrs.x86_64 0:0.1.5-32.el7         libtirpc.x86_64 0:0.2.4-8.el6.el7
libevent-libs.x86_64 0:0.2.5-4.el7         quota.x86_64 1:4.01-19.el7
quota-nls.noarch 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 ~]#
```

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

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

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

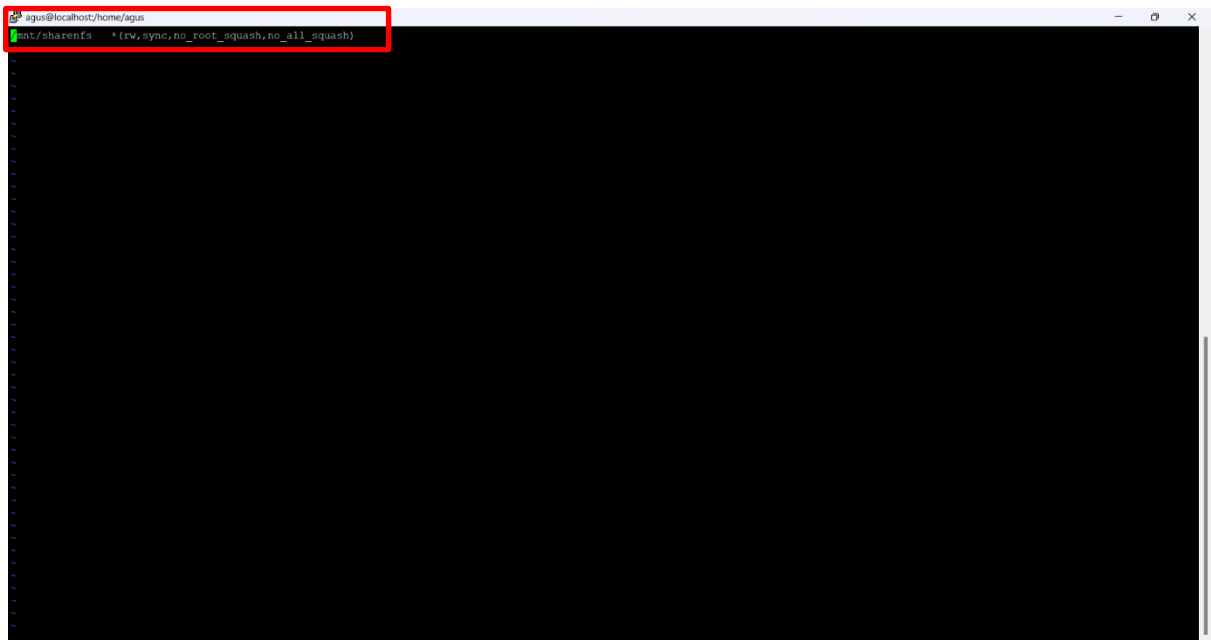
A terminal window titled 'agus@localhost/home/agus' showing the following commands and output: 'login as: agus', 'agus@192.168.56.142's password:', 'Last login: Wed Oct 2 22:53:04 2024', '[agus@localhost ~]\$ su', '[root@localhost agus]# mkdir /mnt/sharenfs', '[root@localhost agus]# chmod 777 /mnt/sharenfs', and '[root@localhost agus]# ls /mnt/'. The last three lines are highlighted with a red box.

```
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/
```

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.

A terminal window titled 'agus@localhost/home/agus' showing the contents of the /etc/exports file. The first line is highlighted with a red box: 'mnt/sharenfs *(rw,sync,no_root_squash,no_all_squash)'.

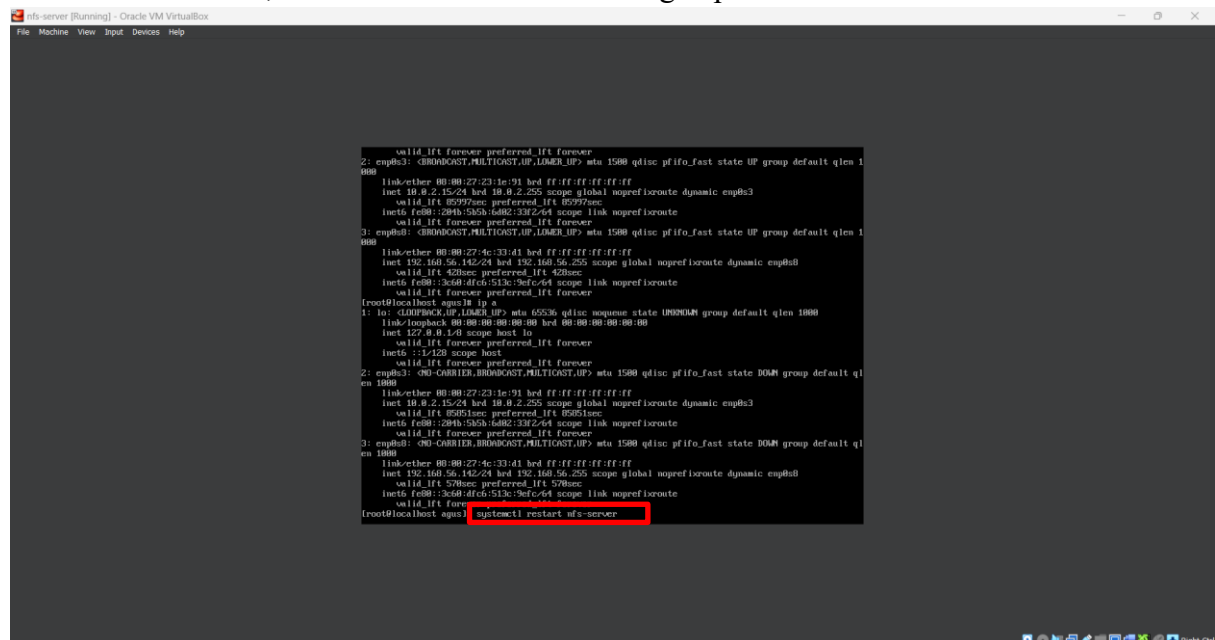
```
agus@localhost/home/agus
mnt/sharenfs *(rw,sync,no_root_squash,no_all_squash)
```

Keterangan:

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

9. *Directory* yang dishare adalah *directory* `/mnt/sharenfs`. *Directory* itu hanya dishare ke client dengan IP address 192.168.56.143 (Sesuaikan dengan IP address client di laptop kita). Apabila kita ingin share ke semua IP address, maka silahkan ganti IP address dengan “*”.

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



```
valid_ift forever preferred_ift forever
2: emph3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qlinc pfifo_fast state UP group default qlen 1
1000
link/ether 08:00:27:23:1e:91 brd ff:ff:ff:ff:ff:ff
inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefixroute dynamic emph3
    valid_ift 0:0:0:0:0:0 preferred_ift 0:0:0:0:0:0
    inet6 fe80::284b:5a5b:6402:33f2:64 scope link noprefixroute
    valid_ift forever preferred_ift forever
3: emph0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qlinc pfifo_fast state UP group default qlen 1
1000
link/ether 08:00:27:4c:33:d1 brd ff:ff:ff:ff:ff:ff
inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefixroute dynamic emph0
    valid_ift 428sec preferred_ift 428sec
    inet6 fe80::2a4b:4f4b:513c:96fc:64 scope link noprefixroute
    valid_ift forever preferred_ift forever
[root@localhost agus18 ip a]
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qlinc 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_ift forever preferred_ift forever
    inet6 ::1/128 scope host
    valid_ift forever preferred_ift forever
2: emph3: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qlinc pfifo_fast state DOWN group default ql
en 1000
link/ether 08:00:27:23:1e:91 brd ff:ff:ff:ff:ff:ff
inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefixroute dynamic emph3
    valid_ift 0:0:0:0:0:0 preferred_ift 0:0:0:0:0:0
    inet6 fe80::284b:5a5b:6402:33f2:64 scope link noprefixroute
    valid_ift forever preferred_ift forever
3: emph0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qlinc pfifo_fast state DOWN group default ql
en 1000
link/ether 08:00:27:4c:33:d1 brd ff:ff:ff:ff:ff:ff
inet 192.168.56.142/24 brd 192.168.56.255 scope global noprefixroute dynamic emph0
    valid_ift 570sec preferred_ift 570sec
    inet6 fe80::2a4b:4f4b:513c:96fc:64 scope link noprefixroute
    valid_ift forever preferred_ift forever
[root@localhost agus1] 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: l1quota-4.01-19.el7.x86_64
--> Processing Dependency: tcp_wrappers for package: l1quota-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 0:25-19.el7 base 50 k
libpath_utils x86_64 0:0.2.1-32.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 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 0:25-19.el7 base 50 k
libpath_utils x86_64 0:0.2.1-32.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 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]#
```

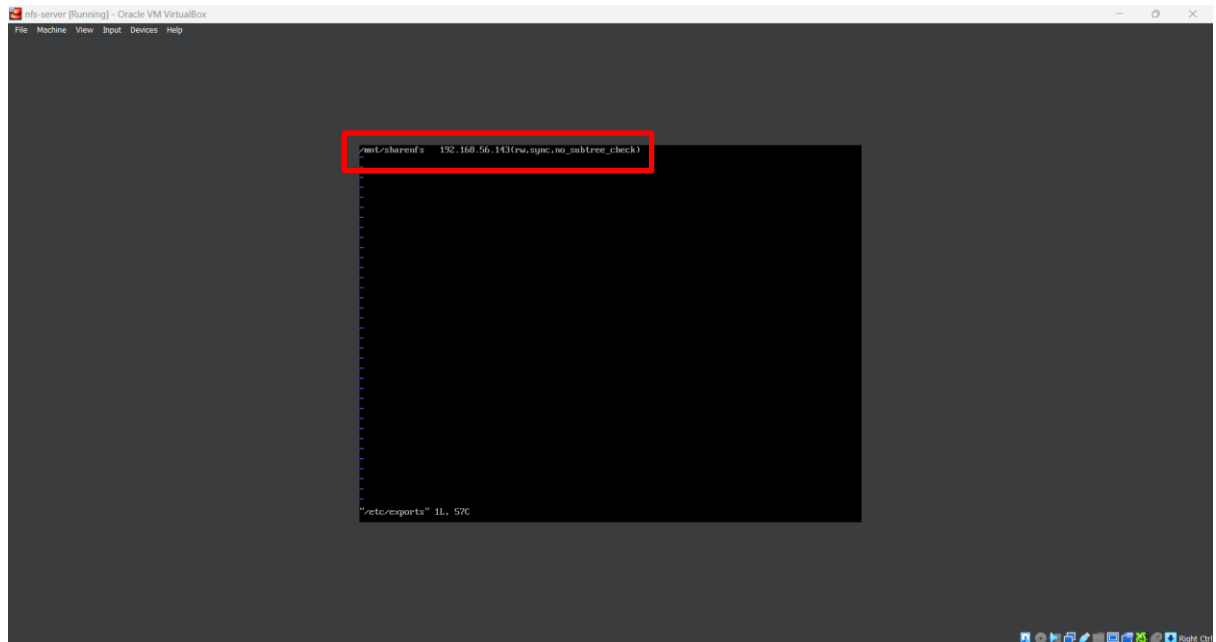
14. Sebelum mounting NFS, Kita harus memeriksa bagian NFS yang tersedia di NFS-Server dengan menjalankan perintah berikut pada NFS-Client.

```
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

[illegible]

- 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-0a41-44a6-91db-27794042bebb /boot xfs defaults 0 0
# Don't mount /etc/fstab on /etc/fstab
192.168.56.142:/mnt/sharenfs /mnt/nfs/share nfs defaults 0 0
```

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)
sunrpc 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`.

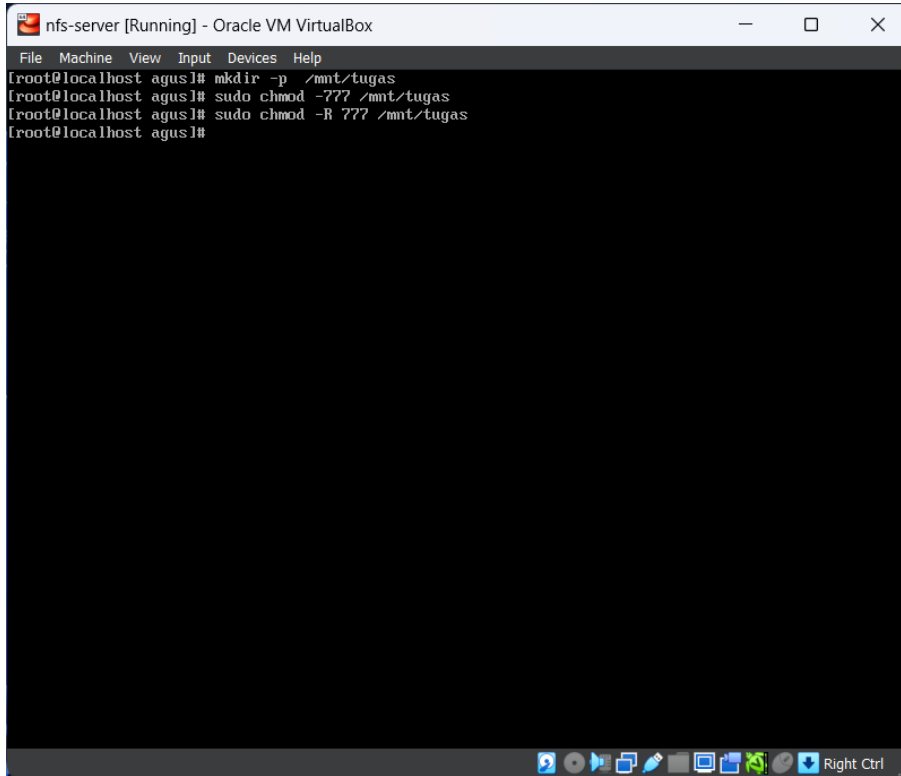
22. Selesai!

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.

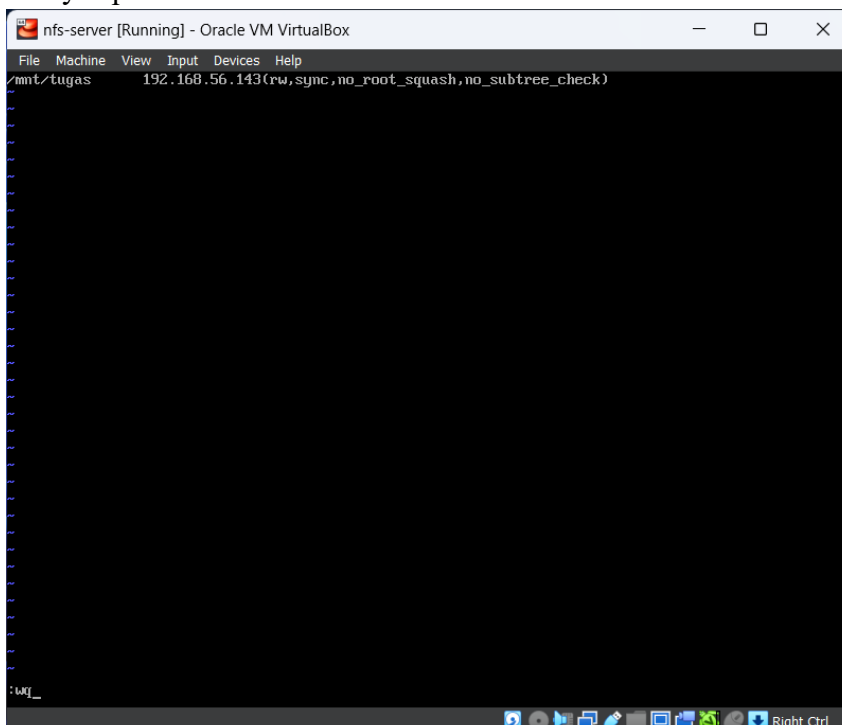
Jawab:

1. Kita buat direktori baru pada NFS-Server dan memberikan akses pada file yang dibuat.



```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
[root@localhost agus]# mkdir -p /mnt/tugas
[root@localhost agus]# sudo chmod -777 /mnt/tugas
[root@localhost agus]# sudo chmod -R 777 /mnt/tugas
[root@localhost agus]#
```

2. Edit /etc/exports yang ada di NFS-Server. Ketika sudah selesai, ketik :wq untuk menyimpan

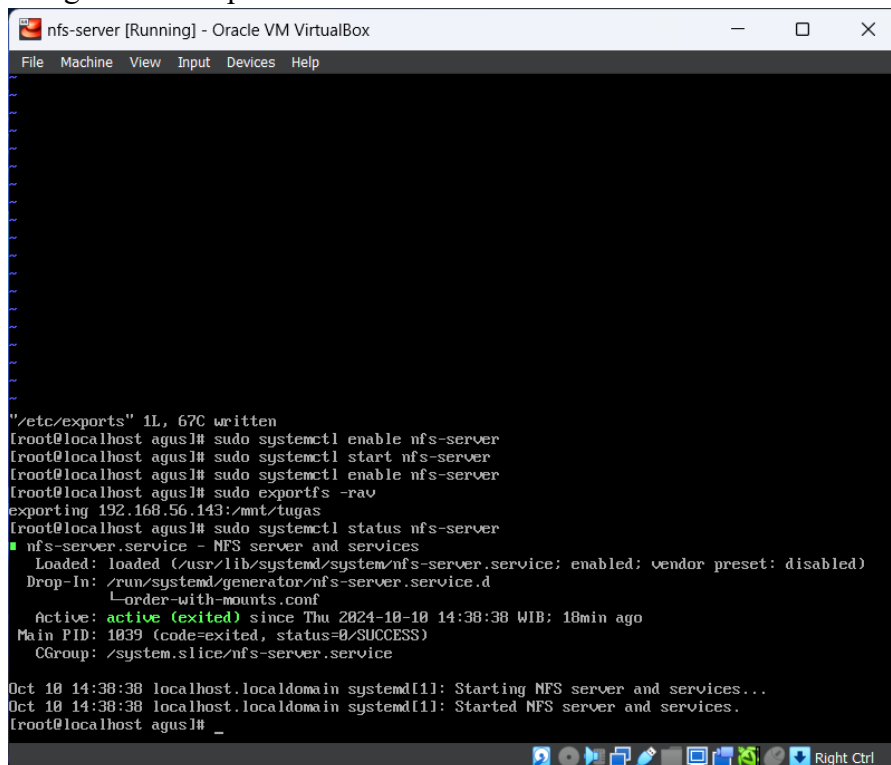


```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
/mnt/tugas 192.168.56.143(rw,sync,no_root_squash,no_subtree_check)
:~#
:wq_
```

Keterangan:

- /mnt/tugas : Direktori pada server
- 192.168.56.143 : IP Server
- (rw, sync, no_root_squash, no_subtree_check) : Untuk memberikan akses pada direktori tersebut.

3. Kemudian kita nyalakan dan memulai nfs-server dan mengekspor nya dan juga mengecek status pada nfs-server.

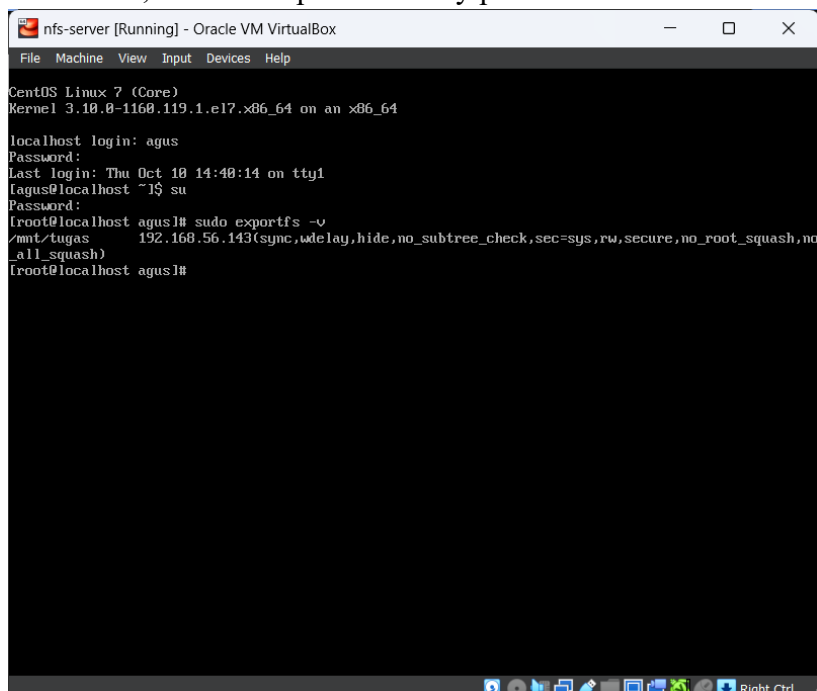


```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

"/etc/exports" 1L, 67C written
[root@localhost agus]# sudo systemctl enable nfs-server
[root@localhost agus]# sudo systemctl start nfs-server
[root@localhost agus]# sudo systemctl enable nfs-server
[root@localhost agus]# sudo exportfs -rav
exporting 192.168.56.143:/mnt/tugas
[root@localhost agus]# 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)
Drop-In: /run/systemd/generator/nfs-server.service.d
└─order-with-mounts.conf
Active: active (exited) since Thu 2024-10-10 14:38:38 WIB; 18min ago
Main PID: 1039 (code=exited, status=0/SUCCESS)
CGroup: /system.slice/nfs-server.service

Oct 10 14:38:38 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:38 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]# _
```

4. Kemudian, kita cek export directory pada NFS-Server untuk memastikan.

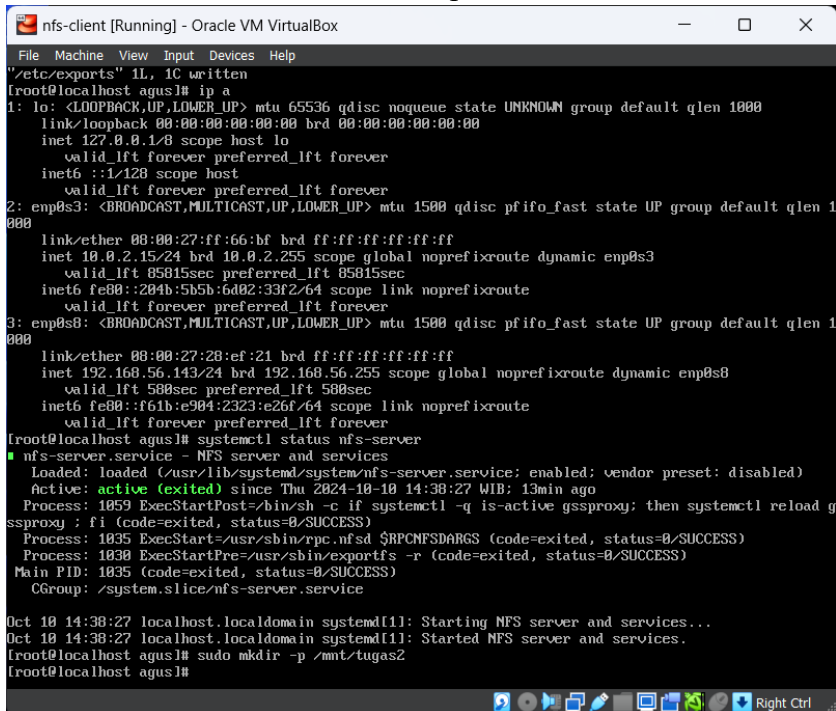


```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

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

localhost login: agus
Password:
Last login: Thu Oct 10 14:40:14 on tty1
[agus@localhost ~]$ su
Password:
[root@localhost agus]# sudo exportfs -v
/mnt/tugas 192.168.56.143(sync,wdelay,hide,no_subtree_check,sec=sys,rw,secure,no_root_squash,no_all_squash)
[root@localhost agus]#
```

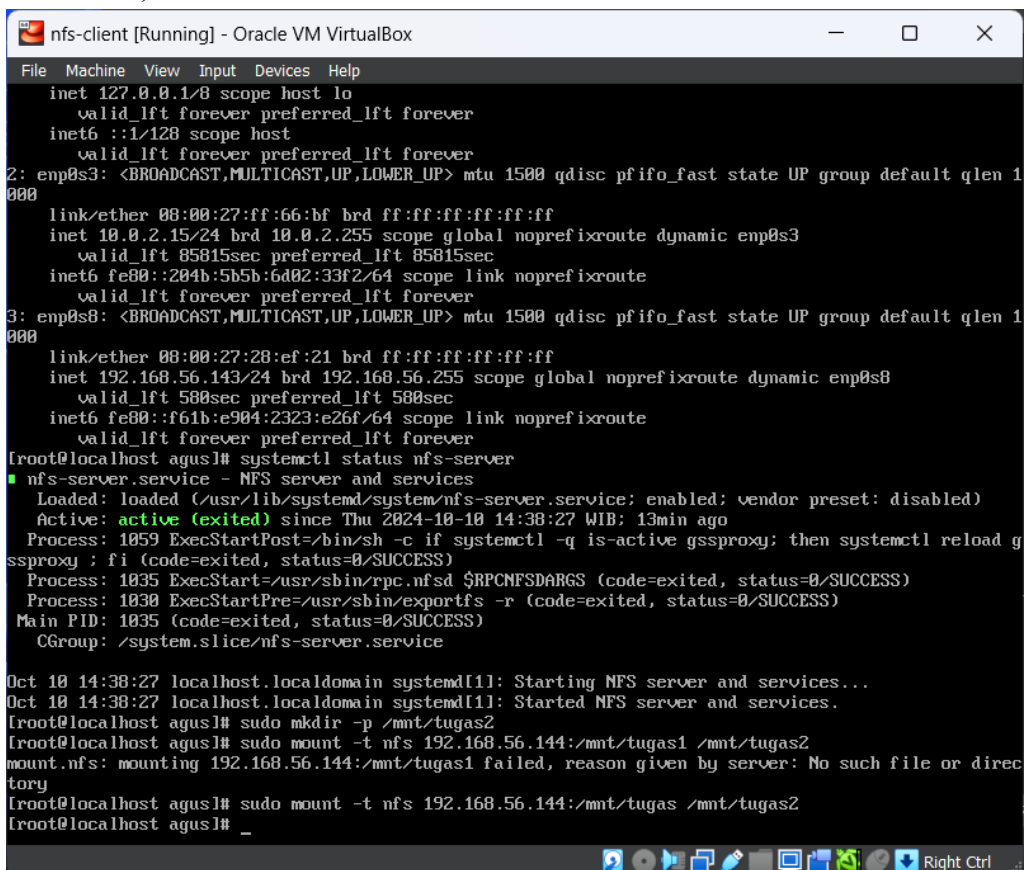
5. Kemudian kita buat direktori baru pada NFS-Client.



```
nfs-client [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
"/etc/exports" 1L, 1C written
[root@localhost agus]# 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: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:ff:66:bf brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefixroute dynamic enp0s3
        valid_lft 85815sec preferred_lft 85815sec
    inet6 fe80::204b:5b5b:6d02:33f2/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:28:ef:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.143/24 brd 192.168.56.255 scope global noprefixroute dynamic enp0s8
        valid_lft 580sec preferred_lft 580sec
    inet6 fe80::f61b:e904:2323:e26f/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
[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)
   Active: active (exited) since Thu 2024-10-10 14:38:27 WIB; 13min ago
     Process: 1059 ExecStartPost=/bin/sh -c if systemctl -q is-active gssproxy; then systemctl reload gssproxy : fi (code=exited, status=0/SUCCESS)
     Process: 1035 ExecStart=/usr/sbin/rpc.nfsd $RPCNFSDARGS (code=exited, status=0/SUCCESS)
     Process: 1030 ExecStartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
    Main PID: 1035 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 10 14:38:27 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:27 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]# sudo mkdir -p /mnt/tugas2
[root@localhost agus]#
```

6. Kemudian, kita lakukan mount di NFS-Client



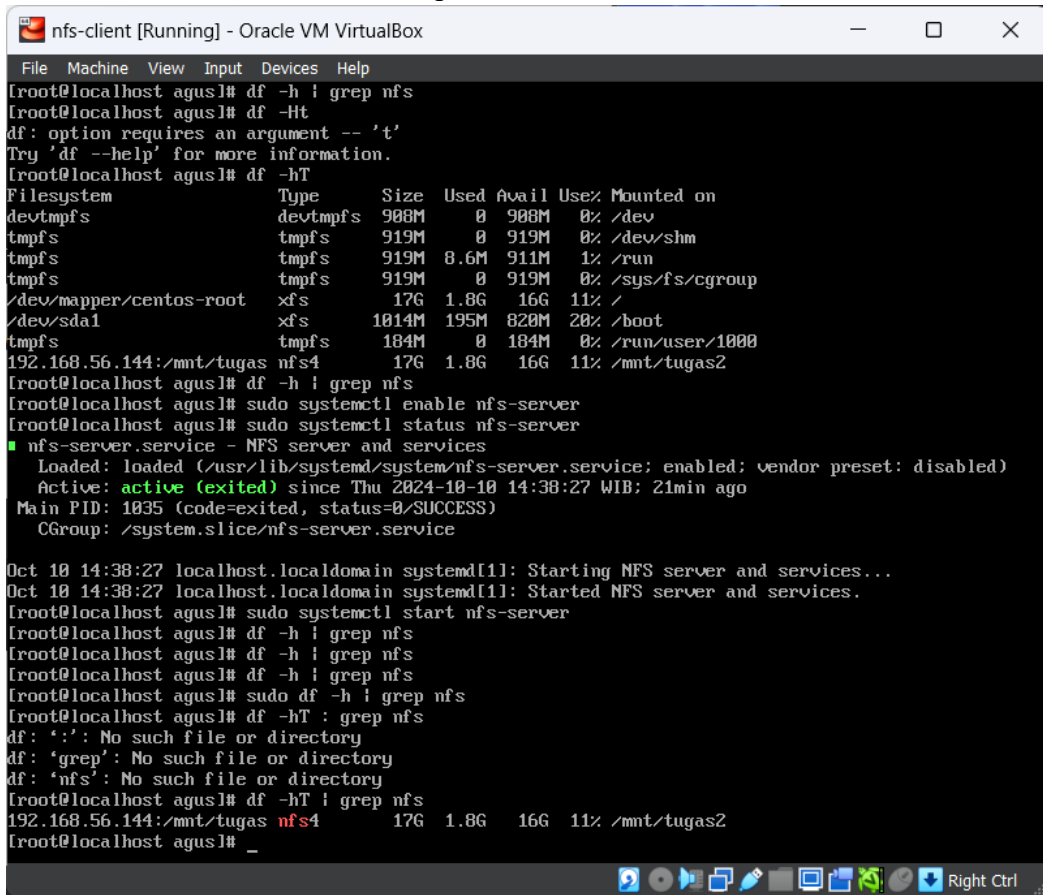
```
nfs-client [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:ff:66:bf brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global noprefixroute dynamic enp0s3
        valid_lft 85815sec preferred_lft 85815sec
    inet6 fe80::204b:5b5b:6d02:33f2/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:28:ef:21 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.143/24 brd 192.168.56.255 scope global noprefixroute dynamic enp0s8
        valid_lft 580sec preferred_lft 580sec
    inet6 fe80::f61b:e904:2323:e26f/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
[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)
   Active: active (exited) since Thu 2024-10-10 14:38:27 WIB; 13min ago
     Process: 1059 ExecStartPost=/bin/sh -c if systemctl -q is-active gssproxy; then systemctl reload gssproxy : fi (code=exited, status=0/SUCCESS)
     Process: 1035 ExecStart=/usr/sbin/rpc.nfsd $RPCNFSDARGS (code=exited, status=0/SUCCESS)
     Process: 1030 ExecStartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
    Main PID: 1035 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 10 14:38:27 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:27 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]# sudo mkdir -p /mnt/tugas2
[root@localhost agus]# sudo mount -t nfs 192.168.56.144:/mnt/tugas1 /mnt/tugas2
mount.nfs: mounting 192.168.56.144:/mnt/tugas1 failed, reason given by server: No such file or directory
[root@localhost agus]# sudo mount -t nfs 192.168.56.144:/mnt/tugas /mnt/tugas2
[root@localhost agus]# _
```

Keterangan:

- /mnt/tugas : Direktori pada server
- /mnt/tugas2 : Direktori pada client
- 192.168.56.144 : IP Server

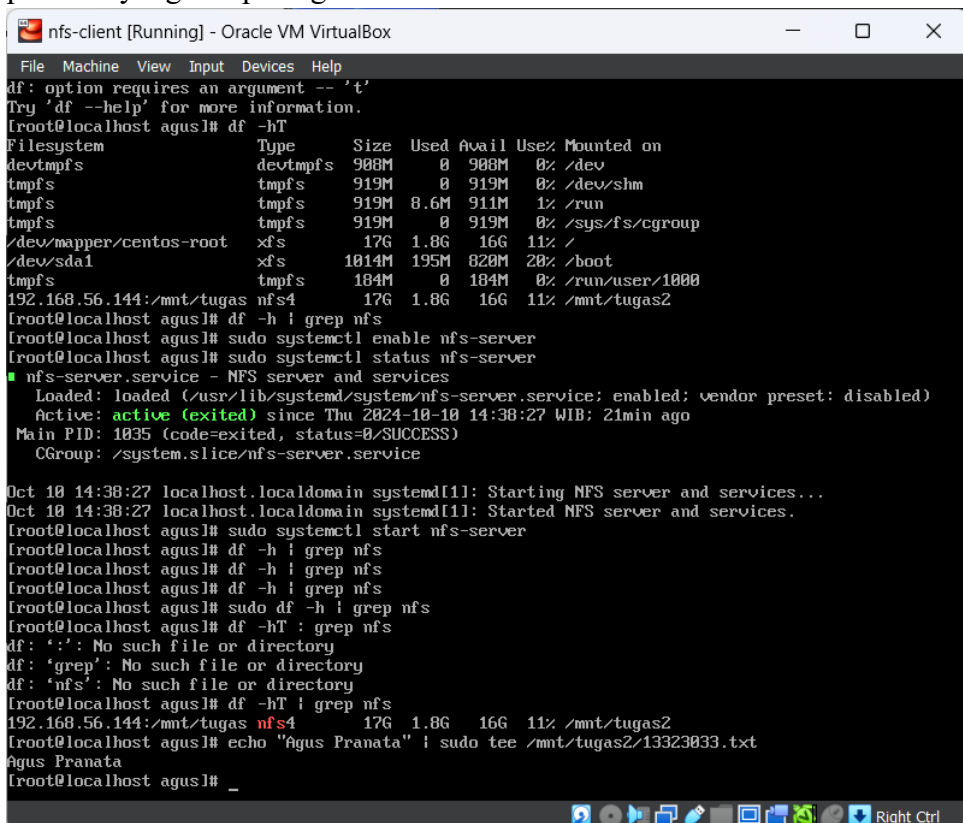
7. Kemudian verifikasi hasil mount pada di NFS-Client



```
nfs-client [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# df -Ht
df: option requires an argument -- 't'
Try 'df --help' for more information.
[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  8.6M  911M   1% /run
tmpfs                     tmpfs     919M   0  919M   0% /sys/fs/cgroup
/dev/mapper/centos-root    xfs       17G   1.8G   16G  11% /
/dev/sda1                  xfs      1014M  195M   820M  20% /boot
tmpfs                     tmpfs     184M   0  184M   0% /run/user/1000
192.168.56.144:/mnt/tugas  nfs4      17G   1.8G   16G  11% /mnt/tugas2
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# sudo systemctl enable nfs-server
[root@localhost agus]# 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 Thu 2024-10-10 14:38:27 WIB; 21min ago
   Main PID: 1035 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 10 14:38:27 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:27 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]# sudo systemctl start nfs-server
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# sudo df -h | grep nfs
[root@localhost agus]# df -hT : grep nfs
df: ':': No such file or directory
df: 'grep': No such file or directory
df: 'nfs': No such file or directory
[root@localhost agus]# df -hT | grep nfs
192.168.56.144:/mnt/tugas nfs4      17G   1.8G   16G  11% /mnt/tugas2
[root@localhost agus]# _
```

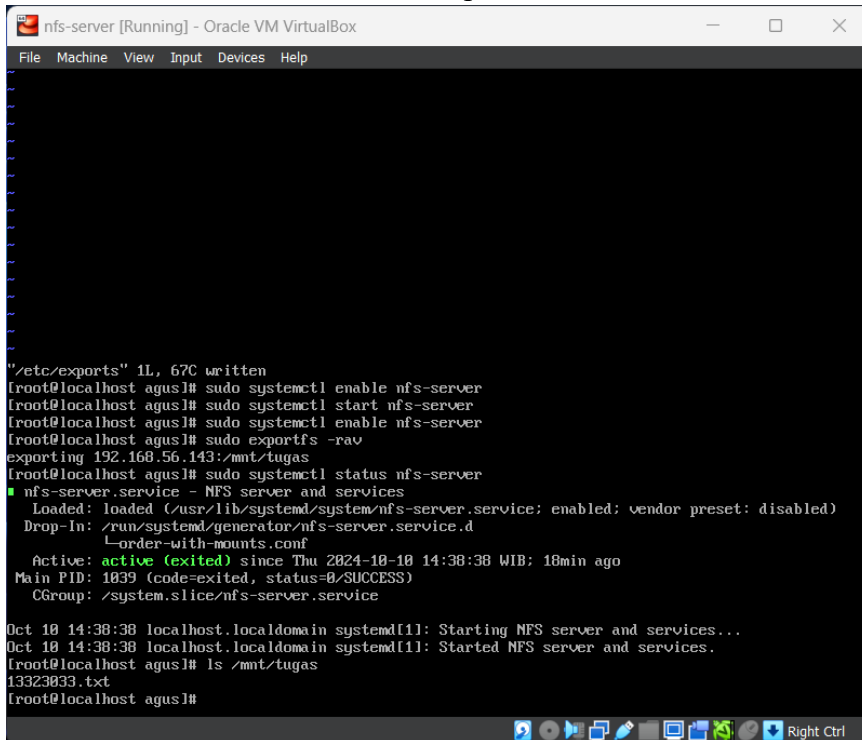
8. Kemudian, kita akan membuat dan mengisi file tersebut dengan menggunakan perintah yang ada pada gambar ini.



```
nfs-client [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
df: option requires an argument -- 't'
Try 'df --help' for more information.
[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  8.6M  911M   1% /run
tmpfs                     tmpfs     919M   0  919M   0% /sys/fs/cgroup
/dev/mapper/centos-root    xfs       17G   1.8G   16G  11% /
/dev/sda1                  xfs      1014M  195M   820M  20% /boot
tmpfs                     tmpfs     184M   0  184M   0% /run/user/1000
192.168.56.144:/mnt/tugas  nfs4      17G   1.8G   16G  11% /mnt/tugas2
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# sudo systemctl enable nfs-server
[root@localhost agus]# 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 Thu 2024-10-10 14:38:27 WIB; 21min ago
   Main PID: 1035 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 10 14:38:27 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:27 localhost.localdomain systemd[1]: Started NFS server and services.
[root@localhost agus]# sudo systemctl start nfs-server
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# df -h | grep nfs
[root@localhost agus]# sudo df -h | grep nfs
[root@localhost agus]# df -hT : grep nfs
df: ':': No such file or directory
df: 'grep': No such file or directory
df: 'nfs': No such file or directory
[root@localhost agus]# df -hT | grep nfs
192.168.56.144:/mnt/tugas nfs4      17G   1.8G   16G  11% /mnt/tugas2
[root@localhost agus]# echo "Agus Pranata" | sudo tee /mnt/tugas2/13323033.txt
Agus Pranata
[root@localhost agus]# _
```

9. Kemudian kita cek di NFS-Server apakah file tersebut ada.

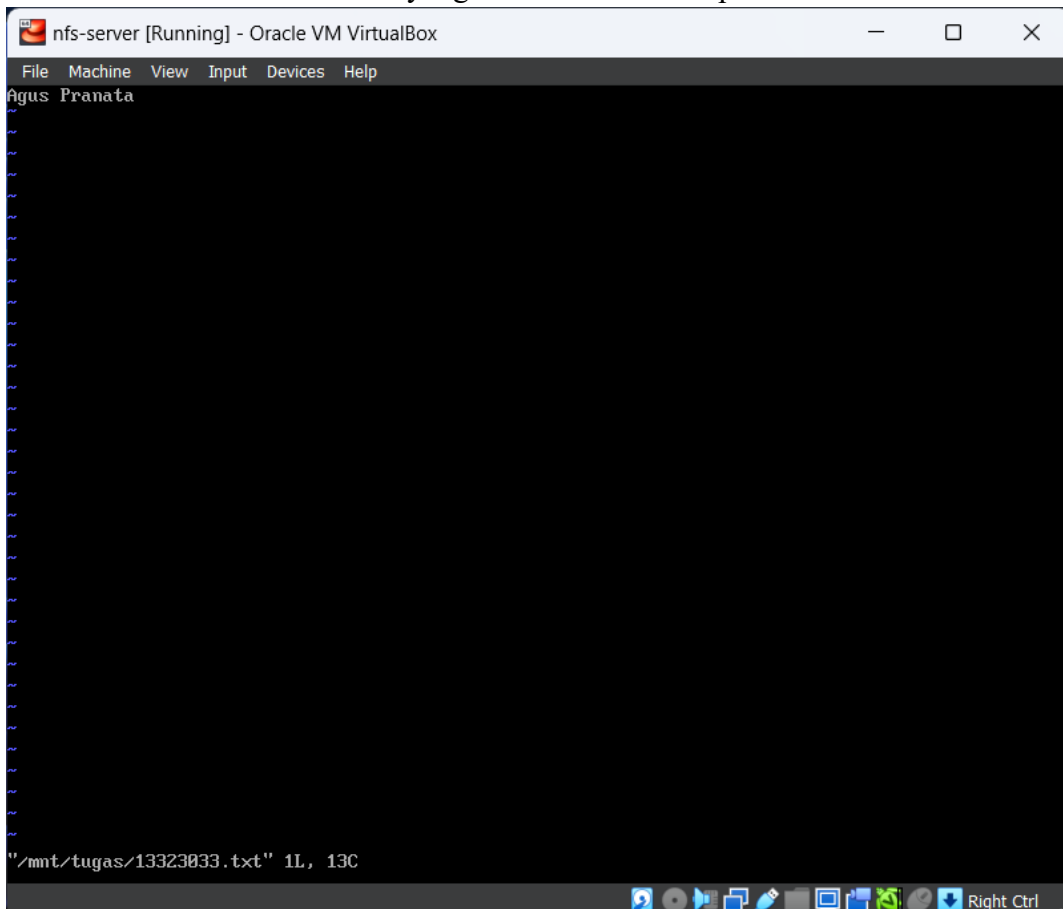


```
nfs-server [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help

"/etc/exports" 1L, 67C written
root@localhost agus1# sudo systemctl enable nfs-server
root@localhost agus1# sudo systemctl start nfs-server
root@localhost agus1# sudo systemctl enable nfs-server
root@localhost agus1# sudo exportfs -rav
exporting 192.168.56.143:/mnt/tugas
root@localhost agus1# 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)
   Drop-In: /run/systemd/generator/nfs-server.service.d
            └─order-with-mounts.conf
   Active: active (exited) since Thu 2024-10-10 14:38:38 WIB; 18min ago
   Main PID: 1039 (code=exited, status=0/SUCCESS)
   CGroup: /system.slice/nfs-server.service

Oct 10 14:38:38 localhost.localdomain systemd[1]: Starting NFS server and services...
Oct 10 14:38:38 localhost.localdomain systemd[1]: Started NFS server and services.
root@localhost agus1# ls /mnt/tugas
13323033.txt
root@localhost agus1#
```

10. Kita cek isi dalam file tersebut yang ada di NFS-Client pada NFS-Server.



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

"/mnt/tugas/13323033.txt" 1L, 13C
```