

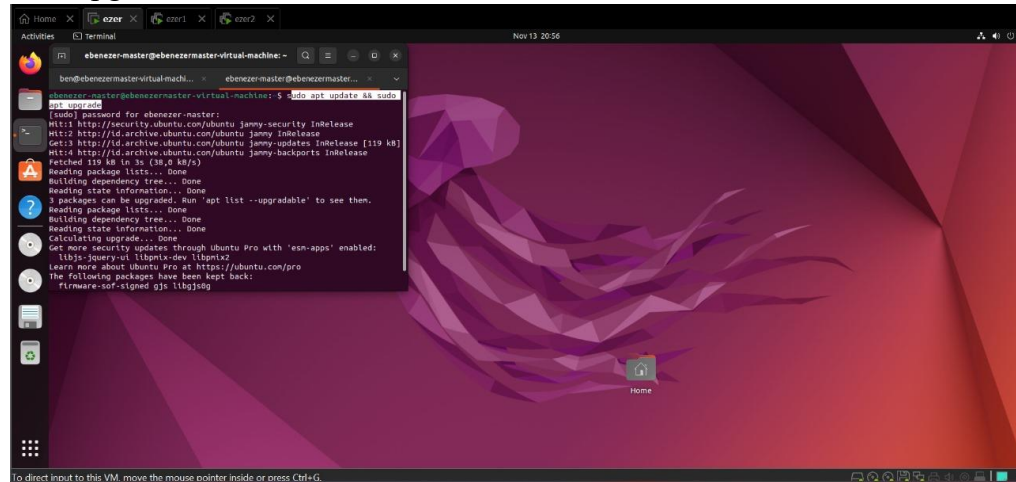
LAPORAN PEMROSESAN PARALEL IMAGE STITCHING DENGAN MPI



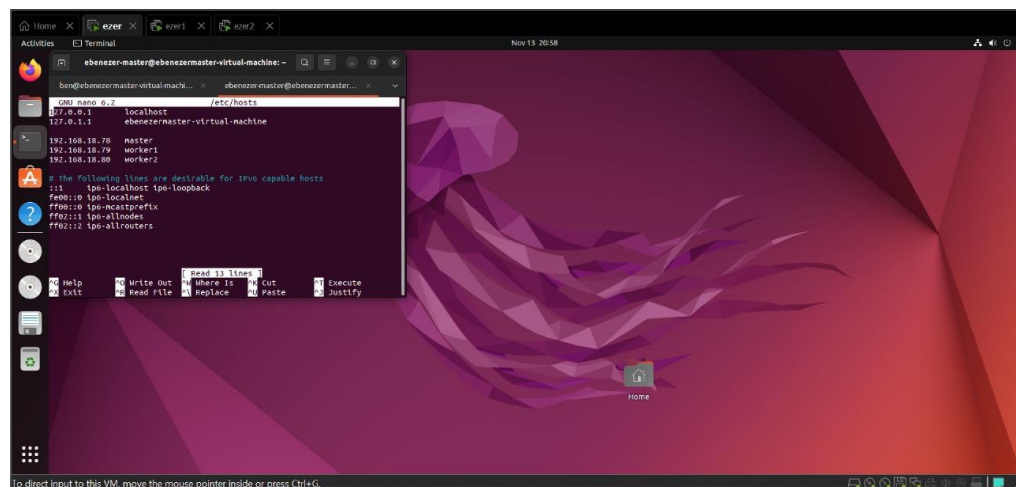
Nama : Ebenezer Hutahaean
NIM : 09011282126080
Kelas : SK5B
Dosen Pengampu : AHMAD HERYANTO, S.KOM, M.T.
ADI HERMANSYAH, S.KOM., M.T.

SISTEM KOMPUTER
FAKULTAS ILMU KOMPUTER
UNIVERSITAS SRIWIJAYA
2023

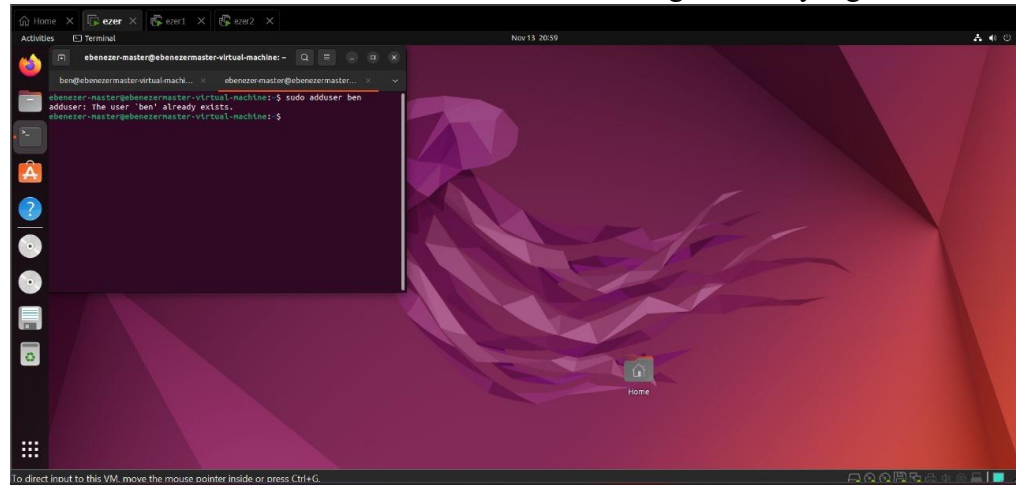
- Device dan Tools yang digunakan
 - 3 Virtual Machine (1 master dan 2 worker/slave)
 - MPI (Message Passing Interface)
 - SSH (Secure Shell)
 - Python
- Update dan Upgrade Ubuntu



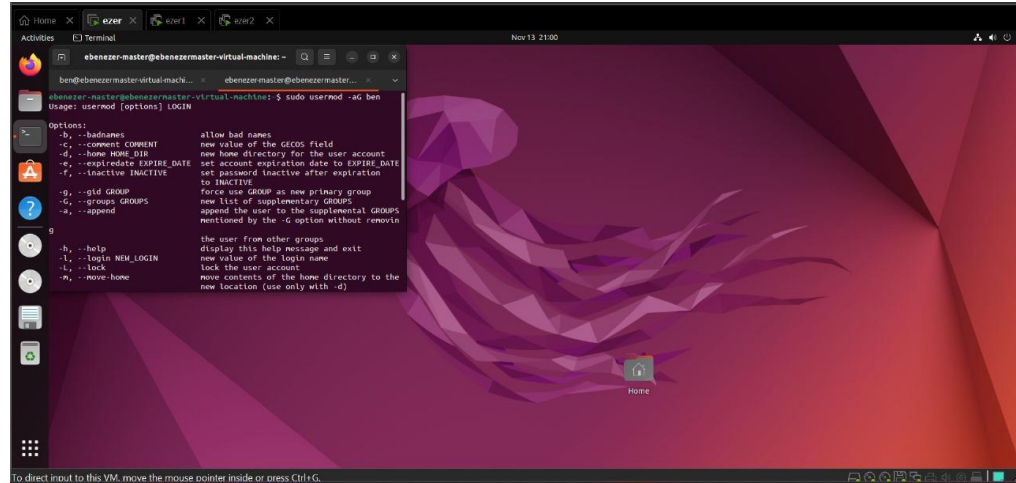
- Konfigurasi MPI
 - Lakukan Konfigurasi /etc/hosts di master dan slave dengan mengisi ip dari master dan slave



- Buat user baru di master, worker1 dan worker2 dengan nama yang sama



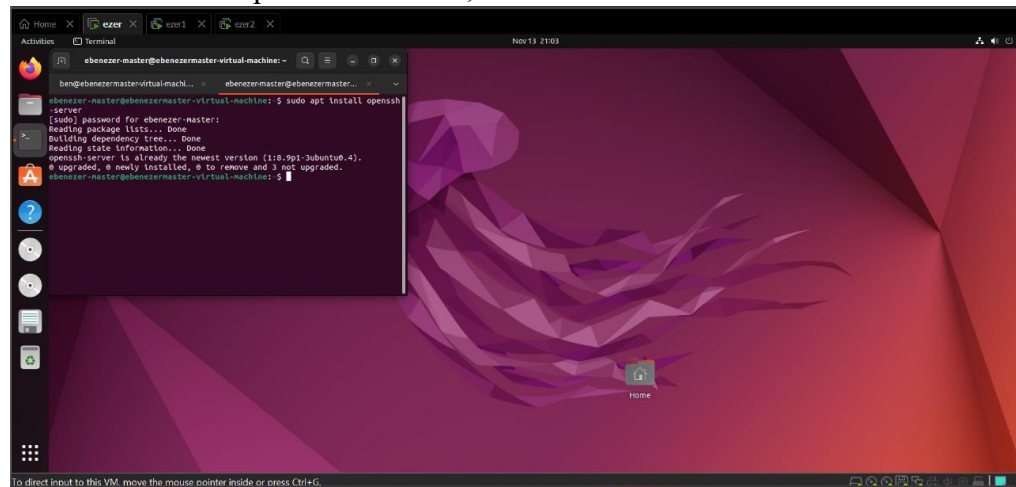
- Berikan akses root ke user baru yang dibuat di master, worker1 dan worker2



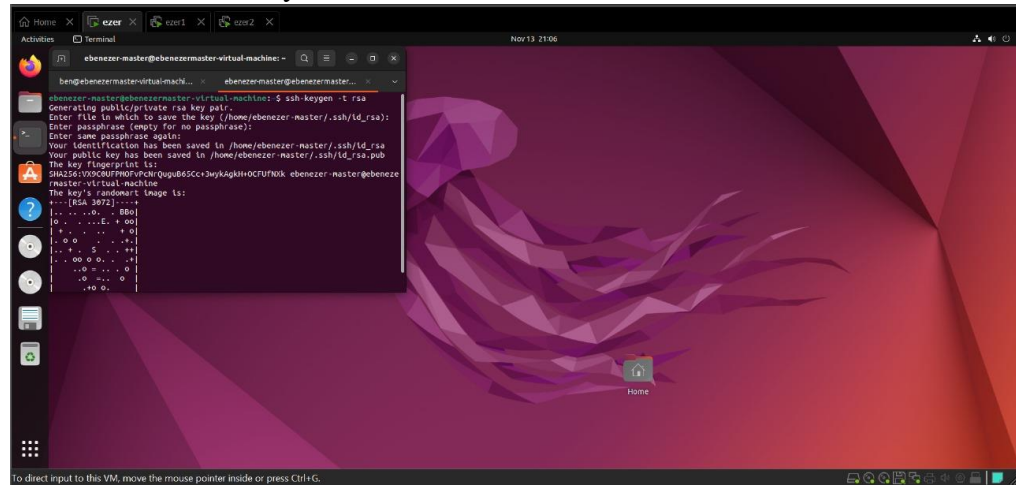
- Kemudian masuklah sebagai “user yang telah dibuat” di master dan kedua worker



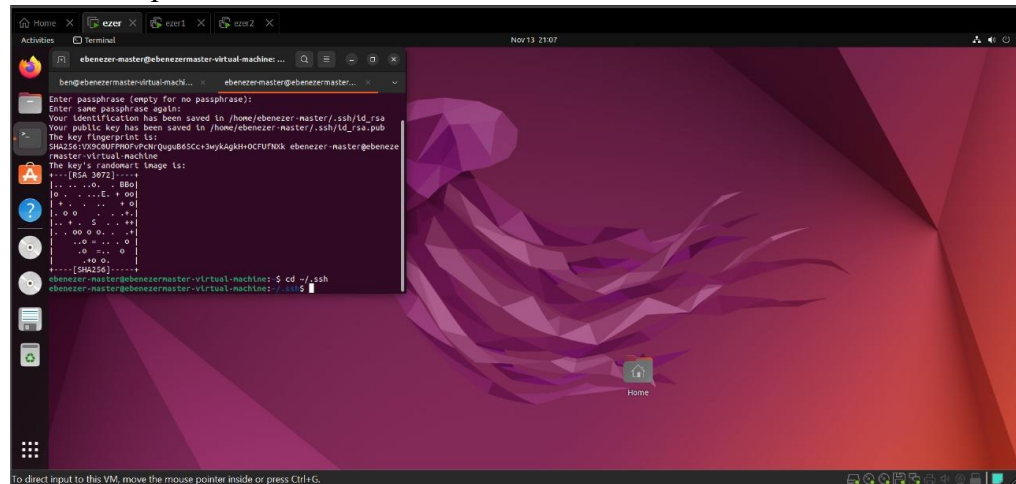
- Kemudian install openssh di master, worker1 dan worker2



- Kemudian buatlah key ssh di master



- Kemudian pindah direktori



-
- The image shows two screenshots of a Kali Linux desktop environment. The top screenshot shows a terminal window with the following output:
- ```

ebenezer-master@ebenezer-master-virtual-machine: ~
ben@ebenezer-master-virtual-machine: ~$ nc -l -p 4444
The key fingerprint is:
SHA256:V09GBU7PMDVPC8KQ8u65Cc3jyKqkshOCUFuXkX ebenezer-master@ebenezer-master-virtual-machine
The key's randomart image is:
+--[RSA 3072]-----+
|o. BB=|
| o.E. + oo|
| +.+|
| . o+|
| .. . S . .+|
| .. oo o o . .+|
| ..o . . . o|
| ..o . . . o|
| ..o . . . o|
| ..o . . . o|
+-----[SHA256]-----+
ebenezer-master@ebenezer-master-virtual-machine: ~$ cd -/.ssh
ebenezer-master@ebenezer-master-virtual-machine: /ssh$ cat td_rsa.pub | ss
h ben@worker1 mkdir .ssh; cat > .ssh/authorized_keys
ben@worker1's password:
mkdir: cannot create directory '.ssh': file exists
ebenezer-master@ebenezer-master-virtual-machine: /ssh$

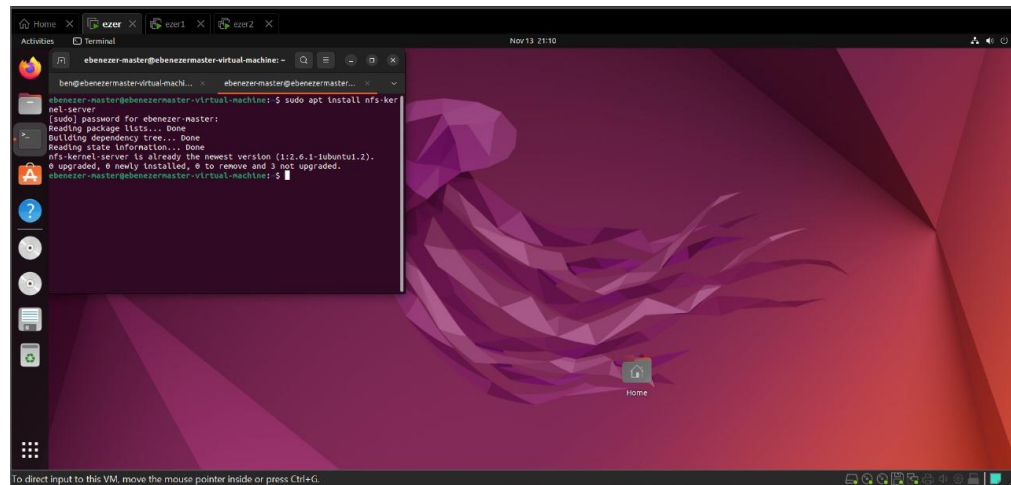
```
- The bottom screenshot shows the same terminal window with the following output:
- ```

ebenezer-master@ebenezer-master-virtual-machine: ~
ben@ebenezer-master-virtual-machine: ~$ nc -l -p 4444
+--[RSA 3072]-----+
| .. .. .o. BB=|
| o. ....E. + oo|
| +. . . . .+|
| . o . . . .+|
| .. . S . .+|
| .. oo o o . .+|
| ..o . . . o|
| ..o . . . o|
| ..o . . . o|
| ..o . . . o|
+-----[SHA256]-----+
ebenezer-master@ebenezer-master-virtual-machine: ~$ cd -/.ssh
ebenezer-master@ebenezer-master-virtual-machine: /ssh$ cat td_rsa.pub | ss
h ben@worker1 mkdir .ssh; cat > .ssh/authorized_keys
ben@worker1's password:
mkdir: cannot create directory '.ssh': file exists
ebenezer-master@ebenezer-master-virtual-machine: /ssh$ cat td_rsa.pub | ss
h ben@worker1 mkdir .ssh; cat > .ssh/authorized_keys
ben@worker1's password:
mkdir: cannot create directory '.ssh': file exists
ebenezer-master@ebenezer-master-virtual-machine: /ssh$

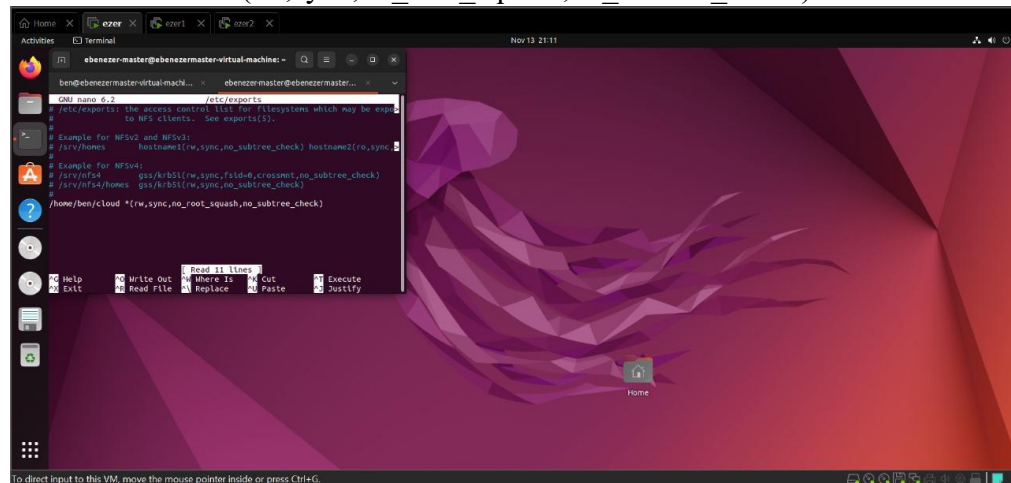
```
- The desktop background is a purple and black abstract design. The terminal window is titled "ebenezer-master@ebenezer-master-virtual-machine: ~". The desktop environment includes a taskbar at the bottom with icons for Home, Applications, and a search bar.

-
- A screenshot of a Linux desktop environment. The desktop background is a purple and red geometric pattern. A terminal window is open in the center, displaying the command prompt 'ben@benecmaster-virtual-machine:~\$' and the command 'mkdir ~/cloud'. The output shows an error: 'mkdir: cannot create directory '/home/ben/cloud': File exists'. The terminal window has a title bar with 'Terminal' and several window control buttons. On the left side of the desktop, there is a vertical dock with icons for Home, Activities, and various applications. At the bottom, there is a taskbar with icons for the Dash, Home, and several open applications. The system clock in the top right corner shows 'Nov 13 21:09'.

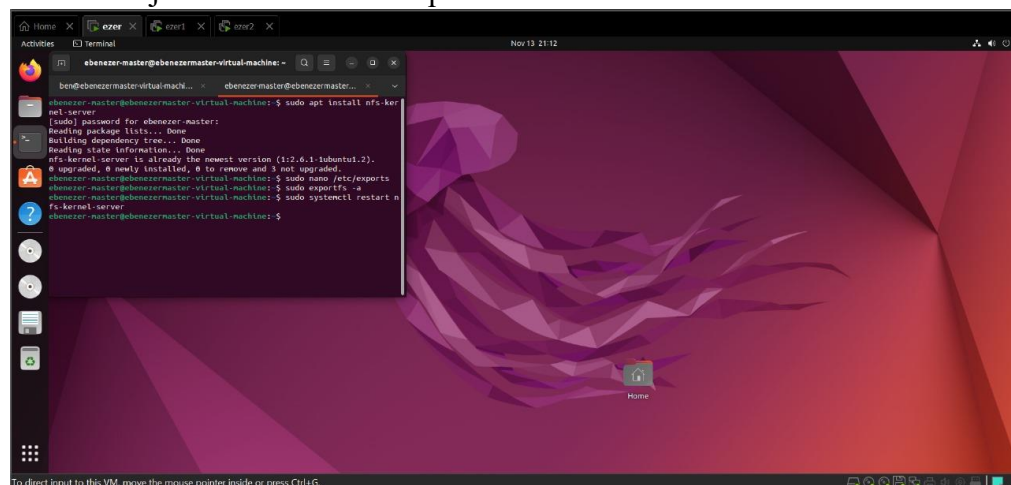
- Setelah itu kemudian install lah nfs di master



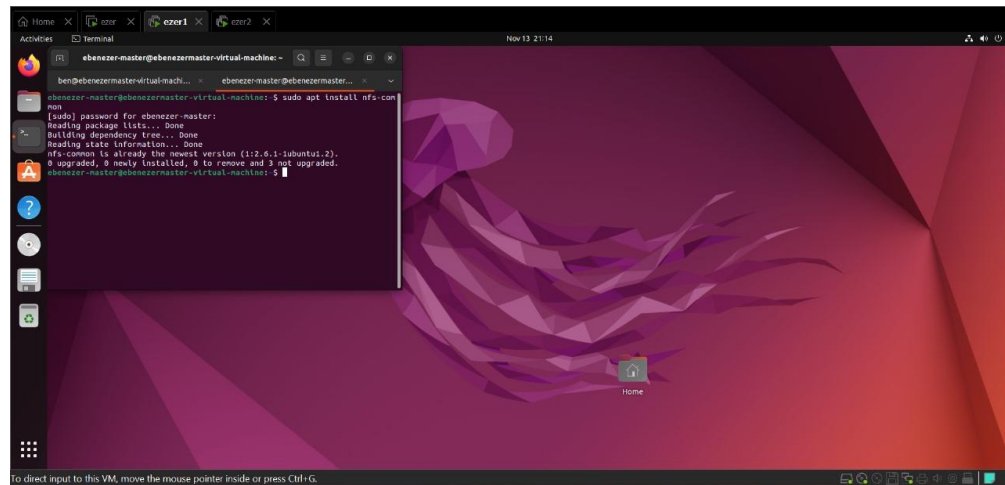
- edit file exports dan tambahkan `/home/ben/cloud*(rw,sync,no_root_squash,no_subtree_check)`



- Kemudian jalankan command seperti dibawah

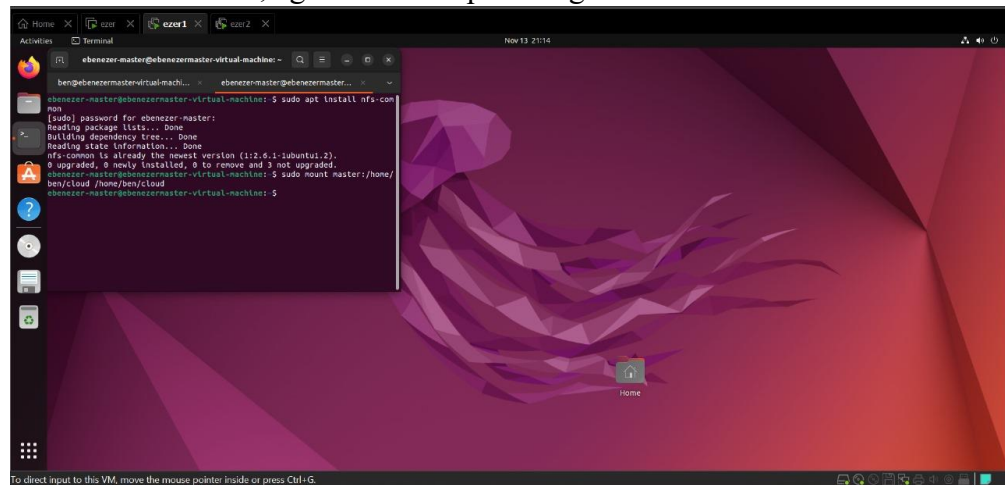


- Kemudian install nfs-common di worker1 dan worker2



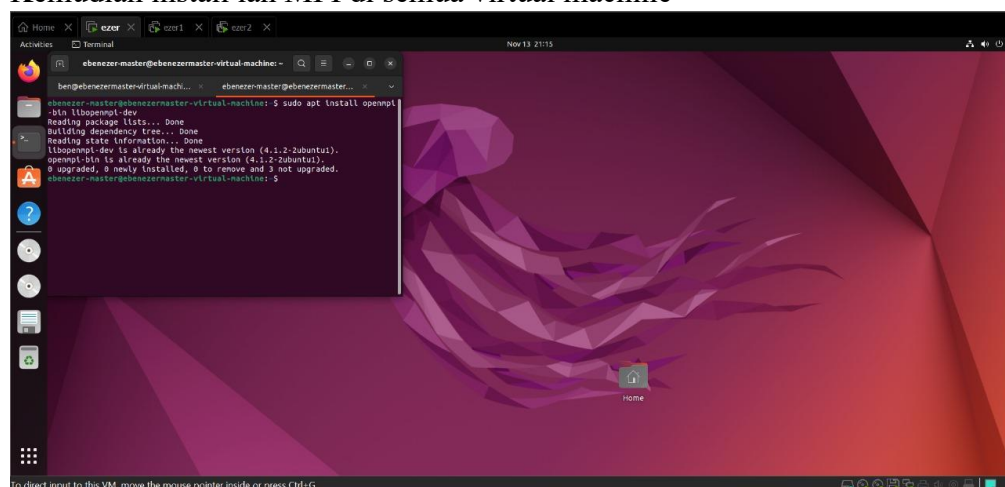
```
ben@ebenezer-master-virtual-machine: ~$ sudo apt install nfs-common
[sudo] password for ebenezer-master:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-common is already the newest version (1:2.6.1-1ubuntu1.2).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
ben@ebenezer-master-virtual-machine: ~$
```

- Kemudian lakukan lah mount direktori cloud yang dibuat tadi, lakukan command ini di kedua worker, agar worker dapat mengakses direktori



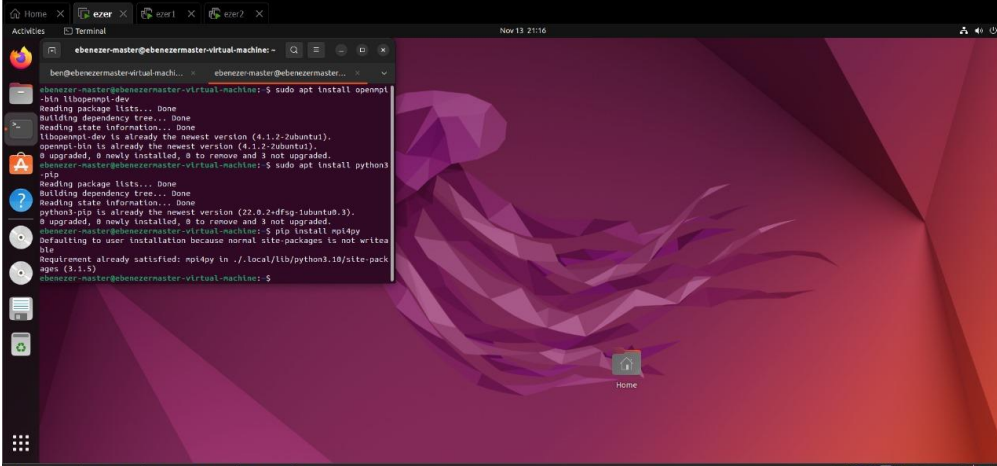
```
ben@ebenezer-master-virtual-machine: ~$ sudo apt install nfs-common
[sudo] password for ebenezer-master:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-common is already the newest version (1:2.6.1-1ubuntu1.2).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
ben@ebenezer-master-virtual-machine: ~$ sudo mount master:/home/ben/cloud /home/ben/cloud
ben@ebenezer-master-virtual-machine: ~$
```

- Kemudian install lah MPI di semua virtual machine



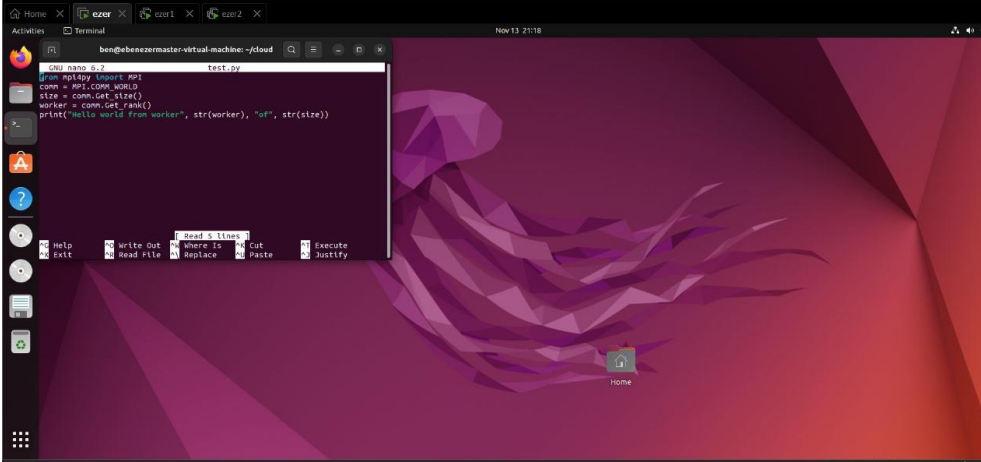
```
ben@ebenezer-master-virtual-machine: ~$ sudo apt install openmpi
-bin libopenmpi-dev
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
libopenmpi-dev is already the newest version (4.1.2-2ubuntu1).
openmpi-bin is already the newest version (4.1.2-2ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
ben@ebenezer-master-virtual-machine: ~$
```

- Setelah terinstall, kemudian lanjutkan dengan menginstall librarynya di semua virtual machine



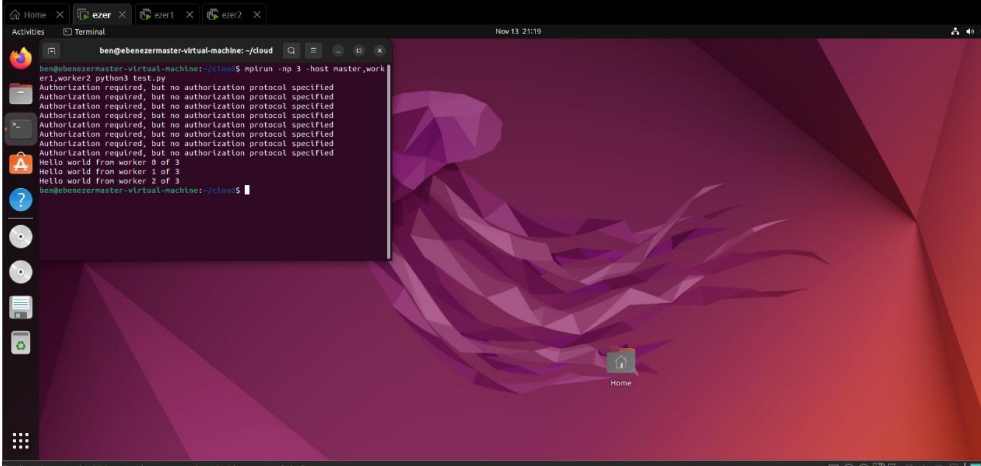
```
ben@ebenezermaster-virtual-machine:~$ sudo apt install openmpi
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openmpi-bin is already the newest version (4.1.2-2ubuntu1).
openmpi-dev is already the newest version (4.1.2-2ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
ben@ebenezermaster-virtual-machine:~$ sudo apt install python3-pip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-pip is already the newest version (22.0.2dfsg-1ubuntu1.3).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
ben@ebenezermaster-virtual-machine:~$ pip install mpi4py
Requirement already satisfied: mpi4py in ./local/lib/python3.10/site-packages (3.1.3)
```

- Batlah program test, untuk menguji apakah mpi sudah dapat dijalankan



```
ben@ebenezermaster-virtual-machine:~/cloud$ nano test.py
# MPI program test
comm = mpi4py.MPI.Comm
size = comm.Get_size()
worker = comm.Get_rank()
print("Hello world from worker", str(worker), "of", str(size))
```

- Kemudian jalankan program tersebut



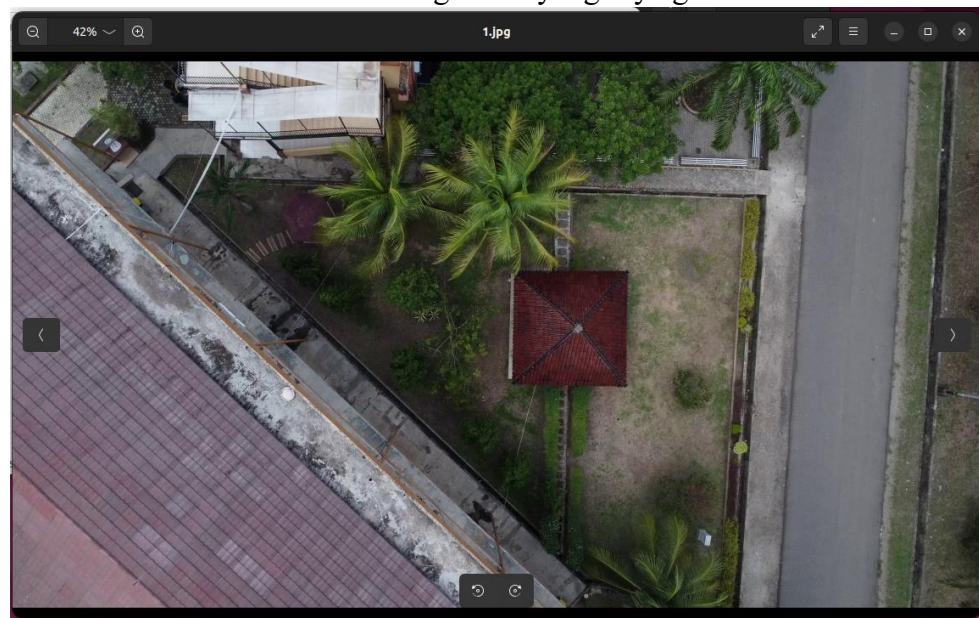
```
ben@ebenezermaster-virtual-machine:~/cloud$ mpirun -np 4 -host master,worker1,worker2 python3 test.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Hello world from worker 0 of 4
Hello world from worker 1 of 4
Hello world from worker 2 of 4
ben@ebenezermaster-virtual-machine:~/cloud$
```


- Setelah berhasil, kemudian lakukanlah program image stitching yang menggunakan data gambar

```
ben@master: ~/cloud
ben@master:~/cloud$ nano fixmpi.py
ben@master:~/cloud$ mpirun -np 3 -host master,worker1,worker2 python3 fixmpi.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified

Stitching berhasil, gambar disimpan sebagai hasil_stitching.jpg
ben@master:~/cloud$ S
```

- Berikut adalah contoh salah satu gambar yang saya gunakan



- Dan berikut adalah hasil stitching-nya

