

# LAPORAN PEMROSESAN PARALEL IMAGE STITCHING DENGAN MPI



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**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

```

ben@ebenezermaster-virtual-machine:~$ sudo apt update
[sudo] password for ebenezermaster:
Hit:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:2 http://id.archive.ubuntu.com/ubuntu jammy InRelease
Get:3 http://id.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Hit:4 http://id.archive.ubuntu.com/ubuntu jammy-backports InRelease
Fetched 119 kB in 3s (38.8 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
3 packages can be upgraded. Run 'apt list --upgradable' to see them.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
Get more security updates through Ubuntu Pro with 'esm-apps' enabled:
libjs-jquery-ui libpmix-dev libpmix2
Learn more about Ubuntu Pro at https://ubuntu.com/pro
The following packages have been kept back:
firmware-sof-signed libjsjag
  
```

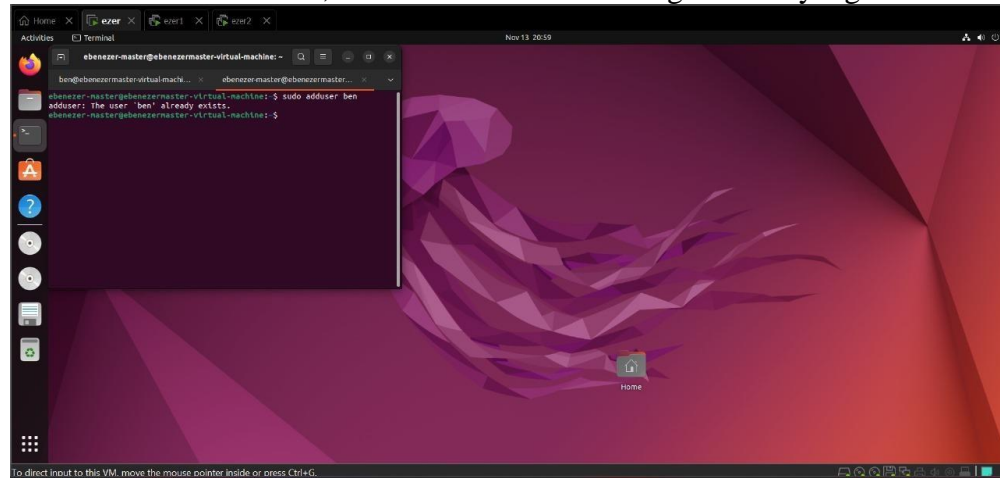
- Konfigurasi MPI
  - Lakukan Konfigurasi /etc/hosts di master dan slave dengan mengisi ip dari master dan slave

```

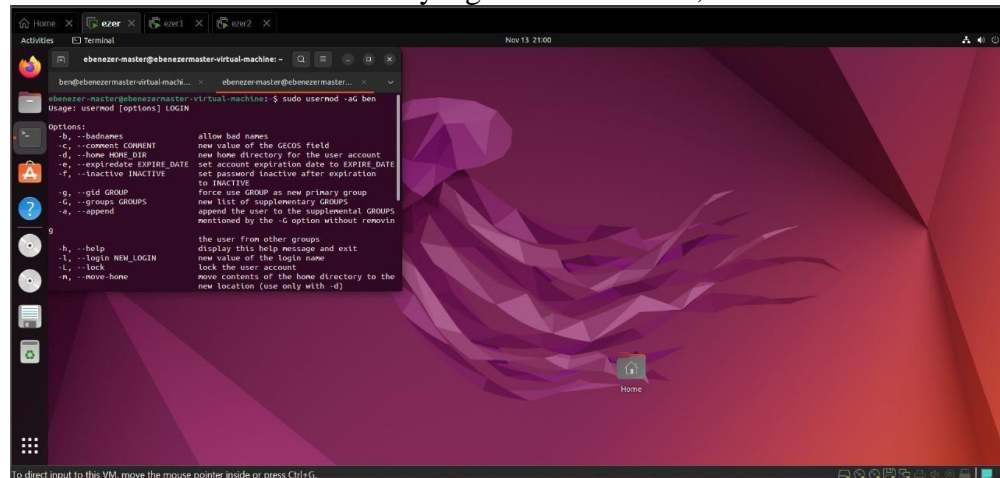
GNU nano 6.2 /etc/hosts
127.0.0.1 localhost
127.0.1.1 ebenezermaster-virtual-machine
192.168.18.76 master
192.168.18.79 worker1
192.168.18.80 worker2

# The following lines are desirable for IPv6 capable hosts
::1 ip6-localhost ip6-loopback
fe80:: ip6-localhost
ff02:: ip6-mcastprefix
ff02:: ip6-allnodes
ff02:: ip6-allrouters
  
```

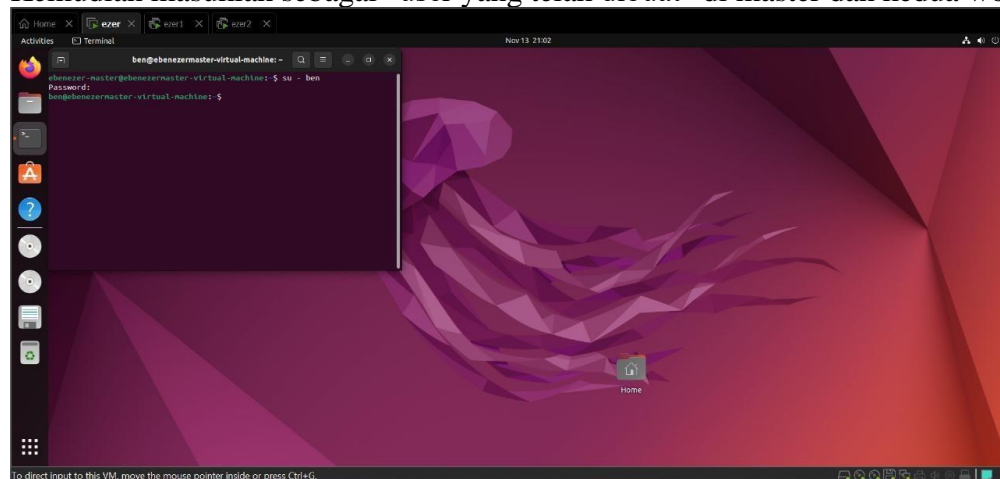
- Buat user baru di master, worker1 dan worker2 dengan nama yang sama



- 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

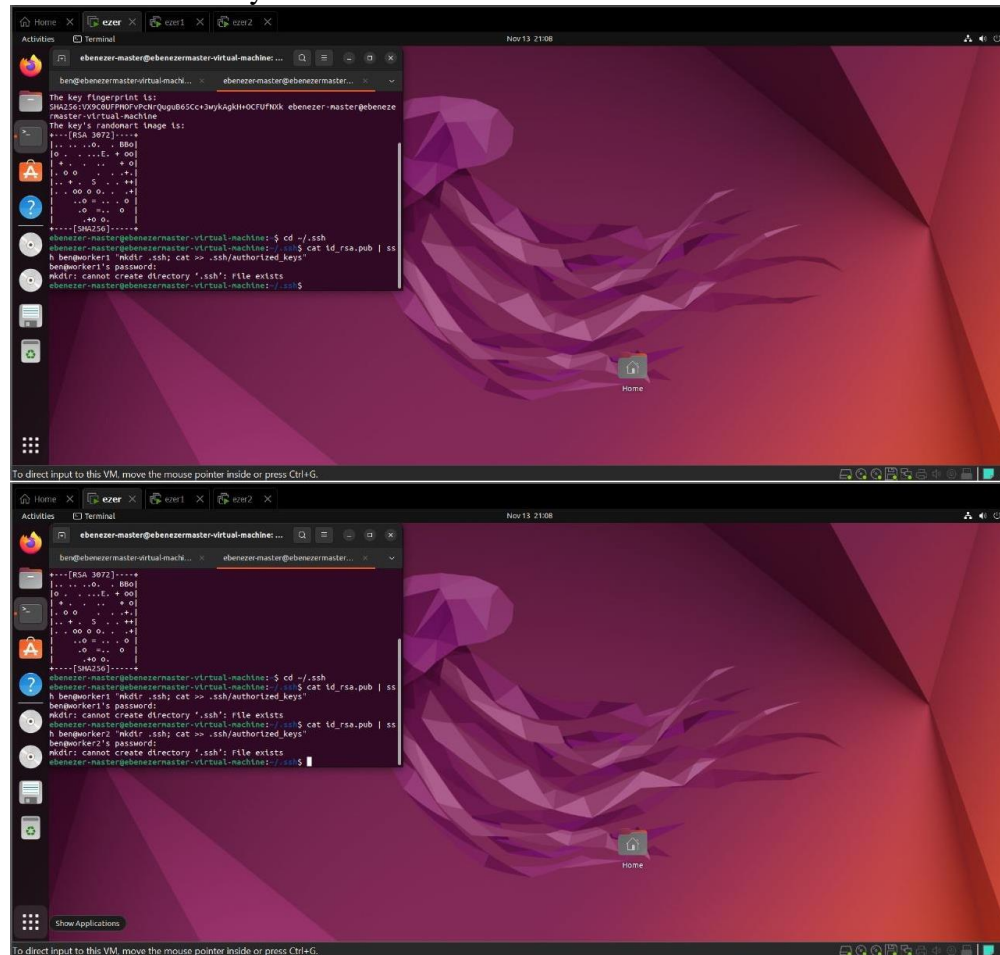


- 
- The screenshot shows a Linux desktop environment. A terminal window is open, displaying the command `sudo apt install openssh-server` and its output. The output indicates that the package list is being read, the dependency tree is being built, and the package `openssh-server` is already the newest version. The desktop background is a red and purple geometric pattern. The terminal window title is `ebenezer-master@ebenezer-master-virtual-machine: ~`. The terminal output is as follows:
- ```
ebenezer-master@ebenezer-master-virtual-machine: ~$ sudo apt install openssh-server
[sudo] password for ebenezer-master:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:8.9p1-3ubuntu0.4).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
ebenezer-master@ebenezer-master-virtual-machine: ~$
```

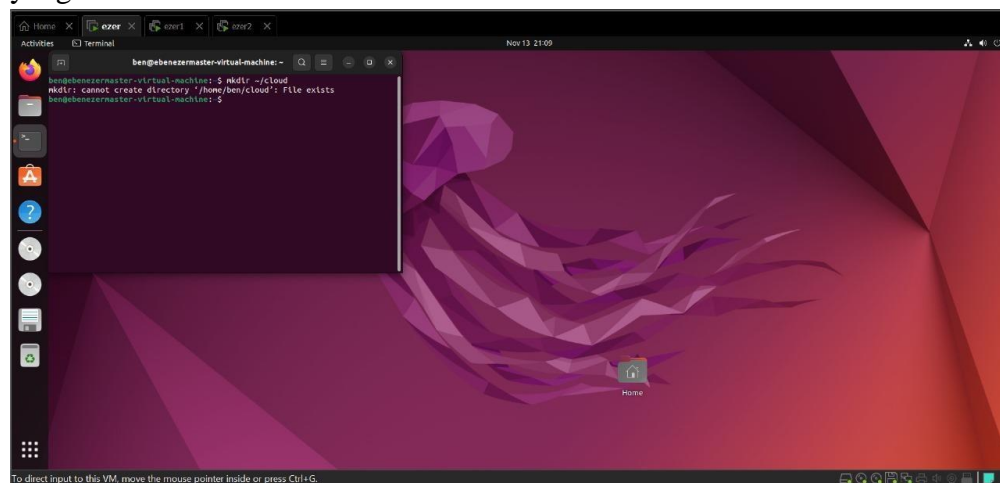
- 
- The screenshot shows a Kali Linux desktop environment. The desktop background is a purple dragon. A terminal window is open, displaying the output of the command `ssh-keygen -t rsa`. The output indicates that a public/private RSA key pair has been generated and saved in `/home/ebenezer-master/.ssh/id_rsa` and `/home/ebenezer-master/.ssh/id_rsa.pub`. The terminal also shows the key fingerprint and a warning about the randomart image. The desktop includes a sidebar with application icons (Firefox, Files, etc.) and a top bar with system information (Nov 13 21:06).

- [illegible]

- Kemudian salin key master ke worker 1 dan worker 2



- Buatlah direktori Bernama cloud di semua virtual machine, lakukan ini di user yang dibuat tadi





- Setelah itu kemudian install lah nfs di master

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

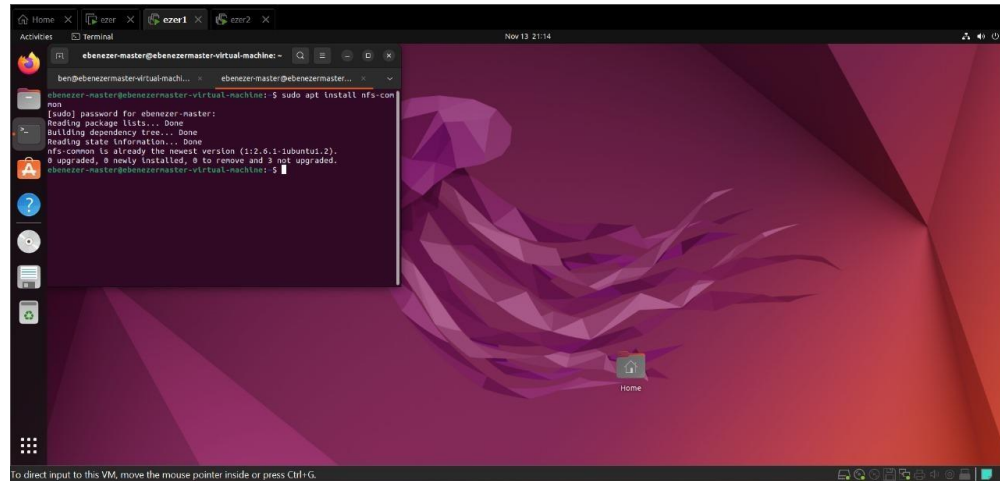
- edit file exports dan tambahkan /home/ben/cloud\*(rw,sync,no\_root\_squash,no\_subtree\_check)

```
ben@ebenezer-master-virtual-machine: ~$ nano /etc/exports
#
# Example for NFSv2 and NFSv3:
# /srv/hosts        hostname1(rw,sync,no_subtree_check) hostname2(rw,sync,
#
# Example for NFSv4:
# /srv/nfs4         gss/krb5(rw,sync,fidw,crossmnt,no_subtree_check)
# /srv/nfs4         gss/krb5(rw,sync,no_subtree_check)
/home/ben/cloud *(rw,sync,no_root_squash,no_subtree_check)
```

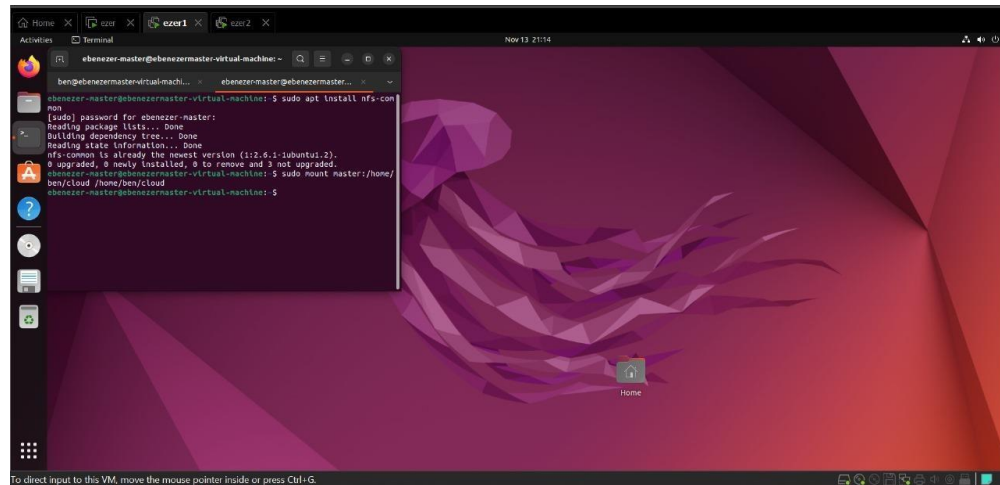
- Kemudian jalankan command seperti dibawah

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

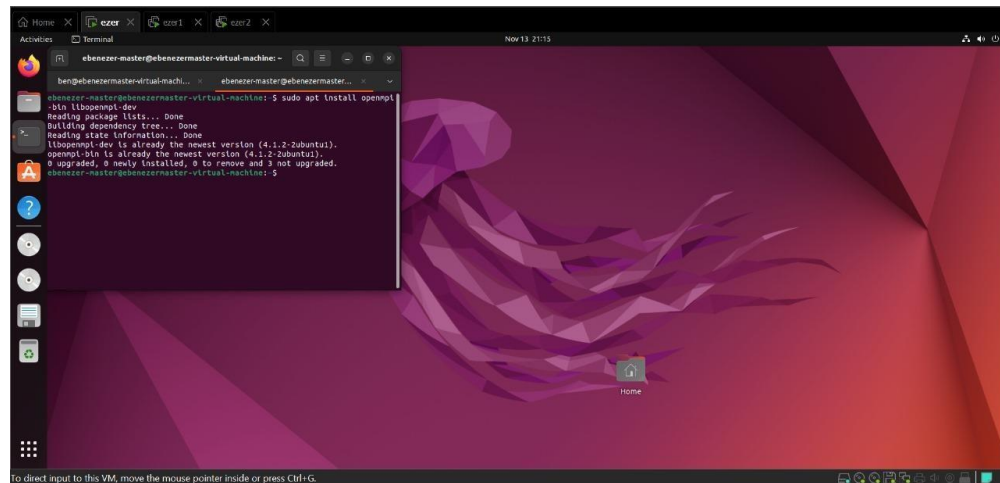
- Kemudian install nfs-common di worker1 dan worker2



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



- Kemudian install lah MPI di semua virtual machine



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

```
ben@benbenmaster-master-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 3 not upgraded.
ben@benbenmaster-master-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 (22.0.2-1ubuntu0.9).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
ben@benbenmaster-master-virtual-machine:~$ pip install mpi4py
Requirement already satisfied: mpi4py in ./local/lib/python3.10/site-packages (3.1.5)
ben@benbenmaster-master-virtual-machine:~$
```

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

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

- Kemudian jalankan program tersebut

```
ben@benbenmaster-master-virtual-machine:~/cloud$ mpirun -np 3 -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 3
Hello world from worker 1 of 3
Hello world from worker 2 of 3
ben@benbenmaster-master-virtual-machine:~/cloud$
```

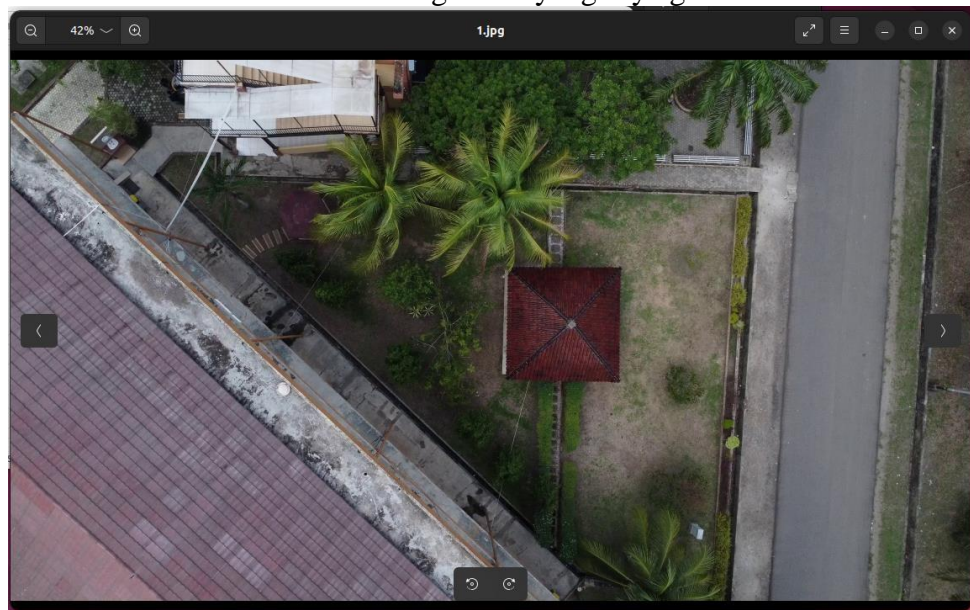


- Setelah berhasil, kemudian lakukanlah program image stitching yang menggunakan data gambar

```
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
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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



- Berikut merupakan hasil stitching-nya

