Pemrosesan Paralel

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Kelompok 1

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JURUSAN SISTEM KOMPUTER
FAKULTAS ILMU KOMPUTER
UNIVERSITAS SRIWIJAYA
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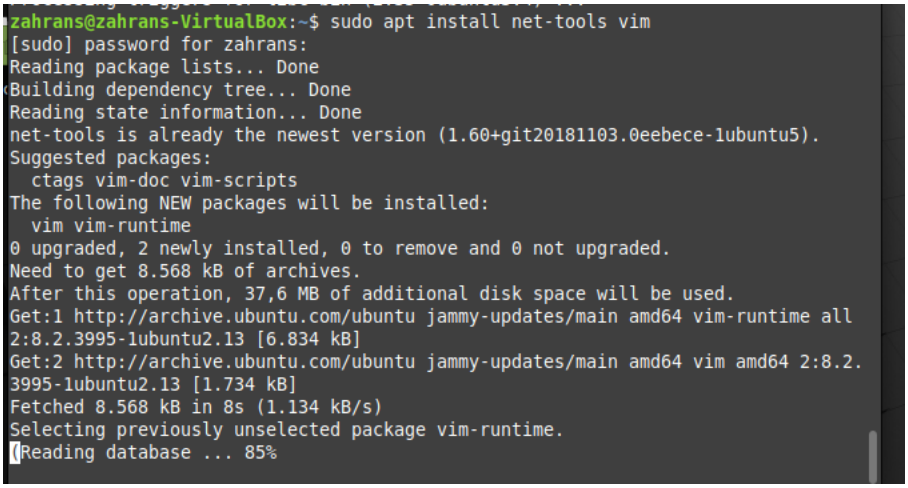
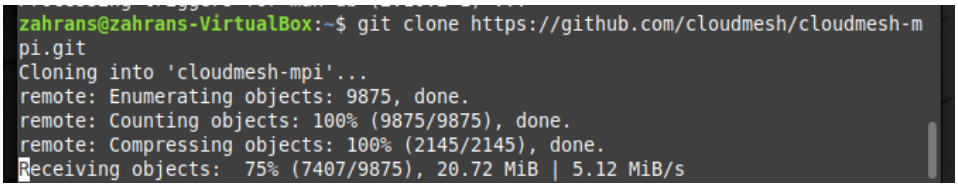
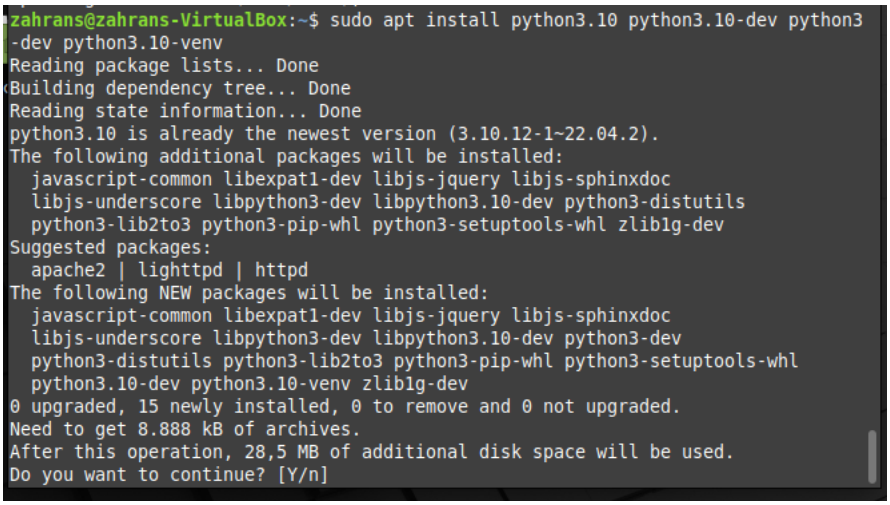
Install net-tools untuk cek IP, vim untuk teks editor.



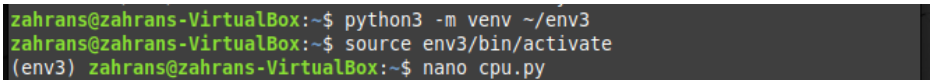
Salin kode cloudmesh-mpi dari github ke linux

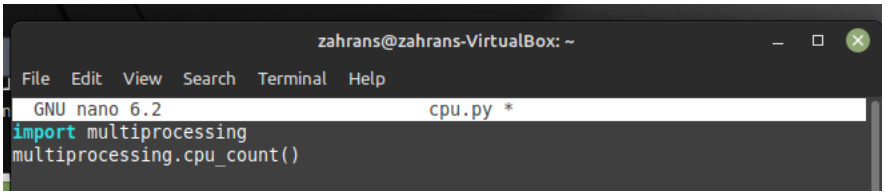


Kemudian install virtual environment pada linux



Lalu membuat virtual environment nya dan menghitung jumlah cpu



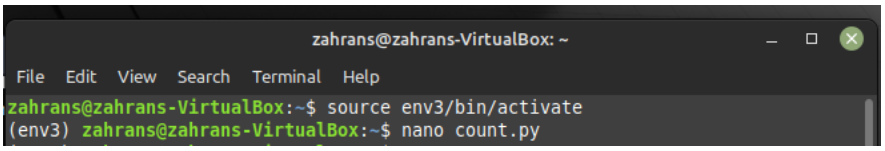



```
zahrans@zahrans-VirtualBox:~$ python3 -m venv ~/env3
zahrans@zahrans-VirtualBox:~$ source env3/bin/activate
(env3) zahrans@zahrans-VirtualBox:~$ nano cpu.py
(env3) zahrans@zahrans-VirtualBox:~$ python -c "import multiprocessing; print(mu
ltiprocessing.cpu_count())"
1
```

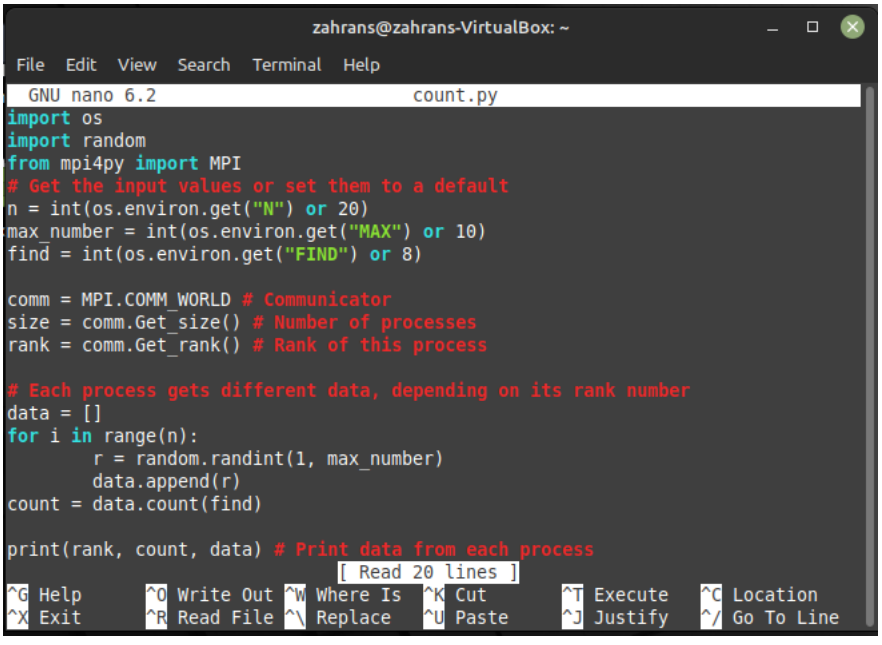
Setelah itu install mpi4py

```
(env3) zahrans@zahrans-VirtualBox:~$ pip install mpi4py -U
Collecting mpi4py
  Using cached mpi4py-3.1.5.tar.gz (2.5 MB)
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Building wheels for collected packages: mpi4py
  Building wheel for mpi4py (pyproject.toml) ... /
```

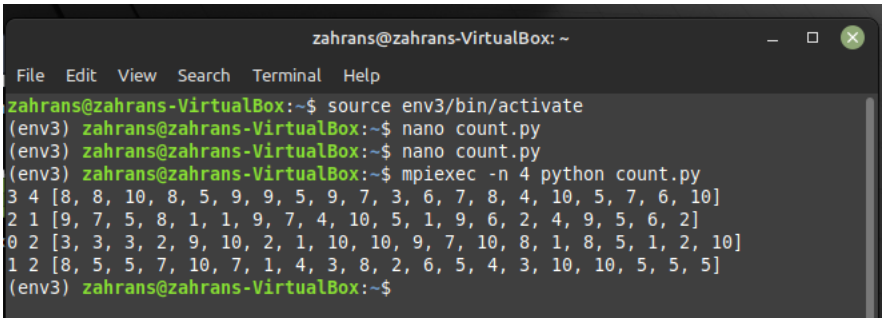
Buat file count.py



Isi dari file count.py

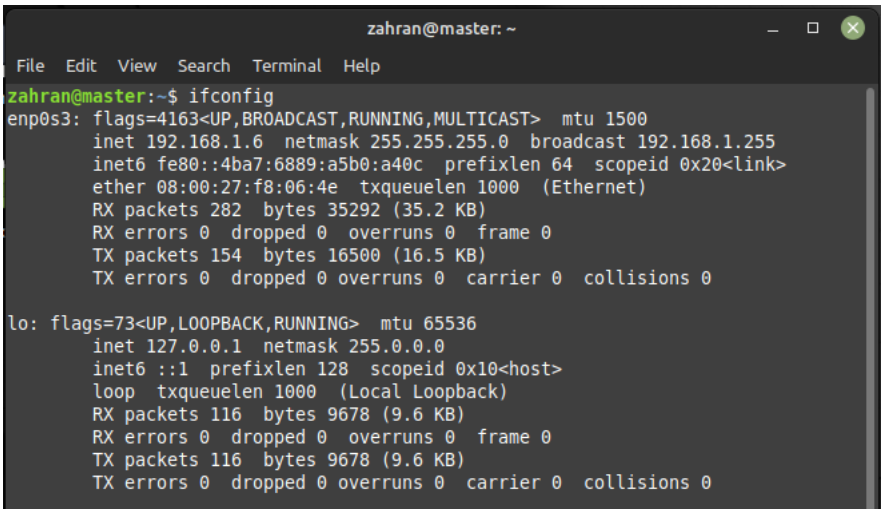


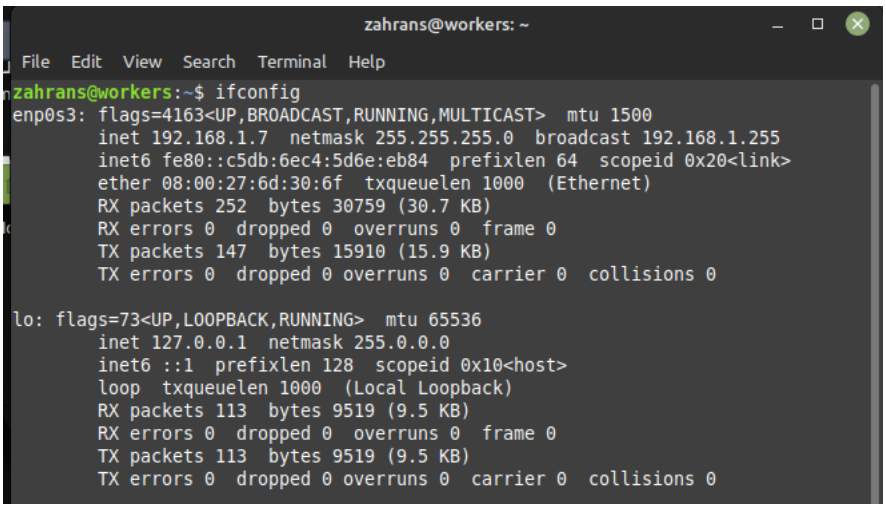
Hasil dari perhitungan



MPI

Cek IP Pada Server dan Client

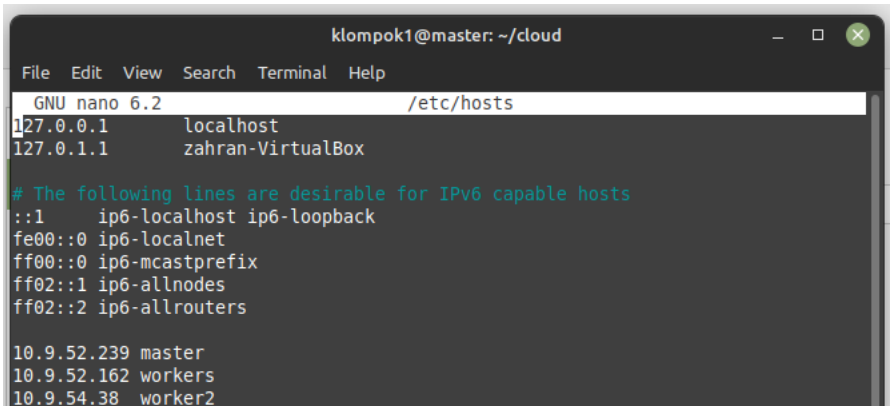




Buka file /etc/hosts

```
zahran@master:~$ sudo nano /etc/hosts
```

tambahkan isinya dengan IP Server dan Client



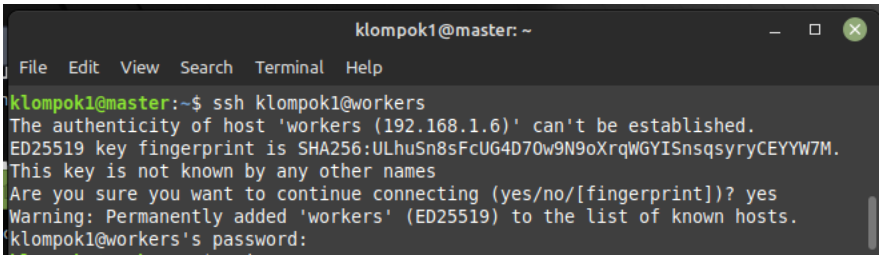
Buat user baru di Server dan Client

```
zahran@master:~$ sudo adduser klompok1
```

Beri akses root dan masuk ke user kemudian install ssh

```
zahran@master:~$ sudo usermod -aG sudo klompok1
```

Hubungkan Server dan Client



Lakukan hal yang sama pada worker

```
klompok1@workers:~$ sudo apt install openssh-server
[sudo] password for klompok1:
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 0 not upgraded.
```

Generate keygen pada server

```
klompok1@master:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/klompok1/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/klompok1/.ssh/id_rsa
Your public key has been saved in /home/klompok1/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:hg4ITUw8Zq0VwYN8Ezb1tqvwsMczqI1QkydU/w75gHw klompok1@master
The key's randomart image is:
+---[RSA 3072]----+
| =o+B=.          |
| oOoBo .         |
|.oo= o. o        |
| o.+ . = .       |
|  * = E S        |
| . + + * .       |
|.   oo. +        |
| . o.==.         |
|  o.o.oo         |
+----[SHA256]-----+
```

Copy key pubic ke client pada server kemudian buat shared folder dan install NFS Server

```
klompok1@master: ~
File  Edit  View  Search  Terminal  Help
klompok1@master:~$ cd .ssh
klompok1@master:~/.ssh$ cat id_rsa.pub | ssh klompok1@master "mkdir .ssh; cat >>
 .ssh/authorized_keys"
klompok1@master's password:
mkdir: cannot create directory ‘.ssh’: File exists
klompok1@master:~/.ssh$ cd
klompok1@master:~$ mkdir cloud
klompok1@master:~$ sudo apt install nfs-kernel-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  nfs-kernel-server
0 upgraded, 1 newly installed, 0 to remove and 43 not upgraded.
Need to get 140 kB of archives.
After this operation, 526 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 nfs-kernel-serve
r amd64 1:2.6.1-1ubuntu1.2 [140 kB]
Fetched 140 kB in 2s (68,1 kB/s)
Selecting previously unselected package nfs-kernel-server.
(Reading database ... 332992 files and directories currently installed.)
Preparing to unpack .../nfs-kernel-server_1%3a2.6.1-1ubuntu1.2_amd64.deb ...
Unpacking nfs-kernel-server (1:2.6.1-1ubuntu1.2) ...
Setting up nfs-kernel-server (1:2.6.1-1ubuntu1.2) ...
```

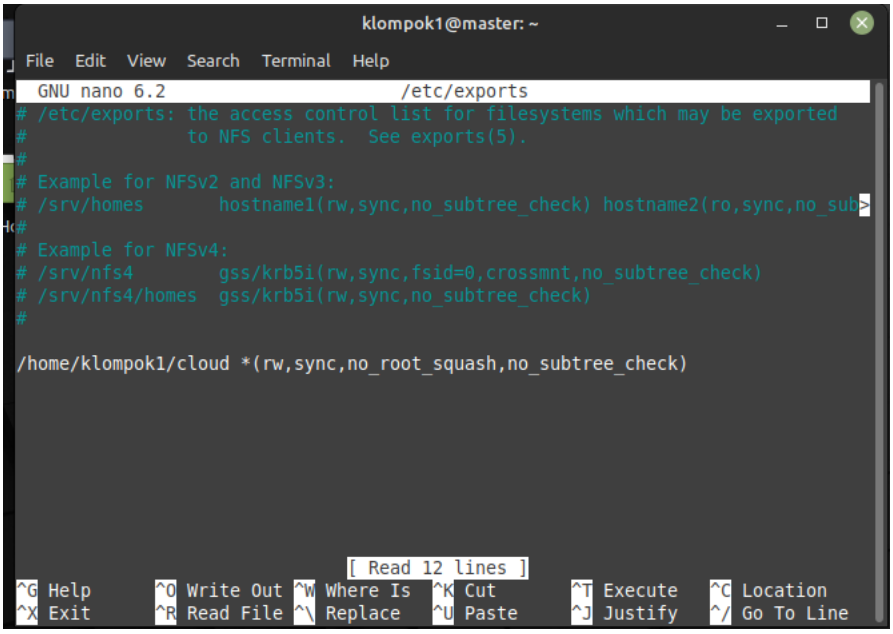
Buat shared folder pada Server dan Client serta lakukan install NFS Server pada Server

```
klompok1@master:~$ mkdir cloud
klompok1@master:~$ sudo apt install nfs-kernel-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  nfs-kernel-server
0 upgraded, 1 newly installed, 0 to remove and 43 not upgraded.
Need to get 140 kB of archives.
After this operation, 526 kB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 nfs-kernel-serve
r amd64 1:2.6.1-1ubuntu1.2 [140 kB]
Fetched 140 kB in 2s (68,1 kB/s)
Selecting previously unselected package nfs-kernel-server.
(Reading database ... 332992 files and directories currently installed.)
Preparing to unpack .../nfs-kernel-server_1%3a2.6.1-1ubuntu1.2_amd64.deb ...
Unpacking nfs-kernel-server (1:2.6.1-1ubuntu1.2) ...
Setting up nfs-kernel-server (1:2.6.1-1ubuntu1.2) ...
```

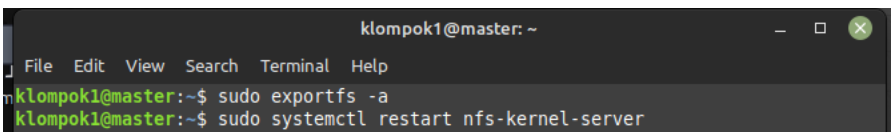
```
klompok1@workers:~$ mkdir cloud
klompok1@workers:~$ sudo apt install nfs-common
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
nfs-common is already the newest version (1:2.6.1-1ubuntu1.2).
0 upgraded, 0 newly installed, 0 to remove and 5 not upgraded.
```

Konfigurasi file /etc/exports pada server

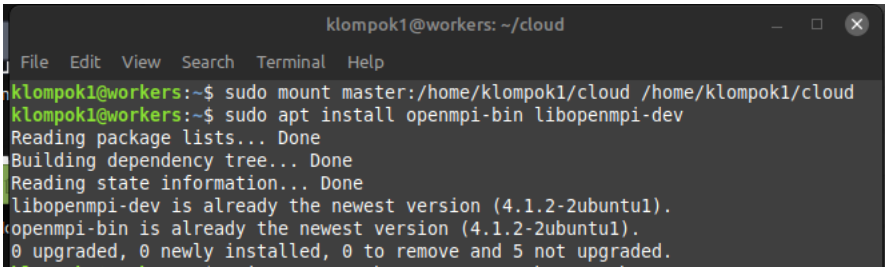
```
klompok1@master:~$ sudo nano /etc/exports
```



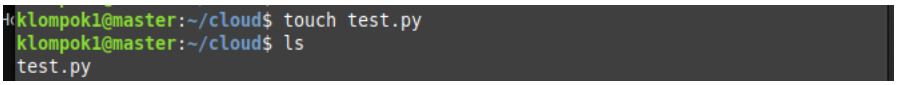
Selanjutnya ketikan perintah berikut



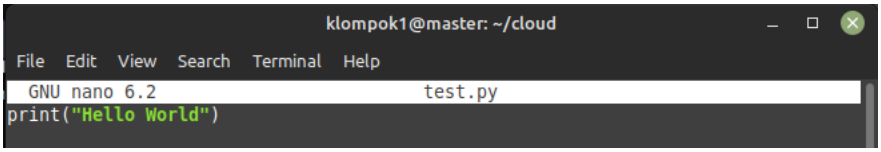
Mounting pada Client lalu install MPI pada Server dan Client



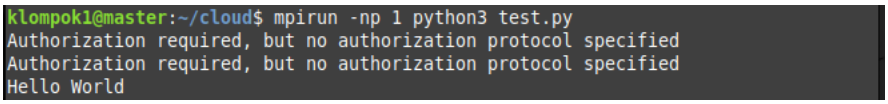
Lakukan testing di server Buat file touch.py



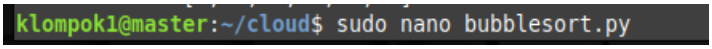
Edit barisnya dengan print(“Hello World”)



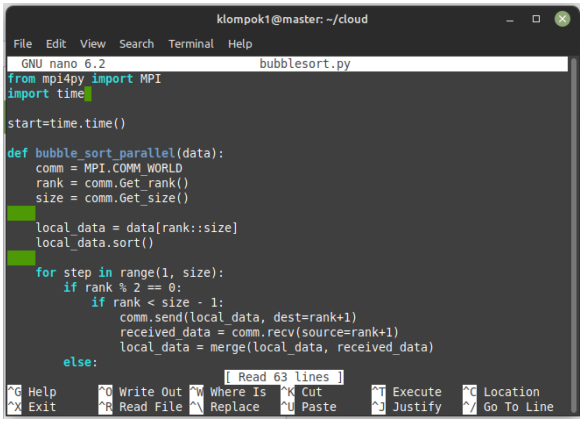
Jalankan file menggunakan MPI

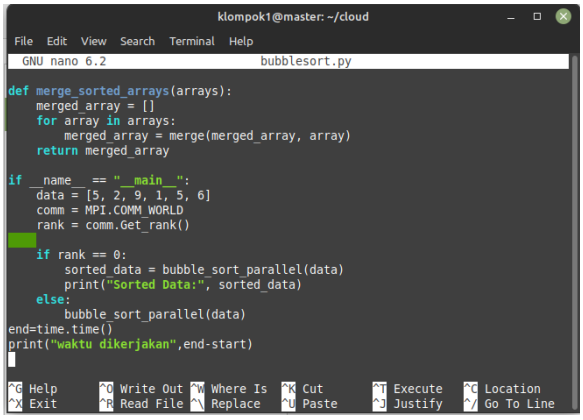


Buat file bubblesort.py



Mengisi file dengan kode berikut





```
 GNU nano 6.2                        bubblesort.py
    sorted_data = comm.gather(local_data, root=0)
    if rank == 0:
        sorted_data = merge_sorted_arrays(sorted_data)
        return sorted_data
    else:
        return None

def merge(arr1, arr2):
    merged_array = []
    i = j = 0
    while i < len(arr1) and j < len(arr2):
        if arr1[i] < arr2[j]:
            merged_array.append(arr1[i])
            i += 1
        else:
            merged_array.append(arr2[j])
            j += 1
    merged_array.extend(arr1[i:])
    merged_array.extend(arr2[j:])
    return merged_array
```

Jalankan file bubblesort.py Menggunakan MPI

```
klompok1@master:~/cloud$ mpirun -np 1 -host master,workers,worker2,worker3 pytho
n3 bubblesort.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
Sorted Data: [1, 2, 5, 5, 6, 9]
waktu dikerjakan 0.0002734661102294922
```

Jalankan file menggunakan python3 untuk melihat perbandingan kecepatan waktu run nya

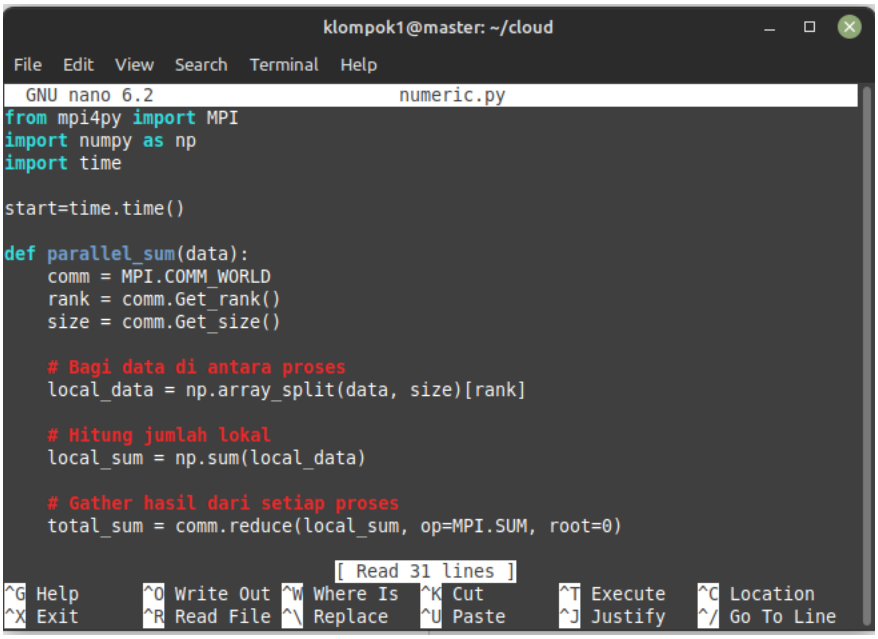
```
klompok1@master:~/cloud$ python3 bubblesort.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Sorted Data: [1, 2, 5, 5, 6, 9]
waktu dikerjakan 0.0001671314239501953
```

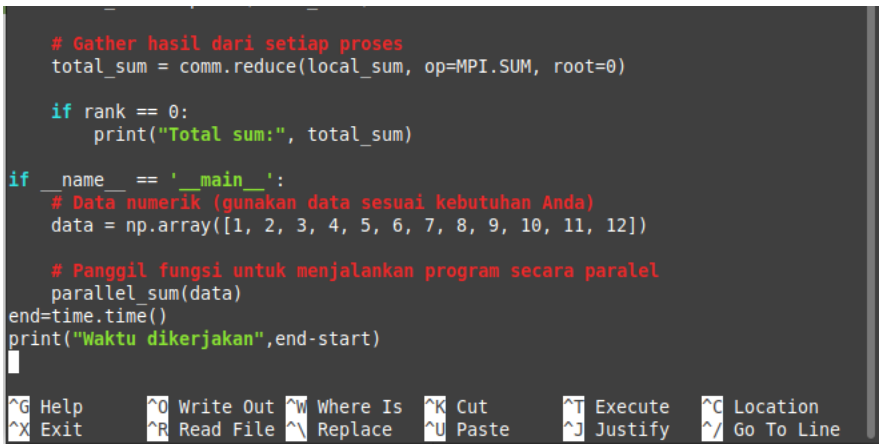
Membuat file numeric.py

```
klompok1@master:~/cloud$ touch numeric.py
```

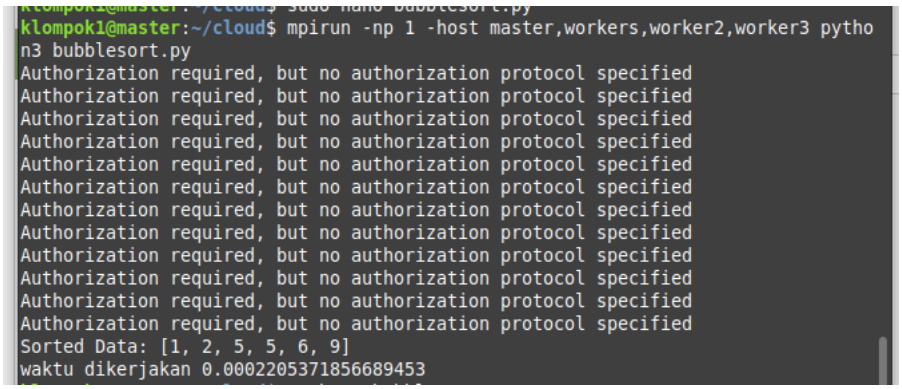
```
klompok1@master:~/cloud$ sudo nano numeric.py
```

Mengisi File dengan kode berikut





Jalankan file numeric.py Menggunakan MPI



Jalankan menggunakan python3 untuk melihat perbandingan waktu kecepatan run nya