**TUGAS PEMROSESAN PARAREL**


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**FAKULTAS ILMU KOMPUTER**

**SISTEM KOMPUTER**

**UNIVERSITAS SRIWIJAYA**

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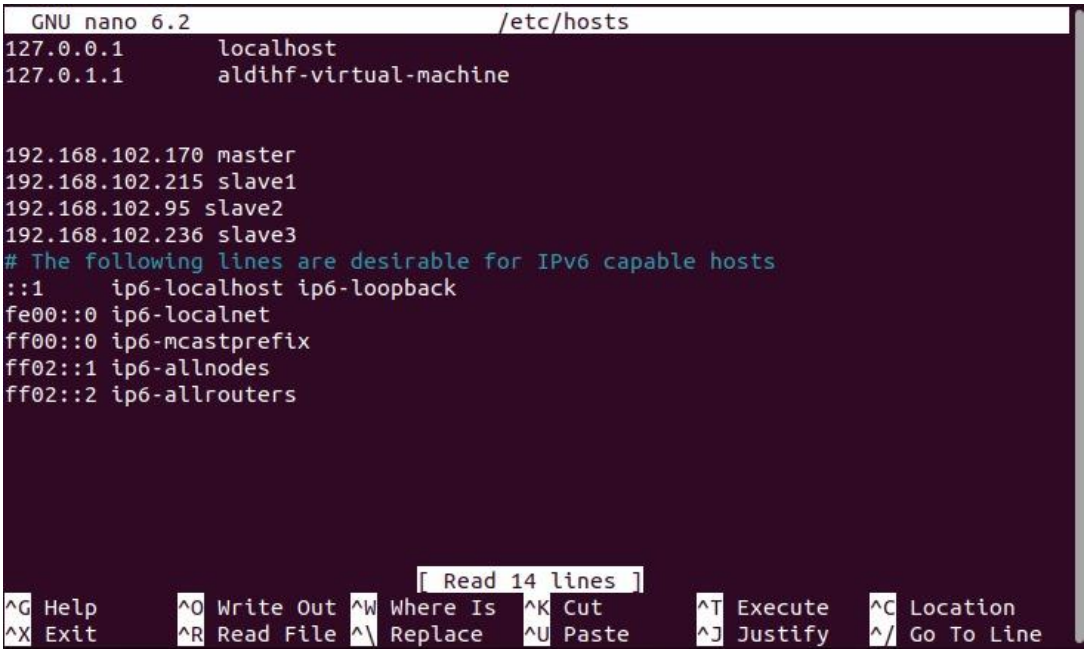
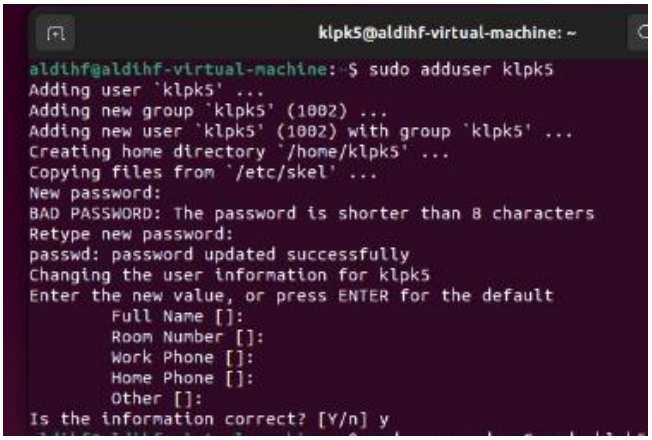
- **Sebelum Pengerjaan**
  1. Memastikan bahwa setiap PC/Laptop dalam satu jaringan yang sama
  2. Menentukan Server dan Slave/worker
  3. Melakukan penginstallan net-tools untuk mengecek IP dan vim untuk teks editor
- **Konfigurasi IP Server dan Slave didalam file /etc/hosts**
  1. Untuk server, buka file /etc/hosts menggunakan perintah sudo nano /etc/hosts
  2. Di dalam file /etc/hosts tambahkan IP master dan Slave/worker,kemudian save file dan keluar dari file dengan ctrl+x

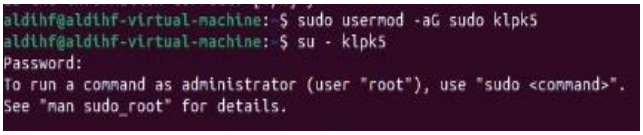



  3. Untuk worker/slave, sama seperti master buka file /etc/hosts kemudian masukkan cukup masukkan IP dari master dan worker pemegang file

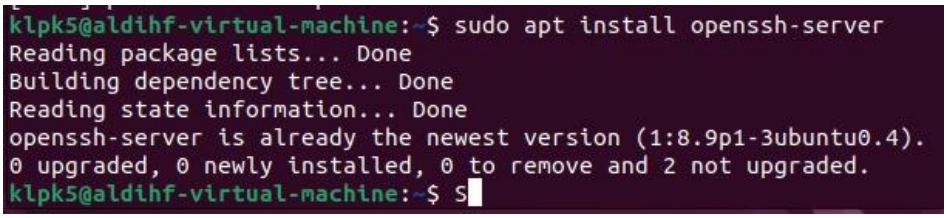
- **Membuat user baru**
  1. Untuk Server dan Worker/slave,Nama user harus sama.Untuk menambahkan User dapat digunakkan perintah sudo adduser (nama user baru)



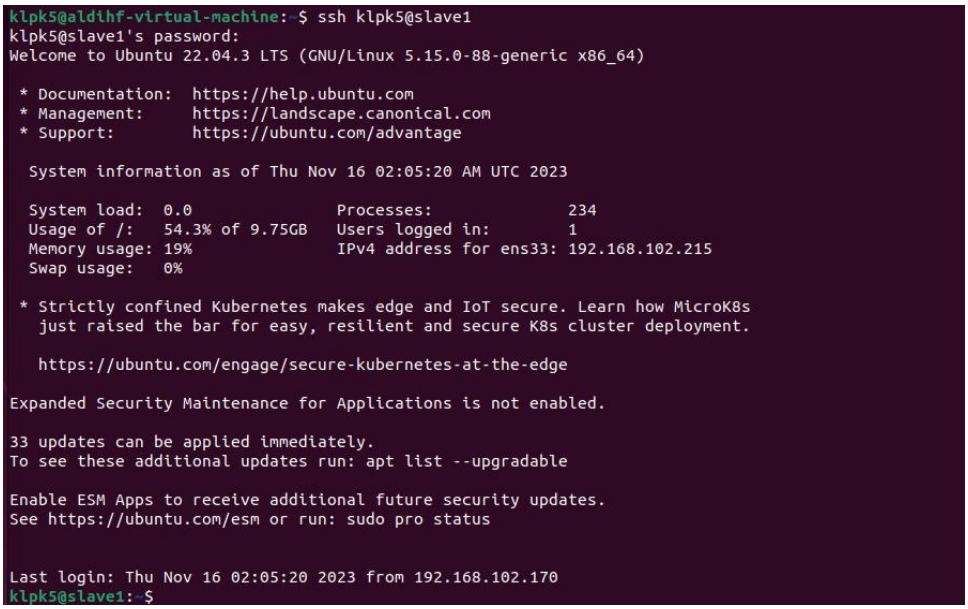

  2. Kemudian berikan akses root kepada user yang telah dibuat dengan perintah sudo usermod -aG sudo (nama user baru)
  3. Terakhir kita masuk sebagai user baru yang telah dibuat dengan perintah su – (nama user baru)




- **Konfigurasi SSH**
  1. Pertama lakukan penginstalan ssh diserver dan slave dengan perintah sudo apt install openssh-server




Kemudian lakukan pengecekan ssh dengan perintah ssh (nama user)@(host)



2. Setelahnya lakukan generate keygen diserver dengan perintah ssh-keygen -t rsa

```
klpk5@aldihf-virtual-machine:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/klpk5/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/klpk5/.ssh/id_rsa
Your public key has been saved in /home/klpk5/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:fvu9eGkjC1G2krP0HPQLmO2t4+VnCcu4bmVv1JQ4V0c klpk5@aldihf-virtual-machine
The key's randomart image is:
+---[RSA 3072]----+
|               .E|
|                o|
|             + . +|
|           O = o.|
|        S O = +..|
|       . . O B o.|
|        . + O O..|
|         . =oO=+o|
|          +=B*== |
+----[SHA256]-----+
klpk5@aldihf-virtual-machine:~$
```

3. Kemudian lakukan copy key publik ke client dengan perintah cd .ssh
   cat id_rsa.pub | ssh <nama user>@<host> "mkdir .ssh; cat >> .ssh/authorized_keys".lakukan berkali-kali sesuai dengan jumlah dan host dari setiap slave.

```
klpk5@aldihf-virtual-machine:~$ cd .ssh
klpk5@aldihf-virtual-machine:~/.ssh$ cat id_rsa.pub | ssh klpk5@slave1 "mkdir .ssh; cat >> .ssh/authorized_keys"
klpk5@slave1's password:
mkdir: cannot create directory '.ssh': File exists
klpk5@aldihf-virtual-machine:~/.ssh$
```

- **Pengkonfigurasian NFS**

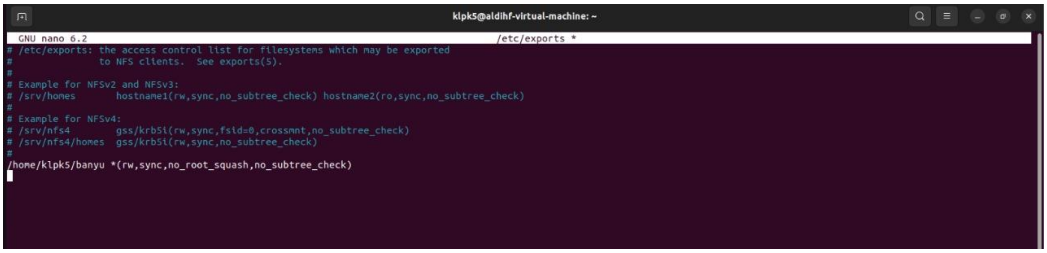
1. Di dalam server dan slave buat sebuah folder dengan nama bebas,gunakan perintah mkdir.Folder setiap pc harus memiliki nama yang sama (nama folder yang ingin dibuat)

```
klpk5@aldihf-virtual-machine:~$ mkdir banyu
klpk5@aldihf-virtual-machine:~$
```

2. Lakukan penginstalan NFS server perintahnnya ialah sudo apt install nfs-kernel-server

```
klpk5@aldihf-virtual-machine:~$ sudo apt install nfs-kernel-server
[sudo] password for klpk5:
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 2 not upgraded.
klpk5@aldihf-virtual-machine:~$
```

3. Lakukan konfigurasi file /etc/exports server, dengan perintah sudo vim /etc/exports
   Kemudian masukkan kalimat berikut:
   <lokasi shared folder> *(rw,sync,no_root_squash,no_subtree_check)
   Sesuaikan lokasi shared folder dengan folder yang telah dibuat sebelumnya.




Kemudian masukkan perintah sudo exportfs -a dan sudo systemctl restart nfs-kernel-server

```
klpk5@aldihf-virtual-machine:~$ sudo nano /etc/exports
klpk5@aldihf-virtual-machine:~$ sudo exportfs -a
klpk5@aldihf-virtual-machine:~$ sudo systemctl restart nfs-kernel-server
klpk5@aldihf-virtual-machine:~$
```

4. Kemudian install nfs pada client dengan perintah sudo apt install nfs-common

```
klpk5@slave1:~$ sudo apt install nfs-common
[sudo] password for klpk5:
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 33 not upgraded.
klpk5@slave1:~$
```

5. Kemudian Mounting dengan perintah sudo mount <server host>:<lokasi shared folder di server> <lokasi shared folder di client> pada slave

```
klpk5@slave1:~$ sudo mount master:/home/klpk5/banyu /home/klpk5/banyu
klpk5@slave1:~$
```

- **MPI**

  Install MPI dengan perintah sudo apt install openmpi-bin libopenmpi-dev pada server dan slave

```
klpk5@aldihf-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 2 not upgraded.
klpk5@aldihf-virtual-machine:~$
```

- **Menjalankan program bubblesort dan numerik**

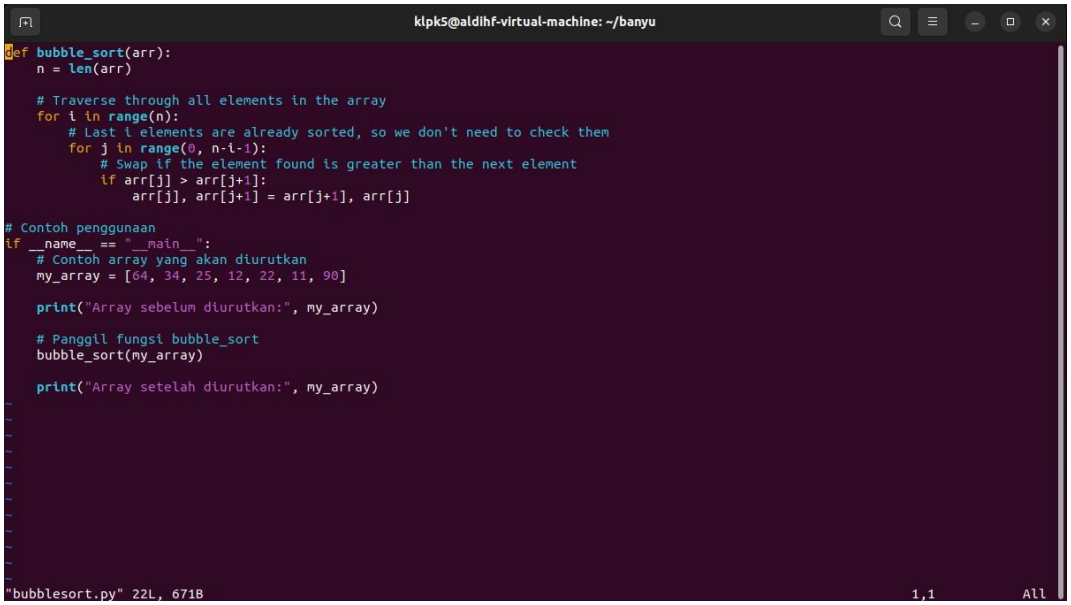
1. Lakukan penginstallan python dan mpi4py dengan perintah sudo apt install python3-pip dan pip install mpi4py

```
klpk5@aldihf-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+dfsg-1ubuntu0.3).
0 upgraded, 0 newly installed, 0 to remove and 2 not upgraded.
klpk5@aldihf-virtual-machine:~$
```

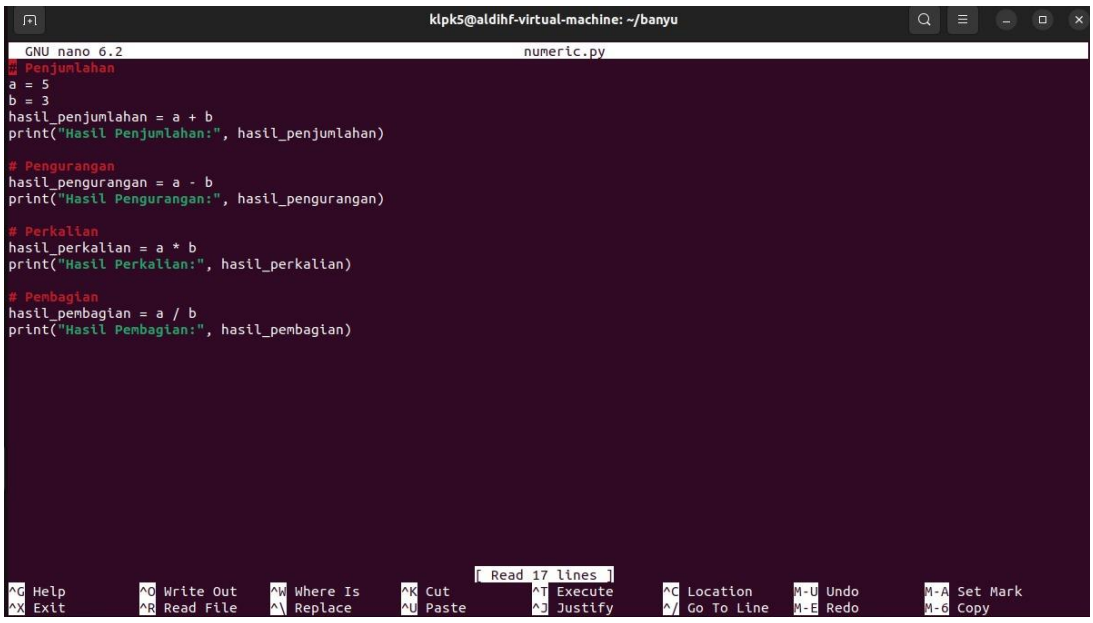
2. Pertama buat 2 buah file python yang pertama bernama bubblesort.py untuk file bubblesort dan yang kedua bernama numeric.py untuk file numeric

3. Kemudian masuk kemasing-masing file dan didalam file tersebut masukkan program sesuai dengan jenis nama file.

Program bubblesort

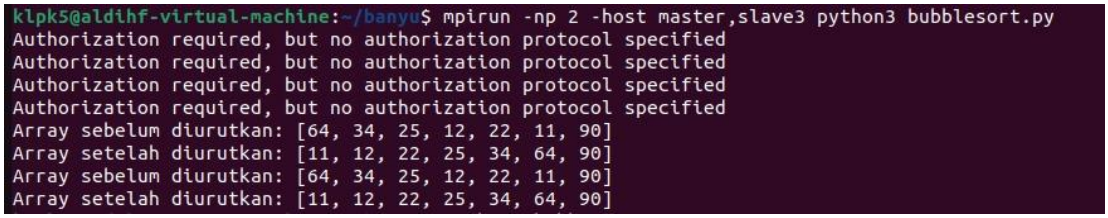



Program numeric



4. Jalankan file menggunakan MPI dengan perintah mpirun -np <jumlah prosesor> -host <daftar host> python3 test.py.

Hasil program bubblesort




Hasil program numeric