

**PEMEROSAN PARALEL**  
**TUGAS 6 PEMROSESAN PARALEL**



Dibuat Oleh :

Nama : Fitri Alfatiya

NIM : 09011182126026

Kelas : SK 5B .INDRALAYA

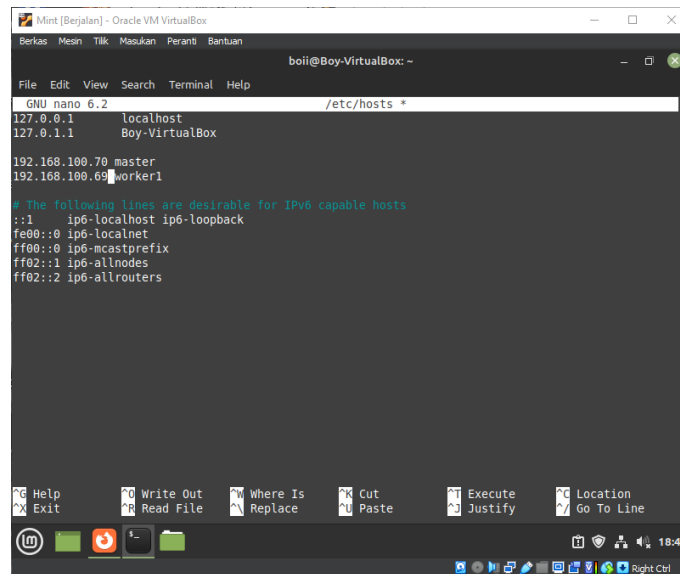
Dosen pengampuh : Ahmad Heryanto. S.Kom., MT

Adi Hermansyah, M.T

**FAKULTAS ILMU KOMPUTER**  
**PROGRAM STUDI SISTEM KOMPUTER**  
**UNIVERSITAS SRIWIJAYA**  
**PALEMBANG**

**2023**

## A. Konfigurasi File '/etc/hosts' Server dan Client

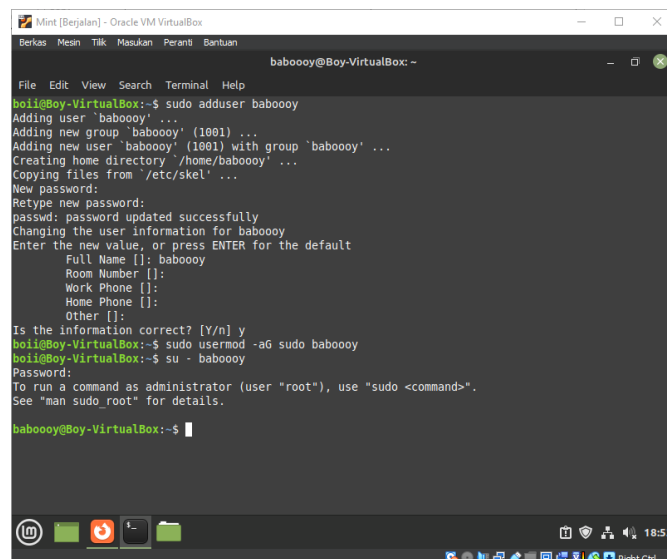


```
GNU nano 6.2 /etc/hosts *
127.0.0.1    localhost
127.0.1.1    Boy-VirtualBox
192.168.100.70 master
192.168.100.69 worker1

# The following lines are desirable for IPv6 capable hosts
::1          ip6-localhost ip6-loopback
fe00::0      ip6-localnet
ff00::0      ip6-mcastprefix
ff02::1      ip6-allnodes
ff02::2      ip6-allrouters
```

Gambar pertama menunjukkan konfigurasi file /etc/hosts pada server dan client. File ini digunakan untuk menetapkan hubungan antara alamat IP dan nama host. Pada konfigurasi ini, kami memastikan bahwa server dan client saling mengenal dengan benar melalui nama host dan alamat IP yang sesuai.

## B. Membuat User Baru "baboooy" dan memberikannya akses ke grub Sudo



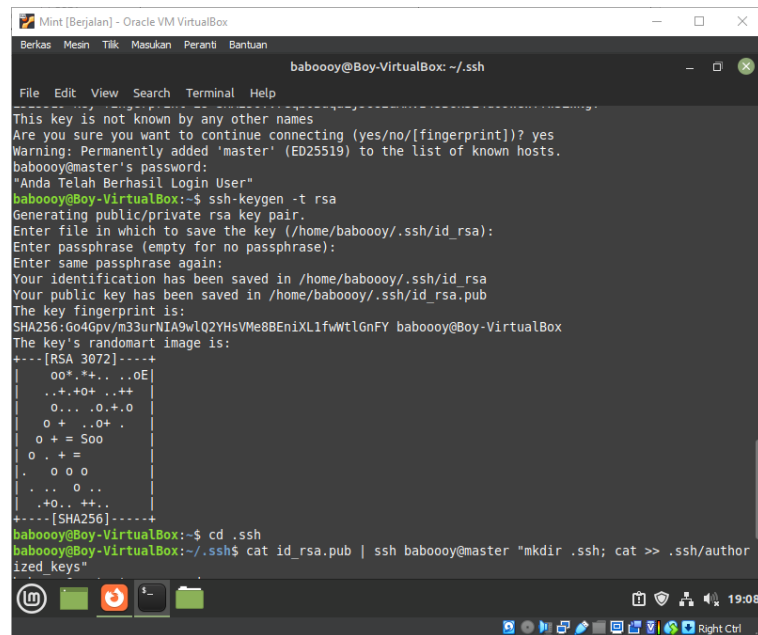
```
baboooy@Boy-VirtualBox: ~
baboooy@Boy-VirtualBox:~$ sudo adduser baboooy
Adding user 'baboooy' ...
Adding new group 'baboooy' (1001) ...
Adding new user 'baboooy' (1001) with group 'baboooy' ...
Creating home directory '/home/baboooy' ...
Copying files from '/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for baboooy
Enter the new value, or press ENTER for the default
Full Name []: baboooy
Room Number []:
Work Phone []:
Home Phone []:
Other []:
Is the information correct? [Y/n] y
baboooy@Boy-VirtualBox:~$ sudo usermod -aG sudo baboooy
baboooy@Boy-VirtualBox:~$ su - baboooy
Password:
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

baboooy@Boy-VirtualBox:~$
```

Pada gambar kedua, langkah-langkah pembuatan pengguna baru dengan nama "baboooy" dan penambahan ke grup "sudo" ditunjukkan. Perintah sudo usermod -aG

sudo babooy digunakan untuk menambahkan pengguna "babooy" ke grup "sudo", memberikan akses administratif.

### C. Konfigurasi SSH



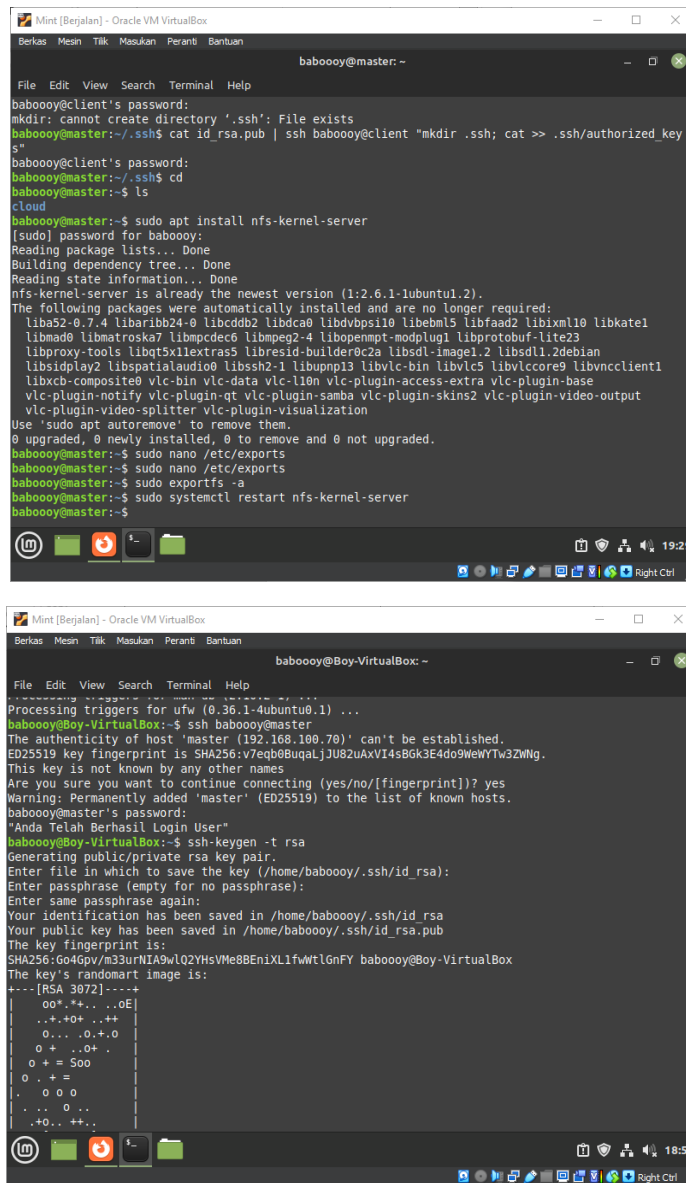
```
Mint [Berjalan] - Oracle VM VirtualBox
Berkas  Mesin  Tindakan  Masukan  Peranti  Bantuan

baboooy@Boy-VirtualBox: ~/.ssh

This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'master' (ED25519) to the list of known hosts.
baboooy@master's password:
"anda Telah Berhasil Login User"
baboooy@Boy-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/baboooy/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/baboooy/.ssh/id_rsa
Your public key has been saved in /home/baboooy/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:Go4Gpv/m33urNIA9wLQ2YHsVMe88EniXl1fwWtLgnFY baboooy@Boy-VirtualBox
The key's randomart image is:
+---[RSA 3072]-----+
|  oo*.+... ..oE|
| ..+.o+ ..++|
| ... ..o+.o|
| o + ..o+ .|
| o + = 5oo .|
| o . + =|
| . o o o|
| .. o ..|
| ..+o.. ++..|
+---[SHA256]-----+
baboooy@Boy-VirtualBox:~$ cd .ssh
baboooy@Boy-VirtualBox:~/.ssh$ cat id_rsa.pub | ssh baboooy@master "mkdir .ssh; cat >> .ssh/authorized_keys"
```

Gambar ketiga menunjukkan konfigurasi Secure Shell (SSH). Langkah-langkah ini mencakup pembuatan kunci SSH, konfigurasi file `sshd_config`, dan pertukaran kunci antara server dan client. Ini diperlukan agar server dan client dapat berkomunikasi secara aman melalui protokol SSH.

## D. Instalasi dan Konfigurasi NFS



```
Mint [Berjalan] - Oracle VM VirtualBox
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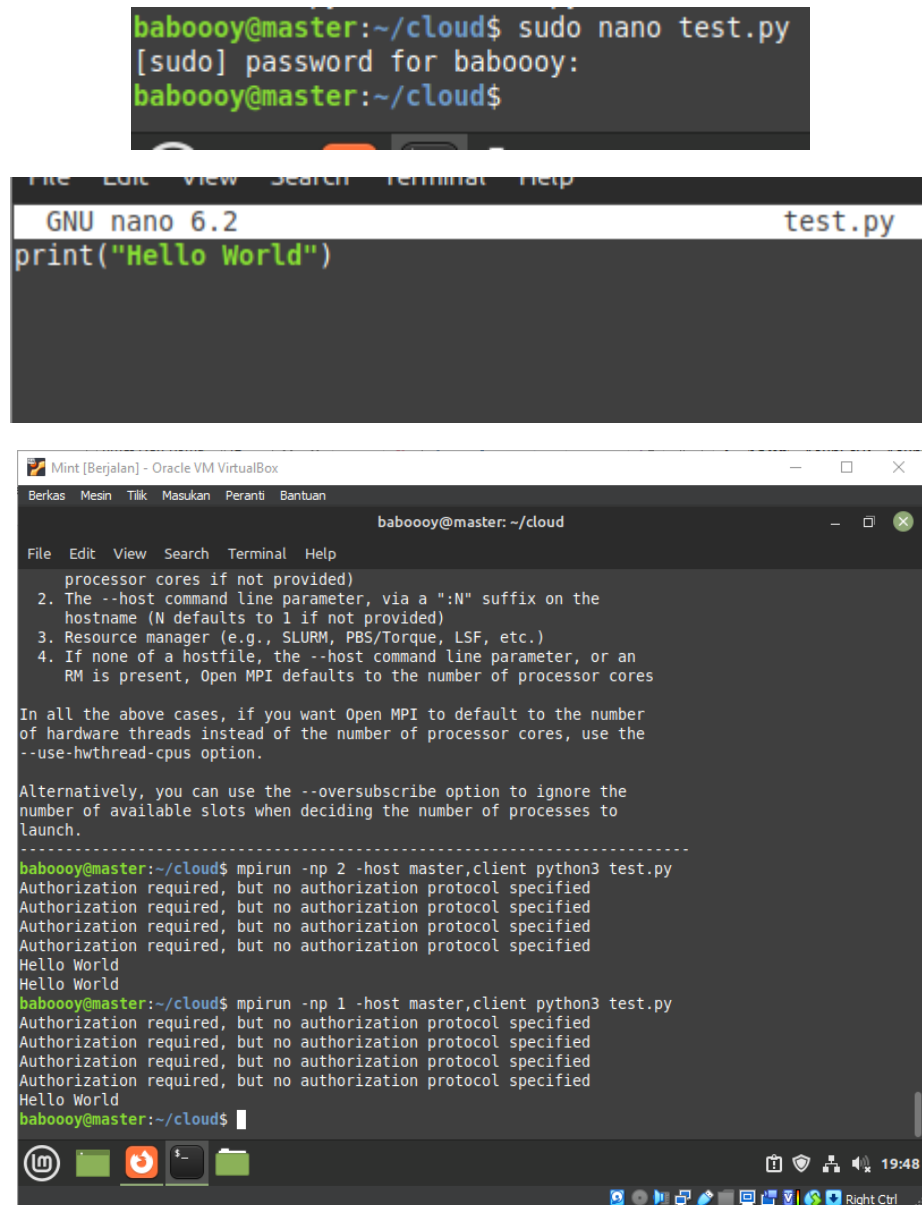
baboooy@master: ~
File Edit View Search Terminal Help
baboooy@client's password:
mkdir: cannot create directory '.ssh': File exists
baboooy@master: ~/.ssh$ cat id_rsa.pub | ssh baboooy@client "mkdir .ssh; cat >> .ssh/authorized_key
s"
baboooy@client's password:
baboooy@master: ~/.ssh$ cd
baboooy@master:~$ ls
cloud
baboooy@master:~$ sudo apt install nfs-kernel-server
[sudo] password for baboooy:
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).
The following packages were automatically installed and are no longer required:
liba52-0.7.4 libaribb24-0 libcdcb2 libdca0 libdvbpsi0 libebml5 libfaad2 libxml10 libkate1
libmad0 libmatroska7 libmpdec6 libmpeg2-4 libopenmpt-modplug1 libprotobuf-lite23
libproxy-tools libqt5xmltrass5 libresid-builder8c2a libSDL-image1.2 libSDL1.2debian
libsidplay2 libspatialaudio0 libssh2-1 libsupnp3 libvlc-bin libvlccore9 libvncclient1
libxcb-composite0 vlc-bin vlc-data vlc-l10n vlc-plugin-access-extra vlc-plugin-base
vlc-plugin-composite vlc-plugin-qt vlc-plugin-samba vlc-plugin-skins2 vlc-plugin-video-output
vlc-plugin-video-splitter vlc-plugin-visualization
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
baboooy@master:~$ sudo nano /etc/exports
baboooy@master:~$ sudo nano /etc/exports
baboooy@master:~$ sudo exportfs -a
baboooy@master:~$ sudo systemctl restart nfs-kernel-server
baboooy@master:~$

Mint [Berjalan] - Oracle VM VirtualBox
Berkas  Mesin  Titik  Masukan  Peranti  Bantuan

baboooy@Boy-VirtualBox: ~
File Edit View Search Terminal Help
Processing triggers for ufw (0.36.1-4ubuntu0.1) ...
baboooy@Boy-VirtualBox:~$ ssh baboooy@master
The authenticity of host 'master (192.168.100.70)' can't be established.
ED25519 key fingerprint is SHA256:v7eqb0BuqLJU82uAXV14sBgk3E4d09WeWY1w3ZwNg.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'master' (ED25519) to the list of known hosts.
baboooy@master's password:
"anda Telah Berhasil Login User"
baboooy@Boy-VirtualBox:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/baboooy/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/baboooy/.ssh/id_rsa
Your public key has been saved in /home/baboooy/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:6o4G9pVn33urnIA9wLQ2YHsVMe8BEniXL1fWtLgNFY baboooy@Boy-VirtualBox
The key's randomart image is:
+--[RSA 3072]-----+
|  oo*.*+...oE |
| ..+..+O+ ..++ |
| O... ..O+.O |
| O + ..O+ . |
| O + = SoO |
| O . + = |
| . O O O |
| .. O .. |
| ..+O.. ++.. |
+-----+
18:58
```

Pada gambar ini, proses instalasi dan konfigurasi Network File System (NFS) diperlihatkan. NFS memungkinkan berbagi sistem file antara server dan client. Instalasi paket NFS, konfigurasi file `/etc/exports`, dan restart layanan NFS.

## E. Pengujian pada File Python (Py)



```
baboooy@master:~/cloud$ sudo nano test.py
[sudo] password for baboooy:
baboooy@master:~/cloud$
```

```
GNU nano 6.2 test.py
print("Hello World")
```

```
Mint [Berjalan] - Oracle VM VirtualBox
Berkas Mesin Tilik Masukan Peranti Bantuan
baboooy@master: ~/cloud
File Edit View Search Terminal Help
processor cores if not provided)
2. The --host command line parameter, via a ":N" suffix on the
hostname (N defaults to 1 if not provided)
3. Resource manager (e.g., SLURM, PBS/Torque, LSF, etc.)
4. If none of a hostfile, the --host command line parameter, or an
RM is present, Open MPI defaults to the number of processor cores
In all the above cases, if you want Open MPI to default to the number
of hardware threads instead of the number of processor cores, use the
--use-hwthread-cpus option.
Alternatively, you can use the --oversubscribe option to ignore the
number of available slots when deciding the number of processes to
launch.
-----
baboooy@master:~/cloud$ mpirun -np 2 -host master,client 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
Hello World
Hello World
baboooy@master:~/cloud$ mpirun -np 1 -host master,client 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
Hello World
baboooy@master:~/cloud$
```

Gambar ini menampilkan tahap pengujian pada file Python (Py). Pada langkah ini, pastikan bahwa server dan client dapat saling terhubung dan berkomunikasi dengan benar melalui jaringan yang telah dikonfigurasi sebelumnya. Uji coba ini memastikan bahwa setiap langkah konfigurasi sebelumnya berhasil dilakukan.

## F. Mengkomputasi Kode Bubblesort dan Numerik

```
babooyo@client:~/cloud$ python3 bubbleshort.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
waktu dikerjakan 0.0002276897430419922
Sorted Data: [1, 2, 5, 5, 6, 9]
babooyo@client:~/cloud$ mpirun -np 1 python3 bubbleshort.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
waktu dikerjakan 0.00020074844360351562
Sorted Data: [1, 2, 5, 5, 6, 9]
babooyo@client:~/cloud$
```

```
babooyo@master:~/cloud$ mpirun -np 1 python3 numerik.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Total hasil perhitungan: 55
waktu dikerjakan 0.0005698204040527344
babooyo@master:~/cloud$ python3 numerik.py
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Authorization required, but no authorization protocol specified
Total hasil perhitungan: 55
waktu dikerjakan 0.0005998611450195312
babooyo@master:~/cloud$
```

Terakhir, gambar ini menunjukkan proses komputasi menggunakan kode Bubblesort dan operasi numerik. Pada tahap ini, kami memastikan bahwa lingkungan pemrosesan paralel dengan MPI telah diatur dengan baik, dan hasil komputasi sesuai dengan ekspektasi.