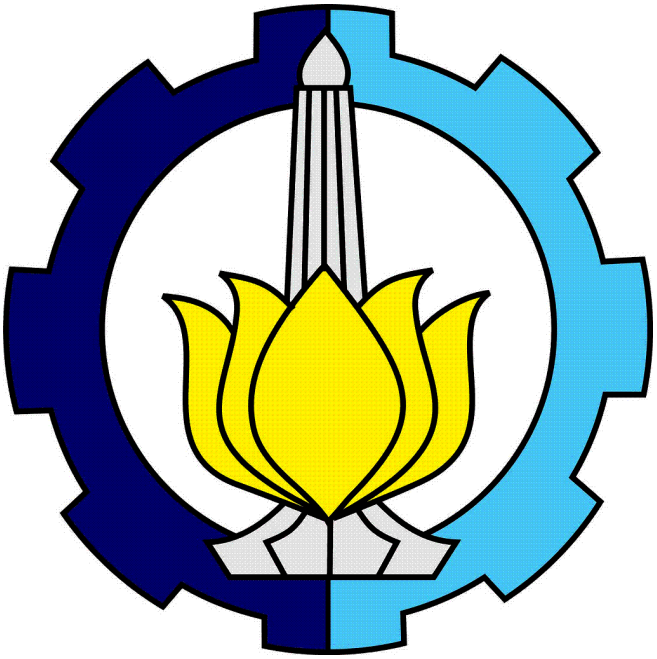
Laporan Final Project Raspberry Parallel

Mata Kuliah Komputasi Klaster



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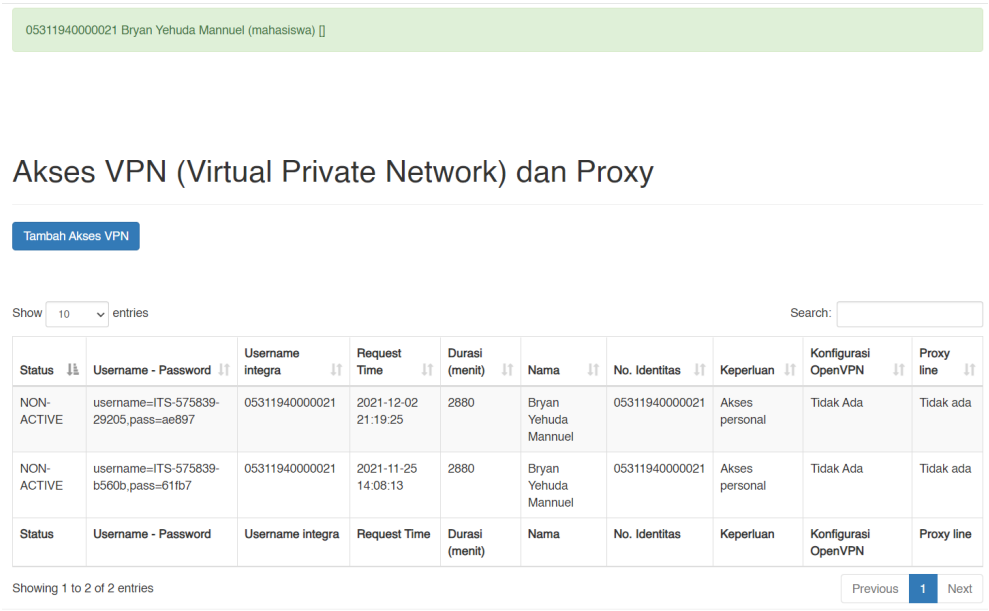
INSTITUT TEKNOLOGI SEPULUH NOPEMBER

2021

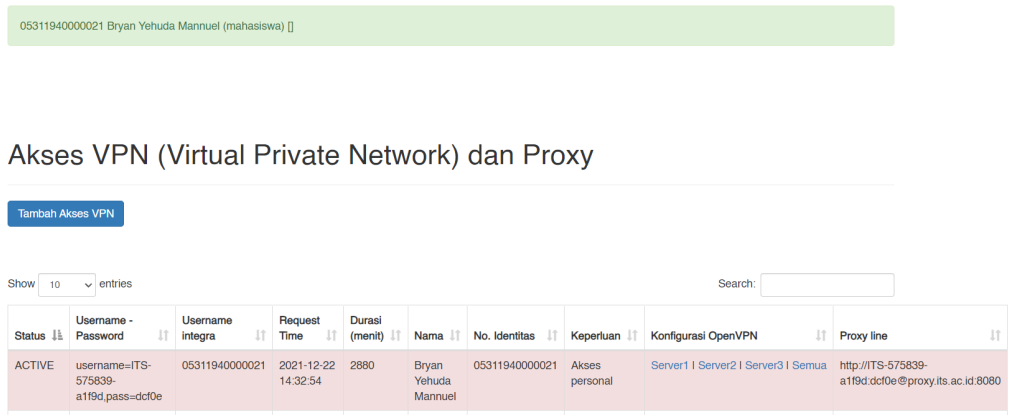
A. Proses Koneksi VPN

Berikut adalah langkah-langkah yang harus dilakukan untuk menghubungkan komputer dengan VPN :

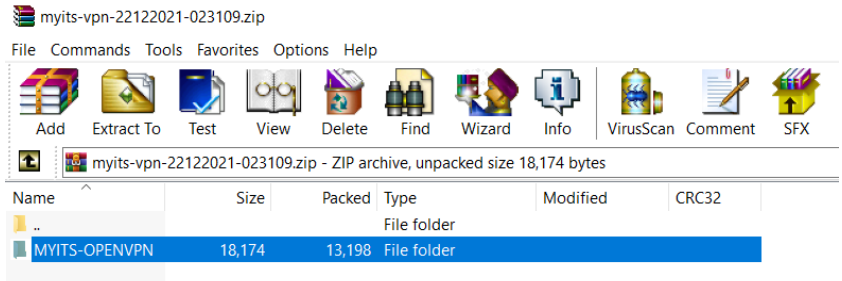
1. Masuk ke menu One Time Password di my.its.ac.id.



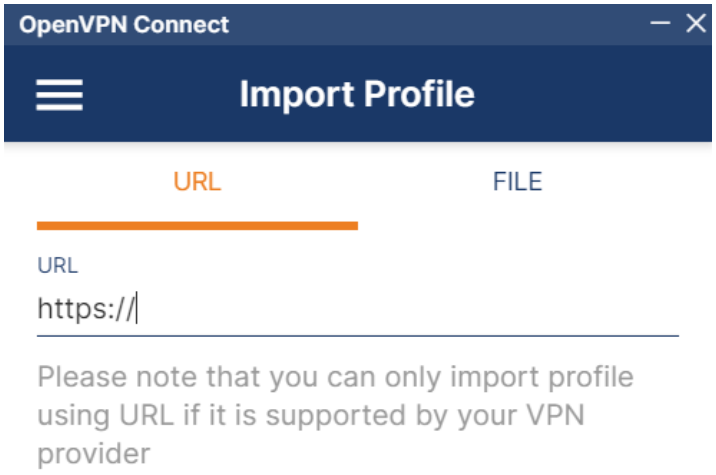
2. Setelah itu buat request yang sesuai dengan kebutuhan



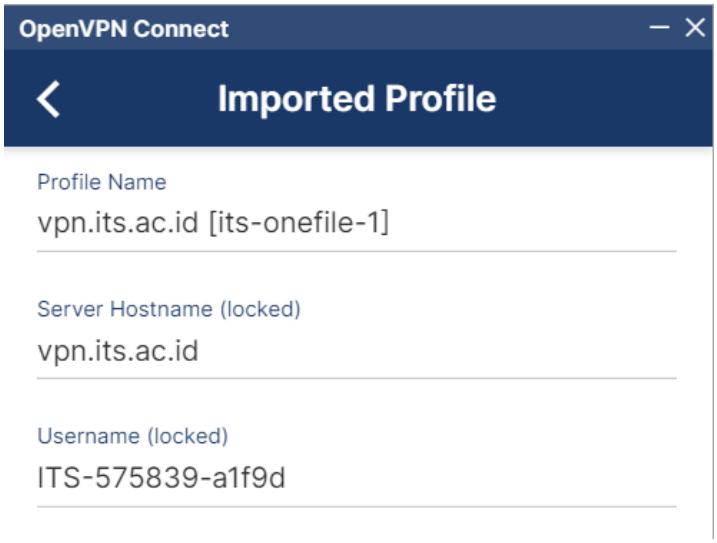
3. Setelah itu akan didapatkan sebuah file .zip yang berisi konfigurasi OpenVPN.



4. Download dan lakukan instalasi OpenVPN



5. Masukkan File .ovpn yang kita dapatkan dari mendownload zip dari MyITS One Time Password ke dalam OpenVPN

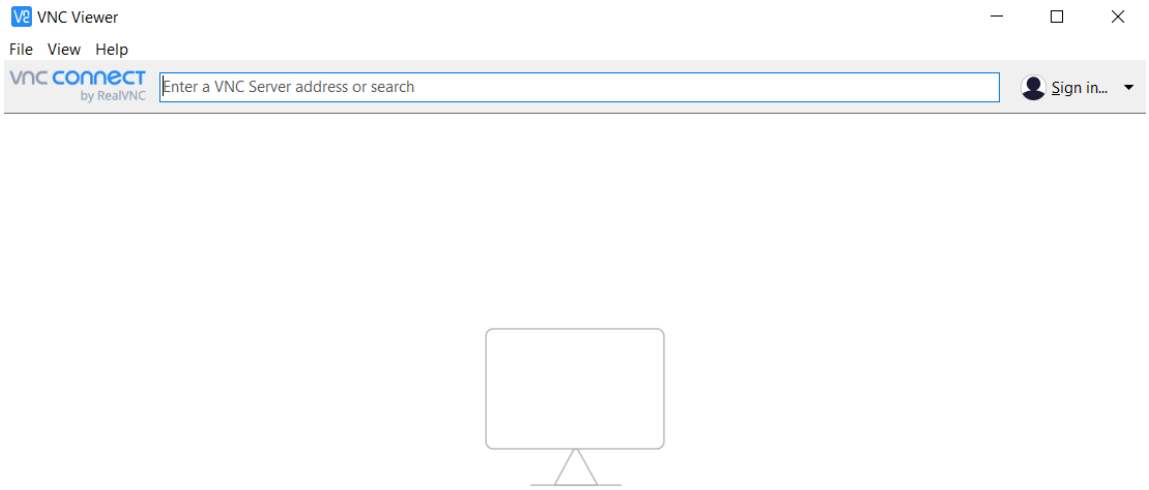


6. Lakukan koneksi pada VPN hingga terhubung pada jaringan ITS

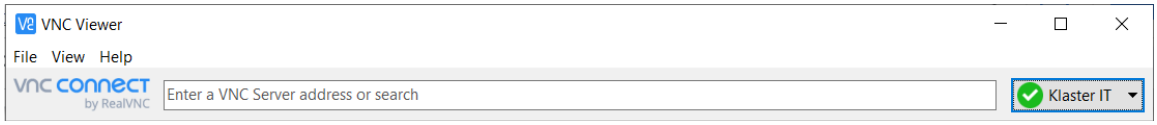
B. Proses Koneksi Melalui VNC

Berikut adalah cara untuk melakukan koneksi ke VNC :

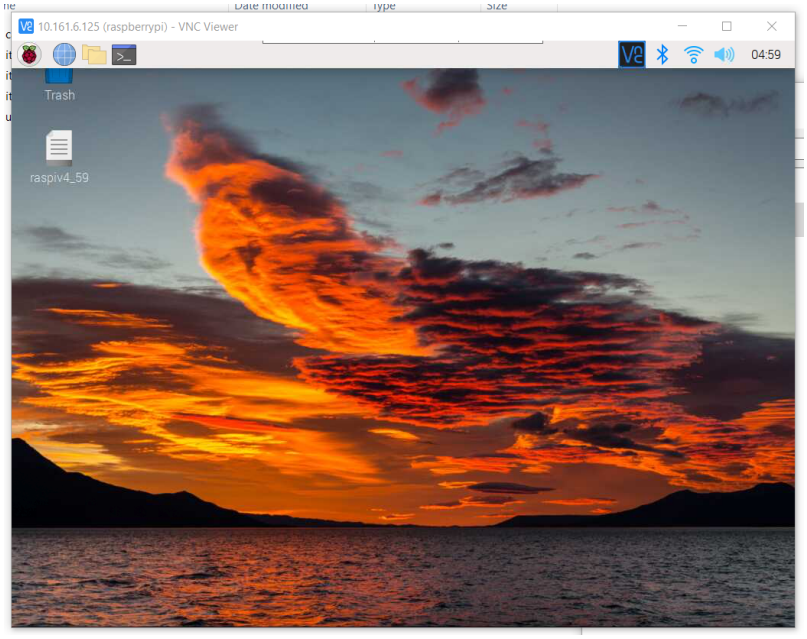
1. Download dan lakukan instalasi VNC Viewer



2. Melakukan login ke email klasterdti@gmail.com dengan password klasterdti1959. Jika login berhasil maka akan muncul tampilan sebagai berikut :



3. Setelah itu kita hubungkan sesuai IP (10.161.6.125) yang diberikan. Dan kemudian akan didapatkan tampilan dari raspberry sesuai dengan IP yang diberikan.



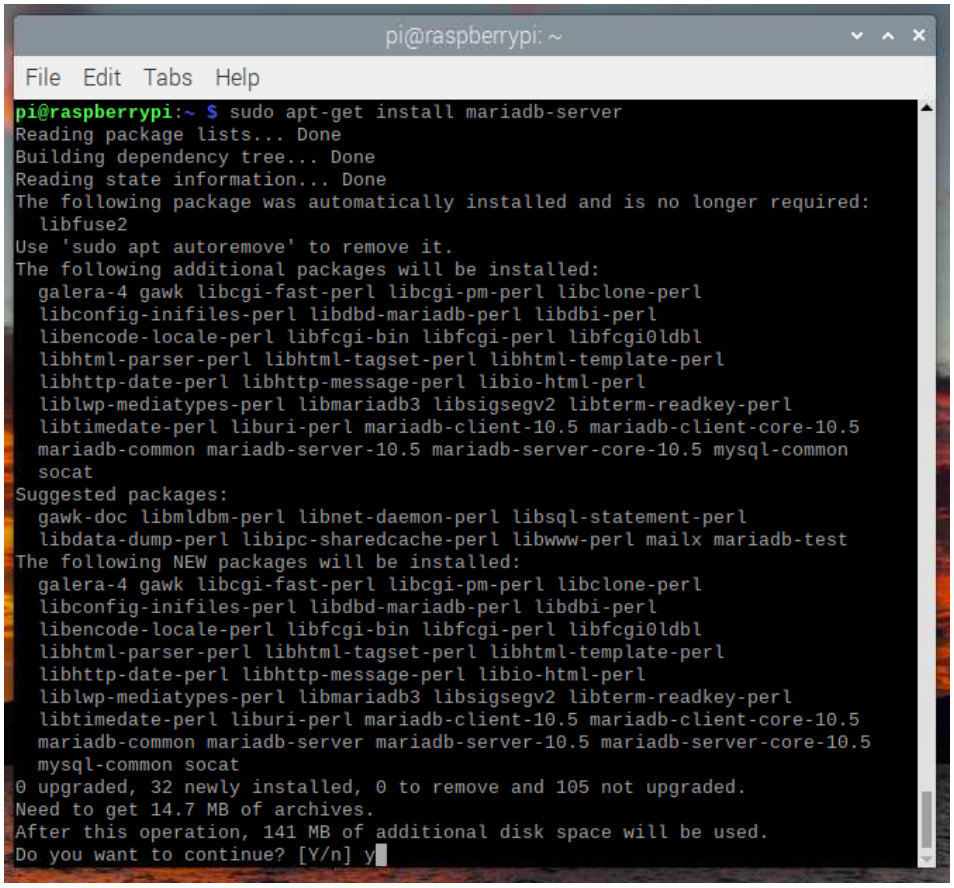
C. Proses Install Mariadb

Berikut adalah command yang digunakan untuk melakukan instalasi Mariadb :

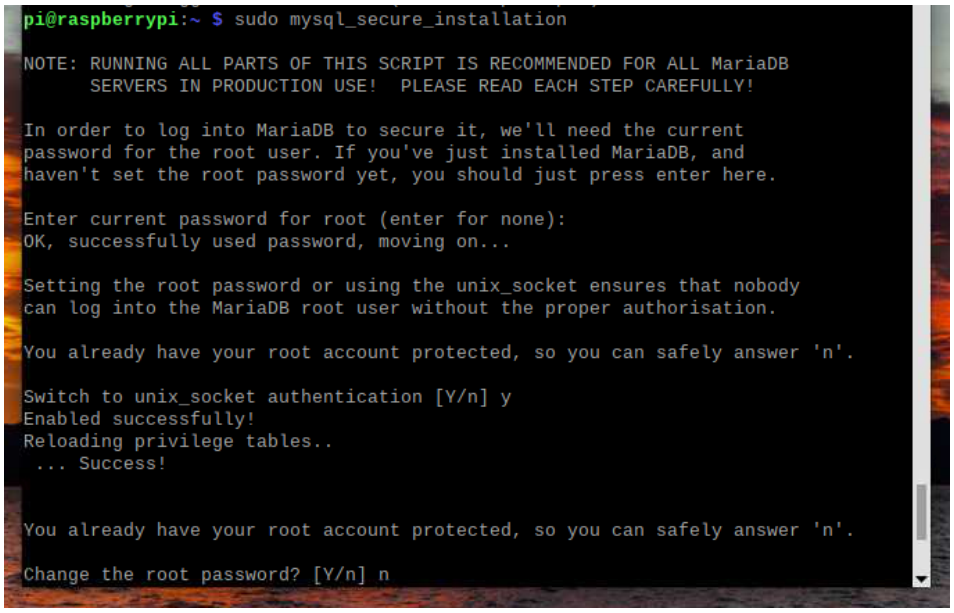
1. sudo apt-get update → untuk melakukan update terhadap package di raspberry

```
pi@raspberrypi:~ $ sudo apt-get update
Get:1 http://archive.raspberrypi.org/debian bullseye InRelease [23.5 kB]
Get:2 http://raspbian.raspberrypi.org/raspbian bullseye InRelease [15.0 kB]
Reading package lists... Done
E: Release file for http://archive.raspberrypi.org/debian/dists/bullseye/InRelea
se is not valid yet (invalid for another 9h 0min 14s). Updates for this reposito
ry will not be applied.
E: Release file for http://raspbian.raspberrypi.org/raspbian/dists/bullseye/InRe
lease is not valid yet (invalid for another 6h 17min 17s). Updates for this repo
sitory will not be applied.
```

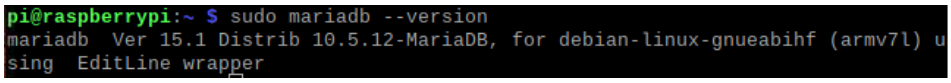
2. sudo apt-get install mariadb-server → untuk menginstall mariadb server



3. sudo mysql_secure_installation → untuk melakukan konfigurasi pada instalasi mysql

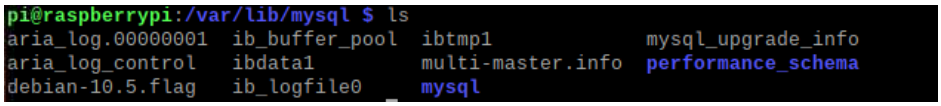


4. sudo mariadb --version → untuk melihat versi dari mariadb sekaligus untuk memastikan apakah mariadb sudah terinstall pada raspberry

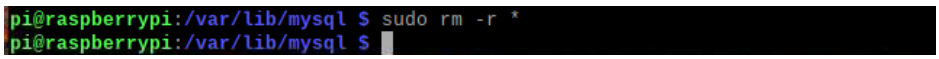


5. cd /var/lib/mysql → untuk berpindah ke folder mysql

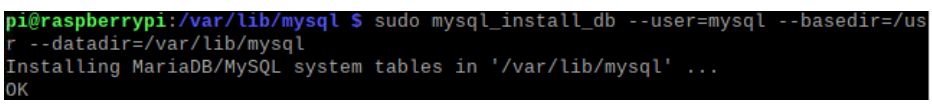
6. ls → untuk melakukan listing file apa saja yang ada dalam folder tersebut



7. sudo rm -r * → menghapus semua isi dari folder tersebut



8. sudo mysql_install_db --user=mysql --basedir=/usr --datadir=/var/lib/mysql → melakukan instalasi db mysql



9. systemctl restart mysqld → melakukan restart mysqld

```
pi@raspberrypi:/var/lib/mysql $ systemctl restart mysqlid
```

10. systemctl restart mysql.service → melakukan restart mysql.service

```
pi@raspberrypi:/var/lib/mysql $ systemctl restart mysql.service
```

11. systemctl restart mariadb → melakukan restart mariadb

```
pi@raspberrypi:/var/lib/mysql $ systemctl restart mariadb
```

12. sudo mysql -uroot → masuk ke mysql sebagai root

```
pi@raspberrypi:/var/lib/mysql $ sudo mysql -uroot
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 31
Server version: 10.5.12-MariaDB-0+deb11u1 Raspbian 11

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]>
```

D. Proses Install Python

Pada raspberry yang diberikan, ternyata Python telah terinstall, sehingga hanya perlu untuk menjalankan dua command sebagai berikut untuk melakukan pemeriksaan versi :

1. sudo python --version → memeriksa versi python

```
pi@raspberrypi:/var/lib/mysql $ sudo python --version
Python 3.9.2
```

2. sudo pip --version → memeriksa versi pip

```
pi@raspberrypi:/var/lib/mysql $ sudo pip --version
pip 20.3.4 from /usr/lib/python3/dist-packages/pip (python 3.9)
```

E. Library Tambahan untuk Menjalankan Python

Ditambahkan 4 library dengan perintah :

1. Install bounded-pool-executor dengan command pip3 install bounded-pool-executor

```
pi@raspberrypi:/var/lib/mysql $ pip3 install bounded-pool-executor
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
WARNING: Retrying (Retry(total=4, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/bounded-pool-executor/
WARNING: Retrying (Retry(total=3, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/bounded-pool-executor/
WARNING: Retrying (Retry(total=2, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/bounded-pool-executor/
WARNING: Retrying (Retry(total=1, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/bounded-pool-executor/
WARNING: Retrying (Retry(total=0, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/bounded-pool-executor/
Collecting bounded-pool-executor
  Downloading bounded_pool_executor-0.0.3-py3-none-any.whl (3.4 kB)
Installing collected packages: bounded-pool-executor
Successfully installed bounded-pool-executor-0.0.3
```

2. Install MySql Connector dengan command pip3 install mysql-connector-python

```
Collecting mysql-connector-python
  Downloading mysql_connector_python-8.0.27-py2.py3-none-any.whl (341 kB)
     |████████████████████████████████| 341 kB 1.5 MB/s
WARNING: Retrying (Retry(total=4, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/protobuf/
WARNING: Retrying (Retry(total=3, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/protobuf/
WARNING: Retrying (Retry(total=2, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/protobuf/
WARNING: Retrying (Retry(total=1, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/protobuf/
WARNING: Retrying (Retry(total=0, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/protobuf/
Collecting protobuf>=3.0.0
  Downloading protobuf-3.19.1-py2.py3-none-any.whl (162 kB)
     |████████████████████████████████| 162 kB 5.0 MB/s
Installing collected packages: protobuf, mysql-connector-python
Successfully installed mysql-connector-python-8.0.27 protobuf-3.19.1
```

3. Install Pandas dengan command pip3 install pandas

```
Collecting python-dateutil>=2.7.3
  Downloading python_dateutil-2.8.2-py2.py3-none-any.whl (247 kB)
     |████████████████████████████████| 247 kB 425 kB/s
Requirement already satisfied: numpy>=1.17.3 in /usr/lib/python3/dist-packages (
from pandas) (1.19.5)
WARNING: Retrying (Retry(total=4, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/pytz/
WARNING: Retrying (Retry(total=3, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/pytz/
WARNING: Retrying (Retry(total=2, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/pytz/
WARNING: Retrying (Retry(total=1, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/pytz/
WARNING: Retrying (Retry(total=0, connect=None, read=None, redirect=None, status
=None)) after connection broken by 'ProtocolError('Connection aborted.', Connect
ionResetError(104, 'Connection reset by peer'))': /simple/pytz/
Collecting pytz>=2017.3
  Downloading pytz-2021.3-py2.py3-none-any.whl (503 kB)
     |████████████████████████████████| 503 kB 1.8 MB/s
Requirement already satisfied: six>=1.5 in /usr/lib/python3/dist-packages (from
python-dateutil>=2.7.3->pandas) (1.16.0)
Building wheels for collected packages: pandas
  Building wheel for pandas (PEP 517) ... done
  Created wheel for pandas: filename=pandas-1.3.5-cp39-cp39-linux_armv7l.whl siz
e=36105670 sha256=d59e3562491b9289ec5f9916e3201610da0fe2f4dda6144b03113c0e254bbc
36
  Stored in directory: /home/pi/.cache/pip/wheels/46/1f/09/be8c6f216f000b48aaef3
009dc7017707a1b18ef30ba548b8d
Successfully built pandas
Installing collected packages: pytz, python-dateutil, pandas
Successfully installed pandas-1.3.5 python-dateutil-2.8.2 pytz-2021.3
```

F. Proses Download Database

Untuk mendapatkan Database yang telah disiapkan maka perlu dilakukan download dari google drive dengan urutan command berikut:

1. Mengatur lokasi ke /home dengan command cd /home

```
pi@raspberrypi:/var/lib/mysql $ cd ..
pi@raspberrypi:/var/lib $ cd ..
pi@raspberrypi:/var $ cd ..
pi@raspberrypi:/ $ cd ..
pi@raspberrypi:/ $ cd home
```

2. Melakukan wget untuk download database dengan command
   sudo wget --load-cookies /tmp/cookies.txt "https://docs.google.com/uc?export=download&confirm=$(wget --quiet --save-cookies /tmp/cookies.txt --keep-session-cookies --no-check-certificate 'https://docs.google.com/uc?export=download&id=1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-' -O- | sed -rn 's/.*confirm=([0-9A-Za-z_]+).*/\1\n/p')&id=1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-" -O cbtjatimsm.tar.gz && rm -rf /tmp/cookies.txt

```
pi@raspberrypi:/home $ sudo wget --load-cookies /tmp/cookies.txt "https://docs.g
oogle.com/uc?export=download&confirm=$(wget --quiet --save-cookies /tmp/cookies.
txt --keep-session-cookies --no-check-certificate 'https://docs.google.com/uc?ex
port=download&id=1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-' -O- | sed -rn 's/.*confirm=(
[0-9A-Za-z_]+).*/\1\n/p')&id=1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-" -O cbtjatimsm.ta
r.gz && rm -rf /tmp/cookies.txt
--2021-12-22 16:27:00--  https://docs.google.com/uc?export=download&confirm=8A_C
&id=1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-
Resolving docs.google.com (docs.google.com)... 142.251.10.139, 142.251.10.100, 1
42.251.10.101, ...
Connecting to docs.google.com (docs.google.com)|142.251.10.139|:443... connected
.
HTTP request sent, awaiting response... 302 Moved Temporarily
Location: https://doc-0g-bg-docs.googleusercontent.com/docs/securesc/umgn6p167k9
812jtmfpped9prr3nvtll/q4057eqq93pq1rh5k0c8jvbln3rgg405/1640165175000/00305834151
187670142/17208126485313759205Z/1oIB6H7KsGQcz2OEVlVWD6oKttmCNsWk-?e=download [fo
llowing]
```

3. Melakukan extract pada file tar yang sudah di download dengan command tar -xvf cbtjatimsm.tar.gz

```
pi@raspberrypi:/home $ ls
cbtjatimsm.tar.gz  pi
pi@raspberrypi:/home $ sudo tar -xvf cbtjatimsm.tar.gz
export-20211014-224615/
export-20211014-224615/Jawaban/
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00000.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00001.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00002.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00003.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00004.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00005.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00006.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00007.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00008.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00009.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00010.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00011.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00012.sql
export-20211014-224615/Jawaban/CBT_JATIM.Jawaban.00013.sql
```

G. Proses Import Database

1. Mengatur lokasi ke folder hasil export dengan command cd

```
pi@raspberrypi:/home $ cd export-20211014-224615/
pi@raspberrypi:/home/export-20211014-224615 $
```

2. Install GNU Parallel dengan command sudo apt-get install parallel

```
pi@raspberrypi:/ $ sudo apt-get install parallel
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following package was automatically installed and is no longer required:
  libfuse2
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  sysstat
Suggested packages:
  isag
The following NEW packages will be installed:
  parallel sysstat
0 upgraded, 2 newly installed, 0 to remove and 105 not upgraded.
Need to get 848 kB of archives.
After this operation, 2,729 kB of additional disk space will be used.
```

3. Mengatur lokasi ke Schema dengan command cd Schema/

```
pi@raspberrypi:/home/export-20211014-224615 $ ls
Jawaban  metadata                  parallel-20211222.tar.bz2.sig  Siswa
Kota     parallel-20211222         README.md                      Soal
Mapel    parallel-20211222.tar.bz2 Schema
pi@raspberrypi:/home/export-20211014-224615 $ cd Schema/
pi@raspberrypi:/home/export-20211014-224615/Schema $
```

4. Membuat sebuah user baru dengan nama user bryan dan password bryan dengan command :

   sudo mysql -u root
   mysql> USE mysql;
   mysql> CREATE USER 'bryan'@'localhost' IDENTIFIED BY 'bryan';
   mysql> GRANT ALL PRIVILEGES ON *.* TO 'bryan'@'localhost';
   mysql> FLUSH PRIVILEGES;
   mysql> exit;

```
pi@raspberrypi:/home/export-20211014-224615/Schema $ sudo mysql -u root
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 69
Server version: 10.5.12-MariaDB-0+deb11u1 Raspbian 11

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> USE mysql;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [mysql]> CREATE USER 'bryan'@'localhost' IDENTIFIED BY 'bryan';
Query OK, 0 rows affected (0.003 sec)

MariaDB [mysql]> GRANT ALL PRIVILIEGES ON *.* TO 'bryan'@'localhost';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MariaDB server version for the right syntax to use near 'PRI
VILIEGES ON *.* TO 'bryan'@'localhost'' at line 1
MariaDB [mysql]> GRANT ALL PRIVILEGES ON *.* TO 'bryan'@'localhost';
Query OK, 0 rows affected (0.002 sec)

MariaDB [mysql]> UPDATE user SET plugin='auth_socket' WHERE User='bryan';
ERROR 1356 (HY000): View 'mysql.user' references invalid table(s) or column(s) o
r function(s) or definer/invoker of view lack rights to use them
MariaDB [mysql]> UPDATE User SET plugin='auth_socket' WHERE User='bryan';
ERROR 1146 (42S02): Table 'mysql.User' doesn't exist
MariaDB [mysql]> UPDATE User SET plugin='auth_socket' WHERE User='bryan';
ERROR 1146 (42S02): Table 'mysql.User' doesn't exist
MariaDB [mysql]> UPDATE user SET plugin='auth_socket' WHERE User='bryan';
ERROR 1356 (HY000): View 'mysql.user' references invalid table(s) or column(s) o
r function(s) or definer/invoker of view lack rights to use them
MariaDB [mysql]> FLUSH PRIVILEGES;
```

5. Import Schema di folder Schema dengan command :

   sudo ls -A1 *.sql | parallel --joblog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"

```
pi@raspberrypi:/home/export-20211014-224615/Schema $ sudo ls -A1 *.sql | paralle
l --joblog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
ERROR 1050 (42S01) at line 5: Table 'Jawaban' already exists
ERROR 1050 (42S01) at line 5: Table 'Kota' already exists
ERROR 1050 (42S01) at line 5: Table 'Mata_Pelajaran' already exists
ERROR 1050 (42S01) at line 5: Table 'Siswa' already exists
ERROR 1007 (HY000) at line 1: Can't create database 'CBT_JATIM'; database exists
ERROR 1050 (42S01) at line 5: Table 'Soal' already exists
```

6. Import tiap tabel (Jawaban, Soal, Kota, Mapel, Siswa) dengan command :

   cd namatabel

   ls -A1 *.sql | parallel --joblog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"

```
pi@raspberrypi:/home/export-20211014-224615 $ cd Siswa
pi@raspberrypi:/home/export-20211014-224615/Siswa $ ls -A1 *.sql | parallel --jo
blog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
```

```
pi@raspberrypi:/home/export-20211014-224615 $ cd Mapel
pi@raspberrypi:/home/export-20211014-224615/Mapel $ ls -A1 *.sql | parallel --jo
blog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
```

```
pi@raspberrypi:/home/export-20211014-224615 $ cd Kota
pi@raspberrypi:/home/export-20211014-224615/Kota $ ls -A1 *.sql | parallel --job
log joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
```

```
pi@raspberrypi:/home/export-20211014-224615 $ cd Soal
pi@raspberrypi:/home/export-20211014-224615/Soal $ ls -A1 *.sql | parallel --job
log joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
```

```
pi@raspberrypi:/home/export-20211014-224615 $ cd Jawaban/
pi@raspberrypi:/home/export-20211014-224615/Jawaban $ ls -A1 *.sql | parallel --
joblog joblog.txt mysql -ubryan -pbryan CBT_JATIM "<"
```

H. Program Parallel

Program yang digunakan adalah sebagai berikut :

```
"""
import mysql.connector as connection
import time
import pandas as pd
import psutil
from bounded_pool_executor import BoundedProcessPoolExecutor
import warnings

warnings.filterwarnings("ignore")


def loadDB(id_kota):
    t = time.time()
    try:
        mydb = connection.connect(host="Localhost",
                                  database='CBT_JATIM',
                                  user="bryan",
                                  password="bryan", use_pure=True)

         query = 'select id_siswa, nama, nrp, value, jawaban_benar,
id_mapel from soal_jawaban where id_kota=%d;' % id_kota
        ujian_siswa = pd.read_sql(query, mydb)

        mydb.close()  # close the connection
    except Exception as e:
        mydb.close()
```

```
            print(str(e))

        elapsed = time.time() - t
        print("Time Load DB  = {:.3f}".format(elapsed))
        ujian_siswa.loc[ujian_siswa['value'] ==
                        ujian_siswa['jawaban_benar'], ['score']] = 1
        ujian_siswa = ujian_siswa.fillna(0)
            result  =  ujian_siswa.groupby(['id_siswa',  'nama',  'nrp',
    'id_mapel'])[
            'score'].agg('sum')
        # result = ujian_siswa.groupby(['id_siswa'])['score'].sum()
        result.to_csv("id_kota_%d.csv" % id_kota)


    if __name__ == '__main__':

        tAll = time.time()
        n_jobs = psutil.cpu_count()
        print("Ready to worker")
        cnt = 0
        with BoundedProcessPoolExecutor(max_workers=n_jobs) as worker:
            for id_kota in range(1, 5):
                print('#%d Worker initialization %s' % (cnt, id_kota))
                cnt += 1
                print("Load DB %d, please wait ..." % id_kota)
                worker.submit(loadDB, id_kota)
        elapsed = time.time() - tAll
        print("Time selesai  = {:.3f}".format(elapsed))
```

1. Buat sebuah file Python baru dengan command sudo nano paralel.py

```
pi@raspberrypi:/home $ sudo nano paralel.py
```

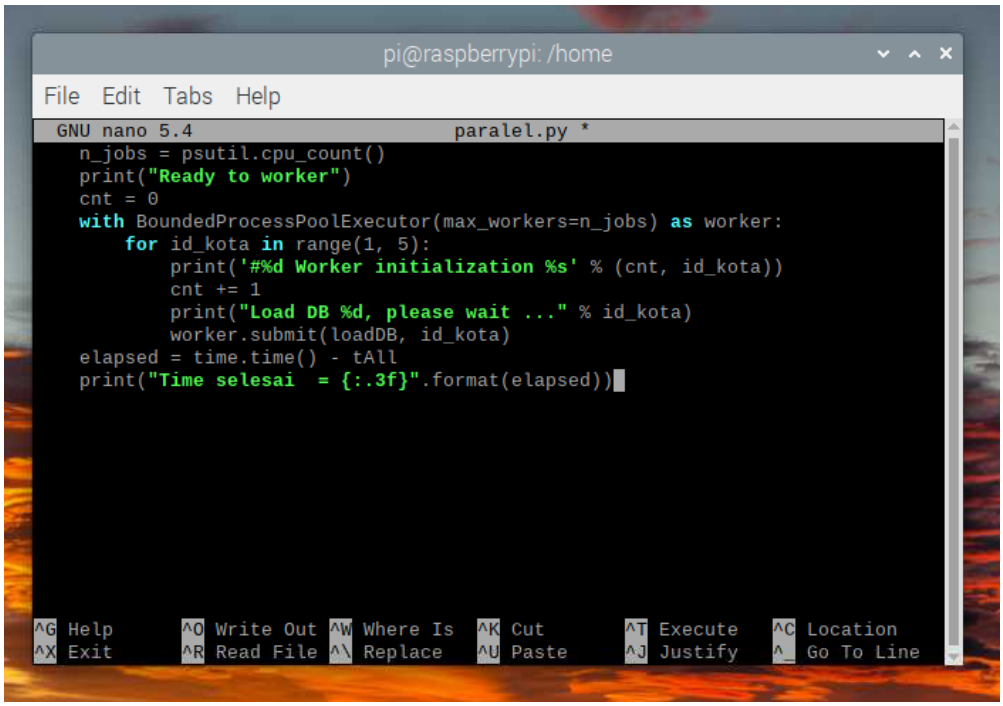
2. Masukkan program dan ganti kredensial menjadi dibawah

```
host="Localhost",
database='CBT_JATIM',
user="bryan",
password="bryan"
```

3. Lalu kita ganti range kota yang diinginkan menjadi seperti dibawah

```
for id_kota in range(1, 5)
```

4. Lakukan save dengan Control-X



5. Buat View baru dengan command :

sudo mysql -u root
mysql> USE CBT_JATIM;
mysql> CREATE VIEW soal_jawaban AS SELECT Jawaban.id_siswa, Siswa.nama, Siswa.nrp, Siswa.id_kota, Jawaban.value, Soal.jawaban_benar, Soal.id_mapel FROM Jawaban INNER JOIN Soal on Jawaban.id_soal = Soal.id INNER JOIN Siswa ON Jawaban.id_siswa = Siswa.id;
mysql> exit;

```
MariaDB [(none)]> USE CBT_JATIM;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [CBT_JATIM]> CREATE VIEW soal_jawaban AS SELECT Jawaban.id_siswa, Siswa.
nama, Siswa.nrp, Siswa.id_kota, Jawaban.value, Soal.jawaban_benar, Soal.id_mapel
 FROM Jawaban INNER JOIN Soal on Jawaban.id_soal = Soal.id INNER JOIN Siswa ON J
awaban.id_siswa = Siswa.id;
Query OK, 0 rows affected (0.006 sec)

MariaDB [CBT_JATIM]> exit
Bye
```

6. Jalankan program paralel.py dengan command python3 paralel.py

```
pi@raspberrypi:/home $ Python3 paralel.py
```

7. Ketika dijalankan akan terlihat hasil seperti berikut

```
pi@raspberrypi:/home $ python3 paralel.py
Ready to worker
#0 Worker initialization 1
Load DB 1, please wait ...
#1 Worker initialization 2
Load DB 2, please wait ...
#2 Worker initialization 3
Load DB 3, please wait ...
#3 Worker initialization 4
Load DB 4, please wait ...
```

8. Dan ketika selesai akan terlihat hasil seperti berikut

```
pi@raspberrypi:/home $ python3 paralel.py
Ready to worker
#0 Worker initialization 1
Load DB 1, please wait ...
#1 Worker initialization 2
Load DB 2, please wait ...
#2 Worker initialization 3
Load DB 3, please wait ...
#3 Worker initialization 4
Load DB 4, please wait ...
Time Load DB  = 537.940
Time Load DB  = 557.248
Time Load DB  = 625.596
Time Load DB  = 633.348
Time selesai  = 645.162
```

9. Dan dengan demikian selesailah tugas Komputasi Klaster Final Project yang diberikan

I. Penutup

Terima kasih atas waktu dan juga perhatian yang sudah diberikan terhadap laporan yang sudah dibuat ini. Mohon maaf jika ada kata yang salah atau kurang berkenan. Saran dan kritik atas laporan ini akan saya terima dan gunakan untuk perbaikan di kemudian hari. Semoga laporan ini bisa berguna bagi kita semua.