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Product Development

Clase 2 – Docker

Docker instalado, verificando versión:

```
C:\Users\mdonis>docker --version
Docker version 20.10.8, build 3967b7d
```

Verificando que la instalación es correcta corriendo un contenedor:

```
C:\Users\mdonis>docker run hello-world

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/

For more examples and ideas, visit:
https://docs.docker.com/get-started/
```

Extraer una imagen de un registro (asume que es "latest" o la más actualizada si no se especifica una versión):

```
C:\Users\mdonis>docker pull busybox
Using default tag: latest
latest: Pulling from library/busybox
Digest: sha256:f7ca5a32c10d51aeda3b4d01c61c6061f497893d7f6628b92f822f7117182a57
Status: Image is up to date for busybox:latest
docker.io/library/busybox:latest
```

Verificar imágenes instaladas en nuestra máquina:

```
C:\Users\mdonis>docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
mysql	5.7.35	8a8a506ccfdc	4 days ago	448MB
jupyter/base-notebook	latest	f14b646c836f	5 days ago	668MB
hello-world	latest	feb5d9fea6a5	3 weeks ago	13.3kB
busybox	latest	16ea53ea7c65	4 weeks ago	1.24MB

Corriendo un segundo contenedor:

```
C:\Users\mdonis>docker run busybox echo "Hello From Galileo Master!"
Hello From Galileo Master!
```

Contenedores que están corriendo:

```
C:\Users\mdonis>docker ps
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
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Listado de contenedores que han sido ejecutados:

```
C:\Users\mdonis>docker ps -a
```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
3b83af0afee0	busybox	"echo 'Hello From Ga..."	About a minute ago	Exited (0)	About a minute ago	bold_blackwell
57c241d98ce0	busybox	"sh"	3 minutes ago	Exited (0)	3 minutes ago	xenodochial_feynman
e3841c88e172	hello-world	"/hello"	18 minutes ago	Exited (0)	18 minutes ago	heuristic_ardinghelli
4699491fd216	jupyter/base-notebook	"tini -g -- start-no..."	2 days ago	Exited (0)	2 days ago	stoic_swanson
c6fcb04c4f5b	mysql:5.7.35	"docker-entrypoint.s..."	2 days ago	Exited (0)	2 days ago	musling_mahavira

Correr y entrar a un contenedor e interactuar con el shell "sh":

```
C:\Users\mdonis>docker run -it busybox sh
/ # ls
bin  dev  etc  home  proc  root  sys  tmp  usr  var
/ # uptime
18:53:22 up 1 day, 23:43,  0 users,  load average: 0.00, 0.00, 0.00
/ # cd home/
/home # cd var/
sh: cd: can't cd to var/: No such file or directory
/home # exit
```

Eliminar contenedores:

```
C:\Users\mdonis>docker ps -a
```

CONTAINER ID	IMAGE	COMMAND
9ba3893b8611	busybox	"sh"
3b83af0afee0	busybox	"echo 'Hello From Ga..."
57c241d98ce0	busybox	"sh"
e3841c88e172	hello-world	"/hello"
4699491fd216	jupyter/base-notebook	"tini -g -- start-no..."
c6fcb04c4f5b	mysql:5.7.35	"docker-entrypoint.s..."

```
C:\Users\mdonis>docker rm 9ba3893b8611 3b83af0afee0
```

```
9ba3893b8611
3b83af0afee0
```

```
C:\Users\mdonis>docker ps -a
```

CONTAINER ID	IMAGE	COMMAND
57c241d98ce0	busybox	"sh"
e3841c88e172	hello-world	"/hello"
4699491fd216	jupyter/base-notebook	"tini -g -- start-no..."
c6fcb04c4f5b	mysql:5.7.35	"docker-entrypoint.s..."

Para eliminar todos los contenedores se puede hacer **Docker container prune**

Docker y Python

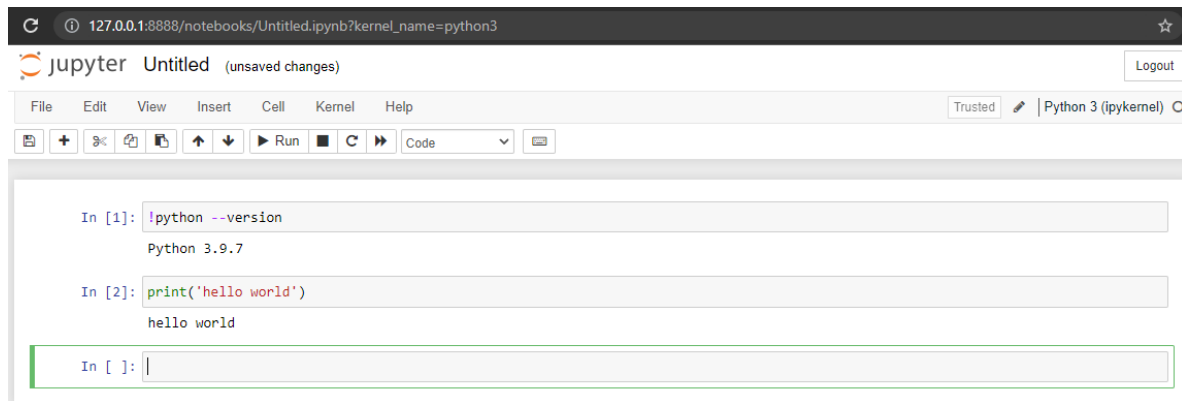
Instalar Jupyter

```
C:\Users\mdonis>docker pull jupyter/base-notebook
Using default tag: latest
latest: Pulling from jupyter/base-notebook
Digest: sha256:9e46cbef898c23c827c49a674cc53363bc68aec82ed27ee549f72c7149091763
Status: Image is up to date for jupyter/base-notebook:latest
docker.io/jupyter/base-notebook:latest
```

Ejecutar Jupyter por medio del mapeo de puertos máquina:contenedor:

```
C:\Users\mdonis>docker run -p 8888:8888 jupyter/base-notebook
WARN: Jupyter Notebook deprecation notice https://github.com/jupyter/docker-stacks#jupyter-notebook-deprecation-notice.
Executing the command: jupyter notebook
[I 19:04:12.475 NotebookApp] Writing notebook server cookie secret to /home/jovyan/.local/share/jupyter/runtime/notebook_cookie_secret
[W 2021-10-16 19:04:19.159 LabApp] 'ip' has moved from NotebookApp to ServerApp. This config will be passed to ServerApp. Be sure to update your config before our next release.
[W 2021-10-16 19:04:19.159 LabApp] 'port' has moved from NotebookApp to ServerApp. This config will be passed to ServerApp. Be sure to update your config before our next release.
[W 2021-10-16 19:04:19.159 LabApp] 'port' has moved from NotebookApp to ServerApp. This config will be passed to ServerApp. Be sure to update your config before our next release.
[W 2021-10-16 19:04:19.159 LabApp] 'port' has moved from NotebookApp to ServerApp. This config will be passed to ServerApp. Be sure to update your config before our next release.
[I 2021-10-16 19:04:19.167 LabApp] JupyterLab extension loaded from /opt/conda/lib/python3.9/site-packages/jupyterlab
[I 2021-10-16 19:04:19.167 LabApp] JupyterLab application directory is /opt/conda/share/jupyter/lab
[I 19:04:19.174 NotebookApp] Serving notebooks from local directory: /home/jovyan
[I 19:04:19.174 NotebookApp] Jupyter Notebook 6.4.4 is running at:
[I 19:04:19.174 NotebookApp] http://48e957b222f6:8888/?token=e7019729510a788bcb4e7eeb74e453de78638e0ad3e28d3
[I 19:04:19.174 NotebookApp] or http://127.0.0.1:8888/?token=e7019729510a788bcb4e7eeb74e453de78638e0ad3e28d3
[I 19:04:19.174 NotebookApp] Use Control-C to stop this server and shut down all kernels (twice to skip confirmation).
[C 19:04:19.221 NotebookApp]

To access the notebook, open this file in a browser:
file:///home/jovyan/.local/share/jupyter/runtime/nbsrvr-8-open.html
Or copy and paste one of these URLs:
http://48e957b222f6:8888/?token=e7019729510a788bcb4e7eeb74e453de78638e0ad3e28d3
or http://127.0.0.1:8888/?token=e7019729510a788bcb4e7eeb74e453de78638e0ad3e28d3
```



Verificando contenedor y mapeo de puertos:

```
C:\Users\mdonis>docker ps
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
40e957b222f6   jupyter/base-notebook   "tiny -g -- start-no..."   3 minutes ago   Up 3 minutes   0.0.0.0:8888->8888/tcp         infallible_solomon
```

Crear una red para conectar Jupyter y MySQL:

```
C:\Users\mdonis>docker network create --driver bridge my_test_network
0f2c1db1d5ff22f5374def969412926181056fb67fb8b91bb1f9c14e0b9f3187
```

```
C:\Users\mdonis>docker network ls
NETWORK ID      NAME                DRIVER              SCOPE
e8e8ad3cea21    bridge             bridge              local
007539c79aa5    host               host                local
0f2c1db1d5ff    my_test_network     bridge              local
5f2991d573f3    none               null                local
```

Ejecutar un contenedor de MySQL en la red previamente creada e interactivamente:

```
C:\Users\mdonis>docker run -it --network my_test_network -e "MYSQL_ROOT_PASSWORD=root123" -e "MYSQL_DATABASE=test" -e "MYSQL_USER=test" -e "MYSQL_PASSWORD=test"
mysql:5.7.35
2021-10-16 20:05:15+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 5.7.35-1debian10 started.
...
2021-10-16T20:06:44.612487Z 0 [Note] Event Scheduler: Loaded 0 events
2021-10-16T20:06:44.612786Z 0 [Note] mysqld: ready for connections.
Version: '5.7.35' socket: '/var/run/mysqld/mysqld.sock' port: 3306 MySQL Community Server (GPL)
```

Ahora nos conectamos de nuevo, esta vez especificando el puerto para tener acceso a la base de datos desde nuestra máquina:

```
C:\Users\mdonis>docker run -it --network my_test_network -e "MYSQL_ROOT_PASSWORD=root123" -e "MYSQL_DATABASE=test" -e "MYSQL_USER=test" -e "MYSQL_PASSWORD=test"
mysql:5.7.35
2021-10-16 20:06:44+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 5.7.35-1debian10 started.
```

Ahora se ejecutará Jupyter pero en la misma red del contenedor de la base de datos para poder hacer una conexión:

```
C:\Users\mdonis>docker run -p 8888:8888 --network my_test_network jupyter/base-notebook
WARN: Jupyter Notebook deprecation notice https://github.com/jupyter/docker-stacks#jupyter
Executing the command: jupyter notebook
[I 20:27:26.801 NotebookApp] Writing notebook server cookie secret to /home/jovyan/.local
[W 2021-10-16 20:27:27.411 LabApp] 'ip' has moved from NotebookApp to ServerApp. This con
e our next release.
[W 2021-10-16 20:27:27.411 LabApp] 'port' has moved from NotebookApp to ServerApp. This c
ore our next release.
[W 2021-10-16 20:27:27.411 LabApp] 'port' has moved from NotebookApp to ServerApp. This c
ore our next release.
[W 2021-10-16 20:27:27.411 LabApp] 'port' has moved from NotebookApp to ServerApp. This c
ore our next release.
[I 2021-10-16 20:27:27.420 LabApp] JupyterLab extension loaded from /opt/conda/lib/python
[I 2021-10-16 20:27:27.420 LabApp] JupyterLab application directory is /opt/conda/share/j
[I 20:27:27.426 NotebookApp] Serving notebooks from local directory: /home/jovyan
[I 20:27:27.426 NotebookApp] Jupyter Notebook 6.4.4 is running at:
[I 20:27:27.426 NotebookApp] http://ecced141b322:8888/?token=ec48886e5fa12fca85a29ff7c6eb
[I 20:27:27.426 NotebookApp] or http://127.0.0.1:8888/?token=ec48886e5fa12fca85a29ff7c6e
[I 20:27:27.426 NotebookApp] Use Control-C to stop this server and shut down all kernels
[C 20:27:27.431 NotebookApp]

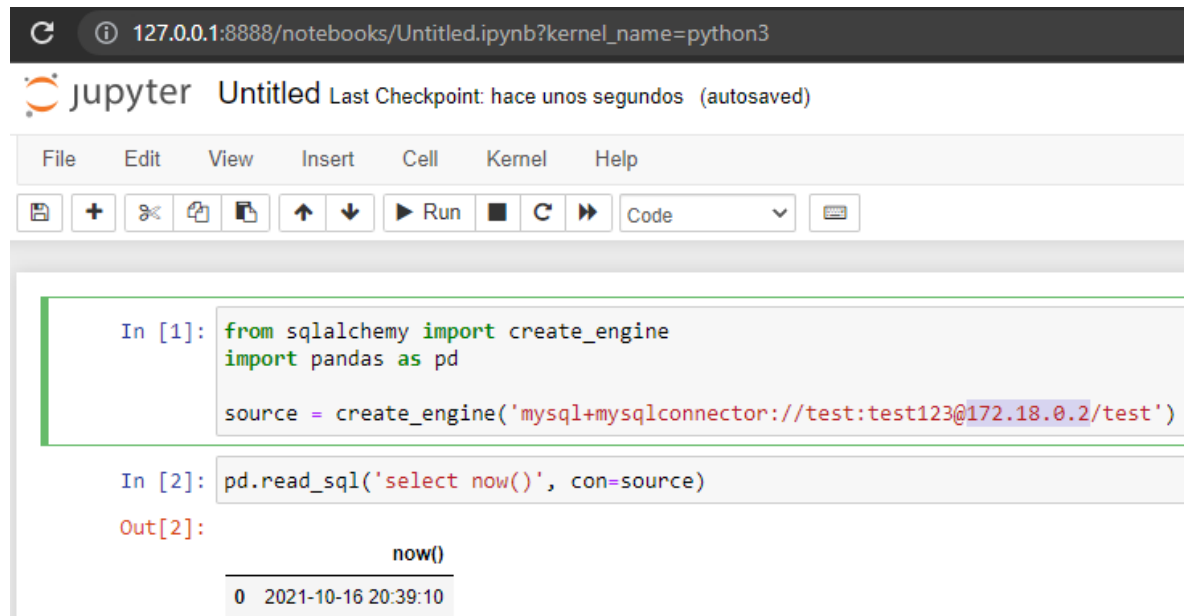
To access the notebook, open this file in a browser:
file:///home/jovyan/.local/share/jupyter/runtime/nbserver-9-open.html
Or copy and paste one of these URLs:
http://ecced141b322:8888/?token=ec48886e5fa12fca85a29ff7c6eba8e4c272c842cee6fc42
or http://127.0.0.1:8888/?token=ec48886e5fa12fca85a29ff7c6eba8e4c272c842cee6fc42
```

Instalación de librerías de Python ingresando al contenedor que contiene Jupyter:

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
ecced141b322	jupyter/base-notebook	"tini -g -- start-no..."	2 minutes ago	Up 2 minutes	0.0.0.0:8888->8888/tcp	festive_elgama
35f272dc9869	mysql:5.7.35	"docker-entrypoint.s..."	8 minutes ago	Up 8 minutes	0.0.0.0:3306->3306/tcp, 33060/tcp	happy_dewdney

```
C:\Users\mdonis>docker exec -it festive_elgama sh
$ ls
Untitled.ipynb work
$ python --version
Python 3.9.7
$ pip install mysql-connector-python
Collecting mysql-connector-python
  Downloading mysql-connector-python-8.0.26-cp39-cp39-manylinux1_x86_64.whl (30.9 MB)
    | 30.9 MB 609 kB/s
Collecting protobuf>=3.0.0
  Downloading protobuf-3.18.1-cp39-cp39-manylinux_2_17_x86_64.whl (1.1 MB)
    | 1.1 MB 104 kB/s
Installing collected packages: protobuf, mysql-connector-python
Successfully installed mysql-connector-python-8.0.26 protobuf-3.18.1
$ pip install pandas
Collecting pandas
  Downloading pandas-1.3.3-cp39-cp39-manylinux_2_17_x86_64.whl (11.5 MB)
    | 11.5 MB 1.3 MB/s
Requirement already satisfied: python-dateutil>=2.7.3 in /opt/conda/lib/python3.9/site-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2017.3 in /opt/conda/lib/python3.9/site-packages (from pandas) (2021.3)
Collecting numpy>=1.17.3
  Downloading numpy-1.21.2-cp39-cp39-manylinux_2_12_x86_64.whl (15.8 MB)
    | 15.8 MB 18 kB/s
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.9/site-packages (from python-dateutil>=2.7.3->pandas) (1.16.0)
Installing collected packages: numpy, pandas
Successfully installed numpy-1.21.2 pandas-1.3.3
$ exit
```

Ubicar ip del host: 172.18.0.2 y conectarnos a la base de datos vía Jupyter:



127.0.0.1:8888/notebooks/Untitled.ipynb?kernel_name=python3

jupyter Untitled Last Checkpoint: hace unos segundos (autosaved)

File Edit View Insert Cell Kernel Help

Run

```
In [1]: from sqlalchemy import create_engine
import pandas as pd

source = create_engine('mysql+mysqlconnector://test:test123@172.18.0.2/test')
```

```
In [2]: pd.read_sql('select now()', con=source)
```

Out[2]:

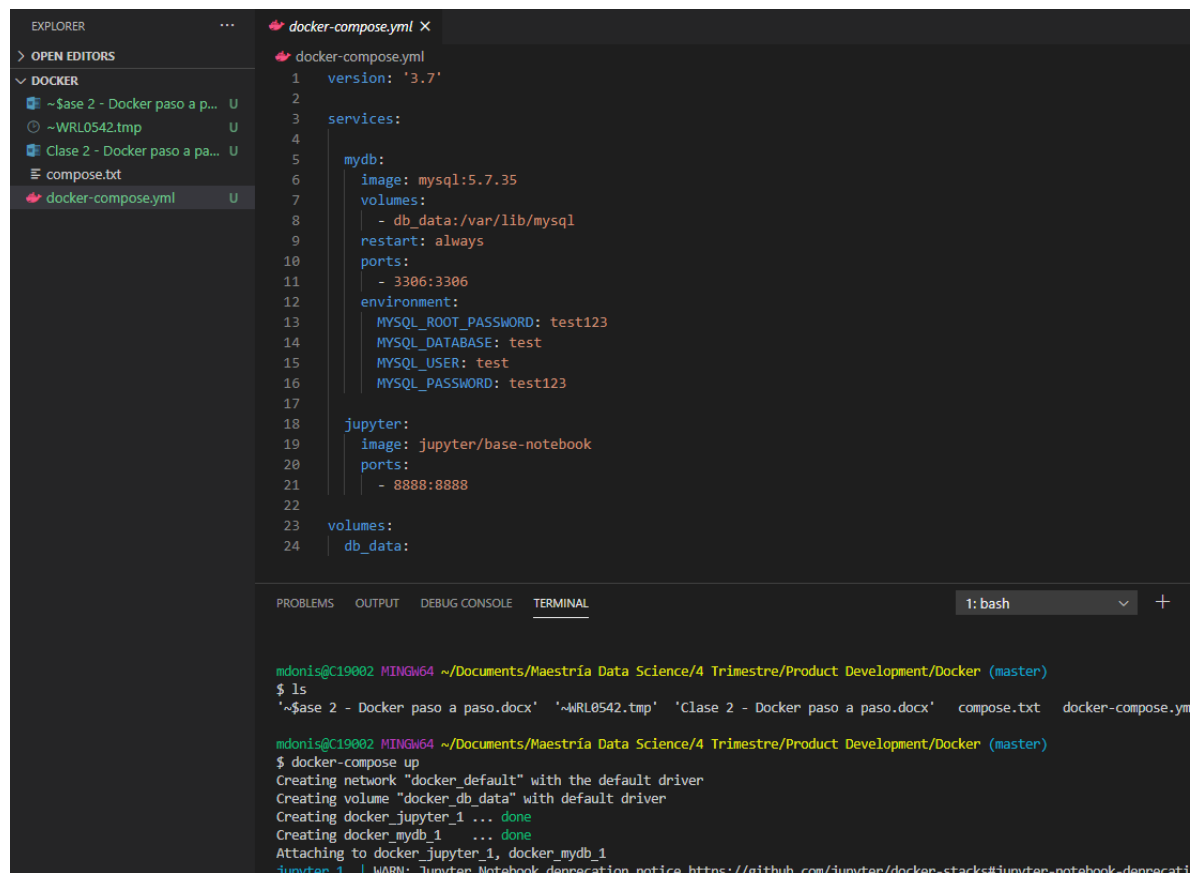
	now()
0	2021-10-16 20:39:10

Docker-Compose y Python

Verificando instalación:

```
C:\Users\mdonis>docker-compose --version
docker-compose version 1.29.2, build 5becea4c
```

Se crea archivo docker-compose.yml, se almacena en una carpeta y se ejecuta el comando docker-compose up:



The screenshot shows a Visual Studio Code editor with a file explorer on the left and a terminal at the bottom. The file explorer shows a project named 'docker-compose.yml' under a folder 'DOCKER'. The terminal shows the execution of 'docker-compose up' command, which creates a network 'docker_default', a volume 'docker_db_data', and two containers: 'docker_jupyter_1' and 'docker_mydb_1'. The output of the command is as follows:

```
mdonis@C19002 MINGW64 ~/Documents/Maestría Data Science/4 Trimestre/Product Development/Docker (master)
$ ls
'~$ase 2 - Docker paso a paso.docx' '~WRL0542.tmp' 'Clase 2 - Docker paso a paso.docx' compose.txt docker-compose.yml

mdonis@C19002 MINGW64 ~/Documents/Maestría Data Science/4 Trimestre/Product Development/Docker (master)
$ docker-compose up
Creating network "docker_default" with the default driver
Creating volume "docker_db_data" with default driver
Creating docker_jupyter_1 ... done
Creating docker_mydb_1 ... done
Attaching to docker_jupyter_1, docker_mydb_1
jupyter_1 | WARN: Jupyter Notebook deprecation notice https://github.com/jupyter/docker-stacks#jupyter-notebook-deprecati
```

The Docker Compose file (docker-compose.yml) is as follows:

```
1 version: '3.7'
2
3 services:
4
5   mydb:
6     image: mysql:5.7.35
7     volumes:
8       - db_data:/var/lib/mysql
9     restart: always
10    ports:
11      - 3306:3306
12    environment:
13      MYSQL_ROOT_PASSWORD: test123
14      MYSQL_DATABASE: test
15      MYSQL_USER: test
16      MYSQL_PASSWORD: test123
17
18   jupyter:
19     image: jupyter/base-notebook
20     ports:
21       - 8888:8888
22
23 volumes:
24   db_data:
```

Luego se instalan las librerías necesarias en Python y se realiza la conexión con la base de datos:



```
127.0.0.1:8888/notebooks/Untitled.ipynb?kernel_name=python3

jupyter Untitled (unsaved changes)

File Edit View Insert Cell Kernel Help

In [1]: !pip install mysql-connector-python

Collecting mysql-connector-python
  Downloading mysql_connector_python-8.0.26-cp39-cp39-manylinux1_x86_64.whl (30.9 MB)
    30.9 MB 1.3 MB/s eta 0:00:01
Collecting protobuf>=3.0.0
  Downloading protobuf-3.18.1-cp39-cp39-manylinux2014_x86_64.whl (1.1 MB)
    1.1 MB 1.1 MB/s eta 0:00:01
Installing collected packages: protobuf, mysql-connector-python
Successfully installed mysql-connector-python-8.0.26 protobuf-3.18.1

In [2]: !pip install pandas

Collecting pandas
  Downloading pandas-1.3.3-cp39-cp39-manylinux2014_x86_64.whl (11.5 MB)
    11.5 MB 1.1 MB/s eta 0:00:01
Requirement already satisfied: pytz>=2017.3 in /opt/conda/lib/python3.9/site-packages (from pandas)
Requirement already satisfied: python-dateutil>=2.7.3 in /opt/conda/lib/python3.9/site-packages (from pandas)
Collecting numpy>=1.17.3
  Downloading numpy-1.21.2-cp39-cp39-manylinux2010_x86_64.whl (15.8 MB)
    15.8 MB 27 kB/s eta 0:00:01
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.9/site-packages (from python-dateutil)
Installing collected packages: numpy, pandas
Successfully installed numpy-1.21.2 pandas-1.3.3

In [3]: from sqlalchemy import create_engine
import pandas as pd

source = create_engine('mysql+mysqlconnector://test:test123@mydb/test')

In [4]: pd.read_sql('select now()', con=source)

Out[4]:
          now()
0  2021-10-16 21:04:33
```

Como paso final se detienen los contenedores:

```
mdonis@C19002 MINGW64 ~/Documents/Maestría Data Science/4 Trimestre/Product Development/Docker (master)
$ docker-compose down
Stopping docker_jupyter_1 ... done
Stopping docker_mydb_1 ... done
Removing docker_jupyter_1 ... done
Removing docker_mydb_1 ... done
Removing network docker_default
```