What is Docker-Compose?

Docker-Compose is a tool provided by Docker. To make it simple, this tool is implemented to solve architectural problems in your projects.

As you may have noticed in my previous article, we created a simple program that displayed “Docker is magic!” when it was launched.

Unfortunately, when you are a developer, you rarely create a stand-alone program (a program that does not require any other services to run, such as a database).

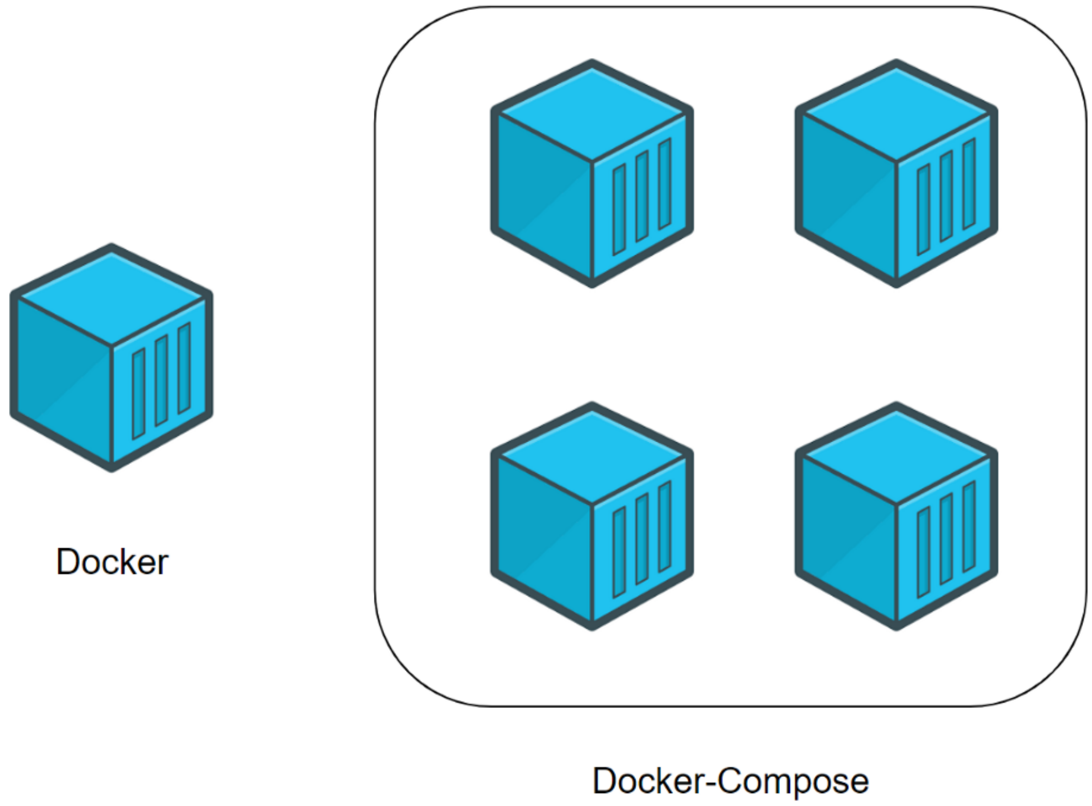
However, how do you know if you need Docker-Compose? It’s easy if your application requires several services to run, you need this tool. For example, if you create a website that needs to connect to your database to authenticate users (here 2 services, website, and database).

Docker-compose offers you the possibility to launch all these services in a single command.

Difference between Docker and Docker-Compose

Docker is used to manage an individual container (service) for your application.

Docker-Compose is used to manage several containers at the same time for the same application. This tool offers the same features as Docker but allows you to have more complex applications.



A typical use case

This tool can become very powerful and allow you to deploy applications with complex architectures very quickly. I will give you a concrete case study that will prove that you need it.

Imagine, you are the proud creator of your web software.

Your solution offers two websites. The first allows stores to create their online store in a few clicks. The second is dedicated to customer support. These two sites interact with the same database.

You are beginning to be successful, and your server is no longer sufficient. So, you decide to migrate your entire software to another machine.

Unfortunately, you didn't use docker-compose. So you're going to have to migrate and reconfigure your services one after the other, hoping nothing has been forgotten.

If you had used a docker-compose, in only a few commands, you would have deployed your entire architecture on your new server. All you have to do now is make a few configurations and load the backup of your database to finalize the migration.

Now let's create your first client/server-side application with Docker-Compose

Now that you know what docker-compose is going to be used for, it's time to create your first client/server-side application!

The objective of this tutorial is to create a small website (server) in Python that will contain a sentence. This sentence must be retrieved by a program (client) in Python that will display the sentence.

1. Create your project

To create your first client/server application, I invite you to create a folder on your computer. It must contain at root the following file and folders:

- A '*docker-compose.yml*' file (docker-compose file that will contain the necessary instructions to create the different services).
- A '*server*' folder (this folder will contain the files necessary to set up the server).
- A '*client*' folder (this folder will contain the files necessary to set up the client).

You should have this folder architecture:

```
.
├── client/
├── docker-compose.yml
└── server/2 directories, 1 file
```

2. Create your server

To start with reminders of Docker's basics, we will start by creating the server.

2a. Create files

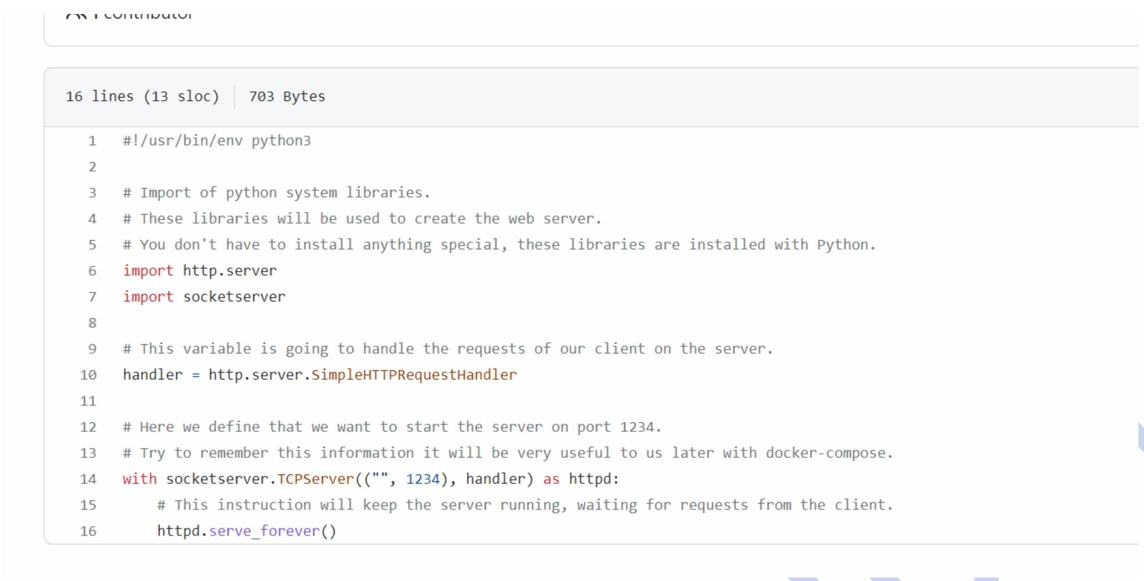
Move to your '*server*' folder and create the following files:

- A '*server.py*' file (python file that will contain the server code).
- An '*index.html*' file (HTML file that will contain the sentence to be displayed).
- A '*Dockerfile*' file (docker file that will contain the necessary instructions to create the environment of the server).

You should have this folder architecture in the following path '*server/*':

```
.
├── Dockerfile
├── index.html
└── server.py0 directories, 3 files
```

You can add the following code to the '*server.py*' file:



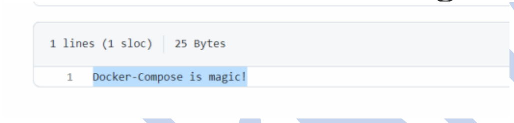
16 lines (13 sloc) | 703 Bytes

```python
#!/usr/bin/env python3

# Import of python system libraries.
# These libraries will be used to create the web server.
# You don't have to install anything special, these libraries are installed with Python.
import http.server
import socketserver

# This variable is going to handle the requests of our client on the server.
handler = http.server.SimpleHTTPRequestHandler

# Here we define that we want to start the server on port 1234.
# Try to remember this information it will be very useful to us later with docker-compose.
with socketserver.TCPServer(("", 1234), handler) as httpd:
    # This instruction will keep the server running, waiting for requests from the client.
    httpd.serve_forever()
```

This code will allow you to create a simple web server inside this folder. It will retrieve the content of the index.html file to share it on a web page.

2c. Edit the Html file

You can add the following sentence to the '*index.html*' file:

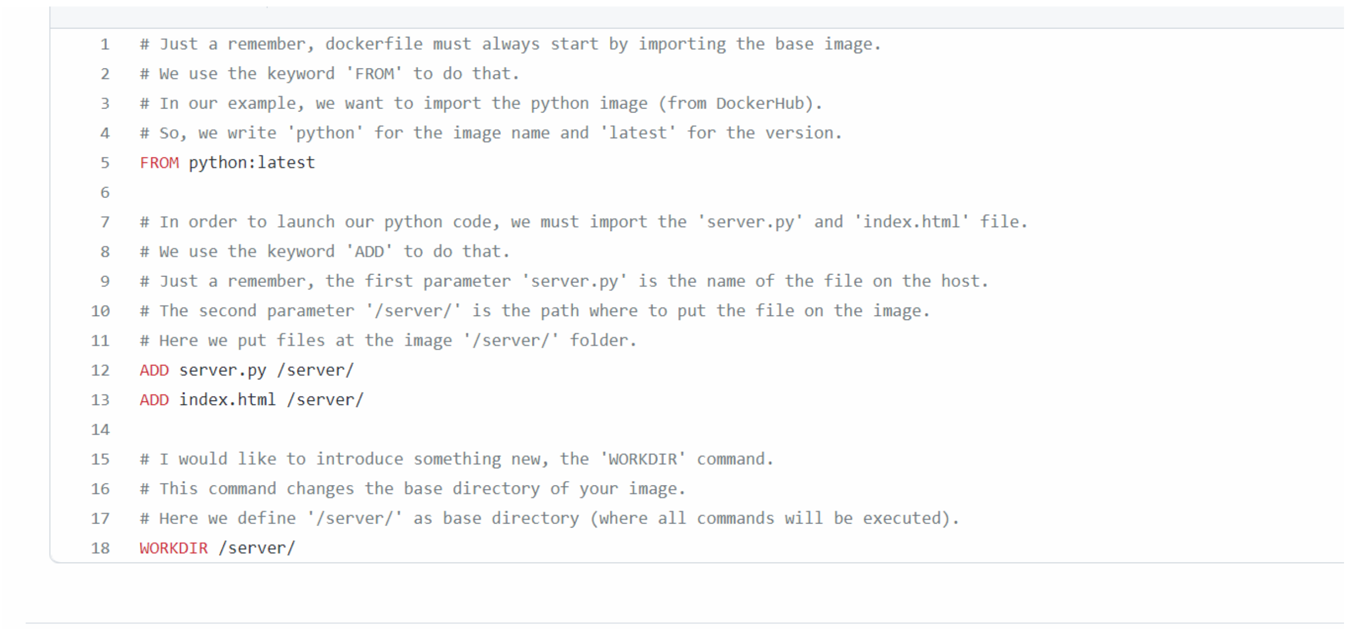


1 lines (1 sloc) | 25 Bytes

```
Docker-Compose is magic!
```

2d. Edit the Docker file

Here we will create a basic Dockerfile that will be in charge of executing our Python file. To do that, we are going to use the official image created to execute Python.



```
# Just a remember, dockerfile must always start by importing the base image.
# We use the keyword 'FROM' to do that.
# In our example, we want to import the python image (from DockerHub).
# So, we write 'python' for the image name and 'latest' for the version.
FROM python:latest

# In order to launch our python code, we must import the 'server.py' and 'index.html' file.
# We use the keyword 'ADD' to do that.
# Just a remember, the first parameter 'server.py' is the name of the file on the host.
# The second parameter '/server/' is the path where to put the file on the image.
# Here we put files at the image '/server/' folder.
ADD server.py /server/
ADD index.html /server/

# I would like to introduce something new, the 'WORKDIR' command.
# This command changes the base directory of your image.
# Here we define '/server/' as base directory (where all commands will be executed).
WORKDIR /server/
```

3. Create your client

To continue with reminders of Docker's basics, we will create the client.

3a. Create files

Move to your '*client*' folder and create the following files:

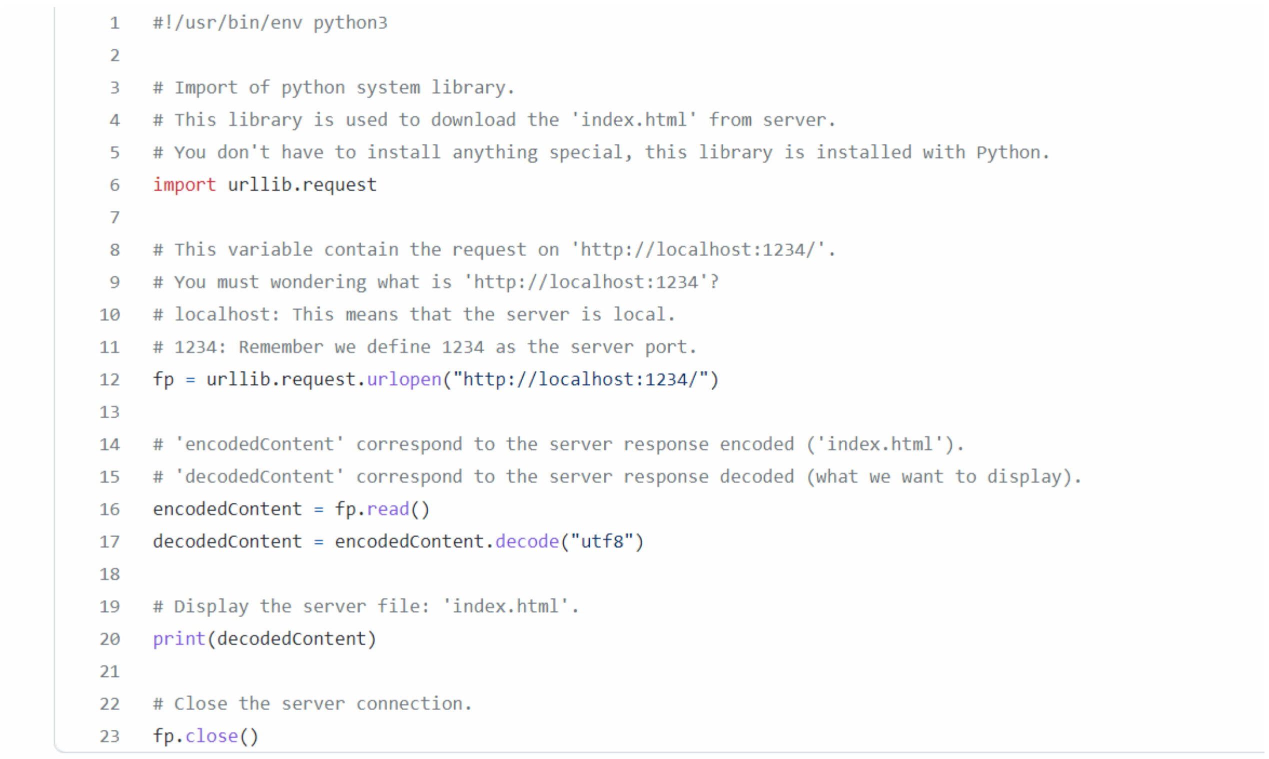
- A '*client.py*' file (python file that will contain the client code).
- A '*Dockerfile*' file (docker file that will contain the necessary instructions to create the environment of the client).

Normally you should have this folder architecture in the following path ‘*client/*’:

```
.
├── client.py
└── Dockerfile0 directories, 2 files
```

3b. Edit the Python file

You can add the following code to the ‘*client.py*’ file:

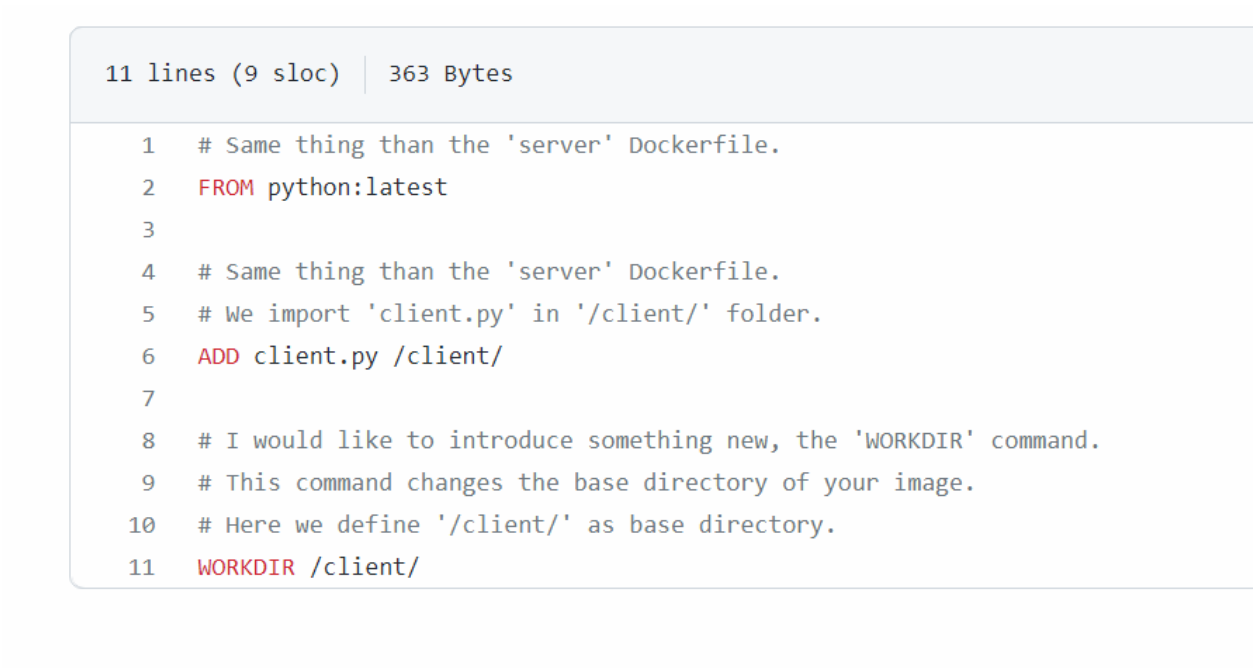


```python
#!/usr/bin/env python3

# Import of python system library.
# This library is used to download the 'index.html' from server.
# You don't have to install anything special, this library is installed with Python.
import urllib.request

# This variable contain the request on 'http://localhost:1234/'.
# You must wondering what is 'http://localhost:1234'?
# localhost: This means that the server is local.
# 1234: Remember we define 1234 as the server port.
fp = urllib.request.urlopen("http://localhost:1234/")

# 'encodedContent' correspond to the server response encoded ('index.html').
# 'decodedContent' correspond to the server response decoded (what we want to display).
encodedContent = fp.read()
decodedContent = encodedContent.decode("utf8")

# Display the server file: 'index.html'.
print(decodedContent)

# Close the server connection.
fp.close()
```

This code will allow you to get the content of the server web page and to display it.

3c. Edit the Docker file

As for the server, we will create a basic Dockerfile that will be in charge of executing our Python file.



```
11 lines (9 sloc)  |  363 Bytes
```

```
# Same thing than the 'server' Dockerfile.
FROM python:latest

# Same thing than the 'server' Dockerfile.
# We import 'client.py' in '/client/' folder.
ADD client.py /client/

# I would like to introduce something new, the 'WORKDIR' command.
# This command changes the base directory of your image.
# Here we define '/client/' as base directory.
WORKDIR /client/
```

4. Back to Docker-Compose

As you may have noticed, we have created two different projects, the server, and the client, both with a Dockerfile.

So far, nothing has changed from the basics you already know.

Now we are going to edit the '*docker-compose.yml*' at the root of the repository.

5. Build Docker-Compose

Once the docker-compose is set up, your client/server application need to be built. This step corresponds to the 'docker build' command but applied to the different services.

```
$ docker-compose build
```

6. Run Docker-Compose

Your docker-compose is built! Now it's time to start! This step corresponds to the 'docker run' command but applied to the different services.

```
$ docker-compose up
```

There you go, that's it. You should see "Docker-Compose is magic!" displayed in your terminal.

Useful commands for Docker

As usual, I have prepared a list of orders that may be useful to you with docker-compose.

- Stops containers and removes containers, images… created by '*docker-compose up*'.

```
$ docker-compose down
```

- Displays log output from services (example: '*docker-compose logs -f client*').

```
$ docker-compose logs -f [service name]
```

- Lists containers.

```
$ docker-compose ps
```

- Executes command in a running container (example: '*docker-compose exec server ls*').

```
$ docker-compose exec [service name] [command]
```

- Lists images.

```
$ docker-compose images
```