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SUPÉRIEURE
D'INFORMATIQUE

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LAB5A Report

Containerization with Docker

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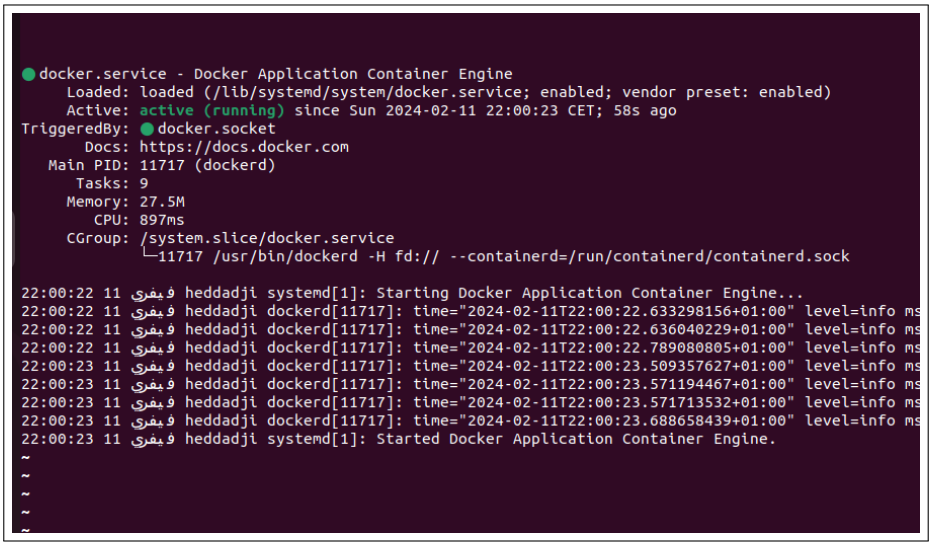
1. Docker Installation

To proceed with this lab, we created the following:

- An Ubuntu server.
- A Docker Hub account

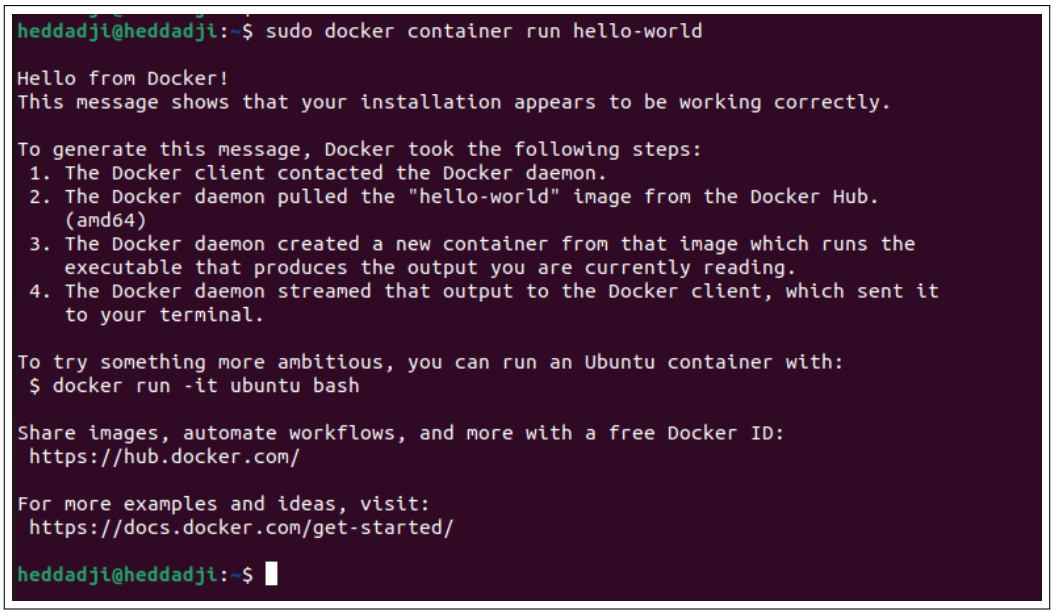
```

    sudo apt update
    sudo apt install apt-transport-https ca-certificates curl software-properties-common
    curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
    sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu bionic stable"
    sudo apt install docker-ce
    #Verify
    sudo systemctl status docker
.
```



2. Getting familiar with Docker

2.1. Hello-world Image

```

    docker container run hello-world
.
```



2.2. Search for an Image in the Registry

This command searches the Docker Hub registry for images related to ”example”.

It returns a list of images available on the registry that match the search term.

```

    docker search example
.
```

2.3. Pulling an image

Pulling an image means **downloading** it to your local machine, making it available for local use.

```

    docker image pull image_name
.
```

2.4. Listing Local Docker Images

```

    docker image ls
.
```

```
heddadji@heddadji:~$ sudo docker search ns2
[sudo] password for heddadji:
NAME                                      DESCRIPTION                                     STARS     OFFICIAL   AUTOMATED
ns208/guestbook-php-frontend                                                              0
tikz/ns2-roundend                                                                         0
tikz/ns2-skill-go                                                                         0
tikz/ns2-discord                                                                          0
tikz/ns2sud-web                                                                           0
ns208/centos6-sshd                                                                        0
tikz/ns2-web                                                                              0
ns208/mycentos-ssh                                                                        0
ekiourk/ns2                               Network Simulator 2.35                          3
tikz/ns2-skill                                                                            0
zenithal/ns2discordbot                                                                    0
massimilianomirelli/ns2_server                                                            0
ns29/get-started                                                                          0
serverboi/ns2                                                                             0
ns265422/julia                                                                            0
ns2808/cheers2019                                                                         0
ns29/cloudserver                                                                          0
christofferbraun/ns2-jenkins-postgresql                                                   0
npranav10/ns2                                                                             0
esion/ns2_server-docker                   Docker Image for Natural Selection 2 Server     0
dotrdg/ns2                                                                                0
kersey/ns2.35                             Comes with GNUPlot                              0
jangelinav/ns2                                                                            0
gcasella/ns2-docker                                                                       0
ns2rk/docker101tutorial                                                                   0
heddadji@heddadji:~$ sudo docker image pull ekiourk/ns2
```

```
heddadji@heddadji:~$ sudo docker image pull ekiourk/ns2
Using default tag: latest
latest: Pulling from ekiourk/ns2
Image docker.io/ekiourk/ns2:latest uses outdated schema1 manifest format. Please upgrade to a schema2 image for better
ibility. More information at https://docs.docker.com/registry/spec/deprecated-schema-v1/
a3ed95caeb02: Pull complete
2d7928839f96: Pull complete
2cbe3e3fa432: Pull complete
76a59787cc98: Pull complete
2eb92b26d2c9: Pull complete
0375c530f5ff: Pull complete
d5da3d004d16: Pull complete
cdfbbc36a11a: Pull complete
Digest: sha256:8c2764a3f35baa783af4dde92c257c6221b8f45279ccf1e84ca21c526df26ef1
Status: Downloaded newer image for ekiourk/ns2:latest
docker.io/ekiourk/ns2:latest
heddadji@heddadji:~$ sudo  docker image ls
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
hello-world   latest    d2c94e258dcb   9 months ago   13.3kB
ekiourk/ns2   latest    afe271929563   8 years ago    743MB
heddadji@heddadji:~$
```

2.5. Docker groups

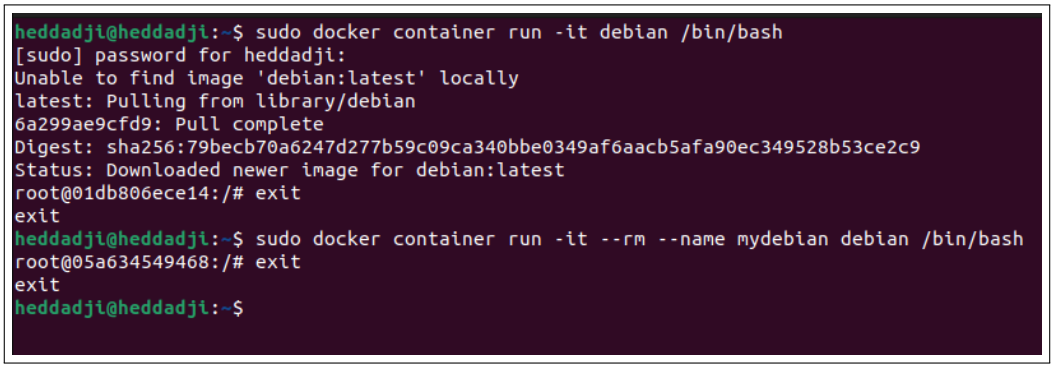
To avoid using sudo each time we run a Docker command.

```

    sudo usermod -aG docker your_username
    groups
.
```

3. Managing Containers

```

    # Start an interactive Debian container and launch a Bash shell
    docker container run -it debian /bin/bash

    #  Start an interactive Debian container with automatic removal and assign a custom name
    docker container run -it --rm --name mydebian debian /bin/bash


```

```
.
```



4. Custom Docker images

A Dockerfile is a text file that contains instructions for creating a Docker image. Instructions are written in the format: **DIRECTIVE argument**.

4.1. Dockerfile Structure

```

    #Create the folder for the project
    mkdir app
    # Create dockerfile
    touch Dockerfile
    nano Dockerfile
    # Opens the Dockerfile in the nano text editor
.
```

This is how a dockerfile should look like :

```

   # Specify the base image
    FROM your_base_image:tag

    # Set the working directory
    WORKDIR /path_to_working_directory

    # Install dependencies
    RUN your_package_manager install your_dependencies

    # Copy application files to the container
    COPY . /app

    # Specify environment variables
```

```
    ENV YOUR_ENV_VARIABLE=value

    # Define the default command to run when the container starts
    CMD ["your_command", "--your-option=option_value"]

.
```

4.2. Building and Running the Custom Image

Open a terminal and navigate to the directory containing the Dockerfile.

```

    # Build the Docker image
    docker build . -t my-custom-image:v1

    # Check the list of Docker images
    docker image ls

    # Run the Docker container
    docker container run -d my-custom-image :v1

.
```

5. Hosting a Python/Flask app on a docker

We will create these files :

- app.py : to store the code for our flask app
- Dockerfile

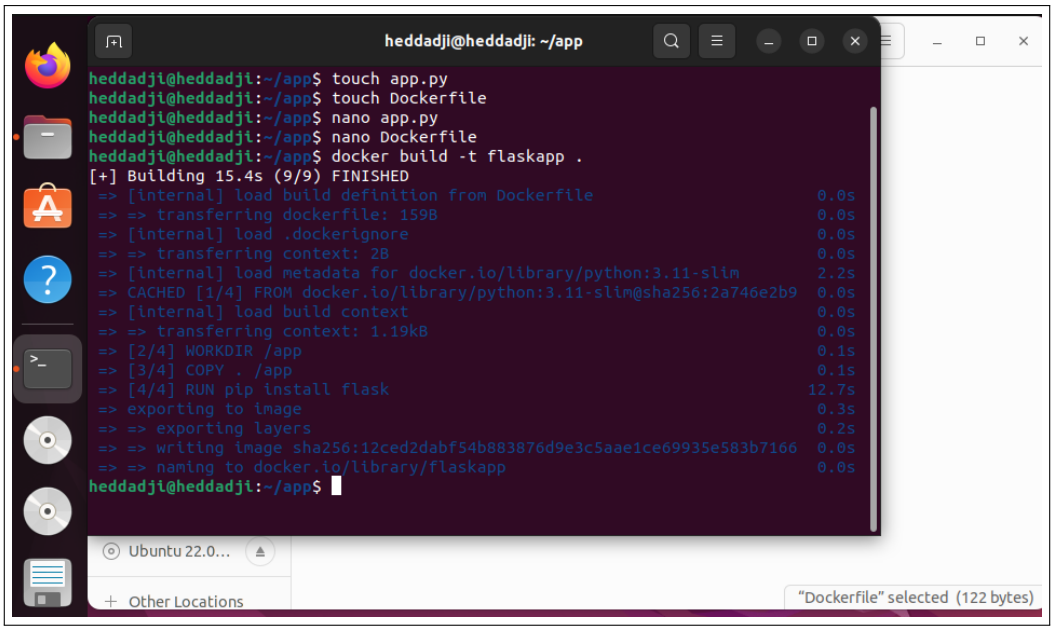
Flask file : app.py

```

    from flask import Flask, render_template_string

    app = Flask(__name__)

    @app.route('/')
    def hello_world():
        html_content = """
        <!DOCTYPE html>
        <html lang="en">
        <head>
            <meta charset="UTF-8">
            <meta http-equiv="X-UA-Compatible" content="IE=edge">
```

```
            <meta name="viewport" content="width=device-width, initial-scale=1.0">
            <title>Mon Premier Conteneur</title>
            <style>
                body {
                    font-family: Arial, sans-serif;
                    background-color: #f4f4f4;
                    text-align: center;
                    margin: 100px;
                }
                h1 {
                    color: #333;
                }
            </style>
        </head>
        <body>
            <h1>Mon Premier Conteneur</h1>
            <p>Test successful!</p>
            <p> Done by : Heddadji and Soltani SIQ2 VCL module </p>
        </body>
        </html>
        """
        return render_template_string(html_content)

    if __name__ == '__main__':
        app.run(host='0.0.0.0', port=8081)

.
```

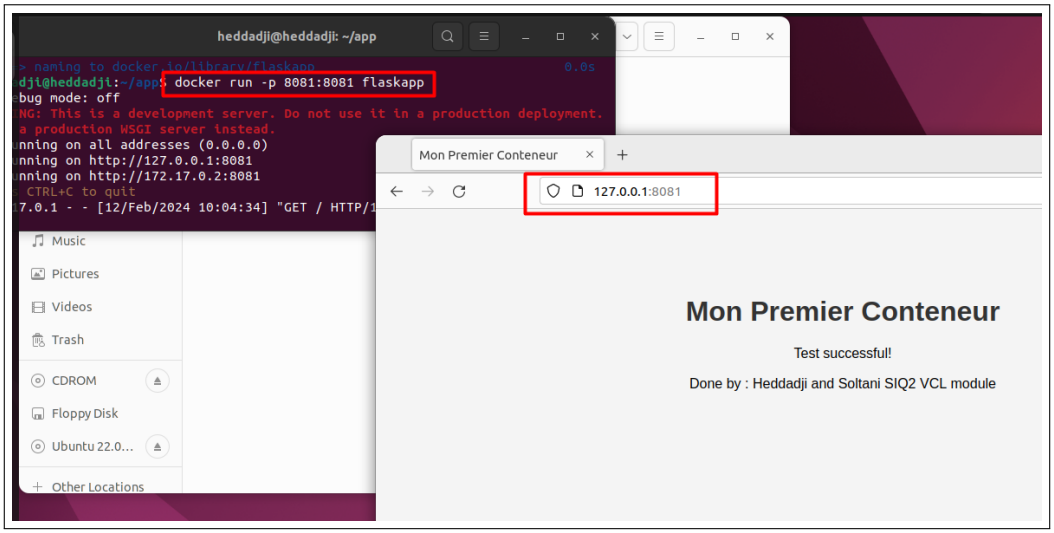
Dockerfile

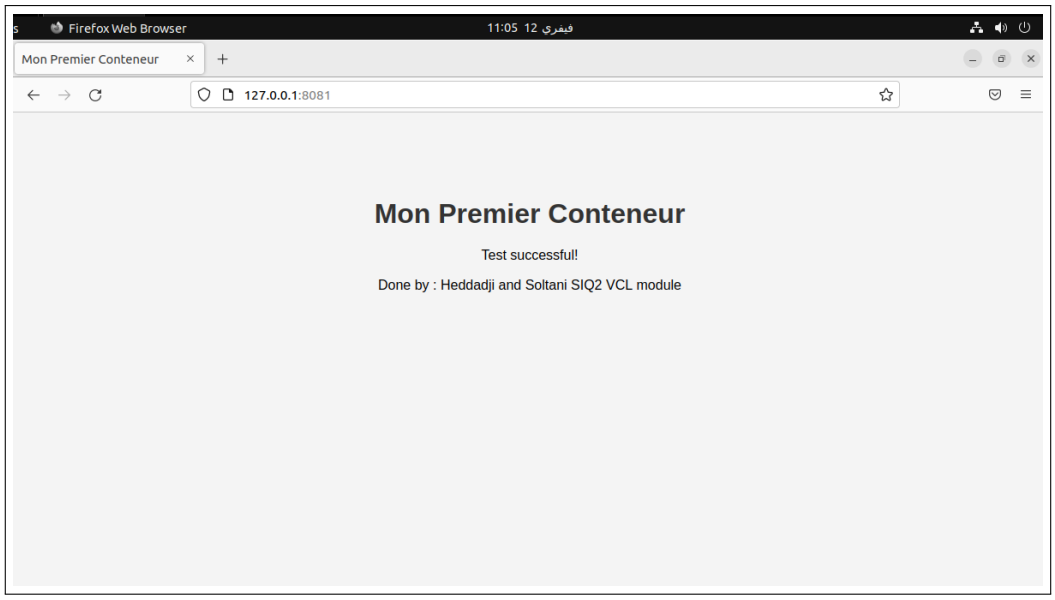
```

    FROM python:3.11-slim

    WORKDIR /app

    COPY . /app

    RUN pip install flask

    CMD ["flask", "run", "--host=0.0.0.0", "--port=8081"]

.
```



5.1. Building and Running the Docker Image

```
cd lab
// . : current dir
docker build -t flaskapp .
docker run -p 8081:8081 flaskapp
#Acess in http://localhost:8081
.
```





5.2. Hosting the Docker image to Docker Hub

1. **Create a Docker Hub Account:** `https://hub.docker.com/`.
2. **Login to Docker Hub:**

```
docker login

```

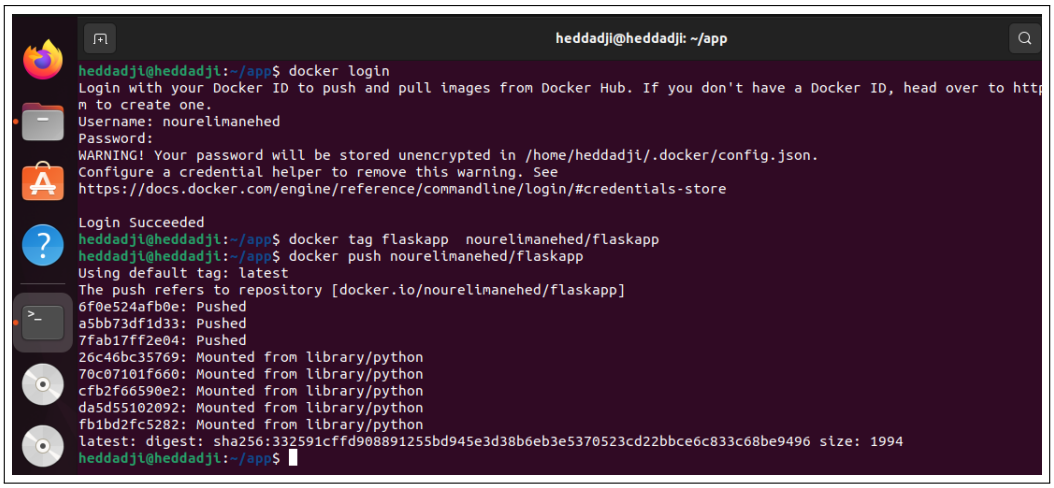
   Enter your Docker Hub username and password when prompted.

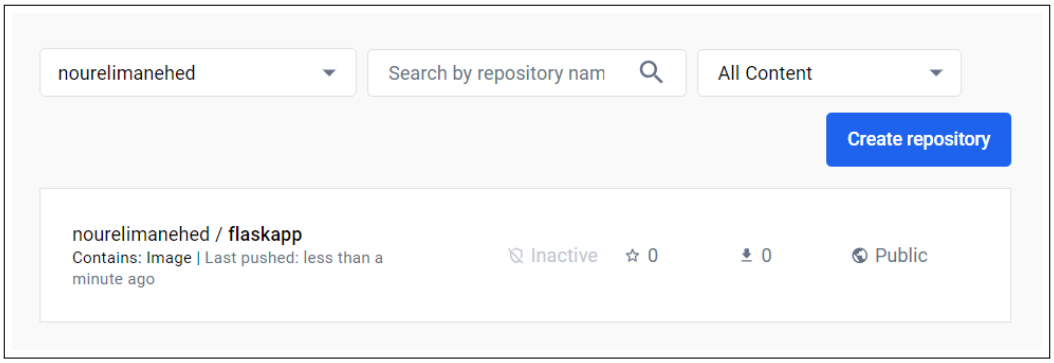
3. **Tag your Docker Image:** with Docker Hub username and the desired repository name.

```
docker tag flaskapp your-username/repository-name

```

4. **Push the Docker Image:**

```
docker push your-username/repository-name

```


heddadji@heddadji: ~/app
heddadji@heddadji:~/app$ docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to http
m to create one.
Username: nourelimanehed
Password:
WARNING! Your password will be stored unencrypted in /home/heddadji/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store
Login Succeeded
heddadji@heddadji:~/app$ docker tag flaskapp nourelimanehed/flaskapp
heddadji@heddadji:~/app$ docker push nourelimanehed/flaskapp
Using default tag: latest
The push refers to repository [docker.io/nourelimanehed/flaskapp]
6f0e524afb0e: Pushed
a5bb73df1d33: Pushed
7fab17ff2e04: Pushed
26c46bc35769: Mounted from library/python
70c07101f660: Mounted from library/python
cfb2f66590e2: Mounted from library/python
da5d55102092: Mounted from library/python
fb1bd2fc5282: Mounted from library/python
latest: digest: sha256:332591cffd908891255bd945e3d38b6eb3e5370523cd22bbce6c833c68be9496 size: 1994
heddadji@heddadji:~/app$


nourelimanehed
Search by repository nam
All Content
Create repository
nourelimanehed / flaskapp
Contains: Image | Last pushed: less than a minute ago
Inactive
0
0
Public