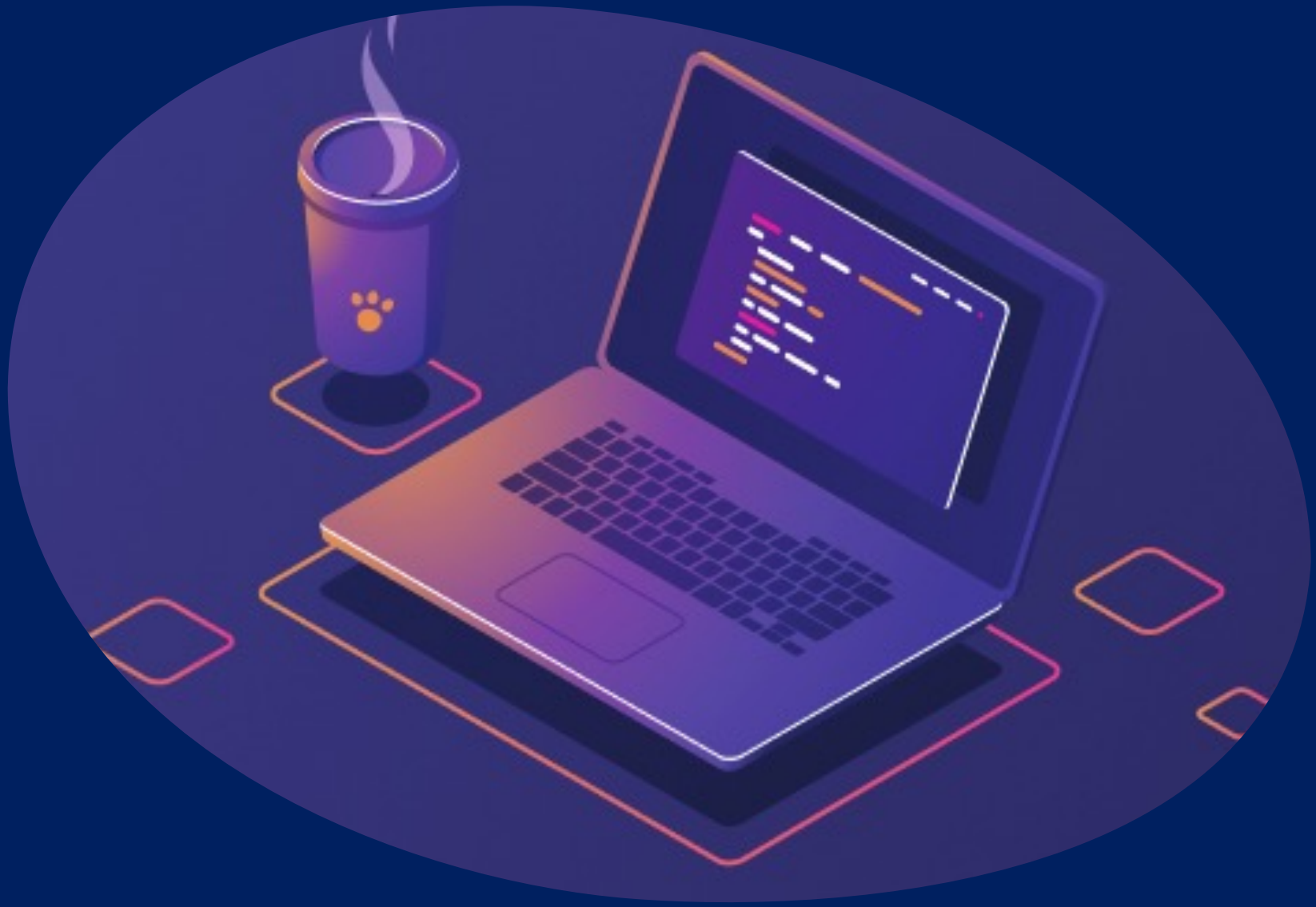
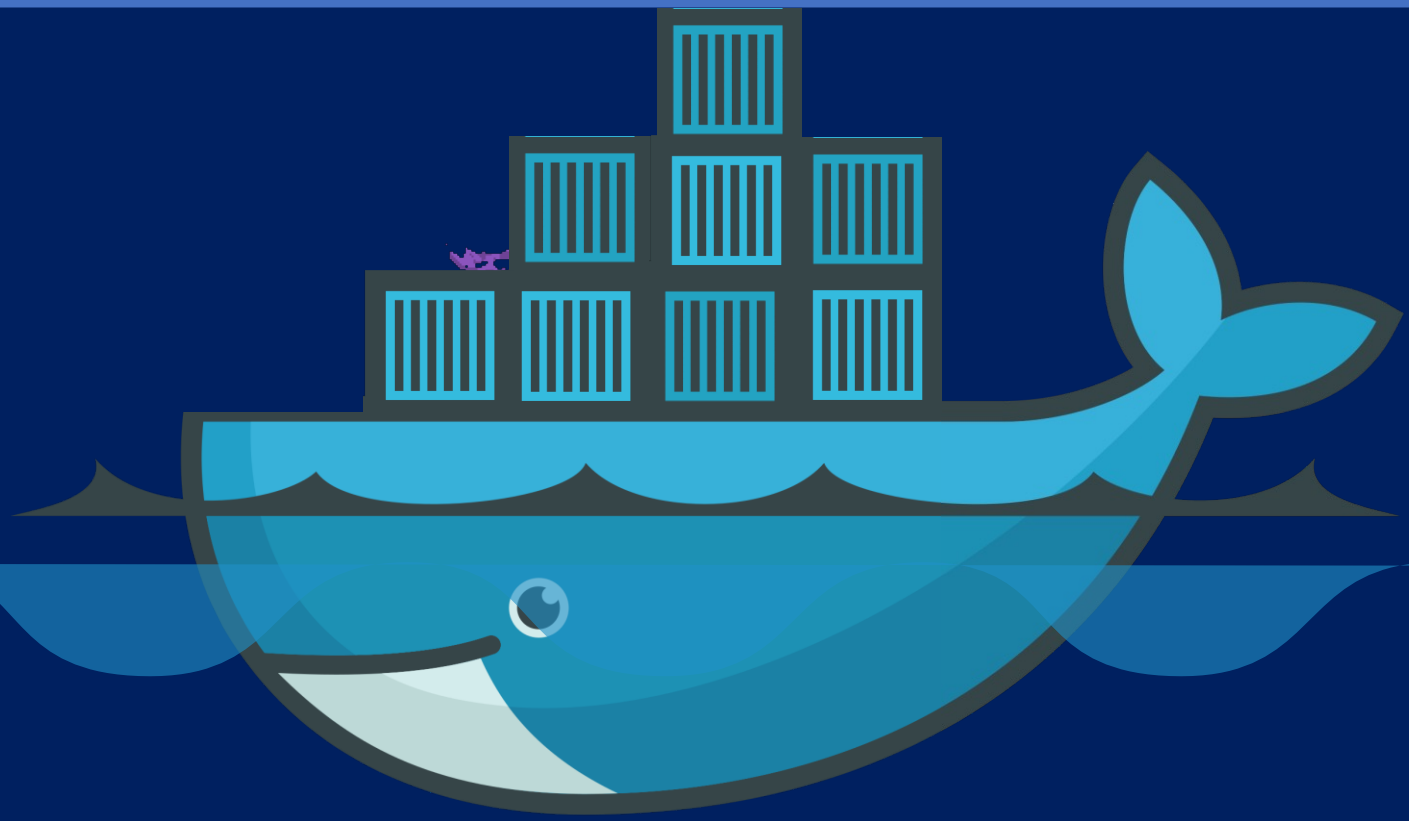


Week 9 : SOFTWARE DEVELOPMENT TOOLS AND ENVIRONMENTS

Docker Command



ps – list containers

```
docker ps
```

```
CONTAINER ID   IMAGE   COMMAND                  CREATED          STATUS          PORTS     NAMES
796856ac413d   nginx   "nginx -g 'daemon of…"   7 seconds ago    Up 6 seconds    80/tcp    silly_sammet
```

```
docker ps -a
```

```
CONTAINER ID   IMAGE   COMMAND                  CREATED          STATUS                      NAMES
796856ac413d   nginx   "nginx -g 'daemon of…"   7 seconds ago    Up 6 seconds                silly_sammet
cff8ac918a2f   redis   "docker-entrypoint.s…"   6 seconds ago    Exited (0) 3 seconds ago    relaxed_aryabhata
```

STOP – stop a container

```
docker ps
```

```
CONTAINER ID   IMAGE   COMMAND                  CREATED          STATUS          PORTS     NAMES
796856ac413d   nginx   "nginx -g 'daemon of…"   7 seconds ago    Up 6 seconds    80/tcp    silly_sammet
```

```
docker stop silly_sammet
```

```
silly_sammet
```

```
docker ps -a
```

```
CONTAINER ID   IMAGE     COMMAND                  CREATED          STATUS                      NAMES
796856ac413d   nginx     "nginx -g 'daemon of…"   7 seconds ago    Exited (0) 3 seconds ago    silly_sammet
cff8ac918a2f   redis     "docker-entrypoint.s…"   6 seconds ago    Exited (0) 3 seconds ago    relaxed_aryabhata
```

To stop all running containers

```
docker stop  $(docker ps -aq)
```

docker ps -aq lists all container IDs on the Docker host, whether they are running or stopped.

Rm – Remove a container

```
docker rm silly_sammet
```

```
silly_sammet
```

```
docker ps -a
```

```
CONTAINER ID   IMAGE     COMMAND                  CREATED              STATUS                          NAMES
cff8ac918a2f   redis     "docker-entrypoint.s…"   6 seconds ago        Exited (0) 3 seconds ago        relaxed_aryabhata
```

To delete all containers

```
docker rm  $(docker ps -aq)
```

This command uses the docker ps command with the -aq flags to list all running and stopped containers in your system, and then passes the list of container IDs to the docker rm command to remove them all.

```
docker container prune -f
```

This command will remove all stopped containers, including their networks and volumes.
The --force flag is used to skip the confirmation prompt and delete the containers directly.

images – List images

```
docker images
```

```
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
nginx               latest              f68d6e55e065        4 days ago          109MB
redis               latest              4760dc956b2d        15 months ago       107MB
ubuntu              latest              f975c5035748        16 months ago       112MB
alpine              latest              3fd9065eaf02        18 months ago       4.14MB
```

rmi – Remove images

```
docker rmi nginx
```

```
Untagged: nginx:latest
Untagged: nginx@sha256:96fb261b66270b900ea5a2c17a26abbfabe95506e73c3a3c65869a6dbe83223a
Deleted: sha256:f68d6e55e06520f152403e6d96d0de5c9790a89b4cfc99f4626f68146fa1dbdc
Deleted: sha256:1b0c768769e2bb66e74a205317ba531473781a78b77feef8ea6fd7be7f4044e1
Deleted: sha256:34138fb60020a180e512485fb96fd42e286fb0d86cf1fa2506b11ff6b945b03f
Deleted: sha256:cf5b3c6798f77b1f78bf4e297b27cfa5b6caa982f04caeb5de7d13c255fd7a1e
```

! Delete all dependent containers to remove image

To delete all images

```
docker rmi -f $(docker images -aq)
```

To clean up unused images.

```
docker image prune -f
```

LAB 1 :

Create two containers with the names "mycontainer1" and "mycontainer2" and "mycontainer3":

```
docker run -d --name mycontainer1 nginx:latest
docker run -d --name mycontainer2 mysql:latest
docker run -d --name mycontainer3 redis:latest
```

List all running containers:

```
docker ps -a
```

Stop the container with the name "mycontainer1":

```
docker stop mycontainer1
```

Remove the container with the name "mycontainer1":

```
docker rm mycontainer1
```

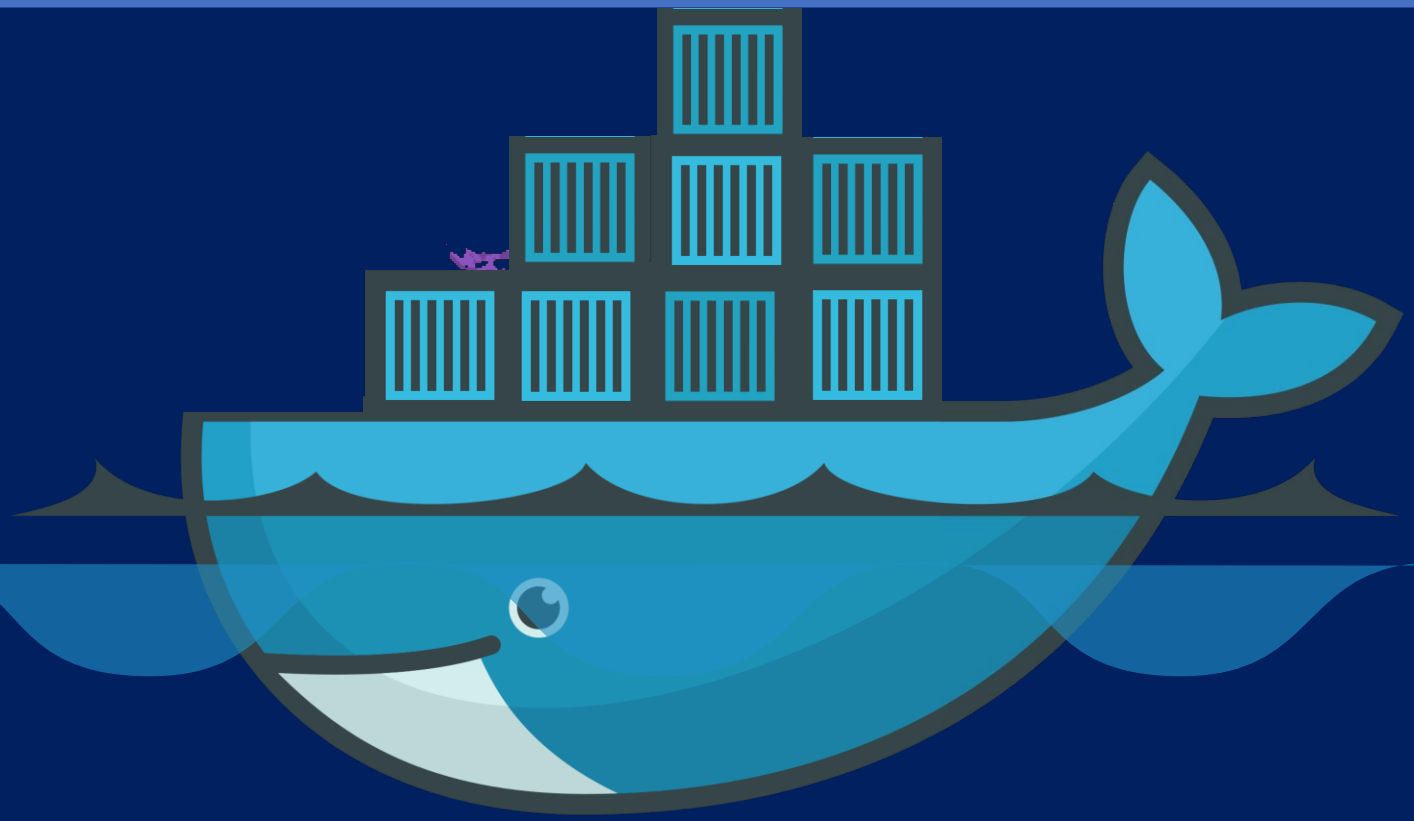
Stop all running containers:

```
docker stop $(docker ps -a -q)
```

Remove all containers

```
docker rm $(docker ps -a -q)
```

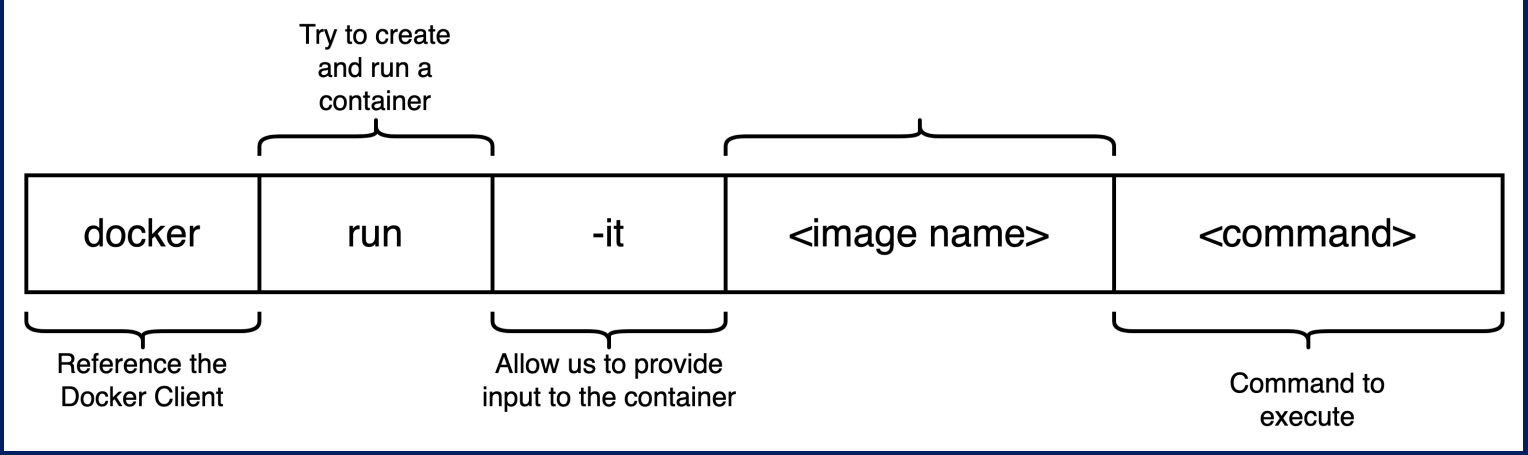
More Docker run and Docker exec



Run – stdin

```
docker pull ubuntu
docker run –it  ubuntu  sh
```

```
# ls
bin   dev  home  media  opt   root  sbin  sys  usr
boot  etc  lib   mnt    proc  run   srv   tmp  var
# echo hello world
hello world
#
```



Run – attach and detach

docker run -d --name lab nginx

```
latest: Pulling from library/nginx
66dbba0fb1b5: Pull complete
6a4b1f0b5a90: Pull complete
16ea4daad357: Pull complete
646b2422838c: Pull complete
c6036fb71e57: Pull complete
dc0e78f15ad0: Pull complete
Digest: sha256:aa0afebbb3cfa473099a62c4b32e9b3fb73ed23f2a75a65ce1d4b4f55a5c2ef2
Status: Downloaded newer image for nginx:latest
252b74d97da0dd09d01cc50358ea86766894ba016dc8c03d22a01399d4298eb6
```

docker run --name lab nginx

```
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
66dbba0fb1b5: Pull complete
6a4b1f0b5a90: Pull complete
16ea4daad357: Pull complete
646b2422838c: Pull complete
c6036fb71e57: Pull complete
dc0e78f15ad0: Pull complete
2023/03/10 03:40:11 [notice] 1#1: start worker processes
2023/03/10 03:40:11 [notice] 1#1: start worker process 29
2023/03/10 03:40:11 [notice] 1#1: start worker process 30
2023/03/10 03:40:11 [notice] 1#1: start worker process 31
2023/03/10 03:40:11 [notice] 1#1: start worker process 32
2023/03/10 03:40:11 [notice] 1#1: start worker process 33
```

Run – tag

```
docker run redis
```

```
Using default tag: latest
latest: Pulling from library/redis
f5d23c7fed46: Pull complete
Status: Downloaded newer image for  redis:latest

1:C 31 Jul 2019 09:02:32.624 # o000o000o000o Redis is starting o000o000o000o
1:C 31 Jul 2019 09:02:32.624 #  Redis version=5.0.5, bits=64, commit=00000000, modified=0,  pid=1, just started
1:M 31 Jul 2019 09:02:32.626 # Server initialized
```

```
docker run redis:4.0
```

TAG

```
Unable to find image 'redis:4.0' locally
4.0: Pulling from library/redis
e44f086c03a2: Pull complete
Status: Downloaded newer image for redis:4.0

1:C 31 Jul 09:02:56.527 # o000o000o000o Redis is starting o000o000o000o
1:C 31 Jul 09:02:56.527 # Redis version=4.0.14, bits=64, commit=00000000, modified=0, pid=1, just started
1:M 31 Jul 09:02:56.530 # Server initialized
```

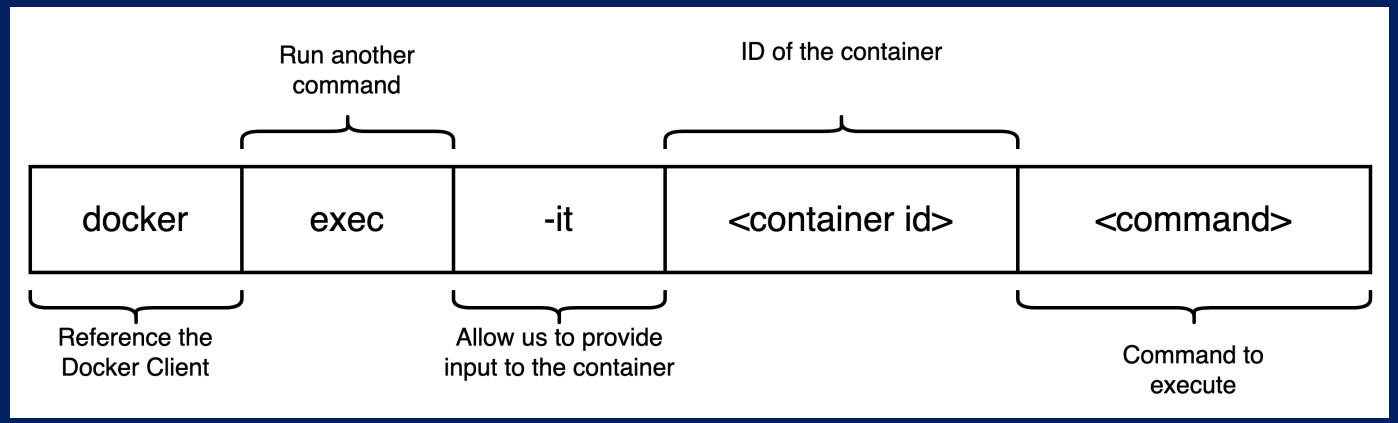
Exec– execute a command

```
docker ps -a
```

```
CONTAINER ID        IMAGE     COMMAND       CREATED             STATUS              NAMES
538d037f94a7        ubuntu    "sleep 100“   6 seconds ago       Up 4 seconds        distracted_mcclintock
```

```
docker exec distracted_mcclintock cat /etc/hosts
```

```
127.0.0.1       localhost
::1     localhost ip6-localhost ip6-loopback
fe00::0 ip6-localnet
ff00::0 ip6-mcastprefix
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
172.18.0.2      538d037f94a7
```



Inspect Container

```
docker inspect blissful_hopper
```


```
[
    {
        "Id": "35505f7810d17291261a43391d4b6c0846594d415ce4f4d0a6ffbf9cc5109048",
        "Name": "/blissful_hopper",
        "Path": "python",
        "Args": [
            "app.py"
        ],
        "State": {
            "Status": "running",
            "Running": true,
        },

        "Mounts": [],
        "Config": {
           "Entrypoint": [
                "python",
                "app.py"
            ],
        },
        "NetworkSettings": {..}
      }
]
```

Container Logs

```
docker logs blissful_hopper
```

```
 This is a sample web application that displays a colored background.
 A color can be specified in two ways.

 1. As a command line argument with --color as the argument. Accepts one of
red,green,blue,blue2,pink,darkblue
2.  As an Environment variable APP_COLOR. Accepts one of
red,green,blue,blue2,pink,darkblue
 3. If none of the above then a random color is picked from the above list.
 Note: Command line argument precedes over environment variable.


No command line argument or environment variable. Picking a Random Color =blue
 * Serving Flask app "app" (lazy loading)
 * Environment: production
   WARNING: Do not use the development server in a production environment.
   Use a production WSGI server instead.
 * Debug mode: off
 * Running on http://0.0.0.0:8080/ (Press CTRL+C to quit)
```

LAB 2 :

2.1 Run – stdin

python Copy code

```
docker run -it ubuntu /bin/bash
```

คำสั่งดังกล่าวจะสร้าง Docker container จาก Ubuntu image และเปิด shell ของ Ubuntu ให้คุณสามารถเข้าถึงและใช้งานได้ทันที หากไม่มี Ubuntu image อยู่ในเครื่องของคุณ ระบบจะดาวน์โหลด Ubuntu image มาให้อัตโนมัติก่อนเริ่มทำงานใน Docker container นี้

2.2 Run – stdin with Dockerfile

git clone

```
git clone https://github.com/Tuchsanai/devpot_week9.git
cd  devpot_week9/Lab2
```

go to Directory

```
cd devpot_week9
```

build Docker image with docker build

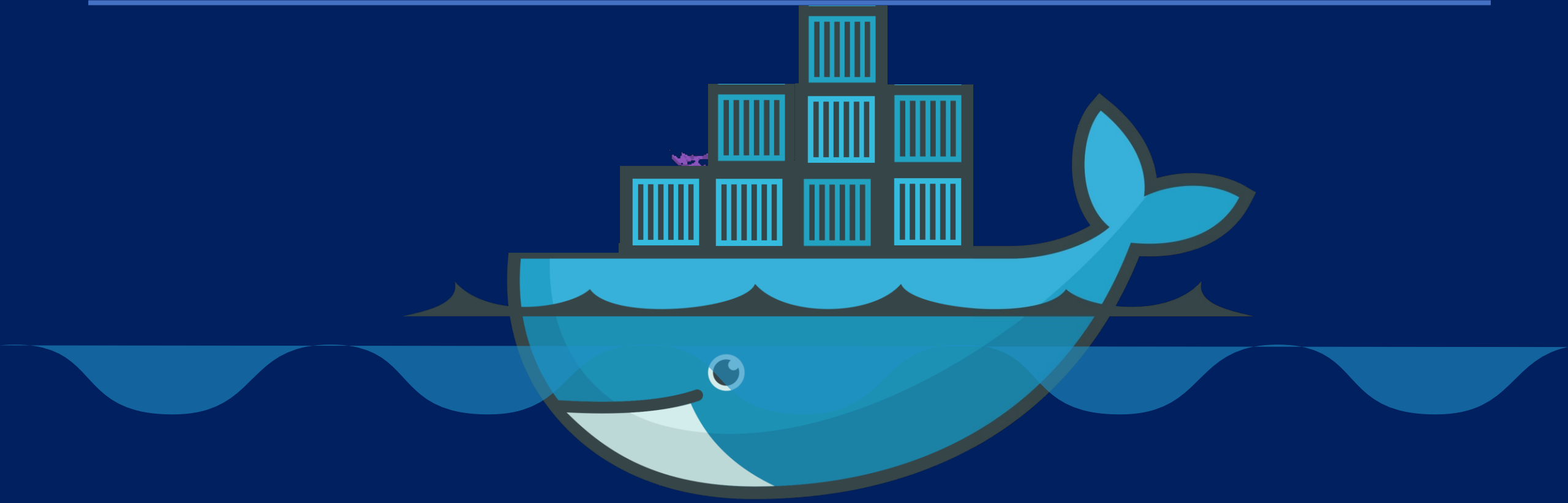
```
docker build -t myubuntu .
```

docker run with -it option

```
docker run -it myubuntu
```


```
FROM ubuntu
RUN apt-get update && apt-get install -y \
    git \
    wget
    ["/bin/bash"]
```

Docker Environment Varibles

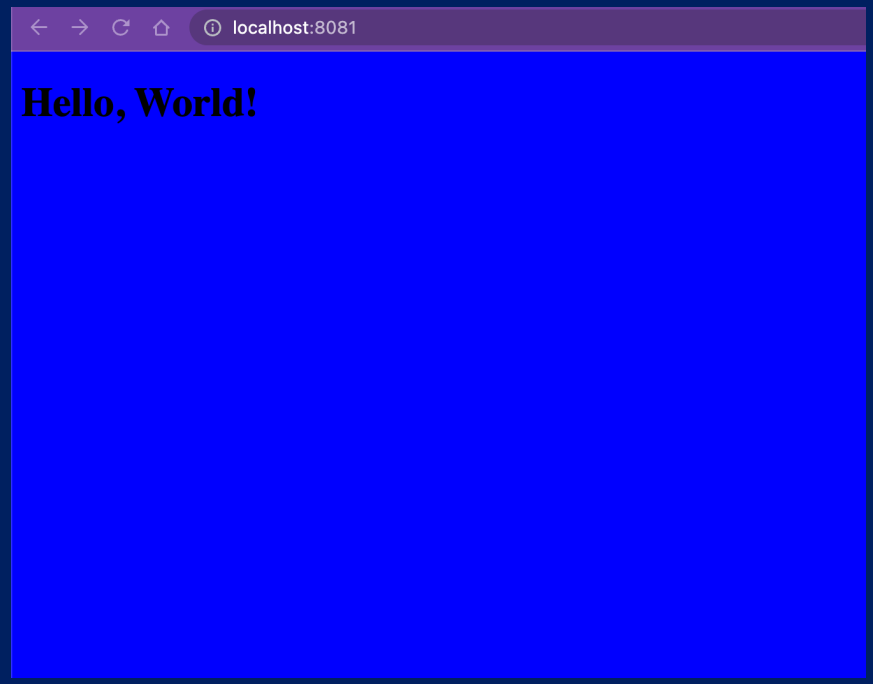


Flask

```python
import os
from flask import Flask, render_template

app = Flask(__name__,template_folder="")


@app.route('/')
def home():

    env_var_colour = os.environ['APP_COLOR']

    return render_template("index.html", color= env_var_colour)


@app.route('/<string:name>')
def template(name):
    return render_template("index.html", color=name)


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

index.html > html

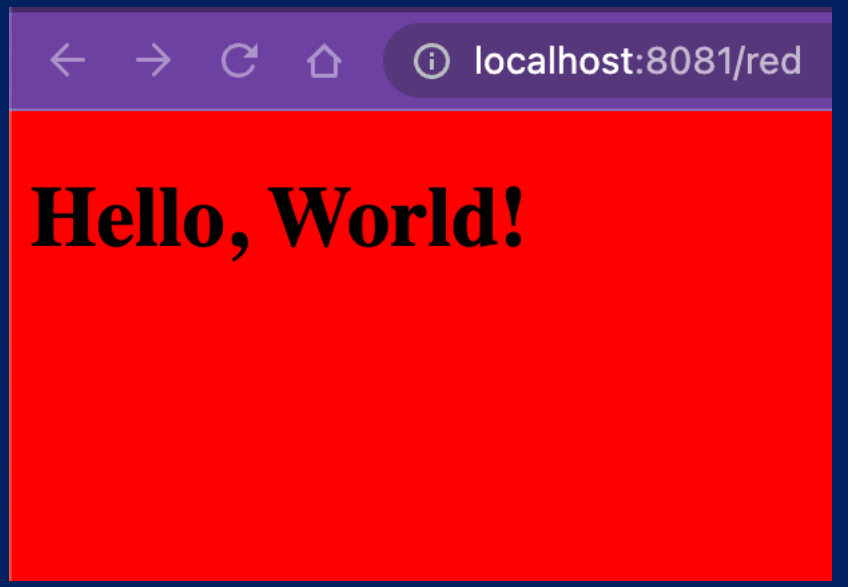
```html
<!DOCTYPE html>
<html>
<head>
    <title>Flask HTML Template</title>
    <style>
        body {
            background-color: {{ color }};
        }
    </style>
</head>
<body>
    <h1>Hello, World!</h1>
</body>
</html>
```

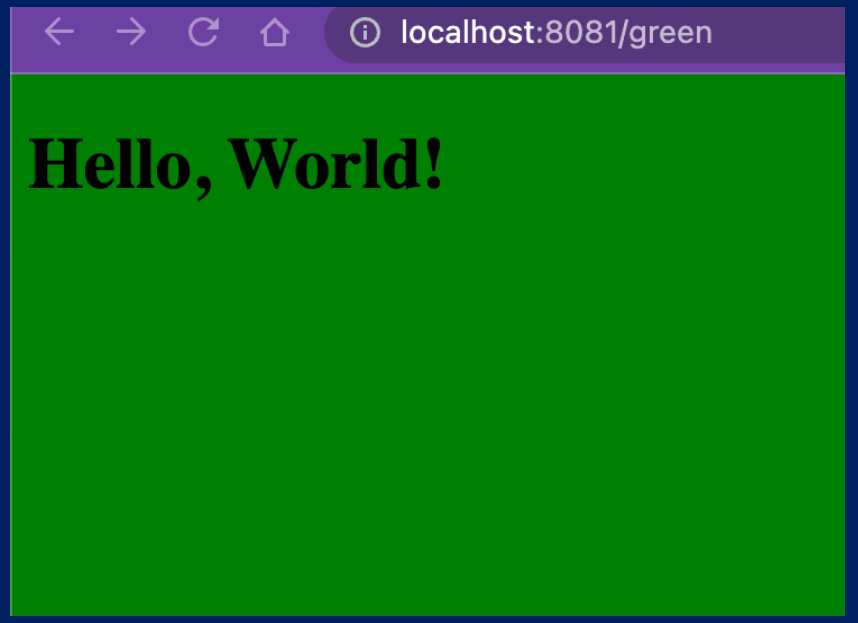


export APP_COLOR=blue; python app.py

```python
import os
from flask import Flask, render_template

app = Flask(__name__,template_folder="")


@app.route('/')
def home():

    env_var_colour = os.environ['APP_COLOR']

    return render_template("index.html", color= env_var_colour)


@app.route('/<string:name>')
def template(name):
    return render_template("index.html", color=name)


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

```
export APP_COLOR=blue; python app.py
```





```
docker build -t flask-docker-app .
```

Lab3
- app.py
- Dockerfile
- index.html
- requirements.txt

Lab3 > requirements.txt

```
1  flask
2
```

Lab3 > Dockerfile > ...

```
1  FROM python:3.8-alpine
2
3  WORKDIR /app
4  COPY requirements.txt requirements.txt
5  COPY . .
6
7  RUN pip install -r requirements.txt
8  EXPOSE 8081
9  CMD ["python", "app.py"]
```

ENV Variables in Docker

```
docker run -p 8081:8081 -e APP_COLOR=red flask-docker-app
```

```
docker run -p 8081:8081 -e APP_COLOR=green flask-docker-app
```

docker inspect flask-docker-app


```
[
    {
        "Id": "sha256:2b702818c295561f3ab6cd973da54cdafcc9d55df29ccb9a0206fa04571558d8",
        "RepoTags": [
            "flask-docker-app:latest"
        ],
        "RepoDigests": [],
        "Parent": "",
        "Comment": "buildkit.dockerfile.v0",
        "Created": "2023-03-10T08:38:08.766249342Z",
        "Container": "",
        "ContainerConfig": {
            "Hostname": "",
            "Domainname": "",
            "User": "",
},
        "DockerVersion": "",
        "Author": "",
        "Config": {
            "Hostname": "",
            "Domainname": "",
            "User": "",
"ExposedPorts": {
                "8081/tcp": {}
            },
            "Tty": false,
            "OpenStdin": false,
            "StdinOnce": false,
            "Env": [
                "PATH=/usr/local/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin",
                "LANG=C.UTF-8",
                "GPG_KEY=E3FF2839C048B25C084DEBE9B26995E310250568",
                "PYTHON_VERSION=3.8.16",
                "PYTHON_PIP_VERSION=22.0.4",
                "PYTHON_SETUPTOOLS_VERSION=57.5.0",
                "PYTHON_GET_PIP_URL=https://github.com/pypa/get-pip/raw/d5cb0afaf23b8520f1bbcfed521017b4a95f5c01/public/get-pip.py",
                "PYTHON_GET_PIP_SHA256=394be00f13fa1b9aaa47e911bdb59a09c3b2986472130f30aa0bfaf7f3980637"
            ],
            "Cmd": [
                "python",
                "app.py"
            ],
            "ArgsEscaped": true,
            "Image": "",
            "Volumes": null,
            "WorkingDir": "/app",
            "Entrypoint": null,
            "OnBuild": null,
            "Labels": null
        },
        "Architecture": "arm64",
        "Variant": "v8",
        "Os": "linux",
        "Size": 63796317,
        "VirtualSize": 63796317,
        "GraphDriver": {
            "Data": {
},
            "Name": "overlay2"
        },
        "RootFS": {
            "Type": "layers",
            "Layers": [
                "sha256:edf70074bd40c0b1216367c29c18d453b43cc69e5123268ba66dd45d86a9e8a8",
",
                "sha256:3f41e4baa3422c67da82b3e986cf3838faec79b4e802924e22ff8c3076892ace",
                "sha256:8beee477711ab384d9ba02beb52a2eaab3f25997dabdb92b64f0543c8a6edf07"
            ]
        },
        "Metadata": {
            "LastTagTime": "2023-03-10T08:38:08.836492133Z"
        }
    }
]
```

LAB 3 :

```
git clone https://github.com/Tuchsanai/devpot_week9.git
```

go to Directory

```
cd devpot_week9/Lab3
```

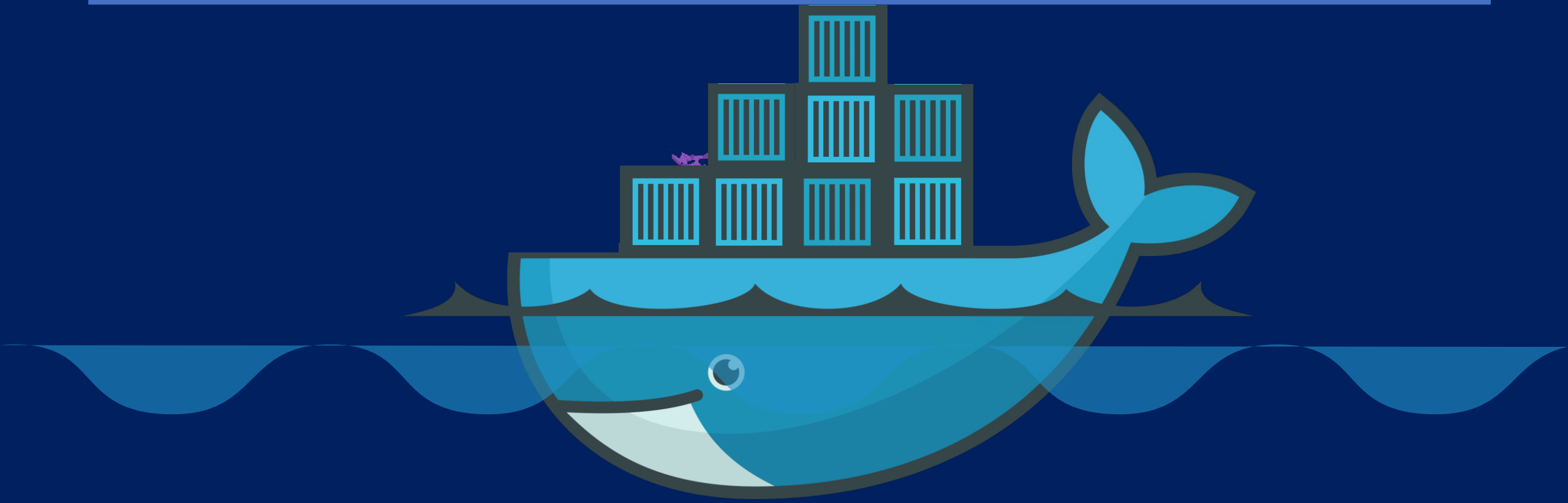
build Docker image with docker build

```
docker build -t flask-docker-app .
```

docker run with -it option

```
docker run -p 8081:8081 -d --name container_red  -e APP_COLOR=red flask-docker-app
docker run -p 8085:8081 -d --name container_green  -e APP_COLOR=green flask-docker-app
```

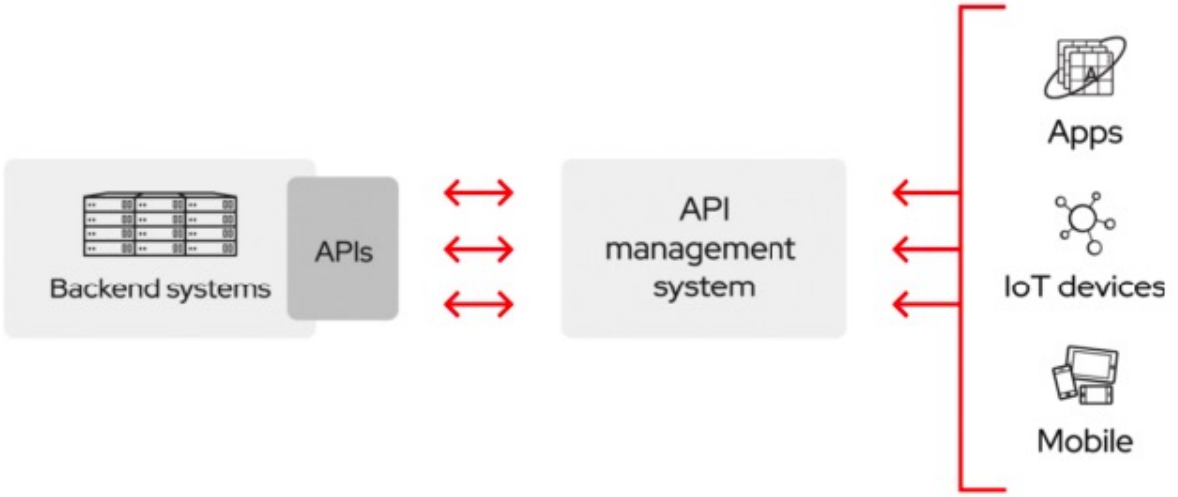
Docker Play with FAST-API



What is an API?

API (Application Programming Interface) creates an entry point for an application, through HTTP requests.

API: Application Abstraction + Simplification of Third Party Integration



Status codes and HTTP methods

HTTP methods

- **GET**: retrieve an existing resource (read only)
- **POST**: Create a new resource/send information
- **PUT**: Update an existing resource
- **PATCH**: partially update an existing resource
- **DELETE**: Delete a resource

HTTP status code

- **2xx**: Successful operation
- **3xx**: Redirect
- **4xx**: client error
- **5xx**: Server Error

Query Parameters

bash Copy code

```
https://example.com/blog/post?id=5678&author=john
```

In this example, the query parameter "id" has a value of "5678", which is the ID of the blog post being displayed on the page, and the query parameter "author" has a value of "john", which is the author of the post.

javascript Copy code

```
https://example.com/reviews/movie?title=inception&rating=4.5
```

In this example, the query parameter "title" has a value of "inception", which is the title of the movie being reviewed, and the query parameter "rating" has a value of "4.5", which is the rating given to the movie.

bash Copy code

```
https://example.com/shop?category=electronics&page=2&sort=price_asc
```

In this example, the query parameter "category" has a value of "electronics", which is the category of products being displayed, the query parameter "page" has a value of "2", which is the page of results being displayed, and the query parameter "sort" has a value of "price_asc", which indicates that the results should be sorted by price in ascending order.

Path Parameters

javascript Copy code

```
https://example.com/users/john
```

In this example, "john" is the username of the user whose profile is being displayed, and "users" is the path parameter that specifies the endpoint for user profiles.

javascript Copy code

```
https://example.com/products/electronics
```

In this example, "electronics" is the name of the category being displayed, and "products" is the path parameter that specifies the endpoint for product categories.

javascript Copy code

```
https://example.com/news/1234
```

In this example, "1234" is the ID of the article being displayed, and "news" is the path parameter that specifies the endpoint for news articles.

Request Body

1. A POST request to create a new user account:

bash — Copy code

```
POST /users HTTP/1.1
Host: example.com
Content-Type: application/json

{
    "username": "john",
    "password": "password123",
    "email": "john@example.com"
}
```

In this example, the request body contains JSON data that includes the username, password, and email address of the new user account being created.

2. A PUT request to update an existing user profile:

bash — Copy code

```
PUT /users/john HTTP/1.1
Host: example.com
Content-Type: application/json

{
    "email": "john.new@example.com",
    "bio": "I am a software engineer"
}
```

In this example, the request body contains JSON data that includes the updated email address and bio information for the user profile being updated.

3. A POST request to submit a contact form:

makefile — Copy code

```
POST /contact HTTP/1.1
Host: example.com
Content-Type: application/x-www-form-urlencoded

name=John&email=john@example.com&message=Hello%20world
```

In this example, the request body contains form data that includes the name, email address, and message entered by the user in the contact form.

4. A PATCH request to partially update an existing resource:

bash — Copy code

```
PATCH /books/1234 HTTP/1.1
Host: example.com
Content-Type: application/json-patch+json

[
    { "op": "replace", "path": "/title", "value": "The Great Gatsby" },
    { "op": "add", "path": "/author", "value": "F. Scott Fitzgerald" }
]
```

In this example, the request body contains JSON data that includes a JSON Patch document specifying the changes to be made to the book resource with ID 1234.

Fast API Basics

Basic function

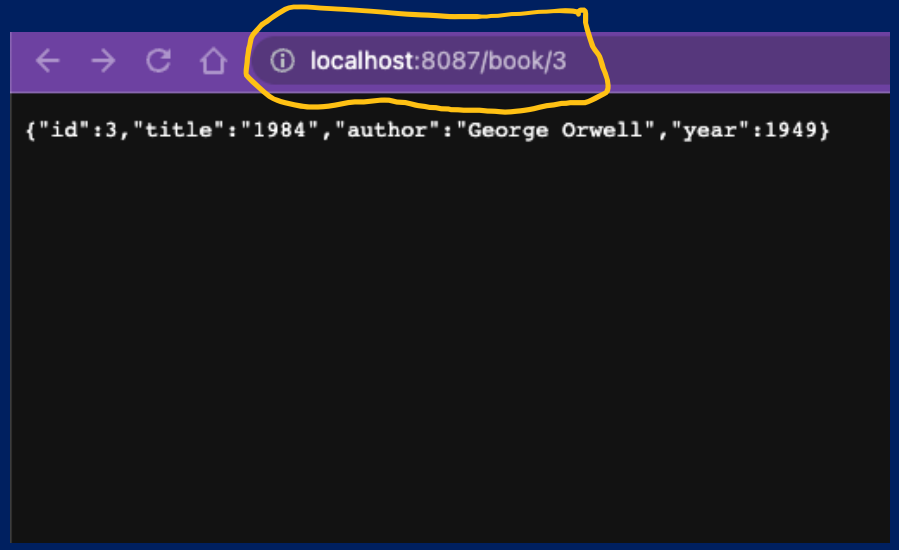
```
import uvicorn
from fastapi import FastAPI

app = FastAPI()

@app.get("/")
def home():
    return {"Hello": "World"}

if __name__ == "__main__":
    uvicorn.run("hello_world_fastapi:app")
```

Methods

```
@app.get("/")
def home():
return {"Hello": "GET"}

@app.post("/")
def home_post():
return {"Hello": "POST"}
```

Path Parameters

```python
from fastapi import FastAPI
from pydantic import BaseModel

app = FastAPI()


# Assuming the book data is stored as a list of 10 dictionaries
books = [
    {"id": 1, "title": "The Great Gatsby", "author": "F. Scott Fitzgerald", "year": 1925},
    {"id": 2, "title": "To Kill a Mockingbird", "author": "Harper Lee", "year": 1960},
    {"id": 3, "title": "1984", "author": "George Orwell", "year": 1949},
    {"id": 4, "title": "Brave New World", "author": "Aldous Huxley", "year": 1932},
    {"id": 5, "title": "The Catcher in the Rye", "author": "J.D. Salinger", "year": 1951},
    {"id": 6, "title": "Pride and Prejudice", "author": "Jane Austen", "year": 1813},
    {"id": 7, "title": "The Hobbit", "author": "J.R.R. Tolkien", "year": 1937},
    {"id": 8, "title": "The Lord of the Rings", "author": "J.R.R. Tolkien", "year": 1954},
    {"id": 9, "title": "The Hitchhiker's Guide to the Galaxy", "author": "Douglas Adams", "year": 1979},
    {"id": 10, "title": "The Shining", "author": "Stephen King", "year": 1977},
]

@app.get("/book/{book_id}")
async def get_book(book_id: int):
    return books[book_id-1]
```




```dockerfile
FROM python:3.9-slim-buster

WORKDIR /app

COPY requirements.txt .
RUN pip install -r requirements.txt

COPY . .

CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "80"]
```

build Docker image with docker build

```
docker build -t fastapi-docker .
```

Run the Docker container by executing the following command:

```
docker run -p 8087:80 fastapi-docker
```

```python
book_id      = 3
url_base     = "http://localhost:8087"
url          = f"{url_base}/book/{book_id}"

response = requests.get(url)
if response.status_code == 200:
    data = response.json()
    print(data)
else:
    print("Error:", response.status_code, response.json())
```

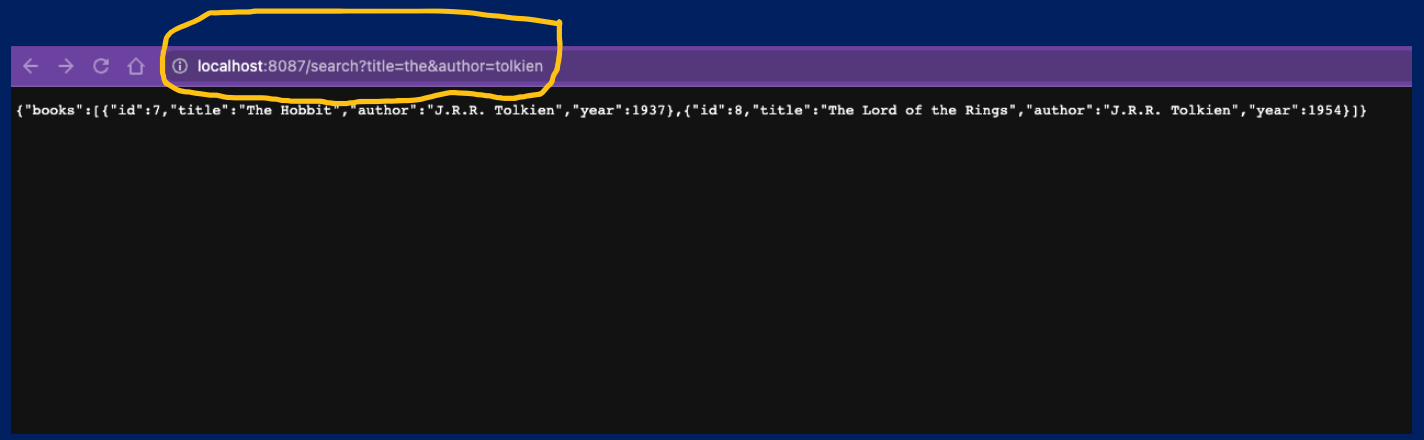
✓ 0.0s

```
{'id': 3, 'title': '1984', 'author': 'George Orwell', 'year': 1949}
```

Query Parameters

```python
from fastapi import FastAPI,Query

from pydantic import BaseModel

app = FastAPI()


# Assuming the book data is stored as a list of 10 dictionaries
books = [
    {"id": 1, "title": "The Great Gatsby", "author": "F. Scott Fitzgerald", "year": 1925},
    {"id": 2, "title": "To Kill a Mockingbird", "author": "Harper Lee", "year": 1960},
    {"id": 3, "title": "1984", "author": "George Orwell", "year": 1949},
    {"id": 4, "title": "Brave New World", "author": "Aldous Huxley", "year": 1932},
    {"id": 5, "title": "The Catcher in the Rye", "author": "J.D. Salinger", "year": 1951},
    {"id": 6, "title": "Pride and Prejudice", "author": "Jane Austen", "year": 1813},
    {"id": 7, "title": "The Hobbit", "author": "J.R.R. Tolkien", "year": 1937},
    {"id": 8, "title": "The Lord of the Rings", "author": "J.R.R. Tolkien", "year": 1954},
    {"id": 9, "title": "The Hitchhiker's Guide to the Galaxy", "author": "Douglas Adams", "year": 1979},
    {"id": 10, "title": "The Shining", "author": "Stephen King", "year": 1977},
]
```

```python
# Quary parameters
@app.get("/search")
def search_books(title: str = Query(None), author: str = Query(None)):
    """
    Returns a list of books that match the search criteria.
    """
    # Filter the list of books by title and/or author
    books_filtered = books
    if title is not None:
        books_filtered = [b for b in books_filtered if title.lower() in b["title"].lower()]
    if author is not None:
        books_filtered = [b for b in books_filtered if author.lower() in b["author"].lower()]

    # Return the filtered list of books
    return {"books": books_filtered}
```




```python
import requests

url_base     = "http://localhost:8087"
url          = f"{url_base}/search"

params = {
    "title": "the",
    "author": "tolkien"
}

response = requests.get(url, params=params)
if response.status_code == 200:
    data = response.json()
    print(data)
else:
    print("Error:", response.status_code, response.json())
```

✓ 0.0s

```
{'books': [{'id': 7, 'title': 'The Hobbit', 'author': 'J.R.R. Tolkien', 'year': 1937}, {'id': 8, 'title': 'The Lord of the Rings', 'author': 'J.R.R. Tolkien', 'year': 1954}]}
```

LAB 4 : Path and Query Parameters

Clone

```
git clone https://github.com/Tuchsanai/devpot_week9.git
```

go to Directory

```
cd devpot_week9/Lab3
```

Next, create a new file called Dockerfile in the root of your project directory with the following contents:

```
FROM tiangolo/uvicorn-gunicorn-fastapi:python3.8

WORKDIR /app

COPY requirements.txt .
RUN pip install -r requirements.txt

COPY . .

CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "80"]
```

build Docker image with docker build

```
docker build -t fastapi-docker .
```

Run the Docker container by executing the following command:

```
docker run -p 8087:80 fastapi-docker
```

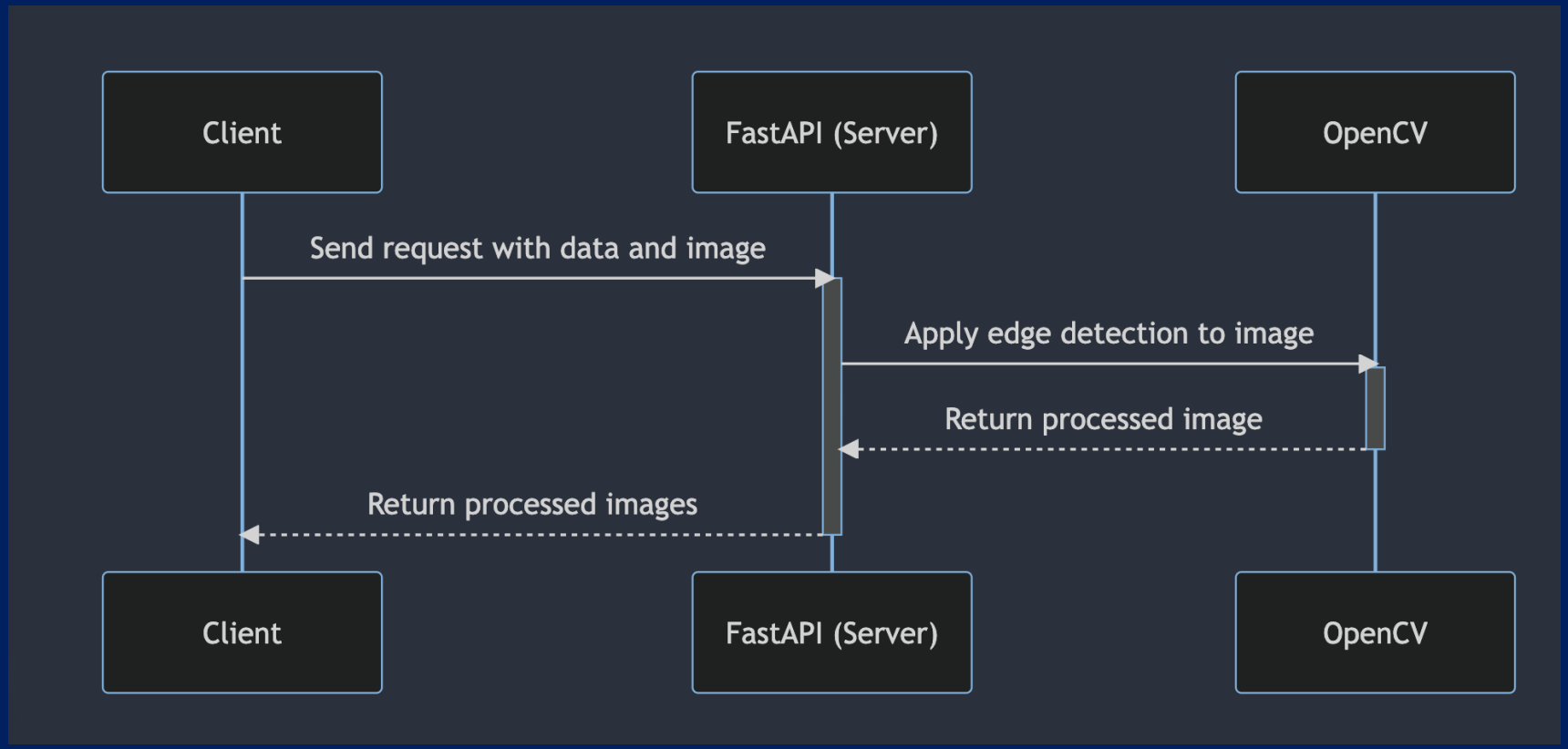
Test Path Parameters

1. With Python

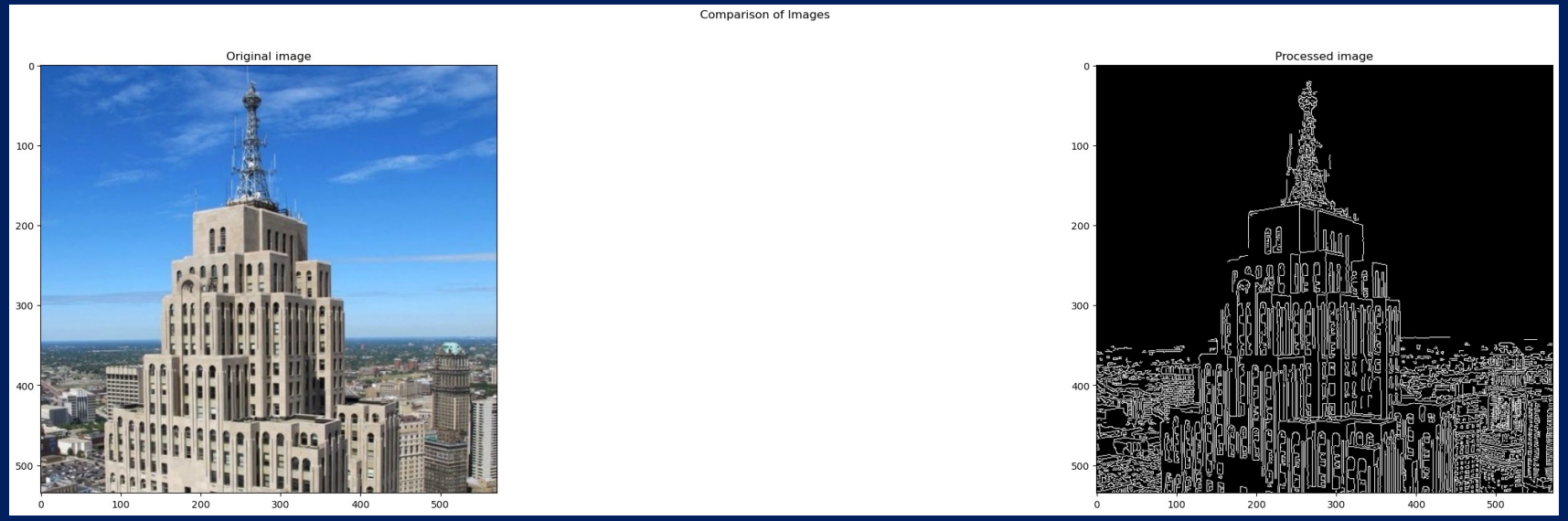
```
book_id      = 3
url_base     = "http://localhost:8087"
url          = f"{url_base}/book/{book_id}"

response = requests.get(url)
if response.status_code == 200:
    data = response.json()
    print(data)
else:
    print("Error:", response.status_code, response.json())
```

2. URL

```
http://localhost:8087/book/3
```



Application to image processing



FAST-API

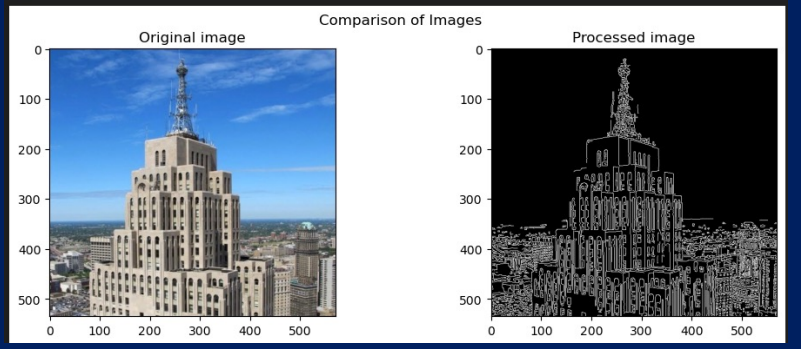
```python
import uvicorn
from fastapi import FastAPI
from pydantic import BaseModel
import numpy as np
import cv2
import base64

app = FastAPI()

class ImageRequest(BaseModel):
    image: str
    name: str
    surname: str
    numbers: List[int]


# encode image as base64 string
def encode_image(image):
    _, encoded_image = cv2.imencode(".jpg", image)
    return "" + base64.b64encode(encoded_image).decode()

# decode base64 string to image
def decode_image(image_string):
    encoded_data = image_string.split(',')[1]
    nparr = np.frombuffer(base64.b64decode(encoded_data), np.uint8)
    return cv2.imdecode(nparr, cv2.IMREAD_COLOR)

def apply_canny(image):
    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    edges = cv2.Canny(gray, 100, 200)
    return edges


@app.post("/process-image")
async def process_image(image_request: ImageRequest):
    image = decode_image(image_request.image)
    edges = apply_canny(image)
    processed_image = encode_image(edges)

    return {"name": image_request.name,
            "surname": image_request.surname,
            "numbers": image_request.numbers,
            "processed_image": processed_image}
```

Client

```python
import requests
import base64
import matplotlib.pyplot as plt
import numpy as np
import cv2


# encode image as base64 string
def encode_image(image):
    _, encoded_image = cv2.imencode(".jpg", image)
    return "" + base64.b64encode(encoded_image).decode()

# decode base64 string to image
def decode_image(image_string):
    encoded_data = image_string.split(',')[1]
    nparr = np.frombuffer(base64.b64decode(encoded_data), np.uint8)
    return cv2.imdecode(nparr, cv2.IMREAD_COLOR)



image_file = 'building.jpg'
url        = "http://localhost:8088"


# Load the image
image        = cv2.imread(image_file)
image        = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
image_string = encode_image(image)

payload = {
    "image": image_string,
    "name": "John",
    "surname": "Doe",
    "numbers": [1, 2, 3, 4, 5]
}

response = requests.post(f"{url}/process-image", json=payload)
data = json.loads(response.content)

processed_image_string = data["processed_image"]
processed_image        = decode_image(processed_image_string)
```

```python
# Create a figure and set the title
fig = plt.figure(figsize=(12, 4))
fig.suptitle('Comparison of Images')

# Add the first image to the left subplot
ax1 = fig.add_subplot(1, 2, 1)
ax1.imshow(image)
ax1.set_title('Original image')

# Add the second image to the right subplot
ax2 = fig.add_subplot(1, 2, 2)
ax2.imshow(processed_image)
ax2.set_title('Processed image')

# Show the plot
plt.show()
```

✓ 0.2s



LAB 5 :

```
docker run -p 8088:80 fastapi-docker_lab5
```

run client test

```
import requests
import base64
import matplotlib.pyplot as plt
import numpy as np
import cv2
import json


# encode image as base64 string
def encode_image(image):
    _, encoded_image = cv2.imencode(".jpg", image)
    return "" + base64.b64encode(encoded_image).decode()

# decode base64 string to image
def decode_image(image_string):
    encoded_data = image_string.split(',')[1]
    nparr = np.frombuffer(base64.b64decode(encoded_data), np.uint8)
    return cv2.imdecode(nparr, cv2.IMREAD_COLOR)



image_file = 'building.jpg'
url        = "http://localhost:8088"


# Load the image
image        = cv2.imread(image_file)
image        = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
image_string = encode_image(image)

payload = {
    "image": image_string,
    "name": "John",
    "surname": "Doe",
    "numbers": [1, 2, 3, 4, 5]
}

response = requests.post(f"{url}/process-image", json=payload)
data = json.loads(response.content)

processed_image_string = data["processed_image"]
processed_image        = decode_image(processed_image_string)
```