

Docker Capstone Project

By Satyam

Objective: Dockerize your existing FastAPI application and connect it to a Postgres/mysql database using Docker Compose. Create a Dockerfile for FastAPI, configure a Postgres/Mysql container with necessary environment variables, and set up networking in docker-compose.yml to enable communication between the two services. Test the setup by running both containers and ensuring the FastAPI app interacts correctly with Postgres/Mysql.

Dockerizing Fastapi application and connecting it to Postgres DB using Docker Compose.

```
E:\Docker\fastapiapp>docker compose up -d --build
time="2025-08-23T16:36:56+05:30" level=warning msg="E:\\Docker\\fastapiapp\\docker-compose.yml:
the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential
confusion"
#1 [internal] load local bake definitions
#1 reading from stdin 492B done
#1 DONE 0.0s

#2 [internal] load build definition from Dockerfile
#2 transferring dockerfile: 313B done
#2 DONE 0.0s

#3 [internal] load metadata for docker.io/library/python:3.10-slim
#3 ...

#4 [auth] library/python:pull token for registry-1.docker.io
#4 DONE 0.0s

#3 [internal] load metadata for docker.io/library/python:3.10-slim
#3 DONE 3.2s

#5 [internal] load .dockerignore
#5 transferring context: 2B done
#5 DONE 0.0s

#6 [1/5] FROM docker.io/library/python:3.10-
slim@sha256:420fbb0e468d3eaf0f7e93ea6f7a48792cbcad939d43ac95b96bee2afe4367da
#6 resolve docker.io/library/python:3.10-
slim@sha256:420fbb0e468d3eaf0f7e93ea6f7a48792cbcad939d43ac95b96bee2afe4367da 0.0s done
#6 DONE 0.0s

#7 [internal] load build context
#7 transferring context: 2.46kB done
#7 DONE 0.0s

#8 [2/5] WORKDIR /app
#8 CACHED

#9 [3/5] COPY requirements.txt .
#9 DONE 0.0s

#10 [4/5] RUN pip install --no-cache-dir --upgrade -r requirements.txt
#10 2.372 Collecting fastapi
#10 2.552   Downloading fastapi-0.116.1-py3-none-any.whl (95 kB)
#10 2.623   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 95.6/95.6 kB 1.3 MB/s eta 0:00:00
#10 2.734 Collecting uvicorn
#10 2.788   Downloading uvicorn-0.35.0-py3-none-any.whl (66 kB)
#10 2.799   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 66.4/66.4 kB 7.1 MB/s eta 0:00:00
#10 3.039 Collecting psycpg2-binary
#10 3.093   Downloading psycpg2_binary-2.9.10-cp310-cp310-
manylinux2_17_x86_64.manylinux2014_x86_64.whl (3.0 MB)
#10 3.364   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 3.0/3.0 MB 11.3 MB/s eta 0:00:00
#10 4.194 Collecting sqlalchemy
```

```
#10 4.250 Downloading sqlalchemy-2.0.43-cp310-cp310-
manylinux_2_17_x86_64.manylinux2014_x86_64.whl (3.2 MB)
#10 4.343 _____ 3.2/3.2 MB 40.4 MB/s eta 0:00:00
#10 4.469 Collecting typing-extensions>=4.8.0
#10 4.523 Downloading typing_extensions-4.14.1-py3-none-any.whl (43 kB)
#10 4.528 _____ 43.9/43.9 kB 76.8 MB/s eta 0:00:00
#10 4.630 Collecting starlette<0.48.0,>=0.40.0
#10 4.688 Downloading starlette-0.47.2-py3-none-any.whl (72 kB)
#10 4.693 _____ 73.0/73.0 kB 35.6 MB/s eta 0:00:00
#10 5.037 Collecting pydantic!=1.8,!<1.8.1,!<2.0.0,!<2.0.1,!<2.1.0,<3.0.0,>=1.7.4
#10 5.093 Downloading pydantic-2.11.7-py3-none-any.whl (444 kB)
#10 5.112 _____ 444.8/444.8 kB 27.9 MB/s eta 0:00:00
#10 5.199 Collecting click>=7.0
#10 5.254 Downloading click-8.2.1-py3-none-any.whl (102 kB)
#10 5.260 _____ 102.2/102.2 kB 70.2 MB/s eta 0:00:00
#10 5.324 Collecting h11>=0.8
#10 5.378 Downloading h11-0.16.0-py3-none-any.whl (37 kB)
#10 5.752 Collecting greenlet>=1
#10 5.808 Downloading greenlet-3.2.4-cp310-cp310-
manylinux_2_24_x86_64.manylinux_2_28_x86_64.whl (584 kB)
#10 5.829 _____ 584.4/584.4 kB 37.7 MB/s eta 0:00:00
#10 5.910 Collecting annotated-types>=0.6.0
#10 5.964 Downloading annotated_types-0.7.0-py3-none-any.whl (13 kB)
#10 7.660 Collecting pydantic-core==2.33.2
#10 7.716 Downloading pydantic_core-2.33.2-cp310-cp310-
manylinux_2_17_x86_64.manylinux2014_x86_64.whl (2.0 MB)
#10 7.776 _____ 2.0/2.0 MB 34.7 MB/s eta 0:00:00
#10 7.846 Collecting typing-inspection>=0.4.0
#10 7.900 Downloading typing_inspection-0.4.1-py3-none-any.whl (14 kB)
#10 8.027 Collecting anyio<5,>=3.6.2
#10 8.082 Downloading anyio-4.10.0-py3-none-any.whl (107 kB)
#10 8.085 _____ 107.2/107.2 kB 195.2 MB/s eta 0:00:00
#10 8.167 Collecting sniffio>=1.1
#10 8.221 Downloading sniffio-1.3.1-py3-none-any.whl (10 kB)
#10 8.289 Collecting idna>=2.8
#10 8.343 Downloading idna-3.10-py3-none-any.whl (70 kB)
#10 8.347 _____ 70.4/70.4 kB 53.6 MB/s eta 0:00:00
#10 8.414 Collecting exceptiongroup>=1.0.2
#10 8.469 Downloading exceptiongroup-1.3.0-py3-none-any.whl (16 kB)
#10 8.620 Installing collected packages: typing-extensions, sniffio, pycpg2-binary, idna, h11,
greenlet, click, annotated-types, uvicorn, typing-inspection, sqlalchemy, pydantic-core,
exceptiongroup, pydantic, anyio, starlette, fastapi
#10 10.46 Successfully installed annotated-types-0.7.0 anyio-4.10.0 click-8.2.1 exceptiongroup-
1.3.0 fastapi-0.116.1 greenlet-3.2.4 h11-0.16.0 idna-3.10 pycpg2-binary-2.9.10 pydantic-2.11.7
pydantic-core-2.33.2 sniffio-1.3.1 sqlalchemy-2.0.43 starlette-0.47.2 typing-extensions-4.14.1
typing-inspection-0.4.1 uvicorn-0.35.0
#10 10.46 WARNING: Running pip as the 'root' user can result in broken permissions and
conflicting behaviour with the system package manager. It is recommended to use a virtual
environment instead: https://pip.pypa.io/warnings/venv
#10 10.72
#10 10.72 [notice] A new release of pip is available: 23.0.1 -> 25.2
#10 10.72 [notice] To update, run: pip install --upgrade pip
#10 DONE 11.1s

#11 [5/5] COPY . .
#11 DONE 0.1s

#12 exporting to image
#12 exporting layers
#12 exporting layers 2.0s done
#12 exporting manifest sha256:296a88245de45e32e5db88f4017c3350d1099a4edd45d3ee682e319b4969bd84
0.0s done
#12 exporting config sha256:c37005a65fd7fcc551cd40fa0ddaddb05ce53f0fecb5013e32543f5bddb75df0
0.0s done
#12 exporting attestation manifest
sha256:b6709d5930b78e3eb0d165ba35f59de0c3213ef0775643d217027604fb6d6fee 0.0s done
#12 exporting manifest list
sha256:c693fe72ce1882cc95355f141e19f92d2951c2fe1fafdd6077ec1cc2200762c9 0.0s done
#12 naming to docker.io/library/fastapiapp-api:latest done
#12 unpacking to docker.io/library/fastapiapp-api:latest
```

```
#12 unpacking to docker.io/library/fastapiapp-api:latest 0.6s done
#12 DONE 2.8s

#13 resolving provenance for metadata file
#13 DONE 0.0s
[+] Running 5/5
  ✓ fastapiapp-api Built
0.0s
  ✓ Network fastapiapp_default Created
0.1s
  ✓ Volume "fastapiapp_postgres_data" Created
0.0s
  ✓ Container fastapiapp-db-1 Healthy
11.0s
  ✓ Container fastapiapp-api-1 Started
```

Dockerfile

```
FROM python:3.10-slim

LABEL maintainer="satyamverma.8.b@gmail.com" \
      version="1.0"
WORKDIR /app
COPY requirements.txt .
RUN pip install --no-cache-dir --upgrade -r requirements.txt

COPY . .

CMD ["uvicorn", "app:app", "--host", "0.0.0.0", "--port", "8000"]
```

Docker-compose.yml

```
version: "3.8"

services:
  api:
    build: .
    ports:
      - "8000:8000"
    environment:
      - DATABASE_URL=postgresql://postgres:12345678@db/postgres
    depends_on:
      db:
        condition: service_healthy
    restart: unless-stopped

  db:
    image: postgres:17-alpine
    volumes:
      - postgres_data:/var/lib/postgresql/data/
    environment:
      - POSTGRES_USER=postgres
      - POSTGRES_PASSWORD=12345678
      - POSTGRES_DB=postgres
    healthcheck:
      test: ["CMD-SHELL", "pg_isready -U user -d mydatabase"]
      interval: 10s
      timeout: 5s
      retries: 5
      restart: always

volumes:
```

```
postgres_data:
```

Application Logs

```
E:\Docker\fastapiapp>docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
580766a17ad7   fastapiapp-api  "uvicorn app:app --h..." About a minute ago Up About a minute   0.0.0.0:8000->8000/tcp, [::]:8000->8000/tcp fastapiapp-api-1
77f409afdef2   postgres:17-alpine "docker-entrypoint.s..." About a minute ago Up About a minute (healthy) 5432/tcp fastapiapp-db-1

E:\Docker\fastapiapp>docker logs fastapiapp-api-1
INFO: Started server process [1]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)

E:\Docker\fastapiapp>docker logs fastapiapp-db-1
PostgreSQL Database directory appears to contain a database; Skipping initialization

2025-08-23 11:21:12.518 UTC [1] LOG: starting PostgreSQL 17.6 on x86_64-pc-linux-musl, compiled by gcc (Alpine 14.2.0) 14.2.0, 64-bit
2025-08-23 11:21:12.518 UTC [1] LOG: listening on IPv4 address "0.0.0.0", port 5432
2025-08-23 11:21:12.518 UTC [1] LOG: listening on IPv6 address "::", port 5432
2025-08-23 11:21:12.523 UTC [1] LOG: listening on Unix socket "/var/run/postgresql/.s.PGSQL.5432"
2025-08-23 11:21:12.531 UTC [29] LOG: database system was shut down at 2025-08-23 11:18:45 UTC
2025-08-23 11:21:12.538 UTC [1] LOG: database system is ready to accept connections
```

```
E:\Docker\fastapiapp>docker ps -a
CONTAINER ID   IMAGE          COMMAND                  CREATED        STATUS        PORTS                               NAMES
500766a17ad7   fastapiapp-api  "uvicorn app:app --h..." About a minute ago Up About a minute   0.0.0.0:8000->8000/tcp, [::]:8000->8000/tcp fastapiapp-api-1
77f409afdef2   postgres:17-alpine "docker-entrypoint.s..." About a minute ago Up About a minute (healthy) 5432/tcp fastapiapp-db-1

E:\Docker\fastapiapp>docker logs fastapiapp-api-1
INFO: Started server process [1]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)

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2025-08-23 11:21:12.531 UTC [29] LOG: database system was shut down at 2025-08-23 11:18:45 UTC
2025-08-23 11:21:12.538 UTC [1] LOG: database system is ready to accept connections
```

Interactions

```
E:\Docker\fastapiapp>docker logs fastapiapp-api-1
INFO: Started server process [1]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)
INFO: 172.20.0.1:46178 - "GET /items/ HTTP/1.1" 200 OK
INFO: 172.20.0.1:40770 - "POST /items/?name=FirstItem HTTP/1.1" 200 OK
INFO: 172.20.0.1:47268 - "GET /items/ HTTP/1.1" 200 OK
```

```
E:\Docker\fastapiapp>docker logs fastapiapp-api-1
INFO: Started server process [1]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)
INFO: 172.20.0.1:46178 - "GET /items/ HTTP/1.1" 200 OK
INFO: 172.20.0.1:40770 - "POST /items/?name=FirstItem HTTP/1.1" 200 OK
INFO: 172.20.0.1:47268 - "GET /items/ HTTP/1.1" 200 OK
```

HTTP

localhost:8000/items/?name=FirstItem

Save

Share

POST

localhost:8000/items/?name=FirstItem

Send

Params

Authorization

Headers (8)

Body

Scripts

Settings

Cookies

Query Params

<input checked="" type="checkbox"/>	Key	Value	Description	...	Bulk Edit
<input checked="" type="checkbox"/>	name	FirstItem			
	Key	Value	Description		

Body

Cookies

Headers (4)

Test Results

200 OK

21 ms

152 B

{ } JSON

Preview

Visualize

```
1 {
2   "id": 1,
3   "name": "FirstItem"
4 }
```

HTTP

localhost:8000/items/

Save

Share

GET

localhost:8000/items/

Send

Params

Authorization

Headers (8)

Body

Scripts

Settings

Cookies

Query Params

	Key	Value	Description	...	Bulk Edit
	Key	Value	Description		

Body

Cookies

Headers (4)

Test Results

200 OK

14 ms

154 B

{ } JSON

Preview

Visualize

```
1 [
2   {
3     "id": 1,
4     "name": "FirstItem"
5   }
6 ]
```