**Full Stack Application Deployment with Docker (React + Flask + PostgreSQL)**

This guide explains how to deploy a full stack application using Docker, including a React frontend, Flask backend, and PostgreSQL database. It is designed for clarity and step-by-step execution.

**Prerequisites**

* Ubuntu / Linux system
* Docker installed

**1) Frontend Setup (React)**

**1.1 Install Node and npm**

Update packages:

* *sudo apt update && sudo apt upgrade -y*
* *sudo apt install -y nodejs npm*

**1.2 Create React Project**

* *npx create-react-app reactapp*
* *cd reactapp/src*

**1.3 Update App.js**

* Copy your React code from the repository.
* Change the API base URL to point to the backend container:

*const API\_BASE = "http://host.docker.internal:5000";*

**1.4 Test React App**

npm start

* Verify the frontend works in your browser before containerizing.

**2) Backend Setup (Python + Flask)**

**2.1 Check Python**

python3 --version

If not installed:

* *sudo apt update*
* *sudo apt install -y python3 python3-pip python3-venv*

**2.2 Create and Activate Virtual Environment**

* python3 -m venv venv
* source venv/bin/activate

**2.3 Install Required Packages**

pip install flask flask-cors psycopg2-binary

**2.4 Create requirements.txt**

*Flask*

*flask-cors*

*psycopg2-binary*

*gunicorn*

**2.5 Create Procfile**

*web: gunicorn application:application*

**2.6 Update application.py**

* Copy the code from your repository.
* Update database configuration:

def get\_db\_connection():

return psycopg2.connect(

host="host.docker.internal",

database="postgres",

user="postgres",

password="123456",

port=5432

)

**2.7 Test Backend**

python3 application.py

* If permission issues occur:

*sudo chown -R $USER:$USER /webapp/backend/venv*

**3) Database Setup (PostgreSQL)**

**3.1 Run PostgreSQL Container**

*docker run -d \*

*--name my-postgres \*

*-e POSTGRES\_USER=postgres \*

*-e POSTGRES\_PASSWORD=123456 \*

*-e POSTGRES\_DB=postgres \*

*-p 5432:5432 \*

*postgres:16*

**3.2 Access Database**

*docker exec -it my-postgres psql -U postgres -d postgres*

**3.3 Create Table**

*CREATE TABLE entries (*

*id SERIAL PRIMARY KEY,*

*text\_entry TEXT NOT NULL*

*);*

**4) Dockerizing Backend**

**4.1 Backend Dockerfile**

# Base image

FROM python:3.12-slim

# Set working directory

WORKDIR /app

# Copy requirements and install

COPY requirements.txt .

RUN pip install --no-cache-dir -r requirements.txt

# Copy backend code

COPY . .

# Expose port

EXPOSE 5000

# Command to run

CMD ["python", "application.py"]

**4.2 Build and Run Backend Container**

* docker build -t backend .
* docker run -d -p 5000:5000 backend

**5) Dockerizing Frontend**

**5.1 Frontend Dockerfile**

# Use official Node image

FROM node:20

# Copy package.json and package-lock.json

COPY package\*.json ./

# Install dependencies

RUN npm install

# Copy all app code

COPY . .

# Expose the port your app runs on

EXPOSE 3000

# Run the app

CMD ["npm", "start"]

**5.2 Build and Run Frontend Container**

docker build -t react-frontend .

docker run -d -p 3000:3000 react-frontend

**6) Final Checks**

1. Verify **frontend** can reach the **backend API**.
2. Verify **backend** connects to **PostgreSQL database**.
3. Ensure **all containers are running** without issues:

docker ps

* You should see react-frontend, backend, and my-postgres containers running.

Now your full stack application is deployed and accessible at:

* Frontend: <http://localhost:3000>
* Backend API: <http://localhost:5000>

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Thanks for reading and watching!