# 1. Frontend (Node.js with Express):

- Create a frontend using Express and Node.js.
- Include a form similar to the one from the Flask Assignment 2.
- Configure the form to send a request to the Flask backend.
- Backend (Flask):
- Use the Flask backend to handle the form submission and process the data.
- Folder Structure:
- Organize the project with separate folders for the frontend and backend.
- Docker Configuration:
- Create a Dockerfile for both the frontend and backend.
- Write a .yaml file (Docker Compose) to connect both services in the same network.
- Upload both images to docker hub and push your whole code to github and add the node modules and other non required files(.vscode) in .gitignore

# ./backend/app.py

```
from flask import Flask, request, jsonify
import os
import psycopg2
app = Flask(__name__)
# Root route
@app.route("/", methods=["GET"])
def home():
    return jsonify({"message": "Backend is running!"})
# API data route
@app.route("/api/data", methods=["GET"])
def get_data():
    return jsonify({"message": "Backend is working", "status": "success"})
# Submit data route
@app.route("/submit", methods=["POST"])
```

```
def submit form():
  data = request.get json()
  name = data.get("name")
  email = data.get("email")
  return jsonify({"message": f"Received {name} with email {email}"})
# Database health check
@app.route("/db-check", methods=["GET"])
def db check():
  try:
    conn = psycopg2.connect(
       host="db", # Docker service name
       database=os.getenv("POSTGRES DB"),
       user=os.getenv("POSTGRES USER"),
       password=os.getenv("POSTGRES_PASSWORD"),
       port=5432
    cur = conn.cursor()
    cur.execute("SELECT version();")
    db version = cur.fetchone()[0]
    cur.close()
    conn.close()
    return jsonify({"db_version": db_version})
  except Exception as e:
    return jsonify({"error": str(e)}), 500
if __name__ == "__main__":
  app.run(host="0.0.0.0", port=5000)
```

This is the Flask backend application.

#### • What it does:

- o Listens on port 5000 (inside container).
- o Provides API endpoints:
  - /api/data  $\rightarrow$  GET  $\rightarrow$  Returns sample backend message.
  - ✓submit → POST → Accepts JSON data (name, email) and returns confirmation.
  - db-check → GET → Checks PostgreSQL DB connection using psycopg2 and returns version info.

## • Why important:

This is the main backend logic. It processes requests from the frontend or tools like curl.

## 2. /backend/requirements.txt

flask

flask-cors

psycopg2-binary

#### • Purpose:

Lists Python dependencies required for the backend.

• What it contains:

flask

psycopg2-binary

### • Why important:

Used by pip inside Docker to install all Python libraries for Flask and PostgreSQL connectivity.

#### 3. /backend/Dockerfile

FROM python:3.11-slim

```
WORKDIR /app

COPY requirements.txt .

RUN pip install -r requirements.txt

COPY . .

CMD ["python", "app.py"]
```

Tells Docker **how to build** the backend image.

# • Steps inside:

- o Use python:3.10 base image.
- O Set working directory to /app.
- o Copy requirements.txt and install packages with pip.
- o Copy all backend files into container.
- o Run python app.py when the container starts.

# • Why important:

Without it, Docker wouldn't know how to set up the backend environment.

# 4. /frontend/server.js

```
const express = require("express");
const axios = require("axios");
const cors = require("cors");
const app = express();
app.use(cors());
app.use(express.json()); // So we can handle JSON bodies

/// Test route
app.get("/", (req, res) => {
  res.send("Frontend is running!");
});

/// Fetch data from backend
app.get("/fetch-backend", async (req, res) => {
```

```
try {
  const response = await axios.get("http://backend:5000/api/data");
  res.json(response.data);
 } catch (error) {
  res.status(500).json({ error: "Backend not reachable" });
 }
});
// Send data to backend
app.post("/send-to-backend", async (req, res) => {
 try {
  const response = await axios.post("http://backend:5000/submit", req.body);
  res.json(response.data);
 } catch (error) {
  res.status(500).json({ error: "Error sending data to backend" });
 }
});
app.listen(3000, () => {
 console.log("Frontend listening on port 3000");
});
```

This is the **Node.js** + **Express frontend server**.

#### • What it does:

- o Listens on port 3000.
- $\circ$  /  $\rightarrow$  Returns "Frontend is running!"
- ∫fetch-backend → GET → Makes a request to backend:5000/api/data (container networking).
- $\circ$  /send-data  $\rightarrow$  POST  $\rightarrow$  Sends JSON to backend /submit.

# • Why important:

Acts as the middle layer between the user and backend APIs.

# 5. /frontend/package.json

```
{
    "name": "frontend",
    "version": "1.0.0",
    "main": "server.js",
    "dependencies": {
        "express": "^4.18.2",
        "axios": "^1.6.0",
        "cors": "^2.8.5"
    }
}
```

# • Purpose:

Node.js project configuration file.

# • What it contains:

- o App metadata (name, version).
- o dependencies like axios, cors, express.
- o Scripts (npm start runs server.js).

# • Why important:

Required by Node.js to install dependencies with npm install.

### 6. /frontend/Dockerfile

FROM node:18

WORKDIR /app

```
COPY package*.json ./
RUN npm install
COPY . .
EXPOSE 3000
CMD ["npm", "start"]
```

Tells Docker how to build the frontend image.

- Steps inside:
  - o Use node:18 base image.
  - O Set working directory to /app.
  - O Copy package\*.json and run npm install.
  - o Copy all frontend files.
  - o Run npm start when the container starts.

# • Why important:

Defines the container environment for Node.js frontend.

# 7. /docker-compose.yml

```
version: "3.9"
services:
backend:
build: ./backend
container_name: backend_container
ports:
- "5000:5000"
env_file:
- ./backend/.env
volumes:
- ./backend:/app
depends_on:
db:
```

```
condition: service healthy
frontend:
 build: ./frontend
 container_name: frontend_container
 ports:
  - "3000:3000"
 volumes:
  - ./frontend:/app
  - /app/node_modules
 stdin_open: true
 tty: true
 depends_on:
  backend:
   condition: service_started
db:
 image: postgres:15
 container_name: postgres_container
 restart: always
 environment:
  POSTGRES_USER: myuser
  POSTGRES_PASSWORD: mypassword
  POSTGRES_DB: mydb
 ports:
  - "5432:5432"
 volumes:
  - postgres data:/var/lib/postgresql/data
 healthcheck:
  test: ["CMD-SHELL", "pg_isready -U myuser -d mydb"]
```

```
interval: 5s
timeout: 5s
retries: 5
```

postgres data:

# • Purpose:

Orchestrates multiple containers: frontend, backend, PostgreSQL DB.

- What it defines:
  - o **backend** → Builds from backend/Dockerfile, connects to DB.
  - o **frontend** → Builds from frontend/Dockerfile, connects to backend.
  - o  $db \rightarrow Uses postgres:15 official image.$
  - o Networking between containers is automatic (Docker Compose default network).

### • Why important:

One command (docker-compose up) starts all services together.

### 8. /.gitignore

```
node_modules/
.vscode/
__pycache__/
*.pyc
.env
```

#### • Purpose:

Lists files/folders Git should **not track**.

# • Example entries:

- $\circ$  .venv/  $\rightarrow$  Python virtual environment.
- o node modules/ → Node.js dependencies.

- $\circ$  .vscode/  $\rightarrow$  Editor configs.
- $\circ$  .env  $\rightarrow$  Environment secrets.

# • Why important:

Prevents uploading large/unnecessary files to GitHub.

### 9. /README.md

# Flask + Node.js + Docker Project

#### **Overview**

This project is a **Dockerized Full Stack App** with:

• Backend: Flask + PostgreSQL

• Frontend: Node.js + Express

• Database: PostgreSQL

#### How to Run

docker-compose up --build

# • Purpose:

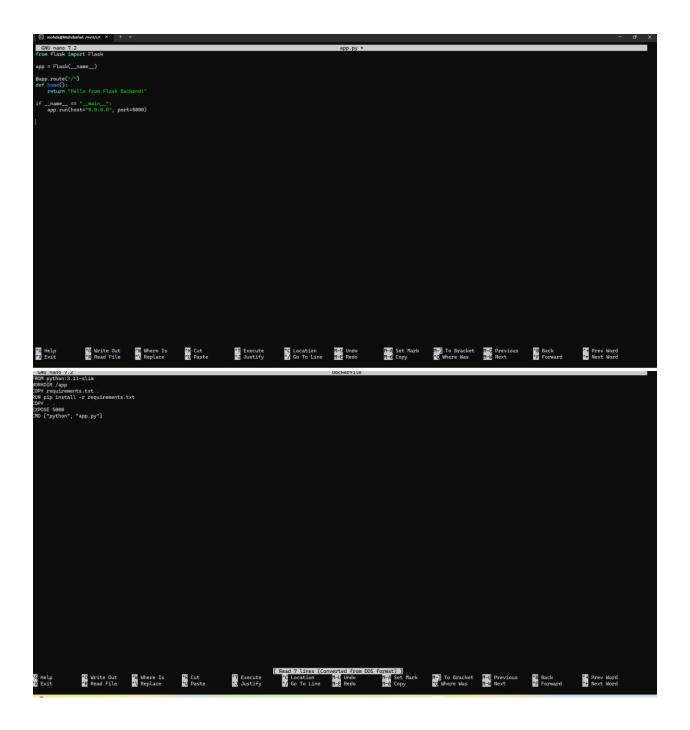
Documentation for the project.

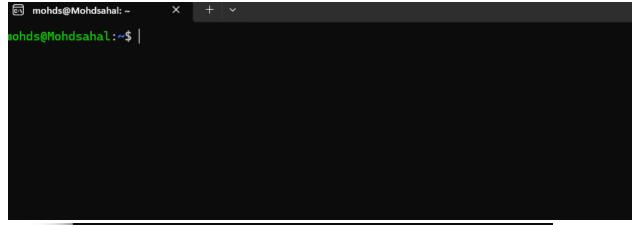
- Contents:
  - Overview of the stack.
  - o Setup instructions.
  - o API endpoint descriptions.
  - o Docker commands.

# • Why important:

Makes the project easy for others (and yourself later) to understand.







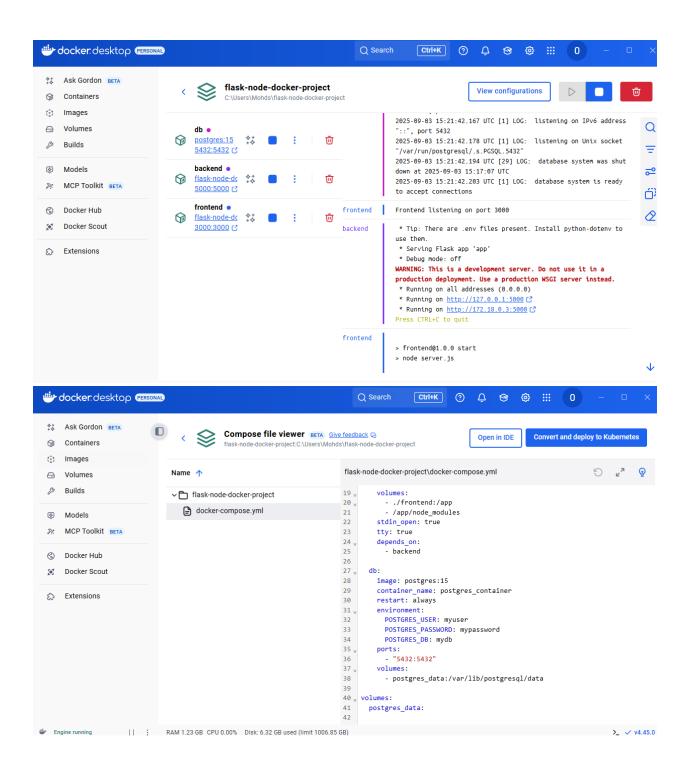
root@Mohdsahal:/mnt/c/Users/Mohds# wsl -u root
Command 'wsl' not found, but can be installed with:
apt install wsl
root@Mohdsahal:/mnt/c/Users/Mohds# passwd mohds
New password:
Retype new password:
passwd: password updated successfully

```
Wohds@Mohdsahal MINGW64 ~/flask-node-docker-project (master_1)

$ \[ \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[ \] \[
```

Frontend is running!

```
Standard Sta
```



```
← C (i) localhost:5000
Pretty-print ✓
{
    "message": "Backend is running!"
← C (3 127.0.0.1:5000
Pretty-print 🗹
{
    "message": "Backend is running!"
```

