Building a 3-Tier Web App with Docker

PostgreSQL as the database

Node.js API and Go API as backends

React as the frontend client

While I followed a tutorial closely, I made small tweaks and now better understand how different components of a full-stack application interact via Docker.

Components

1. Docker Volume Creation

docker volume create pgdata

This volume persists the PostgreSQL data even after the container is stopped or removed.

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2. Running PostgreSQL Container

DATABASE_URL := postgres://postgres:foobarbaz@localhost:5432/postgres

```
.PHONY: run-postgres
run-postgres:
	@echo Starting postgres container
	-docker run \
		--name postgres-db \
		-e POSTGRES_PASSWORD=foobarbaz \
		-v pgdata:/var/lib/postgresql/data \
		-p 5432:5432 \
		postgres:15.1-alpine
```

This command spins up a PostgreSQL container with a volume and exposed port 5432.

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3. Running Node.js API

Directory: api-node

Command (via Makefile):

```
.PHONY: run-api-node
run-api-node:
	@echo Starting node api
	cd api-node && \
		DATABASE_URL=${DATABASE_URL} \
		npm run dev
```

Starts the Node.js server

Connects to PostgreSQL using the DATABASE_URL environment variable

Runs on localhost:3000

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4. Running Go API

Directory: api-golang

Command (via Makefile):

```
.PHONY: run-api-golang
run-api-golang:
	@echo Starting golang api
	cd api-golang && \
		DATABASE_URL=${DATABASE_URL} \
		go run main.go
```

Starts the Go API

Connects to the same PostgreSQL DB

Runs on localhost:8080

Downloads dependencies on first run

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5. Running React Client

Directory: client-react

Command (via Makefile):

```
.PHONY: run-client-react
run-client-react:
	@echo Starting react client
	cd client-react && \
		npm run dev
```

React app runs on port 5173

Communicates with backend APIs

Final Setup

Database: localhost:5432

Go API: localhost:8080

Node API: localhost:3000

React Frontend: localhost:5173

Learnings

How to manage multiple services using Docker

Use of Makefile for simplifying dev commands

Basic structure of a full-stack web app

Linking services using environment variables and ports

Reflection

Didn’t build everything from scratch, but understanding how containers interact to form a functioning app was insightful.
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