Docker Compose

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1. Linking Containers Manually

- Overview
- Non-containerized application
- Containerized application
- Building the MySQL image
- Building the application image
- Running containers

Overview

- In a realistic application, you'll have lots of containers. For example:
  - Container #1 running MySQL
  - Container #2 running an application that talks to container #1

- We're going to show how to link these containers together
  - So the application can get data out of the MySQL database

A Non-Containerized Application

- Take a look at `demo-docker-compose-before`
  - It's a Spring Boot app that accesses data in a MySQL database
  - It's not containerized yet

- `application.properties` specifies connectivity info
  - It assumes MySQL is running on `localhost`
  - We'll need to change this property if MySQL is in a container

```
spring.datasource.url=jdbc:mysql://localhost:3306/MYSCHEMA?serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=c0nygre
```

application.properties

Containerized Application

- Now take a look at `demo-docker-compose-after`
  - This is a containerized version of the app, with 4 new files…
- `Dockerfile-mysql` and `myschema.sql`
  - Builds a Docker image for MySQL, using the SQL script to create and populate tables
- `Dockerfile-app`
  - Builds a Docker image for the Spring Boot app
- `docker-compose.yaml`
  - Uses Docker Compose to simplify things (see later)

Building the MySQL image

- `Dockerfile-mysql` builds an image for MySQL
  - Based on the standard MySQL image, with our database schema

```
FROM mysql:8.0.28

EXPOSE 3306

ENV MYSQL_ROOT_PASSWORD=c0nygre

COPY myschema.sql /docker-entrypoint-initdb.d
```

Dockerfile-mysql

- To build this image, run the following command:

```
docker build -f Dockerfile-mysql -t emps/mysql .
```

Building the Application Image (1 of 2)

- `Dockerfile-app` builds an image for the Spring app

```
FROM openjdk:21

ADD target/employee-app-0.0.1.jar app.jar

RUN sh -c
  'echo spring.datasource.url=jdbc:mysql://mysql:3306/MYSCHEMA?serverTimezone=UTC
                                                    > application.properties'

RUN sh -c 'echo spring.datasource.username=root    >> application.properties'

RUN sh -c 'echo spring.datasource.password=c0nygre >> application.properties'

ENTRYPOINT ["java","-jar","/app.jar"]
```

Dockerfile-app

  - Note it creates a new `application.properties` file, which overrides the one embedded in the JAR
  - Connects to a machine named **`mysql`** (not `localhost`)

Building the Application Image (2 of 2)

- You can build the "Spring Boot app" Docker image as follows:

```
docker build -f Dockerfile-app -t emps/app .
```

Running Containers

- Run a MySQL container as follows:

```
docker run --name mysql -d -p 3306:3306 emps/mysql
```

- Run an application container as follows:

```
docker run --name app --link mysql:mysql emps/app
```

  - Note the **`--link`** option
  - 1st **`mysql`** is the name of the container we want to link to
  - 2nd **`mysql`** is the alias by which we'll refer to it in our container

2. Using Docker Compose

- Overview
- How Docker Compose works
- Defining a Docker Compose configuration file
- Building images and running containers

Overview

- In the previous section, you ran each container individually
  - This is quite a manual process
  - You have to remember to get the ports and names correct
  - This is very error-prone!

- A better approach would be to automate the creation of Docker images and containers via a configuration file
  - You can achieve this using a tool called Docker Compose

How Docker Compose Works

- You supply a configuration file
  - By default, you name the file `docker-compose.yaml`

- The configuration file specifies:
  - A list of services (how to build an image and run a container)
  - What volumes or mount points are needed by the containers
  - How the containers are linked together

Defining a Docker Compose Config File (1)

- Here's the structure of the Docker Compose configuration file for our example:

```
version: '3.0'

services:

   mysql:
      # Details for the MySQL service …

   app:
      # Details for the Spring Boot app service …
```

docker-compose.yaml

Defining a Docker Compose Config File (2)

Here's how we configure the MySQL service

```
mysql:
   container_name: mysql

   build:
      context: .
      dockerfile: Dockerfile-mysql

   image: emps/mysql

   ports:
      - "3306:3306"

   volumes:
      - /docker/emps/mysql:/var/lib/mysql

   restart: always

   environment:
      MYSQL_ROOT_PASSWORD: c0nygre

   command: --explicit_defaults_for_timestamp
```

docker-compose.yaml

Defining a Docker Compose Config File (3)

```
app:

   container_name: app

   build:
      context: .
      dockerfile: Dockerfile-app

   image: emps/app

   depends_on:
      - mysql

   links:
      - mysql:mysql
```

docker-compose.yaml

Here's how we configure the App service

- **Note the link to the mysql container**

Building Images and Running Containers

- You can run the Docker Compose file as follows
  - Builds images if they don't already exist
  - Runs container instances

```
docker-compose up
```

Summary

- Linking containers manually
- Using Docker Compose