

Deploy the multi-container application using docker-compose up

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Description

This guide walks you through deploying a multi-container application using Docker Compose. We will set up a **Java-based TodoApp** and a **MySQL database**. With **docker-compose**, you can manage and deploy both services at once, ensuring they are connected and operational.

Problem Statement

The objective is to deploy the **Java-based TodoApp** that relies on a **MySQL** database, using Docker Compose to manage and link both services efficiently without manual configuration.

Prerequisites

Completion of all previous lab guides (up to Lab Guide-06) is required before proceeding with Lab Guide-07.

Software Requirement

- **Docker Desktop**: Ensure Docker and Docker Compose are installed on your Windows machine.
- **Java SDK**: If you're working with Java.
- **Maven/Gradle**: For building your Java app.
- **MySQL Database**: To store todo application data.
- **TodoAPP_MYSQL**: To download the source folder [click here](#)

Hardware Requirement

- Minimum of 4 GB RAM
- At least 2 cores in the processor
- 5 GB of free storage space for Docker images and containers

Implementation Steps

Step-1 :: Run the Program

To start the multi-container application:

1. Navigate to the project folder containing the **docker-compose.yml** file.

```
cd Docker
```

2. Run Docker Compose to build and start the containers:

```
docker-compose up --build
```

This command:

- **Builds** the Java TodoApp container.
 - **Pulls** the MySQL image if it's not available locally.
 - **Creates** and **starts** the containers for both services.
 - **Establishes** a network (todoapp_network) allowing them to communicate.
3. Check the logs to ensure everything is running properly. Once both containers start, you should see output from both services.

```

C:\Users\Administrator\Documents\TodoApp_MySQL-main>docker-compose up --build
[+] Building 18.7s (8/8) FINISHED
[+] [todoapp internal] load build definition from Dockerfile
[+] -> transferring dockerfile: 125B
[+] [todoapp internal] load metadata for docker.io/library/openjdk:11.0.15-jre
[+] [todoapp internal] load metadata for docker.io/library/openjdk:11.0.15-jre
[+] -> transferring context: 2B
[+] [todoapp internal] load build context
[+] -> transferring context: 54.39MB
[+] CACHED [todoapp 1/2] FROM docker.io/library/openjdk:11.0.15-jre@sha256:b90184c2eec246d8b6aec962546499f0163a5b
[+] -> resolve docker.io/library/openjdk:11.0.15-jre@sha256:b90184c2eec246d8b6aec962546499f0163a5b8fcfb10fe8027
[+] [todoapp 2/2] ADD target/*.jar app.jar
[+] [todoapp] exporting to image
[+] -> exporting layers
[+] -> exporting manifest sha256:b273c01825cf2ac43a48adb5f6dbda4f8e7081de77de6f809cbb96aabb2168221
[+] -> exporting config sha256:8c0b9b1a0fbd50ca5c83093945ea56e5fe1c9344096bcfa5f961ccdef75b3a0
[+] -> exporting attestation manifest sha256:563b3ac4f8673c2312a53e1b1e13a9153816969cecb143ef200e5245df14997
[+] -> exporting manifest list sha256:44409ac1a130e7212a16f1f10742515951faecd9f979bda3a029f356d4885131
[+] -> naming to docker.io/library/todoapp_mysql-main:todoapp:latest
[+] -> unpacking to docker.io/library/todoapp_mysql-main:todoapp:latest

```

```

todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
todoapp-1 |
:: Spring Boot ::
(todoapp-1 | (v2.7.12)
|
|
2024-10-16 03:38:11.416 INFO 8 --- [main] com.company.todoapp.TODOappApplication : Starting TODOappApplication v@0.1-SNAPSHOT using Java 11.0.15 on e481451edaf
With PID 8 (/app.jar started by root in /)
|
2024-10-16 03:38:11.421 INFO 8 --- [main] com.company.todoapp.TODOappApplication : No active profile set, falling back to 1 default profile: "default"
2024-10-16 03:38:13.417 INFO 8 --- [main] s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
2024-10-16 03:38:13.585 INFO 8 --- [main] s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository scanning in 61 ms. Found 1 JPA repository inter
faces.
|
2024-10-16 03:38:14.619 INFO 8 --- [main] o.s.b.w.embedded.tomcat.TomcatWebServer : Tomcat initialized with port(s): 8081 (http)
2024-10-16 03:38:14.665 INFO 8 --- [main] o.apache.catalina.core.StandardService : Starting service [Tomcat]
2024-10-16 03:38:14.665 INFO 8 --- [main] org.apache.catalina.core.StandardEngine : Starting Servlet engine: [Apache Tomcat/9.0.75]
2024-10-16 03:38:14.867 INFO 8 --- [main] o.o.c.x.c.C.[Tomcat].[localhost].[/] : Initializing Spring embedded WebApplicationContext
2024-10-16 03:38:14.888 INFO 8 --- [main] w.s.c.ServletWebServerApplicationContext : Root WebApplicationContext: initialization completed in 3321 ms
2024-10-16 03:38:15.598 INFO 8 --- [main] o.hibernate.jpa.internal.util.LogHelper : HHH000204: Processing PersistenceUnitInfo [name: default]
2024-10-16 03:38:15.613 INFO 8 --- [main] org.hibernate.Version : HHH0000412: Hibernate ORM core version 5.6.15.Final
2024-10-16 03:38:15.887 INFO 8 --- [main] o.hibernate.annotations.common.Version : HCANN000001: Hibernate Commons Annotations [5.1.2.Final]
2024-10-16 03:38:16.094 INFO 8 --- [main] com.zaxxer.hikari.HikariDataSource : HikariPool-1 - Starting...
2024-10-16 03:38:17.039 INFO 8 --- [main] org.hibernate.hikari.HikariDataSource : HikariPool-1 - Start completed.
2024-10-16 03:38:17.067 INFO 8 --- [main] org.hibernate.dialect.Old dialect : HHH000408: Using dialect: org.hibernate.dialect.MySQLInnoDBDialect
Hibernate: create table todo (id integer not null auto_increment, description varchar(20), status bit not null, target_date datetime, task varchar(255) not null, primary key (i
d)) engine=InnoDB

```

4. Once the deployment is successful:
 - **Access** the Java TodoApp on your browser at **<http://localhost:8081/swagger-ui/index.html>**

- The MySQL database will be running on port **3306**, and the TodoApp will communicate with it.

Step-2 :: Manage the Containers

1. Check the status of the containers:

```
docker-compose ps
```

```
C:\Users\Administrator\Documents\TodoApp_MySQL-main>docker-compose ps
NAME                IMAGE             COMMAND                  SERVICE    CREATED         STATUS         PORTS
mysql_db            mysql            "docker-entrypoint.s..." db         15 minutes ago Up About a minute    0.0.0.0:3306->3306/tcp, 33060/tcp
todoapp_mysql-main-todoapp-1 todoapp_mysql-main-todoapp "sh -c 'sleep 30 && ..." todoapp    About a minute ago Up About a minute    0.0.0.0:8081->8081/tcp
```

This will display the list of running containers along with their status and ports.

2. Stop the running containers:

To stop and remove all the containers, networks, and volumes created by **docker-compose**:

```
docker-compose down
```

```
C:\Users\Administrator\Documents\TodoApp_MySQL-main>docker-compose down
[+] Running 3/3
  Container todoapp_mysql-main-todoapp-1   Removed    10.6s
  Container mysql_db                       Removed    1.7s
  Network todoapp_mysql-main_todoapp_network Removed    0.5s
```

3. Run the containers in detached mode:

If you want the containers to run in the background (without displaying logs in the terminal), you can run the following command:

```
docker-compose up -d
```

```
C:\Users\Administrator\Documents\TodoApp_MySQL-main>docker-compose up -d
[+] Running 3/3
  Network todoapp_mysql-main_todoapp_network   Created    0.2s
  Container mysql_db                           Started    2.1s
  Container todoapp_mysql-main-todoapp-1       Started    2.1s
C:\Users\Administrator\Documents\TodoApp_MySQL-main>
```

To stop the detached containers:

```
docker-compose down
```

```
C:\Users\Administrator\Documents\TodoApp_MySQL-main>docker-compose down
[+] Running 3/3
  Container todoapp_mysql-main-todoapp-1   Removed    10.5s
  Container mysql_db                       Removed    2.6s
  Network todoapp_mysql-main_todoapp_network Removed    0.3s
C:\Users\Administrator\Documents\TodoApp_MySQL-main>
```

4. View container logs (for troubleshooting):

```
docker-compose logs
```

```
C:\Users\Administrator\Documents\todoapp_mysql-main>docker-compose logs
mysql_db | 2024-10-16 04:31:43+08:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 9.0.1-1.el9 started.
mysql_db | 2024-10-16 04:31:44+08:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'.
mysql_db | 2024-10-16 04:31:44+08:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 9.0.1-1.el9 started.
mysql_db | '/var/lib/mysql/mysql.sock' -> '/var/run/mysqld/mysql.sock'
mysql_db | 2024-10-16T04:31:44.854913Z 0 [System] [MY-015015] [Server] MySQL Server - start.
mysql_db | 2024-10-16T04:31:45.086416Z 0 [System] [MY-010116] [Server] /usr/sbin/mysqld (mysqld 9.0.1) starting as process 1
mysql_db | 2024-10-16T04:31:45.720904Z 1 [System] [MY-013576] [InnoDB] InnoDB initialization has started.
mysql_db | 2024-10-16T04:31:46.564722Z 1 [System] [MY-013577] [InnoDB] InnoDB initialization has ended.
mysql_db | 2024-10-16T04:31:47.798481Z 0 [Warning] [MY-010806] [Server] CA certificate ca.pem is self signed.
mysql_db | 2024-10-16T04:31:47.798667Z 0 [System] [MY-013602] [Server] Channel mysql_main configured to support TLS. Encrypted connections are now supported for this channel.
mysql_db | 2024-10-16T04:31:47.811888Z 0 [Warning] [MY-011810] [Server] Insecure configuration for --pid-file: Location '/var/run/mysqld/' in the path is accessible to all OS users. Consider choosing a different directory.
mysql_db | 2024-10-16T04:31:47.915815Z 0 [System] [MY-011323] [Server] X Plugin ready for connections. Bind-address: '::' port: 33666, socket: /var/run/mysqld/mysqlx.sock
mysql_db | 2024-10-16T04:31:47.916922Z 0 [System] [MY-010931] [Server] /usr/sbin/mysqld: ready for connections. Version: '9.0.1' socket: '/var/run/mysqld/mysql.sock' port: 3306 MySQL Community Server - GPL.
todoapp-1 | -----
todoapp-1 | Spring Boot :: (v2.7.12)
todoapp-1 | -----
with PID #: (/app.jar started by root in /)
todoapp-1 | 2024-10-16 04:32:17.309 INFO 8 --- [main] com.company.todoapp.TODOApplication : Starting TODOApplication v0.0.1-SNAPSHOT using Java 11.0.15 on 47dbdc0e5bf3
todoapp-1 | 2024-10-16 04:32:17.313 INFO 8 --- [main] com.company.todoapp.TODOApplication : No active profile set, falling back to 1 default profile: "default"
todoapp-1 | 2024-10-16 04:32:20.081 INFO 8 --- [main] .s.d.r.c.RepositoryConfigurationDelegate : Bootstrapping Spring Data JPA repositories in DEFAULT mode.
todoapp-1 | 2024-10-16 04:32:28.096 INFO 8 --- [main] .s.d.r.c.RepositoryConfigurationDelegate : Finished Spring Data repository scanning in 77 ms. Found 1 JPA repository inter
```

- Docker documentation: <https://docs.docker.com/>
- Docker Compose official guide: <https://docs.docker.com/compose/>
- MySQL Docker Hub page: https://hub.docker.com/_/mysql
- Java and Spring Boot examples: [Spring Boot with Docker](#)