容器化部署校园选课系统

一、作业概述

1.1 项目背景

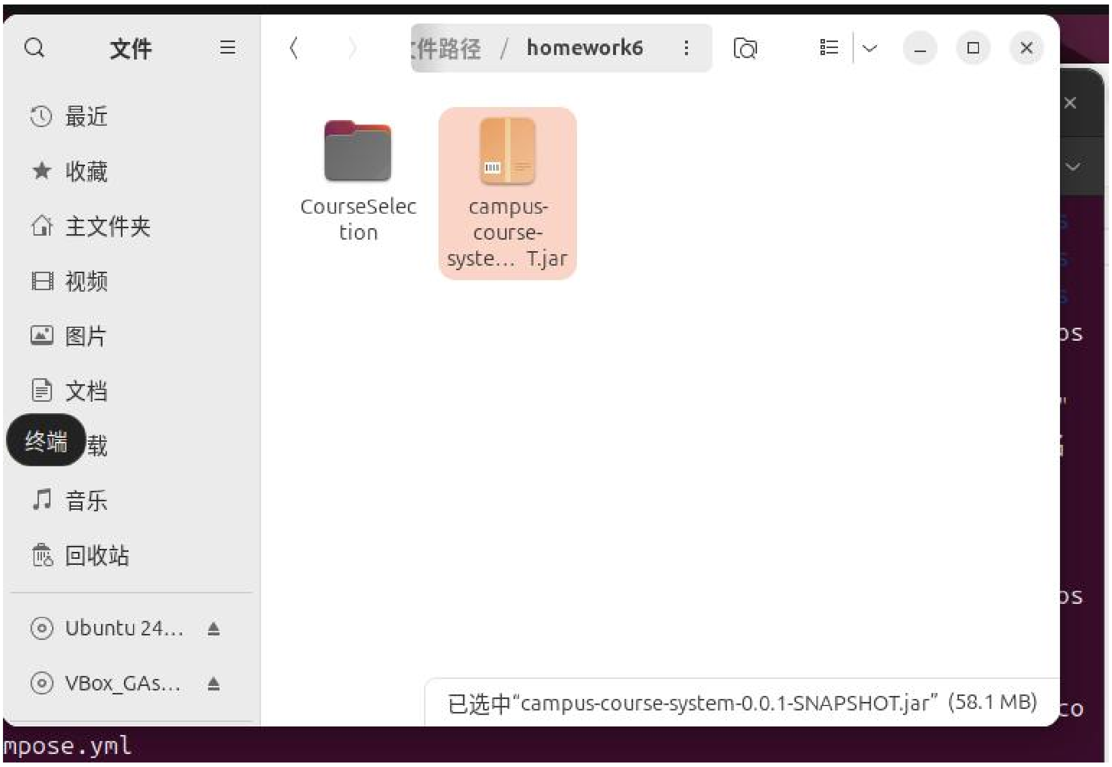
本次作业基于第 04 次作业实现的“校园选课系统”，进行单体应用容器化改造，通过 Docker 与 Docker Compose 实现多容器编排部署，掌握镜像构建、网络配置、数据持久化等核心技能，为后续微服务部署奠定基础。

1.2 学习目标

掌握 Docker 多阶段构建优化镜像大小的方法，熟练使用 Docker Compose 编排多容器应用，实现容器间网络通信与数据卷持久化，通过环境变量与多环境配置适配容器部署，验证容器化应用的功能完整性与稳定性。

二、核心任务实现细节

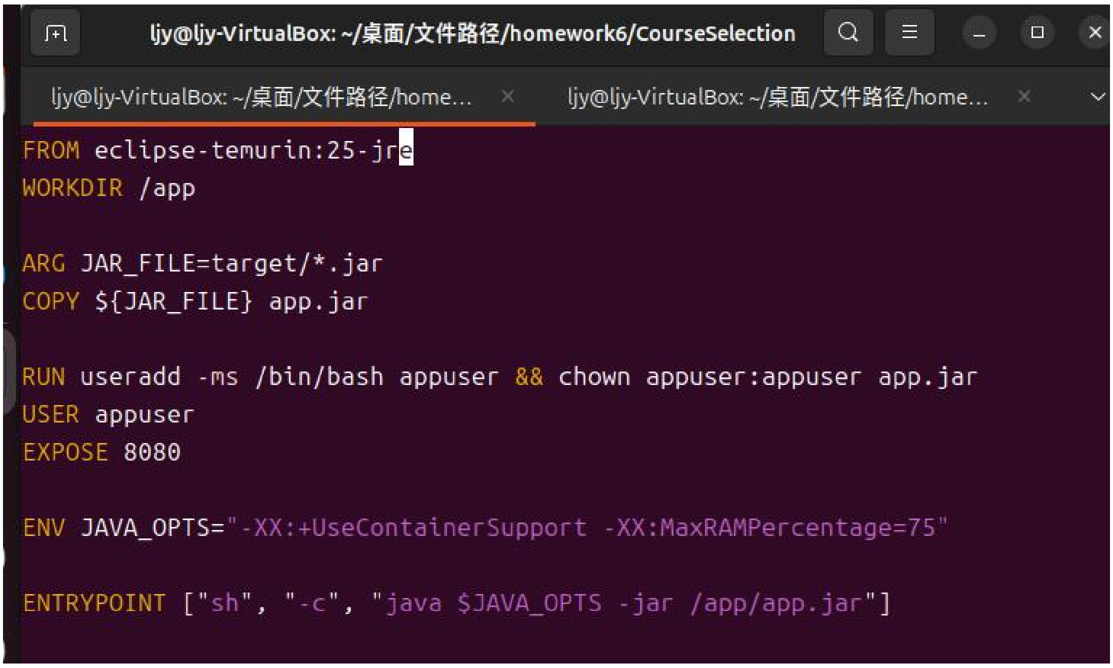
2.1 在 ide 里运行 mvn 命令打包后传入 VirtualBox



已选中“campus-course-system-0.0.1-SNAPSHOT.jar” (58.1 MB)

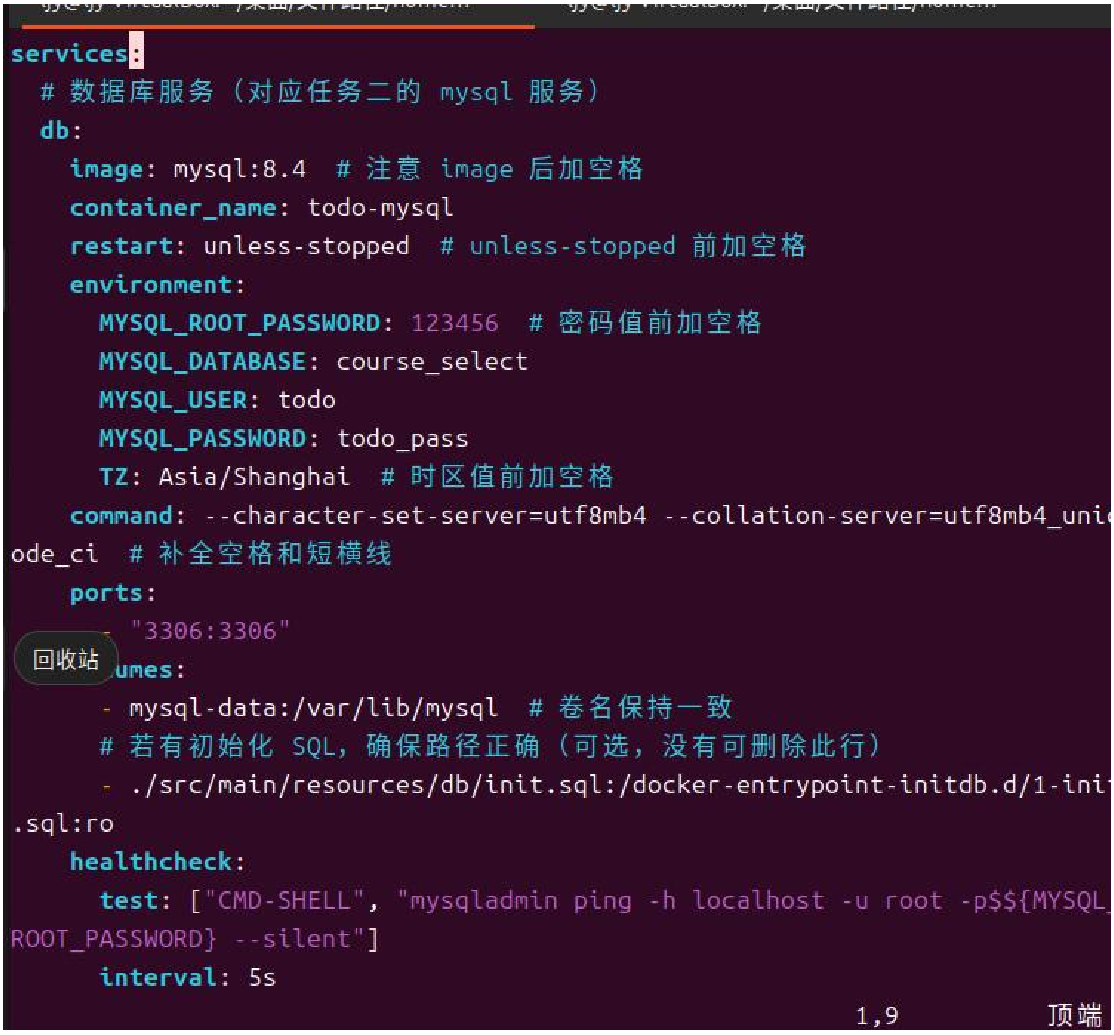
```
mpose.yml
```

2.2 写 Dockerfile


ljy@ljy-VirtualBox: ~/桌面/文件路径/homework6/CourseSelection
ljy@ljy-VirtualBox: ~/桌面/文件路径/home...
ljy@ljy-VirtualBox: ~/桌面/文件路径/home...

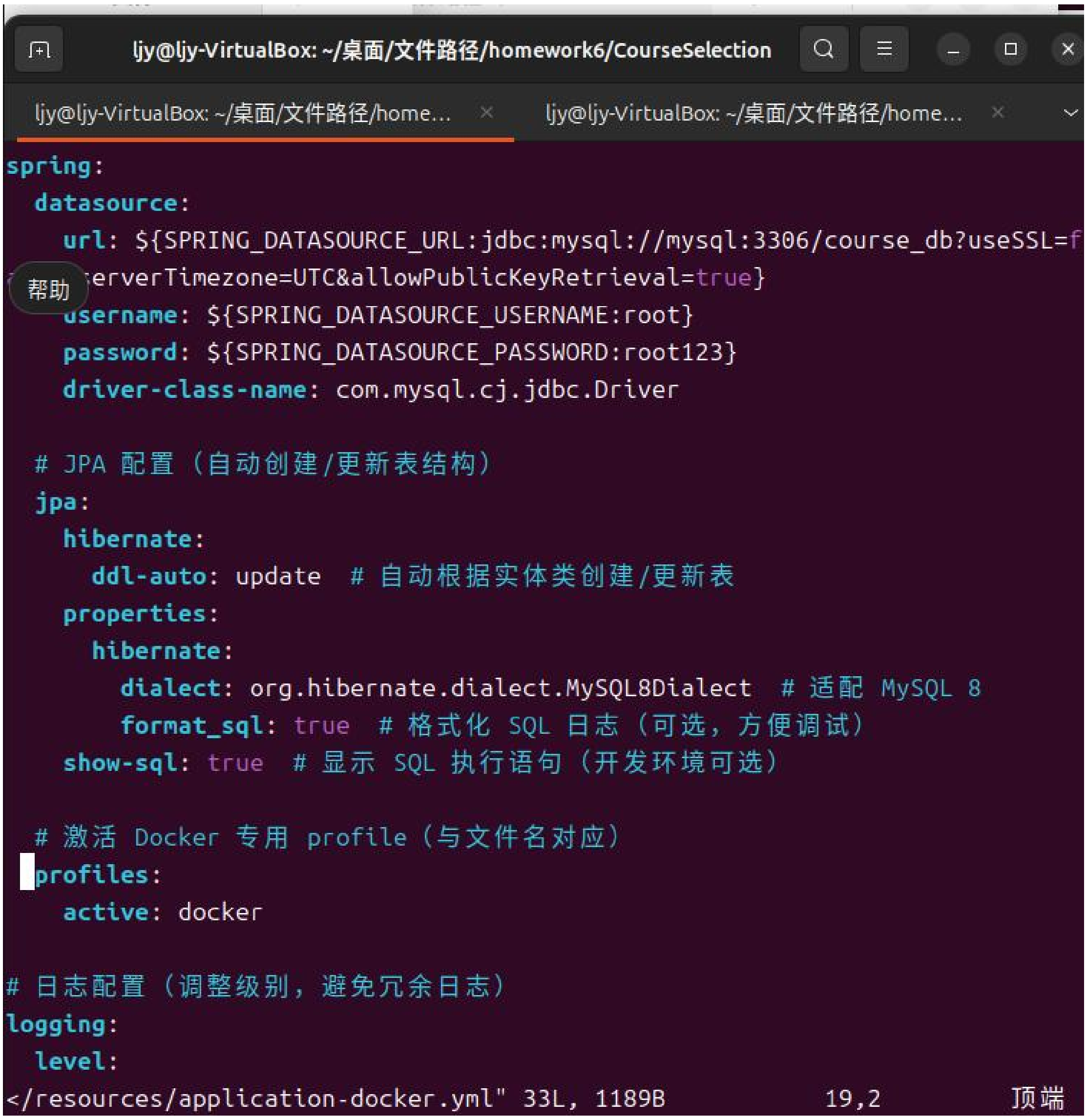
```
FROM eclipse-temurin:25-jre
WORKDIR /app

ARG JAR_FILE=target/*.jar
COPY ${JAR_FILE} app.jar

RUN useradd -ms /bin/bash appuser && chown appuser:appuser app.jar
USER appuser
EXPOSE 8080

ENV JAVA_OPTS="-XX:+UseContainerSupport -XX:MaxRAMPercentage=75"

ENTRYPOINT ["sh", "-c", "java $JAVA_OPTS -jar /app/app.jar"]
```

2.3 Docker Compose 编排配置



```
services:
  # 数据库服务（对应任务二的 mysql 服务）
  db:
    image: mysql:8.4  # 注意 image 后加空格
    container_name: todo-mysql
    restart: unless-stopped  # unless-stopped 前加空格
    environment:
      MYSQL_ROOT_PASSWORD: 123456  # 密码值前加空格
      MYSQL_DATABASE: course_select
      MYSQL_USER: todo
      MYSQL_PASSWORD: todo_pass
      TZ: Asia/Shanghai  # 时区值前加空格
    command: --character-set-server=utf8mb4 --collation-server=utf8mb4_uni
ode_ci  # 补全空格和短横线
    ports:
      - "3306:3306"
    umes:
      - mysql-data:/var/lib/mysql  # 卷名保持一致
      # 若有初始化 SQL，确保路径正确（可选，没有可删除此行）
      - ./src/main/resources/db/init.sql:/docker-entrypoint-initdb.d/1-ini
.sql:ro
    healthcheck:
      test: ["CMD-SHELL", "mysqladmin ping -h localhost -u root -p$${MYSQL_
ROOT_PASSWORD} --silent"]
      interval: 5s
                                                  1,9           顶端
```

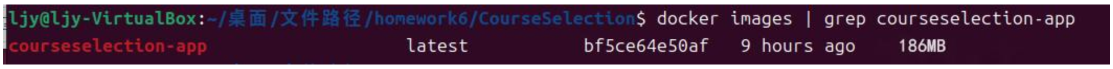
2.4 应用配置调整（application-docker.yml）


ljy@ljy-VirtualBox: ~/桌面/文件路径/homework6/CourseSelection
ljy@ljy-VirtualBox: ~/桌面/文件路径/home...
ljy@ljy-VirtualBox: ~/桌面/文件路径/home...
帮助

```
spring:
  datasource:
    url: ${SPRING_DATASOURCE_URL:jdbc:mysql://mysql:3306/course_db?useSSL=f
    erverTimezone=UTC&allowPublicKeyRetrieval=true}
    username: ${SPRING_DATASOURCE_USERNAME:root}
    password: ${SPRING_DATASOURCE_PASSWORD:root123}
    driver-class-name: com.mysql.cj.jdbc.Driver

  # JPA 配置（自动创建/更新表结构）
  jpa:
    hibernate:
      ddl-auto: update  # 自动根据实体类创建/更新表
    properties:
      hibernate:
        dialect: org.hibernate.dialect.MySQL8Dialect  # 适配 MySQL 8
        format_sql: true  # 格式化 SQL 日志（可选，方便调试）
    show-sql: true  # 显示 SQL 执行语句（开发环境可选）

  # 激活 Docker 专用 profile（与文件名对应）
  profiles:
    active: docker

# 日志配置（调整级别，避免冗余日志）
logging:
  level:
</resources/application-docker.yml" 33L, 1189B          19,2          顶端
```

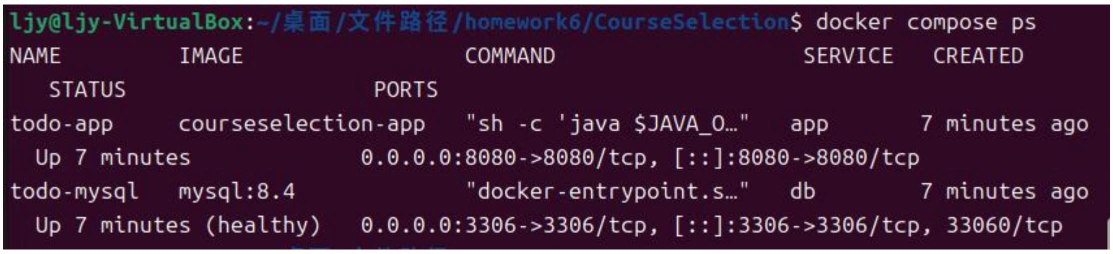
三、测试结果与截图

3.1 镜像大小检查



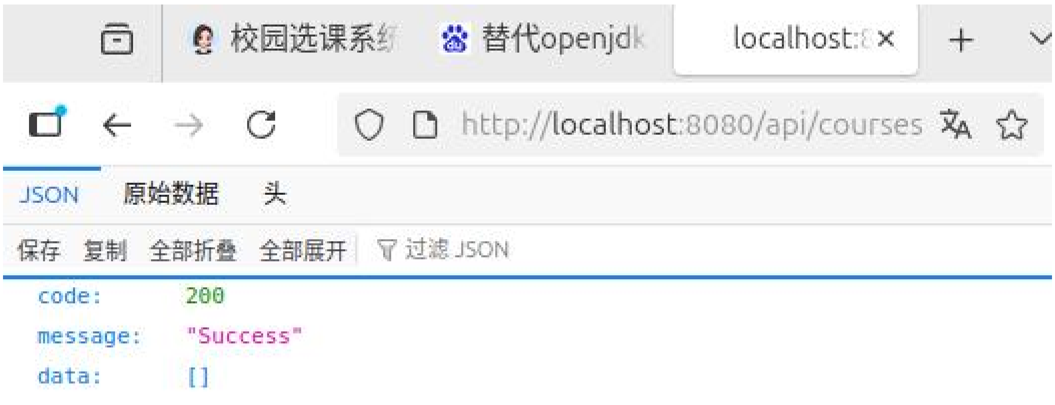
```
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSelection$ docker images | grep courseselection-app
courseselection-app                 latest          bf5ce64e50af   9 hours ago    186MB
```

3.2 容器运行状态截图（docker compose ps 输出）

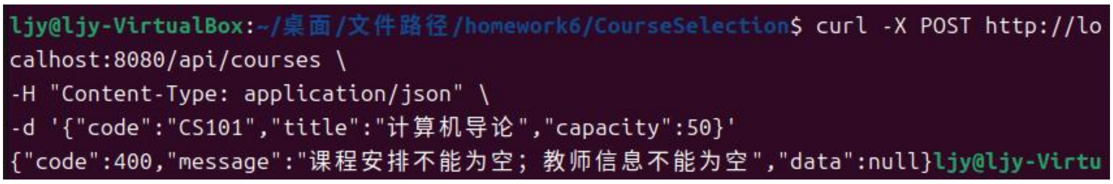


```
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSelection$ docker compose ps
NAME         IMAGE                 COMMAND                    SERVICE    CREATED
   STATUS                    PORTS
todo-app     courseselection-app   "sh -c 'java $JAVA_O…"    app        7 minutes ago
  Up 7 minutes             0.0.0.0:8080->8080/tcp, [::]:8080->8080/tcp
todo-mysql   mysql:8.4             "docker-entrypoint.s…"    db         7 minutes ago
  Up 7 minutes (healthy)   0.0.0.0:3306->3306/tcp, [::]:3306->3306/tcp, 33060/tcp
```

3.3 应用访问成功截图（浏览器或 curl 测试结果）

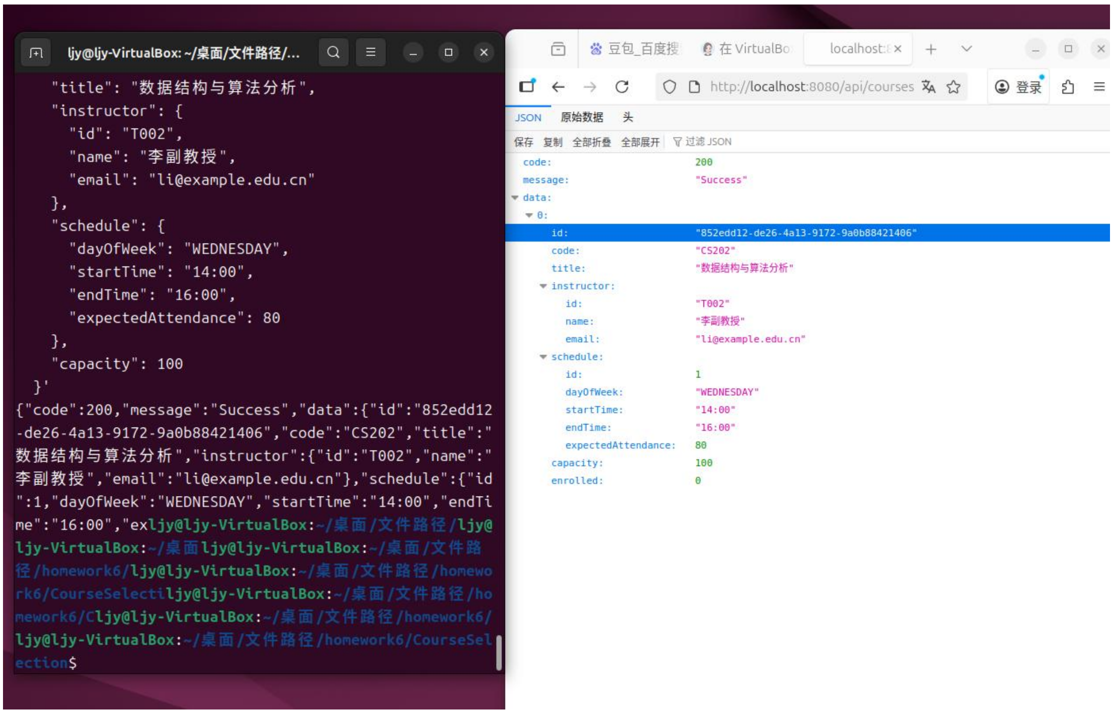


```
code:       200
message:    "Success"
data:       []
```



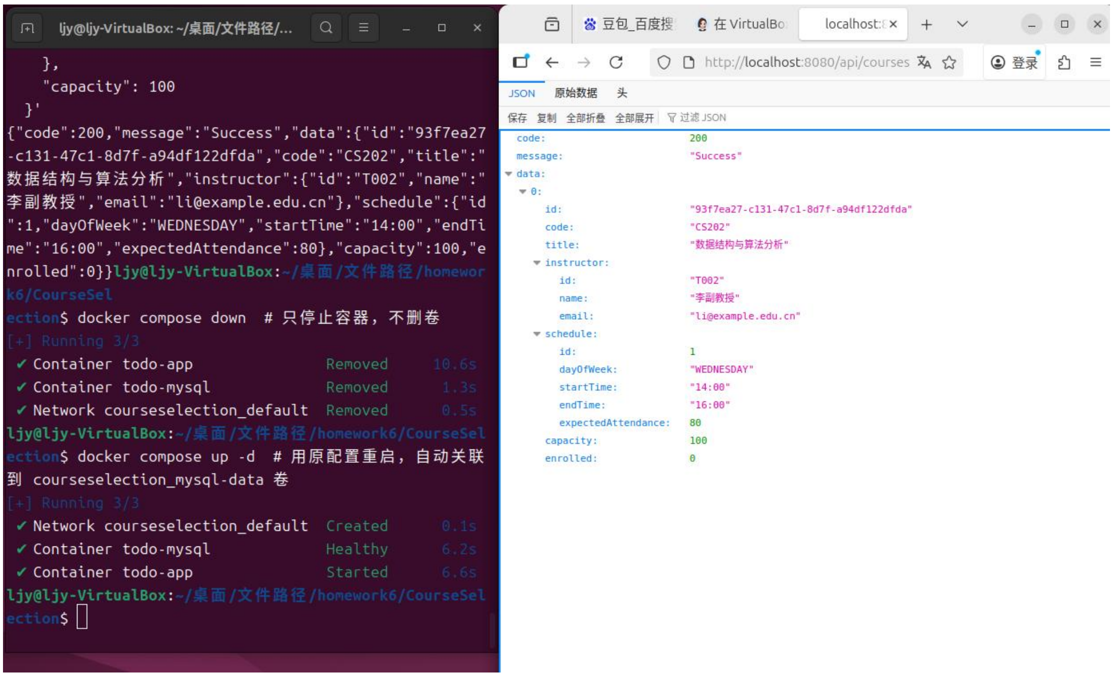
```
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSelection$ curl -X POST http://lo
calhost:8080/api/courses \
-H "Content-Type: application/json" \
-d '{"code":"CS101","title":"计算机导论","capacity":50}'
{"code":400,"message":"课程安排不能为空；教师信息不能为空","data":null}ljy@ljy-Virtu
```

3.4 数据持久化验证截图（重启前后数据对比）



```
    "title": "数据结构与算法分析",
    "instructor": {
      "id": "T002",
      "name": "李副教授",
      "email": "li@example.edu.cn"
    },
    "schedule": {
      "dayOfWeek": "WEDNESDAY",
      "startTime": "14:00",
      "endTime": "16:00",
      "expectedAttendance": 80
    },
    "capacity": 100
  }'
{"code":200,"message":"Success","data":{"id":"852edd12
-de26-4a13-9172-9a0b88421406","code":"CS202","title":"
数据结构与算法分析","instructor":{"id":"T002","name":"
李副教授","email":"li@example.edu.cn"},"schedule":{"id
":1,"dayOfWeek":"WEDNESDAY","startTime":"14:00","endTi
me":"16:00","exljy@ljy-VirtualBox:~/桌面/文件路径/ljy@
ljy-VirtualBox:~/桌面ljy@ljy-VirtualBox:~/桌面/文件路
径/homework6/ljy@ljy-VirtualBox:~/桌面/文件路径/homewo
rk6/CourseSelectiljy@ljy-VirtualBox:~/桌面/文件路径/ho
mework6/Cljy@ljy-VirtualBox:~/桌面/文件路径/homework6/
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSel
ection$
```

```
code:                   200
message:                "Success"
data:
  0:
    id:                 "852edd12-de26-4a13-9172-9a0b88421406"
    code:               "CS202"
    title:              "数据结构与算法分析"
    instructor:
      id:               "T002"
      name:             "李副教授"
      email:            "li@example.edu.cn"
    schedule:
      id:               1
      dayOfWeek:        "WEDNESDAY"
      startTime:        "14:00"
      endTime:          "16:00"
      expectedAttendance: 80
    capacity:           100
    enrolled:           0
```



```
   },
   "capacity": 100
  }'
{"code":200,"message":"Success","data":{"id":"93f7ea27
-c131-47c1-8d7f-a94df122dfda","code":"CS202","title":"
数据结构与算法分析","instructor":{"id":"T002","name":"
李副教授","email":"li@example.edu.cn"},"schedule":{"id
":1,"dayOfWeek":"WEDNESDAY","startTime":"14:00","endTi
me":"16:00","expectedAttendance":80},"capacity":100,"e
nrolled":0}}ljy@ljy-VirtualBox:~/桌面/文件路径/homewor
k6/CourseSel
ection$ docker compose down  # 只停止容器，不删卷
[+] Running 3/3
 ✔ Container todo-app                   Removed     10.6s
 ✔ Container todo-mysql                 Removed      1.3s
 ✔ Network courseselection_default      Removed      0.5s
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSel
ection$ docker compose up -d  # 用原配置重启，自动关联
到 courseselection_mysql-data 卷
[+] Running 3/3
 ✔ Network courseselection_default      Created      0.1s
 ✔ Container todo-mysql                 Healthy      6.2s
 ✔ Container todo-app                   Started      6.6s
ljy@ljy-VirtualBox:~/桌面/文件路径/homework6/CourseSel
ection$ 
```

```
code:                      200
message:                   "Success"
▼ data:
  ▼ 0:
      id:                  "93f7ea27-c131-47c1-8d7f-a94df122dfda"
      code:                "CS202"
      title:               "数据结构与算法分析"
    ▼ instructor:
        id:                "T002"
        name:              "李副教授"
        email:             "li@example.edu.cn"
    ▼ schedule:
        id:                1
        dayOfWeek:         "WEDNESDAY"
        startTime:         "14:00"
        endTime:           "16:00"
        expectedAttendance: 80
      capacity:            100
      enrolled:            0
```

四、遇到的问题和解决方案总结

3.6.1 数据库持续化失败

问题：curl 命令能上传数据，并能在浏览器显示，但是重启后数据未保留。

解决：

docker-compose.yml 中 SPRING_DATASOURCE_URL 没有指向 MySQL 容器的 course_select 库。