
Xideral
Back End Academy

REST APIs with Spring Data JPA

Project By:

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REST APIs with Spring JPA

Summary

This project is a continuation and evolution of the previous REST API. Using the Spring Data JPA framework on top of Spring Web, allowing for more secure data persistence and a more maintainable codebase.

Research

Spring Data JPA

The Spring Data JPA is a framework that simplifies data access across layers in an application. As its name implies, this framework builds on top of the Java Persistence API, or JPA, which provides a consistent model for interaction with a database.

By using Spring Data JPA, we can define a repository interface with only the specific data access methods we desire, while the implementations for the methods are generated at runtime.

However, possibly the best advantage of using this framework is that it belongs to the Spring ecosystem. This provides developers with the most compatibility and ease of use, and the extensive documentation is also a great benefit.

Design

For comparison purposes, our database will be the same as the previous one: a VideoGame database of different video game titles.

```

  Run | New Tab | Active Connection
1  CREATE DATABASE IF NOT EXISTS VideoGameDB;
2
  Run | New Tab
3  USE VideoGameDB;
4
  Run | New Tab
5  DROP TABLE IF EXISTS videogames;
6
  Run | New Tab | Copy
7  CREATE TABLE videogames (
8      id INT NOT NULL AUTO_INCREMENT PRIMARY KEY,
9      title VARCHAR(64) DEFAULT NULL,
10     genre VARCHAR(64) DEFAULT NULL,
11     platform VARCHAR(64) DEFAULT NULL,
12     release_year INT DEFAULT 0,
13     developer VARCHAR(64) DEFAULT NULL,
14     publisher VARCHAR(64) DEFAULT NULL,
15     score DOUBLE DEFAULT 0
16 ) AUTO_INCREMENT=1;
17
```

The classes in the project fall into 4 categories: Entity, Data Access Objects, Services, and a Rest Controller.

Entity - VideoGame

The VideoGame class is the entity, which means it is a single object where data is encapsulated. It is used to properly map the data to and from the database.

```

@Entity
@Table (name="videogames")
@Data
@AllArgsConstructor
@NoArgsConstructor
public class VideoGame{
    @Id
    @GeneratedValue(strategy=GenerationType.IDENTITY)
    @Column(name="id")
    private int id;

    @Column(name="title")
    private String title;
    @Column(name="genre")
    private String genre;
    @Column(name="platform")
    private String platform;
    @Column(name="release_year")
    private int releaseYear;
    @Column(name="developer")
    private String developer;
    @Column(name="publisher")
    private String publisher;
    @Column(name="score")
    private double score;

    @Override
    public String toString() { ...
}

```

There is virtually no change between this project's Entity and the previous one.

Data Access Object - VideoGameRepository

The Data Access Object presents the first major change: by using the JpaRepository interface available in the Data JPA framework, we can create an “empty” interface, which will provide other components with much extended functionality.

```

import org.springframework.data.jpa.repository.JpaRepository;

public interface VideoGameRepository extends JpaRepository<VideoGame, Integer> {}

```

In the previous DAO implementation, we had to manually use the JPA to define all of our desired methods. But here we can see that simply by using an external method we have abstracted lots of boiler-plate code and have saved development time which can now be allocated to other meaningful tasks.

Service - VideoGameService and VideoGameServiceImpl

These classes have also changed, although less than the DAOs.

The VideoGameService interface (and VideoGameServiceImpl by extension) no longer has the “update” method. The reason for this is that the Data JPA framework abstracts the behavior of the **POST** and **PUT** methods, essentially merging them. The POST and PUT methods can still have individual routes in the API, but their implementation will be very similar.

```
public interface VideoGameService {  
    List<VideoGame> findAll();  
    VideoGame findById(int id);  
    VideoGame save(VideoGame videogame);  
    void deleteById(int id);  
}
```

In VideoGameServiceImpl we can observe a special annotation above the class declaration: “@Service”.

```
@Service
public class VideoGameServiceImpl implements VideoGameService{
    private VideoGameRepository repository;

    @Autowired
    public VideoGameServiceImpl(VideoGameRepository repository) {
        this.repository = repository;
    }

    @Override
> public List<VideoGame> findAll(){ ...

    @Override
> public VideoGame findById(int id) { ...

    @Override
> public VideoGame save(VideoGame videogame) { ...

    @Override
> public void deleteById(int id) { ...

}
|
```

This annotation is used to inject the service into a Controller that will consume it. Similarly, the “@Autowired” annotation initializes the constructor of this class and injects a VideoGameRepository object.

Rest Controller - VideoGameRestController

The Rest Controller is the class that handles the HTTP requests received by the API. It defines the routes used by the API, as well as each of the methods associated with it.

The API route is “/api”, but these by itself won’t consume any service. The proper use is to use one of the associated routes, such as “/api/videogames”.

```

@RestController
@RequestMapping("/api")
public class VideoGameRestController {
    private VideoGameService service;

    @Autowired
    public VideoGameRestController(VideoGameService service) { ...

    @GetMapping("/videogames")
    public List<VideoGame> findAll() { ...

    @GetMapping("/videogames/{videoGameId}")
    public VideoGame getVideoGame(@PathVariable int videoGameId) { ...

    @PostMapping("/videogames")
    public VideoGame addVideoGame(@RequestBody VideoGame videoGame) { ...

    @PutMapping("/videogames")
    public VideoGame updateVideoGame(@RequestBody VideoGame videoGame) { ...

    @DeleteMapping("/videogames/{videoGameId}")
    public void deleteVideoGame(@PathVariable int videoGameId) { ...
}

```

The Rest Controller provides 5 different methods

- findAll(): requests the full list of all VideoGames in the database.
- getVideoGame(): this method uses a parameter (retrieved from the path) to search for a video game with the same ID.
- postVideoGame(): this method inserts the data of a VideoGame object into the database
- putVideoGame(): this method updates the data of a VideoGame object already in the database. To identify which entry must be updated, the ID of the object serves as the identifying key.
- deleteVideoGame(): this method retrieves a VideoGame object using the id parameter obtained from the path. If one such object is found, the corresponding entry is removed from the database.

We can observe that our Rest Controller has barely changed from its previous implementation. This is because, while the Data JPA framework abstracts behavior on the Model side of the MVC architecture, the View and Controller don't have to change much. This displays one of the main benefits of the MVC architecture, because despite changing the implementation details of the API, the other components have barely even required modification.

Execution

When running the application, we will only be greeted by the Spring banner.

```

Spring
=====
(v3.3.3)

2024-09-07T23:00:20.641:INFO:203874 [VideoGameREST] [main] c.k.c.v.VideoGameRestApplication Starting VideoGameRestApplication using Java 17.0.12 with PID 203874 (/home/kenneth/Workspace/projects/sdmlab/week-4/VideoGameREST/target/classes started by kenneth in /home/kenneth/Workspace/projects/sdmlab/week-4/VideoGameREST)
2024-09-07T23:00:20.644:INFO:203874 [VideoGameREST] [main] c.k.c.v.VideoGameRestApplication No active profile set, falling back to 1 default profile: "default"
2024-09-07T23:00:22.238:INFO:203874 [VideoGameREST] [main] s.d.f.c.RepositoryConfigurationDelegate Bootstrapping Spring Data JPA repositories in DEFAULT mode.
2024-09-07T23:00:21.268:INFO:203874 [VideoGameREST] [main] s.d.f.c.RepositoryConfigurationDelegate Finished Spring Data repository scanning in 13 ms. Found 6 JPA repository interfaces.
2024-09-07T23:00:21.801:INFO:203874 [VideoGameREST] [main] o.s.b.w.embedded.tomcat.TomcatWebServer Tomcat initialized with port 8080 (http)
2024-09-07T23:00:21.812:INFO:203874 [VideoGameREST] [main] o.apache.catalina.core.StandardService Starting service [Tomcat]
2024-09-07T23:00:21.812:INFO:203874 [VideoGameREST] [main] o.apache.catalina.core.StandardEngine Starting Servlet engine: [Apache Tomcat/10.1.28]
2024-09-07T23:00:21.863:INFO:203874 [VideoGameREST] [main] o.s.c.c.C.[tomcat].[localhost].[/] Initializing Spring embedded WebApplicationContext
2024-09-07T23:00:21.864:INFO:203874 [VideoGameREST] [main] w.s.c.ServletWebServerApplicationContext Root WebApplicationContext: initialization completed in 1170 ms
2024-09-07T23:00:21.901:INFO:203874 [VideoGameREST] [main] com.zaxxer.hikari.HikariDataSource HikariPool-1 - Starting...
2024-09-07T23:00:22.225:INFO:203874 [VideoGameREST] [main] com.zaxxer.hikari.HikariDataSource HikariPool-1 - Added connection com.mysql.cj.jdbc.ConnectionImpl@5708c9db
2024-09-07T23:00:22.225:INFO:203874 [VideoGameREST] [main] com.zaxxer.hikari.HikariDataSource HikariPool-1 - Start completed.
2024-09-07T23:00:22.252:INFO:203874 [VideoGameREST] [main] o.hibernate.jpa.internal.util.LogHelper HH000284: Processing PersistenceUnitInfo [name: default]
2024-09-07T23:00:22.380:INFO:203874 [VideoGameREST] [main] org.hibernate.Version HH000412: Hibernate ORM core version 6.5.2.Final
2024-09-07T23:00:22.523:INFO:203874 [VideoGameREST] [main] o.h.c.internal.RegionFactoryInitiator HH000026: Second-level cache disabled.
2024-09-07T23:00:22.558:INFO:203874 [VideoGameREST] [main] o.s.o.j.p.SpringPersistenceUnitInfo No LoadTimeWeaver setup; ignoring JPA class transformer
2024-09-07T23:00:22.592:INFO:203874 [VideoGameREST] [main] o.h.e.t.j.p.t.JtaPlatformInitiator HH000489: No JTA platform available (set 'hibernate.transaction.jta.platform' to enable JTA platform integration)
2024-09-07T23:00:23.144:INFO:203874 [VideoGameREST] [main] j.LocalContainerEntityManagerFactoryBean Initialized JPA EntityManagerFactory for persistence unit 'default'
2024-09-07T23:00:23.239:WARN:203874 [VideoGameREST] [main] org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean spring.jpa.open-in-view is enabled by default. Therefore, database queries may be performed during view rendering. Explicitly configure spring.jpa.open-in-view to disable this warning
2024-09-07T23:00:23.522:INFO:203874 [VideoGameREST] [main] o.s.b.w.embedded.tomcat.TomcatWebServer Tomcat started on port 8080 (http) with context path '/'
2024-09-07T23:00:23.522:INFO:203874 [VideoGameREST] [main] c.k.c.v.VideoGameRestApplication Started VideoGameRestApplication in 3.293 seconds (process running for 3.65)
```

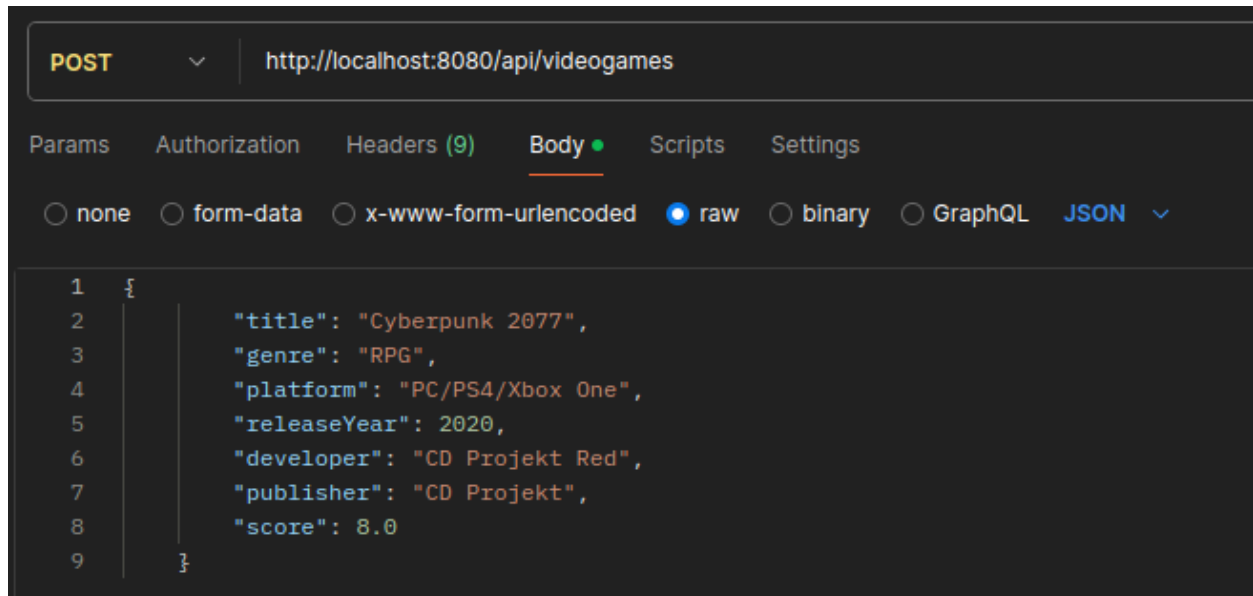
By using **Postman**, we can consume the API and verify that its execution produces the same behavior as the previous API.

```

GET http://localhost:8080/api/videogames

Params Authorization Headers (7) Body Scripts Settings
Query Params
Key Value
Key Value

Body Cookies Headers (5) Test Results
Pretty Raw Preview Visualize JSON
14 "title": "Red Dead Redemption 2",
15 "genre": "Action-adventure",
16 "platform": "PS4/Xbox One/PC",
17 "releaseYear": 2018,
18 "developer": "Rockstar Studios",
19 "publisher": "Rockstar Games",
20 "score": 10.0
21 },
22 {
23 "id": 4,
24 "title": "Dark Souls III",
25 "genre": "Action RPG",
26 "platform": "PS4/Xbox One/PC",
27 "releaseYear": 2016,
28 "developer": "FromSoftware",
29 "publisher": "Bandai Namco",
30 "score": 9.5
31 },
32 {
33 "id": 5,
34 "title": "Hades",
35 "genre": "Roguelike",
36 "platform": "PC/Nintendo Switch",
37 "releaseYear": 2020,
38 "developer": "Supergiant Games",
39 "publisher": "Supergiant Games",
40 "score": 9.8
41 }
42 ]
```

By thoroughly testing our API we can not only confirm that our latest API's behavior is the same as the previous one, but that the previous changes made are persistent.

Conclusion

I am very much a “build-your-own-x” kind of person, but I must admit that using the various Spring frameworks is definitely an eye-opening moment, because they abstract the repetitive behavior and code and instead allow developers to focus and developing the critical aspects of a software project.

This project has made me reconsider my priorities when developing my own software project, so I think I will continue to use it for a while.