

## Spring Data JPA - Quick Example

**File: DemoApplication.java**

```
package com.example.demo;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import org.springframework.web.bind.annotation.*;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

import jakarta.persistence.*;
import org.springframework.beans.factory.annotation.Autowired;
import java.util.List;

@SpringBootApplication
public class DemoApplication {
    public static void main(String[] args) {
        SpringApplication.run(DemoApplication.class, args);
    }
}

@Entity
class User {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;

    public User() {} // default constructor

    // Getters & Setters
    public Long getId() { return id; }
    public void setId(Long id) { this.id = id; }
    public String getName() { return name; }
    public void setName(String name) { this.name = name; }
    public String getEmail() { return email; }
    public void setEmail(String email) { this.email = email; }
}

@Repository
interface UserRepository extends JpaRepository<User, Long> {}
```

```

@RestController
@RequestMapping("/users")
class UserController {

    @Autowired
    private UserRepository userRepository;

    @PostMapping
    public User createUser(@RequestBody User user) {
        return userRepository.save(user);
    }

    @GetMapping
    public List<User> getAllUsers() {
        return userRepository.findAll();
    }

    @GetMapping("/{id}")
    public User getUserById(@PathVariable Long id) {
        return userRepository.findById(id).orElse(null);
    }

    @PutMapping("/{id}")
    public User updateUser(@PathVariable Long id, @RequestBody User newUser) {
        return userRepository.findById(id).map(user -> {
            user.setName(newUser.getName());
            user.setEmail(newUser.getEmail());
            return userRepository.save(user);
        }).orElse(null);
    }

    @DeleteMapping("/{id}")
    public void deleteUser(@PathVariable Long id) {
        userRepository.deleteById(id);
    }
}

```

### **application.properties**

```

spring.datasource.url=jdbc:h2:mem:testdb
spring.datasource.driverClassName=org.h2.Driver
spring.datasource.username=sa
spring.datasource.password=
spring.jpa.hibernate.ddl-auto=update
spring.h2.console.enabled=true
spring.jpa.show-sql=true

```

## Output (in Postman) :

### POST /users

```
{
  "name": "Roshini",
  "email": "roshini@gmail.com"
}
```

### Response:

```
{
  "id": 1,
  "name": "Roshini",
  "email": "roshini@gmail.com"
}
```

### GET /users

```
[
  {
    "id": 2,
    "name": "Shuruthika",
    "email": "shuruthi@gmail.com"
  }
]
```

### PUT /users/1

```
{
  "name": "Roshini SJ",
  "email": "roshini@gmail .com"
}
```

## Implement services for managing Country

Create ,

1. Country entity
2. CountryRepository
3. CountryService
4. CountryController
5. application.properties

### 1. Country Entity

```
package com.example.demo.model;

import jakarta.persistence.*;

@Entity

public class Country {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String name;
    private String capital;

    // Constructors

    public Country() {}

    public Country(String name, String capital) {

        this.name = name;

        this.capital = capital;

    }

    // Getters & Setters

    public Long getId() { return id; }

    public void setId(Long id) { this.id = id; }

    public String getName() { return name; }
```

```
public void setName(String name) { this.name = name; }

public String getCapital() { return capital; }

public void setCapital(String capital) { this.capital = capital; }

}
```

## 2. CountryRepository

```
package com.example.demo.repository;

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

import com.example.demo.model.Country;

public interface CountryRepository extends JpaRepository<Country, Long> {}
```

## 3. CountryService

```
package com.example.demo.service;

import com.example.demo.model.Country;
import com.example.demo.repository.CountryRepository;

import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;
import java.util.Optional;

@Service

public class CountryService {

    @Autowired

    private CountryRepository countryRepository;

    public List<Country> getAllCountries() {
```

```
        return countryRepository.findAll();
    }

    public Country getCountryById(Long id) {

        return countryRepository.findById(id).orElse(null);
    }

    public Country addCountry(Country country) {

        return countryRepository.save(country);
    }

    public Country updateCountry(Long id, Country updatedCountry) {

        Optional<Country> existing = countryRepository.findById(id);

        if (existing.isPresent()) {

            Country c = existing.get();
            c.setName(updatedCountry.getName());
            c.setCapital(updatedCountry.getCapital());
            return countryRepository.save(c);
        }

        return null;
    }

    public void deleteCountry(Long id) {

        countryRepository.deleteById(id);
    }
}
```

#### **4. CountryController**

```
package com.example.demo.controller;
```

```
import com.example.demo.model.Country;

import com.example.demo.service.CountryService;

import org.springframework.beans.factory.annotation.Autowired;

import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController

@RequestMapping("/countries")

public class CountryController {

    @Autowired

    private CountryService countryService;

    @GetMapping

    public List<Country> getAllCountries() {

        return countryService.getAllCountries();

    }

    @GetMapping("/{id}")

    public Country getCountryById(@PathVariable Long id) {

        return countryService.getCountryById(id);

    }

    @PostMapping

    public Country addCountry(@RequestBody Country country) {

        return countryService.addCountry(country);

    }

    @PutMapping("/{id}")

    public Country updateCountry(@PathVariable Long id, @RequestBody Country country) {

        return countryService.updateCountry(id, country);

    }

}
```

```
}

@DeleteMapping("/{id}")

public void deleteCountry(@PathVariable Long id) {

    countryService.deleteCountry(id);

}

}
```

## 5. application.properties

```
spring.datasource.url=jdbc:h2:mem:testdb

spring.datasource.driverClassName=org.h2.Driver

spring.datasource.username=sa

spring.datasource.password=

spring.jpa.hibernate.ddl-auto=update

spring.h2.console.enabled=true
```

## Output Request via Postman

### Add Country

#### POST

http://localhost:8080/countries

```
{
  "name": "India",
  "capital": "New Delhi"
}
```

### Get All Countries

#### GET

http://localhost:8080/countries

Super set ID: 6412328



## Difference between JPA, Hibernate and Spring Data JPA

Feature / Term	JPA (Java Persistence API)	Hibernate	Spring Data JPA
Type	Specification (interface)	Implementation of JPA	Abstraction built on top of JPA
What it is	API that defines ORM for Java	Framework that implements JPA	Spring module that simplifies JPA usage
Provider	Defined by Oracle (as part of Java EE)	Provided by Hibernate (Red Hat)	Provided by Spring Framework
Setup Requirement	Needs an implementation like Hibernate	Needs configuration of SessionFactory, Transaction, etc.	Very minimal setup with Spring Boot; automatic configuration
Usage Level	Low-level (more manual coding)	Medium-level (manual config, but powerful)	High-level (boilerplate-free, auto-query generation)
Example (Create)	<code>em.persist(new Country("India", "Delhi"));</code>	<code>session.save(new Country("India", "Delhi"));</code>	<code>countryRepository.save(new Country("India", "Delhi"));</code>
Example (Read)	<code>em.find(Country.class, 1L);</code>	<code>session.get(Country.class, 1L);</code>	<code>countryRepository.findById(1L);</code>
Querying	JPQL, Criteria API	JPQL, Criteria, Native SQL	Method naming (findByName), @Query, paging, sorting
Boilerplate Code	More	Less than JPA	Very minimal, most is auto-generated
Annotations Used	@Entity, @Id, @OneToMany, @GeneratedValue	Same JPA annotations + additional Hibernate-specific annotations (e.g., @Where)	Uses JPA annotations + Spring's @Repository, @Service, etc.
Ease of Testing	Complex	Easier than raw JPA	Simplified using Spring Boot Test
Integration	Can integrate with any ORM framework	Mostly used standalone or as JPA provider	Deeply integrated with Spring ecosystem

## Find a country based on country code

### CountryApp.java

```
package com.example.country;

import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;

@SpringBootApplication
public class CountryApp {
    public static void main(String[] args) {
        SpringApplication.run(CountryApp.class, args);
    }
}
```

### Country.java (Model)

```
package com.example.country.model;

import jakarta.persistence.*;

@Entity
public class Country {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String capital;
    private String countryCode;

    public Country() {}

    public Country(String name, String capital, String countryCode) {
        this.name = name;
        this.capital = capital;
        this.countryCode = countryCode;
    }

    // Getters and Setters
    public Long getId() { return id; }
    public void setId(Long id) { this.id = id; }

    public String getName() { return name; }
    public void setName(String name) { this.name = name; }

    public String getCapital() { return capital; }
```

```
public void setCapital(String capital) { this.capital = capital; }

public String getCountryCode() { return countryCode; }
public void setCountryCode(String countryCode) { this.countryCode = countryCode; }
}
```

### **CountryRepository.java**

```
package com.example.country.repository;

import com.example.country.model.Country;
import org.springframework.data.jpa.repository.JpaRepository;

public interface CountryRepository extends JpaRepository<Country, Long> {

    Country findByCountryCode(String countryCode);
}
```

### **CountryService.java**

```
package com.example.country.service;

import com.example.country.model.Country;
import com.example.country.repository.CountryRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
```

```
import java.util.List;
```

```
@Service
```

```
public class CountryService {
```

```
    @Autowired
```

```
    private CountryRepository countryRepository;
```

```
public List<Country>
getAllCountries() {
    return countryRepository.findAll();
}

public Country getCountryById(Long id) {
    return countryRepository.findById(id).orElse(null);
}

public Country getCountryByCode(String code) {
    return countryRepository.findByCountryCode(code);
}

public Country addCountry(Country country) {
    return countryRepository.save(country);
}

public Country updateCountry(Long id, Country updatedCountry) {
    return countryRepository.findById(id).map(c -> {
        c.setName(updatedCountry.getName());
        c.setCapital(updatedCountry.getCapital());
        c.setCountryCode(updatedCountry.getCountryCode());
        return countryRepository.save(c);
    }).orElse(null);
}

public void deleteCountry(Long id) {
    countryRepository.deleteById(id);
}
}
```

## CountryController.java

```
package com.example.country.controller;

import com.example.country.model.Country;
import com.example.country.service.CountryService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;
import java.util.List;

@RestController
@RequestMapping("/countries")
public class CountryController {

    @Autowired
    private CountryService countryService;

    @GetMapping
    public List<Country> getAllCountries() {
        return countryService.getAllCountries();
    }

    @GetMapping("/{id}")
    public Country getCountryById(@PathVariable Long id) {
        return countryService.getCountryById(id);
    }

    @GetMapping("/code/{code}")
    public Country getCountryByCode(@PathVariable String code) {
        return countryService.getCountryByCode(code);
    }
}
```

@PostMapping

```
public Country addCountry(@RequestBody Country country) {  
    return countryService.addCountry(country);  
}
```

@PutMapping("/{id}")

```
public Country updateCountry(@PathVariable Long id, @RequestBody Country country) {  
    return countryService.updateCountry(id, country);  
}
```

@DeleteMapping("/{id}")

```
public void deleteCountry(@PathVariable Long id) {  
    countryService.deleteCountry(id);  
}  
}
```

### **application.properties**

```
spring.datasource.url=jdbc:h2:mem:countrydb  
spring.datasource.driverClassName=org.h2.Driver  
spring.datasource.username=sa  
spring.datasource.password=  
spring.jpa.hibernate.ddl-auto=update  
spring.jpa.show-sql=true  
spring.h2.console.enabled=true
```

## **Output Requests in Postman**

### **Add Country**

#### **POST**

http://localhost:8080/countries

```
{  
  "name": "India",  
  "capital": "New Delhi",  
  "countryCode": "IN"  
}
```

## Get Country by Country Code

### GET

<http://localhost:8080/countries/code/IN>

# WEEK 3

## Add a new country

### API Endpoint to Add a Country

#### Method:

POST /countries

#### CountryController.java

```
@PostMapping
public Country addCountry(@RequestBody Country country) {
    return countryService.addCountry(country);
}
```

#### And in the service:

```
public Country addCountry(Country country) {
    return countryRepository.save(country);
}
```

#### Output :

```
{
  "id": 1,
  "name": "India",
  "capital": "New Delhi",
  "countryCode": "IN"
}
```



## **Demonstrate implementation of Query Methods feature of Spring Data JPA**

### **User Entity**

#### **User.java (Entity)**

```
package com.example.demo.model;

import jakarta.persistence.*;

@Entity
public class User {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;
    private String city;

    // Constructors
    public User() {}
    public User(String name, String email, String city) {
        this.name = name;
        this.email = email;
        this.city = city;
    }

    // Getters and Setters
    // ...
}
```

#### **UserRepository.java (with Query Methods)**

```
package com.example.demo.repository;

import com.example.demo.model.User;
import org.springframework.data.jpa.repository.JpaRepository;

import java.util.List;

public interface UserRepository extends JpaRepository<User, Long> {

    // Find by name
    List<User> findByName(String name);
}
```

```
// Find by city
List<User> findByCity(String city);

// Find by email ending with a domain
List<User> findByEmailEndingWith(String domain);

// Find users by name ignoring case
List<User> findByNameIgnoreCase(String name);

// Find by name containing keyword
List<User> findByNameContaining(String keyword);
}
```

### **UserService.java**

```
package com.example.demo.service;

import com.example.demo.model.User;
import com.example.demo.repository.UserRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class UserService {

    @Autowired
    private UserRepository userRepository;

    public List<User> getByName(String name) {
        return userRepository.findByName(name);
    }

    public List<User> getByCity(String city) {
        return userRepository.findByCity(city);
    }

    public List<User> searchByEmailDomain(String domain) {
        return userRepository.findByEmailEndingWith(domain);
    }

    public List<User> searchByNameKeyword(String keyword) {
        return userRepository.findByNameContaining(keyword);
    }
}
```

## UserController.java

```
package com.example.demo.controller;

import com.example.demo.model.User;
import com.example.demo.service.UserService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/users")
public class UserController {

    @Autowired
    private UserService userService;

    @GetMapping("/name/{name}")
    public List<User> getByName(@PathVariable String name) {
        return userService.getByName(name);
    }

    @GetMapping("/city/{city}")
    public List<User> getByCity(@PathVariable String city) {
        return userService.getByCity(city);
    }

    @GetMapping("/email/domain")
    public List<User> getEmailDomain(@RequestParam String domain) {
        return userService.searchByEmailDomain(domain);
    }

    @GetMapping("/search")
    public List<User> searchByName(@RequestParam String keyword) {
        return userService.searchByNameKeyword(keyword);
    }
}
```

## JSON Response

```
[  
  {  
    "id": 1,  
    "name": "John",  
    "email": "john@gmail.com",  
    "city": "Chennai"  
  }  
]
```

# WEEK 3

## Demonstrate implementation of O/R Mapping

One Student → Many Courses

### **Student.java**

```
package com.example.demo.model;

import jakarta.persistence.*;
import java.util.List;

@Entity
public class Student {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    @OneToMany(mappedBy = "student", cascade = CascadeType.ALL)
    private List<Course> courses;

    // Getters and Setters
}
```

### **Course.java**

```
package com.example.demo.model;

import jakarta.persistence.*;

@Entity
public class Course {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String courseName;

    @ManyToOne
    @JoinColumn(name = "student_id")
    private Student student;

    // Getters and Setters
}
```

### **StudentRepository.java**

```
package com.example.demo.repository;

import com.example.demo.model.Student;
import org.springframework.data.jpa.repository.JpaRepository;

public interface StudentRepository extends JpaRepository<Student, Long> {}
```

### **CourseRepository.java**

```
package com.example.demo.repository;

import com.example.demo.model.Course;
import org.springframework.data.jpa.repository.JpaRepository;

public interface CourseRepository extends JpaRepository<Course, Long> {}
```

### **StudentController.java**

```
package com.example.demo.controller;

import com.example.demo.model.Student;
import com.example.demo.repository.StudentRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/students")
public class StudentController {

    @Autowired
    private StudentRepository studentRepository;

    @PostMapping
    public Student addStudent(@RequestBody Student student) {
        return studentRepository.save(student);
    }

    @GetMapping
    public List<Student> getAllStudents() {
        return studentRepository.findAll();
    }
}
```

```
}
```

## JSON to Test in Postman

### POST /students

```
{
  "name": "Alice",
  "courses": [
    {
      "courseName": "Java"
    },
    {
      "courseName": "Spring Boot"
    }
  ]
}
```

### Output :

```
{
  "id": 1,
  "name": "Alice",
  "courses": [
    {
      "id": 1,
      "courseName": "Java"
    },
    {
      "id": 2,
      "courseName": "Spring Boot"
    }
  ]
}
```

## Demonstrate writing Hibernate Query Language and Native Query

### **User.java**

```
package com.example.demo.model;

import jakarta.persistence.*;

@Entity
public class User {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;

    // Getters and Setters
}
```

### **UserRepository.java – Using HQL and Native Queries**

```
package com.example.demo.repository;

import com.example.demo.model.User;
import org.springframework.data.jpa.repository.*;
import org.springframework.data.repository.query.Param;
import org.springframework.stereotype.Repository;

import java.util.List;

@Repository
public interface UserRepository extends JpaRepository<User, Long> {

    // 1. HQL Query
    @Query("SELECT u FROM User u WHERE u.name = :name")
    List<User> findUsersByNameHQL(@Param("name") String name);

    // 2. Native SQL Query
    @Query(value = "SELECT * FROM user WHERE email = :email", nativeQuery = true)
    List<User> findUsersByEmailNative(@Param("email") String email);

    // 3. Native query for partial name
    @Query(value = "SELECT * FROM user WHERE name LIKE %:keyword%",
nativeQuery = true)
    List<User> searchByNameNative(@Param("keyword") String keyword);
}
```



```
}
```

### **UserService.java**

```
package com.example.demo.service;

import com.example.demo.model.User;
import com.example.demo.repository.UserRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class UserService {

    @Autowired
    private UserRepository userRepository;

    public List<User> getUsersByNameHQL(String name) {
        return userRepository.findUsersByNameHQL(name);
    }

    public List<User> getUsersByEmailNative(String email) {
        return userRepository.findUsersByEmailNative(email);
    }

    public List<User> searchByNameNative(String keyword) {
        return userRepository.searchByNameNative(keyword);
    }
}
```

### **UserController.java**

```
package com.example.demo.controller;

import com.example.demo.model.User;
import com.example.demo.service.UserService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/users")
public class UserController {
```

```
@Autowired
private UserService userService;

@GetMapping("/hql/{name}")
public List<User> getByNameHQL(@PathVariable String name) {
    return userService getUsersByNameHQL(name);
}

@GetMapping("/native/email")
public List<User> getByEmailNative(@RequestParam String email) {
    return userService getUsersByEmailNative(email);
}

@GetMapping("/native/search")
public List<User> searchByName(@RequestParam String keyword) {
    return userService.searchByNameNative(keyword);
}
}
```

### HQL: Get users by name

#### Request:

GET http://localhost:8080/users/hql/John

#### Response (JSON):



```
[
  {
    "id": 1,
    "name": "John",
    "email": "john@gmail.com"
  }
]
```

### Native: Get user by email

#### Request:

GET http://localhost:8080/users/native/email?email=john@gmail.com

#### Response:

```
[
  {
    "id": 1,
    "name": "John",
    "email": "john@gmail.com"
  }
]
```

### **Native: Search user by name keyword**

#### **Request:**

GET <http://localhost:8080/users/native/search?keyword=oh>

#### **Response:**

```
[
  {
    "id": 2,
    "name": "Roshini",
    "email": "roshini@gmail.com"
  },
  {
    "id": 3,
    "name": "Shuruthika",
    "email": "shuruthika@gmail.com"
  }
]
```

# WEEK 3