Spring Boot – Transaction Management Using @Transactional Annotation

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@Transactional annotation is the metadata used for managing transactions in the Spring Boot application. To configure **Spring Transaction**, this annotation can be applied at the class level or method level. In an enterprise application, a transaction is a sequence of actions performed by the application that together pipelined to perform a single operation. For example, booking a flight ticket is also a transaction where the end user has to enter his information and then make a payment to book the ticket.

Why Do We Need Transaction Management?

Let's understand transactions with the above example, if a user has entered his information the user's information gets stored in the user_info table. Now, to book a ticket he makes an online payment and due to some reason(system failure) the payment has been canceled so, the ticket is not booked for him. But,

large scale, more than thousands of these things happen within a single day. So, it is not good practice to store a single action of the transaction(Here, only user info is stored not the payment info).

To overcome these problems, spring provides transaction management, which uses annotation to handle these issues. In such a scenario, spring stores the user information in temporary memory and then checks for payment information if the payment is successful then it will complete the transaction otherwise it will roll back the transaction and the user information will not get stored in the database.

@Transactional Annotation

In Spring Boot, @Transactional annotation is used to manage transactions in a Spring boot application and used to define a scope of transaction. This

annotation can be applied to the class level or method level. It provides data reliability and consistency. When a method is indicated with @Transactional annotation, it indicates that the particular method should be executed within the context of that transaction. If the transaction becomes successful then the changes made to the database are committed, if any transaction fails, all the changes made to that particular transaction can be rollback and it will ensure that the database remains in a consistent state.

> ***Note:*** *To use* ***@Transactional*** *annotation, you need to configure transaction management by using* ***@EnableTransactionManagement*** *to your main class of Spring Boot application.*

Configure Transaction in Spring Boot

In this example, we will create an application to store user information along with his address information and will use spring transaction management to resolve the transaction break problem.

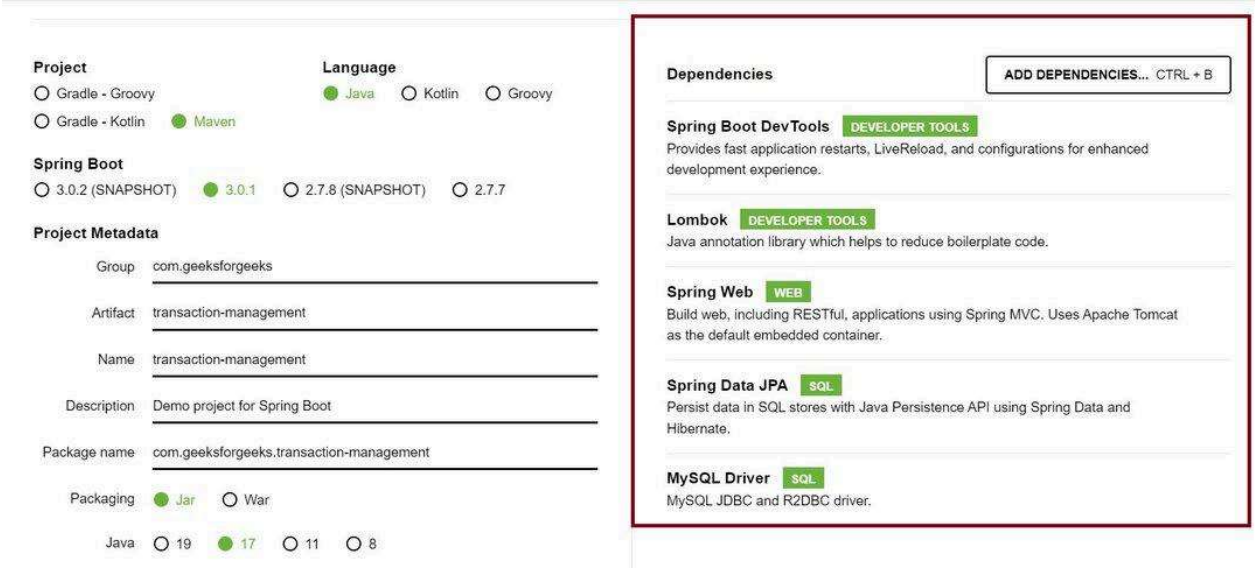
Step By Step Implementation of Transaction Management

Step 1: Create A Spring Boot Project

In this step, we will create a spring boot project. For this, we will be using Spring Initializr. To create a spring boot project please refer to How to Create a Spring Boot Project?

Step 2: Add Dependencies

We will add the required dependencies for our spring boot application.



Step 3: Configure Database

Now, we will configure the database in our application. We will be using the following configurations and add them to our **application.properties** file.

```
server.port = 9090
#database configuration
spring.datasource.url=jdbc:mysql://localhost:3306/employee_db
spring.datasource.username=root
spring.datasource.password=root
spring.jpa.properties.hibernate.dialect=org.hibernate.dialect.MySQL57Dialect
#the ddl-auto=update : It will create the entity schema and map it to db automatically
spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
```

> ***Note**: Please add your database username & password along with the database path.*

Step 4: Create Model Class

In this step, we will create our model class. Here, we will be creating two model classes, **Employee** and **Address**. While creating the model class we will be using Lombok Library.

Employee.java

Java

```java
import jakarta.persistence.Entity;
import jakarta.persistence.GeneratedValue;
import jakarta.persistence.GenerationType;
import jakarta.persistence.Id;
import jakarta.persistence.Table;
import lombok.AllArgsConstructor;
import lombok.Getter;
import lombok.NoArgsConstructor;
import lombok.Setter;
import lombok.ToString;

@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
@Entity
@Table(name="EMP_INFO")
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private int id;
    private String name;

}
```

Address.java

Java

```java
import jakarta.persistence.Entity;
import jakarta.persistence.GeneratedValue;
import jakarta.persistence.GenerationType;
import jakarta.persistence.Id;
import jakarta.persistence.OneToOne;
import jakarta.persistence.Table;
import lombok.AllArgsConstructor;
import lombok.Getter;
import lombok.NoArgsConstructor;
import lombok.Setter;
```

```
import lombok.ToString;

@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
@Entity
@Table(name="ADD_INFO")
public class Address {

    @Id
    @GeneratedValue(strategy = GenerationType.AUTO)
    private Long id;
    private String address;

    // one to one mapping means,
    // one employee stays at one address only
    @OneToOne
    private Employee employee;

}
```

Step 5: Create a Database Layer

In this step, we will create a database layer. For this, we will be creating **EmployeeRepository** and **AddressRepository** and will be extending **JpaRepository<T, ID>** for performing database-related queries.

EmployeeRepository.java

Java

```
import org.springframework.data.jpa.repository.JpaRepository;
import com.geeksforgeeks.transactionmanagement.model.Employee;

public interface EmployeeRepository extends JpaRepository<Employee,
Integer> {

}
```

AddressRepository.java

Java

```
import org.springframework.data.jpa.repository.JpaRepository;
import com.geeksforgeeks.transactionmanagement.model.Address;

public interface AddressRepository extends JpaRepository<Address, Integer>
{

}
```

Step 6: Create a Service Layer

You can use **@Transactional** annotation in service layer which will result interacting with the database. In this step, we will create a service layer for our application and add business logic to it. For this, we will be creating two classes **EmployeeService** and **AddressService**. In EmployeeService class we are throwing an exception.

EmployeeService.java

Java

```
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import org.springframework.transaction.annotation.Transactional;

import com.geeksforgeeks.transactionmanagement.model.Address;
import com.geeksforgeeks.transactionmanagement.model.Employee;
import
com.geeksforgeeks.transactionmanagement.repository.EmployeeRepository;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    @Autowired
    private AddressService addressService;

    @Transactional
    public Employee addEmployee(Employee employee) throws Exception {
        Employee employeeSavedToDB =
this.employeeRepository.save(employee);

        Address address = new Address();
        address.setId(123L);
        address.setAddress("Varanasi");
```

```
            address.setEmployee(employee);

            // calling addAddress() method
            // of AddressService class
            this.addressService.addAddress(address);
            return employeeSavedToDB;
        }
    }
```

AddressService.java

Java

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

import com.geeksforgeeks.transactionmanagement.model.Address;
import
com.geeksforgeeks.transactionmanagement.repository.AddressRepository;

@Service
public class AddressService {

    @Autowired
    private AddressRepository addressRepository;

    public Address addAddress(Address address) {
        Address addressSavedToDB = this.addressRepository.save(address);
        return addressSavedToDB;
    }

}
```

Step 7: Create Controller

In this step, we will create a controller for our application. For this, we will create a Controller class and add all the mappings to it.

Controller.java

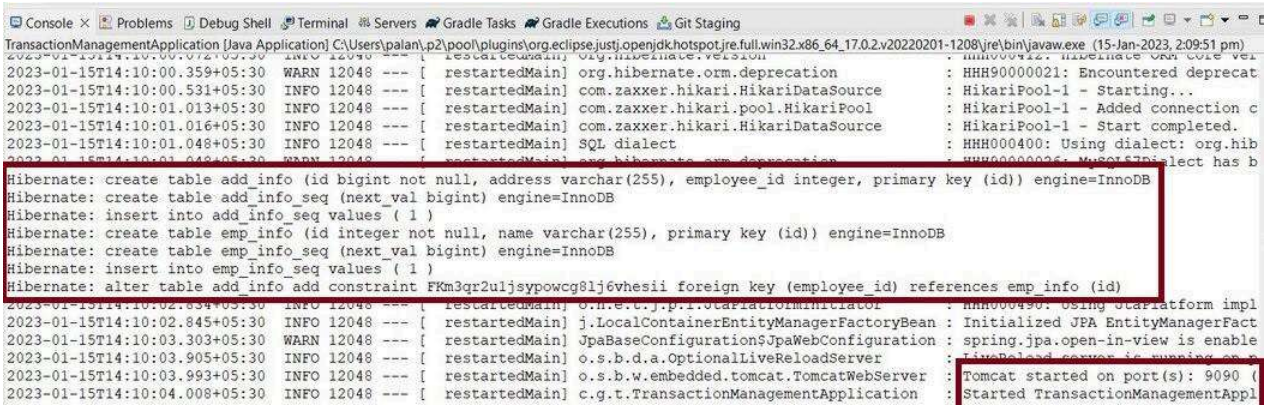
Java

```
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.http.HttpStatus;
import org.springframework.http.ResponseEntity;
```

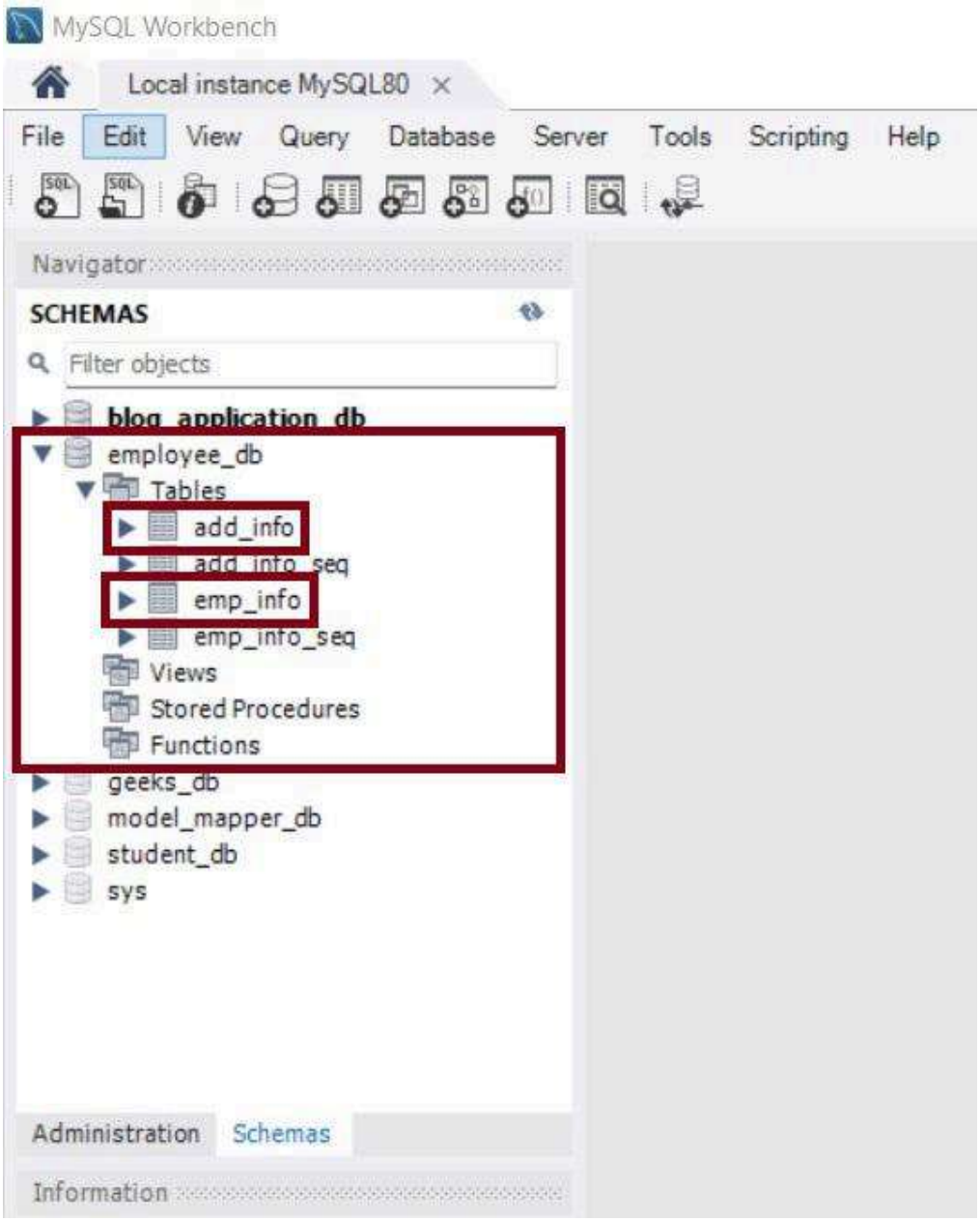
```
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.RequestBody;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.RestController;

import com.geeksforgeeks.transactionmanagement.model.Employee;
import com.geeksforgeeks.transactionmanagement.service.EmployeeService;

@RestController
@RequestMapping("/api/employee")
public class Controller {

    @Autowired
    private EmployeeService employeeService;

    @PostMapping("/add")
    public ResponseEntity<Employee> saveEmployee(@RequestBody Employee
employee) throws Exception{
        Employee employeeSavedToDB =
this.employeeService.addEmployee(employee);
        return new ResponseEntity<Employee>(employeeSavedToDB,
HttpStatus.CREATED);
    }
}
```

Step 8: Running Our Application

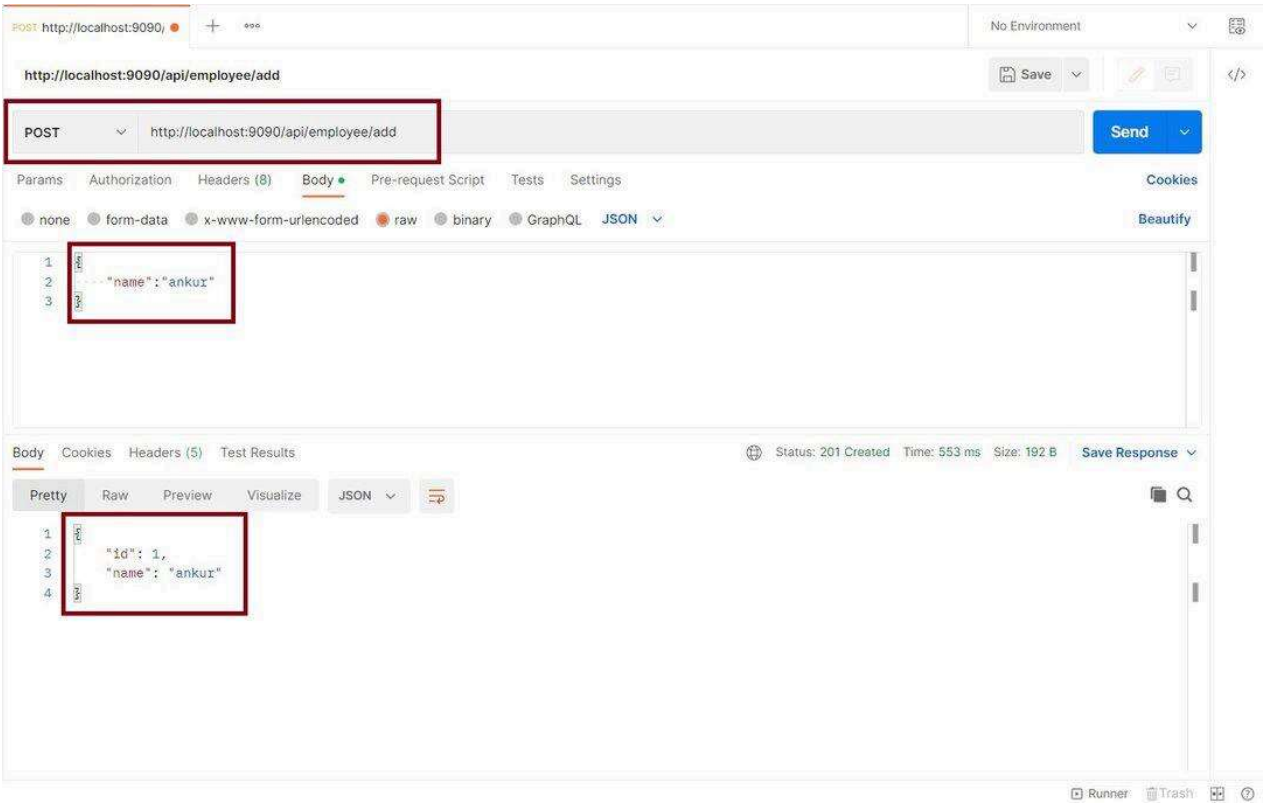
In this step, we will run our application. Once, we run our application using hibernate mapping in our database required tables will be created.



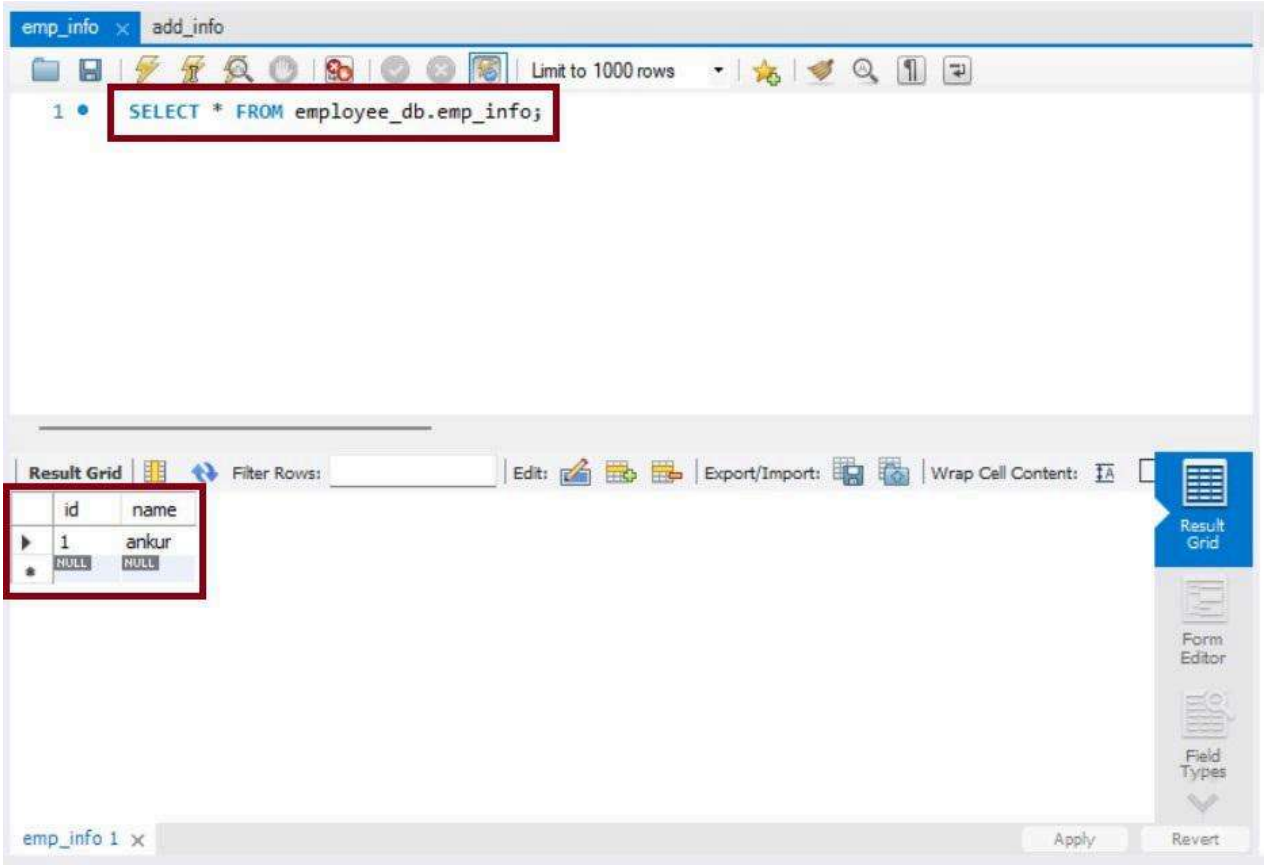
As we can see in logs, our table has been created. We can also confirm it by looking at our database.



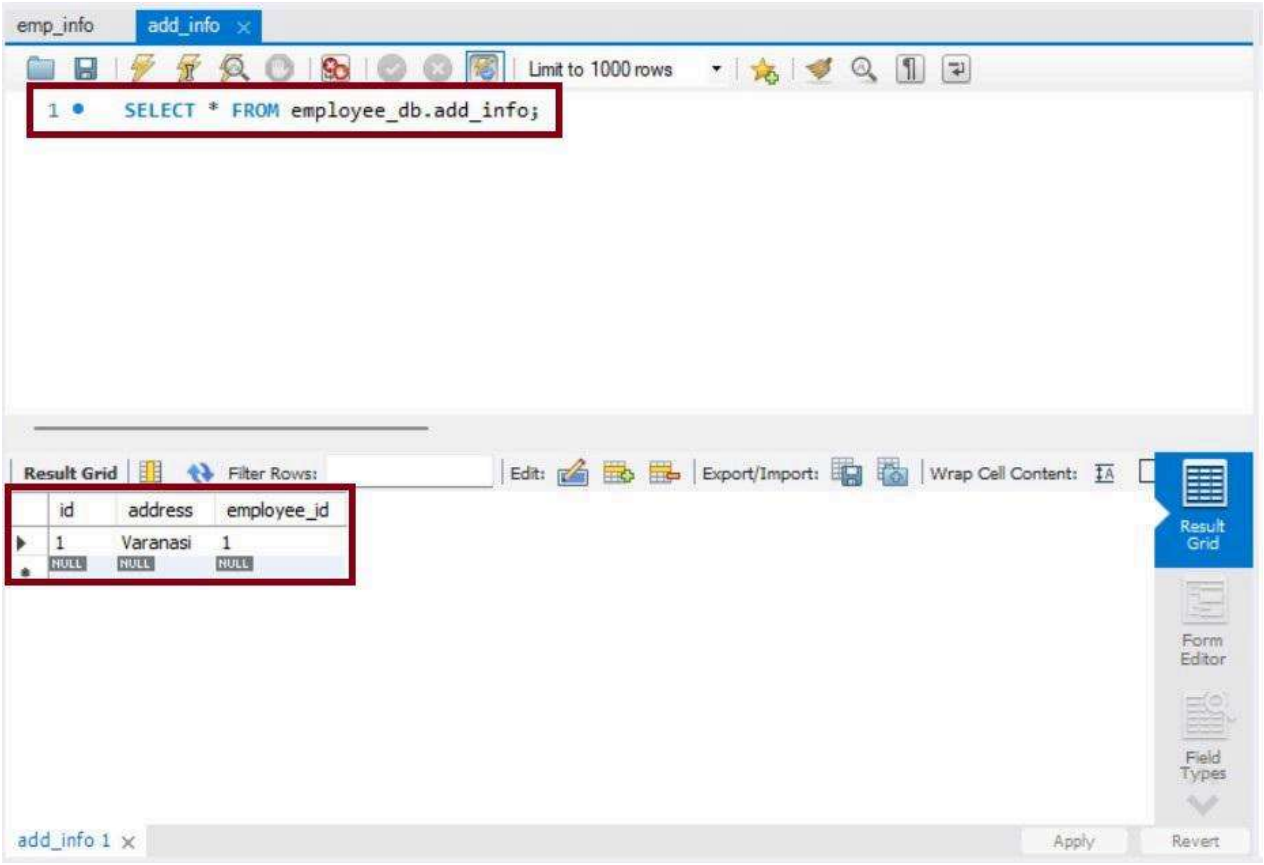
Now, we will request our application for adding an employee to it, using postman. To learn more about postman please refer to Postman – Working, HTTP Request & Responses. Once, we hit the request, **the request moves from the controller to the service layer where our business logic is present**.



As we can see in the above response we have added an employee. We can also check our database for employee data and address data.



Similarly, we can also check for address data.



Step 9: Problem Without Transaction Management

In the EmployeeService class, we initialize the address object to NULL. Consequently, the employee's details cannot be stored in the database due to the null address object. However, as we are not employing transaction management, the employee basic information will persisted in the database. The address details are omitted because of the null value.

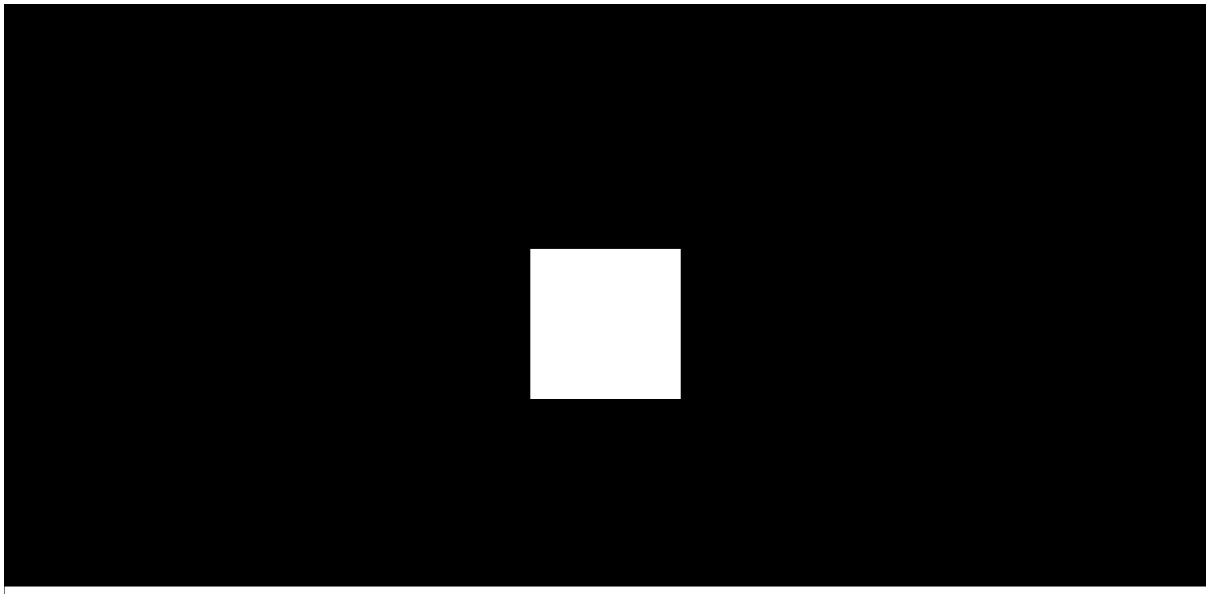
> ***Note:*** *Applying the* ***@Transactional*** *annotation to a method will not trigger a rollback of any operation if* ***@EnableTransactionManagement*** *is not used.*

Java

```
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import org.springframework.transaction.annotation.Transactional;

import com.geeksforgeeks.transactionmanagement.model.Address;
```

```
import com.geeksforgeeks.transactionmanagement.model.Employee;
import
com.geeksforgeeks.transactionmanagement.repository.EmployeeRepository;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    @Autowired
    private AddressService addressService;

    public Employee addEmployee(Employee employee) throws Exception {
        Employee employeeSavedToDB =
this.employeeRepository.save(employee);

        // we will initialize the
        // address object as null
        Address address = null;
        address.setId(123L);
        address.setAddress("Varanasi");
        address.setEmployee(employee);

        // calling addAddress() method
        // of AddressService class
        this.addressService.addAddress(address);
        return employeeSavedToDB;
    }
}
```

Now, we will delete our table from the database and again run our application and will request the application to create an employee.



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As we can see in the above media file, we have initialized the address object as null and requested the application, we have an employee created in the database but the address information is not, as we have received a null pointer exception. But, *this is not good practice in transaction management, as employees should be saved only when the address is saved and vice-versa.*

Step 10: Transaction Management

To overcome this problem, we will use **@Transactional** annotation. This will ensure that the transaction should be complete. That is, **either both employee and address data should be stored or nothing will get stored**. For using transaction management, we need to use **@EnableTransactionManagement in the main class of our spring boot application** and also, and we need to annotate our **addEmployee()** method in EmployeeService class with **@Transactional** annotation.

TransactionManagementApplication.java

Java

```
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
import
org.springframework.transaction.annotation.EnableTransactionManagement;

@SpringBootApplication
@EnableTransactionManagement
public class TransactionManagementApplication {

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

}
```

EmployeeService.java

Java

```
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;
import org.springframework.transaction.annotation.Transactional;

import com.geeksforgeeks.transactionmanagement.model.Address;
import com.geeksforgeeks.transactionmanagement.model.Employee;
import
com.geeksforgeeks.transactionmanagement.repository.EmployeeRepository;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    @Autowired
    private AddressService addressService;

    @Transactional
    public Employee addEmployee(Employee employee) throws Exception {
        Employee employeeSavedToDB =
this.employeeRepository.save(employee);

        // we will initialize the
        // address object as null
        Address address = null;
        address.setId(123L);
        address.setAddress("Varanasi");
        address.setEmployee(employee);

        // calling addAddress() method
        // of AddressService class
        this.addressService.addAddress(address);
        return employeeSavedToDB;
    }
}
```

Step 11: Running Application

Now, we have enabled transaction management for our application. We will again delete the tables from our database and request our application to add an employee.

Conclusion

In this article, we have learned basic configuration of transaction management using in a Spring Boot application. Also we have covered @Transactional and @EnableTransactionManagement annotation and it's uses with a step by step implementation in a spring boot application.

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