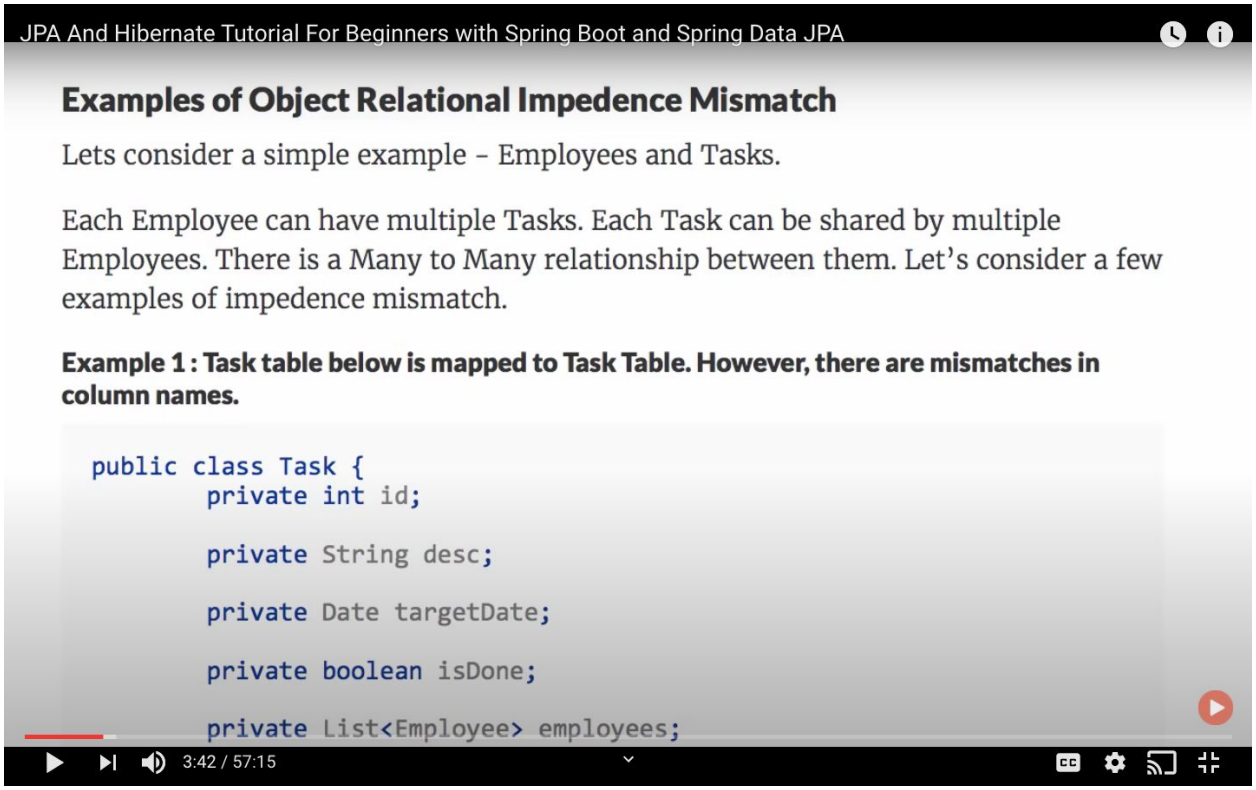
- Step 1 : Object Relational Impedence Mismatch - Understanding the problem that JPA solves



```
        private int id;

        private String desc;

        private Date targetDate;

        private boolean isDone;

        private List<Employee> employees;
}
```

```
CREATE TABLE task
 (
    id          INTEGER GENERATED BY DEFAULT AS IDENTITY,
    description VARCHAR(255),
    is_done     BOOLEAN,
    target_date TIMESTAMP,
    PRIMARY KEY (id)
 )
```

Example 2 : Relationships between objects are expressed in a different way compared with

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Example 2 : Relationships between objects are expressed in a different way compared with relationship between tables.

Each Employee can have multiple Tasks. Each Task can be shared by multiple Employees. There is a Many to Many relationship between them.

```
public class Employee {

     //Some other code

        private List<Task> tasks;
}

public class Task {

     //Some other code

        private List<Employee> employees;
}
```

```sql
CREATE TABLE employee
  (
     id             BIGINT NOT NULL,
     OTHER_COLUMNS
  )


  CREATE TABLE employee_tasks
  (
     employees_id BIGINT NOT NULL,
     tasks_id     INTEGER NOT NULL
  )

  CREATE TABLE task
  (
     id          INTEGER GENERATED BY DEFAULT AS IDENTITY,
     OTHER_COLUMNS
  )
```

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Example 3 : Some times multiple classes are mapped to a single table and vice-versa

Objects

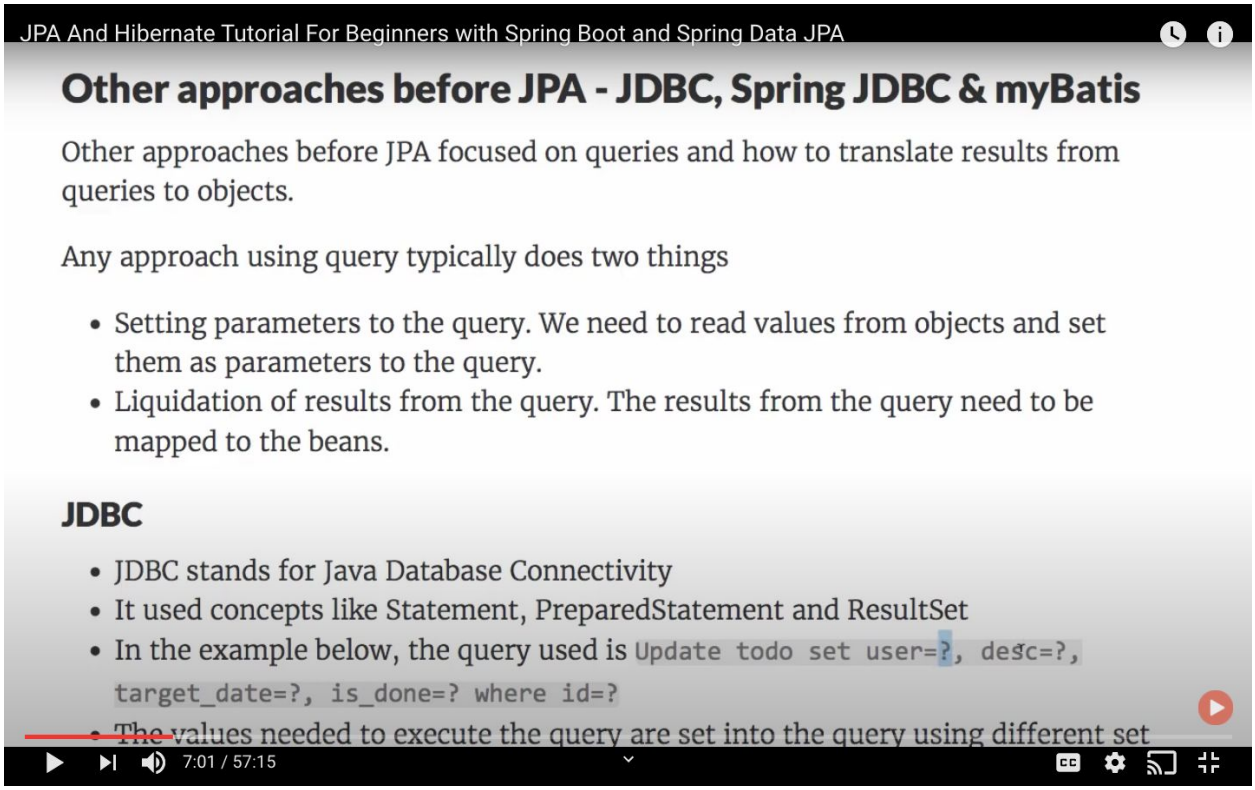
```java
public  class Employee {
    //Other Employee Attributes
}

public class FullTimeEmployee extends Employee {
        protected Integer salary;
}

public class PartTimeEmployee extends Employee {
        protected Float hourlyWage;
}
```

Tables

```sql
CREATE TABLE employee
  (
```

5:12 / 57:15

- Step 2 : World before JPA - JDBC, Spring JDBC and myBatis



We would get the result of sql query in ResultSet and then get values from resultset and

put it in bean

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```
PreparedStatement st = connection.prepareStatement(
                "SELECT * FROM TODO where id=?");

st.setInt(1, id);

ResultSet resultSet = st.executeQuery();


if (resultSet.next()) {

    Todo todo = new Todo();
        todo.setId(resultSet.getInt("id"));
        todo.setUser(resultSet.getString("user"));
        todo.setDesc(resultSet.getString("desc"));
        todo.setTargetDate(resultSet.getTimestamp("target_date"));
        return todo;
}

st.close();

connection.close();

return null;
```

8:31 / 57:15

Spring JDBC

- Spring JDBC provides a layer on top of JDBC
- It used concepts like JDBCTemplate
- Typically needs lesser number of lines compared to JDBC as following are simplified
  - mapping parameters to queries
  - liquidating resultsets to beans

Update Todo

```
jdbcTemplate
.update("Update todo set user=?, desc=?, target_date=?, is_done=? where id=
        todo.getUser(),
        todo.getDesc(),
        new Timestamp(todo.getTargetDate().getTime()),
        todo.isDone(),
        todo.getId());
```

Retrieve a Todo

```
@Override
public Todo retrieveTodo(int id) {

        return jdbcTemplate.queryForObject(
                        "SELECT * FROM TODO where id=?",
                        new Object[] { id }, new TodoMapper());

}
```

Reusable Row Mapper

```
// new BeanPropertyRowMapper(TodoMapper.class)
class TodoMapper implements RowMapper<Todo> {
        @Override
        public Todo mapRow(ResultSet rs, int rowNum)
                        throws SQLException {
                Todo todo = new Todo();

                todo.setId(rs.getInt("id"));
                todo.setUser(rs.getString("user"));
```


myBatis

MyBatis removes the need for manually writing code to set parameters and retrieve results. It provides simple XML or Annotation based configuration to map Java POJOs to database.

We compare the approaches used to write queries below:

- JDBC or Spring JDBC - `Update todo set user=?, desc=?, target_date=?, is_done=? where id=?`
- myBatis - `Update todo set user=#{user}, desc=#{desc}, target_date=#{targetDate}, is_done=#{isDone} where id=#{id}`

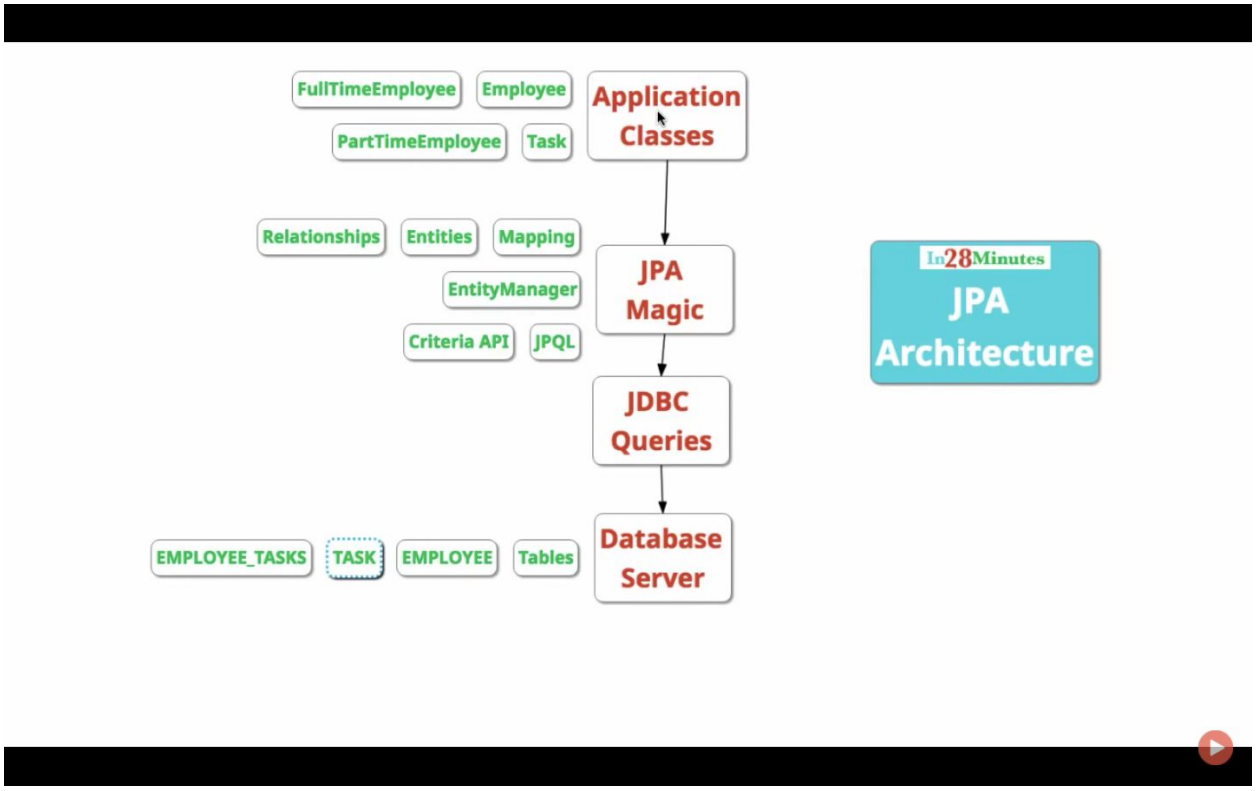
Update Todo and Retrieve Todo

```
@Mapper
public interface TodoMybatisService
                extends TodoDataService {
```

The fundamental thing for all three approaches was the fact they were based on queries.
The Problem with writing big queries is that when relation between tables change ,queries had to be changed.

- Step 3 : Introduction to JPA

JPA provides mapping between classes and database using concept of Entities



Example 1

Task table below is mapped to Task Table. However, there are mismatches in column names. We use a few JPA annotations to do the mapping

- @Table(name = “Task”)
- @Id
- @GeneratedValue
- @Column(name = “description”)

```
import javax.persistence.Column;
import javax.persistence.Entity;
import javax.persistence.GeneratedValue;
import javax.persistence.GenerationType;
import javax.persistence.Id;
import javax.persistence.ManyToMany;
import javax.persistence.Table;

@Entity
@Table(name = "Task")
public class Task {
```


```
import javax.persistence.Entity;
import javax.persistence.GeneratedValue;
import javax.persistence.GenerationType;
import javax.persistence.Id;
import javax.persistence.ManyToMany;
import javax.persistence.Table;

@Entity
@Table(name = "Task")
public class Task {
```


```
        @Id
        @GeneratedValue
        private int id;

        @Column(name = "description")
        private String desc;

        @Column(name = "target_date")
        private Date targetDate;

        @Column(name = "is_done")
        private boolean isDone;

}
```

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```
        @Column(name = "description")
        private String desc;

        @Column(name = "target_date")
        private Date targetDate;

        @Column(name = "is_done")
        private boolean isDone;

}
```

```
CREATE TABLE task
  (
     id          INTEGER GENERATED BY DEFAULT AS IDENTITY,
     description VARCHAR(255),
     is_done     BOOLEAN,
     target_date TIMESTAMP,
     PRIMARY KEY (id)
  )
```

16:09 / 57:15

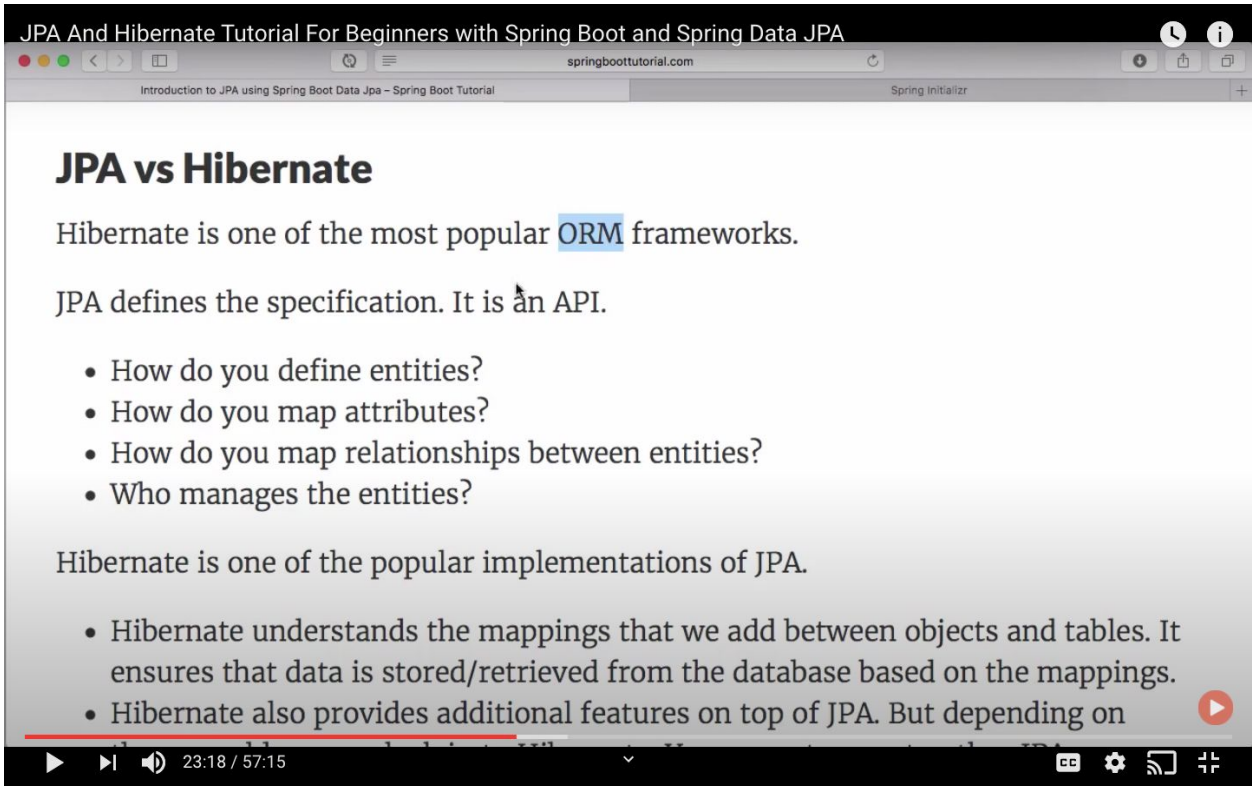
Some times multiple classes are mapped to a single table and vice-versa. In these situations, we define a inheritance strategy. In this example, we use a strategy of InheritanceType.SINGLE_TABLE.

Objects

```
@Entity
@Inheritance(strategy = InheritanceType.SINGLE_TABLE)
@DiscriminatorColumn(name = "EMPLOYEE_TYPE")
public  class Employee {
    //Other Employee Attributes
}

public class FullTimeEmployee extends Employee {
        protected Integer salary;
}

public class PartTimeEmployee extends Employee {
        protected Float hourlyWage;
}
```



- Step 4 : Creating a JPA Project using Spring Initializr
- Step 5 : Defining a JPA Entity - User

Using Entity Manager

@Entity: Map public class User to Table User

@Id : mappes class members as a primary key

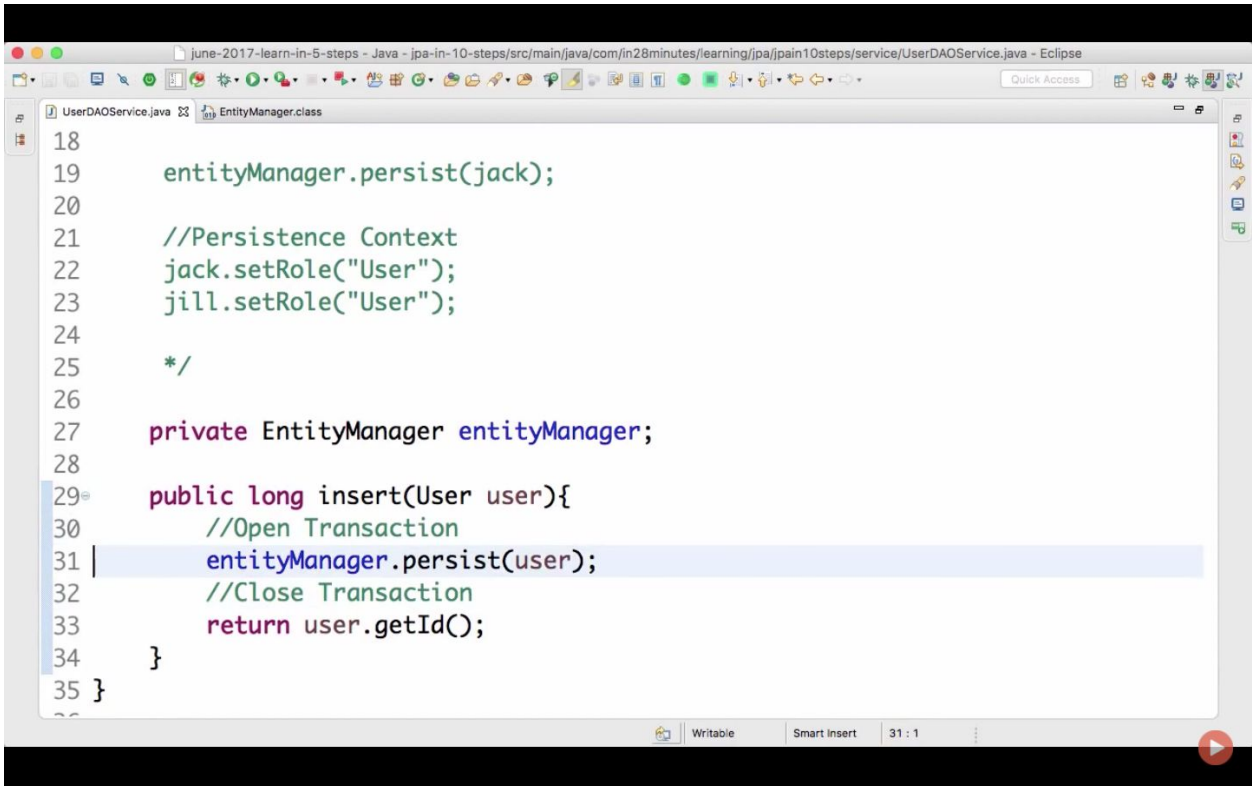
@GeneratedValue : we dont assign value this attribute ,automatically generated

@Repository : class that helps store things to database

class UserDAOService: Data Access Object, helps us access data from database

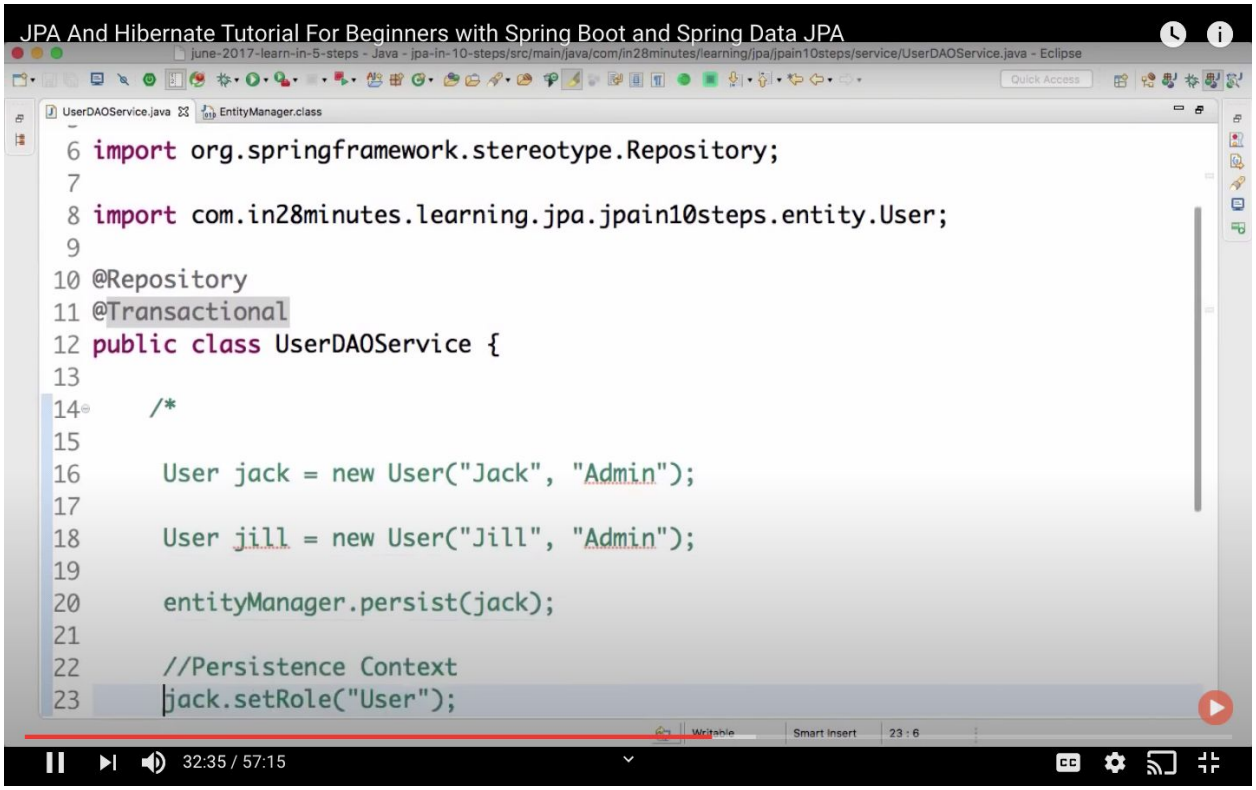
Whenever we modify database using any method

There should be a transaction opened before modify and closed after modify



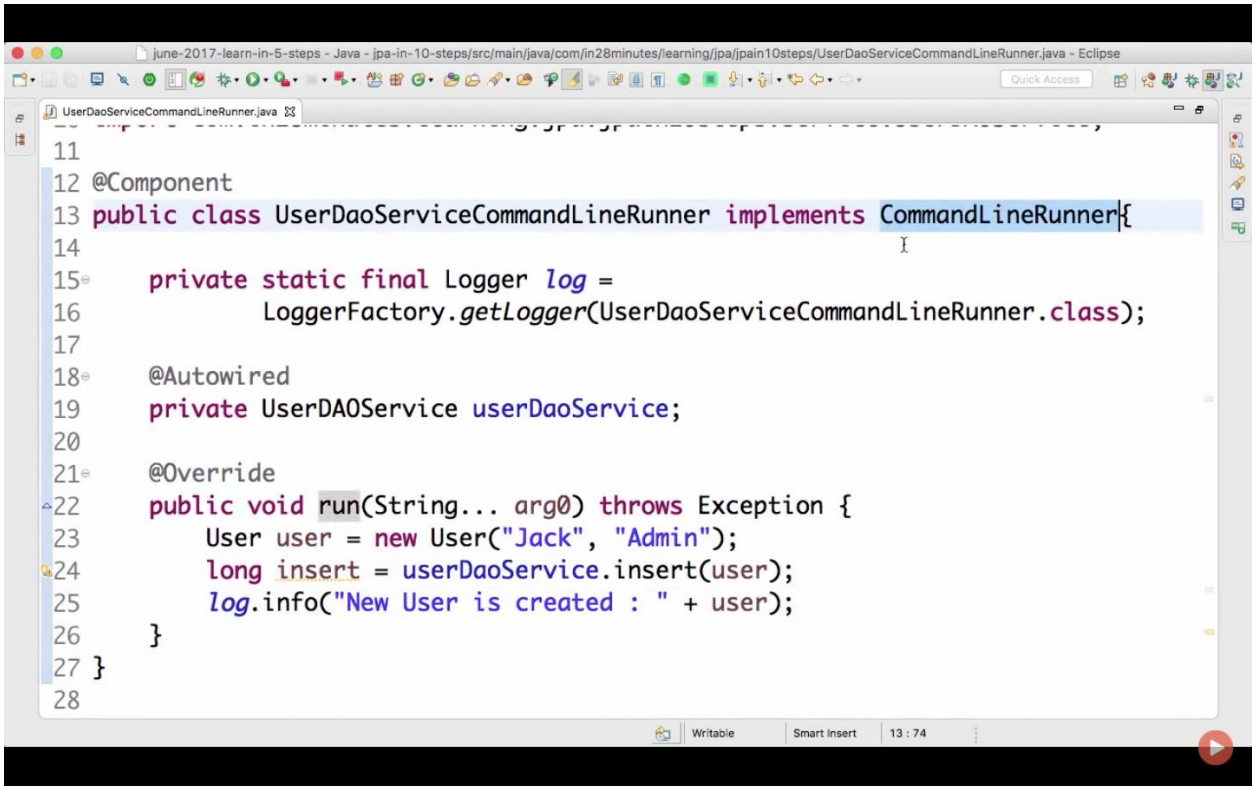
We would have to define this for every modification method

To overcome this use @Transactional

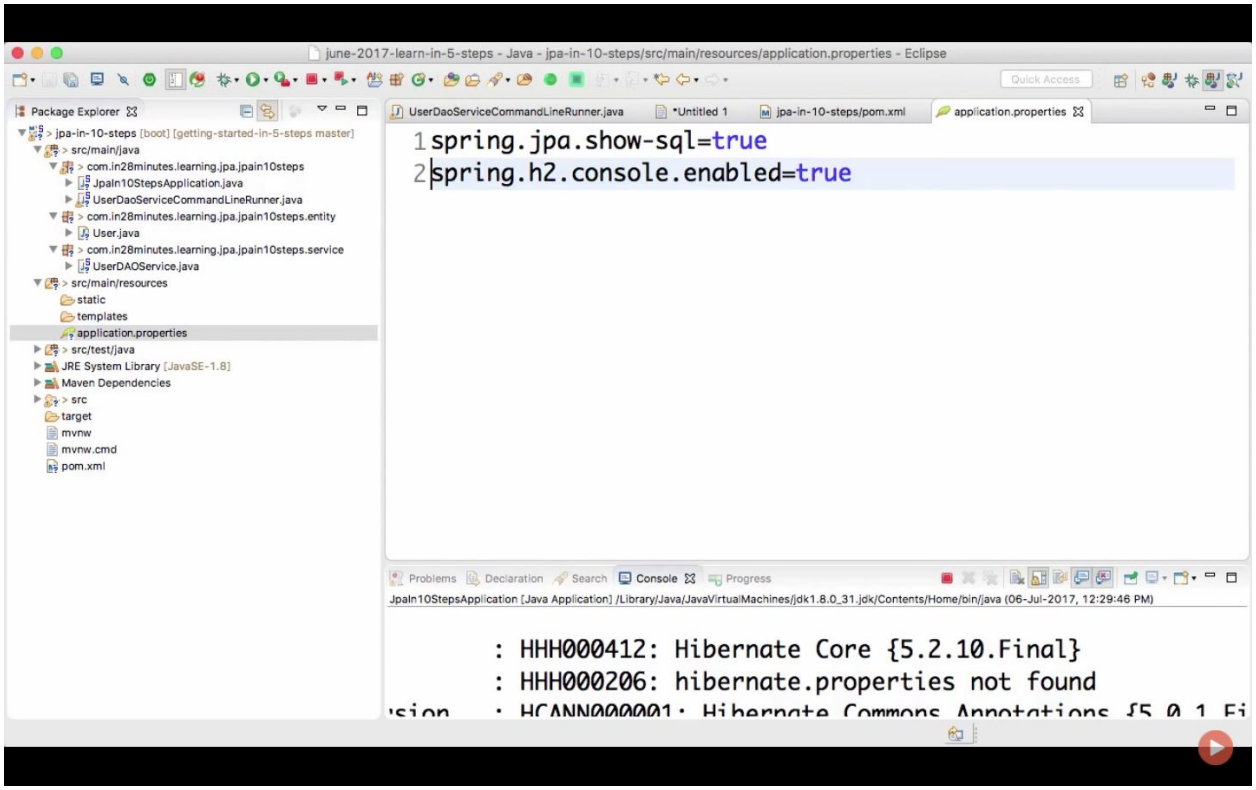


@PersistenceContext == @Autowire ??

- Step 6 : Defining a Service to manage the Entity - UserService and EntityManager
- Step 7 : Using a Command Line Runner to save the User to database.



- Step 8 : Magic of Spring Boot and In Memory Database H2



Questions

- Where is the database created?
  - In Memory - Using H2
- What schema is used to create the tables?
  - Created based on the entities defined
- Where are the tables created?
  - Created based on the entities defined
  - In Memory - Using H2
- Can I see the data in the database?
  - http://localhost:8080/h2-console
  - Use db url jdbc:h2:mem:testdb
- Where is Hibernate coming in from?
  - Through Spring Data JPA Starter
- How is a datasource created?
  - Through Spring Boot Auto Configuration

http://localhost:8080/h2-console

Magic of Spring Boot and in Memory Database

- Zero project setup or infrastructure

- Step 9 : Introduction to Spring Data JPA

When creating more than one entities some common methods such as delete and uodate are repeated again and again for all different entities

For 15 entities ,there would be 15 DAOservices have almost same logic

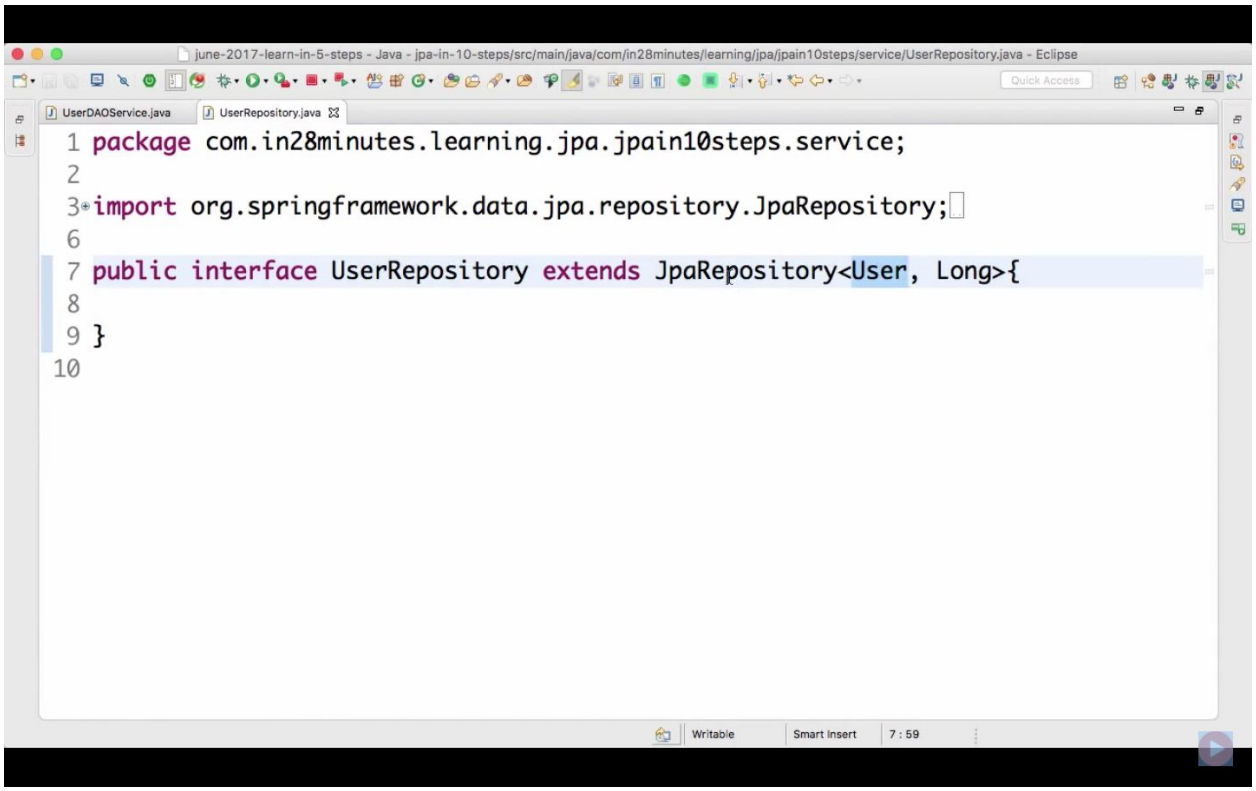
Spring Data solves this problem by letting u create a repository interface and it will take care of implementation by talking with entity manager

- Step 10 : More JPA Repository : findById and findAll

Basically we create this interface

Pass in

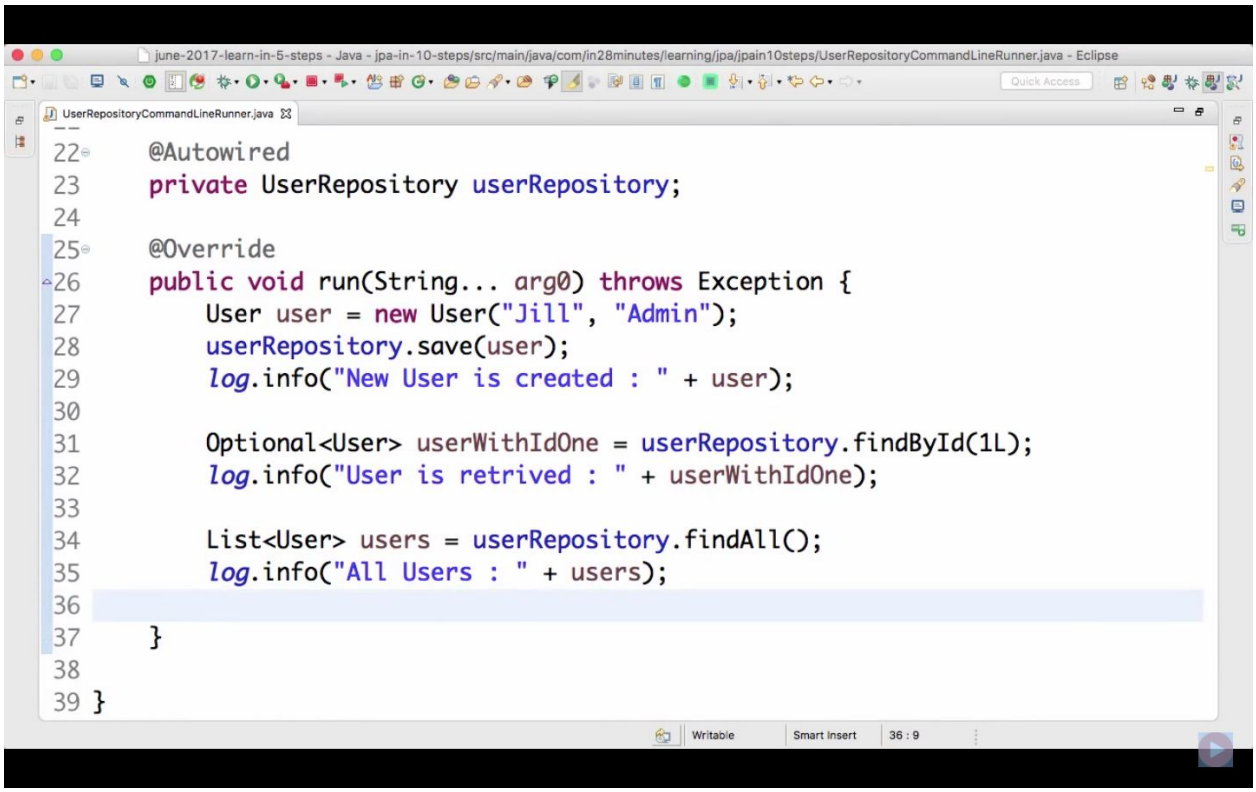
<entity that you want to be managed,Primary key of that entity>

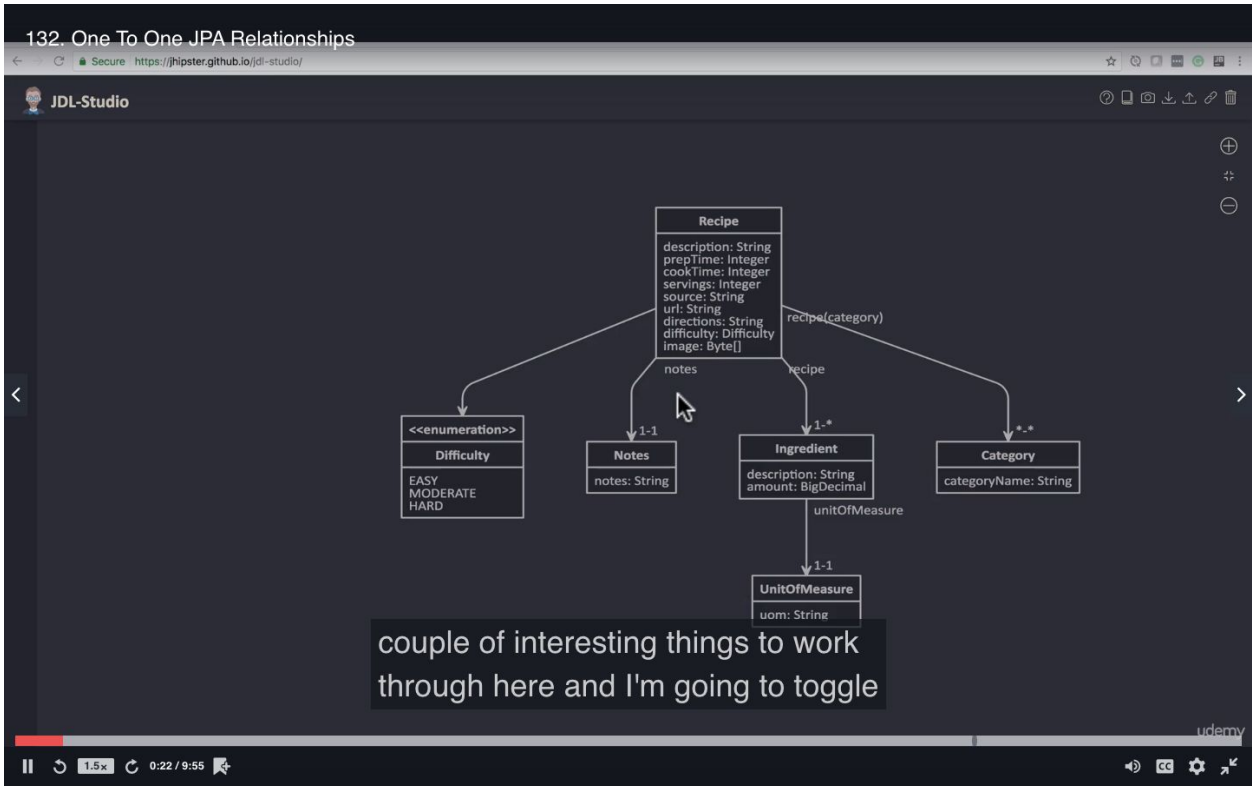


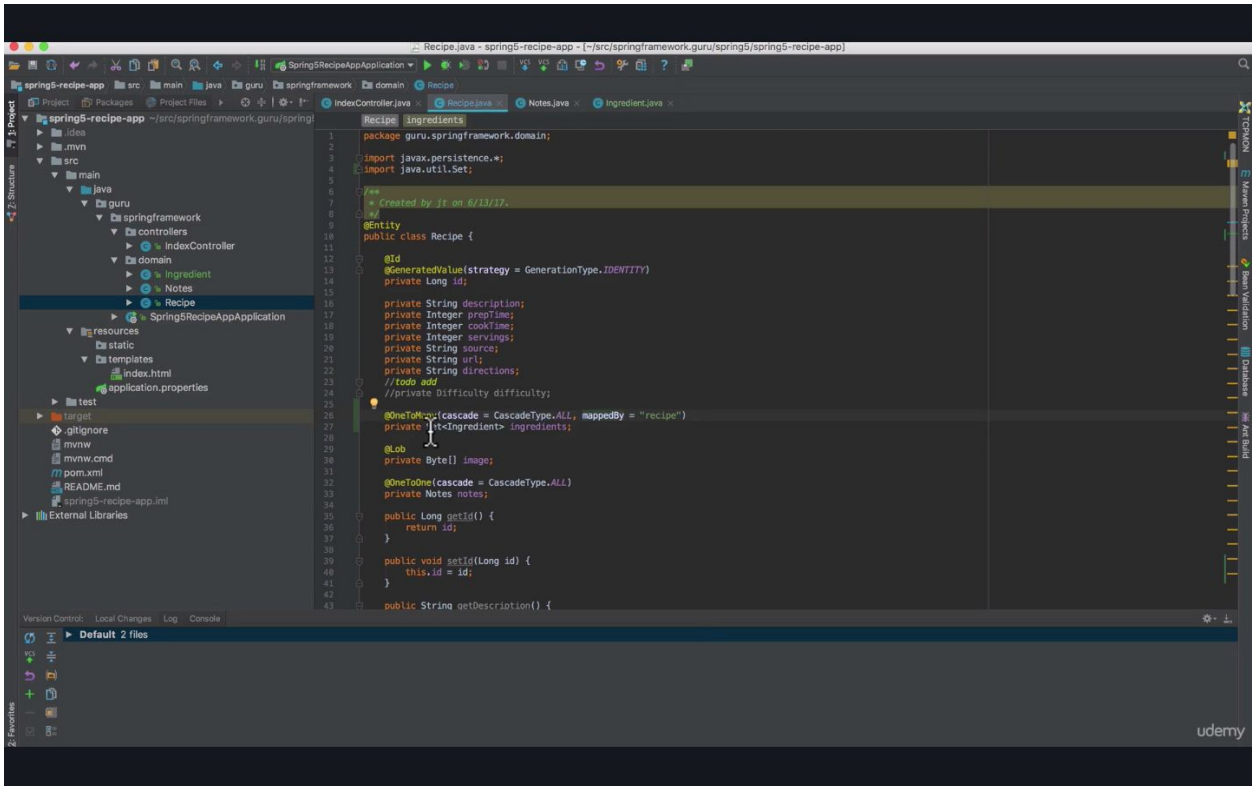
Spring Data provides methods like save which is used to insert

findAll : works Select *

And many predefined methods



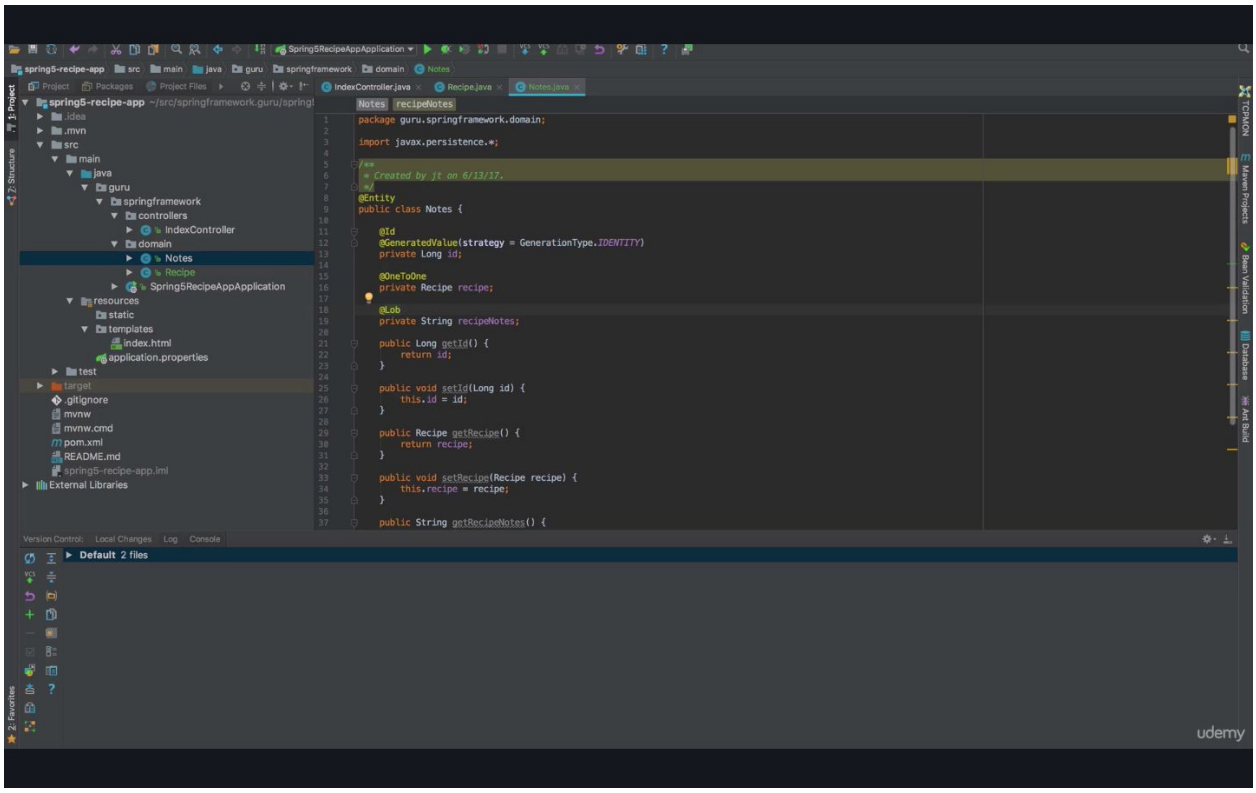

132. One To One JPA Relationships
Secure https://jhipster.github.io/jdl-studio/
JDL-Studio
Recipe
description: String
prepTime: Integer
cookTime: Integer
servings: Integer
source: String
url: String
directions: String
difficulty: Difficulty
image: Byte[]
recipe(category)
notes
recipe
<<enumeration>>
Difficulty
EASY
MODERATE
HARD
1-1
Notes
notes: String
1-*
Ingredient
description: String
amount: BigDecimal
-
Category
categoryName: String
unitOfMeasure
1-1
UnitOfMeasure
uom: String
couple of interesting things to work through here and I'm going to toggle
udemy
1.5x
0:22 / 9:55


Recipe.java - spring5-recipe-app - [~/src/springframework.guru/spring5/spring5-recipe-app]
spring5-recipe-app ~/src/springframework.guru/spring5
.idea
.mvn
src
main
java
guru
springframework
controllers
IndexController
domain
Ingredient
Notes
Recipe
Spring5RecipeAppApplication
resources
static
templates
index.html
application.properties
test
target
.gitignore
mvnw
mvnw.cmd
pom.xml
README.md
spring5-recipe-app.iml
External Libraries
package guru.springframework.domain;
import javax.persistence.*;
import java.util.Set;
/**
* Created by jt on 6/13/17.
*/
@Entity
public class Recipe {
@Id
@GeneratedValue(strategy = GenerationType.IDENTITY)
private Long id;
private String description;
private Integer prepTime;
private Integer cookTime;
private Integer servings;
private String source;
private String url;
private String directions;
//todo add
//private Difficulty difficulty;
@OneToMany(cascade = CascadeType.ALL, mappedBy = "recipe")
private Set<Ingredient> ingredients;
@Lob
private Byte[] image;
@OneToOne(cascade = CascadeType.ALL)
private Notes notes;
public Long getId() {
return id;
}
public void setId(Long id) {
this.id = id;
}
public String getDescription() {
Default 2 files
udemy

By using cascade all we make recipe the owner entity of Notes entity

Note in image below we don't use cascade with recipe property as on deleting Notes class Recipe class should not be deleted but if we delete Recipe , Notes will also be deleted

@Lob= Large objects



133. One To Many JPA Relationships

```
import javax.persistence.*;
import java.math.BigDecimal;

/**
 * Created by jt on 6/13/17.
 */
@Entity
public class Ingredient {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String description;
    private BigDecimal amount;

    //private UnitOfMeasure uom;

    @ManyToOne
    private Recipe recipe;

    public Long getId() {
        return id;
    }

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

    public String getDescription() {
        return description;
    }

    public void setDescription(String description) {
        this.description = description;
    }

    public BigDecimal getAmount() {
        return amount;
    }

    public void setAmount(BigDecimal amount) {
        this.amount = amount;
    }
```

1.25× 4:19 / 5:35