Basic CRUD

ORM, Hibernate and CRUD

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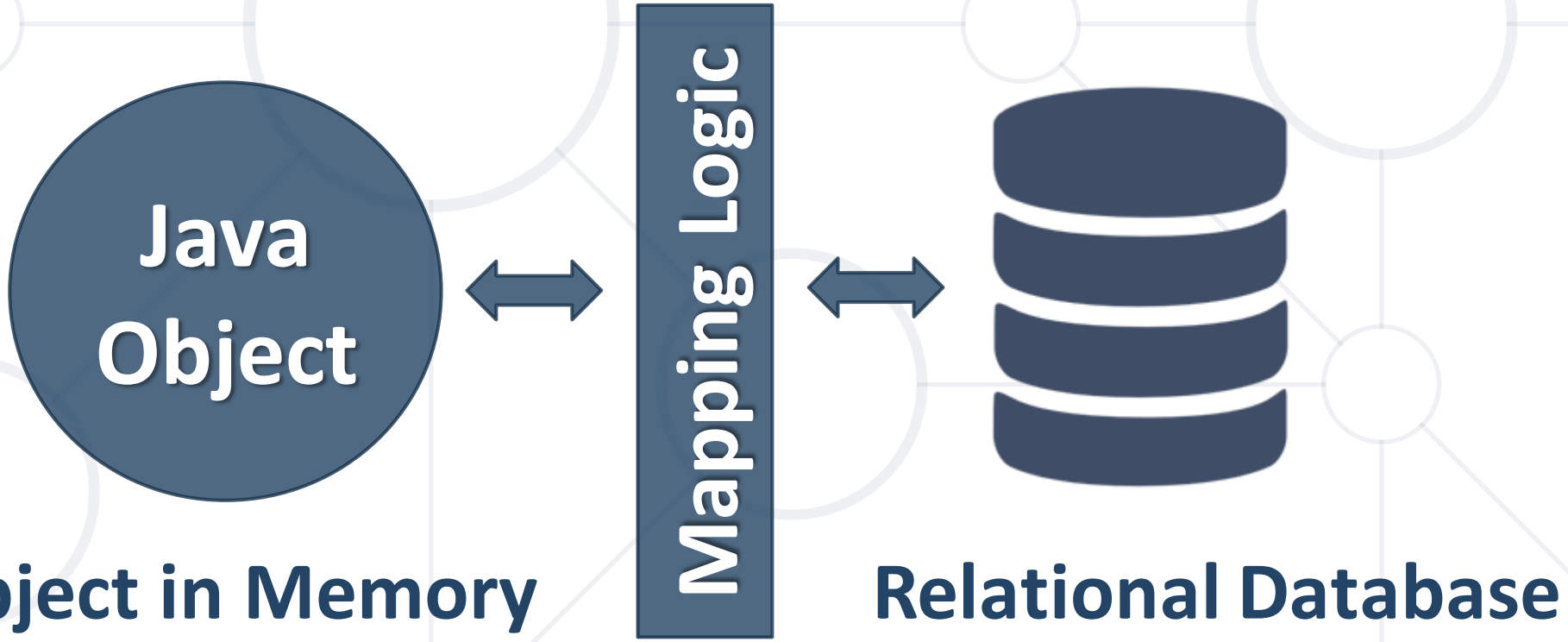
Object-Relational Mapping

ORM Concepts and Features

ORM Overview

- **ORM Frameworks** maps OOP **classes** to database **tables**



ORM Frameworks - Features

- Java **classes** are mapped to DB **tables**
  - DB **relationships** are mapped to class **associations**
- ORM provides API for **CRUD** operations
  - **List** objects / query database
  - **Create** new object
  - **Update** existing object
  - **Delete** existing object

CRUD operations execute **SQL commands** in the DB

- ORM provides **schema synchronization** (DB migrations)

JPA

Java Persistence API

JPA Overview

- Database persistence technology for Java (**official standard**)
- Object-relational mapping (**ORM**) technology
- Operates with **POJO** entities with **annotations** or **XML** mappings
- Implemented by many ORM engines: **Hibernate**, **EclipseLink**, …

Entities in JPA

- A JPA entity is just a **POJO class**
  - Abstract or concrete **top level** Java class
  - Non-final fields/properties, no-arguments constructor
  - Direct field or property-based access
- Getter/setter **can contain logic** (e.g. validation)

Hibernate Framework

Mapping Java Classes to Database Tables

Hibernate Framework

- Hibernate is a **Java ORM framework**
- Using **Java Annotations**
- Implements **JPA Standard**
- Mapping an object-oriented model to a relational database
- Maintain the database schema

Hibernate Configuration

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pom.xml

```
<dependencies>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-thymeleaf</artifactId>
  </dependency>
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-web</artifactId>
  </dependency>
// Continues on the next slide
```

Hibernate Configuration (2)

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pom.xml

```
  <dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-data-jpa</artifactId>
  </dependency>
  <dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
    <scope>provided</scope>
  </dependency>
</dependencies>
```

Hibernate Configuration (3)

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application.properties

```
spring.datasource.driverClassName = com.mysql.cj.jdbc.Driver
spring.datasource.url = jdbc:mysql://localhost:3306/spring_demo?
                                useSSL=false&createDatabaseIfNotExist=true
spring.datasource.username = root
spring.datasource.password =
spring.jpa.properties.hibernate.dialect=org.hibernate.dialect
                                                    .MySQL57InnoDBDialect
spring.jpa.properties.hibernate.format_sql=TRUE
spring.jpa.hibernate.ddl-auto=update
```

Annotations

- **@Entity** - Declares the class as an entity or a table
- **@Table** - Declares table name
- **@Id** - Specifies the property, use for identity of the class
  - **@GeneratedValue** - specifies how the identity attribute can be initialized
- **@Transient** - Specifies the property that is not persistent
- **@Column** - Specifies the column attribute for the persistence property

Hibernate Implementation

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- Entity = = Java Class + Annotation

```
@Entity
@Table(name = "students")
public class Student {
  @Id
  @GeneratedValue(strategy = GenerationType.IDENTITY)
  private Integer id;
  @Column
  private String name;
}
```

```
import javax.persistence.Entity;
import javax.persistence.Table;
```

JPA Repository

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- Spring Data JPA provides a built-In repository

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

- Provides bunch of generic CRUD methods

```
studentReposity.findAll();       //Finds all records
studentReposity.findById();      //Finds record by id
studentReposity.saveAndFlush(); //Inserts an entity
studentReposity.delete();        //Removes an entity
```

Saving an Entity

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- First, we need a html form

```
<form th:action="@{/create}" th:method="POST">
    <div>
        <label>Name: </label>
        <input type="text" name="name"/>
    </div>
    <input type="submit">
</form>
```

- Render the view

```
@GetMapping("/create")
public ModelAndView create(ModelAndView modelAndView) {
  modelAndView.setViewName("create");
  return modelAndView; }
```

Saving an Entity (2)

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- Mappin the data to an object

```
@PostMapping("/create")
public String createProcess(Student student) {
    this.studentRepository.saveAndFlush(student);
    return "redirect:/";
}
```

- As response, redirect to "/"
  - "/" is equivalent to home page

Find an Entity

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- You can find easily an entity by id

```
@GetMapping("/details/{id}")
public ModelAndView details(@PathVariable(value = "id") Integer id,
                            ModelAndView modelAndView) {
    Student student = this.studentRepository.findById(id).get();
    modelAndView.setViewName("details");
    modelAndView.addObject("student", student);
    return modelAndView;
}
```

Implement the view

Editing an Entity

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- First, we need to find the entity by id and pass it to the view

```
@GetMapping("/edit/{id}")
public ModelAndView edit(@PathVariable(value = "id") Integer id,
                         ModelAndView modelAndView) {
    Student student = this.studentRepository.findById(id).get();
    modelAndView.setViewName("edit");
    modelAndView.addObject("student", student);
    return modelAndView;
}
```

Editing an Entity (2)

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- To update the entity, process the post request

```
@PostMapping("/edit/{id}")
public String edit(Student student) {
    this.studentRepository.saveAndFlush(student);
    return "redirect:/";
}
```

- **saveAndFlush** updates the entity
- As a response, redirect to **"/"** – the **index page**

Deleting an Entity

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- Very similar to edit operation
- First, find an entity by id and pass It to the view

```
@GetMapping("/delete/{id}")
public ModelAndView delete(@PathVariable(value = "id") Integer id,
                           ModelAndView modelAndView) {
    Student student = this.studentRepository.findById(id).get();
    modelAndView.setViewName("delete");
    modelAndView.addObject("student", student);
    return modelAndView;
}
```

Deleting an Entity (2)

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- To delete an entity, process the post request

```
@PostMapping("/delete/{id}")
public String delete(@PathVariable(value = "id") Integer id) {
    this.studentRepository.deleteById(id);
    this.studentRepository.flush();
    return "redirect:/";
}
```

- **deleteById** – deletes an entity by id
- **flush** – changes will be saved **immediately**

Summary

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- ORM is used to **map objects** to **database tables**
- Java Persistence API is an **official standard** for Java ORM's
- Hibernate is a widely used **ORM**
  - Implements **JPA**
- Implementing **CRUD** operations

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