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INSIDE KNOWLEDGE

# Spring Workshop



**4 - Data**

Spring Data

Spring Data JPA

Standard

JPA

Implementation

Hibernate

# @Entity and other Annotations

- Associates a database table to a class
- Classname can be different from table name
- Be aware of Naming Strategies
  - Implicit
  - Physical
  - Spring



# Entity

- @Entity
- @Table
- @Id
- @GeneratedValue
  - IDENTITY: auto increment MySQL, identity in SQL Server
  - SEQUENCE: Oracle
  - (TABLE)
- @Transient
- @Column
- BeanValidation



# Repository

- Interface implemented by Spring Data
- Manages database specific actions
- Common Subtypes
  - (List)CrudRepository
  - (List)PagingAndSortingRepository
  - JpaRepository
- Customisable via find\* methods



# Customer as Entity

```
public class Customer {  
  
    private Long id;  
  
    private String firstname;  
    private String lastname;  
  
    private Boolean signedGdpr;  
}
```



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# Customer as Entity

`@Entity`

```
public class Customer {  
  
    private Long id;  
  
    private String firstname;  
    private String lastname;  
  
    private Boolean signedGdpr;  
}
```



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# Customer as Entity

`@Entity`

```
public class Customer {
```

`@Id`

```
@GeneratedValue(strategy = GenerationType.IDENTITY)
```

```
private Long id;
```

```
private String firstname;
```

```
private String lastname;
```

```
private Boolean signedGdpr;
```

```
}
```



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# CustomersRepository

```
package com.softarc.eternal.data;  
  
import com.softarc.eternal.domain.Customer;  
import java.util.List;  
import org.springframework.data.jpa.repository.JpaRepository;  
  
public interface CustomersRepository extends JpaRepository {}
```



# CustomersRepository

```
package com.softarc.eternal.data;  
  
import com.softarc.eternal.domain.Customer;  
import java.util.List;  
import org.springframework.data.jpa.repository.JpaRepository;  
  
public interface CustomersRepository extends JpaRepository<Customer, Long> {}
```



# CustomersRepository

```
package com.softarc.eternal.data;

import com.softarc.eternal.domain.Customer;
import java.util.List;
import org.springframework.data.jpa.repository.JpaRepository;

public interface CustomersRepository extends JpaRepository<Customer, Long> {
    List<Customer> findByFirstnameOrLastnameOrderByLastname(
        String firstname,
        String lastname
    );
}
```



# Database Connection in application.yml for H2

```
spring:
  datasource:
    url: jdbc:h2:./dev-db
    driver-class-name: org.h2.Driver
    username: sa
    password: 'Sag ich dir nicht :)'
```

- H2 is embedded/file/server
- Possibility to use multiple databases
- Make use of profiles
- Credentials
  - plaintext
  - encrypted
  - OS env



# Further useful configuration properties

```
spring:
  jpa:
    hibernate:
      ddl-auto: create-drop

logging:
  level:
    org.hibernate.orm.jdbc.bind: trace

spring:
  jpa:
    show-sql: true
```



# Impact on Testing

- No impact on Unit Tests (no DI)
- Override the datasource properties via `@SpringBootTest`
  - `jdbc:h2:mem:holidays-controller`
  - in-memory instance
- Mock the Repository via `@MockedBean` in Integration Tests



```
55 private void executeLoad(long timeout, int usersCount) {  
56     showDebugInfo(timeout);  
57     Load.setPages(URL, parsingTimeout);  
58     Load.setTimeout(timeout);  
59     List<Load> threads = new ArrayList<>();  
60     for (int i = 0; i < usersCount; i++) {  
61         threads.add(new Load(this.URL));  
62     }  
63     logger.info( s: usersCount + " threads are started");  
64     for (Load thread : threads)  
65         thread.start();  
66     logger.info( s: "All threads are started");  
67     progressInfo(timeout);  
68     System.out.print(".....DONE\nProcessing with data...\n");  
69 }  
70  
71 private void executeAvailability(long timeout, int  
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```

# Demo



Lab Time





# @DataJpaTest

- In-Memory Database is normally used
- Transactional with Rollback
- SQL commands and queries are printed



# @DataJpaTest

```
@DataJpaTest(  
    properties = {  
        "spring.datasource.url=jdbc:h2:mem:test",  
        "spring.jpa.hibernate.ddl-auto=create-drop",  
    }  
)  
public class CustomersControllerIntegrationTest {  
  
    @Autowired  
    CustomersRepository repository;  
  
    @Test  
    void testRepo() {  
        var franz = CustomerMother.franz().build();  
        repository.save(franz);  
        Customer customer = repository.findAll().get(0);  
        assertThat(customer)  
            .usingRecursiveComparison()  
            .ignoringFields("id")  
            .isEqualTo(franz);  
    }  
}
```



# Flyway

- Versioned Migration Tool
- Uses SQL
- Files in resources with convention V{n}\_\_{name}.sql
- Liquibase (database agnostic)
- Careful with line ending (sql files are hashed)
- Rollback possible



# Flyway / MySql Setup

1. Setup MySQL via Docker or in another way
2. Register datasource.url
  - a. `jdbc:mysql://localhost:3306/eternal`
3. Add dependencies
  - a. `implementation 'mysql:mysql-connector-java'`  
`implementation 'org.flywaydb:flyway-core'`  
`implementation 'org.flywaydb:flyway-mysql'`
4. Create init schema in `src/main/resources/db/migration/V1__init.sql`
5. Restart Spring Boot



# Relations

- Used quite often
  - @ManyToOne
  - @OneToMany
- Rarely
  - @OneToOne
  - @ManyToMany



# Relations

@Entity

```
public class Country {
```

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

```
private Long id;
```

```
private String name;
```

@OneToMany(mappedBy = "country")

```
private List<Customer> customers;
```

```
}
```



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# Relations

@Entity

```
public class Customer {
```

@Id

@GeneratedValue(strategy = GenerationType.IDENTITY)

```
private Long id;
```

```
private String firstname;
```

```
private String lastname;
```

```
private Boolean signedGdpr;
```

@ManyToOne

@JoinColumn(name = "country\_id") // optional

```
private Country country;
```

```
}
```



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# Advanced Use Cases





# Agenda

- ManyToMany
- JPQL, Joins & EntityGraph
- Projection
- Query by Example
- Query by Specification
- @Transactional
- Async
- Versioning



# ManyToMany (Owner)

```
public class Holiday {  
    @ManyToMany  
    @JoinTable(  
        name = "holiday_trip",  
        joinColumns = @JoinColumn(name = "holiday_id", referencedColumnName = "id"),  
        inverseJoinColumns = @JoinColumn(  
            name = "guide_id",  
            referencedColumnName = "id"  
        )  
    )  
    public List<Guide> guides;  
}
```



# ManyToMany (Non-Owner)

```
public class Guide {  
    @ManyToMany(mappedBy = "guides")  
    private List<Holiday> holidays;  
}
```



# JPQL

```
public interface HolidaysRepository extends CrudRepository<Holiday, Long> {
```

```
    @Query(
```

```
        "select h from Holiday h inner join h.trips t where t.fromDate > current date"
```

```
    )
```

```
    List<Holiday> findUpcomingHolidays();
```

```
}
```



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# EntityGraph

```
public interface HolidaysRepository extends CrudRepository<Holiday, Long> {  
  
    @Query(  
        "select h from Holiday h inner join h.trips t where t.fromDate > current date"  
    )  
  
    @EntityGraph(attributePaths = { "trips.guide" })  
  
    List<Holiday> findUpcomingHolidays();  
  
}
```



# EntityGraph

```
public interface HolidaysRepository extends CrudRepository<Holiday, Long> {  
  
    @Query(  
        ""  
  
        select h from Holiday h inner join h.trips t  
  
        where t.fromDate > current date  
  
        and t.guide.lastname like :guideName""  
    )  
    @EntityGraph(attributePaths = { "trips.guide" })  
    List<Holiday> findUpcomingHolidays(String guideName);  
}
```



# Simple Projections

```
public interface HolidayTeaser {  
    public Long getId();  
    public String getName();  
    public String getCoverPath();  
}  
  
public interface HolidaysRepository extends CrudRepository<Holiday, Long> {  
    @Query("select h from Holiday h")  
    List<HolidayTeaser> findTeasers();  
}
```



# Advanced Projections

```
public record HolidayWithGuide(Long id, String name, String guide) {}

public interface HolidaysRepository extends CrudRepository<Holiday, Long> {

    @Query(
        """
        select new com.softarc.eternal.data.HolidayWithGuide(h.id, h.name, concat(g.firstname, ' ', g.lastname))
        from Holiday h inner join h.trips t inner join t.guide g"""
    )
    List<HolidayWithGuide> findHolidayGuides();
}
```





# Query by Example

```
@GetMapping("by-example")
public List<String> byExample() {
    var holiday = new Holiday();
    holiday.setCoverPath("jpg");
    var exampleMatcher = ExampleMatcher
        .matching()
        .withMatcher("coverPath", matcher -> matcher.endsWith());

    var example = Example.of(holiday, exampleMatcher);

    return repository
        .findBy(example, q -> q.stream())
        .map(Holiday::getName)
        .toList();
}
```



# Query by Specification

```
public class HolidaySpecs {  
    public static Specification<Holiday> isJpgCover() {  
        return (  
            (root, query, builder) -> builder.like(root.get("coverPath"), "%jpg")  
        );  
    }  
}  
  
public List<String> bySpecification() {  
    return repository  
        .findAll(HolidaySpecs.isJpgCover())  
        .stream()  
        .map(Holiday::getName)  
        .toList();  
}
```



# @Transactional

- Uses internally a TransactionManager
- All changes to Entities will eventually be persisted
  - No Repository::save required
- Supports Nesting
  - By default a single transaction
  - Can be configured to be separated
- Never pass around Entity instances!



# @Version

- Is incremented on every update
- Checks on every update if database has same version as entity
- Different locking modes possible
  - Optimistic: default
  - Pessimistic: Adds lock in Database



# JPQL Alternatives

- JOOQ
- Querydsl
- JDBC Template



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```
55 private void executeLoad(long timeout, int usersCount) {
```

```
56     showDebugInfo(timeout);
```

```
57     Load.setPages(URL, parsingTimeout);
```

```
58     Load.setTimeout(timeout);
```

```
59     List<Load> threads = new ArrayList<>();
```

```
60     for (int i = 0; i < usersCount; i++) {
```

```
61         threads.add(new Load(this.URL));
```

```
62     }
```

```
63     logger.info( s: usersCount +
```

```
64         for (Load thread : threads)
```

```
65             thread.start();
```

```
66     }
```

```
67     logger.info( s: "All threads are started");
```

```
68     progressInfo(timeout);
```

```
69     System.out.print(".....DONE\nProcessing with data...\n");
```

```
70 }
```

```
71 private void executeAvailability(long timeout, int
```

```
72 }
```

```
73 private void
```

# Demo



Lab Time

