Spring Data (JPA Focused)

"Code with Passion!"

Topics

- What is and Why Spring Data?
- Spring Data JPA
- Spring Data Repository interfaces
- Step by step of building Spring Data JPA application
- Paging and Sorting
- Query generation strategies

What is & Why Spring Data?

Data is new frontier in Computing

- The amount of data is exploding
  - Enterprise
  - Social networking
  - Personal data
- The types of data are varying
  - Relational data (table-driven & structured) is not the only data type
  - Most data is now unstructured
- Data management is a new strategic tool in business

Types of Data Stores

- Relational
  - JDBC, JPA
- Document store
  - MongoDB, CouchDB
- Column oriented
  - HBase, Cassandra
- Graph
  - Neo4j, OrientDB
- Data grids
  - GemFire, Coherence
- Key value
  - Redis
- Big data
  - Hadoop

What is Spring Data?

- Spring Data is an umbrella project which aims
  - to provide familiar and consistent Spring-based programming model for new data stores
  - while retaining data store-specific features and capabilities
- Sub-projects
  - Spring Data Common – common for all Spring Data modules
  - Spring Data JPA
  - Spring Data MongoDB
  - Spring Data Neo4J
  - Spring Data Redis
  - Spring Data Gemfire
  - Spring Data REST
  - Spring Data JDBC
  - …

Spring Data JPA

Features of Spring Data JPA

- Sophisticated support to build repositories based on Spring and JPA
- Support for Querydsl predicates and thus type-safe JPA queries
- Transparent auditing of domain class
- Pagination support, dynamic query execution, ability to integrate custom data access code
- Validation of @Query annotated queries at bootstrap time
- JavaConfig based repository configuration by introducing @EnableJpaRepositories

Classes you need in “Plain” Spring JPA (When you are NOT using Spring Data JPA)

- Domain classes
- Repository (Dao) class for each domain class
  - Interface
  - Implementation (you must write the implementation class)
- Service class
  - Uses the repository class

Pain Points of “Plain” Spring JPA

- Too much boiler plate coding
  - You must write same boiler plate code over and over
- Not type safe
  - JPQL is not type safe
- You must deal with pagination and sorting yourself
  - More boiler plate code for pagination and sorting
- Code is not portable to other data storage
  - What if I want to use MongoDB?

Players in Spring Data JPA

- Domain class
- Repository (Dao) class for each domain class
  - Interface
  - No implementation class need to be written - implementation classes are generated by Spring Data JPA during runtime
- Service
  - Uses the repository class

Spring Data Repository Interfaces

Why Spring Data Repository Interfaces?

- Provided by the Spring Data Commons project and extended by the data store specific sub projects
- Provides consistent data access layer over various data stores
  - Enhances the portability of the code
- No need to write data store specific implementation
  - The data store specific implementation is provided by the container during runtime

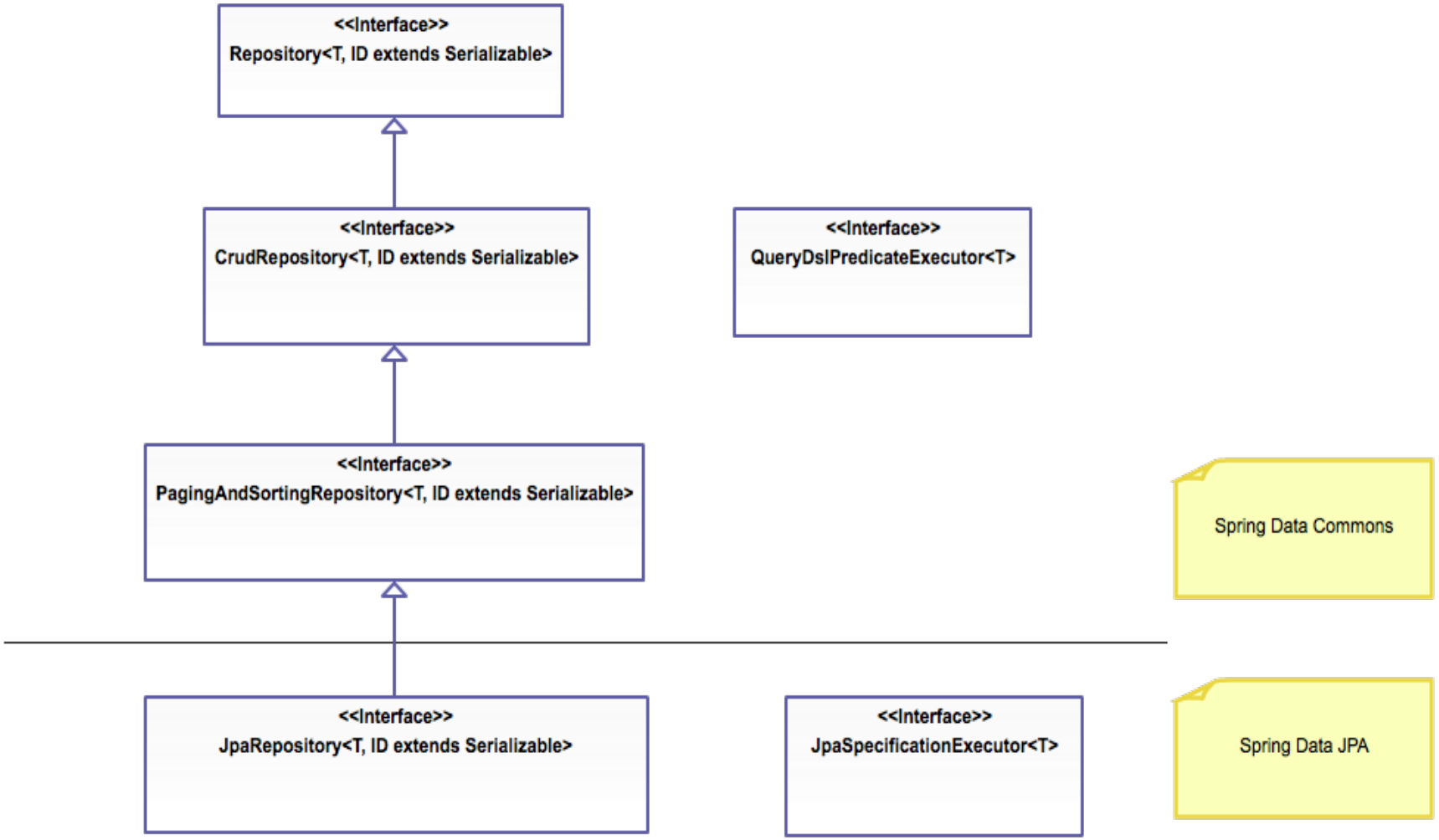
Common Repository Interfaces

- Repository<T, ID extends Serializable>
  - T - the type of the managed entity
  - ID - the type of the entity's id
- CrudRepository<T, ID extends Serializable>
  - Provides CRUD methods for the managed entity
  - save(S entity), findOne(ID id), findAll(), count(), delete(ID id), deleteAll(), exists(ID id)
- PagingAndSortingRepository<T, ID extends Serializable>
  - Supports pagination and sorting
  - findAll(Pageable pageable), findAll(Sort sort)

Data Store specific Interfaces

- JpaRepository<T, ID extends Serializable>
  - Provides JPA specific methods such as flushing the persistence context and delete record in a batch
- MongoRepository<T,ID extends Serializable>
  - Mongo specific Repository interface

Repository Interface Hierarchy



Which Interface to use?

- If you need JPA specific features, use JpaRepository<T, ID extends Serializable>
- Otherwise, use CrudRepository<T, ID extends Serializable
  - Enhanced portability of code
- Use PagingAndSortingRepository<T, ID extends Serializable> if paging and sorting is needed

Step by Step Building Spring Data JPA Application

Spring Data JPA Query Methods

- Spring Data JPA also allows you to define other query methods by simply declaring their method signature
  - findByXxx(aaa) or findFirstByXxx(aaa)
  - findByXxxAndYyy(aaa, bbb) or findFirst findByXxxAndYyy(aaa, bbb)
  - findByXxxOrYyy(aaa, bbb)
  - findByXxxStartingWith(aaa)
  - findByXxxNot(aaa)
  - findByXxxIn(Collection<E> aaa)
  - ...

Steps for Spring Data JPA Application

- Step #1: Create a repository interface
  - Extend one of the repository interfaces, most likely *JpaRepository* interface
- Step #2: Add custom query methods
  - To the created repository interface
  - *findByLastnameAndFirstname()*, for example
- Step #3: Inject the repository interface to another component (for example, a Service bean or a Controller bean)
  - The Service bean or Controller bean will use implementation that is provided automatically by Spring Data

Step #1: Create Custom Repository Interface

```
package com.jpassion;

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

// By extending JpaRepository, CustomerRepository inherits several methods
// for working with Customer persistence, including methods for saving, deleting,
// and finding Customer entities.
public interface CustomerRepository extends JpaRepository<Customer, Long> {


}
```

Step #2: Add Custom Query Method

```
package com.jpassion;

import java.util.List;
import org.springframework.data.jpa.repository.JpaRepository

// By extending JpaRepository, CustomerRepository inherits several methods
// for working with Customer persistence, including methods for saving, deleting,
// and finding Customer entities.
public interface CustomerRepository extends JpaRepository<Customer, Long> {

    //  Define custom query methods by simply declaring their method signature
    List<Customer> findByLastName(String lastName);
}
```

Step #3: Inject Repository object

```
@service
public class CustomerServiceImpl implements CustomerService {

    private final CustomerRepository customerRepository;

    @Autowired
    public CustomerServiceImpl(CustomerRepository customerRepository) {
        this.customerRepository = customerRepository;
    }

    …
}
```

Lab:

Exercise 1: Simple Spring Data JPA Application

Exercise 2: Converting Spring JPA application to use Spring Data JPA

4944_spring4_data_jpa.zip

Paging and Sorting

Paging and Sorting

- PagingAndSortingRepository interface definition

```
public interface PagingAndSortingRepository<T, ID extends Serializable>
                    extends CrudRepository<T, ID> {

  Iterable<T> findAll(Sort sort);
  Page<T> findAll(Pageable pageable);
}
```

additional methods to retrieve entities using the pagination and sorting abstraction

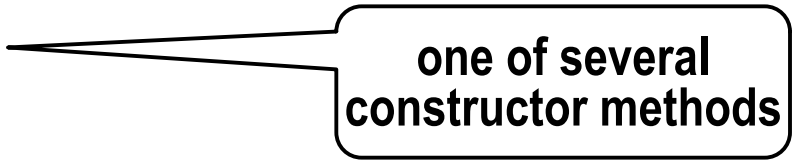
- If you want paging and sorting, use PagingAndSortingRepository interface

```
// Example
public interface CustomerRepository
                    extends PagingAndSortingRepository<Customer, Long> {

}
```

PageRequest Class

- *PageRqquest* - is an implementation of *Pageable* interface

```
public PageRequest(int page,
        int size,
        Sort.Direction direction,
        String... properties)
```



- Example of PageRequest

```
final PageRequest pageRequest1 =
        new PageRequest(0, 3, Direction.ASC,    "lastname", "emailAddress");
Page<Customer> page = customerRepository.findAll(pageRequest1);
customers = page.getContent();

final PageRequest pageRequest2 =
        new PageRequest(0, 2,
                        new Sort(new Order(
                Direction.ASC, "lastname"), new Order(Direction.DESC, "firstname")));
page = customerRepository.findAll(pageRequest2);
customers = page.getContent();
```

Lab:

Exercise 3: Paging and Sorting
4944_spring4_data_jpa.zip

Query Generation Strategy

Query Strategies

- #1: Query generation from method names
- #2: Query generation from @Query annotations
- #3: Query generation from Named queries

#1: Query Generation from Method Names

- Examples
  - findById(Long id), findNameById(Long id),
  - findByNameOrDescription(String name, String description);
  - findDistinctByName(String name)
  - findTopByName(String name), findTop1ByName(String name), findFirstByName(String name), findFirst1ByName(String name)
  - findFirst3ByNameOrderByNameAsc(String name)
  - findByNameContaining(String name)

#2: Query generation from @Query annotation

- Use it to provide your own query implementation
- Supports both JPQL and native SQL

```
// JPQL
@Query("SELECT t FROM Product t WHERE t.name = ?1")
public List<Product> findByName_JPQL(String name);

// SQL
@Query(value = "SELECT * FROM Product t WHERE t.name = ?1", nativeQuery=true)
public List<Product> findByName_SQL(String name);
```

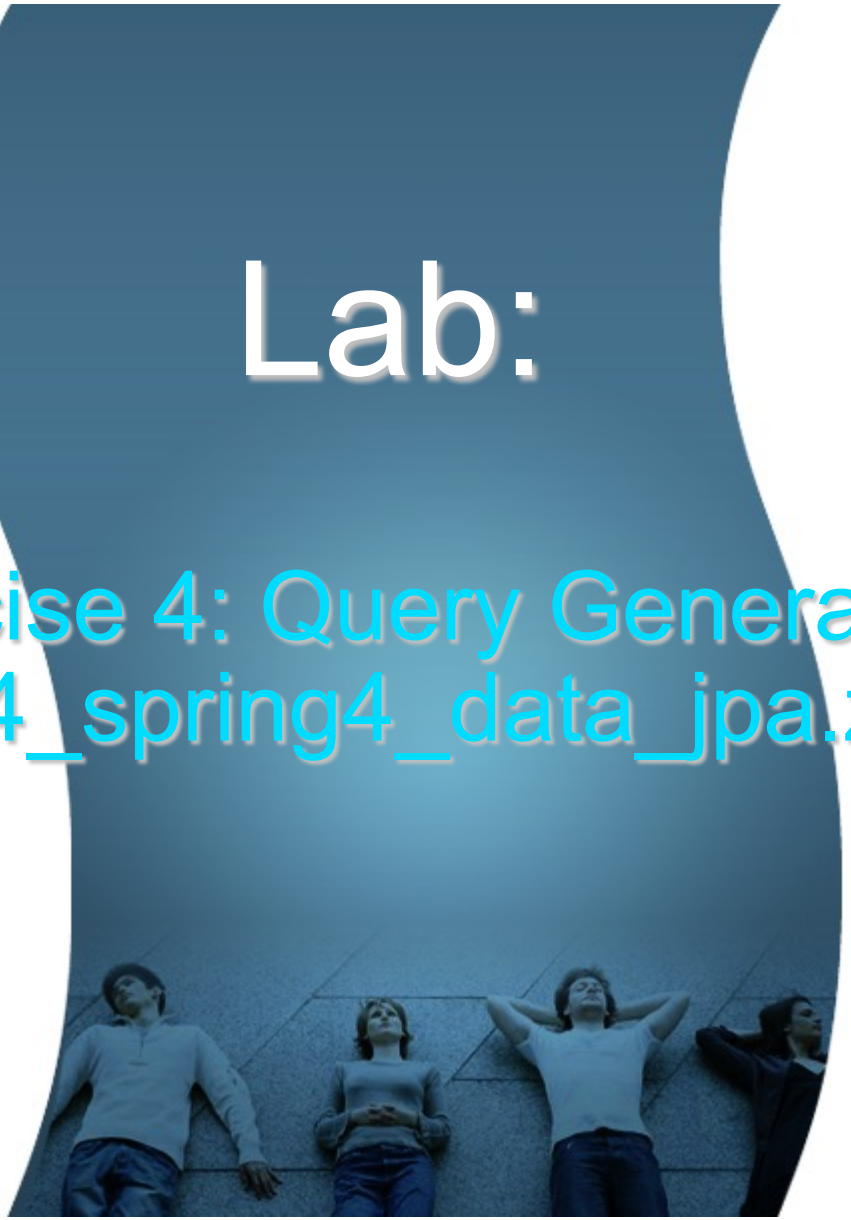
#3: Query generation from Named queries

- You can specify named queries with Spring Data JPA by using annotations, properties file or the orm.xml file

```
// Entity class
@Entity
@NamedQuery(name = "Product.findByName_NamedQuery",
                    query = "FROM Product t WHERE t.name = ?1"
)
public class Product {

}

// Repository interface
public interface ProductRepository extends JpaRepository<Product, Long> {

    // Examples of query generation using Named query
    List<Product> findByName_NamedQuery(String name);
}

// Perform query operation
products = productRepository.findByName_NamedQuery("product1");
```

Lab:

Exercise 4: Query Generation
4944_spring4_data_jpa.zip



Other features

Transaction Support

- Repository classes are transactional by default
  - Methods are @Transactional by default
  - Reads are readOnly
- You can override it

Code with Passion!