Spring data

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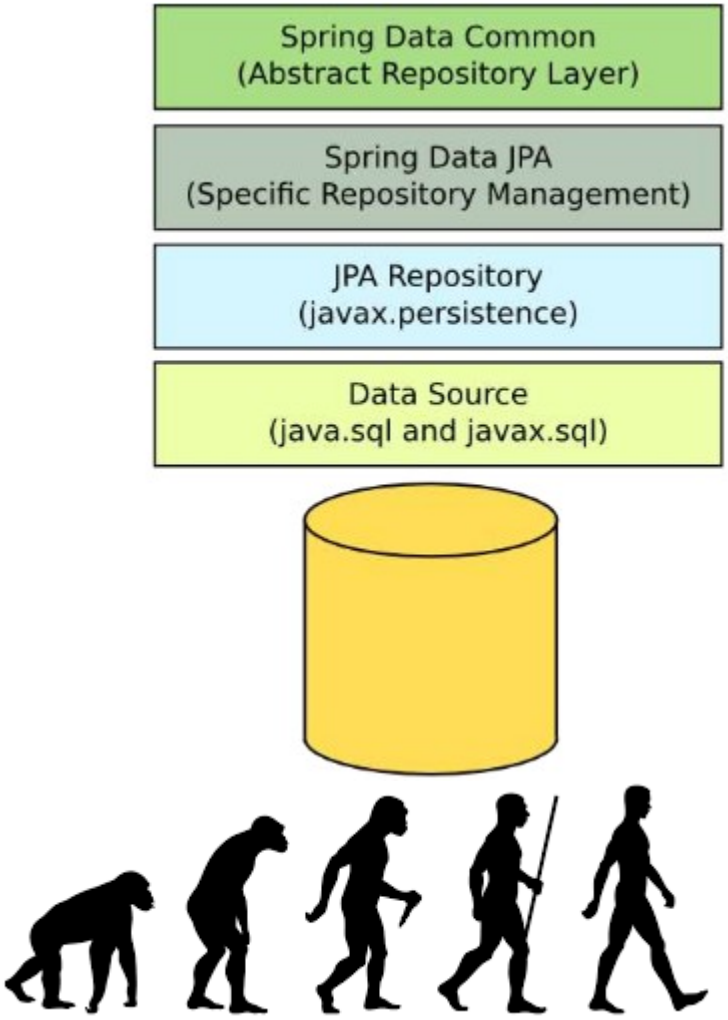
Spring data evaluation



Jdbc

- The JDBC API makes it possible to
- do three things:
  - Establish a connection with a
  - database or access any tabulardata source,Send SQL statements
  - Process the results

```
Connection conn = null;
Statement stmt = null;
Class.forName("com.mysql.jdbc.Driver");
conn = DriverManager.getConnection("jdbc:mysql://localhost/EMP",
"username", "password");
stmt = conn.createStatement();
ResultSet rs = stmt.executeQuery("SELECT id, first FROM Employees");
while (rs.next()) {
        System.out.println("ID: " + rs.getInt("id")
                        + ", First: " + rs.getString("first"));
}
rs.close();
stmt.close();
conn.close();
```

JPA

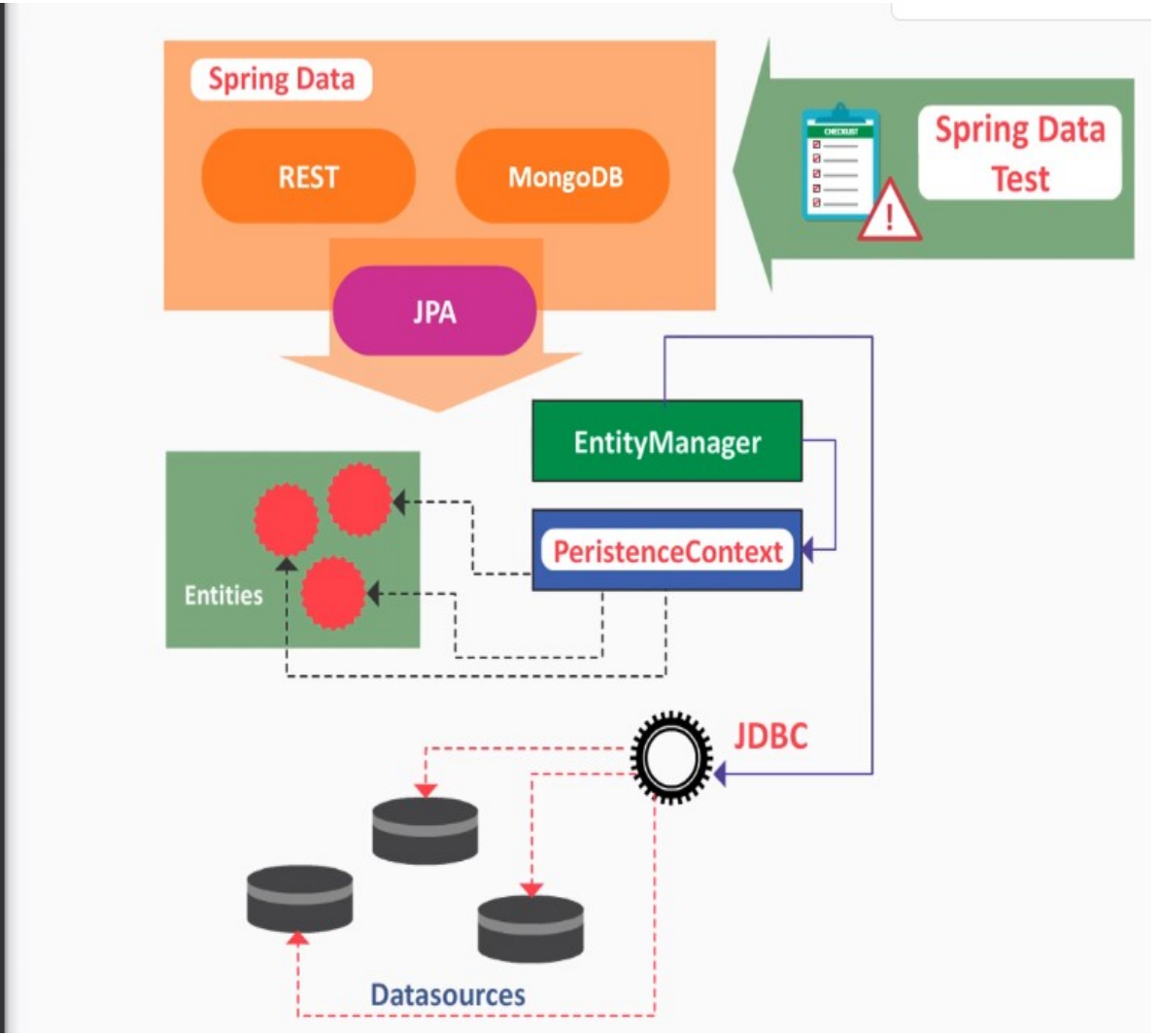
```java
@Entity
@Table(name = "orders")
public class Order {
   @Id
   @GeneratedValue(strategy = GenerationType.AUTO)
   @Column(name = "id")
   private long id;
   @Column(name = "date")
   private Date date;
   @ManyToOne
   @JoinColumn(name = "product_id")
   private Product product;
}
```

```java
Product product = new Product();
Order order = new Order();
order.setProduct(product);

entityManager.persist(product);
entityManager.persist(order);

Product dbProduct = entityManager.find(Product.class, product.getId());

String name = "InitialName";
String query = "SELECT p FROM Product p WHERE p.name LIKE
:productName";
Product product = entityManager.createQuery(query, Product.class)
                .setParameter("productName", name)
                .getSingleResult();
```

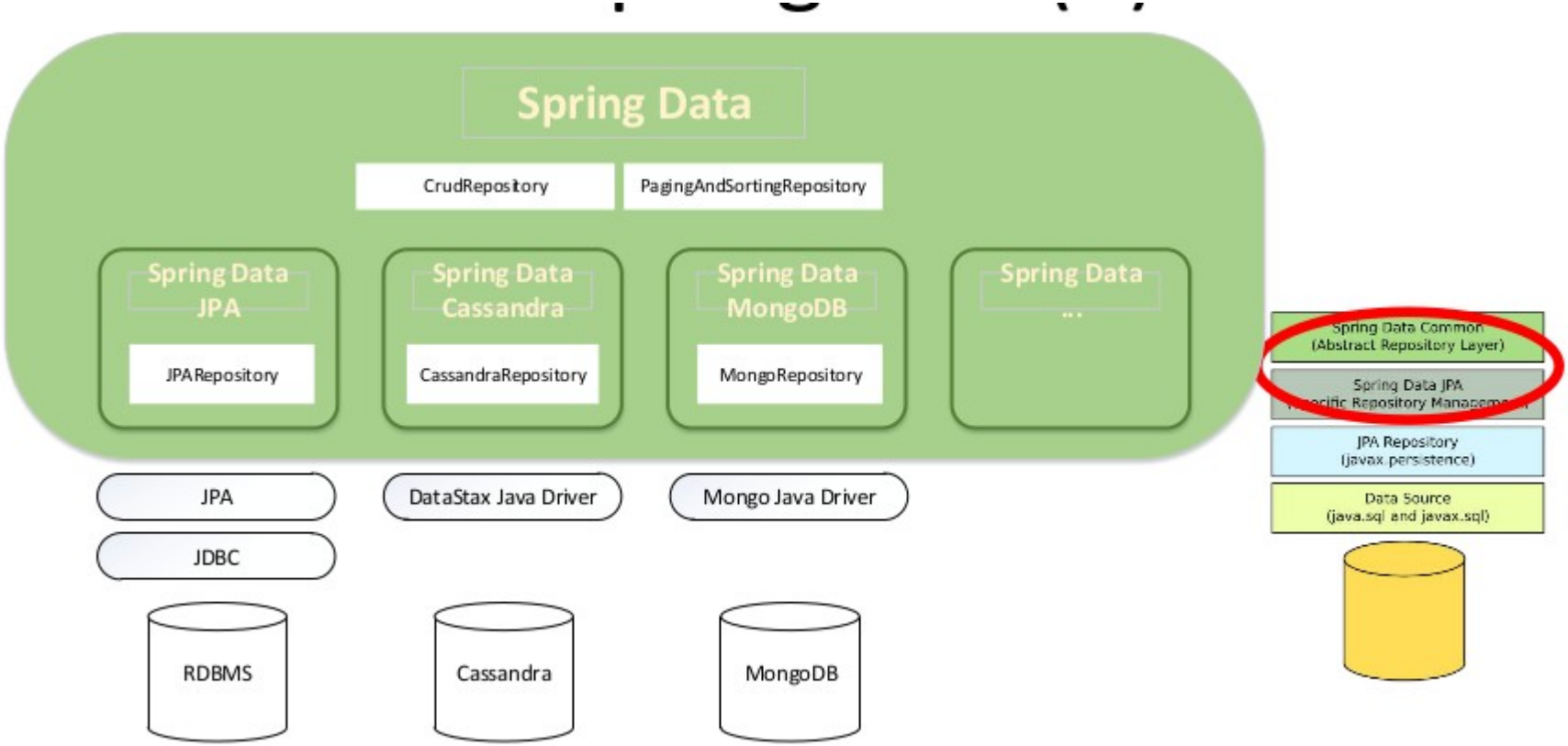
Introduction to Spring data

Introduction

- Spring Data is a framework composed of different modules that support easy access to data repository and cloud services
- Spring Data JPA is a module of Spring Data that avoids boilerplate data repository implementation



Spring data


Spring Data
CrudRepository
PagingAndSortingRepository
Spring Data JPA
JPARepository
Spring Data Cassandra
CassandraRepository
Spring Data MongoDB
MongoRepository
Spring Data ..
JPA
JDBC
DataStax Java Driver
Mongo Java Driver
RDBMS
Cassandra
MongoDB
Spring Data Common (Abstract Repository Layer)
JPA Repository (javax.persistence)
Data Source (java.sql and javax.sql)

JpaRepository vs CrudRepository

`JpaRepository` extends `PagingAndSortingRepository` which in turn extends `CrudRepository`.

Their main functions are:

- `CrudRepository` mainly provides CRUD functions.
- `PagingAndSortingRepository` provides methods to do pagination and sorting records.
- `JpaRepository` provides some JPA-related methods such as flushing the persistence context and deleting records in a batch.

Because of the inheritance mentioned above, `JpaRepository` will have all the functions of `CrudRepository` and `PagingAndSortingRepository`. So if you don't need the repository to have the functions provided by `JpaRepository` and `PagingAndSortingRepository`, use `CrudRepository`.

JpaRepository vs CrudRepository

Basics

The base interface you choose for your repository has two main purposes. First, you allow the Spring Data repository infrastructure to find your interface and trigger the proxy creation so that you inject instances of the interface into clients. The second purpose is to pull in as much functionality as needed into the interface without having to declare extra methods.

The common interfaces

The Spring Data core library ships with two base interfaces that expose a dedicated set of functionalities:

- `CrudRepository` - CRUD methods
- `PagingAndSortingRepository` - methods for pagination and sorting (extends `CrudRepository`)

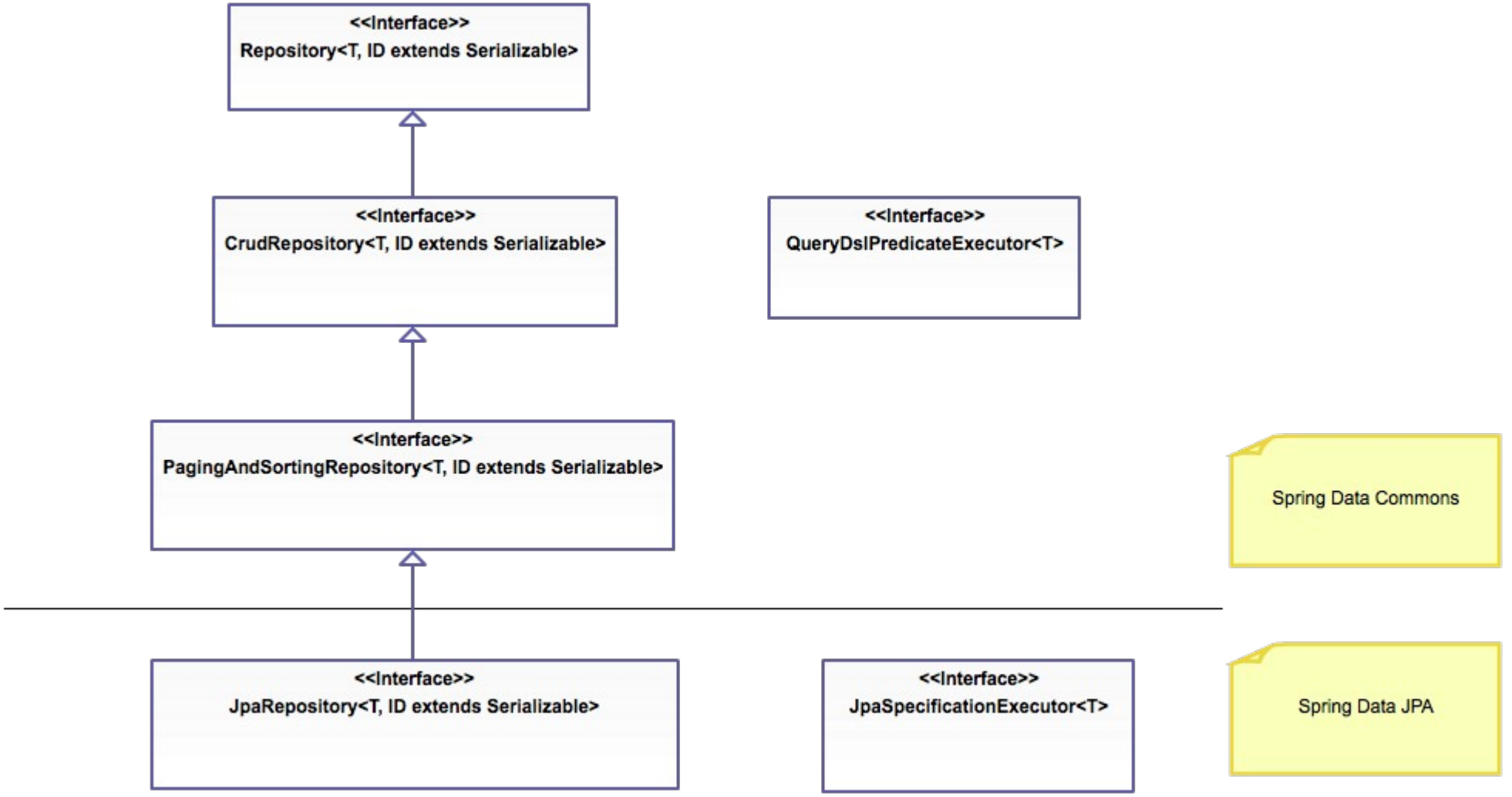
JpaRepository vs CrudRepository

Store-specific interfaces

The individual store modules (e.g. for JPA or MongoDB) expose store-specific extensions of these base interfaces to allow access to store-specific functionality like flushing or dedicated batching that take some store specifics into account. An example for this is `deleteInBatch(…)` of `JpaRepository` which is different from `delete(…)` as it uses a query to delete the given entities which is more performant but comes with the side effect of not triggering the JPA-defined cascades (as the spec defines it).

We generally recommend *not* to use these base interfaces as they expose the underlying persistence technology to the clients and thus tighten the coupling between them and the repository. Plus, you get a bit away from the original definition of a repository which is basically "a collection of entities". So if you can, stay with `PagingAndSortingRepository`.

spring data hierarchy



spring data Example

```
@Entity
@Table(name="book_table")
public class Book {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long bookId;
    private String title;
    private LocalDate publishDate;
    private int pageCount;
    private double price;
```

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long>{
}
```

```
spring.jpa.hibernate.ddl-auto=update
spring.datasource.username=root
spring.datasource.password=root
spring.datasource.driver-class-name=com.mysql.cj.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/boot_demo?useSSL=false
spring.jpa.show-sql=true
logging.level.org.springframework.web: DEBUG
logging.level.org.hibernate: ERROR
```

crud examples

```
bookRepo.deleteById(1L);

bookRepo.delete(bookRepo.findById(2L).orElseThrow(RuntimeException::new));

bookRepo.deleteAll((bookRepo.findAllById((new ArrayList<Long>(){{
    add(3L);
    add(4L);
})))));

bookRepo.deleteInBatch(bookRepo.findAllById(new ArrayList<Long>(){{
    add(5L);
    add(6L);
}}));

bookRepo.deleteAll();

bookRepo.deleteAllInBatch();
```

```
//update records

Book book =bookRepo.findById(1L).orElseThrow(RuntimeException::new);
book.setTitle("java in action");
bookRepo.save(book);
```

Turning off repo definations

- lets say our requirment is to create an safe repo, only for reading purpose
- use @NoRepositoryBean, Spring jpa will only give implementation for methods that are mentioned in interface!

```
@NoRepositoryBean
public interface ReadOnlyRepository<T, ID extends Serializable> extends
        Repository<T, ID> {

    T findOne(ID id);

    Iterable<T> findAll();
}
```

Derived quaries from method names

- Spring Data can derived quaries based on method name declared into the repo interface
- class Person{
  - private firstName;
- }
- public interface PersonRepository extends CrudRepository<Person, String>{
  - public List<Person>findByFirstName(String firstName);

- Quary generated:
  - select p from Person p where p.firstName=?

```
String comparision methods:
---------------------------
```

```
How derived queries are constructed?
@Repository
public interface BookRepository extends JpaRepository<Book, Long> {
        //Spring data inspect method sign and find findBy keyword
        //query builder in background remove findBy and inspect next portion
        //"title" (title of POJO)
        //using this infor spring data enable to construct quaries....

        public Book findByTitle(String title);
}
```

Examples

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long>{

public List<Book> findByTitle(String title);
    public List<Book> findByTitleLike(String title);

    public List<Book> findByTitleContaining(String title);

    public List<Book> findByTitleStartingWith(String title);

    public List<Book> findByTitleEndingWith(String title);

    public List<Book> findByTitleIgnoreCase(String title);

}
```

Relational comparision methods in derived quaries

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> findByTitle(String title);
    public List<Book> findByPageCountEquals(int pageCount);
    public List<Book> findByPageCountGreaterThan(int pageCount);
    public List<Book> findByPageCountLessThan(int pageCount);
    public List<Book> findByPageCountGreaterThanEqual(int pageCount);
    public List<Book> findByPageCountLessThanEqual(int pageCount);
    public List<Book> findByPageCountBetween(int min, int max);

}
```

Logical operator in derived quaries (or not and)

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> findByTitleContainingOrTitleContaining
    (String title, String title2);

    public List<Book> findByTitleContainingAndPageCountGreaterThan
    (String title, int pageCount);

    public List<Book> findByTitleNot(String title);


}
```

Date comparision in spring data

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> findByPublishDateAfter(LocalDate date);

    public List<Book> findByPublishDateBefore(LocalDate date);

    public List<Book> findByPublishDateBetween(LocalDate date,LocalDate date2);
}
```

Quaries to check containing

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> findByTitleContainingOrderByTitleAsc(String title);

    public List<Book> findByTitleContainingOrderByTitleDesc(String title);

    public List<Book> findTopByOrderByPageCountDesc();// find top book

    public List<Book> findFirstByOrderByPageCountAsc();

    public List<Book> findTop5ByOrderByPriceDesc(); // top 5 costly books....
}
```

JPQL data with spring data, Sort quaries

```java
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    @Query("select b from Book b")
    public List<Book> queryOne();

    @Query("select b from Book b where b.pageCount > ?1")
    public List<Book> queryTwo(int pageCount);

    @Query("select b from Book b where b.title = :title")
    public List<Book> queryThree(@Param("title") String title);
}
```

JPQL data with spring data, Sort quaries

- Quary name Book.queryOne corrosponding to method named queryOne() of Book class

```
@Table(name = "book_table")
@NamedQueries({
@NamedQuery(name = "Book.queryOne", query = "select b from Book b"),
@NamedQuery(name = "Book.queryTwo", query = "select b from Book b "
        + "where b.pageCount > ?1"),
@NamedQuery(name = "Book.queryThree", query = "select b from Book b where"
        + " b.title = :title") })
public class Book {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
```

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> queryOne();
}
```

JPQL pagination

- Pagination is imp techenique for large result set to displayed to a web page
- Breading down larger data set to sub set, pagination
- Spring provide paging and sorting repo out of the box....contain several method to support pagination

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    public List<Book> findByPageCountGreaterThan(int pageCount, Pageable pageable);
}
```

```
List<Book>books=bookRepo.findByPageCountGreaterThan(340, new PageRequest(0, 3,
        Direction.DESC, "title"));
books.forEach(book-> System.out.println(book));
```

```
List<Book> booksSortedAsPageCount=bookRepo.findAll(new Sort("pageCount"));
booksSortedAsPageCount.forEach(book-> System.out.println(book));
```

```
bookRepo.findAll(new Sort(Direction.ASC, "pageCount").and(new Sort(Direction.ASC, "price")));
```

JPQL pagination returning page/slice

- Page vs Slice
  - Slice is More efficient then Page, but do not give imp inventory information such as getTotalPages()

```
@Repository
public interface BookRepo extends JpaRepository<Book, Long> {
    //public List<Book> findByPageCountGreaterThan(int pageCount, Pageable pageable);

    //public Page<Book> findByPageCountGreaterThan(int pageCount, Pageable pageable);

    public Slice<Book> findByPageCountGreaterThan(int pageCount, Pageable pageable);
}
```

```
Page<Book> page = bookRepo.findByPageCountGreaterThan
        (200, new PageRequest(1, 2, Direction.ASC, "pageCount"));

page.forEach(p-> System.out.println(p));

//important method of page

System.out.println("no of pages:"+ page.getTotalPages());
System.out.println("how many result available with subset:"+ page.getTotalElements());
```

JPQL pagination returning page/slice: new syntex

```
//Demo on pagination and sorting

Sort sort=Sort.by(Sort.Direction.DESC,"pageCount") ;

List<Book> books=bookRepo.findAll(sort);

books.forEach(b-> System.out.println(b));
```

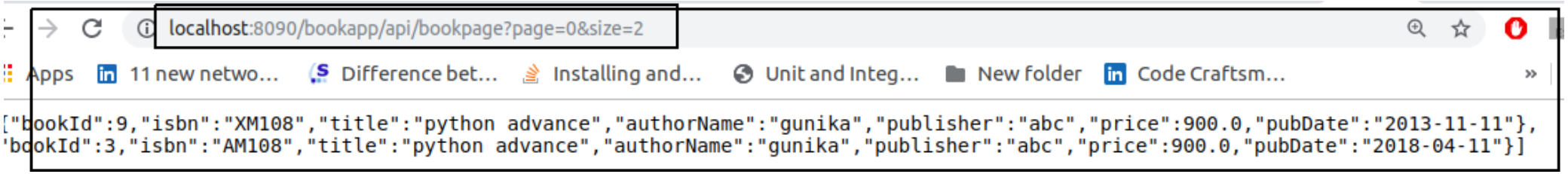
```
Pageable pageable=PageRequest.of(0, 2);

Page<Book> books=bookRepo.findAll(pageable);

books.forEach(b-> System.out.println(b));
```

Pagable rest response

```
public List<Book> getAllBooksPagable(Pageable pageable);
```

```
@Override
public List<Book> getAllBooksPagable(Pageable pageable) {
    return dao.findAll(pageable).getContent();
}
```

```
@GetMapping(path = "/bookpage", produces = MediaType.APPLICATION_JSON_VALUE)
public ResponseEntity<List<Book>> getAllBooksPagination(Pageable pagable) {
    return new ResponseEntity<List<Book>>(
            bookService.getAllBooksPagable(pagable), HttpStatus.OK);
}
```



Spring Data JPA methods

Keyword	Sample	JPQL snippet
And	findByLastnameAndFirstname	… where x.lastname = ?1 and x.firstname = ?2
Or	findByLastnameOrFirstname	… where x.lastname = ?1 or x.firstname = ?2
Is, Equals	findByFirstname, findByFirstnameIs, findByFirstnameEquals	… where x.firstname = ?1
Between	findByStartDateBetween	… where x.startDate between ?1 and ?2
LessThan	findByAgeLessThan	… where x.age < ?1
LessThanEqual	findByAgeLessThanEqual	… where x.age <= ?1
GreaterThan	findByAgeGreaterThan	… where x.age > ?1
GreaterThanEqual	findByAgeGreaterThanEqual	… where x.age >= ?1
After	findByStartDateAfter	… where x.startDate > ?1
Before	findByStartDateBefore	… where x.startDate < ?1

Spring Data JPA methods

`IsNull`, `Null`	`findByAge(Is)Null`	`… where x.age is null`
`IsNotNull`, `NotNull`	`findByAge(Is)NotNull`	`… where x.age not null`
`Like`	`findByFirstnameLike`	`… where x.firstname like ?1`
`NotLike`	`findByFirstnameNotLike`	`… where x.firstname not like ?1`
`StartingWith`	`findByFirstnameStartingWith`	`… where x.firstname like ?1` (parameter bound with appended `%`)
`EndingWith`	`findByFirstnameEndingWith`	`… where x.firstname like ?1` (parameter bound with prepended `%`)
`Containing`	`findByFirstnameContaining`	`… where x.firstname like ?1` (parameter bound wrapped in `%`)

Spring Data JPA methods

EndingWith	findByFirstnameEndingWith	… where x.firstname like ?1 (parameter bound with prepended %)
Containing	findByFirstnameContaining	… where x.firstname like ?1 (parameter bound wrapped in %)
OrderBy	findByAgeOrderByLastnameDesc	… where x.age = ?1 order by x.lastname desc
Not	findByLastnameNot	… where x.lastname <> ?1
In	findByAgeIn(Collection<Age> ages)	… where x.age in ?1
NotIn	findByAgeNotIn(Collection<Age> ages)	… where x.age not in ?1
True	findByActiveTrue()	… where x.active = true
False	findByActiveFalse()	… where x.active = false
IgnoreCase	findByFirstnameIgnoreCase	… where UPPER(x.firstame) = UPPER(?1)

Creating @Repository methods

Spring Boot 2.2 automatically runs `@EnableJpaRepositories (queryLookupStrategy= QueryLookupStrategy.Key.CREATE_IF_NOT_FOUND)`, which generates the query methods if they do not exist

The query methods uses prefixes such as findBy***, readBy***, countBy***, getBy***, and queryBy***

These query methods are generated using some keywords, such as Is, Equals, And, Or, Between, LessThan, GreaterThan, Like, True, False, and so on

Spring Data JPA methods Examples

```
public interface ProfileRepository extends JpaRepository<Profile, Long>{

    public List<Profile> findByNameIgnoreCase(String name);
    public List<Profile> findByUsernameAndPassword(String username, String password);
    public List<Profile> findByUsernameStartingWith(String prefix);
    public List<Profile> findByApprovedTrue();

    @Query(value = "select * from signup", nativeQuery = true)
    public List<Profile> findProfiles();

    @Query(value = "from Profile")
    public Stream<Profile> findStreamProfiles();

    @Query(value = "from Profile p WHERE p.id = :id")
    public Profile findProfile(@Param("id") Long id);

    @Query(value = "from Profile p WHERE p.username = ?1 AND p.password = ?2")
    public List<Profile> findProfiles (String username, String password);

    @Query(value = "Select * from signup WHERE username LIKE ?1 AND password LIKE ?2", nativeQuery
    public List<Profile> findNativeProfiles (String username, String password);
```

Spring Data JPA methods Examples

```
@Query(value = "from Profile")
public Stream<Profile> findStreamProfiles();

@Query(value = "from Profile p WHERE p.id = :id")
public Profile findProfile(@Param("id") Long id);

@Query(value = "from Profile p WHERE p.username = ?1 AND p.password = ?2")
public List<Profile> findProfiles (String username, String password);

@Query(value = "Select * from signup WHERE username LIKE ?1 AND password LIKE ?2", nativeQuer
public List<Profile> findNativeProfiles (String username, String password);

@Modifying
@Query(value = "delete from signup where username = :username ", nativeQuery = true)
public void deleteByUsername(@Param("username") String username);

@Modifying(clearAutomatically = true)
@Query(value = "update signup set name = ?1 where username = ?2", nativeQuery = true)
public void updateByUsername(String name, String username);
```

Any questions?