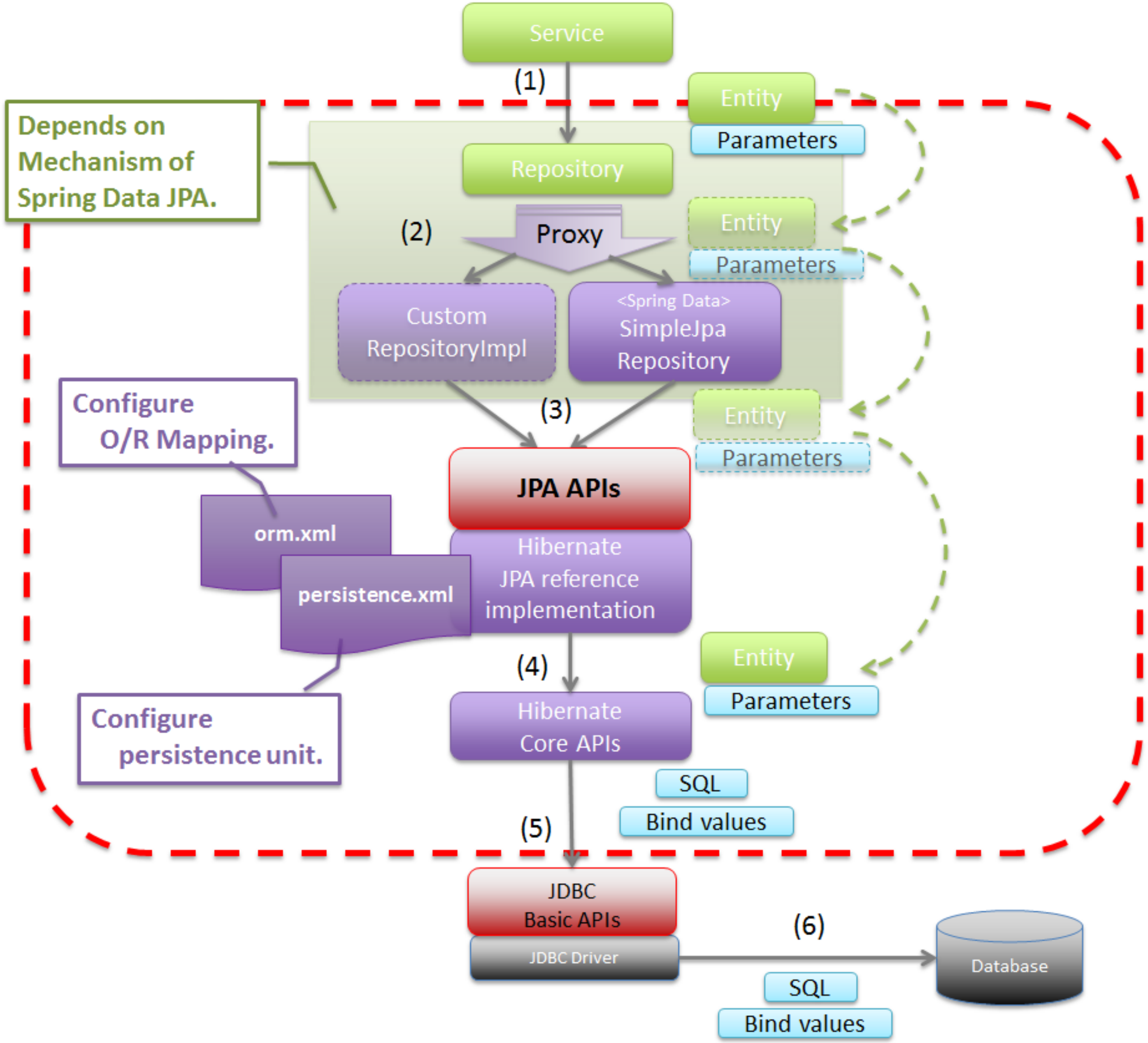
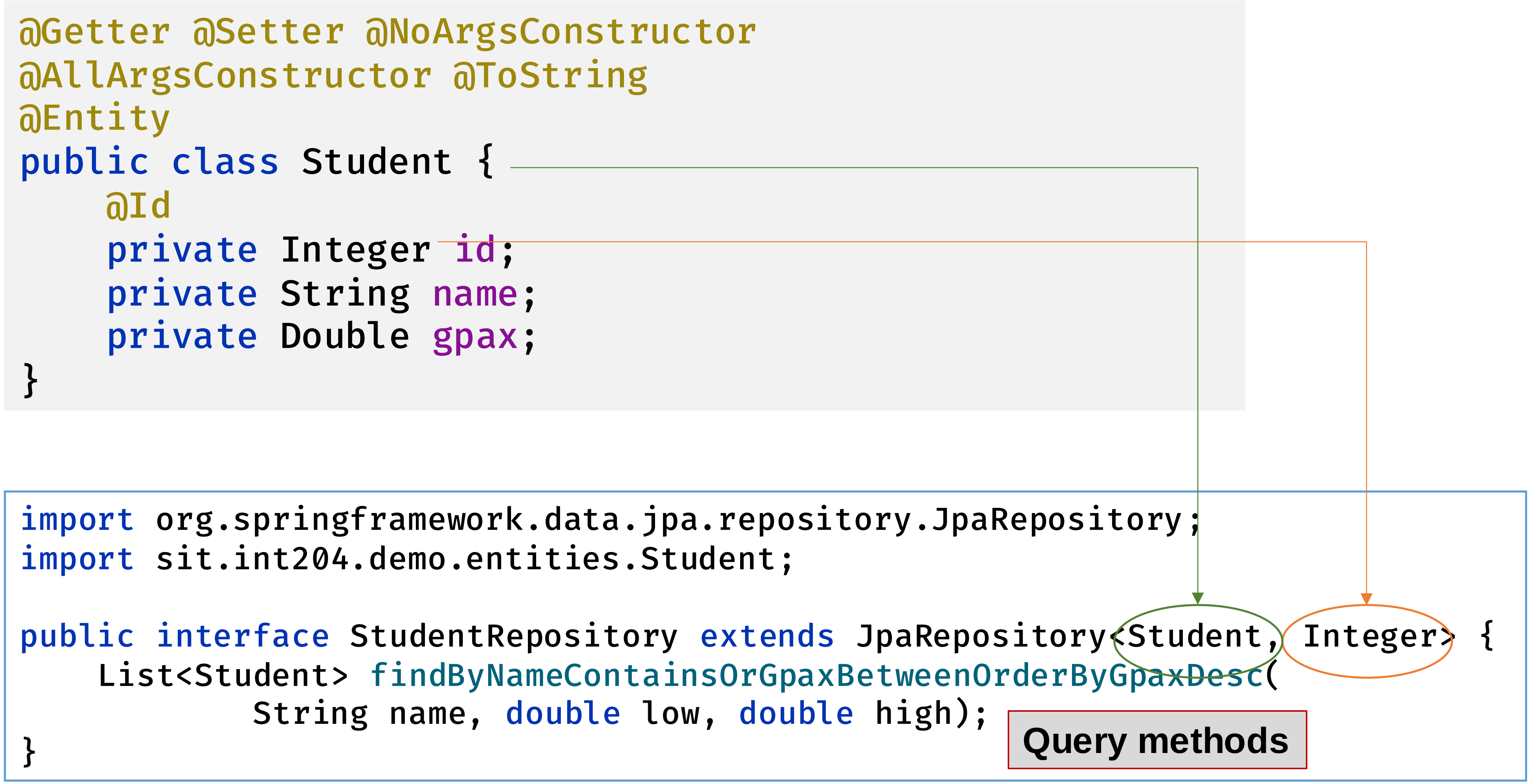
spring
boot

Spring Data JPA
Query Creation

Basic Spring Data JPA Flow



JPA Repository Example



```
@Getter @Setter @NoArgsConstructor
@AllArgsConstructor @ToString
@Entity
public class Student {
    @Id
    private Integer id;
    private String name;
    private Double gpax;
}
```

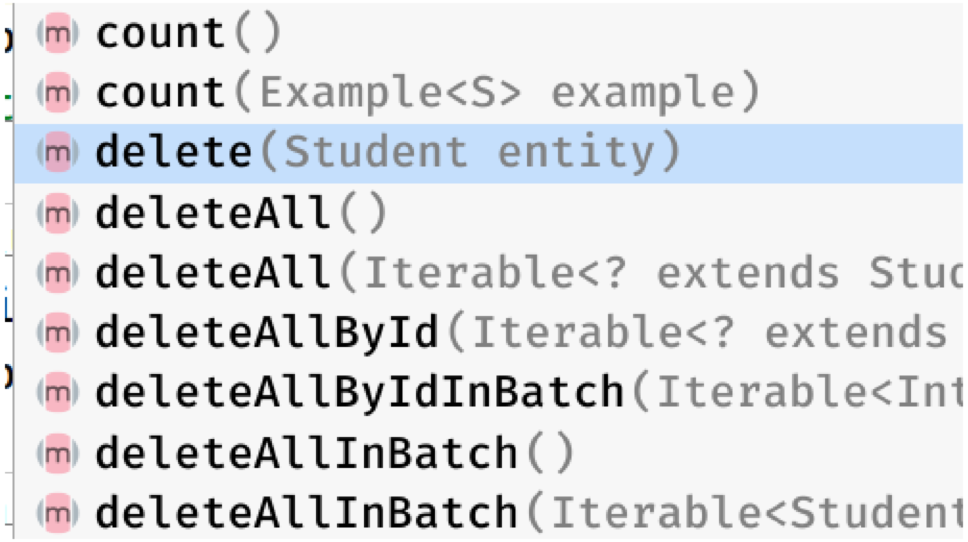
```
import org.springframework.data.jpa.repository.JpaRepository;
import sit.int204.demo.entities.Student;

public interface StudentRepository extends JpaRepository<Student, Integer> {
    List<Student> findByNameContainsOrGpaxBetweenOrderByGpaxDesc(
            String name, double low, double high);
}
```

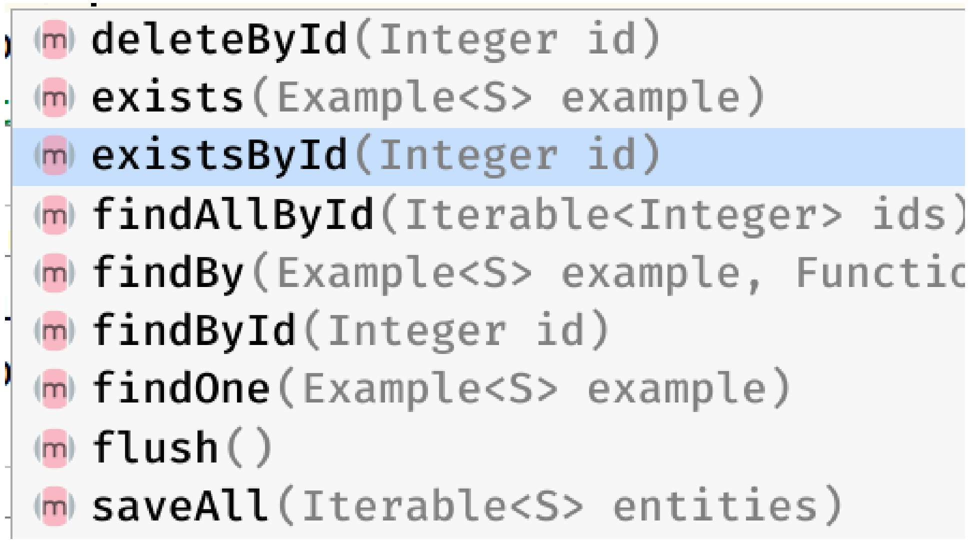
Query methods

Jpa Repository default methods

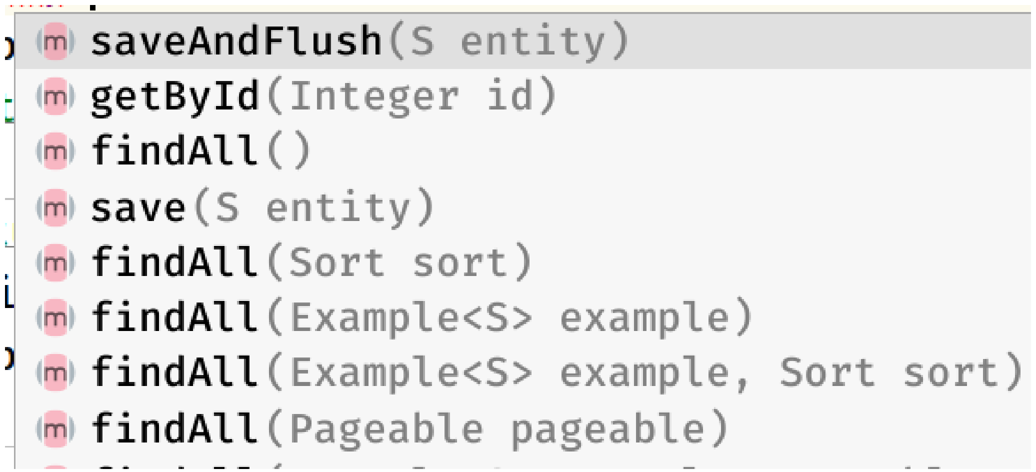
```
public class AppController {
    @Autowired
    private final StudentRepository
studentRepository;
```



```
count()
count(Example<S> example)
delete(Student entity)
deleteAll()
deleteAll(Iterable<? extends Stuc
deleteAllById(Iterable<? extends
deleteAllByIdInBatch(Iterable<Int
deleteAllInBatch()
deleteAllInBatch(Iterable<Student
```



```
deleteById(Integer id)
exists(Example<S> example)
existsById(Integer id)
findAllById(Iterable<Integer> ids)
findBy(Example<S> example, Functic
findById(Integer id)
findOne(Example<S> example)
flush()
saveAll(Iterable<S> entities)
```



```
saveAndFlush(S entity)
getById(Integer id)
findAll()
save(S entity)
findAll(Sort sort)
findAll(Example<S> example)
findAll(Example<S> example, Sort sort)
findAll(Pageable pageable)
```

Examples & Exercises: saveAll(Iterable<S> entities)

```
@Entity
@Data
@AllArgsConstructor
@NoArgsConstructor
public class Customer {
   @Id
   @GeneratedValue(strategy = GenerationType.AUTO)
   private Long id;
   private String firstName;
   private String lastName;
}
```

```
public interface CustomerRepository extends JpaRepository<Customer, Long> { }
```

```
@Service
public class CustomerService {
    @Autowired CustomerRepository customerRepository;
    public List<Customer> addNewCustomers(List<Customer> customers) {
       return customerRepository.saveAll(customers);
    }
}
```

Query Creation

- Generally, the query creation mechanism for JPA works as described in “Query Methods”. The following example shows what a JPA query method translates into:
- Example: Query creation from method names

```
public interface UserRepository extends Repository<User, Long> {
  List<User> findByEmailAddressAndLastname(String emailAddress, String lastname);
}
```

- We create a query using the JPA criteria API from this, but, essentially, this translates into the following query:

```
select u from User u where u.emailAddress = ?1 and u.lastname = ?2.
```

- Spring Data JPA does a property check and traverses nested properties, as described in “Property Expressions”.

Supported keywords inside method names

Keyword	Sample	JPQL snippet
Distinct	findDistinctByLastnameAndFirstname	select distinct … where x.lastname = ?1 and x.firstname = ?2
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

Supported keywords inside method names (2)

Keyword	Sample	JPQL snippet
GreaterThan	findByAgeGreaterThan	… where x.age > ?1
GreaterThanEqual	findByAgeGreaterThanEqual	… where x.age >= ?1
After	findByStartDateAfter	… where x.startDate > ?1
Before	findByStartDateBefore	… where x.startDate < ?1
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

Supported keywords inside method names (3)

Keyword	**Sample**	**JPQL snippet**
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 %)
OrderBy	findByAgeOrderByLastnameDesc	… where x.age = ?1 order by x.lastname desc
NotIn	findByAgeNotIn(Collection<Age> ages)	… where x.age not in ?1
True	findByActiveTrue()	… where x.active = true
False	findByActiveFalse()	… where x.active = false

Query Method Example

```
public interface CustomerRepository extends JpaRepository<Customer, Integer> {
   public List<Customer> findAllByCustomerNameContaining(String name);
   public List<Customer> findAllByCityContainsOrderByCountry(String name);
   public List<Customer> findAllByCreditLimitBetween(Double lower, Double upper);
   public List<Customer> findAllByCustomerNameBetween(String lower, String upper);
}
```

JPA Named Queries

- Using named queries to declare queries for entities is a valid approach and works fine for a small number of queries.
- As the queries themselves are tied to the Java method that runs them, you can actually bind them directly by using the Spring Data JPA @Query annotation rather than annotating them to the domain class.
- This frees the domain class from persistence specific information and co-locates the query to the repository interface.

```
public interface UserRepository extends JpaRepository<User, Long> {
   @Query("select u from User u where u.emailAddress = ?1")
   User findByEmailAddress(String emailAddress);
}
```

Native Queries

- The @Query annotation allows for running native queries by setting the nativeQuery flag to true, as shown in the following example:

- Declare a native query at the query method using @Query

```
public interface UserRepository extends JpaRepository<User, Long> {
        @Query(value = "SELECT * FROM USERS WHERE EMAIL_ADDRESS = ?1", nativeQuery = true)
        User findByEmailAddress(String emailAddress);
}
```

Spring Data REST: Pagination and Sorting

- The PagingAndSortingRepository is an extension of CrudRepository to provide additional methods to retrieve entities using the pagination and sorting abstraction. It implicitly provides two methods:
  - **Page<T> findAll(Pageable pageable)**

    returns a Page of entities meeting the paging restriction provided in the Pageable object.

    ```
    Pageable firstPageTwoElements = PageRequest.of(0, 2); Pageable
    secondPageFiveElements = PageRequest.of(1, 5);
    ```
  - **Iterable<T> findAll(Sort sort)**

    returns all entities sorted by the given options. No paging is applied here.

    ```
    Sort sortedByName = Sort.by("name");
    ```
  - Pagination & Sorting

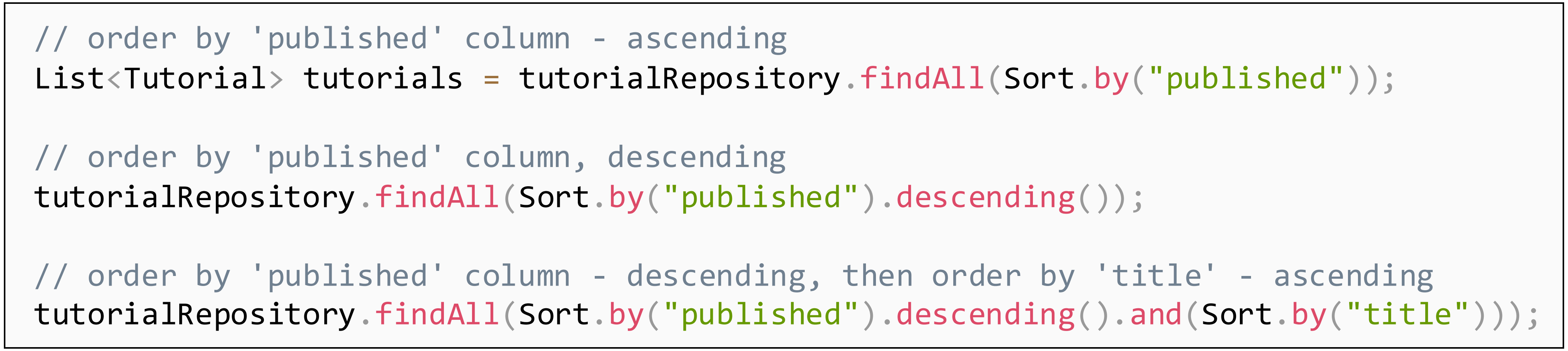
    ```
    Pageable sortedByPriceDescNameAsc = PageRequest.of(0, 5,
    Sort.by("price").descending().and(Sort.by("name")));
    ```

Spring Data Sort and Order

- The Sort class provides sorting options for database queries with more flexibility in choosing single/multiple sort columns and directions (ascending/descending).
  - we use by(), descending(), and() methods to create Sort object and pass it to Repository.findAll()
- You can sort results by Sort and Order object with one or more specified variables.
- Sorting can be done in ascending or descending order.

```
@Service
 :
 :
public List<Customer> getAllCustomers(String sortBy) {
   return repository.findAll(Sort.Direction.DESC, Sort.by(sortBy));
}
```

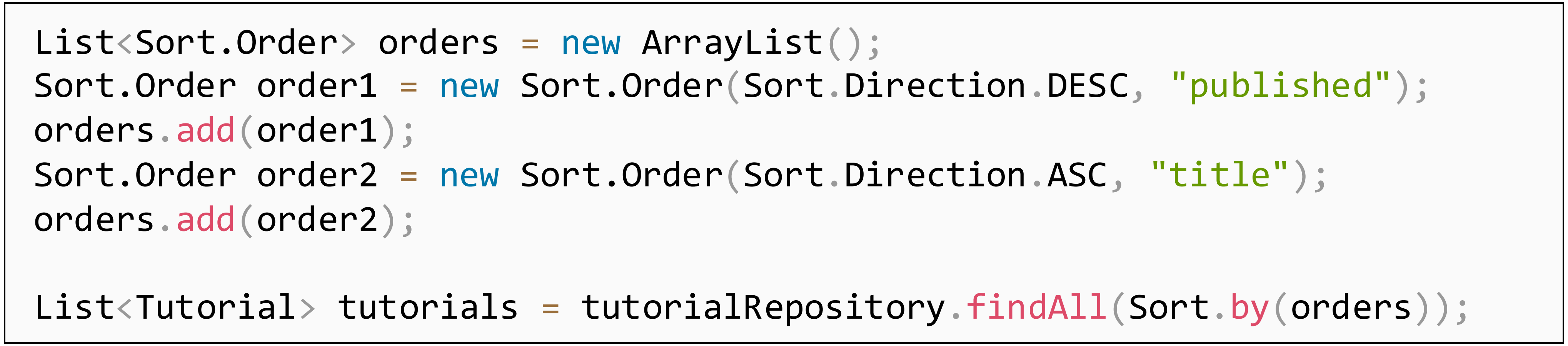
Sort & Order object example



```
// order by 'published' column - ascending
List<Tutorial> tutorials = tutorialRepository.findAll(Sort.by("published"));

// order by 'published' column, descending
tutorialRepository.findAll(Sort.by("published").descending());

// order by 'published' column - descending, then order by 'title' - ascending
tutorialRepository.findAll(Sort.by("published").descending().and(Sort.by("title")));
```



```
List<Sort.Order> orders = new ArrayList();
Sort.Order order1 = new Sort.Order(Sort.Direction.DESC, "published");
orders.add(order1);
Sort.Order order2 = new Sort.Order(Sort.Direction.ASC, "title");
orders.add(order2);

List<Tutorial> tutorials = tutorialRepository.findAll(Sort.by(orders));
```

JpaRepository with Pagination

- findAll(Pageable pageable): returns a Page of entities meeting the paging condition provided by Pageable object.
- Pagination can be added by creation of PageRequest object which is implementation of Pageable interface.
- Similar to sorting adding pagination depends from type of Repository extended by our interface.

```
@Service
  :
public Page<Customer> getAllCustomers(int page, int pageSize) {
        Pageable pageable = PageRequest.of(page, pageSize);
        return repository.findAll(pageable);
}
```

Accepting Page and Sort Parameters

- Generally, paging and sorting parameters are optional and thus part of the request URL as query parameters. If any API supports paging and sorting, ALWAYS provide default values to these parameters – to be used when the client does not choose to specify any paging or sorting preferences.
- Example:

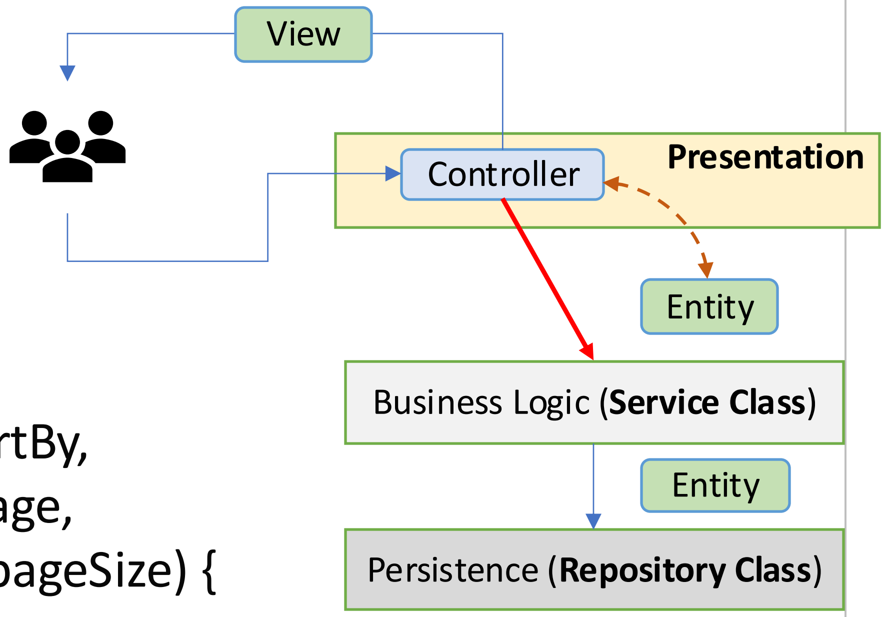
```
@GetMapping("")
   public List<Customer> getAllCustomers(
         @RequestParam(defaultValue = "id") String sortBy,
         @RequestParam(defaultValue = "0") Integer page,
         @RequestParam(defaultValue = "10") Integer pageSize) {
          Page<Customer> customers = service.findAll(sortBy, page, pageSize);
         return customers.getContent();
   }
```

Controller - Paging & Sorting

```
@RestController
@RequestMapping("/api/customers")
public class CustomerController {
   @Autowired
   private CustomerService service;

   @GetMapping("")
   public String getAllCustomers(
         @RequestParam(defaultValue = "id") String sortBy,
         @RequestParam(defaultValue = "0") Integer page,
         @RequestParam(defaultValue = "10") Integer pageSize) {
         return ”customer_list";
   }
}
```

localhost:port/context/customers?sortBy=id&page=0&pageSize=10


View
Controller
Presentation
Entity
Business Logic (Service Class)
Entity
Persistence (Repository Class)