НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ КОРАБЛЕБУДУВАННЯ ІМЕНІ АДМІРАЛА МАКАРОВА

Spring Boot. Spring Data. ORM

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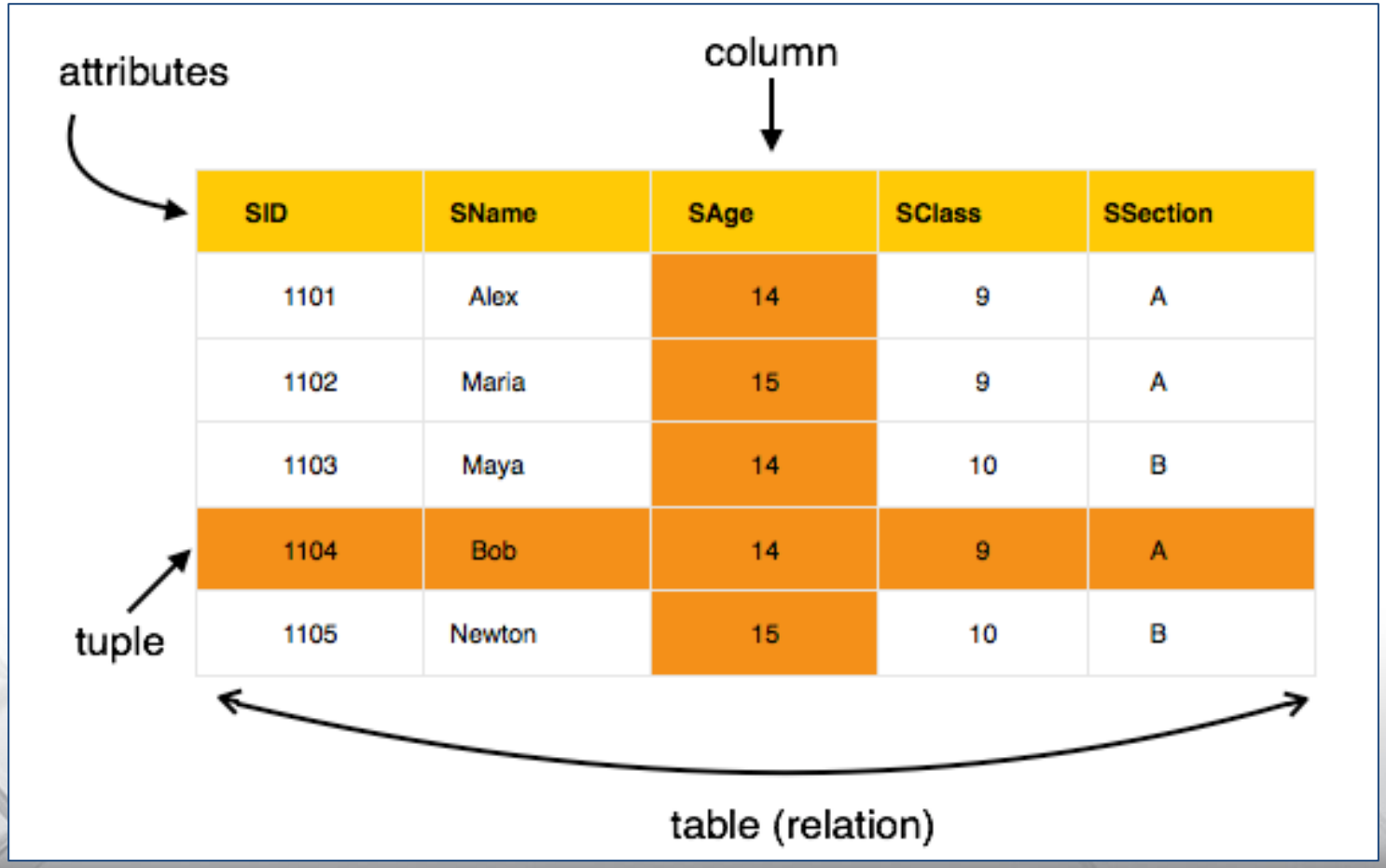
Contents

- SQL, DBMS
- JDBC
- ORM, JPA
- Spring Data JPA

(R) DBMS

Relational **DBMS** (or RDBMS) is a relational database management system. Relational databases store data in tables with rows and columns.



SID	SName	SAge	SClass	SSection
1101	Alex	14	9	A
1102	Maria	15	9	A
1103	Maya	14	10	B
1104	Bob	14	9	A
1105	Newton	15	10	B

SQL

SQL (*structured query language*) — a formal non-procedural programming language used to create, modify, and manipulate data in an arbitrary relational database

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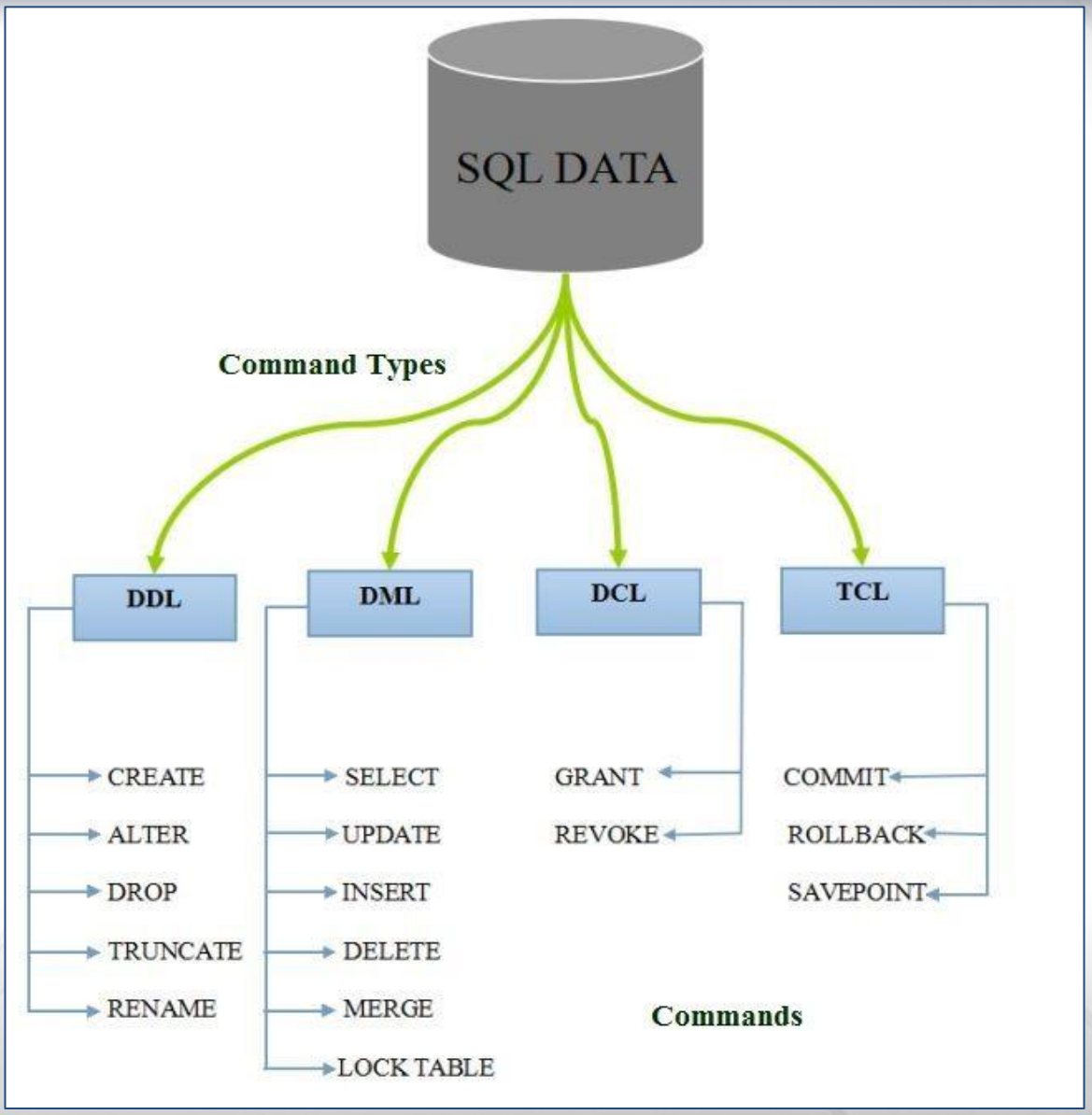
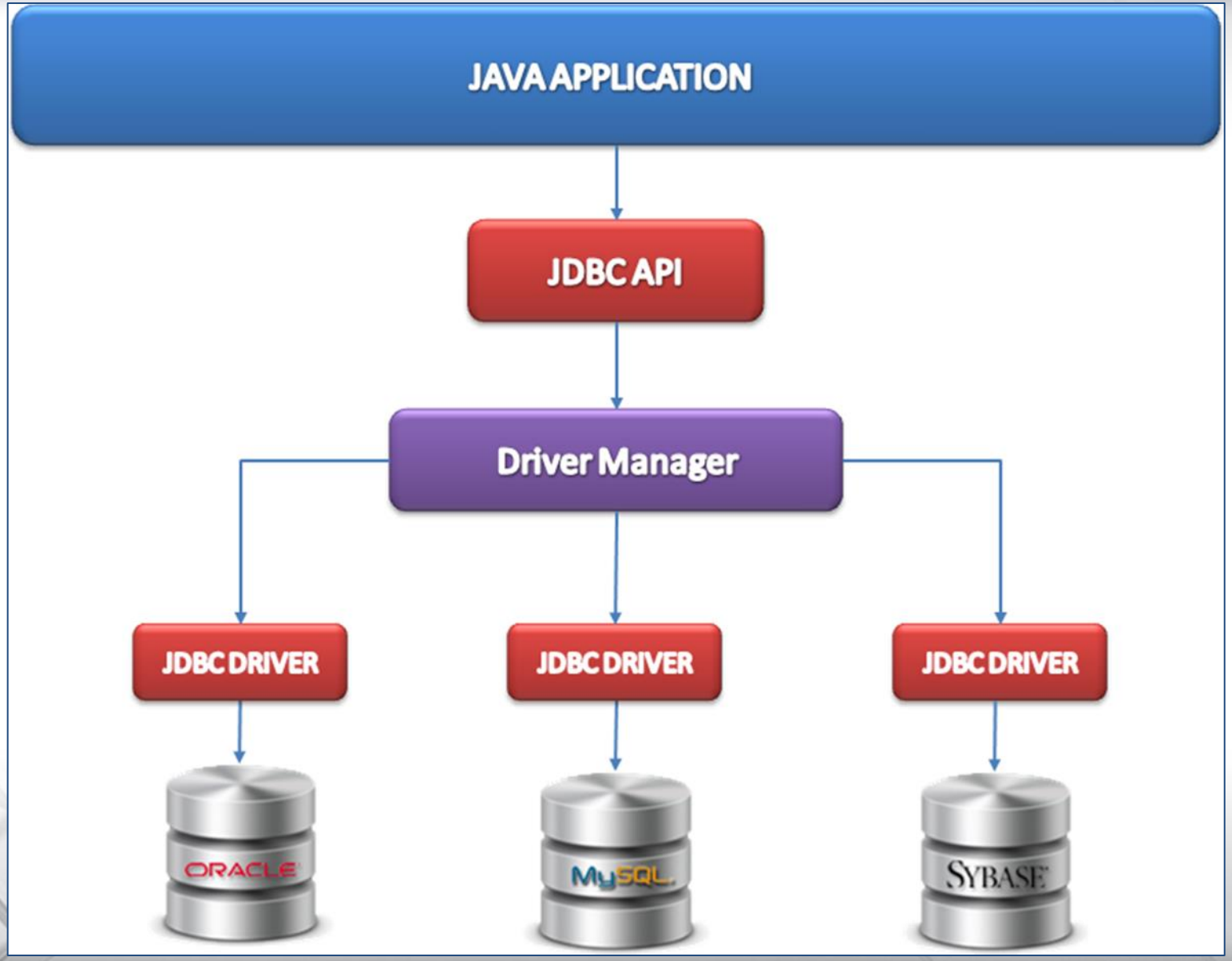
SQL



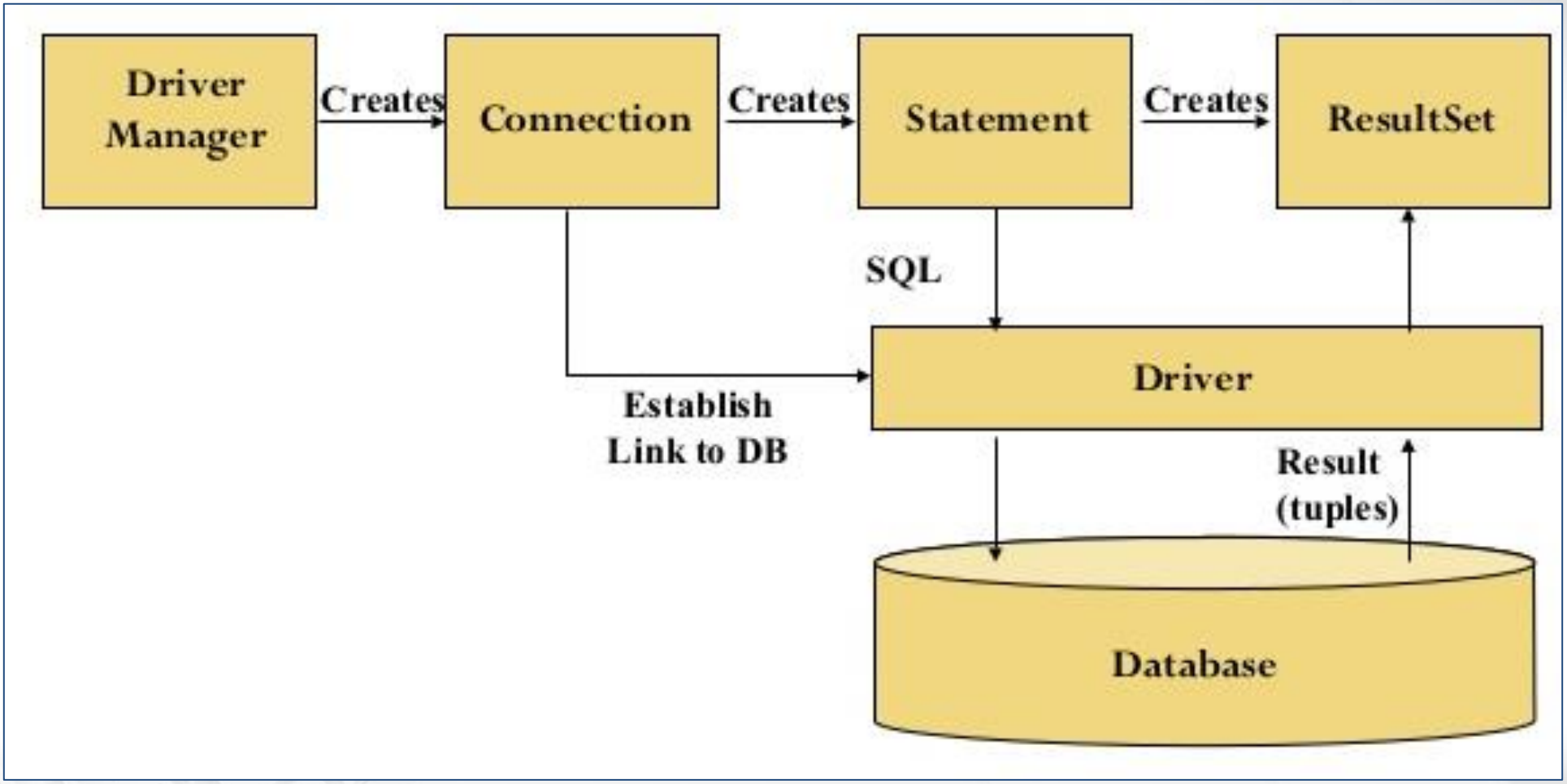
JDBC

JDBC (Java DataBase Connectivity) is a platform-independent industry standard for the interaction of Java applications with various DBMS, implemented as a package java.sql, which is part of Java SE

JDBC


JAVA APPLICATION
JDBC API
Driver Manager
JDBC DRIVER
JDBC DRIVER
JDBC DRIVER
ORACLE
MySQL
SYBASE

JDBC Flow


Driver Manager
Creates
Connection
Creates
Statement
Creates
ResultSet
SQL
Driver
Establish Link to DB
Result (tuples)
Database

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Example

```java
package ua.mk.berkut.model.data;

import lombok.Data;

@Data
public class Student {
    private Long id;
    private String firstName;
    private String lastName;
    private Integer age;
}
```

SELECT * FROM STUDENT ;

ID	FIRST_NAME	LAST_NAME	AGE
1	Вася	Пупкин	17
2	Петя	Дудкин	18
3	Вася	Васильев	18

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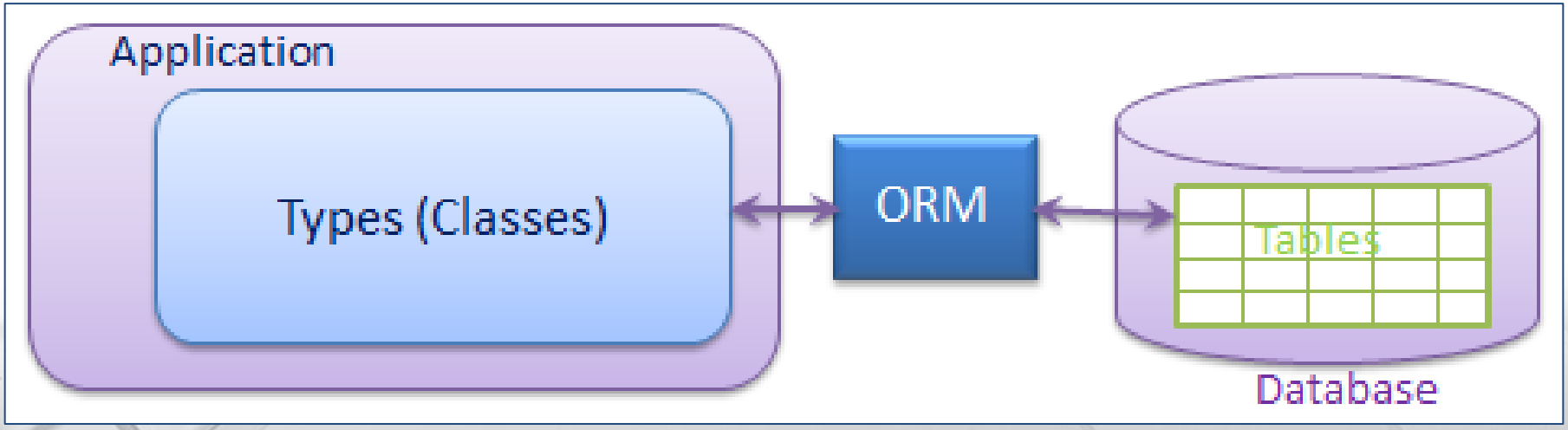
Example

```java
package ua.mk.berkut;

import ...

public class JdbcMain {
    private static final String URL = "jdbc:mariadb://localhost:3306/gfldemo";

    @SneakyThrows
    public static void main(String[] args) {
        try (Connection connection = DriverManager.getConnection(URL, user: "student", password: "123")) {
            PreparedStatement ps = connection.prepareStatement( sql: "select * from student where FIRST_NAME = ?");
            ps.setString( parameterIndex: 1, x: "John");
            ResultSet resultSet = ps.executeQuery();
            List<Student> students = new ArrayList<>();
            while (resultSet.next()) {
                Student student = new Student();
                student.setId(resultSet.getLong( columnLabel: "ID"));
                student.setFirstName(resultSet.getString( columnLabel: "FIRST_NAME"));
                student.setLastName(resultSet.getString( columnLabel: "LAST_NAME"));
                student.setAge(resultSet.getInt( columnLabel: "AGE"));
                students.add(student);
            }
            students.forEach(System.out::println);
        }
    }
}
```

ORM

ORM stands for Object-Relational Mapping. It is a technique used in software development to bridge the gap between object-oriented programming and relational databases.

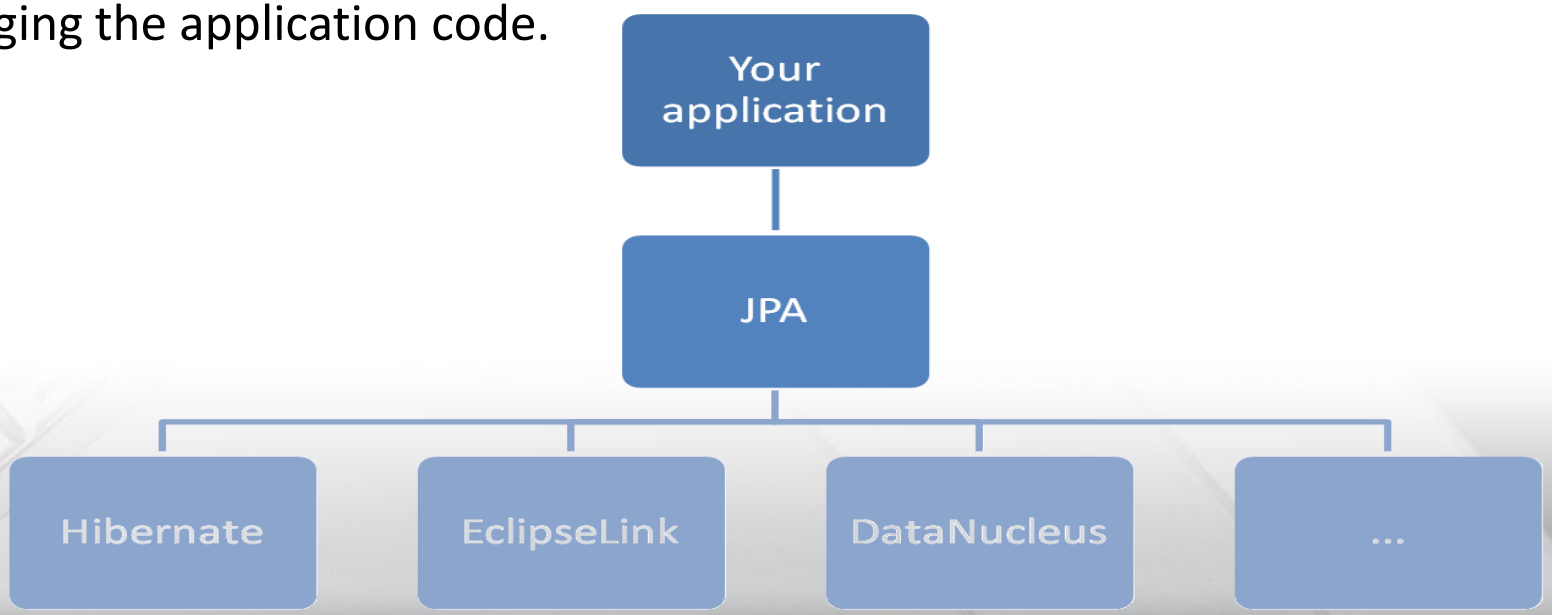
In object-oriented programming, data is represented as objects with attributes and behaviors. On the other hand, relational databases store data in tables with rows and columns. ORM provides a way to map objects to database tables and vice versa, allowing developers to work with objects and their relationships instead of directly dealing with database operations.



JPA

- The Java Persistence API (JPA) is a specification that provides a standard way to access and manage relational data in Java applications. It is part of the Java EE (Enterprise Edition) platform and is also commonly used in Java SE (Standard Edition) applications.

- JPA defines a set of interfaces and annotations that allow developers to map Java objects to database tables and perform database operations using object-oriented syntax. It provides an abstraction layer on top of various underlying ORM frameworks, allowing developers to switch between different implementations without changing the application code.



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Entity

```java
package ua.mk.berkut.model.data;

import ...

@Getter
@Setter
@Entity
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String firstName;
    private String lastName;
    private Integer age;
}
```

SELECT * FROM STUDENT;

ID	AGE	FIRST_NAME	LAST_NAME
1	17	Вася	Пупкин
2	18	Петя	Дудкин

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Main annotations

- @Entity(name)
- @Table(name, schema, uniqueConstraints, indexes, catalog)
- @Column(columnDefinition, insertable, length, name, nullable,precision, scale, table, unique, updatable)
- @Id
- @GeneratedValue(generator, strategy)
- @Transient
- @Temporal(TemporalType)
- @Enumerated(EnumType)

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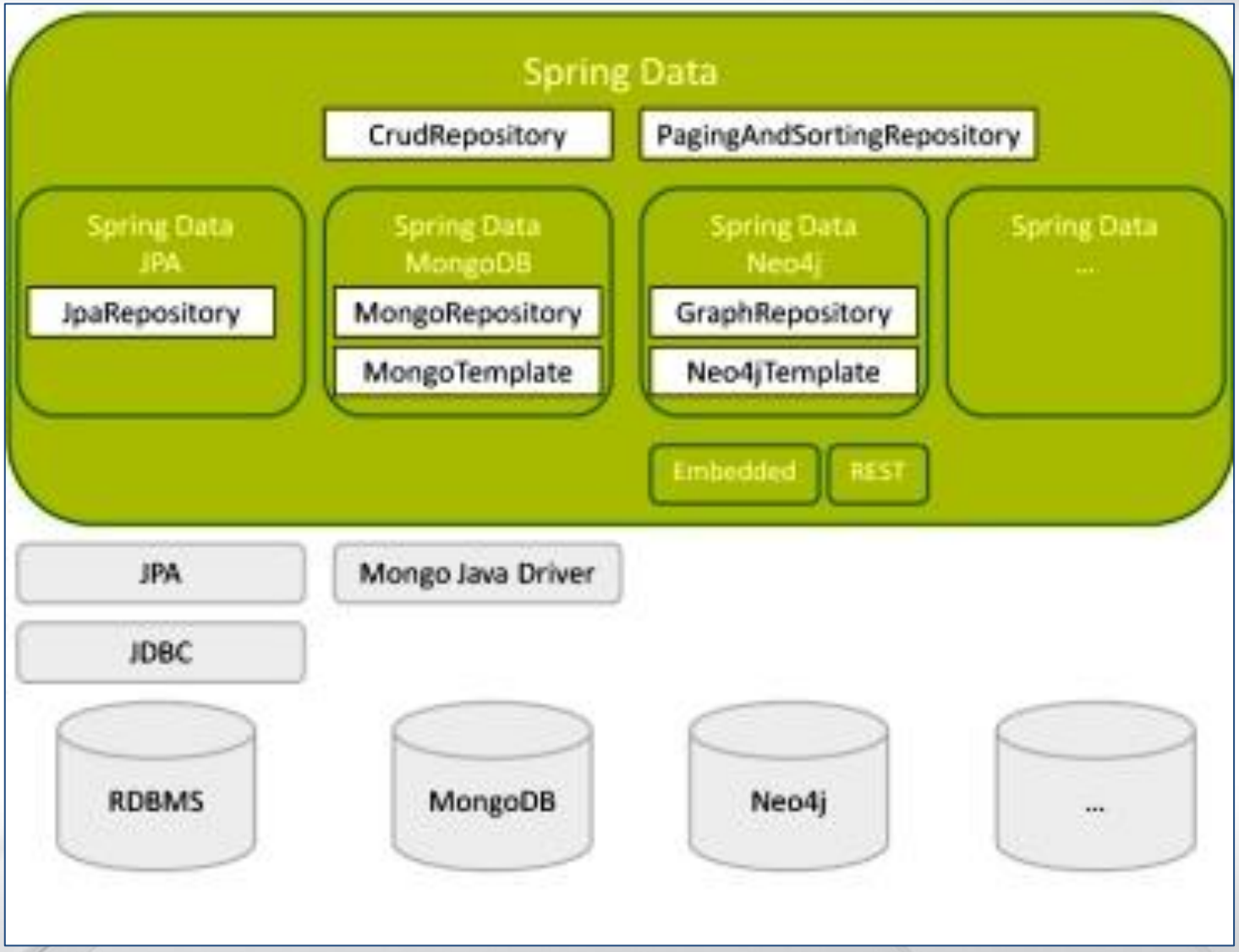
Main annotations

```java
package ua.mk.berkut.model.data;

import ...

@Getter
@Setter
@Entity
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    @Column(name = "FIRST_NAME", length = 20)
    private String firstName;
    @Column(name = "LAST_NAME", length = 30)
    private String lastName;
    @Column(name = "AGE")
    private Integer age;
}
```

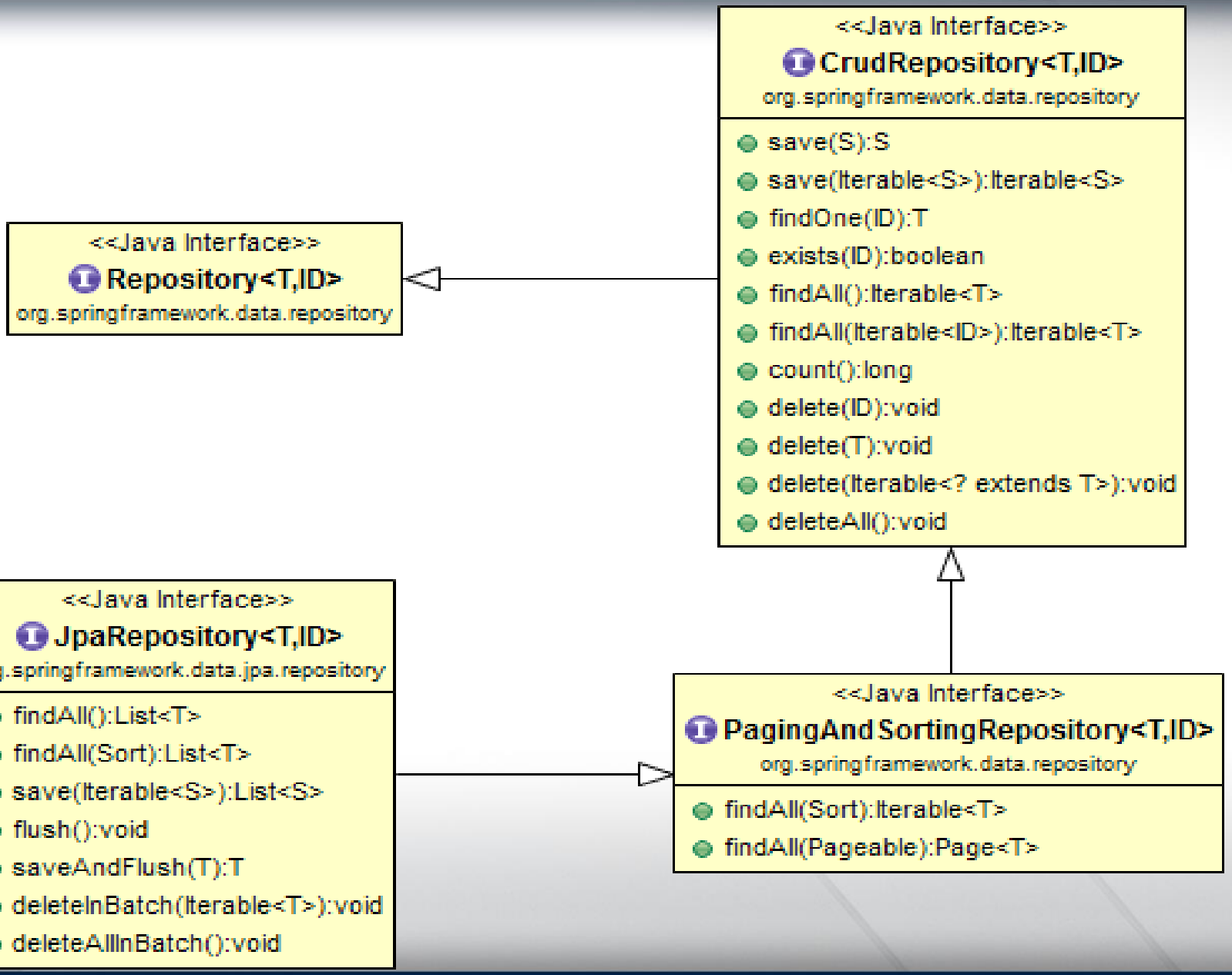
Spring Data


Spring Data
CrudRepository
PagingAndSortingRepository
Spring Data JPA
JpaRepository
Spring Data MongoDB
MongoRepository
MongoTemplate
Spring Data Neo4j
GraphRepository
Neo4jTemplate
Spring Data ...
Embedded
REST
JPA
Mongo Java Driver
JDBC
RDBMS
MongoDB
Neo4j
...

Spring Data

- Spring Data JPA is a subproject of Spring Data (part of Spring Framework), which provides a simplified data access layer for Java applications using the Java Persistence API (JPA).
- It aims to simplify the development of data access layers by providing convenient abstractions and reducing boilerplate code.

Spring Data JPA



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Example

```java
package ua.mk.berkut.repositories;

import ...

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

```java
package ua.mk.berkut.model.data;

import ...

@Getter
@Setter
@Entity
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String firstName;
    private String lastName;
    private Integer age;
}
```

SELECT * FROM STUDENT;

ID	AGE	FIRST_NAME	LAST_NAME
1	17	Вася	Пупкин
2	18	Петя	Дудкин

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Example

```java
package ua.mk.berkut.beans;

import ...

@Component @AllArgsConstructor
public class StudentBean {

    //@Autowired
    StudentRepository repository;

    public void doJob() {
        Student student = new Student();
        student.setFirstName("John");
        student.setLastName("Smith");
        student.setAge(42);
        repository.save(student);

        Long id = student.getId();
        System.out.println(id); // 3

        int size = repository.findAll().size();
        System.out.println("size of students table = " + size); //3

        repository.deleteAll();
        size = repository.findAll().size();
        System.out.println("size of students table = " + size); //0
    }
}
```

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Query Creation

```java
package ua.mk.berkut.repositories;

import ...

public interface StudentRepository extends JpaRepository<Student, Long> {
    List<Student> findByFirstNameIgnoreCase(String firstName);

    List<Student> findByLastNameAndAge(String lastName, Integer age);

    List<Student> findByLastNameLike(String lastName);

    List<Student> findByAgeBetween(Integer ageStart, Integer ageEnd);

}
```

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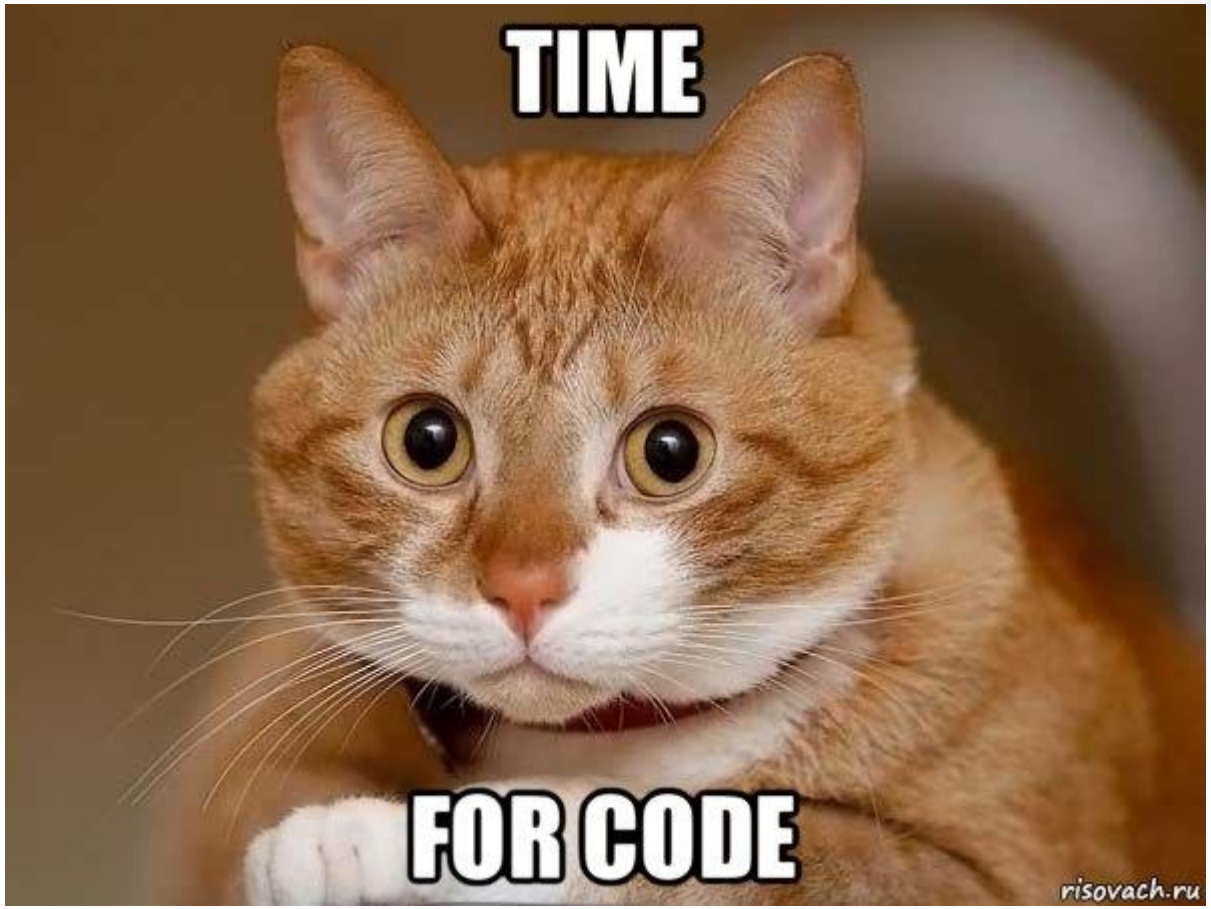
Example



Relations

- @ManyToOne(fetch, cascade, optional, targetEntity, mappedBy)
- @OneToMany(fetch, cascade, targetEntity, orphanRemoval, mappedBy)
- @OneToOne(fetch, cascade, optional, targetEntity, orphanRemoval, mappedBy)
- @ManyToMany(fetch, cascade, targetEntity, mappedBy)
- @JoinColumn(name, foreignKey, referencedColumnName, ..(@Column)
- @JoinTable(name, joinColumns, foreignKey, inverseJoinColumns, inverseForeignKey)

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student

select * from student

3 rows | Tx: Auto | DDL | CSV

WHERE | ORDER BY

	ID	FIRST_NAME	LAST_NAME	AGE	GROUP_ID
1	1	John	Rambo	30	1
2	2	Jake	Sally	28	1
3	3	Sara	Connor	51	2

groups

select * from groups

2 rows | Tx: Auto | DDL | CSV

WHERE | ORDER BY

	id	name
1	1	1141
2	2	4141

```java
package ua.mk.berkut.data;

import ...

@Getter
@Setter
@Entity
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    @Column(name = "FIRST_NAME", length = 20)
    private String firstName;
    @Column(name = "LAST_NAME", length = 30)
    private String lastName;
    @Column(name = "AGE")
    private Integer age;

    @ManyToOne(fetch = FetchType.LAZY)
    @JoinColumn(name = "GROUP_ID")
    private Group group;
}
```

```java
package ua.mk.berkut.data;

import ...

@Getter
@Setter
@Entity
@Table(name = "groups")
public class Group {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    @Column(name = "id", nullable = false)
    private Long id;

    @Column(name = "name", nullable = false, length = 20)
    private String name;

    @OneToMany(mappedBy = "group")
    private Set<Student> students = new LinkedHashSet<>();

}
```

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Example

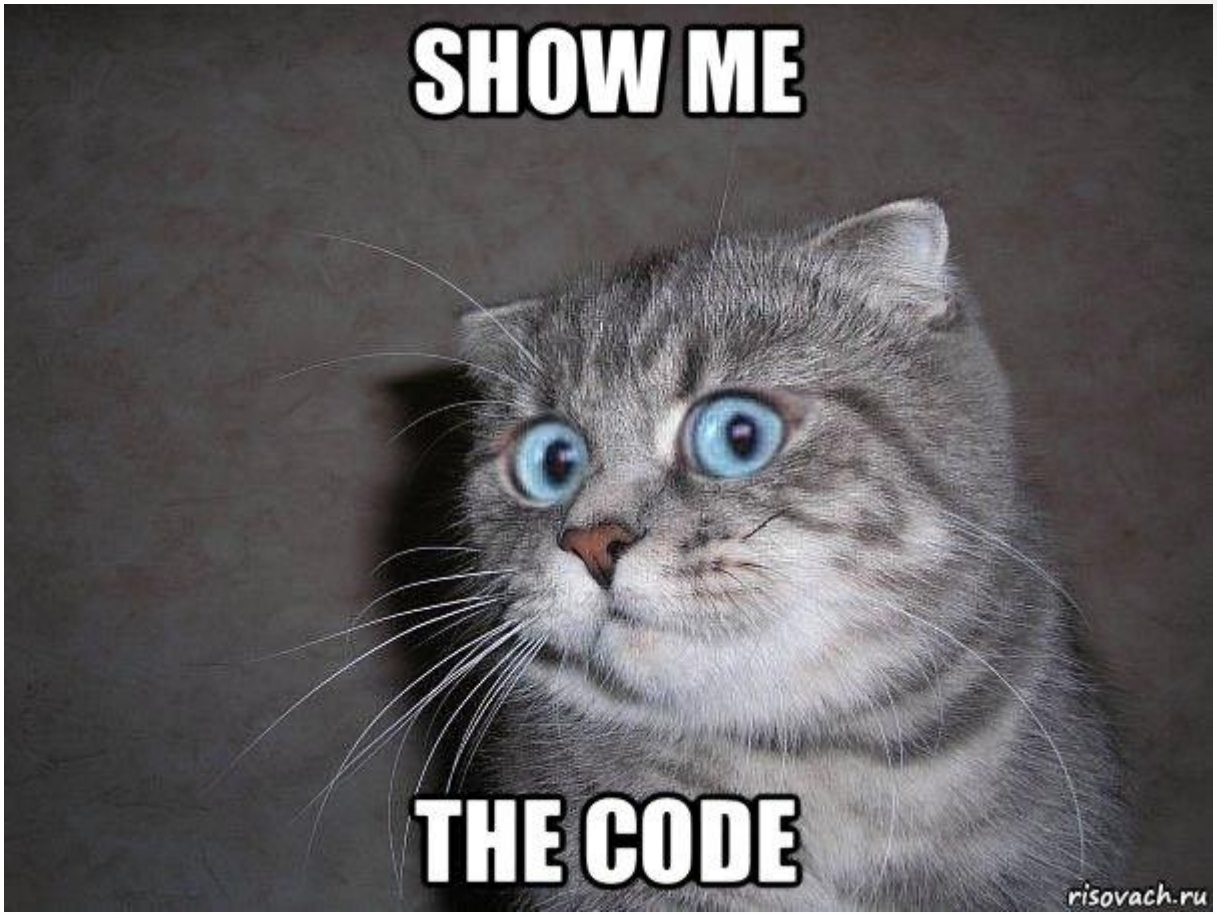
```java
package ua.mk.berkut.repositories;

import ...

public interface GroupRepository extends JpaRepository<Group, Long> {
}
```

```java
@Component
@AllArgsConstructor
public class GroupBean {
    private GroupRepository repository;

    public Map<Group, Set<Student>> doJob() {
        var result = new HashMap<Group, Set<Student>>();
        List<Group> groups = repository.findAll();
        for (Group group : groups) {
            result.put(group, group.getStudents());
        }
        return result;
    }
}
```


SHOW ME
THE CODE
risovach.ru

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Q & A