# Spring data - I

Teaching Faculty: Umur INAN

Prepared by Muhyieddin **AL-TARAWNEH**, Umur **INAN**

# JDBC

- It stands for Java Database Connectivity.
- It provides a set of Java API for accessing the relational databases from Java program.
- It provides a flexible architecture to write a database independent application that can run on different platforms and interact with different DBMS without any modification.

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# JDBC use cases

- Making a connection to a database.
- Creating SQL statements.
- Executing SQL queries in the database.
- Viewing & Modifying the resulting records.

# JDBC drivers

- A JDBC driver is a JDBC API implementation used for connecting to a particular type of database.
    - Type 1 – contains a mapping to another data access API; an example of this is the JDBC-ODBC driver.
    - Type 2 – is an implementation that uses client-side libraries of the target database; also called a native-API driver
    - Type 3 – uses middleware to convert JDBC calls into database-specific calls; also known as a network protocol driver
    - Type 4 – connect directly to a database by converting JDBC calls into database-specific calls; known as database protocol drivers or thin drivers,

# JDBC

### Pros

- Clean and simple SQL processing
- Good performance with large data
- Very good for small applications
- Simple syntax so easy to learn

### Cons

- Complex if it is used in large projects
- Large programming overhead
- No encapsulation
- Query is DBMS specific

# JPA - JAVA PERSISTENCE API

- It is a Java specification for accessing, persisting, and managing data between Java objects / classes and a relational database.

- It is now considered the standard industry approach for Object to Relational Mapping (ORM) in the Java Industry.

- JPA itself is just a specification, not a product; it cannot perform persistence or anything else by itself. JPA is just a set of interfaces and requires an implementation.

# Jpa providers

- Hibernate
- Eclipselink
- Toplink
- Spring Data JPA ???

# ORM - Object relational mapping

- It Acts as a 'Gateway' between OO Domain && Relational Database.
- It Maps Object to Relational Model & Vice Versa.
- ORM tools essentially present a relational database from an object-oriented viewpoint.
- The ORM is not enhancing the Domain Model, it is simply a tool to overcome the O/R differences & to hide SQL.

# ORM advantages

- Business code access objects rather than DB tables.
- Hides details of SQL queries from OO logic.
- Based on JDBC 'under the hood.'
- No need to deal with the database implementation.
- Entities based on business concepts rather than database structure.

# Orm impedance mismatch

- refers to the problems that occurs due to differences between the database model and the programming language model.
- 2 different technologies – 2 different ways to operate

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# SOME IMPEDANCE MISMATCH PROBLEMS

- Data type mismatch:
  - The programming language attribute data type may differ from the attribute data type in the data-model.
- Inheritance Problem:
  - Object oriented paradigm supports Type Inheritance whereas In database model, since a Table is not a type hence super and sub-typing does not apply in the model.

# SOME IMPEDANCE MISMATCH PROBLEMS

- Association Problem:
  - In object model, association represents the connection between classes using object references.
  - In relational model, an association is defined by using a foreign key.
  - The foreign key also maintains the integrity of the association as well.
  - There's no equivalent in the object model for this integrity check.

# Basic orm features

- Mapping Classes To Tables
- Out Of The Box CRUD Functionality
- Hydrating Entities
- Executing Custom “OO“ Queries
- Cache management
- Concurrency support
- Transaction management

# Defining entity class

- @Entity
  - It identifies a class as an entity class.

- @Table
  - By default, each entity class maps a database table with the same name in the default schema of your database.
  - Customize this mapping using the name, schema, and catalog attributes of the @Table annotation.

# Defining entity class

- @Column
  - It is an optional annotation that enables to customize the mapping between the entity attribute and the database column.
  - use the name attribute to specify the name of the database column
  - The length attribute, which defines the length of String-valued database column.

# Defining entity class

- @Column
    - The attributes scale and precision, which specify the scale and precision of a decimal column.
    - The unique attribute that defines a unique constraint on the mapped column.
    - The attributes updatable and insertable enable you to exclude the attribute from insert or update statements.

## Defining entity class

- @Id
  - JPA and Hibernate require to specify at least one primary key attribute for each entity.
- @GeneratedValue
  - use a database sequence by setting the strategy attribute to GenerationType.SEQUENCE
  - use an auto-incremented database column to generate your primary key values by setting strategy to GenerationType.IDENTITY.

# Defining entity class

- @Id
  - marks a field in a model class as the primary key.
  - JPA and Hibernate require to specify at least one primary key attribute for each entity.
- @GeneratedValue
  - use a database sequence by setting the strategy attribute to GenerationType.SEQUENCE
  - use an auto-incremented database column to generate your primary key values by setting strategy to GenerationType.IDENTITY.

# Defining entity class

- @GeneratedValue
  - use a database sequence by setting the strategy attribute to GenerationType.SEQUENCE
  - use an auto-incremented database column to generate your primary key values by setting strategy to GenerationType.IDENTITY.

# ONE-TO-ONE UNIDIRECTIONAL

Foreign Key 'id_address' will be created on Member table

```
@Entity
public class Member {
    @Id
    @GeneratedValue(strategy= GenerationType.IDENTITY)
    private Long id;
    private String email;
    private String password;
    private String title;

    @OneToOne
    @JoinColumn(name = "id_address") // OPTIONAL
    private Address address;
}
```

```
@Entity
public class Address {
   @Id
   @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String zip;
    private String city;
}
```

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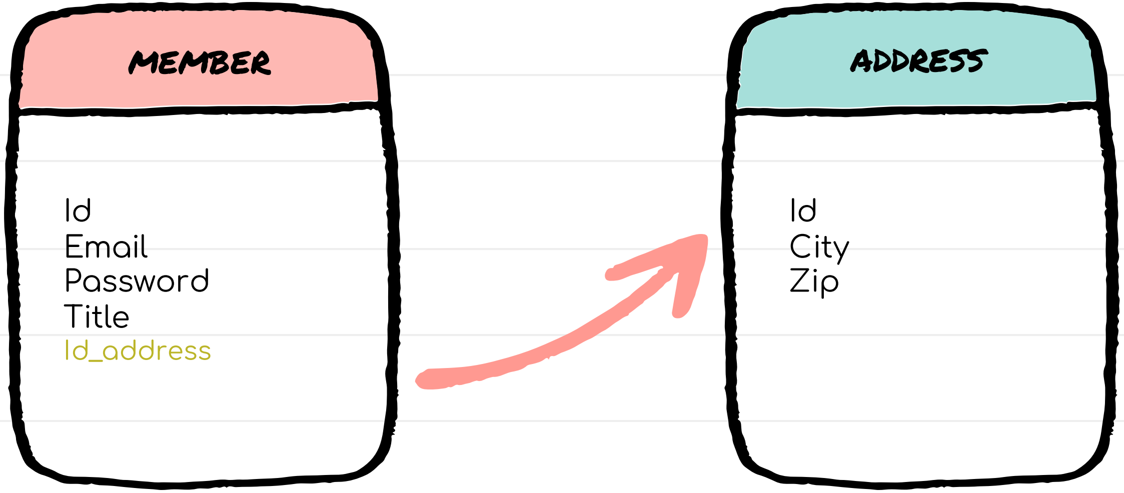
# ONE-TO-ONE UNIDIRECTIONAL



MEMBER

Id
Email
Password
Title
Id_address

ADDRESS

Id
City
Zip

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# ONE-TO-ONE BIDIRECTIONAL

```
@Entity

public class Member {

    @Id

    @GeneratedValue(strategy
   = GenerationType.IDENTITY)

    private Long id;

    private String email;

    private String password;

    private String title;


    @OneToOne

    @JoinColumn(name = "id_address") // OPTIONAL

    private Address address;

}
```

```
@Entity

public class Address {

    @Id

    @GeneratedValue(strategy
   = GenerationType.IDENTITY)

    private Long id;


    private String zip;

    private String city;


    @OneToOne(mappedBy = "address")

    private Member member;

}
```

Foreign Key 'id_address' will be created on Member table.

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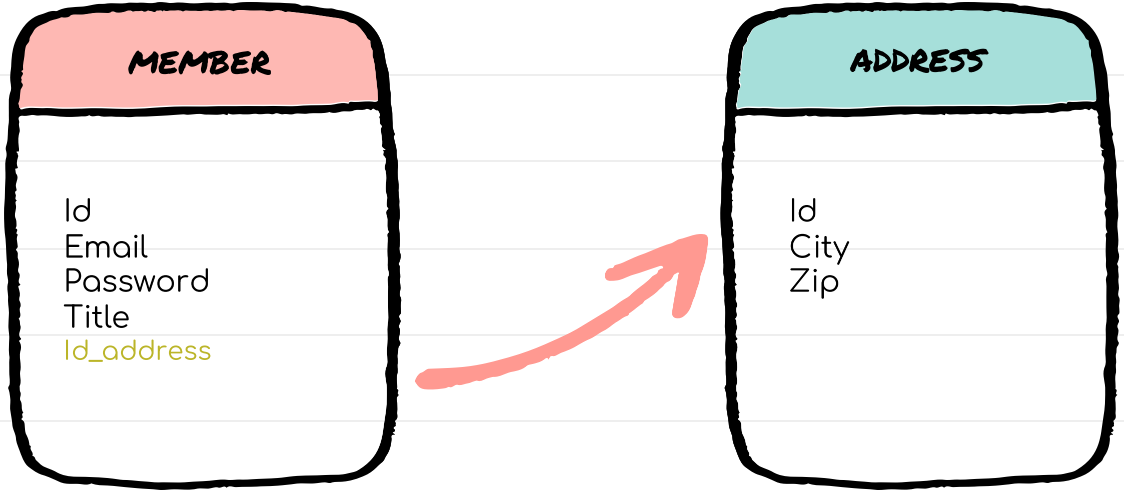
# ONE-TO-ONE BIDIRECTIONAL



MEMBER

Id
Email
Password
Title
Id_address

ADDRESS

Id
City
Zip

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# ONE-TO-MANY UNI-DIRECTIONAL – JOIN TABLE

```
@Entity
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String fullName;
    private int age;

    @OneToMany
    private List<Phone> phones;
}
```

```
@Entity
public class Phone {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String phoneNumber;
}
```

Will create a Join Table.

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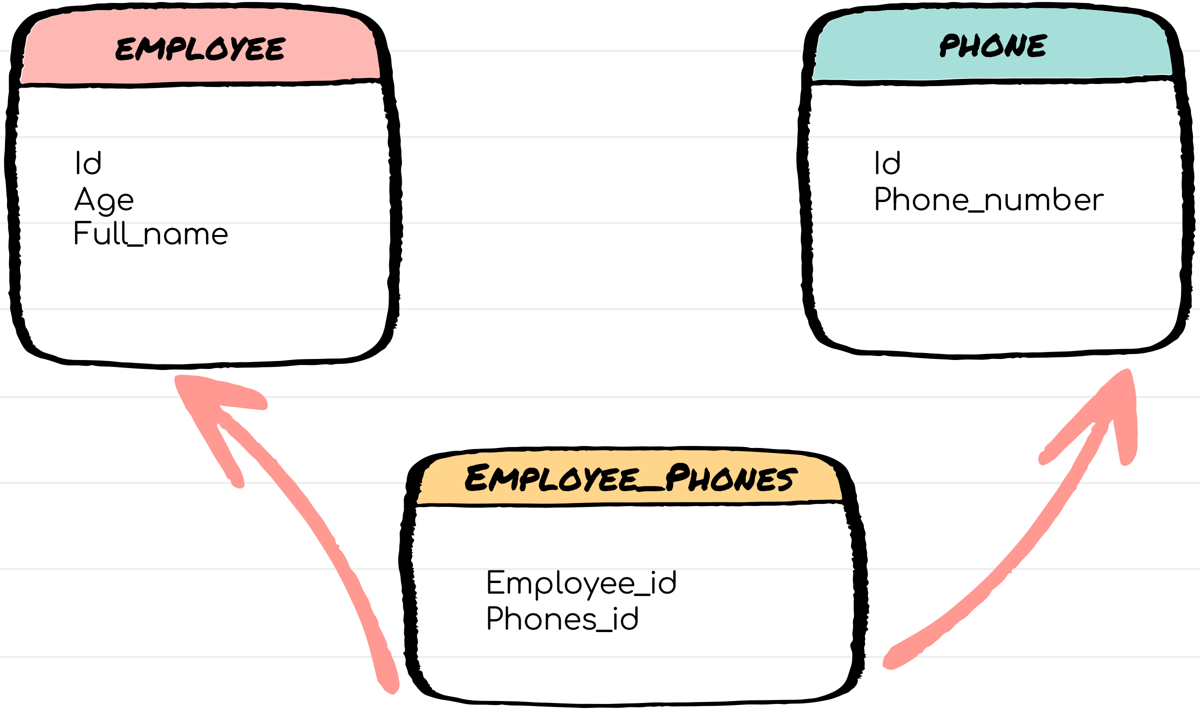
# ONE-TO-MANY UNI-DIRECTIONAL - JOIN TABLE



EMPLOYEE

Id
Age
Full_name

PHONE

Id
Phone_number

EMPLOYEE_PHONES

Employee_id
Phones_id

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# ONE-TO-MANY UNI-DIRECTIONAL – JOIN COLUMN

```
@Entity
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String fullName;
    private int age;

    @OneToMany
    @JoinColumn(name = "id_employee")
    private List<Phone> phones;
}
```

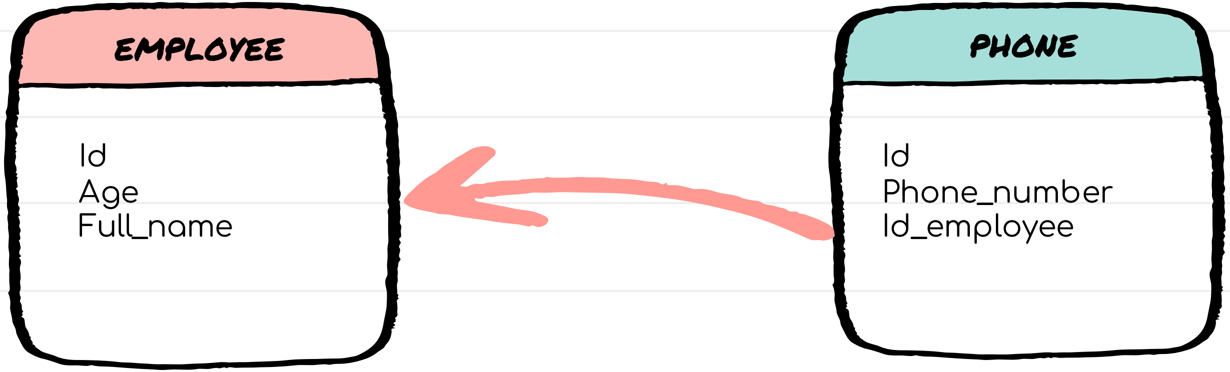
```
@Entity
public class Phone {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String phoneNumber;
}
```

Foreign Key 'id_employee will be created on Phone table.

# ONE-TO-MANY UNI-DIRECTIONAL – JOIN COLUMN



EMPLOYEE

Id
Age
Full_name

PHONE

Id
Phone_number
Id_employee

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# ONE-TO-MANY BIDIRECTIONAL – JOIN TABLE

```
@Entity
public class Employee {
   @Id
   @GeneratedValue(strategy  = GenerationType.IDENTITY)
   private Long id;

   private String fullName;
   private int age;

   @OneToMany
   @JoinTable   // OPTIONAL
   private List<Phone>  phones;
}
```

```
@Entity
public class Phone {
   @Id
   @GeneratedValue(strategy  = GenerationType.IDENTITY)
   private Long id;

   private String phoneNumber;

   @ManyToOne
   private Employee  employee;
}
```

Employee_phones table will be created.

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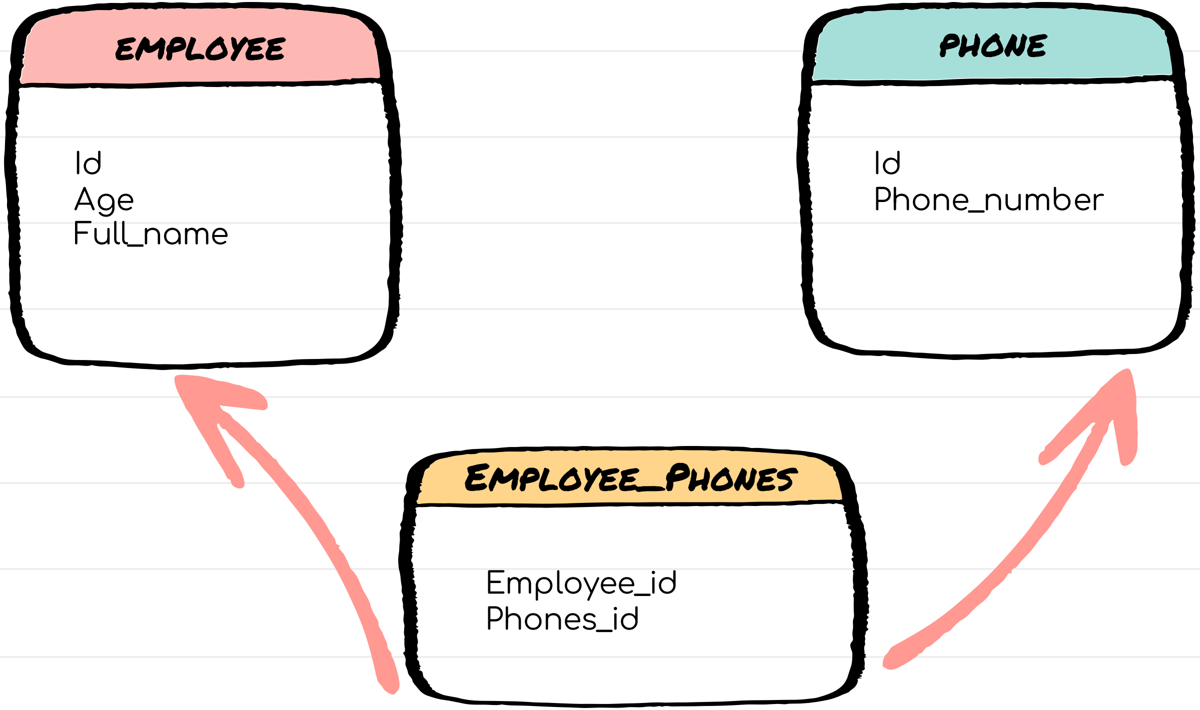
# ONE-TO-MANY BIDIRECTIONAL - JOIN TABLE



EMPLOYEE

Id
Age
Full_name

PHONE

Id
Phone_number

EMPLOYEE_PHONES

Employee_id
Phones_id

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# ONE-TO-MANY BIDIRECTIONAL – JOIN COLUMN

```
@Entity

public class Employee {

    @Id

    @GeneratedValue(strategy
   = GenerationType.IDENTITY)

    private Long id;


    private String fullName;

    private int age;


    @OneToMany(mappedBy = "employee")

    private List<Phone> phones;

}
```

```
@Entity

public class Phone {

    @Id

    @GeneratedValue(strategy
   = GenerationType.IDENTITY)

    private Long id;


    private String phoneNumber;


    @ManyToOne

    @JoinColumn // OPTIONAL

    private Employee employee;

}
```

Foreign Key
id_employee will be created on Phone table.

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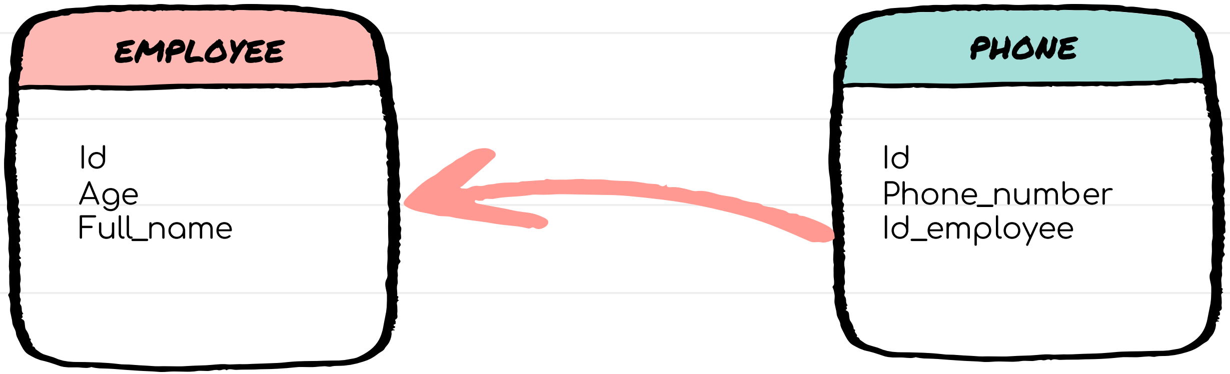
# ONE-TO-MANY BIDIRECTIONAL - JOIN COLUMN



EMPLOYEE

Id
Age
Full_name

PHONE

Id
Phone_number
Id_employee

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# MANY-TO-MANY

```
@Entity
public class Author {
    @Id
    @GeneratedValue(strategy= GenerationType.IDENTITY)
    private Long id;
    private String fullName;

    @ManyToMany
    private List<Book> books;
}
```

```
@Entity
public class Book {

    @Id
    @GeneratedValue(strategy= GenerationType.IDENTITY)
    private Long id;

    private String title;
    private String isbn;

    @ManyToMany(mappedBy = "books")
    private List<Author> authors;
}
```

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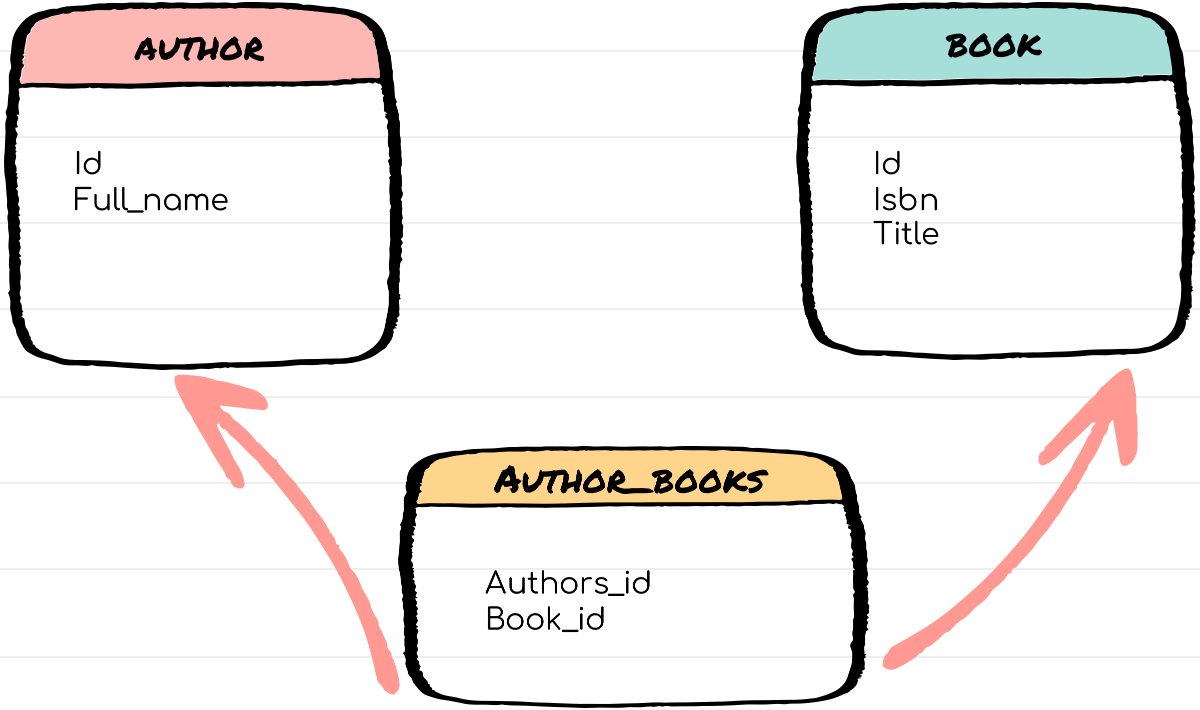
# MANY-TO-MANY



AUTHOR

Id
Full_name

BOOK

Id
Isbn
Title

AUTHOR_BOOKS

Authors_id
Book_id

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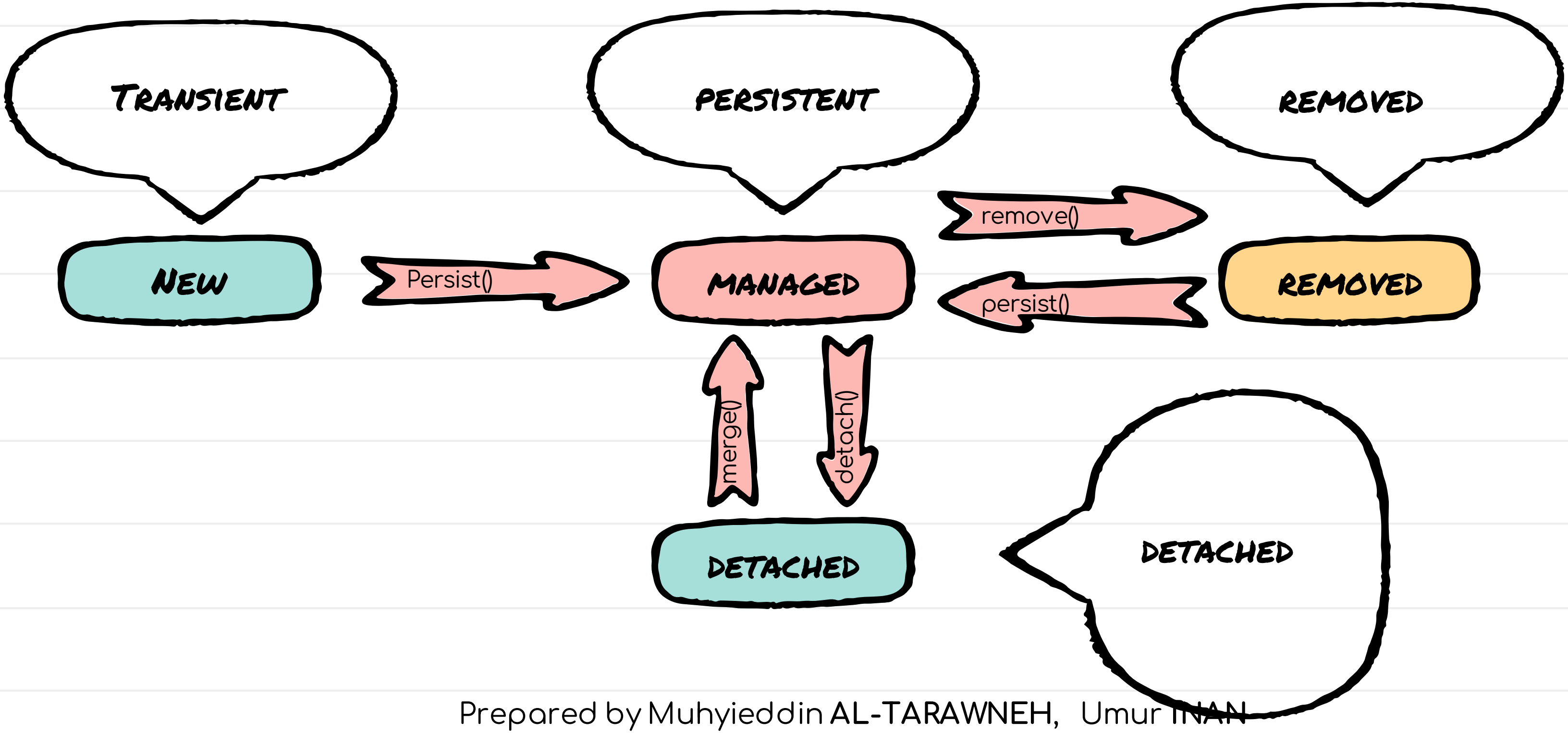
# ORM ENTITY LIFECYCLE



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# Orm entity lifecycle

- Transient
  - It has just been instantiated using the new operator.
  - Not associated with a Persistence Context.
  - No persistent representation in the database.
- Persistent
  - Representation in the database.
  - Has been saved or loaded in Persistence Context.
  - Changes made to an object are synchronized with the database when the unit of work completes.

# ORM ENTITY LIFECYCLE

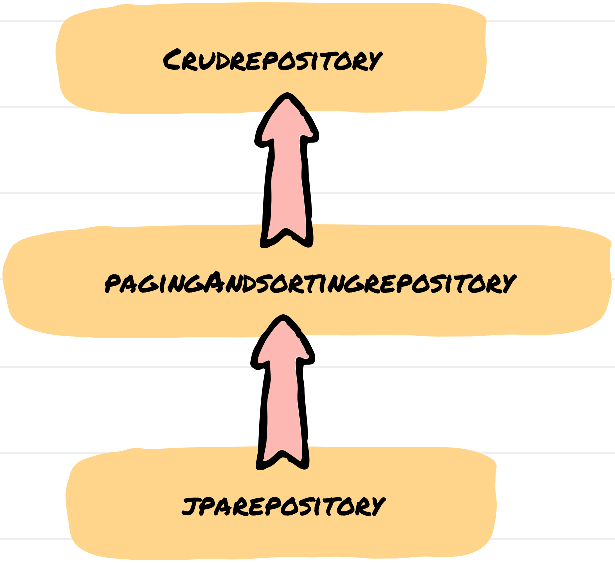
- Detached
  - Object was persistent, but Persistence Context has been closed.

- Removed
  - An object is deleted from the database when the unit of work completes.

# Spring data repositories

- Spring Data repository abstraction.
- Significantly reduce the amount of boilerplate code required to implement data access layers.
- Performs function of a Base Class DAO.

# Spring data repositories



CrudRepository

PagingAndSortingRepository

JpaRepository

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# Crud repository

- Provides CRUD functions
  - count()
  - delete(T entity)
  - deleteAll()
  - deleteAll(Iterable<? extends T> entities)
  - deleteAllById(Iterable<? extends ID> ids)

# Crud repository

- Provides CRUD functions
  - deleteById(ID id)
  - existsById(ID id)
  - findAll()
  - findAllById(Iterable<ID> ids)
  - findById(ID id)
  - save(S entity)
  - saveAll(Iterable<S> entities)

# Paging and sorting repository

- Provides methods to do pagination and sorting records.
    - findAll(Pageable pageable)
    - findAll(Sort sort)

# Jpa repository

- provides methods such as flushing the persistence context and delete record in a batch.

# Derived query methods - naming convention

- Just by looking at the corresponding method name in the code, Spring Data JPA can determine what the query should be.

- Spring Data JPA supports
  - find
  - read
  - query
  - count
  - get

## EXAMPLES

- List<T> findByAgeLessThan(Integer age)
- List<T> findByNameIsNot(String name);
- List<T> findByActiveTrue();
- List<T> findByNameStartingWith(String prefix);

# EXAMPLES

- List<T> findByNameEndingWith(String suffix);
- List<T> findByNameContaining(String infix);
- List<T> findByNameOrBirthDateAndActive(String name, ZonedDateTime birthDate, Boolean active);
- List<User> findByNameOrderByNameAsc(String name);

# JPQL

- Java Persistence Query Language (JPQL) is an object model focused query language similar in nature to SQL.
- JPQL understands notions like inheritance, polymorphism and association.
- JPQL is a heavily-inspired-by a subset of HQL. A JPQL query is always a valid HQL query, the reverse is not true, however.
- Prevents SQL injection.

# JPQL SYNTAX

- CLAUSES:
  - SELECT, FROM, WHERE, GROUP BY, HAVING and ORDER BY
- OPERATORS:
  - Navigation operator (.)
- Arithmetic operators:
  - * (multiplication), / (division), + (addition) and - (subtraction).
- Comparison operators:
  - =, <>, <, <=,>, >=, IS [NOT] NULL, [NOT] BETWEEN,
- Logical operators:
  - AND, OR, NOT.

# Criteria query

- Criteria API is a programmatic approach to query instead of string-based approach as in JPQL.
- Good for Dynamic queries.

JPQL

```
Query query =
   entityManager.createQuery("select m
   from Member m where m.memberNumber
   =:number");
```

Criteria API

```
CriteriaBuilder criteriaBuilder = entityManager.getCriteriaBuilder
();

CriteriaQuery<Member> query=

criteriaBuilder.createQuery(Member.class);

Root<Member> memberRoot = query.from(Member.class);

query.select(memberRoot);

query.where(criteriaBuilder.equal(memberRoot.get("memberNumber"),
   number) );
```

# EXAMPLES

```
@Query(value = "SELECT e FROM Employee e WHERE e.lastName = :lastname")
public List<Employee> findByLastName(String lastname);
```

# Main points

- Spring provides a Transactional capability for ORM applications.

- The mechanism of transcending allows the individual to tap into Transcendental Consciousness and enlivens its qualities in activity.