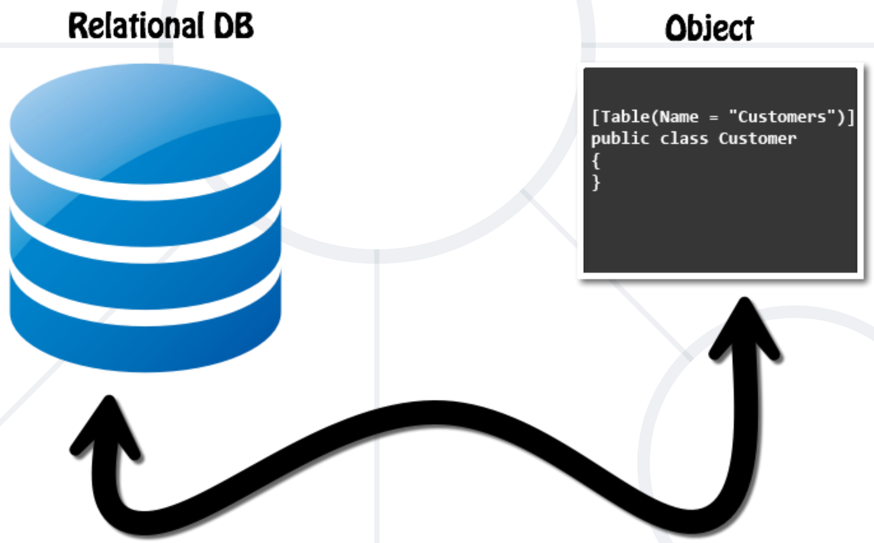
ORM Fundamentals

The ORM Concept, Config, CRUD Operations



```
[Table(Name = "Customers")]
public class Customer
{
}
```

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Table of Contents

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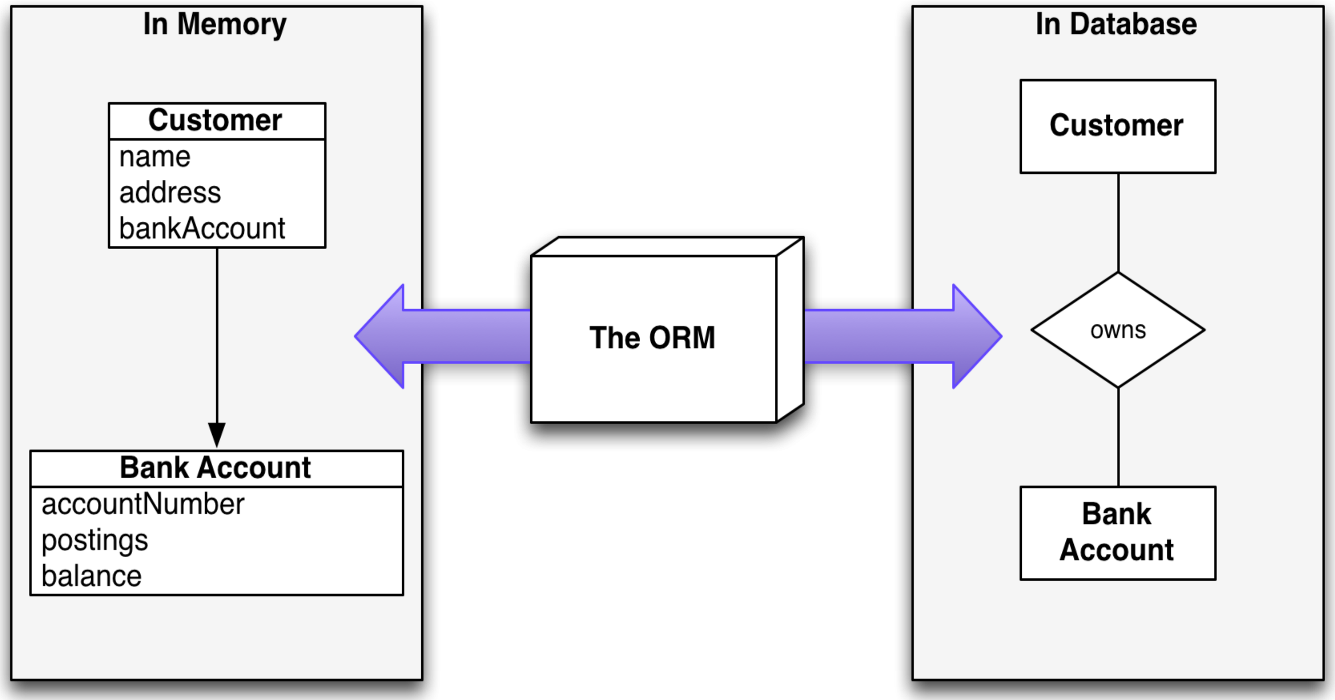


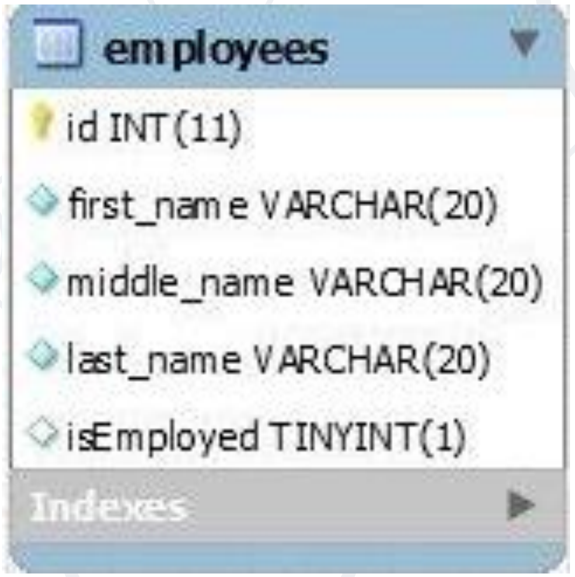
ORM Introduction

Object-Relational Mapping

What is ORM?

- **Technique** for **converting data** between incompatible type systems using **object-oriented programming** languages
- **Object-Relational Mapping** (ORM) allows manipulating databases **using common classes and objects**
  - **Java/C#/etc. classes → Database Tables**
  - **Database Tables → Java/C#/etc. classes**

What is ORM? (2)


employees

id INT(11)

first_name VARCHAR(20)

middle_name VARCHAR(20)

last_name VARCHAR(20)

isEmployed TINYINT(1)

Indexes

```
public class Employee {
    public int id;
    public String firstName;
    public String middleName;
    public String lastName;
    public boolean isEmployed;
}
```

Why do we need ORM?

- In OOP, data-management tasks act on **objects** that are almost always **non-scalar** values
- Many **database** can only store and manipulate **scalar** values, organized within **tables**
- We must **manually** convert values into groups of simpler values to store in DB and convert them back when we retrieve data

JDBC and ORM

- The main difference, between JDBC and ORM, is **complexity**
- **JDBC/SQL**
  - If the application is simple as to present data directly from the database
- **ORM**
  - If the application is domain driven and the relations among objects is complex

Application Architecture

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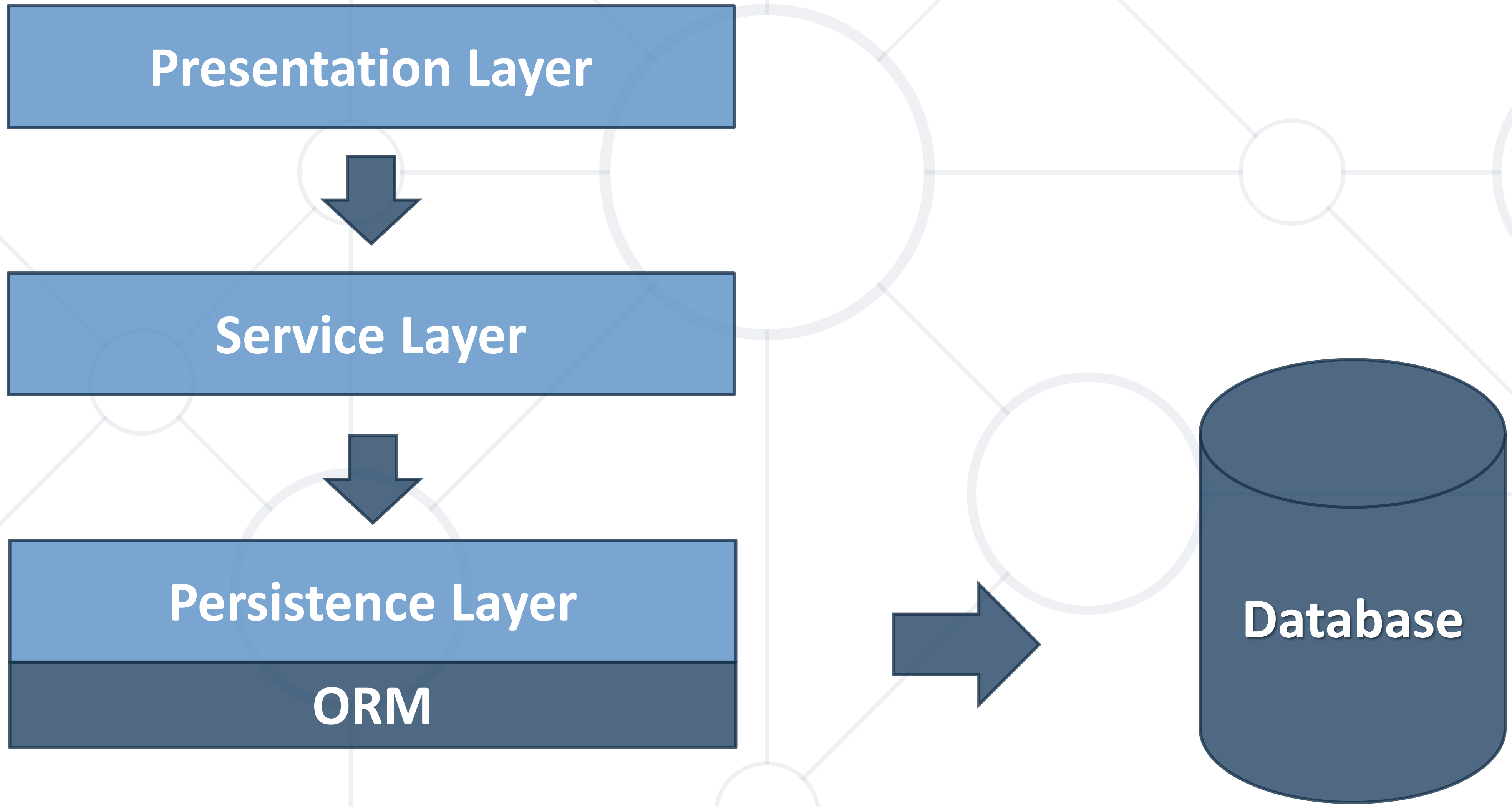


ORM Frameworks: Features

- **ORM frameworks** typically **provide** the following functionality:
  - **Automatically generate SQL** to perform data operations as:
    - persist, update, delete, merge, createQuery and so on.
  - **Object model from database schema** (DB First model)
  - **Database schema from object model** (Code First model)

Perform data operations with ORM (1)

- **Automatically generate SQL** to perform data operations
  - Save entity to DB

```
Student student = new
Student('George', 'Brown');
session.save(student);
```

```
INSERT INTO students
(firstName, lastName)
VALUES
('George', 'Brown')
```

  - Retrieve data from DB

```
Student student = (Student)
session.get(Student.class, 1);
```

```
SELECT * FROM students
WHERE id=1;
```

Perform data operations with ORM (2)

- We can use and specific ORM Query Language as **HQL** or **SQL**
  - Using HQL

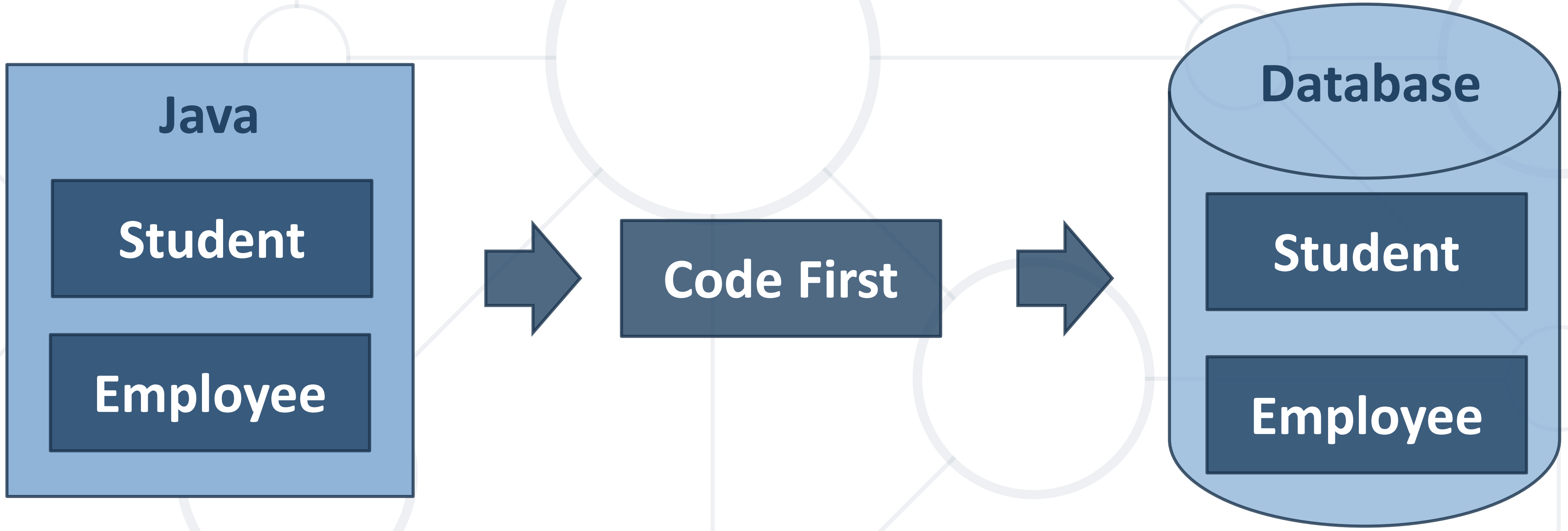
```
List<Student> studentList =
session.createQuery("FROM Student").toList();
```

  - Using SQL

```
String sql = "SELECT * FROM Employee";
SQLQuery query = session.createSQLQuery(sql);
query.addEntity(Employee.class);
List<Employee> results = query.list();
```

Code First Model

- **Models** the database after the entity classes



POJO + XML

- A bit old-fashioned, but very powerful
- Implemented in the "classical" ORM

```
...
   <description>Mapping file</description>
   <entity class="Employee">
      <table name="EMPLOYEETABLE"/>
      <attributes>
         <id name="id">
            <generated-value strategy="TABLE"/>
         </id>
         <basic name="name">
            <column name="EMP_NAME" length="100"/>
         </basic>
         <basic name="salary">
         </basic>
      </attributes>
   </entity>
...
```

POJO Mapped to DB Tables

- Based on Java annotations and XML
- Easier to implement and maintain

```
@Entity
@Table(name = "employees")
public class Employee {
    @Id
    private int id;
    @Column(name = "name")
    private String name;
    @Column(name = "position")
    private String position;
}
```

ORM Advantages

And disadvantages

ORM Advantages (1)

- **Productivity**
  - Eliminates repetitive code
  - Generates database automatically
- **Maintainability**
  - Fewer lines of code
  - Easier to manage object model changes

ORM Advantages (2)

- **Performance**
  - Lazy loading
  - Caching
- **Database vendor independence**
  - The database is abstracted
  - Can be configured outside the application

ORM Disadvantages

- **Reduced performance**
  - Due to overhead or auto generated SQL
- **Reduces flexibility**
  - Some operations are hard to implement
- **Lose understanding**
  - What the code is actually doing - the developer is more in control using SQL

Summary

- **Object-Relational Mapping** (ORM) allows manipulating databases **using common classes and objects**
- The main difference, between JDBC and ORM, is **complexity**
- **POJO + XML** mapping
- **POJO** mapped to **DB tables**

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