Object-Relation Mapping

Hogeschool Rotterdam
Rotterdam, Netherlands

Introduction

Lecture topics

- Recap Java Database Connectivity
- Object-Relation Mapping.
- Java Persistence API
- Setting up JPA with EclipseLink.

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

JDBC

- Provides a set of Java API for accessing the relational databases from Java program.
- It allows querying/updating database data
- JDBC represents statements using one of the following classes:

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

JDBC

- Provides a set of Java API for accessing the relational databases from Java program.
- It allows querying/updating database data
- JDBC represents statements using one of the following classes:
  1. Statement – the statement is sent to the database server each and every time.

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

JDBC

- Provides a set of Java API for accessing the relational databases from Java program.
- It allows querying/updating database data
- JDBC represents statements using one of the following classes:
  1. Statement – the statement is sent to the database server each and every time.
  2. PreparedStatement – the statement is cached and then the execution path is pre-determined on the database server allowing it to be executed multiple times in an efficient manner.

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

JDBC

- Provides a set of Java API for accessing the relational databases from Java program.
- It allows querying/updating database data
- JDBC represents statements using one of the following classes:
  1. Statement – the statement is sent to the database server each and every time.
  2. PreparedStatement – the statement is cached and then the execution path is pre-determined on the database server allowing it to be executed multiple times in an efficient manner.
  3. CallableStatement – used for executing stored procedures on the database.

```
..
try (Connection conn = DriverManager.getConnection(
                "jdbc:somejdbcvendor:other␣data␣needed
                    ␣by␣some␣jdbc␣vendor",
                "myLogin",
                "myPassword" ) ) {

          Statement stmt = conn.createStatement()
          stmt.executeUpdate( "INSERT␣INTO␣Ships(␣
              name␣)␣VALUE␣(␣'destroyer␣XYZ'␣)␣" );
          }
 }
..
```

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Disadvantages of JDBC

- Less maintainable code for large projects
- Queries are DBMS specific

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM

- It's a technique to map object state to the database columns

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM

- It's a technique to map object state to the database columns
- Hides details of SQL queries from OO logic.

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM

- It's a technique to map object state to the database columns
- Hides details of SQL queries from OO logic.
- It provides a way for data conversion between incompatible type systems

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM

- It's a technique to map object state to the database columns
- Hides details of SQL queries from OO logic.
- It provides a way for data conversion between incompatible type systems
- Portability: DB independent

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM

- It's a technique to map object state to the database columns
- Hides details of SQL queries from OO logic.
- It provides a way for data conversion between incompatible type systems
- Portability: DB independent
- Performance: Object and query caching mechanism

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM and Data Persistence Strategies

- There are some strategies designed for persistence of objects
- ORM framework are based on those strategies (also called pattern) and framework specific implementations
- Only two data persistence strategies will be discussed in this lecture

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

ORM and Data Persistence Strategies

- There are some strategies designed for persistence of objects
- ORM framework are based on those strategies (also called pattern) and framework specific implementations
- Only two data persistence strategies will be discussed in this lecture
  - Active record
  - Data mapper

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Active Record Strategy

- In this strategy there is an object for every table or view that wraps a row

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Active Record Strategy

- In this strategy there is an object for every table or view that wraps a row
- Objects structures are tightly coupled to the relational schema

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Active Record Strategy

- In this strategy there is an object for every table or view that wraps a row
- Objects structures are tightly coupled to the relational schema
- This object encapsulates the database access, and adds domain logic on that data

Object-Relation Mapping

Object-Relation Mapping

Introduction

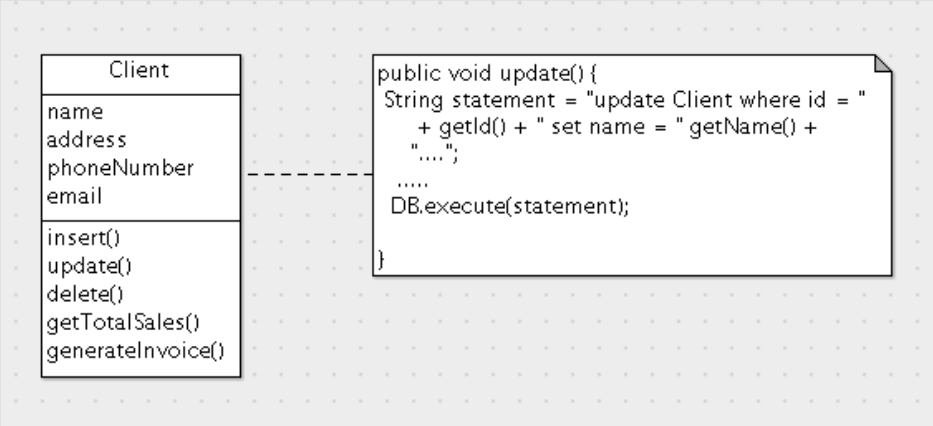
Object-Relation Mapping

Active Record Strategy

- In this strategy there is an object for every table or view that wraps a row
- Objects structures are tightly coupled to the relational schema
- This object encapsulates the database access, and adds domain logic on that data
- So this object carries both data and behavior

Active Record Strategy

- sample structure of active record



Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Active Record Strategy

- What are the limitations of this pattern regarding objects structure?

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Active Record Strategy

- What are the limitations of this pattern regarding objects structure?
- Think of domain object models that are distinguish from the one of the database schema

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Data Mapper Strategy

- In strategy there is a layer of mappers that moves data between objects and a database
- This layer keeps both in-memory objects and database independent from each others
- The reasons for this are:

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Data Mapper Strategy

- In strategy there is a layer of mappers that moves data between objects and a database
- This layer keeps both in-memory objects and database independent from each others
- The reasons for this are:
  - Objects and relational databases have different mechanisms for structuring data

Object-Relation Mapping

Object-Relation Mapping

Introduction

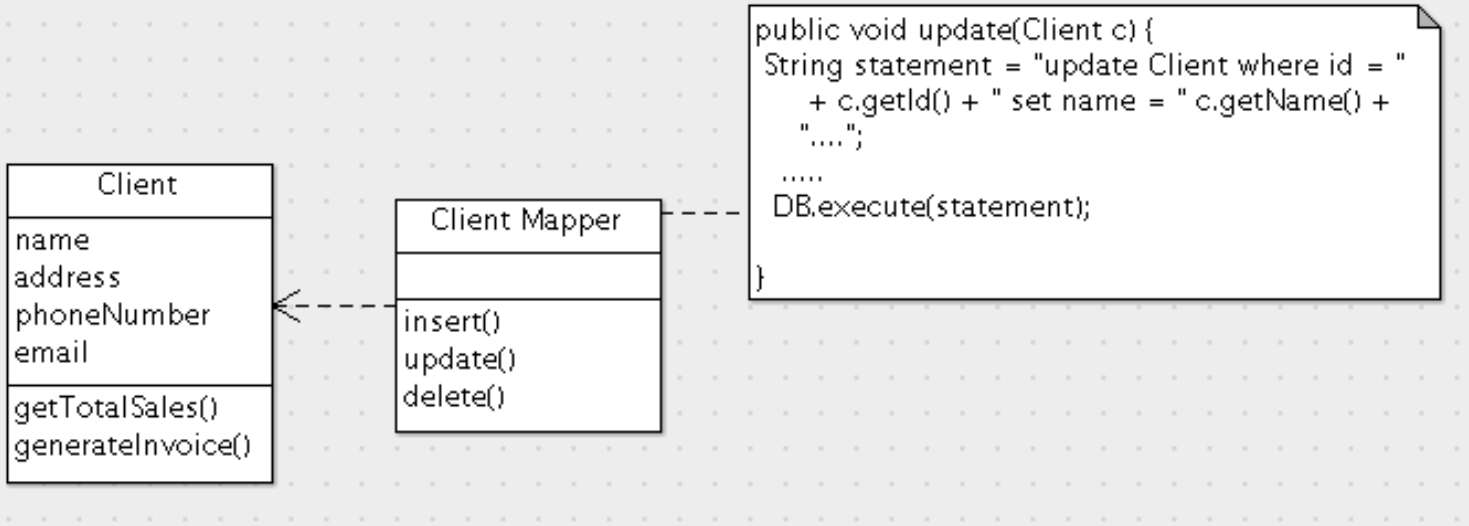
Object-Relation Mapping

Data Mapper Strategy

- In strategy there is a layer of mappers that moves data between objects and a database
- This layer keeps both in-memory objects and database independent from each others
- The reasons for this are:
  - Objects and relational databases have different mechanisms for structuring data
  - Many parts of an object, such as collections and inheritance, aren't present in relational databases
  - Object schema and database schema do not match in many cases

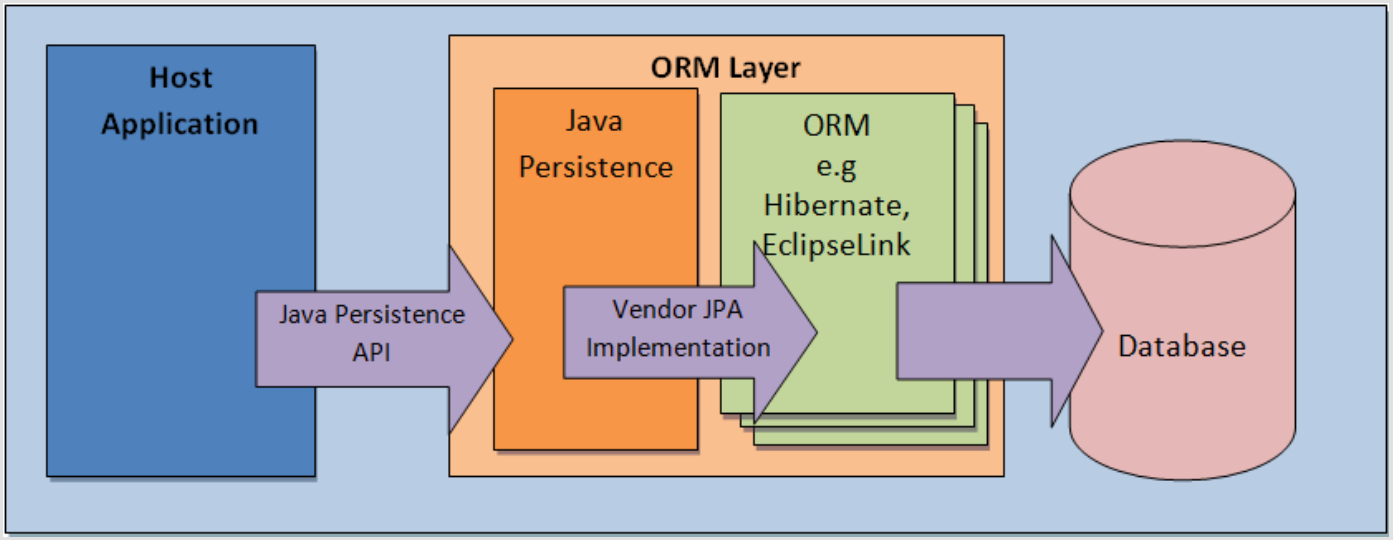
Data Mapper

- sample structure of data mapper



Java Persistence API

- Provides the standard specification for managing the relational data in applications
- JPA is a layer between third party ORM implementations (EclipseLink or Hibernate) and the application
- It uses persistence annotations at three different levels: class, method, and field



Example of using annotation instead of mapping files

```
import javax.persistence.*;

@Entity
@Table(name = "ships")
public class Ships {
    @Id @GeneratedValue
    @Column(name = "serial")
    private int serial;

    @Column(name = "name")
    private String name;

    @Column(name = "armour")
    private String armour;

    public Employee() {}

    ...
```

Sample code for persisting a new ship in JPA with Hibernate

```
....
Ships s = new Ships("walle","metal armour");
....
EntityManagerFactory emf = Persistence.
    createEntityManagerFactory("InfDev5PU");
//create a session object in case of Hibernate
EntityManager em = emf.createEntityManager();
//starts a transaction
em.getTransaction().begin();
//calls the save method of Hibernate
em.persist(em);
em.getTransaction().commit();
em.close();
....
```

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Mapping Tables and Relationships in ORM

- Mapping Simple Types like primitive java types: byte, int, short, etc.
- Mapping relationships
- Mapping ...
- TODO

Object-Relation Mapping

Object-Relation Mapping

Introduction

Object-Relation Mapping

Lab

- Check the tables mentioned in les 0
- Create these tables in Postgres
- Insert some new data into the database using JPA
- Print these data in your terminal using a named query