Experiment-9

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Semester: 6th
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Subject Name: Project Based Learning in Java
Subject Code: 22CSH-359

EASY:

Aim: Create a simple Spring application that demonstrates Dependency Injection (DI) using Java-based configuration instead of XML. Define a Student class that depends on a Course class. Use Spring's @Configuration and @Bean annotations to inject dependencies.

Objective: To develop a simple Spring application that demonstrates Dependency Injection (DI) using Java-based configuration instead of XML. This experiment helps understand the concepts of Spring IoC (Inversion of Control), annotations (@Configuration and @Bean), and how to inject dependencies between classes using Java code.

Implementation/Code:

```
import org.springframework.context.annotation.Bean;

import org.springframework.context.annotation.Configuration;

import org.springframework.context.ApplicationContext;

import
org.springframework.context.annotation.AnnotationConfigApplicationContext;

public class Course {

    private String courseName;

    private int duration;


    public Course(String courseName, int duration) {
```

```
        this.courseName = courseName;
        this.duration = duration;
    }

    public String getCourseName() {
        return courseName;
    }

    public int getDuration() {
        return duration;
    }
}
public class Student {
    private String name;
    private Course course;

    public Student(String name, Course course) {
        this.name = name;
        this.course = course;
    }

    public void displayDetails() {
        System.out.println("Student Name: " + name);
```

```
        System.out.println("Course: " + course.getCourseName() + ", Duration: " +
course.getDuration() + " months");
    }
}
@Configuration
public class AppConfig {

    @Bean
    public Course course() {
        return new Course("Java Development", 6);
    }

    @Bean
    public Student student() {
        return new Student("Aarushi", course());
    }
}
public class MainApp {
    public static void main(String[] args) {
        ApplicationContext context = new
AnnotationConfigApplicationContext(AppConfig.class);
        Student student = context.getBean(Student.class);
        student.displayDetails();
    }
```

}

Output

```
Student Name: Aarushi
Course: Java Development, Duration: 6 months
```

MEDIUM:

Aim: Develop a Hibernate-based application to perform CRUD (Create, Read, Update, Delete) operations on a Student entity using Hibernate ORM with MySQL.

Objective: To create a Hibernate-based application that performs basic CRUD operations (Create, Read, Update, Delete) on a Student entity using Hibernate ORM with MySQL database integration. This experiment aims to give hands-on experience with Hibernate configuration, entity mapping, and using SessionFactory for database transactions.

Code/Implementation:

```
import javax.persistence.*;

import org.hibernate.*;

import org.hibernate.cfg.Configuration;


@Entity

@Table(name = "students")

public class Student {


    @Id
```

```
@GeneratedValue(strategy = GenerationType.IDENTITY)
private int id;

private String name;
private int age;

// Constructors
public Student() {}
public Student(String name, int age) {
    this.name = name;
    this.age = age;
}

// Getters & Setters
public int getId() { return id; }
public String getName() { return name; }
public void setName(String name) { this.name = name; }
public int getAge() { return age; }
public void setAge(int age) { this.age = age; }

// Main method for CRUD operations
public static void main(String[] args) {
    // Configure SessionFactory
    SessionFactory factory = new Configuration()
```

```
                .configure("hibernate.cfg.xml")
                .addAnnotatedClass(Student.class)
                .buildSessionFactory();

        // Create
        Session session = factory.openSession();
        Transaction tx = session.beginTransaction();
        Student s1 = new Student("Aarushi", 21);
        session.save(s1);
        tx.commit();
        System.out.println("Student saved: " + s1.getName());

        // Read
        session = factory.openSession();
        Student fetched = session.get(Student.class, s1.getId());
        System.out.println("Fetched Student: " + fetched.getName() + ", Age: " +
fetched.getAge());

        // Update
        tx = session.beginTransaction();
        fetched.setAge(22);
        session.update(fetched);
        tx.commit();
        System.out.println("Updated Age to: " + fetched.getAge());
```

```
        // Delete
        tx = session.beginTransaction();
        session.delete(fetched);
        tx.commit();
        System.out.println("Deleted Student with ID: " + fetched.getId());

        session.close();
        factory.close();
    }
}
```

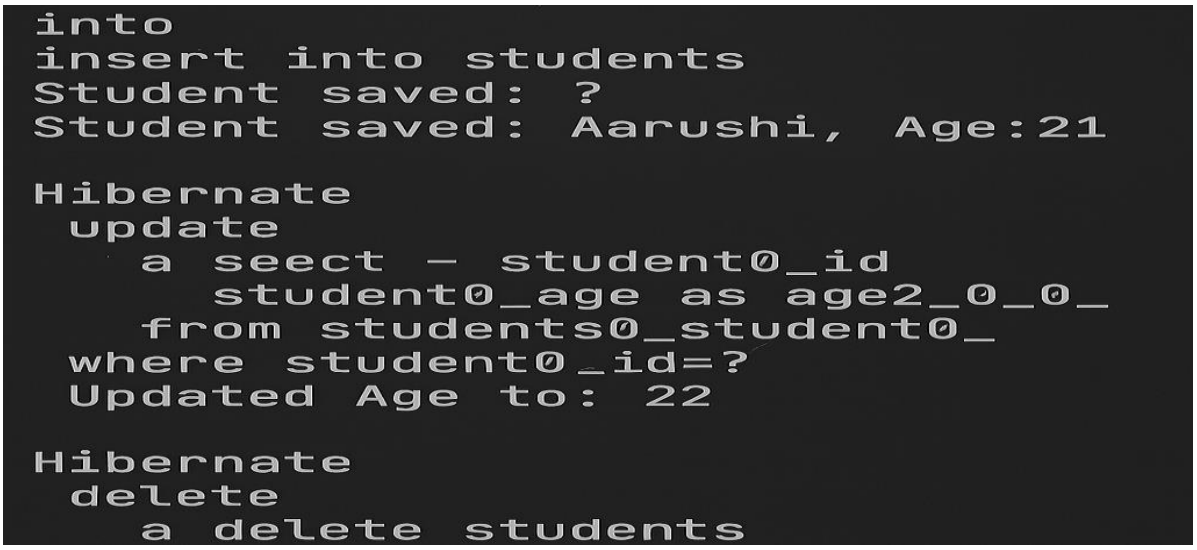
HIBERNATE CRUD

```
import javax.persistence.*;
import org.hibernate.*;
import org.hibernate.cfg.Configuration;
@Entity
@Table(name = "students")
public class Student {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;
    private String name;
    private int age;
    // Constructors
```

```
public Student() {}
public Student(String name, int age) {
    this.name = name;
    this.age = age;
}
// Getters & Setters
public int getId() { return id; }
public String getName() { return name; }
public void setName(String name) { this.name = name; }
public int getAge() { return age; }
public void setAge(int age) { this.age = age; }
// Main method for CRUD operations
public static void main(String[] args) {
    // Configure SessionFactory
    SessionFactory factory = new Configuration()
                        .configure("hibernate.cfg.xml")
                        .addAnnotatedClass(Student.class)
                        .buildSessionFactory();
    // Create
    Session session = factory.openSession();
    Transaction tx = session.beginTransaction();
    Student s1 = new Student("Aarushi", 21);
    session.save(s1);
    tx.commit();
```

```
        System.out.println("Student saved: " + s1.getName());
        // Read
        session = factory.openSession();
        Student fetched = session.get(Student.class, s1.getId());
        System.out.println("Fetched Student: " + fetched.getName() + ", Age: " +
fetched.getAge());
        // Update
        tx = session.beginTransaction();
        fetched.setAge(22);
        session.update(fetched);
        tx.commit();
        System.out.println("Updated Age to: " + fetched.getAge());
        // Delete
        tx = session.beginTransaction();
        session.delete(fetched);
        tx.commit();
        System.out.println("Deleted Student with ID: " + fetched.getId());
        session.close();
        factory.close();
    }
}
```

Output:



HARD:

Aim: Develop a Spring-based application integrated with Hibernate to manage transactions. Create a banking system where users can transfer money between accounts, ensuring transaction consistency.

Objective: To design and implement a Spring-based application integrated with Hibernate ORM that simulates a basic banking system, enabling users to securely transfer money between accounts. The system ensures data consistency and atomicity of transactions using Hibernate Transaction Management, with rollback mechanisms for failed transactions.

Code/Implementation:

```
import org.hibernate.Session;

import org.hibernate.SessionFactory;

import org.hibernate.Transaction;

import org.hibernate.cfg.Configuration;

import javax.persistence.*;

import java.util.Date;
```

```
// Entity: Account
@Entity
class Account {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;
    private String holderName;
    private double balance;

    public Account() {}
    public Account(String holderName, double balance) {
        this.holderName = holderName;
        this.balance = balance;
    }

    // Getters and Setters
    public int getId() { return id; }
    public String getHolderName() { return holderName; }
    public void setHolderName(String holderName) { this.holderName =
holderName; }
    public double getBalance() { return balance; }
    public void setBalance(double balance) { this.balance = balance; }
}
```

```
// Entity: Transaction Record
@Entity
class TransactionRecord {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private int id;

    private int fromAccount;
    private int toAccount;
    private double amount;
    private Date transactionDate;

    public TransactionRecord() {}
    public TransactionRecord(int from, int to, double amount) {
        this.fromAccount = from;
        this.toAccount = to;
        this.amount = amount;
        this.transactionDate = new Date();
    }

    // Getters
    public int getId() { return id; }
    public int getFromAccount() { return fromAccount; }
```

```
    public int getToAccount() { return toAccount; }
    public double getAmount() { return amount; }
    public Date getTransactionDate() { return transactionDate; }
}

// Main App with Configuration and Service
public class BankingApp {

    private static SessionFactory sessionFactory;

    public static void main(String[] args) {
        try {
            // Configure Hibernate
            Configuration cfg = new Configuration().configure("hibernate.cfg.xml")
                    .addAnnotatedClass(Account.class)
                    .addAnnotatedClass(TransactionRecord.class);
            sessionFactory = cfg.buildSessionFactory();

            // Add test data (Optional, only once)
            //createDummyAccounts();

            // Perform a money transfer
            transferMoney(1, 2, 500);
```

```
    } catch (Exception e) {
        e.printStackTrace();
    } finally {
        sessionFactory.close();
    }
}

public static void transferMoney(int fromId, int toId, double amount) {
    Session session = sessionFactory.openSession();
    Transaction tx = null;

    try {
        tx = session.beginTransaction();

        Account from = session.get(Account.class, fromId);
        Account to = session.get(Account.class, toId);

        if (from == null || to == null) {
            throw new RuntimeException("Account not found.");
        }

        if (from.getBalance() < amount) {
            throw new RuntimeException("Insufficient funds.");
        }
```

```
            from.setBalance(from.getBalance() - amount);
            to.setBalance(to.getBalance() + amount);

            session.update(from);
            session.update(to);

            TransactionRecord txn = new TransactionRecord(fromId, toId, amount);
            session.save(txn);

            tx.commit();
            System.out.println("Transaction Successful.");
        } catch (Exception e) {
            if (tx != null) tx.rollback();
            System.out.println("Transaction Failed. Rolled back. Reason: " +
e.getMessage());
        } finally {
            session.close();
        }
    }

    // Optional method to add initial accounts
    public static void createDummyAccounts() {
        Session session = sessionFactory.openSession();
```

```
        Transaction tx = session.beginTransaction();

        session.save(new Account("Aarushi", 1000));
        session.save(new Account("Riya", 1000));

        tx.commit();
        session.close();

        System.out.println("Dummy accounts created.");
    }
}
```

HIBERNATE FILE

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE hibernate-configuration PUBLIC
        "-//Hibernate/Hibernate Configuration DTD 3.0//EN"
        "http://hibernate.sourceforge.net/hibernate-configuration-3.0.dtd">
<hibernate-configuration>
    <session-factory>
        <property
name="hibernate.connection.driver_class">com.mysql.cj.jdbc.Driver</property>
        <property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/yourdb</property>
        <property name="hibernate.connection.username">root</property>
```

```
        <property name="hibernate.connection.password">yourpassword</property>
        <property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
        <property name="hibernate.show_sql">true</property>
        <property name="hibernate.hbm2ddl.auto">update</property>
    </session-factory>
</hibernate-configuration>
```

Output:

```
Hibernate: update Account set balance=? where id=?
Transaction Successful.
```

Learning Outcome:

1. We will be able to develop Spring and Hibernate applications with form handling and database connectivity.
2. We will learn to implement dynamic web applications for real-time data processing and display.