Hibernate - Many-to-Many Mapping

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A Many-to-Many relationship occurs when multiple records in one table are associated with multiple records in another table. For example:

- An employee can have multiple skills.
- A skill can belong to multiple employees.

To represent this scenario, we use three tables:

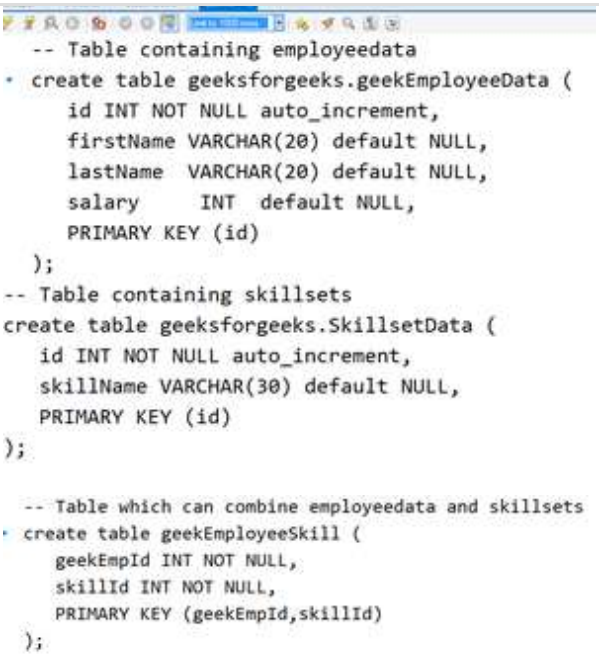
1. **geekEmployeeData:** stores employee details.
2. **SkillsetData:** stores skill details.
3. **geekEmployeeSkill:** a join table that maps employees to their skillsets using foreign keys.

Step-by-Step Implementation

Step 1. Create Database Tables

```
-- Employee table
create table geeksforgeeks.geekEmployeeData (
   id INT NOT NULL auto_increment,
   firstName VARCHAR(20) default NULL,
   lastName  VARCHAR(20) default NULL,
   salary     INT  default NULL,
   PRIMARY KEY (id)
);

-- Skills table
create table geeksforgeeks.SkillsetData (
   id INT NOT NULL auto_increment,
   skillName VARCHAR(30) default NULL,
   PRIMARY KEY (id)
);

-- Junction table for Many-to-Many mapping
```

```
create table geekEmployeeSkill (
   geekEmpId INT NOT NULL,
   skillId INT NOT NULL,
   PRIMARY KEY (geekEmpId,skillId)
);
```



```
-- Table containing employeedata
create table geeksforgeeks.geekEmployeeData (
    id INT NOT NULL auto_increment,
    firstName VARCHAR(20) default NULL,
    lastName  VARCHAR(20) default NULL,
    salary     INT  default NULL,
    PRIMARY KEY (id)
);
-- Table containing skillsets
create table geeksforgeeks.SkillsetData (
   id INT NOT NULL auto_increment,
   skillName VARCHAR(30) default NULL,
   PRIMARY KEY (id)
);

-- Table which can combine employeedata and skillsets
create table geekEmployeeSkill (
    geekEmpId INT NOT NULL,
    skillId INT NOT NULL,
    PRIMARY KEY (geekEmpId,skillId)
);
```

Step 2. Create POJO Classes

- In this step, we create the tables needed for storing employees, skills, and their relationships.
- The geekEmployeeSkill table acts as a join table to maintain the Many-to-Many mapping.

1. GeekEmployeeData.java: For geekEmployeeData table data CRUD operations, this is required

```
import java.util.Set;

public class GeekEmployeeData {
    private int id;
    private String firstName;
    private String lastName;
    private int salary;

    // Many-to-Many: employee can have multiple skills
    private Set skillSets;

    public GeekEmployeeData() {}
    public GeekEmployeeData(String firstName, String lastName, int salary) {
```

```
        this.firstName = firstName;
        this.lastName = lastName;
        this.salary = salary;
    }

    // Getters & Setters
    public int getId() { return id; }
    public void setId(int id) { this.id = id; }
    public String getFirstName() { return firstName; }
    public void setFirstName(String firstName) { this.firstName = firstName;
}
    public String getLastName() { return lastName; }
    public void setLastName(String lastName) { this.lastName = lastName; }
    public int getSalary() { return salary; }
    public void setSalary(int salary) { this.salary = salary; }
    public Set getSkillSets() { return skillSets; }
    public void setSkillSets(Set skillSets) { this.skillSets = skillSets; }
}
```

Explanation:

- This class represents the geekEmployeeData table and stores basic employee info.
- The Set<SkillsetData> models the Many-to-Many relationship with skills.

2. SkillsetData.java : For SkillsetData table data CRUD operations, this is required

```
public class SkillsetData {
    private int id;
    private String skillName;

    public SkillsetData() {}

    public SkillsetData(String skillName)
    {
        this.skillName = skillName;
    }

    public int getId() { return id; }

    public void setId(int id) { this.id = id; }

    public String getSkillName() { return skillName; }
```

```
    public void setSkillName(String skillName)
    {
        this.skillName = skillName;
    }

    public boolean equals(Object obj)
    {
        // This method is definitely required in order to check
whether any two elements/objects are equal
        if (obj == null)
            return false;
        if (!this.getClass().equals(obj.getClass()))
            return false;

        SkillsetData obj2 = (SkillsetData)obj;
        if ((this.id == obj2.getId())
            && (this.skillName.equals(
                obj2.getSkillName()))) {
            return true;
        }
        return false;
    }
    // collections calculate the hash value for a given key using
the hashCode() method.
    public int hashCode()
    {

        // This method is definitely required in order to check
whether any two elements/objects are equal
        int tmp = 0;
        tmp = (id + skillName).hashCode();
        return tmp;
    }
}
```

Explanation:

- Represents the SkillsetData table and contains skill information.
- equals() and hashCode() ensure that Set collections properly manage duplicates.

Step 3. Hibernate Mapping File

In many-to-many relationships, Hibernate uses a mapping file to define associations between entities. The <set> element specifies the relationship and how related objects should be persisted.

geekEmployeeData.hbm.xml

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE hibernate-mapping PUBLIC
"-//Hibernate/Hibernate Mapping DTD//EN"
"http://hibernate.org/dtd/hibernate-mapping-3.0.dtd">

<hibernate-mapping>

  <!-- Employee mapping -->
  <class name="com.geeksforgeeks.GeekEmployeeData" table="geekEmployeeData">
      <id name="id" type="int" column="id">
         <generator class="native"/>
      </id>

      <set name="skillSets" cascade="save-update" table="geekEmployeeSkill">
         <key column="geekEmpId"/>
         <many-to-many column="skillId"
class="com.geeksforgeeks.SkillsetData"/>
      </set>

      <property name="firstName" column="first_name" type="string"/>
      <property name="lastName" column="last_name" type="string"/>
      <property name="salary" column="salary" type="int"/>
  </class>

  <!-- Skill mapping -->
  <class name="com.geeksforgeeks.SkillsetData" table="SkillsetData">
      <id name="id" type="int" column="id">
         <generator class="native"/>
      </id>
      <property name="skillName" column="skillName" type="string"/>
  </class>
</hibernate-mapping>
```

Explanation:

- Maps Java classes to database tables, including the Many-to-Many relationship.
- <set> and <many-to-many> elements define how skills are associated with employees.

Step 4. Hibernate Configuration File

hibernate.cfg.xml

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE hibernate-configuration PUBLIC
"-//Hibernate/Hibernate Configuration DTD 3.0//EN"
"http://hibernate.org/dtd/hibernate-configuration-3.0.dtd">

<hibernate-configuration>
    <session-factory>
        <property
name="hibernate.connection.driver_class">com.mysql.jdbc.Driver</property>
        <property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/geeksforgeeks</pr
operty>
        <property name="hibernate.connection.username">root</property>
        <!-- Change your appropriate password here -->
        <property name="hibernate.connection.password">xxxx</property>
        <property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
        <property name="show_sql">true</property>
        <property name="format_sql">true</property>
        <property name="hbm2ddl.auto">update </property>
        <mapping resource="geekEmployeeData.hbm.xml" />
    </session-factory>
</hibernate-configuration>
```

Explanation:

- Configures database connection, Hibernate dialect, and mapping resources.
- hbm2ddl.auto=update ensures schema is automatically updated when the app runs.

Step 5. Implementation Class

GeekEmployeeManytoManyExample.java

```
import java.util.HashSet;
import java.util.Iterator;
import java.util.List;
import java.util.Set;
import org.hibernate.*;

public class GeekEmployeeManytoManyExample {
    private static SessionFactory factory;
```

```
    public static void main(String[] args) {
        try {
            factory = new Configuration().configure().buildSessionFactory();
        } catch (Throwable ex) {
            System.err.println("Failed to create sessionFactory object." +
ex);
            throw new ExceptionInInitializerError(ex);
        }

        GeekEmployeeManytoManyExample app = new
GeekEmployeeManytoManyExample();

        HashSet skillSets = new HashSet();
        skillSets.add(new SkillsetData("Java"));
        skillSets.add(new SkillsetData("Python"));
        skillSets.add(new SkillsetData("R Programming"));

        HashSet databaseSkillSets = new HashSet();
        databaseSkillSets.add(new SkillsetData("MySQL"));
        databaseSkillSets.add(new SkillsetData("SQL Server"));
        databaseSkillSets.add(new SkillsetData("MongoDB"));

        app.addEmployee("GeekA", "GeekA", 100000, skillSets);
        app.addEmployee("GeekB", "GeekB", 50000, databaseSkillSets);
        app.addEmployee("GeekC", "GeekC", 50000, skillSets);

        app.listGeekEmployeeData();
    }

    public Integer addEmployee(String fname, String lname, int salary, Set
skillSets) {
        Session session = factory.openSession();
        Transaction tx = null;
        Integer employeeID = null;
        try {
            tx = session.beginTransaction();
            GeekEmployeeData employee = new GeekEmployeeData(fname, lname,
salary);
            employee.setSkillSets(skillSets);
            employeeID = (Integer) session.save(employee);
            tx.commit();
        } catch (HibernateException e) {
            if (tx != null) tx.rollback();
            e.printStackTrace();
        } finally {
            session.close();
        }
        return employeeID;
    }

    public void listGeekEmployeeData() {
        Session session = factory.openSession();
        Transaction tx = null;
        try {
            tx = session.beginTransaction();
            Criteria criteria =
```

```
session.createCriteria(GeekEmployeeData.class);
            List employees = criteria.list();

            for (Iterator iterator = employees.iterator();
iterator.hasNext();) {
                GeekEmployeeData emp = (GeekEmployeeData) iterator.next();
                System.out.print("First Name: " + emp.getFirstName());
                System.out.print(" Last Name: " + emp.getLastName());
                System.out.println(" Salary: " + emp.getSalary());

                Set skillSets = emp.getSkillSets();
                for (Iterator it = skillSets.iterator(); it.hasNext();) {
                    SkillsetData skill = (SkillsetData) it.next();
                    System.out.println("SkillName: " + skill.getSkillName());
                }
            }
            tx.commit();
        } catch (HibernateException e) {
            if (tx != null) tx.rollback();
            e.printStackTrace();
        } finally {
            session.close();
        }
    }
}
```

Explanation:

- Implements adding employees with multiple skills and listing them using Hibernate.
- Demonstrates fetching related entities in a Many-to-Many relationship easily with Hibernate criteria queries.

Run and Varify

Parallelly Checking the table values:

geekemployeeskill data

Let us list the records by using hibernate criteria query.

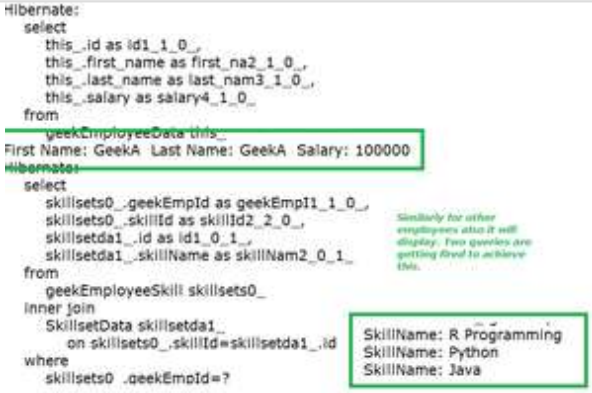
The following method retrieves all employees along with their associated skillsets.

```
public void listGeekEmployeeData() {
    Session session = factory.openSession();
    Transaction tx = null;

    try {
        tx = session.beginTransaction();

        // Create criteria for GeekEmployeeData
        Criteria geekEmployeeCriteria =
session.createCriteria(GeekEmployeeData.class);
        List geekEmployeeList = geekEmployeeCriteria.list();

        for (Iterator iterator = geekEmployeeList.iterator();
iterator.hasNext();) {
            GeekEmployeeData employeeData = (GeekEmployeeData)
iterator.next();
            System.out.print("First Name: " + employeeData.getFirstName());
            System.out.print("  Last Name: " + employeeData.getLastName());
            System.out.println("  Salary: " + employeeData.getSalary());

            // Iterate over skill sets
            Set skillSets = employeeData.getSkillSets();
            for (Iterator it = skillSets.iterator(); it.hasNext();) {
                SkillsetData skill = (SkillsetData) it.next();
                System.out.println("SkillName: " + skill.getSkillName());
            }
```

```
        }

        tx.commit();
    } catch (HibernateException e) {
        if (tx != null) tx.rollback();
        e.printStackTrace();
    } finally {
        session.close();
    }
}
```

Uses:

```
/* List down all the employees by using Hibernate criteria */
geekEmployeeObject.listGeekEmployeeData();
```



Filtering Employee Records

You can filter employees based on multiple criteria, such as salary greater than 50,000 and first name starting with 'Geek'.

```
public void listGeekEmployeesByNameAndSalaryCriteria() {
    Session session = factory.openSession();
    Transaction tx = null;

    try {
        tx = session.beginTransaction();

        // Create criteria for GeekEmployeeData
        Criteria geekEmployeeCriteria =
session.createCriteria(GeekEmployeeData.class);

        // Define restrictions
        Criterion salaryExpectation = Restrictions.gt("salary", 50000);
        Criterion nameExpectation = Restrictions.ilike("firstName", "Geek%");

        // Combine restrictions with AND
        LogicalExpression logicalAndExpression =
Restrictions.and(salaryExpectation, nameExpectation);
```

```
        geekEmployeeCriteria.add(logicalAndExpression);

        // Fetch list
        List geekEmployeeList = geekEmployeeCriteria.list();

        for (Iterator iterator = geekEmployeeList.iterator();
iterator.hasNext();) {
            GeekEmployeeData employeeData = (GeekEmployeeData)
iterator.next();
            System.out.print("First Name: " + employeeData.getFirstName());
            System.out.print("  Last Name: " + employeeData.getLastName());
            System.out.println("  Salary: " + employeeData.getSalary());

            // Iterate over skill sets
            Set skillSets = employeeData.getSkillSets();
            for (Iterator it = skillSets.iterator(); it.hasNext();) {
                SkillsetData skill = (SkillsetData) it.next();
                System.out.println("SkillName: " + skill.getSkillName());
            }
        }

        tx.commit();
    } catch (HibernateException e) {
        if (tx != null) tx.rollback();
        e.printStackTrace();
    } finally {
        session.close();
    }
}
```

Explanation:

- Demonstrates filtering employees based on multiple conditions (salary > 50000 AND firstName LIKE 'Geek%').
- Shows how Hibernate criteria queries simplify complex SQL joins with Many-to-Many relationships.

Uses:

```
// Let us add filter data by using Restrictions
geekEmployeeObject.listGeekEmployeesByNameAndSalaryCriteria();
```

Video explanation:

0:00