# HIBERNATE

TUTORIAL

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# Hibernate Tutorial



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# 1. Introduction

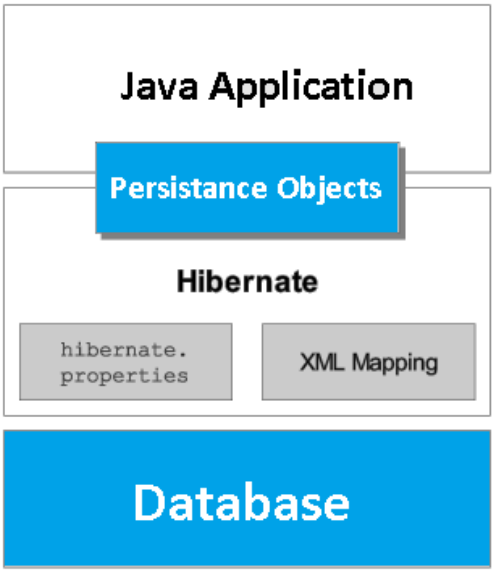
Hibernate is the ORM tool given to transfer the data between a java (object) application and a database (Relational) in the form of the objects. Hibernate is the open source lightweight tool given by **Gavin King**.

Hibernate is a non-invasive framework, means it won't force the programmers to extend/implement any class/interface, and in hibernate we have all POJO classes so its light weight

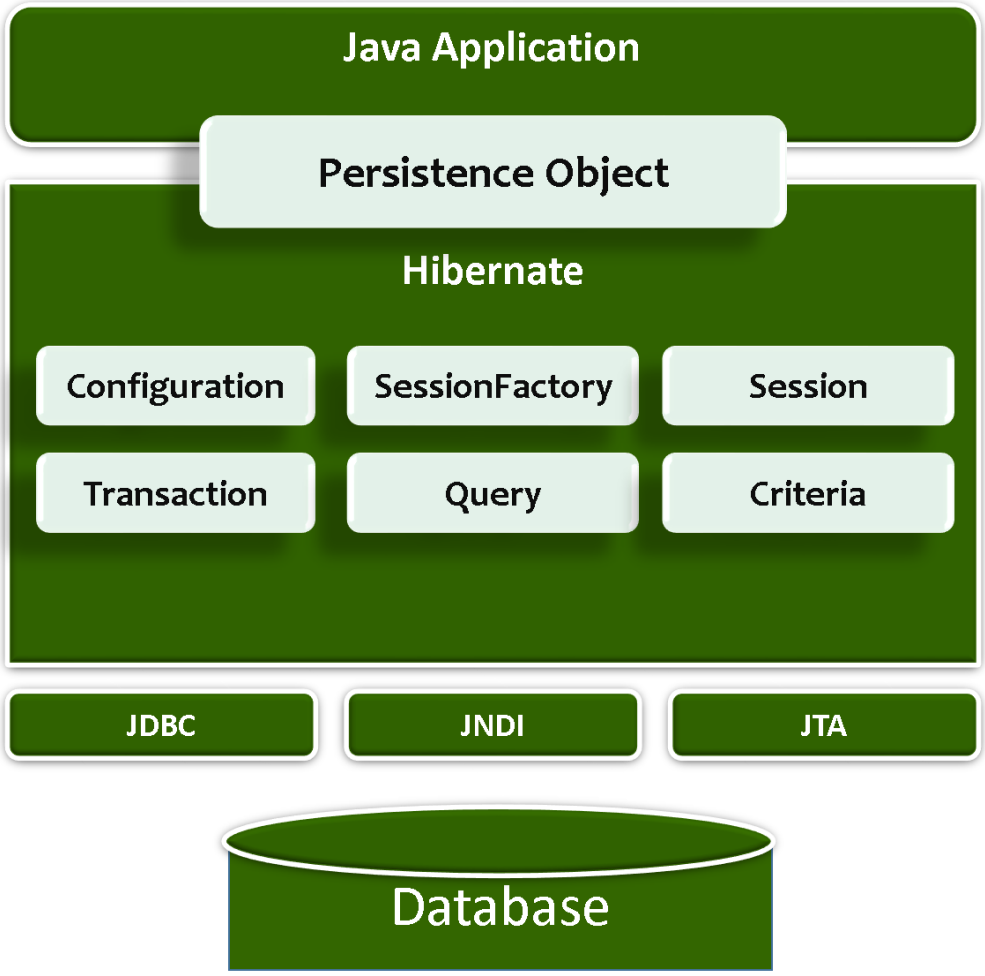
| JDBC vs. HIBERNATE | |
|---|---|
| **JDBC** | **HIBERNATE** |
| Programmer must close the connection. Jdbc does not responsible to close the connection. | Hibernate will take care about closing the connections |
| if the table structure is modified then the JDBC program doesn't work, again we need to modify and compile the programs | Hibernate has its own query language (HQL) and it is database independent. So if we change the database, then also our application will work, because HQL is database independent |
| In Jdbc all exceptions are checked exceptions, so we must write code in try, catch and throws | hibernate we have only Un-checked exceptions, so no need to write try, catch, or throws |
| JDBC won't generate primary keys automatically | Hibernate has capability to generate primary keys automatically while we are storing the records into database. |
| JDBC won't support Caching mechanism | Hibernate supports caching mechanism by this, the number of round trips between an application and the database will be reduced, by using this caching technique an application performance will be increased automatically. |
| In JDBC , we need to write SQL queries manually | Hibernate provided Dialect classes, so we no need to write sql queries in hibernate, instead we use the methods provided by that API |

## Hibernate Architecture

The diagram below provides a high-level view of the Hibernate architecture:




Following is a detailed view of the Hibernate Application Architecture



Hibernate uses various existing Java APIs, like JDBC, Java Transaction API(JTA), and Java Naming and Directory Interface (JNDI) along with its own API objects like SessionFactory, Session, Transaction etc.,

## 1. Configuration

It represents a **configuration or properties file required by the Hibernate**. Configuration is the file loaded into hibernate application when working with hibernate.

Configuration file contains 3 types of information.

i. **Connection Properties**
ii. **Hibernate Properties**
iii. **Mapping file name(s)**

```
   <? 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>
        <! -- Database connection settings -->
        <property name="connection.driver_class">com.mysql.jdbc.Driver</property>
        <property name="connection.url">jdbc:mysql://localhost:3306/mydb</property>
        <property name="connection.username">root</property>
        <property name="connection.password">root</property>
        <property name="connection.pool_size">1</property>

        <!-- Hibernate Properties -->
        <property name="dialect">org.hibernate.dialect.MySQLDialect</property>
        <property name="show_sql">true</property>
            <property name="hbm2ddl.auto">validate</property>

      <!-- Mapping file name(s)-->
        <mapping resource="res/employee.hbm.xml"/>
    </session-factory>
</hibernate-configuration>
```

## 2. SessionFactory Object

It holds second level cache (optional) of data like **Dialect, username and password**. The **org.hibernate.SessionFactory** interface provides factory method **to get the object of Session**

## 3. Session Object

It Opens a Session between Database and our Application. It holds a **first-level cache (mandatory**) of data. The **org.hibernate.Session** interface provides **methods to insert, update and delete** the object

## 4. Transaction Object

The **org.hibernate.Transaction** interface provides methods for transaction management.

## 5. Query Object

Query objects use SQL or Hibernate Query Language (HQL) string to retrieve data from the database and create objects.

## 6. Criteria Object

Criteria object are used to create and execute object oriented criteria queries to retrieve objects.

# Hibernate Installation

Working with the framework software is nothing but, adding the .jar(s) files provided by that framework to our java application. We can add hibernate jars in two ways

## 1.Hibernate install using maven

We just need to add hibernate maven dependencies in pom.xml

```
<dependency>
   <groupId>org.hibernate</groupId>
   <artifactId>hibernate-core</artifactId>
   <version>5.2.10. Final</version>
</dependency>
```

## 2. Download Hibernate jars & add to project

Download jar from hibernate.org / from here & extract the zip file. We don't need to add all the jars. We need to add following jars.

```
Anttr-2.7.6.jar
asm.jar
asm-attrs.jar
cglib-2.1.3.jar
commons-collections-2.1.1.jar
commons-logging-1.0.4.jar
ehcash.jar
dom4j-1.6.1.jar
hibernate3.jar
jta.jar
log4j-1.2.3.jar
```

along with the hibernate jars we must include one more jar file, which is nothing but related to our database, this is depending on your database

# 2. Hibernate Example Step by Step

For Developing, any hibernate application we need create below four files always

1. **Choose Database Table**
2. **POJO class**
3. **Mapping XML**
4. **Configuration XML**
5. **Application class for main logic**

Above are the minimum requirement to run any hibernate application, but we may create any number of POJO classes and any number of mapping xml files (**Number of POJO classes = that many number of mapping xmls**), and only **one configuration xml** and finally **one java file to write our logic**.

## 1. Choose Database Table

In this Example, we are taking '**employee'** table of 'mydb' database.

```
CREATE TABLE `employee` (
`eid` INT(11) NOT NULL AUTO_INCREMENT,
`name` VARCHAR(50) NOT NULL DEFAULT '0',
`address` VARCHAR(50) NOT NULL DEFAULT '0',
PRIMARY KEY (`eid`)
)
COLLATE='latin1_swedish_ci'
ENGINE=InnoDB
AUTO_INCREMENT=5
;
```

```
mysql> select * from employee;
+-----+-------+------------+
| eid | name  | address    |
+-----+-------+------------+
|   1 | SATYA | VIJAYAWADA |
|   2 | SURYA | HYDERABAD  |
|   3 | RAVI  | PUNE       |
+-----+-------+------------+
```

## 2. POJO class / Persistence class

- **POJO is a simple java file**, no need to extend any class or implement any interface.
- Pojo class contains **table column names as data members,**
- In above table eid, name, address are columns
- **It contains column names as private data members with setters and getters**

**EmployeeBo.java**

```
package bo;
public class EmployeeBo {
        private int eid;
        private String name;
        private String address;
       public int getEid() {
              return eid;
       }
       public void setEid(int eid) {
              this.eid = eid;
       }
       public String getName() {
              return name;
       }
       public void setName(String name) {
              this.name = name;
       }
       public String getAddress() {
              return address;
       }
       public void setAddress(String address) {
              this.address = address;
       }
}
```

## 3. Mapping File

- Mapping file contains **mapping from a pojo class name to a table name** and **pojo class variable names to table column names.**
- We can create any no. of mapping files
- Mapping can be done using two ways, using XML & using Annotations.

**Syntax of mapping xml (Pojaclassname.hbm.xml)**

```
<hibernate-mapping>
<class name="POJO class name" table="table name in database">
  <id name="variable name" column="column name in db" type="java/hib type" />
  <property name="var1 name" column="column name in db"     type="java/hib type" />
  <property name="var2 name" column="column name in db"     type="java/hib type" />
</class>
</hibernate-mapping>
```

**Example: EmployeeBo.hbm.xml**

```
<hibernate-mapping>
       <class name="bo.EmployeeBo" table="employee">
              <id name="eid" column="eid">
                     <generator class="assigned" />
              </id>
              <property name="name" column="name" />
              <property name="address" column="address" />
       </class>
</hibernate-mapping>
```

**Explanation**

- **<hibernate-mapping>** is the root element in the mapping file.
- **<class/>** specifies the Persistent/POJO class.
- **<id/>** specifies the primary key attribute in the class.
- **<generator>** is the sub element of id. It is used to generate the primary key. There are many generator classes such as assigned (It is used if id is specified by the user), increment, hilo, sequence, native etc. We will learn all the generator classes later.
- **property** It is the sub element of class that specifies the property name of the Persistent class.

## 4. Configuration File

- Configuration file contains 3 types of information.
  - i. **Connection Properties**
  - ii. **Hibernate Properties**
  - iii. **Mapping file name(s)**
- **We must create configuration file for each database we are going to use.**

**No. of databases we are using = That many number of configuration files**

**Syntax of Configuration file**

```
<hibernate-configuration>
<session-factory>

<!-- Related to the connection START -->
<property name="connection.driver_class">Driver Class Name </property>
<property name="connection.url">URL </property>
<property name="connection.user">user </property>
<property name="connection.password">password</property>
<!-- Related to the connection END -->

<!-- Related to hibernate properties START -->
<property name="show_sql">true/false</property>
<property name="dialet">Database dialet class</property>
<property name="hbm2ddl.auto">create/update or what ever</property>
<!-- Related to hibernate properties END-->
<!-- Related to mapping START-->
<mapping resource="hbm file 1 name .xml" / >
<mapping resource="hbm file 2 name .xml" / >
<!-- Related to the mapping END -->

</session-factory>
</hibernate-configuration>
```

**Example: hibernate.cfg.xml**

```
<?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.jdbc.Driver</property>
<property name="hibernate.connection.url">jdbc:mysql://localhost:3306/smlcodes</property>
<property name="hibernate.connection.username">root</property>
<property name="hibernate.connection.password">root</property>

<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
<property name="show_sql">true</property>
<property name="hbm2ddl.auto">update</property>

<mapping resource="EmployeeBo.hbm.xml" />
</session-factory>
</hibernate-configuration>
```

## 5. Application class for main logic

We will create our application class with the **main()** method to run the application. We will use this application to save Employee data. Please follow the steps to write Application class

## 1. Load Hibernate API into Our Application

Load hibernate API by writing these two lines on the top of the application.

```
import org.hibernate.*;
import org.hibernate.cfg.*;
```

## 2. Load Configurations

Among **Configuration(hibernate.cfg.xml), Mapping xml files**, first we need to load configuration xml, because once we load the configuration file, automatically mapping xml file will also load, because it is defined it **Configuration(hibernate.cfg.xml) file**

We can load the configuration file by using **Configuration** class Object. **cfg.configure("xml")** loads the all the configurations from config file and save in **config object, now config object contains all configuration details.**

```
Configuration cfg = new Configuration();
cfg.configure("hibernate.cfg.xml");
```

## 3. Open Session

SessionFactory will produces the Session objects based on the requests. To get Session Object we have to call openSession() method on Sessionfactory Object.

Usually an application has a single SessionFactory instance and threads servicing client requests obtain Session instances from this factory.

**Whenever session is opened then internally a database connection will be opened**

```
SessionFactory factory = cfg.buildSessionFactory();
Session session = factory.openSession();
```

## 4. Create Transaction Object

While working with **insert, update, delete, operations** from a hibernate application onto the database then hibernate needs a logical Transaction, if we are **selecting an object** from the database then we do **not require any logical transaction** in hibernate.

To begin a logical transaction in hibernate then we need to call a method **beginTransaction()** given by Session Interface

```
Transaction tx = session.beginTransaction();
session.save(bo);
System.out.println("Employee Data saved successfully.....!!");
tx.commit();
```

We have following methods for performing CURD operations

```
session.save(bo)    -     Inserting object "bo"into database
session.update(bo)  -     Updating object "bo" in the database
session.load(bo)    -     Selecting object "bo" object
session.delete(bo)  -     Deleting object "bo"from database
```

Finally we need to call **commit()** in Transaction, like **tx.commit()**;

## 5. Close the Connections

Finally, we need to close the all opened connections

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

**Example : EmployeeSave.java**

```
package app;

import org.hibernate.*;
import org.hibernate.cfg.*;
import bo.EmployeeBo;

public class EmployeeSave {
      public static void main(String[] args) {
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();

            EmployeeBo bo = new EmployeeBo();
            bo.setEid(5);
            bo.setName("DILEEP");
            bo.setAddress("BANGLORE");

            Transaction tx = session.beginTransaction();
            session.save(bo);
            System.out.println("Employee Data saved successfully.....!!");
            tx.commit();
            session.close();
            factory.close();
      }
}
```

```
log4j:WARN No appenders could be found for logger
(org.hibernate.cfg.Environment).
log4j:WARN Please initialize the log4j system properly.
Employee Data saved successfully.....!!
Hibernate: insert into employee (name, address, eid) values (?, ?, ?)
```

| Summarized Steps for creating Application class |
| --- |
| Configuration |
| SessionFactory |
| Session |
| Transaction |
| Close Statements |

## Dialects in Hibernate

For connecting any hibernate application with the database, you must specify the SQL dialects. There are many Dialects classes defined for RDBMS in the org.hibernate.dialect package. They are as follows:

| RDBMS | Dialect |
|---|---|
| **Oracle (any version)** | **org.hibernate.dialect.OracleDialect** |
| **Oracle9i** | **org.hibernate.dialect.Oracle9iDialect** |
| **Oracle10g** | **org.hibernate.dialect.Oracle10gDialect** |
| **MySQL** | **org.hibernate.dialect.MySQLDialect** |
| **MySQL with InnoDB** | **org.hibernate.dialect.MySQLInnoDBDialect** |
| **MySQL with MyISAM** | **org.hibernate.dialect.MySQLMyISAMDialect** |
| **DB2** | **org.hibernate.dialect.DB2Dialect** |
| **DB2 AS/400** | **org.hibernate.dialect.DB2400Dialect** |
| **DB2 OS390** | **org.hibernate.dialect.DB2390Dialect** |
| **Microsoft SQL Server** | **org.hibernate.dialect.SQLServerDialect** |
| **SAP DB** | **org.hibernate.dialect.SAPDBDialect** |
| **Informix** | **org.hibernate.dialect.InformixDialect** |

# 3. Hibernate CURD Operations

Now we will see how to insert, delete, update & select data from/into database using hibernate. Below files are common to all CURD operation examples, follow the Steps

## 1. Choose Database Table

```
mysql> select * from employee;
+-----+--------+-------------+
| eid | name   | address     |
+-----+--------+-------------+
|   1 | Satya  | VIJYAYAWADA |
|   2 | Ravi   | HYDERABAD   |
|   3 | SURYA  | HYDERABAD   |
|   4 | RAMAN  | PUNE        |
|   5 | DILEEP | BANGLORE    |
|   6 | DILEEP | BANGLORE    |+-----+--------+-------------+
```

## 2. POJO class(EmployeeBo.java)

```
package bo;
public class EmployeeBo {
        private int eid;
        private String name;
        private String address;

       //Setters& getters
}
```

## 3. O/R Mapping XML(EmployeeBo.hbm.xml)

```
<?xml version="1.0"?>
<!DOCTYPE hibernate-mapping SYSTEM
"hibernate-mapping-3.0.dtd">

<hibernate-mapping>
       <class name="bo.EmployeeBo" table="employee">
              <id name="eid" column="eid">
                     <generator class="assigned" />
              </id>
              <property name="name" column="name" />
              <property name="address" column="address" />
       </class>
</hibernate-mapping>
```

## 4. Hibernate Configuration file

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration SYSTEM
"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/smlcodes</property>
<property name="hibernate.connection.username">root</property>
<property name="hibernate.connection.password">root</property>

<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
<property name="show_sql">true</property>
<property name="hbm2ddl.auto">update</property>

<mapping resource="EmployeeBo.hbm.xml" />
</session-factory>
</hibernate-configuration>
```

## 1. SELECT Operation using Hibernate

We have following methods to perform SELECT Operation in Hibernate

```
Object load(Class theClass, Serializable id)
```

```
package curd;

import org.hibernate.*;
import org.hibernate.cfg.*;
import bo.EmployeeBo;

public class EmployeeSelect {
      public static void main(String[] args) {

            //1.Load Configuration
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            //2.Create Session
            SessionFactory sf = cfg.buildSessionFactory();
            Session session = sf.openSession();


            //3.Perform Operations
            Object ob = session.load(EmployeeBo.class, new Integer(1));
            EmployeeBo bo = (EmployeeBo) ob;

            System.out.println("SELECTED DATA\n ================");
            System.out.println("EID : "+bo.getEid());
            System.out.println("NAME : "+bo.getName());
            System.out.println("ADDRESS : "+bo.getAddress());
      }
}
```

```
log4j:WARN No appenders could be found for logger
org.hibernate.cfg.Environment).
log4j:WARN Please initialize the log4j system properly.
Hibernate: select employeebo0_.eid as eid0_0_, employeebo0_.name as name0_0_,
employeebo0_.address as address0_0_ from employee employeebo0_ where
employeebo0_.eid=?

SELECTED DATA
 ================
EID : 1
NAME : Satya
ADDRESS : VIJYAYAWADA
```

## 2. INSERT Operation using Hibernate

We have Following methods to perform insert Operation in Hibernate

- Serializable **save(Object object)**
- void **persist(Object object)**
- void **saveOrUpdate(Object object)**

```
package curd;
public class EmployeeInsert {
	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		// 3.Create Transaction Object
		Transaction tx = session.beginTransaction();

		EmployeeBo ob1 = new EmployeeBo(12, "KARTHIK", "ONGOLE");
		session.save(ob1);
		tx.commit();

		tx.begin();
		EmployeeBo ob3 = new EmployeeBo(10, "NAG", "HYD");
		session.saveOrUpdate(ob3);
		tx.commit();

		EmployeeBo ob2 = new EmployeeBo(11, "PERSIST", "VIZAG");
		session.persist(ob2);

		System.out.println("Data Saved Sussesfully");
		session.close();
		sf.close();
	}
}
```

```
mysql> select * from employee;
+-----+---------+-------------+
| eid | name    | address     |
+-----+---------+-------------+
|   1 | Satya   | VIJYAYAWADA |
|   2 | Ravi    | HYDERABAD   |
|   3 | SURYA   | HYDERABAD   |
|   4 | RAMAN   | PUNE        |
|   5 | DILEEP  | BANGLORE    |
|   6 | DILEEP  | BANGLORE    |
|   7 | ANANTH  | CHENNAI     |
|   8 | vijay   | CHENNAI     |
|   9 | KARTHIK | ONGOLE      |
|  10 | NAG     | HYD         |
|  12 | KARTHIK | ONGOLE      |
+-----+---------+-------------+
```

## 3. UPDATE Operation using Hibernate

We have two approaches for updating already saved data in database.

## Approach 1:

In this approach, we load the existing row, and we will set the appropriate properties. On committing transaction, hibernate automatically updates the data. But this is not recommended.

## Approach 2:

In this approach to modify object in the database, we need to create new object with same id and we must call **update()** given by session interface

We have following method to perform UPDATE Operation in Hibernate

```
void   update(Object object)
```

```
package curd;

public class EmployeeUpdate {

      public static void main(String[] args) {
            // 1.Load Configuration
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            // 2.Create Session
            SessionFactory sf = cfg.buildSessionFactory();
            Session session = sf.openSession();

            //======Approach 1 ==========
            Transaction tx = session.beginTransaction();
EmployeeBo ob1 = (EmployeeBo)session.load(EmployeeBo.class, new Integer(4));
            ob1.setAddress("VIJAYAWADA");
            tx.commit();

            //======Approach 2 ==========
            tx = session.beginTransaction();
EmployeeBo ob2 = new EmployeeBo(new Integer(5), "ANANTH", "HYDERABAD");
            session.update(ob2);
            tx.commit();
            System.out.println("Update Completed!");

            session.close();
            sf.close();

      }
}
```

```
mysql> select * from employee;
+-----+--------+--------------+
| eid | name   | address      |
+-----+--------+--------------+
|   1 | Satya  | VIJYAYAWADA  |
|   2 | Ravi   | HYDERABAD    |
|   3 | SURYA  | HYDERABAD    |
|   4 | RAMAN  | CHENNAI      |
|   5 | ANANTH | CHENNAI      |
+-----+--------+--------------+
5 rows in set (0.00 sec)
```

Before update

```
mysql> select * from employee;
+-----+--------+--------------+
| eid | name   | address      |
+-----+--------+--------------+
|   1 | Satya  | VIJYAYAWADA  |
|   2 | Ravi   | HYDERABAD    |
|   3 | SURYA  | HYDERABAD    |
|   4 | RAMAN  | VIJAYAWADA   |
|   5 | ANANTH | HYDERABAD    |
+-----+--------+--------------+
5 rows in set (0.00 sec)
```

After Update

## 4. DELETE Operation using Hibernate

We have following method to perform DELETE Operation in Hibernate

```
void delete(Object object)
```

```
package curd;
import bo.EmployeeBo;

public class EmployeeDelete {

	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		//======Load the Object & DELETE ==========
		Transaction tx = session.beginTransaction();
	EmployeeBo bo =(EmployeeBo)session.load(EmployeeBo.class, new
Integer(4));
		session.delete(bo);
		tx.commit();

		session.close();
		sf.close();

	}
}
```

```
mysql> select * from employee;
+-----+--------+--------------+
| eid | name   | address      |
+-----+--------+--------------+
|   1 | Satya  | VIJYAYAWADA  |
|   2 | Ravi   | HYDERABAD    |
|   3 | SURYA  | HYDERABAD    |
|   4 | RAMAN  | VIJAYAWADA   |
|   5 | ANANTH | HYDERABAD    |
+-----+--------+--------------+
5 rows in set (0.00 sec)
```

Before Delete

```
mysql> select * from employee;
+-----+--------+--------------+
| eid | name   | address      |
+-----+--------+--------------+
|   1 | Satya  | VIJYAYAWADA  |
|   2 | Ravi   | HYDERABAD    |
|   3 | SURYA  | HYDERABAD    |
|   5 | ANANTH | HYDERABAD    |
+-----+--------+--------------+
4 rows in set (0.00 sec)
```

After DELETE

# 4. Hibernate POJO Class Lifecycle

In Hibernate POJO class, (Persistence class) object will have 3 States

1. **Transient state**
2. **Persistent state**
3. **Detached state**

## 1. Transient state

- Whenever an object of a pojo class is created then it will be in the **Transient state**
- When the object is in a Transient state it **doesn't represent any row of the database**
- If we modify the data of a pojo class object, when it is in transient state then **it doesn't effect on the database table**

## 2. Persistent state

- When the object is in persistent state, then it represents one row of the database
- if the object is in persistent state then it is associated with the **unique Session**

## 3. Detached state

- After Persistent State Object will goes under Dethatched State
- if we want to move an object from persistent to detached state, we need to do either **closing that session** or need to **clear the cache of the session**

```
package curd;


public class POJOLifeCycle {

	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		//======1.Transient State START==========
		EmployeeBo bo = new EmployeeBo();
		bo.setEid(6);
		bo.setName("RAJESH");
		bo.setAddress("NEWYORK");
		//======1.Transient State END==========


		//======2.Persistent state START==========
```

```
            Transaction tx = session.beginTransaction();
            session.save(bo);
            tx.commit();
            //======2.Persistent state END==========

            //========3.Detached State START========
            session.close();
            bo.setEid(7);
            bo.setName("MADHU");
            bo.setAddress("COLOMBO");
            //========3.Detached State END========
            sf.close();

        }
}
```

# 5. Hibernate Inheritance Mapping

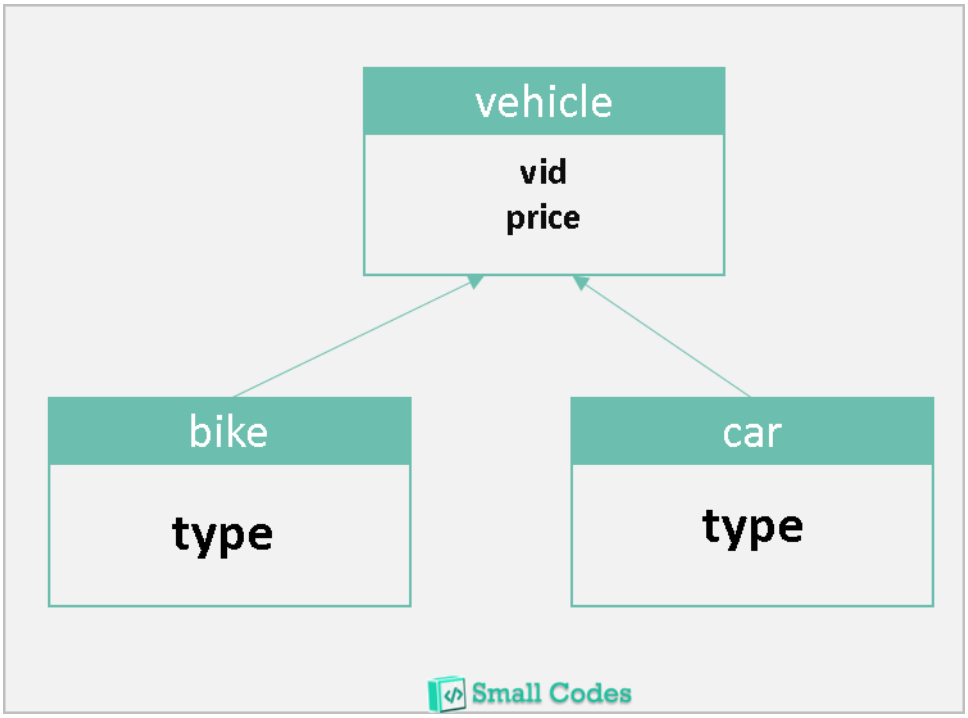
In hibernate inheritance, if we have base and derived classes, now **if we save derived(sub) class object, base class object will also be stored into the database.**

Hibernate supports 3 types of Inheritance Mappings:

1. **Table per class hierarchy**
2. **Table per sub-class hierarchy**
3. **Table per concrete class hierarchy**

We will understand one by one with examples. Below tables are used in upcoming examples.

```
CREATE TABLE `vehicle` (
`vid` INT(11) NOT NULL AUTO_INCREMENT,
`price` DOUBLE NOT NULL DEFAULT '0',
PRIMARY KEY (`vid`));


CREATE TABLE `bike` (
`type` VARCHAR(50) NULL DEFAULT NULL
);

CREATE TABLE `car` (
`type` VARCHAR(50) NULL DEFAULT NULL
);
```




**Following files are common to all examples, only we need to change mapping xml & Application class**

**Vehicle.java**

```
package inheritance;

public class Vehicle {
	private int vid;
	private double price;

	public int getVid() {
		return vid;
	}

	public void setVid(int vid) {
		this.vid = vid;
	}

	public double getPrice() {
		return price;
	}

	public void setPrice(double price) {
		this.price = price;
	}
}
```

**Bike.java**

```
package inheritance;

public class Bike extends Vehicle {
	private String biketype;

	public String getBiketype() {
		return biketype;
	}

	public void setBiketype(String biketype) {
		this.biketype = biketype;
	}
}
```

**Car.java**

```
package inheritance;
public class Car extends Vehicle {
	private String cartype;

	public String getCartype() {
		return cartype;
	}

	public void setCartype(String cartype) {
		this.cartype = cartype;
	}
}
```

**hibernate.cfg.xml**

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration SYSTEM
"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/smlcodes</property>
		<property name="hibernate.connection.username">root</property>
		<property name="hibernate.connection.password">root</property>

		<property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
		<property name="show_sql">true</property>
		<property name="hbm2ddl.auto">update</property>

		<!-- <mapping resource="EmployeeBo.hbm.xml" /> -->
		<mapping resource="Vehicle.hbm.xml" />
	</session-factory>
</hibernate-configuration>
```

**InheritanceCommonApp.java**

```
package inheritance;
import org.hibernate.*;
import org.hibernate.cfg.*;

public class TablePerClassExample {

	public static void main(String[] args) {
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		SessionFactory factory = cfg.buildSessionFactory();
		Session session = factory.openSession();

		Bike bike = new Bike();
		bike.setVid(101);
		bike.setBiketype("HONDA");
		bike.setPrice(50000);

		Car car = new Car();
		car.setVid(102);
		car.setCartype("MARUTHI");
		car.setPrice(600000);

		Transaction tx = session.beginTransaction();
		session.save(bike);
		session.save(car);
		tx.commit();
		session.close();
		factory.close();
	}
}
```

## 1. Table per class hierarchy

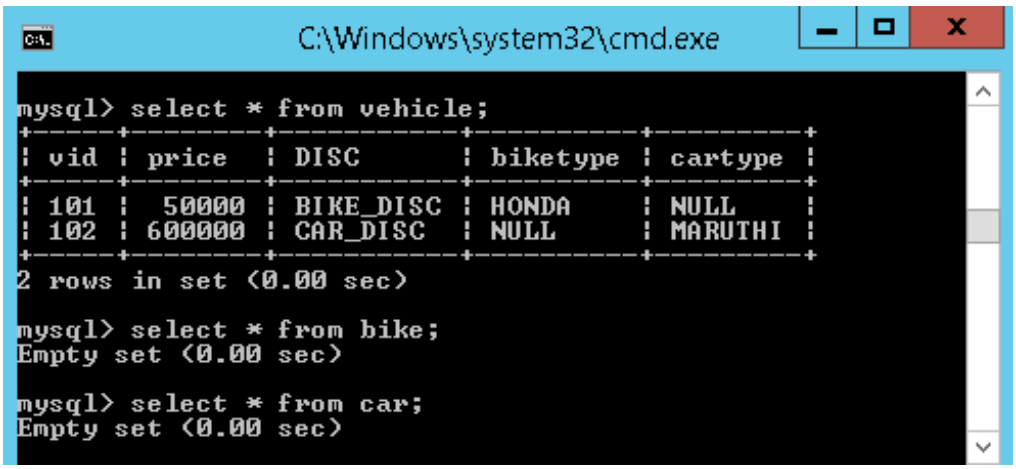
If we **save** the derived class object in the database, then automatically base class data will also be saved into the database in base class Table

For example, if we save the **derived class** object like Car or Bike then automatically Vehicle class object will also be saved into the database, and in the **database** all the data will be stored into a **single table** only, which is base class table.

For this type of hierarchy, we must use one extra **discriminator column** in the database, to identify which **derived** class object we have been saved in the table along with the base class object, if we are not using this column hibernate will **throws the exception.**

**Vehicle.hbm.xml**

```
<hibernate-mapping>
  <class name="inheritance.Vehicle" table="vehicle">
       <id name="vid" column="vid"></id>
       <discriminator column="DISC" type="string"/>
       <property name="price" column="price"></property>

       <subclass name="inheritance.Bike" discriminator-value="BIKE_DISC">
              <property name="biketype" column="biketype"></property>
       </subclass>

       <subclass name="inheritance.Car" discriminator-value="CAR_DISC">
              <property name="cartype" column="cartype"></property>
       </subclass>
  </class>
</hibernate-mapping>
```




We added one new line discriminator, after the id element just to identify which derived class object we have been saved in the table. Here everything has been saved in a single table(vehicle)

## 2. Table per sub-class hierarchy

In this type of hierarchy**, if we save the Base class object, first hibernate will saves the Base class object into the base class table**, **then it will save the subclass object data into subclass table**. Here first it will save data into Base class table.

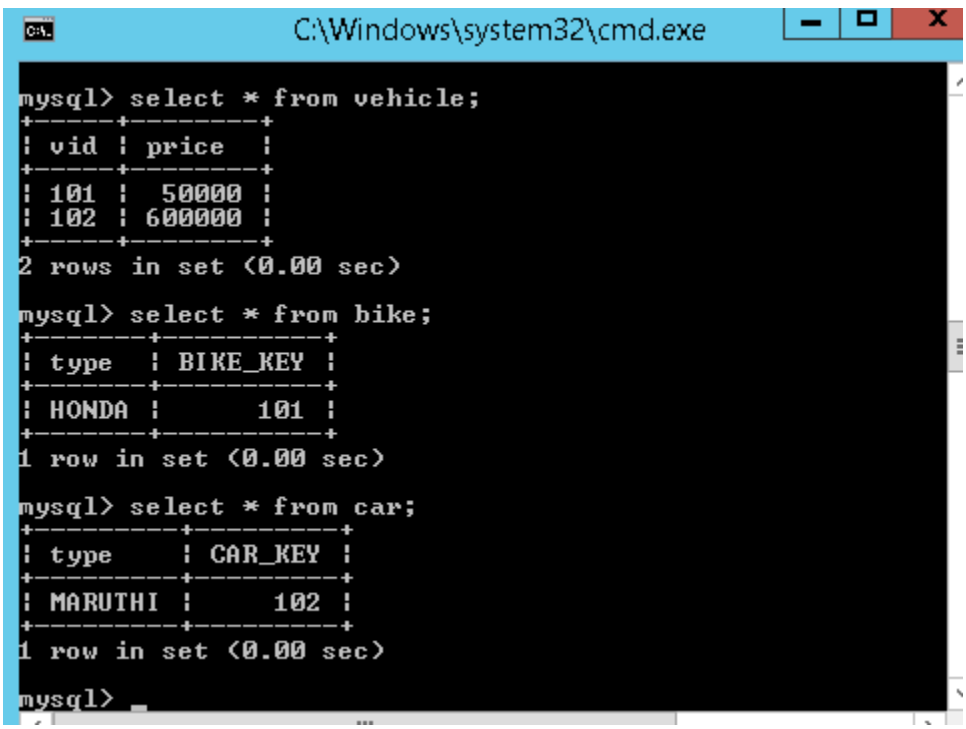
In below Example, if we save the Car/Bike class object, first hibernate will saves the data related to Vehicle class object into the vehicle table and then Car/Bike object data in Car/Bike related tables.so we can say, **No. of classes equals to No. of Tables**

**No. of classes = No. of Tables**

Here **<joined-subclass>** element of **<class>** is used to map the child class with parent class using the primary key and foreign key relation

**Vehicle.hbm.xml**

```
<hibernate-mapping>
      <class name="inheritance.Vehicle" table="vehicle">
      <id name="vid" column="vid"></id>
      <property name="price" column="price"></property>

      <joined-subclass name="inheritance.Bike" table="bike">
            <key column="BIKE_KEY" />
            <property name="biketype" column="type"></property>
      </joined-subclass>

       <joined-subclass name="inheritance.Car" table="car">
            <key column="CAR_KEY" />
            <property name="cartype" column="type"></property>
      </joined-subclass>
      </class>
</hibernate-mapping>
```



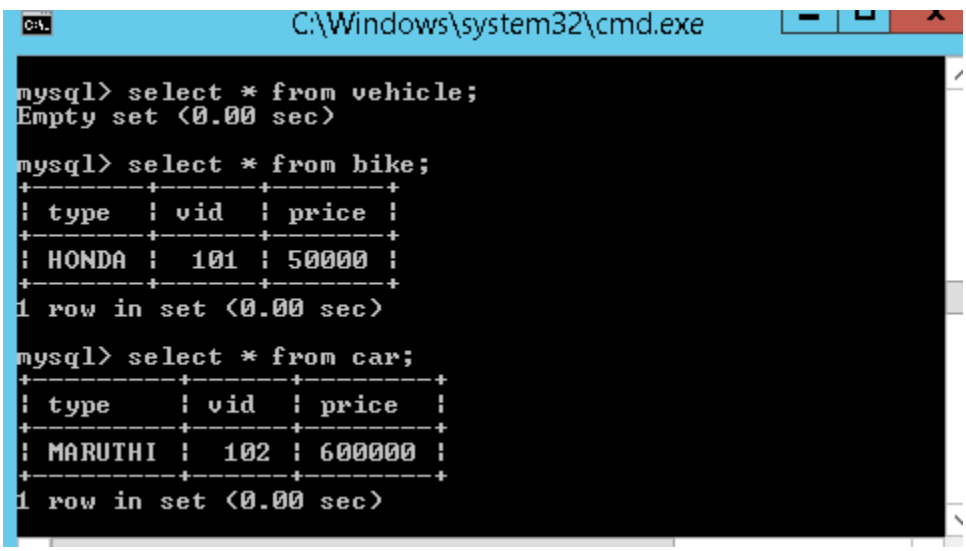

- Once we save the **derived** class object, then hibernate will first save the **base class** object then derived class object.
- At the time of saving the derived class object, hibernate will copy the **primary key** value of the base class into the corresponding derived class, by using **<key>** tag. From the above output
    - 102 copied into **CAR_KEY** column of **car** table
    - 101 copied into **BIKE_KEY** column of the **bike** table

## 3. Table per concrete class hierarchy

- Once we save the **derived class object**, **then derived class data and base class data will be saved in the derived class related table** in the database
- for this type we **need** the tables for **derived classes**, but **not for the base class**
- we need to use one new element **<union-subclass>** under <class>

**Vehicle.hbm.xml**

```
<hibernate-mapping>
      <class name="inheritance.Vehicle" table="vehicle">
      <id name="vid" column="vid"></id>
      <property name="price" column="price"></property>

      <union-subclass name="inheritance.Bike" table="bike">
            <property name="biketype" column="type"></property>
      </union-subclass>

       <union-subclass name="inheritance.Car" table="car">
            <property name="cartype" column="type"></property>
      </union-subclass>
      </class>
</hibernate-mapping>
```



# 6. Hibernate Generators <generator>

The **<generator>** subelement of id used to **generate the unique identifier** for the objects of persistent class. There are many generator classes defined in the Hibernate Framework.

**Example:**

```
<hibernate-mapping>
	<class name="bo.EmployeeBo" table="employee">
		<id name="eid" column="eid">
			<generator class="assigned" />
		</id>
		<property name="name" column="name" />
		<property name="address" column="address" />
	</class>
</hibernate-mapping>
```

In Above example class="*assigned*" means, while inserting data into database user will take care about generating Primary key value. But, hibernate can also generate the primary keys without user interaction, by using **Generators**.

## List of generators

- hibernate using different primary key generator algorithms, for each algorithm internally a class is created by hibernate for its implementation

- hibernate provided different primary key generator classes and all these classes are implemented from `org.hibernate.id.IdentifierGeneratar` Interface

The following are the list of main generators we are using in the hibernate framework

1. **assigned**
2. **increment**
3. **sequence**
4. **identity**
5. **hilo**
6. **native**
7. **foregin**
8. **uuid**

## 1.assigned

- This is the **default generator class** used by the hibernate, **if we do not specify <generator >** element under id element then hibernate by **default assumes it as "assigned"**
- If generator class is assigned, then the **programmer is responsible for assigning the primary key** value to object which is going to save into the database

```
<class name="bo.EmployeeBo" table="employee">
   <id name="eid" column="eid">
         <generator class="assigned" />
   </id>
   <property>....</property>
</class>
```

## 2.increment

- First select the max id if there, if no 1 as max
- for each record it **increments by 1 (i++)**
- Increment will take **care by Application Layer[Hibernate]**

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
            <generator class="increment"/>
      </id>
      <property>....</property>
</class>
```

## 3.identity

- First select the max id if there, if no 1 as max
- for each record it **increments by 1 (i++)**
- Increment will **have taken care by DB Layer[MySQL]**
- MySQL, DB2 Support this. Oracle Won't Support it.

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
               <generator class=" identity"/>
      </id>
      <property>....</property>
</class>
```

## 4.sequence

- while inserting a new record in a database, **hibernate gets next value from the sequence** under assigns that value for the new record
- If programmer has created a sequence in the database, then that sequence name should be passed as the generator
- **Sequence start with 1 and Incremented by 1**
- Internally it creates Sequence table, and increment operations done here
- **Increment will take care by Both Application Layer[Hibernate] & DB Layer[MySQL]**
- MySQL, DB2 Support this. Oracle Wont

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
            <generator class="sequence"/>
      </id>
      <property>....</property>
</class>
```

For defining your own sequence, use the param subelement of generator.

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
             <param name="sequence">USER_DEFIED_SEQUENCE</param>
      </id>
      <property>....</property>
</class>
```

## 5.hilo

- hilo **start with 0**
- Internally it creates **hilo table**
- **It will take High value form Hilo table, and it will Increment**
- for each Deployment/Restart application, **High value increment by 32768**
- 1 st Deploy:  1,2,3,4...
- 2 nd Deploy: 32768,32769.....
- MySQL, DB2 Support this. Oracle Won't Support it.

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
              <generator class="hilo"/>
      </id>
      <property>....</property>
</class>
```

## 6.native

when we use this generator class, it first checks whether the database supports **identity or not**, if not checks for **sequence and if not**, then **hilo** will be used finally the order will be.

- **identity**
- **sequence**
- **hilo**

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
             <generator class="native"/>
      </id>
      <property>....</property>
</class>
```

## 7.foregin

It uses the id of another associated object, mostly used with <one-to-one> association.

## 8.uuid

It uses 128-bit UUID algorithm to generate the id. The returned id is of type String, unique within a network (because IP is used). The UUID is represented in hexadecimal digits, 32 in length.

## Custom generator

For ur application, you want to generate keys as per ur wish like **icici_101, icici_102, icici_103, .....**

- write **IciciGenerator** class implementing **IdentityGenerator**
- override generate method
- and write logic for keys

```
<class name="bo.EmployeeBo" table="employee">
      <id name="eid" column="eid">
             <generator class="IciciGenerator"/>
      </id>
      <property>....</property>
</class>
```

## Generators Example

**EmployeeBo.java**

```
package bo;
public class EmployeeBo {
        private int eid;
        private String name;
        private String address;
 //Setters & Getters
}
```

**GeneratorsExample.java**

```
package app;

import org.hibernate.*;
import org.hibernate.cfg.*;
import bo.EmployeeBo;

public class GeneratorsExample {

      public static void main(String[] args) {
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();

            EmployeeBo bo = new EmployeeBo();
            //bo.setEid(100);
            bo.setName("sequence");
            bo.setAddress("BANGLORE");

            Transaction tx = session.beginTransaction();
            session.save(bo);

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

**EmployeeBo.hbm.xml**

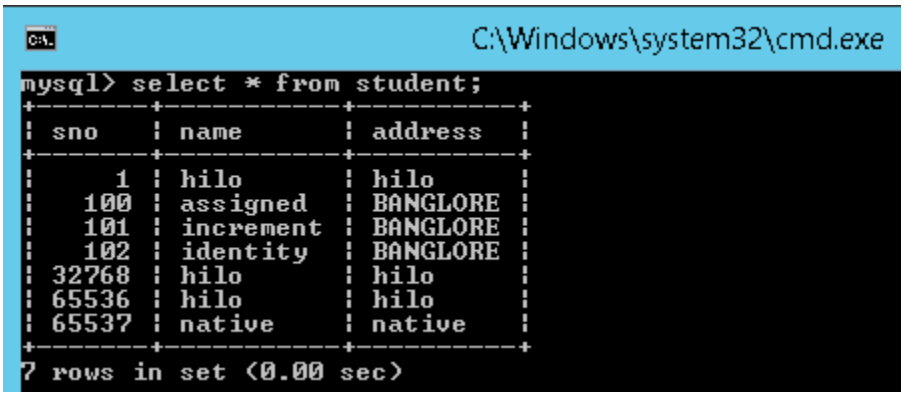
```
<hibernate-mapping>
      <class name="bo.EmployeeBo" table="employee">
            <id name="eid" column="eid">
                  <generator class="sequence" />
            </id>
            <property name="name" column="name" />
            <property name="address" column="address" />
      </class>
</hibernate-mapping>
```

Here we are changing generator classes one-by-one, check the how data stored in DB in output window.

**hibernate.cfg.xml**

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration SYSTEM
"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/smlcodes</property>
		<property name="hibernate.connection.username">root</property>
		<property name="hibernate.connection.password">root</property>

		<property
name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
		<property name="show_sql">true</property>
		<property name="hbm2ddl.auto">update</property>

		<mapping resource="EmployeeBo.hbm.xml" />

		<!-- <mapping resource="EmployeeBo.hbm.xml" /> -->
		<!-- <mapping resource="Vehicle.hbm.xml" /> -->
	</session-factory>
</hibernate-configuration>
```

**Output**




```
For Sequence,
Exception in thread "main" org.hibernate.MappingException: could not instantiate id
generator
	at
org.hibernate.id.IdentifierGeneratorFactory.create(IdentifierGeneratorFactory.java:98
)
```

# 7. Hibernate Query Language (HQL)

**Hibernate Query Language (HQL)** is same as SQL (Structured Query Language) but it doesn't depend on the table of the database. Instead of table name, we use class name in HQL. So it is database independent query language

- **HQL is database independent**, means if we write any program using HQL commands then our program will be able to execute in all the databases without doing any further changes to it.
- HQL supports object oriented features like **Inheritance, polymorphism, Associations (**Relationships)

## SQL vs HQL

If we want to select a **Complete Object** from the database, we use POJO class reference in place of ***** while constructing the query

```
// In SQL
sql> select * from Employee
Note: Employee is the table name.

// In HQL
hql> select s from EmployeeBo s
[ or ]
from EmployeeBo s
Note: here s is the reference of EmployeeBo
```

If we want to load the **Partial Object** from the database that is only selective properties of an objects, then we need to replace column names with POJO class variable names

```
// In SQL
sql> select eid,name,address from Employee
Note: eid,name,address are the columns of Employee the table.

// In HQL
hql> select s.eid,s.name,s.address from EmployeeBo s
```

It is also possible to **select** the object from the database **by passing run time values** into the query using **" ? "**

```
//In SQL
sql> select * from employee where eid=?

// In HQL
hql> select s from EmployeeBo s where s.eid=?
[ or ]
     select s from EmployeeBo s where s.eid =:101
```

## Query Interface

If we want to execute a HQL query on a database, we need to create a **Query** interface object. To get query object, we need to call **session**. **createQuery()** method in the session Interface.

Following are the most commonly used methods in Query interface

- **public int executeUpdate()** -is used to execute **the update or delete query**.
- **public List list()** -returns the result of the relation as a list.
- **public Query setFirstResult(int rowno)** - row number from where record will be retrieved.
- **public Query setMaxResult(int rowno)** - no. of records to be retrieved from the relation (table).
- **public Query setParameter(int position, Object value)** it sets the value to query parameter.
- **public Query setParameter(String name, Object value)** it sets the value to a named query param.

**Synatx:**

```
Query qry = session.createQuery("--- HQL command ---");
List l = qry.list();
Iterator it = l.iterator();
while(it.hasNext())
{
  Object o = it.next();
  EmployeeBo s = (EmployeeBo)o;
  ----- ------- ---------
}
```

## HQL Examples

Following files are common to all the examples

**Table :bank**

```
CREATE TABLE `bank` (
`accno` INT(11) NOT NULL AUTO_INCREMENT,
`accname` VARCHAR(50) NULL DEFAULT NULL,
`balance` DOUBLE NULL DEFAULT NULL,
PRIMARY KEY (`accno`)
)
ENGINE=InnoDB
;
```

```
mysql> select * from bank;
+--------+---------+---------+
| accno  | accname | balance |
+--------+---------+---------+
|    121 | Satya   |  589000 |
|    127 | Surya   |   56000 |
|    133 | Ravi    |  800000 |
+--------+---------+---------+
```

**BankBo.java**

```
package hql;

public class BankBo {
	private int accno;
	private String accname;
	private double balance;

	public int getAccno() {
		return accno;
	}
	public void setAccno(int accno) {
		this.accno = accno;
	}
	public String getAccname() {
		return accname;
	}
	public void setAccname(String accname) {
		this.accname = accname;
	}
	public double getBalance() {
		return balance;
	}
	public void setBalance(double balance) {
		this.balance = balance;
	}
}
```

**BankBo.hbm.xml**

```
<?xml version="1.0"?>
<!DOCTYPE hibernate-mapping SYSTEM "hibernate-mapping-3.0.dtd">

<hibernate-mapping>
	<class name="hql.BankBo" table="bank">
		<id name="accno" column="accno" />
		<property name="accname" column="accname" />
		<property name="balance" column="balance" />
	</class>
</hibernate-mapping>
```

**hibernate.cfg.xml**

```
<hibernate-configuration>
	<session-factory>
<property name="hibernate.connection.driver_class">com.mysql.jdbc.Driver</property>
<property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/smlcodes</property>
		<property name="hibernate.connection.username">root</property>
		<property name="hibernate.connection.password">root</property>
<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>

		<mapping resource="BankBo.hbm.xml" />
	</session-factory>
</hibernate-configuration>
```

## 1. HQL Select Query Example

```
package hql;

import java.util.Iterator;
import java.util.List;
import org.hibernate.Query;
import org.hibernate.SessionFactory;
import org.hibernate.cfg.Configuration;
import org.hibernate.classic.Session;

public class HQLSelect {
	public static void main(String[] args) {
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		SessionFactory factory = cfg.buildSessionFactory();
		Session session = factory.openSession();

		System.out.println("====1.Selecting Complete Object====== ");
		Query query = session.createQuery("Select b from BankBo b");
		List list = query.list();
		Iterator it = list.iterator();
		while (it.hasNext()) {
			BankBo bo = (BankBo) it.next();
			System.out.println("------------------------");
			System.out.println("ACC No : " + bo.getAccno());
			System.out.println("Name : " + bo.getAccname());
			System.out.println("Balance : " + bo.getBalance());

		}

		System.out.println("====2.Selecting Partial Object====== ");
		query = session.createQuery("Select b.accname, b.balance from
BankBo b where b.accno=?");
		query.setParameter(0, new Integer(127));
		list = query.list();
		it = list.iterator();
		while (it.hasNext()) {
			Object o[] = (Object[]) it.next();
			System.out.println("Name : " + o[0]);
			System.out.println("Balance : " + o[1]);
		}
	}
}
```

```
====1.Selecting Complete Object======
ACC No : 121
Name : Satya
Balance : 589000.0
------------------------
ACC No : 127
Name : Surya
Balance : 56000.0
====2.Selecting Partial Object======
Name : Surya
Balance : 56000.0
```

## 2. HQL Update/Delete Query Example

while working with DML operations in HQL we have to call **executeUpdate();** to execute the query, which **will returns one integer value** after the execution it will **tells the count of effected rows**.

```
package hql;

import org.hibernate.Query;
import org.hibernate.SessionFactory;
import org.hibernate.Transaction;
import org.hibernate.cfg.Configuration;
import org.hibernate.classic.Session;

public class HQLUpdateDelete {
	public static void main(String[] args) {
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		SessionFactory factory = cfg.buildSessionFactory();
		Session session = factory.openSession();

		System.out.println("====== UPDATE OPERATION =========");
		Transaction tx = session.beginTransaction();
Query query = session.createQuery("update BankBo b set b.balance =? where
b.accno=?");
		query.setParameter(0, new Double(0));
		query.setParameter(1, new Integer(127));
		int rs = query.executeUpdate();
		tx.commit();
		System.out.println(rs + " :Rows are Updated");

		System.out.println("====== DELETE OPERATION =========");
		tx = session.beginTransaction();
	query = session.createQuery("delete from BankBo b where b.accno=?");
		query.setParameter(0, new Integer(133));
		rs = query.executeUpdate();
		System.out.println(rs + " :Rows are Updated");
		tx.commit();
		session.close();
	}
}
```

```
mysql> select * from bank;
+-------+---------+---------+
| accno | accname | balance |
+-------+---------+---------+
|   121 | Satya   |  589000 |
|   127 | Surya   |       0 |
+-------+---------+---------+
2 rows in set (0.00 sec)
```

## 3. HQL Insert Query Example

while writing the insert query, we need to select values from other table, we can't insert our own values manually. Because, HQL supports only the **INSERT INTO..... SELECT..... ;** it won't support **INSERT INTO.....VALUES**

```
Query query = session.createQuery("insert into Stock(stock_code, stock_name)" +
                    "select stock_code, stock_name from backup_stock");
int result = query.executeUpdate();
```

## HQL with Aggregate functions

We may call avg(), min(), max() etc. aggregate functions by HQL. Let's see some common examples:

**Example to get total salary of all the employees**

```
Query q=session.createQuery("select sum(salary) from Emp");
List<Integer> list=q.list();
System.out.println(list.get(0));
```

**Example to get maximum salary of employee**

```
Query q=session.createQuery("select max(salary) from Emp");
```

**Example to get minimum salary of employee**

```
Query q=session.createQuery("select min(salary) from Emp");
```

**Example to count total number of employee ID**

```
Query q=session.createQuery("select count(id) from Emp");
```

**Example to get average salary of each employees**

```
Query q=session.createQuery("select avg(salary) from Emp");
```

# 8. Hibernate Criteria Query Language (HCQL)

Criteria is nothing but a **Condition**. CQL is used to apply conditions on **SELECT** Queries. The **Criteria interface** provides methods to apply criteria on SELECT queries.

## Criteria Interface

The Criteria interface provides many methods to specify criteria. The object of Criteria can be obtained by calling the **createCriteria()** method of Session interface

```
public Criteria createCriteria(Class c)
```

commonly used methods of Criteria interface are as follows:

1. **public Criteria add(Criterion c)** is used to add restrictions.
2. **public Criteria addOrder(Order o)** specifies ordering.
3. **public Criteria setFirstResult(int firstResult)** specifies the first number of record to be retreived.
4. **public Criteria setMaxResult(int totalResult)** specifies the total number of records to be retreived.
5. **public List list()** returns list containing object.
6. **public Criteria setProjection(Projection projection)** specifies the projection

## Working with Criteria Query Language

**Example Criteria**

```
Criteria crit = session.createCriteria(Products.class);
Criterion c1=Restrictions.gt("price", new Integer(12000));
//price is our pojo class variable
crit.add(c1); // adding criterion object to criteria class object
List l = crit.list(); // executing criteria query
```

- If we want to put, we need to create one **Criterion Interface** object and we need to **add()** this object to **Criteria Class object**
- In order to get Criterion object, we need to use **Restrictions class.** Restrictions is the factory for producing Criterion objects
- In **Restrictions class**, **we have all static methods** and each method of this class **returns Criterion object**

**REMEMBER: CQL is only used on SELECT Queries**

## Example: Get the details from bank table where balance>3000.

Table : Bank

```
mysql> select * from bank;
+-------+---------+---------+
| accno | accname | balance |
+-------+---------+---------+
|   101 | Satya   |    2000 |
|   102 | Surya   |    3000 |
|   103 | Ravi    |    1000 |
|   104 | Rakesh  |    4000 |
|   105 | CHANDU  |    5000 |
+-------+---------+---------+
5 rows in set (0.00 sec)
```

**BankBo.java**

```java
package hql;

public class BankBo {
	private int accno;
	private String accname;
	private double balance;

	public int getAccno() {
		return accno;
	}
	public void setAccno(int accno) {
		this.accno = accno;
	}
	public String getAccname() {
		return accname;
	}
	public void setAccname(String accname) {
		this.accname = accname;
	}
	public double getBalance() {
		return balance;
	}
	public void setBalance(double balance) {
		this.balance = balance;
	}
}
```

**BankBo.hbm.xml**

```xml
<?xml version="1.0"?>
<!DOCTYPE hibernate-mapping SYSTEM "hibernate-mapping-3.0.dtd">

<hibernate-mapping>
	<class name="hql.BankBo" table="bank">
		<id name="accno" column="accno" />
		<property name="accname" column="accname" />
		<property name="balance" column="balance" />
	</class>
</hibernate-mapping>
```

**hibernate.cfg.xml**

```
<hibernate-configuration>
      <session-factory>
<property name="hibernate.connection.driver_class">com.mysql.jdbc.Driver</property>
<property
name="hibernate.connection.url">jdbc:mysql://localhost:3306/smlcodes</property>
            <property name="hibernate.connection.username">root</property>
            <property name="hibernate.connection.password">root</property>
<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>

            <mapping resource="BankBo.hbm.xml" />
      </session-factory>
</hibernate-configuration>
```

```
package cql;

import java.util.Iterator;
import java.util.List;
import org.hibernate.*;
import hql.BankBo;

public class CriteriaDemo {
      public static void main(String[] args) {

            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();

            Criteria criteria = session.createCriteria(BankBo.class);
            Criterion cn = Restrictions.gt("balance", new Double(3000));
            criteria.add(cn);
            List list = criteria.list();

            System.out.println("List Size : " + list.size());
            Iterator it = list.iterator();

            while (it.hasNext()) {
                  BankBo bo = (BankBo) it.next();
             System.out.println(bo.getAccno() + ", " + bo.getAccname() + ", "
+ bo.getBalance());
            }
            session.close();
            factory.close();
      }
}
```

```
log4j:WARN No appenders could be found for logger
(org.hibernate.cfg.Environment).
log4j:WARN Please initialize the log4j system properly.
Hibernate: select this_.accno as accno0_0_, this_.accname as accname0_0_,
this_.balance as balance0_0_ from bank this_ where this_.balance>?
List Size : 2
104, Rakesh, 4000.0
105, CHANDU, 5000.0
```

## Example: Adding ORDERBY Conditions to Criteria

If we want to add some sorting order for the objects, we need to add an **Order class** object to the Criteria class object by calling **addOrder() method.** In Order class, we have **asc() and dsc()** for getting an objects in required order.

```
public class CriteriaOrderExample {
      public static void main(String[] args) {

            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");

            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();

            Criteria criteria = session.createCriteria(BankBo.class);
            Criterion cn = Restrictions.gt("balance", new Double(2000));
            criteria.add(cn);
            criteria.addOrder(Order.asc("balance"));
            List list = criteria.list();
            Iterator it = list.iterator();

            while (it.hasNext()) {
                  BankBo bo = (BankBo) it.next();
                  System.out.println(bo.getAccno() + ", "+ bo.getBalance());
            }
            session.close();
            factory.close();
      }
}
```

```
log4j:WARN No appenders could be found for logger
102, 3000.0
104, 4000.0
105, 5000.0
```

hibernate will select the records (rows) from **BankBo** table and stores them into a **ResultSet** and then converts each row data of resultset into a **POJO class object** basing on our field type, then all these objects into a list according to the order you have given

## Example: Adding multiple conditions

If we want to put more conditions on the data (multiple conditions) then we can use **and** method, **or** method given by the Restrictions class

```
      crit.add(Restrictions.and(Restrictions.like("accname","%satya%"),
      Restrictions.eq("price",new Integer(12000))));
      List l=crit.list();
      Iterator it = l.iterator();
```

Like this we can add any number of conditions

## Hibernate Projections

In criteria, we are able to load complete object only, to load the partial objects (Selected Columns only) we need to use projections.

- **Projection** is an Interface, **Projections** is an class for producing projection objects.
- In **Projections** class, we have **all static methods** and each method of this class returns Projection interface object.
- If we want to add a Projection object to Criteria then we need to call a method **setProjection()**

## Projections Syntax

while adding projection object to criteria, it is possible to **add one object at a time**. It means if we add 2nd projection object then this 2nd one will override the first one (first one won't be work), so at a time we can only one projection object to criteria object.

Using criteria, if we want to load partial object from the database, then we need to create a **projection object for property** that is to be loaded from the database

**Example:**

```
Criteria crit = session.createCriteria(Products.class);
crit.setProjection(Projections.proparty("proName"));
List l=crit.list();
Iterator it=l.iterator();
while(it.hasNext())
{
String s = (String)it.next();
// ---- print -----
}
```

## Example 1: Load Single Column using Projections

In below example we are using same configuration files and BanlBo.java as above examples

```
public class ProjectionsDemo {
      public static void main(String[] args) {
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");
            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();
            Criteria criteria = session.createCriteria(BankBo.class);
            Criterion cn = Restrictions.gt("balance", new Double(2000));
            criteria.add(cn);

            criteria.setProjection(Projections.property("balance"));
            List list = criteria.list();

            System.out.println("List Size : " + list.size());
```

```
            Iterator it = list.iterator();
            while (it.hasNext()) {
                  Double bal = (Double) it.next();
                  System.out.println("Balance : " + bal);
            }
            session.close();
            factory.close();
      }
}
```

```
Hibernate: select this_.balance as y0_ from bank this_ where this_.balance>?
List Size : 3
Balance : 3000.0
Balance : 4000.0
Balance : 5000.0
```

## Example 2: Load Multiple Columns using Projections

If we want to **load partial object, with multiple columns** using criteria then we need to **create the ProjectionList with the multiple properties** and then we need to add that Projectionist to the criteria.

```
public class ProjectionsMultipleColumns {
      public static void main(String[] args) {
            Configuration cfg = new Configuration();
            cfg.configure("hibernate.cfg.xml");
            SessionFactory factory = cfg.buildSessionFactory();
            Session session = factory.openSession();

            Criteria criteria = session.createCriteria(BankBo.class);
            Criterion cn = Restrictions.gt("balance", new Double(2000));
            criteria.add(cn);

            ProjectionList projectionList = Projections.projectionList();
            projectionList.add(Projections.property("accname"));
            projectionList.add(Projections.property("balance"));
            criteria.setProjection(projectionList);

            List list = criteria.list();
            Iterator it = list.iterator();
            while (it.hasNext()) {
                  Object[] o = (Object[]) it.next();
                  System.out.println(o[0]+" : " +o[1]);
            }
            session.close();
            factory.close();
      }
}
```

```
Hibernate: select this_.accname as y0_, this_.balance as y1_ from bank this_ where
this_.balance>?
Surya : 3000.0
Rakesh : 4000.0
CHANDU : 5000.0
```

## Difference between HQL and CQL

| HQL (Hibernate Query Language) | CQL (Criteria Query Language) |
|---|---|
| We can perform **both select and non-select operations** | Criteria **is only for selecting** the data, we cannot perform non-select operations |
| suitable for executing **Static Queries** | suitable for executing **Dynamic Queries** |
| Takes less time to execute | Takes more time to execute |

# 9. Native SQL Queries

HQL or Criteria queries able to execute almost any SQL query you want. However, many developers are complaint about the Hibernate's generated SQL statement is slow and more prefer to generated their own SQL (native SQL) statement.

Hibernate provide a **createSQLQuery()** method to let you call your native SQL statement directly. Your application will create a native SQL query from the session with the **createSQLQuery()** method on the Session interface.:

```
public SQLQuery createSQLQuery(String sqlString) throws HibernateException
```

- By using Native SQL, we can perform both **SELECT & NON- SELECT** operations on the data
- We can use the database specific keywords (commands), to get the data from the database
- The main drawback of Native SQL is it makes the hibernate application as **database dependent**.

## Working with Native SQL Queries

Even though we are selecting complete objects from the database **we need to type cast into Object[]** array only, **not into our pojo class type**, because we are giving direct table, column names in the Native SQL Query so it doesn't know our class name

```
SQLQuery qry = session.createSQLQuery("select * from EMPLOYEE");
// Here EMPLOYEE is the table in the database...
List l = qry.list();
Iterator it = l.iterator();
while(it.hasNext())
{
Object row[] = (Object[])it.next();
--- -------
}
```

In the above code, we typecast into the **object[]** , if we want to type cast into our POJO class , then we need to go with **entityQuery** concept. to make the query as an entityQuery, we need to call **addEntity()** method

```
//We are letting hibernate to know our pojo class too
SQLQuery q=session.createSQLQuery("select *from
EMPLOYEE").addEntity(EmployeeBo.class);
	List l = q.list();
	Iterator it = l.iterator();
	while(it.hasNext())
	{
		EmployeeBo s = (EmployeeBo)it.next();
	--- -------
	}
```

## Example

```
public class NativeSqlDemo {
	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");
		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		System.out.println("1.Simple Native SQL\n ========================");
		SQLQuery query1 = session.createSQLQuery("select *from EMPLOYEE");
		List list1 = query1.list();
		Iterator it1 = list1.iterator();
		while (it1.hasNext()) {
			Object[] ob = (Object[]) it1.next();
			System.out.println(ob[0] + ", " + ob[1] + ", " + ob[2]);
		}
		System.out.println("2.Native SQL with entityQuery\n ==========");
		SQLQuery query2 = session.createSQLQuery("select *from EMPLOYEE");
		query2.addEntity(EmployeeBo.class);
		List list2 = query2.list();
		Iterator it2 = list2.iterator();
		while (it2.hasNext()) {
			EmployeeBo bo = (EmployeeBo) it2.next();
System.out.println(bo.getEid() + ", " + bo.getName() + ", " + bo.getAddress());
		}
		session.close();
		sf.close();
	}
}
```

```
1.Simple Native SQL
 ========================
1, SATYA, VIJAYAWADA
2, SURYA, HYDERABAD
2.Native SQL with entityQuery
 ========================
1, SATYA, VIJAYAWADA
2, SURYA, HYDERABAD
```

# 10. Named Queries

if we want to execute the **same queries for multiple times** in our program then we can use the **Named Queries mechanism**

- In this Named Queries concept, **we use some name for the query configuration**, **and that name will be used whenever the same query is required to execute**
- If you want to create Named Query, in hibernate mapping file we need to configure a **query** by putting some name for it.
- In HQL, we need to use **<query name="query_name">** to configure query

```
<query name="bankHQLQuery">
<![CDATA[from BankBo b where b.balance>:bal ]]>
</query>
```

- In Native SQL, we need to use **<sql-queryname="query_name">** to configure query

```
<sql-query name="bankNativeQuery">
  select * from Employee
</sql-query>
```

- In our main program, we need to use **getNamedQuery()** given by **session** interface, for getting the **Query** reference and we need to execute that query by calling **list()**

```
Query qry = session.getNamedQuery("Name given in hib-mapping-xml");
qry.setParameter("bal",new Integer(3000));
List l = qry.list();
```

## Example 1 : HQL Named Query  Example

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration SYSTEM
"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/smlcodes</property>
              <property name="hibernate.connection.username">root</property>
              <property name="hibernate.connection.password">root</property>
<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
              <property name="show_sql">true</property>
              <property name="hbm2ddl.auto">update</property>
              <mapping resource="EmployeeBo.hbm.xml" />
              <mapping resource="BankBo.hbm.xml" />
              </session-factory>
</hibernate-configuration>
```

**BankBo.java**

```
public class BankBo {
	private int accno;
	private String accname;
	private double balance;
	//Setters & getters
```

**BankBo.hbm.xml**

```
<hibernate-mapping>
	<class name="hql.BankBo" table="bank">
		<id name="accno" column="accno" />
		<property name="accname" column="accname" />
		<property name="balance" column="balance" />
	</class>

<query name="bankHQLQuery">
<![CDATA[from hql.BankBo b where b.balance>:bal ]]>
</query>
</hibernate-mapping>
```

**HQLNamedQuery.java**

```
package namedQuery;
public class HQLNamedQuery {
	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");
		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		System.out.println("HQL-NamedQuery Example\n----------");
		Query qry = session.getNamedQuery("bankHQLQuery");
		qry.setParameter("bal", new Double(3000));
		List list = qry.list();
		Iterator it = list.iterator();
		while (it.hasNext()) {
		BankBo bo = (BankBo) it.next();
		System.out.println(bo.getAccname() + ", " + bo.getBalance());
		}
		session.close();
		sf.close();
	}
}
```

```
HQL-NamedQuery Example
------
Hibernate: select bankbo0_.accno as accno1_, bankbo0_.accname as accname1_,
bankbo0_.balance as balance1_ from bank bankbo0_ where bankbo0_.balance>?
Rakesh, 4000.0
CHANDU, 5000.0
```

## Example 2 : Native SQL Named Query  Example

**EmployeeBo.java**

```
package bo;

public class EmployeeBo {
	private int eid;
	private String name;
	private String address;
  //Setters & getters
}
```

**EmployeeBo.hbm.xml**

```
<hibernate-mapping>
	<class name="bo.EmployeeBo" table="employee">
		<id name="eid" column="eid">
			<generator class="uuid" />
		</id>
		<property name="name" column="name" />
		<property name="address" column="address" />
	</class>

<sql-query name="employeeNativeQuery">
  select * from Employee
</sql-query>
</hibernate-mapping>
```

**NamedQueryDemo.java**

```
package namedQuery;
public class NamedQueryDemo {
	public static void main(String[] args) {
		// 1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");
		// 2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();
		Query qry = session.getNamedQuery("employeeNativeQuery");
		List list = qry.list();
		Iterator it = list.iterator();
		while (it.hasNext()) {
			Object o[] = (Object[]) it.next();
			System.out.println(o[0] + ", " + o[1] + ", " + o[2]);
		}
		session.close();
		sf.close();
	}
}
```

```
HQL-NamedQuery Example------------------------
Hibernate: select bankbo0_.accno as accno1_, bankbo0_.accname as accname1_, bankbo0_.balance
as balance1_ from bank bankbo0_ where bankbo0_.balance>?
Rakesh, 4000.0
CHANDU, 5000.0
```

# 11. Hibernate Relationships

In JAVA we have ***three types*** of relationships

1. ***IS – A***
2. ***HAS –A***
3. ***Uses – A***

**1.Is-a** relationship is one in which **data members of one class is obtained into another class through the concept of inheritance.**

```
class B{
}

public class A extends B{

}
```

**2.Has-a** relationship is one in which an **object of one class is created as a data member in another class**.

```
class Emp{
    int a =100;
}

public class Demo {
private Emp emp;
 public static void main(String[] args) {

}
}
```

**3.Uses-a** relationship is one in which an **Object of one class is created inside a method of another class.**

```
class Emp {
    int a = 100;
}

public class Demo {
    public void get() {
        Emp ob = new Emp();
    }

}
```

**NOTE: But in Database We don't have is-a,has-a,uses-a relationships like in java**

## Relationships in Hibernate

In database, we don't have above mentioned relationships, but we can form the relationship between database tables by using **Primary Key (P.K), Foreign Key (F.K)**. **We can only form HAS-A relationship in hibernate.**

We have four types of relationships

1. **One-To-One** **(P.K → P.K, F.K(Unique) → P.K)**
2. **One-To-Many** **(P.K → F.K)**
3. **Many-To-One** **(F.K → P.K)**
4. **Many-To-Many** **(Table1 → LinkTable → Table2)**

**If you see above replations One→P.K, Many→F.K. Just kidding☺**

## Mapping Directions

Each relationship can be achieved in two directions

**1.Unidirectional** relationship refers to the case when relationship between two objects can be accessed by **one way only**. i.e. from Library we can access books, from book we can't access Library, not vice versa.

```
class Book{
    Long bookId;
    String bookName;
     …........
}
class Library{
     Long libraryId;
     String libraryName;
      Set<Book> bookSet;
}
```

**2.Bidirectional** relationship refers to the case when relationship between two objects can be accessed both ways. i.e. From Library we can access books, from book we can access Library, vice versa.

```
class Book{
    Long bookId;
    String bookName;
    Library library;
     …........
}
class Library {
     Long libraryId;
     String libraryName;
      Set<Book> bookSet;
}
```

| Relationship | Explanation | Example |
|---|---|---|
| **One-To-One** | Each record in one table is related to exactly one record in the second table and vice versa. The other side could also be a zero record. | A car has only one engine. |
| **One-To-Many (or) Many-To-One** | Each record in one table is related to zero or more records in the second table. | A movie has many actors (one-to-many); an actor can act in many movies (manyto-one). |
| **Many-To-Many** | Each record in either of the tables is related to zero or more records in the other table | Each student can enroll in multiple courses, and each course can have many students registered. |

**REMEMEBER: Object means one row in hibernate terminology**

## 1.One-to-One Relationship Mapping Example

Using our **Car and Engine example**, we develop a one-to-one association. There are two ways of establishing a one-to-one association, **using a primary key using a foreign key.**

**Example: OneToOne Mapping (BiDirectional)**

```
CREATE TABLE CAR (
CAR_ID int(10) NOT NULL,
NAME varchar(20) DEFAULT NULL,
COLOR varchar(20) DEFAULT NULL,
PRIMARY KEY (CAR_ID));

CREATE TABLE ENGINE (
CAR_ID int(10) NOT NULL,
SIZE varchar(20) DEFAULT NULL,
MODEL varchar(20) DEFAULT NULL,
PRIMARY KEY (CAR_ID),
FOREIGN KEY (CAR_ID) REFERENCES car (CAR_ID));
```

- **CAR** table with a **CAR_ID** as the primary key.
- **ENGINE** table, primary key is a **CAR_ID**.
- **ENGINE** table has a foreign key constraint pointing to the primary key of the CAR table. So, an engine will always be created with the same id as that of a car. Thus, we say both tables share the same primary key.

**<u>Car.java</u>**

```
package onetoone;
public class Car {
	private int id;
	private String name;
	private String color;
	private Engine engine;
	//Setters & Getters
}
```

**Engine.java**

```
package onetoone;
public class Engine {
	private int id = 0;
	private String model = null;
	private String size = null;
	// this engine is fitted to a car
	private Car car = null;
	 //Setters & Getters
}
```

**Car.hbm.xml**

```
<hibernate-mapping package="onetoone">
	<class name="Car" table="CAR">
		<id name="id" column="CAR_ID">
			<generator class="assigned" />
		</id>
		<property name="name" column="NAME" />
		<property name="color" column="COLOR" />
		<one-to-one name="engine" class="Engine" cascade="all" />
	</class>
</hibernate-mapping>
```

**Engine.hbm.xml**

```
<hibernate-mapping package="onetoone">
	<class name="Engine" table="ENGINE">
		<id name="id" column="CAR_ID">
			<generator class="foreign">
				<param name="property">car</param>
			</generator>
		</id>
		<one-to-one name="car" class="Car" constrained="true" />
		<property name="size" column="SIZE" />
		<property name="model" column="model" />
	</class>
</hibernate-mapping>
```

**hibernate.cfg.xml**

```
<hibernate-configuration>
	<session-factory>
		 . . . . .
		<mapping resource="onetoone/Car.hbm.xml" />
		<mapping resource="onetoone/Engine.hbm.xml" />
		. . . . .
	</session-factory>
</hibernate-configuration>
```

**OneToOneTest.java**

```
package onetoone;
public class OneToOneTest {
public static void main(String[] args) {
	Configuration cfg = new Configuration();
	cfg.configure("hibernate.cfg.xml");
	SessionFactory sf = cfg.buildSessionFactory();
	Session session = sf.openSession();

	Car car = new Car();
	// Remember, we are using application generator for ids
	car.setId(1);
	car.setName("SWIFT");
	car.setColor("BLUE");
	// Next, create an instance of engine and set values.
	// Note: you are not setting the id!
	Engine engine = new Engine();
	engine.setModel("2009");
	engine.setSize("85KG");
	// Now we associate them together using the setter on the car
	car.setEngine(engine);
	engine.setCar(car);
	// Lastly, we are persisting them

	Transaction tx = session.beginTransaction();
	session.save(car);
	session.save(engine);
	tx.commit();
	System.out.println("Succuess");
}
}
```

```
mysql> select * from car;
+--------+--------------------+-------+
| CAR_ID | NAME               | COLOR |
+--------+--------------------+-------+
|      1 | SWIFT              | BLUE  |
+--------+--------------------+-------+
2 rows in set (0.00 sec)

mysql> select * from engine;
+--------+------------+-------+
| CAR_ID | size       | MODEL |
+--------+------------+-------+
|      1 | 85KG       | 2009  |
+--------+------------+-------+
```

## 2.One-to-Many / Many-to-One Relationship

To achieve one-to-many between two pojo classes in the hibernate, then the following two changes are required

- In the parent pojo class, we need to take a **collection property**, the collection can be either **Set, List, Map** .

```
public class Movie {
       private int mid;
       private String title;
       private Set<Actor> actors;
        //Setters & Getters
}
```

- In the mapping file of that parent pojo class, we need to configure the collection

```
        <set name="actors" table="actor" cascade="all">
                    <key column="mid" not-null="true" />
                    <one-to-many class="Actor" />
             </set>
```

In this example we are taking Movie & Actor table, the relation between them is **"one" movie consists of "one or more (i.e., many)" actors**

```
CREATE TABLE `movie` (
`mid` INT(10) NOT NULL AUTO_INCREMENT,
`title` VARCHAR(10) NULL DEFAULT NULL,
PRIMARY KEY (`mid`)
)


CREATE TABLE `actor` (
`actorid` INT(10) NOT NULL AUTO_INCREMENT,
`name` VARCHAR(20) NULL DEFAULT NULL,
`age` INT(10) NULL DEFAULT NULL,
`mid` INT(10) NULL DEFAULT NULL,
PRIMARY KEY (`actorid`),
INDEX `FK585A9F550821B2A` (`mid`),
INDEX `FK585A9F578674FF6` (`mid`),
CONSTRAINT `FK585A9F550821B2A` FOREIGN KEY (`mid`) REFERENCES `movie` (`mid`)
)
```

```
mysql> select * from movie;
+-----+----------+
| mid | title    |
+-----+----------+
| 501 | 3 IDIOTS |
+-----+----------+
```

```
mysql> select * from actor
    -> ;
+------+---------+----------------+------+
| mid  | actorid | name           | age  |
+------+---------+----------------+------+
| 501  |     101 | AMIR KHAN      |   42 |
| 501  |     102 | R. MADHAVAN    |   36 |
| 501  |     103 | KAREENA KAPOOR |   31 |
+------+---------+----------------+------+
```

**Actor.java**

```
package onetomany;
public class Actor {
	private int actorid;
	private String actorname;
	private int age;
 //Setters & getters
}
```

**Movie.java**

```
package onetomany;
public class Movie {
	private int mid;
	private String title;
	private Set<Actor> actors;
	 //Setters & Getters
}
```

**Actor.hbm.xml**

```
<hibernate-mapping package="onetomany">
	<class name="Actor" table="actor">
		<id name="actorid" column="actorid">
			<generator class="assigned" />
		</id>
		<property name="actorname" column="name" />
		<property name="age" column="age" />
	</class>
</hibernate-mapping>
```

**Movie.hbm.xml**

```
<hibernate-mapping package="onetomany">
	<class name="Movie" table="movie">
		<id name="mid" column="mid">
			<generator class="assigned"/>
		</id>

		<property name="title" column="title" />
		<set name="actors" table="actor" cascade="all">
			<key column="mid" not-null="true" />
			<one-to-many class="Actor" />
		</set>
	</class>
</hibernate-mapping>
```

- In order to transfer operations on parent object to child object we need to add **cascade** attribute
- By default, cascade value is none, it means even though relationship is exist, the operations we are doing on parent will not transfer to child.
- In above xml, we used **cascade =" all"** means all operations at parent object will be transfer to child

- In the mapping file, we need to use **<key />** **element to configure foreign key column name**, in this example "*mid*" is foreign key
- **<one-to-many>** is child class with which relation been done, in our example **Actor** is the child class

**OneToManyTest.java**

```
 package onetomany;

import java.util.HashSet;
import java.util.Set;

import org.hibernate.Session;
import org.hibernate.SessionFactory;
import org.hibernate.Transaction;
import org.hibernate.cfg.Configuration;

public class OneToManyTest {
public static void main(String[] args) {

       Configuration cfg = new Configuration();
       cfg.configure("hibernate.cfg.xml");
       SessionFactory sf = cfg.buildSessionFactory();
       Session session = sf.openSession();

       Actor amir = new Actor();
       amir.setActorname("AMIR KHAN");
       amir.setAge(42);
       amir.setActorid(101);

       Actor madhav = new Actor();
       madhav.setActorname("R. MADHAVAN");
       madhav.setAge(36);
       madhav.setActorid(102);

       Actor kareena = new Actor();
       kareena.setActorname("KAREENA KAPOOR");
       kareena.setAge(31);
       kareena.setActorid(103);

       Set<Actor> actors =new HashSet<Actor>();
       actors.add(amir);
       actors.add(madhav);
       actors.add(kareena);

       Movie movie = new Movie();
       movie.setTitle("3 IDIOTS");
       movie.setActors(actors);
       movie.setMid(501);

       Transaction tx = session.beginTransaction();
       session.save(movie);
       tx.commit();
       System.out.println("Succuess");
}
}
```

## 3.Many to Many Relationship

Applying many to many relationships between two pojo class objects is nothing but applying **one to many relationships on both sides**, which tends to Bi-Directional i mean many to many.

- when ever we are applying many to many relationships between two pojo class objects**, on both sides we need a collection property**
- While applying **many to many** relationships between pojo classes, a **mediator table is mandatory in the database**, to store primary key as foreign key both sides, we call this table as Join table

In the example of **Student and Course**, the relationship can be many-to-many: a student can take many courses, while a course may consist of many students

```
CREATE TABLE `course` (
`courseId` INT(11) NOT NULL AUTO_INCREMENT,
`courseName` VARCHAR(50) NULL DEFAULT NULL,
PRIMARY KEY (`courseId`)
)

CREATE TABLE `student` (
`studentId` INT(11) NOT NULL AUTO_INCREMENT,
`studentName` VARCHAR(50) NULL DEFAULT NULL,
PRIMARY KEY (`studentId`)
)

// mediator table
CREATE TABLE `student_course` (
`COURSE_ID` INT(10) NOT NULL,
`STUDENT_ID` INT(10) NOT NULL,
PRIMARY KEY (`COURSE_ID`, `STUDENT_ID`),
INDEX `FKCB6FBEBFAD895D0F` (`COURSE_ID`),
INDEX `FKCB6FBEBF88820545` (`STUDENT_ID`),
CONSTRAINT `fk_c_id` FOREIGN KEY (`COURSE_ID`) REFERENCES `course` (`courseId`),
CONSTRAINT `fk_s_id` FOREIGN KEY (`STUDENT_ID`) REFERENCES `student` (`studentId`)
)
```

Course.java

```
package manytomany;

public class Course {
	private int courseId;
	private String courseName;
	private Set<Student> students;
//Setters & Getters
}
```

Student.java

```
package manytomany;

public class Student {
	private int studentId;
	private String studentName;
	private Set<Course> courses;
//Setters & Getters
}
```

**Course.hbm.xml**

```
<hibernate-mapping package="manytomany">
	<class name="Course" table="course">
		<id name="courseId" column="courseId">
			<generator class="assigned" />
		</id>
		<property name="courseName" column="courseName" />
		<set name="students" table="STUDENT_COURSE" inverse="true"
			cascade="all">
			<key column="COURSE_ID" />
			<many-to-many column="STUDENT_ID" class="Student" />
		</set>
	</class>
</hibernate-mapping>
```

**Student.hbm.xml**

```
<hibernate-mapping package="manytomany">
	<class name="Student" table="student">
		<id name="studentId" column="studentId">
			<generator class="assigned" />
		</id>
		<property name="studentName" column="studentName" />
		<set name="courses" table="STUDENT_COURSE" cascade="all">
			<key column="STUDENT_ID" />
			<many-to-many column="COURSE_ID" class="Course" />
		</set>
	</class>
</hibernate-mapping>
```

```
package manytomany;
public class ManyToManyTest {
public static void main(String[] args) {

	Configuration cfg = new Configuration();
	cfg.configure("hibernate.cfg.xml");
	SessionFactory sf = cfg.buildSessionFactory();
	Session session = sf.openSession();

	 Student s1 = new Student();
	 s1.setStudentId(101);
	 s1.setStudentName("SATYA");
```

```
        Student s2 = new Student();
        s2.setStudentId(102);
        s2.setStudentName("ARJUN");

        Course c1 = new Course();
        c1.setCourseId(301);
        c1.setCourseName("JAVA");

        Course c2 = new Course();
        c2.setCourseId(302);
        c2.setCourseName(".NET");

        Set<Student> students = new HashSet<Student>();
        students.add(s1);
        students.add(s2);
        c1.setStudents(students);
        c2.setStudents(students);

        Set<Course> courses = new HashSet<Course>();
        courses.add(c1);
        courses.add(c2);
        s1.setCourses(courses);
        s2.setCourses(courses);

       Transaction tx = session.beginTransaction();
       session.save(s1);
       session.save(s2);
       tx.commit();
       System.out.println("Succuess");
}
}
```

```
mysql> select * from student;
+-----------+-------------+
| studentId | studentName |
+-----------+-------------+
|       101 | SATYA       |
|       102 | ARJUN       |
+-----------+-------------+
2 rows in set (0.00 sec)
```

```
mysql> select * from course;
+----------+------------+
| courseId | courseName |
+----------+------------+
|      301 | JAVA       |
|      302 | .NET       |
+----------+------------+
2 rows in set (0.00 sec)
```

```
mysql> select * from student_course;
+----------+----------+
| COURSE_ID | STUDENT_ID |
+----------+----------+
|      301 |      101 |
|      301 |      102 |
|      302 |      101 |
|      302 |      102 |
+----------+----------+
```

## Cascade Attribute In Hibernate

Cascade attribute is mandatory, whenever we apply relationship between objects, cascade attribute transfers operations done on one object onto its related child objects. default value of **cascade ="none"** means no operations will be transfers to the child class

If we write **cascade = "all"** then changes like insert, delete, update at parent object will be effected to child object.

Cascade having following values

- none (default), save, update, save-update, delete, all, all-delete-orphan

# 12. Hibernate Cache

Every fresh session having its own **cache memory**, **Caching is a mechanism for storing the loaded objects into a cache memory**. The advantage of cache mechanism is, whenever again we want to load the same object from the database then instead of hitting the database once again, it loads from the local cache memory only**, so that the no. of round trips between an application and a database server got decreased**. It means caching mechanism increases the performance of the application.

In hibernate we have two levels of caching

1. **First Level Cache (**Session Cache)
2. **Second Level Cache** (Session Factory Cache/ JVM Level Cache)

## 1.First Level Cache

- By default, for each hibernate application, **the first level cache is automatically enabled. We can't Enable/Disable first level cache**
- the first level cache is associated with the **session** object and **scope** of the cache **is limited to one session only**
- When we load an object for the first time from the database then the object will be loaded from the database and the loaded object will be stored in the cache memory maintained by that session object
- If we load the same object once again, with in the same session, then the object will be loaded from the local cache memory not from the database
- If we load the same object by opening other session, then again the object will load from the database and the loaded object will be stored in the cache memory maintained by this new session

**Example:**

```
Session session = factory.openSession();
Object ob1 = session.get(Actor.class, new Integer(101)); //1

Object ob2 = session.get(Actor.class, new Integer(101));//2
Object ob3 = session.get(Actor.class, new Integer(101));//3
session.close();//4

Session ses2 = factory.openSession();
Object ob5 = ses2.get(Actor.class, new Integer(101));//5
```

1, We are loaded object with id 101, now it will load the object from the database only as its the first time, and keeps this object in the session cache

2,3 i tried to load the same object 2 times, but here the object will be loaded from the stored cache only not from the database, as we are in the same session

4, we close the first session, so the cache memory related this session also will be destroyed

5, again i created one new session and loaded the same object with id 101, but this time hibernate will loads the object from the database

if we want to remove the objects that are stored in the cache memory, then we need to call either **evict()** **or** **clear()** methods

## 2.Second Level Cache

Whenever we are loading any object from the database, then hibernate verify whether that object is available in the local cache(**first level cache**) memory of that particular session, if not available then hibernate verify whether the object is available in global cache(**second level cache)**, if not available then hibernate will hit the database and loads the object from there, and then **first stores in the local cache** of the session , then in the global cache

**SessionFactory** holds the second level cache data. It is global for all the session objects and not enabled by default.

Different vendors have provided the implementation of Second Level Cache

1. **EH Cache**
2. **OS Cache**
3. **Swarm Cache**
4. **JBoss Cache**

To enable second level cache in the hibernate, then the following **3** changes are required

1. **Add provider class** in hibernate configuration file

```
<property name="hibernate.cache.provider_class">
      org.hibernate.cache.EhCacheProvider
</property>
```

2. **Configure cache element** for a class in hibernate mapping file

```
<cache usage="read-only" />
```

   - **read-only:** caching will work for read only operation.
   - **nonstrict-read-write:** caching will work for read and write but one at a time.
   - **read-write:** caching will work for read and write, can be used simultaneously.
   - **transactional:** caching will work for transaction.

3. create xml file called **ehcache.xml** and place where you have mapping and configuration xml's

**Example:**

```
public class Employee {
	private int eid;
	private String name;
	private String address;
//Setters & Getteers
}
```

**Employee.hbm.xml**

```
<hibernate-mapping package="cache">
	<class name="Employee" table="employee">
		<cache usage="read-only" />
		<id name="eid" column="eid">
			<generator class="native"></generator>
		</id>
		<property name="name"></property>
		<property name="address"></property>
	</class>
</hibernate-mapping>
```

**ehcache.xml**

```
<?xml version="1.0"?>
<ehcache>
	<defaultCache maxElementsInMemory="100" eternal="false"
		timeToIdleSeconds="120" timeToLiveSeconds="200" />
	<cache name="cache.Employee" maxElementsInMemory="100"
		eternal="false" timeToIdleSeconds="5" timeToLiveSeconds="200" />
</ehcache>
```

**hibernate.cfg.xml**

```
<hibernate-configuration>
	<session-factory>
		<property> Driver Class, URL, Username, password, etc </property>
		<property
name="cache.provider_class">org.hibernate.cache.EhCacheProvider</property>
		<property name="hibernate.cache.use_second_level_cache">true</property>
		<mapping resource="cache/employee.hbm.xml" />
	</session-factory>
</hibernate-configuration>
```

**CacheDemo.java**

```
package cache;

import org.hibernate.*;
import org.hibernate.cfg.*;
public class CacheDemo {

	public static void main(String[] args) {

		//1.Load Configuration
		Configuration cfg = new Configuration();
		cfg.configure("hibernate.cfg.xml");

		//2.Create Session
		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();

		//3.Perform Operations
		Object ob = session.load(Employee.class, new Integer(1));
		Employee bo = (Employee) ob;

		System.out.println("SELECTED DATA\n ================");
		System.out.println("SNO : "+bo.getEid());
		System.out.println("NAME : "+bo.getName());
		System.out.println("ADDRESS : "+bo.getAddress());
	}
}
```

```
mysql> select * from employee;
+-----+-------+------------+
| eid | name  | address    |
+-----+-------+------------+
|   1 | SATYA | VIJAYAWADA |
|   2 | SURYA | HYDERABAD  |
|   3 | RAVI  | PUNE       |
+-----+-------+------------+
3 rows in set (0.00 sec)
```

# 13. Hibernate with Annotations

The EJB 3 standard annotations are contained in the **javax.persistence** package, so we import this package.

- Use annotations in POJO classes. These classes are called Entity Bean Classes
- No need of xml files
- We use **AnnotationConfiguartion** class instead of Configuration class

```
Configuration cfg = new AnnotationConfiguartion ();
```

- From Hibernate 4.x version Configuration is enough for both annotation and xml configuration
- We have to configure POJO class in hbm.xml

```
<mapping class="bean.Student">
```

## Commonly used Annotations in Hibernate

**1.@Entity**

- Annotation marks this class as an entity.
- We have to place this annotation at the top of class

**2.@Table**

- Specifies Table to be connect with this class. If you don't use **@Table** annotation, hibernate will use the **class name as the table name by default**.
- We have to **place this annotation at the top of class.**

**3.@Id**

Every table has a primary key; we can make the data member as Primary Key using @Id annotation.

**4.@GeneratedValue**

It will generate the Primary Key/ ID values automatically

**5.@Column**

- This Annotation specifies the details of the column for this property or field.
- If @Column is not specified, property name will be used as the column name by default.

**6. @Transient**

We can declare the data members which are **not have columns in database table**

**7.@ManyToMany**

- **Cascade:** Marks this field as the owning side of the many-to-many relationship and cascade modifier specifies which operations should cascade to the inverse side of relationship
- **mappedBy:** This modifier holds the field which specifies the inverse side of the relationship

**8.@JoinTable**

- **Name**: For holding this many-to-many relationship, maps this field with an intermediary database join table specified by name modifier
- **joinColumns:** Identifies the owning side of columns which are necessary to identify a unique owning object
- **inverseJoinColumns:** Identifies the inverse (target) side of columns which are necessary to identify a unique target object

**9.@JoinColumn**

Maps a join column specified by the name identifier to the relationship table specified by @JoinTable

## Example: CURD operations using Annotations

```
CREATE TABLE `studenttable` (
`sno` INT(11) NOT NULL AUTO_INCREMENT,
`name` VARCHAR(50) NULL DEFAULT NULL,
`address` VARCHAR(50) NULL DEFAULT NULL,
PRIMARY KEY (`sno`)
)
```

**StudentBo.java**

```
package annotations;


@Entity
@Table(name="studenttable")
public class StudentBo {

@Id
@Column(name="sno")
@GeneratedValue(strategy=GenerationType.AUTO)
private int sno; //PRIMARY_KEY

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

@Column             //By default it will take datamember name
private String address;
```

```java
@Transient
private String iamnotindatabase;
//This column not their in db

public int getSno() {
	return sno;
}

public void setSno(int sno) {
	this.sno = sno;
}

public String getName() {
	return name;
}

public void setName(String name) {
	this.name = name;
}

public String getAddress() {
	return address;
}

public void setAddress(String address) {
	this.address = address;
}

public StudentBo( String name, String address) {
	super();

	this.name = name;
	this.address = address;
}
public StudentBo() {
	super();
}
}
```

```xml
<hibernate-configuration>
	<session-factory>
		<property name="hibernate.connection.driver_class">com.mysql.jdbc.Driver</property>
		<property name="hibernate.connection.url">jdbc:mysql://localhost:3306/smlcodes</property>
		<property name="hibernate.connection.username">root</property>
		<property name="hibernate.connection.password">root</property>

		<property name="hibernate.dialect">org.hibernate.dialect.MySQLDialect</property>
		<property name="show_sql">true</property>
		<property name="hbm2ddl.auto">update</property>

		<property name="cache.provider_class">org.hibernate.cache.EhCacheProvider</property>
		<property name="hibernate.cache.use_second_level_cache">true</property>

		<mapping class="annotations.StudentBo"/>
	</session-factory>
</hibernate-configuration>
```

**AnnotationExample.java**

```
package annotations;
public class AnnotationExample {
	public static void main(String[] args) {

		Configuration cfg = new AnnotationConfiguration();
		cfg.configure("hibernate.cfg.xml");

		SessionFactory sf = cfg.buildSessionFactory();
		Session session = sf.openSession();
		Transaction tx = session.beginTransaction();
		System.out.println("1.Save Operation");
		System.out.println("==============================");
		StudentBo e1 = new StudentBo("SATYA", "HYD");
		StudentBo e2 = new StudentBo("RAM", "BANGLORE");
		StudentBo e3 = new StudentBo("KIRAN", "MUMBAI");
		session.save(e1);
		session.save(e2);
		session.save(e3);

		System.out.println("2.Select Operation");
		System.out.println("==============================");
		List<StudentBo> ob = session.createQuery("FROM StudentBo").list();

		for (StudentBo e : ob) {
		System.out.println(e.getSno()+", "+e.getName()+", "+e.getAddress());
		}
		tx.commit();
		session.close();
		sf.close();
	}
}
```

```
log4j:WARN No appenders could be found for logger
(org.hibernate.cfg.annotations.Version).
log4j:WARN Please initialize the log4j system properly.
1.Save Operation
==============================
Hibernate: insert into studenttable (name, address) values (?, ?)
Hibernate: insert into studenttable (name, address) values (?, ?)
Hibernate: insert into studenttable (name, address) values (?, ?)
2.Select Operation
==============================
Hibernate: select studentbo0_.sno as sno0_, studentbo0_.name as name0_,
studentbo0_.address as address0_ from studenttable studentbo0_
1, SATYA, HYD
2, RAM, BANGLORE
3, KIRAN, MUMBAI
```

## 1.one-to-one mapping using Annotations

Car.java

```
package annotations.onetoone;

@Entity
@Table(name="car")
public class Car {

	@Id
	@Column(name="CAR_ID")
	private int id;

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

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

	//Setters & Getters
}
```

Engine.java

```
package annotations.onetoone;

@Entity
@Table(name="engine")
public class Engine {

	@Id
	private int id = 0;

	@Column
	private String model = null;

	@Column
	private String size = null;


	@OneToOne(targetEntity=Car.class,cascade=CascadeType.ALL)
	 @JoinColumn(name="CAR_ID",referencedColumnName="CAR_ID")
	private Car car = null;

	//Setters & Getters
}
```

OneToOneTest.java

```
package annotations.onetoone;


public class OneToOneTest {
public static void main(String[] args) {

	Configuration cfg = new AnnotationConfiguration();
	cfg.configure("hibernate.cfg.xml");


	SessionFactory sf = cfg.buildSessionFactory();
	Session session = sf.openSession();

	Car car = new Car();
	car.setId(2);
	car.setName("BENZ");
	car.setColor("RED");

	Engine engine = new Engine();
	engine.setModel("2209");
	engine.setSize("815KG");
	engine.setCar(car);

	Transaction tx = session.beginTransaction();
	session.save(car);
	session.save(engine);
	tx.commit();
	System.out.println("Succuess");
}
}
```

```
mysql> select * from car;
+--------+------+-------+
| CAR_ID | NAME | COLOR |
+--------+------+-------+
|      2 | BENZ | RED   |
+--------+------+-------+
1 row in set (0.00 sec)
```

```
mysql> select * from engine;
+--------+-------+-------+------+
| CAR_ID | size  | MODEL | id   |
+--------+-------+-------+------+
|      2 | 815KG | 2209  |    0 |
+--------+-------+-------+------+
1 row in set (0.00 sec)
```

## 2.one-to-many Mapping Using Annotations

Actor.java

```
package annotations.onetomany;

@Entity
@Table(name="actor")
public class Actor {
	@Id
	@Column
	private int actorid;

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

	@Column
	private int age;

	//Setters & Getters

}
```

Movie.java

```
package annotations.onetomany;

@Entity
@Table(name="movie")
public class Movie {

	@Id
	@Column
	private int mid;

	@Column
	private String title;

	 @OneToMany(cascade = CascadeType.ALL)
	 @JoinColumn(name="mid",referencedColumnName="mid")
	private Set<Actor> actors;
	//Setters & Getters
}
```

OneToManyTest.java

```
package annotations.onetomany;

public class OneToManyTest {
public static void main(String[] args) {
	Configuration cfg = new AnnotationConfiguration();
	cfg.configure("hibernate.cfg.xml");


	SessionFactory sf = cfg.buildSessionFactory();
	Session session = sf.openSession();

	Actor amir = new Actor();
	amir.setActorname("PRABAS");
	amir.setAge(36);
	amir.setActorid(106);

	Actor madhav = new Actor();
	madhav.setActorname("DAGGUBATI RANA");
	madhav.setAge(31);
	madhav.setActorid(107);

	Actor kareena = new Actor();
	kareena.setActorname("KATTAPPA");
	kareena.setAge(61);
	kareena.setActorid(108);

	Set<Actor> actors =new HashSet<Actor>();
	actors.add(amir);
	actors.add(madhav);
	actors.add(kareena);


	Movie movie = new Movie();
	movie.setTitle("BAAHUBALI");
	movie.setActors(actors);
	movie.setMid(502);

	Transaction tx = session.beginTransaction();
	session.save(movie);
	tx.commit();
	System.out.println("Succuess");
}
}
```

```
mysql> select * from movie;
+-----+-----------+
| mid | title     |
+-----+-----------+
| 502 | BAAHUBALI |
+-----+-----------+
1 row in set (0.00 sec)
```

```
mysql> select * from actor;
+------+---------+----------------+------+
| mid  | actorid | name           | age  |
+------+---------+----------------+------+
|  502 |     106 | PRABAS         |   36 |
|  502 |     107 | DAGGUBATI RANA |   31 |
|  502 |     108 | KATTAPPA       |   61 |
+------+---------+----------------+------+
3 rows in set (0.00 sec)
```

## 3.Many-to-many Mapping Using Annotations

Course.java

```
package annotations.manytomany;

@Entity
@Table(name="course")
public class Course {

	@Id
	@Column
	private int courseId;

	@Column
	private String courseName;

	@ManyToMany(fetch = FetchType.LAZY, cascade = CascadeType.ALL)
	@JoinTable(name = "student_course",   joinColumns = {
	@JoinColumn(name = "COURSE_ID", nullable = false, updatable = false) },
	inverseJoinColumns = { @JoinColumn(name = "STUDENT_ID",
                                nullable = false, updatable = false) })
	private Set<Student> students;

	 //Setters & Getters

}
```

Student.java

```
package annotations.manytomany;

@Entity
@Table(name="student")
public class Student {
	@Id
	@Column
	private int studentId;

	@Column
	private String studentName;

	@Column
	@ManyToMany(mappedBy = "students")
	private Set<Course> courses;

	//Setters & Getters
}
```

ManyToMantTest.java

```
package annotations.manytomany;
public class ManyToManyTest {
public static void main(String[] args) {
	Configuration cfg = new AnnotationConfiguration();
	cfg.configure("hibernate.cfg.xml");
	SessionFactory sf = cfg.buildSessionFactory();
	Session session = sf.openSession();

	Student s1 = new Student();
	 s1.setStudentId(105);
	 s1.setStudentName("SACHIN");
	 Student s2 = new Student();
	 s2.setStudentId(112);
	 s2.setStudentName("DHONI");


	 Course c1 = new Course();
	 c1.setCourseId(303);
	 c1.setCourseName("DEVOPS");
	 Course c2 = new Course();
	 c2.setCourseId(304);
	 c2.setCourseName("HACKING");

	 Set<Student> students = new HashSet<Student>();
	 students.add(s1);
	 students.add(s2);
	 c1.setStudents(students);
	 c2.setStudents(students);


	 Set<Course> courses = new HashSet<Course>();
	 courses.add(c1);
	 courses.add(c2);
	 s1.setCourses(courses);
	 s2.setCourses(courses);

//we have to save the Course object, because we defiend M2M in Course class only
	Transaction tx = session.beginTransaction();
	session.save(c1);
	session.save(c2);
	tx.commit();
	System.out.println("Succuess");
}
}
```

```
mysql> select * from course;
+----------+------------+
| courseId | courseName |
+----------+------------+
|      303 | DEVOPS     |
|      304 | HACKING    |
+----------+------------+
2 rows in set (0.00 sec)
```

```
mysql> select * from student_course;
+------------+------------+
| COURSE_ID | STUDENT_ID |
+------------+------------+
|       303 |        105 |
|       303 |        112 |
|       304 |        105 |
|       304 |        112 |
+------------+------------+
```

```
mysql> select * from student;
+------------+-------------+
| studentId | studentName |
+------------+-------------+
|        105 | SACHIN      |
|        112 | DHONI       |
+------------+-------------+
2 rows in set (0.00 sec)
```

# Errors & Solutions

## org.hibernate.HibernateException: Could not parse configuration: hibernate.cfg.xml

It was failing because there was no internet connection / you are behind proxy. To solve this issues

- Extract hibernate3.jar file find hibernate-mapping-3.0.dtd, hibernate-configuration-3.0.dtd files
- Paste the above two files root folder of your project

In **hibernate.cfg.xml** change lines to

```
<?xml version='1.0' encoding='utf-8'?>
<!DOCTYPE hibernate-configuration SYSTEM
"hibernate-configuration-3.0.dtd">
```

In **<Class>.hbm.xml** change lines to

```
<?xml version="1.0"?>
<!DOCTYPE hibernate-mapping SYSTEM
"hibernate-mapping-3.0.dtd">
```

# References


http://www.java4s.com/hibernate

Mappings: OReilly.Just.Hibernate.Jun.2014.ISBN.1449334377.pdf

**Hibernate Properties:** properties you would require to configure for a database in a standalone situation.

| | |
|---|---|
| 1 | **hibernate.dialect**<br>This property makes Hibernate generate the appropriate SQL for the chosen database. |
| 2 | **hibernate.connection.driver_class**<br>The JDBC driver class. |
| 3 | **hibernate.connection.url**<br>The JDBC URL to the database instance. |
| 4 | **hibernate.connection.username**<br>The database username. |
| 5 | **hibernate.connection.password**<br>The database password. |
| 6 | **hibernate.connection.pool_size**<br>Limits the number of connections waiting in the Hibernate database connection pool. |
| 7 | **hibernate.connection.autocommit**<br>Allows autocommit mode to be used for the JDBC connection. |

If you are using a database along with an application server and JNDI

| | |
|---|---|
| 1 | **hibernate.connection.datasource**<br>The JNDI name defined in the application server context you're using for the application. |
| 2 | **hibernate.jndi.class**<br>The InitialContext class for JNDI. |
| 3 | **hibernate.jndi.<JNDIpropertyname>**<br>Passes any JNDI property you like to the JNDI InitialContext. |
| 4 | **hibernate.jndi.url**<br>Provides the URL for JNDI. |
| 5 | **hibernate.connection.username**<br>The database username. |
| 6 | **hibernate.connection.password**<br>The database password. |

## Core Interfaces in Hibernate

*Configuration:*

*Application use configuration instance to specify the location of mapping docs and hibernate specific properties.*

*Application get instance of SessionFactory from Configuration .*

*SessionFactory :*

*Application get instance of session from SessionFactory .*
*Not light weighted.*
*Thread safe*
*Single session factory for whole application*

*Session interface:*
*Session interface is primary interface use by hibernate applications.*

*Transaction:*
*Application get an instance of Transaction from Session.*

*Query and Criteria Interface:*

*The query interface allowed you to perform queries against the database and control how the query is executed.*

```
<?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="connection.driver_class">com.microsoft.jdbc.sqlserver.SQLServerDriver</property>
        <property name="connection.url">jdbc:microsoft:sqlserver://10.7.100.146:143;databasename=YashTraining</property>
        <property name="connection.username">trainingyash</property>
        <property name="connection.password">trainingyash</property>

<!-- JDBC connection pool (use the built-in) -->

        <property name="connection.pool_size">1</property>
        <property name="dialect">org.hibernate.dialect.SQLServerDialect</property>

<!-- Echo all executed SQL to stdout -->

        <property name="show_sql">true</property>

<!--create-drop,create,update the database schema on startup -->

        <property name="hbm2ddl.auto">update</property>
        <mapping resource="HighScore.hbm.xml"/>
        <mapping resource="GameScore.hbm.xml"/>

</session-factory>
</hibernate-configuration>
```

*Used to Map Persistance class with OracleDatabse.*

*that means Persistanec class will communicate with Database*

## Hibernate JDBC Properties

| Property name | Purpose |
|---|---|
| hibernate.connection.driver_class | *jdbc driver class* |
| hibernate.connection.url | *jdbc URL* |
| hibernate.connection.username | *database user* |
| hibernate.connection.password | *database user password* |
| hibernate.connection.pool_size | *maximum number of pooled connections* |

## Hibernate Datasource Properties

| Property name | Purpose |
|---|---|
| hibernate.connection.datasource | *datasource JNDI name* |
| hibernate.jndi.url | *URL of the JNDI provider* (optional) |
| hibernate.jndi.class | *class of the JNDI* `InitialContextFactory` (optional) |
| hibernate.connection.username | *database user* (optional) |
| hibernate.connection.password | *database user password* (optional) |

## Dialect:

*Type of Database Software using in our HIBERNATE application, with version*

| | |
|---|---|
| Oracle (any version) | org.hibernate.dialect.OracleDialect |
| Oracle 11g | org.hibernate.dialect.Oracle10gDialect |
| Oracle 10g | org.hibernate.dialect.Oracle10gDialect |
| Oracle 9i | org.hibernate.dialect.Oracle9iDialect |
| MySQL | org.hibernate.dialect.MySQLDialect |
| Microsoft SQL Server 2000 | org.hibernate.dialect.SQLServerDialect |
| Microsoft SQL Server 2005 | org.hibernate.dialect.SQLServer2005Dialect |
| Microsoft SQL Server 2008 | org.hibernate.dialect.SQLServer2008Dialect |
| DB2 | org.hibernate.dialect.DB2Dialect |
| HSQLDB | org.hibernate.dialect.HSQLDialect |

org.hibernate.dialect.

| |
|---|
| PostgreSQL |
| Progress |
| SAP DB |
| Sybase |
| Sybase Anywhere |
| DB2 |
| HSQLDB |
| HypersonicSQL |
| Informix |
| Ingres |
| Interbase |

## Mapping Configuration File

*1.You should save the mapping document in a file with the format <classname>.hbm.xml.*

*2.<hibernate-mapping> as the root element which contains all the <class> elements.*

*3.The <class> elements are used to define specific mappings from a Java classes to the database tables*

*4.The Java class name is specified using the "name" attribute*

*5. the database table name is specified using the "table" attribute.*

*6.The <id> element maps the unique ID attribute in class to the primary key of the database table.*

*7.The "name" attribute of the id element refers to the column in the database table.*

*8.The <property> element is used to map a Java class property to a column in the database table.*

*9.The "name" attribute of the element refers column in the database table.*

```
<hibernate-mapping>

    <class name="persistance.IdName" table="idname">

            <id name = "id"  column = "id"/>
            <property name = "name"  column = "name"/>

</class>

</hibernate-mapping>
```