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Hibernate Essentials

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About Me

- Maruthi R Janardhan
  - Been doing java since jdk 1.2
  - Been with IBM, ANZ, HCL-HP, my own startup Leviossa..
  - Total 16 years programming C, C++, Java, Ruby, Perl, Python, PHP, etc

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ORM

- Object Relational Mapping
  - Does all the plumbing work
  - Acts as a layer of abstraction over JDBC and keeps the code queries database independent (ideally)
  - Allows for a lot of easy programming fragments
  - Special patterns allow loading only whats needed

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Comparison

```
Statement statement =
getCon().createStatement();
ResultSet rs =
statement.executeQuery("select * from
users");
List<User> users = new
ArrayList<User>();
while(rs.next()){
    User u = new User();
    u.setId(rs.getInt("id"));
    u.setAge(rs.getInt("age"));
u.setEmailId(rs.getString(“email_id"));
u.setJoinDate(rs.getDate(“join_date"));
    u.setName(rs.getString(“name"));
u.setPassword(rs.getString(“password”))
;
u.setState(rs.getString("state"));
       users.add(u);
}
return users;
```

```
session.createQuery("select u from
User u").list();
```

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Standard SQL

Derby

```
CREATE TABLE users
(
    id INTEGER NOT NULL GENERATED
    ALWAYS AS IDENTITY (START WITH 1, INCREMENT BY 1),
    name varchar(100),
    email_id varchar(100) ,
    password varchar(100) ,
    join_date timestamp ,
    age int  ,
    state varchar(2) ,
    CONSTRAINT primary_key_users PRIMARY KEY (id)
)
```

MySql

```
CREATE TABLE `users` (
  `id` int(10) unsigned NOT NULL AUTO_INCREMENT,
  `email` varchar(255) COLLATE utf8_unicode_ci NOT NULL,
  `name` varchar(255) COLLATE utf8_unicode_ci NOT NULL,
  `password` varchar(255) COLLATE utf8_unicode_ci NOT NULL,
  `created_at` timestamp NOT NULL DEFAULT '0000-00-00 00:00:00',
  `updated_at` timestamp NOT NULL DEFAULT '0000-00-00 00:00:00',
  `remember_token` varchar(100) COLLATE utf8_unicode_ci DEFAULT NULL,
  PRIMARY KEY (`id`),
  UNIQUE KEY `users_email_unique` (`email`)
) ENGINE=InnoDB AUTO_INCREMENT=4 DEFAULT CHARSET=utf8 COLLATE=utf8_unicode_ci;
```

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Hibernate Dialects

```
<property
name=“hibernate.dialect">org.hibernate.dialect.DerbyDialect</
property>

OR

<property
name="hibernate.dialect">org.hibernate.dialect.MySqlDialect</
property>
```

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Loading Relationships

```
List<Users> userList = session.createQuery("select u from User
u").list();
for (Users u : userList) {
   Set<Orders> orders = u.getOrders();
}
```

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Configuring Session Factory

```
<hibernate-configuration>
 <session-factory>
  <property
name="hibernate.connection.driver_class">org.apache.derby.jdbc.ClientDri
ver</property>
  <property name="hibernate.connection.password">app</property>
  <property name="hibernate.connection.url">jdbc:derby://localhost:
1527//Users/maruthir/Documents/Training/workspace/CRUD/WebContent/WEB-
INF/mydb</property>
  <property name="hibernate.connection.username">APP</property>
  <property
name="hibernate.dialect">org.hibernate.dialect.DerbyDialect</property>
  <property name="hibernate.show_sql">true</property>
  <mapping resource="com/mydomain/model/Users.hbm.xml"/>
 </session-factory>
</hibernate-configuration>
```

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Mapping Objects

```
<hibernate-mapping>
   <class name="com.mydomain.model.Users" table="USERS" schema="APP">
      <id name="id" type="int">
         <column name="ID" />
         <generator class="native" />
      </id>
      <property name="name">
         <column name="NAME"/>
      </property>
      <property name="emailId">
         <column name="EMAIL_ID"/>
      </property>
</hibernate-mapping>
```

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Loading SessionFactory And Querying

```
Configuration configuration = new
Configuration().configure("hibernate.cfg.xml");
        ServiceRegistry serviceRegistry
            = new StandardServiceRegistryBuilder()
                .applySettings(configuration.getProperties()).build();
SessionFactory sessionFactory =
configuration.buildSessionFactory(serviceRegistry);

Session session = sessionFactory.openSession();
List<Users> userList = session.createQuery("select u from User
u”).list();
System.out.println(userList);
session.close();
```

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Annotation Based Config

- Instead of mapping hbm.xml, the configuration can be done with annotations too

- Mapping resource change in hibernate.cfg.xml:

```
<mapping class="com.mydomain.model.Users"/>
```

- Mapping on entity

```
@Entity
@Table(name="USERS")
public class Users implements java.io.Serializable {

    @Id
    @GeneratedValue(strategy=GenerationType.AUTO)
    private Integer id;
    @Column(name = "EMAIL_ID", nullable = true, length=100)
    private String emailId;
    @OneToMany
    private Set<Orders> orders;
```

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Saving Data

- Create a new User object, set all fields except the ID

- call session.save()

- Wrap it in a transaction

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

Updating Data

- Create an User object
- Set all fields including the ID field
- call session.update() wrapped in a transaction

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An Experiment

- Open a session and start a transaction
- Load all users and print them
- Now create an user object and set all fields including id for updating
- call session.update
- Commit transaction

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Session Cache

- Session acts like a first level cache
- Session.evict removes an object from session cache
- Session.clear removes all objects from session
- Create a new object, save it with Session.save, then modify the object and commit the transaction

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More About Session

- Create a new object, save it with Session.save, then modify the object, evict the object using session.evict() and commit the transaction

- Create a new object, save it with Session.save, then modify the object, flush using session.flush(), evict the object using session.evict() and commit the transaction

Problems With Session Cache

- Session cache can cause memory issues in long running operations with heavy data.
- Flush and clear the session often in long running operations

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Session Behaviour

- Open two sessions, start two transactions, read an user object using session.load(User.class,id) in both sessions
- Modify age field in both objects
- Commit both transactions
- Re-run the same program

Session Cache

- Session keeps a copy of every loaded object in its original form and knows when an object is modified by means of comparing with existing objects at the time of commit.

- If the object has not changed, there is no update done

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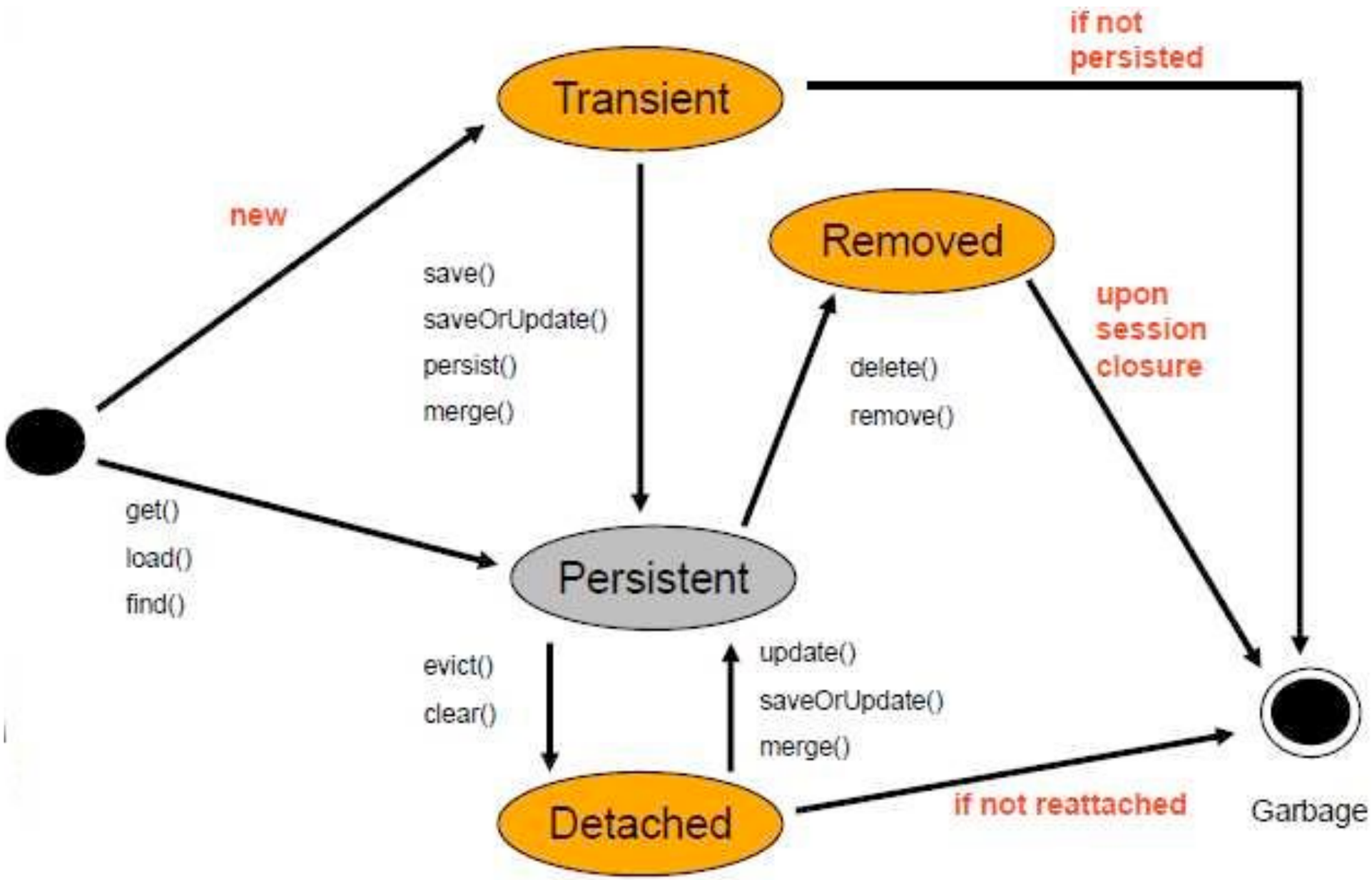
Bean Life Cycle



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Transaction Isolation

Isolation Level	Dirty Read	Nonrepeatable Read	Phantom Read
READ UNCOMMITTED	Permitted	Permitted	Permitted
READ COMMITTED	--	Permitted	Permitted
REPEATABLE READ	--	--	Permitted
SERIALIZABLE	--	--	--

- <property name="hibernate.connection.isolation">2</property>
- 1: READ UNCOMMITTED
- 2: READ COMMITTED
- 4: REPEATABLE READ
- 8: SERIALIZABLE

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Isolation Behaviour 1

- Open two sessions, start two transactions, read an user object using session.load(User.class,id) in both sessions
- Modify age field in both objects
- Commit both transactions
- Repeat the program with isolation setting 8,4,2

```
<property name="hibernate.connection.isolation">8</property>
```

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Isolation Behaviour 2

- Open two sessions, start two transactions, select all users using

```
List<Users> userList = session.createQuery("select u from User
u”).list();
```

- Create a new user object and call session.save in any one session
- Commit both transactions
- Repeat the program with isolation setting 8,4,2

```
<property name="hibernate.connection.isolation">8</property>
```

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Optimistic Locking

- Use a lower isolation level but prevent objects from being overwritten in other transactions
- Map the PRODUCTS table to Product entity
- Map the version column after id column in hbm like this: <version column="version" name="version" type="int" insert="false" />
- Repeat the isolation behaviour 1 program with isolation setting removed

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Mapping Relationships

- One to Many
- Many to Many
- Many to One
- One to One

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One to Many

- Map the order table's fields to an Order entity with a hbm.xml

- Define a "Set<Order> orders" property in User entity

- In User.hbm.xml mention this relationship

```
<set name="orders">
   <key column="order_id" not-null="true" />
   <one-to-many class="com.mydomain.model.Orders" />
</set>
```

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Many to One

- Define a property “private User user” in Order class

- Define the Many to One relationship

```
<many-to-one name="user" column="user_id"
                class="com.mydomain.model.Users" not-null="true"/>
```

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Many to Many

- Map the “Products” table to Product entity in hbm.xml
- In Order entity create a “Set<Product> products” property
- Map the many to many relationship in orders.hbm.xml using the intermediate table

```
<set name="products" table="PRODUCT_ORDER_LNK">
    <key column="order_id" />
    <many-to-many column="product_id" class="com.mydomain.model.Products" />
</set>
```

- Map the reverse relationship from Product to order aswell

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One to One

- Map the Billing_info table to BillingInfo entity in hbm.xml
- In Order create a “BillingInfo billingInfo” property
- Then provide the mapping in order.hbm.xml

```
<one-to-one name="billingInfo" class="com.mydomain.model.BillingInfo"
        cascade="all" foreign-key="order_id"></one-to-one>
```

Transform the WebApp to Hibernate

- A WebApp implemented with JDBC is shared (HibernateWebApp). Transform that to use hibernate.

- Create a class HibernateUtil that loads the SessionFactory from configuration.

- Bring in User<—>Order relationship and in User::getOrderCount, return orders.size();

- Change getAllUsers method to use hibernate

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Basic HibernateUtil

```
public class HibernateUtil {

   private static SessionFactory sesFac = null;
   static{
       Configuration configuration = new
Configuration().configure("hibernate.cfg.xml");
        ServiceRegistry serviceRegistry
            = new StandardServiceRegistryBuilder()
                .applySettings(configuration.getProperties()).build();
       sesFac = configuration.buildSessionFactory(serviceRegistry);
   }

   public static Session getSession(){
      return sesFac.openSession();
   }
}
```

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Lazy Initialisation

- Works on one to many, many to many and many to one relationships

- Javassist (Java programming assistant) is a Java library providing a means to manipulate the Java bytecode of an application.

  - Support for structural reflection, i.e. the ability to change the implementation of a class at run time.

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Open Session-in-view

- Design Pattern for solving lazy loading issues in Web apps
- A filter opens a session and sets it in a thread-local
- DAO uses the session from thread-local

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Filter For This Pattern

```
public void doFilter(ServletRequest req, ServletResponse res, FilterChain chain) throws
IOException, ServletException {
    Transaction tx=null;
    HttpServletRequest request = (HttpServletRequest) req;
    try {
        //Begin and Commit Transaction
        Session ses = HibernateUtil.currentSession();
        tx = ses.beginTransaction();
        chain.doFilter(req, res);
        tx.commit();
    } catch (Exception e) {
        tx.rollback();
        throw new ServletException(e);
    } finally {
        HibernateUtil.closeSession();
    }
}
```

```
<filter>
    <filter-name>HibernateSessionFilter</filter-name>
    <filter-class>com.mydomain.HibernateSessionFilter</filter-class>
</filter>
<filter-mapping>
    <filter-name>HibernateSessionFilter</filter-name>
    <url-pattern>/*</url-pattern>
</filter-mapping>
```

Hibernate Interceptors

- Interceptors in hibernate are fired for various events in the session and session factory

- There can be an interceptor for the entire session factory or one for each session.

- Create a class that extends EmptyInterceptor and override onSave() method. Update the join date of a user whenever an user is saved

- Also prevent users from saving string data with leading/trailing spaces

- Override the onFlushDirty method to update the modified date each time an user is updated