*Web*开发技术

*Web Application Development*

# 第10课
# WEB后端框架-O/R映射I

**Episode Ten**

## O/R Mapping

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# Overview



- O/R mapping
  - Basic O/R Mapping
  - Relationship Mapping
  - Work with Objects
  - Id Mapping
  - Id Generator

# O/R Mapping



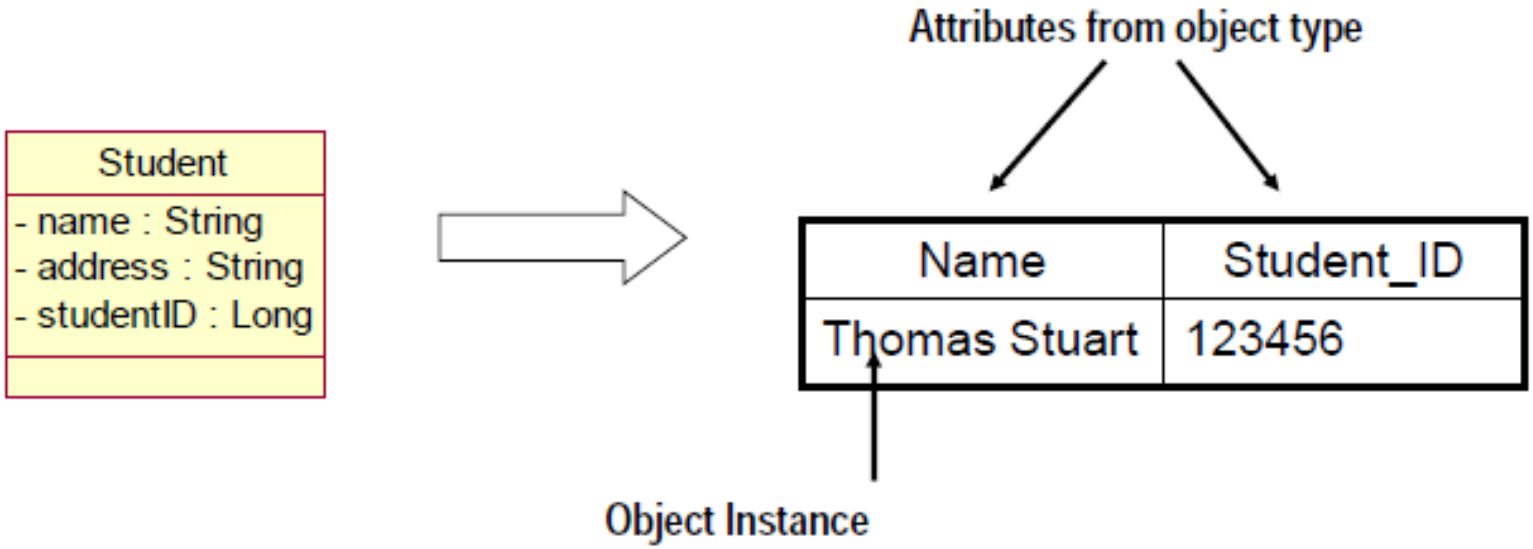
- The term Object/Relational Mapping refers to
  - the technique of mapping data from an object model representation to a relational data model representation (and visa versa)

- Hibernate is an Object/Relational Mapping solution for Java environments.

# Mapping Persistent Classes to Tables



- In a relational database
  - Every row is regarded as an object
  - A column in a table is equivalent to a persistent attribute of a class



# Hibernate – first class



- Event.class

```
import java.util.Date;
public class Event {
    private Long id;
    private String title;
    private Date date;

    public Event() {}
    public Long getId() { return id; }
    private void setId(Long id) { this.id = id; }
    public Date getDate() { return date; }
    public void setDate(Date date) { this.date = date; }
    public String getTitle() { return title; }
    public void setTitle(String title) { this.title = title; }
}
```

# Hibernate – mapping



- Event.hbm.xml

```
<hibernate-mapping package=“Sample.Entity">
    <class name="Event" table="EVENTS">
        <id name="id" column="EVENT_ID">
            <generator class="native"/>
        </id>
        <property name="date" type="timestamp"
                  column="EVENT_DATE"/>
        <property name="title"/>
    </class>
</hibernate-mapping>
```

# Hibernate – configuration



- hibernate.cfg.xml

```
<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/test</property>
        <property name="connection.username">root</property>
        <property name="connection.password">12345678</property>

        <!-- JDBC connection pool (use the built-in) -->
        <property name="connection.pool_size">1</property>

        <!-- SQL dialect -->
        <property name="dialect">org.hibernate.dialect.MySQL5Dialect</property>

        <!-- Enable Hibernate's automatic session context management -->
        <property name="current_session_context_class">thread</property>
```

# Hibernate – configuration

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- hibernate.cfg.xml

```
        <!-- Disable the second-level cache  -->
        <property name="cache.provider_class">
            org.hibernate.cache.internal.NoCacheProvider
        </property>

        <!-- Echo all executed SQL to stdout -->
        <property name="show_sql">true</property>

        <!-- Drop and re-create the database schema on startup -->
        <property name="hbm2ddl.auto">update</property>

        <mapping resource="Sample/Entity/User.hbm.xml"/>

    </session-factory>

</hibernate-configuration>
```

# Helper class



```
import org.hibernate.SessionFactory;
import org.hibernate.cfg.Configuration;

public class HibernateUtil {
    private static final SessionFactory sessionFactory = buildSessionFactory();
    private static SessionFactory buildSessionFactory() {
        try {
            // Create the SessionFactory from hibernate.cfg.xml
            return new Configuration().configure().buildSessionFactory(); }
        catch (Throwable ex) {
            // Make sure you log the exception, as it might be
            System.err.println("Initial SessionFactory creation failed." + ex);
                    throw new ExceptionInInitializerError(ex);
        }
    }
    public static SessionFactory getSessionFactory() {
        return sessionFactory;
    }
}
```

# Servlet - storing object



```
@WebServlet("/EventServlet")
public class EventServlet extends HttpServlet {
    protected void processRequest(HttpServletRequest request,
            HttpServletResponse response) throws ServletException, IOException {
        ……
        try {
            String title = (String) request.getParameter("title");
            SimpleDateFormat sdf = new SimpleDateFormat("yyyy-MM-dd");
            String datestr = (String) request.getParameter("date");
            Date date=sdf.parse(datestr);
            Session session =
                        HibernateUtil.getSessionFactory().getCurrentSession();
            session.beginTransaction();
            Event t = new Event();
            t.setDate(date);
            t.setTitle(title);
            session.save(t);
            session.getTransaction().commit();
```

# Servlet - loading object



```
out.println("<h1>The event has been inserted!</h1><br>");

session = HibernateUtil.getSessionFactory().getCurrentSession();
session.beginTransaction();
List events = session.createQuery("from Event").list();
session.getTransaction().commit();
for (int i = 0; i < events.size(); i++) {
   Event theEvent = (Event) events.get(i);
   out.println("id: " + theEvent.getId() + "<br>" + "title: "
               + theEvent.getTitle() + “<br>” + “date: ”
                 + theEvent.getDate()
               + "<br><br>");
```

……

# Mapping associations



- Person.class

```
package org.hibernate.tutorial.domain;
public class Person {
    private Long id;
    private int age;
    private String firstname;
    private String lastname;
    public Person() {}
  //Accessor methods for all properties, private setter for 'id'
    ……
    private Set events = new HashSet();
    public Set getEvents() { return events; }
    public void setEvents(Set events) { this.events = events; }
}
```

# Unidirectional association



- Person.hbm.xml

```
<class name="Person" table="PERSON">
    <id name="id" column="PERSON_ID">
        <generator class="native"/>
    </id>
    <property name="age"/>
    <property name="firstname"/>
    <property name="lastname"/>
    <set name="events" table="PERSON_EVENT">
        <key column="PERSON_ID"/>
        <many-to-many column="EVENT_ID" class="Event"/>
    </set>
</class>
```

- Hibernate's configuration

```
<mapping resource="org/hibernate/tutorial/domain/Event.hbm.xml"/>
<mapping resource="org/hibernate/tutorial/domain/Person.hbm.xml"/>
```

# Database Schema

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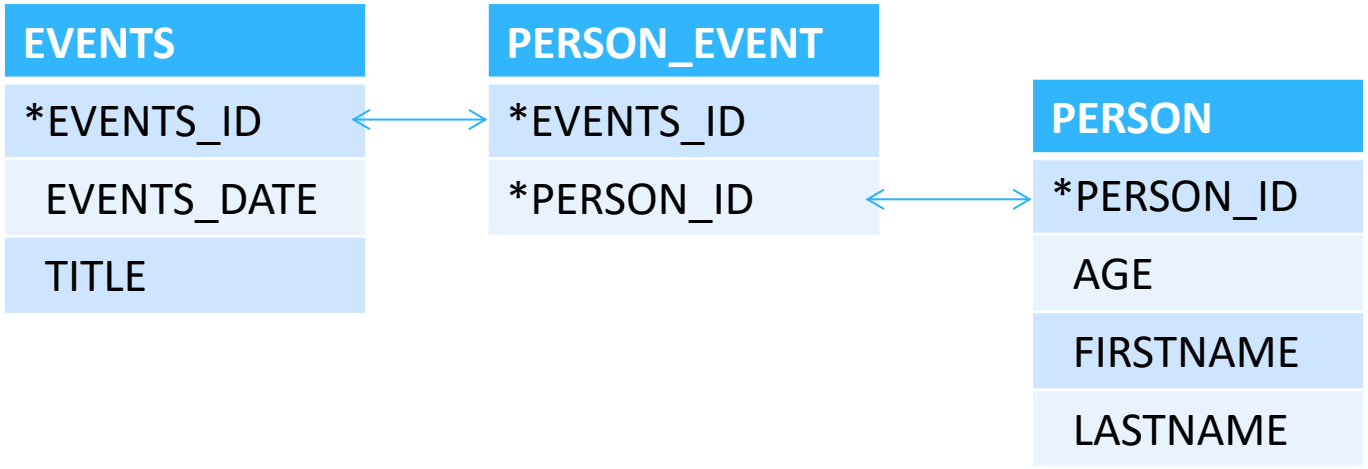

# Working the association



```
@WebServlet("/PersonServlet")
public class PersonServlet extends HttpServlet {
    protected void processRequest(HttpServletRequest request,
         HttpServletResponse response) throws ServletException, IOException {
            ……
            String event = (String) request.getParameter("event");
            String person = (String) request.getParameter("person");
            long eventId = new Long(event);
            long personId = new Long(person);

            Session session = HibernateUtil.getSessionFactory().getCurrentSession();
            session.beginTransaction();
            Person aPerson = (Person) session.createQuery(
                  "select p from Person p left join fetch p.events where p.id = :pid").
                   setParameter("pid", personId).uniqueResult();
            Event anEvent = (Event) session.load(Event.class, eventId);
            session.getTransaction().commit();

                 aPerson.getEvents().add(anEvent);

            session = HibernateUtil.getSessionFactory().getCurrentSession();
            session.beginTransaction();
            session.update(aPerson);
            session.getTransaction().commit();
```

# Database Schema

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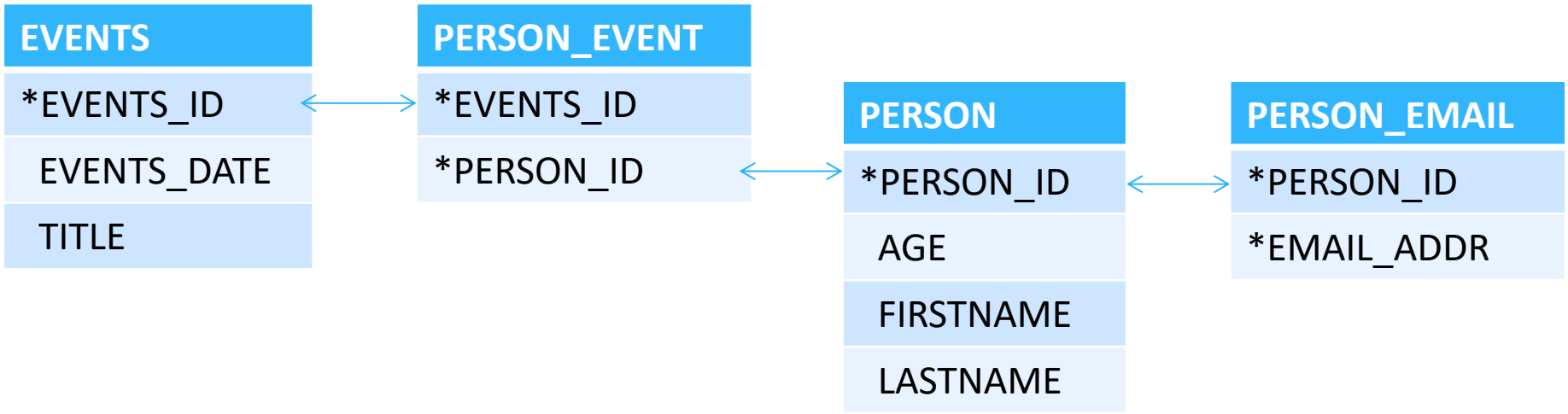

# Mapping associations



- Person.class

```
public class Person {
    private Long id;
    private int age;
    private String firstname;
    private String lastname;
    public Person() {}
    // Accessor methods for all properties, private setter for 'id'

    private Set events = new HashSet();
    public Set getEvents() { return events; }
    public void setEvents(Set events) { this.events = events; }

    private Set emailAddresses = new HashSet();
    public Set getEmailAddresses() { return emailAddresses; }
    public void setEmailAddresses(Set emailAddresses)
    { this.emailAddresses = emailAddresses; }
}
```

# Unidirectional association



- Person.hbm.xml

```
<class name="Person" table="PERSON">
    <id name="id" column="PERSON_ID">
        <generator class="native"/>
    </id>
    <property name="age"/>
    <property name="firstname"/>
    <property name="lastname"/>
    <set name="events" table="PERSON_EVENT">
        <key column="PERSON_ID"/>
        <many-to-many column="EVENT_ID" class="Event"/>
    </set>
    <set name="emailAddresses" table="PERSON_EMAIL">
        <key column="PERSON_ID"/>
        <element type="string" column="EMAIL_ADDRESS"/>
    </set>
</class>
```

# Collection of values



```
private void addEmailToPerson(Long personId, String emailAddress) {
    Session session = HibernateUtil.getSessionFactory().getCurrentSession();
    session.beginTransaction();
    Person aPerson = (Person) session.load(Person.class, personId);
    session.getTransaction().commit();

    session = HibernateUtil.getSessionFactory().getCurrentSession();
    session.beginTransaction();
    session.refresh(aPerson);
    aPerson.getEmailAddresses().add("new@new.com");
    session.getTransaction().commit();
}
```

# Bi-directional association



- Event.class

```
public class Event {
 private Long id;
 private String title;
 private Date date;
 public Event() {}
 public Long getId() { return id; }
 private void setId(Long id) { this.id = id; }
 public Date getDate() { return date; }
 public void setDate(Date date) { this.date = date; }
 public String getTitle() { return title; }
 public void setTitle(String title) { this.title = title; }

 private Set participants = new HashSet();
 public Set getParticipants() { return participants; }
 public void setParticipants(Set participants) {
    this.participants = participants;
 }
}
```

# Hibernate – mapping



- Event.hbm.xml

```
<hibernate-mapping package="org.hibernate.tutorial.domain">
    <class name="Event" table="EVENTS">
        <id name="id" column="EVENT_ID">
            <generator class="native"/>
        </id>
        <property name="date" type="timestamp"
                  column="EVENT_DATE"/>
        <property name="title"/>
        <set name="participants" table="PERSON_EVENT" inverse="true">
           <key column="EVENT_ID"/>
           <many-to-many column="PERSON_ID" class="Person"/>
       </set>
    </class>
</hibernate-mapping>
```

# Collection of values

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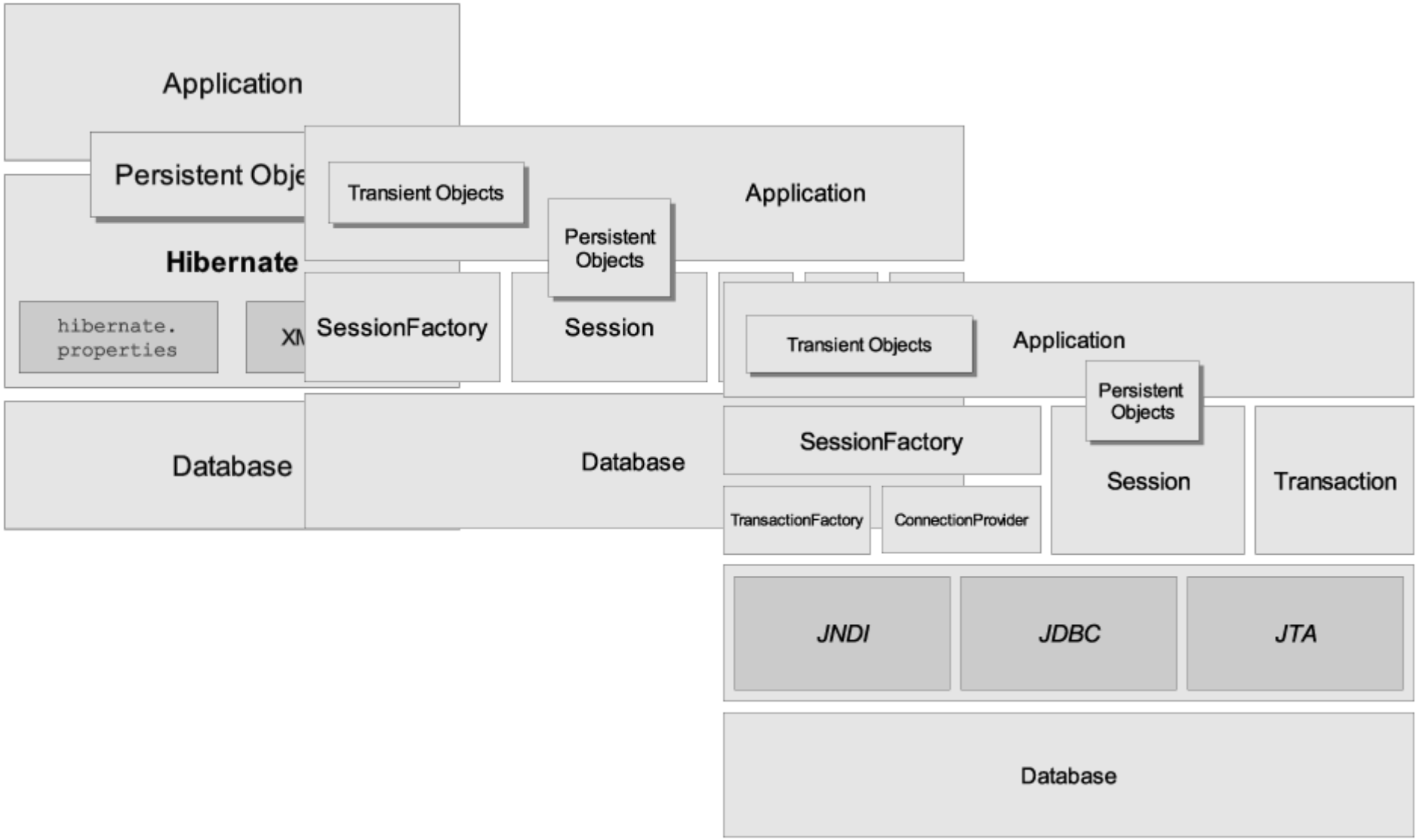
```
private void addEmailToPerson(Long personId, String emailAddress) {
    Session session =
            HibernateUtil.getSessionFactory().getCurrentSession();
    session.beginTransaction();
    Person aPerson = (Person) session.load(Person.class, personId);
    session.getTransaction().commit();

    session = HibernateUtil.getSessionFactory().getCurrentSession();
    session.beginTransaction();
    session.refresh(anEvent);
    Set participants = anEvent.getParticipants();
    Iterator iter = participants.iterator();
    while(iter.hasNext()){
      Person thePerson = (Person)iter.next();
      out.println("Participant: " + thePerson.getFirstname() + " " +
                  thePerson.getLastname() + "<br><br>");
    }
    session.getTransaction().commit();
}
```

# Architecture





# Basic API



- SessionFactory (org.hibernate.SessionFactory)
- Session (org.hibernate.Session)
- Persistent objects and collections
- Transient and detached objects and collections
- Transaction (org.hibernate.Transaction)(Optional)
- ConnectionProvider (org.hibernate.connection.ConnectionProvider)(Optional)
- TransactionFactory (org.hibernate.TransactionFactory)(Optional)
- *Extension Interfaces*

# Entity



- An entity is a regular Java object (aka POJO) which will be persisted by Hibernate.

```
@Entity
public class Flight implements Serializable {

   Long id;

   @Id
   public Long getId() { return id; }
   public void setId(Long id) { this.id = id; }
}
```

# Entity



```
@Entity
@Table(name="TBL_FLIGHT",
       schema="AIR_COMMAND",
       uniqueConstraints=
              @UniqueConstraint(
                name="flight_number",
                columnNames={"comp_prefix","flight_number"} ) )
public class Flight implements Serializable {

    @Column(name="comp_prefix")
    public String getCompagnyPrefix() {
      return companyPrefix;
    }

    @Column(name="flight_number")
    public String getNumber() { return number; }
}
```

# Entity



```
name="ClassName“
table="tableName“
discriminator-value="discriminator_value“
mutable="true|false“
schema="owner“
catalog="catalog“
proxy="ProxyInterface“
dynamic-update="true|false“
dynamic-insert="true|false“
select-before-update="true|false“
polymorphism="implicit|explicit“
where="arbitrary sql where condition
persister="PersisterClass“
batch-size="N“
optimistic-lock="none|version|dirty|all“
lazy="true|false"
entity-name="EntityName"
check="arbitrary sql check condition"
rowxml:id="rowid"
subselect="SQL expression"
abstract="true|false"
node="element-name"
```

# Identifiers



```
@Entity
public class Person {
    @Id Integer getId() { ... }
    ...
}

<id
    name="propertyName"
    type="typename"
    column="column_name"
    unsaved-value="null|any|none|undefined|id_value"
    access="field|property|ClassName" >
     node="element-name|@attribute-name|element/@attribute|."
    <generator class="generatorClass"/>
</id>
```

# Composite identifier



- id as a property using a component type

```
@Entity
class User {
   @EmbeddedId
   @AttributeOverride(
      name="firstName", column=@Column(name="fld_firstname")
   UserId id;
   Integer age;
}

@Embeddable
class UserId implements Serializable {
   String firstName;
   String lastName;
}
```

# Composite identifier



- id as a property using a component type

```
@Entity
class Customer {
   @EmbeddedId
   CustomerId id;
   boolean preferredCustomer;

   @MapsId("userId")
   @JoinColumns({
      @JoinColumn(name="userfirstname_fk",
                  referencedColumnName="firstName"),
      @JoinColumn(name="userlastname_fk",
                  referencedColumnName="lastName")
   })
   @OneToOne
   User user;
}

@Embeddable
class CustomerId implements Serializable {
   UserID userId;
   String customerNumber;
   //implements equals and hashCode
}
```

# Composite identifier



- Multiple id properties without identifier type

```
@Entity
class Customer implements Serializable {
   @Id
   @OneToOne
   @JoinColumns({
      @JoinColumn(name="userfirstname_fk",
                  referencedColumnName="firstName"),
      @JoinColumn(name="userlastname_fk",
                  referencedColumnName="lastName")
   })
   User user;

   @Id
   String customerNumber;
   boolean preferredCustomer;
   //implements equals and hashCode
}
```

# Composite identifier



- Multiple id properties with a dedicated identifier type

```
@Entity
@IdClass(CustomerId.class)
class Customer implements Serializable {
   @Id
   @OneToOne
   @JoinColumns({
      @JoinColumn(name="userfirstname_fk", referencedColumnName="firstName"),
      @JoinColumn(name="userlastname_fk", referencedColumnName="lastName")
   })
   User user;

   @Id
   String customerNumber;
   boolean preferredCustomer;
}

class CustomerId implements Serializable {
    UserId user;
    String customerNumber
   //implements equals and hashCode
}
```

# Identifier generator



- IDENTITY
- SEQUENCE (called seqhilo in Hibernate)
- TABLE (called MultipleHiLoPerTableGenerator in Hibernate)
- AUTO

```
@Entity
public class Customer {
    @Id
    @GeneratedValue
    Integer getId() { ... };
}

@Entity
public class Invoice {
    @Id
    @GeneratedValue(strategy=GenerationType.IDENTITY)
    Integer getId() { ... };
}
```

# Project



- To reconstruct your project by using Hibernate
  - Mapping your tables into classes.
  - Accessing DB by manipulating objects.
  - Primary Keys of users, books and records are Auto Incremented.

# References



- HIBERNATE - Relational Persistence for Idiomatic Java,
  - http://docs.jboss.org/hibernate/orm/4.1/manual/en-US/html_single/#preface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# Thank You!