Introduction to Session beans

EJB - continued

Local Interface

```
/**
* This is the HelloBean local interface.
*
* This interface is what local clients operate
* on when they interact with EJB local objects.
* The container vendor will implement this
* interface; the implemented object is the
* EJB local object, which delegates invocations
* to the actual bean.
*/
public interface HelloLocal extends javax.ejb.EJBLocalObject
{
/**
* The one method - hello - returns a greeting to the client.
*/
   public String hello();
}
```

May throw EJBException instead of RemoteException

Local Home Interface

```
/**
* This is the home interface for HelloBean. This interface
* is implemented by the EJB Server's tools - the
* implemented object is called the Home Object, and serves
* as a factory for EJB Objects.
*
* One create() method is in this Home Interface, which
* corresponds to the ejbCreate() method in HelloBean.
*/
public interface HelloLocalHome extends javax.ejb.EJBLocalHome
{
/*
* This method creates the EJB Object.
*
* @return The newly created EJB Object.
*/
  HelloLocal create() throws javax.ejb.CreateException;
}
```

Local Client

```
Object ref = jndiContext.lookup("HelloHome");
HelloHome home = (HelloHome)
        PortableRemoteObject.narrow(ref,HelloHome.class);
...
HelloHome cabin_1 = home.create();
```

```
HelloLocalHome home = (HelloLocalHome )
        jndiContext.lookup("java:comp/env/ejb/ HelloLocalHome ");
...
HelloLocalHome cabin_1 = home.create();
```

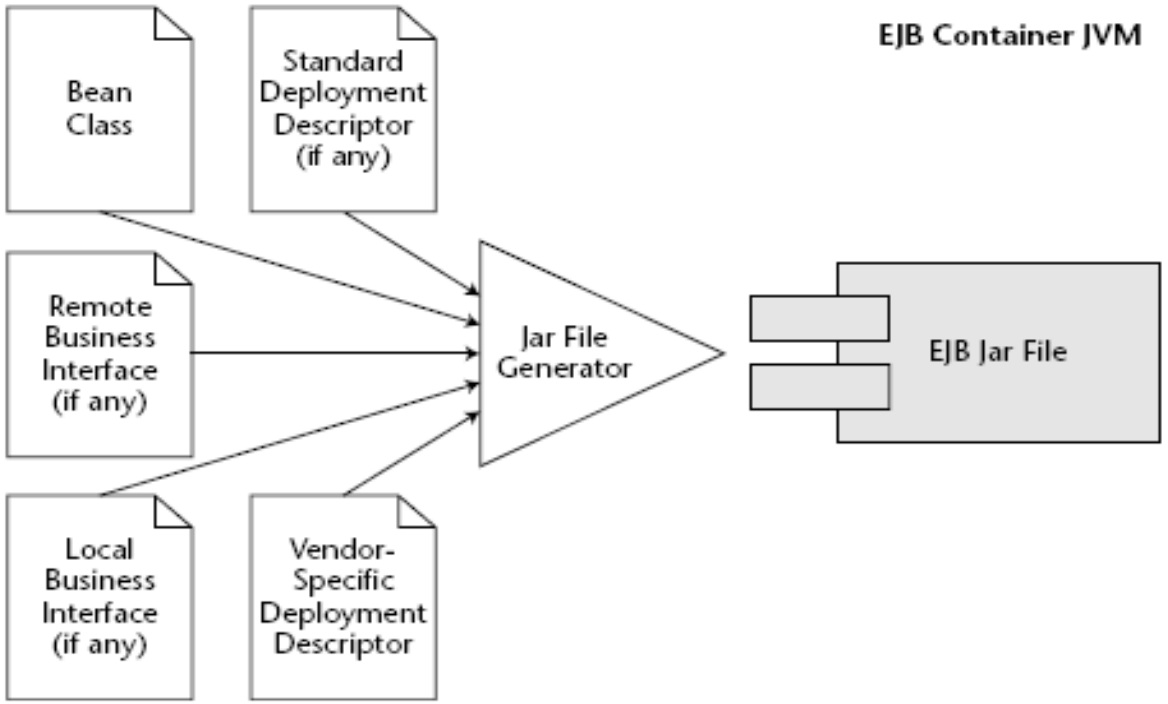
We looked up a bean in *java:comp/env/ejb*.
This is the JNDI location that the EJB specification recommends (but does not require) you put beans that are referenced from other beans.

Bean Implementation

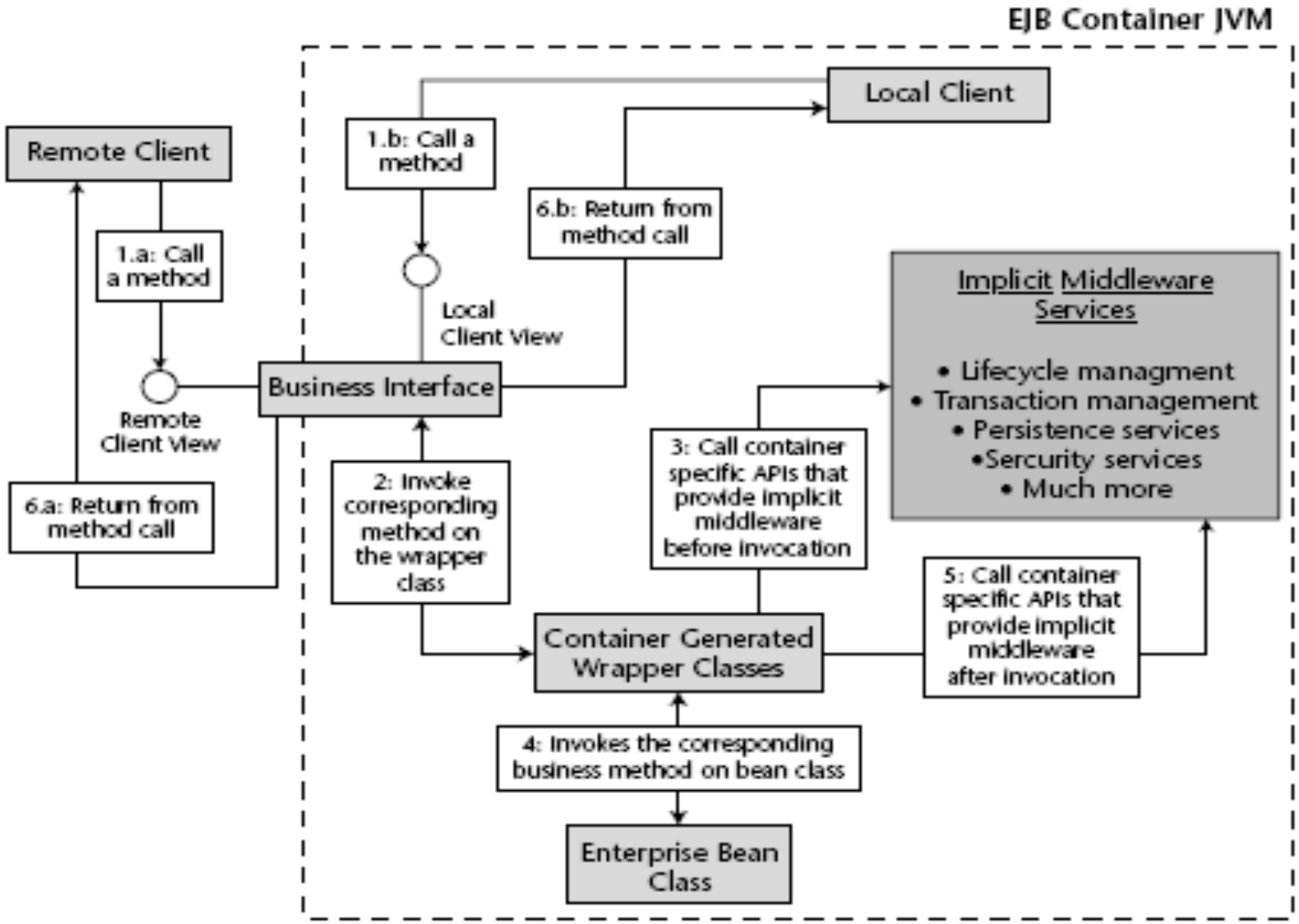
```
EJB 3.0 ==========================================================
package examples.session.stateless;
import javax.ejb.Local; import javax.ejb.Stateless;
@Stateless
@Local(Hello.class)
public class HelloBean implements Hello {
    public String hello() {
        System.out.println("hello()"); return "Hello, World!";
    }
}
```

enterprise bean instance

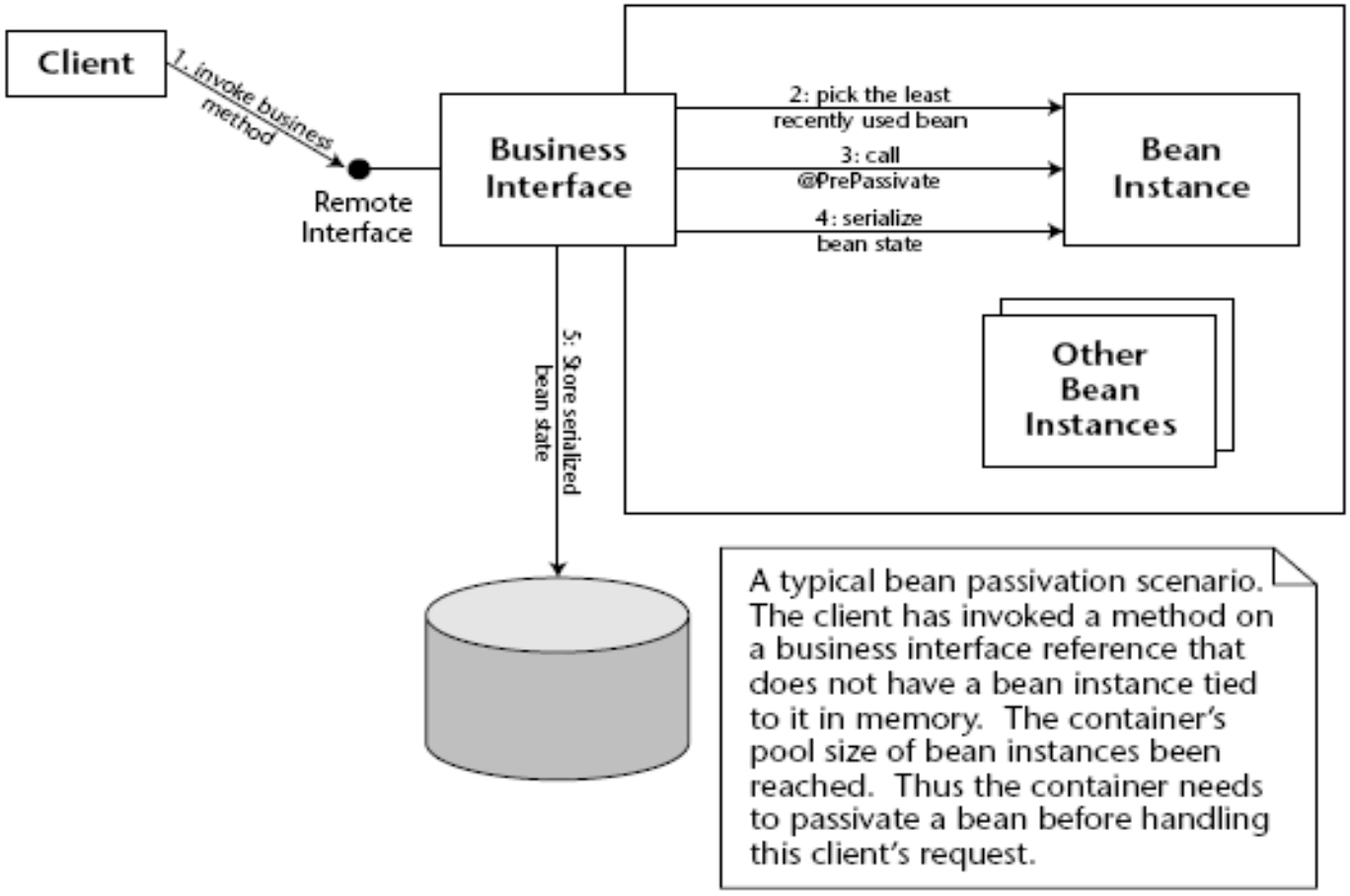
3.0 Packaging



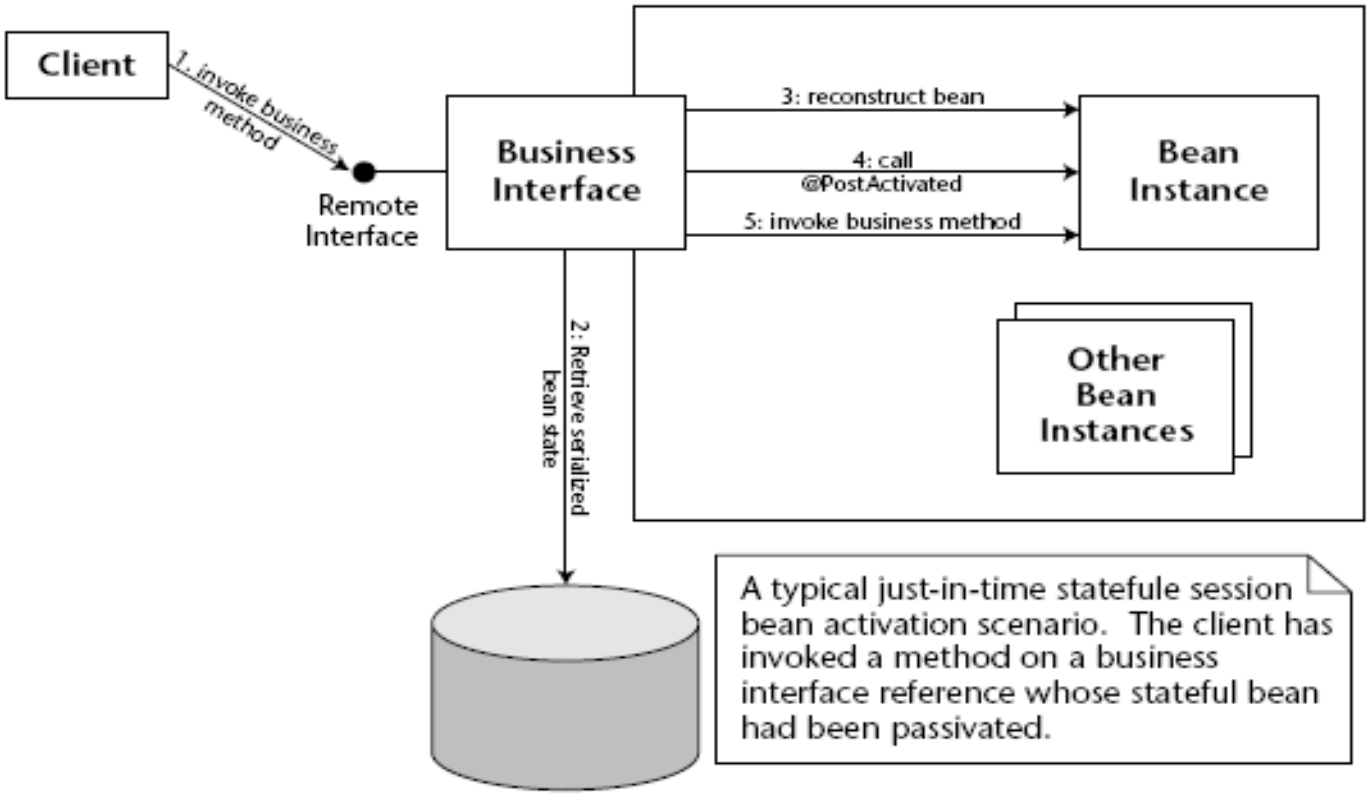
3.0 Lifecycle



Passivation



Activation


Client
1. invoke business method
Remote Interface
Business Interface
3: reconstruct bean
4: call @PostActivated
5: invoke business method
Bean Instance
Other Bean Instances
2: Retrieve serialized bean state
A typical just-in-time statefule session bean activation scenario. The client has invoked a method on a business interface reference whose stateful bean had been passivated.

Managing the lifecycle – 3.0

```
@Stateful
public class MyBean {
@PrePassivate
        public void passivate() {
        <close socket connections, etc...>
        }
        ...
@PostActivate
        public void activate() {
        <open socket connections, etc...>
        }
        ...
}
```

Installing a Derby DB

Derby quick installation

- download Derby from http://db.apache.org/derby/ and unzip it
- in a shell, set DERBY_HOME and execute setEmbeddedCP

  DERBY_HOME=/*yourpathto*/db-derby-10.11.1.1-bin

  DERBY_HOME/bin/setEmbeddedCP

- start Derby

  java –jar DERBY_HOME/lib/derbyrun.jar server start &

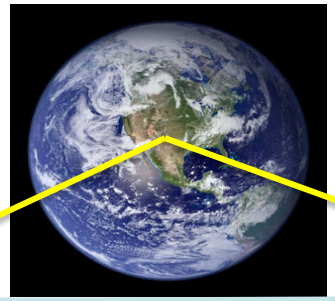
Persistency Demo

download Hibernate from

http://sourceforge.net/projects/hibernate/

unzip it

ORM - DAO



WORLD

MODEL

UML

ORM

ERA

ARCHITECTURE

DAO

DB

Actual storage

Data

Object

FS

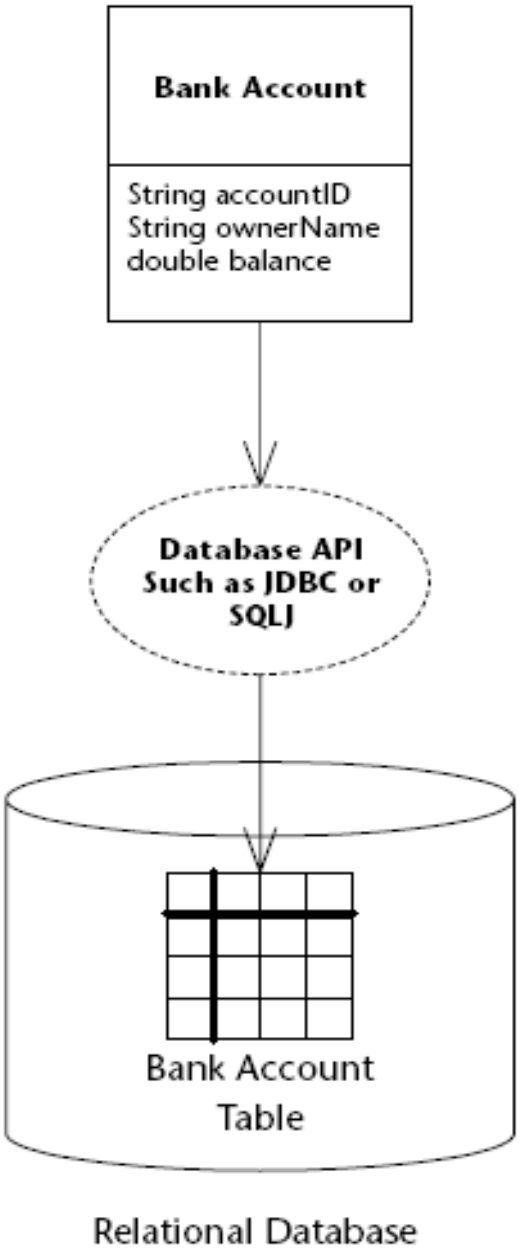
platforms

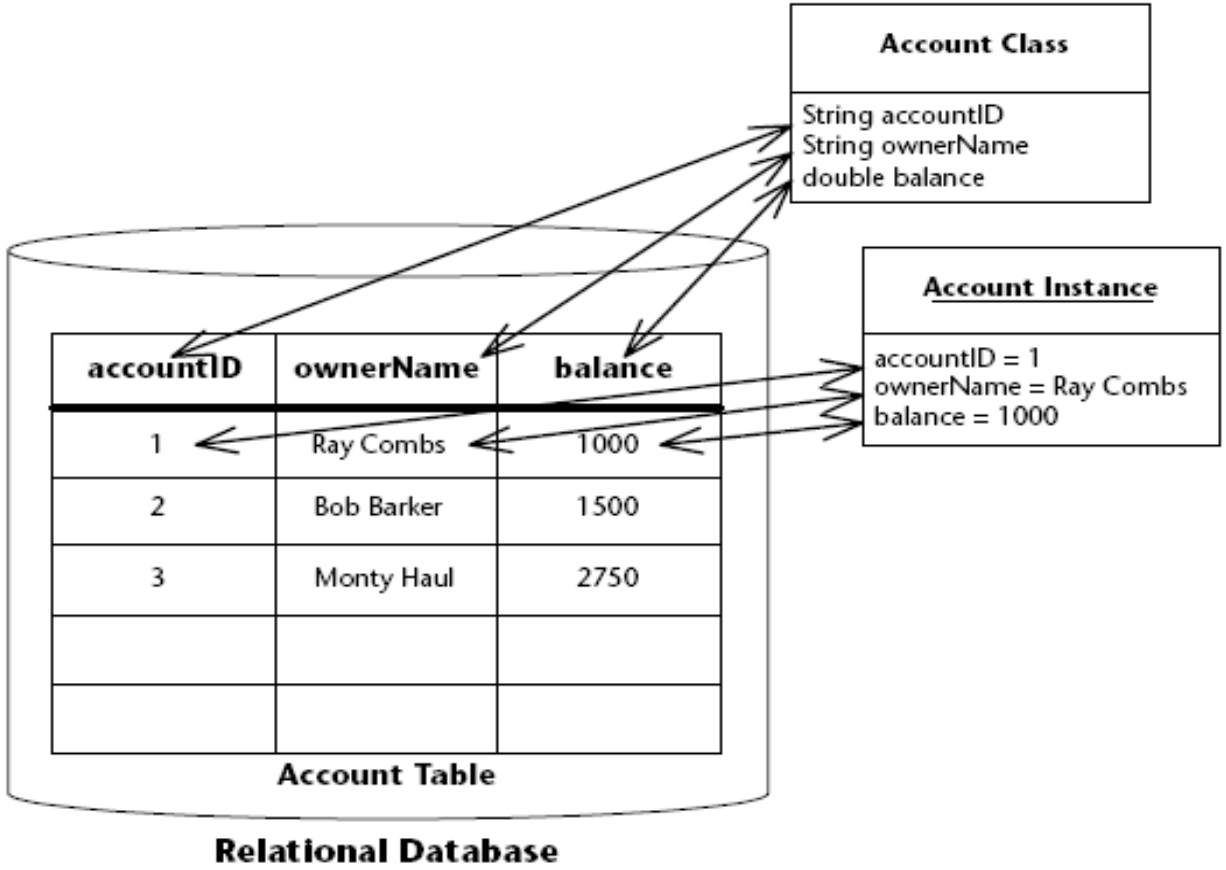
temp

tools

ORM

Object-Relational Mapping is NOT serialization!





Technologies

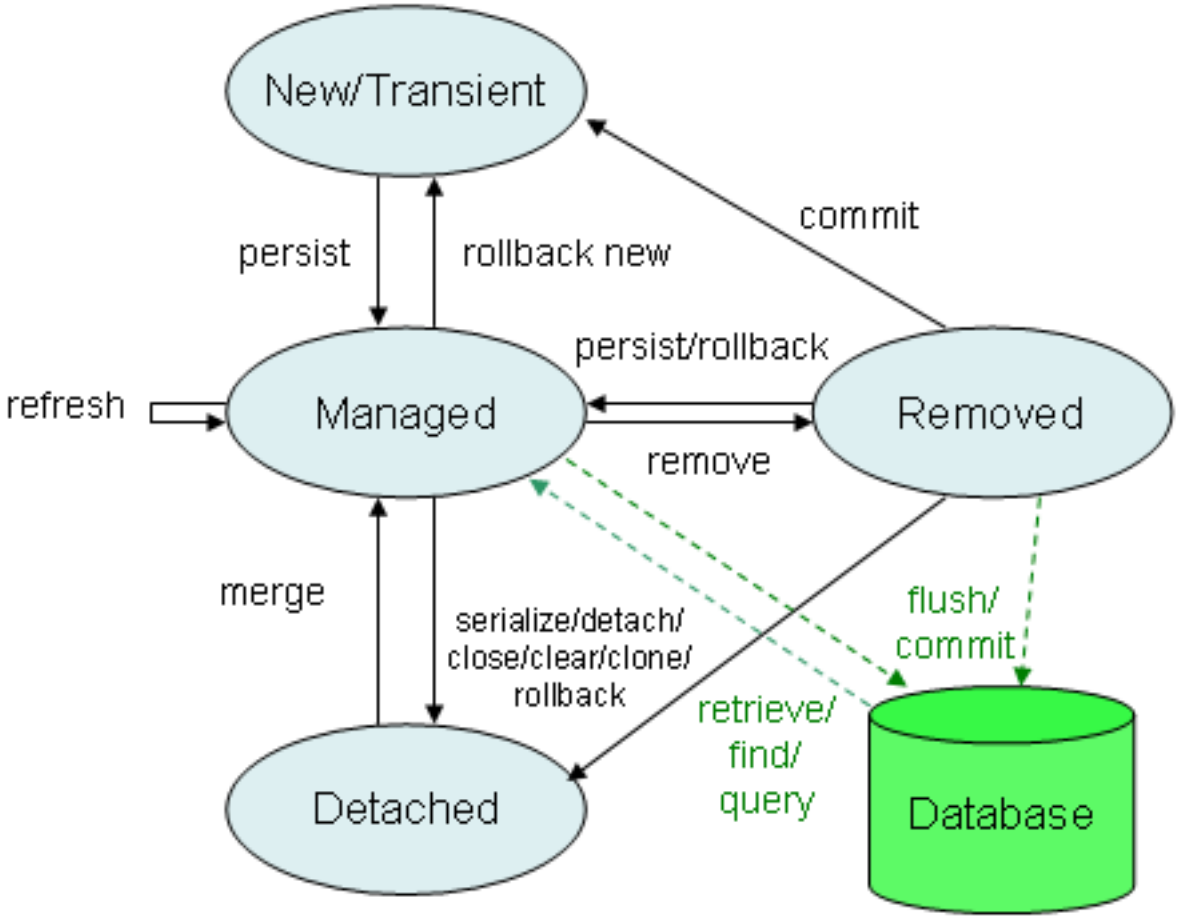
- *Java Data Objects* (JDO)
- EJB 2.0 Container Managed Persistence (CMP)

evolved into

- Java Persistence API (JPA)

configuration via XML or Annotation

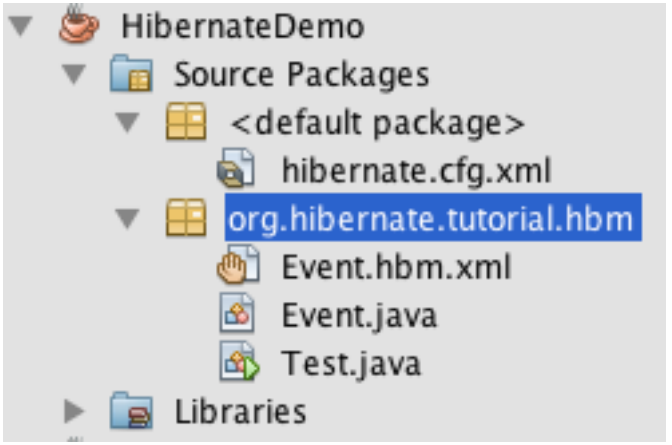
Object states in JPA



Demo

Event.java

```
package org.hibernate.tutorial.hbm;
import java.util.Date;
public class Event {
        private Long id;
        private String title;
        private Date date;
        public Event() {
                // this form used by Hibernate
        }
        public Event(String title, Date date) {
                // for application use, to create new events
                this.title = title;
                this.date = date;
        }
        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; }
}
```



Event.hbm.xml

```
<!DOCTYPE hibernate-mapping PUBLIC
        "-//Hibernate/Hibernate Mapping DTD 3.0//EN"
        "http://www.hibernate.org/dtd/hibernate-mapping-3.0.dtd">
<hibernate-mapping package="org.hibernate.tutorial.hbm">
    <class name="Event" table="EVENTS">
        <id name="id" column="EVENT_ID">
            <generator class="increment"/>
        </id>
        <property name="date" type="timestamp" column="EVENT_DATE"/>
        <property name="title"/>
    </class>
</hibernate-mapping>
```

Demo

Test.java

```
package org.hibernate.tutorial.hbm;
import …;
public class Test {
      private SessionFactory sessionFactory;
      public static void main (String a[]) throws Exception{
         Test x= new Test();
         x.setUp();
         if (a[0].equalsIgnoreCase("R"))  x.read();
         if (a[0].equalsIgnoreCase("W")) x.write();
         x.tearDown();

      }
      protected void setUp() throws Exception {
            // A SessionFactory is set up once for an application
             sessionFactory = new Configuration()
             .configure() // configures settings from hibernate.cfg.xml
             .buildSessionFactory();
      }
      protected void tearDown() throws Exception {
            if ( sessionFactory != null ) { sessionFactory.close();
           }
```

Demo

```
    public void write() {
        // create a couple of events...
        Session session = sessionFactory.openSession();
        session.beginTransaction();
        session.save( new Event( "Our very first event!", new Date() ) );
        session.save( new Event( "A follow up event", new Date() ) );
        session.getTransaction().commit();
        session.close();
    }
    public void read() {
        // now lets pull events from the database and list them
        Session session = sessionFactory.openSession();
        session.beginTransaction();
            List result = session.createQuery( "from Event" ).list();
            for ( Event event : (List<Event>) result ) {
                System.out.println( "Event (" + event.getDate() +
                ") : " + event.getTitle() );
            }
        session.getTransaction().commit();
        session.close();
    }
}
```

hibernate.cfg.xml

```
<!DOCTYPE hibernate-configuration PUBLIC
        "-//Hibernate/Hibernate Configuration DTD 3.0//EN"
        "http://www.hibernate.org/dtd/hibernate-configuration-3.0.dtd">

<hibernate-configuration>
    <session-factory>
        <!-- Database connection settings -->
        <property name="connection.driver_class">org.apache.derby.jdbc.ClientDriver</
property>
        <property name="connection.url">jdbc:derby://localhost:1527/
databaseName;create=true</property>
        <property name="connection.username">admin</property>
        <property name="connection.password">admin</property>
        <!-- JDBC connection pool (use the built-in) -->
        <property name="connection.pool_size">1</property>

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

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: create instead of validate -->
        <property name="hbm2ddl.auto">validate</property>

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

    </session-factory>

</hibernate-configuration
```

Note: bindings for other DBs:
http://karussell.wordpress.com/2009/06/09/hibernate-cfg-xml-settings-for-derby-oracle-and-h2/

write

- run:
- set 30, 2014 12:12:44 PM org.hibernate.annotations.common.reflection.java.JavaReflectionManager <clinit>
- INFO: HCANN000001: Hibernate Commons Annotations {4.0.5.Final}
- …
- INFO: HHH000037: Columns: [title, event_date, event_id]
- Hibernate: select event0_.EVENT_ID as EVENT_ID1_0_, event0_.EVENT_DATE as EVENT_DA2_0_, event0_.title as title3_0_ from EVENTS event0_
- **INFO: HHH000037: Columns: [title, event_date, event_id]**
- **Hibernate: select max(EVENT_ID) from EVENTS**
- **Hibernate: insert into EVENTS (EVENT_DATE, title, EVENT_ID) values (?, ?, ?)**
- **Hibernate: insert into EVENTS (EVENT_DATE, title, EVENT_ID) values (?, ?, ?)**
- set 30, 2014 12:12:45 PM org.hibernate.engine.jdbc.connections.internal.DriverManagerConnectionProviderImpl stop
- INFO: HHH000030: Cleaning up connection pool [jdbc:derby://localhost:1527/databaseName;create=true]
- BUILD SUCCESSFUL (total time: 1 second)

read

- run:
- set 30, 2014 12:12:44 PM org.hibernate.annotations.common.reflection.java.JavaReflectionManager <clinit>
- INFO: HCANN000001: Hibernate Commons Annotations {4.0.5.Final}
- …
- INFO: HHH000037: Columns: [title, event_date, event_id]
- Hibernate: select event0_.EVENT_ID as EVENT_ID1_0_, event0_.EVENT_DATE as EVENT_DA2_0_, event0_.title as title3_0_ from EVENTS event0_
- **Event (2014-09-30 12:12:35.622) : Our very first event!**
- **Event (2014-09-30 12:12:35.682) : A follow up event**
- set 30, 2014 12:12:45 PM org.hibernate.engine.jdbc.connections.internal.DriverManagerConnectionProviderImpl stop
- INFO: HHH000030: Cleaning up connection pool [jdbc:derby://localhost:1527/databaseName;create=true]
- BUILD SUCCESSFUL (total time: 1 second)

persistence.xml vs hibernate.cfg.xml

- If you are using Hibernate's proprietary API, you'll need the hibernate.cfg.xml. If you are using JPA i.e. Hibernate EntityManager, you'll need the persistence.xml.
- So you generally don't need both as you use either Hibernate proprietary API or JPA.
- However, if you were using Hibernate Proprietary API and already have a hibernate.cfg.xml (and hbm.xml XML mapping files) but want to start using JPA, you can reuse the existing configuration files by referencing the hibernate.cfg.xml in the persistence.xml in the hibernate.ejb.cfgfile property - and thus have both files

Introduction to Entities

Entities

- Entities have a client-visible, persistent *identity* (the primary key) that is distinct from their object reference.
- Entities have persistent, client-visible *state*.
- Entities are *not remotely accessible*.
- An entity's *lifetime* may be completely independent of an application's lifetime.
- Entities can be used in both Java EE and J2SE environments

Entities - example

This demo entity represents a Bank Account. The entity is not a remote object and can only be accessed locally by clients. However, it is made serializable so that instances can be passed by value to remote clients for local inspection. Access to persistent state is by direct field access.

```
package examples.entity.intro;
import java.io.Serializable;
import javax.persistence.Entity;
import javax.persistence.Id;
@Entity
public class Account implements Serializable {
    // The account number is the primary key
    @Id
    public int accountNumber;
    public int balance;
    private String ownerName;
    String getOwnerName() {return ownerName;}
    void setOwnerName(String s) {ownerName=s;}

    /** Entities must have a public no-arg constructor */
    public Account() {
        // our own simple primary key generation
        accountNumber = (int) System.nanoTime();
    }
```

Entities - example

```
    public void deposit(int amount) {
       balance += amount;
    }
    public int withdraw(int amount) {
        if (amount > balance) {
          return 0;
        } else {
          balance -= amount;
          return amount;
        }
    }
}
```

The entity can expose **business methods**, such as a method to decrease a bank account balance, to manipulate or access that data. Like a session bean class, an entity class can also declare some standard callback methods or a callback listener class. The persistence provider will call these methods appropriately to manage the

Access to the entity's persistent state is by direct field access. An entity's state can also be accessed using JavaBean-style set and get methods.

The persistence provider can determine which access style is used by looking at how annotations are applied. In Source 6.1, the @Id annotation is applied to a field, so we have field access.

Access to the Entity

```
package examples.entity.intro;
import java.util.List;
import javax.ejb.Stateless;
import javax.ejb.Remote;
import javax.persistence.PersistenceContext;
import javax.persistence.EntityManager;
import javax.persistence.Query;
@Stateless
@Remote(Bank.class)
public class BankBean implements Bank {
    @PersistenceContext
    private EntityManager manager;
    public List<Account> listAccounts() {
        Query query = manager.createQuery ("SELECT a FROM Account a");
        return query.getResultList();
    }
    public Account openAccount(String ownerName) {
        Account account = new Account();
        account.ownerName = ownerName;
        manager.persist(account);
        return account;
    }
```

Access to the Entity

```
    public int getBalance(int accountNumber) {
        Account account = manager.find(Account.class, accountNumber);
        return account.balance;
    }
    public void deposit(int accountNumber, int amount) {
        Account account = manager.find(Account.class, accountNumber);
        account.deposit(amount);
    }
    public int withdraw(int accountNumber, int amount) {
        Account account = manager.find(Account.class, accountNumber);
        return account.withdraw(amount);
    }
    public void close(int accountNumber) {
        Account account = manager.find(Account.class, accountNumber);
        manager.remove(account);
    }
}
```

Persistence.xml

```
<?xml version=”1.0” encoding=”UTF-8”?>
<persistence xmlns=”http://java.sun.com/xml/ns/persistence”>
    <persistence-unit name=”intro”/>
</persistence>
```

- A persistence unit is defined in a special descriptor file, the persistence.xml file, which is simply added to the META-INF directory of an arbitrary archive, such as an Ejb-jar, .ear, or .war file, or in a plain .jar file.