Hibernate

Bringing Java and SQL closer together

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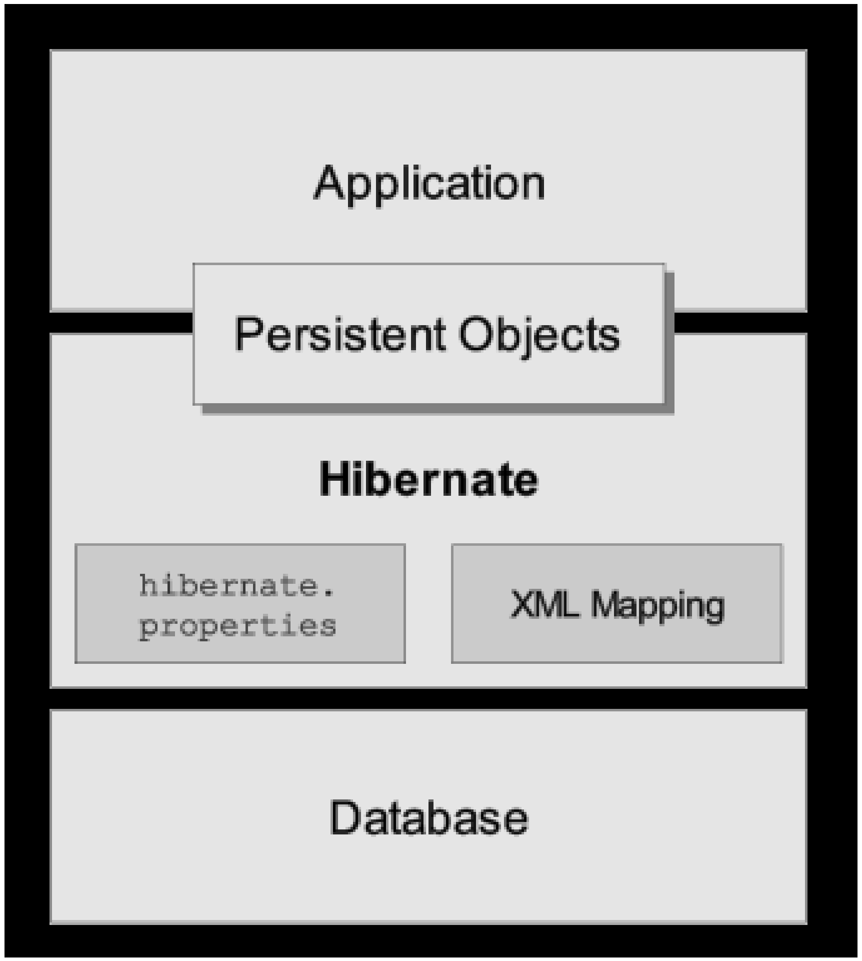
Hibernate

- An object-relational mapping (ORM) library for Java
- Allows us to interact with a database using regular Java objects
- Provides a closer relationship between your Java objects and tables in your database

Overview

- Runs on top of JDBC
- Allows us to easily *persist* objects in a database
- Works with different database types, and so is an *abstraction* layer



Object mapping

```
class Patient {
  private int id;
  private String name;
  private Date dob;

  …
}
```

Hibernate allows to associate database columns with class properties

id	name	dob
1	Ben	1993-04-21
2	Rowan	1981-05-28
3	Rita	1983-01-07

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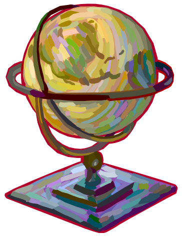
Object mapping

- We tell Hibernate how to map a Java class to a database table
- Hibernate can then
  - Save instances as new table rows
  - Load instances of that class from rows in the table
  - Update instances

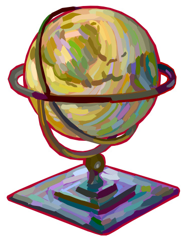
Mapping files



- We describe the relationship between a Java class and a database table in an XML file, e.g.

```
<hibernate-mapping package="eh203.emr">

    <class name="Patient" table="patients">
        <id name="id" column="patient_id">
            <generator class="native"/>
        </id>
        <property name="dob" type="date" column="dob"/>
        <property name="name"/>
    </class>

</hibernate-mapping>
```

Mapping files



Java class name

Package of Java class

Table name

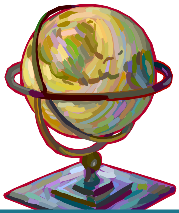
```
<hibernate-mapping   ackage="eh203.emr">

    <class name="Patient" table="patients">
        <id name="id" column="patient_id">
            <generator class="native"/>
        </id>
        <property name="dob" type="date" column="dob"/>
        <property name="name"/>
    </class>

</hibernate-      ing>
```

Class property name

Column type

Table column name

Mapping files

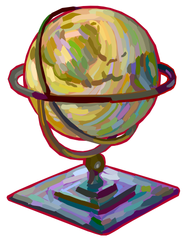


Types are not Java or SQL types but special Hibernate mapping types

```
<hibernate-mapping package="eh203.emr">

    <class name="Patient" table="patients"
        <id name="id" column="patient_id">
            <generator class="native"/>
        </id>
        <property name="dob" type="date" column="dob"/>
        <property name="name"/>
    </class>

</hib
```

When column name is not specified it defaults to the property name

Mapping types



- Often Hibernate can guess the correct type using reflection
- But sometimes we need to state the type explicitly, e.g.
  - Should a property of type `java.util.Date` map to a column of type TIMESTAMP, DATETIME or DATE?

Hibernate types (basic)

Hibernate mapping type	Java	SQL
integer, long, short, float, double, character, boolean	Primitive types, e.g. `int`	`INT`, `BIGINT` etc
string	`java.lang.String`	`VARCHAR`
text	`java.lang.String`	`TEXT`, `CLOB`
binary	`byte[]`	`BINARY`

See http://docs.jboss.org/hibernate/stable/core/reference/en/html/mapping.html#mapping-types

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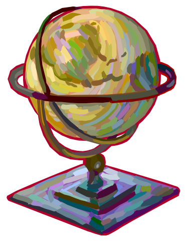
Hibernate types (dates)

- These require some extra attention…

Hibernate mapping type	Java	SQL
date	`java.util.Date`	DATE
time	`java.util.Date`	TIME
timestamp	`java.util.Date`	TIMESTAMP
calendar	`java.util.Calendar`	TIMESTAMP
calendar_date	`java.util.Calendar`	DATE

See http://docs.jboss.org/hibernate/stable/core/reference/en/html/mapping.html#mapping-types

Ids and keys



- Primary keys in the database have to be linked to "id" properties on the class, e.g.

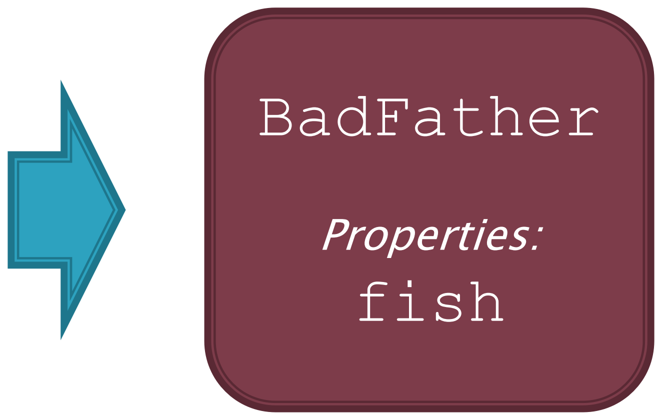
```
<hibernate-mapping package="eh203.emr">

    <class name="Patient" table="patients">
        <id name="id" column="patient_id">
            <generator class="native"/>
        </id>
        <property name="dob" type="    etime" column="dob"/>
        <property name="name"/>
    </class>

</hibernate-mapping>
```

Tells Hibernate to use the id value generated by the database (AUTO_INCREMENT)

Bean properties

- The mapping files reference the names of the properties of the class as a Java Bean
- They are NOT the names of the fields, e.g.

```
class BadFather {
  private int snake;
  public int getFish() {
    return snake;
  }
}
```



XML configuration

- For example…

Database connection settings

```
<?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">org.hsqldb.jdbcDriver</property>
        <property name="connection.url">jdbc:hsqldb:hsql://localhost</property>
        <property name="connection.username">dbuser</property>
        <property name="connection.password">dbpass</property>
        <property name="connection.pool_size">1</property>

        <property name="dialect">org.hibernate.dialect.HSQLDialect</property>
        <property name="current_session_context_class">thread</property>
        <property name="cache.provider_class">org.hibernate.cache.NoCacheProvider</property>
        <property name="show_sql">true</property>
        <property name="hbm2ddl.auto">update</property>

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

Mapping files

Configuration

- Different values for **hbm2ddl.auto** tell Hibernate what do to the database schema when starting up...
  - *validate*: validate the schema, makes no changes to the database.
  - *update*: update the schema.
  - *create*: creates the schema, destroying previous data.
  - *create-drop*: drop the schema at the end of the session.

Configuration

- Setting the value of **show_sql** to *true* allows us to see all of the SQL which Hibernate executes
- We can use Hibernate with different types of SQL server by changing the value of **dialect** – to use MySQL we set it to…

  org.hibernate.dialect.MySQLDialect

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Project structure

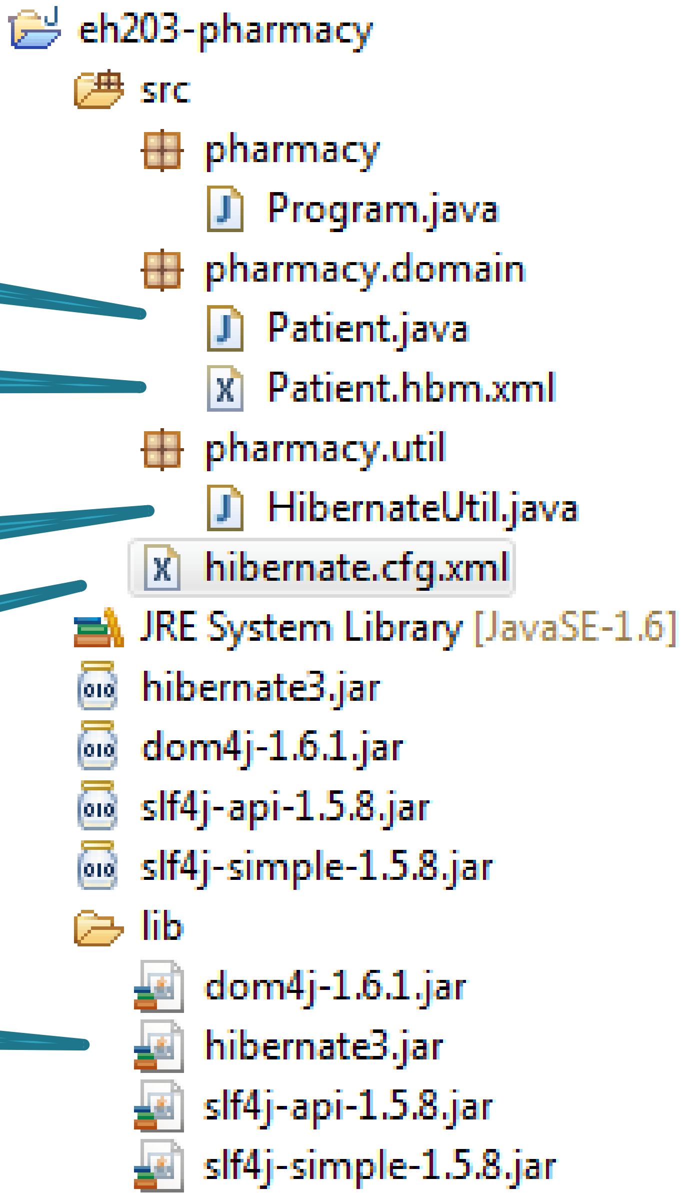
Java bean classes

Corresponding mapping XML files

Standard utility class to create Hibernate sessions

Hibernate configuration file

Hibernate JAR and other required JARS



```
eh203-pharmacy
    src
        pharmacy
            Program.java
        pharmacy.domain
            Patient.java
            Patient.hbm.xml
        pharmacy.util
            HibernateUtil.java
        hibernate.cfg.xml
    JRE System Library [JavaSE-1.6]
    hibernate3.jar
    dom4j-1.6.1.jar
    slf4j-api-1.5.8.jar
    slf4j-simple-1.5.8.jar
    lib
        dom4j-1.6.1.jar
        hibernate3.jar
        slf4j-api-1.5.8.jar
        slf4j-simple-1.5.8.jar
```

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Creating domain objects: classes

```java
public class Patient {
  protected int patientId;
  protected String name;
  protected Date dob;

  public Patient() {
  }

  public Patient(String name, Date dob) {
    this.name = name;
    this.dob = dob;
  }

  public int getPatientId() {
    return patientId;
  }
  ...
}
```

Hibernate requires classes with default constructors

We can also define an explicit constructor for our use

All properties are accessed through BEAN methods

HibernateUtil

- This is a utility class that we can put in our Hibernate projects
- Why isn't it part of the Hibernate library??? Who knows…
- Simply allows to get a valid Hibernate session object anytime we need one, e.g.

```
Session session
   = HibernateUtil.getSessionFactory().getCurrentSession();
```

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Persisting objects

- We can use the Hibernate session object to persist an instance of a mapped class, e.g.

```
Session session
 = HibernateUtil.getSessionFactory().getCurrentSession();

Patient patient = new Patient("Bob", new Date());

session.beginTransaction();
session.save(patient);
session.getTransaction().commit();
```

Creates a new row in the database

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Persisting objects

- We can make changes to persisted object and then tell Hibernate to update the database, e.g.

```
Patient patient = new Patient("Bob", new Date());

session.beginTransaction();

session.save(patient);

patient.setName("Bob Jones");

session.save(patient);

session.getTransaction().commit();
```

Creates a new row in the database

Updates the existing row in the database

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Persisting objects

- Hibernate looks at the id property of an object to know if it is already in the database, e.g.

```
Patient patient = new Patient("Bob", new Date());

session.beginTransaction();

session.save(patient);

patient.setName("Bob Jones");

session.save(patient);

session.getTransaction().commit();
```

Patient id is 0

Now id is > 0

Hibernate knows to UPDATE rather than CREATE because id > 0