Object Relational Mapping Principles

Sohel Merchant
Bioinformatics Software Engineer
dictyBase
Center for Genetic Medicine
Northwestern University, Chicago
Outline

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The Problem

- Developers need to perform Create, Retrieve, Update, Delete (aka CRUD) operations on data inside an application.
- The real world objects represented using a programming language needs to be stored in databases.
- Using relational databases to store object-oriented data leads to a semantic gap.
- RDBMS have fixed types, but OO can have more complicated user defined types.
Solutions

- **Data Access Object (DAO)**
  - Developer writes a class which contains one attribute for each field in the table.
  - Methods for CRUD typically contain JDBC/DBI code with the necessary SQL statements.

- **Object Relational Mapping (ORM)**
  - "**ORM** is a programming technique that links databases to object-oriented language concepts, creating (in effect) a virtual object database." - Wikipedia
  - Developer needs to configure the ORM
  - Less amount of manual coding
  - CRUD methods are automatically generated by the ORM layer
ORM solutions

- Perl
  - Class::DBI
- Java
  - EJB
  - Hibernate
  - JDO
  - iBatis
Perl - Class::DBI

- Provides a simple interfaces for wrapping Perl classes around a database tables
- Tables are mapped directly to objects
- The table column name are mapped to the get/set methods
- Can be used with transactions
Defining a class in Class::DBI

```
package Chado::Cvterm;
use base 'Chado::DBI';
Chado::Cvterm->set_up_table(' Cvterm');
```
## Create

```perl
$term_dbobj = Chado::Cvterm->create(
    name => "DUMMY TERM",
    cv_id => 1,
    dbxref_id => 125
);
```

## Retrieve

```perl
$term_dbobj = Chado::Cvterm->retrieve(2);
```

## Update

```perl
$term_dbobj->name( $term->name() );
$term_dbobj->definition( $term->definition );
```

## Delete

```perl
$term_dbobj->delete();
```
Java - Hibernate

- Hibernate maps Java Objects directly to database tables
- Scalable
- Works well for controlled Data model
Java - iBatis

- iBATIS maps Java Objects to the results of SQL Queries
- XML definitions for queries
- Queries and managing Maps
- Transactions
- Good fit for existing database schema
Summary

- ORM provides painless roundtrip of data between the application and database.
- Reduces the amount of SQL code and allows a programmatic style interface to the RDBMS.
- Choice of ORM solution depends on the type of project.