New Database Manipulation Tools in the Easy Learning on-line Platform

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Abstract
The present paper deals with the new Object-Relational Mapping tool introduced in the Easy Learning platform. Propel 1.5 is the latest version of Propel, one of the ORMs fully compatible with the Symfony Framework, and, in comparison with the older versions, it has drastically improved the way the Easy Learning platform can manipulate its database. Being a complex platform, the database behind it is complex as well and can contain a large number of entries that can increase the time required to load pages, slowing down the whole application. Propel 1.5 provides queries which are minimized and optimized, written and executed faster and the speed of retrieving information from the database is also improved. Besides these aspects, Propel 1.5 comes with new behavior that provide a robust database, reducing the risk of losing references between tables and allowing the administrators of the Easy Learning platform to temporarily delete objects, giving the possibility of restoring them in case they are needed once more. Another feature is the admin15 theme provided to the Symfony admin-generator files, making them easy to manage, edit and improve. Using this tool has three purposes: speeding up the platform, providing a robust database and giving the platform the ability to be maintained more easily.

1 Introduction: Object-Relational Mapping tool

An Object-Relational Mapping is a programming technique used at converting data between incompatible type systems in object-oriented programming languages. The result is a “virtual object database” that can be used from within the programming language. Many popular database products such as structured query language database management systems can only store and manipulate scalar values such as integers and strings organized within normalized tables. These object values can either be converted into groups of simpler values for storage in the database or only use simple scalar values within the program.

Object-relational mapping is can be used to implement the first approach. The main problem is translating those objects to forms that can be stored in the database for easy retrieval, while preserving the properties of the objects and their relationships; these objects are then said to be persistent.

Databases are relational. PHP and Symfony are object-oriented. In order to access the database in an object-oriented way, an interface translating the object logic to the relational logic is required. This interface is called an object-relational mapping, or ORM.

An ORM is made up of objects that give access to data and keep business rules within themselves. One benefit of an object/relational abstraction layer is that it prevents from using a syntax that is specific to a given database. It automatically translates calls to the model objects to SQL queries optimized for the current database.
An abstraction layer encapsulates the data logic. The rest of the application does not need to
know about the SQL queries, and the SQL that accesses the database is easy to find. Using objects
instead of records, and classes instead of tables, has another benefit: there can be added new
accessory to tables. For instance, if there is a table called Student with two fields, FirstName
and LastName, it might be needed to retrieve just a Name. In an object-oriented world, this is as
easy as adding a new accessory method to the Student class, like this:

```php
public function getName()
{
    return $this->getFirstName().' '.$this->getLastName();
}
```

Fig. 1. New accessory method to the Student class

## 2 Easy Learning, Symfony 1.4 and Propel 1.5

The latest version of the Easy Learning platform is developed with the aid of Symfony 1.4, one of
the most powerful open-source PHP5 frameworks. Symfony is a full-stack MVC framework that
helps at developing websites faster. It also establishes a set of best practices that will help at to
developing maintainable and secure websites.

Symfony is a complete framework designed to optimize the development of web applications
by way of several key features. For starters, it separates a web application's business rules, server
logic, and presentation views. It contains numerous tools and classes aimed at shortening the
development time of a complex web application. Additionally, it automates common tasks so that
the developer can focus entirely on the specifics of an application. The end result of these
advantages means there is no need to reinvent the wheel every time a new web application is built!

Fig. 2 Symfony and Propel relationship
Symfony is written entirely in PHP. It has been thoroughly tested in various real-world projects, and is actually in use for high-demand e-business websites. It is compatible with most of the available databases engines, including MySQL, PostgreSQL, Oracle, and Microsoft SQL Server.

This version of the framework is significantly better than the 1.0 version of Symfony used on the former Easy Learning platform. It provides a new default mailer based on SwiftMailer 4.1, new widgets, validations, a new and versatile form sub-framework, autoloaders, support for more powerful plug-ins, and last but not least, support for the new Propel 1.5 ORM. Propel 1.5 is an open-source Object-Relational Mapping (ORM) for PHP5. It allows access to the database using a set of objects, providing a simple API for storing and retrieving data. It uses PDO as an abstraction layer, and code generation to remove the burden of runtime introspection therefore it is a fast ORM.

Propel 1.5 implements all the key concepts of mature ORM layers: the ActiveRecord pattern, validations, behaviors, table inheritance, reverse engineering an existing database, nested sets, nested transactions, lazy loading and LOB.

3 Query API

Along Model and Peer classes, Propel 1.5 generates one Query class for each table of the Easy Learning database. These query classes inherit from Criteria, but have additional abilities since the Propel generator has a deep knowledge of the defined schema. That means that Propel 1.5 recommends the usage of ModelQueries instead of raw Criteria.

Model queries have smart filter methods for each column and termination methods on their own. That means that the following code:

```php
$c = new Criteria();
$c->add(StudentPeer::NUM, 'Ionescu');
$student = StudentPeer::doSelectOne($c);
```

Fig. 3 Old Student Criteria Query

can be replaced by this one:

```php
$q = new StudentQuery();
$q->filterByNum('Ionescu');
$student = $q->findOne();
```

Fig. 4. New Student ModelQuery

In addition, each Model Query class benefits from a factory method called `create()`, which returns a new instance of the query class. And the filter methods return the current query object. So it's even easier to write the previous query as follows:

```php
$book = StudentQuery::create()
    ->filterByNum('Ionescu')
    ->findOne();
```

Fig. 5. Short Student ModelQuery
These commands are transformed into minimized and optimized database queries which are executed faster, resulting in a faster information retrieval. This is a very important aspect in the Easy Learning platform considering the large number of entries in the database and that the users, administrators, teachers or students need specific information from it. This unique Propel 1.5 feature makes the Easy Learning platform faster and easier to use, administer and manage.

Propel 1.5 eases the way of finding objects related to a model object that is already known. The developer has the advantage of the generated filterByXXX() methods in the query objects, where XXX is a relation name:

```php
<?php
    $serie = SerieQuery::create()->findPk(1);
    $grupe = GrupaQuery::create()
        ->filterBySerie($serie)
        ->orderByName()
        ->find();
```

**Fig. 6. Retrieving related objects**

There is no need to specify that the serie_id column of the “Grupa” object should match the id column of the “Serie” object. Since it has been already defined the foreign key mapping in the schema, Propel knows enough to figure it out.

4 **The soft_delete Behavior**

Behaviors are a great way to package model extensions for reusability. They are the powerful, versatile, fast, and help at organizing the code in a better way. The soft_delete behavior overrides the deletion methods of a model object to make them hide the deleted rows but keep them in the database. Deleted objects still don’t show up on select queries, but they can be retrieved or undeleted when necessary.

This feature is used on specific tables from the database, mainly the tables which provide foreign keys to other objects. In the Easy Learning platform, the student, teacher, course, test and poll tables have soft_delete behaviors implemented. For each of these tables, Propel automatically creates a deleted_at column having by default a NULL value and automatically updates the query classes.

**Fig. 7. Restoring a deleted student**

When an object of that type is deleted, its deleted_at property is set with the date and time of the action. The query classes are set to ignore the objects which don’t have the deleted_at column NULL. This way, even though these object exist in the database, they are hidden so that they appear as deleted and can be revealed at any time by using the undelete method.
In the previous version of the Easy Learning platform, when an important object such as a student which has information in related tables, for example grades, was deleted, the reference to those grades were lost, resulting in a bad organized database. The soft_delete behavior allows the administrator and the teacher to restore the objects deleted by mistake.

5 Admin15 Generator Theme

Propel 1.5 comes bundled with a new admin generator theme named 'admin15'. This theme provides additional features to the Easy Learning platform, based on the new Propel 1.5 query objects, and is backwards compatible with sfPropelPlugin's admin generator theme.

The admin15 theme doesn't use the Peer classes anymore; therefore settings referencing the Peer classes are ignored in this theme. This includes peer_method, and peer_count_method. The new theme provides a simple alternative for these settings, called “with”. There can be added each of the objects to hydrate together with the main object in the “with” setting list. Hydrating the objects is a faster way to retrieve large amounts of information from related tables in the database in only one query.

The new theme provides an easy way to make virtual columns and foreign key columns sortable in the list view. Just declare the corresponding fields with is_sortable to true, and the generated module will look for an orderByXXX() method in the generated query. For instance, to allow a groups list to be sortable on the series name:

6 Conclusions

The new Propel 1.5 is a very important tool for the new version of the Easy Learning platform. The ORM speeds up the platform by using the new Model Query, provides a more robust database by implementing the soft_delete behavior and makes the platform more user-friendly by using the new admin15 generator theme.

7 References

17. http://www.symfony-project.org/book/1.0/