Lesson learned from using EMF to build Desktop & Web Applications

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About us

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Introduction

RCP Vision is an Italian company based on Eclipse Technologies since 2009.

Our specialization is Eclipse RCP and EMF based applications

- Evangelization on EMF based technologies
- Consultant on Graphical and Textual DSL
- Integration and problem solving with CDO repository
- EMF Parsley for speed up UI development

In the past years we worked a lot on RAP and Parsley integration.

We do a lot of Architectural work with our customers.

Our Challenge

We faced recently a big challenge by migrating our biggest application from a Desktop (CDO based) client-server to the WEB.

- Several views
- PDF and Image managment
- Document acquisition engine based on EMF
- Several type of acquisition and document format

... and we've been surprised by how we had done it easily in a couple of week.

So far so good..

So we spent some time asking ourself why we got it so easily..

The answer is probably a mix of good patterns and technologies that we've learned after some years of experience with Eclipse:

- EMF runtime and edit
- Reflective UI using EMF Parsley
- Persistence based on Resource APIs
- Use of Inversion of Control (Guice and OSGI services)

Our goal

Build up an EMF-based architecture that is independent from Persistence layer for Web and Desktop applications.

RAP framework [1] resolves the problem of UI single sourcing.

Persistence implementation is quite easy with EMF.

We have a lot of frameworks... but what about a legacy DB?

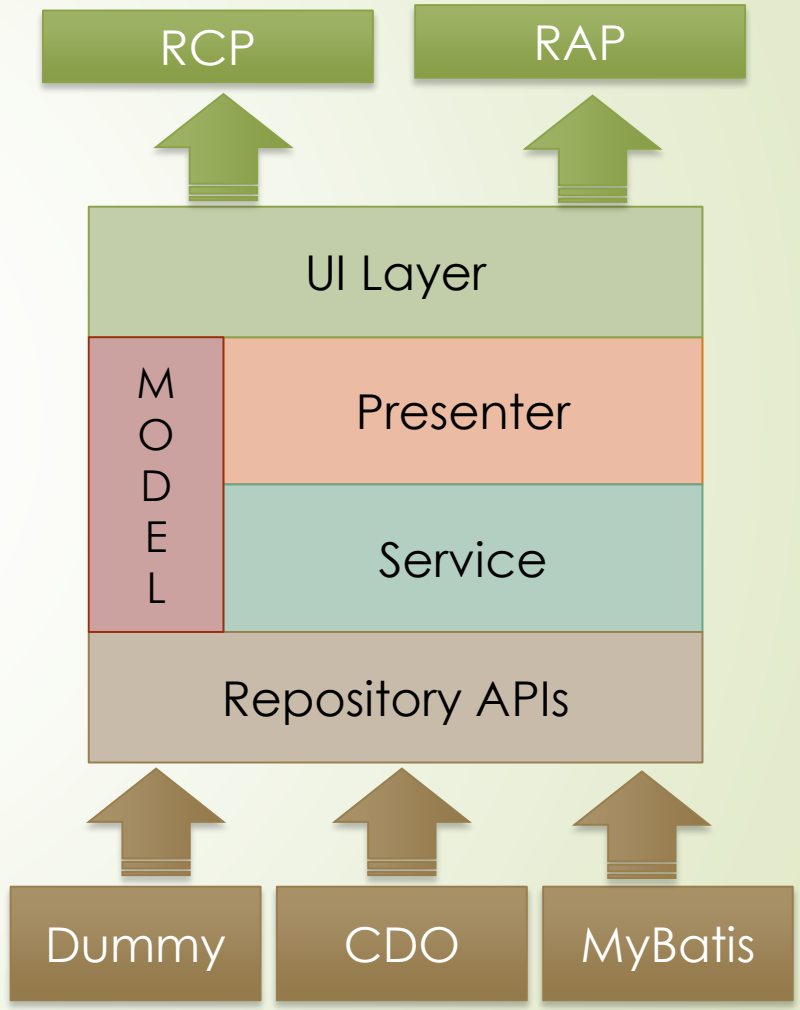
[1] www.eclipse.org/rap

About this talk

- Some theoretical slides on basic patterns and how we (revisited and) applied them to our architecture.
- Some pratical slides with code snippets to highlight most important stuff.
- A pratical example, that is a proof of concept and demonstrates that we can develop one single application with different UI and Persistence implementations.

Overall Architecture

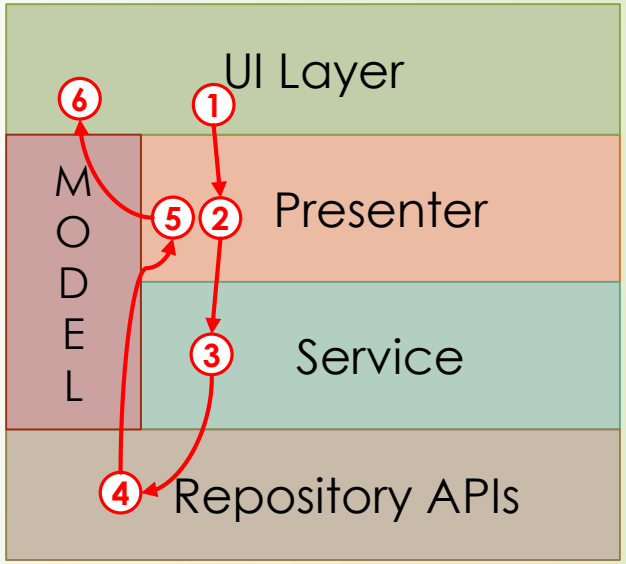
- UI layer is 100% compliance RCP / RAP
- Presenter layer...
- Service layer uses the Repository API
- There are 3 different type of repository
- Persistence is injected as OSGI service



Architecture simulation

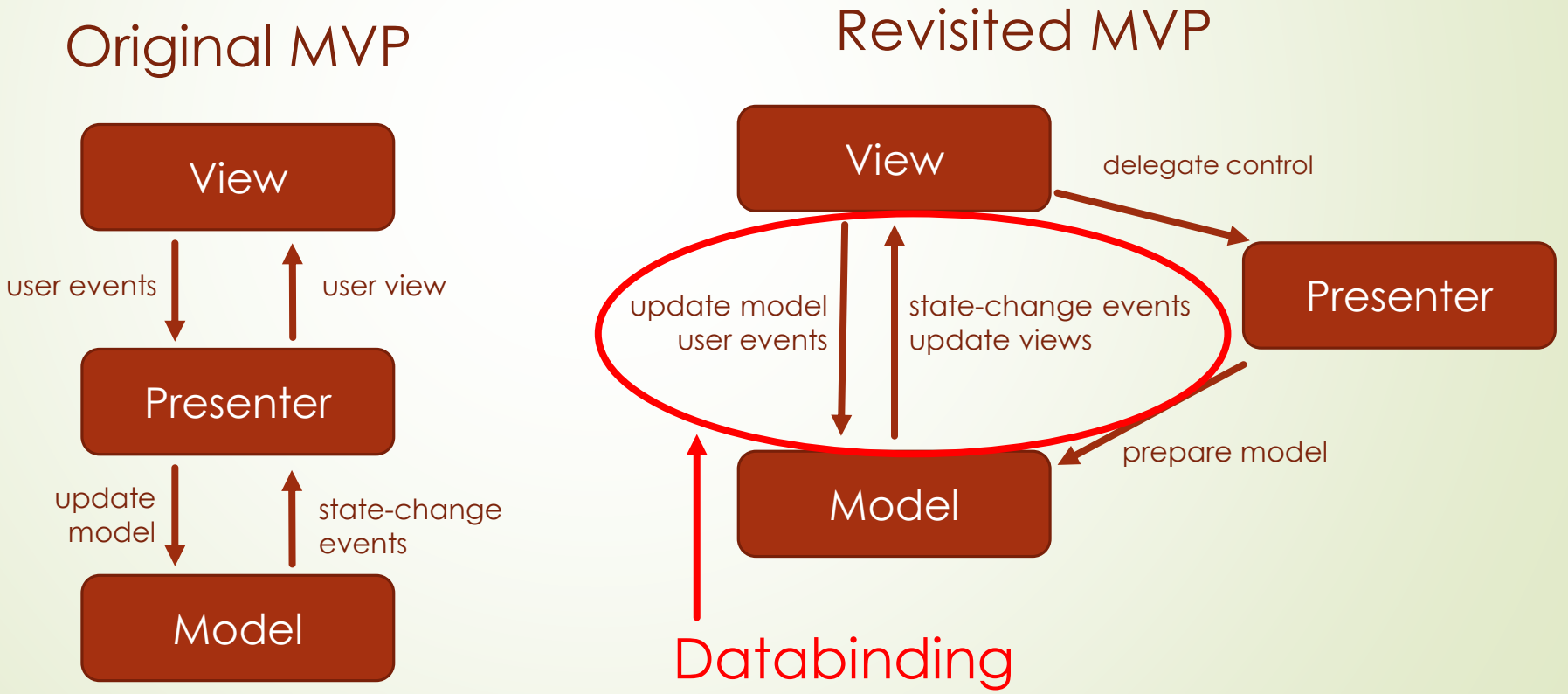
Quering for objects

1. The UI layer ask the presenter for objects to be shown
2. The Presenter call the Service layer to get the objects
3. The Service layer implements the business logic and knows which repositories are needed for the job.
4. The repository implementations return all objects that satisfy the query.
5. The presenter prepare the objects for visualization.
6. The UI layer performs the databinding between the objects and the UI controls



Pattern: Model View Presenter (revisited)

Ther UI is strongly coupled with the model and the control logic is completely delegated to a Presenter.

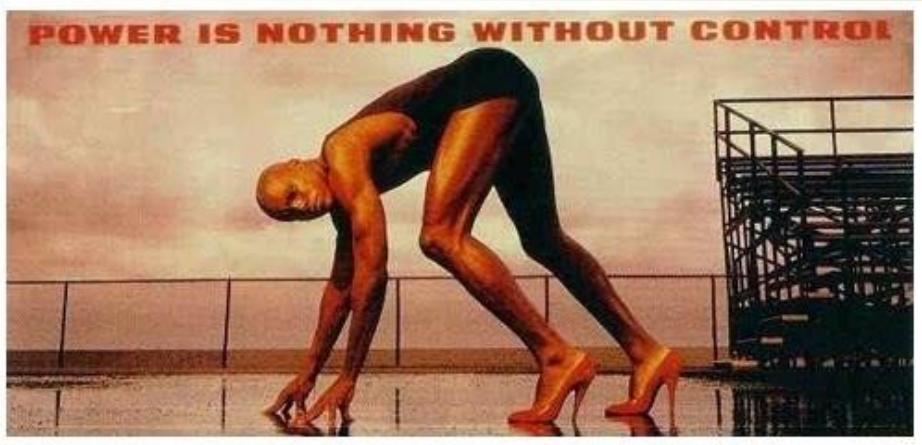


Source: https://en.wikipedia.org/wiki/Model-view-presenter

Full EMF Compliance

EMF is a great framework but you have to use it properly:

- Resource APIs
- Editing Domain
- Adapter factories



... then you'll get a lot for free:

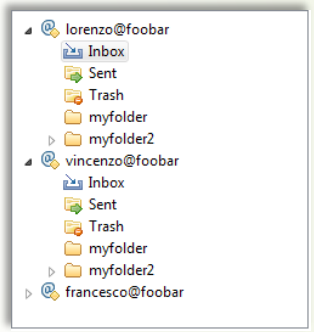
- UI - Model Databinding
- Notificaton system
- more advanced (Validation, DnD support, Undo/Redo, etc...)

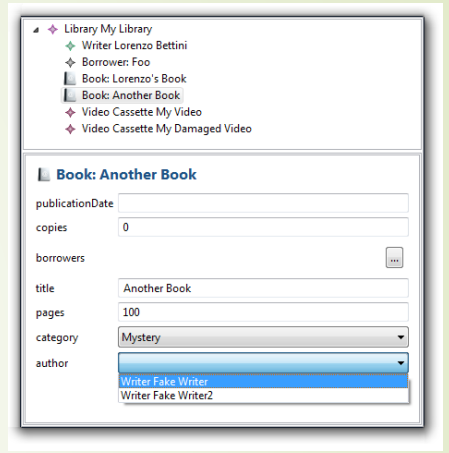
EMF Parsley

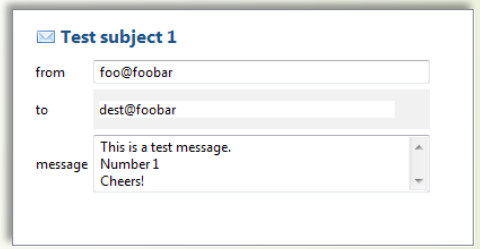
www.eclipse.org/emf-parsely

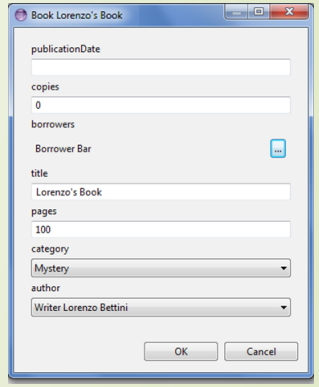
Basic components can be used out of the box:

- Tree
- Table
- Form
- Tree Form
- Table Form
- Dialog









- simple APIs
- DSL for customization
- Google Guice for injection

EMF Parsley in practice

How we use EMF Parsley to build the Table Form component.

```
public abstract class TableFormView<V extends IViewerPresenter> extends ViewPart {

@Inject
private TableFormFactory tableFormFactory;

@Inject
V presenter;

@Override
public void createPartControl(Composite parent) {
      presenter.init();

      tableFormComposite = tableFormFactory
              .createTableFormMasterDetailComposite(parent, SWT.BORDER, getEClass());
      tableFormComposite.update(presenter.getViewerInput());

      Button saveButton = new Button(buttonContainer,SWT.NONE);
      saveButton.setText("Save");
      saveButton.addSelectionListener(
            uiUtil.createSelectionAdapter(presenter::saveButtonPressed));
}
```

Parsley Injection

Parsley Table Form creation

Viewer input

MVP in practice

The View (UI Layer) uses the presenter to delegate all control logic.

```
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public void createPartControl(Composite parent) {
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}
```

Presenter Injection

Explicit Initialization

Viewer input

Lambda action

Inversion of Control

Guice is used to inject implementations in UI, Presenter and Service layers....

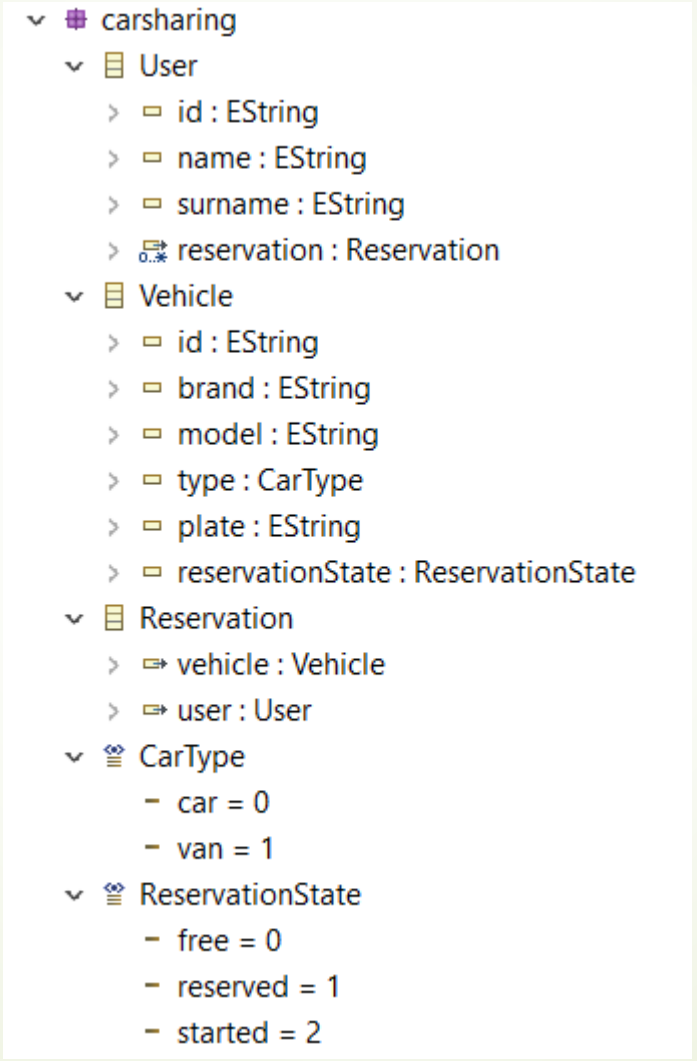
It can be used with generics to gain very powerful mechanism for Inversion of Control.

```
public abstract class AbstractViewerPresenter<T extends EObject,
            S extends IViewerService<T>> implements IViewerPresenter{

@Inject
IEditingStrategy editingStrategy;

@Inject
protected S service;

@Inject
private EmfUtil emfUtil;
```

Define the object

Define the service

Example model

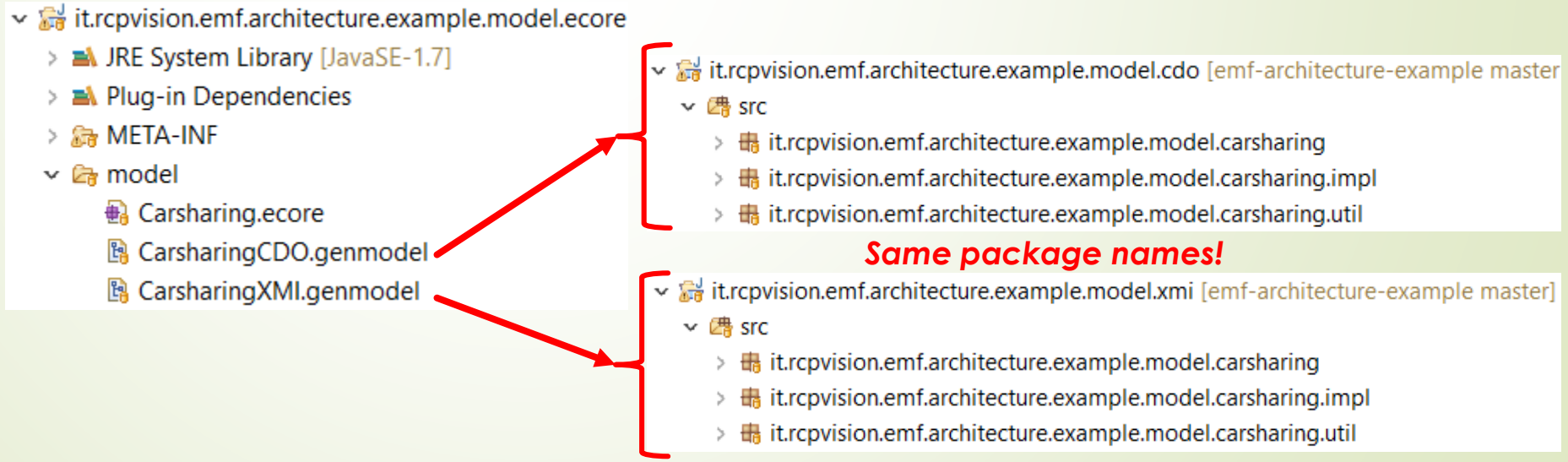


EMF and CDO generated code

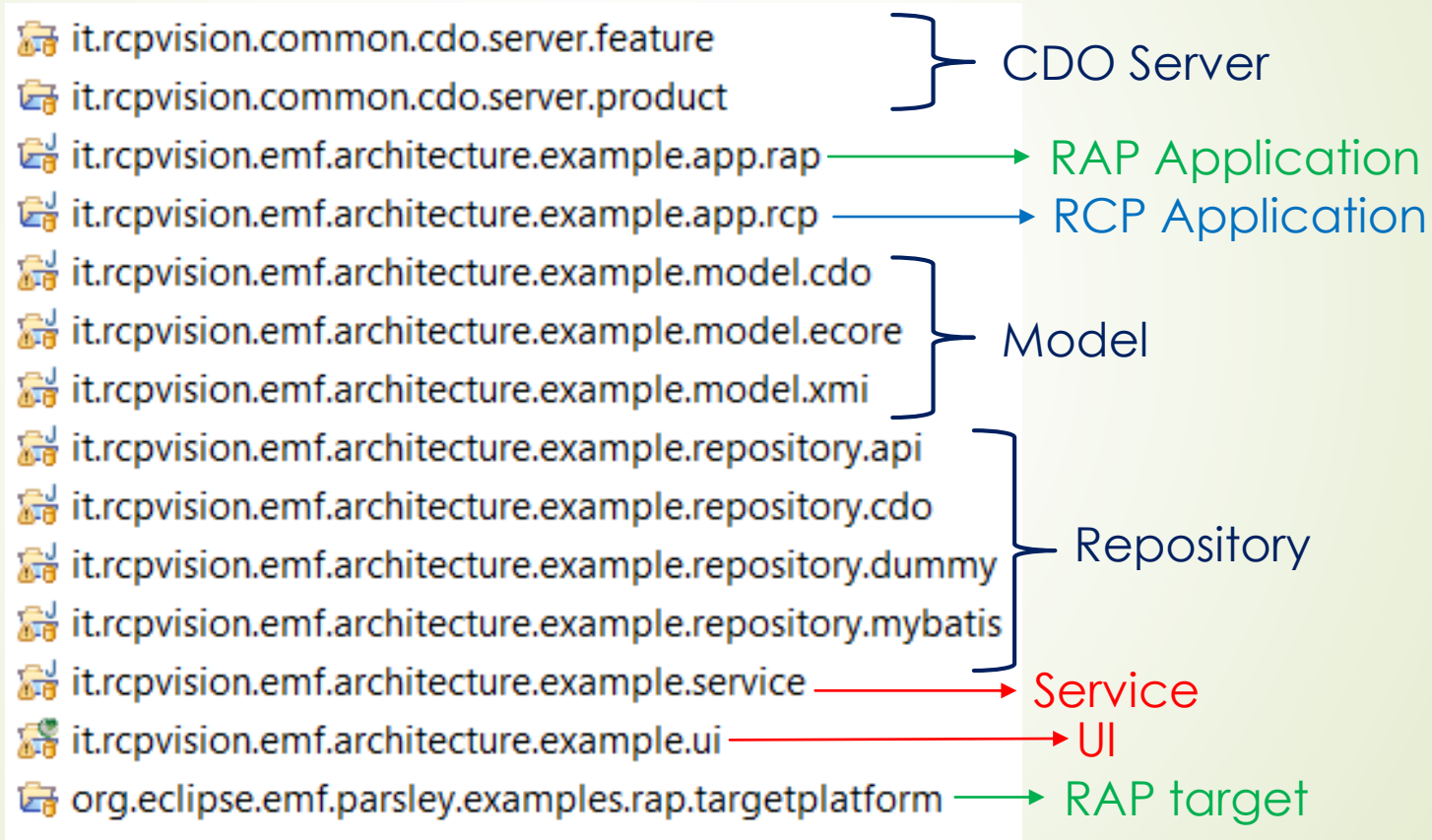
CDO Object is an EObject, but CDOObjectImpl is not an EMFObjectImpl!

EMF and CDO have two differtent generation how can we manage in a single application?

- Generate EMF and CDO cdo into 2 different plugin
- Using **import package** instead of required bundle in **dependencies** (see next slides)



The Example projects



RAP / RCP UI plug in

```
Bundle-Name: it.rcpvision.emf.architecture.example.ui
Bundle-Vendor: My Company
Bundle-Version: 1.0.0.qualifier
Bundle-SymbolicName: it.rcpvision.emf.architecture.example.ui
Bundle-Activator: it.rcpvision.emf.architecture.example.ui.UiActivator
Bundle-ActivationPolicy: lazy
Require-Bundle: org.eclipse.core.runtime,
 org.eclipse.ui;resolution:=optional,
 org.eclipse.emf.parsley.views;resolution:=optional,
 org.eclipse.xtext.xbase.lib,
 org.eclipse.rap.ui;resolution:=optional,
 org.eclipse.emf.parsley.rap.views;resolution:=optional,
 it.rcpvision.emf.architecture.example.service,
 org.eclipse.core.databinding.observable,
 org.eclipse.emf.ecore,
 it.rcpvision.emf.architecture.example.repository.api
Import-Package: it.rcpvision.emf.architecture.example.model.carsharing,
 it.rcpvision.emf.architecture.example.model.carsharing.impl,
 it.rcpvision.emf.architecture.example.model.carsharing.util,
 org.apache.commons.logging,
 org.apache.log4j,
 org.eclipse.emf.cdo;resolution:=optional,
 org.eclipse.emf.parsley.cdo;resolution:=optional,
 org.eclipse.emf.parsley.cdo.util;resolution:=optional
```

In the example UI code is contained in one single project.

The dependencies are defined to support both RAP and RCP target platforms.

And both CDO and EMF have to be suported

Repository Pattern

A Repository *mediates between the domain and data mapping layers using a collection-like interface for accessing domain objects*.

Objects can be added to and removed from the Repository, as they can from a simple collection of objects, and the mapping code encapsulated by the Repository will carry out the appropriate operations behind the scenes.

https://martinfowler.com/eaaCatalog/repository.html

An Emf Resource is very similar to a Repository!

Resource based Persistence APIs

We use the Repository Pattern to separate the domain model from the persistence layer. The Repository layer uses the Domain model as input.

```
public interface IRepository<T extends EObject> {

        void insert(T obj) throws RepositoryException;

        void update(T obj) throws RepositoryException;

        void delete(T obj) throws RepositoryException;

        T getByKey(Object key);

        List queryAll();
}
```

Repository implementations

- **DUMMY** implementation fulfills the task to provide the same APIs of other repositories, based on mock-up objects
- **CDO** is one of the implementation of a Model Repostory that provides some interesting notification mechanism between different instances of a model. www.eclipse.org/cdo
- **MyBatis** is a simple Data Mapper that speeds up the development with a set of facilities and can be very useful with Legacy DB. www.mybatis.org

The example sources

Download source code from GitHub

https://github.com/fraguid/emf-architecture-example.git

There will be 2 application projects (RCP and RAP) that contain the launch configurations:

RAP Launches	RCP Launches
Rap Application (Dummy).launch	Rcp Application (Dummy).launch
Rap Application (MyBatis).launch	Rcp Application (MyBatis).launch
Rap Application (CDO).launch	Rcp Application (CDO).launch

The Example IDE setup

We recommend to install Oxygen Modeling EPP, that contains all modeling requirements(EMF, CDO, etc)

For RAP you need to install from Oxygen update site:

RAP Tools (in Web category)

For MyBatis Generator use the update site:

https://dl.bintray.com/mybatis/mybatis-generator

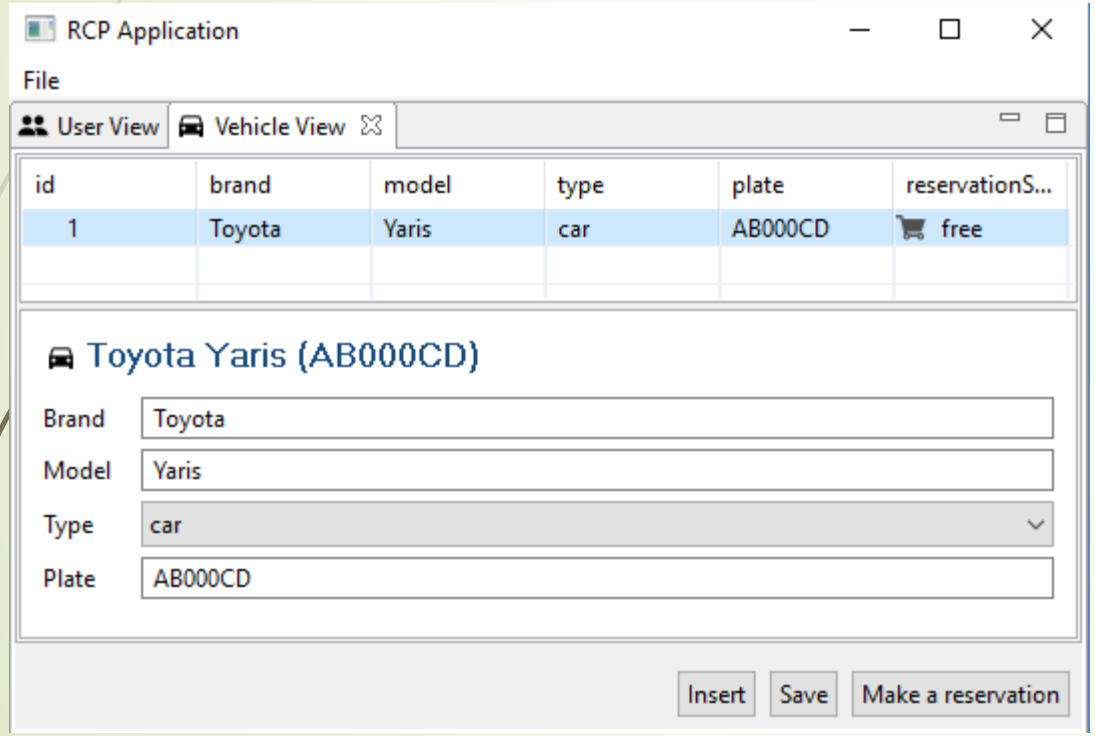
The Example target platform setup

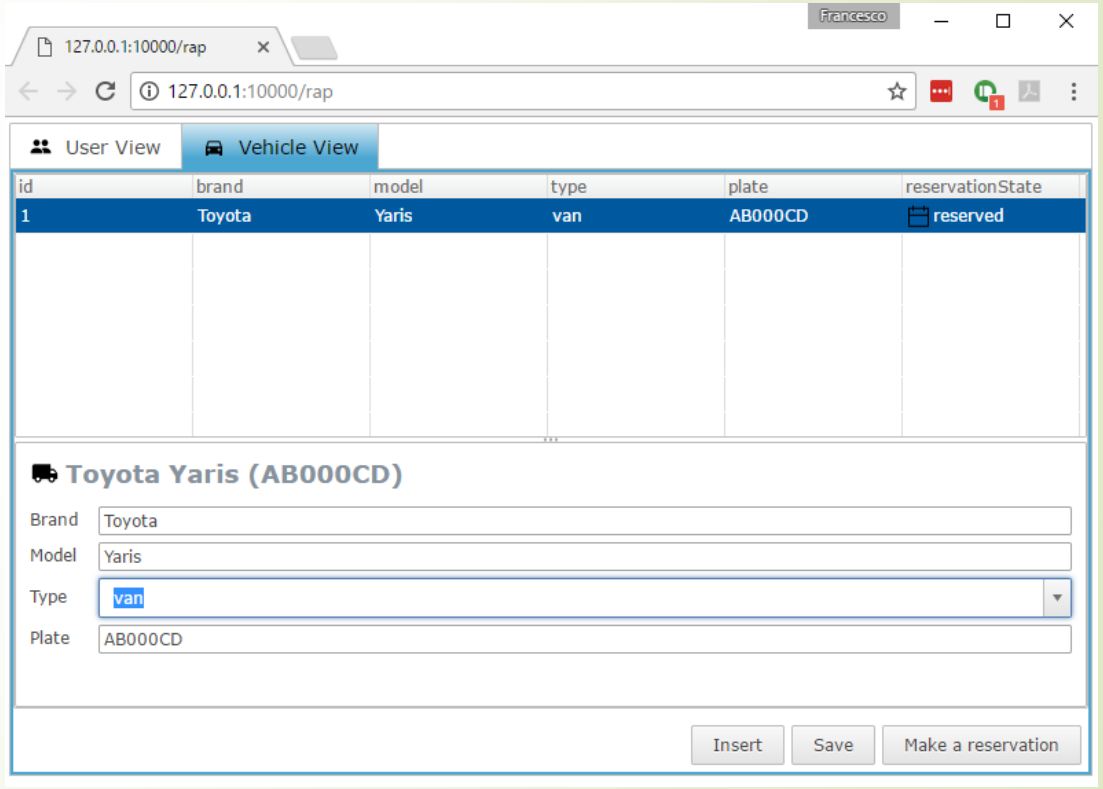
You can use the same IDE for RAP and RCP applications, simply switching between the 2 different target platforms:

- RCP target platform – You can use the running platform of Oxygen with Modeling EPP package.
- RAP target platform – You can use the Parsley RAP target platform, available as an example, by selecting menu:

File -> New example -> EMF Parsley ->
EMF Parsley RAP Target Platform Example

The example: Demo time





Questions?

Thank you for your attention

Remember to evaluate this session

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