IBM

Learn Eclipse GMF in 15 minutes

Get started with model-driven development the Eclipse way

Chris Aniszczyk, Software Engineer, IBM

Summary: This article introduces the Graphical Modeling Framework (GMF) project, shows how to develop a simple Eclipse Modeling Framework (EMF) model, and transform it into a full-blown graphical editor using GMF's tooling.

Date: 12 Sep 2006
Level: Intermediate
Activity: 3188 views
Comments: 0 (Add comments)

Average rating

Background

Let me be blunt: In the past, creating graphical editors within Eclipse using the Graphical Editor Framework (GEF) was slow and painful. It involved understanding a complex framework and quite a bit of redundant code. That said, GEF is an excellent framework for creating graphical editors because it is model-agnostic. On the other hand, being model-agnostic creates its own problems.

GMF trivia

The runtime component of GMF was donated by IBM® to the Eclipse Foundation, and previously supported IBM Rational® modeling products.

GEF, in the spirit of the Model-View-Controller (MVC) paradigm, allows you to bring your own model to the table. In the early days of GEF, most people used custom models (think Plain Old Java™ Objects (POJOs)). The problem with custom models is that you find yourself writing common code to support your model, like serialization and the ability to listen to model changes.

The next logical step for using a model in GEF was to use the Eclipse Modeling Framework (EMF), which provides facilities to serialize your model in various formats and the ability to listen to model changes, all out of the box.

Want to learn more about EMF?

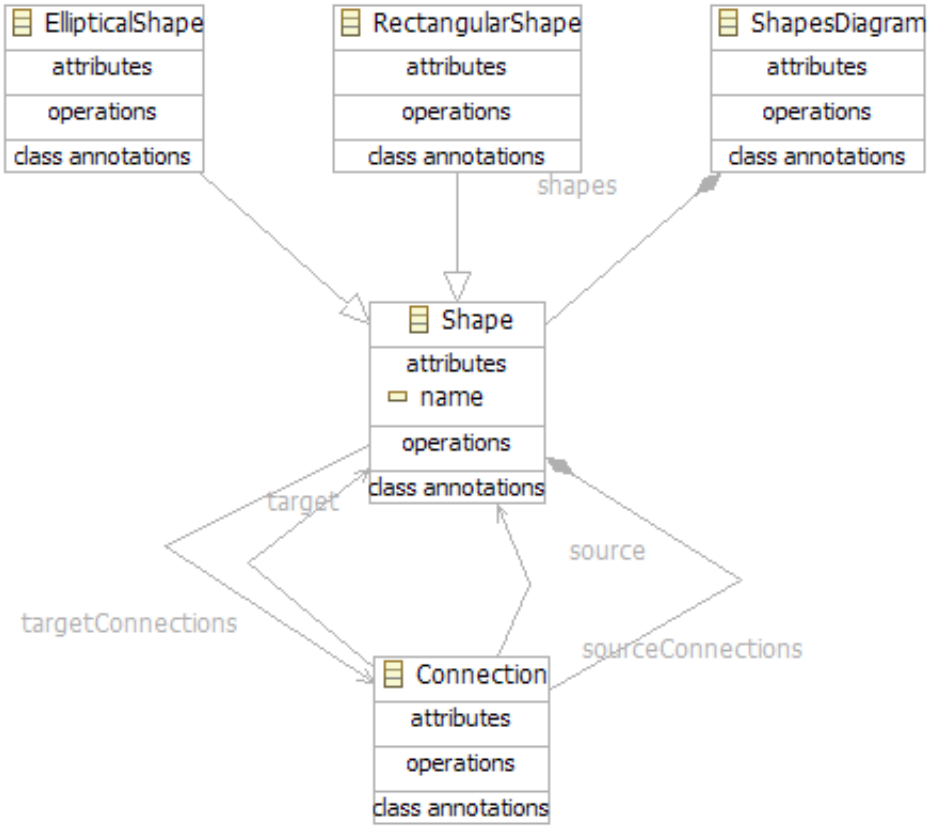
If you feel that you're lacking basic Eclipse Modeling Framework (EMF) knowledge, or would just like to strengthen your overall knowledge of it, I recommend several great resources. One is a book, and another is a series of introductory developerWorks articles. See Resources for these and other EMF resources.

However, there were technical challenges (like different command stacks) integrating EMF models within the GEF framework, which delayed adoption of EMF models for GEF-based editors. In the end, the GMF project was born out of this frustration and the desire to bring an expedited way to generate graphical editors. In a similar way, EMF generates basic editors for EMF models.

Create your EMF model

The first step on our adventure is to define an EMF model with which to work. My goal is just to show the process of defining the model and not go into the depth of the facilities that EMF provides for manipulating a model. The model we will use in this example is a simple shapes model. I like to start with a picture to help me visualize how the model will look.

Figure 1. The shapes model visualized



As you can see, the model is a very simple way to help us understand how everything works. It has a notion of some shapes, connections, and a shapes diagram.

EMF supports multiple ways of defining a model. I decided to use annotated Java technology for simplicity. The code listings below show how to define a model using EMF. Our first model object is a shape that has a name attribute, source, and target connections (of type `Connection`). Please note that this is an abstract EMF class.

Listing 1. Shape.java

```
/**
 * @model abstract="true"
 */
public interface Shape {

/**
 * @model
 */
String getName();

/**
 * @model type="com.ibm.model.shapes.model.Connection" containment="true"
 */
List getSourceConnections();

/**
 * @model type="com.ibm.model.shapes.model.Connection"
 */
List getTargetConnections();
}
```

Next, we define a shapes diagram that will hold a list of all our shapes.

Listing 2. ShapesDiagram.java

```
/**
 * @model
 */
public interface ShapesDiagram {
/**
 * @model type="com.ibm.model.shapes.model.Shape" containment="true"
 */
List getShapes();
}
```

Next, we define some special shapes to liven up our model a bit.

Listing 3. RectangularShape.java

```
/**
 * @model
 */
public interface RectangularShape extends Shape {}
```

Listing 4. EllipticalShape.java

```
/**
 * @model
 */
public interface EllipticalShape extends Shape {}
```

Finally, it would be nice if we had some notion of a connection so we could actually connect our shapes together.

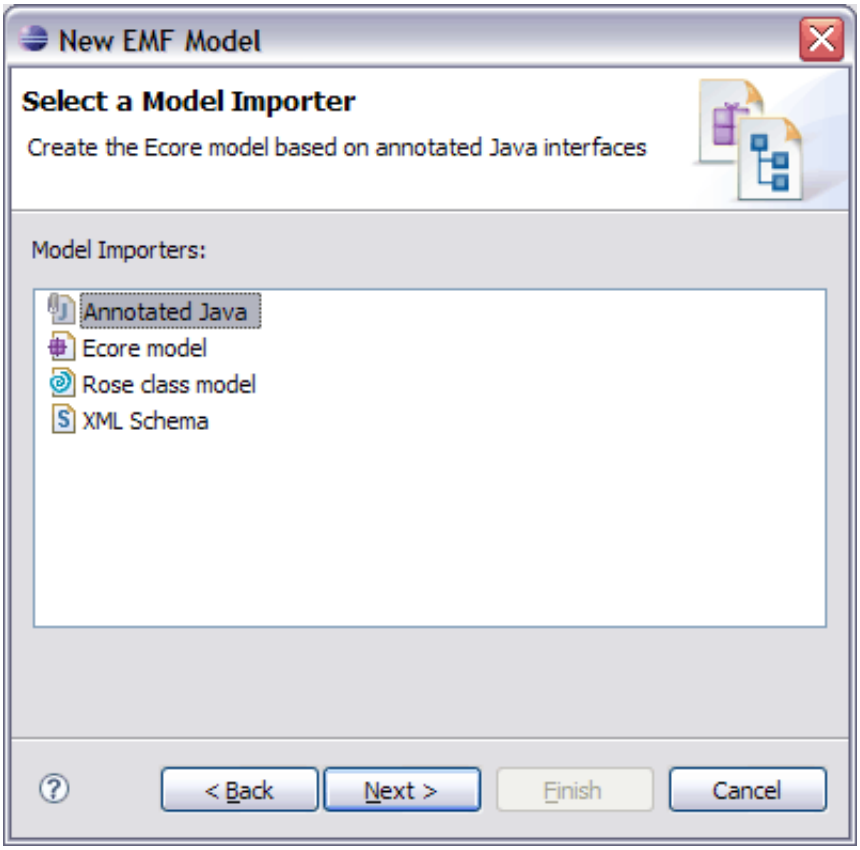
Listing 5. Connection.java

```
/**
 * @model
 */
public interface Connection {
/** @model */
Shape getSource();

/** @model */
Shape getTarget();
}
```

After we have our models defined in the Java programming language, we define a new EMF genmodel by using **File > New > Eclipse Modeling Framework > EMF Model** (see Figure 2). **Note:** If you don't have an EMF project, create one first.

Figure 2. EMF annotated Java importer



Generating EMF models

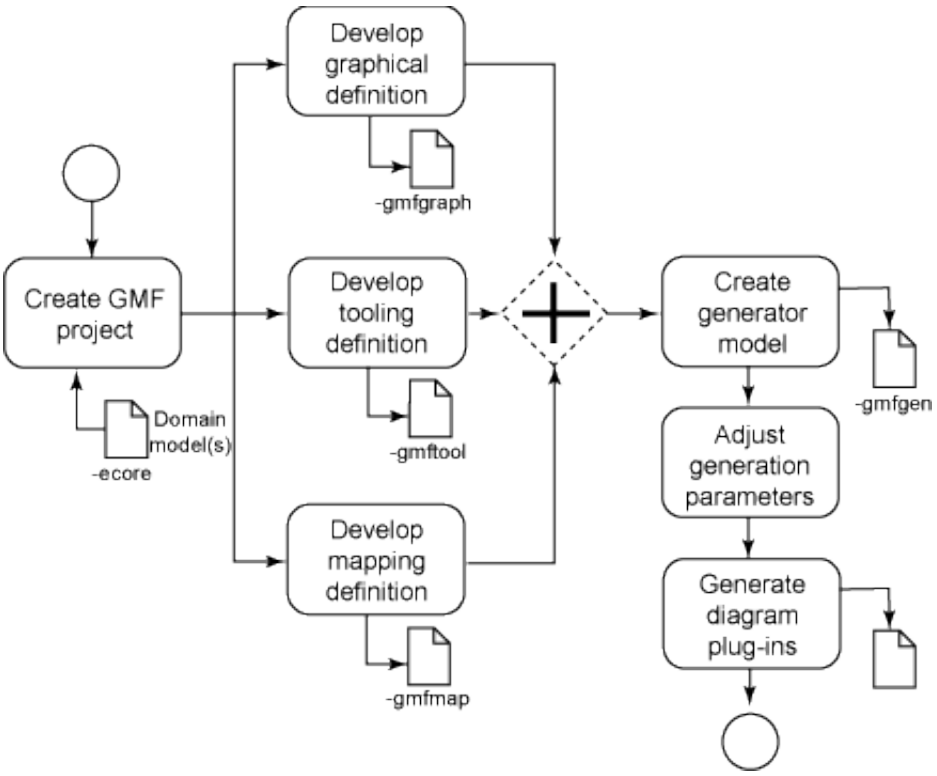
If you're having trouble generating EMF models, there's a great tutorial titled "Generating an EMF Model" that can help you get started. See Resources.

After you create your EMF genmodel, right-click on the file and make sure to generate **Model** and **Edit** components (you can just select **Generate All** to make your life easier).

Create your GMF models

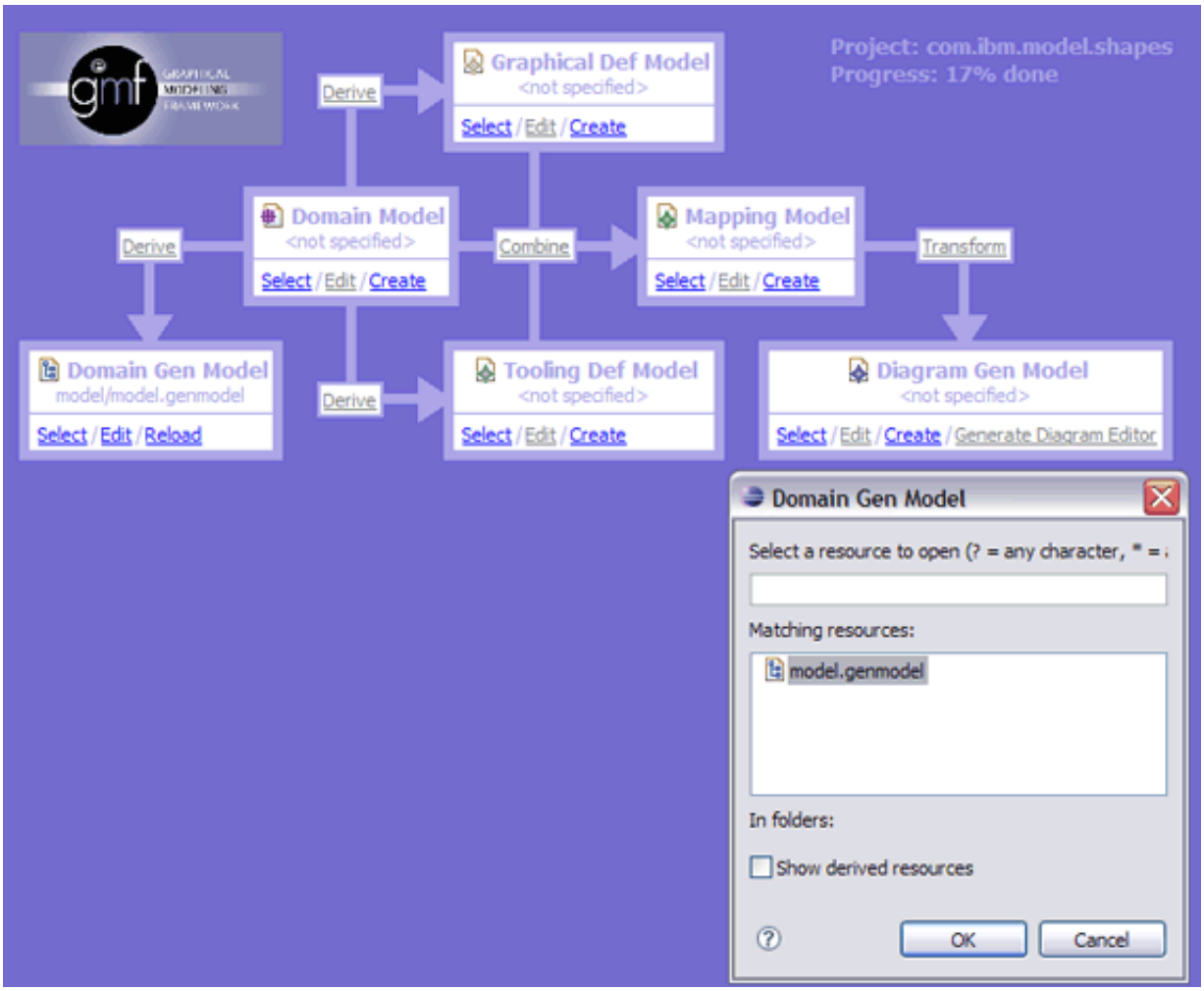
GMF has a set of models you need to create to generate a graphical editor. Figure 3 displays the process involved in creating these models. The first model we need to work with is the graphical definition, which defines the visual aspects of our generated editor. Next is the tooling definition, which comprises things related to editor palettes, menus, etc. Finally, the last model we need is the mapping definition that defines -- you guessed it -- the mapping between the business logic (your EMF shapes model) and visual model (graphical and tooling definition).

Figure 3. GMF overview (from the GMF wiki)



GMF has a great utility called the GMF dashboard (**Window > Show View > Other > GMF Dashboard**). The dashboard serves as an easy way to go through the process of generating a graphical editor. At this stage, you should already have your domain model and domain genmodel selected.

Figure 4. GMF dashboard



The GMF graphical definition model

GMF cheat sheets

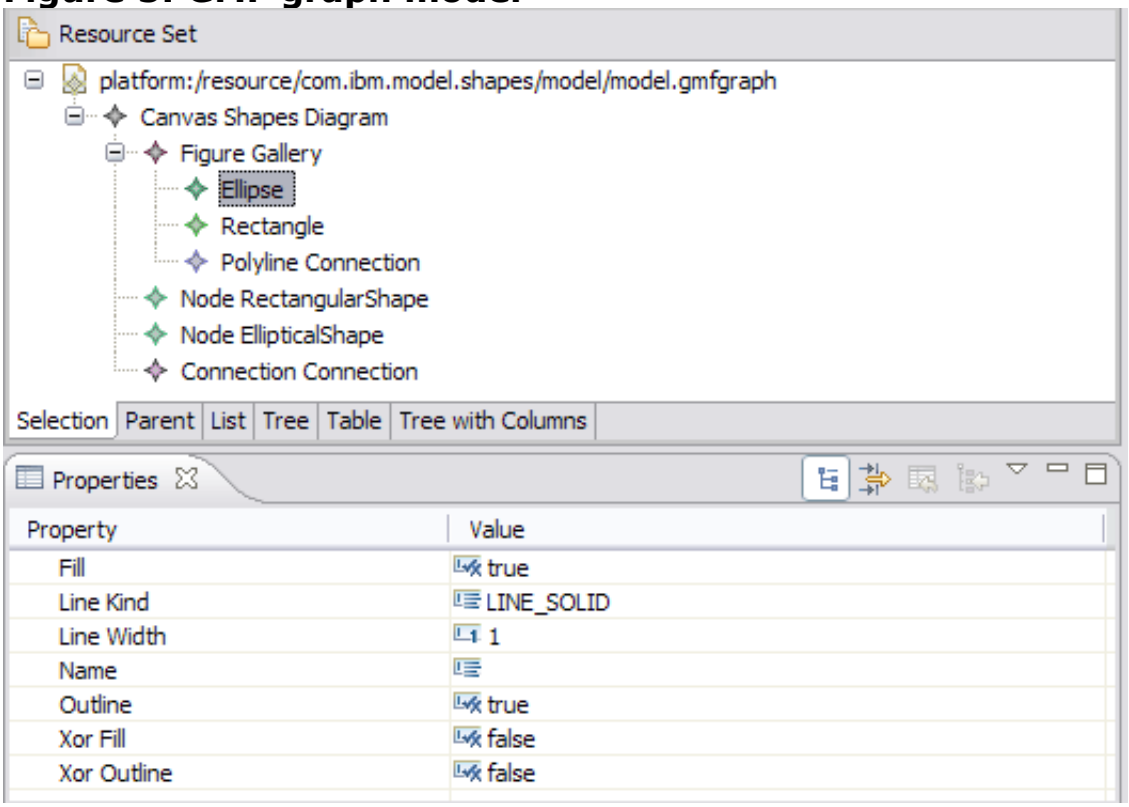
GMF has a fantastic cheat sheet available to guide you through the process of creating a GMF-generated editor. I recommend using it along with the GMF dashboard. Access the cheat sheet through menu item **Help > Cheat Sheets...**.

The first model we create is the *graphical definition model* (click the create hyperlink under the **Graphical Def Model** in the dashboard). Make sure to select **Canvas** as the model object. This model is simple to create:

1. Create the figures we want displayed on the diagram. This is done by creating a new **Figure Gallery** entry in the editor and creating various figures.
2. Create the nodes we'll see on our diagram (rectangular shape and elliptical shape).
3. Create a connection on our diagram.
4. Make sure each node matches up to the figure created in the figure gallery.

Note: If you're having trouble with this task, there is a sample plug-in download that has all the models already made for you.

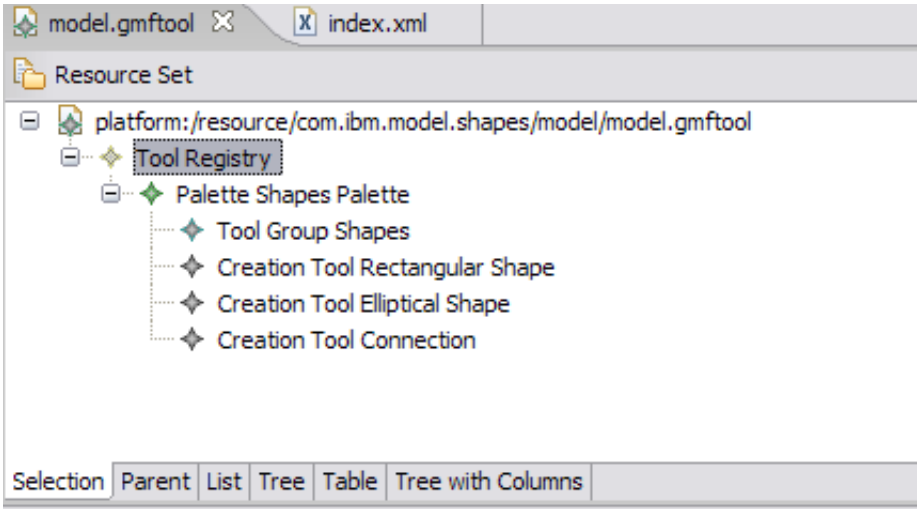
Figure 5. GMF graph model



The GMF tooling definition model

In this step, we need to define the *tooling definition model*, which lets us define information-like palettes and menus for our graphical editor. To define a tooling definition model, open the GMF Dashboard and click **create**. Our simple model only needs to define a palette and some creation tools to help with model creation (see Figure 6).

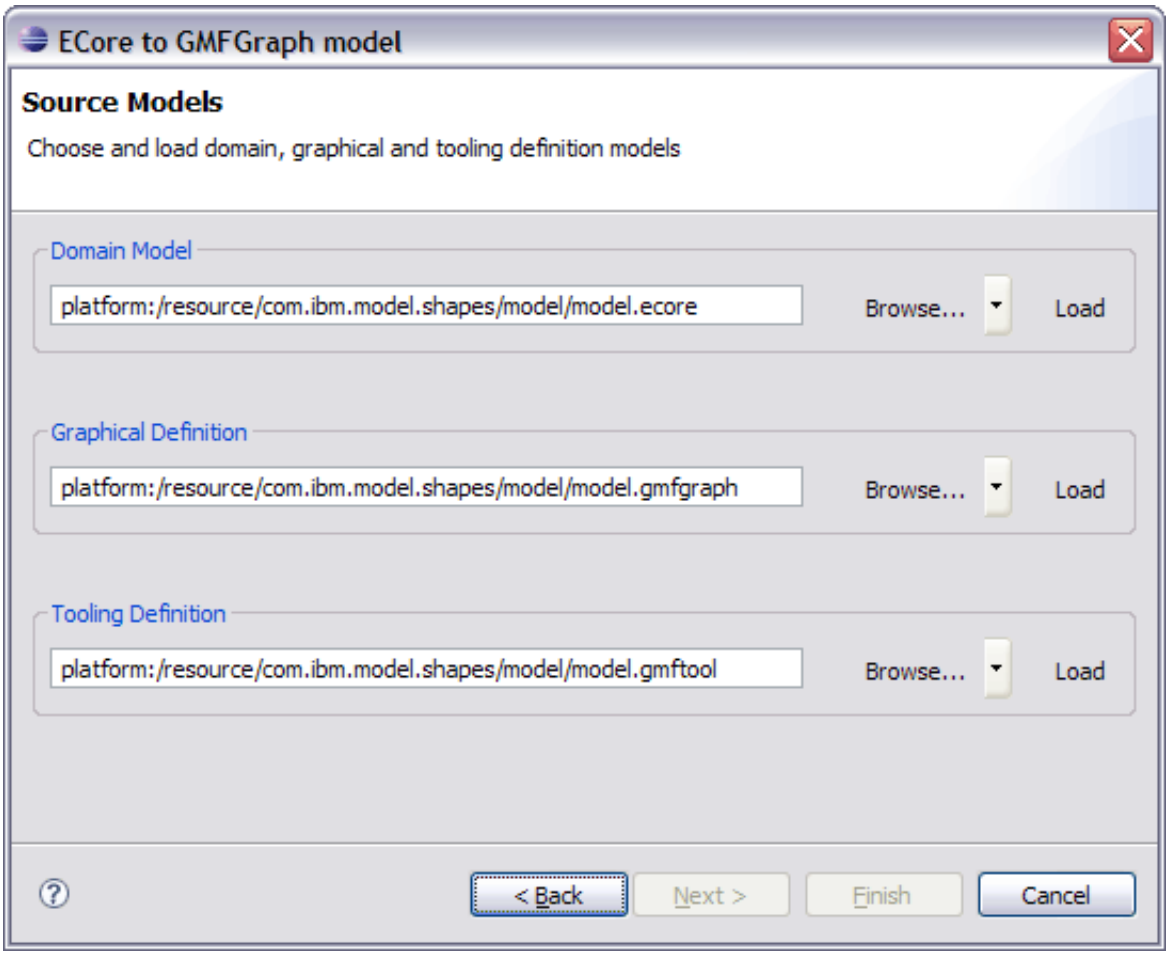
Figure 6. GMF tooling model



The GMF mapping definition model

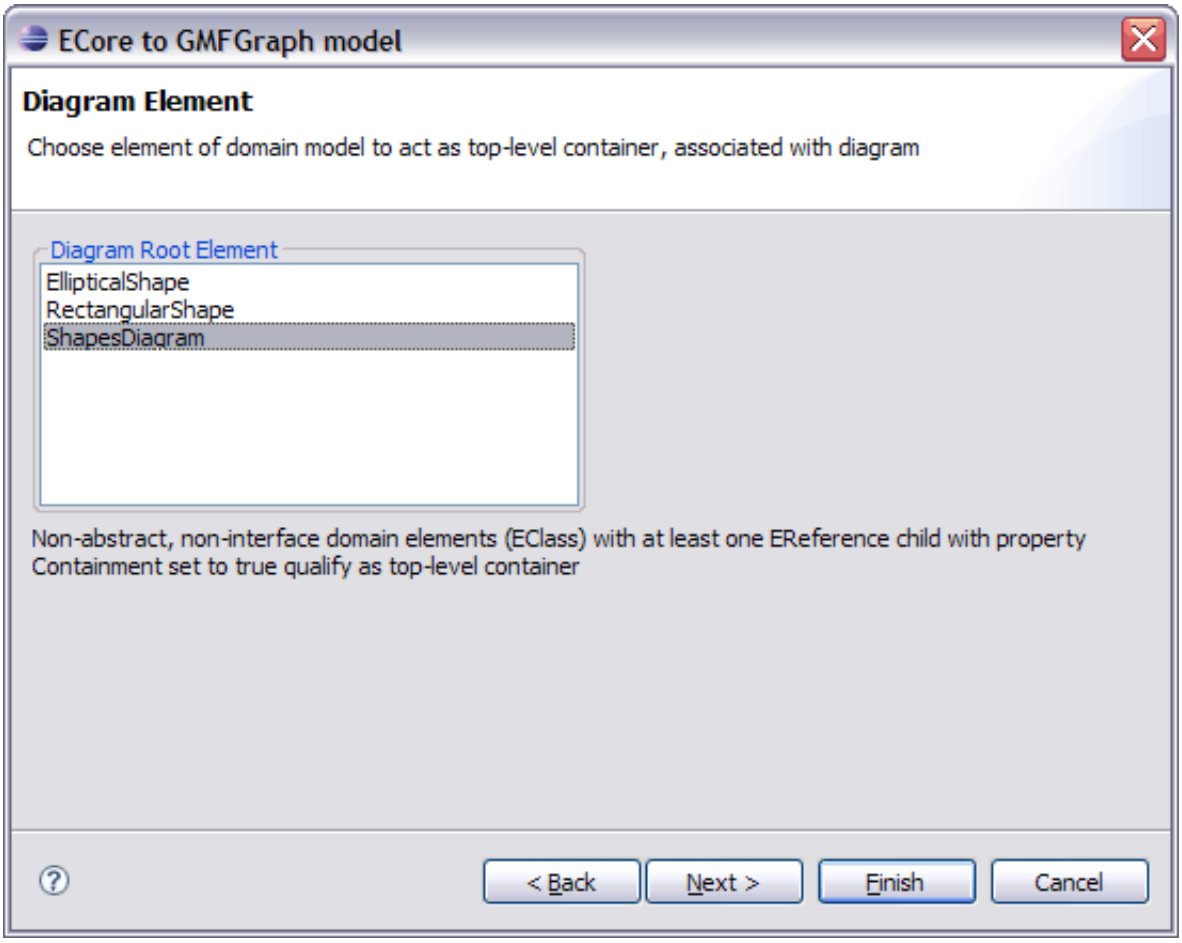
The *mapping definition model* is where it all comes together. In this model, we map our visual (graph) model to our business logic (domain model). GMF has a neat set of wizards to help create a mapping definition. It can be invoked using **File > New > Graphical Modeling Framework > Guide GMFMap Creation**. The first step is to select all of our GMF models (see Figure 7).

Figure 7. GMFMap guide wizard 1



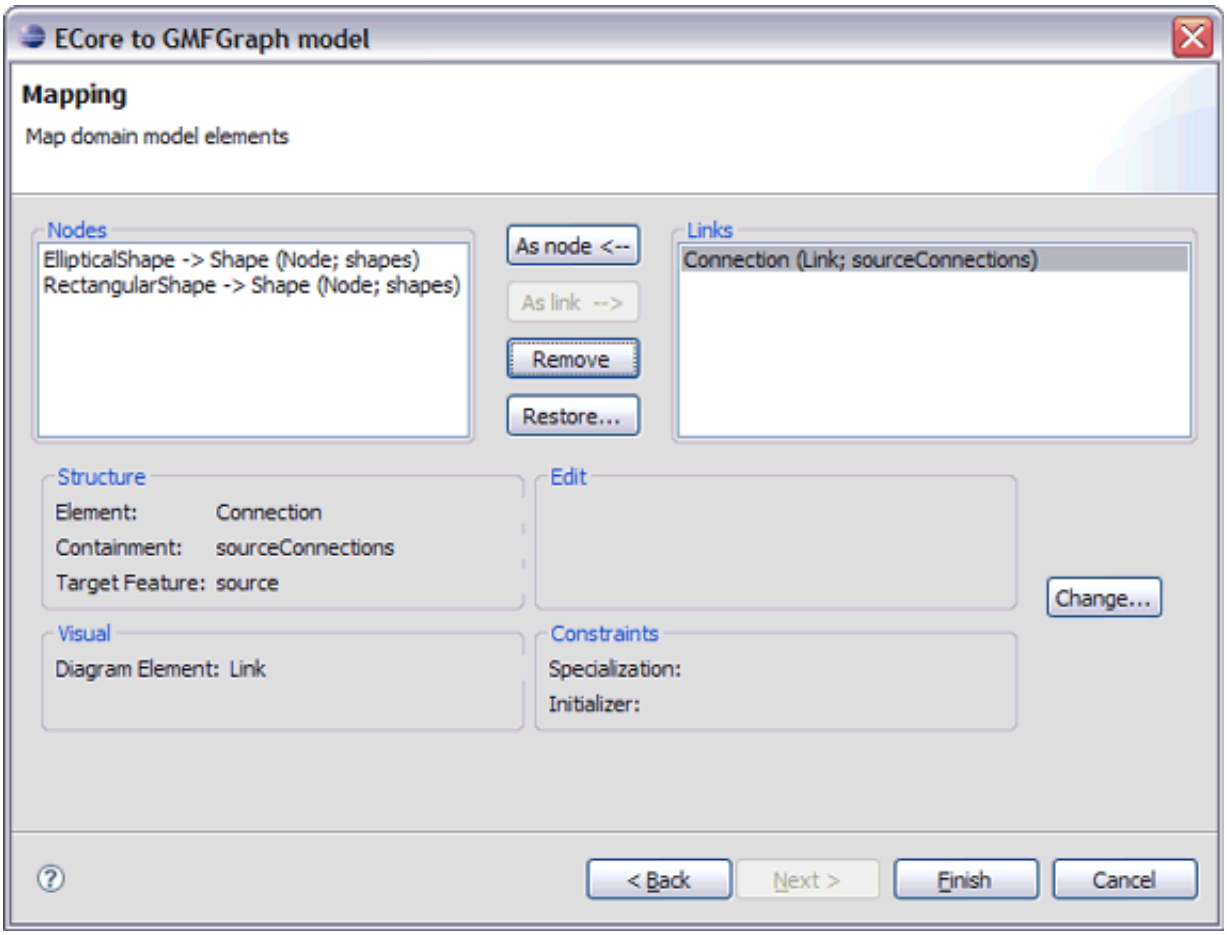
Next, the wizard intelligently asks us to select which model element we want to use as the diagram root element. In our case, this will be the **ShapesDiagram** model element.

Figure 8. GMFMap guide wizard 2



Finally, GMF does some magic for us to figure out what model elements should be mapped to what visual elements.

Figure 9. GMFMap Guide wizard 3



GMF mapping customizations

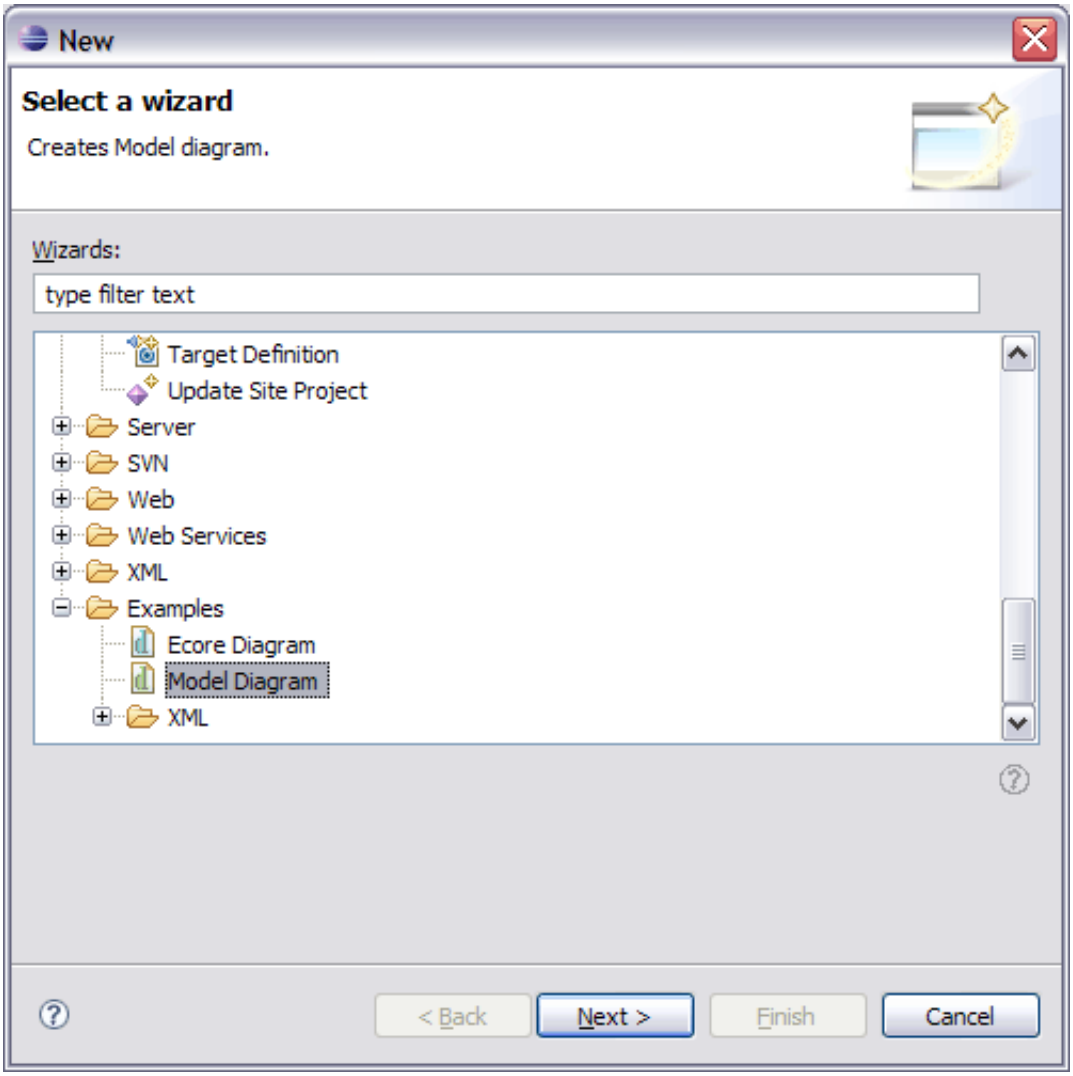
The GMF mapping definition file can be edited using a basic editor to add more advanced customizations. Don't be afraid to explore!

It is important to note that these wizards may change as GMF evolves. There is talk of GMF using graphical editors bootstrapped by GMF itself to help with the creation of the mapping definition file (and the other GMF models).

Generate your GMF editor

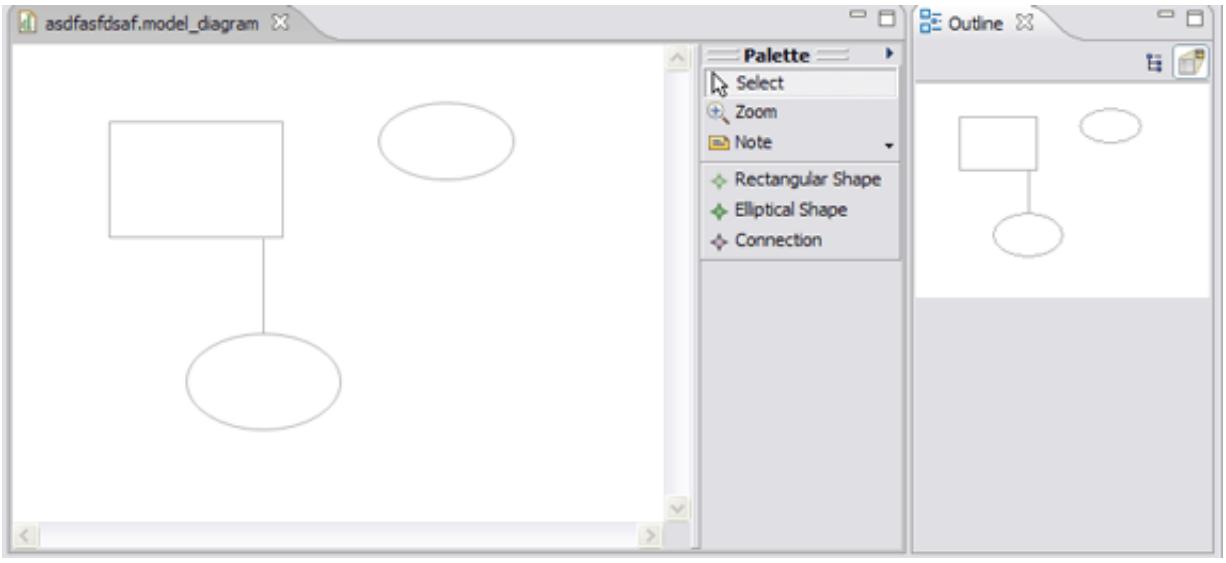
The last and most enjoyable step of this whole process is to generate your graphical editor. To do this, create a *GMFGen model* from your mapping definition model. To do this, right-click your mapping definition file and select **Create generator model...**. A new project should be generated containing all the code to work with your graphical editor. To use your graphical editor, launch a new Eclipse runtime workbench and go to **File > New > Examples > Model Diagram** (see Figure 10).

Figure 10. Model wizard



After your model file is created, you should be able to work with the generated editor (see Figure 11). That wasn't too bad, was it?

Figure 11. Shapes editor



GMFGen model customizations

The GMFGen model you get from a mapping definition file can be precisely tailored to your needs. For example, the GMFGen model has properties that can be edited using the properties view. It has properties that control the naming conventions of the code generated, whether you want printing support for your generated editor, and many other customizations. Explore these options and customize it to fit your needs.

GMF features

It's important to note that the generated editor we've concocted is only a fraction of GMF's capabilities. There is much tweaking that can be done to take advantage of the advanced features of the framework.

For example, GMF has support for validation. What I mean by this: What happens if we wanted to restrict our shapes model to only allow one connection per model element? Only allow similar elements to connect to each other? Or, how about have control over what type of names can be used for our shapes? GMF is fully capable of supporting these types of validation and more. For validation, GMF takes advantage of the Eclipse Modeling Framework Technology (EMFT) to support scenarios involving defining validators using Java code and the Object Constraint Language (OCL). GMF will put error markers for files that don't pass validation similar to what Eclipse does for Java files that don't compile. To find out more about what GMF supports, see Resources.

Conclusion

My goal here was twofold: I wanted to demonstrate a new and exciting part of the

Eclipse Callisto release that supports model-driven development, and I wanted to show how cool it is, in just 15 minutes, to generate graphical editors in Eclipse.

Download

Description	Name	Size	Download method
Sample plug-in	os-ecl-gmf.zip	41KB	HTTP

Information about download methods

Resources

Learn

- New to Eclipse Modeling Framework? Read Part 1 and Part 2 in the developerWorks series "Model with the Eclipse Modeling Framework."
- Visit The Eclipse Graphical Modeling Framework (GMF) to learn about GMF in general.
- The Graphical Modeling Framework wiki offers tutorials and plenty of information about advanced GMF features.
- Frederic Plante wrote a wonderful article titled "Introducing the GMF Runtime," detailing the advanced features of the GMF runtime.
- Check out the Eclipse Modeling Framework (EMF) for tutorials and articles that can be useful for the EMF novice.
- The EMF team has a good introductory tutorial titled "Generating an EMF Model."
- If you need the definitive source on EMF, the book *Eclipse Modeling Framework* is a great reference.
- The Eclipse Modeling Project is a new Eclipse top-level project aimed at promoting model-based development technologies within the Eclipse community by providing a unified set of modeling frameworks, tooling, and standards implementations. The EMF and GMF projects will be under this project in the future.

- The Eclipse Modeling Framework Technology (EMFT) Project is a new Eclipse project that incubates new EMF-related technologies.
- Learn more about the Eclipse Foundation and its many projects.
- For an excellent introduction to the Eclipse platform, see "Getting started with the Eclipse Platform."
- Expand your Eclipse skills by visiting IBM developerWorks' Eclipse project resources.
- Browse all of the Eclipse content on developerWorks.
- Visit the developerWorks Open source zone for extensive how-to information, tools, and project updates to help you develop with open source technologies and use them with IBM's products.
- Stay current with developerWorks technical events and webcasts.

Get products and technologies

- Check out the latest Eclipse technology downloads at IBM alphaWorks.
- Innovate your next open source development project with IBM trial software, available for download or on DVD.

Discuss

- The Eclipse Foundation's EMF newsgroups should be your first stop to discuss questions about EMF.
- And check out the Eclipse Foundation's GMF newsgroups to learn about the intricacies of GMF.
- The Eclipse newsgroups has many resources for people interested in using and extending Eclipse.
- Get involved in the developerWorks community by participating in developerWorks blogs.

About the author

Chris Aniszczyk is a software engineer at IBM Lotus focusing on OSGi related development. He is an open source enthusiast at heart, and he works on the Gentoo Linux distribution and is a committer on a few Eclipse projects (PDE, ECF, EMFT). He's always available to discuss open source and Eclipse over a frosty beverage.