1. Summary

This document, besides exercises, contains details about the setup of the required software and the code artefacts for Manipulating Models and Metamodels using a Model-Driven Approach using EMF and Eclipse Framework in the Eclipse IDE as well as dealing with Sirius Visual Editors. The text is to be used as a collection of practical examples to support the lab lectures of the course on Model-Driven Engineering at Faculdade de Ciências e Tecnologia at Universidade Nova de Lisboa (FCT/UNL) in Portugal.

2. Eclipse Setup

The detailed descriptions in this section, and the following ones, are using **Eclipse IDE 2022-09** downloaded from <u>https://www.eclipse.org/epsilon/download/</u>

Make sure that when you run the installer, you select the Eclipse Modeling Tools, as in the Figure:





When running Eclipse after installing it, you will have to install Epsilon 2.4 by introducing the following path http://download.eclipse.org/epsilon/updates/ in the dialogue box you get when you select Help->Install New Software as follows:

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Available Software			
Check the items that you wish to install.			S.F.
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Epsilon Core Development Tools			
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Epsilon HTML Integration			
Epsilon JDT Integration			
Epsilon Simulink Integration			
Details			
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Show only the latest versions of available software	Hide items that are already installed	ł	
Group items by category	What is already installed?		
Show only software applicable to target environment			
Show only software applicable to target environment			
Contact all update sites during install to find required software			
	< Back Next >	Finish	Cancel
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3. Creating my First Modelling Project

The first thing to do is to follow File->New->Ecore Modelling Project :



Then introduce a name like, for instance, "HelloWorld":

Enter a project name				
roject name: HelloW	orld			
Use <u>d</u> efault locatio	ı			
ocation: C:\Users\va	co\eclipse-LectureNotes\He	elloWorld		B <u>r</u> owse
Working sets				
Add projec <u>t</u> to wo	rking sets			Ne <u>w</u>
W <u>o</u> rking sets:			~	S <u>e</u> lect

After pressing Finish whole set of files and folders will be automatically created:

eclipse-LectureNotes - platform:/resource/HelloWorld/m	odel/helloWorld.aird/helloWorld - Eclipse IDE	- 0	\times
File Edit Diagram Navigate Search Project Run	Window Help		
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	Annotation Ns LIRI: (2) http://www.example.org/helloWorld		
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When navigating on the model explorer you will see the model folder, which is the place where you are going to edit all the models and metamodels manipulation files. An empty helloWorld.ecore empty file was created, and automatically the helloWolrd.aird is opened in the visual Diagram editor. You can start immediately modelling your first metamodel with the Ecore UML-like Class models notation. You can Model the following HelloWorld metamodel. By convention, you should always name the classes starting with capital letters and the names of attributes should be started with a lower-case character.



What we are saying here is that HelloWorld models have Hello's and Worlds. Each instance of those classes should have a name (or text, if you will) and a language. Each Hello is related to zero or more worlds.

Now save everything you've done so far (this should be a common procedure when you are dealing with these tools to keep consistency as this automatically should synchronize/update with your ecore file).

The next thing to do is to try out some instances of this metamodel. So let us create an example model by double-clicking on helloWorld.ecore file on the Model Explorer:



If you don't see the window like editor like the figure before, you can also right-click on the helloWorld.ecore file and select Open With->Sample Reflective Ecore Model Editor like this:



The next step is to create the model instances. For that, you need to right-click on the class HelloWorldModel. It should be always the class that contains the other elements, also called root node (and that usually, we name XXXModel to be clear). Select Create Dynamic Instance like in the following figure:



A dialogue box will appear asking for the name you want to persist the instance model you want to build as an example. You can call here, for instance, HelloWorldExampleModel.xmi: orld/model/HelloWorldExampleModel.xmi - Eclipse IDE



odel.xmi

Now you are able to add to the XMI file the instances in a explorer-tree-like fashion. Let us create the following example:



You can save it now. And that is it! You now have instances of your meta-model persisted in a XMi file.

The next step is to make something with the instances.

Let us now translate the model instance to text, which is called model-to-text transformation. To do this we will use Epsilon. More specifically, we will use the Epsilon Generation Language (EGL) language (for more details about the language see the epsilon Book <u>http://https://www.eclipse.org/epsilon/doc/book/</u>).

For that, you have to create in the same model folder a EGL file. Just follow the sequence **File->New->Other**:



The next step is to look for egl:

Select a wizard						×
Select a wizard						->
Create a new EGL Temp	late				1	
Wizards:						
egl						×
 Epsilon EGL Template Examples Epsilon Experiment v Generating H 	with the different f	features of EGL using a an XML document	a Flowchart-to-HT	⁻ ML tran	sformatio	in.
0	< Back	Next >	Finish		Cancel	

Give a name to the file you want to store the egl code (e.g. generate-output.egl) and press **Finish**:

🖨 New EGL Program					×
New EGL Program					
This wizard creates a ne	w EGL program file	with *.egl extensior	1		
Enter or select the parent	t folder:				
HelloWorld/model					
👻 🖆 HelloWorld					
🗁 .settings					
🗁 bin					
META-INF					
🗁 model					
SrC 🤅					
File name: generate-out	put				
Advanced >>					
Advanced >>					
(?)	< Back	Next >	Finish	Cancel	

You can write the following code:

```
& helloWorld @ helloWorld.ecore @ HelloWorldExampleModel.xmi @ *generate-output.egl ×
1 International
2 ------
3
4 [% for (h in Hello.all) { %]
5 ->>>>>
6 [%=h.name%] [%=h.world.name%]
7 <<<<<--
8 [%]%]
9
10 ------
11
12 It seems to work!</pre>
```

Finally lets do the last steps to run it. Start by right-clicking on the egl file on the model explorer tree. Next, follow **Run As -> Run Configurations**:

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		Import Export Refresh Run As Debug As Profile As		F5 > > > > >	Problems Run Configura	ations

Then double click EGL Generator:





And you should see:

Create a configuration to launch an EC	iL generator.	
P So B × E 7 ▼	Name: generate-output Template & Models @ Parameters & Advanced 🖻 Generated Text 🛈 Profilin	g 🗉 Common
 Acceleo Application ECL Comparison Eclipse Application EGL Generator generate-output EMG Program 	Source: /HelloWorld/model/generate-output.egl Text generated should be printed to: • The console • The following file:	Browse Workspace
 № EML Merging № EOL Program № EPL Program ▼ Epsilon Flock Migration Strategy № ETL Transformation ♥ FVI Validation 	Append to file Trace: Produce a trace model?	Browse Workspace
 Java Applet Java Application JUnit JUnit Plug-in Test Launch Group OSGi Framework Pinset File QVT Operational Transformation 		Browse Workspace
▶		

Select the **Models** tab and click on the "**Add...**" button, so that we can now associate the input instance model so that the egl code can manipulate it:

Run Configurations			
Create, manage, and run configu Create a configuration to launch an EG	rations L generator.		
Image: Second	Name: generate-output	iommon	Add Edit Remove Duplicate
QVT Operational Transformation		Revert	Apply
0		Run	Close

The next step is to select the option **EMF Model**:

💑 Select type of model	×
Select type of model	
Select the type of model to add	
BEMF Model	
A Registered EMF EPackage	
& GraphML Muddle	
🗷 Plain XML Document	
✓Simulink Model	
⊠Microsoft Excel Spreadsheet	
€ UML Model	
	Show all model types
?	OK Cancel

Give a name (e.g. firstTest) and then press the Browse Workspace for finding the input file, that in this case we named it **HelloWorldExampleModel.xmi**. It will find by itself some metamodels. Remove them and press "**Add File...**" and look for the **helloWorld.ecore** file (our metamodel). Before finishing unselect

the "**Store on disposal**" checkbox to prevent that some wrong manipulation by egl can corrupt the **HelloWorlExampleModel.xmi** file. Everything should look like this:

Configure	e EMF model		×
Configure	EMF model		
Configure t	ne details of the EMF model		
Identification)		
Name: first	stTest		
Aliases:			
Performance			
Cache m	odel elements to improve execution time		
Thread-s	afe cache		
EMF			
🗹 Include e	xternal references		
Reuse un	modified file-based metamodels		
U Validate i	model		
Files/URIs			
Model file:	/HelloWorld/model/HelloWorldExampleModel.x	mi	Browse Workspace
Metamodels	: HelloWorld/model/helloWorld.ecore		Add file
			Add URI
			Remove
			Clear
Load/Store C	Options		
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Store on dis	posal:		
(?)		ОК	Cancel

You just need to press "**OK**" then "**Apply**" and then "**Run**". The result should be your first Model-Driven Hello World in the console:

eclipse-LectureNotes - HelloWorld/model/generate-output.egl - Eclipse IDE File Edit Navigate Search Project Run Window Help | 📸 ▾ 🔛 🐚 | 🐐 ▼ 🗿 ▼ 🂁 ▼ ! 🔗 ▼ ! 🗳 ! 🖉 ▼ 🕅 ▼ 🏷 😅 ⇔ 🗢 ▼ | 🛃 🕏 Model Explorer 🗵 📄 😫 🖗 🗖 🗖 🎄 helloWorld 🖷 helloWorld.ecore 🛛 🗟 HelloWorldExample × 1 International type filter text ✓ [™] HelloWorld ➡ Project Dependencies 4 [% for (h in Hello.all) { %] > 🖙 src [in HelloWorld] 5 ->>>> 6 [%=h.name%] [%=h.world.name%] > 🔺 JRE System Library [jre] 7 <<<<-> 🔺 Plug-in Dependencies 8 [응}응] > 👂 META-INF 9 10 ----👻 🗁 model _____ 11 generate-output.egl 12 It seems to work! > 🖻 helloWorld.aird . > # helloWorld 👌 📓 helloWorld.genmodel □ Properties Problems 🗳 Console × > # HelloWorldExampleModel.xmi Epsilon J^az 📚 = 🗖 International E Outline × _____ ->>>> Olá Mundo <<<<-->>>> Hallo Welt <<<<-->>>> Bonjour Monde <<<<--_____ It seems to work!

Congratulations!