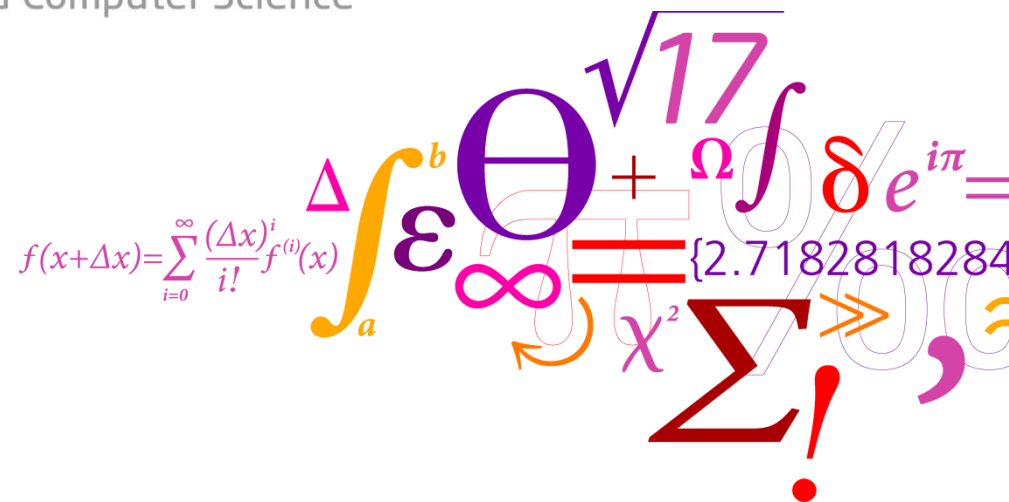


Model-based Software Engineering (02341, spring 2016)

Ekkart Kindler

DTU Compute

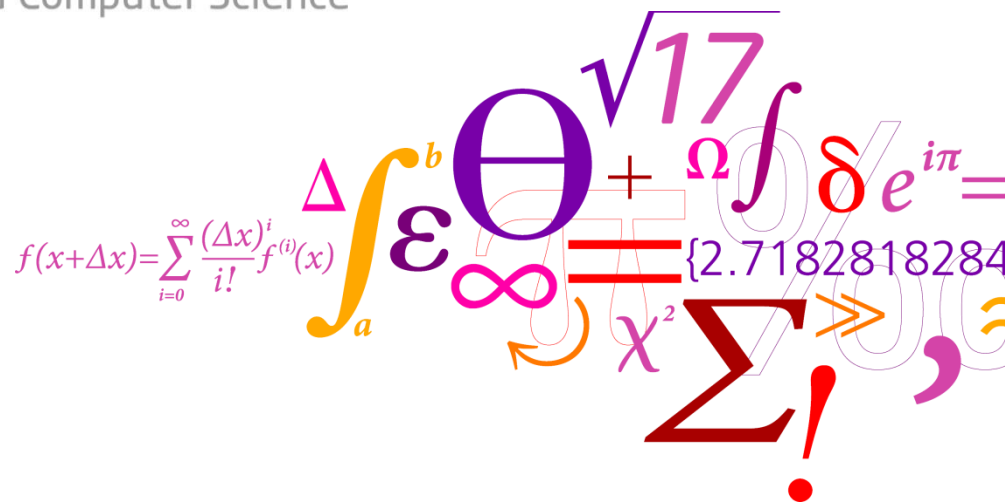
Department of Applied Mathematics and Computer Science



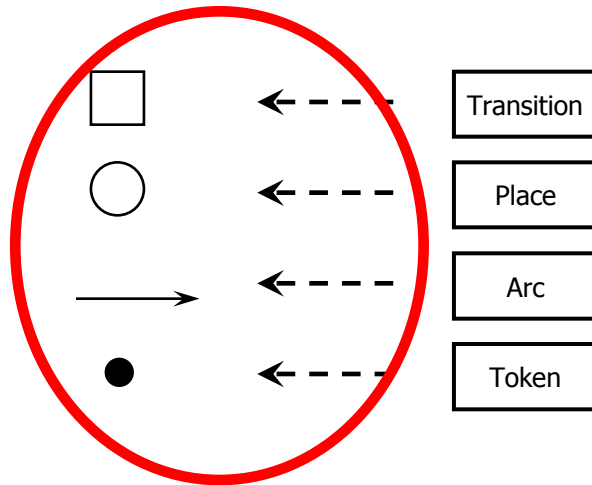
Tutorial 3: GMF

DTU Compute

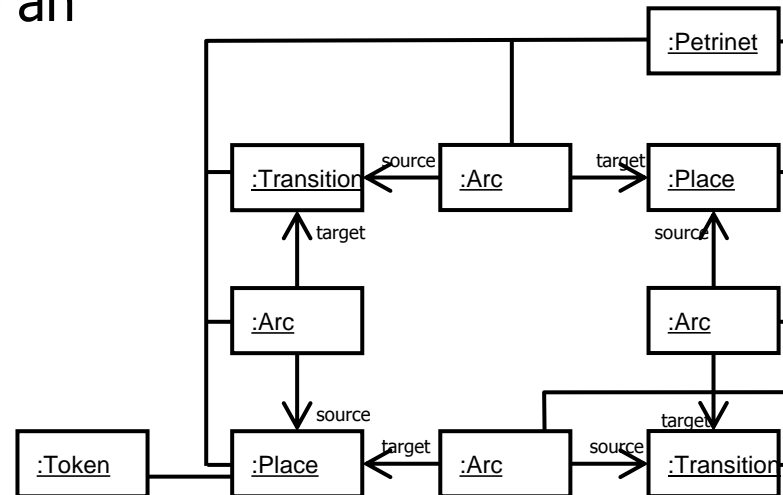
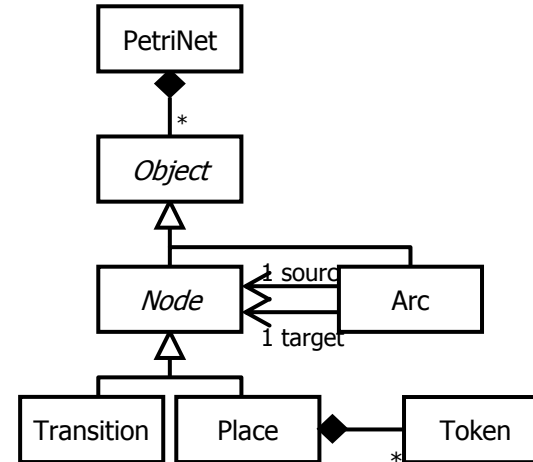
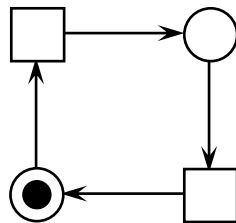
Department of Applied Mathematics and Computer Science



A collage of colorful mathematical symbols and expressions. It includes a large purple Θ , a yellow integral \int_a^b , a pink infinity ∞ , a red summation \sum , a blue square root $\sqrt{17}$, a red delta δ , a blue $e^{i\pi}$, a pink plus $+$, a yellow minus $-$, a blue equals $=$, a red less-than $<$, a yellow greater-than $>$, a blue comma $,$, a red exclamation mark $!$, a blue χ^2 , a pink Δ , a blue ε , a pink Ω , a blue $f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$, a blue $\{2.7182818284\}$, a blue \sqrt{e} , a blue π , a blue γ , a blue β , a blue α , a blue λ , a blue μ , a blue ν , a blue ξ , a blue η , a blue θ , a blue ϕ , a blue ψ , a blue ω , a blue κ , a blue ι , a blue \jmath , a blue κ , a blue λ , a blue μ , a blue ν , a blue ξ , a blue η , a blue θ , a blue ϕ , a blue ψ , a blue ω , a blue κ , a blue ι , a blue \jmath .



generate an editor



Open GMF Dashboard

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The screenshot shows the Eclipse IDE with the 'Plug-in Development - Eclipse SDK' window. The left sidebar contains a project tree for 'dk.dtu.imm.se2.petrinets'. The main editor area displays the 'GMF Dashboard' view, which is a flowchart of GMF components. A red rounded rectangle is drawn over the main editor area with the text: 'Window → Show View → Others → General → GMF Dashboard'. The GMF Dashboard view itself has a purple background and shows a hierarchy of models: 'Graphical Def Model' (top), 'Domain Model' (middle), 'Mapping Model' (middle), 'Domain Gen Model' (bottom left), 'Tooling Def Model' (bottom middle), and 'Diagram Editor Gen Model' (bottom right). Arrows indicate relationships between these models, such as 'Derive' and 'Combine'. The bottom status bar shows 'Ctrl Contrib (Bottom)'.

Window → Show View →
Others → General →
GMF Dashboard

Select Model and Genmodel

Plug-in Development - Eclipse SDK

File Edit Source Refactor Navigate Search Project Run Field Assist Window Help

Package Explorer

- dk.dtu.imm.se2.petrinets 13 [https://svn...]
- src 14
- JRE System Library [JavaSE-1.6]
- Plug-in Dependencies
- META-INF 14
- model 14
 - Petrinet.ecore 15
 - Petrinet.ecorediag 14
 - Petrinet.genmodel 15
- build.properties 15
- plugin.properties 15
- plugin.xml 15
- dk.dtu.imm.se2.petrinets.edit 21 [https://svn...]
- dk.dtu.imm.se2.petrinets.editor

Outline

An outline is not available.

Error Log Tasks Problems History Progress Console Properties Search GMF Dashboard

Project: dk.dtu.imm.se2.petrinets
Progress: 0% done

Graphical Def Model
<not specified>
Select / Edit / Create

Domain Model
<not specified>
Select / Edit / Create

Mapping Model
<not specified>
Select / Edit / Create

RCP Transform

Domain Gen Model
<not specified>
Select / Edit / Reload

Tooling Def Model
<not specified>
Select / Edit / Create

Diagram Editor Gen Model
<not specified>
Select / Edit / Create
Generate diagram editor

Ctrl Contrib (Bottom)

Petrinet.ecore - dk.dtu.imm.se2.petrinets/model

Create GraphDefModel

The screenshot shows the GMF 'Domain Model' dialog. The 'Model URI' is set to 'platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.ecore'. The 'Diagram Element' list on the left includes Arc, Node, POBJECT, Petrinet, Place, Token, and Transition. The 'Domain model elements to pre-define' list on the right shows a tree structure of elements with checkboxes for selection. Red callouts provide instructions:

- Select as node!**: Points to the 'Node' element in the 'Diagram Element' list.
- Select as label!**: Points to the 'Petrinet' element in the 'Domain model elements to pre-define' list.
- Select as connection!**: Points to the 'Arc' element in the 'Domain model elements to pre-define' list.
- Initially, do NOT select tokens at all!!!**: Points to the checkbox for 'Token' in the 'Domain model elements to pre-define' list, which is currently unchecked.

The bottom part of the image shows a workflow diagram with boxes for 'Domain Model' and 'Domain Gen Model', connected by 'Derive' arrows. The 'Domain Model' box has a 'Derive' button circled in red.

Create ToolingDefModel

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Plug-in Development - dk.dtu.imm.se2.petrinets/model/Petrinet.gmfgraph - Eclipse SDK

New Domain Model
Select file with ecore domain model.

Model URI:

Diagram Element:

- Arc
- Node
- PObject
- Petrinet**
- Place
- Token
- Transition

New Tooling Definition
Specify basic tooling definition of the domain model.

Domain model elements to process:

Element	<input type="checkbox"/>	<input type="checkbox"/>
Petrinet	<input type="checkbox"/>	<input type="checkbox"/>
object : PObject	<input type="checkbox"/>	<input type="checkbox"/>
PObject	<input type="checkbox"/>	<input type="checkbox"/>
Node -> PObject	<input type="checkbox"/>	<input type="checkbox"/>
out : Arc	<input type="checkbox"/>	<input type="checkbox"/>
in : Arc	<input type="checkbox"/>	<input type="checkbox"/>
Arc -> PObject	<input type="checkbox"/>	<input checked="" type="checkbox"/>
source : Node	<input type="checkbox"/>	<input type="checkbox"/>
target : Node	<input type="checkbox"/>	<input type="checkbox"/>
Transition -> Node	<input checked="" type="checkbox"/>	<input type="checkbox"/>
out : Arc	<input type="checkbox"/>	<input type="checkbox"/>
in : Arc	<input type="checkbox"/>	<input type="checkbox"/>
Place -> Node	<input checked="" type="checkbox"/>	<input type="checkbox"/>
out : Arc	<input type="checkbox"/>	<input type="checkbox"/>
in : Arc	<input type="checkbox"/>	<input type="checkbox"/>
token : Token	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Token	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Initially, do NOT select tokens at all!!!

Workflow diagram showing the derivation of the Tooling Def Model from the Domain Model.

Selected Object: platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfgraph

Create MappingModel

Initially, do NOT select tokens at all!!!

Select the right source and target elements for the Arc.

Change...

Combine

GMF Dashboard

Domain Model
Petrinet.ecore
Select / Edit / Create

Mapping Model
<not specified>
Select / Edit / Create

Domain Gen Model
Petrinet.genmodel
Select / Edit / Reload

Tooling Def Model
Petrinet.gmftool
Select / Edit / Create

Diagram Editor Gen Model
<not specified>
Select / Edit / Create
Generate diagram editor

Selected Object: platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmftool

Create GraphGenmodel

Plug-in Development - dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap - Eclipse SDK

File Edit Navigate Search Project Run GMFMap Editor Field Assist Window Help

Petrinet.gmfgraph Petrinet.gmftool Petrinet.gmfmap

Resource Set

platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap

Selection Parent List Tree Table Tree with Columns

Error Log Tasks Problems History Progress Console Properties Search GMF Dashboard

Project: dk.dtu.imm.se2.petrinet Progress: 83% done

Derive Graphical Def Model Petrinet.gmfgraph Select / Edit / Create

Derive Domain Model Petrinet.ecore Select / Edit / Create

Combine Mapping Model Petrinet.gmfmap Select / Edit / Create

Derive Domain Gen Model Petrinet.genmodel Select / Edit / Reload

Derive Tooling Def Model Petrinet.gmftool Select / Edit / Create

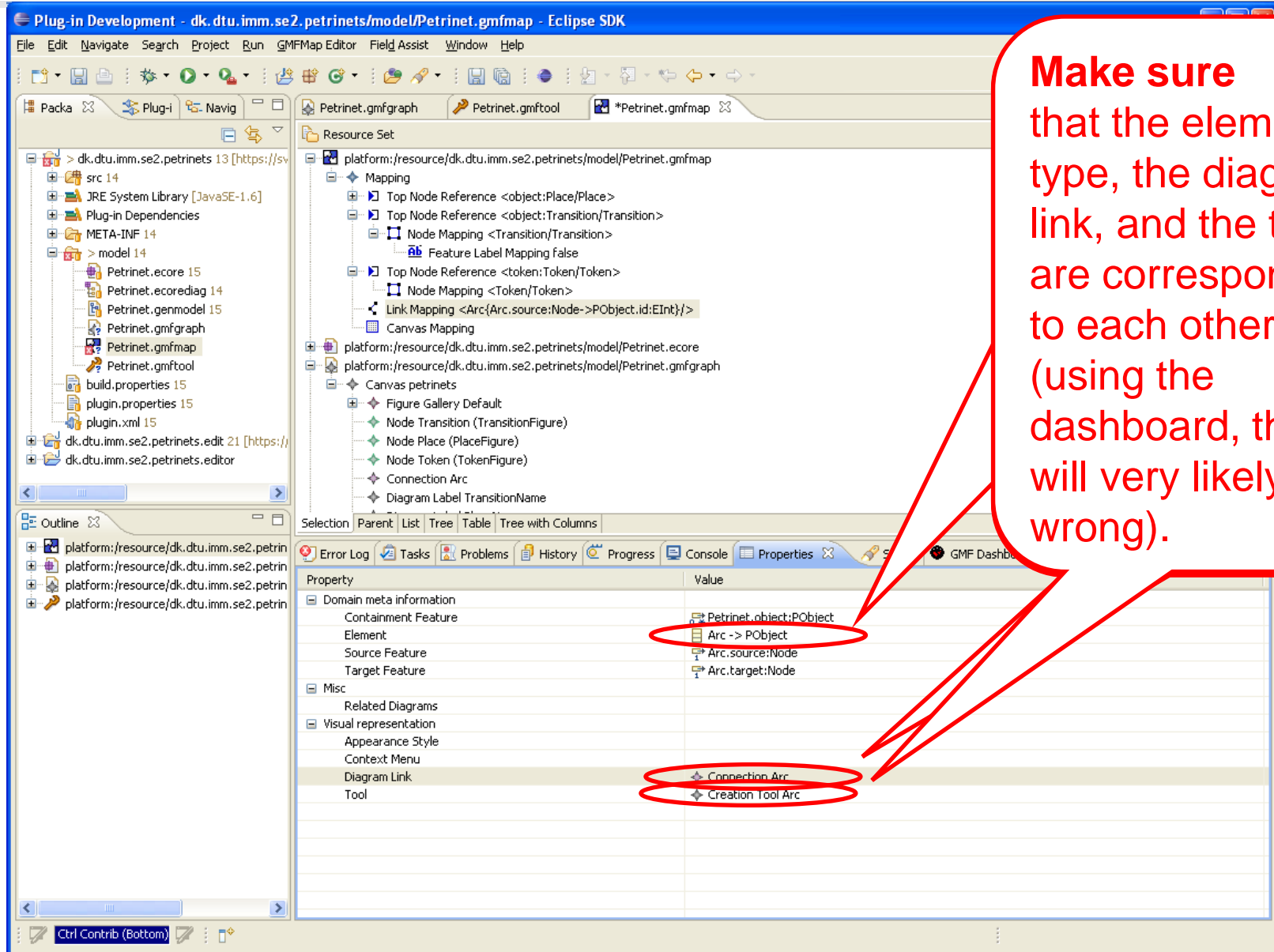
Diagram Editor Gen Model <not specified> Select / Edit / Create Generate diagram editor

RCP Transform

This will very likely result in several error messages, since the mapping model is incorrect or incomplete!

Find tips to fix problems on next slides!

In .gmfmap: Align graphics, tool and type



Plug-in Development - dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap - Eclipse SDK

File Edit Navigate Search Project Run GMFMap Editor Field Assist Window Help

Petrinet.gmfgraph Petrinet.gmfmap *Petrinet.gmfmap

Resource Set

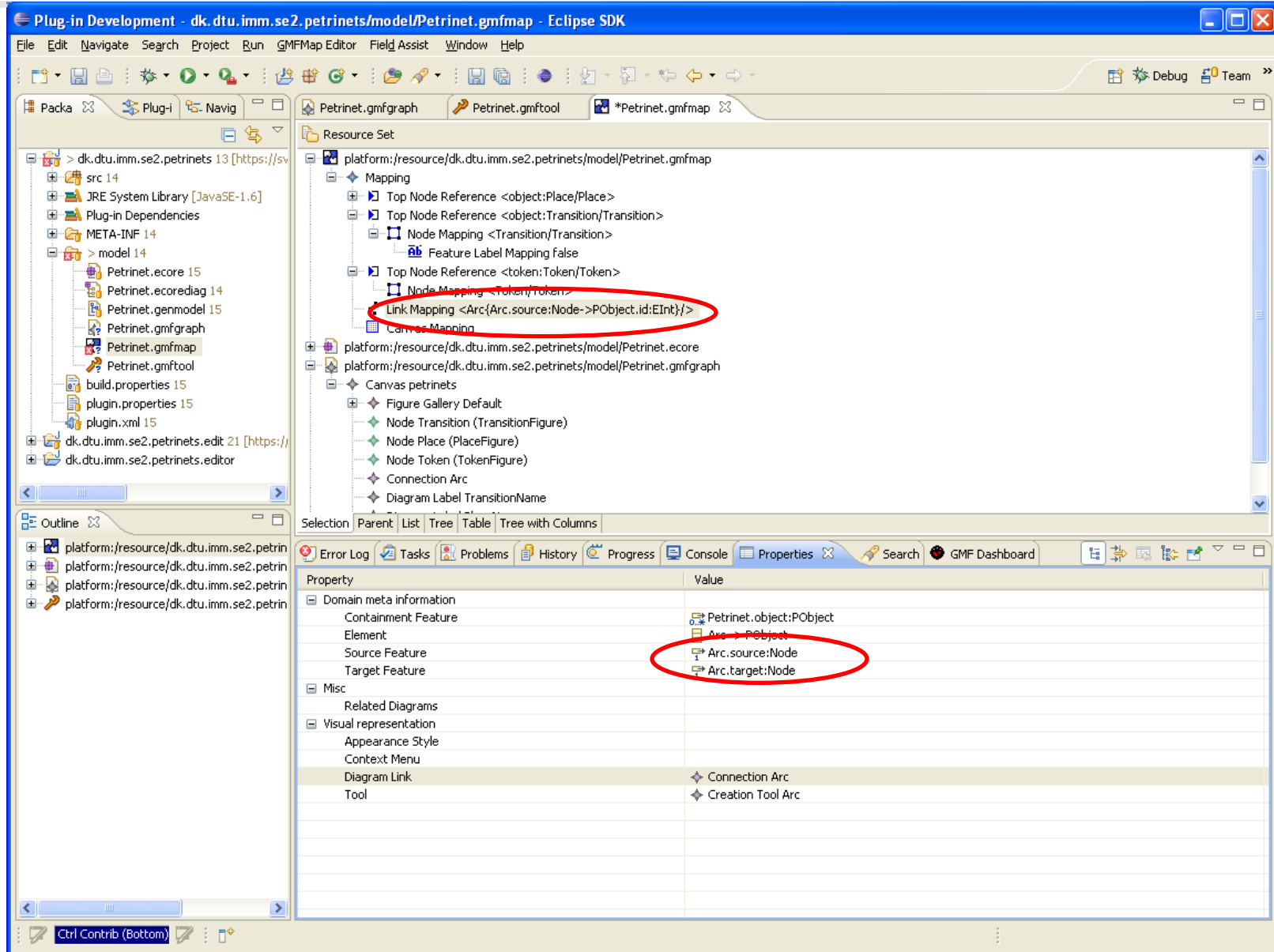
- platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap
 - Mapping
 - Top Node Reference <object:Place/Place>
 - Top Node Reference <object:Transition/Transition>
 - Node Mapping <Transition/Transition>
 - Feature Label Mapping false
 - Top Node Reference <token:Token/Token>
 - Node Mapping <Token/Token>
 - Link Mapping <Arc{Arc.source:Node->POBJECT.id:ElInt}/>
 - Canvas Mapping
 - platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.ecore
 - platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfgraph
 - Canvas petrinets
 - Figure Gallery Default
 - Node Transition (TransitionFigure)
 - Node Place (PlaceFigure)
 - Node Token (TokenFigure)
 - Connection Arc
 - Diagram Label TransitionName

Selection Parent List Tree Table Tree with Columns

Property Value

Property	Value
Domain meta information	
Containment Feature	
Element	Petrinet.object:POBJECT
Source Feature	Arc -> POBJECT
Target Feature	Arc.source:Node
	Arc.target:Node
Misc	
Related Diagrams	
Visual representation	
Appearance Style	
Context Menu	
Diagram Link	Connection Arc
Tool	Creation Tool Arc

Some changes in MapModel



The screenshot displays the Eclipse IDE interface for the Petrinet.gmfmap editor. The main editor shows the Resource Set for the Petrinet.gmfmap file. The 'Link Mapping' entry is circled in red, showing the mapping for the 'Arc' object. The Properties view at the bottom shows the 'Arc' object with the 'source:Node' and 'target:Node' properties circled in red.

Property	Value
Domain meta information	
Containment Feature	Petrinet.object:PObject
Element	Arc -> PObject
Source Feature	Arc.source:Node
Target Feature	Arc.target:Node
Misc	
Related Diagrams	
Visual representation	
Appearance Style	
Context Menu	
Diagram Link	Connection Arc
Tool	Creation Tool Arc

Some changes in MapModel

Mistake here:
When you, in the end (!), add the token make sure that the Token is NOT a Top Node Reference!!!

The screenshot shows the Eclipse IDE with the Petrinet.gmfmap editor. The Resource Set tree on the left shows the following structure:

- platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap
 - Mapping
 - Top Node Reference <object:Place/Place>
 - Top Node Reference <object:Transition/Transition>
 - Node Mapping <Transition/Transition>
 - Feature Label Mapping false
 - Top Node Reference <token:Token/Token>**
 - Node Mapping <Token/Token>**
 - Link Mapping <Arc (ArcResourceNode->PObject.id:ElInt)>
 - Canvas Mapping
 - platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.ecore
 - platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfgraph
 - Canvas petrinets
 - Figure Gallery Default
 - Node Transition (TransitionFigure)
 - Node Place (PlaceFigure)
 - Node Token (TokenFigure)
 - Connection Arc
 - Diagram Label TransitionName

The Properties view at the bottom shows the following table:

Property	Value
Domain meta information	
Element	Token
Misc	
Visual representation	
Appearance Style	
Context Menu	
Diagram Node	Node Token (TokenFigure)
Tool	Creation tool token

Make Token a Child Reference

Plug-in Development - dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap - Eclipse SDK

File Edit Navigate Search Project Run GMFMap Editor Field Assist Window Help

Package Explorer: dk.dtu.imm.se2.petrinets 13 [https://...]
src 14
JRE System Library [JavaSE-1.6]
Plug-in Dependencies
META-INF 14
model 14
Petrinet.ecore 15
Petrinet.ecorediag 14
Petrinet.genmodel 15
Petrinet.gmfgen
Petrinet.gmfgraph
Petrinet.gmfmap
Petrinet.gmftool
Petrinet.trace
build.properties 15
plugin.properties 15
plugin.xml 15
dk.dtu.imm.se2.petrinets.edit 21 [https://...]

Outline: platform:/resource/dk.dtu.imm.se2.petrinet
platform:/resource/dk.dtu.imm.se2.petrinet
platform:/resource/dk.dtu.imm.se2.petrinet
platform:/resource/dk.dtu.imm.se2.petrinet

Resource Set: platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfmap
Mapping
Top Node Reference <object:Place/Place>
Node Mapping <Place/Place>
Feature Label Mapping false
Child Reference <token:Token/Token>
Node Mapping <Token/Token>
Top Node Reference <object:transition/Transition>
Node Mapping <Transition/Transition>
Link Mapping <Arc{Arc.source:Node->Arc.target:Node}/Arc>
Canvas Mapping
platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.ecore
platform:/resource/dk.dtu.imm.se2.petrinets/model/Petrinet.gmfgraph
Canvas petrinets
Figure Gallery Default
Figure Descriptor ArcFigure
Figure Descriptor TransitionFigure
Figure Descriptor PlaceFigure
Rectangle PlaceFigure
Child Access getFigurePlaceNameFigure
Figure Descriptor TokenFigure
Node Transition (TransitionFigure)
Node Place (PlaceFigure)
Node Token (TokenFigure)

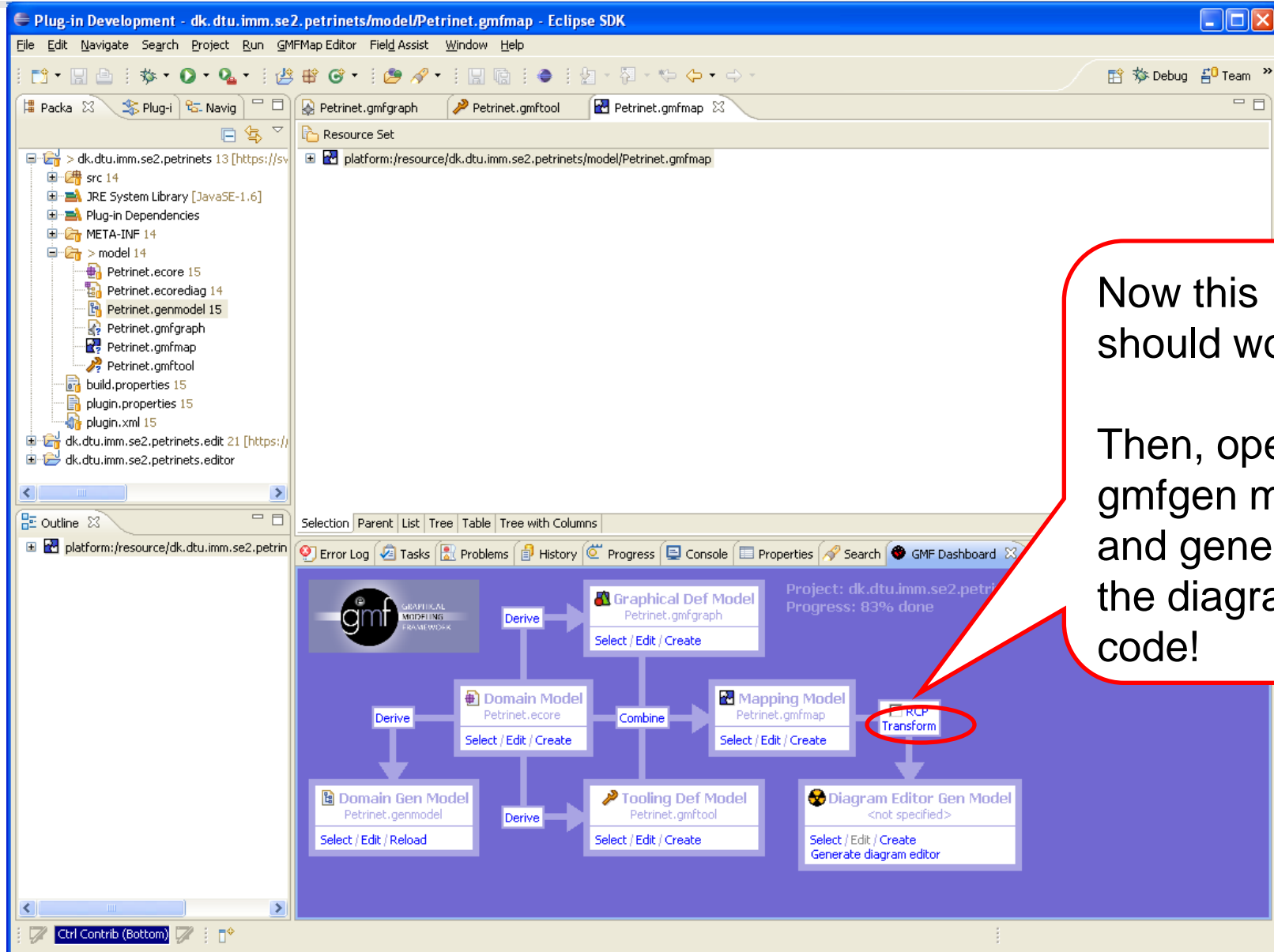
Selection Parent List Tree Table Tree with Columns

Properties: Property Value
Child
Children Feature
Compartment
Containment Feature
Referenced Child
Node Mapping <Token/Token>
Place.token:Token
Node Mapping <Place/Place>

Ctrl Contrib (Bottom) Selected Object: Child Reference <token:Token/Token>

The token should be ChildReference within the TopNode Reference for the Place!

Select Model and Genmodel



The screenshot shows the Eclipse IDE with the Petrinet project open. The left sidebar displays the project structure, including the 'model' package and its sub-packages. The main editor area shows the 'Petrinet.gmfmap' file, which is a GMF Mapping Model. A red circle highlights the 'RCP Transform' button in the 'Petrinet.gmfmap' file. A red speech bubble points to this button with the text: 'Now this should work! Then, open the gmfgen model and generate the diagram code!'.

Selection Parent List Tree Table Tree with Columns

Project: dk.dtu.imm.se2.petrinet
Progress: 83% done

Derive

Graphical Def Model
Petrinet.gmfgraph
Select / Edit / Create

Domain Model
Petrinet.ecore
Select / Edit / Create

Mapping Model
Petrinet.gmfmap
Select / Edit / Create

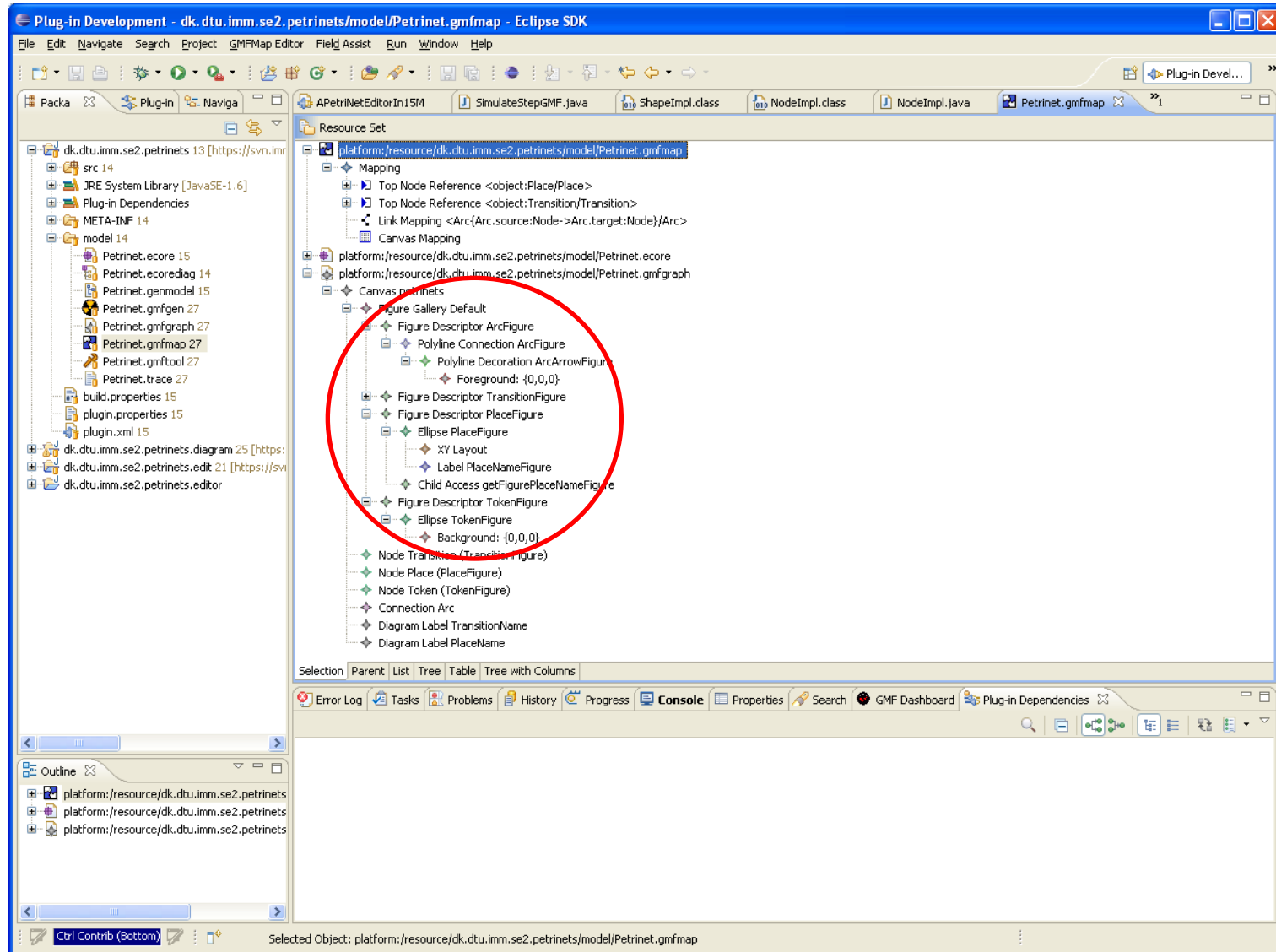
RCP Transform

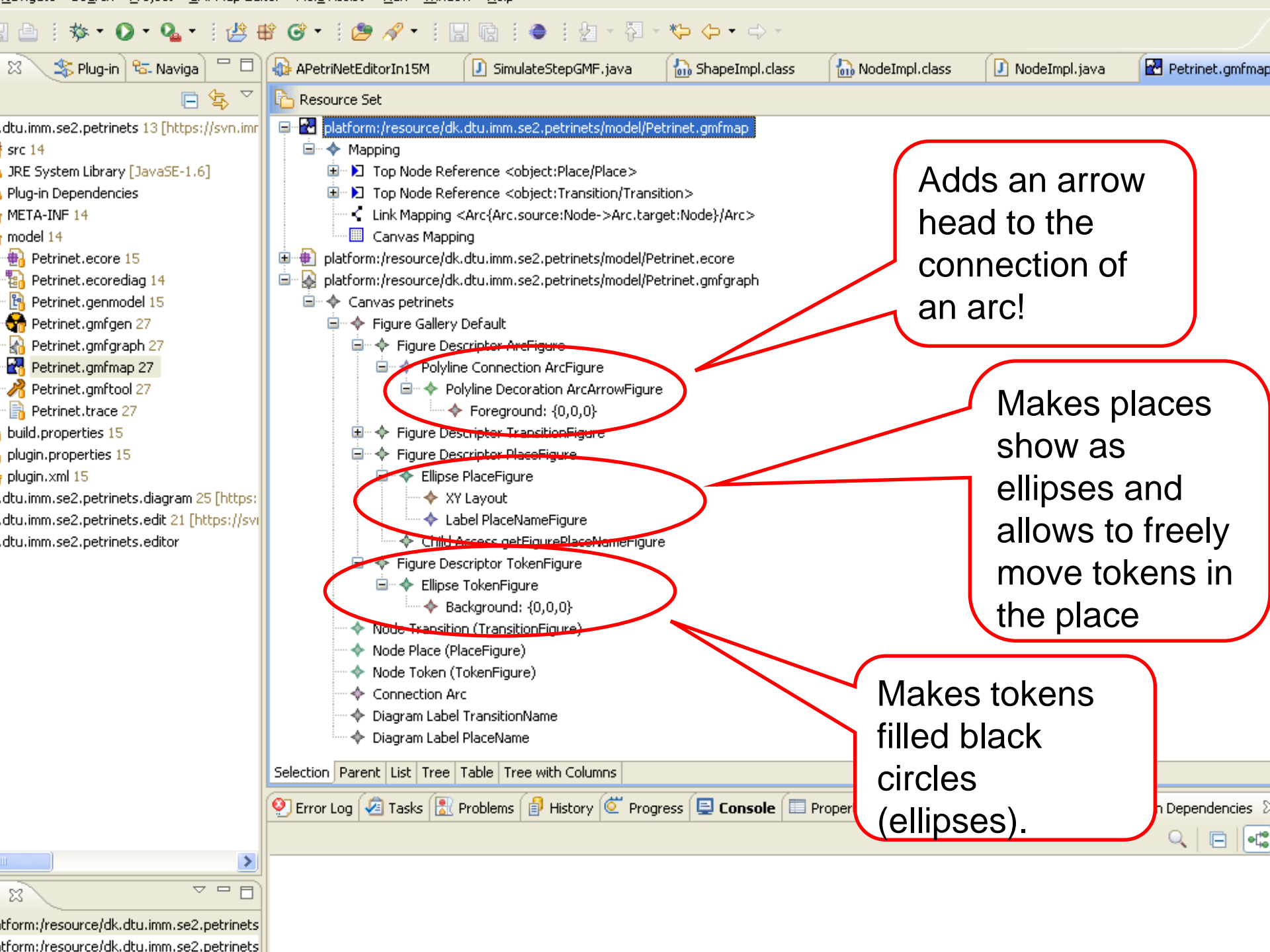
Domain Gen Model
Petrinet.genmodel
Select / Edit / Reload

Tooling Def Model
Petrinet.gmftool
Select / Edit / Create

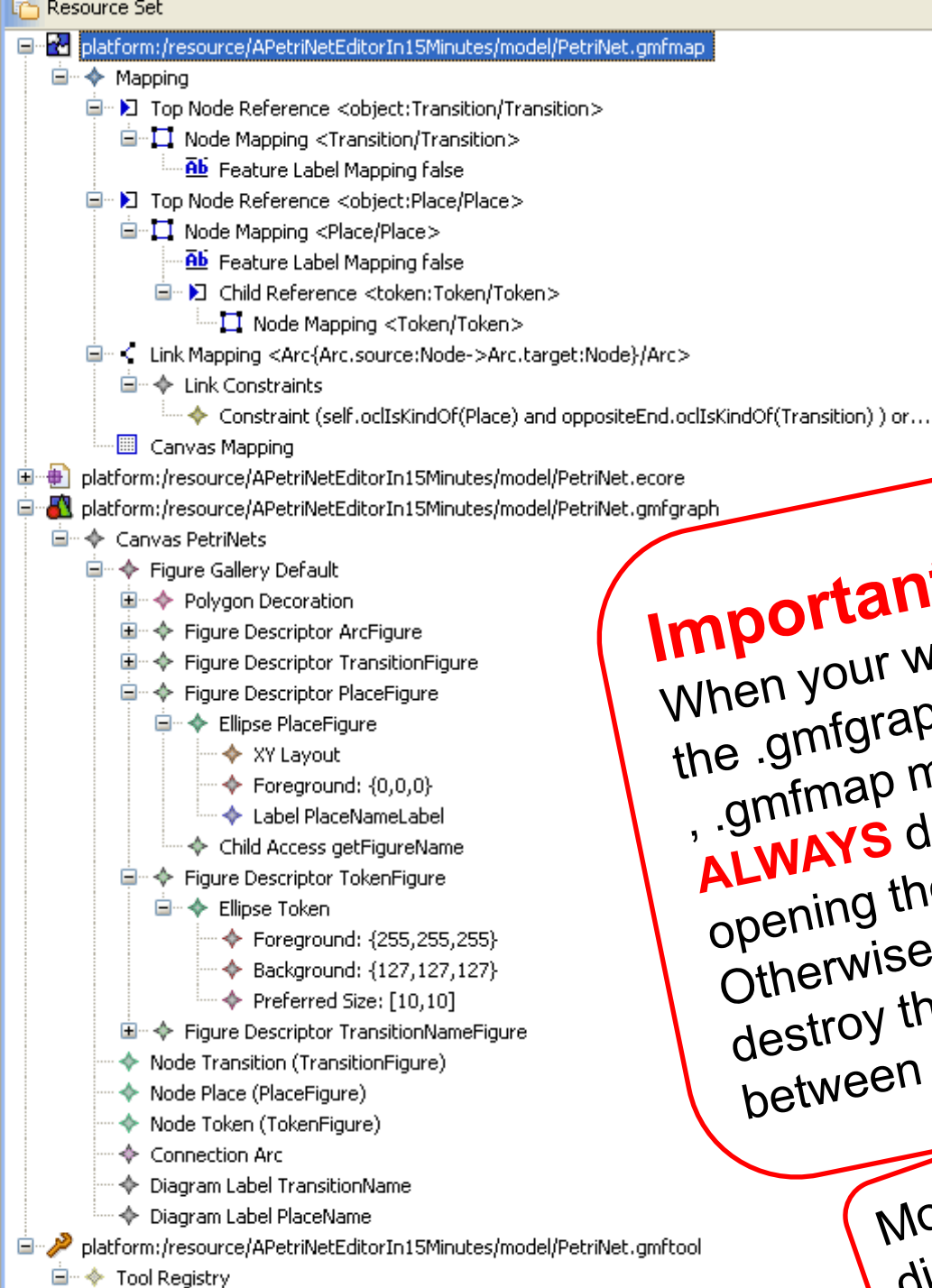
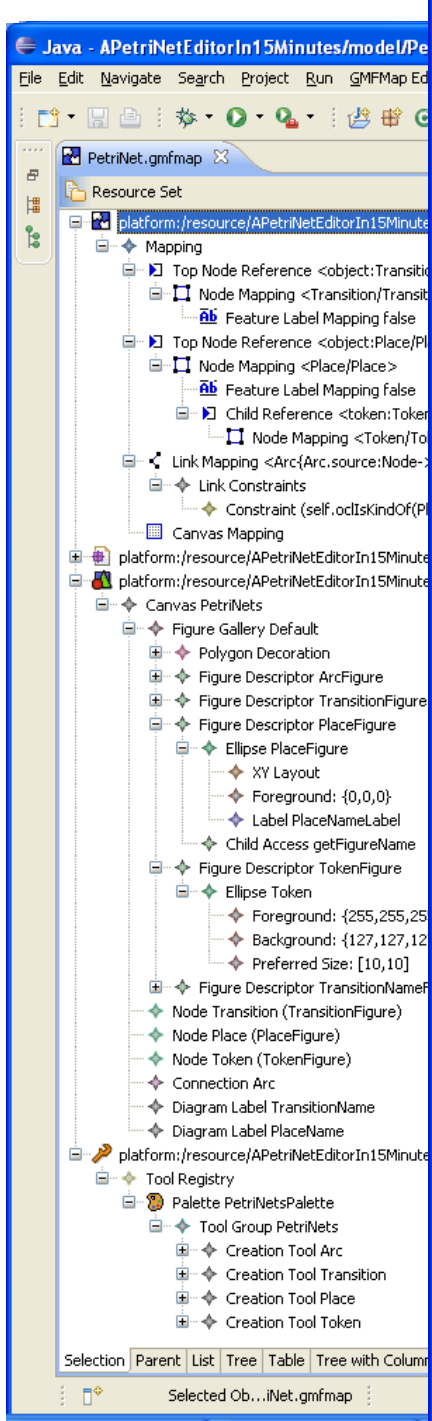
Diagram Editor Gen Model
<not specified>
Select / Edit / Create
Generate diagram editor

"Nicyfying" graphics





1. Graph model (.gmfgraph):
Defining the graphical elements and appearance of the Petri net
2. Tooling model (.gmftool):
Defining the tools in the toolbar (basically)
3. Mapping model (.gmfmap):
Mapping the model elements to the graphical ones (and the tools)
4. Generator model (.gmfgen):
Some information for code generation (similar to EMF .genmodel)



Important tip:
When you want to change
the .gmftool, .gmftool or
.gmftool model,
ALWAYS do this by
opening the .gmftool file!
Otherwise you might
destroy the consistency
between these files!!

More details in
discussion in the
itself!

1. Create a simple graphical editor on top of your Petri net model (ignore tokens for now)!
 - a) Create the different GMF models with the help of the GMF Dashboard
 - b) Have a look at the generated files (and fix possible errors)
 - c) Generate the code for the graphical editor and check whether it works
2. The GMF Dashboard does not allow you (in a straightforward way) to make places show as ellipses. Change the .gmfgraph model manually to make places show as ellipses!
3. Add tokens to the editor: To this end, change the files .gmfgraph, .gmftool, and .gmfmap (in the .gmfmap tokens a "submapping" of the mapping for places (see slides 11/12).