Core – Creating Role Diagrams and More

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Introduction

- since my diploma thesis, I have accomplished some work on representing role-oriented software models in terms of formal contexts
- when working at the Department of Computer Science, I was supposed to work with the Eclipse Graphical Modeling Framework (GMF)
- this gave rise to the idea to develop a modeling tool to create role models
- the intended tool should transform contexts into role models and vice versa

Introduction

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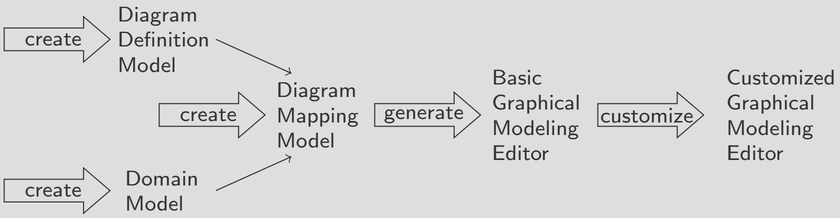
- the intended tool should transform contexts into role models and vice versa
  . . . and maybe act as a model checker resp. design advisor

Graphical Modeling Framework

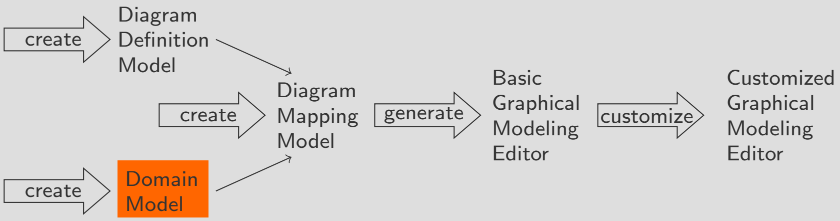
- GMF provides a set of generative components to develop graphical editors using Eclipse Modeling Framework (EMF) and Graphical Editing Framework (GEF)
- EMF:
  - code generation facility for building tools based on a structured data model
  - requires a model specification in XMI
  - provides tools to generate Java classes and adapter classes, that allow for viewing and editing of the model
- GEF:
  - provides technology to realize graphical editors
  - integrates these editors into Eclipse workbench

(wiki.eclipse.org)

GMF Workflow



GMF Workflow



Domain Model: define,

- available diagram elements
- available relations between diagram elements
- properties of diagram elements

GMF Workflow

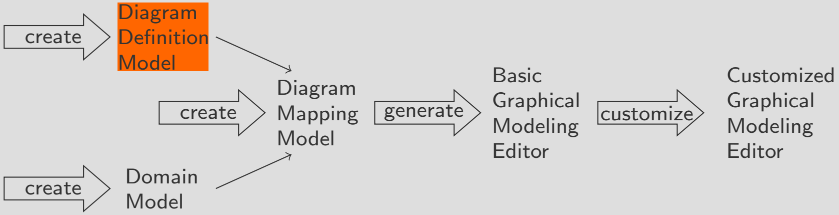


Diagram Definition Model:

- Tooling Model → available tools to create diagram elements
- Graphical Model → graphical representation of diagram elements

GMF Workflow

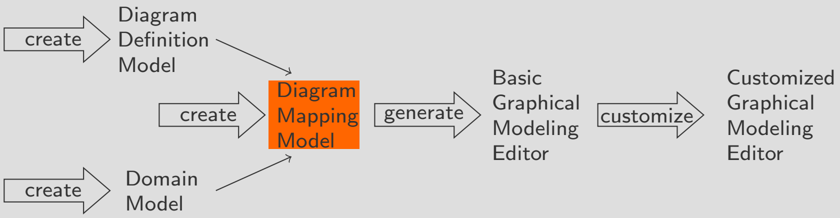
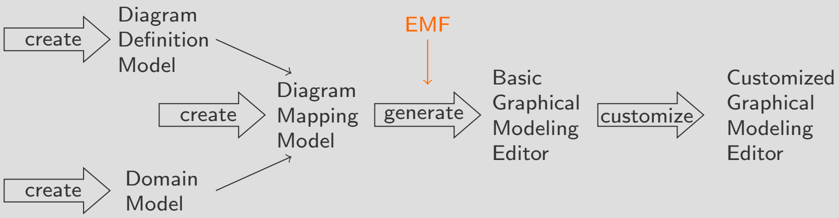


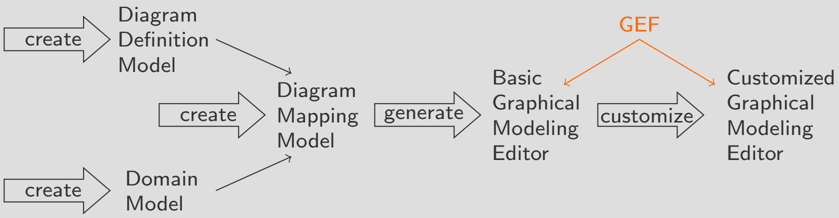
Diagram Mapping Model:

- map creation tools to graphical elements
- map diagram elements to both

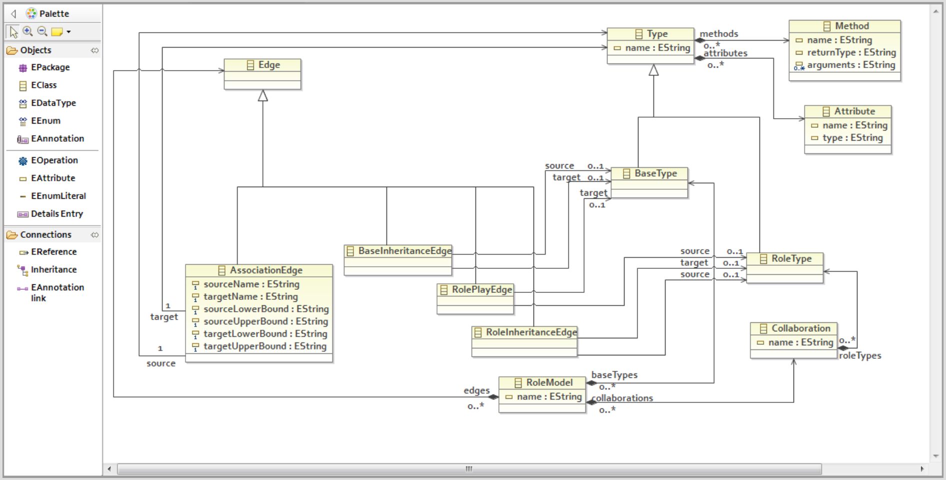
GMF Workflow



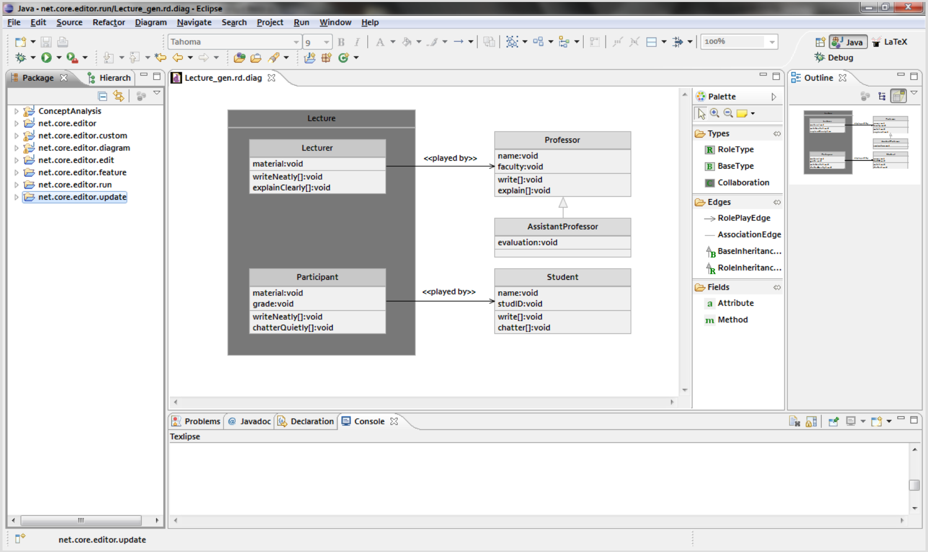
GMF Workflow



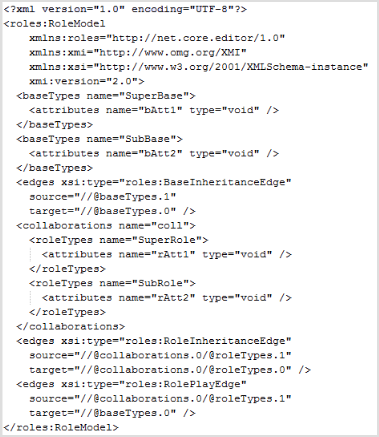
Example: Domain Model of Core



Example: GMF-based Diagram Editor of CoRE

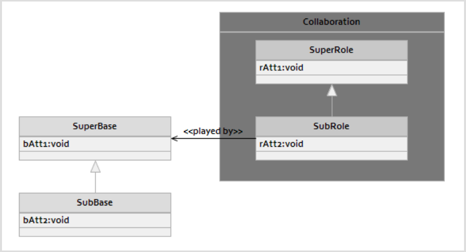


Output of the Diagram Editor



```
<?xml version="1.0" encoding="UTF-8"?>
<roles:RoleModel
    xmlns:roles="http://net.core.editor/1.0"
    xmlns:xmi="http://www.omg.org/XMI"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmi:version="2.0">
  <baseTypes name="SuperBase">
    <attributes name="bAtt1" type="void" />
  </baseTypes>
  <baseTypes name="SubBase">
    <attributes name="bAtt2" type="void" />
  </baseTypes>
  <edges xsi:type="roles:BaseInheritanceEdge"
    source="//@baseTypes.1"
    target="//@baseTypes.0" />
  <collaborations name="coll">
    <roleTypes name="SuperRole">
      <attributes name="rAtt1" type="void" />
    </roleTypes>
    <roleTypes name="SubRole">
      <attributes name="rAtt2" type="void" />
    </roleTypes>
  </collaborations>
  <edges xsi:type="roles:RoleInheritanceEdge"
    source="//@collaborations.0/@roleTypes.1"
    target="//@collaborations.0/@roleTypes.0" />
  <edges xsi:type="roles:RolePlayEdge"
    source="//@collaborations.0/@roleTypes.1"
    target="//@baseTypes.0" />
</roles:RoleModel>
```

$\longleftrightarrow$



XMI description

Role Model

Some Basics

- Core = **Co**ntextual **R**ole **E**ditor
- it basically consists of two parts:
  1. the graphical diagram editor as a plugin for eclipse (based on EMF, GMF, GEF)
  2. a command-line tool for converting diagrams into contexts and vice versa
- this enables us to do the following:
  - generate readable UML-like diagrams from formal contexts
  - create an FCA-description of a role model in the sense of [MW10]

Some Features

- due to [GMM11] valid role play relations form bonds between the contraordinal scales of base and role types
  - a role play relation $P \subseteq B \times R$ is called **valid**, if for fixed $b \in B, r \in R$ and $\forall b' \leq b, r \leq r'$ holds $bPr \Rightarrow b'Pr'$
- thus, Core acts as a design advisor, since it enumerates the possible role play relations, given the base and role types
- additionally, we can count the number of (proper) mergings of base and role types as well as generate the context of (proper) mergings
  - but yet, there is no direct application (other than the previous) of these mergings in the role description framework

Some open Tasks

- adding some relational features to enable typed attributes (i. e. association edges in the type diagram)
- adding a code generator
- adding a model checker (naïve: diff between input XML and generated XML)

- Core can be found at `http://homepage.univie.ac.at/henri.muehle/core.php`

– Demo –

Thank you.

Bibliography

[GMM11] Bernhard Ganter, Christian Meschke, and Henri Mühle.
Merging Ordered Sets.
Proceedings of the 9th International Conference on Formal Concept Analysis, pages 183–203, 2011.

[MW10] Henri Mühle and Christian Wende.
Describing Role Models in Terms of Formal Concept Analysis.
Proceedings of the 8th International Conference Formal Concept Analysis, pages 241–255, 2010.