Mapping-Based Exchange of Models between Meta-Modeling Tools

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**Motivation for Model Exchange**

- Replacement of tools -> reuse of models
- Development of tool chains -> combination of model processing

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<td>Maturity level</td>
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<td>Tools</td>
<td>GMF, CDO, Epsilon, ATL, XText, BPMN, UML</td>
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Problem of Model Exchange

- Model exchange between meta-modeling tools
  - Migration of models between different tools
  - Modeling languages are already defined in tools

Problem: Heterogeneity of modeling languages
- (1) Different meta-metamodels
  - GOPPRR, Visio, GME, ARIS, Ecore, ...
- (2) Different meta-models
  - Name of concepts, definition of relationships, inheritance, ...
### Lack of Model Exchange

#### Low interoperability

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380 possibilities (20 x 20 - 20)

31 x exchange → 8.2%

28 x lang.-specific → 7.4%

3 x lang.-independent → 0.8%
State of the Art

- **Common structure**
  - Language-specific formats
    - XPDL, BPMN-XML, ... 
  - Meta-modeling tool-specific 
    - GXL, MOF/EMF-XMI, Visio-format, CDIF 
  - Result: No common structure

- **Transformation-based**
  - Simple mappings
    - Visual Paradigm 
    - ARIS Business Architect 
  - Complex M2M-transformations
The Exchange Approach
Transformation between Meta-Modeling Environments

Tool A (Source)
- Meta-metamodel
- Meta-models
- Models

Tool B (Target)
- Meta-metamodel
- Meta-models
- Models

Meta-Modeling Environment
- Meta-Metamodel
- Meta-models
- Models
### Example

<table>
<thead>
<tr>
<th>MetaEdit+ (Source)</th>
<th>Eclipse Modeling Framework</th>
<th>Visio (Target)</th>
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#### Meta-models

- **Event**
- **Function**
- **Connector**

#### Models

- [Image of a diagram showing event-driven process chain](image)
- [Image of a diagram showing an event-driven process chain](image)
- [Image of a diagram showing an event-driven process chain](image)
Step 2: Mapping between different Meta-Models

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rule graph2page
transform
evc_3395083925:INMM!EPC_3395083925
to
evisiopage:OUTMM!EVisioPage
extends Graph2Page
{
evisiopage.text := epc_3395083925.Name;
}

rule event2Event
transform
event_3395083771:INMM!Event_3395083771
to
event:OUTMM!Event
{
event.text := event_3395083771.Name;
}

rule arc2dynamicConnector
transform
arc_3395083800:INMM!Arc_3395083800
to
dyn_connector:OUTMM!Dynamic_Connector
{
dy_connector.target :=
arc_3395083800.me_role.equivalent ();
dyn_connector.source :=
arc_3395083800.me_role.equivalent ();
}
Mapping Language

- Mapping Container
  - Link (0..*)
  - Node (1)
  - ConstantValue
  - Element
  - Function (1)
  - Selector (0..1)
  - ArgumentAssignment (0..*)
- OneToAny
- ManyToOne
- OneToOne
- OneToMany
- ManyToMany
Evaluation

- Use Case
  - MetaEdit+ and Visio

- Exchange quality and completeness
  - The M3-Level-based Bridge is the limiting factor
  - Mapping language is suitable in this use case
    - **Problem:** definition of fine-grained expressions (e.g. conditions, queries/navigation)

- Usability of the mapping editor
  - Graphical representation fits to the skills of a modeler
  - But many lines between meta-models are confusing

- Expandability and effort
  - Each tool -> binding incl. import and export of (meta-)models
  - Each pair of tools -> generator for transformations
Summary

- Mapping-based approach for the exchange of models
  - Import and export: M3-Level-based bridge
  - Mapping: binding, mapping editor and generator for transformations

- Future work
  - Improvement of the mapping language/editor
    - Usability
    - Expandability
    - Expression language
  - Application
    - More meta-modeling tools
    - Other domains
Thank You.
Questions?