



Mapping-Based Exchange of Models between Meta-Modeling Tools

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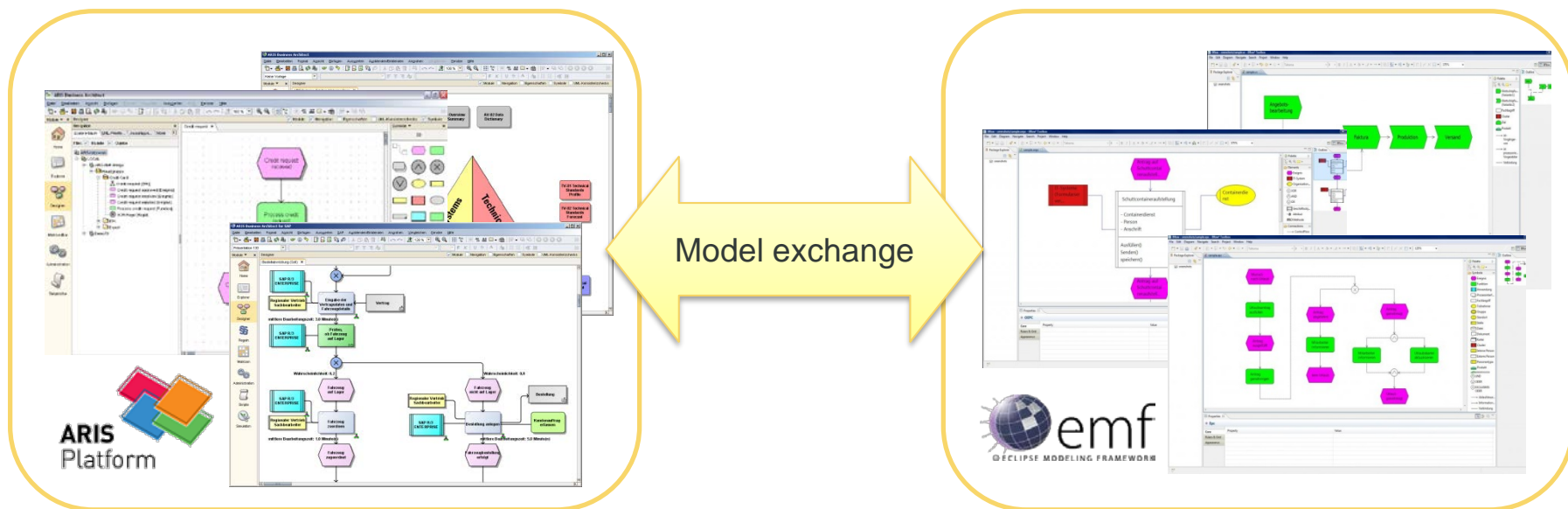
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Motivation for Model Exchange



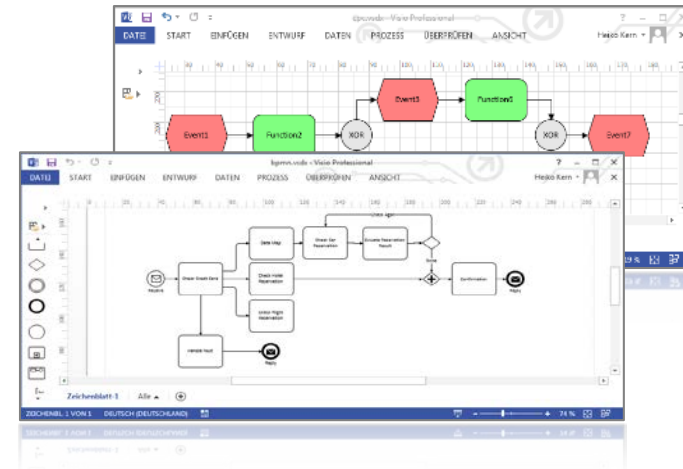
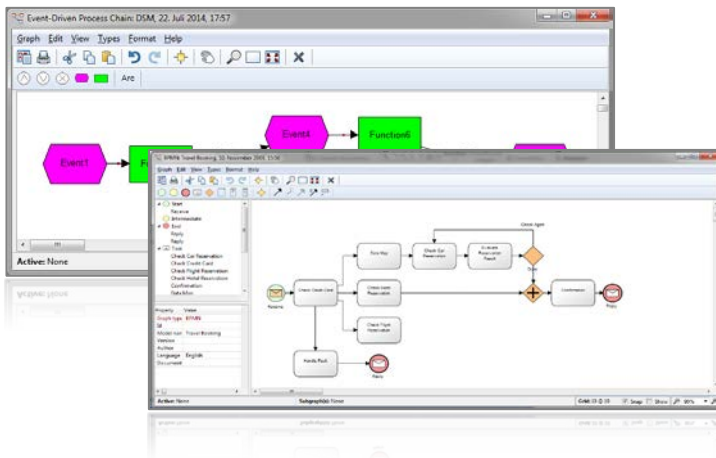
Commercial	License	Open source
Version 7.2	Maturity level	Version 2.6
Business Process Management	Application domain	Universal
Software AG, SAP	Ecosystem	Eclipse
Strategy, Design, Implementation, Controlling Platform	Tools	GMF, CDO, Epsilon, ATL, XText, BPMN, UML

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

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
 - **GOPRR, Visio, GME, ARIS, Ecore, ...**
- ▶ (2) Different meta-models
 - **Name of concepts, definition of relationships, inheritance, ...**

Lack of Model Exchange

Tools	Agilian	ARIS BA	Atom ³	Business Process VA	ConceptDraw	Cubetto Toolset	Dia	Edraw Max	Enterprise Architect	GME	iGrafix Process	Lucidchart	Maram Meta-Tools	MetaEdit+	Microsoft Visio	PowerDesigner	ViFlow	VP for UML	VMSDK	yED
Agilian	⊕																			
ARIS BA		⊕																		
AToM ³			□																	
Business Process VA				⊕																
ConceptDraw					□										□					
Cubetto Toolset						□														
Dia							□													
Edraw Max								□												
Enterprise Architect									⊕											
GME										□										
iGrafix Process											□									
Lucidchart												□								
Maram Meta-Tools													□							
MetaEdit+														□						
Microsoft Visio															□					
PowerDesigner																⊕				
ViFlow																	□			
VP for UML																		⊕		
VMSDK																			□	
yED																				□

380 possibilities (20 x 20 - 20)
 31 x exchange → 8.2%
 28 x lang.-specific → 7.4%
 3 x lang.-independent → 0.8%



Low interoperability

⊕ language-specific □ language-independent

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

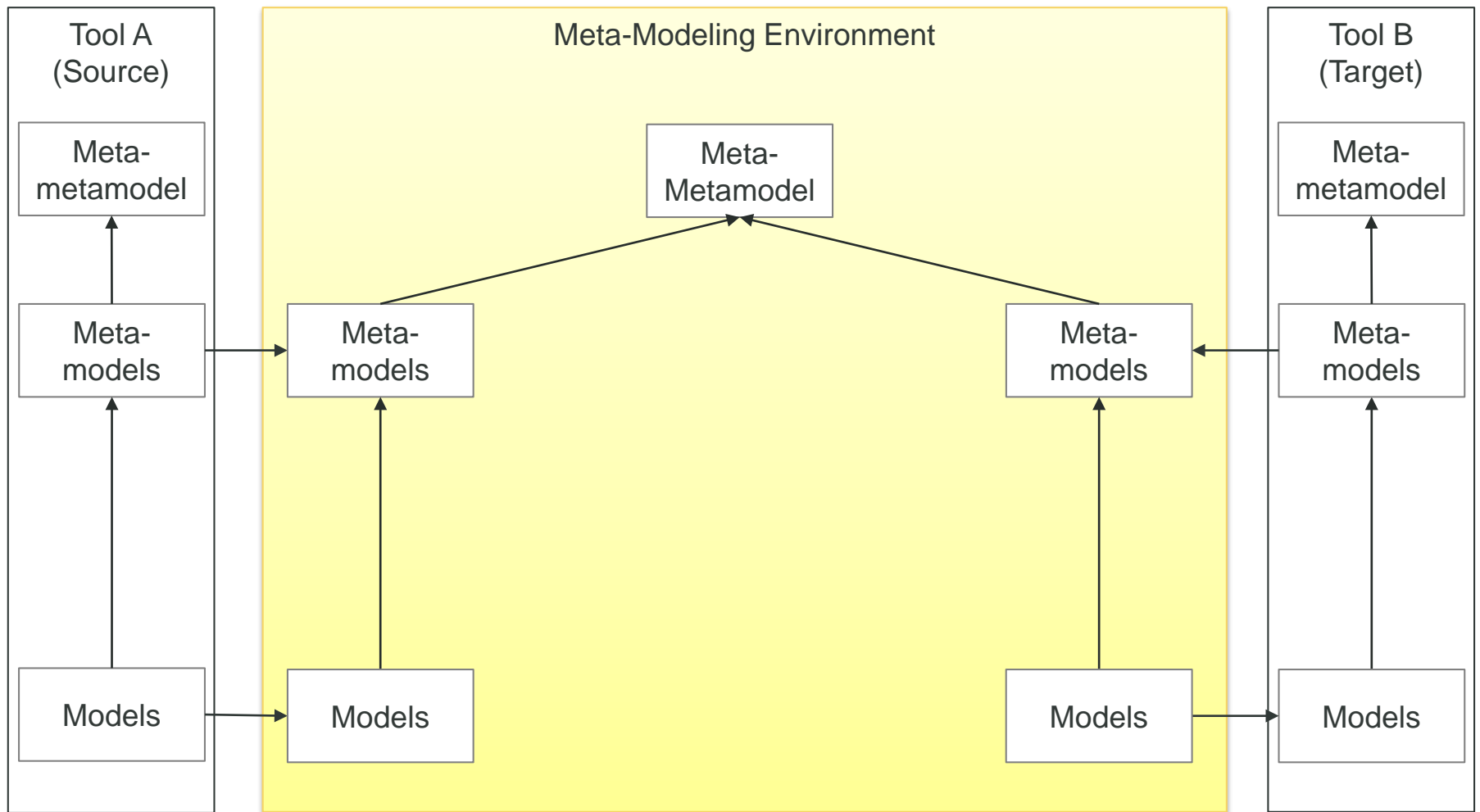
- ▶ Simple mappings
 - **Visual Paradigm**
 - **ARIS Business Architect**
- ▶ Complex M2M-transformations





The Exchange Approach

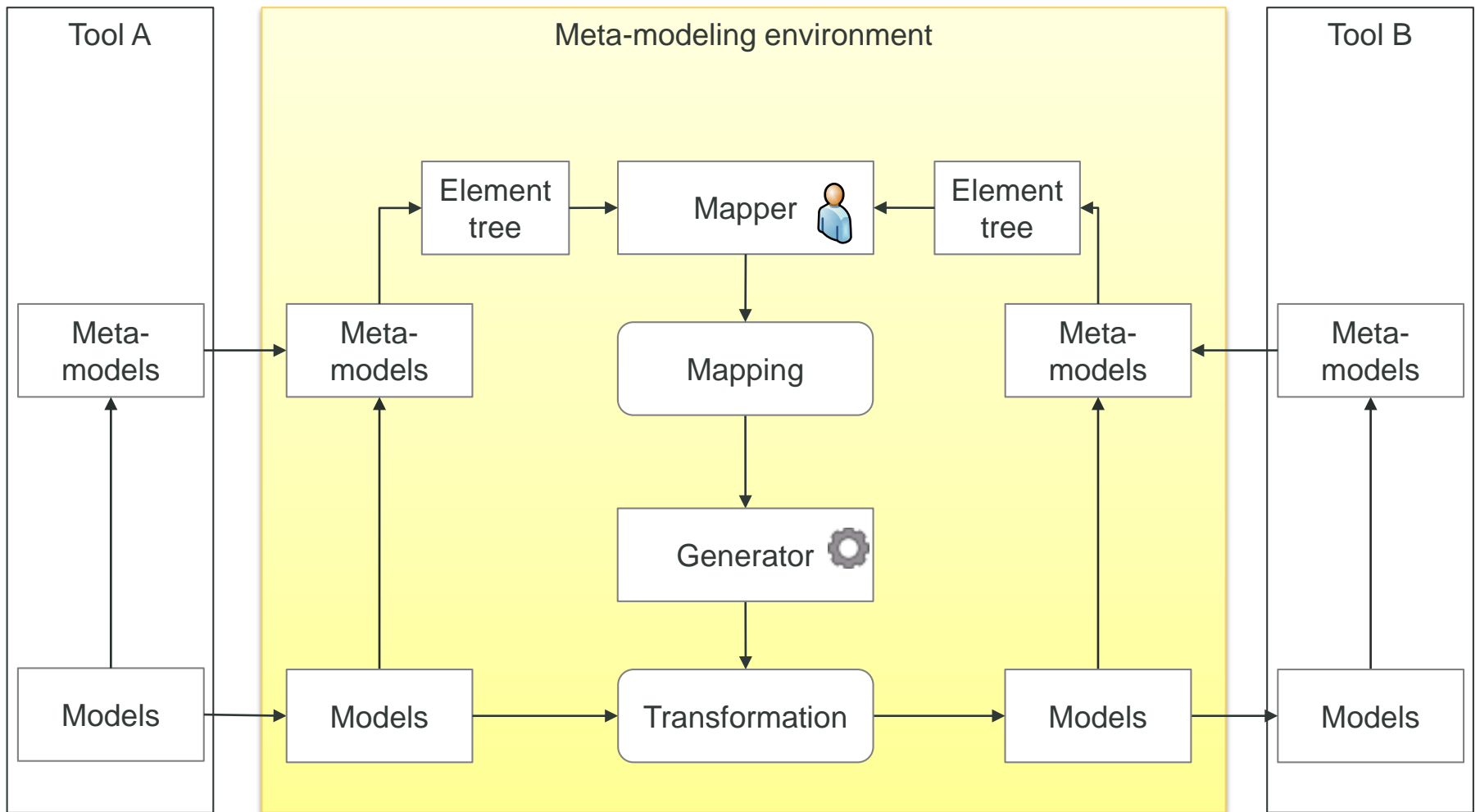
Transformation between Meta-Modeling Environments



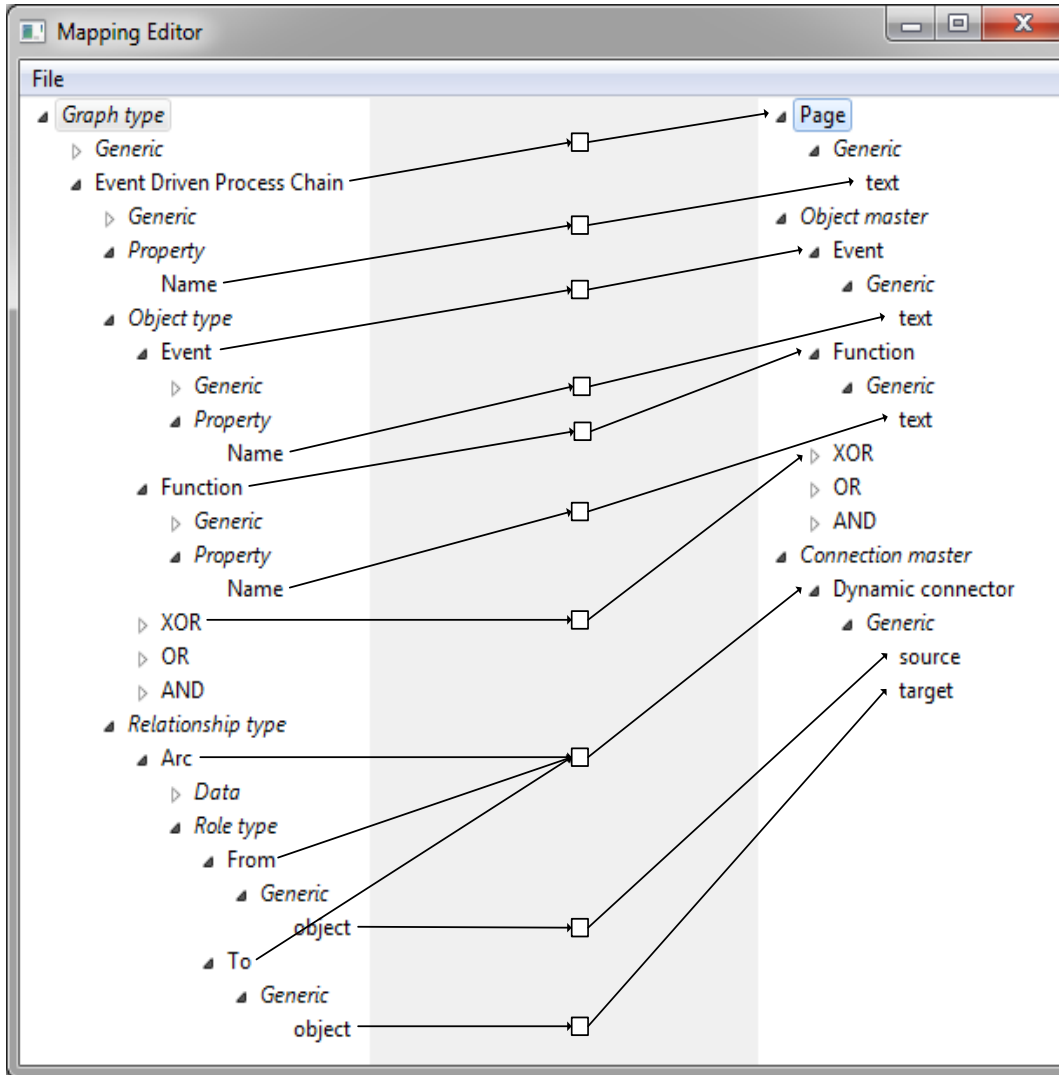
Example

	MetaEdit+ (Source)	Eclipse Modeling Framework	Visio (Target)	
Meta-models				
Models				

Step 2: Mapping between different Meta-Models



Mapping Example



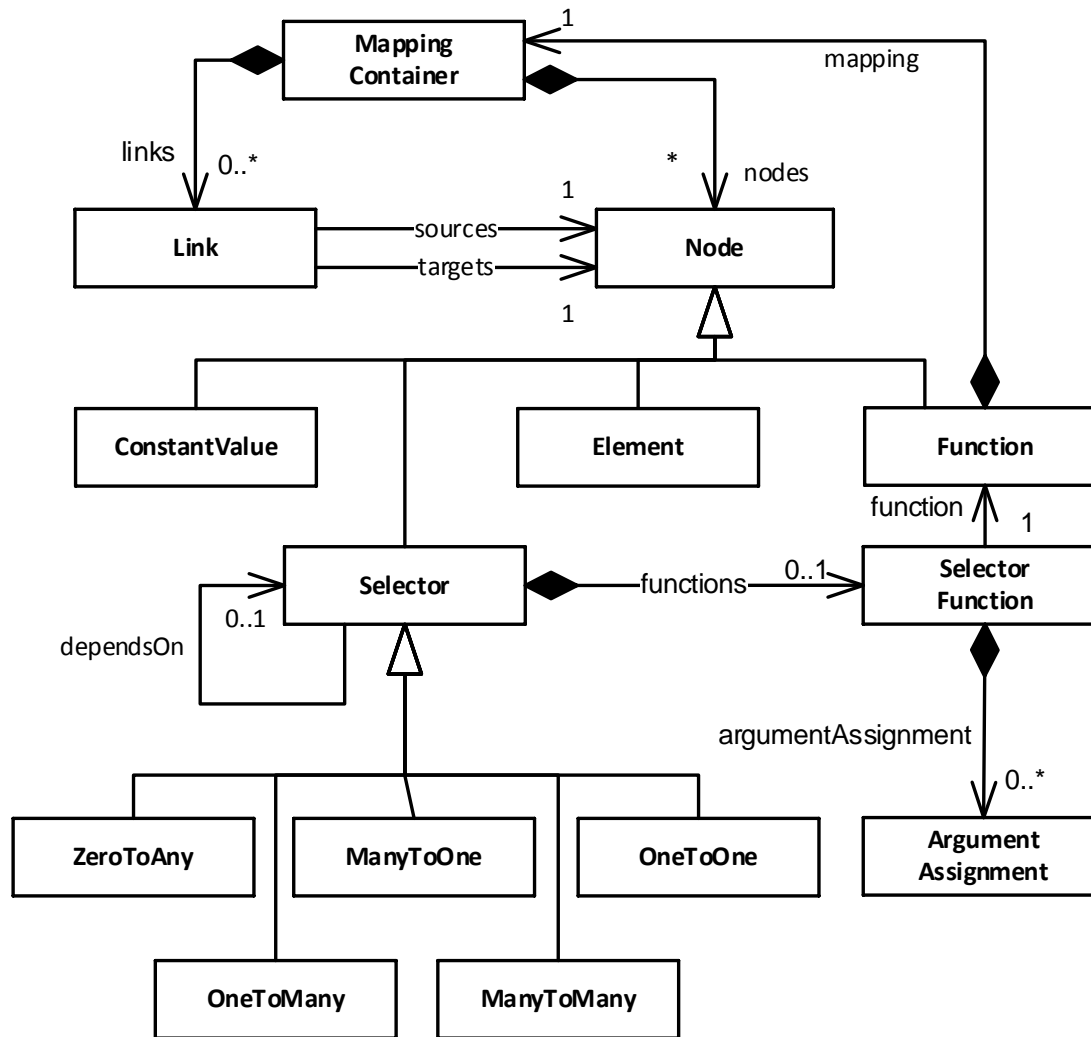
Generated ETL-transformation

```
rule graph2page
transform
epc_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



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?**