

51. How to Synchronize Models with Triple Graph Grammars

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- 1) Triple Graph Grammars
- 2) TGG in MOFLON



DRESDEN
concept
Exzellenz aus
Wissenschaft
und Kultur

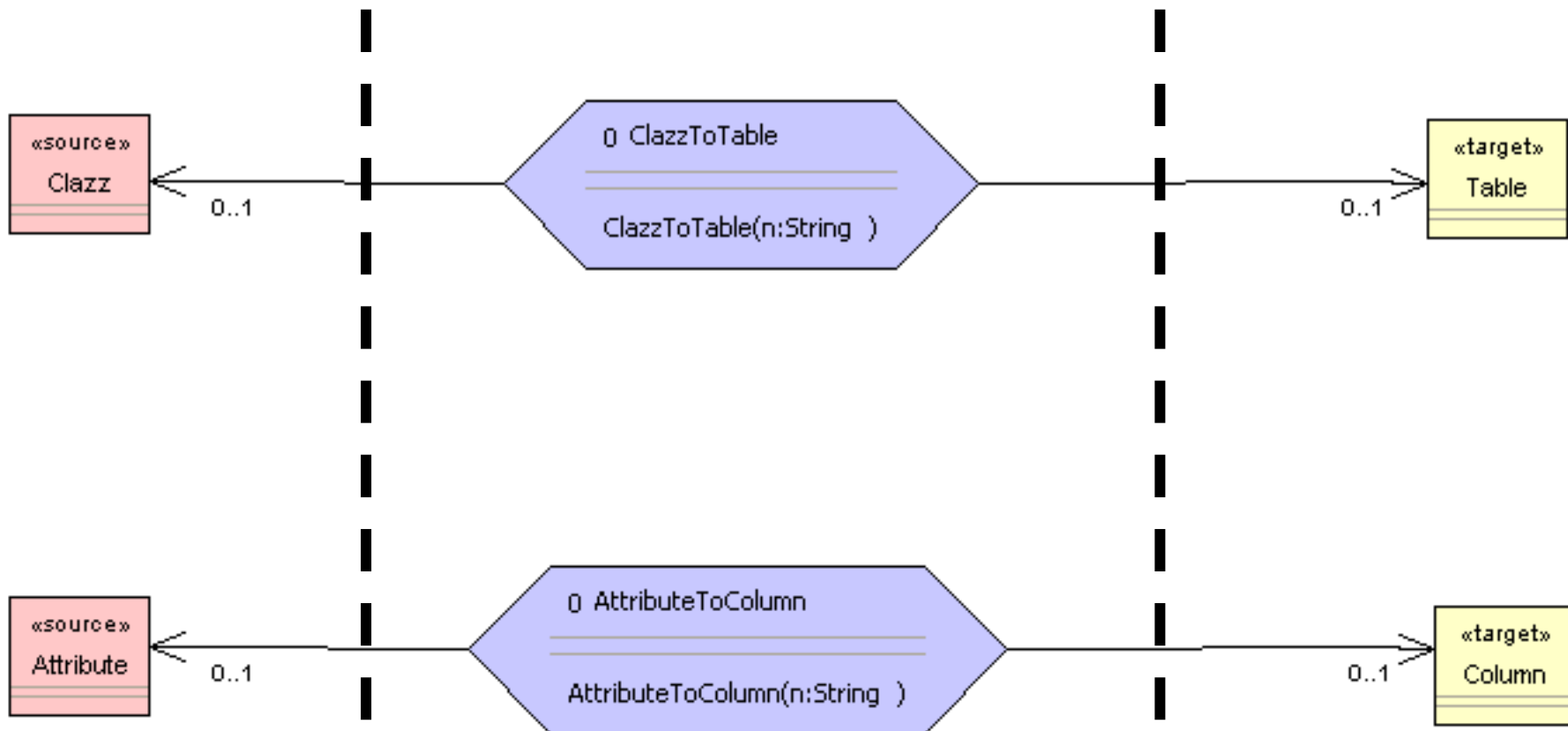
Mapping graphs to other graphs
Specification of mappings with mapping rules
Incremental transformation
Traceability

51.1 „SYNCHRONIZING“ MODELS WITH TRIPLE GRAPH GRAMMARS



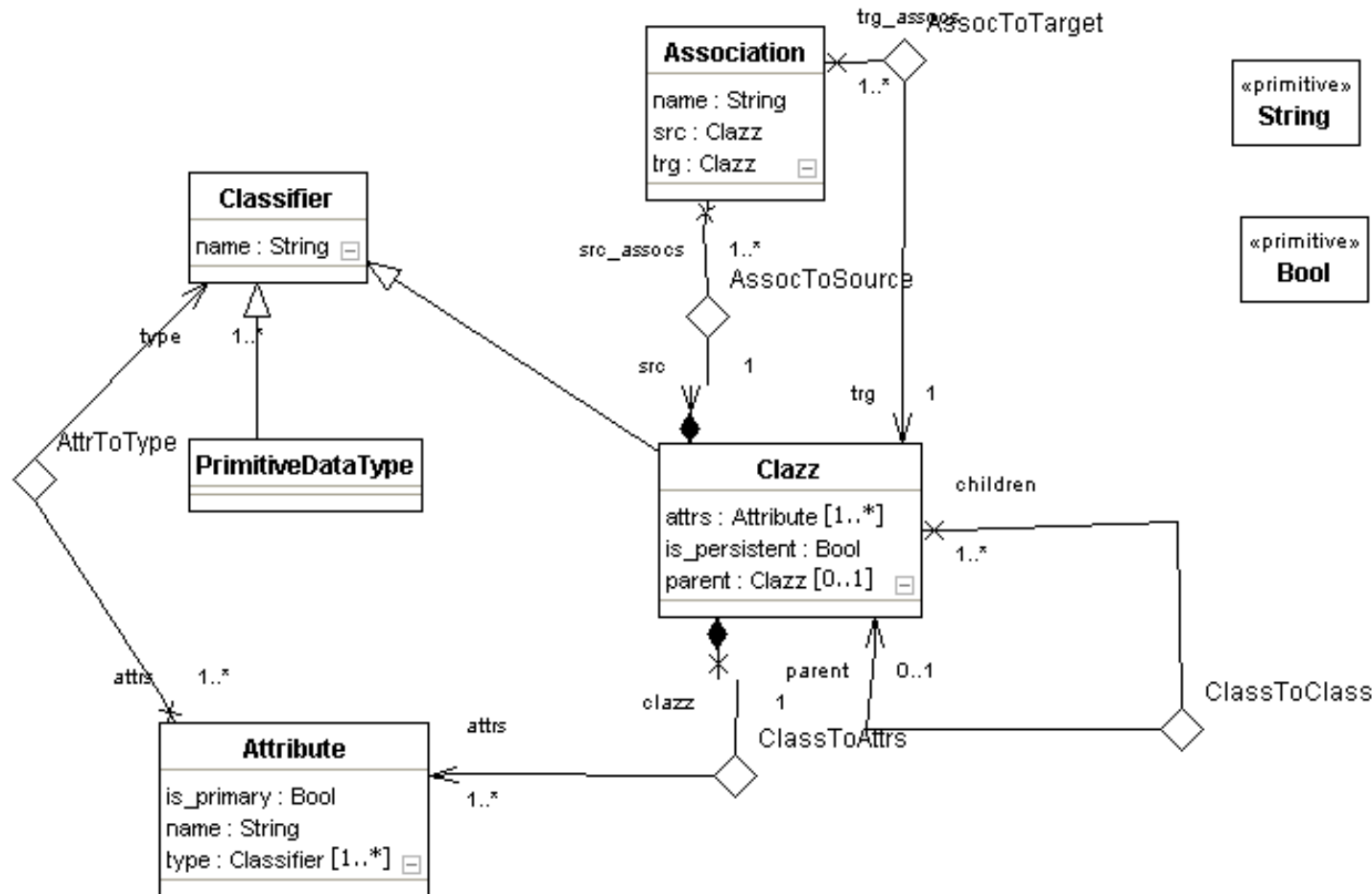
Triple Graph Grammars – Moflon Example

- ▶ A **triple Graph Grammar (TGG)** is a mapping-oriented transformation system, consisting of rules with three „areas“
 - Left side: graph pattern 1 in graph 1
 - Right side: graph pattern 2 in graph 2
 - Middle: relational expression (net) relating graph pattern 1 and 2

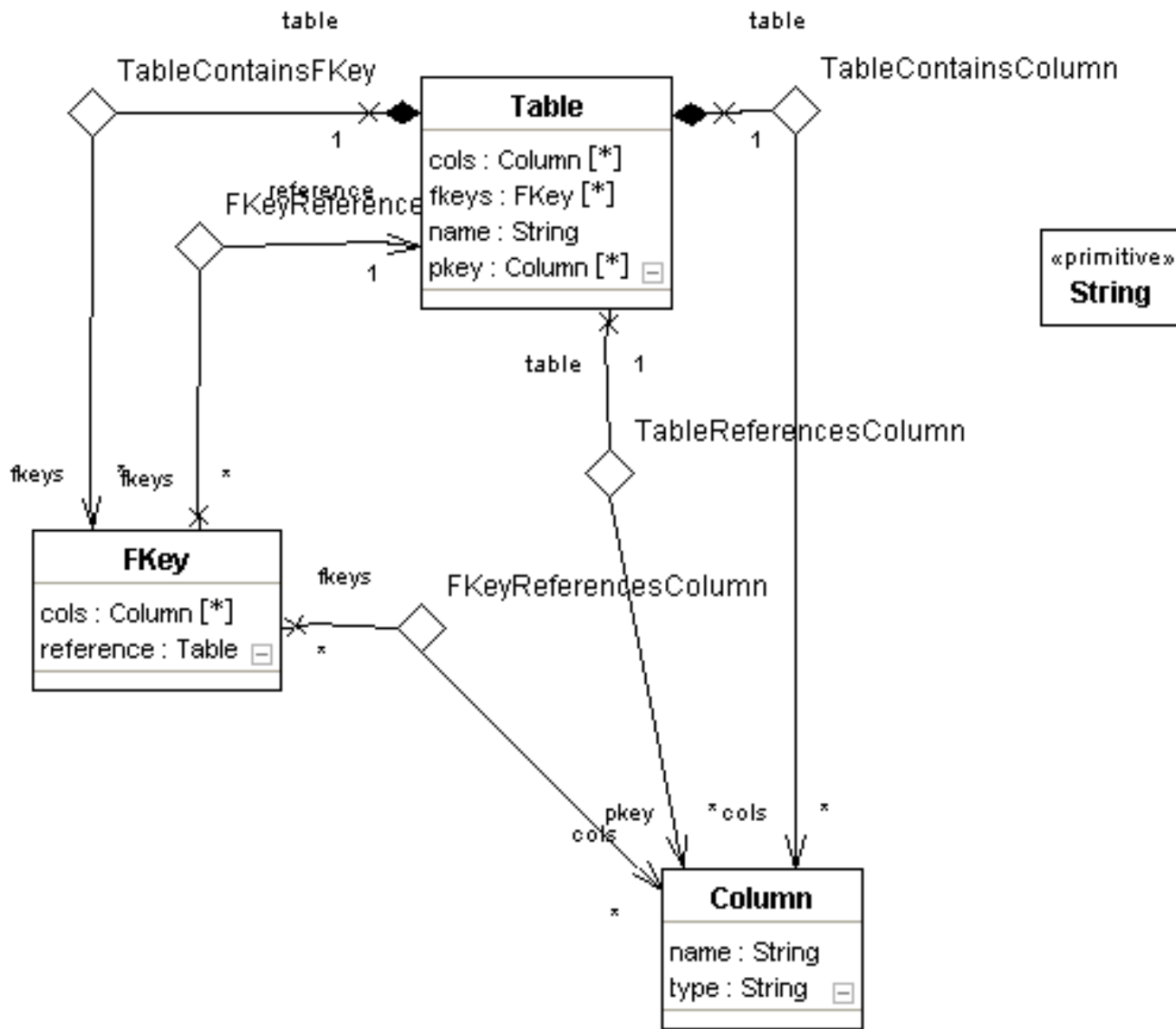


Triple Graph Grammars – Class Diagram Metamodel (CD)

- Synchronize object-metamodel with a relational schema (ORM)

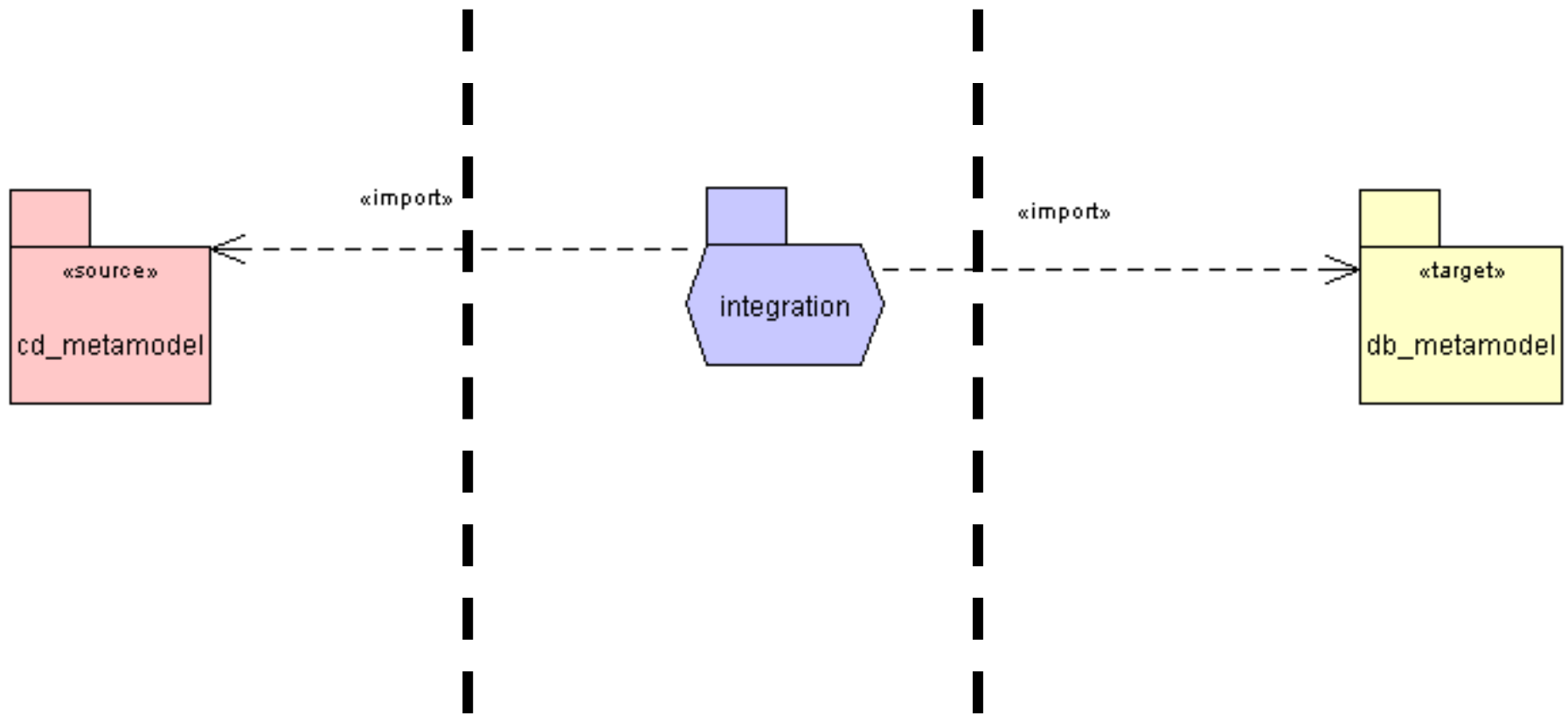


Relational Metamodel (DB, relational schema)



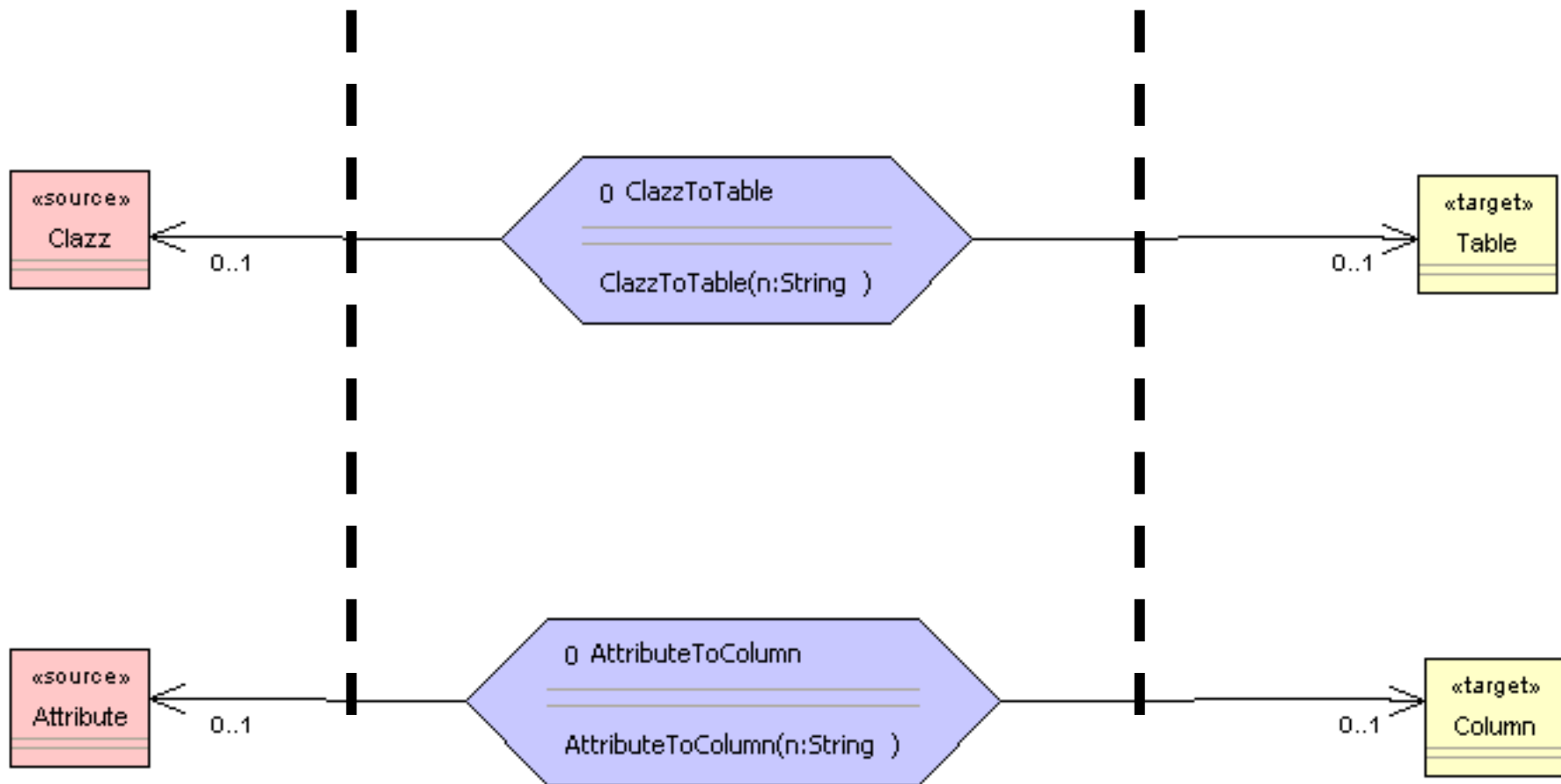
Triple Graph Grammars – Moflon Example

- A TGG has a top rule (start rule) which describes the relationship of the graphs on topmost level



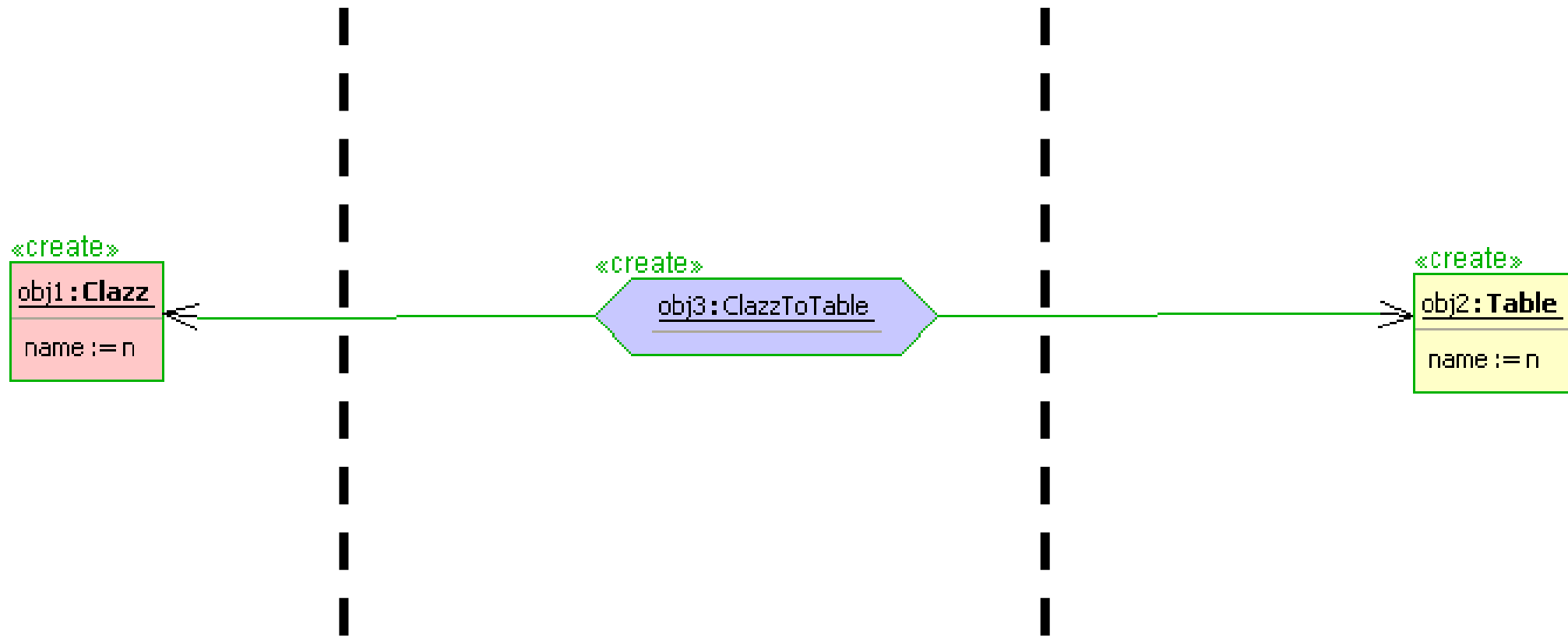
Triple Graph Grammars – Moflon Example

- From the top-rule, other TGG rules are associated („called“)



Triple Graph Grammars – Moflon Example

- This rule connects a class in the Object Model to the Table in the relational schema, synchronizing the attribute „name“



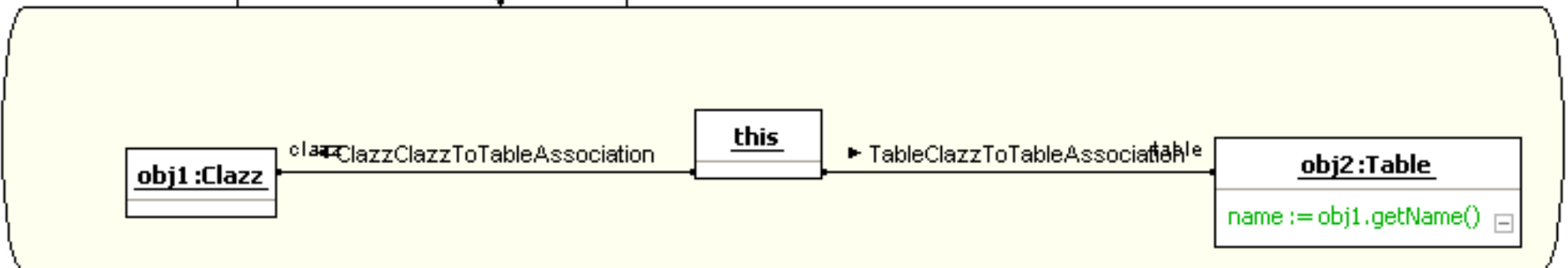
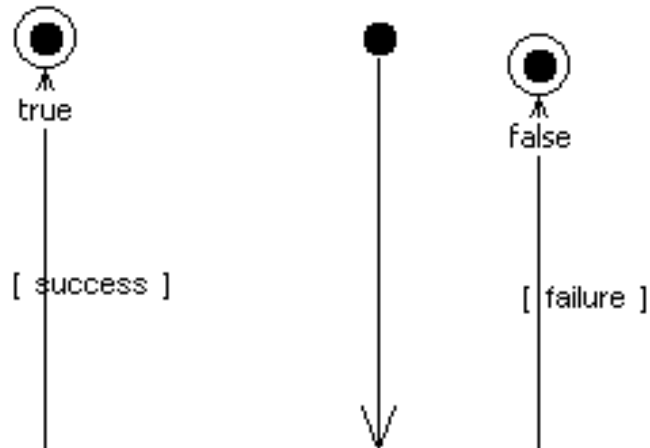
Triple Graph Grammars – Moflon Example

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Model-Driven Software Development in Technical Spaces (MOST)

- TGG rules can be started by Fujaba Storyboards

ClazzToTable::performForwardAttributeValuePropagation(): Boolean

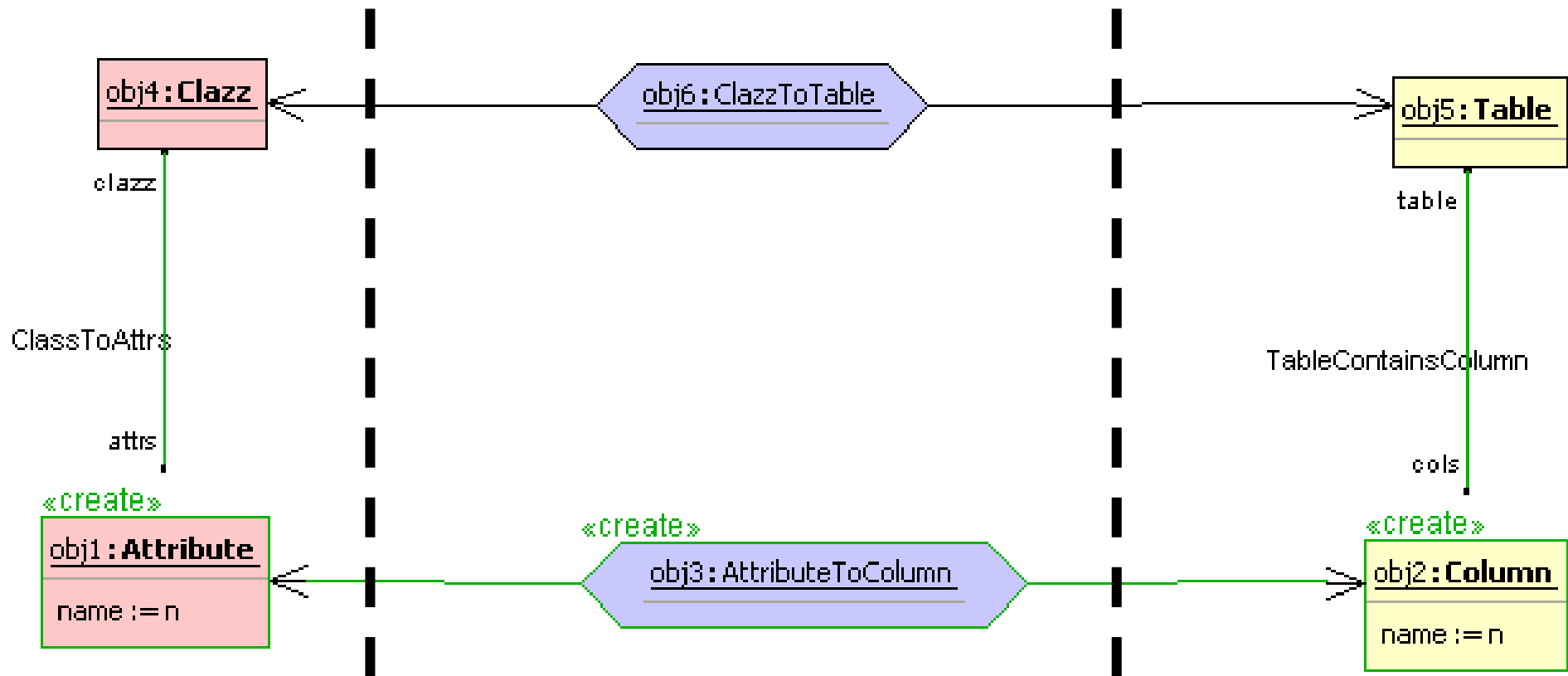


Triple Graph Grammars – Moflon Example

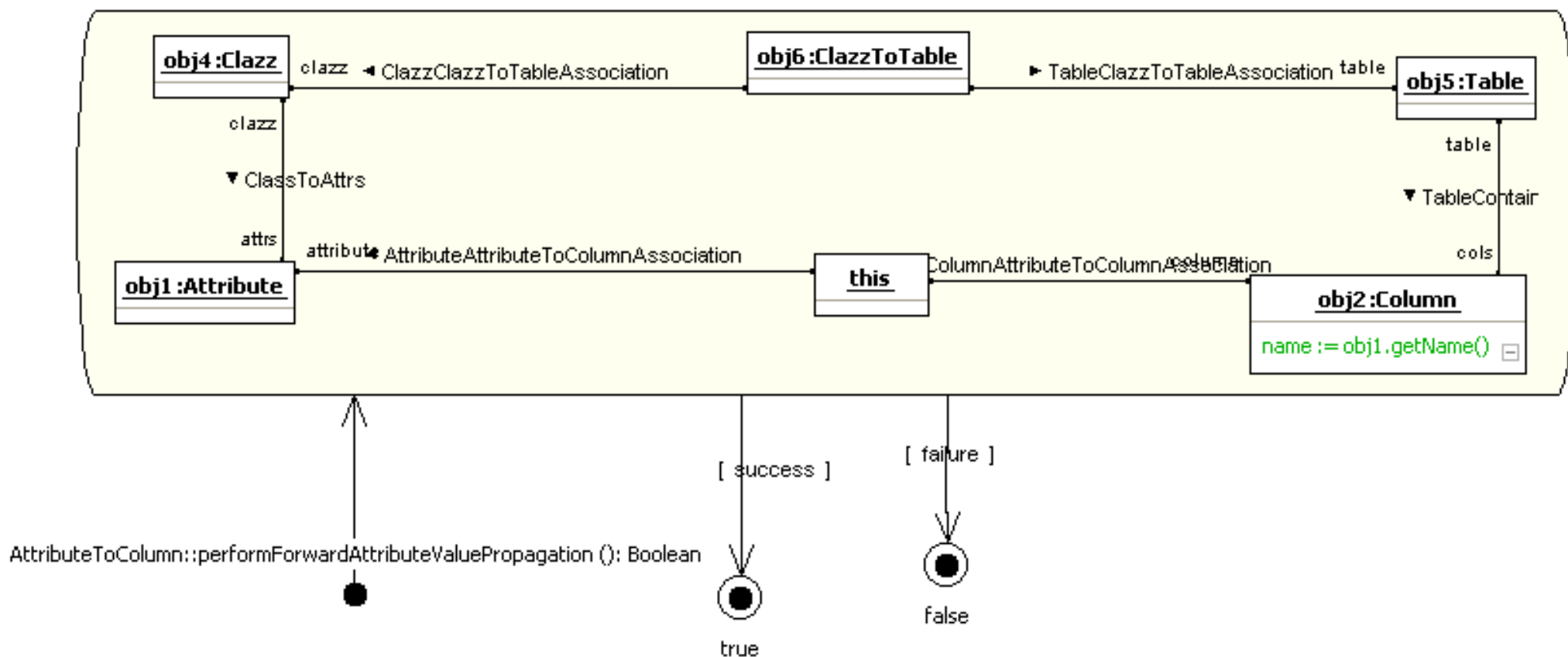
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Model-Driven Software Development in Technical Spaces (MOST)

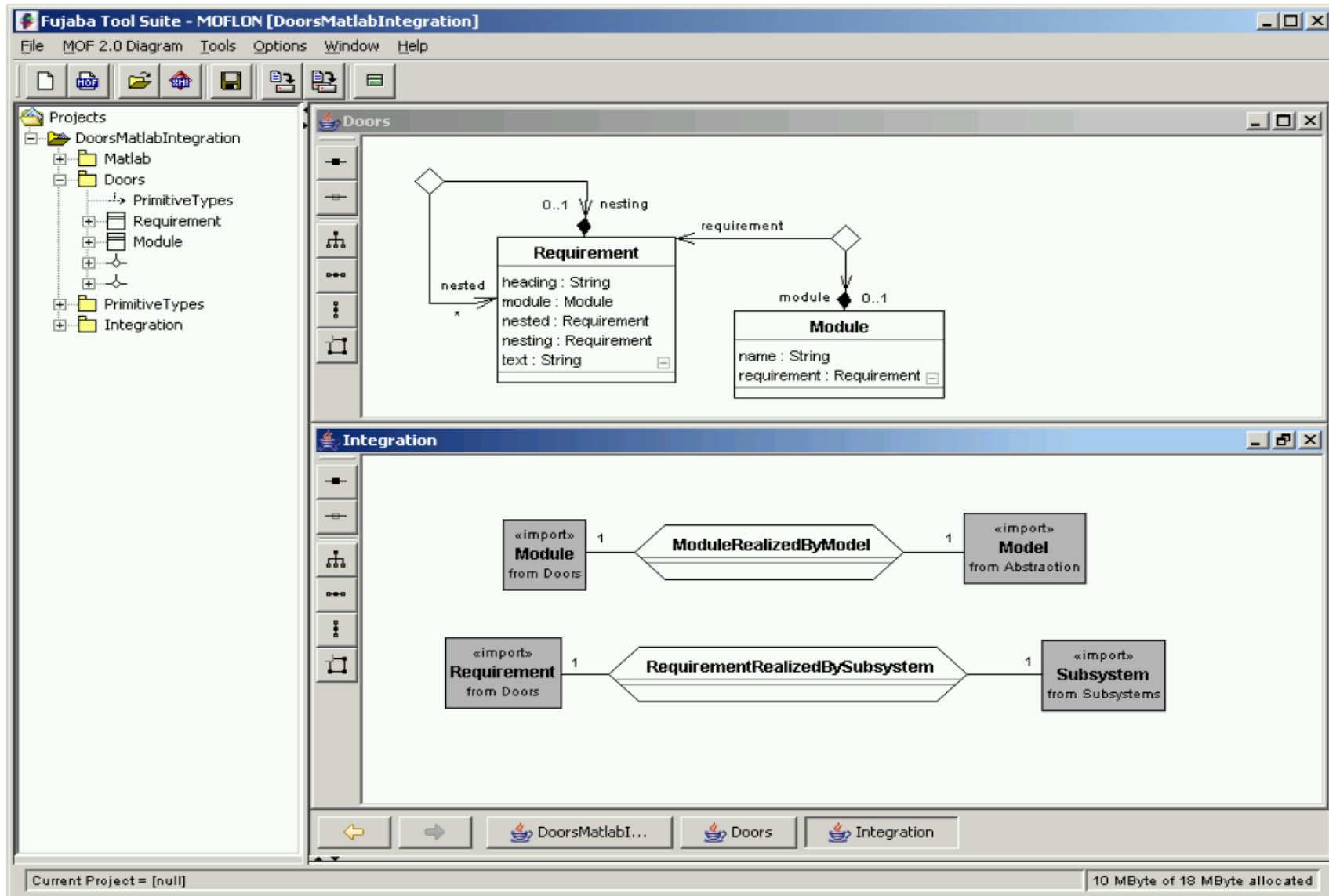
➤ Pairwise correspondance



Triple Graph Grammars – Moflon Example



TGG Coupling Requirements Specification and Design



TGG Coupling Requirements Specification and Design





51.1. Triple Graph Grammars in MOFLON



Example: Integration with TGG - Object-Relational Mapping (ORM) from Class Diagrams to Database Schema (Tie-CDDs)

domain specific language,
e.g. Class Diagrams

domain specific language,
e.g. Database Schemata

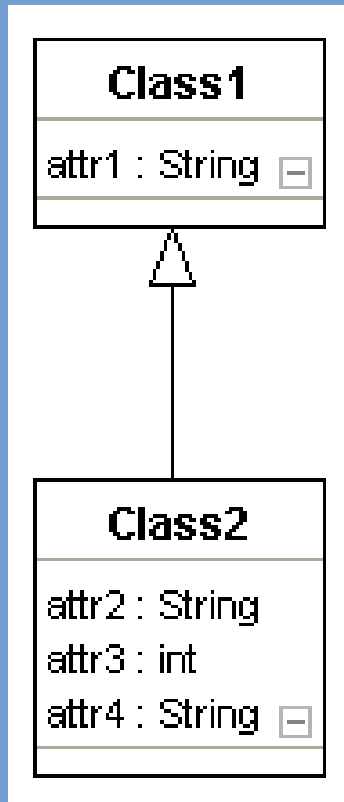


Table class1

Server: localhost Database: icgt2008 Table: class1

Browse Structure SQL Search Insert

	Field	Type	Collation	Attributes	Null
<input type="checkbox"/>	attr1	varchar(1024)	latin1_general_ci		No
<input type="checkbox"/>	attr2	varchar(1024)	latin1_general_ci		No
<input type="checkbox"/>	attr3	int(11)			No
<input type="checkbox"/>	attr4	varchar(1024)	latin1_general_ci		No

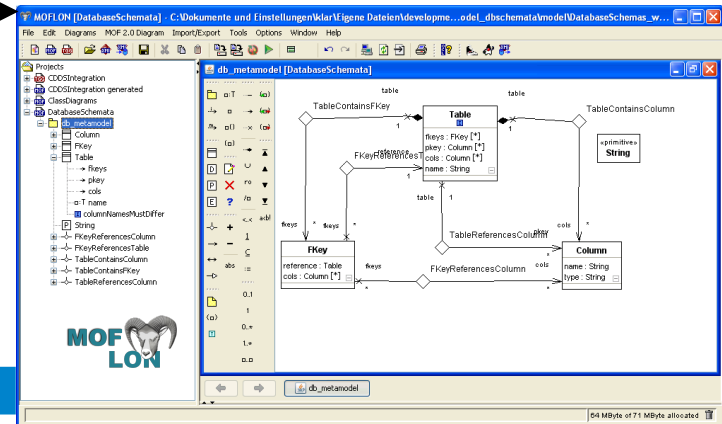
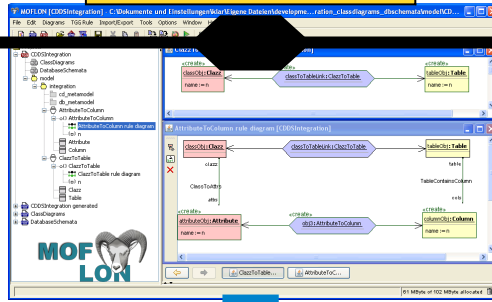
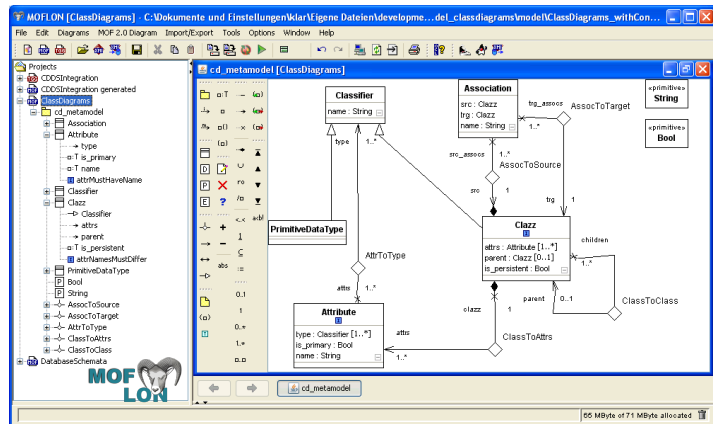
Table class2

Example: Tool Integration Scenario TiE-CDDs: (ClassDiagrams / DatabaseSchema)

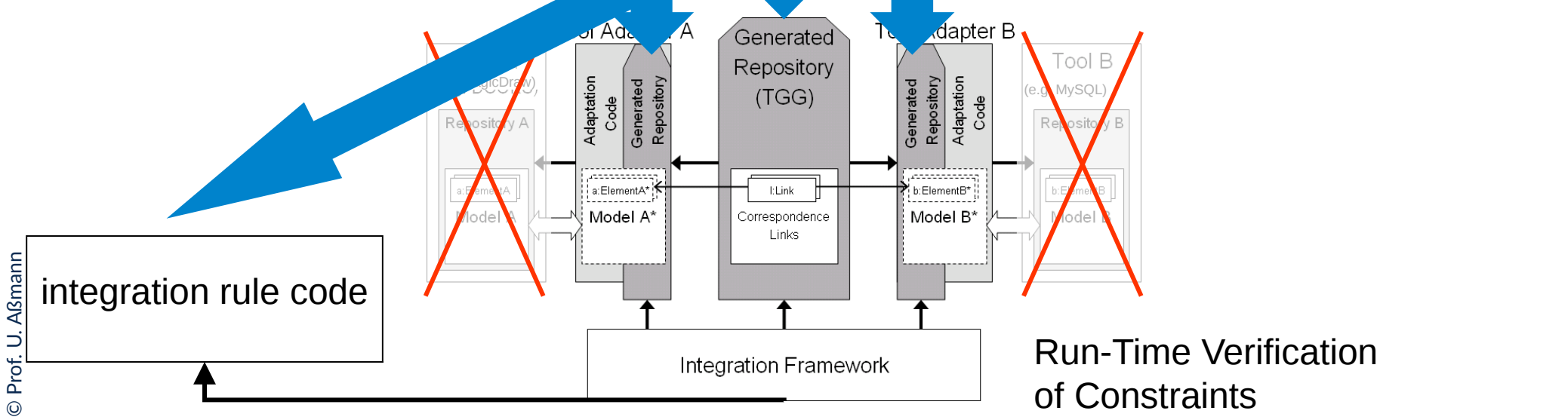
Class Diagrams Metamodel

TGGs relate

Database Schemata Metamodel



MOFLON generates



Other Software Engineering Applications of Model Synchronization

- ▶ Mapping a PIM to a PSM in Model-Driven Architecture
- ▶ Graph Structurings (see course ST-II)
- ▶ Refactorings (see Course DPF)
- ▶ Semantic refinements
- ▶ Round-Trip Engineering (RTE)

The End: What Have We Learned

- ▶ Graph rewrite systems are tools to transform graph-based models and graph-based program representations
- ▶ TGG enable to bidirectionally map models and synchronize them