

51. How to Synchronize Models with Triple Graph Grammars

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



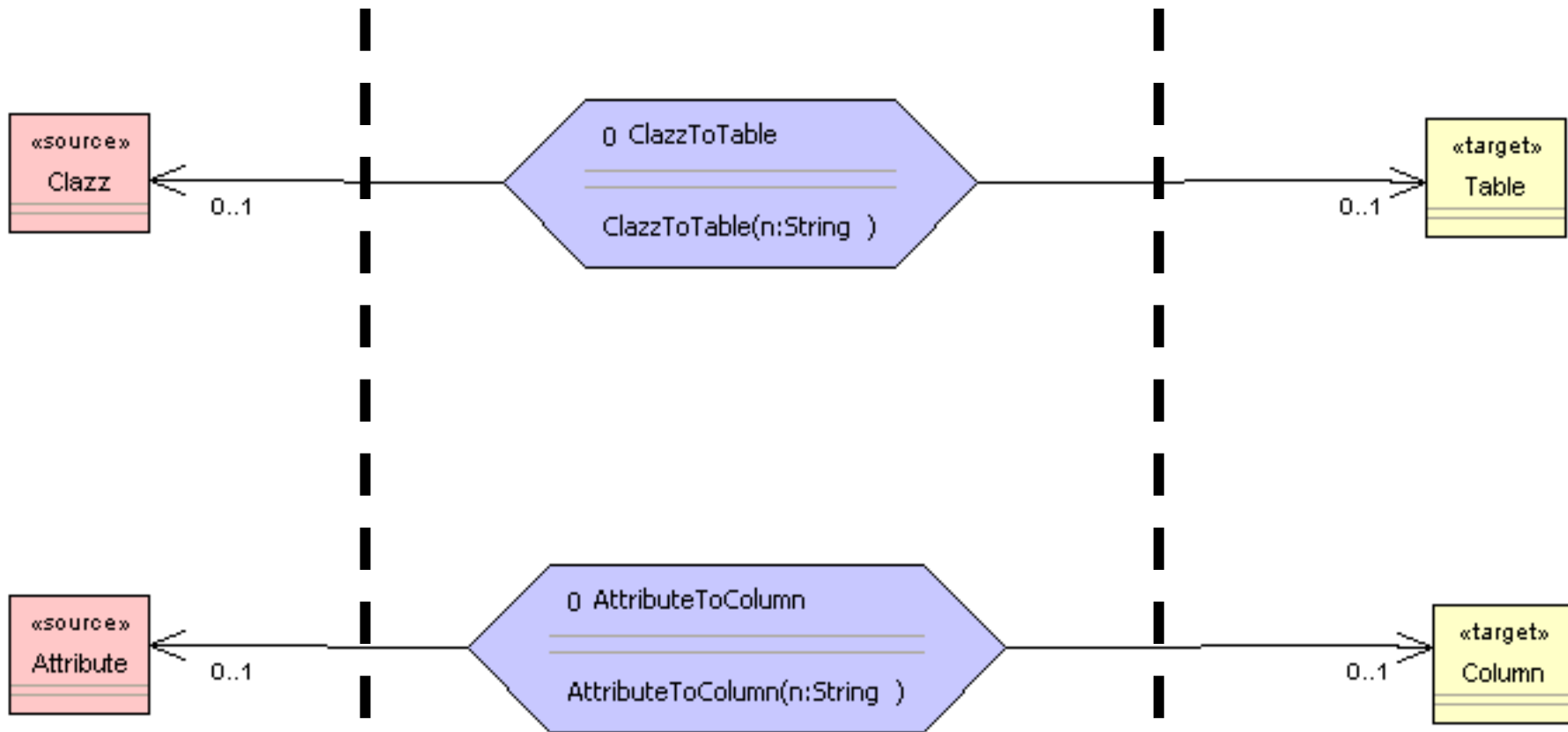
Mapping graphs to other graphs
Specification of mappings with mapping rules
Incremental transformation
Traceability

51.1 „SYNCHRONIZING“ MODELS WITH TRIPLE GRAPH GRAMMARS



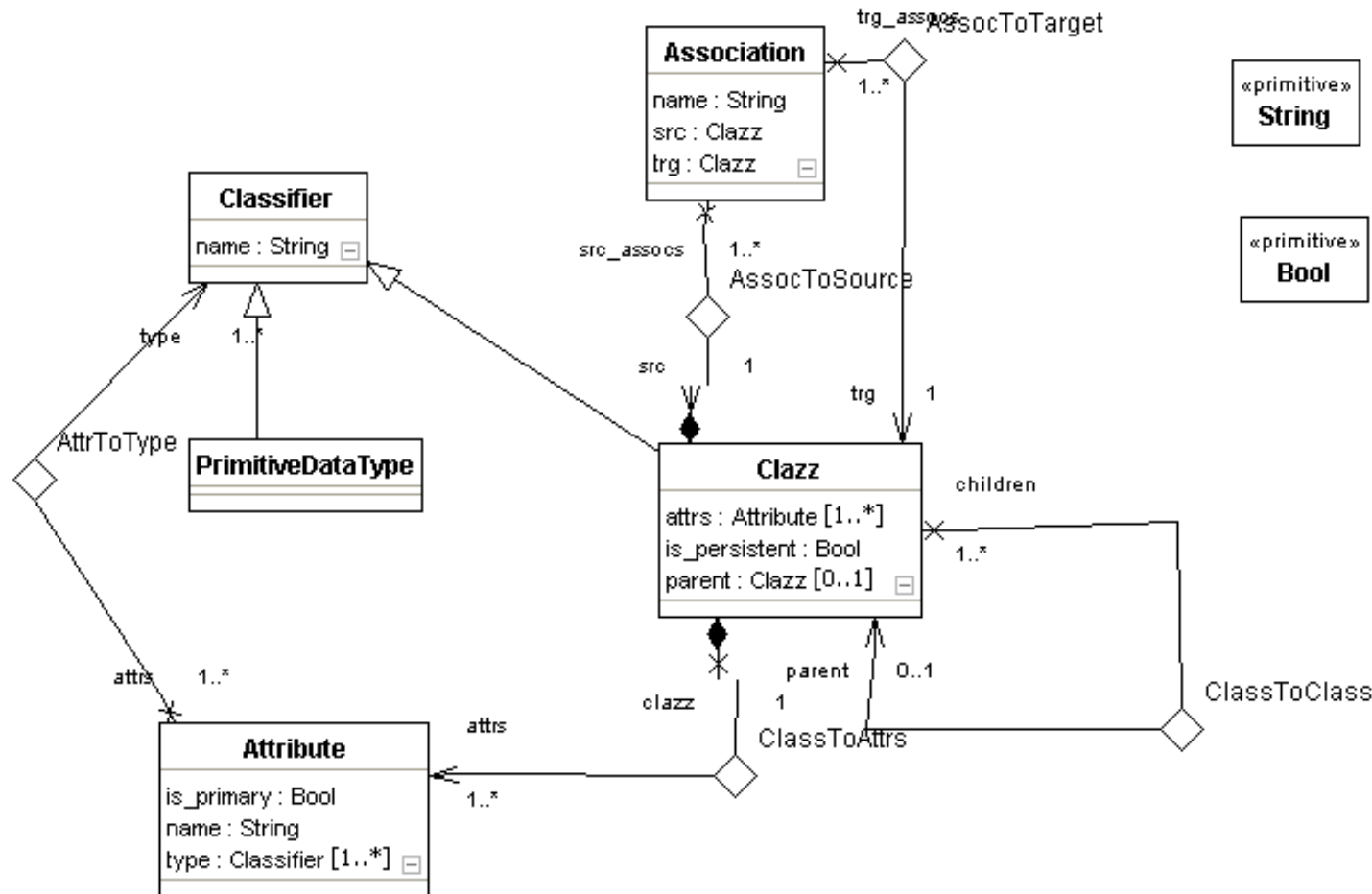
Triple Graph Grammars – Moflon Example

- A triple Graph Grammar (TGG) consists 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

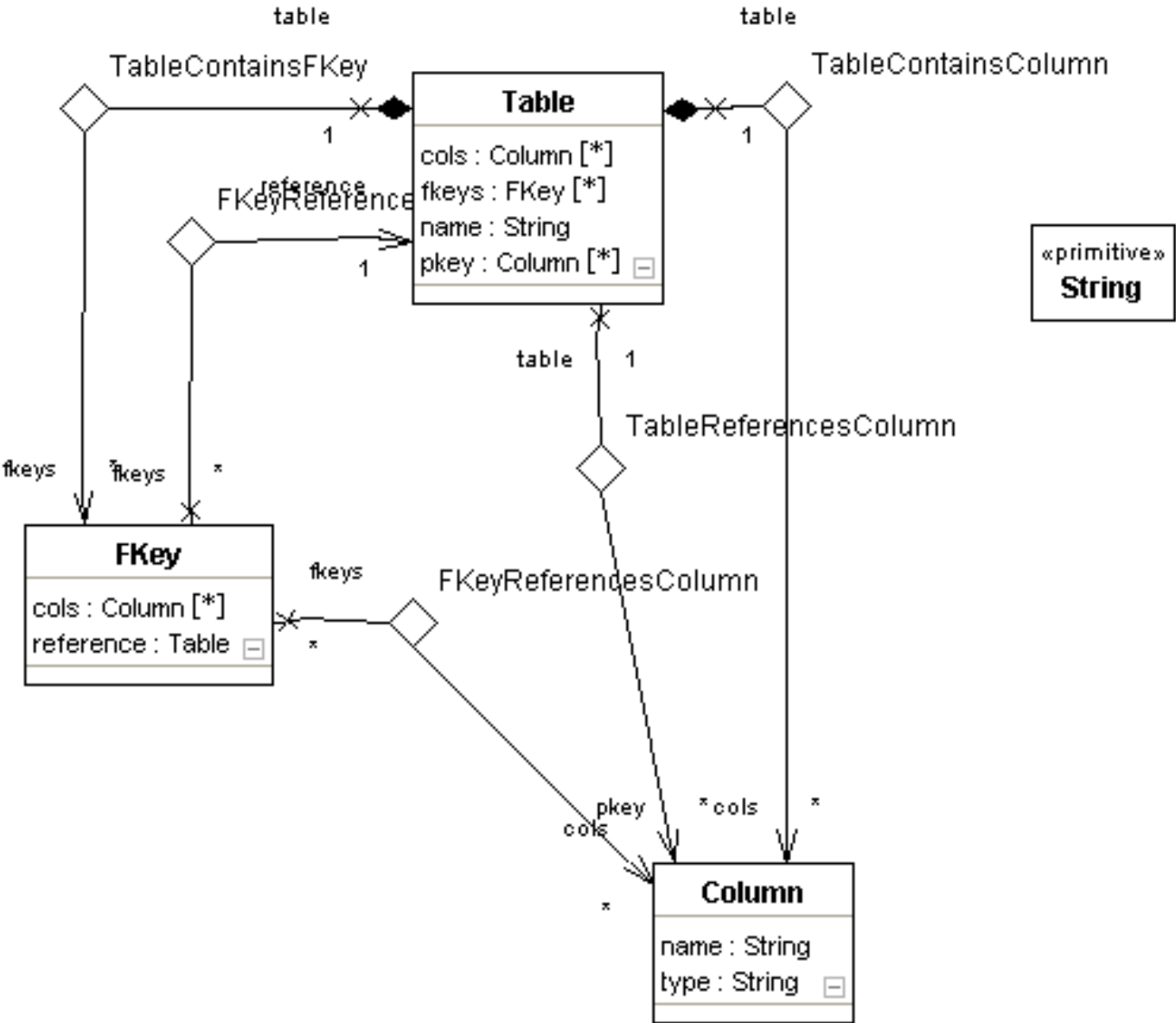


Triple Graph Grammars – Class Diagram Metamodel (CD)

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

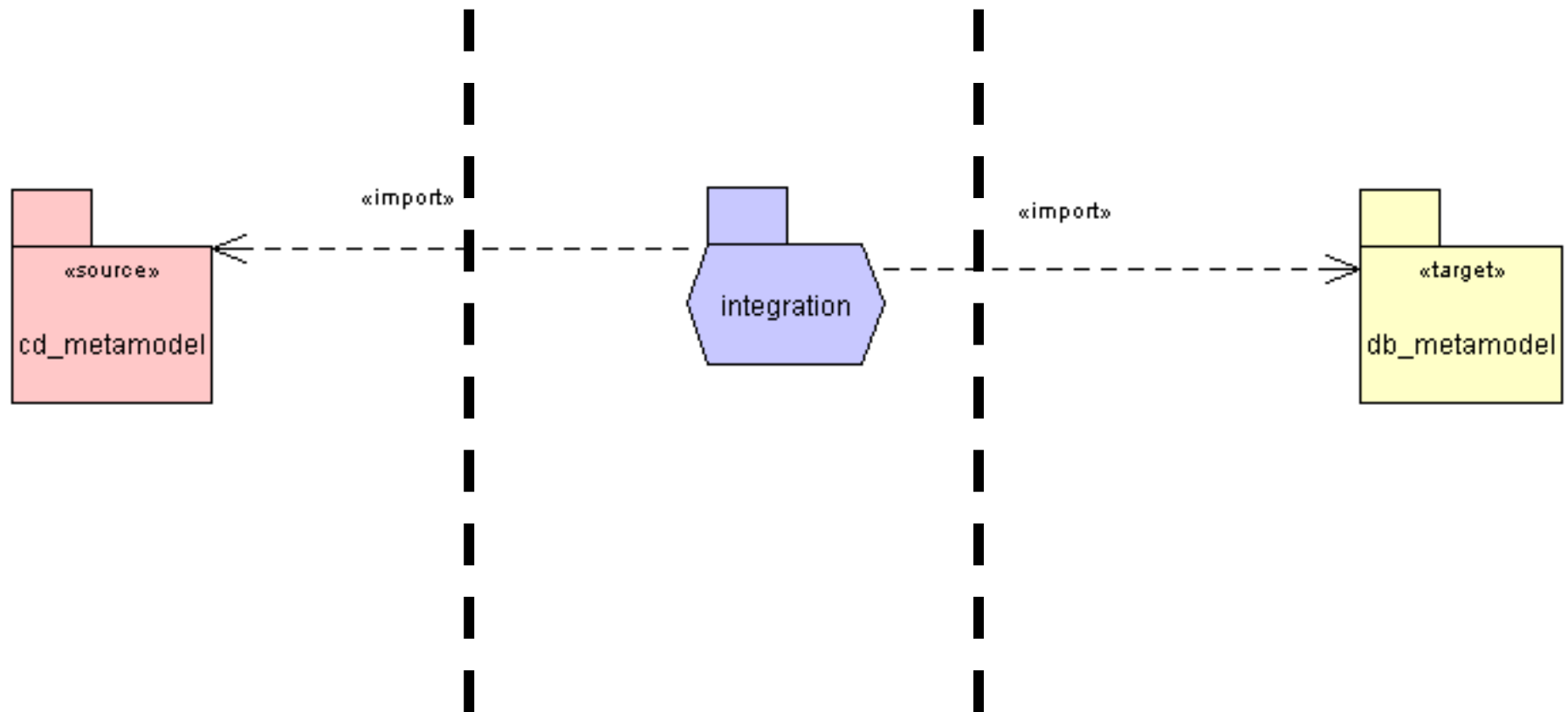


Relational Metamodel (db, relational schema)



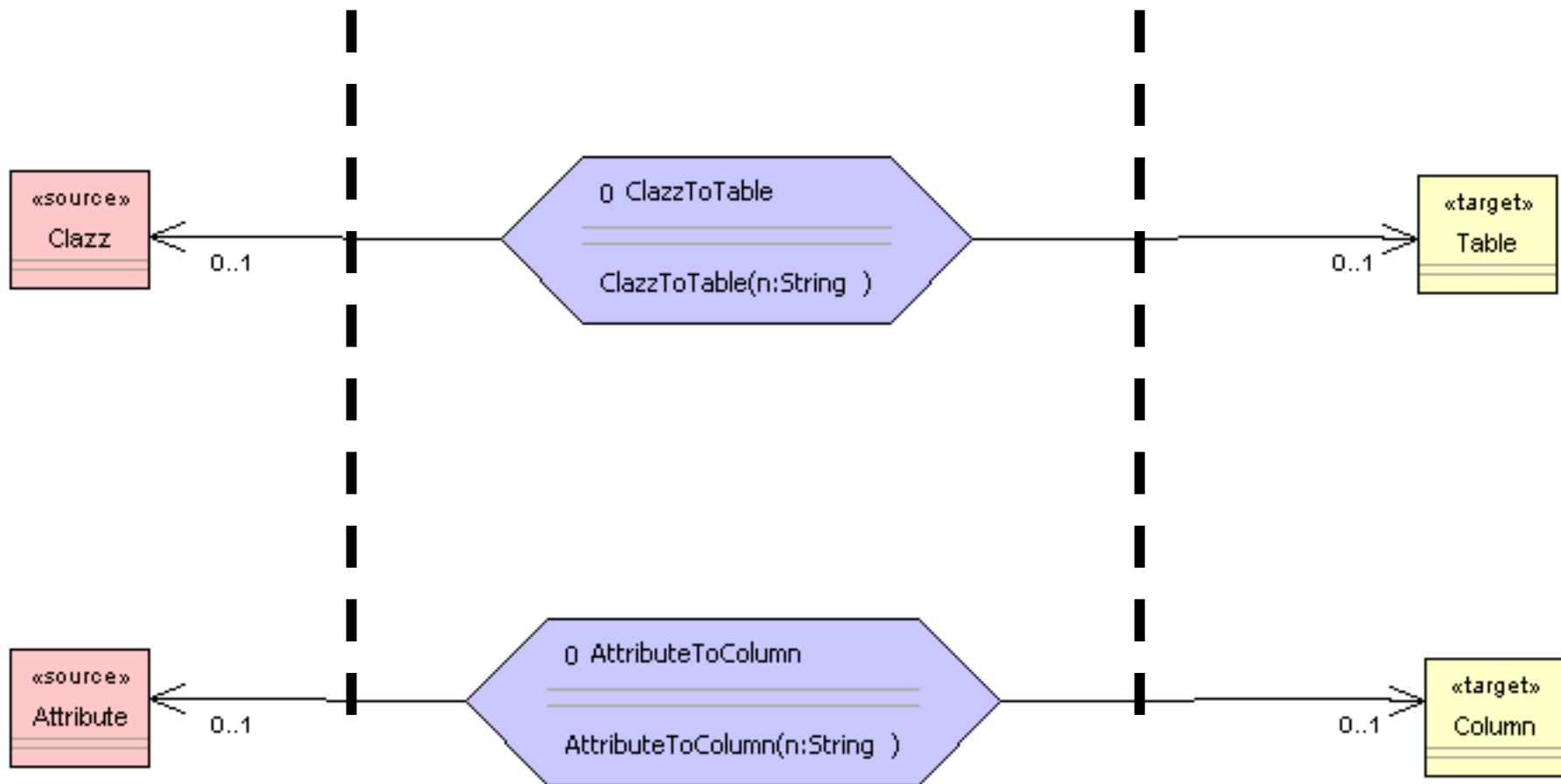
Triple Graph Grammars – Moflon Example

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



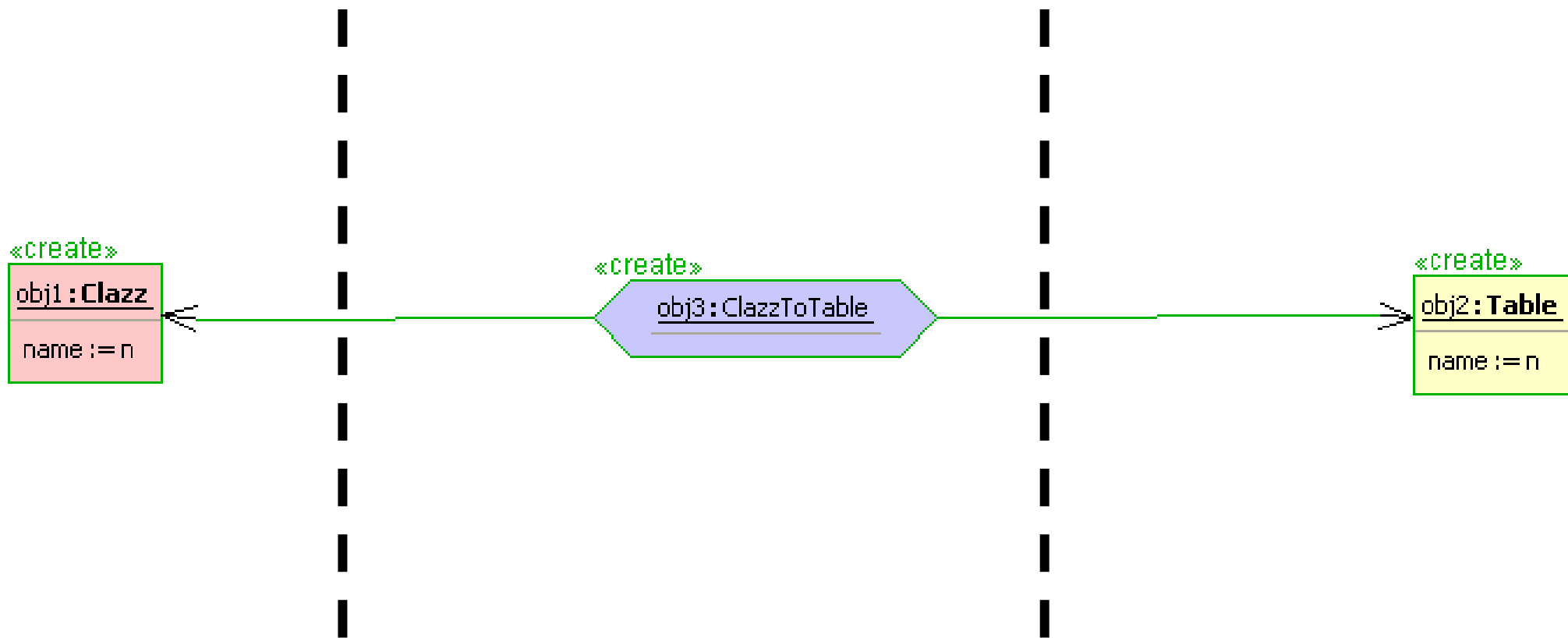
Triple Graph Grammars – Moflon Example

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



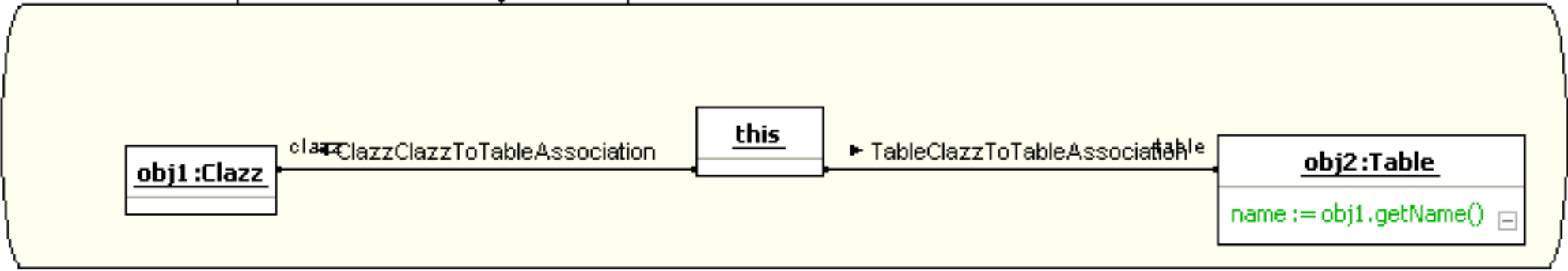
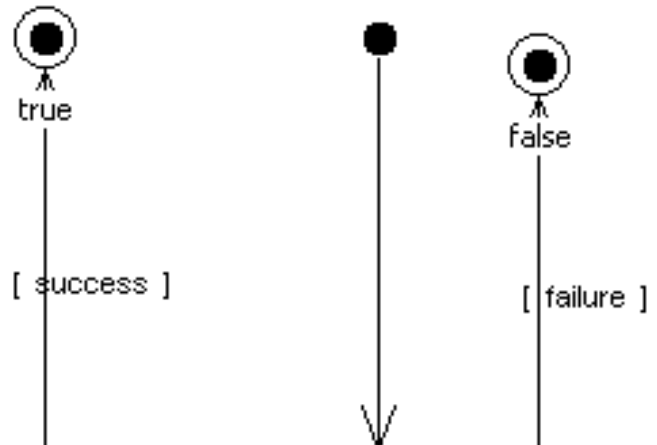
Triple Graph Grammars – Moflon Example

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



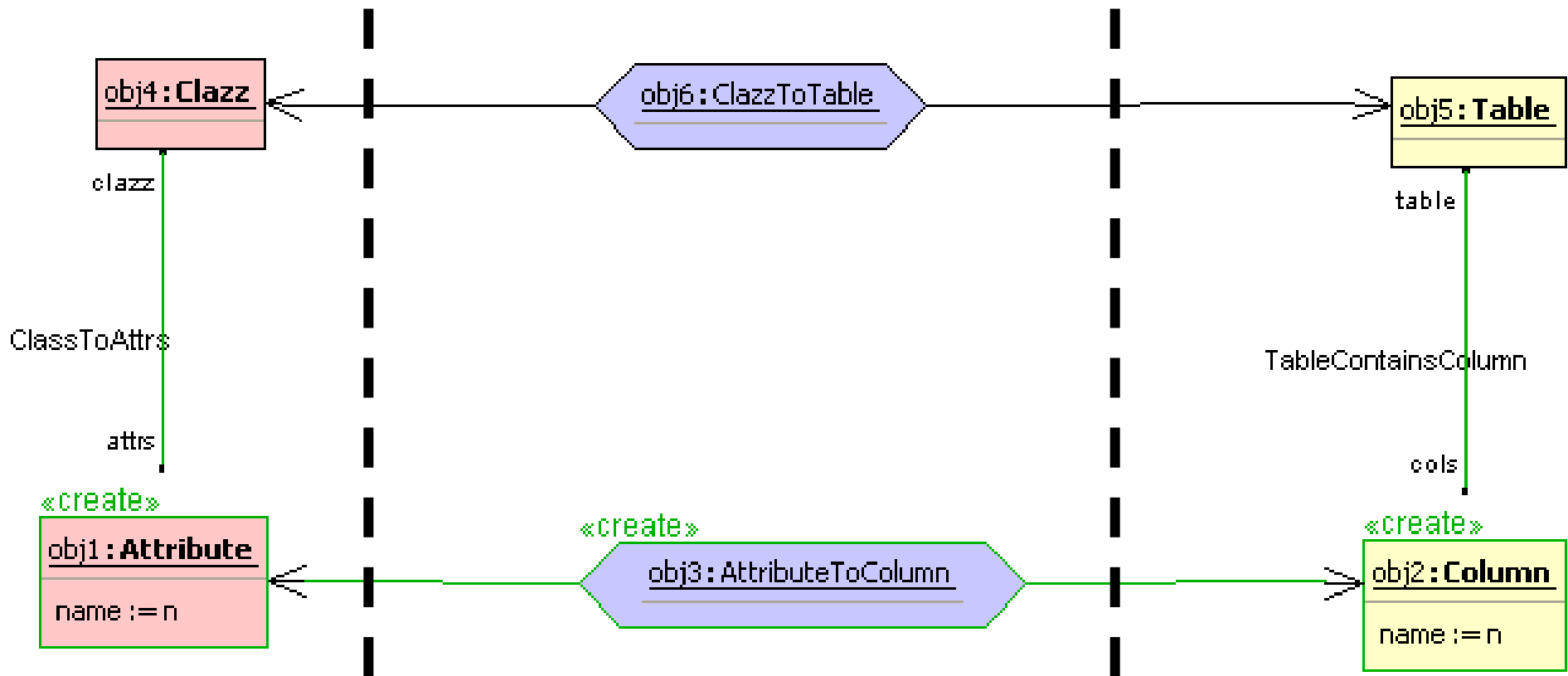
Triple Graph Grammars – Moflon Example

ClazzToTable::performForwardAttributeValuePropagation(): Boolean

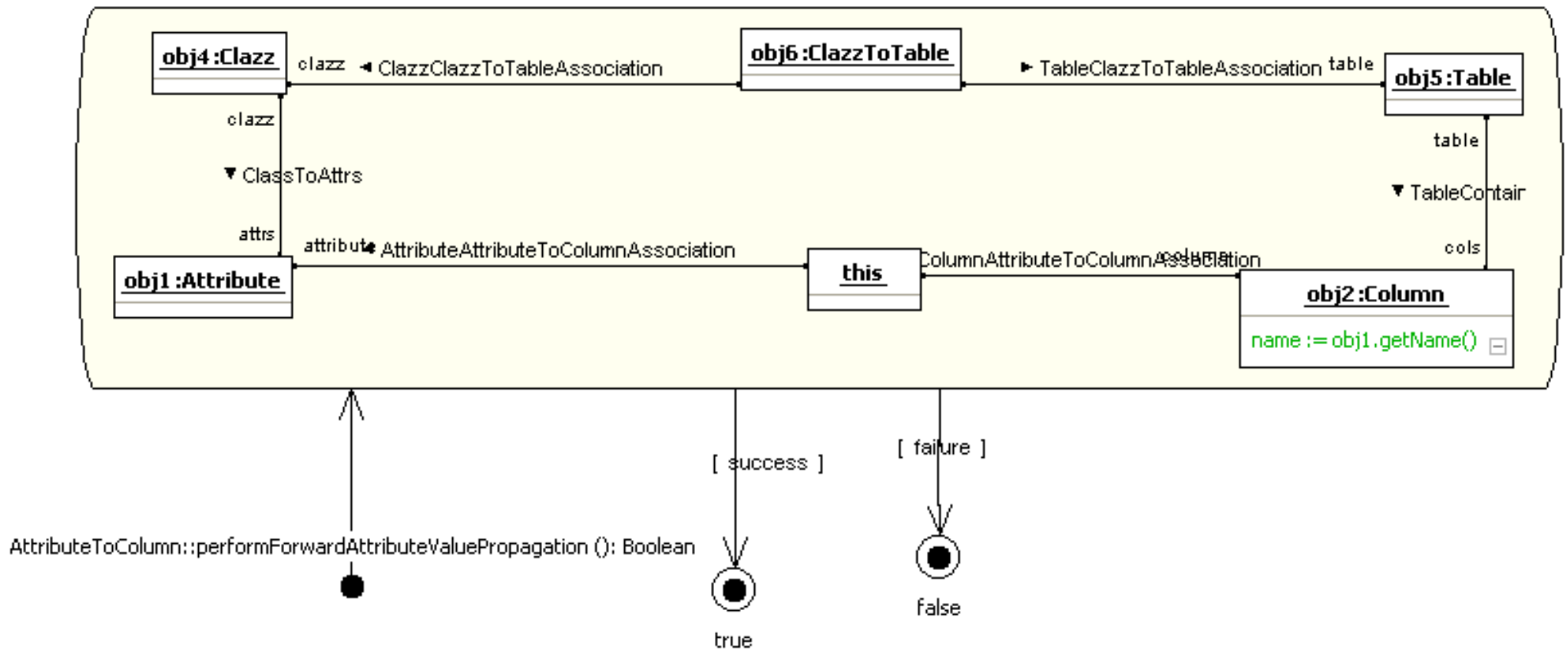


Triple Graph Grammars – Moflon Example

➤ Pairwise correspondance



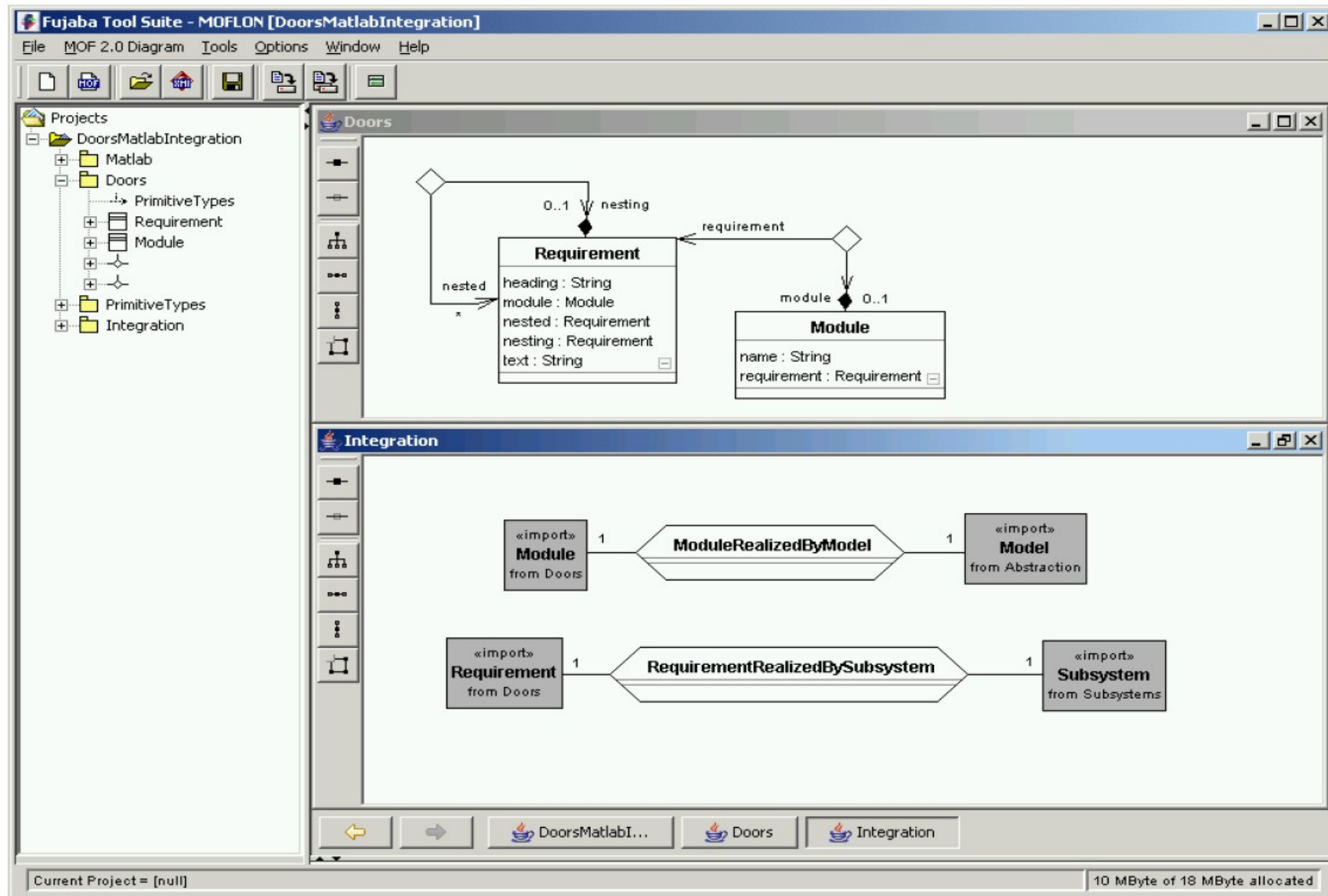
Triple Graph Grammars – Moflon Example



TGG Coupling Requirements Specification and Design

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Model-Driven Software Development in Technical Spaces (MOST)



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

domain specific language,
e.g. Class Diagrams

domain specific language,
e.g. Database Schemata

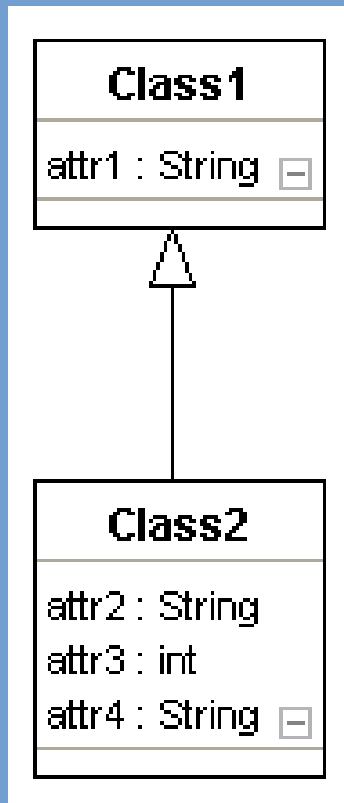


Table class1

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 |

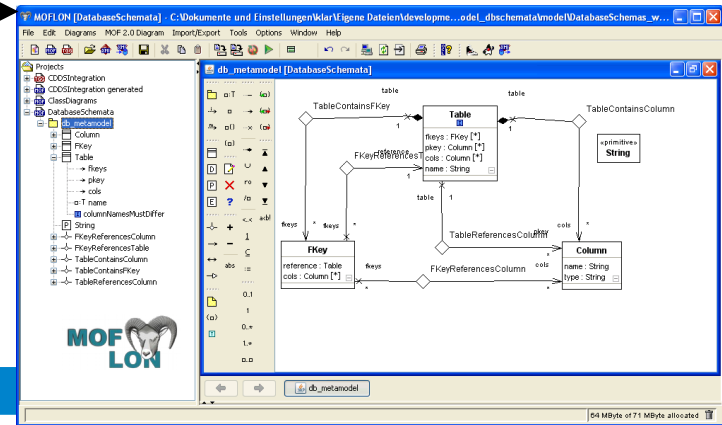
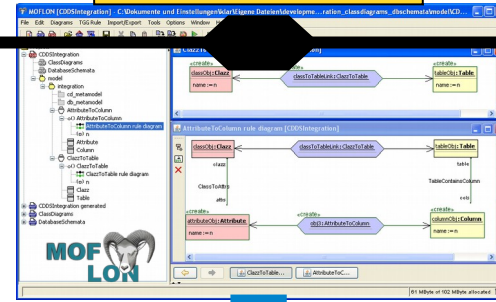
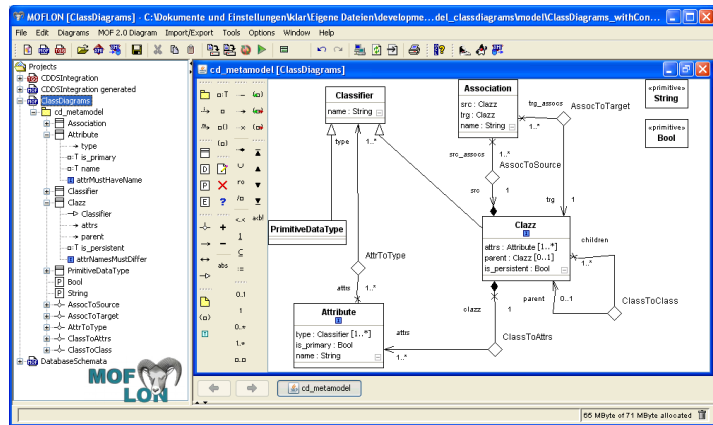
Table class2

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

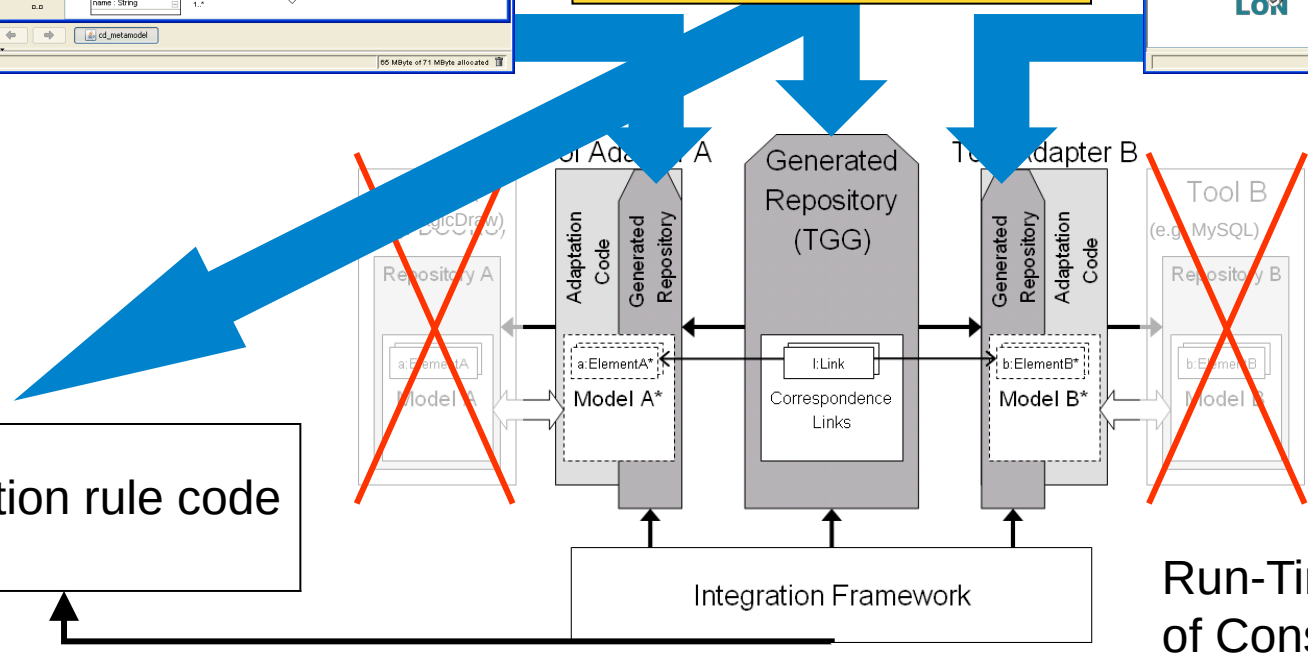
Class Diagrams Metamodel

TGGs relate

Database Schemata Metamodel



MOFLON generates



Other Software Engineering Applications

- ▶ 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