

# Case Study: *uniNDTotal* Consistency Relation

October 2, 2013

## 1 Motivation and origin

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## 2 Specification

### 2.1 Metamodels ( $M, N$ )

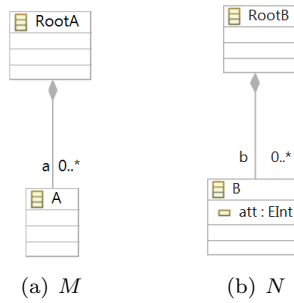


Figure 1: Metamodels

### 2.2 Consistency relation ( $R$ )

**Type:** *uniNDTotal*, *one*  $\leftrightarrow$  *some*

For every  $M$  instance there exists **one**  $N$  instance such that both are related by  $R$ ;

For every  $N$  instance there exists **exactly one**  $M$  instance such that both are related by  $R$ .

	injective	entire	simple	surjective
$R$	✓	✓		✓

### Definition

For every  $A$  in  $RootA$  there exists **one**  $B$  in  $RootB$ ; <sup>1</sup>

For every  $B$  in  $RootB$  there exists **exactly one**  $A$  in  $RootA$ .

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<sup>1</sup>This direction is non deterministic since any  $B$  is consistent regardless of its attribute value.

### 3 Test instances $(m,n)$

#### 3.1 One A



Figure 2: One A  $(m)$

#### 3.2 No As

*(no As  $(m)$ )*

#### 3.3 One B attribute 0



Figure 3: One B with attribute value 0  $(n)$

#### 3.4 One B attribute 15



Figure 4: One B with attribute value 15  $(n)$

### 3.5 Transformations to assess

	$m$	$n$	$\overrightarrow{R}$	$\overleftarrow{R}$
T1	One A	One B attribute 0	✓	
T2	No As	One B attribute 15		✓
T3	One A	One B attribute 15	✓	

## 4 Tools assessment

### 4.1 *eMoflon*

#### 4.1.1 Specification implementation

*Specification environment:* Enterprise Architect [4]

##### Metamodels

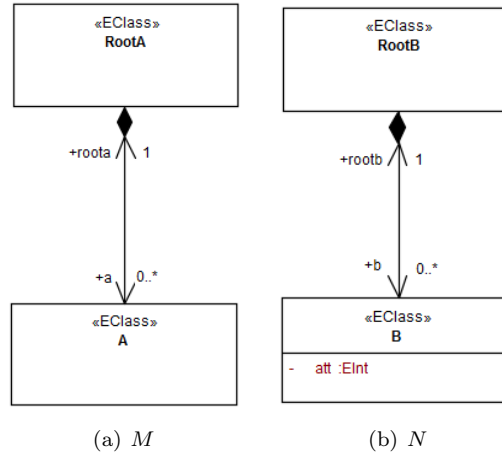


Figure 5: Metamodels modelled as *EA Ecore Diagrams*

##### Consistency Relation

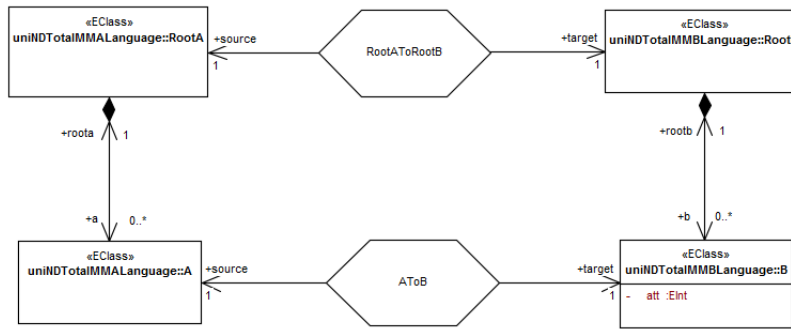


Figure 6: *TGG Schema Diagram*

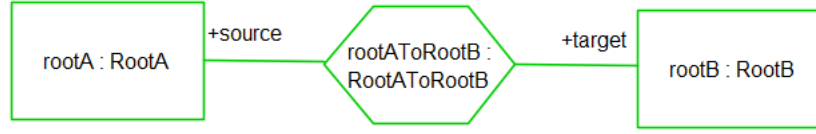


Figure 7: *TGG Rule Diagram* RootAToRootB

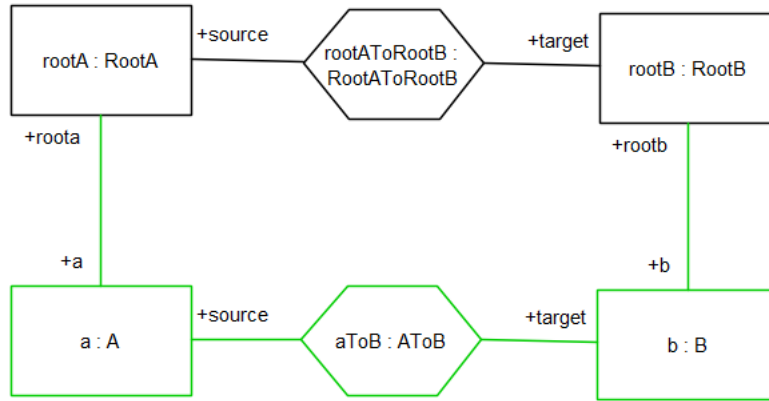


Figure 8: *TGG Rule Diagram* AToB

#### 4.1.2 Instances transformation results

*Integration environment:* Eclipse Modelling Tools [5]

T1 - One A / One B attribute 0 ( $\vec{R}$ )

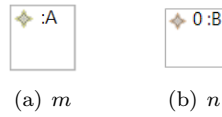


Figure 9: T1 result

T2 - No As / One B attribute 15 ( $\overleftarrow{R}$ )



Figure 10: T2 result

T3 - One A / One B attribute 15 ( $\overrightarrow{R}$ )



Figure 11: T3 result

#### 4.1.3 Assessment

correct	✓
hippocratic	
undoable	
history-ignorant	
simply-matching	
matching	
least-change	

## 4.2 *Echo*

### 4.2.1 Specification implementation

*Specification environment:* Eclipse Modeling Tools

**Metamodels**

**Consistency Relation**

### 4.2.2 Instances transformation results

*Integration environment:* Eclipse Modeling Tools

T1 - One A / One B attribute 0 ( $\vec{R}$ )



Figure 12: T1 result



T2 - No As / One B attribute 15 ( $\overleftarrow{R}$ )



Figure 13: T2 result

T3 - One A / One B attribute 15 ( $\overrightarrow{R}$ )



Figure 14: T3 result

#### 4.2.3 Assessment

correct	✓
hippocratic	✓
undoable	?
history-ignorant	?
simply-matching	?
matching	?
least-change	✓

### 4.3 *Focal*

#### 4.3.1 Specification implementation

*Specification environment:*

**Metamodels**

**Consistency Relation**

#### 4.3.2 Instances transformation results

*Integration environment:*

#### 4.3.3 Assessment

correct	
hippocratic	
undoable	
history-ignorant	
simply-matching	
matching	
least-change	

#### 4.4 Summary table and comparison

## 5 Discussion

## References

- [1] <http://homepages.inf.ed.ac.uk/perdita/>
- [2] Stevens, Perdita. "Bidirectional model transformations in QVT: Semantic issues and open questions." *Model Driven Engineering Languages and Systems*. Springer Berlin Heidelberg, 2007. 1-15.
- [3] Stevens, Perdita. "Observations relating to the equivalences induced on model sets by bidirectional transformations." *Electronic Communications of the EASST* 49 (2012).
- [4] <http://www.sparxsystems.com/products/ea/index.html>
- [5] <http://www.eclipse.org/>