



Meta-Modelling as a Concept: The Conceptualisation of Modelling Methods

Invited Tutorial

Tutorial Team

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Tutorial Specific Scenarios

Selected Scenarios for Tutorial specific Hands-On:

1. Realising a **Modelling Language**

- Case: Entity Relationship Model

2. Implementing an **Algorithm**

- Case: Structural Similarities of Business Processes

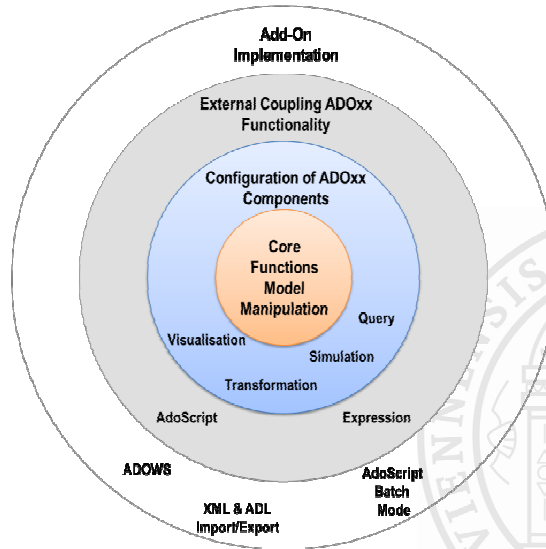
3. **API / Web-Service** Invocations

- Case: WIKI Interaction
- Case: Google Map Interaction

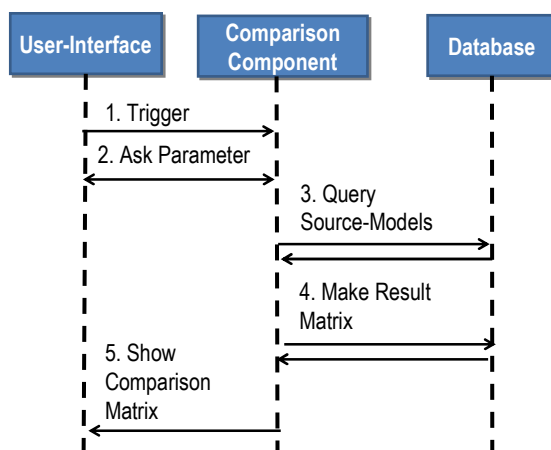
4. Coupling Modelling Languages to support **Modelling Procedures**

- Case: Coupling BPMN and UML-Use Case Diagram

ADOxx Functionality on Meta Level



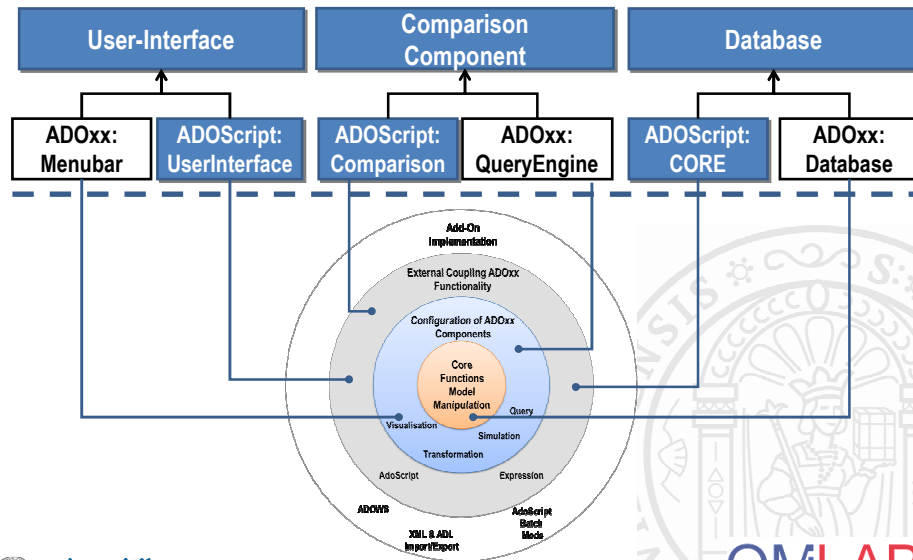
Description of Algorithm



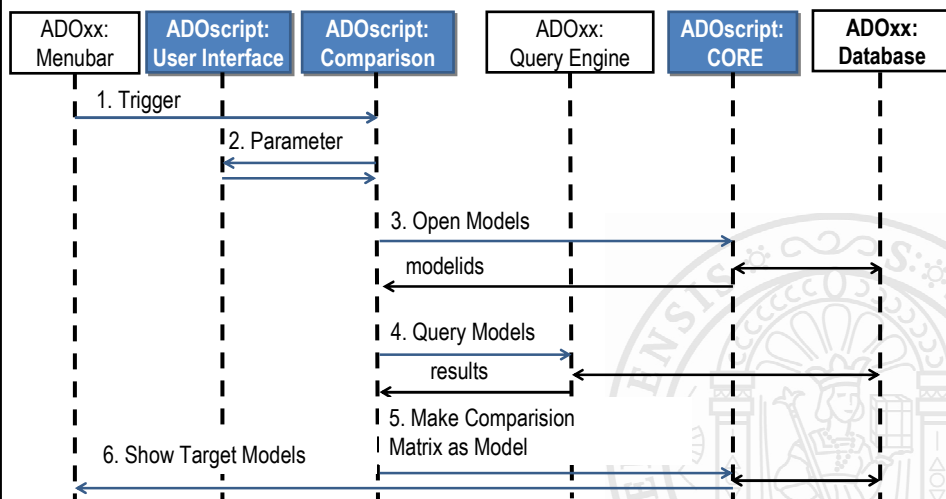
Additional Aspects:

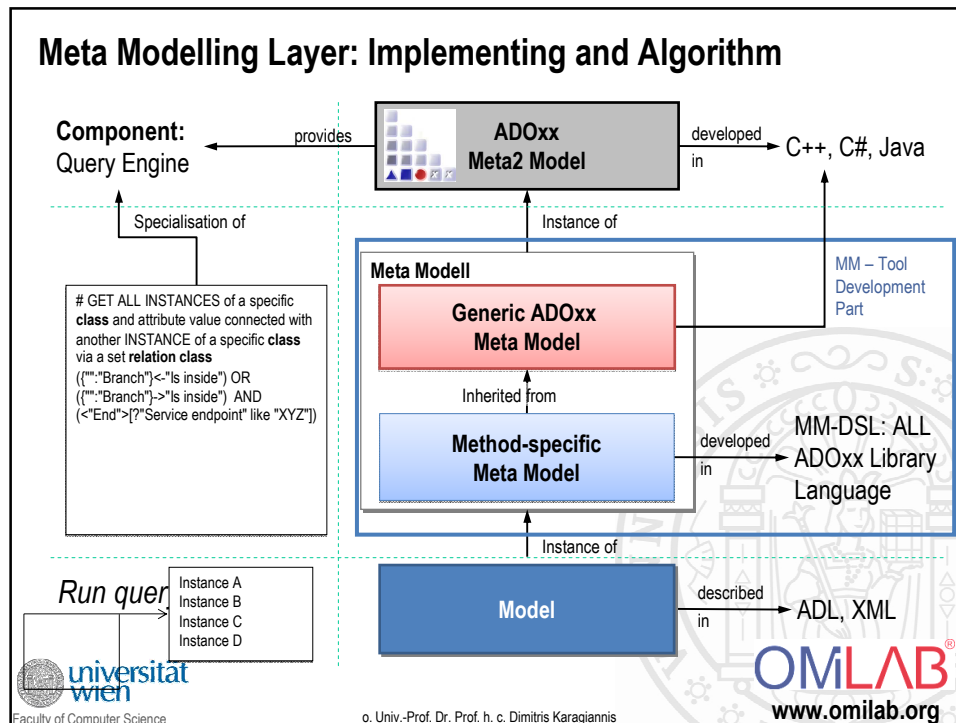
- Implementation as plug-In to be used in other modelling languages.
- Comparison queries should be adaptable but start with comparing used objects.
- Migration from modelling language without plug-In to modelling language with plug-In has to be considered.

Mapping ADOxx Functionality



ADOxx Realisation Approach





Added Value of Metamodelling Platform

Used meta-modelling functionality for realisation of the scenario:

•**ADOScrip**: ADOScript can generate a new model “Comparison Matrix” to present the results of the business process comparison. This technique can also be used for graph-rewriting.

•AQL: ADOxx Query Language

- **ADOxx query engine** is provided by the platform and can analyze business process models.
- **ADOScripts** can invoke the query engine and hence compare in a stepwise approach business processes

•**Hyperlinks and INTERREF**: Similar to the first scenario, the resulting model can use **INTERREFS** and **Hyperlink** for better navigation from the resulting “Comparison Matrix” to the originally compared business processes.

ADOxx Realisation Hands-On

1. Modelling Language Extensions to enable this algorithms

1. New model type "Comparison Model"
2. New class "Box", "Row Name" for Comparison Matrix Element




2. Configure ADOxx

1. Configure Menubar
2. Write AQL statements for query engine

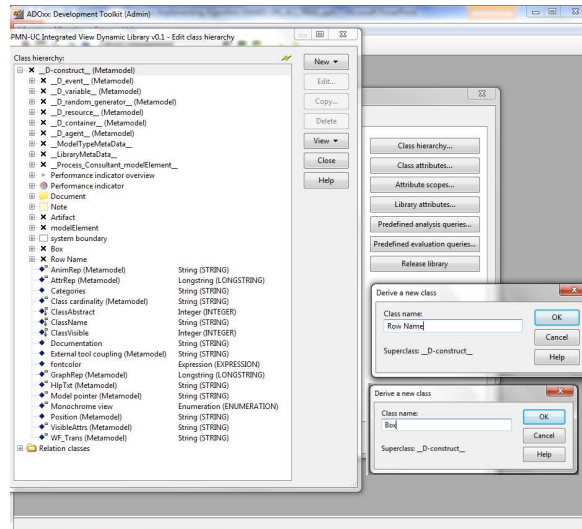
3. Implement Algorithm with ADOscript

1. ADOscript User Interface
2. Invoking query engine with ADOscript
3. Create target model "Comparison Matrix and place matrix elements according the results of the query.

Used ADOxx Functionality: Implementing an Algorithm

Introduction	Mechanisms & Algorithms Implementation
Setup of Implementation Environment	Core Functions for Model Manipulation
	Database
	Visualisation
	Query 
	Transformation
Modelling Language Implementation	Configuration of ADOxx Components
Classes	Visualisation
Relations	Query
Class Attributes and Attributes	External Coupling ADOxx Functionality 
GRAPHREP	ADOscript Triggers
ATTRREP	ADOscript Language Constructs
CLASS Cardinality	Visualisation ADOscript
CONVERSION	Visualisation Expression
Model Pointer	Query ADOscript 
Attribute Facets	Transformation ADOscript
Model Types	ADD-ON Implementation
	ADOxx Web-Service
	XML / ADL Import – Export
	ADOscriptBatch Mode

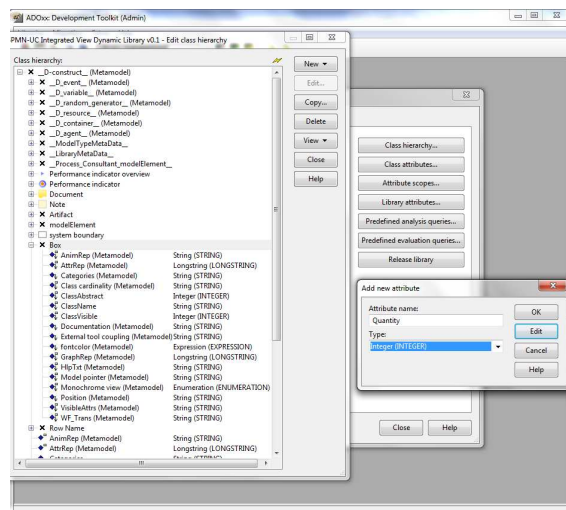
Make New Modeltype



New Modeltype:

- Select "BPMN-UC Integrated View Dynamic Library" and open Library attributes.
- Open Class hierarchy, view "Metamodel" and "Class hierarchy" in the View button, select `__D-construct__` and click new class.
- Name new classes: "Box" and "Row Name"
- Box and Row Name are now sub-classes of `__D-construct__`

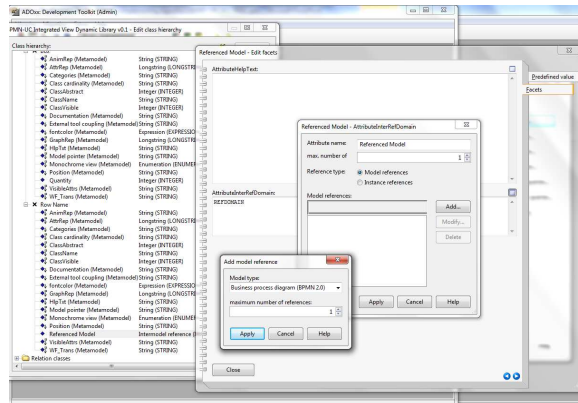
Add Attributes for Classes „Box“ and „Row Name“



Add Attributes

- Select "Box" and click New, attribute.
- Make "Quantity" as type INTEGER.
- Select "Row Name" and click New, attribute.
- Make "Referenced model" an INTERREF to target modeltype "BPMN"
- Make "Row name" a STRING.

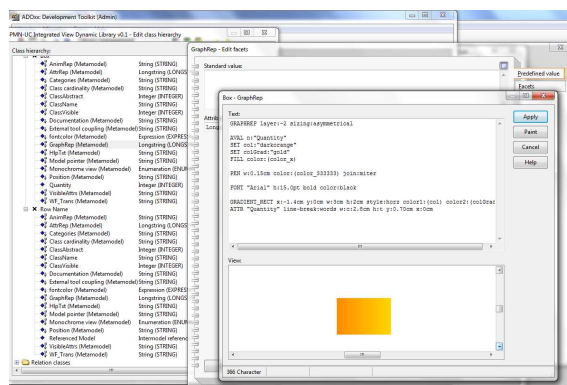
Edit INTERREF



Specification of INTERREF

- EDIT Facet
- Select AttributeInterrefDomain
- Select "Model reference"
- Max number of references is 1
- Select Business Process Diagram
- Max number of references is 1

Add GRAPHREP



Specification of GRAPHREP

- Select "Box"
- Click on Attribute "GraphRep"
- Open the GraphRep Editor
- Enter text, paint it and apply.

GRAPHREP layer:-2 sizing:asymmetrical
 AVAL n:"Quantity"
 SET col:"darkorange"
 SET colGrad:"gold"
 FILL color:(color_x)
 PEN w:0.15cm color:(color_333333) join:miter
 FONT "Arial" h:15.0pt bold color:black
 GRADIENT_RECT x:-1.4cm y:0cm w:3cm h:2cm style:horz color1:(col) color2:(colGrad)
 ATTR "Quantity" line-break:words w:c:2.8cm h:t y:0.70cm x:0cm

GRAPHREP

GRAPHREP layer:-2 sizing:asymmetrical

AVAL n:"Quantity"
SET col:"darkorange"
SET colGrad:"gold,"

FILL color:(color_x)

PEN w:0.15cm color:(color_333333) join:miter
FONT "Arial" h:15.0pt bold color:black

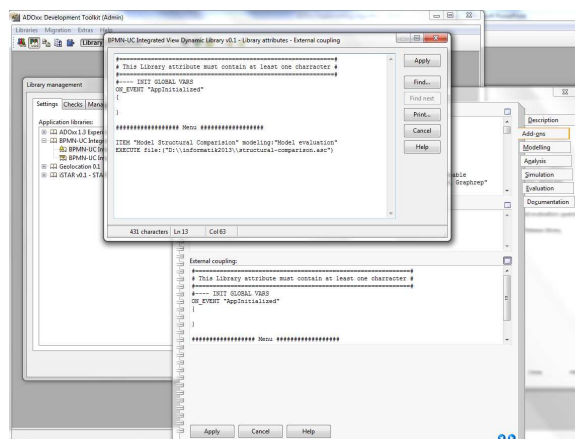
GRADIENT_RECT x:-1.4cm y:0cm w:3cm h:2cm style:horz color1:(col) color2:(colGrad)
ATTR "Quantity" line-break:words w:c:2.8cm h:t y:0.70cm x:0cm

GRAPHREP
FONT "Arial" h:10pt bold color:black

AVAL reference:"Referenced model"
AVAL rowname:"Row name"

```
IF(LEN reference > 0)
  ATTR "Referenced model" line-break:words x:-1.4cm y:0.75cm w:c:2.8cm h:c:1.5cm format:"%m"
ELSIF (LEN rowname > 0)
  ATTR "Row name" line-break:words x:-1.4cm y:0.75cm w:c:2.8cm h:c:1.4cm
ELSE
  ATTR "Name" line-break:words x:-1.4cm y:0.75cm w:c:2.8cm h:c:1.4cm
ENDIF
```

Add Menubar



Add Menubar

- Select Dynamic Library.
- Open Library Attributes
- Select Add-On
- Open External Coupling
- Add Menubar in External Coupling

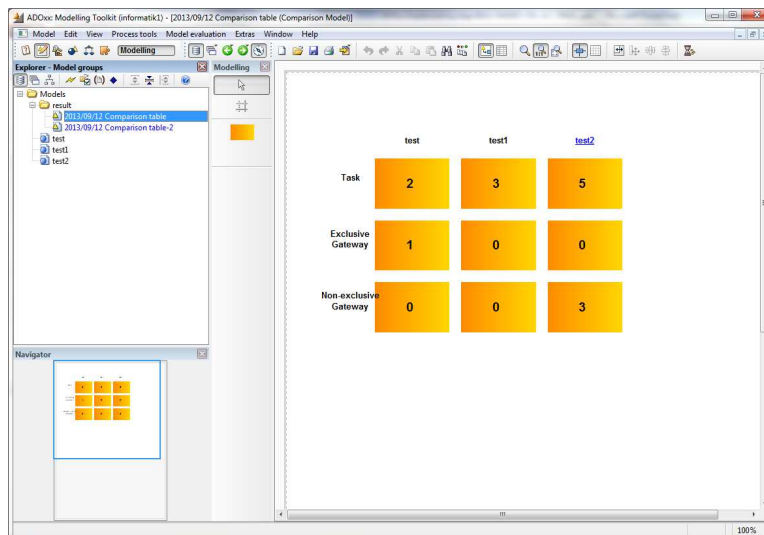
Menu

ITEM "Model Structural Comparison" modeling:"Model evaluation"
EXECUTE file:("D:\informatik2013\structural-comparison.asc")

Copy and Configure ADOscript

```
#####  
# Structural Comparison #  
#####  
  
#-----  
# Parameter setup  
#-----  
  
SETL strtkn_element:"Task,Exclusive Gateway,Non-exclusive Gateway,X"  
SETL aqltkn_statements:"(<\Task\>)&(<\Exclusive Gateway\>)&(<\Non-exclusive Gateway\>)"  
SETL int_cnt_elements:(tokcnt((strtkn_element),","))  
  
SETL str_modeltype-1:"Business process diagram (BPMN 2.0)"  
SETL str_modeltype_name:"Comparison Model"  
  
#-----  
# Source Model and Target Model selection  
#-----  
  
...
```

Result



Thank you for your attention!

In case of any questions, please contact

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