The Second International Workshop on
Aspect-Based and Model-Based
Separation of Concerns
in Software Systems

July 10th 2006, Bilbao, Spain
How Can Model-Driven and Aspect-Oriented Approaches Enrich Each Other?

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The goal of MDA is separating
• the computation independent modelling (CIM)
• the platform independent modelling (PIM)
• from the platform specific modeling (PSM)
and automating the production of the PSM and the Code from the PIM.
The advantage is in preserving of the intellectual value in form of the PIM when the application should migrate to another platform.
The major goal of MDA is model portability.
How to Automate the production of PSM and Code from PIM?

Ashley McNeie “MDA: The Vision with the Hole? “

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How to Automate the production of PSM and Code from PIM?

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<table>
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<tr>
<th>1. Elaborationist (MDA1)</th>
<th>2. Translationist (MDA2)</th>
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<tr>
<td>Generating the skeleton of the PSM on the basis of the PIM and adding details.</td>
<td>Translating the PIM directly to the PSM and to the Code. The so-called generation rules should be implemented in the translator. The generation rules are the Achilles' heel of this approach because they can be formulated only for a specific domain (e.g. Enterprise applications or some classes of embedded systems) Validation: not required</td>
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Validation:
From the modified PSM the PIM is generated to be compared with the initial PIM.
The Aspect–Oriented (AO) Approach

• The goal of the AO approach is separating concerns to simplify their understanding and implementation.

The advantage is in preserving the intellectual value in form of models of concerns that appear a multiple number of times in one application and migrate to other applications.

The major goal of the AO approach is reuse of models of concerns and their composition rules.
The Aspect–Oriented (AO) Approach

- Separation of modelling of concerns;
- Specification of composition rules for each pair of concerns;
- Specification of composition goals;
- Composition of models of concerns (called weaving);
- Verification of the composition.

- The AO approach can be applied to any kind of model and to the Code.
- The AO approach gives a systematic way to deal with crosscutting model modifications so that the modifications can be managed.
- The non-crosscutting (localizable) modification is a partial case of the crosscutting modification.
The Aspect–Oriented (AO) Approach

Model (code) of concern

Composition (weaving)

Composition rules & Composition goals

Verification

System Model

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## Where is the place of the Aspect-Oriented approach in the MDA?

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<td>1. AO evolution of PIM</td>
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<tr>
<td>2. Aspect-oriented way of adding details to the PSM and to the Code</td>
<td>2. AO modification of the generation rules</td>
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Steps of system development

Current state of approaches

1. Requirements engineering or problem analysis
   - modelling of some parts of the CIM and the PIM in the MDA1 and MDA2
   - modelling of concerns in the AO approach

2. Solution synthesis
   - generation rules for PSM in the MDA (developed for specific domains)
   - AO weaving rules for models (under development)

3. Implementations
   - generation rules for the Code in MDA (developed for specific domains)
   - AO programming languages (well developed)

4. Verification
   - back generating of the PIM from the actual PSM in MDA1
   - not required in the MDA2
   - under development in the AO

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During the first workshop ABMB 2005 the following issues combining MDA and AO were discussed

1. **AO synthesis of PIM fragments (model merging)**; by Samir Ammour and Philippe Desfray
2. **AO requirements engineering, synthesis and implementation of an e-governement system**; by Pablo Amaya, Carlos González en Juan Murillo
3. **AO requirements engineering and synthesis based on the introduction of crosscutting preconditions and class invariants**; by Kiyoshi Yamada and Takuo Watanabe
4. **AO based separation of control concern from other concerns in component based systems**; by Kung-Kiu Lau and Vlagyslav Ukis
5. **AO approach to MDA model transformation**; by Dominik Stein and Stefan Hannenberg
6. **AO-like approach to transformation of models based on different abstractions** by Hans Schippers and Dirk Janssens

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During the second workshop ABMB 2006
the following papers will be presented
(we can classify them together)

1. Using aspect-orientation techniques to improve the reuse of metamodels
   A. M. Reina Quintero, J. Torres Valderrama
   Department of Languages and Computer Systems; University of Seville. Seville, Spain

2. Concern-Specific Languages in a Visual Web Service Creation Environment
   Mathieu Braem, Niels Joncheere, Wim Vanderperren, Ragnhild Van Der Straeten
   Viviane Jonckers, System and Software Engineering Lab; Vrije Universiteit Brussel;

3. Model Driven Development of Security Aspects
   Julia Reznik, Tom Ritter, Frounhofer Institute FOKUS, Berlin, Germany
   Rudolf Schreiner, Ulrich Lang, ObjectSecurity Ltd., Cambridge, UK

4. On the Dominance of Decompositions in Models and their Aspect-Oriented Implementations
   Tommi Mikkonen; Institute of Software Systems; Tampere University of Technology;
   Tampere, Finland

   Bedir Tekinerdogan, Mehmet Aksit, Francis Henninger.
   Department of Computer Science; University of Twente.

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