



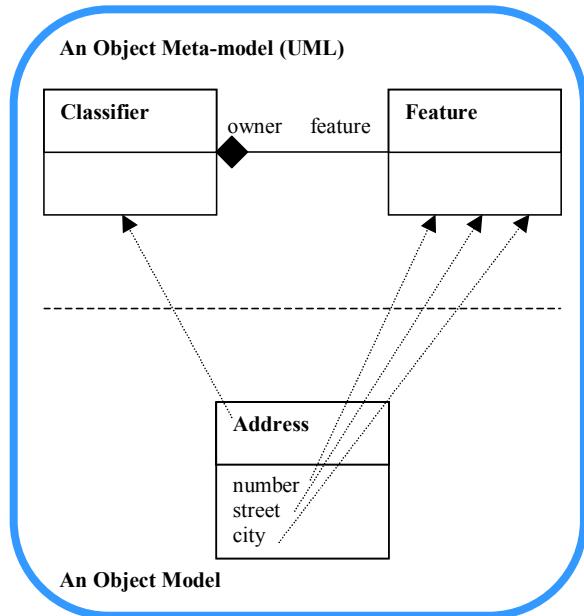
Do model transformations solve all the problems?

AtlanMod

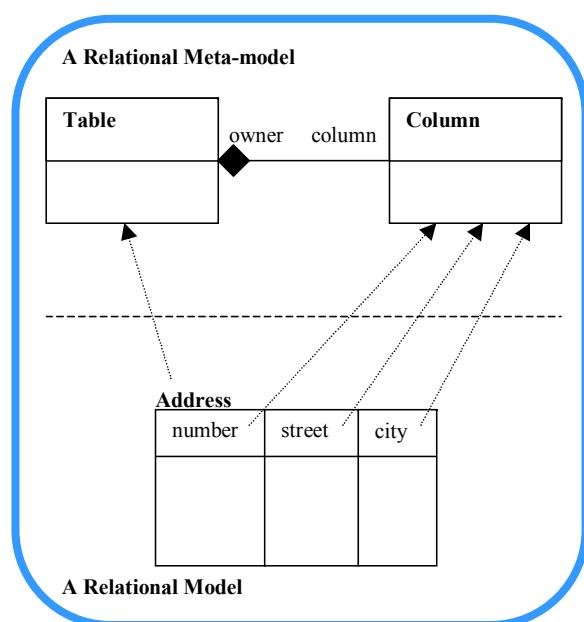
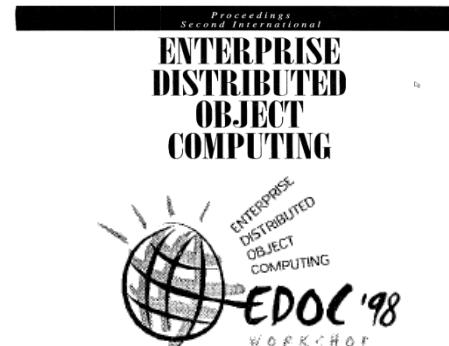
Panel@ICFEM'2008
Kitakyuschu City, October, 27th
Jean Bézivin (AtlanMod team, INRIA& EMN)

Ten years of Research in Model Transformation: where do we stand?

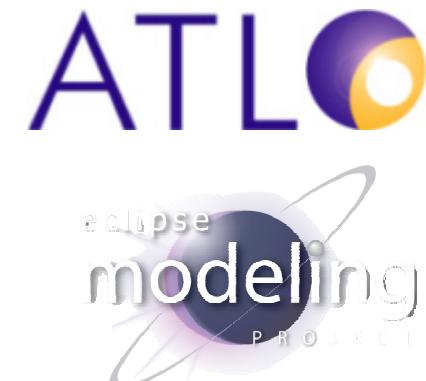
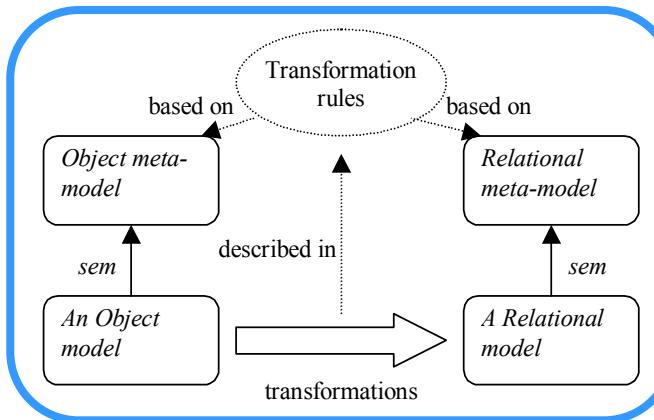
Transformation Rules Based on Meta-modeling



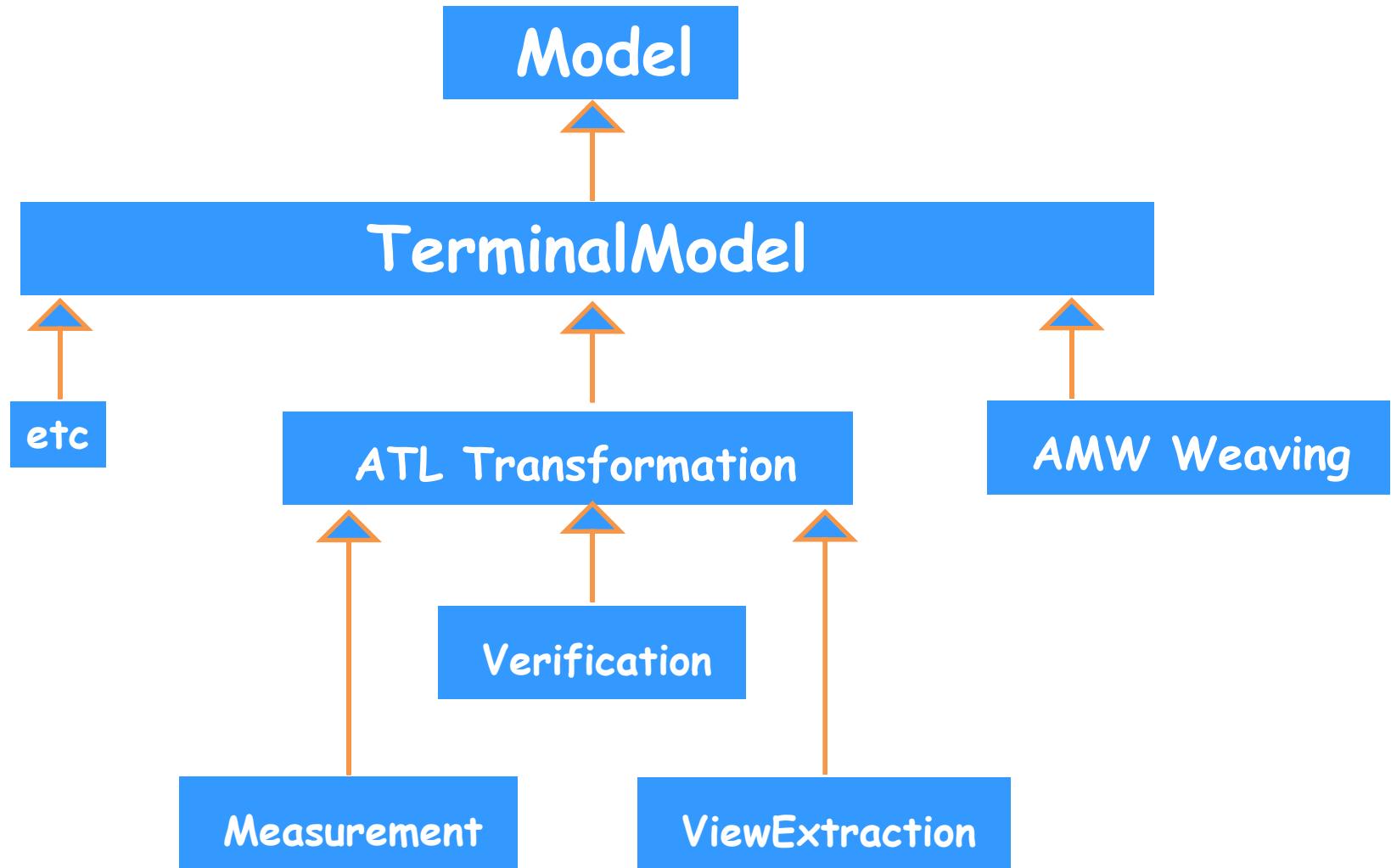
Lemesle Richard
Laboratoire de Recherche
en Sciences de Gestion,
Université de Nantes



Lemesle R.,
"Transformation rules
based on meta-modeling",
EDOC'98, San Diego,
November 3-5, 1998



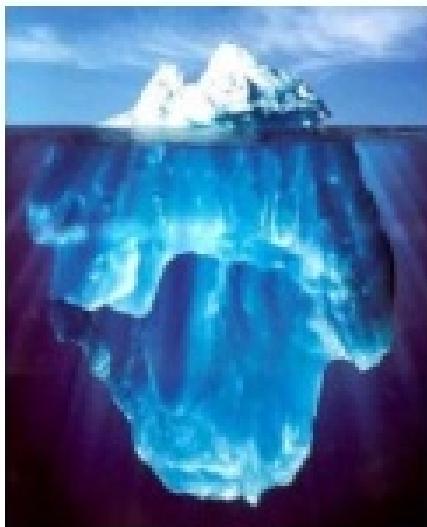
Ubiquitous transformations



What did we learn?

The model transformation community promises to improve the efficiency and quality of software engineering processes and products, but engineering concepts for the development of large model transformations themselves including their analysis, design, documentation, testing, and evolution are still in their infancy.

- We learned a lot of lessons about model transformation in the past 10 years.
- But we have only seen the emerged part of the iceberg.



Metamodel Based.
Declarative Rule Based.
 (Why imperative model transformation is a bad idea)
Higher Order Transformations.
 (Why HOTs are more than an academic hobby)
Verification as Transformation.
Measurement as Transformation.
Traceability as a side effect of transformation.
 etc.



Transforming Large & Heterogeneous Models?

- Size

- Models of data vs. models of code
- Models of behavior vs. models of static structure
- Large Models (5×10^6 elements)
- Very Large (50×10^6 elements)
- ~~Uninfiniteable~~ (infinite models, e.g. streams or execution traces)

- Heterogeneity

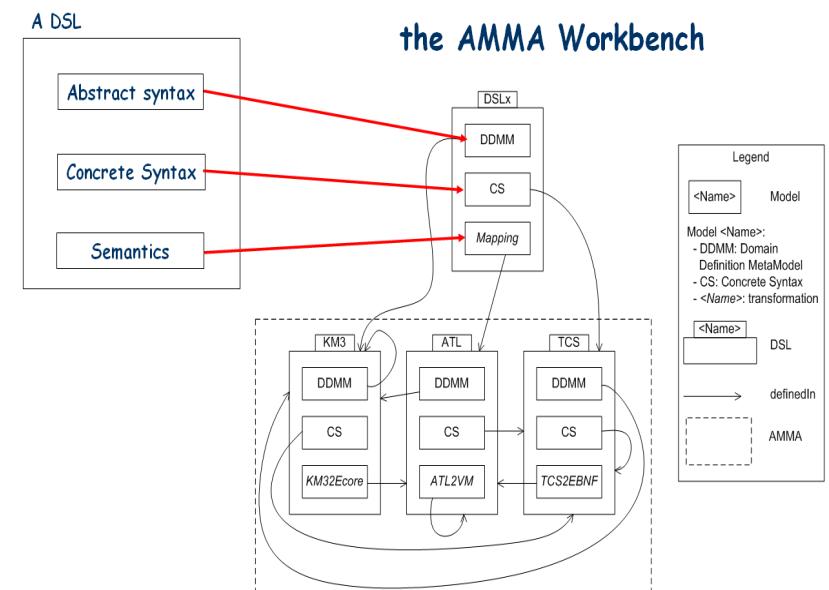
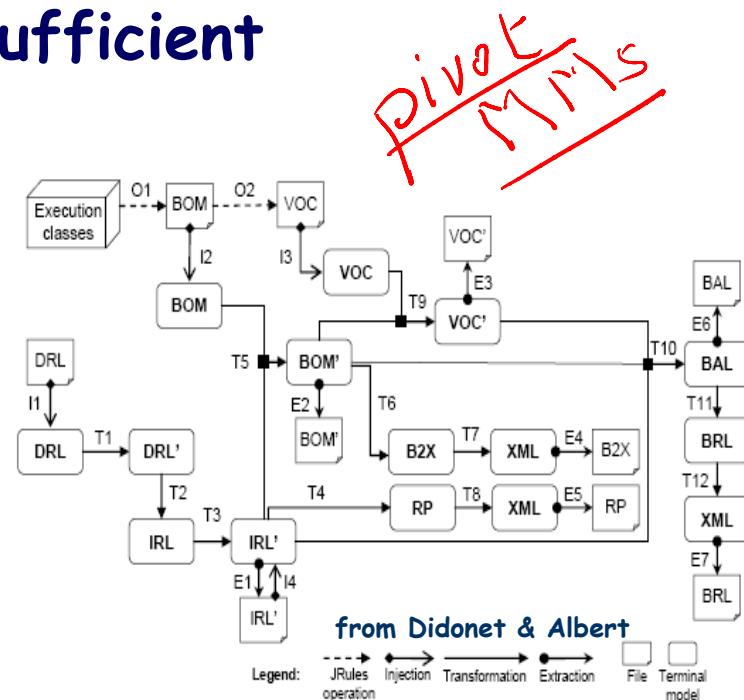
- Not only XMI ! (XMI represents a negligible proportion)
- Code (grammar based)
- XML-encoded
- Binary structured data
- etc.

Model Transformation alone is not sufficient

- Model Weaving (see AMW)
- Code to Model and Model to Code (see TCS)
- Forward and reverse (see Modisco)
- Binary to Model and Model to Binary
- Specification
- Bidirectional Synchronization
- Testing
- Deploying
- Transformation by Example
- Property analysers
- Chains of Transformations
- Networks of Transformations
- Pivoting TC architecture with transformations

and ...

- There is no unique model transformation language
- The AMMA2 Model Engineering Workbench
- The ultimate test: using MDE to build MDE

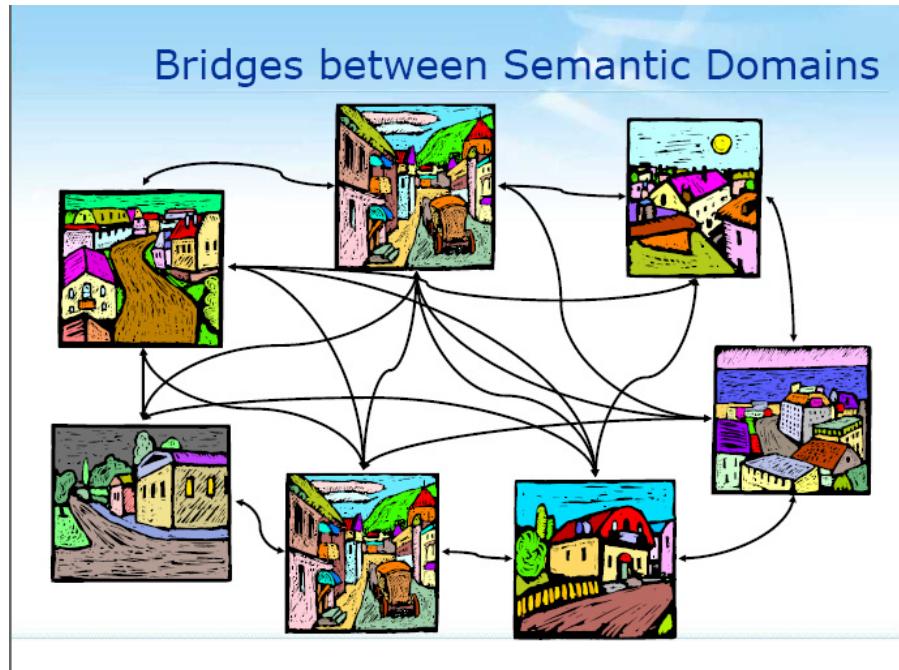


The "Towers of Models" Grand Challenge (Robin Milner)

A more thorough science-based approach to informatics and ubiquitous computing is both necessary and possible. We often think in terms of models, whether formal or not. These models, each involving a subset of the immense range of concepts needed for ubiquitous computer systems, should form the structure of our science.

- Even more importantly, the relationships (either formal or informal) among them are the cement that will hold our towers of models together. For example, how do we derive a model for senior executives from one used by engineers in designing a platform for business processes, or by theoreticians in analyzing it?
- The essence of software engineering and informatics is formulating, managing, and realizing models.

The «Village metaphor» by Antonio Vallecillo (University Malaga)



- The Prolog village**
- The Petri net village**
- The Coloured Petri Net Village**
- The Z village**
- The B village**
- The Maude village**
- The Coq village**
- The MARTE village**
- The Fiacre village**
- The UML village**
- The OCL village**
- The ALLOY village**
- etc.**

Expressing correspondences

As Model Transformations

- Possible if correspondences can be expressed as functions
- Pairwise consistency can be formally studied

➤ One form of consistency involves a set of correspondence rules to steer a transformation from one language to another. Thus given a specification S_1 in viewpoint language L_1 and specification S_2 in viewpoint language L_2 , a transformation T can be applied to S_1 resulting in a new specification $T(S_1)$ in viewpoint language L_2 which can be compared directly to S_2 to check, for example, for behavioral compatibility between allegedly equivalent objects or configurations of objects [RM-ODP, Part 3]

As Weaving Models

- Possible if correspondences are just mappings

We have only seen the beginning of the story



- Many new research initiatives on MT



GRACE International Meeting on Bidirectional Transformations

Shonan Village Center, Japan
14-18 December

- The ATL-Research projects (stay tuned)

- From rules to constraints
- Stream transformations
- Point of view computation
- Typed transformation systems
- Pattern-based optimization
- etc.

