**Multi-Level Modeling with Melanie**

Colin Atkinson

Commit Workshop
June 18th 2012

*Software Engineering Group*

**Universität Mannheim**
Modeling Everywhere

- Modeling is now a key activity in most software, database and knowledge engineering projects.

- Core structural languages
  - UML, OWL, ERA, ...

- Core behavioural languages
  - UML activity diagrams, Petri nets, ...

- Associated languages
  - OCL, ATL, QVT, ...

- Domain specific language
  - .....
Inconsistencies in modeling infrastructure

No natural support for “deep classification”

Artificial barriers between “constructive” and “exploratory” modes of modeling

Mutual exclusiveness of general-purpose and domain-specific languages

OMG Four Level Infrastructure (UML, EMF, OWL, ERA ...
UML 2.x Interpretation

from UML Infrastructure Specification
Multi-Level Modeling

- The existence of multiple classification levels in a subject of interest
  - often involves four or more levels
- today can only be represented using ad hoc workarounds
  - stereotypes, type-instance pattern, powertypes, ...

Orthogonal Classification Architecture
**Domain Specific v General Purpose?**

**GPMLs**
- E.g UML, OWL etc.
- Lingua Franca
- less concise and efficient
- facilitate inter-domain communication

**DSMLs**
- E.g. BPMN, Circuit Diagrams etc
- optimized for special tasks
- more concise and efficient
- “Tower of Babel“ problem
Constructive v Exploratory?

**Constructive**
- Software engineering oriented modeling
- UML as flagship language
- Often characterized as prescriptive
- Generally focused on supporting the creation of instances in a program or database

**Exploratory**
- Semantic web oriented modeling
- Models characterized as ontologies
- OWL as flagship language
- Often characterized as descriptive
- Generally focused on codifying the knowledge wrapped up by existing instances in a domain
Different Views of the Infrastructure

Pan Level Model

Tool Developer's View

Modeler's View
A practical Eclipse plugin supporting
- true, strict metamodeling
- multi-level modeling
- symbiotic general purpose and domain specific languages
- unified constructive and exploratory modeling
  - full range of reasoning and checking services
- fully embedded in EMF
  - usable with OCL, ATL, QVT,..
- real-time (meta)modeling
- emendation support
- ...

**Multi-level Modeling and Ontology Engineering Environment**
- all connector model elements are rendered as nodes (with lines to the sources and target clabjects)
- by allowing the nodes to be “visually insignificant” the traditional UML representation metaphor is retained
DSLs defined in rigid, disjoint phases and environments

- result of one phase has to be “deployed” in a major compilation step to enable the second phase
- in each phase/environment only one classification level is “soft”
- only one concrete syntax is available in a given phase.
Symbiotic Language Example (1/2)
**Symbiotic Language Example (2/2)**

Reasoning Example

Video: http://code.google.com/a/eclipselabs.org/p/melanie/wiki/FirstSteps#Execute_Reasoning_Operations
Melanie points the way to the next generation of modeling environments
- Natural, inherent support for deep characterization
- Unified constructive and exploratory modeling use cases
- Symbiotic languages
- Embedded in EMF (with all associated tools)
- ....

Next steps
- Transf., Rule, Enquiry, Action, Constraint LanguageE (TREACLE)
- Multi-rendered formats (textual, tabular, GUI, ....)
- ....

Open Source
- Eclipse Public Licence
- Will become an official example of GMF Tooling Project
Project Home Page
- http://eclipselabs.org/melanie

Video Tutorials:
- http://code.google.com/a/eclipselabs.org/p/melanie/wiki/FirstSteps

Eclipse Download

Plugin Update Site
- http://svn.codespot.com/a/eclipselabs.org/melanie/de.uni_mannheim.informatik.swt.mlm.deploy.update/