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FAKULTÄT II
DEPARTMENT FÜR INFORMATIK

Master Thesis
-Proposal-

Towards Ecore based Meta Model Evolution and Model Co-Evolution

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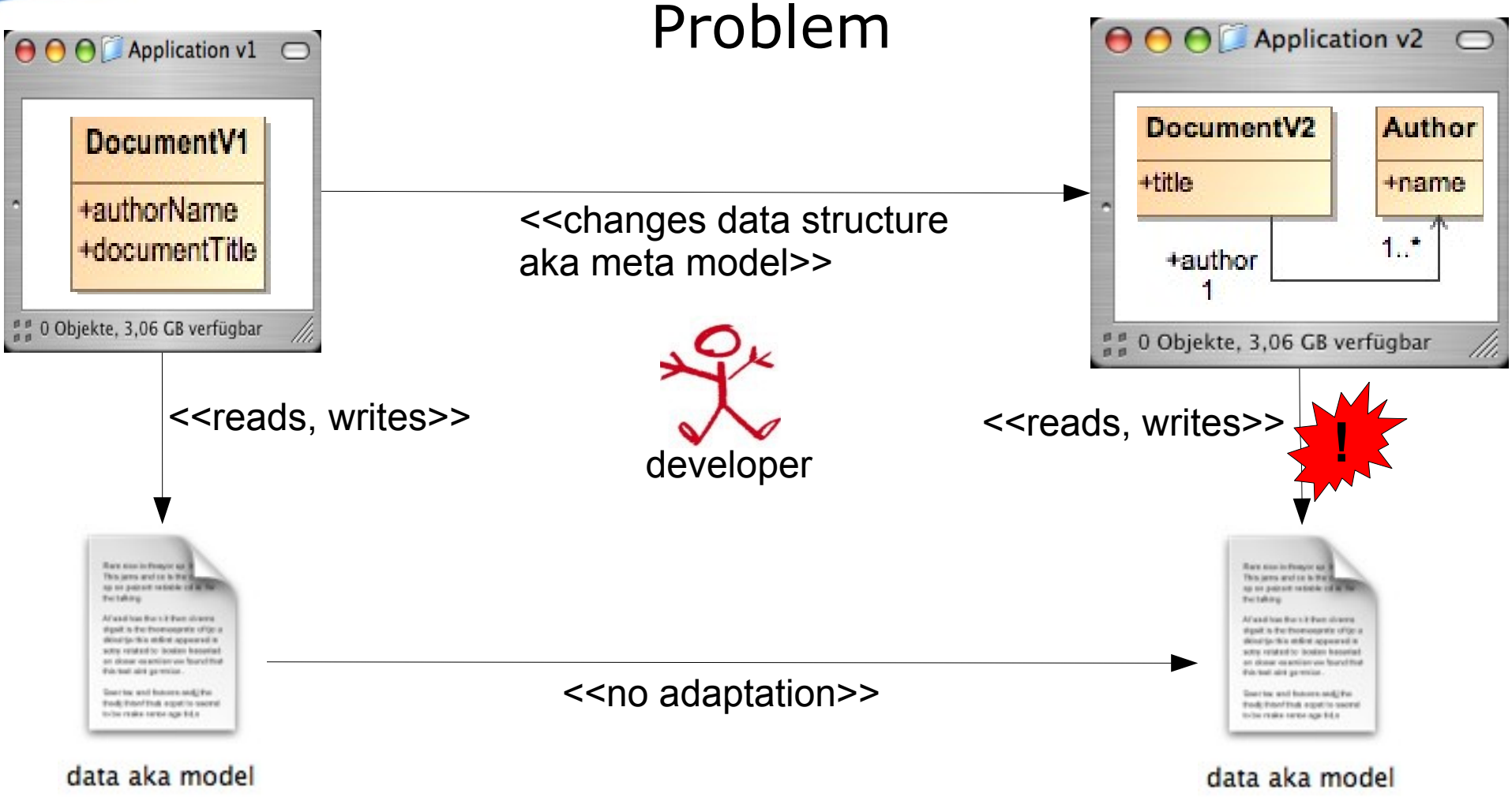
itemis

Outline

- Problem & Motivation
- EMF Introduction
- Overview: Roles & Processes
- Details: Processes
- Epatch & Metapatch
- Outlook

Problem


Application v1
DocumentV1
+authorName
+documentTitle
0 Objekte, 3,06 GB verfügbar
<<changes data structure
aka meta model>>
Application v2
DocumentV2
+title
Author
+name
+author
1
1..*
0 Objekte, 3,06 GB verfügbar
<<reads, writes>>
developer
<<reads, writes>>
!
<<no adaptation>>
data aka model
data aka model
v1
edit
v2

Problem #2

- Changeability of the meta model: Essential for further advancement of the application
- Model: Often not accessible for the developer
- Changes that can be made to the meta model without breaking the model are limited

Possible Approaches

- Ignore backward compatibility: Schema Revolution!
- Use a “weak” meta model
- Mark elements “deprecated”, leave the migration work to the users

- Wanted: automatic adaptation of the model to be valid for the new meta model.
  - > Meta model evolution & model co-evolution

Eclipse Modeling Framework (EMF)

- Ecore
  - The meta meta model
  - Similar to OMG EMOF
  - Defines itself
  - Classes, DataTypes, Packages, Attributes, (containment/bidirectional) References, Operations, Lists, FeatureMaps, Enums, etc.
- Models Serializable to XMI
- Available Ecore based meta models: XMLSchema, UML2, BPEL, etc.

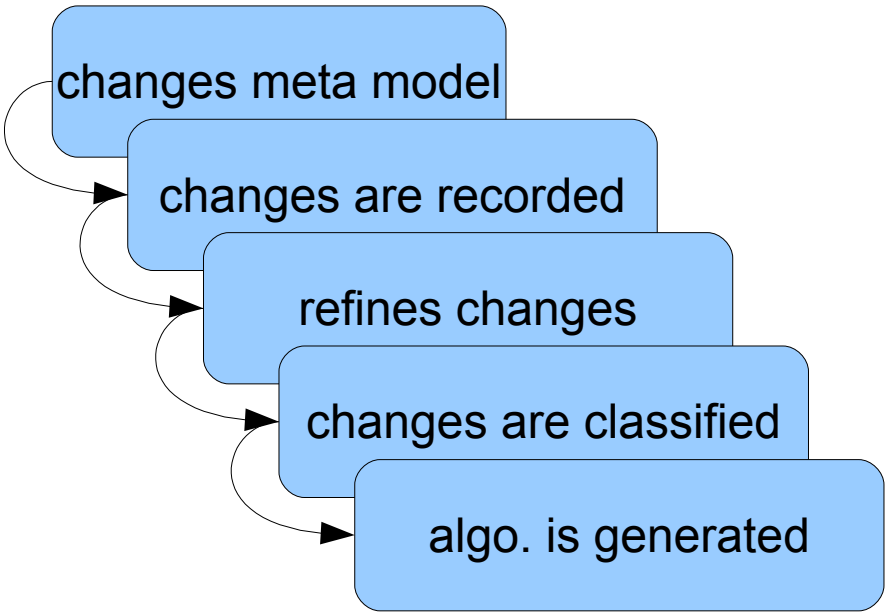
Proposal

- To derive a model to model transformation from the meta model's editing operations which automatically adapts models to the changes.
- Problem: This can not be done completely automatically in all cases
  - > User assistance necessary

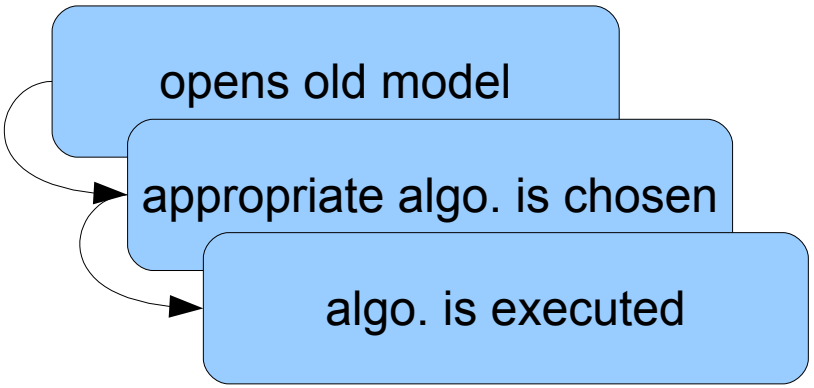
Roles and Processes

(overview, details follow)

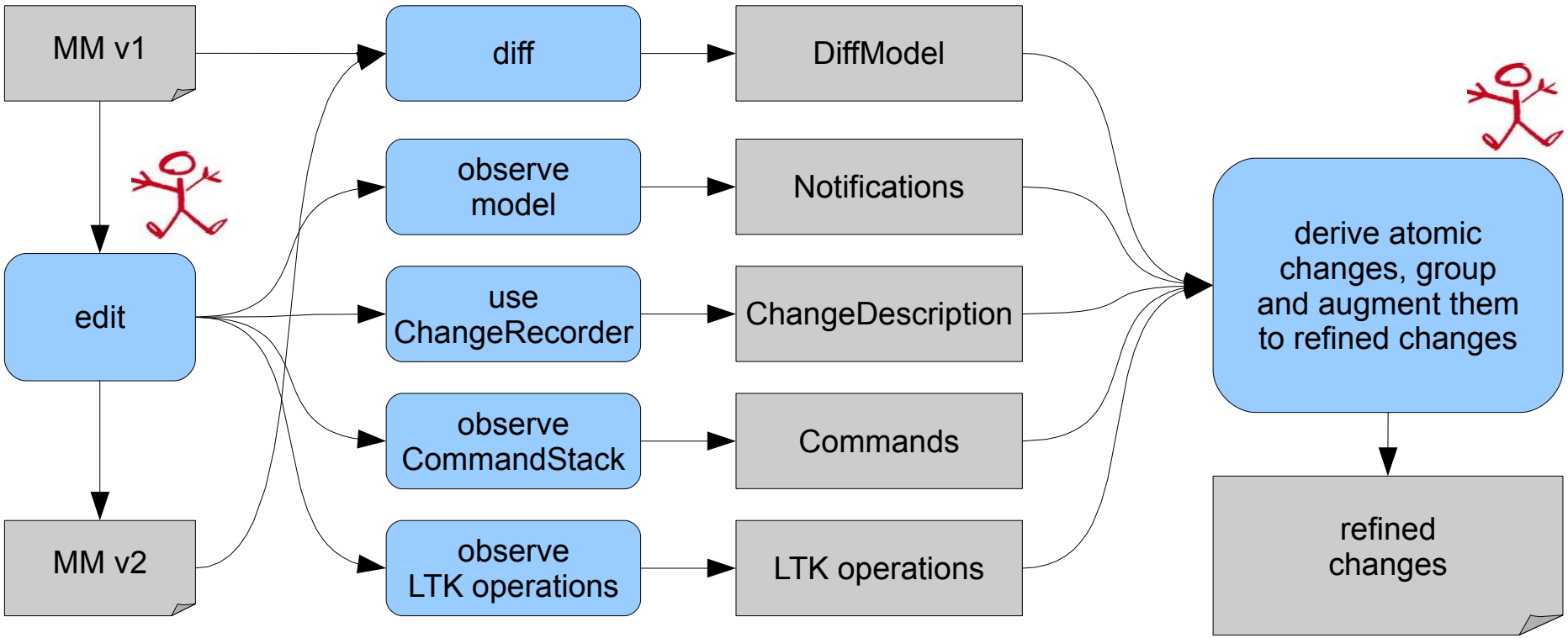
Meta Model Engineer



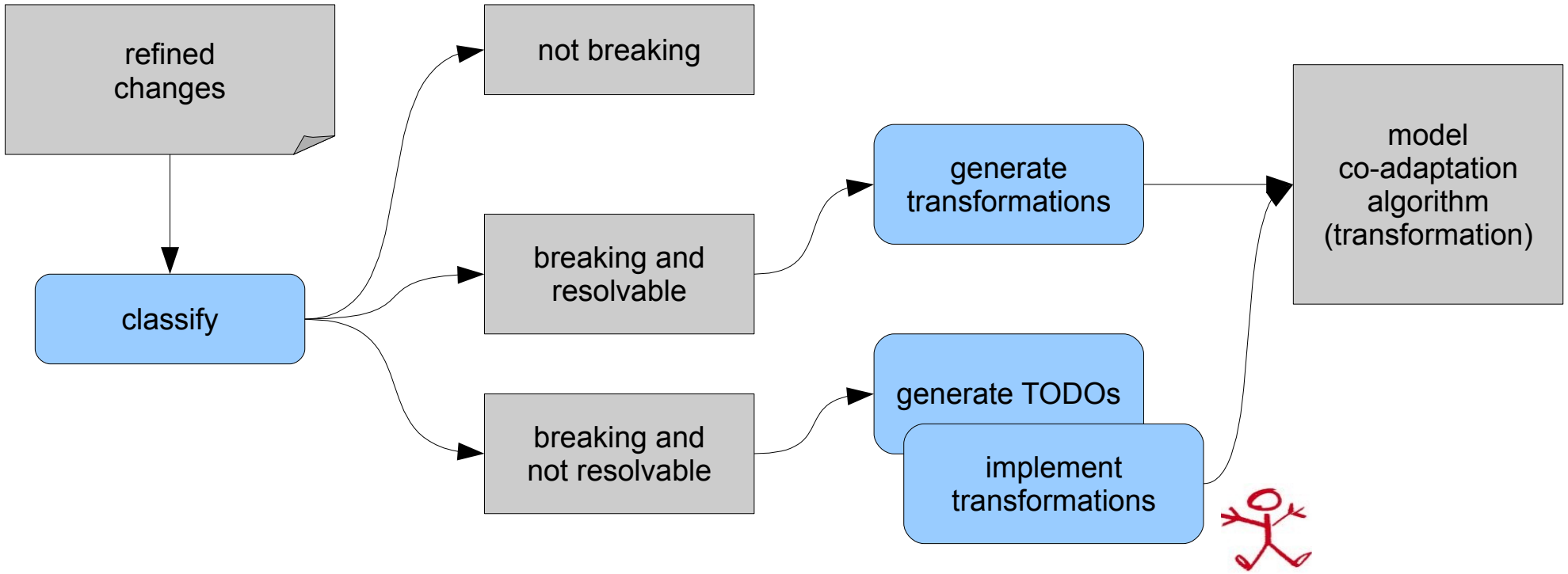
Model Engineer



Meta Model Engineer's Process: Step 1

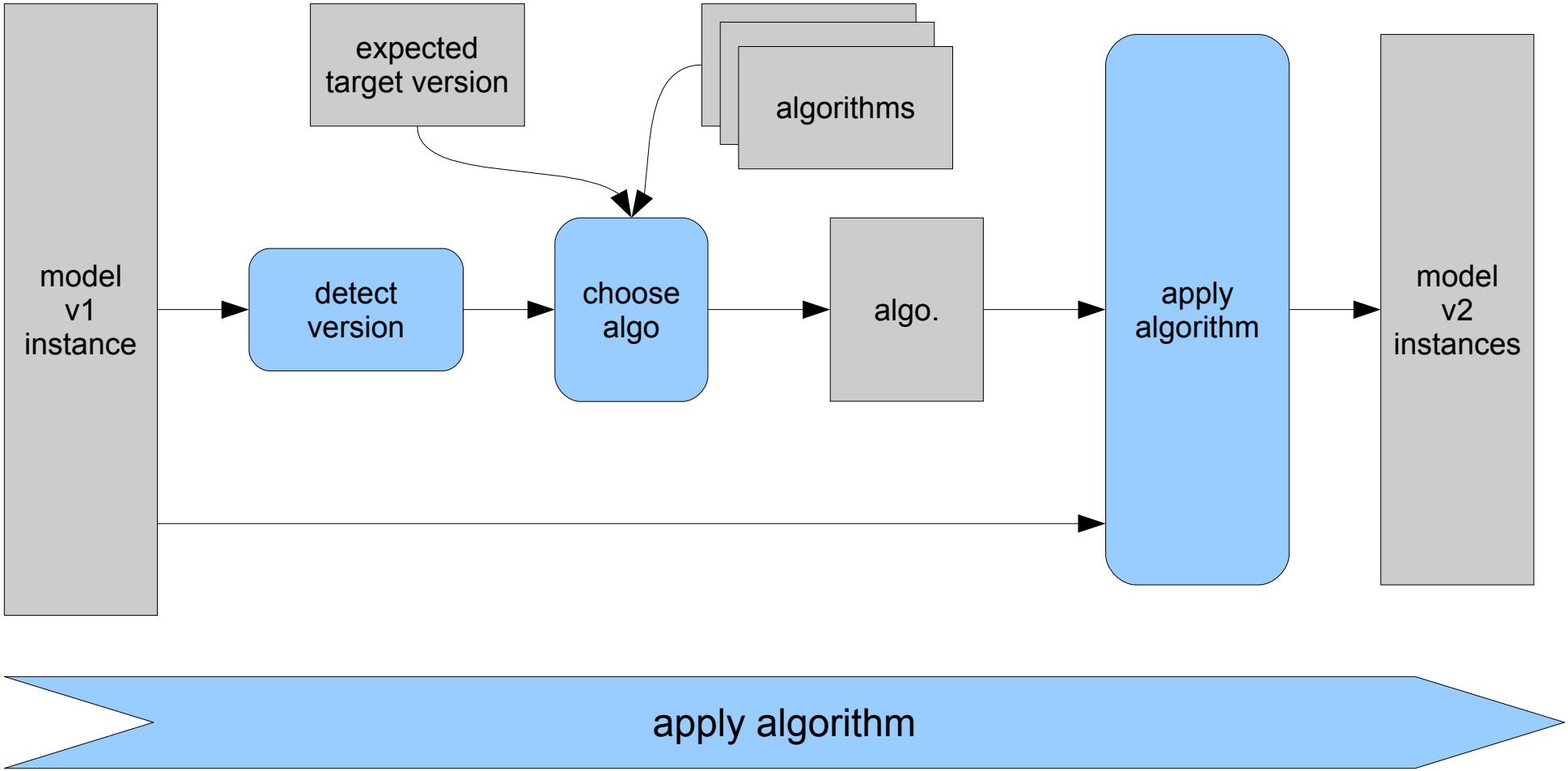


Meta Model Engineer's Process: Step 2



change classification → generate model transformation algorithm

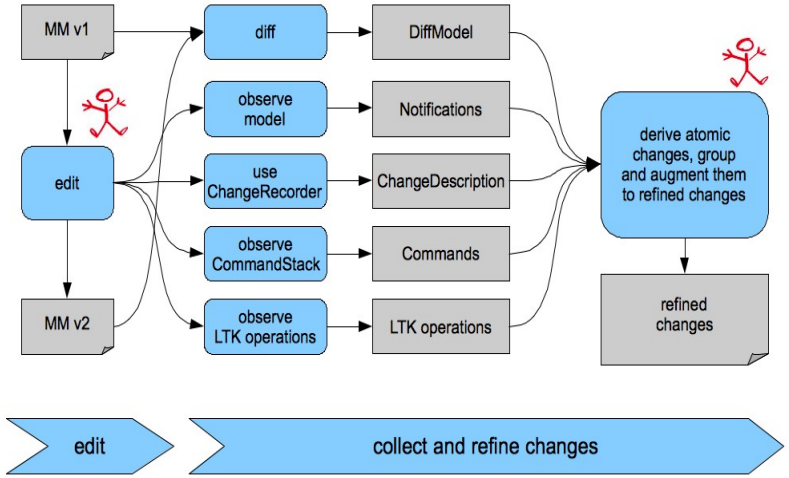
Model Engineer's Process



My Focus

Focus on the Meta Model Engineer's process:

1. Obtain changes made to the meta model and store them in a model: *Epatch*
2. Group and Enrich these changes and store them in a model: *MetaPatch*
3. Implement an execution mechanism for MetaPatches



The Epatch

- Inspired by the UNIX-world's patch
- A model that describes differences between two models.
- Bidirectional: The same Epatch can upgrade model v1 to v2 as well as downgrade model v2 to v1
- A set of atomic changes that can be reused by the MetaPatch
- Imperative/Declarative format? Declarative preferred
- Must cover element move/copy operations
- Implement a recorder

The MetaPatch

- Extends Epatches that define differences between meta models with instructions how to co-adapt the models
- Group atomic changes from the Epatch to composite changes
- Enrich composite changes with co-adaption information
- Major part of my work: find reasonable groupings and options for enrichment

Outlook

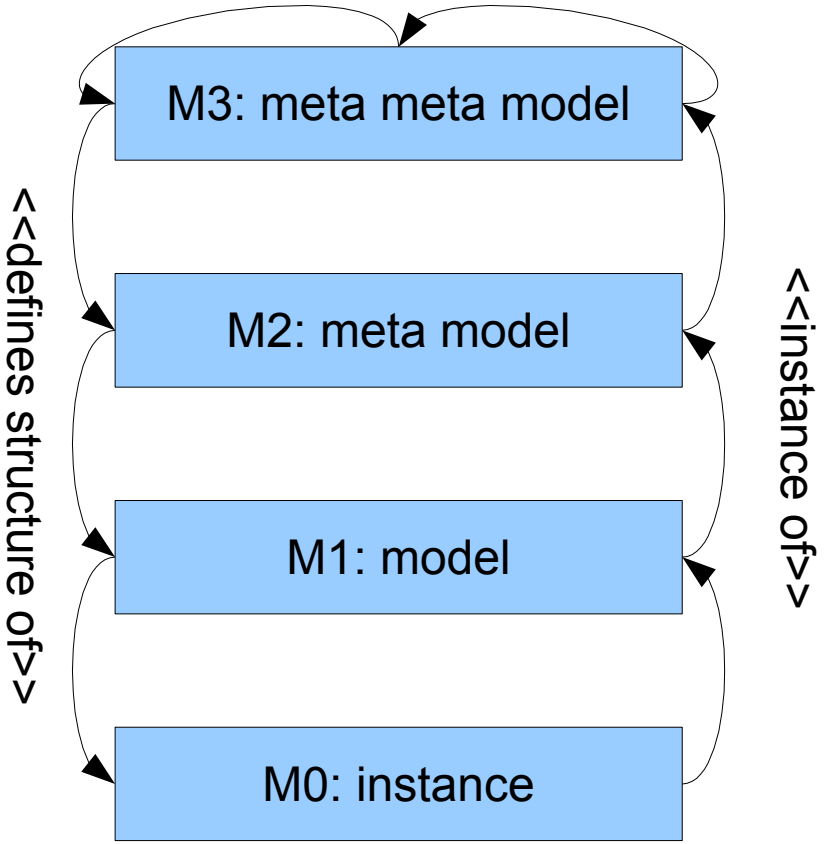
- Code generation: Generate code for the model co-adaptation algorithm
- Deriving Epatches from diffs: Using EMF Compare? Challenge: Identify copies/moves
- Handling a meta model's extended information
  - XML: XSD Infoset uses EMF Annotations
  - DSL: TMF Xtext has separate grammar files
  - Relational Database: Teneo?

Sources

- Eclipse Modeling Framework by F. Budinsky, D. Steinberg, E. Merks, R. Ellersick, T. Grose. Addison-Wesley, 6th printing, Feb. 2007
- Refactoring: Improving the Design of Existing Code by Martin Fowler, Kent Beck, John Brant, and William Opdyke, Addison-Wesley, Jul. 1999
- A Process Model and Classification Scheme for Semi-Automatic Meta-Model Evolution by Steffen Becker, Thomas Goldschmidt, Boris Gruschko, Heiko Koziolek, Chair Software Design & Quality, University of Karlsruhe, FZI Forschungszentrum Informatik, SAP Research, Graduiertenkolleg Trustsoft, University of Oldenburg, 2007
- Refinement of Alternation Traces in Context of Model-Driven Change Management by Mariya Denysova, Master Thesis, Hamburg University of Technology, Nov. 2007

Questions?
Comments?

Models: M0, M1, M2, M3



EMF Ecore, MOF, XML Schema etc.

EMF Meta Models, Grammars (DSL)
UML Diagram Types etc.

EMF Models, UML Diagrams,
DSL-Script, Sourcecode etc.

Program Instance