

# Requirements model evolution throughout the system lifecycle

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## The Problem

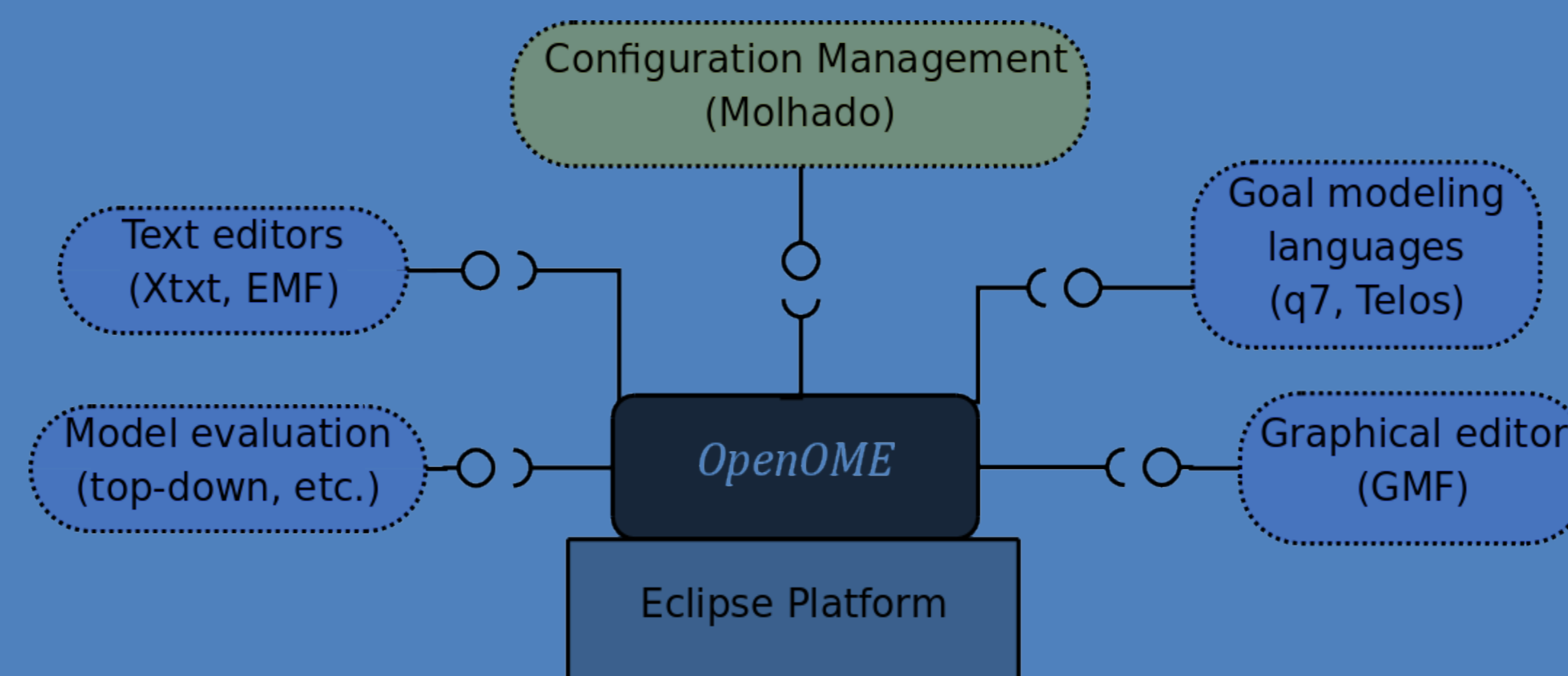
- Requirements change post-implementation
- Little research addresses this issue
- Requirements changes are the source for system maintenance tasks (e.g., change requests)
- Requirements models should persist post-implementation just like code

## Requirements model management framework

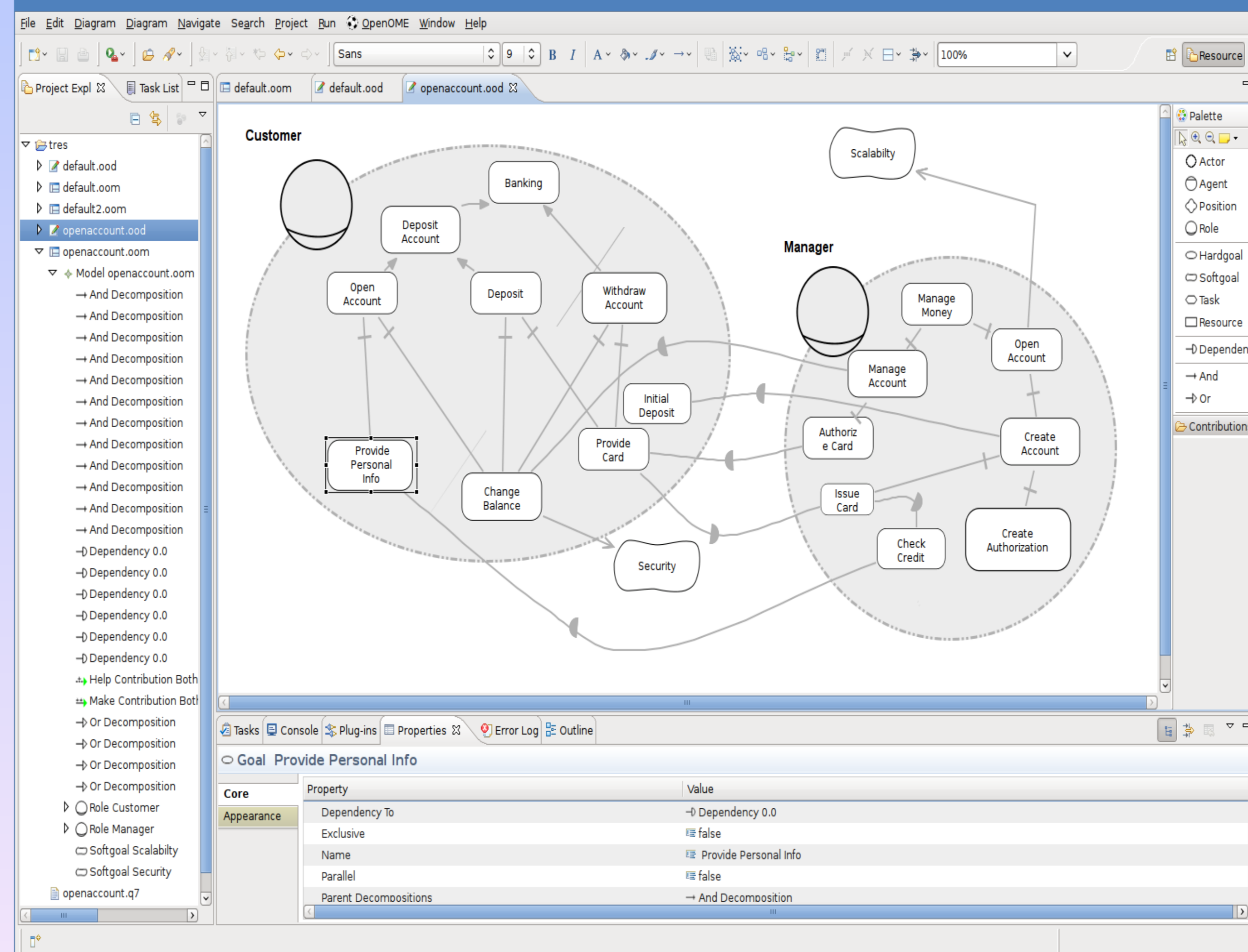
- Define requirements and related models using an abstract data type (ADT)
- Supports configuration of requirements models at multiple points in time
- Links requirements and implementation
- Define **elements**: *G* – goal models, *I* – implementation models, *T* – traceability links between them
- Define **operators** on the models:
  - Generic model management:
    - *merge, match (split), trace*
  - Model queries:
    - *slice, temporal query*
  - Configuration management:
    - *diff, version, temporal commit*
  - Goal model specific:
    - *evaluate*

## Implementation

- OpenOME is an extensible implementation of most of the requirements model management framework



- Integrated an Eclipse-based goal modeling tool with Molhado, an object-based configuration management backend



The GMF editor of OpenOME, showing the creation of an i\* model

## Evaluation

- Evaluated tool on three versions of Trac<sup>1</sup>, a project management tool, by reverse engineering the source code to goal models.

### Scalability:

- Algorithms:  $O(N)$  or  $O(\log N)$ ,  $N = \#$  elements
- Changesets smaller than *diff* or XML diff

### Minimality

- OpenOME works on artifacts in the problem domain, not the model syntax, e.g.:
  - From  $V_1$  to  $V_2$ , OpenOME shows 871 added and 339 deleted artifacts; whereas
  - From  $V_1$  to  $V_2$ , *diff* shows 3375 lines added and 2309 lines deleted

### Conformance

- Tests demonstrated OpenOME preserved model elements throughout the process
- Change rationale recording algorithm preserved entire edit chain from  $V_1$  to  $V_2$

<sup>1</sup> trac.edgewall.org

## Future work

- Work on traceability using incremental Latent Semantic Indexing
- Examine model management ADT and less formal requirements practices
- Implement slice/query operators