Using Ontologies for Flexibly Specifying Multi-User Processes

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Formal Tools

Pros

- automatic detection of errors
- maintenance throughout the model is simple
- reusable throughout a project

Cons

- restricted by metamodel
- early commitment
- overhead for small projects

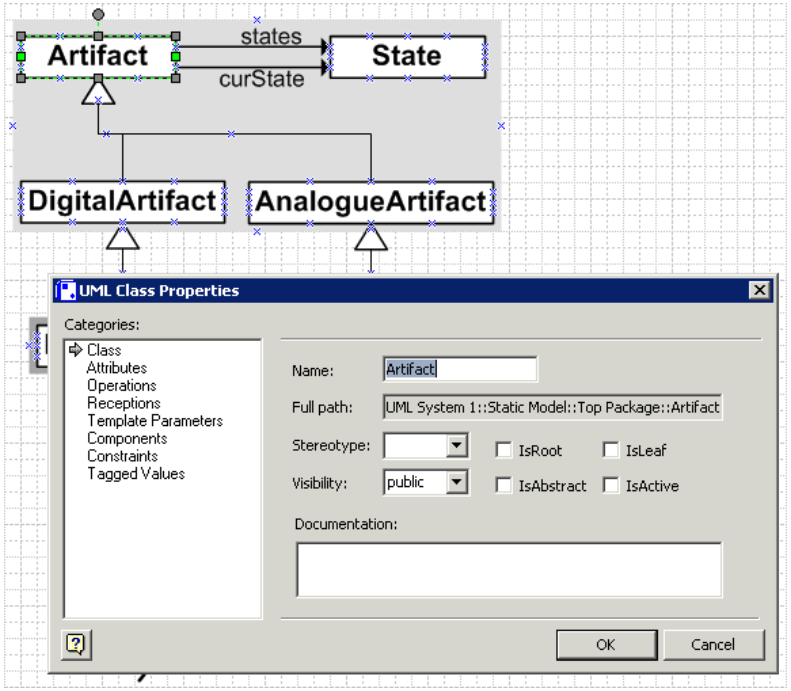


Figure: UML Model (MS Visio)

Informal and General-Purpose Tools

Pros

- easy to use
- everything can be captured
- degrees of freedom are similar to whiteboards

Cons

- no metamodel
- changing references
- presentable, rarely reusable

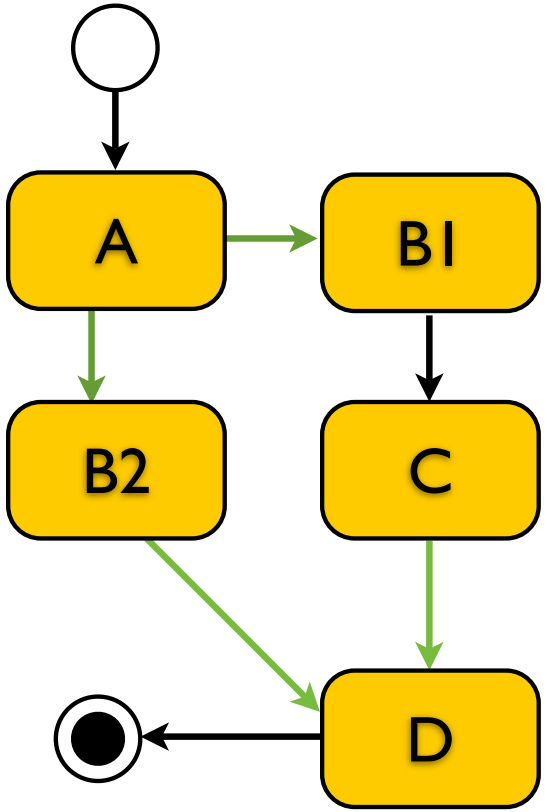
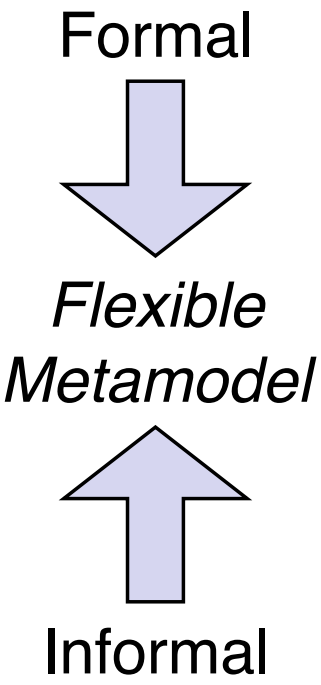


Figure: Process Model (Keynote)

Bridging the Gap



Ontologies as Flexible Metamodels

- less restrictive
  - missing concepts can be added on demand
- capable of capturing the modeler's intent
  - a model can always be interpreted with its corresponding metamodel

HPI – Stanford
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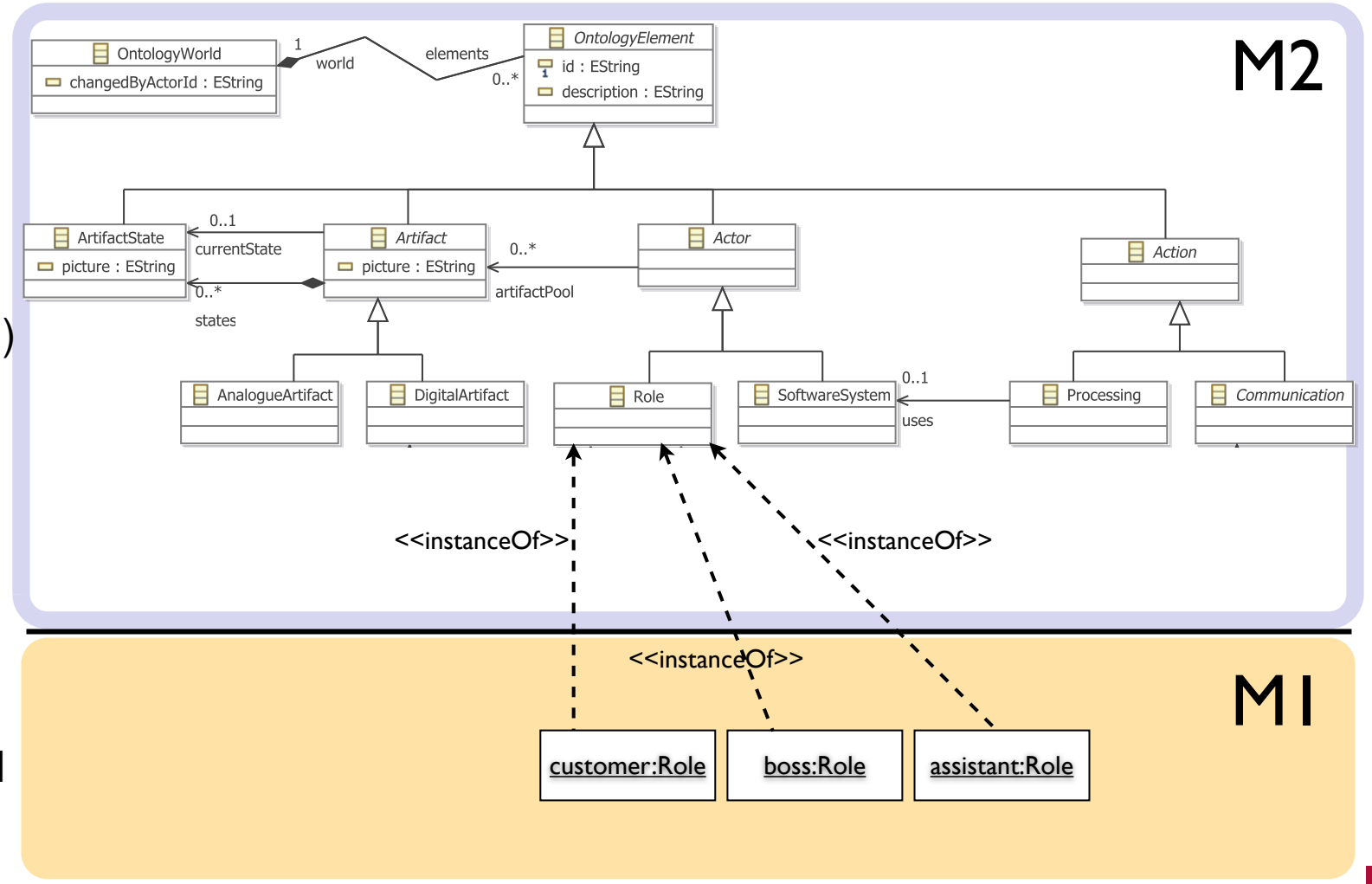
Using a Formal Modelling Tool

Metamodel (Formal Tool)

User Generated Model

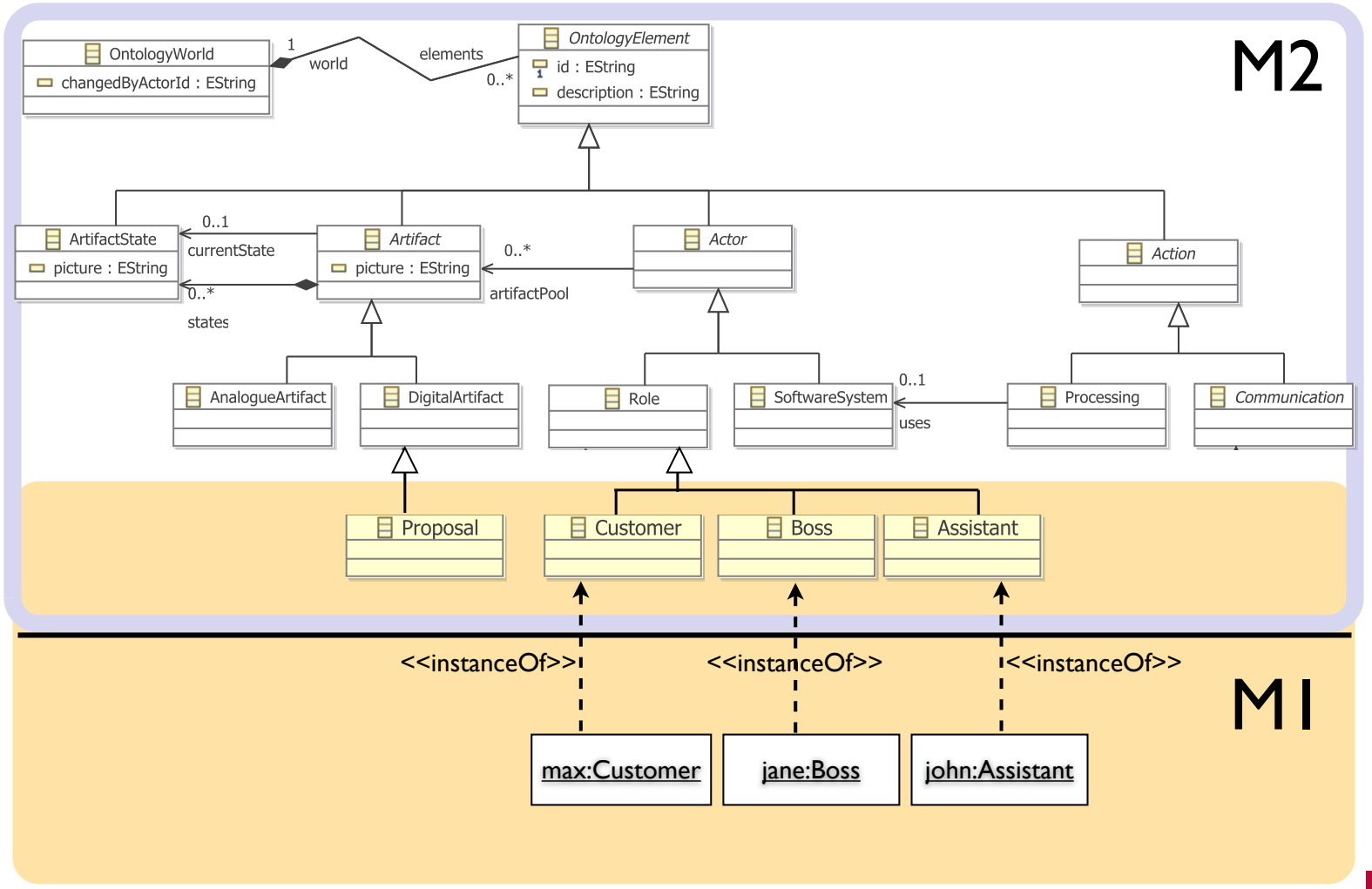


Extending the Meta Model

Metamodel

Project-Specific

User Generated Model

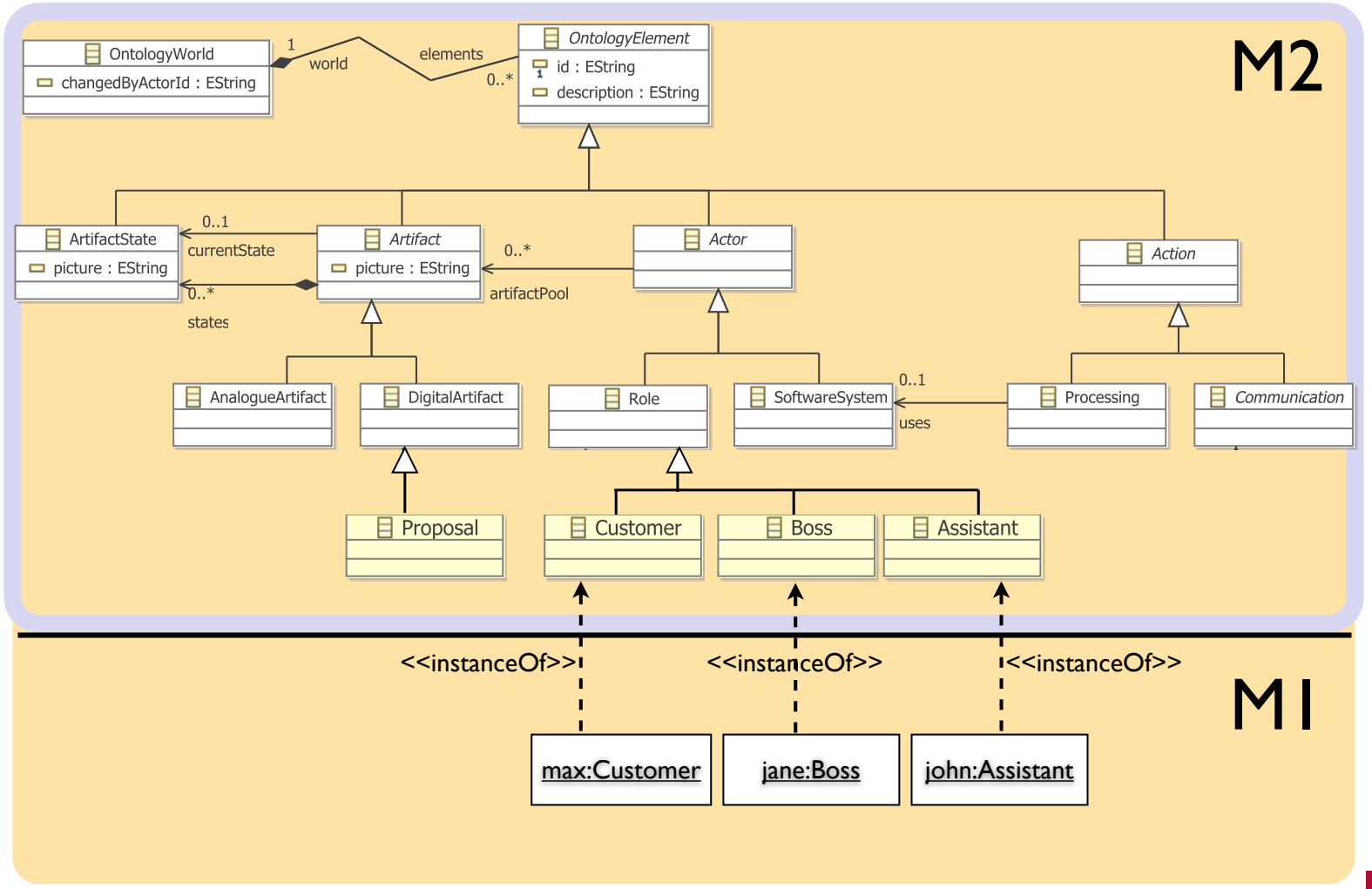


Using Ontologies as Meta Model

Basic Ontology

Project-Specific

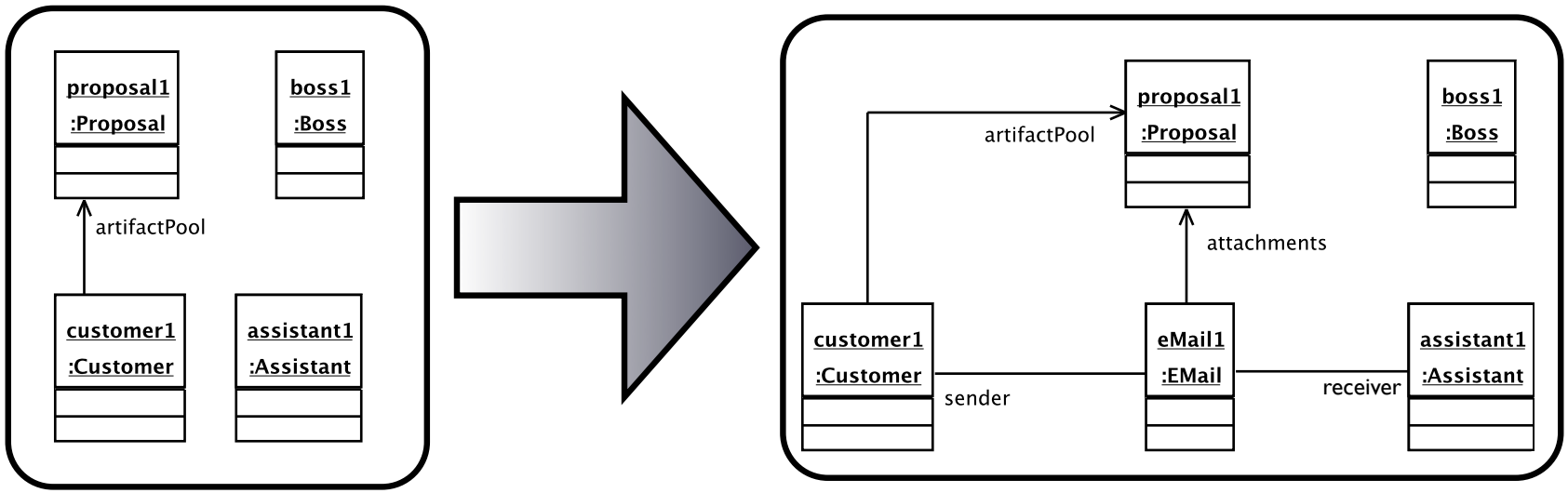
User Generated Model



Creating Behavioral Specifications I

Using the terminology defined in the ontology, an analyst can...

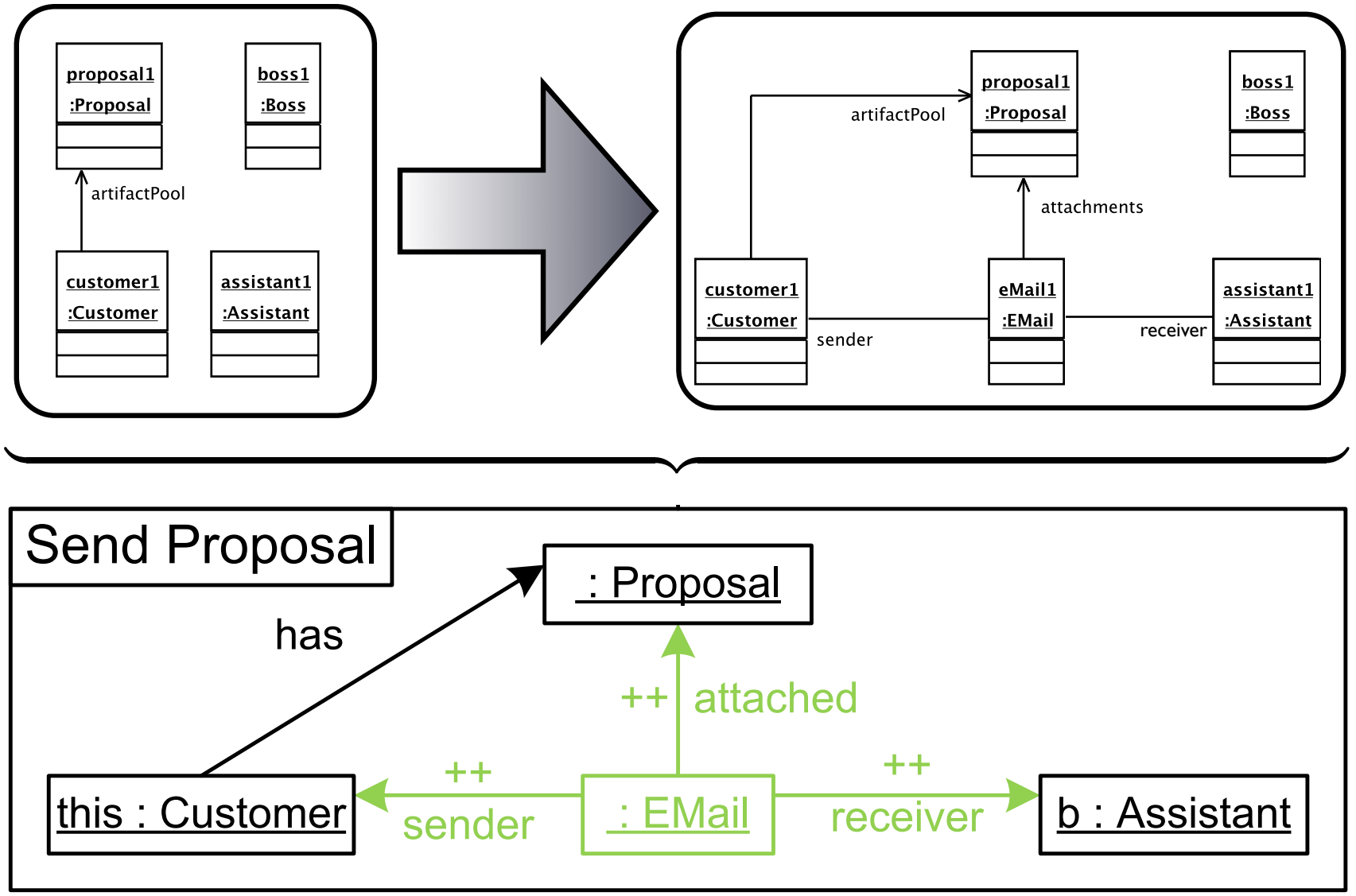
- describe an observed situation
- describe the follow-up state
- the difference between both specifies an action
  - specified in the terminology defined in the ontology



Initial state

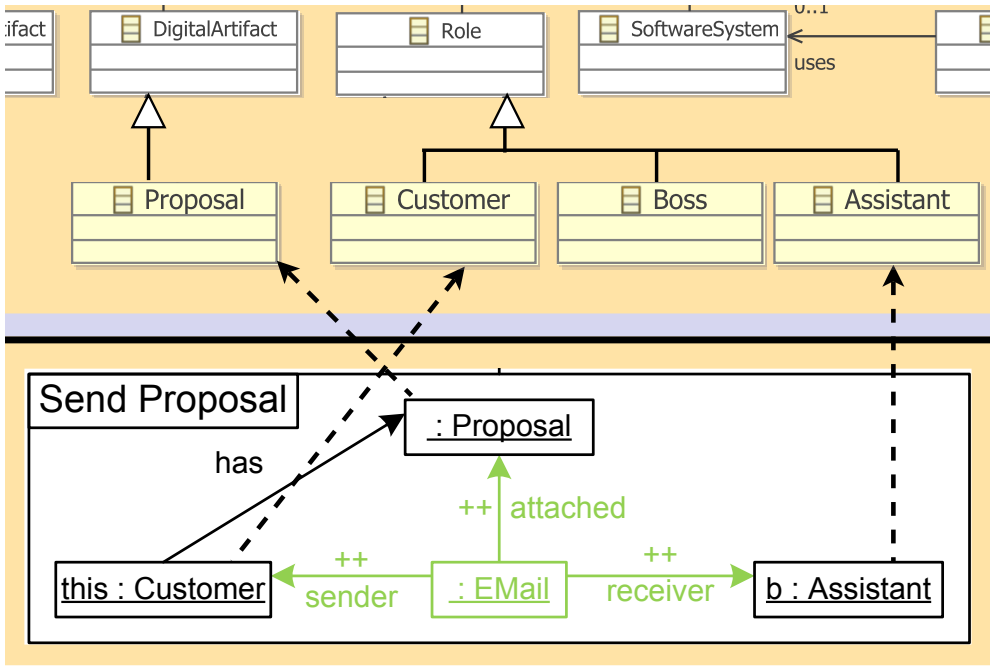
Follow-up state

Creating Behavioral Specifications II



So, what do we have?

- behavioral and situational specification of a process
  - formal specifications that can be simulated
- all specifications reference elements of the flexible metamodel
  - specified in the terminology defined in the ontology
  - specification is affected by changes in the ontology



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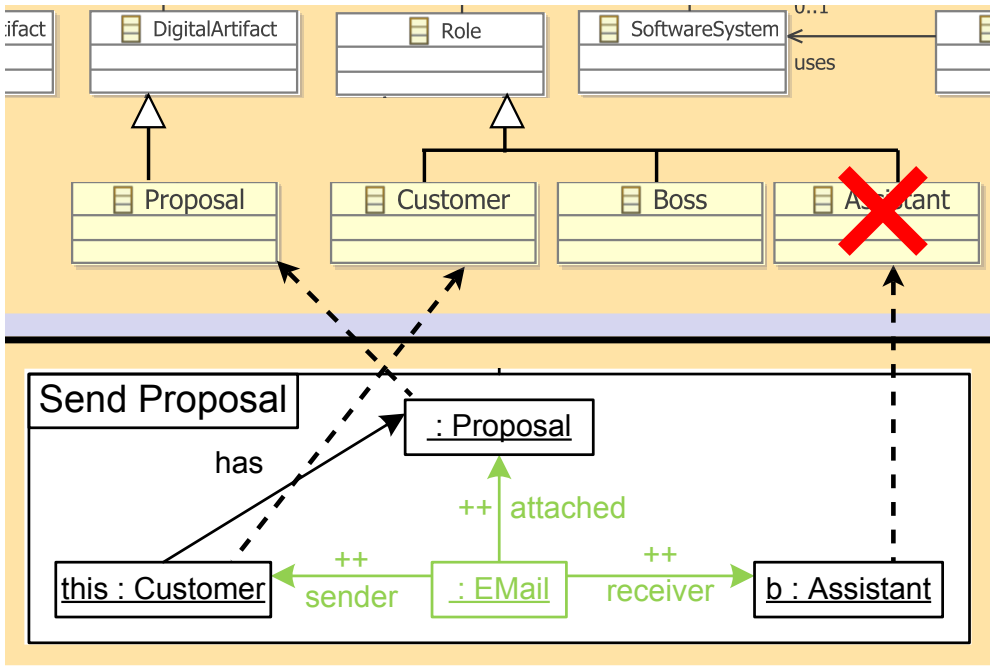

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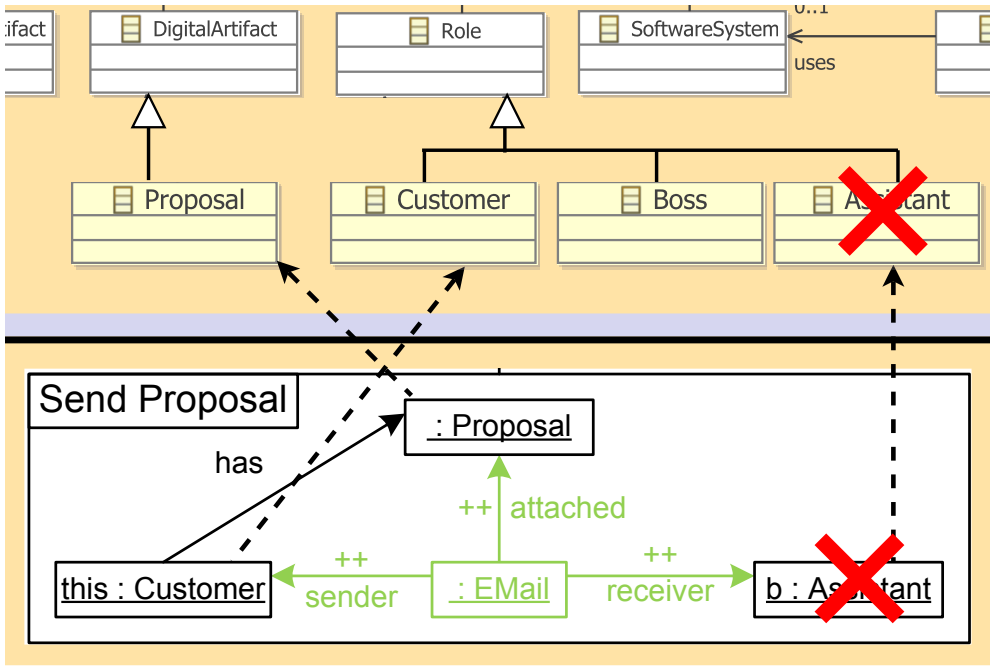
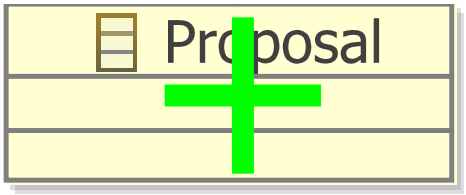
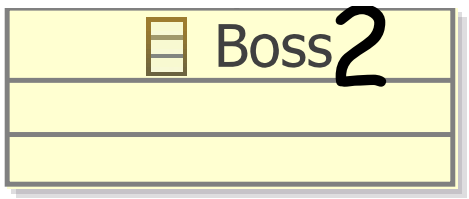


When Working with Flexible Metamodels...

We have to deal with ...

- addition, modification, and removal of
- classes, properties, methods, and associations





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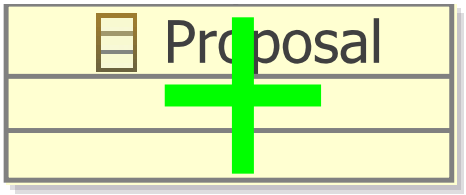

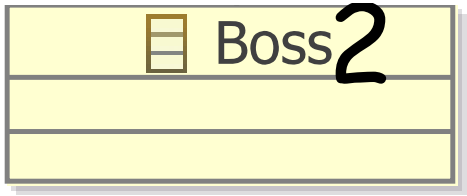

Worst Case Scenario

modeled specifications become **unreadable** with modified metamodel

Modifications of the Ontology

	Addition	Removal	Modification
Class	☑	☐	☐
Property	☑	☐	☐
Association	☑	☐	☐

Addition of any new Element

- not referenced yet $\Longrightarrow$ no action necessary
- save as often as possible
  - small deltas between versions
  - old version of the ontology is kept
  - when saving, *ID*s can be added

Modifications of the Ontology

	Addition	Removal	Modification
Class	☑	☑	☐
Property	☑	☑ (user assisted)	☐
Association	☑	☑ (user assisted)	☐

Removal of any *referenced* Element

- **Class**: dangling references are redirected (recursively) to the corresponding superclass
- **Property**: either delete references or move to superclass
- **Association**
  - pointing to deleted class: redirect to superclass
  - else: either delete references or propose substitutes

Modifications of the Ontology

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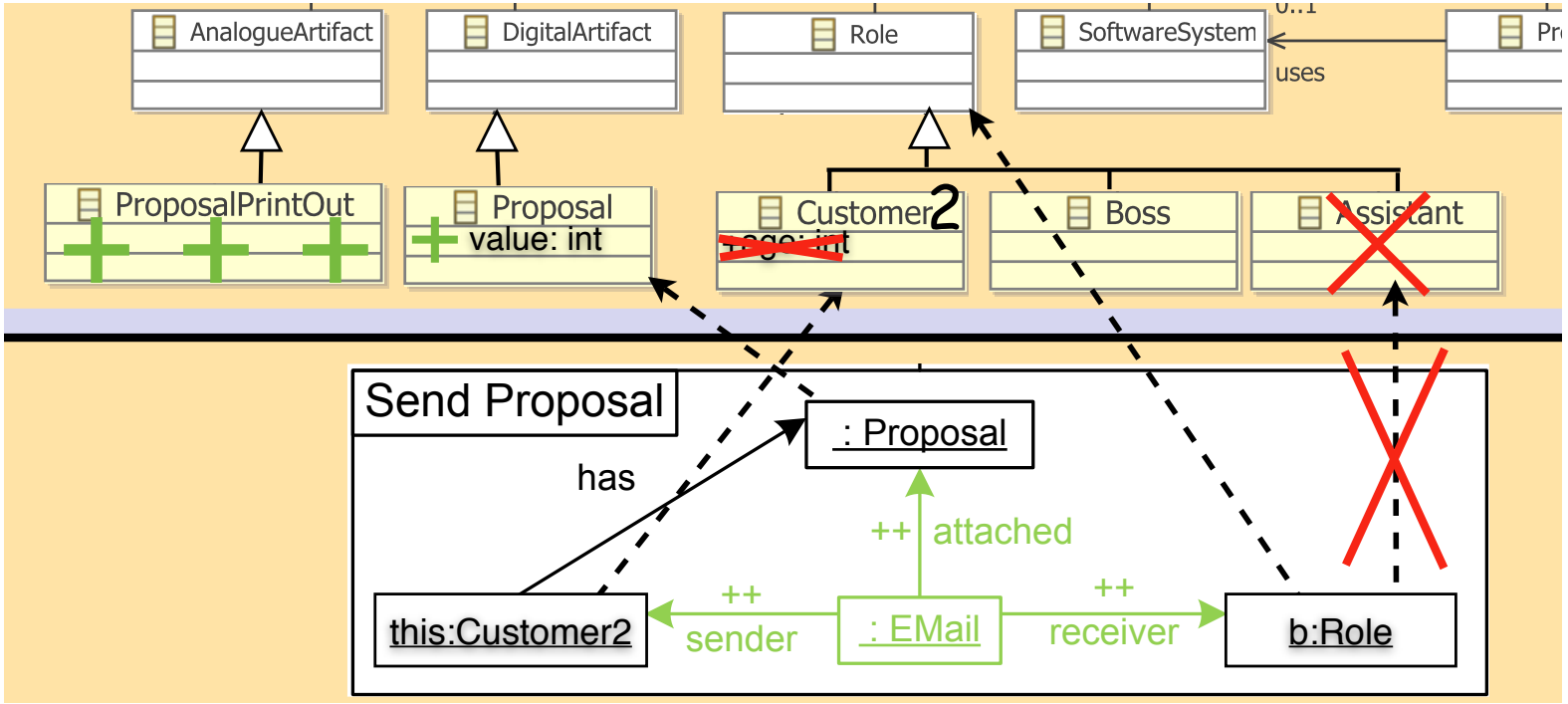
Class	☑	☑	☑ (user assisted)
Property	☑	☑ (user assisted)	☑ (user assisted)
Association	☑	☑ (user assisted)	☑ (user assisted)

Modification of any *referenced* Element

- modeler's intent is unclear
- syntactical change (`Bosss` becomes `Boss`):
  - **same concepts** apply, references still valid
  - IDs can be used to redirect from `Bosss` to `Boss`
- semantical change (`+getX()` becomes `+setX()`):
  - **different concepts** apply, references invalid
  - remove old version + add new version

Conclusions



- ontologies as flexible metamodels
- concepts for handling metamodel changes
- implementation in Eclipse & EMF
  - automatic reload of changes in metamodel
  - *Addition* of elements fully functional