

SiLift: Extending EMF Compare with an Operational View on Model Differences

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Eclipse DemoCamp
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Semantic Lifting of Model Differences

<http://pi.informatik.uni-siegen.de/Projekte/SiLift>

Outline

Introduction

The SiLift Approach

End-user Tool Environment

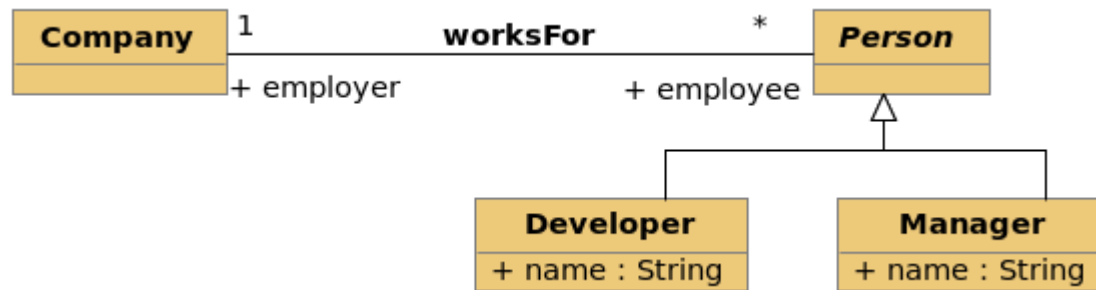
Summary

Context: Model-driven Development



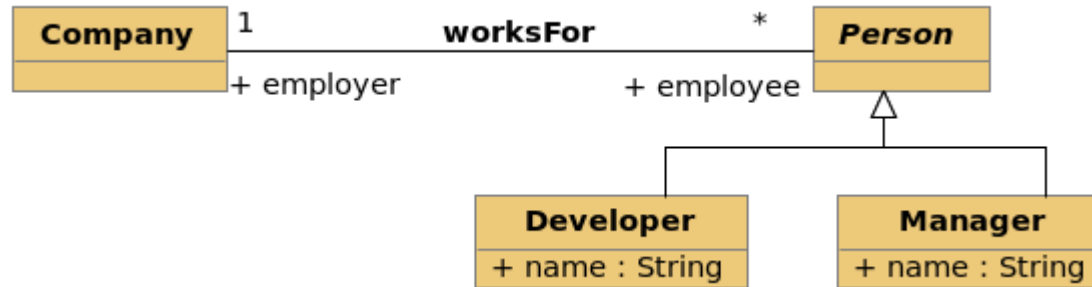
Model evolution

rev. 1.1

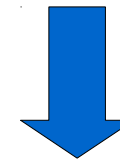
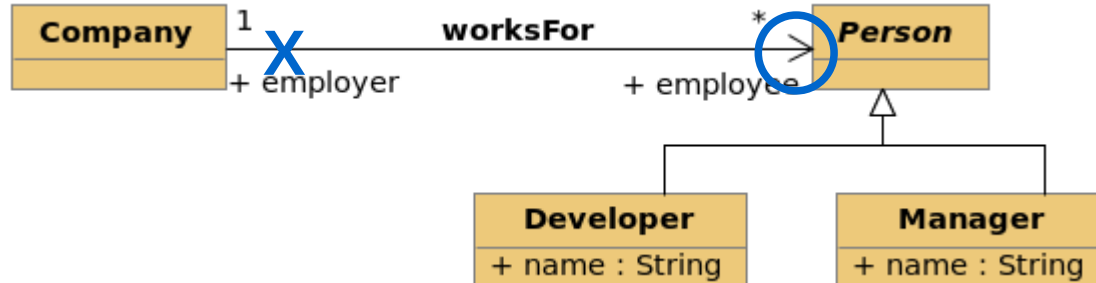


Model evolution

rev. 1.1



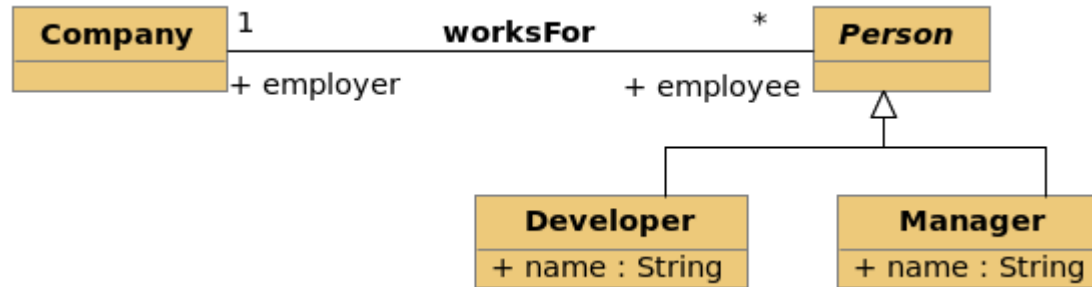
rev. 1.2



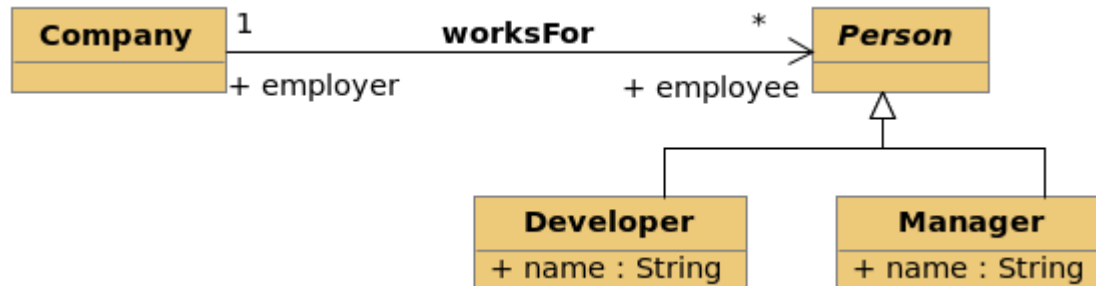
Design Decision:
Restrict association
navigability

Model evolution

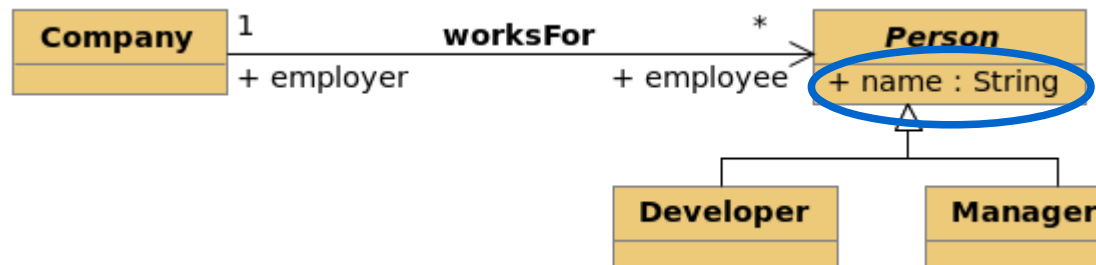
rev. 1.1



rev. 1.2



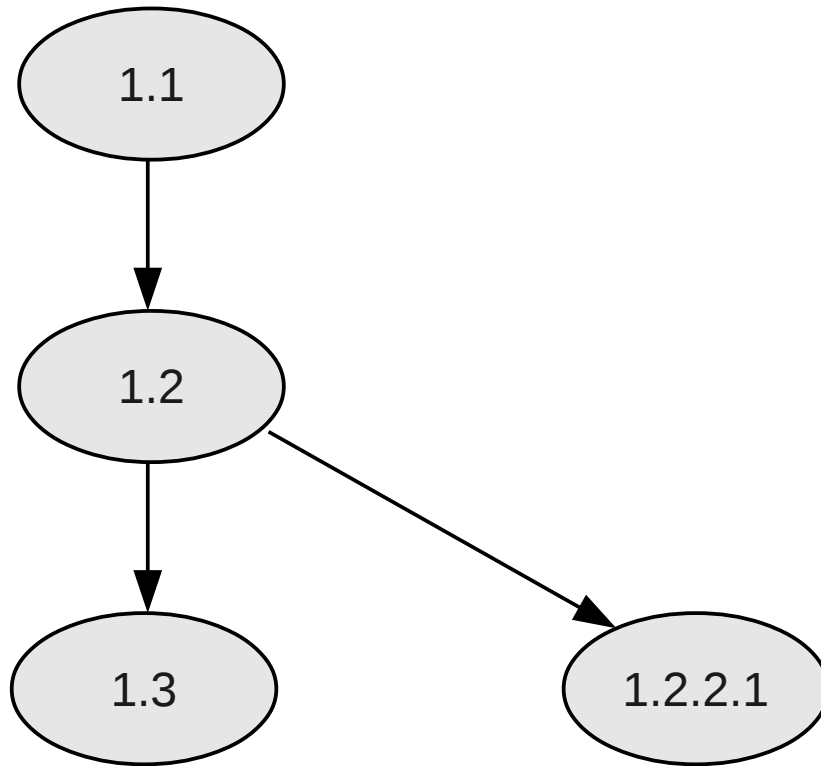
rev. 1.3



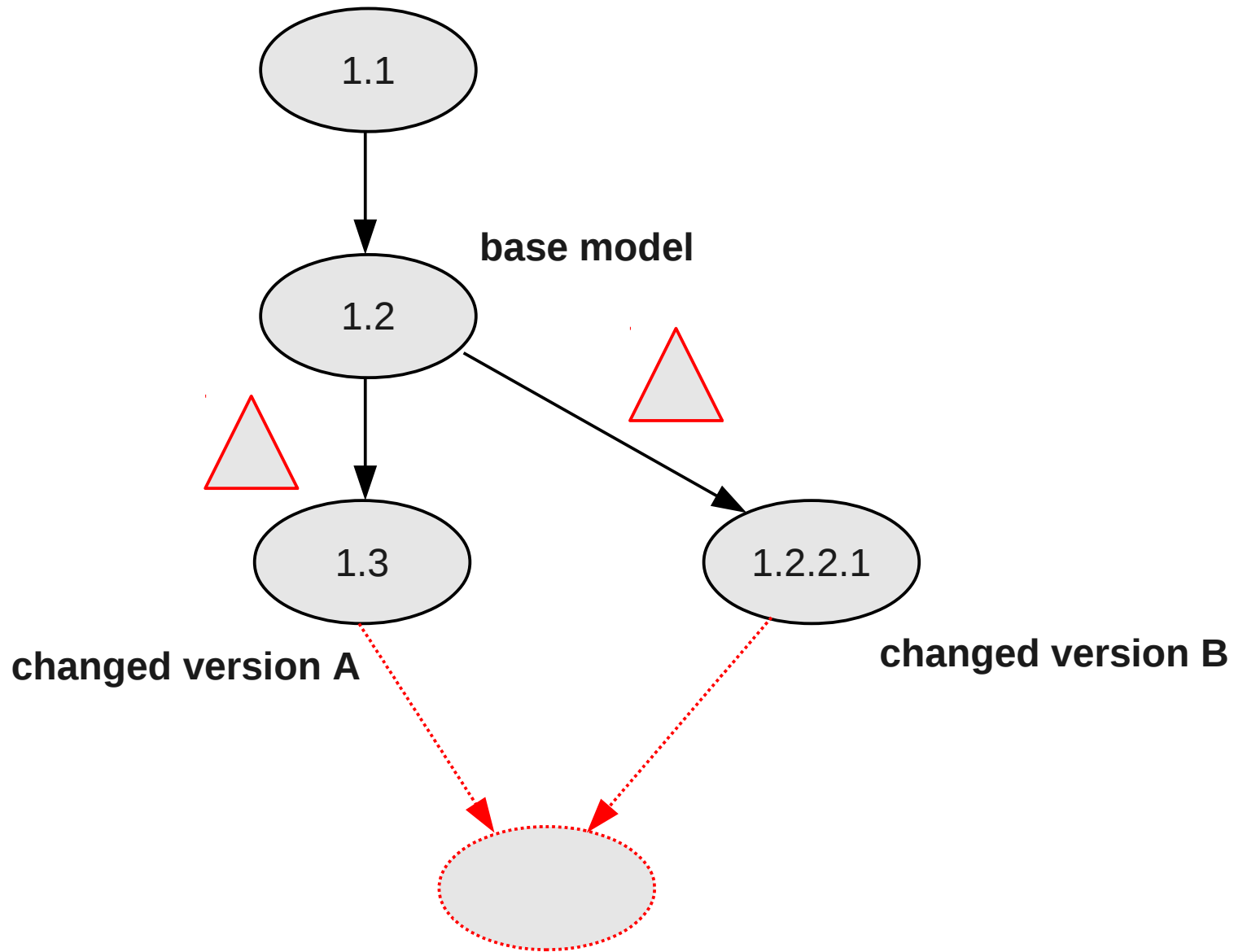
Design Decision:
Restrict association
navigability

Refactoring:
Pull up attribute

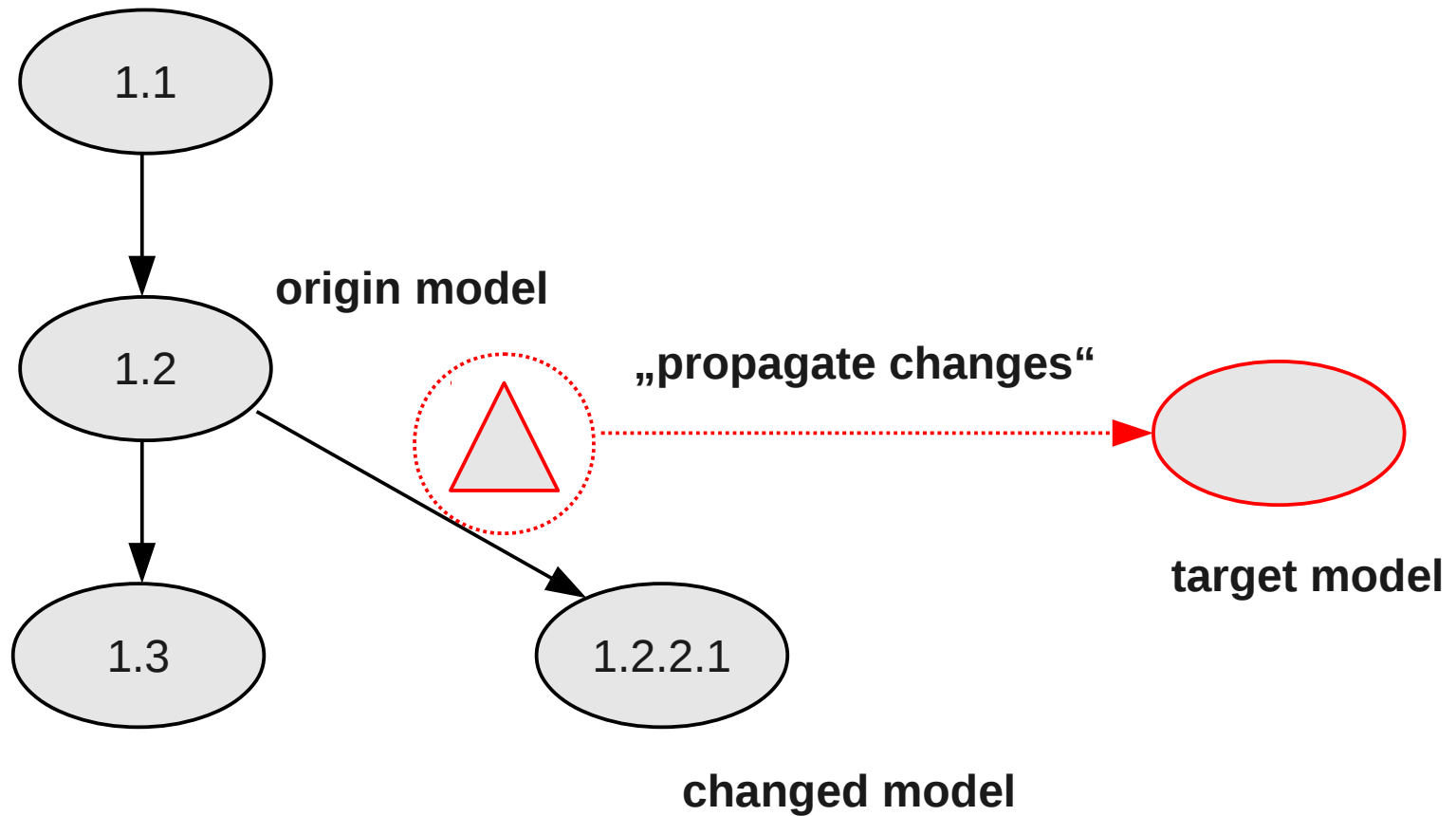
Model versions and variants



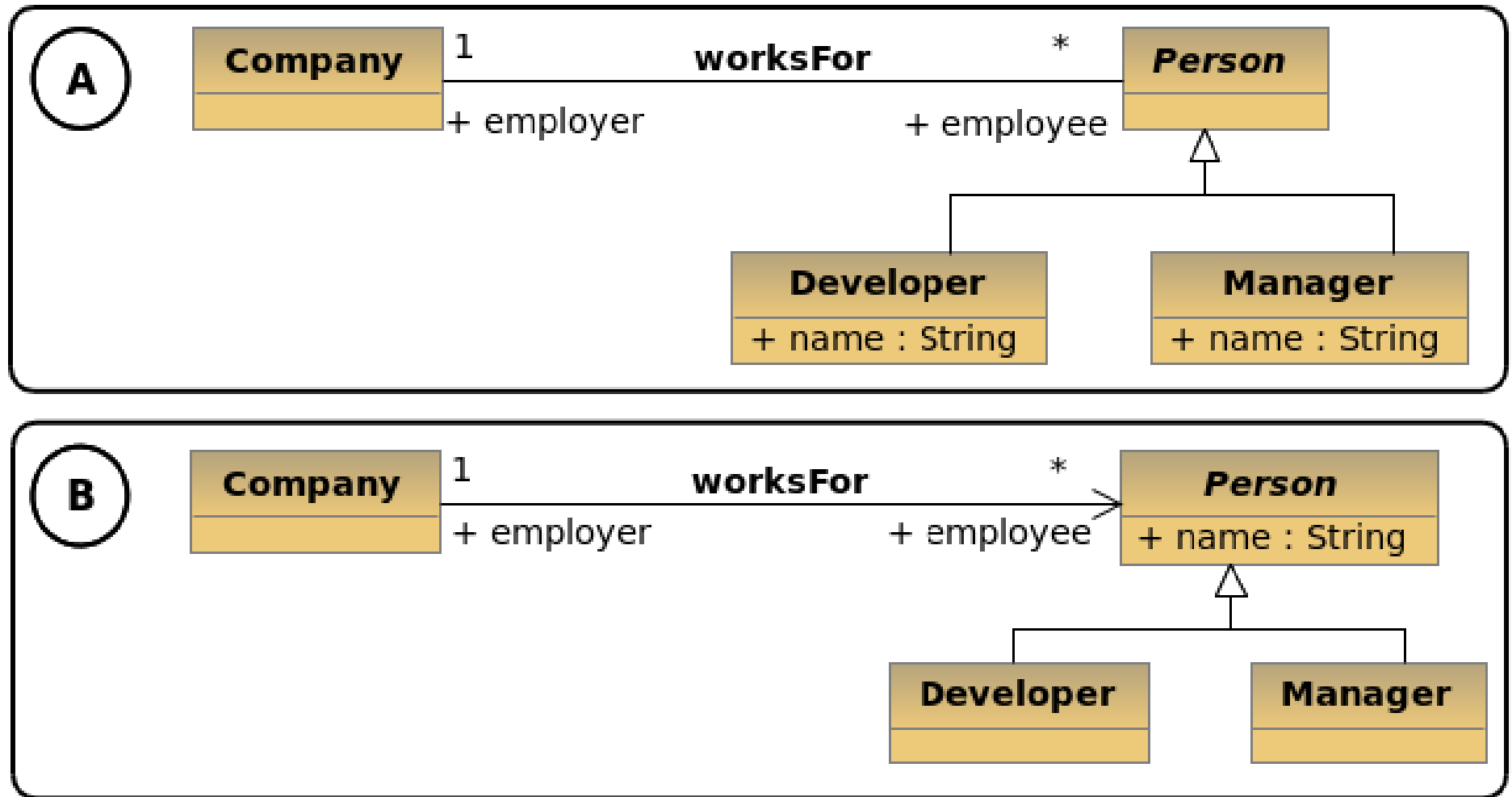
3-Way model merging



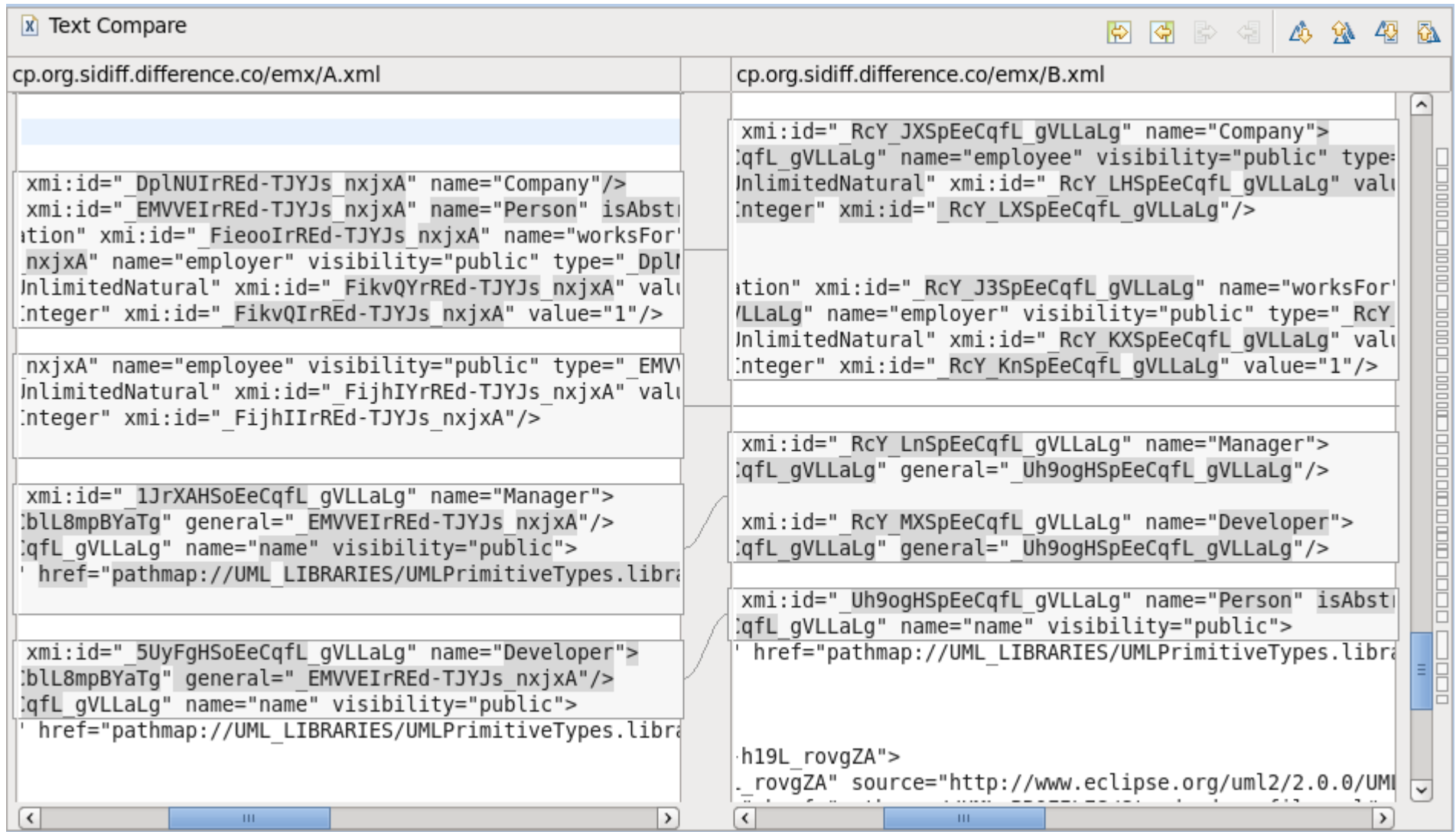
Model patching



Basic challenge: Model comparison

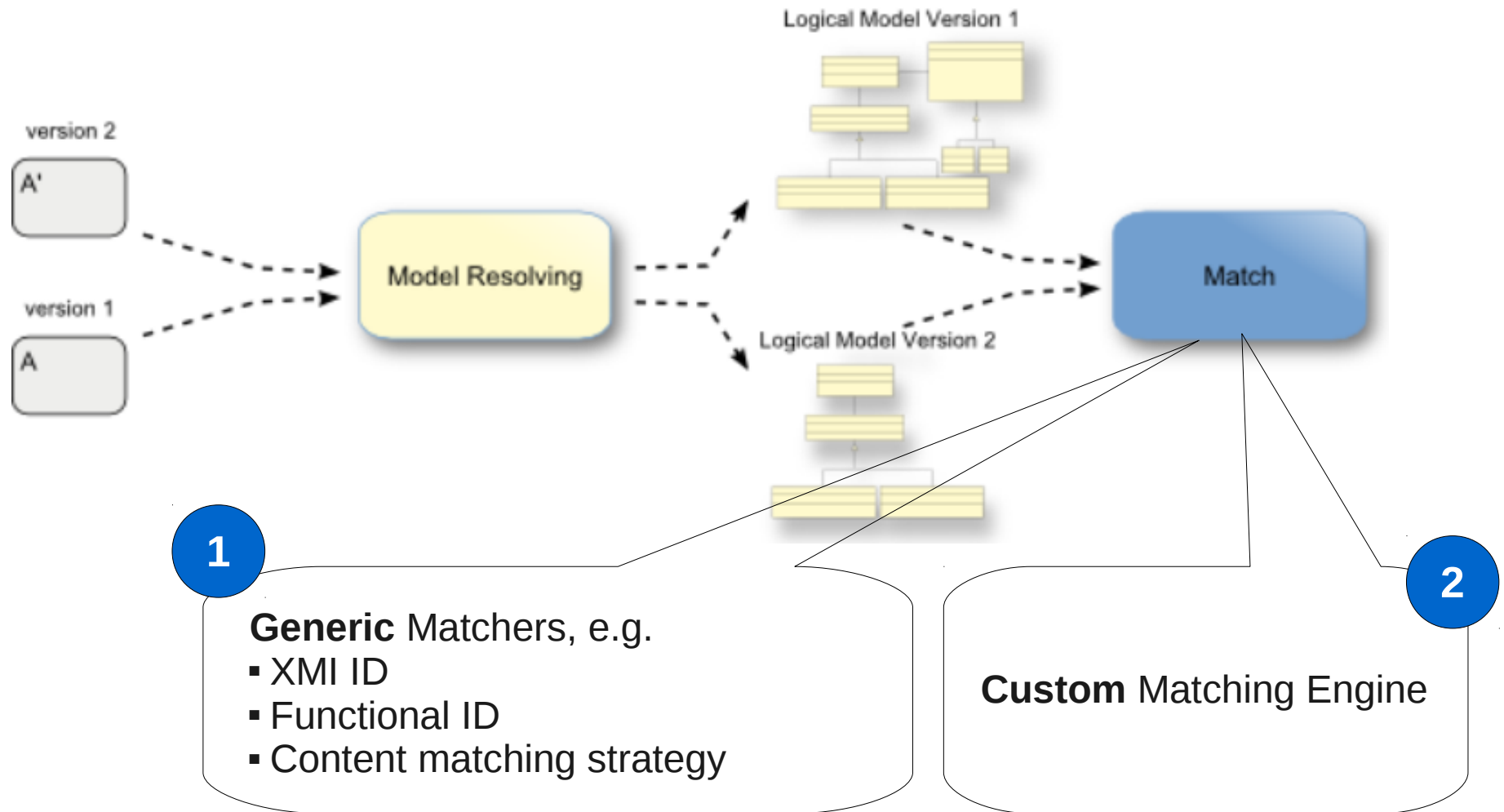


What textual difference tools report...



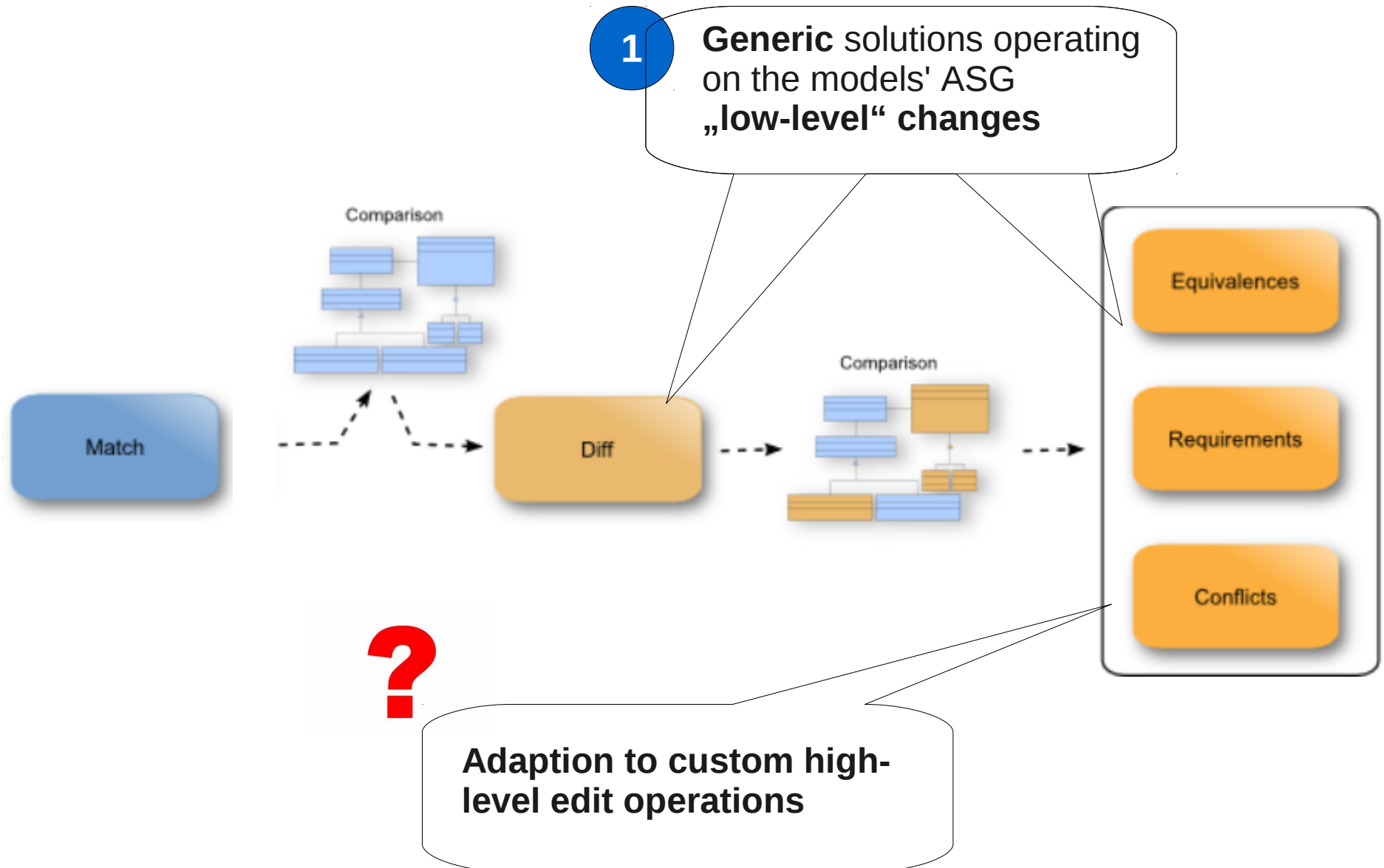
The processing pipeline of EMF Compare

Part 1: Matching



The processing pipeline of EMF Compare

Part 2: Differencing



Outline

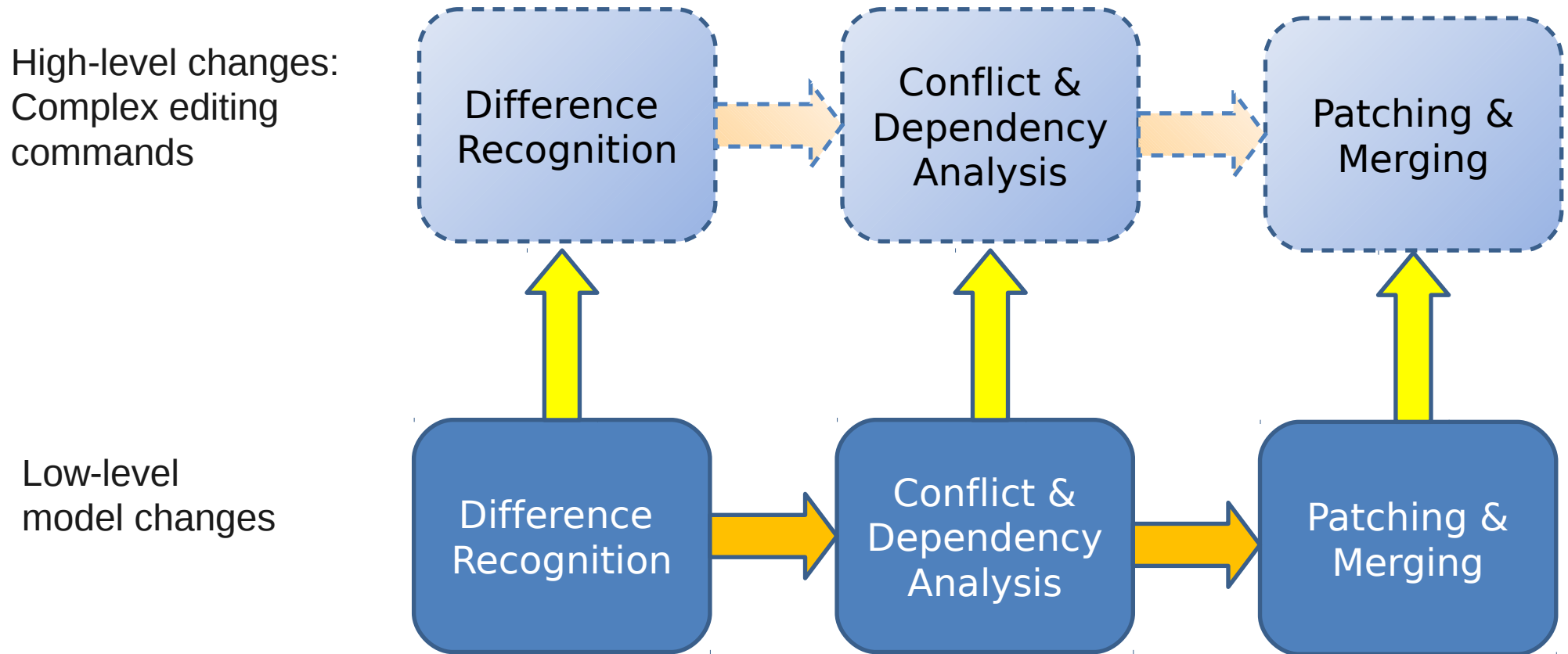
Introduction

The SiLift Approach

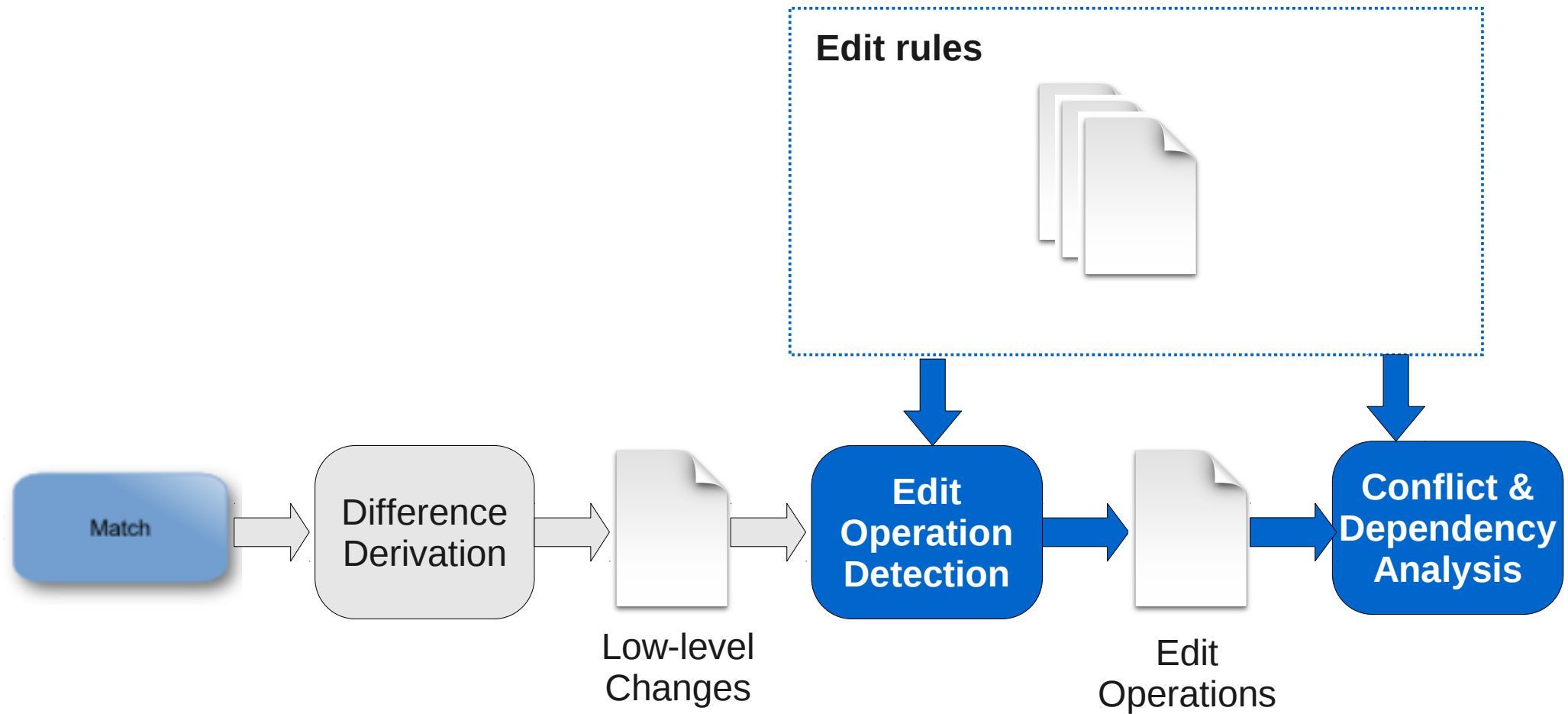
End-user Tool Environment

Summary

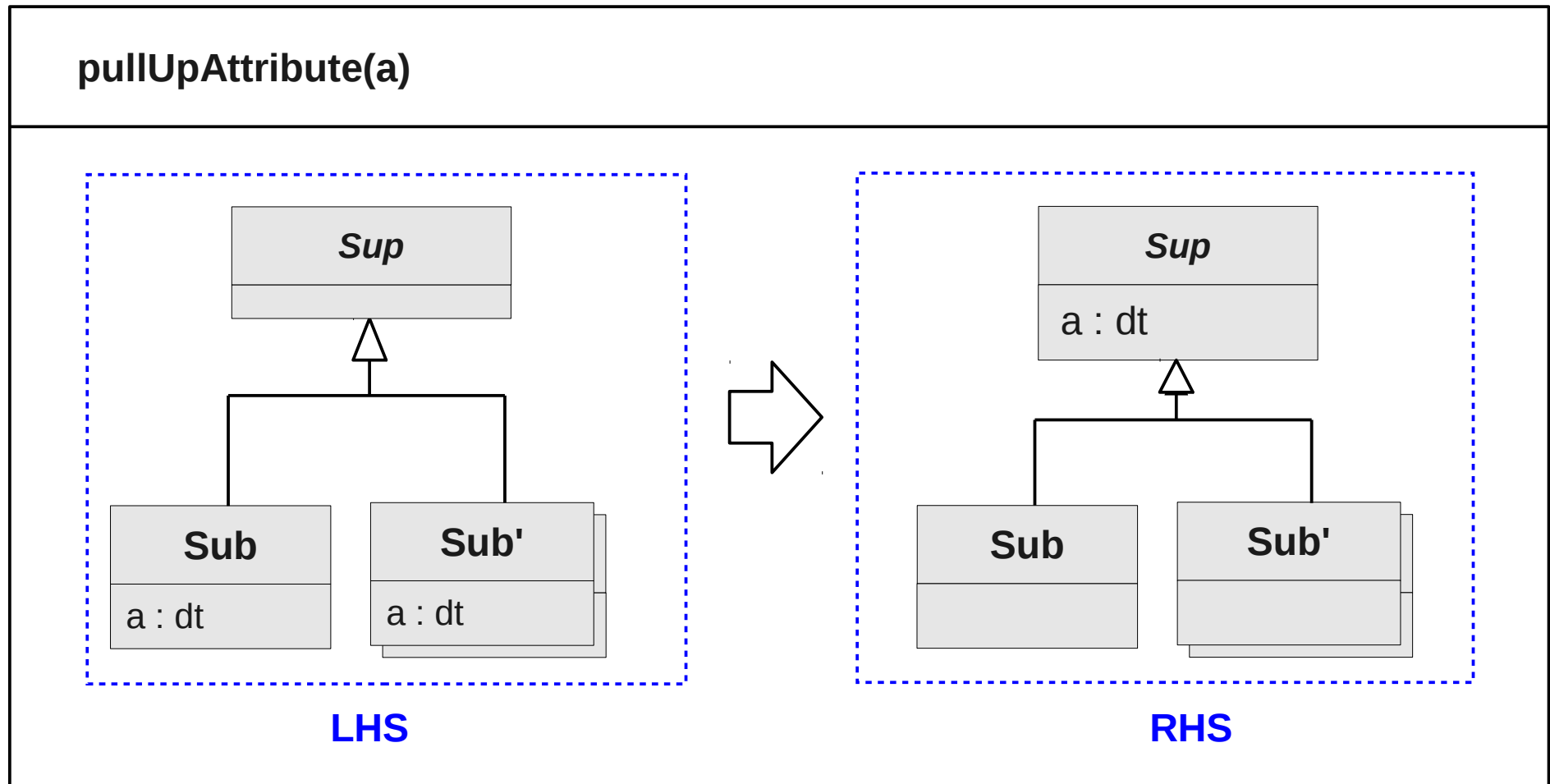
Overall goal: Lift model versioning to the abstraction level of edit operations



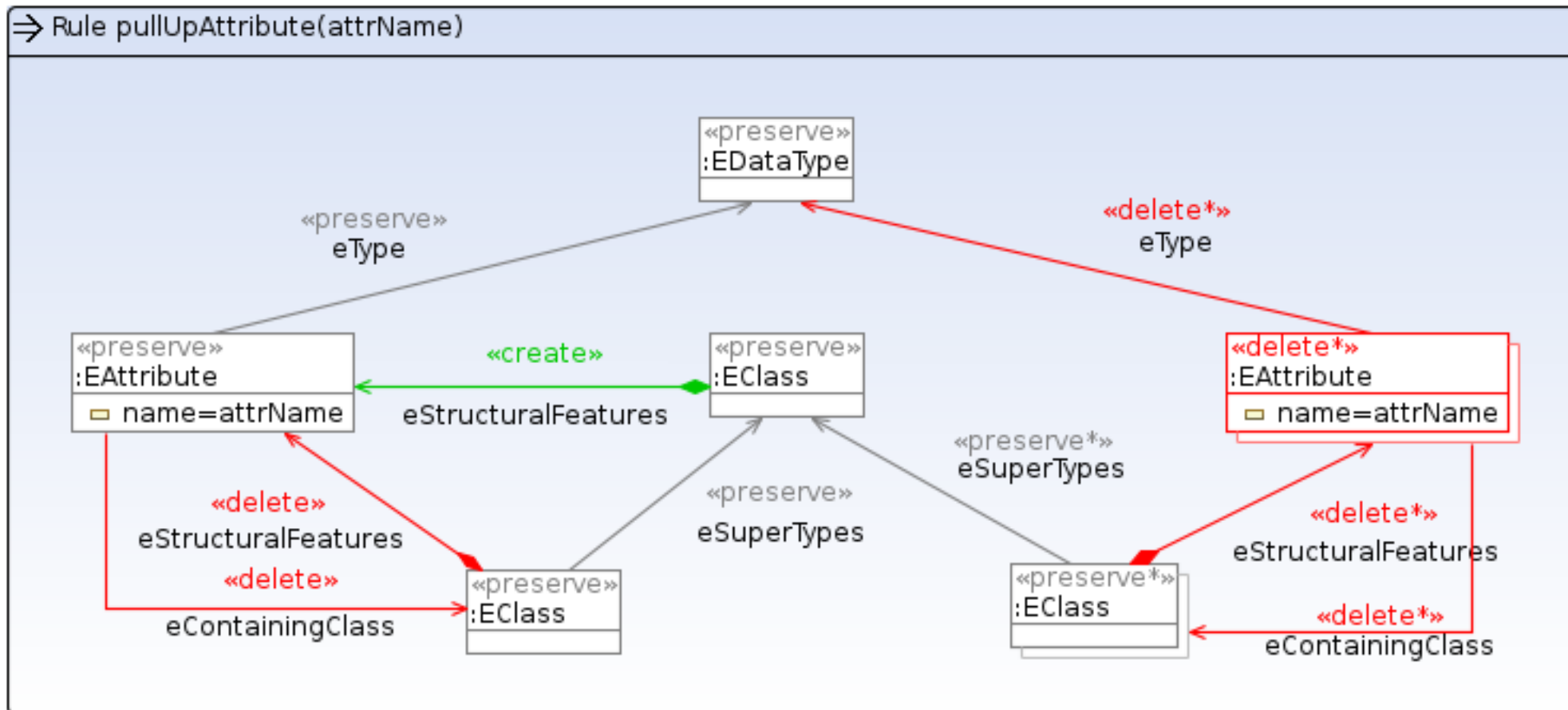
Basic approach



Sample edit rule: „pullUpAttribute“ (theoretical foundation)



Sample edit rule: „pullUpAttribute“ (implementation in EMF Henshin)



Outline

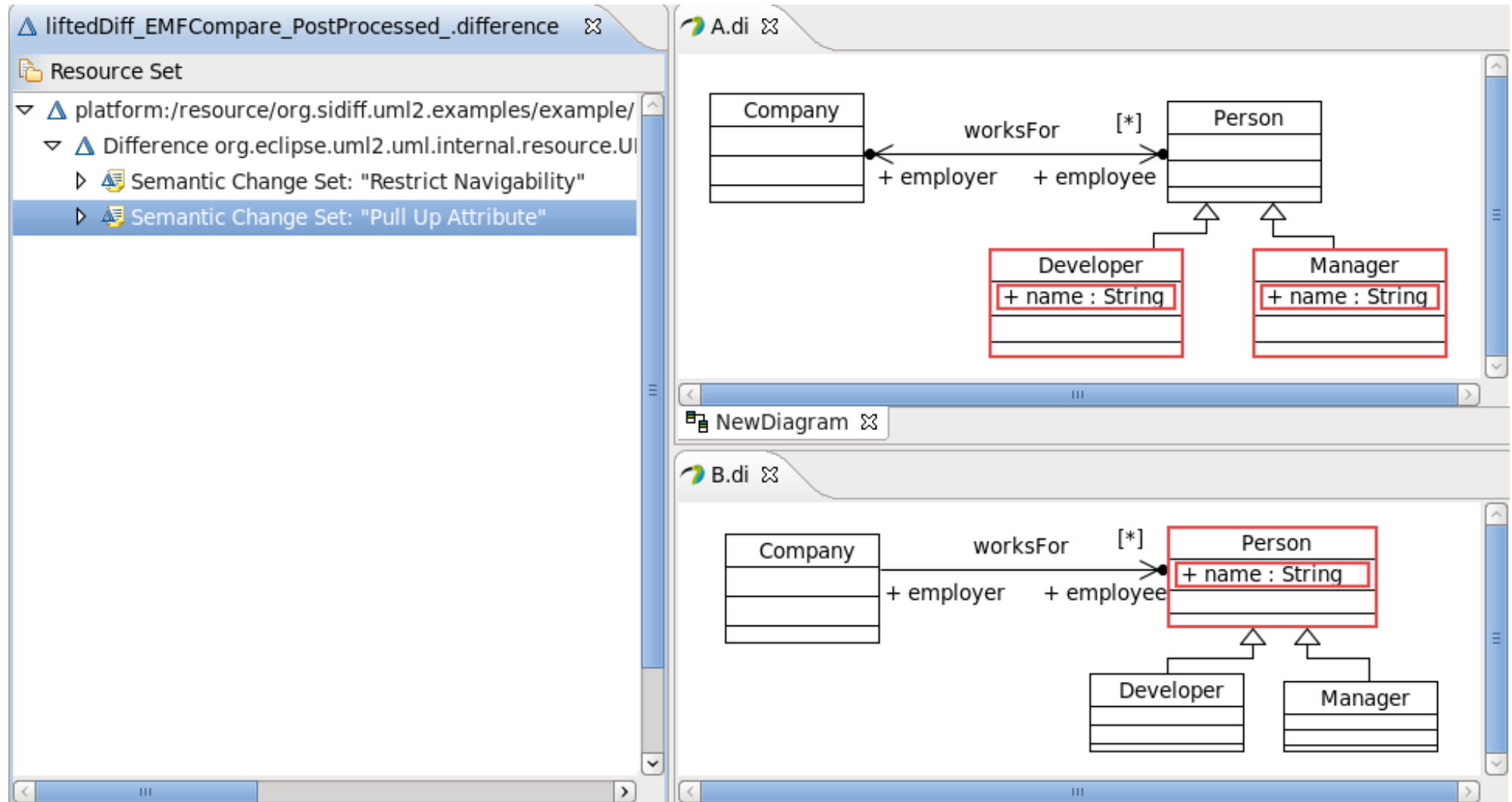
Introduction

The SiLift Approach

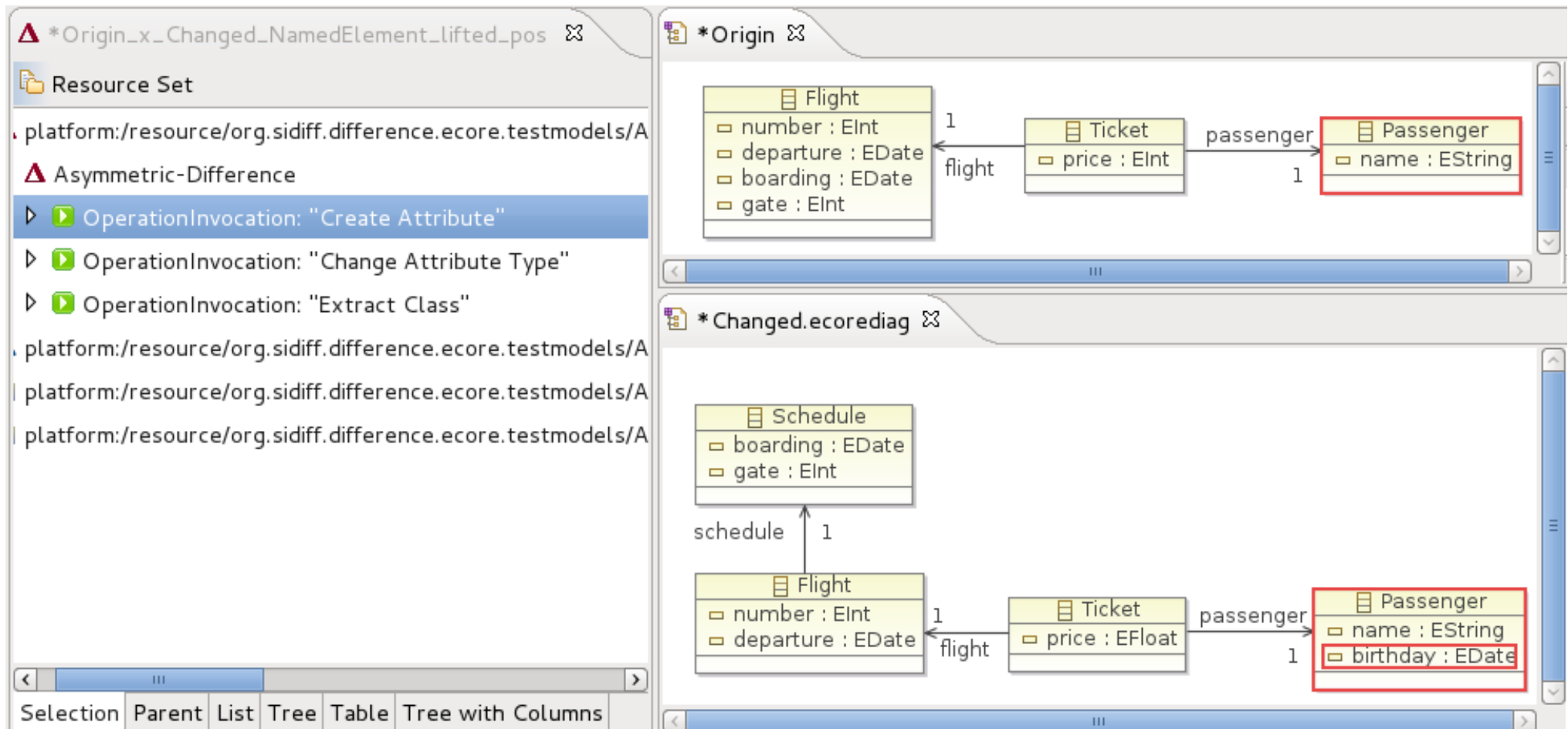
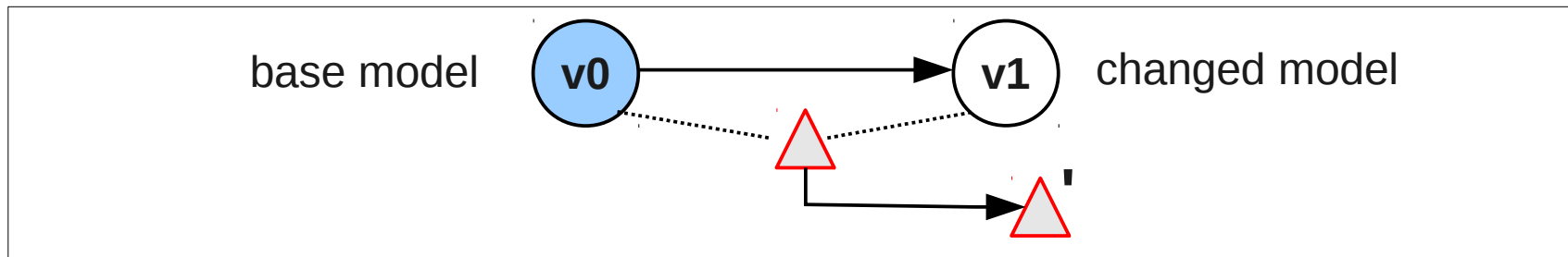
End-user Tool Environment

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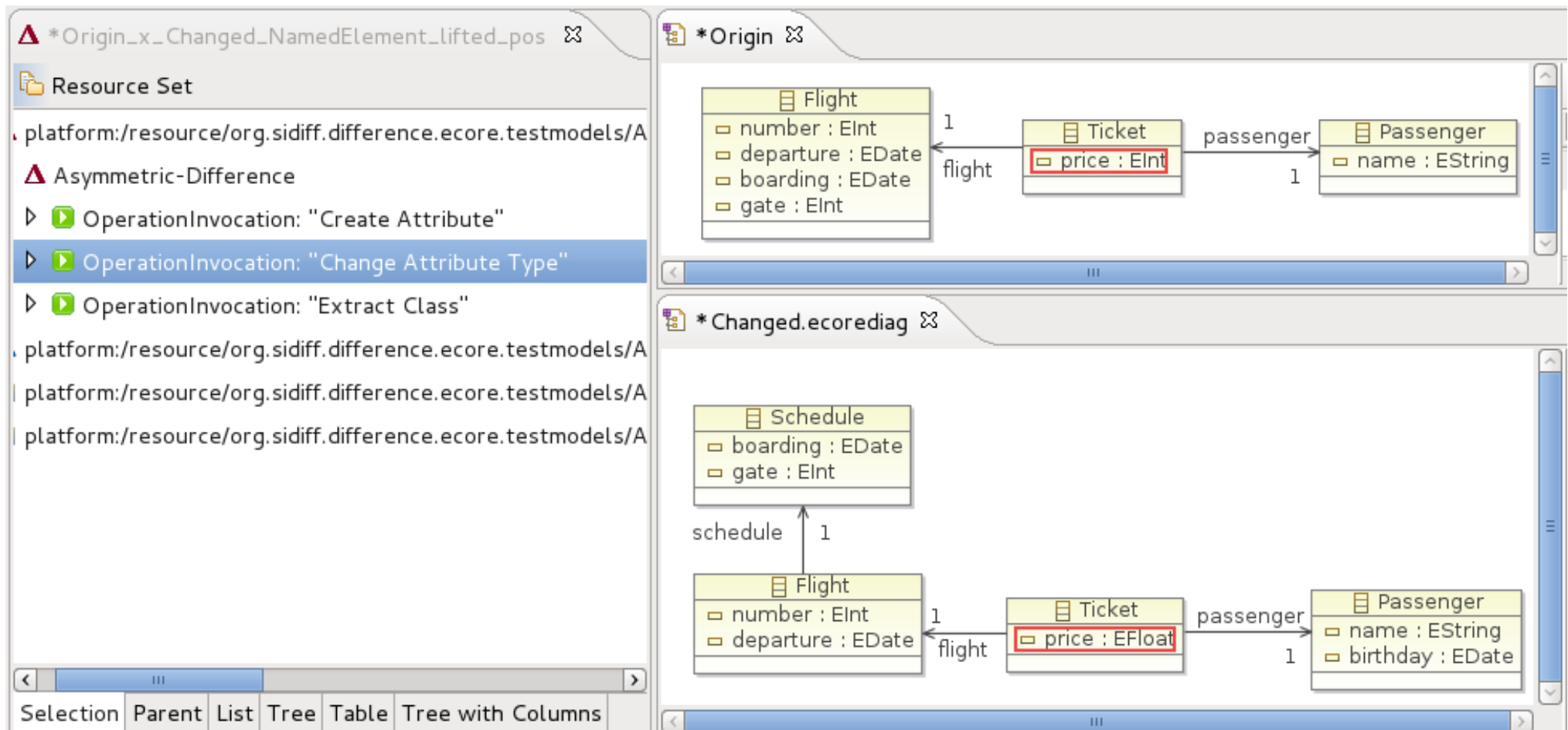
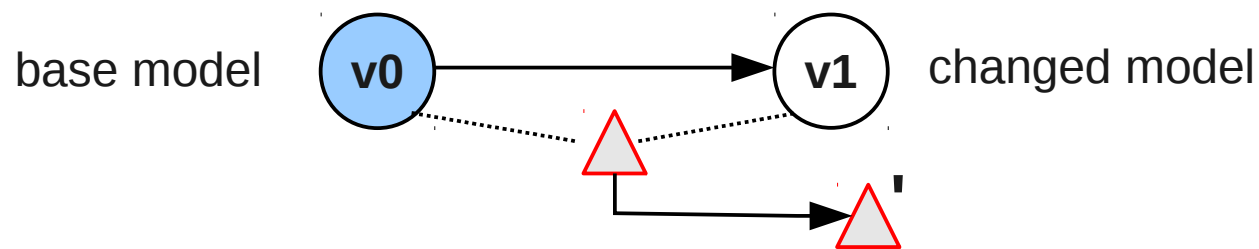
Difference Viewer



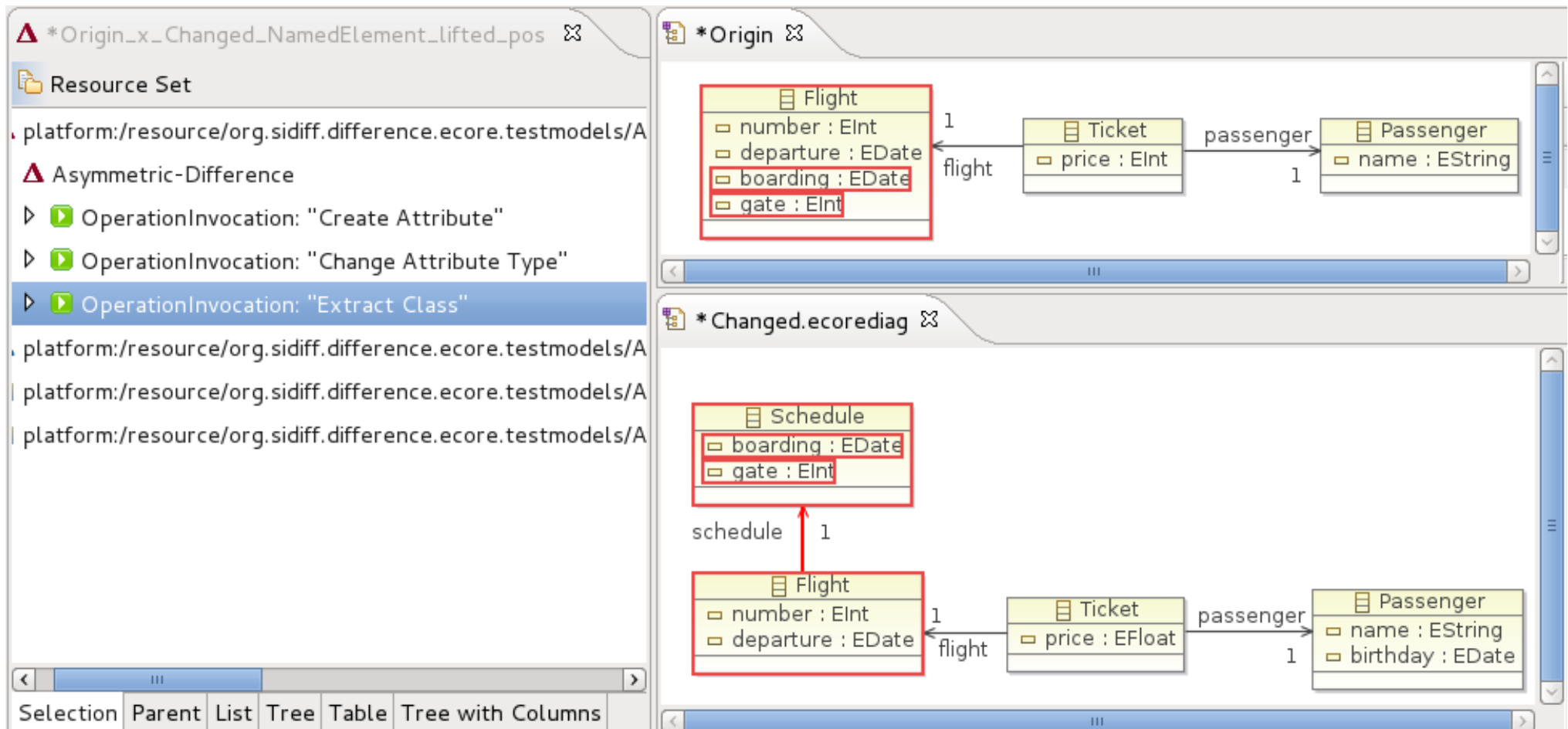
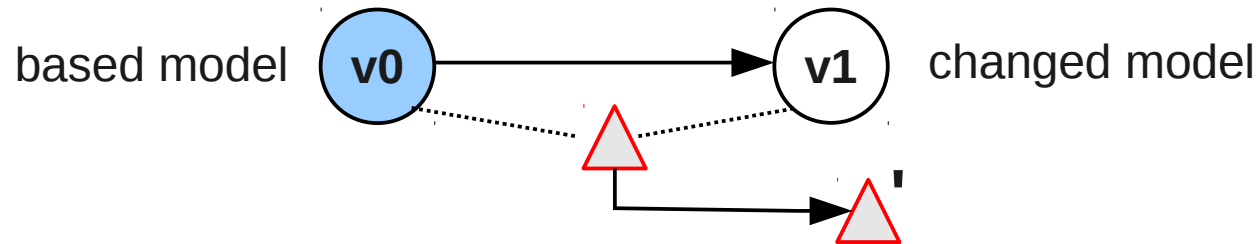
Consistency-preserving editing of patches



Consistency-preserving editing of patches



Consistency-preserving editing of patches



Controlled application of model patches

Resource - org.sidiff.ecore.examples/AirtravelPatch/Target.ecorediag - Eclipse Platform

File Edit Diagram Navigate Search Project Run EDevTools Window Help

Patch Project Explorer

Target.ecorediag

Target.ecore

airtravel

- Ticket
- Flight
- Passenger -> Person
- Person
- EconomyTicket -> Ticket
- BusinessTicket -> Ticket

Flight

- number : EInt
- departure : EDate

Ticket

- price : EInt

BusinessTicket

- price : EInt

EconomyTicket

- price : EInt

Person

- name : EString
- birthday : EDate

Passenger

- birthday (New)

Passenger (0.44291013)

birthday (New)

EDate

(Missing object: price)

EFloat

S	Type	Description
●	Parameter	ObjectParameter "selectedEObject" is set!
●	Parameter	ObjectParameter "NewTarget" is set!
●	Parameter	ObjectParameter "selectedEObject" not set!
●	Parameter	ObjectParameter "NewType" is set!
●	Henshin	Create EAttribute
●	Henshin	Set EAttribute Type
●	Henshin	Change EAttribute Type
●	EMF-Validation	There may not be two features named 'birthday'

Diagram illustrating the controlled application of model patches in the Eclipse Platform. The interface shows the Target.ecorediag editor with a class diagram for the AirtravelPatch/Target.ecore model. The diagram includes classes: Flight (attributes: number : EInt, departure : EDate), Ticket (attribute: price : EInt), BusinessTicket (attribute: price : EInt), EconomyTicket (attribute: price : EInt), Person (attributes: name : EString, birthday : EDate), and Passenger (attribute: birthday (New)). Relationships include: Flight (1) to Ticket (1) via flight, Ticket (1) to Passenger (1) via passenger, and inheritance from BusinessTicket and EconomyTicket to Ticket, and from Passenger to Person. The Project Explorer shows the Target.ecore file. The Patch tab displays a list of patches applied, including Create EAttribute, Set EAttribute Type, and Change EAttribute Type, with a status table at the bottom. The Target.ecore file is open in the editor, showing the package structure: airtravel (Ticket, Flight, Passenger -> Person, Person, EconomyTicket -> Ticket, BusinessTicket -> Ticket).

Controlled application of model patches

Resource - org.sidiff.ecore.examples/AirtravelPatch/Target.ecorediag - Eclipse Platform

File Edit Diagram Navigate Search Project Run EDevTools Window Help

Patch Project Explorer

Target.ecorediag

Palette

Objects

EPackage

EClass

Connecti...

EReference

Flight

number : EInt

departure : EDate

Person

name : EString

birthday : EDate

Ticket

passenger

BusinessTicket

price : EInt

EconomyTicket

price : EInt

Passenger

flight 1

passenger 1

Retrieveal of operation context

S	Type	Description
●	Parameter	ObjectParameter "sel
●	Parameter	ObjectParameter "Ne
●	Parameter	ObjectParameter "sel
●	Parameter	ObjectParameter "Ne
●	Henshin	Create EAttribute
●	Henshin	Set EAttribute Type
●	Henshin	Change EAttribute Type
●	EMF-Validation	There may not be two features named 'birthday'

core.examples/AirtravelPatch/Target.ecore

Person

EconomyTicket -> Ticket

BusinessTicket -> Ticket

Controlled application of model patches

Resource - org.sidiff.ecore.examples/AirtravelPatch/Target.ecorediag - Eclipse Platform

File Edit Diagram Navigate Search Project Run EDevTools Window Help

Patch Project Explorer

Target.ecorediag

Palette

Objects

Connecti...

EReference

Inheritance

Flight

number : EInt

departure : EDate

Person

name : EString

birthday : EDate

Ticket

passenger

1

BusinessTicket

price : EInt

EconomyTicket

price : EInt

Passenger

1

Operation execution log

target.ecore

Parameter

Description

ObjectParameter "selectedEObject" is set!

ObjectParameter "NewTarget" is set!

ObjectParameter "selectedEObject" not set!

ObjectParameter "NewType" is set!

Henshin

Create EAttribute

Set EAttribute Type

Change EAttribute Type

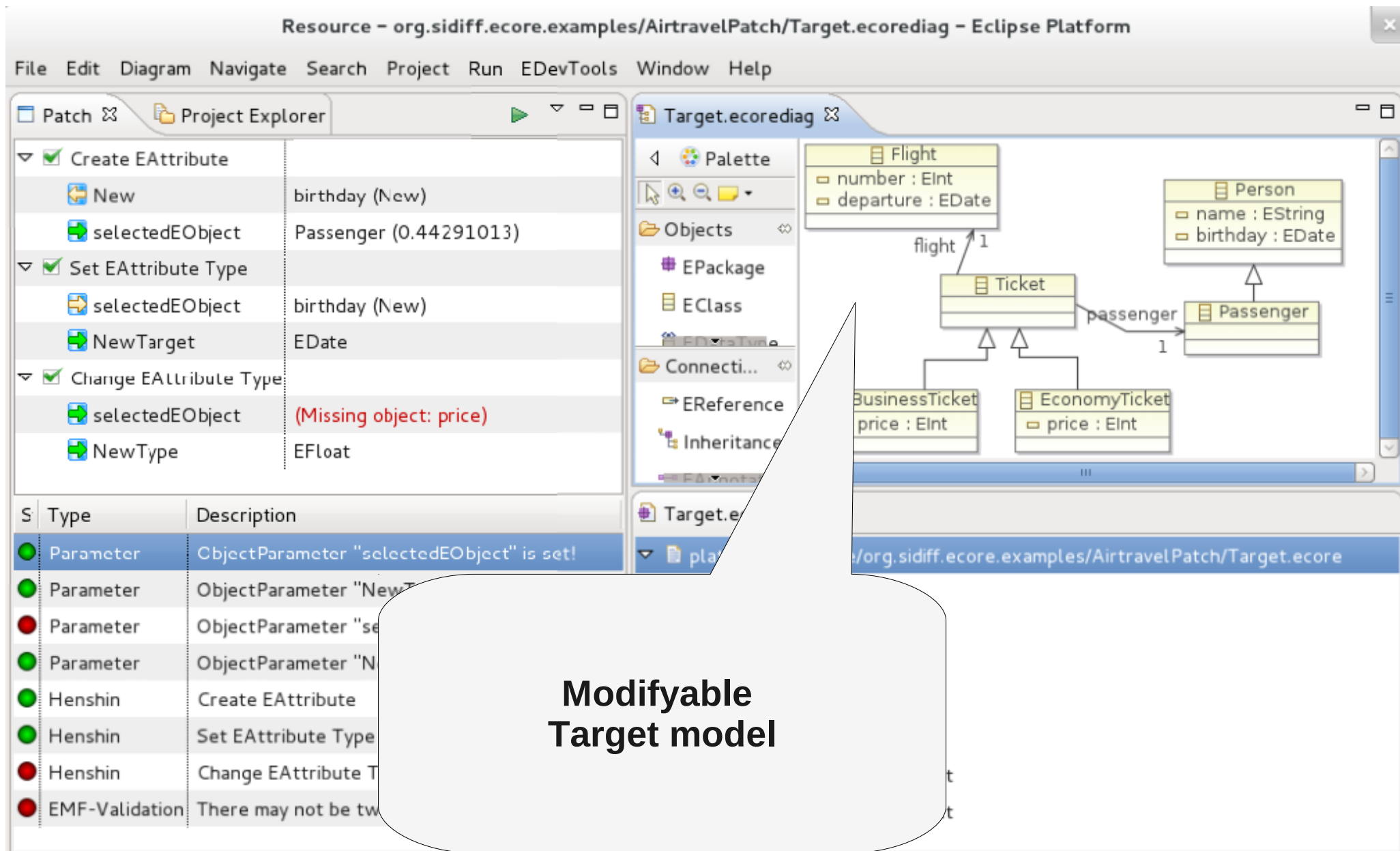
EMF-Validation

There may not be two features named 'birthday'

(Missing object: price)

EFloat

Controlled application of model patches



Controlled application of model patches

Resource - org.sidiff.ecore.examples/AirtravelPatch/Target.ecorediag - Eclipse Platform

File Edit Diagram Navigate Search Project Run EDevTools Window Help

Patch Project Explorer

Target.ecorediag

Palette

Objects

EPackage

EClass

Connecti...

EReference

Inheritance

Flight

number : EInt

departure : EDate

Ticket

BusinessTicket

EconomyTicket

price : EInt

Person

name : EString

birthday : EDate

Passenger

flight 1

passenger 1

Result of the patch application

airtravel

- Ticket
- Flight
- Passenger -> Person
- Person
- EconomyTicket -> Ticket
- BusinessTicket -> Ticket

Parameter	ObjectParameter "NewTarget" is set!
Parameter	ObjectParameter "selectedEObject" not set!
Parameter	ObjectParameter "NewType" is set!
Henshin	Create EAttribute
Henshin	Set EAttribute Type
Henshin	Change EAttribute Type
EMF-Validation	There may not be two features named 'birthday'

Outline

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Summary

Summary

- Unit of change; high-level edit operations
- Formal foundation; graph transformation concepts
- Support for complex edit operations
- High-level conflict and dependency detection
- Consistency-preserving patching

Further information

- **SiLift project web site:**
<http://pi.informatik.uni-siegen.de/Projekte/SiLift>
- Timo Kehrer, Pit Pietsch, Hamed Shariat Yazdi, Udo Kelter. **Detection of High-Level Changes in Evolving Java Software.** WSR 2013
- Udo Kelter, Timo Kehrer, Dennis Koch. **Patchen von Modellen.** Software Engineering 2013
- Timo Kehrer, Udo Kelter, Manuel Ohrndorf, Tim Sollbach. **Understanding Model Evolution through Semantically Lifting Model Differences with SiLift.** ICSM 2012
- Timo Kehrer, Udo Kelter, Gabriele Taentzer. **Integrating the Specification and Recognition of Changes in Models.** WSR 2012
- Timo Kehrer, Udo Kelter, Gabriele Taentzer. **A Rule-Based Approach to the Semantic Lifting of Model Differences in the Context of Model Versioning.** ASE 2011