



Definition and Uses of the i^* Metamodel

Carlos Cares

Universidad de la Frontera (Temuco, Chile)

Xavier Franch, Lidia López, Jordi Marco

Universitat Politècnica de Catalunya (Barcelona, Spain)

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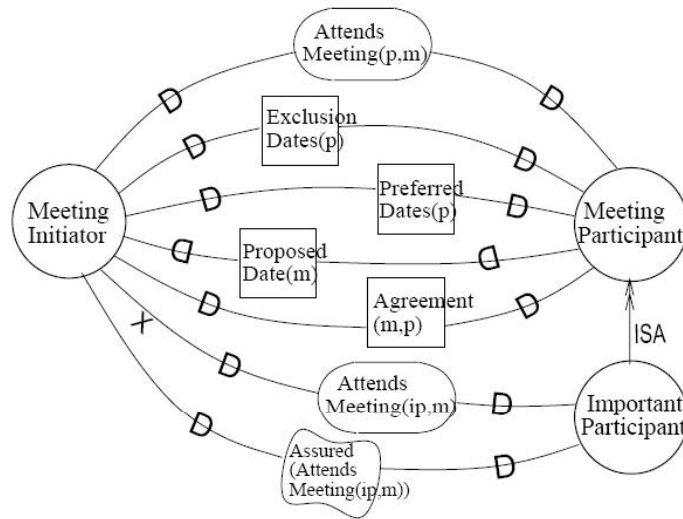


Outline

- ▶ Motivation
- ▶ An i^* metamodel
- ▶ Applications
 - Interoperability
 - Inheritance
 - Metrics
 - Modules
- ▶ Conclusions



Motivation



fit for purpose

evolution

Variants

i* wiki

An *i** Metamodel

An *i** me

as we ha

Attitudes for coping with language heterogeneity:

1. Pick one.

with semantics-preserving refactorings allowed

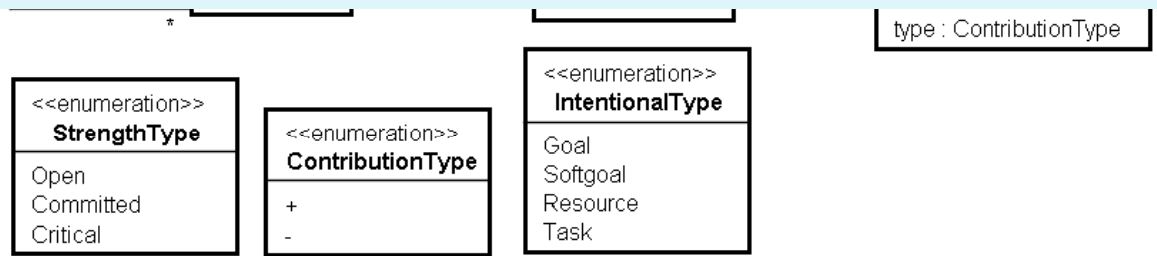
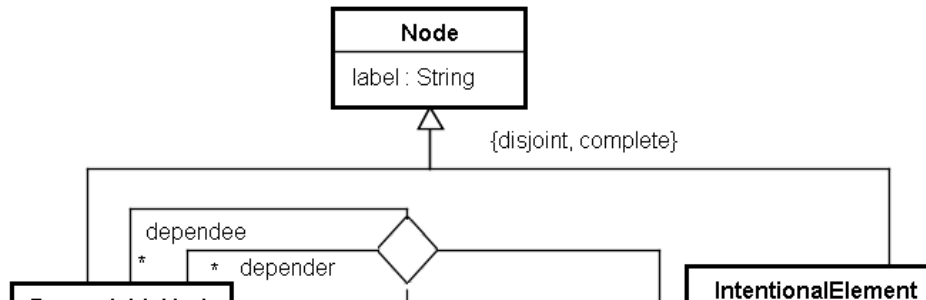
2. Design a “union” language.

3. Design an “intersection” language.

relaxed

4. Give up.

Garlan, Monroe, and Wile (ACME definition, 1997)



Adaptability

Table 17.2
Comparative analysis of the relationships among intentional elements in *r**

	Yu's <i>r*</i>	GRL	Tropos'01	Tropos'02
<i>Means-end</i>	Name	<i>means-end</i>	<i>means-end</i>	<i>means-end</i>
	Connected elements	G → G T → G S R T	T → G T R T → G	G T → T R T → T
	Operation	OR	OR	AND
<i>Decomposition</i>	Name	<i>task-decomposition</i>	<i>decomposition</i>	<i>AND/OR decomposition</i>
	Connected elements	G S R T → T	G S R T → T G	G S T → G S T G S T
	Operation	AND	AND	AND OR
<i>Contribution</i>	Name	<i>means-end</i>	<i>correlation, contribution</i>	<i>contribution</i>
	Connected elements	S T → S		
	Operation	does not exist		
Attributes	+, -, sup, sub	make, break, help, hurt, some+, some-, equal, unknown		

Mainly got via integrity constraints on the metamodel

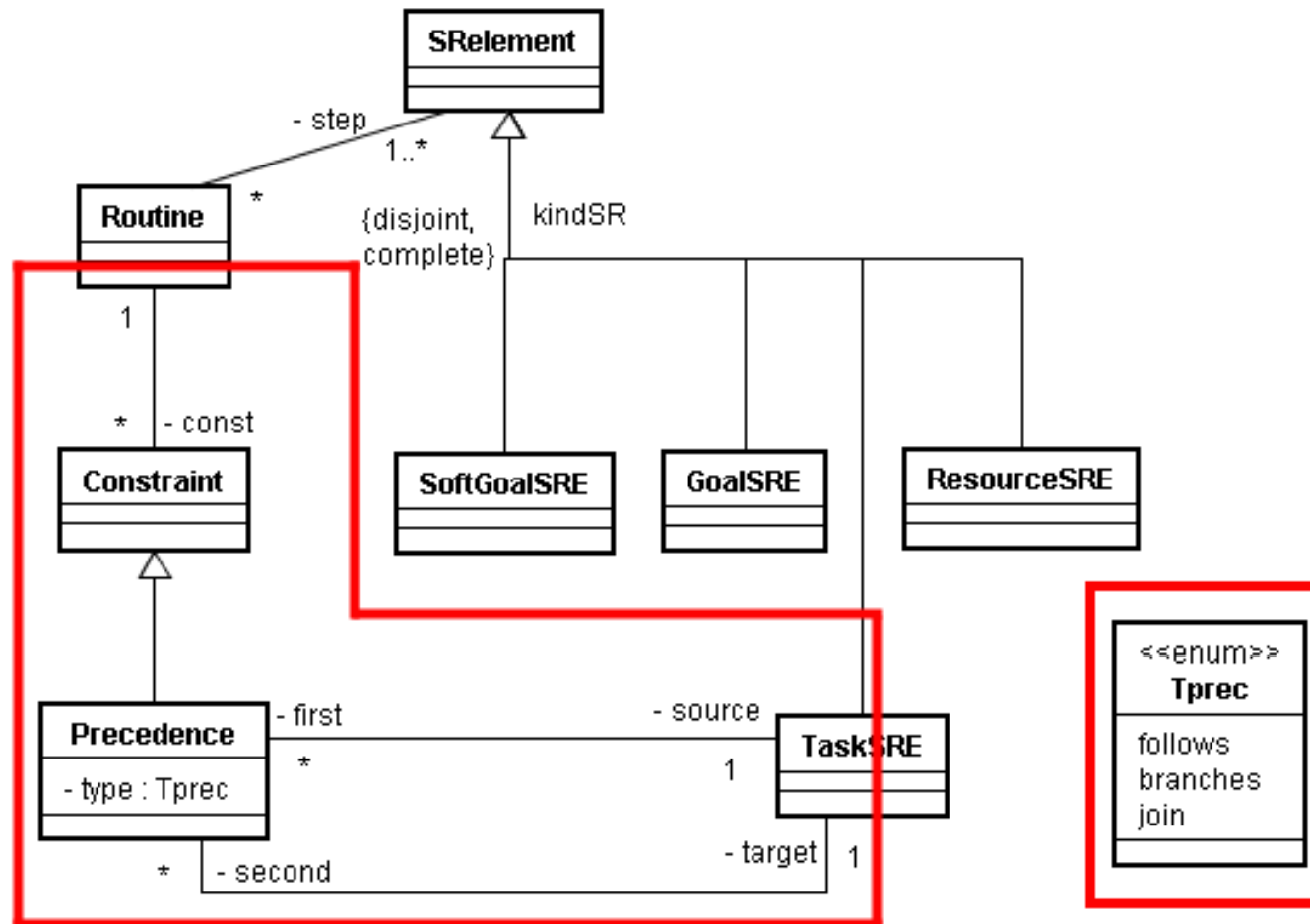
G, goal; S, softgoal; T, task; R, resource; B, belief; L, link (decomposition, contribution, means-end, or correlation).

(Cares et al., 2011)

(Horkoff et al., 2008)

		in A	in Pr	in
Decomposition Links	Decomposition links are drawn directly from goals to tasks	5	4	9
	Decomposition links are used between goals	4	2	6
	Decomposition links are drawn from goals to softgoals	2	3	5
	Decomposition links extend outside actors' boundaries	1	3	4
	Decomposition links are used between Softgoals	2	1	3
	Decomposition links drawn from softgoals to tasks	2	0	2
	Decomposition links are used between resources	1	0	1
	Decomposition links are drawn from goals to resources	0	1	1
Dependency Links	Dependency links are used in more than one strategic relationship	4	4	8
	Softgoal dependency is met by a goal	5	0	5
	Softgoal dependency is met by a task	1	1	2
	Dependency links are used inside actors	0	1	1
	Dependency links do not have dependums	0	1	1
	Dependencies link to actor boundary	0	1	1
Means-Ends Links	Means-Ends links are used between tasks	2	1	3
	Means-Ends links are used between goals	1	2	3
	Means-Ends extend outside actors' boundaries	0	3	3
	Means-Ends are drawn from goals to softgoals	2	0	2
	Means-Ends are drawn from goals to tasks	1	1	2
	Means-Ends are drawn from softgoals to goals	1	1	2
	Mean-Ends are used between softgoals	1	0	1
	Means-Ends are drawn from resources to goals	0	1	1
	Contribution links extend outside actors' boundaries	1	5	6

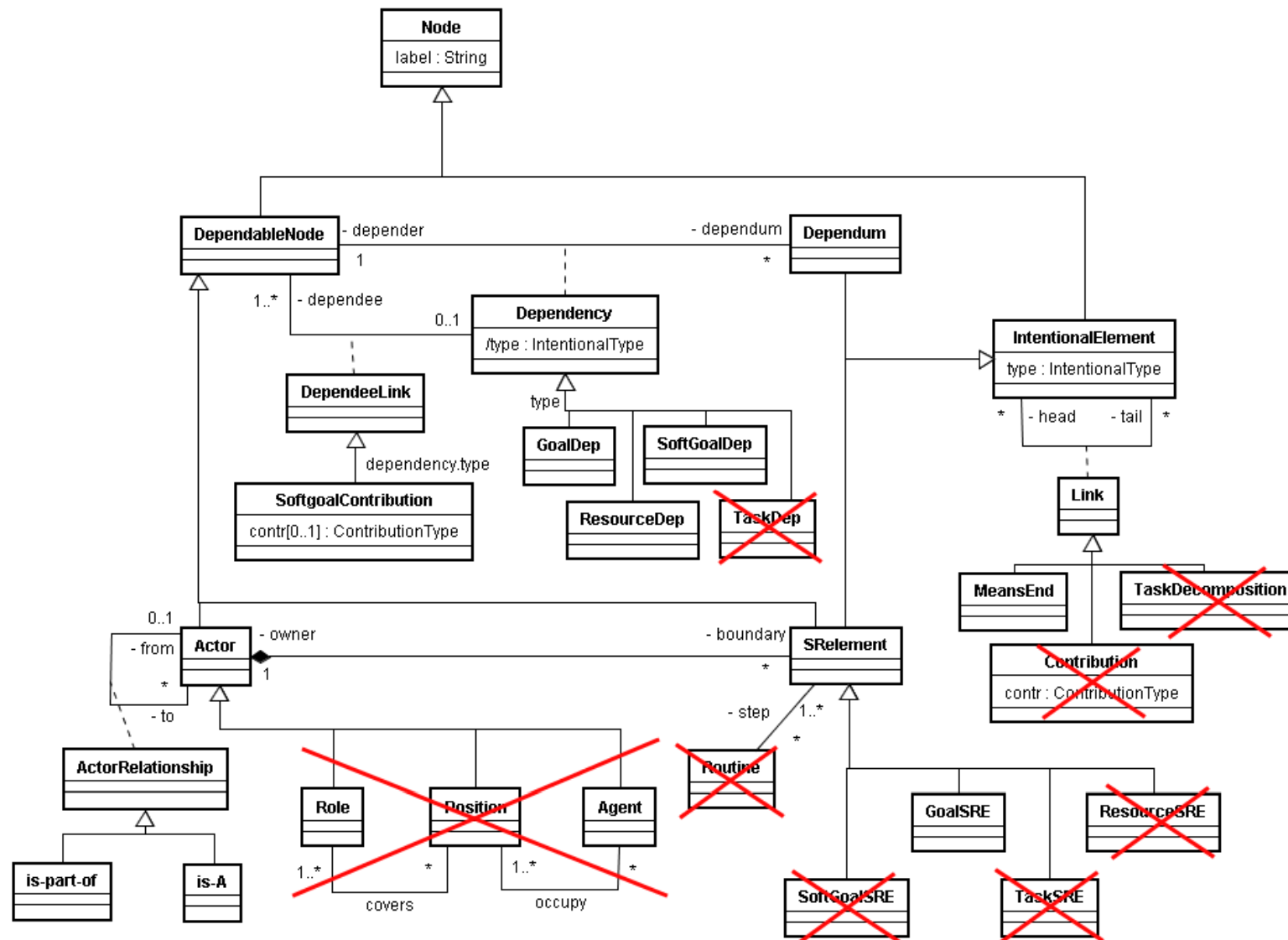
Extensions



BPM case (CAiSE'09)

several constraints

Projections



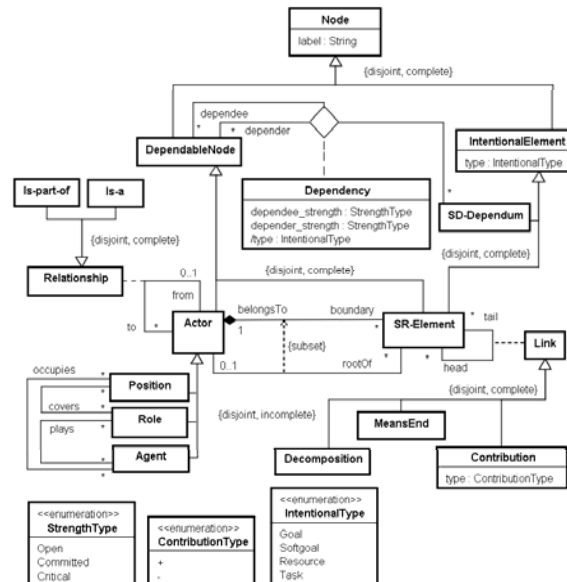
Applications

modularization

pragmatics

inheritance

formalization

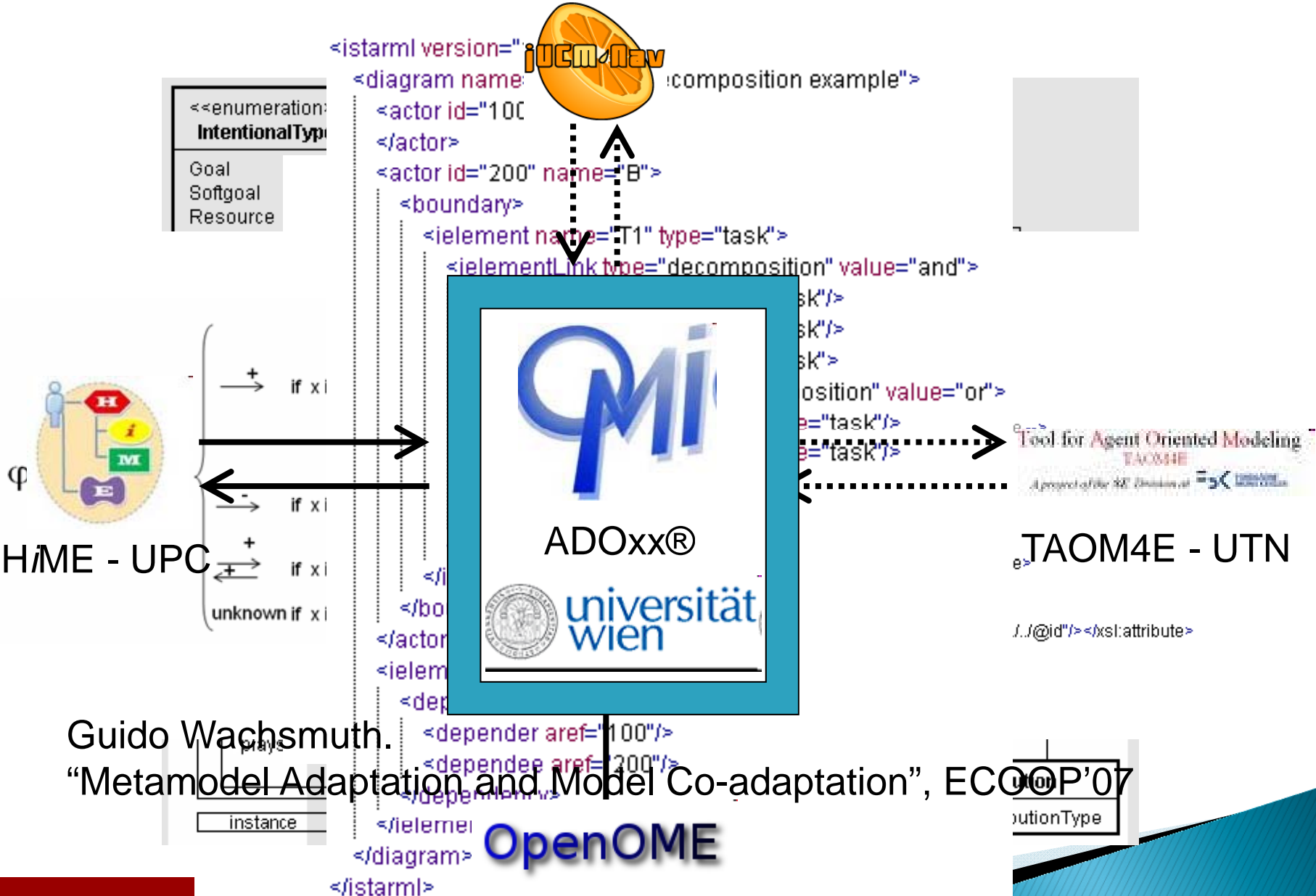


interoperability

iStarML

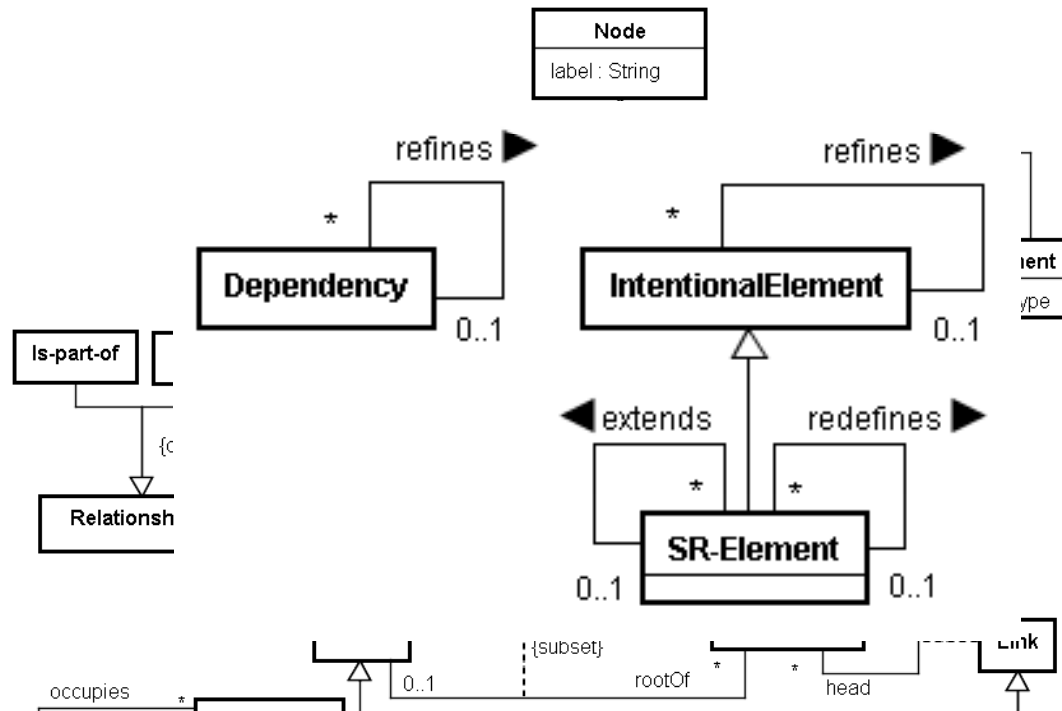
measurement

iMDF



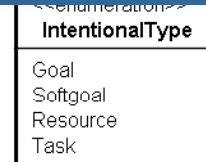
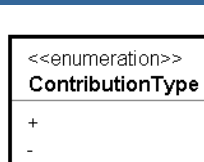
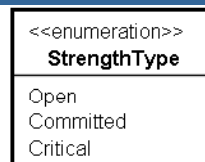
Guido Wachsmuth. "Metamodel Adaptation and Model Co-adaptation", ECOOP'07

Inheritance

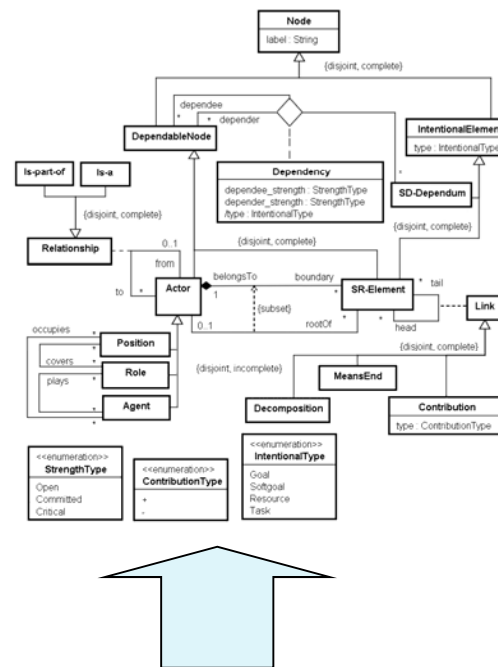


```

context IntentionalElement::correctRefinement(): Bool
pre: self.refines[refined] <> null
post: result = self.refines[refined] <> softGoal implies self.tail.size() = 0
    
```



(Thanks for answering the survey 😊.)



context Dependency::metric(): Type

post: result = self.dependency.dependum.filter() *

ownerActor(self.dependency.depender).correctionFactorDer() *

ownerActor(self.dependency.dependee).correctionFactorDee()

CAiSE'08 actorDependencies(self)->size() = 0 implies

result = actorDependencies(self).predicatibility()->sum()

CAiSE'06 / actorDependencies(self)->size()

Metrics Formulation

AAF

Proportion of total activities in a process that are either interactive or automated.

context *Elem::metric(): Type*
post: *Size = 0 implies result = 1.0*
post: *Size > 0 implies result = Value / Size*

Balasubramanian, S., Gupta, M.:

metric ::= AAF

Elem ::= Routine

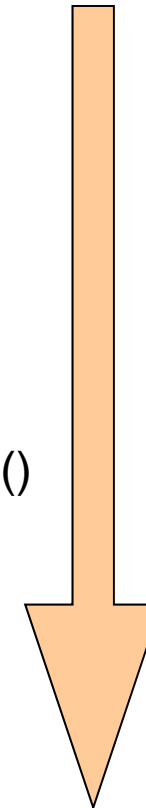
Type ::= Float

Size ::= self.step.oclAsType(TaskSRE)->size()

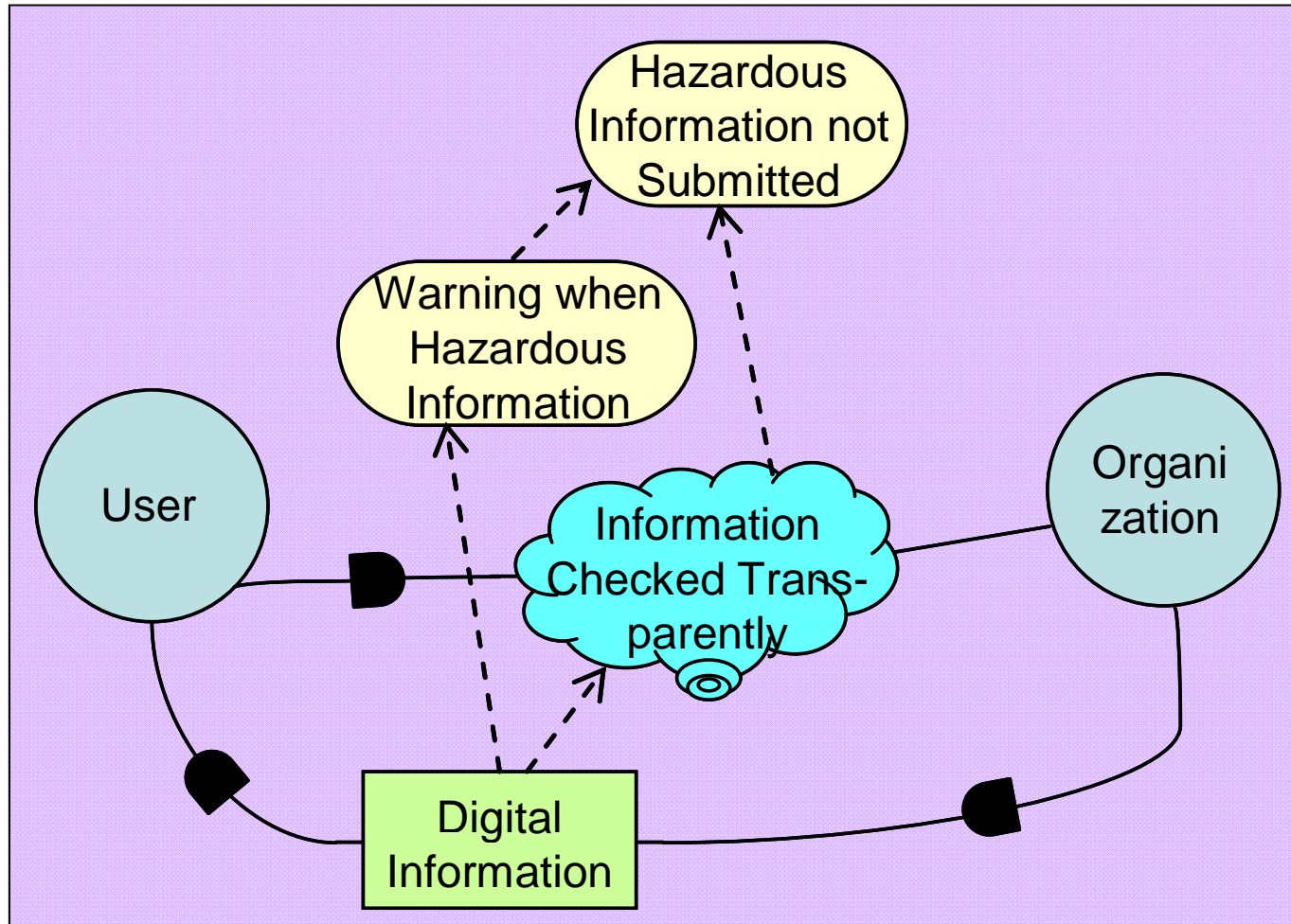
Value ::= self.step.oclAsType(TaskSRE)->
 select(interactive() or automated())->size()

TaskSRE::interactive() ::=

isHuman(self.owner) and
 exists(t | self.allSubtasks()->includes(t)
 and t.**requiresSoftware**())



Modularization



Dependency module

Modularization

```
apply(m: Model, a: i*-Module, depMtch: Set(dpdm: Dependum, x: DependableNode))
  /* common nodes are of the same type */
pre compatibleNodes(allNodes(m), allNodes(a)) -- nodes in m not in a are not
  /* the dependency matching is correct */           -- considered
pre depMtch->forAll(
  allNodes(a)->includes(dpdm) and
    dpdm.dependency.isOclTypeOf(DependencyWithoutDependee) and
  allNodes(m)->includes(x) and not allNodes(m).label->includes(dpdm.label) and
  compatibleLinkEndPoints(dpdm.dependency.depender, x))
  /* the nodes in the module are included in the model */
post hasNodes(m, allNodes(a))
  /* the nodes keep being compatible after the application */
post compatibleNodes(allNodes(m), allNodes(a))
  /* the matching has been applied in the model */
post depMtch->forAll(
  allNodes(m).label->includes(dpdm.label)) and
  allNodes(m)->select(label = dpdm.label).
    dependency.depender.label = dpdm.dependency.depender.label and
  allNodes(m)->select(label = dpdm.label).dependency.dependee = x))
```

Conclusions

- ▶ Our position: importance of an i^* metamodel
 - For clarification
 - For model interchange
 - For supporting extensions and customizations
- ▶ Although it seems not to be an universal agreement
 - Let each community have theirs?
 - Including technology-oriented?
- ▶ Still matter of discussion...



Thanks for your attention!

Contact me at franch@essi.upc.edu

Visit our website <http://www.essi.upc.edu/~gessi>

