

EXTENSION SPECIFICATION

***Xipho: Extending Tropos to Engineer Context-Aware
(RECREATED)***

Researchers: <i>Enyo Gonçalves</i>
Email: ejtg@cin.ufpe.br

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PRESENTATION OF THE ISTAR EXTENSION: Xipho: Extending Tropos to Engineer Context-Aware (RECREATED)

This document specifies the following iStar extension: Xipho: Extending Tropos to Engineer Context-Aware (RECREATED). The list of constructs included, their descriptions and representations are presented following. The metamodel is also presented.

A general description should be introduced here to present an overview of the iStar extension proposed. The iStar extension metamodel should be presented and described here.

We selected the iStar extension Murukannaiah, P., Singh, M. Xipho: Extending Tropos to Engineer Context-aware Personal Agents, International Conference on Autonomous Agents and Multi-Agent Systems, 2014. It was choice because it has conflict, incompleteness (Absence of a metamodel). Although a metamodel of another paper has been mentioned by this paper, it does not refer to this iStar extension.

The number of problems in original and recreated versions is presented in the table following.

Evaluation criteria	Original	Recreated
PIM1	4	0
PIM2	1	0
PIN1	0	0
PIN2	0	0
PCO1	0	0
PCO2	2	0
PCO3	0	0
PCO4	0	0
PCO5	0	0

- PIM1: Non-definition of the meaning of the constructors introduced;
- PIM2: Non-representation of the extension in the abstract syntax;
- PIN1: Inconsistencies with iStar default syntax due absence of nodes and links;
- PIN2: Inconsistencies between the abstract syntax and concrete syntax;
- PCO1: One concept with two or more representations in concrete syntax;
- PCO2: Two or more concepts with only one construct in concrete syntax;
- PCO3: New Constructs in conflict with the iStar default syntax;
- PCO4: Wrong representation of iStar default syntax construct;
- PCO5: Representation of constructs that are not part of the extension.

1 Analyse The Need For Extension Proposal

1.1 Study a domain/application area

It was not necessary contact experts in domain/application area in this task. We just did a survey of the article references, which are probably what the author used to extract the concepts added by the extension. The following list of references follows:

ID_reference	Reference
REF_SPCP1	M. Baldauf, S. Dustdar, and F. Rosenberg. A survey on context-aware systems.

	Int. J. Ad Hoc Ubiquitous Comput., 2(4):263{277, June 2007
REF_SPCP2	C. Bettini, O. Brdiczka, K. Henriksen, J. Indulska, D. Nicklas, A. Ranganathan, and D. Riboni. A survey of context modelling and reasoning techniques. Perv. Mob. Comput., 6(2):161{180, Apr. 2010.
REF_SPCP3	C. Bolchini, G. Orsi, E. Quintarelli, F. A. Schreiber, and L. Tanca. Context modeling and context awareness: Steps forward in the Context-ADDICT project. IEEE Data Eng. Bull., 34(2):47{54, 2011.
REF_SPCP4	S. Ceri, F. Daniel, M. Matera, and F. M. Facca. Model-driven development of context-aware web applications. ACM TOIT, 7(1), Feb. 2007.
REF_SPCP5	J. Hong, E.-H. Suh, J. Kim, and S. Kim. Context-aware system for proactive personalized service based on context history. Expert Syst. Appl., 36(4):7448{7457, May 2009.
REF_SPCP6	K. Krippendor, Reliability in content analysis. Human Comm. Res., 30(3):411{433, 2004.
REF_SPCP7	P. Bresciani, A. Perini, P. Giorgini, F. Giunchiglia, and J. Mylopoulos. Tropos: An agent-oriented software development methodology. JAAMAS, 8(3):203{236, May 2004.
REF_SPCP8	Dalpiaz, F., Franch, X., Horkoff, J. iStar 2.0 Language Guide. arXiv:1605.07767, May 2016, Available in http://arxiv.org/pdf/1605.07767v1.pdf

1.2 Identify the concepts to be introduced by the extension

We identified 6 concepts to be introduced by the extension, being 3 nodes and 3 links.

ID_concept	Name of the Concept	Reference
<i>Nodes</i>		
CON_XIP_01	Plan	REF_SPCP7
CON_XIP_02	Contextual resource	REF_SPCP1
CON_XIP_03	Contextual belief	REF_SPCP1
<i>Links</i>		
CON_XIP_04	Context-means	REF_SPCP2
CON_XIP_05	Or refinement*	REF_SPCP8
CON_XIP_06	And refinement*	REF_SPCP8

This extension introduced a notation to represent *and* and *or* in means-end links. However, iStar 2.0 created a new representation to this links. Thus, we maintained these links in the list of concepts included by the extension once the original paper included them, but we used the concepts from iStar 2.0 here.

1.3 Contact experts and Model an example with the identified concepts using iStar

We did not have any doubts about the domain/application area, so we did not contact these experts. We also did not have any doubts about the domain concepts which is possible to represent with iStar without creating new representations and what is not possible to identify with iStar.

1.4 Search if there is an extensions related to the new proposal in iStar extensions catalogue

It was searched in the repository using context term. Five extensions were found but none of them is related to this extension. Thus, we can conclude that, excluding these articles, there is no extension proposed for this purpose.

For the next process gateways the flow is: To Is there an extension suitable for your need? - Is not the extension related to a domain / application area? - Y. Thus, activity 1.2. Study a domain / application area is started.

2 Conceptualise the iStar extension

2.1 Search and select constructs to be reused.

The list of found constructs is shown below:

ID_concept	Name of the Concept	Reference of Extension to be reused
<i>Nodes</i>		
CON_XIP_01	Plan	Bresciani, P., Perini, A., Giorgini, P., Giunchiglia, F., Mylopoulos, J. Tropos: An Agent-Oriented Software Development Methodology, Autonomous Agents and Multi-Agent Systems Journal, 2004.
<i>Links</i>		
CON_XIP_05	Or refinement	Dalpiaz, F., Franch, X., Horkoff, J. iStar 2.0 Language Guide. arXiv:1605.07767, May 2016, Available in http://arxiv.org/pdf/1605.07767v1.pdf
CON_XIP_06	And refinement	Dalpiaz, F., Franch, X., Horkoff, J. iStar 2.0 Language Guide. arXiv:1605.07767, May 2016, Available in http://arxiv.org/pdf/1605.07767v1.pdf

We found two constructors to be reused. The original version of the recreated extension represented the plan by a octagon. Plan can be reused from TROPOS (A new graphical representation for it was proposed by the paper Gonçalves, E., Almendra, C., Castro, J., Araújo, J., Goulão, M. Using Empirical Studies to Mitigate Conflicts in iStar Extensions, Software and Systems modelling (Under review), 2018).

iStar 2.0 introduced the standardisation of *and* and *or* links using the refinement link. The representation of And-refinement in iStar 2.0 is the same of decomposition in the initial version of iStar (i.e. a t-shaped form) and Or-refinement is represented by the means and representation (without the word or).

2.2 Define extension's concepts

The definition of the extension's concepts is presented in following table.

ID_concept	Name of the Concept	Definition	Reference
<i>Nodes</i>			
CON_XIP_01	Plan	A set of actions performed to achieve a goal	REF_SPCP7
CON_XIP_02	Contextual resource	A resource that depends of a context	REF_SPCP1
CON_XIP_03	Contextual belief	A belief that depends of a context	REF_SPCP1
<i>Links</i>			
CON_XIP_04	Context-means	The objective of context-means analysis is to identify scenarios where an actor's context provides the application a means of making a decision	REF_SPCP2
CON_XIP_05	Or refinement	The fulfillment of at least one child makes the parent fulfilled. This relationship allows for a single child.	REF_SPCP8
CON_XIP_06	And refinement	The fulfillment of all the n children ($n \geq 2$) makes the parent fulfilled;	REF_SPCP8

2.3 Analyse how the extension constructs can be integrated with the iStar constructs

We tried to relate the concepts to be introduced with the iStar standard concepts. So, we concluded that we could specialise two iStar constructs. Contextual resource and Contextual belief can be represented as a kind of resource and goal, respectively. The list of the relation between extension and iStar constructs is given in Table VI.

Plans can be linked to goals and qualities by OR-refinement and context-means links. Plans can be liked to other plans by or-refinement.

ID_concept	Name of the Concept	Relation with iStar constructs
<i>Nodes</i>		
CON_XIP_02	Contextual resource	<i>This construct can be represented by a specialization of the resource.</i>
CON_XIP_03	Contextual belief	<i>This construct can be represented by a specialization of the belief.</i>

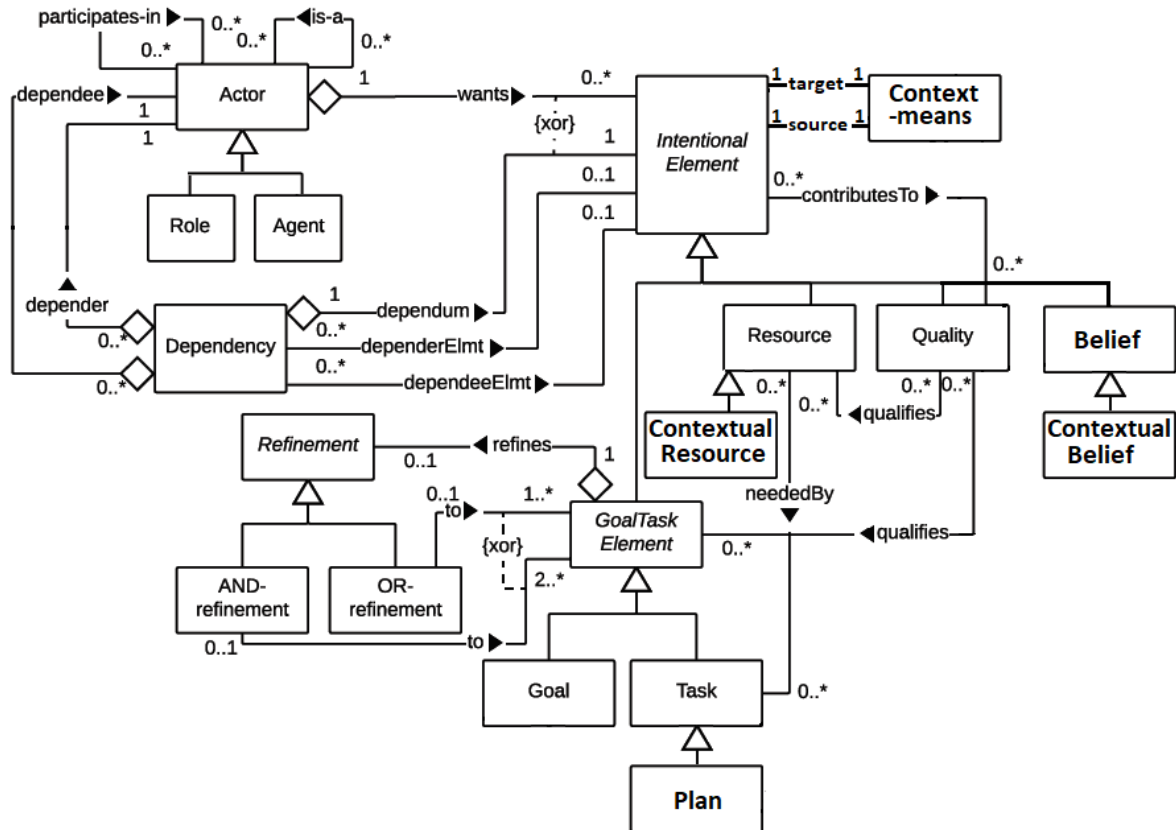
3 DEVELOP ISTAR EXTENSION

3.1 Define metamodel of extension

We included the concepts identified in the List of concepts to be introduced in the iStar metamodel. We considered the relationship of extension's constructs and iStar constructs in this step. The result is presented in the figure below.

The new metaclasses Plan, Contextual resource and Contextual belief were created by specialising the existing iStar constructs. The context-means link is represented by a new relation between intentional elements.

It was not necessary to add validation rules in this extension (task 3.2).



3.2 Define validation rules of extension

It was not necessary.

3.3 Define concrete syntax of extension

The representations of extension's constructs are presented in next table. We used the iStar extensions catalogue to identify the representation of reused constructs. We considered the results of experiment (Gonçalves, E., Almendra, C., Castro, J., Araújo, J., Goulão, M. Using Empirical Studies to Mitigate Conflicts in iStar Extensions, Software and Systems modelling (Under review), 2018) to help the choice of plan representation. We used the new graphical representations to Contextual resource, contextual belief and context-means introduced by the Murukannaiah, P., Singh, M. Xipho: Extending Tropos to Engineer Context-aware Personal Agents, International

Conference on Autonomous Agents and Multi-Agent Systems, 2014. The results are presented in table following.

ID_concept	Name of the Concept	Representation	Explanation about the graphical representation	Reused?
<i>Nodes</i>				
CON_XIP_01	Plan		The new representation of plan is similar to task but it has only one tip.	Yes
CON_XIP_02	Contextual resource		The authors of the original paper represented this specialisation by the resource with the widest border.	No
CON_XIP_03	Contextual belief		The authors of the original paper represented this specialisation by the belief with the widest border.	No
<i>Links</i>				
CON_XIP_04	Context-means		The authors of the original paper represented this specialisation by a concavity to represents the context.	No
CON_XIP_05	Or refinement		iStar 2.0 represents this link by Or-refinement an arrow with a tip.	No
CON_XIP_06	And refinement		iStar 2.0 represents this link by And-refinement an t-shaped figure.	No

3.4 Check completeness, consistency and conflicts

Completeness

Which level the iStar extension was applied

[X] Concepts definition [X] Metamodel ☐ Well-formedness rules (optional) [X] Concrete syntax

Consistency

List following the concepts in each level

Concept	Concept's definition	Metamodel	Concrete syntax
Plan	[X]	[X]	[X]

Contextual resource	[X]	[X]	[X]
Contextual belief	[X]	[X]	[X]
Context-means	[X]	[X]	[X]
Or refinement	[X]	[X]	[X]
And refinement	[X]	[X]	[X]

Presence of nodes and links of iStar default syntax			
Construct		Metamodel	Concrete syntax
Goal		[X]	[X]
Quality		[X]	[X]
Resource		[X]	[X]
Task		[X]	[X]
Actor		[X]	[X]
Agent		[X]	[X]
Role		[X]	[X]
Refinement		[X]	[X]
Qualification		[X]	[X]
Contribution (make, help, break, hurt)		[X]	[X]
NeededBy		[X]	[X]
Dependency		[X]	[X]
Association links	is-a	[X]	[X]
	Participates-in	[X]	[X]

Conflicts				
List the concepts and verify the occurrence of conflicts between the constructs of the extension and the existing extensions.				
Concept	Conflicts			
	One construct with two or more Symbols	Two of more constructs with only one Symbol	Wrong representation of iStar constructs	Construct which is not part of the extension
Plan	[0]	[0]	[0]	[0]
Contextual resource	[0]	[0]	[0]	[0]
Contextual belief	[0]	[0]	[0]	[0]
Context-means	[0]	[0]	[0]	[0]
Or refinement	[0]	[0]	[0]	[0]
And refinement	[0]	[0]	[0]	[0]

Details about the problem(s): Problems were not identified.

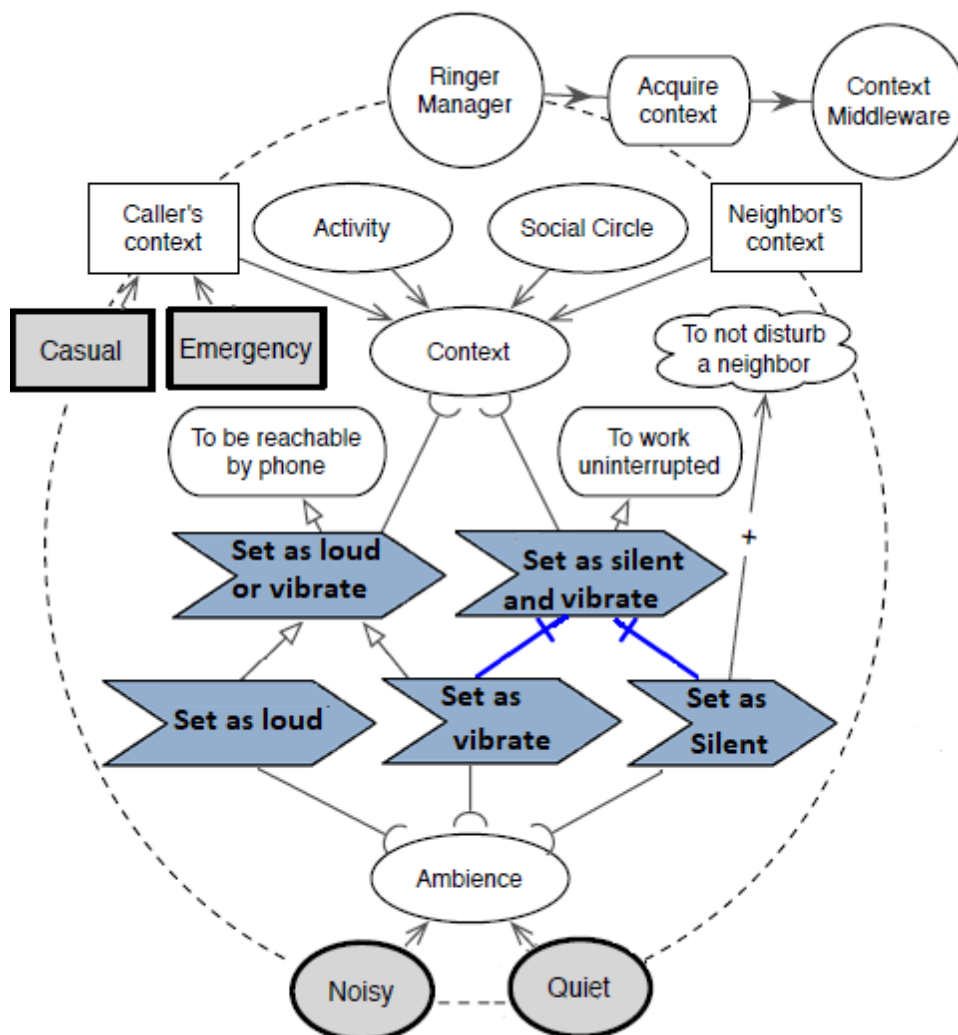
3.5 Apply the extension to a modelling tool

We did not propose a modelling tool. So, the flow goes to 4. Evaluate and validate iStar extension.

4 Evaluate and validate iStar extension

4.1 Use the iStar extension proposed to model a system

You should relate the plans with the related context intentional element by context-means link. The hierarchy of plans should be represented by and-refinement and or-refinement. Next, the contextual belief and contextual resources should be represented.



4.2 Evaluate the iStar extension

We did not perform the evaluation of the iStar extension because we are only revisiting one existing iStar extension. We will propose a new extension using all tasks of the PRISE.