iStarML: an XML-based Interchange Format for *i** Models

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Abstract. There are several tools currently available in the *i** community with different purposes. This situation poses both benefits and difficulties. Benefits, because different groups may be able to share their models and results among their tools, and even connect different tools in order to perform complex processes. Difficulties, because most of these tools differ either in the underlying metamodel of the language, or the format in which they store the models, or in both. To overcome the difficulties and exploit the benefits, we have defined the iStarML model interchange format as a practical solution to this problem. In this paper we present the research line which supports this outcome. We present its motivation, objectives and current outcomes, the expected contributions and finally our on going and future work.

1 Introduction

The *i** framework has been recognized like both: a goal-oriented and agent-oriented modelling framework. Several extensions and variants to the original framework have been defined in order to handle different modelling situations. Most recent approaches aim at dealing with the increasing complexities in developing nowadays information systems, which need to operate in open, heterogeneous and evolving environments. This has implied a diversity of *i** applications on a wide research community[3].

In general, existing *i**-based tools and development frameworks are not capable to interoperate, which prevents taking advantage of existing functionalities. One of the main reasons related to the lack of interoperability of different *i** frameworks is that the different *i**-based proposals use, define, or redefine the syntax or even the semantics of the seminal *i** constructs. Among the main *i** variations are: the seminal proposal, the variation presented as the modelling language of Tropos, the Secure-Tropos (S-Tropos) proposal, the Formal-Tropos (F-Tropos) proposal and the URN/GRL proposal. Moreover different tools are supporting these variants which have configured a global scenario where reusing diagramming and/or analyzing tool capabilities are a serious difficulty. In table 1 we present a summary of the *i** tools and their main interoperability features. Table 1 mainly shows that in spite of using similar technologies the specific store formats, these are all different ones.

[3] For a more complete idea on the prolific community working around *i** you may visit the *i** wiki page at http://istar.rwth-aachen.de.

Table 1. Interoperability scenario of *i** tools, extracted from http://istar.rwth-aachen.de

*i** Tool	Institution	*i** variant	Importing file formats	Exporting file formats	Technology
OpenOME	University of Toronto	*i** / GRL	.tel .sml .vdx	.tel .vdx	Eclipse plug-in
OME		*i** / GRL	.tel .sml	.tel	Java
REDEPEN-REACT	City University & Tec. University of Catalonia	*i**	Visio XML	Visio XML	Visio plug-in
TAOM4E	Foundazione Bruno Kessler	Tropos	XMI (Tropos)	XMI (Tropos)	Eclipse plug-in
ST-Tool	University of Trento	S-Tropos / F-Tropos	Datalog files	Own XML F-Tropos, Datalog,	Java/Datalog
J-PRIM	Tec. University of Catalonia	*i**	No	No	Java/MySql
jUCMNav	University of Ottawa	GRL / URN	XMI (URN) own XML	XMI (URN) own XML	Eclipse plug-in
DesCARTES	Catholic Univ. of Louvain	*i** / Tropos	Own XML	Own XML, SQL, JACK	Eclipse plug-in

2 Objectives of the Research

Our work has focused on practical issues related to *i** interoperability. In particular, our main objective is to provide a formal representation where differences and similarities among *i** variants are explicit, generating a common representational framework for the *i** community and, in spite of the differences, enabling effective communication inside the community, tool interoperability and a common representation for repository of *i** models. Therefore we have worked with three specific objectives in mind: (i) To propose an interoperability language using a contemporary and easy-to-adopt technology and, at the same time, based on a core common set of *i** concepts, (ii) To propose an interoperability scenario to help understanding the roles of different *i** -related tools on software and organizational process, and (iii) To get a formal specification of the common and abstract conceptual framework to allow dealing with current and maybe future *i** differences and be helpful to design new and useful *i** variations.

We have already reached the first objective. A preliminary work was about understanding the *i** variations, their differences and similarities [1], then we extended this work including a study of the maturity of the common *i** concepts on most widespread *i** variations and we created an *i** Reference Model including many *i** variation communalities [2]. From here we have extracted a core set of abstract and common concepts which has been the platform for defining an XML-based language for *i** model interoperation named iStarML [3]. In table 2 we show the core concepts and their corresponding iStarML tags. Also we have included some of the main options in order to illustrate how particular *i** constructs can be represented.

Table 2. Core concepts of *i**-based modelling languages and proposed XML tags for iStarML

*i** core concept	iStarML Tag	Main attributes or subtags
Actor	<actor>	*type* attribute to specify different types of actors (e.g. agent)
Intentional element	<ielement>	*type* attribute to specify different kind of intentional elements (e.g. goal)
Dependency	<dependency>	Can contains two subtags: <dependee> and <depender>
Boundary	<boundary>	*type* attribute for representing future variations on boundary conceptualizations
Intentional element link	<ielementLink>	*type* attribute to specify types of intentional relationships (e.g. contribution) *value* attribute to specify values related to the relationship (e.g. +,++,-,++)
Actor association link	<actorLink>	*type* attribute to specify different types of actors' associations (e.g. is_part_of)

3 Scientific Contributions

We believe that proposing an interoperability solution to the *i** community can positively impact on it enabling the synergy among groups and among specific frameworks and tools. Besides, given that this proposal includes a format specification, it enables the transition from research proposals to industrial applications. Moreover we think that the definition and adoption of a reference format based on a limited set of concepts, flexible enough in order to consider the different existing *i** variations and also extensible in order to consider new variations, would help to reach interoperability objectives. In particular, we believe that the definition of iStarML allows: (i) having a file format for diagrams interchanging among existing and new tools; (ii) motivating the development and compliance of drawing tools to the defined format; (iii) developing *i**-based analysis algorithms independently of the graphic issues; (iv) extending existing tools with new *i**-based analysis components; (v) representing specific additional syntactic constraints to specify evolutions or new variations; (vi) having a common way of representing the differences and similarities between existing *i** variations.

However, this interesting set of benefits depends on the acceptability of the proposal which could be engaged offering tools that helps its implementation and mainly, having a flexible perspective for including the mainstream lines inside the *i** research activity. About the first point we have already developed a Java Library for checking, creating, importing and exporting iStarML files. About the second one, we are applying a survey to get information which would help to improve the proposal.

4 Conclusions

In this paper we have reviewed the join activity among the Technical University of Catalonia and IRST in order to propose an interoperability framework for the *i** research community. We have presented the scenario which motivates this initiative, which is characterized such as highly prolific, with conceptual *i** variants and

derivations, and having a wide set of isolated tools. We have presented our objectives where the focus is on three points: (i) the proposal of a interoperation language: iStarML, which has been already reached, (ii) the proposal of an interoperability scenario which helps to understand the roles of different *i** -related tools on software and organizational process, and (iii) to get a formal specification of the common and abstract conceptual framework. Finally we have presented 6 expected benefits for *i** models interoperability which, we claim, can be achieved with the iStarML proposal.

5 Ongoing and future work

In order to finish this initial step of proposing iStarML, we have planned to test this first version following two experiences of interconnecting *i**-related tools. One of them is already working as a prototype, connecting the J-PR*i*M editor subsystem with the Decision King variability modelling tool [4]. Also we are applying a survey to analyze the perception on iStarML constructs. We hope it obtains interesting feedback in order to improve the current iStarML version and get a revised new version. About the other objectives we are formulating interoperability scenarios which use *i** itself like representational mechanism, i.e. we are proposing agent-oriented socio-technical perspectives for *i** interoperability. Finally, our future work is planned to get a formalization of the common structure of iStarML which would allow discovering or avoiding inconsistencies and projecting new *i** variations and applications which can be developed under a shared interoperability scenario.

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