Semantic Consistency in Enterprise Models – Through Seamless Modelling and Execution Support

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Abstract. Semantic consistency, in context of a socio-technical view on Enterprise Information Systems (EIS), concern consistency between Enterprise Models, Conceptual Models expressed in professional language, Information Systems models and the factual data manipulation and functions implemented in runtime IT artefacts. CoreWeb, an environment for modelling and testing conceptual models, implemented as an easy to use web service, provide support for model editing and execution, semantic consistency exploration and checking as well as producing documentation for either requirement specifications and/or for execution in model driven runtime environments such as CorePro. CoreWeb modelling views and features are presented in the paper and illustrated in the Demo comprising a walkthrough of a case supporting dialog and model verification between users, domain experts, modellers and system designers.

Keywords: Information Systems, Phenomena Modelling, Semantic Quality, Natural Language, Modelling Environment, Model Execution

1 Background

Conceptual models can be used to reflect relevant concepts of an enterprise and play an important role in communication between users, domain experts, modellers and system designers, in the life cycle management of IT based Information Systems (ITbIS).

If the Enterprise Information System (EIS) is regarded as a socio-technical system i.e. a system of people and information artefacts, the semantic consistency of a conceptual model as a foundation for ITbIS development, can only be fully evaluated with the resulting ITbIS put in context of the socio-technical EIS. This evaluation will of course only be relevant if the ITbIS implementation accurately correspond to the semantic model.

Additionally, the socio-technical systems are comprised of various enterprise actors with different semantic perspectives. If the semantic model is to be con-

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sistent with these perspectives, the semantic modelling facility should include a perspective-modelling component.

The life cycle process, from conceptual model to target ITbIS, in traditional approaches, involves several steps of manual transformations of what the conceptual model expresses. Each step involves several degrees of freedom for design and implementation compromises resulting in deviations from the statements of the conceptual model. However, with a semantic model driven ITbIS, i.e. semantic model execution, free from manual transformation processes, consistency between model and implementation could be guaranteed.

2 Approaches to conceptual model execution

Environments executing conceptual models in purpose of verifying conceptual consistency exist, such as *Merode* [1] a modelling and model execution environment aimed at practitioners and students. Merode however does not support multi perspectives modelling, such as suggested in [2].

Core Enterprise Architecture Framework (CoreEAF) is a process agnostic, rule based, reference architecture and modelling method for multi perspectives information systems, proven to be viable for large scale information systems development [3] in combination with CorePro model and runtime environment (a C++, SQL and XSLT based information systems platform).

3 CoreWEB

CoreWEB is an experimental (non commercial) modelling and execution WEB *service* based on CoreEAF. CoreWEB is aimed at students and practitioners who want to focus on enterprise phenomena modelling with multi-actor perspectives.

The CoreWEB project was initiated in 2015 with the key target to simplify the 'model to system' process as well as exploring various new modelling and system quality aspects.

CorePros web based modelling component was partly reused and extended. A new (and compared with CorePro) simplified system execution strategy was designed, including Javascript code generation for phenomena model execution, a model driven user interface engine with user interface model editing capability and a web service platform.

CoreWEB, apart from being a WEB service, offers new features focusing on semantic quality for both conceptual model and system. Adding professional language sentences feedback (currently in Swedish and English). A semantic user interface model ensures semantic consistency between model and user interface, an auto layout system enforce a syntactically consistent user interface.

As an experiment and requirement elicitation driver, CoreWEB, with some additions, has been used for a limited production system case (Lazarus, a live action role play event association with 600 members).

Environment and demonstration videos are available from Association for Model Enabled Information Systems. https://ameis.se/cml/index.htm

4 Demo of CoreWEB

The CoreWEB phenomenon type-modelling component has some different views Fig. 1. The phenomenon map, is a two dimensional map of types of phenomena and their basic relationships, used for model navigation. The definition of a phenomenon type is comprised of attribute definitions. Types of phenomena and their attributes, except Boolean attributes, should be labelled with nouns or noun phrases, in stating both singular and plural forms.

In the phenomenon map, types of phenomena are displayed using the plural noun form, since the model item represents a set of instances of a certain type. Relation attribute labels are displayed according to their multiplicity, zero-one or zero-many. From the model, a dictionary can be generated, defining each modelled enterprise concept with an auto generated statement. Also when executing the ITbIS, singular and plural noun forms are displayed appropriately, in Fig. 1 for example the 2 possessions list and the owner field.

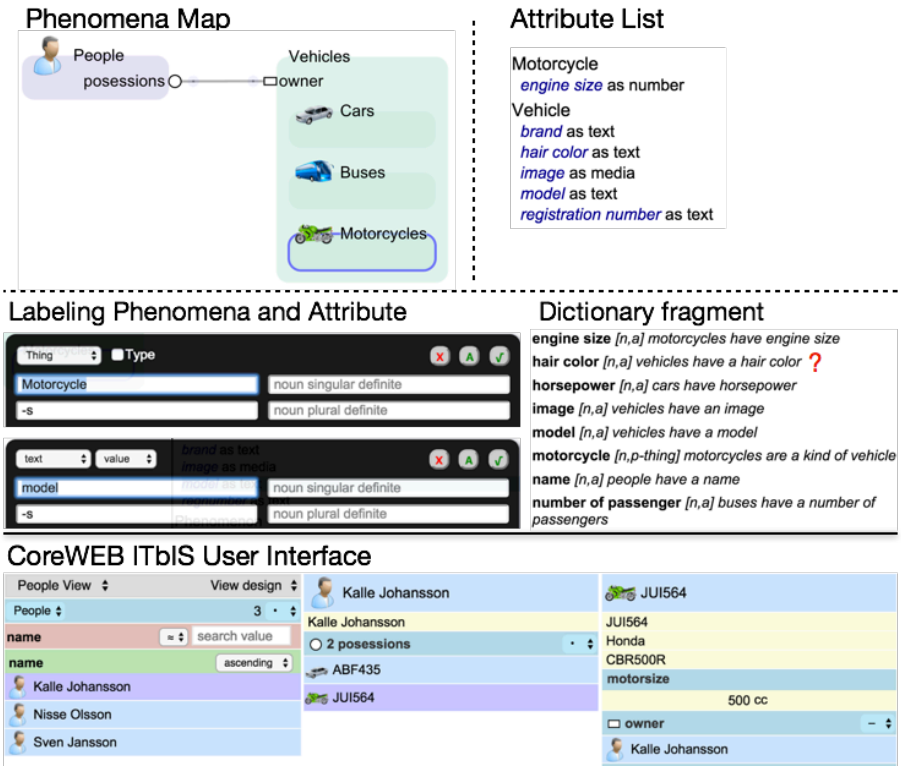

Fig. 1. Views in CoreWEB environment. Top: Phenomenon map and attributes of selected phenomenon. Middle: Labelling concepts and generated dictionary. Bottom: Resulting runtime ITbIS

4.1 CoreWEB Technical Architecture

The phenomena modelling component generates XML Fig. 2, which is transformed by three XSLT processes into, natural language statements, executable Javascript phenomena model equivalent and a user interface model, which is kept consistent in respect to changes to the phenomena model. When system is executed, the UI Engine will read the UI-model and interact with the executing phenomena instance model according to the UI model.

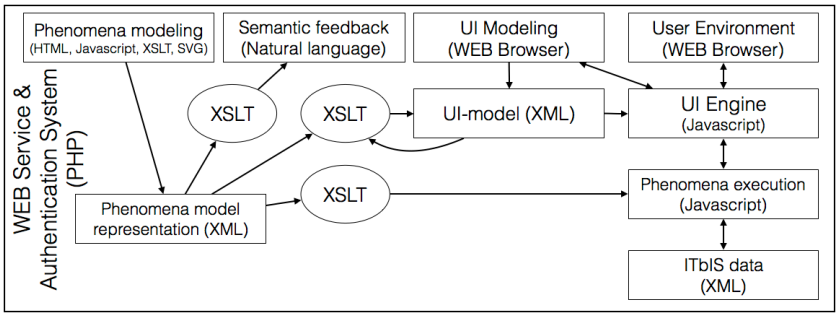

Fig. 2. CoreWEB environment architecture

5 Notes and Comments

CoreWEB approach to enterprise modelling facilitates dialog, user involvement, conceptual conflict resolution and rich expressions of enterprise knowledge as a direct design basis for information management and ITbIS artefacts.

The resulting models, phenomenon and UI models, can be used as part of a specification for ITbIS development regardless of implementation strategy or be transferred to the CorePro production system development environment.

Future research includes enrichment of model semantics and natural language model feedback by adding semantic variants of relations and phenomena and experiments with data content and explanatory text and speech generation.

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