OPM/S: Semantic Information Systems Engineering Using OPM

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The Semantic Web [2] holds great opportunities for information systems engineering. Its formal descriptive methods and distributed architecture have the potential of supporting information systems engineering by providing a consistent description of their domain ontology. The description can bridge semantic gaps that cause problems in various scenarios, for example, when integrating two systems that utilize different semantics to similar entities. Even though these systems might employ a common XML interface, the same concepts might be denoted differently. In this case, the semantic differences must be resolved manually, and this is unavoidably an error-prone process.

The Semantic Web provides an infrastructure in which concepts are specified formally, so relations between different concepts can be reasoned automatically, creating a basis for automatic or at least semi-automatic semantic reconciliation processes. Several standards have emerged to support the Semantic Web vision. One such generic ontology description standard is the Web Ontology Language (OWL) [3]. A more restricted standard is DAML-S [1], which defines ontology for Web Services.

As of today, semantic methods have not crossed the boundary between academia and industry. Our hypothesis is that the information system industry avoids using these methods due to their complexity and lack of accessibility. In particular, we can point the following obstacles: a) Separation between the definition of the information system and the semantic meta-information requires knowing several languages and translating among them; b) The lack of suitable complexity management mechanisms makes the readability of the domain scripts difficult for humans; c) Different types of notation are used for the information handled by the system's processes and the processes themselves, requiring consistency and integrity checking. The aim of this research is to suggest a new approach, OPM/S, for the utilization of Semantic Web methods in the area of information systems engineering in general, and in Web services engineering in particular. This approach is based on an examination of the conditions in which semantic methods would be accepted and efficiently used in information systems engineering tasks.

OPM/S is composed of a modeling framework and an algorithm, which together provide structure-matching services that support various information systems engineering tasks. The modeling framework integrates software engineering and semantic engineering methods in order to overcome the obstacles listed above. The framework is based on Object-Process Methodology (OPM) [4]. OPM is an integrated system development approach that combines the object-oriented and procedural paradigms into a single frame of reference. OPM is suitable infrastructure for the Semantic Web domain since it represents both processes and objects, it provides a notation that is both formal and readable, it has built-in abstraction management methods, and it is used successfully for modeling web applications [5]. In this work, OPM is extended to support semantic information within the system-modeling framework, in compliance with existing Semantic Web standards, such as OWL and DAML-S. The OPM/S framework utilizes the matching algorithm in order to provide automatic module integration and verification. The algorithm uses semantic reasoning and structural characteristics in order to provide matching and comparison between Web services across different levels of abstraction.

This research also proposes a suite of techniques and procedures for utilizing semantic notations and incorporating it within the information system engineering process for Web services. This capability will be integrated into OPCAT – Object-Process CASE Tool, enabling us to check the efficiency and ease of applying OPM/S in information systems engineering.

References

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