Chapter V
SDRule Markup Language:
Towards Modeling and Interchanging Ontological Commitments for Semantic Decision Making

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ABSTRACT

The emergence of ontology based applications, e.g. the Semantic Web, marks the importance of ontologies. Application rules, such as decision making rules, are often committed to an existing domain ontology when a new application needs to be designed and developed. During this process, the semantics of application rules is required to be precisely grounded. In this chapter, we tackle the problems of modeling and interchanging ontological commitments in order to support ontology based decision making. We model and visualize ontological commitments by means of an extension to Object Role Modeling Language (ORM), which was called ORM Plus (ORM$^+$) and is now named Semantic Decision Rule Language (SDRule-L). SDRule-L is a commitment language for modeling dynamic and non-monotonic decision rules. SDRule-L models are further stored in an XML-based markup language called Semantic Rule Markup Language (SDRule ML), which is a hybrid language of Rule Markup Language (Rule-ML) and Object Role Modeling Markup Language (ORM-ML). We also illustrate its supporting tool called SDRule-Lex, which is based on Tiny Lexon Browser (T-Lex). We demonstrate in the field of on-line customer management.

INTRODUCTION AND MOTIVATION

An ontology is a semiotic representation of agreed conceptualization in a subject domain (Gruber, 1993; Guarino, 1997). In 1994, Tom Gruber proposed to use relational database schemata as ontologies when he gave the definition of ontology.

"…In the knowledge sharing context, ontologies are specified in the form of definitions of representational vocabulary. A very simple case would be a type hierarchy, specifying classes and their subsumption relationships. **Relational database schemata** *also serve as ontologies by specifying the relations that can exist in some shared database and the integrity constraints that must hold for them."* (Tom Gruber, 1994; SRKB Mailing list, cited by Nicola Guarino, (1997))

In the later 90's of the last century, Prof. Robert Meersman from VUB STARLab brought forward the idea of applying the principles of database engineering to ontology engineering. The idea later laid the foundation of a framework called *Developing Ontology-Grounded Methods and Applications*[1] (DOGMA, Meersman, 1999 a; Meersman, 1999 b; Meersman, 2001; Spyns et al., 2002), which is designed and inspired by the *tried-and-tested* principles from conceptual database modeling.

In DOGMA, formally committing an application (e.g. application rules, task processes and application symbols) to a domain ontology is complicated. In order to do this, Object Role Modeling (ORM, Halpin, 2001) is adopted for *modeling*, *validating* and *visualizing* the ontological commitments. In (Demey et al., 2002; Spyns et al., 2002), the authors studied many advantages of using ORM as a commitment modeling language.

Later, Demey et al. (2002) present an XML-based ORM markup language (ORM-ML), which enables exchanging ORM models including ORM application rules. The ORM-ML can be fully mapped to OWL[2] (Mustafa, 2007), which makes it possible to adapt many available ontology technologies.

However, ORM still lacks several logical operators and connectors while grounding the semantics for dynamic decision rules, e.g. the *sequences* and *dependences*. Moreover, ORM is limited on the use of some specific operators, such as the *implication* operator. Therefore, we recently propose to design an extension to ORM, the result of which was called ORM+ (Tang et al., 2007; Tang & Trog, 2008), and is now named SDRule-L. We use SDRule-L specifically for modeling semantically rich *decision* rules, intending to model the ontological commitments for collaborative decision support systems.

BACKGROUND

This section introduces the background of DOGMA approach to ontology engineering and the ORM approach to ontological commitments. In the meanwhile, we discuss our related work.

DOGMA Approach to Ontology Engineering

The research efforts on the DOGMA framework, its methodologies and application design from different scientific inspirations, have been performed at VUB STAR Lab over past ten years. We transport the principle of data independence (as applied in modern database) into the principle of meaning independence (to be applied for ontologies), which is called the principle of *double articulation*. By applying this principle, one constructs (or converts) ontologies by the principle into two layers: 1) the lexon base layer that contains a vocabulary of simple binary facts called *lexons*, and 2) the *commitment* layer that formally defines rules and constraints on how an application (or "agent") may make use of these lexons.

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