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SBVR based Business Contract and Business Rule IDE

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Abstract. We propose an IDE – Integrated Development Environment to model SBVR (Semantic of Business Vocabulary and Business Rule) compliant business rules [2] extracted from business contract of services and store them in an ontological structure of rules, facts and terms as defined in the SBVR metamodel. Business rules are based on principles of deontic logic for treating expressions in the form of normative policies. Deontic constraints express what parties to the contract are required to perform (obligations), what they are allowed to do (permissions), or what they are not allowed to do (prohibitions).

Keywords: Business contract, Business rule, SBVR, Ontology, IDE

1 Introduction

One of the main difficulties in the software engineering area continues being the mapping of business rules to computational systems. This scenario becomes much more complicated due to the current Web based dynamic and highly competitive business environment. Hence, the computational solutions for the business problems cannot accompany the speed in which the change necessities appear. One of the main sources of change is response to changes in regulations and contracts towards which businesses are obligated to comply.

Commonly, documents containing contracts and regulations define the strategies, policies and relationships among organizations. From those documents arise the rules that define the behavior of the business processes in the organizations [1]. Hence, the computational systems must be compliant with these business documents.

We propose an IDE – Integrated Development Environment to model SBVR (Semantic of Business Vocabulary and Business Rule) compliant business rules [2] extracted from business contract of services and store them in an ontological structure of rules, facts and terms as defined in the SBVR metamodel. Business rules are based on principles of deontic logic [3] for treating expressions in the form of normative

policies. Deontic constraints express what parties to the contract are required to perform (obligations), what they are allowed to do (permissions), or what they are not allowed to do (prohibitions).

The next section discusses aspects related to business rules and business contracts formalization. Section 3 presents some requirements on the business contracts edition. Section 4 provides a conclusion and discussion on future researches.

2 Business Contracts formalized as SBVR Business Rules

This section discusses some aspects related to the formalization of business contracts and business rules. First, we present a business contract, initially introduced in [4] and then we show how it could be formalized as SBVR compliant rules.

The contract example is an agreement between an ISP Provider and a Purchaser of ISP services. The contract is structured in terms of a number of clause groups, each of which contains contract conditions. In [5] we propose the transformation of such contract clauses into FCL (Formal Contract Language). FCL was introduced in [6] for the formal analysis of business contracts and it is based on previous work [7] and on normative positions based on Deontic Logic with Directed Obligations [8].

Usually a contract comprises two types of clauses: definitional clauses giving the meaning of the terms used in the contract and clauses specifying the normative behaviors (i.e., giving the obligations, permissions, prohibitions the signing parties of the contract are subject to). To save space, we will concentrate only on some normative specifications of a contract, which are the sections 5 and 6 of the contract [4] that will be used in the subsequent sections.

CONTRACT OF SERVICES

This Deed of Agreement is entered into as of the Effective Data identified below.

BETWEEN ABC Company (To be known as the Purchaser)

AND ISP Plus (To be known as the Supplier)

WHEREAS (Purchaser) desires to enter into an agreement to purchase from (Supplier) Application Server (To be known as (Service) in this Agreement).

NOW IT IS HEREBY AGREED that (Supplier) and (Purchaser) shall enter into an agreement subject to the following terms and conditions:

…

5 Service Delivery

5.1 The (Supplier) shall ensure that the (Services) are available to the (Purchaser) under Quality of Service Agreement (http://supplier/qos1.htm). (Services) that do not conform to the Quality of Service Agreement shall be replaced by the (Supplier) within 3 days from the notification by the (Purchaser), otherwise the (Supplier) shall refund the (Purchaser) and pay the (Purchaser) a penalty of $1000.

5.2 The (Supplier) shall on receipt of a purchase order for (Services) make them available within 1 days.

5.3 If for any reason the conditions stated in 4.1 or 4.2 are not met, the (Purchaser) is entitled to charge the (Supplier) the rate of $ 100 for each hour the (Services) are not delivered.

6 Payment

6.1 The payment terms shall be in full upon receipt of invoice. Interest shall be charged at 5 % on accounts not paid within 7 days of the invoice date. The prices shall be as stated in the sales order unless otherwise agreed in writing by the (Supplier).

6.2 Payments are to be sent electronically, and are to be performed under standards and guidelines outlined in PayPal.

…

The problem is how these contract clauses could be transformed into computational code. According to MDA methodology, this kind of contract clauses, if formalized, they can be transformed into computational code. Although there are a lot of discussion around the definition of what "business rule" means [2], [9] in the context of this work, a business rule is "a rule that can be interpreted by computers, that defines or restricts some aspects of a business, introducing obligations or needs, according to the organization policies" [10]. Following are some business rules in the context of ISP service community:

- The (Supplier) shall on receipt of a purchase order for (Services) make them available within 1 day.
- The payment terms shall be in full upon receipt of invoice.
- Payments are to be sent electronically, and are to be performed under standards and guidelines outlined in PayPal.

The main objective of the SBVR metamodel [2] is to allow business people to define the policies and the rules that drive the organizations in the business people's own language, in terms of the artifacts with which they perform the businesses. Besides, the other objective is to capture those rules in a clear way, without ambiguity, and quickly transformable in other representations.

According to SBVR metamodel a business rule can be expressed formally in statements in a structured English language using a font style convention. There are four font styles with formal meaning: (i) term - the 'term' font is used for a designation for a noun concept (other than an individual concept); (ii) Name - the 'name' font is used for a designation of an individual concept that tend to be proper nouns (e.g., Washington); (iii) *verb* - the 'verb' font is used for designations for fact types — usually a *verb*, preposition, or combination thereof; and (iv) `keyword` - the 'keyword' font is used for linguistic symbols used to construct statements – the words that can be combined with other designations to form statements and definitions (e.g., '**each'** and '**it is obligatory that'**). For example, in the business rule, adapted from the previous contract of service based on clause 6.1, a**s** shown in the Figure 1, includes four **keywords** or phrases, two designations for noun concepts and two for *fact types*.

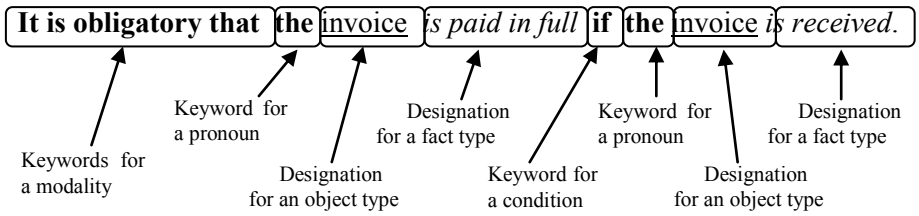

Figure 1. Business rule elements.

3 Contract of Services IDE

A Contract of Services IDE (Integrated Development Environment) should provide some editors and functionalities to define contracts, business rules, facts and terms. The business contract editor should provide specific templates using community terminology to facilitate the inclusion of contract clauses as business rules, which are compliant to the SBVR metamodel. Besides, the business fact editor should provide templates to facilitate the inclusion of terms and fact types, which will be components for the business rules. In this way, considering the ISP services community, the IDE must provide facilities to define object type designations for supplier, purchaser and service terms; to define facts, such as, "service *is replaced within* 3 days" and "service *is under* Quality of Service Agreement" by combining terms and fact type designations; and to define rules, such as, "**It is obligatory that the** supplier *ensure to* **the** purchaser **that the** service *is refunded* **and a** penalty of $1000 *is paid* **if the** service *is* **not** *replaced within* 3 days" by composing keywords, terms and facts. All these elements are meaningful to that community and should be defined using the IDE. When the business analyst defines terms, verbs, facts and rules contained in a contract of service, they will be stored in the Business Rule Ontology, which is the core of the IDE infrastructure.

Figure 2 gives an idea of how could be the external interface of an IDE to define business contracts and rules. From this window, the user can access all the main features that he/she can perform in contracts, rules, facts and terms edition activities. On the top part there are usual toolbars as in many IDEs. In the third line there are tab controls for Contracts, Business Rules, Facts and Terms to coordinate user actions according to what he/she wants to perform. In the middle, there are two panels: the left one is used to browse rules, facts and terms and de right one is to create or edit contracts and its components. At the bottom there is another panel to hold the business rules organized as ruleset.

Figure 3 shows the class diagram for the Business Contract Ontology. The Business Contract Ontology instantiates a structure similar to Business Vocabulary+Rules, defined in SBVR [2]. Thus, it organizes the business terms, concepts and rules specified in the business terminology that make sense for a user community. It also organizes the relationships and the existing associations among these elements. To provide the ability in the definition of connections among concepts that are of the organization interest the repository maintains a semantic structure in the business terminology.

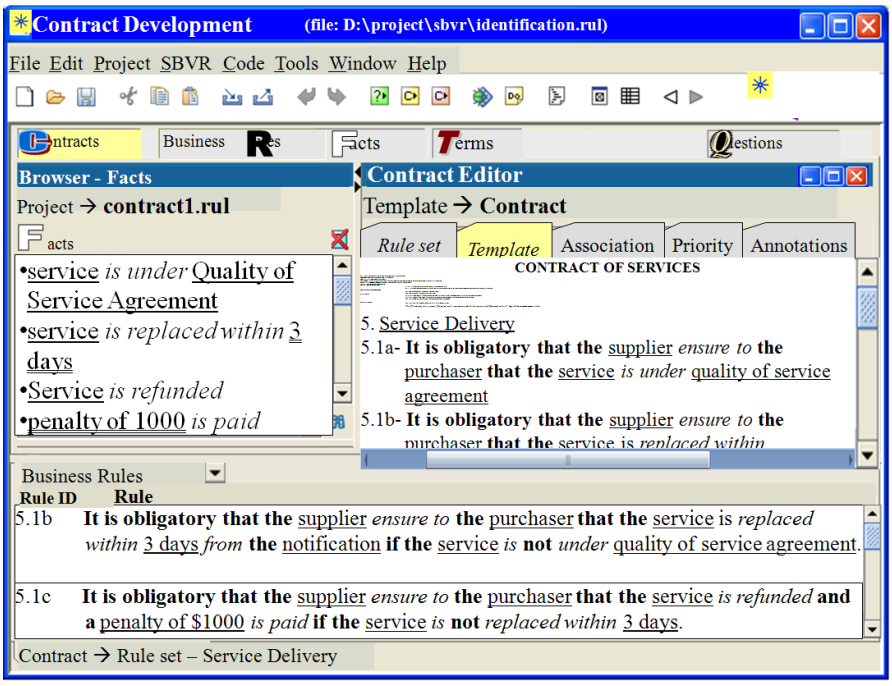

Figure 2. Interface Prototype for the Business Contract and Business Rules IDE

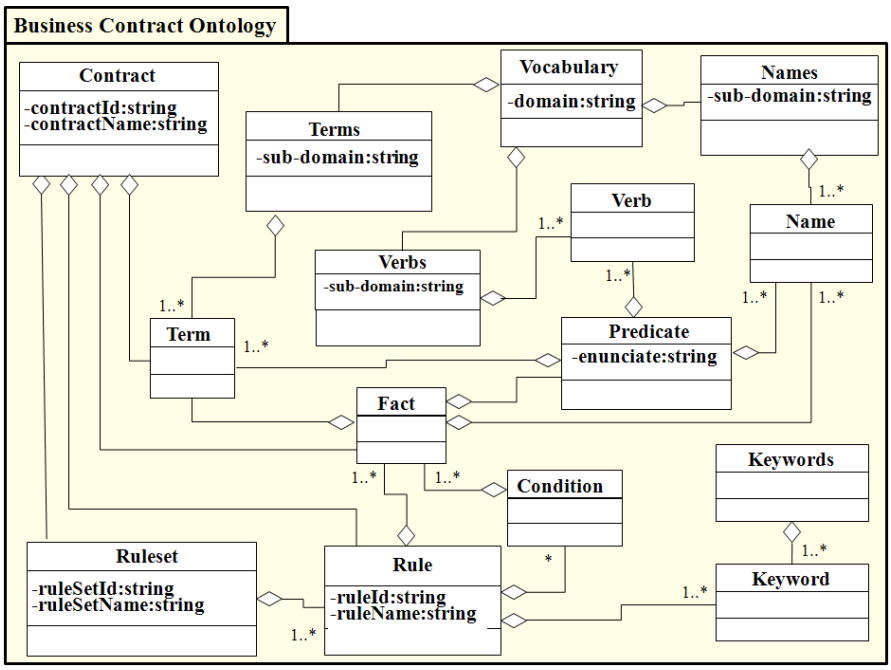

Figure 3. Class Diagram for Business Contract Ontology

A vocabulary is composed of two fundamental groups of elements: (i) terms, representing concepts about anything, any concept, or any significant fact for a business community and (ii) verbs, which are fundamental elements of predicates and are the base for the representation of facts. On the other hand, a Rule set is a "collection of business rules grouped together for some purpose", as defined in SBVR metamodel [2]. The business rules are composed by keywords, facts and conditions. The keywords are very useful in the model creation to formalize rules without ambiguities. A fact is a simple period and it is composed of one or more terms that can be associated to a predicate. Facts can be grouped in conditions. All these elements are properly organized in the repository so that the business rules are formalized referencing these elements consistently.

Considering the business to business (B2B) scenario and the contract of services above mentioned the associated rule set contained in the Business Rules Ontology should include all the rules of the contract. Other issues on the IDE requirements can be seen in [10]. Figure 4 presents an instance, included in the Business Rule Ontology, for the service replacement rule model.

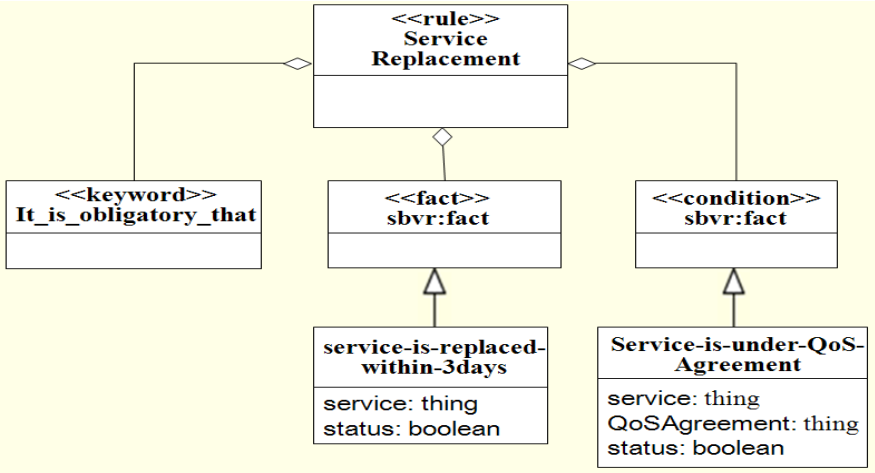

Figure 4. Model for Service Replacement rule

4 Conclusions

The proposed IDE aims to facilitate the contract elaboration process by providing editors, tools and templates for definition of contracts, business rules, facts and terms customized for specific user community.

The results indicate that the concepts, ideas and proposed IDE are promising. Besides business contracts and rules formalization technologies, services (SOA), repositories and ontologies, it seems that the complete solution for the mentioned problems includes the (i) inclusion of a mechanism in the IDE to contemplate process composition modeling using, for instance, languages such as BPMN and that could make transformation to executable languages like WS-BPEL; and (ii) development of

a prototype implementing the IDE, including repository instances for ontologies, adherent to the MOF metamodel, with standardized query and manipulation language. A preliminary presentation version of this work is available at http://www.cti.gov.br/images/stories/cti/publicacoes/pdf/2010/SBVR_basedBusinessContract_and_BusinessRuleIDE.pdf

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