Evolution and Reactivity

Abstract

Towards evolution and reactivity in the Web and Semantic Web: the working group "Evolution and Reactivity" aims at defining declarative languages, tools and methodologies for specifying and dealing with reactivity, evolution and propagation of changes in the Web.

Mission

The Semantic Web can be seen as a "living organism", combining evolving data sources and knowledge repositories. This dynamic character of the Semantic Web requires languages and mechanisms for specifying its maintenance and evolution. Moreover, the Semantic Web resources may need to be reactive, not only to incorporate and propagate updates, but also in that they should perceive events and incoming messages, communicate with other components and execute actions. For performing reasoning tasks about the evolution and its propagation, and reactivity, it is crucial that these languages be declarative.

In the working group we will work towards the definition of declarative rule-based languages, methodologies and tools for specifying evolution and reactivity in the Web and in the Semantic Web.

Use Scenarios

As a use scenario, consider a set of Web resources of travel agencies and airline companies. In such a scenario, besides the capability of being able to query the set of resources for e.g. timetables of flights, availability of tickets, etc., it should also be possible to make reservations, making the resources of agencies react on these requests and update their data correspondingly, and automatically making the corresponding airlines and other agencies aware of the changes. To deal with such a scenario, languages for specifying reactive behavior of resources, and for specifying how a knowledge repository should be updated, as well as methodologies and tools for consistently propagating these changes are required.

Moreover, such a language for reactivity and evolution should allow e.g. for the travel agencies to specify their selling policies, as rules describing conditions for the changes (in this case, in the availability of tickets) to take place. The existence of such rules should make it possible for a user to reason about the various policies of the agencies, in order to better choose where to buy. Such a scenario calls for declarative languages for the specification of changes, so that automated reasoning is possible.

In a dynamic environment, it is well plausible that these selling-rules themselves may change over time. It would be important that, for dealing with changes in the reaction and evolution rules, one should simply specify how their knowledge is to be changed, rather than having to be concerned with the dynamically obtained and possibly inter-related information coming from various resources. Note here that a rule specifying a selling policy of an agency may itself depend on rules from other companies. For making it possible to deal with these (meta) changes, mechanisms for consistency handling and propagation are required. Here, again, declarativity of the language is an important issue.

More information available at

http://rewerse.net/i5

Description of Research

We start by specifying a language and corresponding implementation, for updating XML documents that is compatible, and defined in close collaboration with the query language in development in REWERSE. Based on the experiences with this language, we proceed by defining an ontology for reaction (event-condition-action-like) rules, and to study models to deal with evolution and propagation of changes. These require investigating and developing theories, and making choices for the definition of: an event language, taking in consideration atomic events, complex events and also event metadata; an action language, capable of dealing with (internal) updates as well as external actions and transactions; strategies for dealing with the propagations of changes. The work is to be developed stepwise, starting from the simpler case of XML-based data sources reacting to the outside requests and updating their own data, continuing to the case of (controlled) communities of resources with a common ontology, and only then taking in consideration the Semantic Web where various ontologies have to be combined.

Tools & Technologies

An important issue is also to provide interfaces to existing technologies from the database area, for Web Services, for ECA rules, and for agents. These have to be integrated with a modular tool support for communication on the Web, especially, propagation of changes.

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