

Position Paper for: Workshop on Improving Access to Financial Data on the Web [1], co-organized by W3C [2] and XBRL International, Inc. [3], and hosted by FDIC [4], Oct. 5-6, 2009, Arlington, VA, USA

Opportunities for Semantic Web knowledge representation to help XBRL

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XBRL and Semantic Web have historically evolved separately and in parallel with each other. There's been a degree of convergent evolution. Each includes data, ontologies, and rules – all in XML markup. Now, there are large opportunities for synergy between them. This paper overviews those briefly.

By “Semantic Web”, we mean in the broad sense that includes semantic technology more generally (cf., say, [6]).

Semantic Web can offer XBRL:

- Sophistication in knowledge representation (KR). E.g., expressiveness, nonmonotonic reasoning (conflict handling), interoperability, and performance optimization techniques. E.g., rule-based ontologies, rule-based business policies, rule-based analytics, expressive queries and views.
 - Key semantic rule standards today are based primarily on declarative logic programs (LP) and include: W3C Rule Interchange Format (RIF) [10] and OWL 2 RL (Rules Profile) [12]. The next steps of standardization, esp. of RIF, are likely to be highly influenced by the RuleML standards design [13] and the recent SILK approach [9]. ISO Common Logic [14] and OMG SBVR [15], based primarily on classical first-order logic (FOL), are relevant as well; so are SPARQL [11], SQL, and XQuery, which are based primarily on LP.
- Related domain ontologies and knowledge bases. These may be broad or narrow in scope.
- Directions for “virality”, to extend the set of applications, methods, and domains for XBRL by combining it with those for Semantic Web. E.g., in e-commerce, health care & life science, and business intelligence. E.g., semantic wikis [7].

XBRL can offer Semantic Web:

- A centrally important domain of knowledge/info and tasks.
- Practicality, and a platform for wide acceptance and adoption.
- Firm connection to XML-Schema.

Key KR challenges in leveraging Semantic Web to help XBRL include how to handle well:

- Numerical reasoning, including equalities, equations, inequalities, constraints, temporal (times/dates), and associated KR context mappings (reformulations) between heterogeneous source and use contexts. OWL and RDF are quite weak in this area. Other approaches from Semantic Web are much more capable, e.g., ECOIN [8] and SILK [9].

SILK [9], whose development I lead, is perhaps today's most sophisticated, highly scalable, overall Semantic Web KR approach. It has advanced expressiveness that addresses several of the above challenges and opportunities. It includes a KR language, reasoning system, and interface/interoperability capabilities.

Tutorial: An up to date, detailed tutorial presentation about semantic rules on the web [15] that I have recently co-authored will be soon be available free on the web.

Links and References

- [1] <http://www.w3.org/2009/03/xbrl/cfp.html>
- [2] <http://www.w3.org>
- [3] <http://www.xbrl.org>
- [4] <http://www.fdic.gov>
- [5] <http://www.mit.edu/~bgrosf/#Consulting>
- [6] Semantic Technology Conference. <http://www.semantic-conference.com>
- [7] Semantic MediaWiki+ (SMW+), sponsored by Vulcan, Inc. <http://wiki.ontoprise.de>
- [8] Extended COntext INterchange (ECOIN), e.g.: "Financial Information Integration in the Presence of Equational Ontological Conflicts". By A. Firat, S. Madnick, and B. Grosf. Proc. 12th Workshop on Information Technologies and Systems (WITS-2002). Winner, Best Paper Award. Available at: <http://www.mit.edu/~bgrosf/#ecoin-wits2002>.
- [9] Semantic Inferencing on Large Knowledge (SILK), sponsored by Vulcan Inc. <http://silk.semwebcentral.org>
- [10] W3C Rule Interchange Format (RIF). <http://www.w3.org/2005/rules/> Currently a Last Call Working Draft.
- [11] W3C OWL 2 RL (Rules Profile). <http://www.w3.org/2007/OWL/> Currently a Last Call Working Draft.
- [12] SPARQL Query Language for RDF. <http://www.w3.org/2001/sw/DataAccess>
- [13] RuleML (Rule Markup and Modeling Language). <http://www.ruleml.org>
- [14] ISO Common Logic <http://www.common-logic.org>
- [15] "Rules on the Web", half-day tutorial, at 8th International Semantic Web Conference (ISWC-2009). <http://www.mit.edu/~bgrosf/#ISWC2009RulesTutorial>. Available by Oct. 27, 2009 there and also at [9].