Semantic Web Tools: An Overview

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Abstract

The WWW is the largest single information resource humanity. Unfortunately, despite its dependence on computers to operate at all, most of the information is only understandable by humans and not by computers. While computers can use the syntax of HTML documents to display in a web browser, Web computers can't understand the content the semantics. Human beings are capable of using the Web to carry out tasks such as finding the information. However, a computer cannot accomplish the same tasks without human direction because web pages are designed to be read by public, not machines. The semantic web is a vision of information that is understandable by computers, so that public can perform more of the tedious work involved in finding, sharing and combining information on the web. The paper emphasizes the semantic tools available.

Keywords: Semantic Web, Ontology, Resource Description Framework, Web Ontology Language, Web Service Modeling Language, Web Service Modeling Framework, DARPA

1. Introduction

The Semantic Web takes the solution further. The Semantic Web is not a separate entity from the WWW. It is an extension to the Web that adds new data and metadata to existing Web documents, extending those documents into data. This extension of Web documents to data is what will enable the Web to be processed automatically by machines and also manually by humans. It involves publishing in languages specifically designed for data of Resource Description Framework (RDF), Web Ontology Language (OWL), and eXtensible Markup Language (XML). HTML describes documents and the links between them. RDF works on Web pages and also inside applications and databases. The RDF, OWL, and XML, by contrast, can describe arbitrary things such as people, meetings, or airplane parts. Tim Berners-Lee calls the resulting network of Linked Data the Giant Global Graph, in contrast to the HTML-based WWW.

Web 2.0 is focused on people the Semantic Web is focused on machines. The Web requires a human operator, using computer systems to perform the tasks required to find, search and aggregate its information. It's impossible for a computer to do these tasks without human guidance because Web pages are specifically designed for human readers. The Semantic Web is a project that aims to change that by presenting Web page data in such a way that it is understood by computers, enabling machines to do the searching, aggregating and combining of the Web's information without a human operator.

2. Meaning

The Semantic Web is a mesh of information linked up in such a way as to be easily processable by

machines, on a global scale. One can think of it as being an efficient way of representing data on the WWW, or as a globally linked database. The Semantic Web was thought up by Tim Berners-Lee, inventor of the WWW, Unified Resource Identifiers (URI), HTTP, and HTML. There is a dedicated team of people at the W3C working to improve, extend and standardize the system, and many languages, publications, tools and so on have already been developed. However, Semantic Web technologies are still very much in their infancies, and although the future of the project in general appears to be bright, there seems to be little consensus about the likely direction and characteristics of the early Semantic Web. [4]

Semantic Web is the abstract representation of data on the WWW, based on the RDF standards and other standards to be defined. This is being developed by the World Wide Web Consortium (W3C), with participations from academic researchers and industrial partners. Data can be defined and linked in such a way so that there is more effective discovery, automation, integration, and reuse across different applications.

The Semantic Web is an evolving extension of the WWW in which the semantics of information and services on the web is defined, making it possible for the web to understand and satisfy the requests of people and machines to use the web content. It derives from WWW director Sir Tim Berners-Lee's vision of the Web as a universal medium for data, information, and knowledge and wisdom exchange [3].

The Semantic Web is the extension of the World Wide Web that enables people to share content beyond the boundaries of applications and websites. It has been described in rather different ways: as a utopic vision, as a web of data, or merely as a natural paradigm shift in our daily use of the Web. Most of all the Semantic Web has inspired and engaged many people to create innovative semantic technologies and applications. Semanticweb.org is the common platform for this community. [11]

The Semantic Web is a Web with a meaning if HTML and the Web made all the online documents look like one huge book, RDF, schema, and inference languages will make all the data in the world look like one huge database [8].

3. Semantic Web Objects

The Semantic Web can be seen as a distributed data objects framework, and therefore can be validly seen as an Object Oriented Framework. It is also quite valid to use a Unified Markup Language (UML) diagram to express a Semantic Web graph. Both the Semantic Web and Object Oriented Programming have:

i. Classes
ii. Attributes (also known as Relationships)
iii. Instances

Furthering this, Linked Data also introduces Dereferenceable URI, which provides Data-by-Reference which find in Object Oriented Programming and Object Oriented Databases in the form of Object Identifiers.

4. Resource Description Framework

RDF is a markup language for describing information and resources on the web. A language which utilises three URIs in such a way is called RDF: the W3C have developed an XML serialization of RDF, the "Syntax" in the RDF Model and Syntax recommendation. RDF XML is considered to be the standard interchange format for RDF on the Semantic Web, although it is not

the only format. Once information is in RDF form, it becomes easy to process it, since RDF is a generic format, which already has many parsers.

When people are confronted with XML RDF is quite simple, and is twofold. Firstly, the benefit that one gets from drafting a language in RDF is that the information maps directly and unambiguously to a model, a model which is decentralized, and for which there are many generic parsers already available.

4.1. RDF Language for the Semantic Web

This is the specification of the Notation3 language, of internet Media Type text/n3. Normative parts of the specification are thus, non-normative parts and comments thus. This is a language which is a compact and readable alternative to RDF's XML syntax, but also is extended to allow greater expressiveness. It has subsets, one of which is RDF 1.0 equivalent, and one of which is RDF plus a form of RDF rules. [5] XML RDF can be rather difficult, but there are simpler teaching forms of RDF. One of these is called "Notation3", and was developed by Tim Berners-Lee.

5. W3C Semantic Web Activity

The Semantic Web provides a common framework that allows data to be shared and reused across application, enterprise, and community boundaries. It is a collaborative effort led by W3C with participation from a large number of researchers and industrial partners. It is based on the RDF. [10]

The Semantic Web is about two things. It is about common formats for integration and combination of data drawn from diverse sources, where on the original Web mainly concentrated on the interchange of documents. It is also about language for recording how the data relates to real world objects. That allows a person, or a machine, to start off in one database, and then move through an unending set of databases which are connected not by wires but by being about the same thing.

6. Semantic Web Technology

Semantic Web technologies can be considered in terms of layers, each layer resting on and extending the functionality of the layers beneath it. Although the Semantic Web is often talked about as if it were a separate entity, it is an extension and enhancement of the existing Web rather than a replacement of it. [9]

Semantic Web technologies are popular in areas such as research and life sciences where it can help researchers by aggregating data on different medicines and illnesses that have multiple names in different parts of the world. On the Web, some sites offering knowledge networking application has been built with Semantic Web technologies. Here Semantic technology is used to help this site, users understand the relationships between pieces of content, and enabling them to find the types of content they want most. Oracle offers a Semantic Web view of its Oracle Technology Network, called the OTN Semantic Web to name a few of those companies who are implementing Semantic Web technologies.

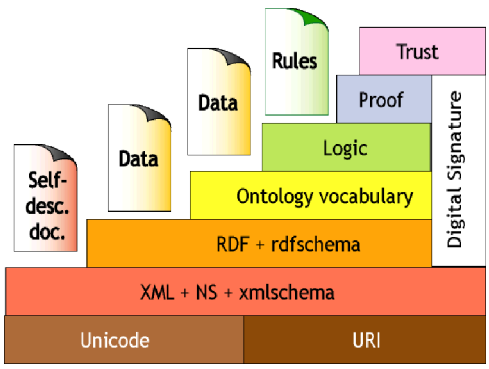

Figure - 1: The Semantic Web Layer Tower by Tim Berners-Lee.

7. Advanced Markup Languages

There are many ways in which the two areas of Web Services and the Semantic Web could interact to lead to the further development of Semantic Web Services. Berners-Lee has suggested that both of these technologies would benefit from integration that would combine the Semantic Web's meaningful content with Web Services' business logic.

However, the technology issues of the Next Generation Web create many problematic questions that must be solved before the full power and capability of the Semantic Web Services are available.

8. Semantic Web Languages

8.1. Ontology Inference Layer / Ontology Interchange Language (OIL)

It can be regarded as an Ontology infrastructure for the Semantic Web. OIL is based on concepts developed in

Description Logic (DL) and frame-based systems and is compatible with RDFS. It was developed by Dieter Fensel, Frank van Harmelen (Vrije Universiteit, Amsterdam) and Ian Horrocks (University of Manchester).

8.2. The DARPA Agent Markup Language (DAML)

It is a agent markup language developed by the DARPA for the semantic web. The DAML program has generated the DAML+OIL markup language. The submission of the DAML+OIL language to the World Wide Web consortium captures the work done by DAML contractors and the EU/U.S. Joint Committee on Markup Languages. This submission was the starting point for the language to be developed by W3C's web ontology working group, WebOnt.

8.3. DAML + OIL

It is a successor language to DAML and OIL that combines features of both. In turn, it was superseded by OWL. It is the central research and development organization for the Department of Defense. The DAML program ended in early 2006.

8.4. The Web Ontology Language (OWL)

It is a family of knowledge representation languages for authoring ontologies, and is endorsed by the W3C. This family of languages is based on two (largely, but not entirely, compatible) semantics: OWL DL and OWL Lite semantics are based on Description Logics, which have attractive and well-understood computational properties, while OWL Full uses a novel semantic model intended to provide compatibility with RDF Schema. OWL ontologies are most commonly serialized using RDF/XML syntax. OWL is considered one of the fundamental technologies underpinning the Semantic Web, and has attracted both academic and commercial interest.

8.5. Web Service Modeling Language (WSML)

It is a formal language that provides a syntax and semantics for the Web Service Modeling Ontology (WSMO). It provides means to formally describe the WSMO elements as Ontologies, Semantic Web services, Goals, and Mediators. The WSML is based on the logical formalisms as Description Logic, First-order Logic and Logic Programming.

Language Variants of WSML

1. WSML Core, defined as an intersection of the Description Logic and Horn Logic. Supports modeling classes, attributes, binary relations and instances.

2. WSML-DL, extension of the WSML Core, fully captures the Description Logic.
3. WSML-Flight, extension of the WSML Core, provides features as meta-modeling, constraints and nonmonotonic negation.
4. WSML-Rule, extension of the WSML-Flight, provides Logic Programming capabilities.
5. WSML-Full, an unification of the WSML-DL and WSML-Rule.

8.6. Web Service Description Language – Semantic (WSDL-S)

It is a standard operates at the syntactic level and lacks the semantic expressivity needed to represent the requirements and capabilities of Web Services. Semantics can improve software reuse and discovery, significantly facilitate composition of Web services and enable integration of legacy applications as part of business process integration.

8.7. Semantic Annotations for Web Services Description Language (SAWSDL)

SAWSDL defines how to add semantic annotations to various parts of a WSDL document such as input and output message structures, interfaces and operations. The extension attributes defined in this specification fit within the WSDL and XML Schema Structures] extensibility frameworks.

9. Semantic Web Service Frameworks:

9.1. Web Service Modeling Framework (WSMF)

It is a management framework to provide a consistent and secure mechanism based on Web services for managing various types of resources, including Web services themselves. The framework takes advantage of the work being done to define the protocols and behavior around Web services and uses this infrastructure to perform management.

9.2. Web Ontology Language for Services (OWL-S)

OWL-S is an ontology built on top of OWL by the DARPA DAML program. It replaces the former DAML-S ontology. "OWL-S is ontology, within the OWL-based framework of the Semantic Web, for describing Semantic Web Services. It will enable users and software agents to automatically discover, invoke, compose, and monitor Web resources offering services, under specified constraints.

9.3. Quality Assurance of Semantic Annotations for Services (QUASAR)

Web services offer a convenient mechanism for packaging specialist services and resources for use across organisational and technical boundaries. They can facilitate rapid application development and the sharing of computational know-how on a global scale. In order to realise these benefits, however, it must be possible for potential service consumers to be able to locate service implementations that offer the kind of functionality required, and to understand how two or more services will function when connected together.

9.4. Web Service Modeling Ontology (WSMO)

WSMO is a conceptual model for relevant aspects related to Semantic Web Services. It provides an ontology based framework, which supports the deployment and interoperability of Semantic Web Services. The main components of WSMO are

a. Goals - The client's objectives when consulting a Web Service.

b. Ontologies - A formal Semantic description of the information used by all other components.
c. Mediators - Connectors between componentes with mediation facilities. Provides interoperability between different ontologies.
d. WebServices - Semantic description of Web Services. May include functional (Capability) and usage (Interface) descriptions.

9.5. The Internet Reasoning Service (IRS-III)

IRS - is KMi's Semantic Web Services framework, which allows applications to semantically describe and execute Web services. The IRS supports the provision of semantic reasoning services within the context of the Semantic Web.

9.6. METEOR-S

The METEOR-S project at the LSDIS Lab, University of Georgia aims to extend these standards with Semantic Web technologies to achieve greater dynamism and scalability. Specifically, focus on adding semantics to WSDL and UDDI focus on adding semantics to BPEL4WS, and discusses a semi-automatic approach for annotating Web services described using WSDL.

9.7. HALEY

It is an automated, scalable and end-to-end Web service composition framework. It naturally models uncertainty nature of Web services, takes into consideration both functional and QoS descriptions of Web services and provide a cost-based optimization of the generated business processes. It is implemented as a freely-available Eclipse plug-in and stand-alone Eclipse RCP.

9.8. BioMOBY (Bioinformatics)

It is a registry of web services used in bioinformatics. It allows interoperability between biological data hosts and analytical services by annotating services with terms taken from standard ontologies.

10. Semantic Web Tools

The Semantic Web community descriptions of many related too, the tools that can be used to translate specific types of information. This article provides some tools of semantic web. The choice of tools is somewhat arbitrary but may serve illustrative purposes. It is also remarkable that in this early stage of the development of semantic web technology, it is already possible to compile a list of hundreds of components that in one way or another can be used in building or extending semantic webs.

The semantic web comprises the standards and tools of XML, XML Schema, RDF, RDF Schema and OWL that are organized in the Semantic Web Stack.

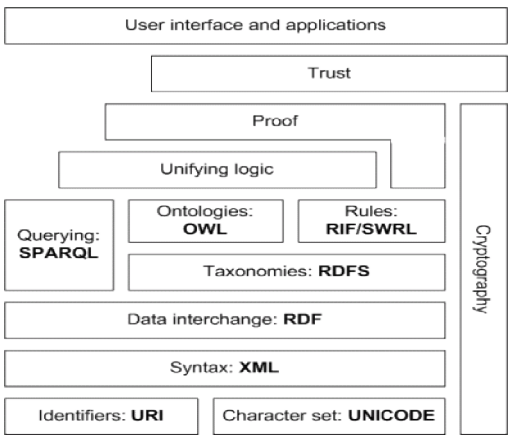

Figure - 2: The Semantic Web Stack

1 ARC http://arc.semsol.org/

ARC is a flexible RDF system for semantic web and PHP practitioners, developed by Benjamin Nowack. It's open-source, easy to use, and runs in most web server environments.

2. ASD http://lsdis.cs.uga.edu/projects/asdoc/

Active Semantic Documents are documents (typically in XML based format). ASDs are semantic since they are semantically annotated using one or more relevant ontologies which provide the nomenclature and conceptual model for interpreting and reasoning with the concept, and optionally annotated using lexically significant concepts and phrases.

3. AceRules http://attempto.ifi.uzh.ch/acerules/

AceRules is a forward-chaining rule system based on the controlled natural language Attempto Controlled English (ACE).

4. AceWiki http://attempto.ifi.uzh.ch/acewiki

AceWiki is a semantic wiki using the controlled natural language Attempto Controlled English (ACE). The use of controlled natural language makes it easy for everybody to understand the semantics of the wiki. GNU Lesser General Public License (LGPL)

5. Artificial Memory http://www.artificialmemory.net/

Artificial Memory is a Semantic Wiki and Personal Knowledge Management System. It tries to find a balance between schema-rigidity and usability, implementing a number of innovations in ontology management and ontology usage.

6. BRAHMS http://lsdis.cs.uga.edu/projects/semdis/brahms/

BRAHMS is designed as a fast main-memory RDF/S storage, capable of storing, accessing and querying large ontologies. It does not used any DB backend and all data is kept in main memory. It is implemented in C++ for high performance and strict memory control.

7. BibSonomy http://www.bibsonomy.org/tag/swikig

BibSonomy is a public web platform for managing bookmarks and references in a united, tag-based way. BibSonomy is run by the Knowledge & Data Engineering Group of the University of Kassel, Germany.

8. Cerebra http://www.cerebra.com

The semantic technology company that first enabled enhanced enterprise data management through its sophisticated Cerebra Server platform.

9. ConverterToRdf http://esw.w3.org/topic/ConverterToRdf

A Converter to RDF is a tool which converts application data from an application-specific format into RDF for use with RDF tools and integration with other data.

10. Corese http://www-sop.inria.fr/acacia/soft/corese/

Conceptual Resource Search Engine (Corese) Semantic Web Factory is a semantic Web search engine based on Conceptual Graphs It is an RDF engine based on Conceptual Graphs (CG). It enables the processing of RDF Schema and RDF statements within the CG formalism.

11. Cypher http://www.monrai.com/products/cypher

Natural language processing, RDF and SPARQL software all in one. A Natural Language User Interface (LUI) for the Semantic Web. This is the AI software program available which generates the RDF graph and SPARQL/SeRQL query representation of a plain language input, allowing users to speak plain language to update and query semantic databases.

12. DartGrid http://www.swi-prolog.org/packages/SeRQL/

DartGrid is an java-based application development framework for integrating heterogeneous relational databases using semantic web technologies

13 HKW http://semweb4j.org/site/cds.gwt/ http://mavenrepo.fzi.de/semweb4j.org/site/cds.gwt/

The Hypertext Knowledge Workbench (HKW), is an editor and browser for semantic personal knowledge models. The tool is designed to be used by a single person to manage her personal notes about any topic that seems relevant.

14 HAWK

HAWK is a repository framework and toolkit that supports OWL. It provides APIs as well as implementations for parsing, editing, manipulating and preservation of OWL ontologies.

15 IdeaGraph http://esw.w3.org/topic/IdeaGraph

Desktop client tool, based around Jena. The main UI is graphic (node and arc), but it aims to hide the icky RDF details from the users.

16 IODT http://www.alphaworks.ibm.com/tech/semanticstk

IODT is IBM's Integrated Ontology Development Toolkit for ontology-driven development. The toolkit includes: 1. the EMF Ontolgy Definition Metamodel (IODT EODM) run-time library; 2. the EODM workbench ontology editor; and 3. an OWL Ontology Repository (named Minerva).

17 IsaViz http://esw.w3.org/topic/IsaViz

IsaViz is a visual RDF graph editor that uses GraphStyleSheets to present data.

18 Jena http://jena.sourceforge.net

Jena is a Java framework for building Semantic Web applications. It provides a programmatic environment for RDF, RDFS and OWL, SPARQL and includes a rule-based inference engine.

19 Krextor https://trac.kwarc.info/krextor/

Krextor, the Knowledge Adaptation and Reasoning for Content (KWARC) RDF Extractor, is an extensible XSLT-based framework for extracting RDF from XML, supporting multiple input languages as well as multiple output RDF notations.

20 Metatomix M3t4.Studio Semantic Toolkit http://www.m3t4.com/index.jsp

The M3t4.Studio Semantic Toolkit is a free set of Eclipse plugins to allow developers to create and manage OWL ontologies and RDF documents.

21 Morla http://esw.w3.org/topic/Morla

Morla is a multiplatform editor of RDF documents. With Morla you can import RDFS documents and use its content to write new RDF triples. Templates are also RDF documents and they make Morla easily personalizeble.

22 OWL API http://owlapi.sourceforge.net

The OWL API is a Java interface and implementation for the W3C, OWL, used to represent Semantic Web ontologies. The API is focused towards OWL DL and the upcoming OWL 2. The OWL API also offers specific bindings for the OWL DL reasoners FaCT++ and Pellet.

23 OWL-S UDDI Matchmaker http://www.daml.ri.cmu.edu/

OWL-S UDDI Matchmaker is a matchmaker for OWL-S. ATLAS is being developed by researchers

in the Software Agents Group of the Robotics Institute at Carnegie Mellon University, collaborating with the Nokia Research Center and the German Research Center for Artificial Intelligence.

24. OpenLink Data Spaces http://virtuoso.openlinksw.com/wiki/main/Main/OdsIndex

OpenLink Data Spaces (ODS) is a distributed collaborative application platform for creating Semantic Web presence in conjunction with Web 2.0 application profiles such as: Weblogs, Wikis, Feed Aggregators, Bookmark Mangers, Discussion Forums, Photo Galleries, Social Networks, and more.

25. Paggr http://paggr.com/

It is an online tool that provides novel ways to manage and repurpose information on the web.

26. Protégé http://protege.stanford.edu/

Stanford University's general Protégé 2000 ontology editor tool has a plugin architecture that allowed the development of a number of Semantic Web related tools.

27. RAP http://www4.wiwiss.fu-berlin.de/bizer/rdfapi/

RAP, the RDF API for PHP, is a software package for parsing, searching, manipulating, serializing and serving RDF models

28. RDF Entity Manager http://sourceforge.net/projects/texai/

RDF Entity Manager provides a Java persistence framework using semantic annotations to save objects to the Sesame RDF store.

29. RDFJAVA http://rdf2java.opendfki.de/cgi-bin/ trac.cgi

It is a small tool written in Java. It allows easy handling of RDF data. Instead of using an RDF api for creating and searching for RDF triples, i.e., (subject, predicate, object), you just work with Java objects representing RDF subjects / objects.

30. RDFSuite http://athena.ics.forth.gr:9090/RDF/

ICS-FORTH RDFSuite open source, high-level scalable tools for the Semantic Web. This suite includes Validating RDF Parser (VRP), a RDF Schema Specific DataBase (RSSDB) and supporting RDF Query Language (RQL).

31. RacerPro http://www.racer-systems.com/

It is an OWL reasoner and inference server for the Semantic Web

32. Redland http://librdf.org/

Redland is a set of free software libraries that provide support for the RDF. The software is available under multiple licenses, namely GPL, LGPL, and Apache License, to simplify reuse.

33. Redland RDF Libraries http://librdf.org/

It is a set of free software C libraries that provide support for the RDF.

34. S3DB http://s3db.org/

Simple Sloppy Semantic Database is a way to represent information on the Semantic Web without the rigidness of relational/XML schema while avoiding the "spaghetti" of unconstrained RDF stores.

35. SSBhttp://www.vectorc.com/

VectorC's Semantic Service Bus (SSB) is a Semantic Web runtime framework based on an enterprise service bus (ESB) architecture. The SSB can query, transform, route and perform reasoning over RDF data and associated ontologies.

36. SWIC http://moustaki.org/swic/

The SWI Semantic Web Client from the Centre for Digital Music is an implementation of a linked data client, looking programmatically for particular information on the Semantic Web.

37. SemanticFlash.Org http://www.semanticflash.org/

SemanticFlash is an open source ActionScript 3 Semantic Web framework. It will provide a standard I/O stack (parsers, network), native bindings for RDF scripting and User Interface binding facilities along with basic inference.

38. Semantic MediaWiki http://semantic-mediawiki.org/wiki/Semantic_MediaWiki

SMW is a semantic wiki engine that enables users to add semantic data to wiki pages. This data can then be used for better searching, browsing, and exchanging of information. Among many other sites, SMW also powers semanticweb.org.

39. Semantic Studio http://semanticsoft.net:8080/semanticwebtools.html #semanticstudio

It is an ontology development tool of Semantic Soft which stores the ontology in a semantic repository, a database or file system of any platform. Development can be done in various modes, including design, graphics, or source mode.

40. Semantic Web Client http://sites.wiwiss.fu-berlin.de/suhl/bizer/ng4j/semwebclient/

The Semantic Web Client Library represents the complete Semantic Web as a single RDF graph. The library enables applications to query this global graph using SPARQL.

41. Sesame http://openrdf.org/

Sesame is a community site to support the development of Sesame. Sesame is an open source framework for storage, inferencing and querying of RDF data.

42. Sesame 2 Windows Client http://sourceforge.net/projects/sesamewinclient/

Sesame 2 Windows client is a Windows GUI application for interacting with a Sesame 2 RDF server lets you connect to a Sesame repository, do queries, export, add and remove data is developed by Jeen Broekstra

43. SemVersion http://semweb4j.org/site/semversion.

It is a versioning system for RDF and Ontologies, maintained at FZI and AIFB. The main features of this tool are 1. Version your Models; 2. Rich metadata support; and 3. RDF commitment.

44. Semweb4j http://ontoware.org/projects/semweb4j/

Use the toolkit semweb4j and get in a single download all you need to semantic-web-enable your application. Very little semantic web knowledge is required. Semweb4j gives a Java developer the semantic web within natural Java constructs.

45 SemWeb-DotNet http://razor.occams.info/code/semweb/

SemWeb is an open-source library written in C# for Mono or Microsoft's .NET 1.1/2.0. The library can be used for reading and writing RDF (XML, N3), keeping RDF in persistent storage (memory, MySQL, etc.), querying persistent storage via simple graph matching.

46. Sparta http://www.mnot.net/sw/sparta/

It is a Python API for RDF that is designed to help easily learn and navigate the Semantic Web programmatically. Unlike other RDF interfaces, which are generally triple-based, Sparta binds RDF nodes to Python objects and RDF arcs to attributes of those Python objects.

47. SPARQL Python Wrapper http://sparql-wrapper.sourceforge.net/

A wrapper in Python around a SPARQL service. It helps in creating the query URI and, possibly, convert the result into a more manageable format.

48 SpecGen http://forge.morfeo-project.org/wiki_en/index.php/SpecGen

SpecGen is a free software python tool, available under the MIT license, to generate technical specifications of ontologies. It takes an ontology source (RDFS or OWL), and generates a HTML specification off all its classes, properties and instances.

49. SWeDE http://owleclipse.projects.semwebcentral.org/

The Semantic Web Development Environment (SWeDE) is an extensible framework for integrating new and existing tools for the Semantic Web.

50. SWI-Prolog Semantic Web Server http://www.swi-prolog.org/packages/SeRQL/

The SWI-Prolog Semantic Web Server unifies the SWI-Prolog general Web support and Semantic Web support, providing both a starting point for dedicated applications and a platform for exchange of RDF-based data using a standardised language and protocol

51. Tabulator http://www.w3.org/2005/ajar/tab

The Tabulator project is a generic data browser and editor. Using outline and table modes, it provides a way to browse RDF data on the web. RDF is the standard for inter-application data exchange.

52. Topaz http://www.topazproject.org/trac/

opaz is a powerful object to RDF persistence and query service. Based loosely on the ORM family of software, Topaz lets you develop persistent classes following object-oriented concepts such as inheritance, composition, association, etc.

53. TopQuadrant's TopBraid Suite http://www.topquadrant.com/topbraid/

TopQuadrant's TopBraid Suite is a complete standards-based platform for developing, testing and deploying Semantic Web applications. The Suite consists of TopBraid Composer (a data integration toolkit and ontology editor) and TopBraid Live (an application deployment platform with a Flex-based user interface API). The tools also implements RDFa and GRDDL.

54. Vapour http://vapour.sourceforge.net/

Vapour is a web-based validator tool developed by CTIC Foundation to check the compliance of a web site against the recipes described in the Best Practices Recipes for Publishing RDF Vocabularies (W3C Working Draft).

55. Virtuoso http://virtuoso.openlinksw.com/

Virtuoso Universal Server s a middleware and database engine hybrid that combines the functionality of a traditional RDBMS, ORDBMS, virtual database, RDF, XML, free-text, Web Application Server, and File Server functionality in a single server product offering.

56. VisualKnowledge http://www.visualknowledge.com

Visual Knowledge is a fully integrated Web 3.0 development and execution platform for building semantic sites, semantic wikis, semantic blogs and high performance knowledge-driven applications.

57. WOM http://www.alphaworks.ibm .com/tech/wom

IBM Web Ontology Manager facilitates browsing and searching OWL ontology repositories same as submitting own ontologies to a repository. The tool supports ontology engineers in searching sets of registered ontologies by presenting them similarity reports between different ontologies.

58. Wilbur http://wilbur-rdf.sourceforge.net/

It is lisp based toolkit for Semantic Web Programming. Wilbur is Nokia Research Center's toolkit for programming Semantic Web applications that use RDF written in Common Lisp.

59. Weso http://weso.sourceforge.net/

Weso is a set of semantic web tools developed as part of a Declarative Programming course at the University of Oviedo.

11 Conclusion

The Semantic Web provides opportunities for users to get better search results and get more targeted traffic as users find what they really want in case of site owners. But these benefits don't just magically appear. Although the aim of Tim Berners-Lee's Semantic Web is yet to be fully realized, the years of thinking and research that have gone into it are starting to bear fruit in terms of solutions to practical problems that people face today. The strong collaboration trends in Web 2.0 will only lead to more requirements for structured and semantically encoded data being available on the Web. This paper lists overview of the RDF and OWL semantic web tools.

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