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DARPA-FUNDED WEB LANGUAGE BECOMES INTERNATIONAL STANDARD
OWL Will Improve Web Services and Web Searching

The investment by the Defense Advanced Research Projects Agency (DARPA) in the DARPA Agent Markup Language was validated this week as the World Wide Web Consortium approved the Web Ontology Language as an official web standard.

The Web Ontology Language, known as OWL, is largely based on the DARPA Agent Markup Language (DAML) and the European Commission's Ontology Interchange Language (OIL). The World Wide Web Consortium's action allows OWL to join Hypertext Markup Language (HTML), Extensible Markup Language (XML), and other standard and widely used web languages.

OWL is a new markup language that makes possible the next-generation semantic web – a web of pure data that parallels the current page-based web. OWL provides a clear, machine-readable structure for the data in pages already published on the web. It also allows computers to accurately reason about information given by OWL-marked web pages. OWL's unique combination of these two capabilities – the representation of knowledge on the web, and the ability to reason with this knowledge – supplies the foundational technology for the semantic web. The standardization of OWL by the World Wide Web Consortium allows semantic web technology to move out of the research and development community and into broad-based, commercial-grade platforms for building highly distributed, web-enabled, cross-enterprise applications. Having OWL as an international standard allows companies and the DoD to proceed with confidence to develop the sophisticated, interoperable tools and web services that will seed the semantic web.

The web contains a vast amount information and is expanding at a rapid rate. Most of that information is currently being represented using HTML, which allows web developers to display information in formatted, human-readable pages. While HTML defines the way web pages will be displayed in browsers, it provides only a rudimentary capability to describe the information present in these documents in ways that software programs can find or interpret. XML allows page-based information to be labeled using a tag system, but it cannot encode the rich relationships that data bear to each other.

OWL uses networks of hyperlinked ontologies to clearly and precisely represent data relationships that exist on world wide web pages. An ontology precisely defines the vocabulary used to describe and represent an area of knowledge. Ontologies are used to semantically integrate data and

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to automatically overcome interoperability problems between separately developed, legacy applications. For the U.S. military, DAML and OWL provide a way to encode ontologies that can be distributed across many systems, can scale to the large sizes needed by military applications, and are compatible with web standards for accessibility (a Federal Government mandate) and internationalization (needed for Coalition operations).

What will this mean to the average person? The additional information provided by OWL markup will dramatically improve the utility of web-based queries and web services. Browser queries will return results that are much more accurate and precise, rather than the hundreds or thousands of responses that are received today. Networks of web services will have the information needed to automatically and dynamically compose together into large-scale user-directed virtual processes. For the U.S. military, relationships between objects and processes will be more readily identified and linked, greatly increasing the efficiency of data evaluation and reaping benefits for intelligence analysis and battlespace planning.

As well as being involved in the design of the OWL language, DARPA's DAML program has supported a number of teams in developing tools and ontologies in DAML (and later OWL) and deploying these within the Department of Defense community.   A web site developed by the DAML program (http://www.daml.org) contains over 280 ontologies and more than 100 open-source tools that support work in the semantic web area. The web site and its tools were instrumental in validating the design of the OWL language and proving that it could be implemented and used.

In addition, DARPA's DAML program sponsors a Semantic Web Military Users Group, and is funding a project to capture and analyze complex relationships embedded in U.S. national security textual products. The DAML community is also working on ways to use automated tools to help analysts and commercial users quickly, consistently and reliably mark up documents in OWL.

The World Wide Web Consortium is an international body that develops common protocols and standards to ensure interoperability of web components. The Consortium approved the original web authoring languages HTML and XML as standards.

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Media with questions, please contact Jan Walker, (703) 696-2404, or jwalker@darpa.mil.