

# Ontologies and the Semantic Web

# Introduction

The Internet is the globally integrated system of computer networks, which uses for communication and routing of data packets the protocols TCP / IP.

Semantic Web is the direction of development of the World Wide Web, the purpose of which is to provide information in a form that is suitable for machining on the basis of technology standards that are developed and implemented by World Wide Web Consortium (W3C).

The concept of Semantic Web was introduced in 2001 by Tim Berners-Lee.

The user using unique URI identifiers can easily express concepts, which were introduced by them, and even can integrate with the Internet the real-world objects.

W3 Consortium decided that for the practical use of Semantic Web it is enough to develop:

the universal language of knowledge representation, which is using the links on the ontology (RDF);

languages of describing of ontology (OWL) and languages of the description of Web services (WSDL, OWL-S);

tools for the creation of documents and their processing (Jena, Haystack, Protege);

languages of queries to knowledge (SPARQL) and inference of knowledge;

semantic search engines (SHOE) and software agents.

# Technical part

The Semantic Web is a system with the rudiments of artificial intelligence.

The basic functionality of the Semantic Web can be divided into several basic groups according to the type of service that they provide to users.

The first group is represented by the type of the service, which was named resource review.

The basic function of replenishment of knowledge in storage is assured by users (users of social networks).  
A striking example of such systems is the Wiki-systems.

On the Internet at the time of the appearance of the Semantic Web, there were the specialized stores of large amounts of data.

The main problem of their direct use in Semantic Web was their various structuredness or its lack in general.

At a certain level of abstraction, we can say that the construction and development of the Semantic Web for practical use is based on optimizing the use of three basic components: software agents, Extensible Markup Language XML, and Web-based ontologies.

The most common set of the used optimization techniques is presented in the form of a specialized "pie".

The lower layers of the pie (at least until the RDF + RDF Schema) became a reality.

At the heart of the semantic web, lay such three principles as aggregation, security, and logic.

The next level is the XML language as a basic form of marking and means for determining and describing of classes of XML-documents (DTD, XML-schema), deployment of means for describing of resources RDF and RDF-schema, which are explaining how XML data should be stitched in the network and how to build directories and concepts dictionaries.

The main methodological purpose of RDF model in the Semantic Web is the describing of the connections (relationships) between network resources and information.

The technical part of the Semantic Web is formed by the family of standards, which includes XML, XML Schema, RDF, RDF Schema, OWL, and others.

The need for metadata description leads to duplication of information.

The basic principle of the work of protocol is the next: file distribution is fully controlled by tracker (whose address is in the torrent file).

The user interaction with Web-fragment can be enriched by the use of visual elements and built-in (or global) CSS styles.

OWL Web Ontology Language is intended to describe the classes and relations between them that are inherent in both the network documents and applications.

The class is a concept in the ontology, the main unit of OWL.

The dynamic part of the Semantic Web is the semantic Web services SWS (Semantic Web Services), which are available via the Web and are suitable for search, composition, and performance.

Basic principles of the implementation of Semantic Web were used in various individual projects. Among them, two are traditionally distinguished: Dublin Core and DBpedia.

Ontologies are the foundation of the Semantic Web and description in some formal language of concepts of a domain and the relationships between them.

Ontologies are very similar to thesauri and taxonomies, but, in fact, they are wider because they provide additional means for the description of the structure of the described data.

Ontology is a specification of a conceptualization of domain, or simply, the document or file that formally defines the relations between the terms (dictionary of concepts in the domain and the set of explicitly expressed assumptions about the meaning of these concepts).

Development of language for the description of structured ontologies OWL recently became one of the most important parts of the work on the improvement of the Semantic Web, which is held by the consortium W3C.

In practice, the creation of ontology begins with the construction of one or more classes of hierarchies of concepts that make up the subject area, each of which can have subclasses, which are more accurate concepts than the original class.



Summing up the results of the general review we should not miss the list of main valid recommendations of the W3C, which are associated with the existence of the Semantic Web:

XML ([www.w3c.org/XML](http://www.w3c.org/XML)) provides the syntax for structured documents but imposes no semantic constraints on the content of these documents.

XML Schema ([www.w3c.org/XML/Schema](http://www.w3c.org/XML/Schema)) defines the structure of XML documents and complements XML by the specific types of data.

RDF ([www.w3c.org/TR/2002/WDrdf-concepts-20021108](http://www.w3c.org/TR/2002/WDrdf-concepts-20021108)) allows us to describe a data model for the resources and the relationships between them, provides a simple semantics for this data model, presenting them in XML syntax.

RDF Schema ([www.w3c.org/TR/2002/WD-rdf-schema-20021112](http://www.w3c.org/TR/2002/WD-rdf-schema-20021112)) provides a means for describing properties and classes of the RDF-resources, and semantics for hierarchies-generalizations of such properties and classes.

OWL (<http://www.w3.org/TR/owlfeatures/>) provides the advanced describing properties and classes.

The process of developing of ontology traditionally include:

the allocation of a glossary of terms (concepts) for the study of the properties and characteristics of presented terms;

creation of the list of precise definitions for the terms of the glossary;

the construction of the concepts of classification trees (class hierarchy) on the basis of the taxonomic relationships;

the allocation from the not involved in the preparation of the concepts of classification trees the class attributes and their possible values for installation of the basic relations between the classes;

optional adding of instances of classes;

creation of rules for logical inferences by experts to manipulate and extract new knowledge.

# Future prospects

In our research, we have highlighted many aspects of the relationship between Ontologies and the Semantic Web, however, not all.

In the future, we plan to provide classifications of Ontologies by the main parameters (level, weight and so on).

Moreover, we plan to highlight in details the role of intellectual agents in the relationship between Ontologies and the Semantic Web.

The special attention will be paid to the organization of collective and personal repositories of knowledge Wiki.

Modern semantic Wiki also will be highlighted (NoodleWiki, DidiWiki, OpenWiki, WackoWiki, EddiesWiki and so on).

# Conclusions

The Semantic Web is a system with the rudiments of artificial intelligence.

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At a certain level of abstraction, we can say that the construction and development of the Semantic Web for practical use is based on optimizing the use of three basic components: software agents, Extensible Markup Language XML, and Web-based ontologies.

At the heart of the semantic web, lay such three principles as aggregation, security, and logic.

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Microformats are the way to semantically mark information about various entities on the Webpages using the standard elements of HTML (or XHTML).

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