Towards an Ontology Metadata Standard

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ABSTRACT
In this poster, we present (i) a proposal for a metadata standard, known as Ontology Metadata Vocabulary (OMV) which is based on discussions in the EU IST thematic network of excellence Knowledge Web[1] and (ii) two complementary reference implementations which show the benefit of such a standard in decentralized and centralized scenarios, i.e. the Oyster P2P system and the Onthology metadata portal.

Categories and Subject Descriptors
I.2.4 [**Knowledge Representation Formalisms and Methods**]: Representation languages.

K.6.4 [**System Management**]: Centralization/descentralization

General Terms
Management, documentation, design, reliability, experimentation, standardization.

Keywords
Ontology, Metadata, Peer-to-Peer, Repository

1. INTRODUCTION
Ontologies have undergone an enormous development and application in many domains within the last years, especially in the context of the Semantic Web. Currently however, efficient knowledge sharing and reuse, a pre-requisite for the realization of the Semantic Web vision, is a difficult task since it is hard to find and share existing ontologies because of the lack of standards for documenting and annotating ontologies with metadata information. Without an ontology-specific metadata developers are not able to exploit existing ontologies, which leads to problems of interoperability as well as duplicate efforts. Then, in order to provide a basis for an effective access and exchange of ontologies across the web it is necessary to agree on a standard for ontology metadata, that is a common set of terms and definitions describing ontologies, that is called metadata vocabulary. Furthermore, an appropriate technology infrastructure is required, e.g. tools and metadata repositories, compatible to the ontology metadata standard, must be developed to support the creation, maintenance and distribution of ontology metadata.

2. OMV
Some of the aspects captured by OMV[2] (the complete ontology is described in [1]) are similar to other metadata standards, like Dublin Core [2]. However, some important differences like the conceptual models (semantics) behind ontologies require a detailed analysis and a different representation of metadata about ontologies. From a conceptual design point of view, OMV distinguishes between the OMV Core, which captures information relevant to the majority of ontology reuse settings and various OMV Extensions that allow ontology developers/users to specify task/application-specific ontology-related information.

2.1 Overview
OMV core distinguishes between an ontology conceptualisation and its implementation(s) in concrete representation languages. From an ontology engineering perspective, a person first develops such core idea of what should be modeled (and maybe how) in his mind. Further, this initial conceptualisation might be discussed with other persons and then, an ontology will be built using an ontology editor and stored in a specific format. Over time, several realizations of this initial conceptualisation might be created in many different formats, e.g. in RDF(S) or OWL. The two concepts are defined as follows:

Ontology Conceptualisation: *(OC)* represents the (abstract) core model or idea behind an ontology. It describes the core properties of an ontology, independently of any implementation details.

Ontology Implementation: An *(OI)* represents a specific realization of a conceptualisation. It describes properties of an ontology that are related to the realization or implementation.

The distinction between the two concepts provides an efficient mechanism for the realization of several ontology management utilities, such as the tracking of several versions, the evolution flow of an ontology or the handling of different representations of the same knowledge model. OMV also models additional classes that are required to represent and support the reuse of ontologies by such metadata vocabulary, especially in the context of the Semantic Web. Hence, we modeled further classes and properties representing *environmental information* and *relations* such as: Party, Organisation, Person, OntologyType, LicenseModel, OntologyLanguage, etc. The main classes and properties of the OMV ontology are illustrated in Figure 1.

3. USE CASES
We shortly introduce two complementary applications based on OMV, namely the decentralised P2P system Oyster[3] and the centralized metadata portal Onthology[4], to show the benefits of using such a vocabulary in real life scenarios. Both applications

Demos and Posters of the 3rd European Semantic Web Conference (ESWC 2006), Budva Montenegro, 11th - 14th June, 2006

[1] http://knowledgeweb.semanticweb.org

[2] OMV ontology is available at http://ontoware.org/projects/omv/

[3] Available at http://oyster.ontoware.org/

[4] http://www.onthology.org/

have in common that they support single users and

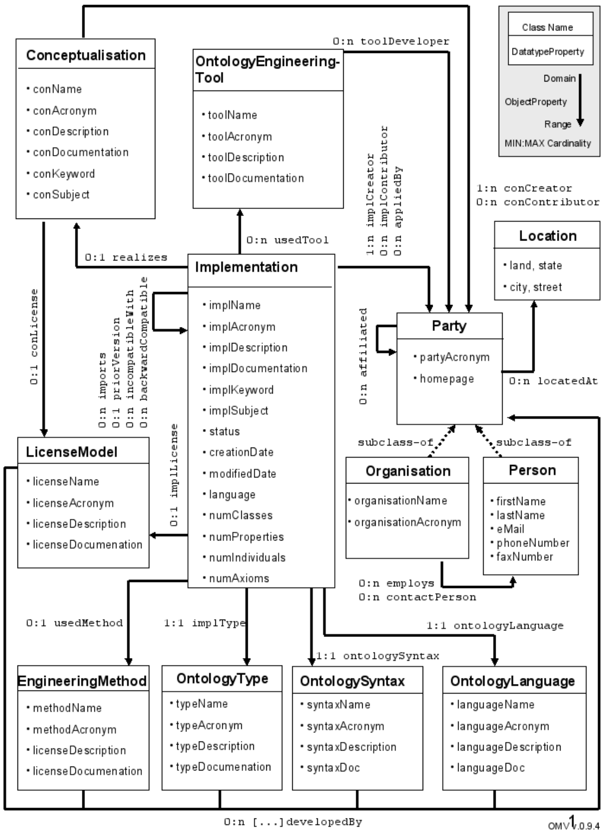

Figure 1. OMV overview

communities of users in *identifying*, *reusing* and *providing* ontology metadata. However, both applications are covering a variety of different tasks and have different usage perspective. For users who want to store metadata individually, a repository is required to which the user has full access and can perform any operation without any consequences to other users. In this situation a decentralised system is the technique of choice, as it allows the maximum of individuality while it still ensures exchange with other users. Centralized systems allow reflecting long-term community processes in which some ontologies become well accepted for a domain or community and others become less important. The benefit of connecting both systems lies mainly in the simple use of ontology metadata information existing within Oyster. So, while users are applying or even developing their own ontologies they can manage their own metadata along with other existing metadata in Oyster. If some metadata entries from Oyster have reached a certain confidence, they can be easily imported into Onthology.

4. RELATED WORK

We will briefly mention related metadata standards, in particular those relevant to the Semantic Web. The **Dublin Core (DC)** metadata standard [2] is a simple yet effective element set for describing a wide range of networked resources. The **Reference Ontology** [3] is a domain ontology that gathers, describes and links existing ontologies. However its focus is to characterize ontologies from the user point of view, and provides only a list of property-value pairs for describing ontologies. **FOAF** [4] provides a way to create machine-readable Web homepages for people, groups, companies and other things. The Semantic Web search engine **SWOOGLE** [5] makes use of particularly metadata which can be extracted automatically. There exist some similar approaches to our proposed solution to share ontologies, but in general their scope is quite limited. E.g. the **DAML ontology library** [6] provides a catalog of DAML ontologies that can be browsed by different properties. The **FIPA ontology service** [7] defines an agent wrapper of open knowledge base connectivity. Finally the **SchemaWeb Directory** [8] is a repository for RDF schemas expressed in RDFS, OWL and DAML+OIL.

5. CONCLUSIONS AND FUTURE WORK

A key issue for sharing knowledge on the Semantic Web is to reuse existing ontologies. Our contribution aims at facilitating reuse of ontologies which was previously unknown for ontology developers by providing an Ontology Metadata Vocabulary (OMV) and two applications for decentralized (Oyster) and centralized (Onthology) sharing of ontology metadata based on OMV. Our current work is DEMO [9], a framework for the development and deployment of ontology metadata, which comprises OMV and an inventory of methods to collaboratively extend OMV in accordance to the requirements of an emerging community of users, and tools for metadata management. Finally, our future work includes many challenges such as the application of OMV extensions, the evaluation of the application of OMV in different scenarios and pushing OMV to a community standard.

6. ACKNOWLEDGMENTS

Our thanks to our partners from the EU project Knowledge Web for their present and future collaboration. Especially we would like to thank Elena Paslaru (FUB), Denny Vrandecic (AIFB).

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