Chapter 3

ONTOLOGY MANAGEMENT INFRASTRUCTURES

Walter Waterfeld¹, Moritz Weiten², Peter Haase³
¹Software AG, Uhlandstr. 12, D-64289 Darmstadt, Germany, Walter.Waterfeld@softwareag.com; ²Ontoprise GmbH, Amalienbadstr. 36, D-76227 Karlsruhe, Germany, Weiten@ontoprise.com; ³AIFB, Universität Karlsruhe(TH), Englerstr. 28, D-76128 Karlsruhe, Germany, pha@aifb.uni-karlsruhe.de

Abstract: In this chapter we examine tools for ontology management. A state of the art analysis of the currently existing tools like editors, browsers and reasoners shows a number of deficits like many isolated tools, which cover only a small part of the lifecycle. Thus there is the need for an integrated environment for ontology management. Based on these deficits we define for such an integrated environment critical requirements, which cover the whole engineering lifecycle of large scale ontologies in a distributed environment. The NeOn architecture — a reference architecture for ontology management tools — addresses these requirements through a layered and extensible architecture. It enhances ontology management techniques with mechanisms for large distributed semantic applications. It also opens traditional closed ontology management tools with a service-based integration into scalable standard infrastructures. The NeOn toolkit as the reference implementation of the NeOn architecture resolves the deficits of these tools concerning the stated requirements

Keywords: Ontology management; OWL; reasoner; registry; repository; rules

1. INTRODUCTION AND MOTIVATION

Ontology management tools are needed for the development of semantic applications especially in the growing corporate Semantic Web, which comprises the application of semantic technologies in an enterprise environment. The main infrastructure components needed are tools to develop ontologies and reasoners to process these ontologies. The
functionality of development tools is currently mainly focussed on editing and browsing ontologies. A broad range of tools and a large common core of features have emerged in recent years. Opposite to that, reasoners as the other established ontology infrastructure, have quite small core functionality. Here the activities concentrate more in the area of the supported ontology languages and on efficient realisations of the reasoning process.

Analyzing the state-of-the-art ontology management tools, we observe that the evolution of semantic technologies has led to a number of concrete implementations to support specific ontology engineering activities and that in particular the initial development of single, static ontologies is well supported.

However, popular tools available today for ontology development are limited with respect to (i) lifecycle support, (ii) collaborative development of semantic applications, (iii) Web integration, and (iv) the cost-effective integration of heterogeneous components in large applications.

While typically today’s environments are ‘closed,’ and focus on a single or a few individual aspects/phases of the lifecycle, we require an environment that adequately supports the developer user loop over the lifecycle of networked ontologies.

The NeOn project\textsuperscript{1} addresses those aspects. NeOn is a large European Research project developing an infrastructure and tool for large-scale semantic applications in distributed organizations. Within NeOn, we aim at advancing the state of the art in ontology management by developing a reference architecture. Particularly, we aim at improving the capability to handle multiple networked ontologies that are created collaboratively, and might be highly dynamic and constantly evolving. This is achieved by providing — in a major integrative effort — an infrastructure for networked ontology management capable of suiting the community’s needs. The heart of this infrastructure is the NeOn Toolkit\textsuperscript{2} for engineering contextualized networked ontologies and semantic applications.

In this chapter, we will first provide an overview of the state-of-the-art in management tools in the subsequent Section 2. We then analyze requirements that modern ontology management tools must meet in order to support the lifecycle of ontologies in networked, distributed, and collaborative environments in Section 3. In Section 4 we present an overview of the NeOn reference architecture for ontology management in large-scale semantic applications. We conclude with a summary in Section 5.

\footnotesize\textsuperscript{1} http://www.neon-project.org/
\footnotesize\textsuperscript{2} http://www.neon-toolkit.org/