

# Semantic Yellow Page Service Discovery: The Veturi Portal

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## Abstract

A prototype semantic yellow page service portal is described. Our idea is to represent service offerings as events and processes in terms of ontologies. Based on versatile semantic descriptions, users can be provided with a flexible view-based search engine enhanced with semantic text autocompletion.

## 1 Introduction

Yellow page directory services<sup>1</sup> on the Web are widely used for helping people in finding goods and services. It can, however, be difficult for the end-users to map their needs to the services offered [2; 1]. The service provider is faced with an analogous service description problem, when trying to index his services in such a way that the end-users do not miss them. This paper overviews the yellow page service discovery portal VETURI<sup>2</sup>. We first present how to represent services semantically. After this, a view-based service discovery system based on ontological descriptions is discussed.

## 2 Semantic Service Description

Service descriptions in VETURI are based on a unified ontology-based annotation schema where a service is represented in terms of events and roles related to them, such as 'patient', 'instrument', 'locality', and 'time'. Furthermore, the service can be divided into operational subevents to form processes. For example, figure 1 depicts some ontological structures for representing 'Rock removing' services with the roles 'consumer' and 'producer', and subevents 'Destruction' and 'Transportation' that both have 'patient' as a role.

The schema makes heavy use of extant classifications and ontologies, such as TOL [6], COICOP [7], and SUMO [5], particularly its Process-branch. The data used in the VETURI portal was transformed from the the yellow pages business advertisement database of Fonecta Ltd<sup>3</sup>, and was extended with a dataset of health and social service descriptions from

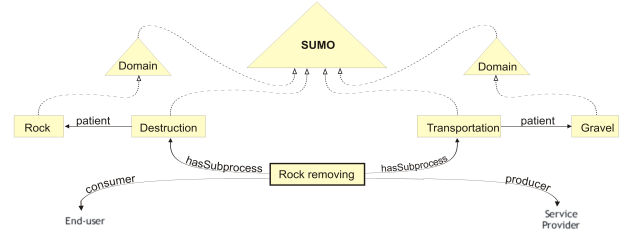


Figure 1: Core ontological structures of the Veturi system

the National Research and Development Centre for Welfare and Health STAKES<sup>4</sup>. The full dataset of some 220,000 service descriptions was semantically enhanced to match the annotation schema by the application of manually crafted ontological and logical transformation rules.

## 3 Efficient View-Based Service Retrieval

In searching for yellow page services users typically know what they are looking for, but cannot always formulate their queries accordingly. The annotation schema depicted above allows for the services to be queried versatily from a number of different viewpoints. For example, the end-user may want to constrain the search in terms of service type, location, service producer, or other roles related to the service. To facilitate multiple views to the portal content, we decided to employ the view-based search paradigm based on ontologies, as developed for the MUSEUMFINLAND portal [3] in VETURI, too.

The user interface of the Veturi portal is based on a new version of the ONTOVIEWS-tool [4], projecting the ontological hierarchies inherent in the schema into different views, and then on-the-fly semantically autocompleting keywords into these categories. There are five view-facets in the search interface (cf. figure 2): Consumer (Kuluttaja), Producer (Tuottaja), Target (Mitä?), Service type (Prosessi), and Location of the Service (Paikka). They are located at the top, initially marked only by their name and an empty keyword box. Typing search terms in the boxes immediately opens the corresponding facet to show matching categories. The results view below the facets also updates to show relevant hits, defined by the current search constraints in other facets, and a

<sup>1</sup>e.g., <http://www.yell.co.uk>

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<sup>3</sup><http://www.fonecta.fi/>

<sup>4</sup><http://www.stakes.fi/>

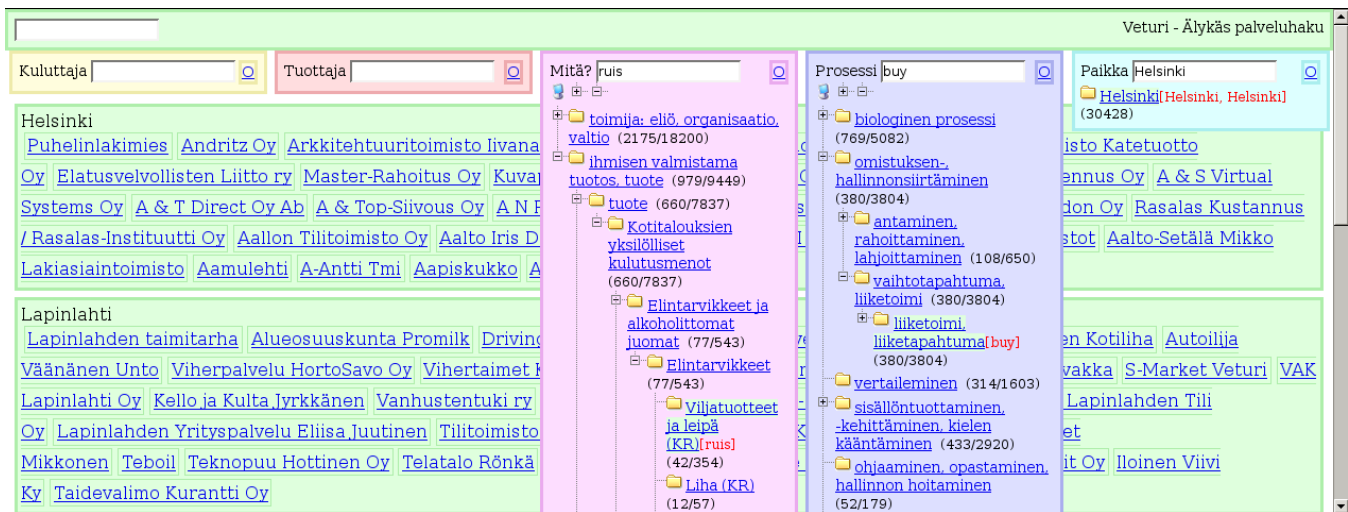


Figure 2: The main user interface of the Veturi portal

union of all the matched categories in the current facet. If there is need for more specificity or an alternate selection, a single category can be chosen from the facet. After such a selection, the facet again closes, showing only the newly selected constraint, with the results view updating accordingly. In this way, the user is guided in formulating his query by focusing the annotation schema and by extension the views on clear, distinct variables of the service.

For users more familiar with the portal's service description model, a globally effective keyword search box is provided in the upper left corner for quick searches. Because the contents of the views seldom overlap, most queries can be adequately replied to simply by typing the service need in plain text in the global keyword box, e.g. 'car repair helsinki', with possible disambiguations done through the facets.

The example search depicted in figure 2 shows a user trying to find out where he can buy rye bread in Helsinki. He has already selected Helsinki as the locale for the service. Now, he is in the process of describing the actual service. In the view 'Mitä?' (service target), the user has typed the word 'ruis' (rye). While the ontology used does not contain different grains, the concept 'Viljatuotteet ja Leipä (KR)' (grain products and bread) contains a textual reference to rye, resulting in a category match. In this way, existing textual material can be used to augment incomplete ontologies.

As can be seen in the figure, the matched categories are shown directly in their hierarchical contexts. This allows for quick evaluation of hit relevance, as well as reveals close misses, where, for example, the keyword matches a more appropriate sibling category. As a side effect, the user is also guided on the indexing used in the system. The trees can be opened and navigated freely without using keywords for an alternate form of navigation and familiarization.

The search query entered in the view 'Prosessi' (service type) divulges an additional feature of the portal: multilingual support. Typing in the word 'buy' in English matches the appropriate business transaction, even though the word for 'buy' in Finnish would be 'ostaa'. The implementation

also supports T9-type mobile phone numerical queries.

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## **The Veturi System Demonstration**

We propose to demonstrate the functionality of the VETURI portal user interface live on the web at ISWC2005. The actual components and techniques to be demonstrated include the ontology-based multi-facet search and semantic autocompletion, as described in the poster.