D1.4.6 Cupboard—Supporting Ontology Reuse by Combining a Semantic Web Gateway, Ontology Registry and Open Ratings Systems – Improved and Final Version

Deliverable Co-ordinator: Holger Lewen

Deliverable Co-ordinating Institution: Universität Karlsruhe (TH)

Other Authors: Mathieu d'Aquin amd Salman Elahi (OU)

In this deliverable, we present the update to the Cupboard system for ontology publishing, sharing and reuse. In this deliverable we focus on the new features: Key concept visualization, alignment integration into the front-end, and an updated version of the TS-ORS. We furthermore describe the Cupboard Java API and the NeOn Toolkit plugin. The results from conducted user-study are also included.

Document Identifier:	NEON/2010/D1.4.6/v1.0	Date due:	February 28, 2010
Class Deliverable:	NEON EU-IST-2005-027595	Submission date:	February 28, 2010
Project start date	March 1, 2006	Version:	v1.0
Project duration:	4 years	State:	Final
		Distribution:	Public

NeOn Consortium

This document is part of the NeOn research project funded by the IST Programme of the Commission of the European Communities by the grant number IST-2005-027595. The following partners are involved in the project:

Open University (OU) – Coordinator Knowledge Media Institute – KMi Berrill Building, Walton Hall Milton Keynes, MK7 6AA United Kingdom Contact person: Martin Dzbor, Enrico Motta E-mail address: {m.dzbor, e.motta}@open.ac.uk	**Universität Karlsruhe – TH (UKARL)** Institut für Angewandte Informatik und Formale Beschreibungsverfahren – AIFB Englerstrasse 11 D-76128 Karlsruhe, Germany Contact person: Peter Haase E-mail address: pha@aifb.uni-karlsruhe.de
Universidad Politécnica de Madrid (UPM) Campus de Montegancedo 28660 Boadilla del Monte Spain Contact person: Asunción Gómez Pérez E-mail address: asun@fi.ump.es	**Software AG (SAG)** Uhlandstrasse 12 64297 Darmstadt Germany Contact person: Walter Waterfeld E-mail address: walter.waterfeld@softwareag.com
Intelligent Software Components S.A. (ISOCO) Calle de Pedro de Valdivia 10 28006 Madrid Spain Contact person: Jesús Contreras E-mail address: jcontreras@isoco.com	**Institut 'Jožef Stefan' (JSI)** Jamova 39 SL–1000 Ljubljana Slovenia Contact person: Marko Grobelnik E-mail address: marko.grobelnik@ijs.si
Institut National de Recherche en Informatique et en Automatique (INRIA) ZIRST – 665 avenue de l'Europe Montbonnot Saint Martin 38334 Saint-Ismier, France Contact person: Jérôme Euzenat E-mail address: jerome.euzenat@inrialpes.fr	**University of Sheffield (USFD)** Dept. of Computer Science Regent Court 211 Portobello street S14DP Sheffield, United Kingdom Contact person: Hamish Cunningham E-mail address: hamish@dcs.shef.ac.uk
Universität Kolenz-Landau (UKO-LD) Universitätsstrasse 1 56070 Koblenz Germany Contact person: Steffen Staab E-mail address: staab@uni-koblenz.de	**Consiglio Nazionale delle Ricerche (CNR)** Institute of cognitive sciences and technologies Via S. Marino della Battaglia 44 – 00185 Roma-Lazio Italy Contact person: Aldo Gangemi E-mail address: aldo.gangemi@istc.cnr.it
Ontoprise GmbH. (ONTO) Amalienbadstr. 36 (Raumfabrik 29) 76227 Karlsruhe Germany Contact person: Jürgen Angele E-mail address: angele@ontoprise.de	**Food and Agriculture Organization of the United Nations (FAO)** Viale delle Terme di Caracalla 00100 Rome Italy Contact person: Marta Iglesias E-mail address: marta.iglesias@fao.org
Atos Origin S.A. (ATOS) Calle de Albarracín, 25 28037 Madrid Spain Contact person: Tomás Pariente Lobo E-mail address: tomas.parientelobo@atosorigin.com	**Laboratorios KIN, S.A. (KIN)** C/Ciudad de Granada, 123 08018 Barcelona Spain Contact person: Antonio López E-mail address: alopez@kin.es

Work package participants

The following partners have taken an active part in the work leading to the elaboration of this document, even if they might not have directly contributed to the writing of this document or its parts:

- OU

Change Log

Version	Date	Amended by	Changes
0.1	01-20-2010	Holger Lewen	Skeleton of Deliverable created
0.2	01-22-2010	Holger Lewen	User Study Included
0.3	01-25-2010	Holger Lewen	New components described
0.4	02-01-2010	Mathieu d'Aquin	API and Plugin chapters
0.9	02-05-2010	Holger Lewen	Finalizing deliverable and updated manual
1.0	02-17-2010	Holger Lewen	Incorporating reviewer's comments.

Executive Summary

In this deliverable, we present the updates to the Cupboard system for ontology publishing, sharing and reuse. This system is intended to support both ontology engineers and ontology users/practitioners. For the developers of ontologies, it offers a complete infrastructure to host their ontologies in online ontology spaces, providing mechanisms to describe, manage and effectively exploit these ontologies (through APIs). Furthermore, these ontologies are then exposed to the community, providing users with a complete, friendly environment to find, assess and reuse ontologies. In the deliverable we focus on an update to the TS-ORS integration, the new key concept visualization and the integration of the alignment server into the UI. Also the Cupboard Java API is introduced and the integration into a NeOn Toolkit plugin is described. We furthermore present a user study we conducted to see how Cupboard can facilitate ontology reuse. The updated user's guide is provided in the annex.

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Chapter 1

Introduction – What is new in Cupboard

After the basic infrastructure and the main ideas and components have been presented in the last Cupboard deliverable [LdE$^+$09], we will here focus on the new features, updates, the Cupboard Java API, the integration of Cupboard into a NeOn Toolkit plugin and an improved user manual.

Features that have been implemented since the last deliverable include the key concept visualization from WP4 [PMd08], the alignment integration into the front-end, and a revised version of the Topic-Specific Trust Open Rating System (TS-ORS). Furthermore we have conducted a user-study, using a beta version of the NeOn Toolkit Cupboard plugin to test how users could interact with and benefit from Cupboard within an ontology engineering environment.

In the remainder of the deliverable, we will first shortly describe the new components. Then we elaborate on the Java API and the plugin for the NeOn Toolkit. We finish with the user study and a conclusion. In the annex, we provide the updated user manual.

Chapter 2

New Components in the Cupboard System

In this section we will briefly describe the new components of the Cupboard system.

2.1   Key Concept Visualization

Using the approach for identifying key concepts in an ontology, through the integration of cognitive principles with statistical and topological measures presented at ASWC 2008 [PMd08], a method was developed to visualize found key concepts. The method takes as input the ontology and renders the results of the key concept analysis as an image, which is then displayed in Cupboard (see Fig. 2.1.

2.2   Alignment Server

The user can now choose to add and load alignments for ontologies in their Cupboard space. They can furthermore select alignments as selected. This functionality is for use with the Cupboard APIs, it does not affect the ontology space as such. A more detailed description can be found in the user manual.

2.3   TS-ORS

Apart from an update to the source code and a resulting performance increase, also a meta-trust abilities have been added. A user can now choose, after clicking on ńńI trust" or ńńI distrust" whether to trust the reviewer for this review, for all reviews covering this property of an ontology, for all properties of this ontology, or for all properties of all ontologies (globally). This allows to add trust or distrust way faster compared to having to go through all reviews and trusting/distrusting them.

AKTPortal

Implemented-System

Address

Employee

Generic Agent

Person

Organization

1480 triples - RDF OWL

★ ★ ★ ★ ★ - Read Reviews (1)
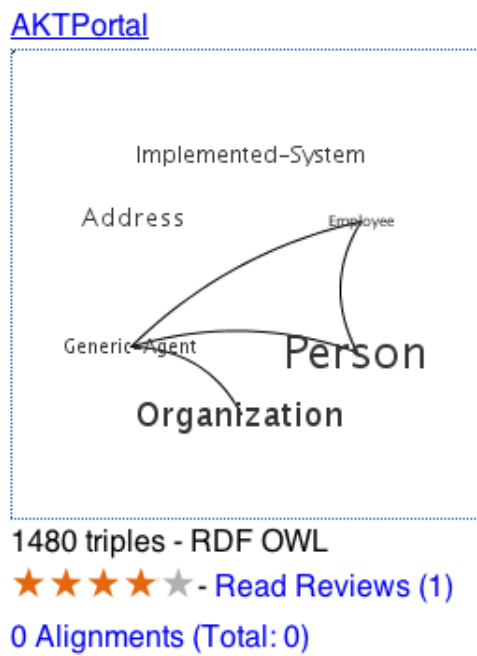
0 Alignments (Total: 0)

Figure 2.1: This screenshot shows how the AKTPortal ontology is displayed in Cupboard including the key concept visualization

Chapter 3

The Cupboard Java API

Cupboard is intended to address the needs of three different types of users: ontology developers, ontology practitioners and ontology application developers. For ontology application developers, each ontology space in Cupboard acts like a virtual infrastructure, where ontologies can be stored, indexed, found and explored. In this chapter, we provide a brief description of the Java API developed to allow application development on top of such a virtual infrastructure.

This Java API can be retrieved as a Jar file at the following address: `http://cupboard.open.ac.uk:8081/cupboard-client-api.jar`

3.1 Core Component: the Watson Client API

The core of the Cupboard system being the Watson system, the Cupboard API reuses a large part of the Watson client API, to access the corresponding SOAP services. In the same way as for Watson, these services provide 3 different types of functions:

Search functions. These functions take as input keywords and a set of configuration parameters and return either ontologies indexed by Cupboard, or the entities within an ontology that match the keywords with the given parameters.

Exploration functions. These correspond to a variety of function to obtain meta-information about the ontologies (e.g., number of statements, language used, location), or to obtain elements of the content of the ontologies (classes, relations, etc.)

Query function. A function dedicated to the execution of SPARQL queries on selected ontologies is also available.

More information about the way to use these functions, and examples, are provided in the documentation of the Watson Client API at `http://watson.kmi.open.ac.uk/WS_and_API-v2.html`.

In addition, one important difference has been introduced in the Cupboard services and API, compared the the ones of Watson: the ability to restrict the search for ontologies to a particular ontology space. Indeed, using a generic filter mechanism, it is possible to specify to the Cupboard API the particular Ontology Space one is interested in, like in the following example, where ontologies matching the keyword "fish" are searched in the ontology space called "Experiment1":

```
SemanticContentSearchServiceLocator locator =
   new SemanticContentSearchServiceLocator();
try{
   SemanticContentSearch scs = locator.getUrnSemanticContentSearch();
```

```
    String[] params = {"fish"};
    SearchConf conf = new SearchConf();
    conf.setEntities(SearchConf.CLASS+SearchConf.INDIVIDUAL+
            SearchConf.PROPERTY);
    conf.setScope(SearchConf.LOCAL_NAME+SearchConf.LITERAL);
    conf.setMatch(SearchConf.EXACT_MATCH);
    String[][] filters = {{"user","Experiment1"}};
    conf.setFilters(filters);
    SemanticContentResult[] res =
        scs.getSemanticContentByKeywords(params, conf);
    System.out.println("total:: "+res.length);
} catch (Exception e) {
    e.printStackTrace();
    System.out.println(e.getCause());
}
```

In addition to the services provided by the Watson engine, the Cupboard API includes a number of other services, from the other components which it integrates.

3.2   Obtaining Ontology Rating with the TS-ORS Service

The TS-ORS allows users to express reviews and assign scores to ontology properties such as reusability or complexity. The Cupboard Java API includes a function, based on a REST service of TS-ORS, to retrieve the overall rating for a particular ontology identified by its URI. The following example shows how to realize that:

```
RatingService rs = new RatingService();
System.out.println(Rating for AKT Potal =  "
    +rs.getOverallRating(
    "http://kmi-web06.open.ac.uk:8081/cupboard/ontology/enrico/AKTPortal"));
```

3.3   Updating an Ontology Space

Of course, one fundamental difference between Watson and Cupboard is that Watson automatically collects ontologies from the Web, while Cupboard's ontologies are contributed by the community of users. By providing in the API the ability to automatically update an ontology space, Cupboard allows to build applications generating ontology spaces "on demand" and to automatically synchronize particular, local ontology repositories with their corresponding ontology spaces. The following code example shows how to add an ontology to an ontology space ("enrico"):

```
OntologySpaceService oss = new OntologySpaceService("enrico", "passwd");
// uploading. true for changing the URI to Cupboard location
oss.uploadOntology("http://www.aktors.org/ontology/portal",
                                "AKTPortal", true);
```

3.4   Examples of usage

For the purpose of the SemanticNomenclature application, ATOS have created an ontology space containing a variety of ontologies related to the pharmaceutical sector (see http://cupboard.open.ac.uk:

`8081/cupboard/SemNomenclature`). This ontology space is accessed at run-time by the application to answer queries based on the ontologies it contains.

Also, in order to have the benefit of both a specific interface on a wiki and of the added-value of the Cupboard API (in particular, the rating system, indexing, etc.), a script has been developed that can automatically populate an ontology space, based on the ontology design patterns submitted to the OntologyDesignPatterns.org portal (see, `http://cupboard.open.ac.uk:8081/cupboard/ODP`).

Chapter 4

Integrating Cupboard into the Watson plugin for the NeOn Toolkit

The Watson plugin for the NeOn Toolkit was developed on the basis of the Watson client API with the idea of bringing Semantic Web ontologies directly in the ontology development environment, hence facilitating reuse. As the two systems are based on the same core engine, we first developed another plugin, the Cupboard plugin, realizing a very similar task, but using ontologies submitted to Cupboard ontology spaces and the Cupboard API described above.
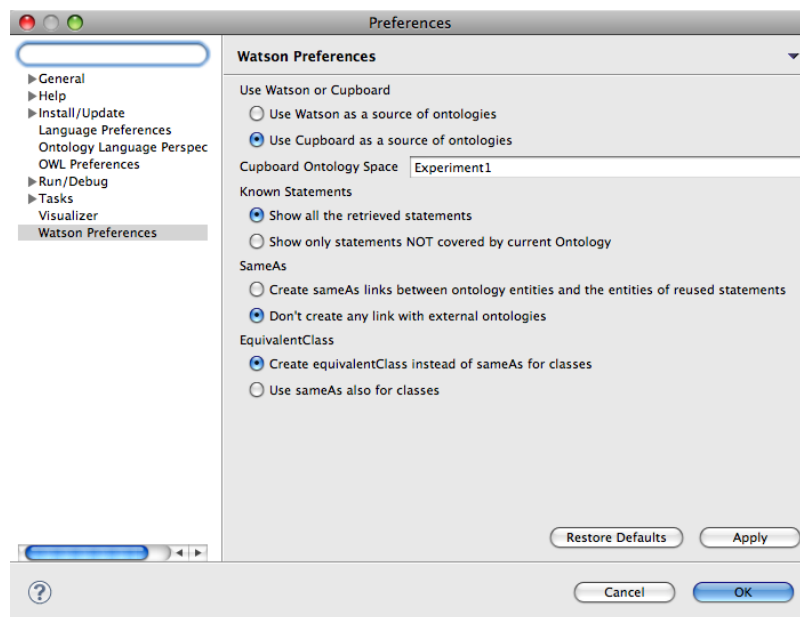

Figure 4.1: The Watson Plugin's preference panel.

Finally, we decided that there was no point in making the user experience more complex than necessary by providing two different plugins essentially providing the same feature, but relying on different sources. We therefore merged the two plugins, giving to the Watson plugin the ability to also make use of the Cupboard repository. Here, the choice is given to the user in the plugin preference panel about which source to employ (see Figure 4.1). In the case of Cupboard, the user can also decide to restrict the searches to a specific Ontology Space, or leave the corresponding field blank to search in any Cupboard ontology space.

In addition, through the use of Cupboard, another feature is added to the Watson plugin, which is the possibility to rank the resulting ontologies according to the user evaluation provided in the system. In that case, the aggregated score for each ontology will be represented in the results by a number of stares (see Figure 4.2).
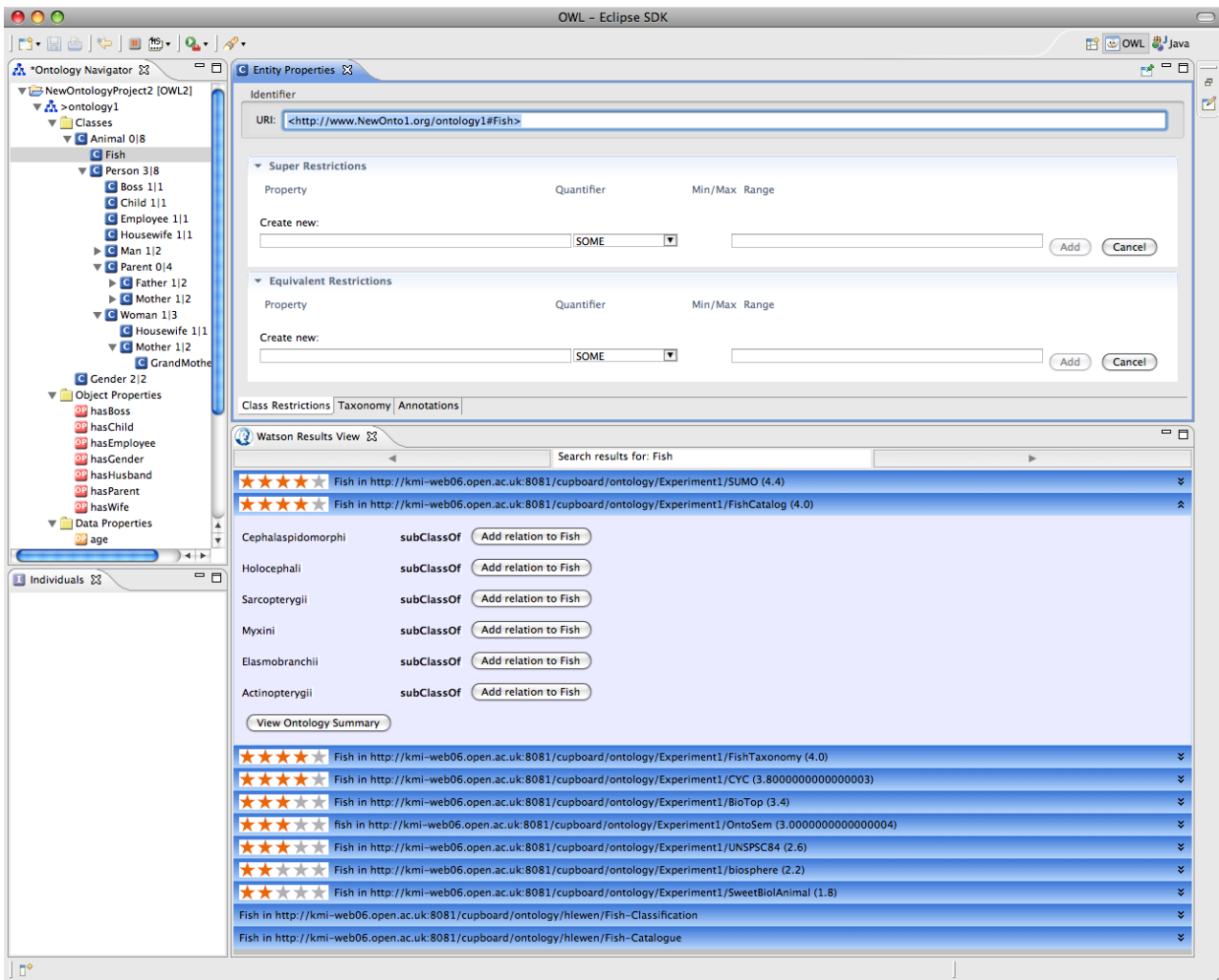
Figure 4.2: The Watson Plugin's preference panel.

A number of other features are currently being developed as part of this plugin, such as the ability to customize the way the overall ontology score is calculated, as well as the ability to update an ontology space within the ontology developed with the NeOn Toolkit.

Chapter 5

User Study

One of our main interest was assess the usability of Cupboard in an ontology reuse scenario. Since one of our main motivations for developing Cupboard was to provide tool support for each step of the reuse process, we tested Cupboard in comparison to other tools and methods within a user study.

Based on the NeOn methodology [dCSFdCB$^+$08], the main steps a user has to go through when trying to reuse ontologies or ontological content during the ontology engineering process, are the following:

- Finding an ontology to reuse

- Assessing the ontologies found

- Selecting reusable ontologies or statements from these ontologies

- Integrating the ontologies or statements into the currently developed ontology

- Ensure local consistency after import.

The last step, checking for consistency, is fairly trivial using one of the reasoners available today. For users of the NeOn Toolkit, the RaDON Plugin [QHJ08] provides methods to not only check for consistency, but also provides help if an inconsistent ontology has to be repaired. For the first steps, some tools and methods that can assist the user exist.

For the first step, finding an ontology to reuse, ontology search engines provide users with ontologies matching a query. There are a number of different search engines[1] which provide a varying degree of flexibility in terms of queries they accept, and also in terms of integration with an ontology engineering tool. Watson[2] [dMS$^+$08] for example exposes its search functionalities via the Watson plugin[3] [dMD$^+$08]) for the NeOn Toolkit. This means that users can trigger a Watson search from within the NeOn Toolkit by right-clicking on for example a concept, and then selecting the Watson search from the context menu. The results are then displayed in a special Watson view that allows the users to see the URIs and expand the ontologies to show axioms matching the query. These axioms can then be imported into the developed ontology by means of a simple mouse-click (see Fig. 5.1).

While the Watson plugin addresses the problems of finding ontologies to reuse, and also help with the integration of found ontologies, it does not offer any help in assessing or selecting the ontologies found. The ranking of the results is based on Lucene,[4] and thus on simple statistical measures like TF/IDF [FBY92] that do not take into account the quality of an ontology.

We have closed this gap by extending the Watson plugin to feature the ratings from Cupboard and base the result-ranking on the overall-rating scores provided by the TS-ORS (see Fig. refCupboard-Plugin). In

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[1]For a selection see `http://esw.w3.org/topic/TaskForces/CommunityProjects/LinkingOpenData/SemanticWebSearchEngines`

[2]`http://watson.kmi.open.ac.uk`

[3]`http://watson.kmi.open.ac.uk/editor_plugins.html`
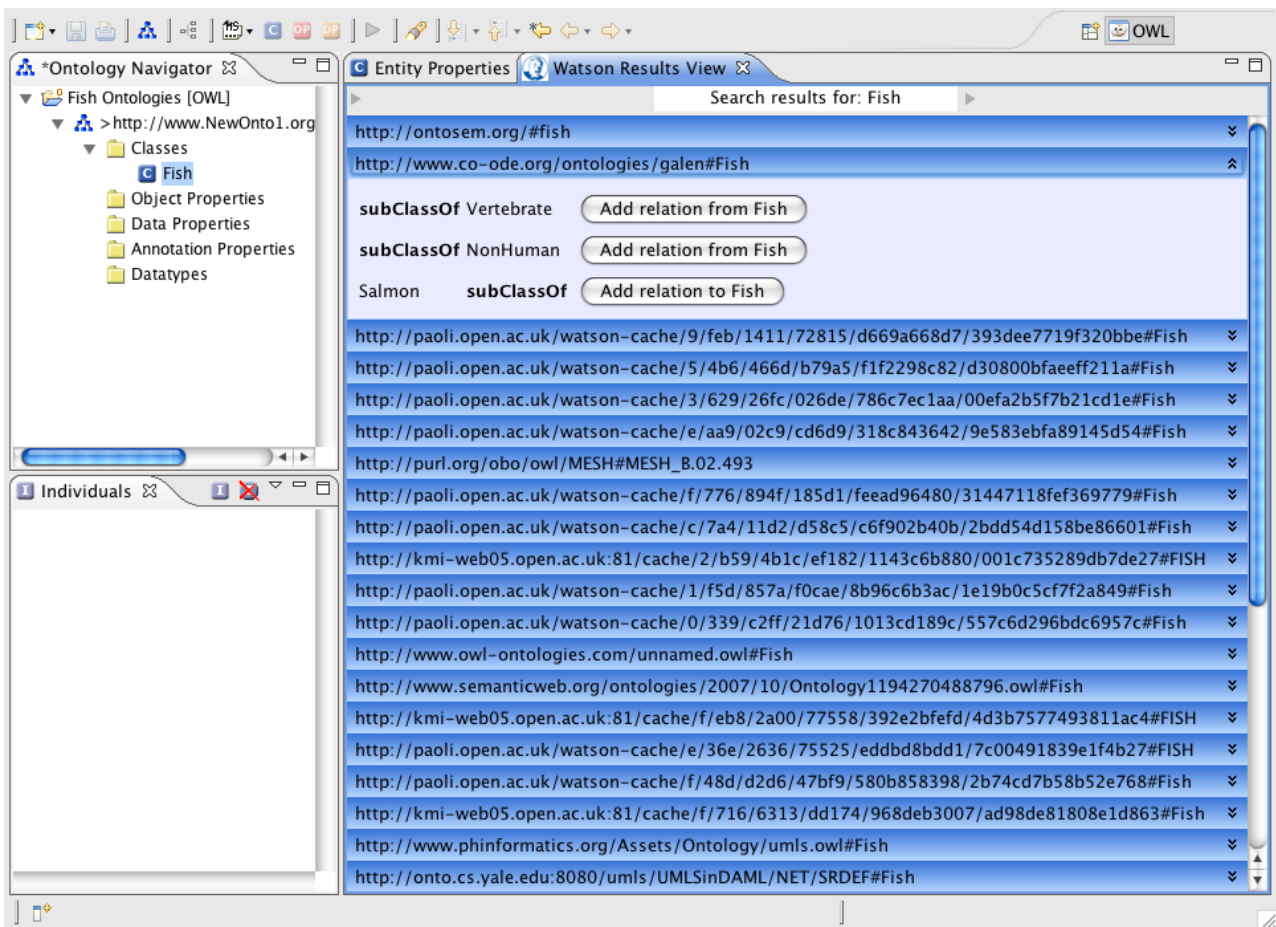
[4]`http://lucene.apache.org/`

Figure 5.1: This screenshot shows the Watson plugin displaying results within the NeOn Toolkit
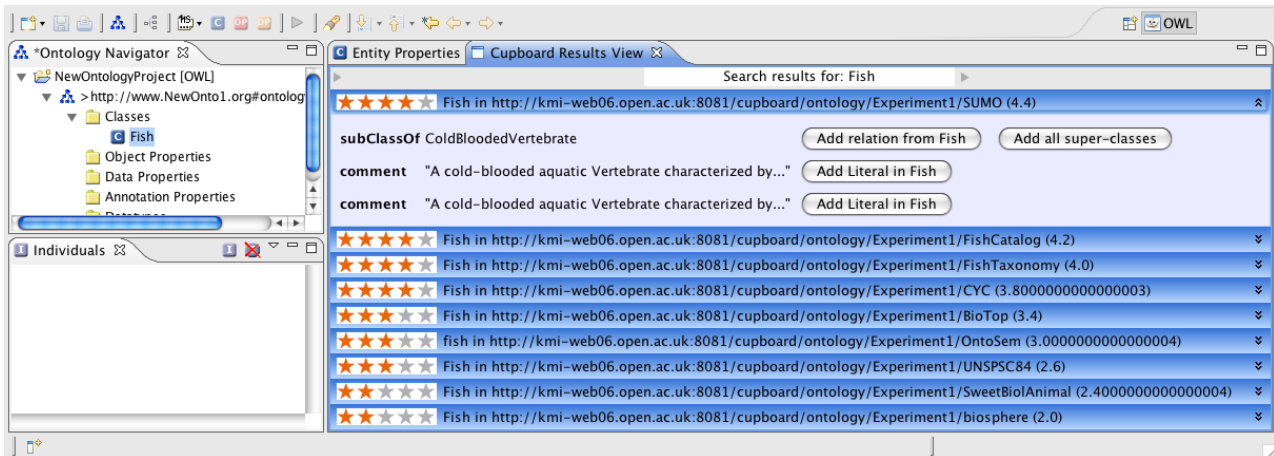
Figure 5.2: This screenshot shows the Cupboard plugin displaying results within the NeOn Toolkit

the latest version of the Watson plugin the user can select whether the results of the search should come from Watson or from Cupboard. For our user study we had a dedicated version of the Cupboard plugin that we compared against the Watson plugin and simple Web search as a baseline. In the experiment we had 20 users divided into 3 groups perform the same task: Extend an ontology containing only the class "Fish" by ontological knowledge found on the Web, in search engines or repositories. All of the three groups had 20 minutes time to perform the given task using the NeOn Toolkit. Group 1 had access to the Web, but no additional plugins apart from the RaDON plugin installed. Group 2 was given the Watson plugin in addition to the Web access. The third group could use the Cupboard plugin and the Web. All groups were furthermore given an adapted version of the NeOn reuse methodology incorporating potential help from plugins if available.

A more detailed description of the experiment and the results can be found in [Lew09], while we here focus on the results obtained. A general observation was that users from group 1 had problems finding existing ontologies to reuse, and integrating them. Bare in mind that they did not have any tool support. Their resulting ontologies were quite small. Group 2 had problems assessing the ontologies presented by Watson, while the search itself and the integration were easy. The ontologies created were bigger, and contained knowledge from more different ontologies than the ontologies from group 1. One problem with some of the created ontologies was that users tend to start reusing blindly without thinking about the applicability of the statement in the context or ontology currently modeled. The ontologies produced by the group with access to Cupboard were bigger and of better quality, because the users were using the rating information to guide their assessment of the ontologies. The ontologies produced were also very similar, because most users reused the same top-ranked ontologies.

The questionnaire completed by participants mirrors our observations. Given tool support, the users do not face problems in finding ontologies to reuse. But without quality information (like the star ratings from cupboard), the users face problems assessing and selecting found ontologies or ontological content. These findings support our hypothesis that with the Cupboard plugin we have facilitated ontology reuse, by addressing the assessment and selection step of the reuse cycle.

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Chapter 6

Distribution Modality

The open registration process is in place and in the final stages of testing. It will go live before the end of February 2010. The development of an open source package bundling all Cupboard components is still ongoing, but is planned to be completed before the end of 2010. With the release of the Cupboard open source package, everyone can setup their own Cupboard locally. The plan is to offer the users an option to interlink their version of Cupboard with other Cupboard installations, leading to information exchange between the different instances.

Chapter 7

Conclusion

In this document, we presented the updates made in the past year to our Cupboard system. We have included key concept visualization, integrated the alignments into the front end and updated the TS-ORS including meta-trust and trust statistics for the reviews. Furthermore we have described a user study we ran to show that Cupboard can facilitate the reuse of ontological knowledge. The results indicate that user perceive it as superior over other tools trying to serve the same purpose, and our analysis of the produced ontologies support this indication. We will open the registration to all users pretty soon, and are looking forward to learn from the user feedback and the data gathered and improve the system even more.

Chapter 8

Appendix

8.1 User Manual

We plan to also have the latest version of the user manual linked from the Cupboard website.

8.1.1 Installation

Cupboard does not have to be installed by the end user, it is accessible by Web Browser (currently tested on Firefox and Safari) by simply entering the URI. We will however, at a later point, make a complete Cupboard package available for companies wanting to run their own local version of Cupboard. This package will then come with a dedicated developer and system administrator handbook. Our local installation can be found at `http://cupboard.open.ac.uk`. To register one has to fill out a registration form (see fig. 8.1).

8.1.2 Getting started – Logging in

You can normally log into the system using your OpenID[1], or a username/password combination (see fig. 8.2). Once logged in, the Ontology Space of the logged-in user is displayed.

8.1.3 Ontology Space

The ontology space (for an example see fig. 8.3) contains all the ontologies added by a user. If you browse your own ontology space, you can find all the ontologies you added. It is like the home screen of Cupboard. For each ontology, the title, number of statements, format and overall rating are displayed. Furthermore, the key concepts are visualized and the number of active and total alignments is displayed. From this screen you have several options: Add an ontology, search, write a review or read reviews, add an alignment or view additional metadata about the ontology. We will now explain each of these functionalities.

8.1.4 Adding an ontology

When you click on "Add Ontology" in your ontology space, you will get a dialog that allows you to upload ontologies. You can enter the name, and either specify a location on the filesystem where your ontology is located, specify its URL, or enter the ontology source code directly (see fig. 8.4). After the ontology has been added, the URI can be adapted to be properly dereferencable to its location within Cupboard. The adaptation can be done by simply clicking the button (see fig. 8.5). As a next step, metadata information is gathered by the system. By default, only one form is expanded (see fig. 8.6), but by clicking on the "+" sign, also the other categories can be extended, so that metadata can be entered (see fig. 8.7). Whenever possible, we use controlled vocabularies, which then are presented as a drop-down list (see fig. 8.7).

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[1] for more information see `http://openid.net/`

Cupboard

OpenID:
Ontology space name:
Password:
First Name:
Last Name:
e-mail address:

Submit

Search | About | Contact Us

Figure 8.1: To register you have to fill out this registration form.

Cupboard

OpenID:

or Login:
and Password:

Submit

Figure 8.2: The system accepts an OpenID or username/password combination as login-credential.
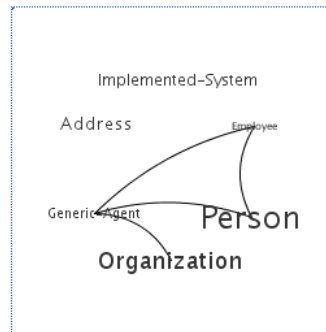
Figure 8.3: The ontology space contains all ontologies added by the user. It also displays additional metadata of the ontologies.

Figure 8.4: Using this form, ontologies can be added to the ontology space.

Cup board

The current default namespace of the FOAF ontology is

http://xmlns.com/foaf/0.1/

In order for the URI of this ontology and of the entities it contains to be `dereferenceable' to its location in Cupboard, it should be changed into/set to

http://cupboard.open.ac.uk:8081/cupboard/ontology/hlewen/FOAF

Do you agree with this change?

[OK, do that]   [Hmm... I prefer not]

Note that if you chose not to apply this change, the ontology will still be added to your Ontology Space, but the entities it contains will not be *dereferenceable*

Figure 8.5: Here the user can decide to adapt the namespace of the ontology.

Cup board   **Ontology Metadata Form**

General Metadata ⊟

Ontology Name: [_____]
URI: [_____]
Description: [_____]
Creation Date: [_____]

Provenance Metadata ⊞

Applicability Metadata ⊞

Format Metadata ⊞

Availability Metadata ⊞

Statistics Metadata ⊞

[Submit   ]

Figure 8.6: Metadata can be entered for the ontology.
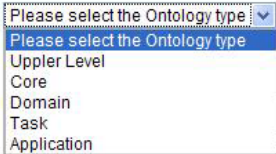
NeOn

Figure 8.7: For certain metadata, entries can be selected from a drop-down list.

In the ontology space, ontology metadata can be seen when clicking on the URI of the ontology (see fig. 8.8)

Alignments

If one clicks on "add alignment" in the ontology space, a page come up that allows the user to specify with which ontology to match the ontology and what method to choose (see fig. 8.9). One can also upload an alignment from disk (see fig. 8.10). All alignments can be displayed and marked as selected (see fig. 8.11). Selected alignments show are displayed in the ontology space by the number in front of alignments and total number in brackets (see fig. 8.12). Selected alignments can be used by the API.

Search

If Cupboard, the user can access the search functionality by either clicking on "search" in the ontology space (see fig. 8.3), or search an ontology directly from the metadata view (see fig. 8.8). The search screen can be seen in fig. 8.13. The user can enter a search term, and also specify specific search options. Once the results are found, they are presented (see fig. 8.14) to the user.

It is also possible to search within an ontology (see fig. 8.15). The resultset can be extended by clicking on the "+" signs (see fig. 8.14).

Ontology Metadata

Cupboard

Home
Edit Metadata
Get OMV Code
Get RDF Code
Get SPARQL
Search

General Metadata⊟

Ontology Name:	FOAF
Ontology Space:	hlewen
URI:	http://cupboard.open.ac.uk:8081/cupboard/ontology/hlewen/FOAF
Rating:	Not reviewed yet - Write a Review!
Description:	
Creation Date:	

(Note: URI and Ontology Space appear in order URI, Ontology Space in layout)

Provenance Metadata⊞

Applicability Metadata⊞

Format Metadata⊞

Availability Metadata⊞

Statistics Metadata⊟

Number of Axioms:	613
Number of Classes:	16
Number of Properties:	60
Number of Individuals:	1

Figure 8.8: Here the metadata for an ontology is displayed.

Alignment Result

Cupboard

Home
Upload an Alignment

Please select an ontology and a matching method from the lists below to match the *Fish-Catalogue* ontoloy

http://xmlns.com/foaf/0.1/

es.upm.fi.dia.ontology.semanticmapper.pronto.ODEAlignment

Match

Figure 8.9: Here the user can choose the ontology and method for the matching.

Please select the alignment to upload: (Datei auswählen) Keine Datei ausgewählt

(Upload)

Figure 8.10: Using this dialog, the user can upload an alignment from disk.

Reviews and Reviewing

One of the central ideas of Cupboard is to also allow the community to make use of other users' experience. We therefore allow for detailed reviews of the ontologies, and employ a sophisticated ranking system to provide the results in a user-specific order. When a user clicks on "Write a review", a form is displayed (see fig. 8.17) that allows the user to rate each of the ontological properties defined in the system by selecting a 1–5 star rating. They can and should also comment on the rating, explaining why this star rating was chosen. It is important to note that not all the properties have to be reviewed, it is also possible to review only one or some properties. On the other hand, when clicking read reviews on the ontology space, the reviews for this ontologies are displayed in a personalized order (if logged in) (see fig. 8.18), or based on global trust (what most people think is right) (see fig. 8.19). Note that when you are logged in, you can also add trust and meta-trust statements to the reviews, and thus change the way the reviews are ranked. This works by first clicking on 'I trust" or "I don't trust", and then selecting the scope of the trust or distrust statement.

- http://aserv.inrialpes.fr/alid/1242127009864/234 ☐ Selected

Method: AROMA

Alignment with: http://kmi-web06.open.ac.uk:8081/cupboard/ontology/enrico/SWRC?rdf

Show Alignment: Show

Created: Tue Feb 02 10:47:44 CET 2010

- http://aserv.inrialpes.fr/alid/1242123097282/417 ☑ Selected

Method: AROMA

Alignment with: http://kmi-web06.open.ac.uk:8081/cupboard/ontology/enrico/AKTPortal?rdf

Show Alignment: Show

Created: Wed Feb 03 23:01:09 CET 2010

- http://aserv.inrialpes.fr/alid/1264594664474/211 ☑ Selected

Method: AROMA

Alignment with: http://kmi-web06.open.ac.uk:8081/cupboard/ontology/enrico/AKTPortal?rdf

Show Alignment: Show

Created: Wed Jan 27 13:17:44 CET 2010

Update

Figure 8.11: Using this dialog, the user can mark alignments as selected.

NeOn
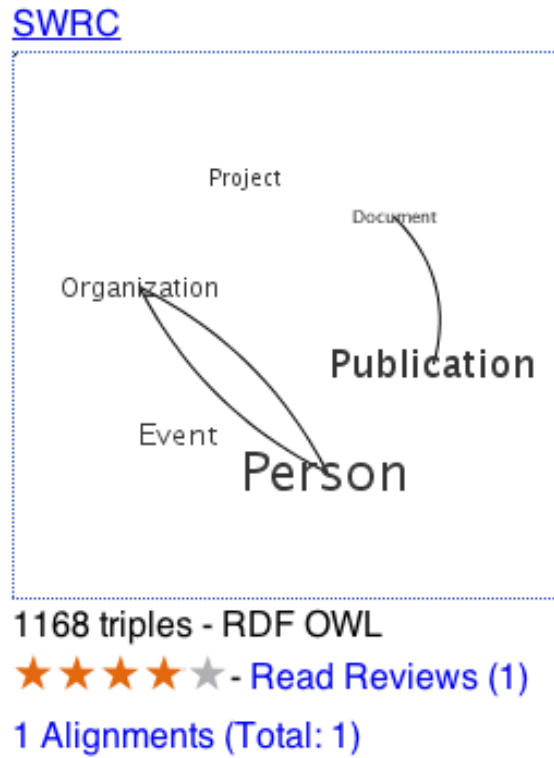
Figure 8.12: This screenshot displays an ontology with one selected alignment and 1 alignment total.

Figure 8.13: Using this form, the Cupboard system can be queried.

Cupboard

Details for http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe (view as graph)

- In http://localhost:8080/cupboard/ontology/xcv/xcvFifth
    - ◆ *Individual*
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
- In http://localhost:8080/cupboard/ontology/xcv/xcvFifth
    - ◆ *Individual*
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
- In http://localhost:8080/cupboard/ontology/xcv/xcvFifth
    - ◆ *Individual*
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **name**: University of Karlsruhe
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University
    - **type**: http://annotation.semanticweb.org/2004/iswc#University

Figure 8.14: A result set for the query for "University".

Cupboard

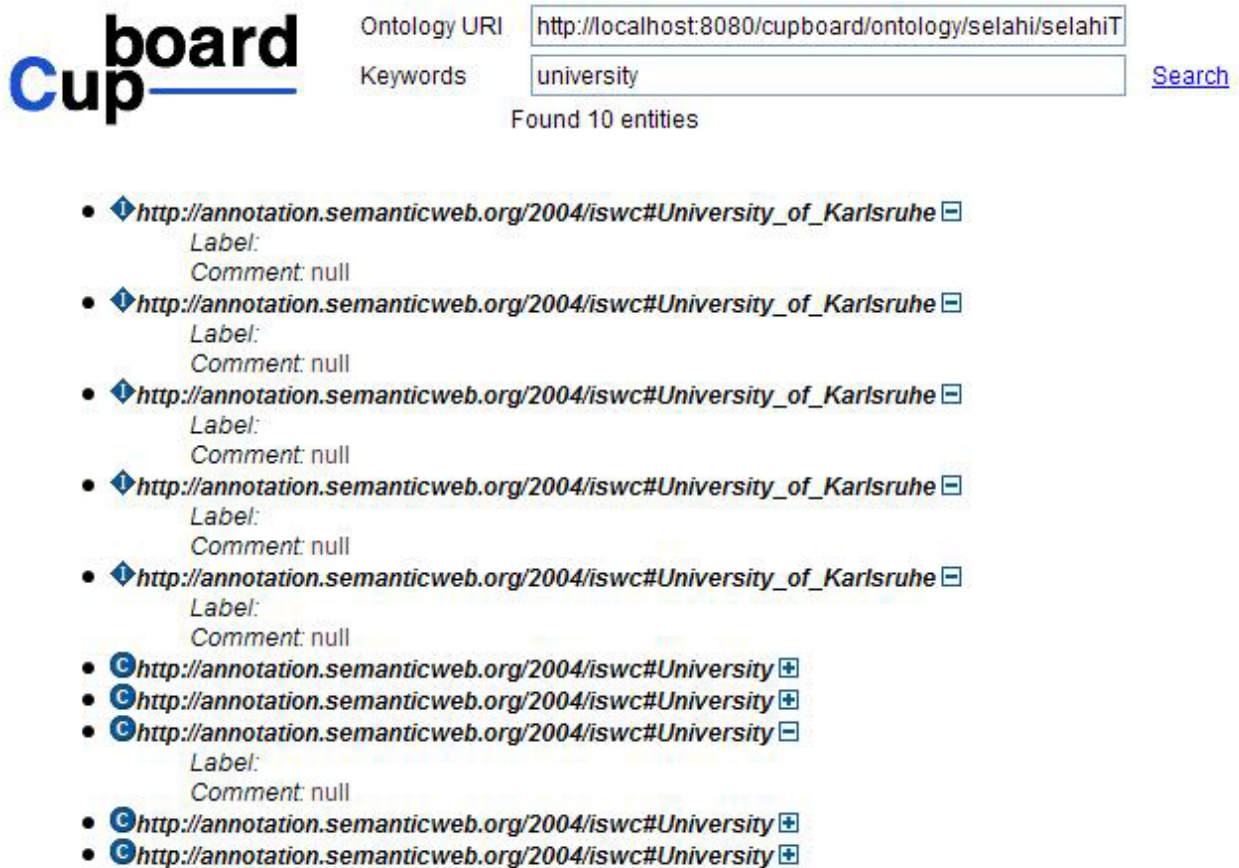|	
Ontology URI	http://localhost:8080/cupboard/ontology/selahi/selahiT
Keywords	university

Search

Found 10 entities

- ◆ *http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe* ⊞
- ◆ *http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe* ⊞
- ◆ *http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe* ⊞
- ◆ *http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe* ⊞
- ◆ *http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe* ⊞
- **C** *http://annotation.semanticweb.org/2004/iswc#University* ⊞
- **C** *http://annotation.semanticweb.org/2004/iswc#University* ⊞
- **C** *http://annotation.semanticweb.org/2004/iswc#University* ⊞
- **C** *http://annotation.semanticweb.org/2004/iswc#University* ⊞
- **C** *http://annotation.semanticweb.org/2004/iswc#University* ⊞

Figure 8.15: A result set for the query for "University" within the specified ontology.

Figure 8.16: After clicking on the "+", the results are extended to display additional information.

Figure 8.17: The user can provide star ratings and explanations for these ratings for each of the five ontological properties.

Figure 8.18: The reviews are presented broken down into the 5 properties. The most relevant review is displayed first. By clicking on "I trust" or "I don't trust", trust or distrust statements, the user can choose to add trust and meta-trust statements to the databased and the web of trust is updated.

Figure 8.19: The reviews are presented broken down into the 5 properties. The most relevant review is displayed first, based on the general opinion of the users.

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