Reusing Ontology Statements

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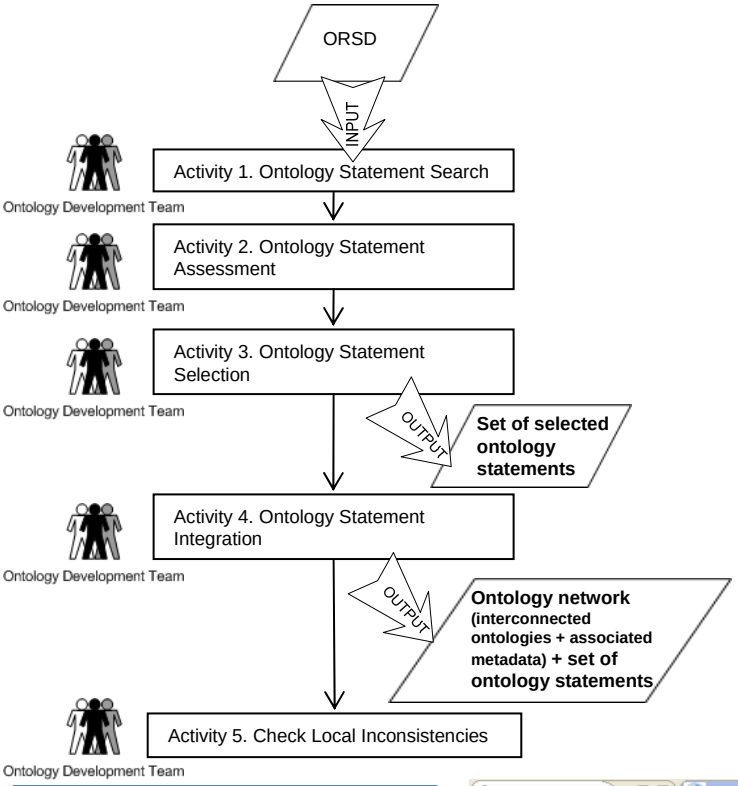
Motivation

The reuse of large ontologies (such as the NCI ontology) is difficult because they contain a large amount of knowledge that may not be needed when developing a particular ontology. Sometimes, the reuse requires to retrieve bits of knowledge (e.g., statements) to be integrated in the new ontology being built rather than to reuse entire ontologies.

What is the process?



What is Reusing Ontology Statements?

Ontology Statements Reuse

Definition

Ontology Statement Reuse refers to the process of using ontology statements (from domain ontologies) in the solution of different problems.

Goal

The goal of this process is to make use of ontology statements from an ontology that was not originally designed for the task at hand.

Input

The Ontology Requirements Specification Document (OSRD)

Output

Ontology network extended with reused ontology statements.

Who

Software developers and ontology practitioners.

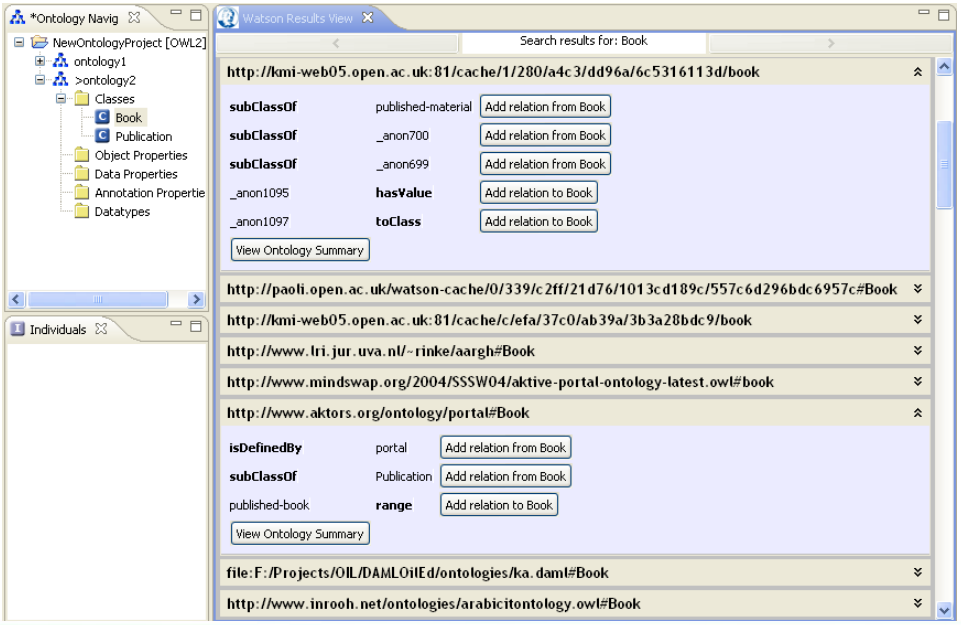
When

Ontology statement reuse can be done in various stages of the ontology life cycle. Most naturally reuse is performed at the stage of building the ontology and it can be helpful in a variety of situations, whether the ontology is built from scratch or extended from an initial ontology. Reuse can also appear at later stages of the life cycle when the ontology is updated and/or extended to cover new knowledge.

The process in detail (1)

Activity 1. Ontology Statement Search.

The goal of this activity is to search the Web for ontology statement candidates that could satisfy the ontological needs. The ontology development team carries out this activity taking as input the ORSD, specifically those terms that have a high frequency in the ORSD, and using existing gateways to the Semantic Web, such as **WATSON**, or the **Watson plug-in in the NeOn Toolkit**.



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Reusing Ontology Statements

The process in detail (2)

Activity 2. Ontology Statement Assessment.

The goal of this activity is to decide whether a concrete ontology statement (obtained in Activity 1) is useful for the ontology network being developed. The ontology development team must inspect the content and granularity of ontology statements to assess whether they satisfy their needs. We provide the following set of criteria:

- To check if the statement belongs to an ontology with similar scope to the ontology being developed.
- To check if the statement belongs to an ontology with similar purpose to the ontology being developed.
- To check the clarity of the ontology statement. Ambiguous statements (e.g., "Book subclass of '_anon699'", "Publication subclass of T") are not useful by themselves. Such statements should not be reused.
- To check the information content of the statement. In some cases, the statements retrieved provide little additional information, for example, by linking a concept to an abstract root concept (e.g., "Publication is subclass of: 'Root', 'Object', 'Thing', 'DEF_ROOT_CONCEPT'"), or by declaring that a concept is equivalent to itself ("Publication is equivalent to: 'Publication'"). Such statements should not be reused.
- To assess the correctness of the statement from a formal modeling perspective.
  - To check that the naming of concepts in the ontology statement reflect the intended meaning of the statement given its ontological context (e.g., "Publication is subclass of Event" is not correct because the name 'Publication' clearly refers to 'publishingEvent'). In these cases, it is important to rename the concepts to clearly reflect the meaning of the statement.
  - To check if the ontology statement is not invalid from a formal perspective, e.g., by confusing "subclassOf" relations with other relations such as "partOf" or "relatedTo" relations. For example, "Chapter subclass of Book", what is not correct.

Activity 3. Ontology Statement Selection.

The goal of this activity is to decide among those useful ontology statements (obtained in Activity 2) which ones are the best or most convenient for the ontology being developed. The ontology development team should select those statements that require a minimum effort to integrate them in the ontology network being developed.

Activity 4. Ontology Statement Integration.

The goal of this activity is to decide how the selected ontology statements (obtained in Activity 3) will be integrated in the ontology network being developed. The ontology development team should use any of the following three integration modes: (a) statements will be reused as they are, (b) statements will be reengineered, and (c) statements will be merged. Apart from these integration modes, the development team also has to decide among:

- Importing the ontology statements. The advantage is that it maintain a link with the ontology from which the statement was originated. As a side effect, other elements of such an ontology can have an impact on the ontology being built.
- Copying the ontology statements. As it reproduces the statement, copying ensures that no side effect will appear, that is, only the statement itself is integrated, but it loses the link with the original ontology.
- Establishing mappings with the ontology statements. This can be seen as a compromise solution where the statement is first copied in the ontology being built and the newly created entities are aligned with the entities of the original ontology. In this way, links are maintained between these ontologies and side effects can be more easily controlled.

After integrating an ontology statement, the following work will probably have to be done: (a) changing names (concepts, properties) to adapt them to the naming conventions used in the ontology network being developed; (b) adding range in properties and changing cardinalities; and (c) adding restrictions.

Activity 5. Check Local Inconsistencies.

The goal of this activity is to check for local inconsistencies in the ontology network. Such inconsistencies could be introduced by adding new knowledge to the ontology. The **RaDON plug-in in the NeOn Toolkit** can be used.

Additional information:

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- *NeOn Deliverable D5.4.1 (http://www.neon-project.org/web-content/images/Publications/neon_2008_d5.4.1.pdf)*
- *KCAP'09 Paper: M. d'Aquin. Formally Measuring Agreement and Disagreement in Ontologies.*
- *ASWC'09 Paper: M. Fernandez, C. Overbeeke, M. Sabou, E. Motta. What makes a good ontology? A case-study in fine-grained knowledge reuse.*
- *NLDB''09 Paper: M. Sabou, M. Fernandez, E. Motta. Evaluating Semantic Relations by Exploring Ontologies on the Semantic Web.*
- *IWOD'09 Paper: F. Zablith, M. d'Aquin, M. Sabou, E. Motta. Investigating the Use of Background Knowledge for Assessing the Relevance of Statements to an Ontology in Ontology Evolution.*