

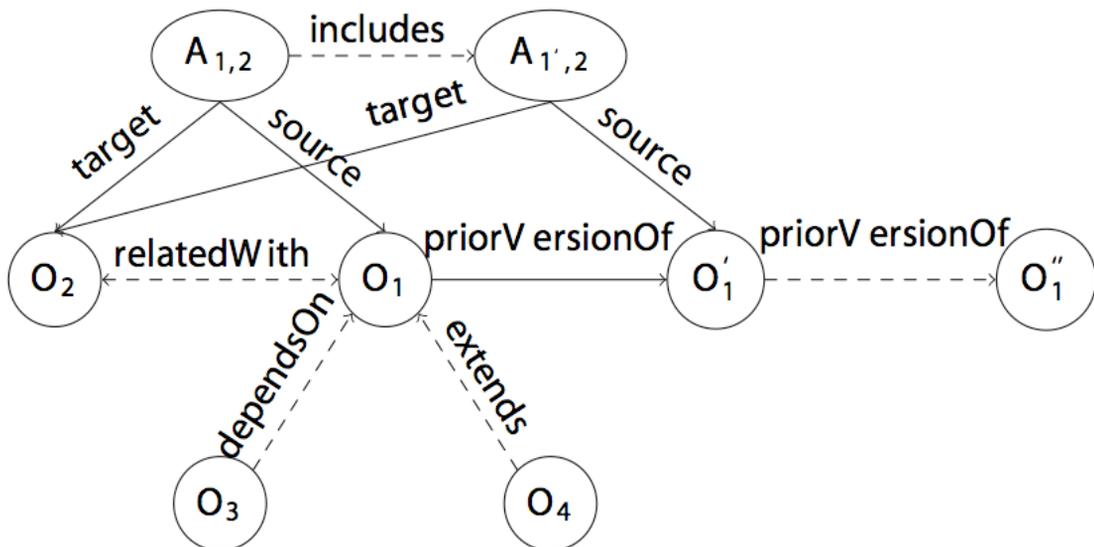
Definition of Ontology Networks

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High Level Definition

Ontologies on the Web are not standalone artifacts. They relate to each other in ways that might affect their meaning, and are inherently distributed in a network of interlinked semantic resources. More precisely, a **network of ontologies** is a collection of ontologies related together via a variety of relationships such as alignment, modularization, version and dependency. Accordingly, we call a **networked ontology** an ontology included in such a network, sharing relationships with a potentially large number of other ontologies.

Intuitively, this aspect of considering ontologies as included in a network implies to define them not only through their content, but also including information *about* the ontologies through the use of ontology metadata providing high-level information on the ontologies, their provenance, purpose and the relations with other ontologies and semantic resources.



Example of Ontology Relationships

Imports and dependencies.

One of the most common ways for two ontologies to relate is to be dependent on each other. More precisely, it is often the case that in order to define its own model, an ontology requires to refer the definitions included in another ontology. The OWL language includes a primitive (`owl:imports`) allowing an ontology developer to declare such a relationship, merging the definitions of the imported ontology with the ones of the importing one.

Ontology versioning.

Versioning relates to the activity of keeping track of the different versions of an ontology. This is of particular importance in a collaborative ontology engineering environment, where the ontology evolution process needs to be carefully monitored, but also to ensure that up-to-date information is delivered. The OWL language includes primitives to declare versioning relations between ontologies, but these do not consider fine grained changes and are not really used in practice.

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Alignments.

Different ontologies often represent overlapping parts of a domain in different ways. Aligning ontologies is a way to put different models in correspondence by declaring which of their entities should be considered as being the same, or as being more general than the others. In practice, these correspondences are often called mappings. The main purpose of alignments is to ensure semantic interoperability, making it possible to merge the ontologies in a meaningful way, or to represent information in one ontology in terms of the other.

Modularization.

Large, monolithic ontologies are hard to manipulate, use and maintain. Modular ontologies on the contrary try to divide the ontological model in self-contained, interlinked components which can be considered independently but that participate each in a specific aspect or sub-domain of the ontology. Therefore, different modules share the relation that they are common components of a larger ontology, and often include dependencies and alignments with each other. Ontology networks designed with eXtreme Design (pattern-based) are a special case of modularized ontologies.

Networked Ontology Models

A number of models have been proposed that cover both the syntactic aspects of dealing with ontology relationships in networked ontologies and the semantic aspects of interpreting ontology networks and the relations between networked ontologies. As already mentioned, the OWL ontology language already includes a few primitives to relate ontologies with each other (imports and versioning). More fine-grained models to represent versioning information have also been developed, which allow keeping track of the changes occurred between the different versions. In the same way, formats have been designed to represent the correspondences in an alignment between ontologies, as well as to encapsulate the components of a modular ontology, that is, ontology modules, in clearly specified interfaces describing what they expose to other modules and their dependencies.

The semantics of networked ontologies is a particularly tricky issue, for which a number of proposals have been made. Indeed, it is expected for each ontology in a network to have its own interpretation, but also for this interpretation to be somehow influenced by the relationships between ontologies. In many cases, the semantics of alignments and modular ontologies rely on the Distributed Description Logic formalism, which allows in particular keeping separated the issues related to the local consistency of each ontology from the ones related to the global consistency of the network.

Ontology Metadata

Ontology metadata refers to the information which is attached to the ontology itself, not to its content. They are critical in ontology networks as they allow keeping track of the provenance, purpose and design of ontologies. The Ontology Metadata Vocabulary (OMV) defines classes and relations to talk about authoring aspects, ontology type, purpose, etc. The Collaborative Ontology Design Ontology (C-ODO) is an ontology network that enables designers to talk about design entities (ontologies, modules, ontology elements, requirements, activities, tools, reusable knowledge, teams, people, etc.).

Additional Information:

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NeOn deliverables D1.1.1, D1.1.2, D1.1.3, D1.1.4, D1.1.5, D1.1.6, D2.1.2