

Ontology Integration and Interoperability (OntoOp) – Part 1: The Distributed Ontology Language (DOL)

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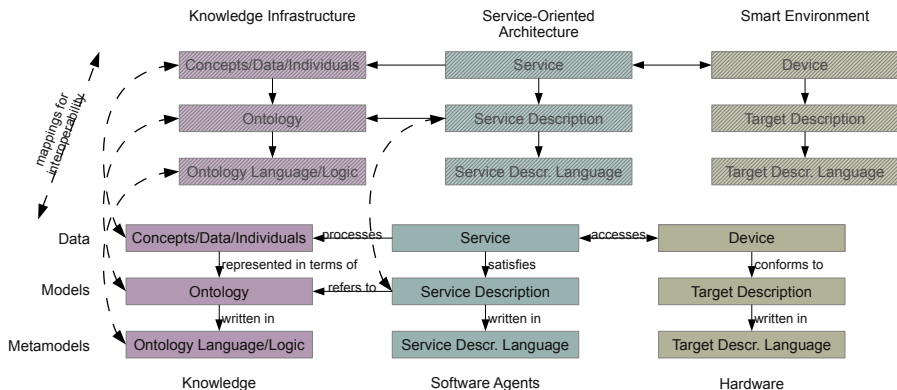
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Interoperable Assistive Technology

- **Assistive technology increasingly relies on communication**
 - among **users**,
 - between users and their **devices**, and
 - among these devices.
- Making such ICT **accessible** and **inclusive** is costly or even impossible
- We aim at more interoperable
 - **devices**,
 - **services** accessing these devices, and
 - **content** delivered by these services
- . . . at the levels of
 - **data** and metadata
 - **data models** and data modelling methods
 - **metamodels** as well as a meta ontology language

The Big Picture of Interoperability



For now we focus
on the "content"/
"knowledge"
column

DOL (Distributed Ontology Language)

- In practical applications, **one ontology language and one logic doesn't suffice** to achieve semantic integration and interoperability
- Part 1 of the OntoOp standard provides a **meta-language** (DOL) for:
 - **logically heterogeneous** ontologies
 - **modular** ontologies
 - formal and informal **links** between ontologies/modules
 - **annotation** and documentation of ontologies
- DOL will have a **formal semantics** and concrete XML, RDF and text serializations
- We leave services and devices to future parts of the standard

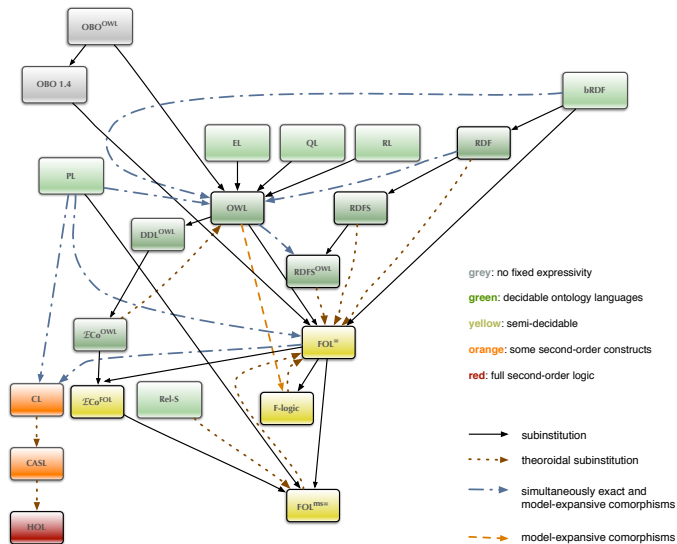
Why a Standard?

- DOL is now being developed
 - as **ISO Working Item 17347**
 - within **ISO TC 37** (Terminology and other language and content resources) / **SC 3** (Systems to manage terminology, knowledge and content)
 - by a **project team (= us)** and **experts** from \approx 15 countries
- In practice, interoperability can only be achieved via **standards** (cf. Christian Galinski @ OASIS 2009)
 - **formulate consensual rules** under participation of major **stakeholders** (here: ontology language communities)
 - **improve suitability** of products, processes and services
 - **facilitate communication**
 - **reduce complexity** (and thus **costs**)
 - **increase quality** via **certification**

Requirements I

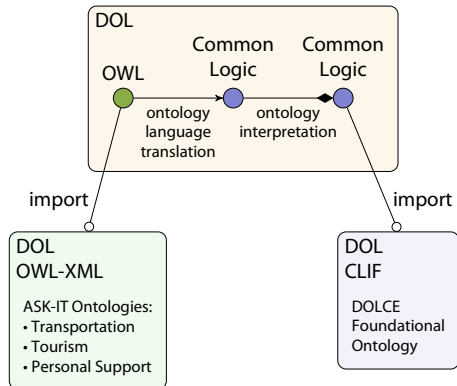
- DOL should be **generally applicable, open, and extensible**
- DOL shall be a **logic-agnostic** metalanguage
- DOL should have **user- and machine-readable** serializations
- DOL should have a well-defined **formal, logic-based semantics**

The Onto-Logical Translation Graph



Requirements II

- DOL should allow for expressing logically **heterogeneous** ontologies (and literal reuse of existing modules)
- DOL should allow for expressing **links** between ontologies



Requirements III

- DOL should allow for writing down ontologies and ontology links as **implicitly** as possible **and** as **explicitly** as needed
- DOL should allow for **rich annotation and documentation** of ontologies

Conformance Criteria

- DOL should work with **any existing or future ontology language** (if the latter *conforms!*)

We shall establish the conformance of OWL, Common Logic, RDFS, F-logic, UML class diagrams, and OBO

- Conformance of a **logic** (directly or by translation):

semantic conformance > *entailment conformance*

- Conformance of a **serialization**:

XML conformance > *RDF conformance* > *text conformance* > *standoff markup conformance*

- Conformance of a **document**

("Is this document a DOL ontology?")

- Conformance of an **application**:

A DOL-conforming application produces DOL-conforming *documents!*

Example: A Heterogeneous Time Ontology

```

logic OWL
spec TimeOWL =
  Class: TemporalEntity
  ObjectProperty: before
    Domain: TemporalEntity
    Range: TemporalEntity
  Characteristics: Transitive

```

end

```

logic RIF
spec TimeRIF = TimeOWL then
  Group (
    Forall ?t1 ?t2 ?t3
      (before(?t1 ?t3) :-
        before(?t1 ?t2)
        before(?t2 ?t3))

```

end

```

logic CommonLogic
spec TimeCL = TimeRIF then
  . (forall (t1 t2)
      (or (before t1 t2)
          (before t2 t1)
          (= t1 t2)))

```

end

Existing and future DOL features relevant here:

- literal inclusion of existing languages ✓
- modular reuse ✓
- XML and RDF serializations
- further link types
- documenting translations explicitly
- rich annotations and documentation

Roadmap

Current development is done via mailing list and file repository.
Later, we will more and more follow the formal ISO procedures.

- Now (Oct–Dec 2011): **WD (Working Draft)** in preparation of the **CD (Committee Draft)** ballot
- from Dec 2011: experts **review** and prepare formal **vote** on **CD**; **discussions** at **meetings** in Feb 2012 and Jun 2012
- Aug 2013: **DIS (Draft International Standard)**
- Feb 2015: **FDIS (Final Draft International Standard)**
- Aug 2015: **IS (International Standard)**

<http://ontolog.cim3.net/cgi-bin/wiki.pl?OntoIOP>