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

IAOA/OOR/Ontolog "Ontologies and Standards" mini-series

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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

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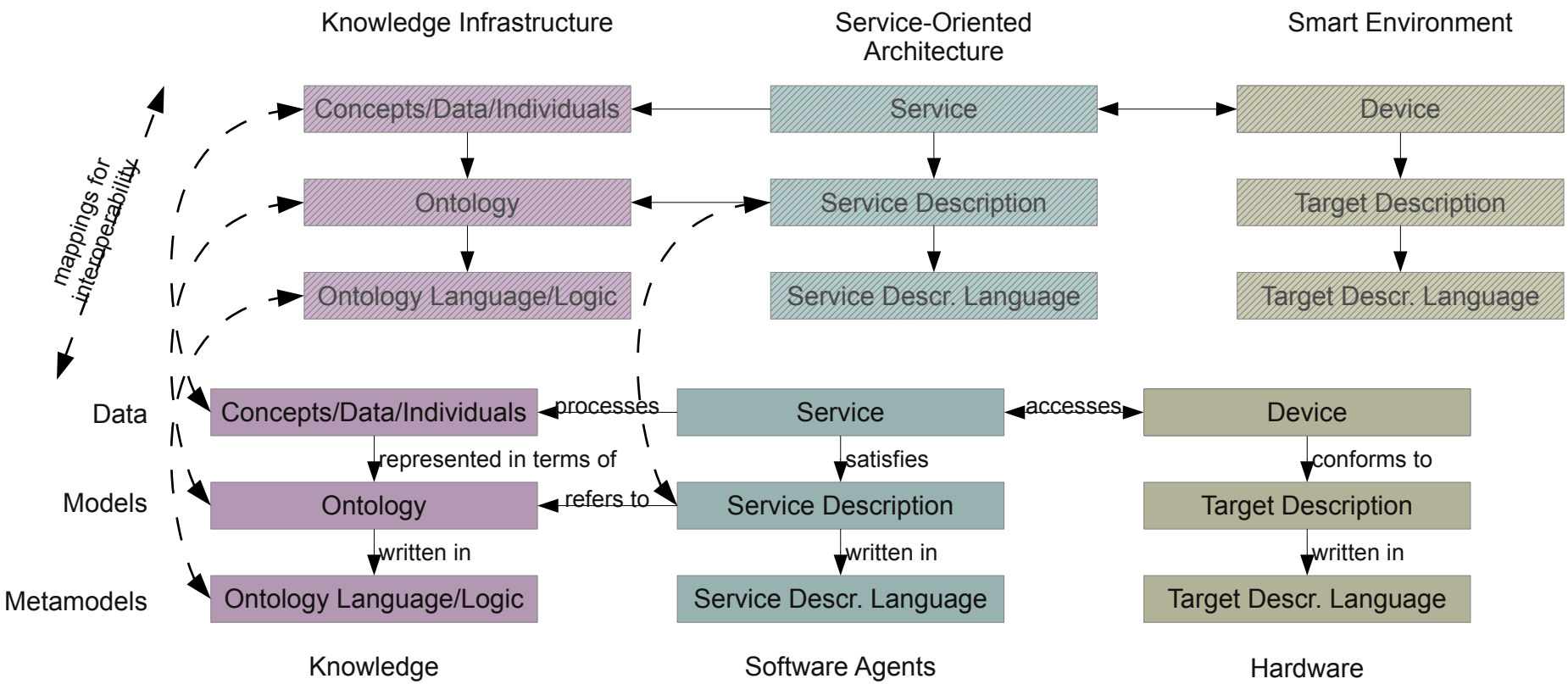
The Big Picture of Interoperability



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Overview of 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 OntoIOp draft 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

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Requirements I

- DOL should be **generally applicable**, **open**, and **extensible**
  - "generally applicable" = not restricted to one domain, nor to foundational ontologies
  - "open" → language-/logic-agnostic
  - "extensible" → conformance criteria
- DOL shall be a **logic-agnostic** metalanguage
  - structural elements: ontologies, modules, axioms
    but not the *content* of axioms, as that is logic-specific –
    we'll borrow that from existing languages
  - → links between ontologies

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Requirements II

- DOL should have **user- and machine-readable** serializations
  - for users: text
  - for machines: XML and RDF
  - literally include constructs from existing ontology languages as far as technically possible
    $\Rightarrow$ ability to reuse existing ontologies
- DOL should have a well-defined **formal, logic-based semantics**
  - criteria for logics to conform with DOL
  - translations between these logics (next slide)

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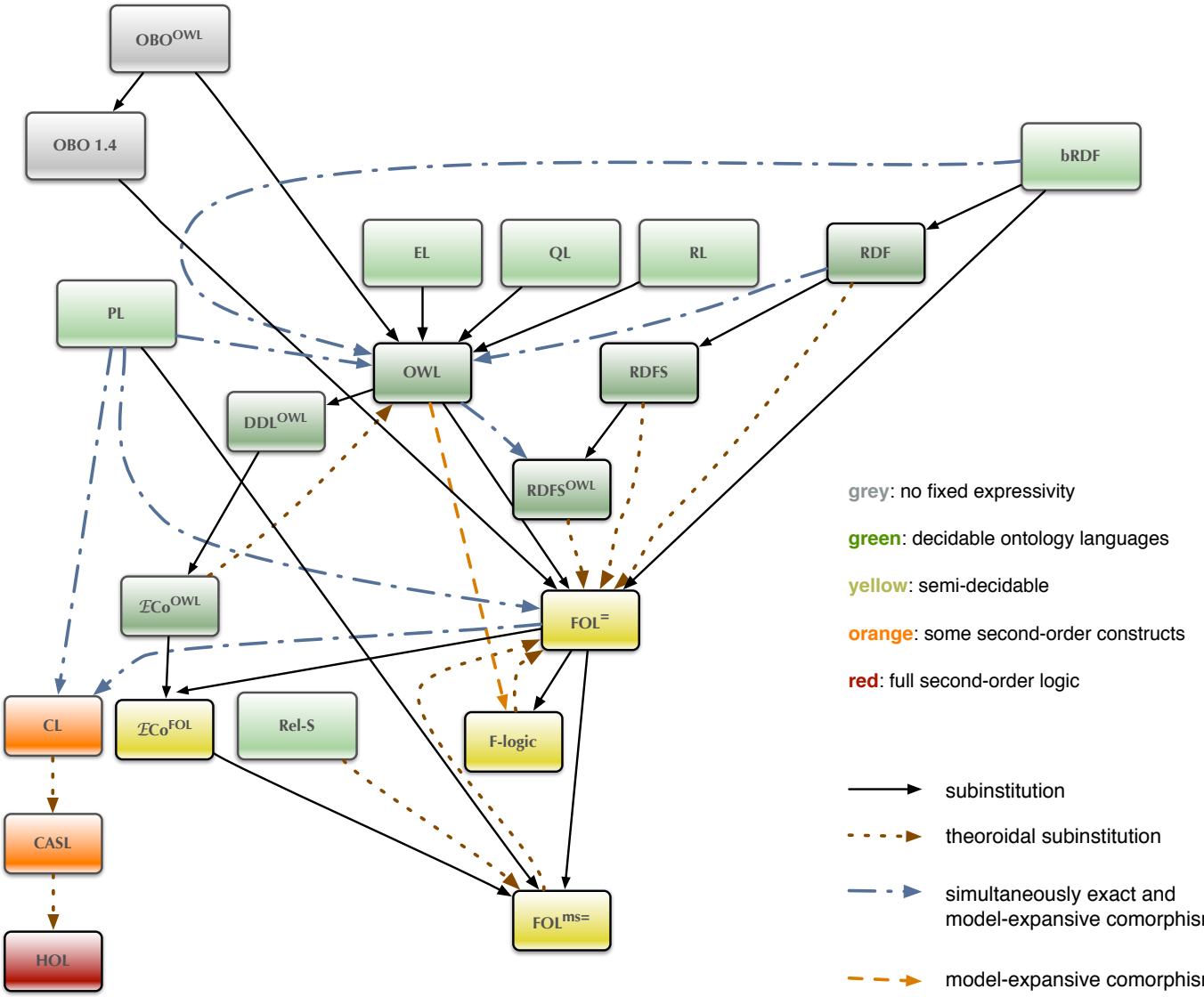
The Onto-Logical Translation Graph



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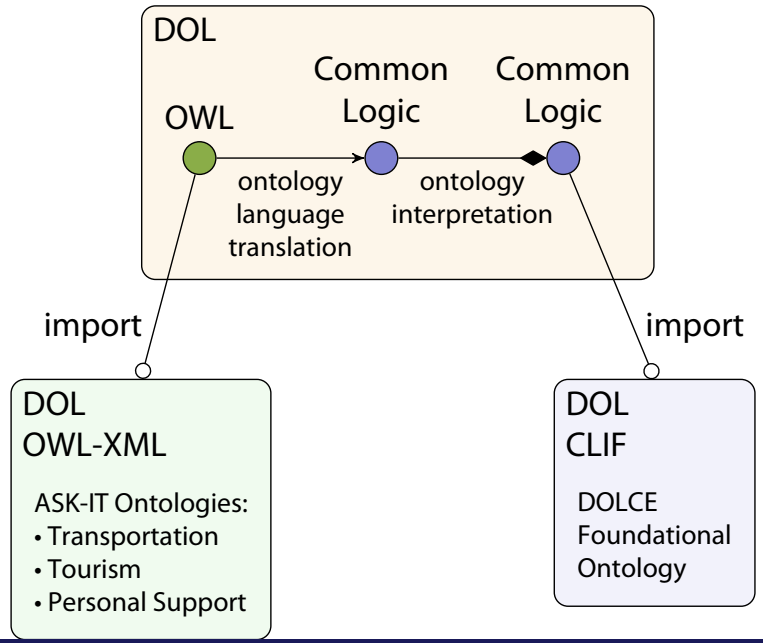
Requirements III

- DOL should allow for expressing **heterogeneous** ontologies
  - e.g. an OWL ontology with some FOL axioms
  - . . . for use with an OWL reasoner, a FOL theorem prover, and a FOL model finder
- DOL should allow for expressing **links** between ontologies
  - formal/structural links
  - informal (statistical/heuristical) alignments



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Requirements IV

- DOL should allow for writing down ontologies and ontology links as **implicitly** as possible **and** as **explicitly** as needed
  - Examples for explicit information:
    - alignment computed by a matcher
    - translation path determined by lookup from the ontology graph
  - If you have access to these tools, you don't need the information
    $\Rightarrow$ keep it implicit
  - If you pass on the ontology to a co-developer, he may need it
    $\Rightarrow$ make it explicit
- DOL should allow for **rich annotation and documentation** of ontologies
  - RDF(a)-compatible annotations
  - fine-grained intermixture of formalization and documentation (literate programming)
  - We shall recommend a list of RDF vocabularies (OMV etc.)

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Conformance Criteria I

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

  We shall establish the conformance of
  - OWL, Common Logic, RDFS (normative)
  - F-logic, UML class diagrams, OBO (informative)
- Conformance of a **logic** (directly or by translation):

  semantic conformance (institutions)

  > *entailment conformance* (entailment system; useful to include non-monotonic logics)
- Conformance of a **serialization**:

  XML conf. (annotation/markup up to literate programming)

  > *RDF conformance* (annotation but no markup)

  > *text conformance* (can still use special comments)

  > *standoff markup conformance* (can still use XPointer)

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Conformance Criteria II

- Conformance of a **document**
  ("Is this document a DOL ontology?"):
  e.g. auto-identification of the ontology language used for an axiom is possible – if there are no name clashes with other ontology languages used in the same document
- Conformance of an **application**:

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

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Organization and People

- OntoIOp is **WD (Working Draft) 17347**
- developed within **ISO TC 37/SC 3/WG 3**
  (→ Sue Ellen Wright's presentation)
- **Project team**: Till Mossakowski, Oliver Kutz, Christoph Lange (Bremen, Germany)
- **Secretary**: Gottfried Herzog, DIN, Germany
- So far we have registered **experts** from:
  Austria, Belgium, **Canada**, China, Denmark, **Spain**, Finland, Greece, Italy, Korea, Mexico, UK, **US**, South Africa
  (bold: have been active so far)

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Infrastructure and Resources

In the current phase we mainly use an unofficial community infrastructure; in later phases we will more and more use Livelink

- **Mailing list**: ontoiop-wg@interop.cim3.net
  - Archive at http://interop.cim3.net/forum/ontoiop-wg/
- **Community file repository** (WebDAV): http://interop.cim3.net/file/work/OntoIOp/
  - Working drafts (not including the *source*)
  - Meeting minutes, voting results, review comments
  - Relevant literature and other standards
- **Homepage**: http://ontolog.cim3.net/cgi-bin/wiki.pl?OntoIOp

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Roadmap

- Nov 2011: 2nd **WD (Working Draft)**

  6 weeks review period (informal community feedback highly appreciated)
- 23 Feb 2011: OntoIOp **meeting** in Berlin
- Apr 2012: 3rd **WD**

  6 weeks review period (informal community feedback highly appreciated)
- Jun 2012: ISO/TC 37 **meeting** in Madríd
- Aug 2012: **CD (Committee Draft)**

  3 months review and voting (more formal)
- Aug 2013: **DIS (Draft International Standard)**
- Feb 2015: **FDIS (Final Draft International Standard)**
- Aug 2015: **IS (International Standard)**

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