The making of a Web Ontology Language a chair's perspective

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Overview

- The W3C Web Ontology Working Group
- The OWL language and its dialects
- The making of OWL: reflections about the W3C process
- New W3C Semantic Web activities

The W3C philosophy

- The web is a public domain
- No company should dominate it
    - no vendor-specific email attachments
    - use web technology as much as possible
- W3C "process": fairness through bureaucracy
- Accessibility is a prime concern

W3C Recommendation Process

Working draft
: draft versions for public review

Last Call Working draft
: "final" working draft for public review

Candidate Recommendation

W3C director decides that the specification is ready for a call for implementations

Proposed Recommendation

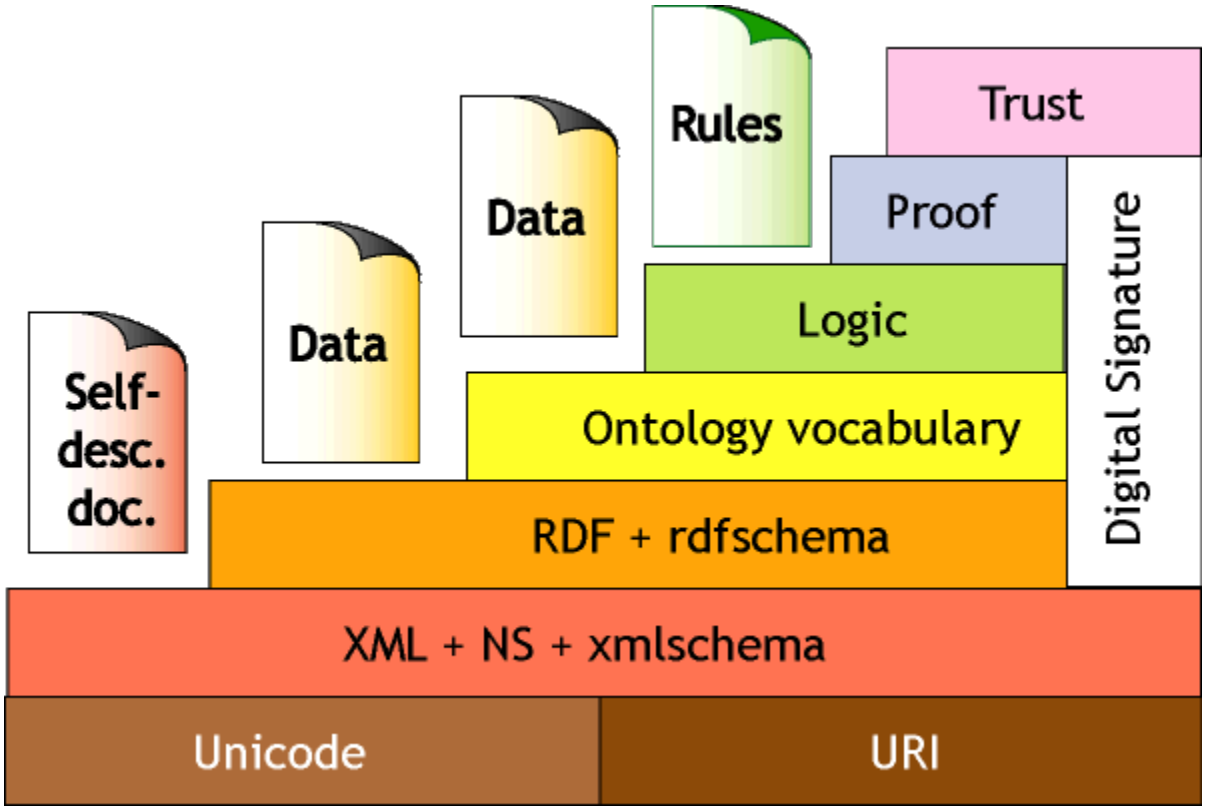
vote by W3C membership

Recoommendation

W3C standard is officially published

W3C Web Ontology Working Group

Chartered to develop the Ontology Vocabulary for the Semantic Web. Starting point: DAML+OIL



Web Ontology Working Group (2)

- Started in November 2001
- Factions:
  - logicians (Description Logic, KIF)
  - knowledge/ontology engineers
  - RDF developers
- OWL Recommendation published 10 February 2004
- Dutch participants:
  - van Harmelen: DAML+OIL developer, semantics "broker"
  - ter Horst: semantics "checker"
  - Schreiber: co-chair together with Hendler

Working group communication

Mailing lists
: working-group list: 8,000 messages in two years
: public comments list: 600 messages in 18 months

Telecons
: 60 telecons of 60-90 minutes with 10-30 people
: simultaneous scribing in IRC (chat) channel

Face-to-face meetings
: five two-day meetings during first 15 months

All proceedings in the public domain.

Handling public comments

- No public comments is a bad sign
- Strong preference for reaching consensus with commenter
- Reply to comment should always quote the specification and/or suggest changes to it (nor personal opinions).

Use Cases for OWL

Web portal
: ontology-based

Multi-media collections
: annotating, searching

Corporate Website
: knowledge management

Documentation
: engineering & design

Agents & Services

Ubiquitous computing
: interoperability

Requirement: "classes as instances"

Example

```
Ontology A
  Class(Species)
  Individual(Chimpanzee type(Species))

Ontology B
  Class(Chimpanzee)
```

```
Individual(Joe  type(Chimpanzee)
```

RDF Schema allows classes of classes.

WordNet example

Representation by Decker and Melnik:

```
Class(LexicalConcept)
Class(Noun subClassOf(LexicalConcept))
Property(hyponymOf
    domain(LexicalConcept)
    range(LexicalConcept))
Individual(1000768 type(LexicalConcept)
    wordForm(Human))
```

(stylized for presentation purposes)

Problem: how to use the hyponym hierarchy as a subclass hierarchy?

WordNet example (cont.)

RDF solution: use metamodelling

```
subClassOf(LexicalConcept Class)

subPropertyOf(hyponymOf subClassOf)

subPropertyOf(wordForm rdfs:label)
```

Reaching consensus

Issue-driven process:
(1) issue raised by participant or public (2) issue accepted by WG (3) issue opened by chair (4) issue owner assigned (5) discussion on possible resolutions (6) owner proposes resolution to **close** or **postpone**.

Avoid objections
Chairs should do utmost to get consensus

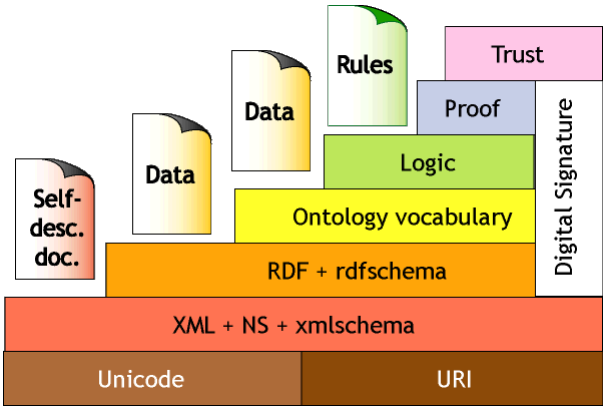
OWL WG: 48 issues
Two were closed under objections.
Ten issues were postponed.

People learn to play the consensus game.

Example issue

Issue 5.3 Semantic Layering

- OWL is expected to be semantically compatible with RDF(S).
- Problems were foreseen with aligning a DL-style model theory with the RDF model theory, as the latter allows more or less unlimited metamodelling.



The Semantic Layering debate

Cf. the SIKS seminar in April 2002 with talks by Pat Hayes and Peter Patel-Schneider

Excerpt from a telecon debate;

> "You are not creating a semantic web, but semantic islands with high fences"
>
> "But your are creating a semantic swamp, with crocodiles and snakes"

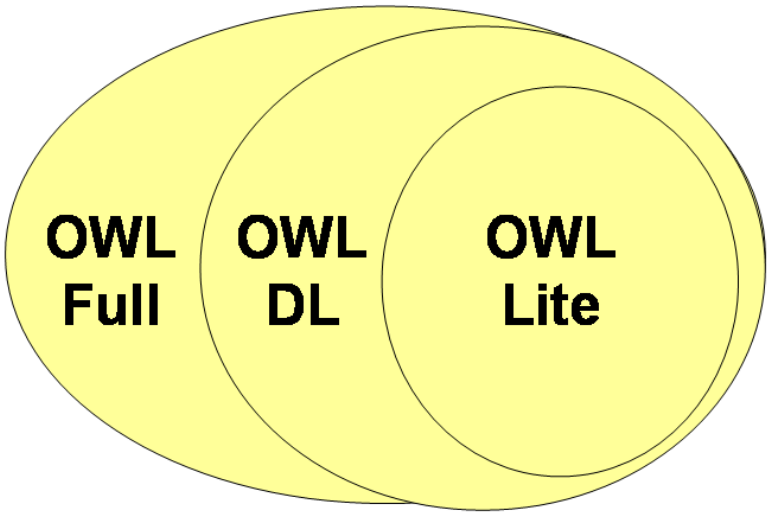
Which do you prefer?

Consensus on Semantic Layering

OWL Full ("Large OWL", "Great Horned OWL")
Free mixing of OWL and RDF = high expressivity
Non-standard formalisation
Tractability not guaranteed
OWL DL ("Fast OWL")
Maximize expressiveness while retaining tractability
Standard formalisation
Same language constructs as OWL Full
Constraints on RDF/OWL vocabulary use

Correspondence theorem links the two styles of semantics: entailments in OWL DL also hold in OWL Full.

The sublanguages of OWL



OWL Lite is a syntactic restriction of OWL DL: intended to be used for classification hierarchies with simple constraints.

OWL DL is closest to DAML+OIL

OWL language constructs

RDF Schema
(sub)classes, individuals
(sub)properties, domain, range
OWL Lite
conjunction, (in)equality
cardinality 0/1, XML Schema datatypes
inverse, transitive, symmetric
allValuesFrom, someValuesFrom
OWL DL
negation, disjunction
hasValue, enumerated types, full cardinality
OWL Full
metaclasses

Is OWL just antoher KR language?

Key differences:

- All classes/properties/individuals have a URI as identifier
- RDF/XML exchange syntax enables interoperability

For the rest:

- OWL DL is state-of-the-art concept language
- semantic-layering solution was/is "research"

A piece of OWL in RDF/XML syntax

```
<owl:Class rdf:ID="MozartDaPonteOpera">
 <owl:equivalentClass>
  <owl:Class>
   <owl:oneOf rdf:parseType="Collection">
    <Opera rdf:about="#NozzDiFigaro"/>
    <Opera rdf:about="#DonGiovanni"/>
    <Opera rdf:about="#CosiFanTutte"/>
   </owl:oneOf>
  </owl:Class>
 </owl:equivalentClass>
</owl:Class>
```

OWL presentation syntaxes

UML Profile
: Under development by OMG

XML
: More human-readable than the RDF/XML syntax

Abstract syntax
: See examples in this presentation

OWL tools and tests

- Suite of OWL tools is already available
- Repository of tests is part of recommendation:

  http://www.w3.org/2002/03owlt/

- See also test results of tools:

  http://www.w3.org/2003/08/owl-systems/test-results-out

More information

Working group home page:

http://www.w3.org/2001/sw/WebOnt/

Technical details about OWL:

- OWL documents: requirements, overview, guide, reference, semantics, tests
- Academic publications, e.g.:

    Horrocks, Patel-Schneider, van Harmelen. From SHIQ and RDF to OWL: The Making of a Web Ontology Language. Journal of Web Semantics, **1**(1), 2003.

New W3C Semantic Web Activities

Semantic Web Best Practices

Publishing key ontologies/vocabularies
Modelling guidelines and ontology-design patterns
Tools and demo inventory
Links to MPEG, Topic Maps, UML

Data access

See: the W3C Semantic Web page for more details:

http://www.w3.org/2001/sw/