A year on the Semantic Web @ W3C
(or: what is happening these days?)

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The Past...

- Some technologies have been recently finalized:
  - OWL 2
  - Rule Interchange Format (RIF)
The present...

- Technical work is going on
  - SPARQL 1.1
  - RDFa 1.1
  - RDB2RDF

- "Community" contacts at W3C are also happening with
  - health care and life science community
  - financial world, eg, XBRL
  - (digital) library world
  - eGovernment
The (possible) future

- Finalize the present 😊
- Possible new technical activities:
  - Provenance
  - Revision of RDF
  - …
OWL 2
OWL 2

- A small revision of the 2004 version of OWL
- Some new features:
  - keys
  - extended datatypes facilities
    - eg, numerical intervals without relying on XML Schemas
  - property chains
    - the “uncle” example can now be formulated in OWL
  - qualified cardinality restrictions
  - profiles
  - …
- Better documents, clearer structures
It was a slightly stormy process...

- There were misunderstanding between the “core” RDF and the OWL communities
  - “does OWL abandon RDF?”
  - will there be an OWL 2 Full specification at all?
- Luckily, all those were really just misunderstandings
The overall structure has not changed
OWL 2 profiles

- OWL 2 maintains the OWL Full and OWL DL “duality”
- But OWL Lite has been replaced by “profiles”:  
  - syntactic restrictions to OWL
  - restricted facilities ↔ better reasoning performance
- Goal is to make lighter OWL reasoners possible
OWL profiles

- OWL Full
- OWL DL
- OWL EL
- OWL QL
- OWL RL
An example: OWL RL

- **Goal:** to be implementable through rule engines
- **Usage follows a similar approach to RDFS:**
  - merge the ontology and the instance data into an RDF graph
  - use the rule engine to add new triples (as long as it is possible)
  - then, for example, use SPARQL to query the resulting (expanded) graph
- **This application model is very important for RDF based applications**
What can be done in OWL RL?

- Many features are available:
  - identity of classes, instances, properties
  - subproperties, subclasses, domains, ranges
  - union and intersection of classes (though with some restrictions)
  - property characterizations (functional, symmetric, etc)
  - property chains
  - keys
  - some property restrictions (but not all inferences are possible)
What cannot be done in OWL RL?

- Some features are not available or are restricted:
  - not all datatypes are available
  - no datatype restrictions
  - no minimum or exact cardinality restrictions
  - maximum cardinality only with 0 and 1
  - some consequences cannot be drawn

- Very informally: rules cannot draw conclusions that involves a “there is a resource such as…”
Rule Interchange Format (RIF)
Why rules on the Semantic Web?

- Some conditions may be complicated in ontologies (ie, OWL)
  - eg, Horn rules: \((P_1 \& P_2 \& \ldots) \rightarrow C\)
- In many cases applications just want 2-3 rules to complete integration
- Ie, rules may be an alternative to (OWL based) ontologies
Things you may want to express

- An example from a bookshop integration:
  - “I buy a novel with over 500 pages if it costs less than $20”
  - something like (in an ad-hoc syntax):

```{?x rdf:type p:Novel;
  p:page_number ?n;
  p:price [p:currency p:$_;
            rdf:value ?z]
  ?n > "500"^^xsd:integer.
  ?z < "20.0"^^xsd:double.}
=>
{ <me> p:buys ?x }
Things you may want to express

?-x

rdf:type
p:page_number
?n
?n>500

rdf:type
p:price
p:currency
p:$

 rdf:value
?z
?z<20

me

p:buys

?x
RIF (Rule Interchange Format)

- The goals of the RIF:
  - define simple rule language(s) for the Semantic Web
  - define interchange formats for rule based systems

- RIF defines several “dialects” of languages
  - some are geared towards production rule systems, for example
  - ie, RIF is not bound to RDF only

- Ie, RIF is also a general framework to define/interchange rule languages
RIF Core

- The simplest RIF “dialect”
- A Core document is
  - some directives like import, prefix settings for URIs, etc
  - a sequence of logical implications
    - technically, Horn rules without functions
  - can use the familiar datatypes and operators
  - has the notion of “anonymous” resources, a bit like blank nodes
RIF Syntaxes

- RIF defines
  - a “presentation syntax”
    - a bit like the functional syntax for OWL
  - a standard XML syntax to encode and exchange the rules
  - there is a draft for expressing Core in RDF
    - just like OWL is represented in RDF
Remember the what we wanted from Rules?

{  
    ?x rdf:type p:Novel; 
    p:page_number ?n;  
    p:price [ 
        p:currency p:$; 
        rdf:value ?z  
    ].  
    ?n > "500"^^xsd:integer.  
    ?z < "20.0"^^xsd:double. 
}  
=>  
{ <me> p:buys ?x }
The same with RIF Presentation syntax

```xml
Document {
  Prefix ... 
  Group {
    Forall ?x ?n ?z {
      <me>[p:buys->?x] :-
      And{
        ?x rdf:type p:Novel
        ?x[p:page_number->?n p:price->_abc]
        _abc[p:currency->p:$ rdf:value->?z]
        External(pred:numeric-greater-than(?n "500"^^xsd:integer))
        External(pred:numeric-less-than(?z "20.0"^^xsd:double))
      }
    }
  }
}
```
A word on the syntax

- The RIF Presentation syntax is... only syntax
- It can express more than what RDF needs
- Hopefully, a syntax will emerge with
  - close to one of the RDF syntaxes with a better integration of rules
  - can be mapped on Core implementations
Usage of rule with RDF

- A system gets
  - a set of RIF Core rules in some syntax
  - data in RDF
  - new RDF triples are generated

- Sounds familiar? Remember OWL RL?
What about OWL RL?

- OWL RL stands for “Rule Language”…
- OWL RL is in the intersection of RIF Core and OWL
  - inferences in OWL RL can be expressed with rules
    - the rules are precisely described in the OWL spec, b.t.w.
  - there are OWL RL implementations that are based on RIF
- An application may also “declare” a subset of OWL RL rules it uses and let a RIF engine do the rest…
SPARQL 1.1
SPARQL as a unifying point
SPARQL 1.1: filling some missing features

- Update, ie, to change the RDF store
  - remove or add triples
- Nested queries (ie, SELECT within a WHERE clause)
- Negation (MINUS, and a NOT EXIST filter)
- Aggregate functions in SELECT (SUM, MIN, MAX…)
- Property path expressions (?x foaf:knows+ ?y)
- Basic federated queries
- Combination with entailment regimes (RDFS, OWL, RIF)
SPARQL 1.1 and RDFS/OWL/RIF

SPARQL Engine with entailment

- RDF Data
- RDFS/OWL/RIF data
- SPARQL Pattern

Query result

entailment

RDF Data with extra triples

pattern matching
SPARQL as a unifying point
SPARQL 1.1 as a unifying point
RDFa 1.1
RDFa has a significant traction

- RDFa (and microformats) are indexed by Yahoo!, by Google,…
- Commercial, governmental, etc, sites add it to pages (BestBuy, Tesco, UK egov sites, LCS)
- Is used by Facebook’s Open Graph Protocol
- May turn into the largest source of RDF data on the Web…
RDFa 1.1

- A new Working Group on a new release of RDFa
- Goals
  - simplify the work of RDFa authors via new features
  - separation of RDFa “Core”, that can be used with any XML dialect, and XHTML+RDFa and HTML5+RDFa
  - definition of a separate RDFa API
- It is still at the beginning, first public drafts have just been published
Revision of RDF?
“RDF Next Steps” Workshop

- Workshop takes place in Stanford in a week
- There were over 30 submissions
- Issues:
  - do we need a revision of RDF?
  - if yes, what would that entail?
- Discussions will happen at the Workshop
- A new Working Group *might* be created in 2010
Preliminary conclusions from the submissions

- There is probably no need for a radical overhaul of RDF
- Some new features/changes may become necessary
Some of the discussion topics

- **Feature changes:**
  - deprecation (reification, containers)
  - new features
    - named graphs, quads, n-quads
    - lists as first class entities

- **Semantic changes:**
  - change bnode semantics
  - adopt “ter Horst” semantics for RDFS
  - remove current restrictions (literal subjects, bnode predicates)
Some of the discussion topics

- **Syntaxes:**
  - standard Turtle syntax
  - Json
  - new (schema friendly) XML syntax
  - Atom

- **Special vocabularies:**
  - unordered lists, measurement units
  - n-ary relations, identity management
These are all discussion topics!

- Only future can tell what the community will agree upon in a charter (or charters)
- RDF is the basis for many things, any change must be carefully considered from a deployment point of view!
That is all I have time for…

- There are many issues that were not discussed
  - provenance, linked data, open government initiatives, applications, open R&D issues, …
- There is work for everyone!
- Think of
  - convincing your employer to join W3C…
  - … and then join one of the current or upcoming groups!
Thank you for your attention!

These slides are also available on the Web:

http://www.w3.org/2010/Talks/0617-Seattle-IH/