Web services in corporate semantic Webs

On intranets and extranets too, a little semantics goes a long way.

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Plan & progression

Motivating scenarios:
- Research community – Starting spring 2006
- Engineering projects – Starting spring 2006
- Design and production – Started January 2006

Brief reminder of what the semantic web is
*i.e.* an extension of the current web with metadata for machines.

A proof of concept using corporate semantic webs
- Semantic annotation of web services
- Semantic composition of web services
- Interactions between services and semantic annotations
Scenario #1: the eWok hubs

- Members: IFP, INRIA, ENSMA, EADS, BRGM, ENSMP, CRCFAO
- Cooperation between different organisations (companies, institutes, etc.) participating in an engineering workflow: projects to capture et and store CO₂ reusing oil drillings.
  - Integrate information bases and domain/expert tools from different partners
  - Requirements: "a set of communicating portals providing web applications (for humans), web services (for machines) and information resources (for humans and machines)."
Scenario #2: SeaLife world-wide lab

- Members: TU Dresden, Heriot-Watt University, City University, University of Manchester, Scionics, INRIA

- Computational and data infrastructure to facilitate researches in Life sciences
  - Cooperation of geographically distributed organisations
  - Seamless integration of their computational and data resources

- Requirements: "Browsers that can automatically identify entities such as protein and gene names, molecular processes, diseases, types of tissue, etc. and the relationships between them, in any Web document, collect these entities and then apply further analyses to them using applicable Web and Grid services."
Scenario #3: SevenPro and eDesign

Members: Semantic Systems, INRIA, Fraunhofer, Czech Technical University, Living Solids, Italdesign-Giugiaro, Fundiciones del Estanda

Allow the integration of tools used in industrial design
- Mining of engineering knowledge in multimedia repositories
- 3D interaction with that knowledge

Requirements: "Engineering environments integrating CAD tools, document repositories, ERP, virtual reality rendering, corporate Databases, etc. to improve the process of product engineering and development in manufacturing and engineering companies."
Combing two stacks of recommendations

HTML

Web Services
- SOAP
- MTOM
- WSDL
- WS-CDL
- WS-A

Semantic Web
- OWL
- SKOS
- SW BP
- RIF

XML, Namespaces, Schemas, XQuery/XPath, XSLT, DOM, XML Base, XPointer, RDF/XML, SPARQL

XML Infoset, RDF(S) Graph

Web Architectural Principles

URI/IRI, HTTP

One Web

URL, HTTP

The Initial Web

Internet

Internet
The semantic cake

"The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation."

© W3C – Tim Berners-Lee, Ivan Herman
Resource Description Framework

- Represent assertions about (Web) resources
e.g.: doc.html has for author Jeremy and is about Genetics

- Model of triples (subject, property, value)

  (http://.../doc.html, author, #jthomas)
  (#jthomas, firstname, "Jeremy")
  (http://.../doc.html, subject, "Genetics")

- XML syntax to exchange these on the Web

- Crawl triple stores and build graphs:

```
http://.../doc.html  author  #jthomas
  subject  "Genetics"
  firstname  "Jeremy"
```
SparQL Query Language

Query triple stores, SQL for the semantic Web

Example: retrieve long papers on genetics and sort them by alphabetic order of their title.

```
SELECT ?articles ?title
WHERE {
  ?article rdf:type eg:Article .
  ?article eg:subject eg:Genetics .
  ?article eg:nbpage ?nbpage .
  FILTER ( ?nbpage > 5 )
}
ORDER BY ?title
```
RDF Schema and OWL

- Publish and define the **vocabulary** used in the triples e.g. author, first name, article, etc.
- Describe **hierarchies** of concepts and relations e.g. article *is a kind of* document
  
  firstname *is a kind of* designation
  
  firstname *applies to* persons
- Give **formal characterisation** of types and relations e.g. hasSpouse *is a symmetric relation*
  
  hasChild *is the inverse of* hasParent
  
  a Mother *is a woman with at least one child*
- OWL cake with three flavours: Lite / DL / Full
Le cluster **Environnement Telecom**

nb Comp. 6 11 11 6
Corporate information systems evolution

- Evolution of Knowledge Management and Enterprise Application Integration

- Corporate memories on intranets providing:
  - information **capture** services;
  - information **storage** services;
  - information **computation** and **inference** services;
  - information **flows management** services;
  - information **mediation** services;
  - information **presentation** services.

- Resources may be **internal or external** (external standard library & online services)

- Interoperate smoothly and **integrate workflows** at the business layer.
Corporate semantic web services

- Consider services just like other (web) resources and annotate them with the vocabulary defined in semantic web schemas (e.g. OWLS)
  - Types of services (directory, buying service, delivery, etc.)
  - Types of inputs (people names, ISBN, dates & places, etc.)
  - Types of outputs (phone, confirmation, etc.)
  - Quality of service, duration, cost, etc.

- Rely on semantic search engines to discover services and match a request; enhance UDDI with inferences e.g. a phonebook is a kind of directory
Composing services

- Link output(s) of a service with input(s) of another; compose processes to create applications

Different types of compositions:
- Manual composition e.g. an IT manager describes a useful composition and makes it public
- Semi-automatic composition: assist selection
- Simple composition: find sequences of services
- Fully automatic composition (???)

Other interactions between Web services and the semantic Web:
- SPARQL to provide service inputs
- Services and annotation life-cycles
Automatic sequences

Search for services More See

select list * display table where
?s1 proc:step ?s2
?s1 proc:hasInput ?x
?s2 proc:hasOutput ?y
?x proc:semanticType c:EmployeeName
?y proc:semanticType c:AssistantName

0.02 s for 1 projections

Corese RDF engine version 2.1.1.11 INRIA 2005-05-01

name
Phone of Secretary
phone
Phone → Name
name
employee
secretary
Perspectives or "the cherry on the cake"

- SPARQL and data flows in choreographies (input and select, output and assert/update)
- Rules in workflows and semantic integration
- Visual frameworks to manage services, composition, choreography, orchestration, etc.
- Dynamic interfaces generation adaptation.

The semantic web cake © W3C
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