Semantic Web Use cases and challenges at EADS

ESWC Industry Forum
May the 30th, 2005

Anne MONCEAUX
Barthélémy LONGUEVILLE
CRC-F
Outline

1. Industrial context: EADS, CRC
2. Our approach to the Semantic Web
3. Potential Impact on EADS business applications
4. Use cases in KM application domain
Industrial context

- Commercial Aircraft
- Helicopters
- Commercial Launch Vehicles
- Missile Systems
- Satellites
- Mil. Transport Aircraft
- Military Aircraft
Industrial context

CRCs MISSION:
- Fundamental & applied researches in various domains (Electromagnetism, Applied mathematics, Simulation…) among which: Engineering & Information technologies, and KM.

- Provide EADS BU’s with a current and up to date survey on the methods, standards, tools, research projects and best industrial practices related to their business processes.

- Transfer to EADS Bus through demonstrators
Our approach to the Semantic Web

The vision of the Semantic Web first emerged as a solution to the problem of organising the huge amount of information available on Internet (WWW) to make searches efficient, and (in the future) to guaranty that information is reliable.

Our approach is rather exploring the potential of the SW new technology to improve the EADS BUs industrial processes.

- application oriented (not a pure analogy of Web (www) + Semantic)
- which can be mastered
- dedicated to teams or groups
- who have precise tasks or goals
Our approach to the Semantic Web

“Like the web, the semantic web is not an application: it is an infrastructure on which many different applications (like electronic commerce) will develop”

- SW supply the existing web with a complementary **infrastructure** and a set of **technologies** that will allow to add machine-readable knowledge to describe the meaning of the accessible “resources” (content and data).

- SW is a **large community** of researchers (academics and industrials) driven by W3C projects and standardisation efforts.
Our approach to the Semantic Web

OUR OBJECTIVES IN SW INDUSTRIAL APPLICATION

- To **share** information between humans and computers
  by using a common and yet evolving representation of a domain (i.e. ontologies)

- To make **retrieval** (while searching for information) more efficient
  by using semantic search engine and agents which are able to understand the
  knowledge describing web (accessible) contents

- To allow **reasoning** on information
  by using inference engine, inference rules representing specific knowledge of a
  domain.
Our approach to the Semantic Web

**Knowledge Representing**
To gradually add a formal representation to the existing Web content and make it machine-processable.

**Reasoning**
Use inference engines and rules, to take advantage of these representations.

**Application**
Provide services that concretely improve or ease the organisation processes.
Which potential impact?

- SW is a **potential source of evolution** / improvements of industrial Information systems and Knowledge Management applications.

- KM (in a large acceptation of the word) aims at acquiring, organizing, maintaining and sharing knowledge within the organization…
- KM in industrial context is apparent in deployed applications
- with expected gain in efficiency & working integration
- and in a way tightly linked to the working context : technical, international, intercultural, geographically dispersed organizations, concurrent engineering…
Which potential impact?

THE USUAL KM INTERFACES:

- Information Services
  - IS provides policy and guidelines for information and archiving methods and tools
  - IS supports knowledge within the information system

- Product Integrity
  - PI manages the experience feedback process for the security and airworthiness of the product

- Information and Documentation Centres
  - IDC manages the “outside knowledge”: competitive intelligence and technology monitoring
  - IDC supports KM with DMS

- Transversal functions (quality, organization, HR...)
  - Manage People & working organization

KM provides guidelines & recommendations, deploys applications for a proper integration of knowledge concern.
Which potential impact?

- Some identified transfer of SW approaches and technologies to industrials applications:
  - Information retrieval on the web (business intelligence…)
  - Publishing (well-targeted portals, REX sharing…)
  - E-Commerce, marketplaces
  - Data / Information integration
  - Information / Knowledge management (strict sense of the word)
Which potential impact?

KEY PROBLEMS and CURRENT TECHNOLOGY SoA

- Search and access information
- Organize and share Knowledge
- Maintain & prove information
  - inconsistencies in naming
  - outdated information
- Display information
  - Efficient display, graphical view, information integration & IHM

- Unstructured informations
  - Text, pictures, audio, video
  - but search engines based on automatic indexing or keywords
- Heterogeneous data & schemata
  - But wrappers (access distributed sources) based on
    - human mediation (select sources, browse, select & combine the information)
    - extensive programming
Which potential impact?

**EXPECTED BENEFICES**

- **Organise / Share**
  
  *Conceptual “knowledge spaces”*
  
  Organize knowledge in contextual spaces
  
  From personal to organizational knowledge spaces

- **Find / Access**

  *Semantic enabled information search*
  
  Semantic query answering
  
  Query answering over heterogeneous documents or data sources

- **Integrate / use**

  *Enterprise application integration*
  
  Remote invocation of business functionality over the Intranet through message exchange
  
  Sequence the treatments performed by those applications

- **Maintain**

  *Integrity*
  
  Coherence of the data between the applications
NEEDS:
i. to combine complementary information from different domains (≠ management/NatCos)
ii. to solve the problem of training catalogues obesity
iii. to offer added value training services, possibly externally in ACE S/C context
iv. to rely on a sufficiently generic, explicit and detailed domain model in order to adapt with evolving contexts and organizations

to support staffing and training activities in a distributed engineering environment

Principle:

Semantic services integrate complementary data independently organised and managed!

– Rely on existing business applications
– Access and combine the distributed and heterogeneous data
– Define learning needs in relation to the processes (activities to be performed) and skill management
– Based on an abstract vision of the application domain (ontology & rules)
TrainMe – 1st scenario & architecture

Find a training offer relevant to a working situation?

Find skilled people modulo training (staffing)?

Build a relevant training plan? (training object combination)
TrainMe – Challenges for the SW community

What do we need?

1. Efficient Web Service infrastructure for information/data discovery & selection – and to allow the sources owners (at least training providers/designers) to publish their services directed towards eligible ‘End-users’
   - easy deployment
   - reuse of legacy
   - mediation technology

2. Mechanisms to reason over answers
   - the combining of information (e.g. for negotiation and composition) requires inference/reasoning mechanisms.
   - For ex. find relevant training, that is, the eligibility conditions of which (with respect to the ‘end user’ and his learning needs) are verified by a search profile

3. KR expertise: ontology-based representation expressive and flexible enough to specify realistic learning needs
   - to express our complete needs for the all subjects Competence, Skill, Training and Qualification
   - standardization initiatives to express goals & profiles

4. Q/A at User interaction level: NL, query refinement…
ANITA – A semantic annotation platform

NEEDS:

i. Better handling of information content
ii. Share information handled by individuals within a team
iii. Creation / Combination of knowledge based on existing information

In teams and projects with shared interests and objectives (action driven)

Principle:

Knowledge sharing based on individual and manual annotations on documents!

- contextual knowledge
- Added value (Post It)
- No direct link with the document textual content
- Based on a shared vision of a team domain knowledge (small ontologies)
What are main use cases of SW for Knowledge Management in engineering?

**Search Results:**
- Relevant to my process
- With added-value and knowledge

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**ANITA – Scenario**

**ANITA**

- Annotation Editor
  - Annotate
  - Publish

**Annotations repository**

- Annotations

**Semantic Web Server**

- Search
- Retrieve
- Cluster
- Ontology based search
- Reasoning (Inference)

**Document**

- DMS
- Email
- Search Engine
- …

**Team**

- Project A
- Project B
- Project C
ANITA – Challenges for the SW community

What do we need?

1. A fast and easy to use annotation editor (“Please no more forms!”)
   
   Why?
   ✐ Ontology based manual annotation (even for small ontologies) is to heavy.
   ✐ Too many information have to be captured
   
   Any solutions?
   ✐ Pre-fill annotation with help of inference mechanism, based on existing resources
   ✐ Use of document content for some aspects (Name, Companies,…)
   ✐ Innovative annotation paradigms (NL annotation, capture annotation from individual use of documents, …)

2. Expertise on the definition of Inference Rules to provide innovative services:
   Why?
   ✐ Inference are powerful and technically feasible but we are still looking for the demonstration from the user perspective of the advantages
   
   How?
   ✐ Information completion, profiling, auto-emerging resources…

3. A way to maintain our applications
   ✐ One year to stabilize a simple team specific ontology
   ✐ Companies Organizations and people changing every two years
Thanks