EADS Corporate Research Centre - France

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

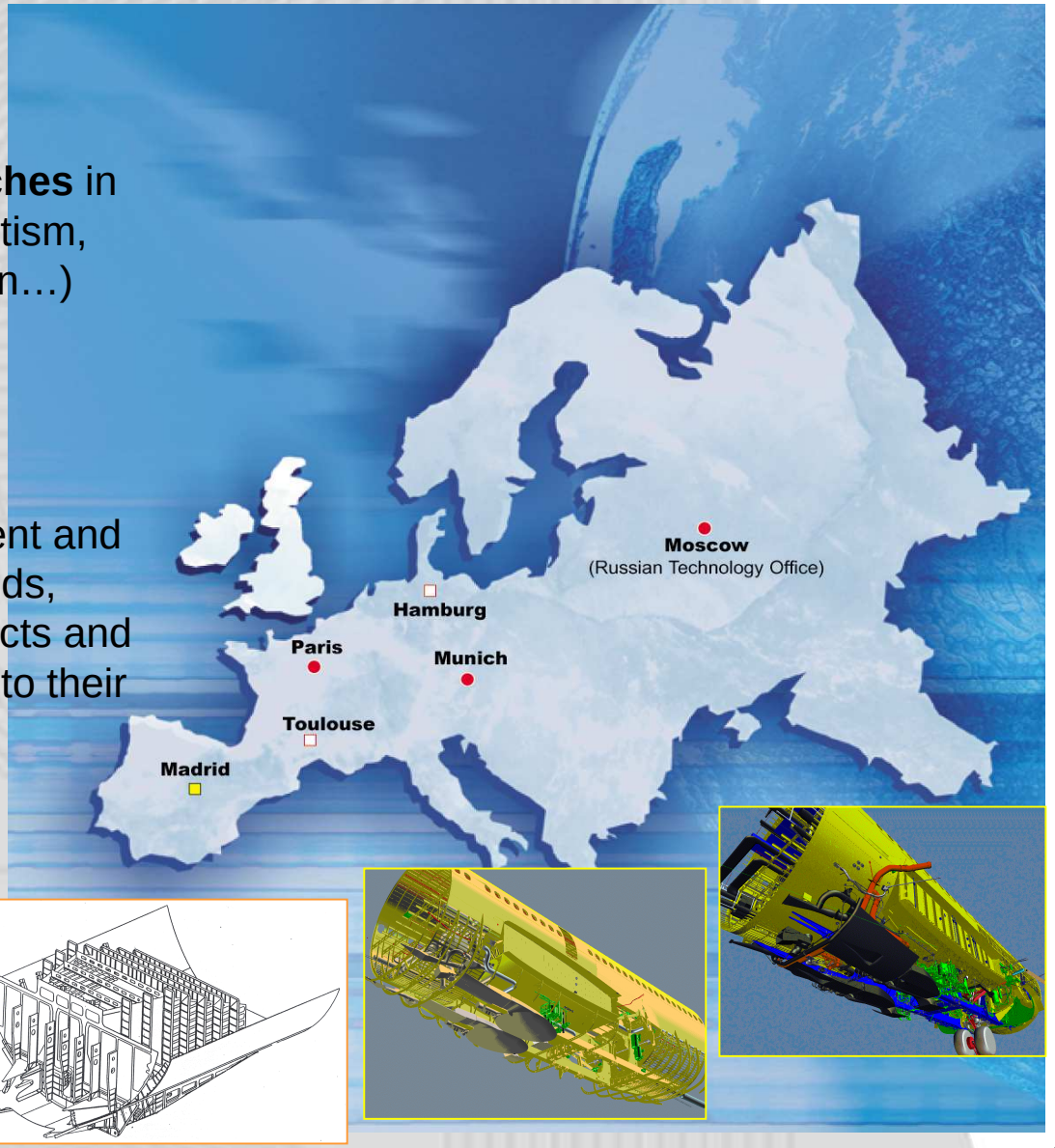
- Commercial Aircraft
- Helicopters
- Commercial Launch Vehicles
- Missile Systems
- Satellites
- Mil.Transport Aircraft
- Military Aircraft

EADS
European Aeronautic Defence and Space Company

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

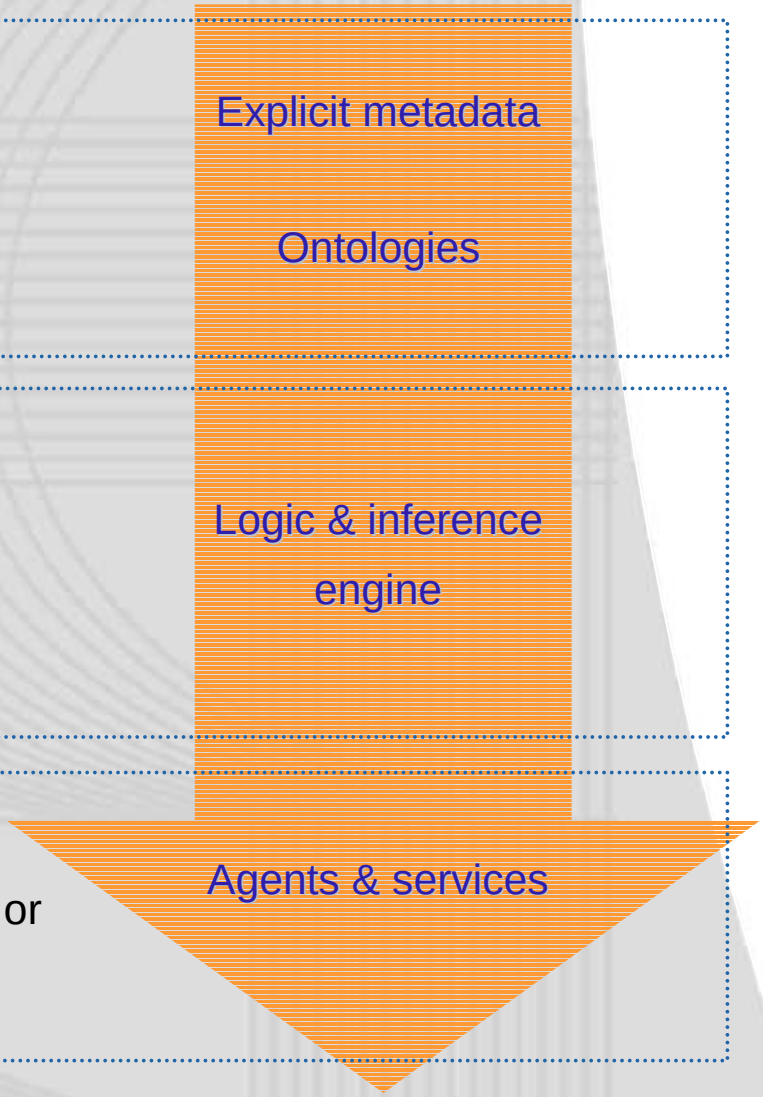
To gradually add a formal representation to the existing Web content and make it machine-processable.

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 feed-back 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

Maintain

Integrity

Coherence of the data between the applications

Find / Access

Semantic enabled information search

Semantic query answering

Query answering over heterogeneous documents or data sources

Enterprise application integration

Integrate / use

Remote invocation of business functionality over the Intranet through message exchange

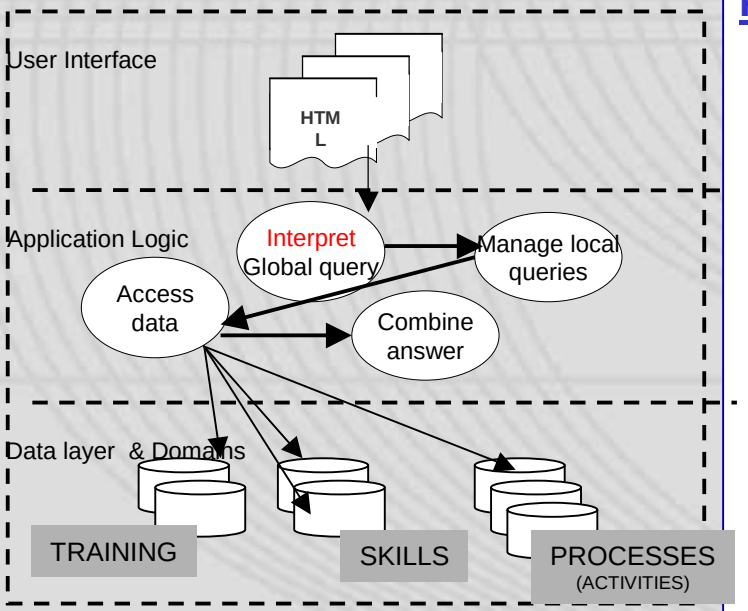
Sequence the treatments performed by those applications

TrainMe – Q/A services over training and skills data

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 !

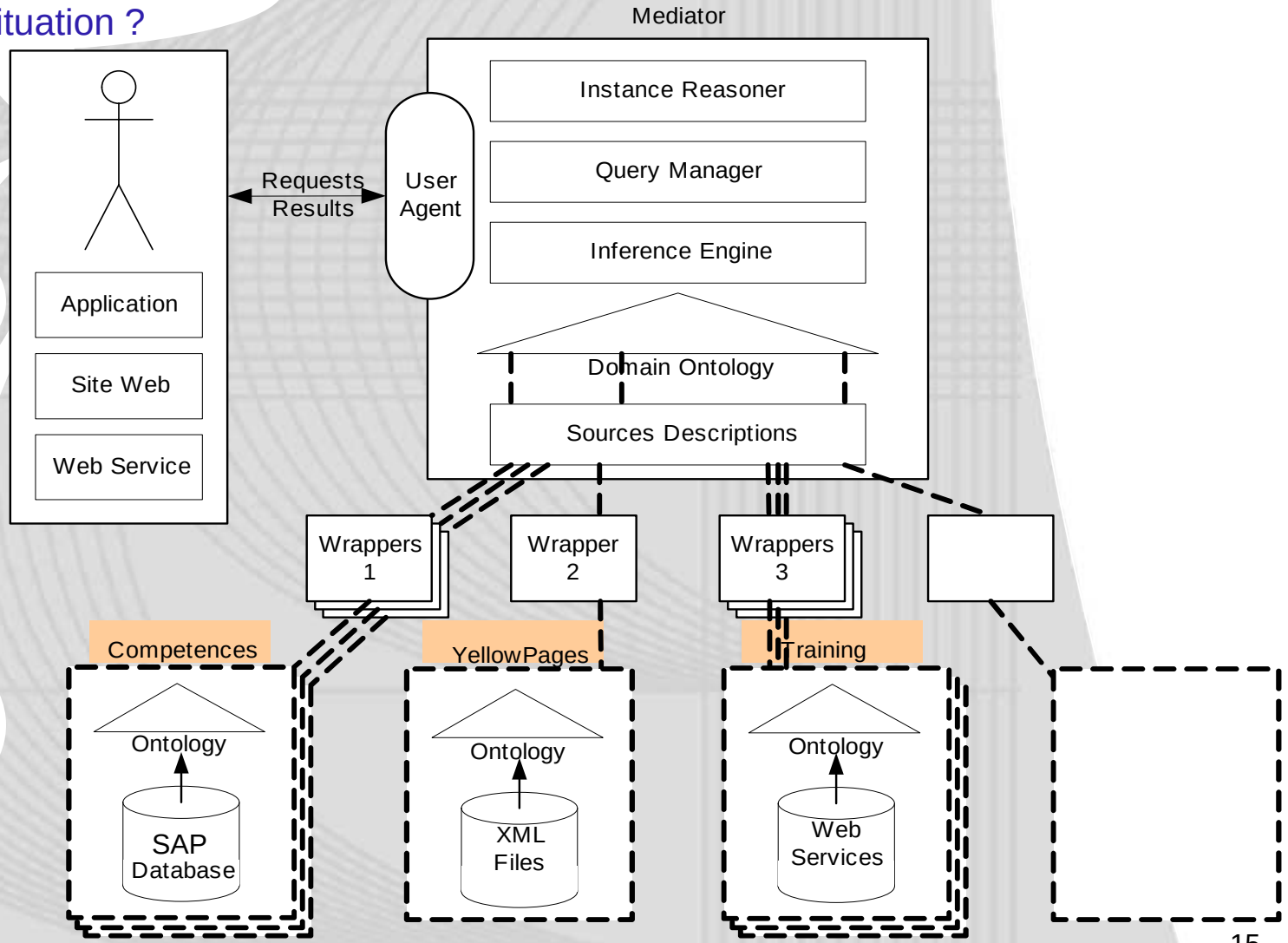
- Rely on existing business applications
- Access and combine the distributed and heterogeneous data
- Define learning needs in relation to the processes (activities to be performed) and skill management
- Based on an abstract vision of the application domain (ontology & rules)

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*

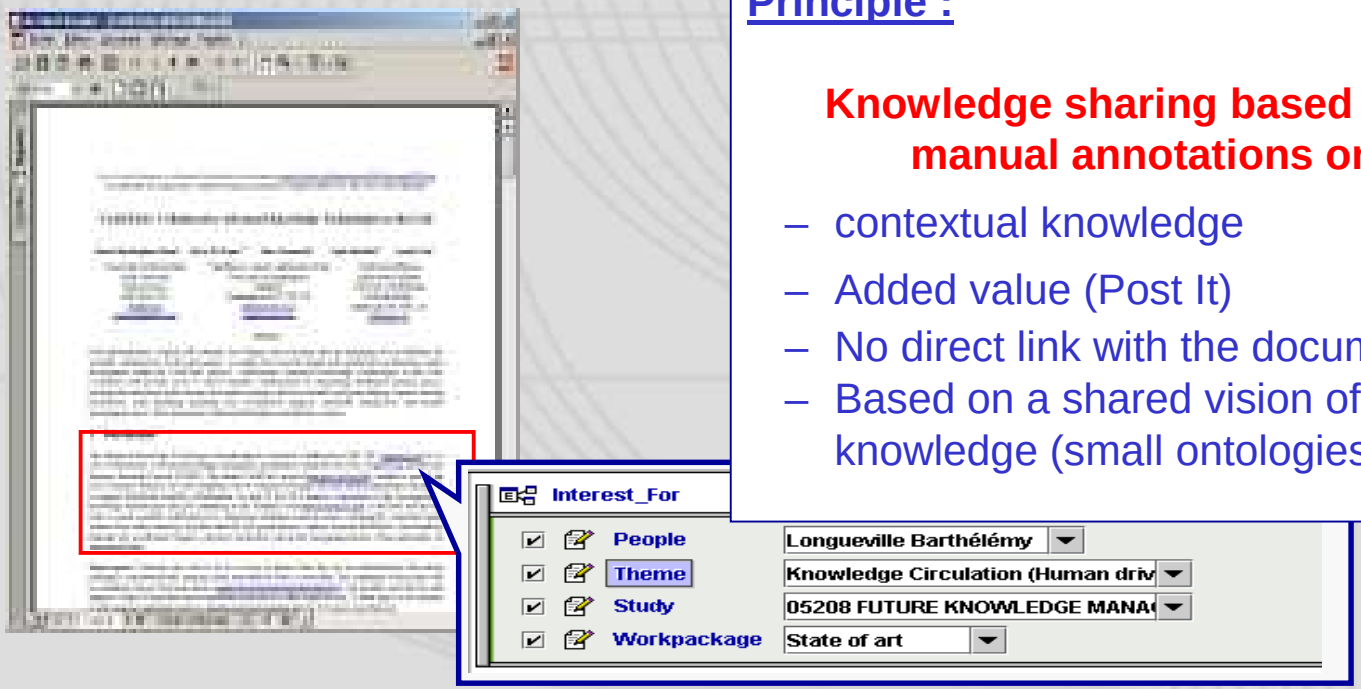
4. Q/A at User interaction level : ➔ NL, query refinement…

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!

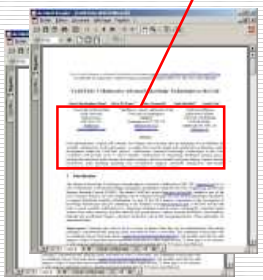
- contextual knowledge
- Added value (Post It)
- No direct link with the document textual content
- Based on a shared vision of a team domain knowledge (small ontologies)

ANITA – Scenario

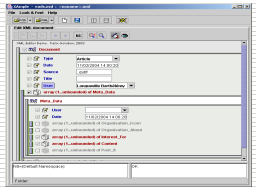
ANITA

Annotations repository

Annotations

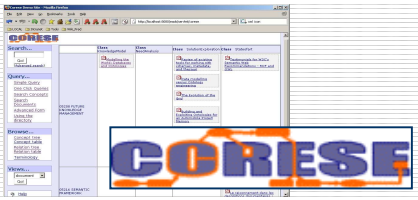


Annotation Editor



- Annotate
- Publish

Semantic Web Server



- Search
- Retrieve
- Cluster

- Ontology based search
- Reasoning (Inference)

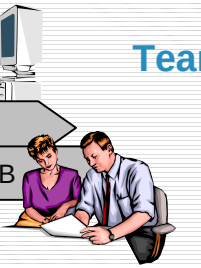
What are main use cases of SW for Knowledge Management in engineering?

Team

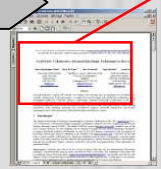
Project A

Project B

Project C



Annotations



Document

- DMS
- Email
- Search Engine
- …

Document

Search Results :

- Relevant to my process
- With added-value and knowledge

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