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Pedro Isaías
Miguel Baptista Nunes
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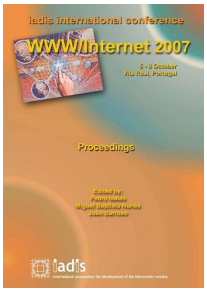

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SEARCH IN E-LEARNING SYSTEMS WITH SEMANTIC WEB TECHNOLOGIES

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ABSTRACT

The traditional view of learning puts most of the emphasis on face-to-face teaching and curriculum. It is very slow and expensive. Many people try to find e-Learning systems and learning objects on the Web. But that can be very difficult to find what we need with the actual search engines. How can someone quickly find and with meaning the learning objects existing in the Web?
Our proposal is: Use Semantic Web technologies and software agents to develop an search engine for the Semantic Web Infrastructure learning environments.

KEYWORDS

Semantic Web, e-Learning, Metadata, Ontologies, Inference, software agents.

1. INTRODUCTION

The Web can be understood as a multimedia library of documents at world level. It currently consists of the largest information repository which makes multimedia contents available. However, their localization is not an easy task, mainly due to the fact that their semantics or meaning can only be captured in their context and in accordance to the human perspective.

In the past years, the international scientific community has been carrying out significant efforts with the view to improve the finding, retrieval and reuse of information objects, which may be inaccessible or stored in servers scattered around the deep Web or the invisible Web.

Metadata and ontologies, metalanguages, annotation tools, tools for the creation of ontologies and topic maps, intelligent agents and mobile agent systems, among other technological developments of Computer Sciences and of Artificial Intelligence within the scope of Information and Knowledge Management and Distributed Web Systems, are the key elements for the development of solutions that will gradually lead to changing the present Web reality.

The project that has been receiving more attention is the Semantic Web whose main purpose is the integration, interchange and semantic understanding of information not only from the viewpoint of humans, but also from the perspective of machines by means of changing the current Web into a Web of semantic data. This would then allow for the description, interrelation and understanding of contents through metadata, ontologies and software agents.

In this context, the present poster specifies the architecture for a retrieval system of learning objects based on the technologies of the Semantic Web, e-Learning and software agents, aiming to solve the problem of locating learning objects and training courses. According to this architecture, we also developed an experimental prototype for the semantic search of learning objects stored in e-Learning systems, learning object repositories and other Web servers for educational contents.

2. SEMANTIC WEB ARCHITECTURE FOR EDUCATION

Our academic project goals were:

- To use Semantic Web technologies in learning environments;
- To implement search engines with Semantic Web technologies;
- To evaluate the advantages of their integration in open-source e-Learning platforms;
- To analyze the influence of these technologies in the description, organization, reutilization, sharing and interoperability of new media contents.

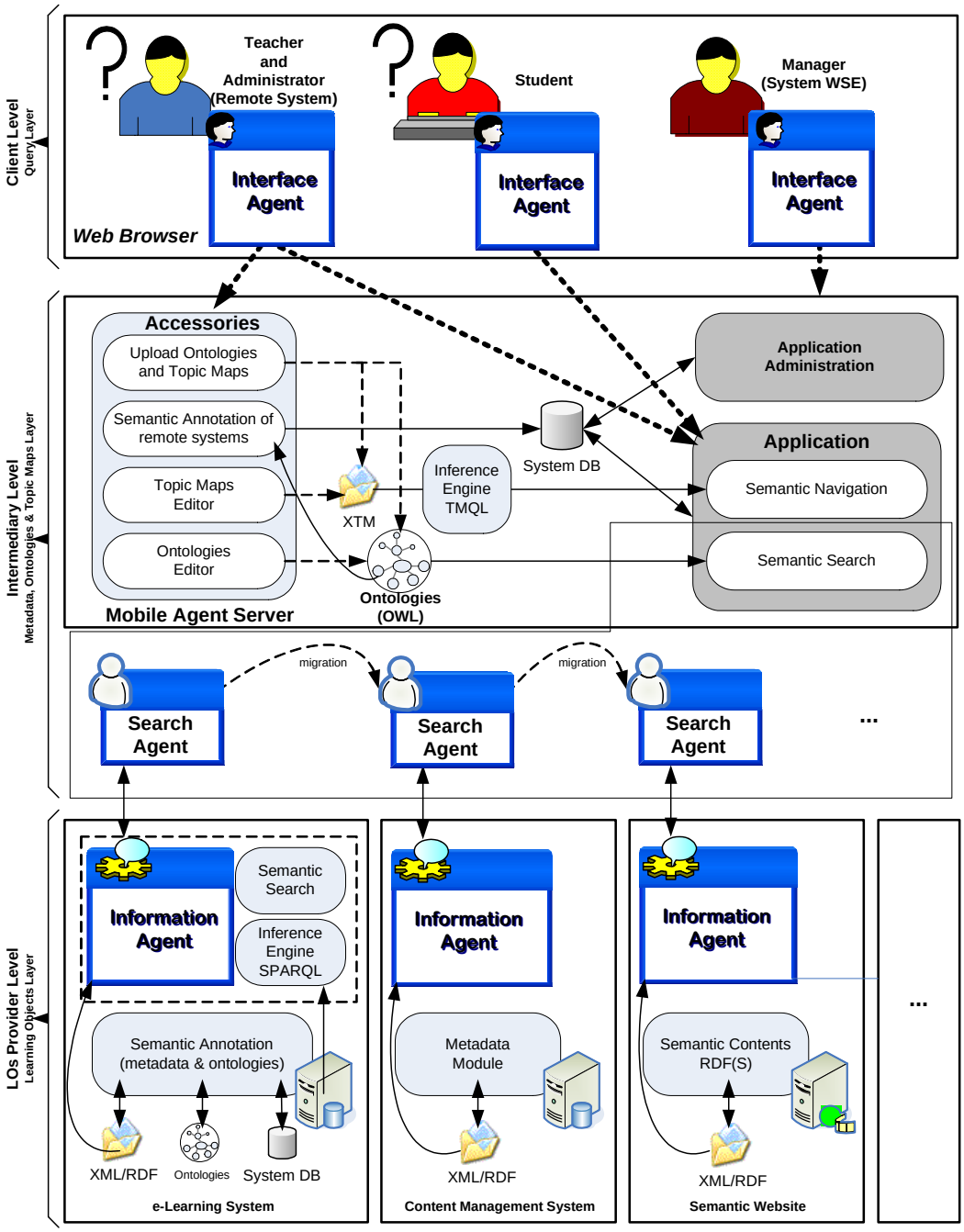

Figure 1. Semantic Web architecture for a retrieval system of learning objects

The technologies used in the development of the experimental prototype for the semantic search of learning objects stored in e-Learning systems, learning object repositories and other Web servers for educational contents were:

- e-Learning technologies and standards:
  - Open Source e-Learning platforms: such as Moodle or Atutor;
  - Sharable Content Object Reference Model (SCORM);
  - IMS Content Packing (IMS-CP);
  - IMS Learning Design (IMS-LD);
  - Learning Object Metadata (LOM);
  - Dublin Core Metadata (DCM).
- Semantic Web technologies:
  - XML and metadata schemas;
  - RDF (Resource Description Framework);
  - Expressing Metadata in RDF/XML (LOM/RDF and DCM/RDF);
  - Ontologies: Web Ontology Language (OWL) and Topic Maps (XTM);
  - Rules: SWRL (Semantic Web Rule Language);
  - Inference: SPARQL (RDF Query Language and Protocol).
- Agent technologies:
  - Voyager Edge (Recursion Software).

3. CONCLUSION

The architecture we proposed resulted in a prototype accessible through the Web for the recovery of stored learning objects in e-Learning systems, in learning objects repositories and in other Web servers for education proposes. The environment of the prototype presents the following characteristics: distributed, opened, modular and transparent.

The main limitations are the automatic generation of metadata based on the counting of words and the simplicity of the rules defined. Better algorithms for metadata automatic generation and more completed ontologies and rules are needed.

However, the description, interrelation and understanding of contents through metadata, ontologies and software agents allows students, teachers and researchers to quickly find learning objects with meaning and context.

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