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Semantic Web Services and Multi Agent Approach for Building and Managing a Distributed Organizational Memory

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ABSTRACT

In this work, we present a technological approach to develop and integrate a management and exploitation platform for heterogeneous resources on the intranet, because organizations manage documents dispersed in large quantities. We have implemented an organizational memory based on semantic web technologies and multi-agent systems, by introducing a new O'CoMMA ontology which ensures the consistency of the proposed memory as well as the management of communications between different actors and users.

Key words: semantic web, multi-agent, technologies, organizational memory.

1. INTRODUCTION

Advances in information and communication technology in the administrative world require the renovation of heterogeneous and dispersed memory, database, document and information management systems. Due to this renewal in documents and personnel, in a globalized and changing environment requires restructuring indefinitely as well as management based on refreshing systems. Due to growing memory structures, organizations need new methodologies to manage and use the information in their memory. This organizational memory is often based on the use of the technologies of different intranet tools based on the classical web and the tools of the semantic web and the intra web, which makes it possible to collaborate on a large amount of data and information [1].

Methodologies based on the O'CoMMA project were used to assess the contributions of several emerging tools to the problem of a distributed and heterogeneous memory (employee integration, document management). Different anthologies have been proposed to annotate the intra web resources of the administration of companies, companies and establishments.

We studied the functionalities of proactive dissemination of information circulated in an organizational memory in the database containing the administrative information of the students, as well as their sharing according to needs and requests.

We will define below all the technical architecture of work which takes the concepts of the semantic web as a promising approach included in a persistent and explicit distributed system of O'CoMMA based on the notions of intra web. A multi-agent architecture is thus defined to represent memory management, its actors, their tasks as well as the documents circulated.

2- TOWARDS A SEMANTIC INTRA WEB

2-1 The concept of a semantic Web

Generally we define the Semantic Web a promising approach to the classical Web, which is based on the automation of the content of documents is made explicit by annotations used to guide the use of these documents in a later way , the semantic web is supported by the W3C. The information presented in the Semantic Web can be interpreted by machines (terminals, computers), this information is not represented in a natural language but formalized using common languages.
The semantic web represents a large space for exchanging information resources between agents (users, machines, etc.) Allowing these of a large volume of varied and heterogeneous information and services. RDF (Resource Description Framework [2]) is the basis of the Semantic Web and has XML syntax.
The following figure shows the difference between the classic web and the semantic web (figure1):

	Current web	Semantic web
Partage de :	Documents	Knowledge
Basé sur :	HTML	XML and RDF
Recherche par :	Keywords	Concepts
Utilisable par :	Human	Machine

Figure 1: Characteristics of the current web and the semantic web

A large space is then created for different exchanges of informative resources between machines which provide access to a large volume of information and various services. To exchange resources on the Internet, architecture is necessary to define all the standards and associated anthologies (formats, addressing of resources or documents.

Resource Description Framework (RDF) is the basic language of the Semantic Web; it is a graph modeling intended to describe in a formal and generic way the resources of the Web as well as their metadata . It is developed by the W3C . A shared architecture is then necessary to exchange all the resources on the web, as well as standards for different anthologies of formats and addresses of these resources.

A common layered architecture recommended by the W3C, it is a schematic vision classified into five major families, as shown in the following figure 2:

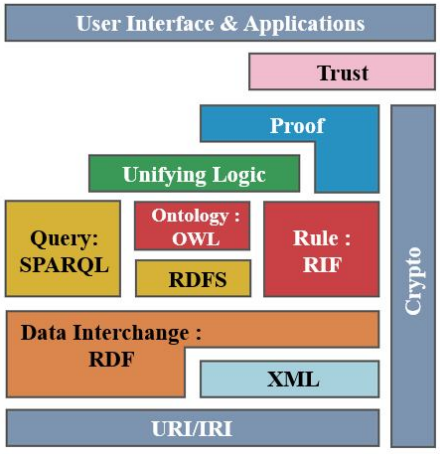

Figure 2: Resource Description Framework (RDF) architecture

RDF proposes interoperability between the applications that share information on the Web and are interpreted by machines. We then study the memory of an administrative enterprise such as a semantic corporate web or intra semantic web.

2-2 O'CoMMA ontology

Organizational memory is a persistent and explicit distributed system, its distribution includes information within an organization in order to facilitate its access and use by members of the organization according to different tasks and collective traceability (Dieng et al., 2000).
Some sharing models must go beyond the technical / IT dimension and account for the organization, and its infrastructural environment.
A multi-agent system that presents the software architecture of CoMMA designed to manage an organizational memory based on the notions of the Semantic Web.

The memory organization distributed is a heterogeneous memory that presents a landscape of heterogeneous information and varied, hence the Semantic Web is based on a promising approach, which made explicit the semantics of documents on the Web through their meta data or annotations.

The users of such organizational memory are heterogeneous because there are several members of different profiles that are affected by the operation of the memory and everyone has its peculiarities in the organization distributed.

Several techniques allowing to learn the individual particularities or to assist the emergence of communities of interest and the proactive diffusion of information by a collective exploitation of the profiles.

2-3 Intra-Web based on a model

An intra web (internal web or corporate web) designates a network developed within an organization and reserved for its employees to facilitate communication and access to company information, operating with the same components as the Internet., and including all HTTP nodes on an intranet.

The following (figure 3) shows a system based on the client / server architecture for an organization or a company.

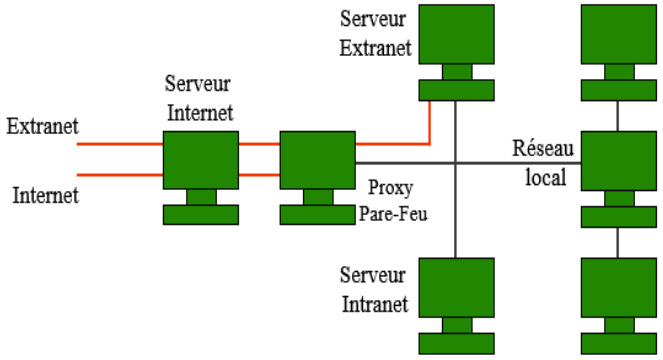

Figure 3: Information system internal to an organization or a company

Example: Administration employees within the university can access student documents (certificates, letters). The users of this organizational memory are heterogeneous and diversified in terms of their profile in the organization. The memory is then model-based structural and l are profiles of user. These models allow intelligent dissemination of information, based on user interests.

2-3-1 Description of user profiles: "annotate people"

The objective is to define the behavior of the system which we proposed for the management of the organizational memory of the administration within the faculty of sciences Ben M ' sik, in order to describe the user profile which captures all the aspects which have been identified as relevant and formalizable.

Such a profile contains administrative information and any explicit preferences that personalization interface users to missions and interests and their positions mints in the organization (role, knowledge network, mission tasks) for the access to memory and dissemination actions.

Users (administrative employees) can access the system through a usage session in order to memorize the history of all the documents visited and the traceability of all the requests requested by students and administrators from different departments.

The use of such information included in the memory allows the system to learn re certain preferences user. The profiles are materialized s and exchanged s as an RDF annotation described by the Semantic Web technology.

2-3-2 Description of the company: "annotate the organization"

The modeling of our organizational memory is mainly intended for the simulation of optimization of our production system, while our model is a well directed representation of the organization.

She provided t for assemblies for various business processes and is used for their reverse engineering, which represents the set of activities that are to study an object to determine its internal function or method of manufacture.

For example for year's architecture CoMMA, the model aims to support and record the activities of memory occurring in the application scenarios. Thus, the system operates the aspects described in the e model for assu r er interaction between agentset users. Our system understands the general environment of the organization, its goals and its policy, so that the global system works in collaboration with human agents (administrators and students) in order to achieve a common objective [3].

An RDF annotation is used to implant the description of our memory, by annotating the organizational entities (activities, tasks, services, traceability) with their relationships.

2-3-3 Memory architecture

Doyle and Hayes-Roth [4] explained in their research that the annotated spaces containing descriptions about the uses and their possible activities where they evolve, allow different agents to become intelligent actors in these environments. The aspects general annotated information used to make the art more intelligent agents. In our case s i organizational memory (heterogeneous) is annotated, agents can use the semantic annotations thanks to different techniques of the Semantic Web.

We describe the nature of the documents (certificates, bulletins, statements, etc.) and descriptions of our organizational environment through semantic annotations in RDF, and then we infer to intelligently explore the volume of information in our memory. The proposed approach leads our database to be materialized as a corporate Semantic Web or intraweb

2-3-4 CORESE: semantic search engine

Corese is an ontology-based search engine for the semantic Web, it is dedicated to retrieving annotated web resources in RDF (S) [5] using a query language based on RDF (S).

Two hierarchies of concepts and relations are provided thanks to the representation of Corese which takes into account all the subsumption links between concepts and relations when matching a query with an annotation, these annotations are represented in RDF and linked to the RDF schema described above representing the ontology on which they are built.

CORESE combines the advantages of RDF (S) / XML to express and exchange the different metadata, and the request and inference mechanisms that are available for the formalism of Conceptual Graphs (GCs) [6]. The hierarchy of classes and their characteristics described in an RDFS schema are translated into a hierarchy of concepts and a hierarchy of types of relation in the formalism of GCs.

In our study, a CORESE query represents an RDF statement using variables to describe the statements sought by users. The query's RDF is translated s in a graph that is projected on the basis of facts-graphs. A technique of isolated action is applied to extract the required values.

3- A MULTI-AGENT SOFTWARE ARCHITECTURE

Organizational memory is heterogeneous and the t â tasks to be performed by users who are distributed. The software architecture of our computer system must spread to the needs of the population and it must itself be distributed.
We used development and programming techniques through higher and higher abstractions which allow us to model systems in different ways.

3-1 Multi-agent information system

It is a set of agents which can be real users, robots or processes (requests requested by users) located in the memory environment grouping any task performed in the system. Users in the multi-agent system interact according to relationships. An agent is represented by an entity partially characterized by its autonomy. The art multi agent information systems are used by a software architecture that supports the Semantic Web deployment [7-8].

The employees at the university level are represented by agent s, and little wind reacts in real time and according to their workspace. There intelligent agents are integrated into our distribution system and connected and working together. Our system is used to model the traceability of the movements of different memory players, and the mass of information that seems irrational.
The following figure 4 shows the relationship between different actors in the multi-agent system:

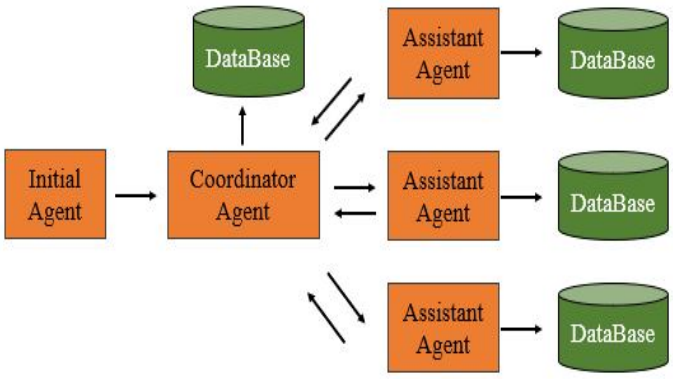

Figure 4: Architecture of the Multi Agent system

3. 1 .1 From the macroscopic level of ADM at the microscopic level Agents

Depending on the context of the organizational memory levels microscopic and macroscopic operate the distinction between the art of small and large objects that depend on the set of information distributed system.
The architecture of this multi agent system is approached as a database, in terms of roles, missions and relationships between agents.

In this memory virtual, the objective major is management of different tasks and the flow of information (applications, processes) distributed. Users are typically demanding heterogeneous services and resources.
D their roles major and recurring present in our software solution:

- Creation and management of interface for user: for better communication between them, in order to express their queries and refine;
- Profile management: to make profiles with different characteristics available so that they can be used for memory access.

3. 1 .2 roles, interactions and protocols

The analysis of the architecture of our proposed system has allowed us to identify the different roles of agents (administrative staff, students, supervisors) and we can then study their assignments and their interactions with the environment in order to study their traceability of different processes in memory .
All roles are the task of e the agent in the administration of the university and the activities assigned to each task. A description of the identified roles and their characteristics is given according to various criteria discussed in the community of our multi-agent system, as well as the characteristics of the roles of the users are defined using the notion of ontology (O'COMMA for example). Agents of various types can join the system and access the memory, so it is necessary to have a set of primitives describing their services and activities and the needs issued by these agents in order to identify themselves and access the system.

3.2 Methodology and algorithm

The aim of this work is to develop a computer-based management system that works according to a Client / Server architecture for administrative use by employees, which promotes their exchange of documents and enhances their activities.

The application allows the simulation of the activities carried out on the organizational memory by different techniques of the multi-agent architecture. This is a new technical tool to create accounts for each user to share applications and study the acquired traceability, as well as presenting results found s after each activity. The simulation application allows the generation of files representing the results of each manipulation carried out after authentication to access the system.

The design of an administrative program is a process which aims to formalize all the preliminary stages of the development of a system in order to make this development more faithful to the needs of the learner.

The design of the system developed within this research will follow three main phases:

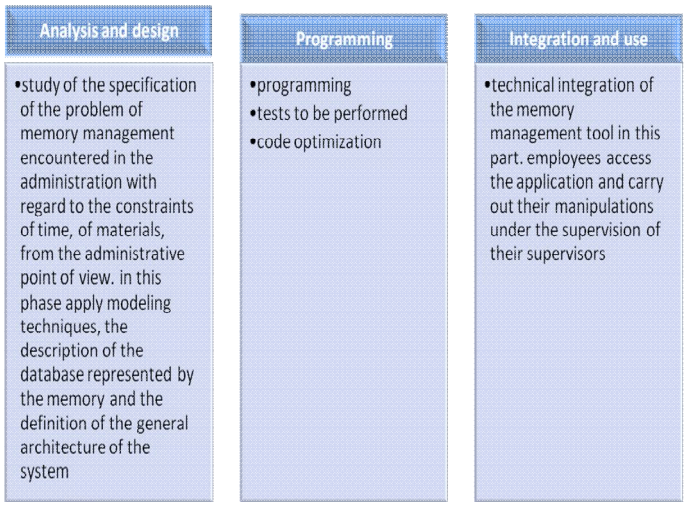

Figure 5: Steps in achieving the organizational memory management system

Our architecture is divided into three layers to organize data traceability and trigger processing:

• Presentation layer produced by one of the graphical interfaces which are included in the .NET Framework.
• Information management layer which guarantees communication between the different other layers of the system, developed by the C # programming language.
• Persistence layer which manages the database created and managed by Oracle using Sql Server.

We present in Figure 6 different tasks of the APOGEE service such as:

- The modeling of new industries
- The reaction of the calculation rules and terms of collection
- The reaction models of VPs and transcripts
- The repair lists for programming courses and exams
- The e elaboration of the monitoring summonses
- The inscription mass student
- The educational EGISTRATION
- The treatment claims
- The Pedagogical derogation

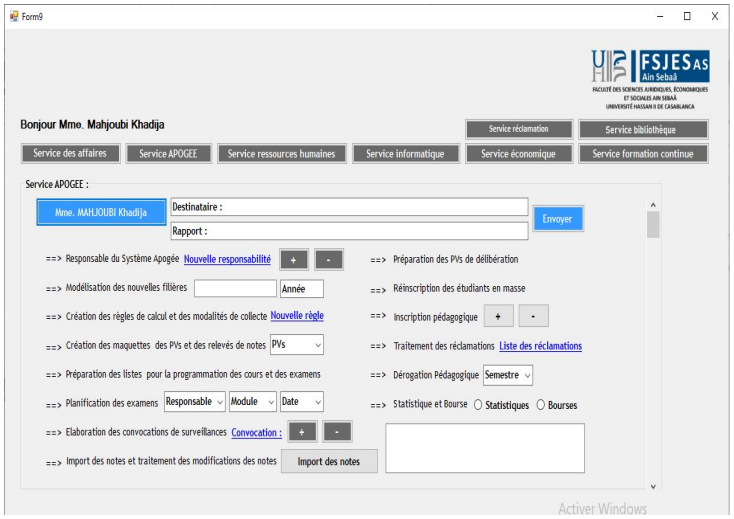

Figure 6: Activities of the APOGEE service

Figures 7, 8 and 9 show the APOGEE and human resources services, as well as the administrative identification page:

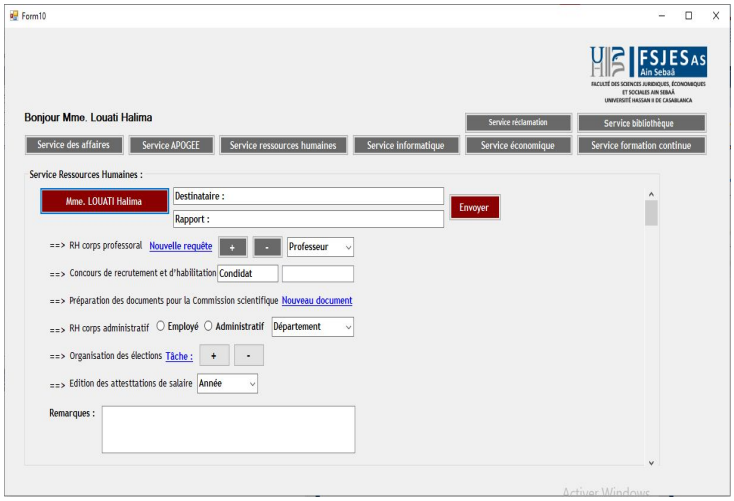

Figure 7: Activities of the human resources department

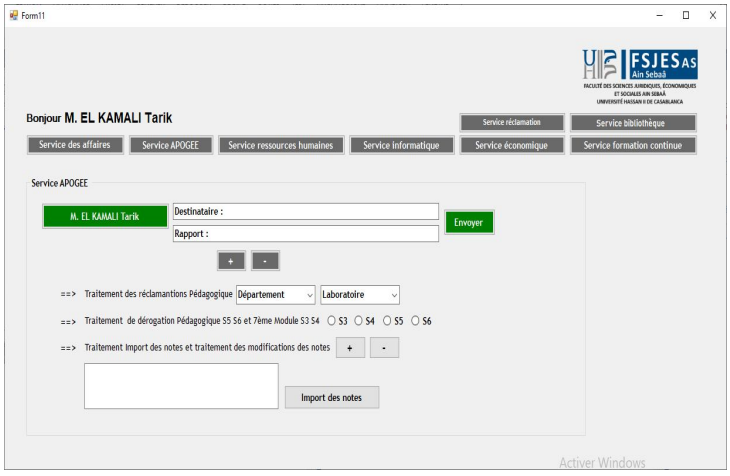

Figure 8: Activities of the APOGEE service

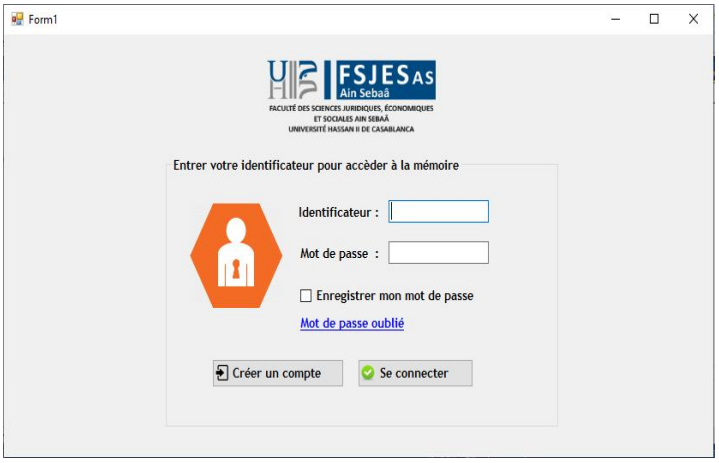

Figure 9: Registration and identification page

3. 3 .Example: organizational memory to manage documents

The organization chart of the administration of the Faculty of Legal, Economic and Social Sciences-Ain Sebaâ is distributed according to the tasks assigned to each service. Vice dean of the faculty are responsible for the research and cooperation, administrative affairs and public relations, teaching business and communication partnership and insertion professional. Different services for student companies, resources pm UMAN of formation continue are grouped within an administrative framework. The responsibilities of administrative employees and their activities are presented in the following figures:

We decided this memory find mechanisms to organize the stock age of art submitted annotations and how to dispatch the request s to accommodate the art answers.

A sample is selected within the Faculty of Science Ben M ' sik, it is a created database is managed by Oracle that contains the documents of students in various department s of the establishment (Mathematics and Computer, Physics, Chemistry, etc.), such as the physical chemistry of materials laboratories [9-12].

The questionnaire survey that we carried out is a crucial step in our study, which makes it possible to conduct a survey on the use of the proposed organizational memory and on the validation rate of access to the various communication and sharing tools. Of information we selected a sample of 10 service supervisors within the administration of the faculty, and 20 administrators who are responsible for organizing documents from memory, receiving requests, managing student data in order to share requests with the system

The results have been favorable and are going to achieve the objectives recommended for effective use of the system.

According to the results collected on the use of the application, more than 82 % of the requests circulated in real time on the memory were treated according to the logic of the semantic web at the multi agent level, in order to spread to the requirements of the memory and provide better results . Only 56% of the requests collected give answers in real time for the classic web by processing all the information at the microscopic level by the memory processing software.

The following diagram (figure 10) represents the results obtained:

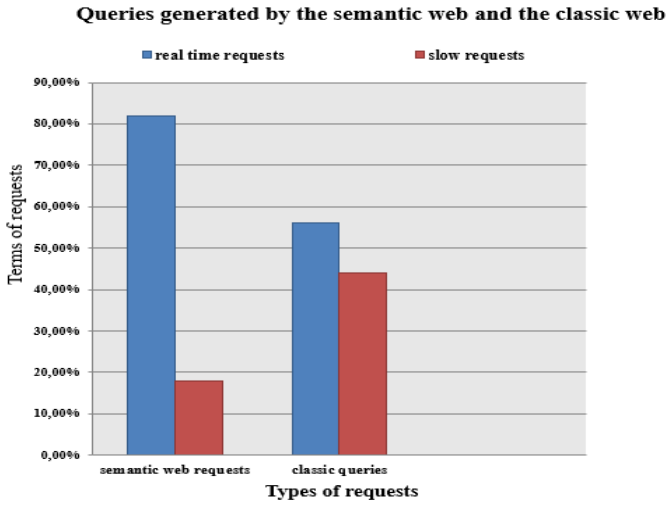

Figure 10: Queries generated by the semantic web and the classic web

4- CONCLUSION

We die shown in this work development and the integration of a new approach to knowledge engineering networks based on intra web by annotation semantic web to create organizational memory collaborating information from a database containing administrative documents of students of the Ben M'sik Faculty of Science. The proposed system is based on the multi-agent architecture by cooperation at the semantic level whose objective is to solve the dispersion of the information distributed on the heterogeneous memory. The results have been benevolent and are going to achieve the work objectives; more than 82% of requests received are processed in real time using our system by different machines that use the semantic web.

There are other points to deepen and as a perspective of this work, we propose to put a system based on anthologies to supervise the memory life cycle in order to carry out the updates available according to the process of traceability of organizational memory.

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