INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team ACACIA

Acquisition des Connaissances pour l'Assistance à la Conception par Interaction entre Agents

Sophia Antipolis

THEME SYM

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2. Overall Objectives

2.1. Overall Objectives

2.1.1. Context and Objectives

Our multidisciplinary project aims at offering methodological and software support (i.e. models, methods and tools) for knowledge management (KM), i.e., for building, managing and distributing a corporate memory. This research can be extended to any organization or community.

2.1.2. Research Topics

We study the case where the building of a corporate memory relies on use of knowledge underlying documents, on the management of links between documents and knowledge bases or on the modeling of multiple viewpoints. We study knowledge acquisition, modeling and management from multiple expertise sources (experts and documents). We are especially interested in several scenarios of corporate memory: technical memory, profession memory and project memory, in particular in concurrent design, skills management and scientific and technological watch.

We study the problems raised by the dissemination of knowledge through a knowledge server via the corporate Intranet or via the Web: we consider the semantic Web as a privileged way for supporting management of knowledge distributed either inside a company or between several companies. We aim at building knowledge servers enabling search for information in a heterogeneous corporate memory, this search being "intelligently" guided by ontologies and semantic annotations.

We pioneered the notion of "corporate semantic Web" for a company or a community. We focus on the case of a corporate memory materialized in the form of a XML-based corporate semantic Web.

For representing ontologies or knowledge models, we use Sowa's conceptual graphs formalism and the languages of the XML galaxy (especially RDF - Resource Description Framework).

Our research topics can be decomposed as follows:

- Support to Corporate Memory Construction:
  - Methodology for building a corporate memory.
  - Multi-agents or distributed architecture for corporate memory.
  - Project memory and technical memory for concurrent design.
  - Management of multi-expertise:
    * Acquisition, modeling and capitalizing knowledge from several experts.
    * Managing multiple expert models, multiple ontologies, multiple points of view.
  - Acquisition, modeling and capitalizing knowledge from texts.
- Support for Corporate Memory Broadcast and Use:
  - Knowledge Servers on a Semantic Web.
  - Tools for Querying and Browsing Ontologies and Documents.
  - Support to "Intelligent" Information-Retrieval, guided by ontologies.
  - Multi-agents System for Information Retrieval in a Distributed Corporate memory and for Proactive Dissemination.

2.1.3. International and industrial relations

We collaborate or collaborated with industrialists in the following fields: aeronautics (Aerospace, Dassault-Aviation, EADS), car industry (Renault), telecommunications (CSELT, T-NOVA, Telecom Valley), service integration (Atos Origin), semi-conductors (Philips Semi-Conductors). We also had collaborations with researchers in accidentology (INRETS) and in the field of health (Nautilus). Currently we have collaborations in civil engineering sector (CSTB) and in biology (IPMC). We had international relations with Griffith University and CSIRO (Australia), Parma University (Italia) and T-Systems Nova (Germany).

Our work was applied in the context of the IST project CoMMA and we took part in the OntoWeb thematic network. We take part in the Knowledge Web Network of Excellence, in the integrated project Palette and in the STREPS projects Sealife and SevenPro.

3. Scientific Foundations

3.1. Foundations

Keywords: *Artificial Intelligence*, *Assistance to the User*, *Co-operation*, *Cognitive Sciences*, *Conceptual Graph*, *Corporate Memory*, *Corporate Web*, *Information Retrieval* , *Intranet*, *Knowledge Acquisition*, *Knowledge Engineering*, *Knowledge Management*, *Knowledge Server*, *Knowledge representation*, *Knowledge-Based System*, *Multiagent System*, *Multiexpertise*, *OWL*, *Ontology*, *RDF*, *Semantic Web*, *Structured Document*, *Web architectures*, *XML.*

Knowledge Management (KM) is one of the key progress factors in organizations. It aims at capturing explicit and tacit knowledge of an organization, in order to facilitate its access, sharing out and reuse [57]. The considered organization can be an actual enterprise or a public organization, but it may also just consist of a given department or service; it can also be a group, or a community, or a virtual enterprise (made of members possibly stemming from different companies, but sharing a common interest). An organization is made up of people interacting for common objectives, in an internal environment and with an external environment. These persons may have different functions and tasks in the organization, different competencies, knowledge, opinions, and work methods and they may produce explicit traces of their activities. In the course of their individual or collective tasks, they may need to find people able to give them useful information or to find such helpful information in an information source (a document, a database, a CD-ROM, a film, etc.).

The members of the organization have individual knowledge (that may be explicit, implicit or tacit), as well as individual and collective objectives in the framework of their group or of the whole organization. The organization has global objectives and KM must be guided by a strategic vision. This vision enables the organization to determine the main organizational objectives for KM:

- Improve knowledge sharing and cooperative work between people inside the organization.
- Disseminate the best practices in the company.
- Preserve past knowledge of the company so as to reuse it.
- Improve quality of projects and innovation.
- Improve relationships with the external world (such as customers, or privileged partners).
- Anticipate the evolution of the external environment (clients, competitors, etc.).
- Be ready to react to unexpected events and to manage emergency and crisis situations.

So a KM policy must rely on a deep understanding of what is the organization, what is its corporate culture, what kinds of knowledge exist (either individual, or collective in an internal group or collective in the whole organization), how can the organization intellectual capital be assessed, how can the past explain the present and help prepare the future, what can be the strategic objectives of KM and how they can be achieved according to the corporate culture and the environment of the end-users.

In an organization, knowledge can be individual or collective, it can be explicit, implicit, or tacit. In Nonaka's model [72], organizational learning relies on transformation between these different types of knowledge. Collective knowledge can also emerge in a community of practice. Tacit knowledge can be transmitted without any language (e.g. through observations), but in order to be transmitted to other persons, explicit knowledge generally needs a medium (i.e. document, database, etc.) so that people can create their own knowledge either by interacting with each other or by retrieving information from explicit traces and productions of other colleagues' knowledge. Knowledge can also be distributed among several knowledge sources in the organization, with possibly heterogeneous viewpoints.

There are three significant aspects to be tackled:

- People: their knowledge, the way they acquire and communicate this knowledge, their organizational functions, their interest centers, their knowledge networks, their work environment, etc. Any KM solution must be compatible with the end-users' cognitive models, roles, tasks, skills and work environment.
- Organization: its objectives, its business processes, the corporate culture, its corporate strategy, etc. Any KM solution must be compatible with the organizational strategy and culture, its objectives, its practices, its rules, its structure, its size, etc.
- Information technologies for supporting the intended knowledge management: the chosen technologies will depend on the KM objectives and on the intended end-users' environment.

The strategic vision for KM must enable the organization to select the KM priority needs and to orientate the choice of relevant techniques. One possible approach for KM is the building of a corporate memory or organizational memory (OM). A corporate memory can be defined as an "explicit, disembodied, persistent representation of crucial knowledge and information in an organization, in order to facilitate their access, sharing and reuse by members of the organization, for their individual or collective tasks" [57]. So different scopes and grains are possible for an organizational memory. Its building can rely on the following steps (cf. 1) [57], with Management throughout all such steps: (1) Detection of needs, (2) Construction, (3) Diffusion, (4) Use, (5) Evaluation, (6) Maintenance and evolution, all these steps being supervised by management.

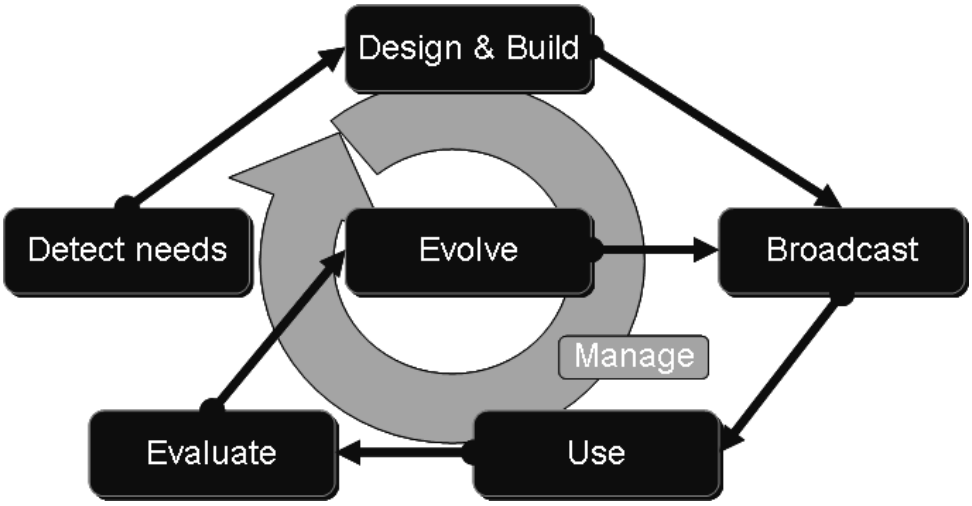

Figure 1. Life cycle of corporate memory

An organizational memory can be modeled from several perspectives: for whom, why, what, how, when, who and where. It aims at delivering the right knowledge to the right person at the right time in the right format, in order to enable the right action / decision. Although KM is an issue in human resource management and enterprise organization beyond any specific technological issues, there are important aspects that can be supported or even enabled by intelligent information systems. Especially artificial intelligence (AI) and related fields provide solutions for parts of the overall KM problem. Several techniques can be adopted for the building of an OM. The choice of a solution depends on the type of organization, its needs, its culture and must take into account people, organization and technology.

Several research topics can be useful for OM design:

- Knowledge engineering and enterprise modeling techniques [53], [75], [60], [59] can contribute to the identification and analysis of a company's knowledge-intensive work processes (e.g. product design or strategic planning): the analysis of information flows and involved knowledge sources allows us to identify shortcomings of business processes, and to specify requirements on potential IT support.
- In order to acquire implicit knowledge, knowledge engineering methods and techniques are useful, in particular concepts handled in knowledge engineering such as ontologies, tasks and problem-solving methods. Knowledge modeling can be needed. The degree of depth of required knowledge modeling can vary: a significant depth can be required if the organizational memory is materialized in a knowledge base, a shallow modeling is sufficient for building a competence map or a resource map of the organization.
- Past experiences (e.g. lessons of past projects, past incidents, past successes or failures, etc.) can be represented in a case-based system [51]; case-based reasoning techniques can then be useful for retrieving them and reusing them for a new situation.
- Ontologies can be a component of a corporate memory so as to be explored by the end-users; they can also be used for improving information retrieval about resources (such as documents or persons) constituting the memory if these resources are annotated w.r.t. the ontology. Such a use of ontology is close to the Semantic Web approach relying on metadata describing the semantic content of the Web resources, using ontologies [61], [73]. This approach for a corporate memory is inspired of the Semantic Web and is called "corporate semantic web" by the Acacia team [7].
- Natural language processing (NLP) tools can be exploited for the construction or enrichment of such ontologies [52] or for building annotations on the resources constituting the corporate memory.
- KM in an organization requires abilities to manage disparate know-how and heterogeneous viewpoints, to make them accessible and suitable for the organization members that need them. When the organizational knowledge is distributed on several experts and documents in different locations, Intranet and Web technologies can be a privileged means for acquiring, modeling, managing this distributed knowledge. Agent technologies and Semantic Web technologies can be combined to handle such a distributed memory. Moreover, CSCW [54] offers an interesting way to enhance collaborative work between persons through distributed memories.
- A specific kind of corporate memory is a project memory for preserving knowledge acquired during a project, for improving project management, for reusing past project experiences, design technical issues and lessons learned [57]. KM can rely on the business processes. This process-oriented vision of KM can lead to OM integrating workflow systems.
- A corporate memory can rely on a competence map, and techniques enabling expertise location are very useful for knowing who knows what in the company.

The Acacia approach relies on the analogy between the resources of a corporate memory and the resources of the Web. We consider that a corporate memory can be materialized in a corporate semantic web, that consists of [57], [58]:

- resources (i.e. documents in XML, HTML or non Web-oriented formats, people, services, software, materials),
- ontologies (describing the conceptual vocabulary shared by the different communities of the organization),
- semantic annotations on these resources (i.e. on the document contents, on persons' skills, on the characteristics of the services/software/materials), these annotations using the conceptual vocabulary defined in ontologies.

The underlying research topics are:

- How can we build and make evolve each component (resource, ontology, annotation)?
- How can we build them semi-automatically through knowledge acquisition from textual sources or from structured databases?
- How can we take into account multiple viewpoints?
- How can agent technology enable us to build, manage and use a distributed memory?
- How can we offer "intelligent", ontology-guided information retrieval or pro-active dissemination?
- How can we rely on scenarios of use for stakeholder-centered needs detection and for stakeholder-centered evaluation?

From knowledge representation viewpoint, we rely on the Sowa's conceptual graphs formalism, more precisely simple conceptual graphs extended by graph rules (Simple Graph SG-family proposed by LIRMM). The CG model enables to represent knowledge through bipartite labelled graphs using the vocabulary offered by a domain ontology. Reasoning on CG can be performed through graph operators such as projection. Reasoning on CG is logically founded since projection is sound and complete w.r.t. deduction in first-order logics, for simple graphs, for nested graphs and for more general graphs equivalent to first-order logics.

4. Application Domains

4.1. Panorama

Keywords: *Accidentology*, *Aeronautics*, *Automobile*, *Biology*, *Engineering*, *Health*, *Micro-electronics*, *Oncology*, *Telecommunications*, *Transportation*.

There are various application domains of the project: our work on technical memory or project memory has applications in engineering (aircraft industry and car industry). Our work on the knowledge servers also has applications in engineering, in the sector of telecommunications (for corporate memory, skills management and technological watch) and in the biomedical field. Accidentology for road safety was a privileged application domain of all our work. But many other fields are possible.

4.2. Transportation: Accidentology

We collaborated with INRETS for the modeling of knowledge of several experts in road accident analysis (psychologists specialized in the driver's behavior, vehicle engineers, infrastructure engineers). This application of accidentology illustrates an example of (partial) corporate memory and moreover, served as concrete example for numerous works of the team: analysis of co-operation between experts during a collective problem resolution, analysis of explanatory dialogues, comparison between multiple expertise models via our MULTIKAT software, exploitation of CommonKADS method generic models, association of conceptual graphs to expertise documents via our CGKAT software, representation of the artificial agents associated to the experts and their COMMONKADS expertise models, exploitation of the C-VISTA model for the representation of multiple points of view of different experts. We developed the RESEDA system (Intranet Network for Detailed Study of Accidents) in XML and Java, in order to support INRETS for road accident analysis.

4.3. Transportation and Engineering: Automobile

In the context of the improvement of the vehicle design process control, we collaborated with Renault to develop a memory of problems encountered during vehicle projects, whose traces were stored in the corporate information system. The construction of this project memory relied on techniques of knowledge engineering and of linguistic analysis. SAMOVAR (Système d'Analyse et de Modélisation des validations Renault) system can be considered as a concrete example of corporate semantic Web.

4.4. Transportation and Engineering: Aeronautics

In the past, we had collaborated with Aérospatiale and Dassault Aviation on project memory. Recently, we collaborated with EADS Corporate Research Laboratory for building a Corporate Memory for an Industrial Research Laboratory.

4.5. Telecommunications

Our work on corporate memory, in particular the use of intelligent agents, ontologies and XML technology, is of particular interest for companies of the telecommunications sector. We thus collaborated with T-NOVA (Deutsche Telekom) and CSELT (Italian Telecom) in the framework of the CoMMA IST project. T-NOVA applied this work for the assistance to insertion of new employees and CSELT for the assistance to technological monitoring. We also collaborated with Telecom Valley and the GET (ENST and ENST-Bretagne) for our work on skills management in the RNRT KmP project. We finally collaborated with ENST-Bretagne for the CNRS Specific Action on "Semantic Web and E-learning".

4.6. Civil Engineering Sector

Our work on corporate memory, in particular the use of intelligent agents, ontologies and XML technology, is also interesting for the construction industry: we thus collaborated with the CSTB (French Scientific and Technical Center for Building) within the framework of the CoMMA project for a scenario of technological watch. We continue a collaboration on the topics of technological watch.

4.7. Micro-electronics

Since September 2005, we started a new collaboration with Philips Semi-Conductors, now NXP, for an intra-firm skills management application.

4.8. Biomedical Domain

Our work on corporate memory, in particular our corporate semantic Web approach (ontologies and XML technology), is applied to several biomedical applications: use of linguistic techniques for building an experiment memory for transcriptome analysis (in the framework of the MEAT project in collaboration with IPMC), use of a medical ontology, viewpoints and CSCW for supporting collaborative work in a healthcare network (in the context of the ACI *Ligne de Vie* project in collaboration with the SARL Nautilus and SPIM (Service de Santé Publique et d'Informatique médicale de la Faculté de Médecine Broussais-Hôtel Dieu)). In the framework of Sealife IST project, we work on a semantic browser for Life Sciences.

4.9. Earth Sciences

We collaborate with IFP and BRGM on semantic portals enabling access to resources and services in Earth Sciences domain. The semantic portals will in particular assist geologists in discovering geological sites where storing carbon dioxide (CO_2) produced by power stations, so contributing to reductions in global Greenhouse Gas emissions.

5. Software

5.1. Corese

Keywords: *Conceptual Graph*, *Information Retrieval*, *OWL*, *RDF*, *RDFS*, *SPARQL*, *Semantic Web*, *XML*, *ontology*.

Participants: Olivier Corby [correspondant], Virginie Bottollier.

5.1.1. Description.

Corese (COnceptual REsource Search Engine) is an RDF(S)-dedicated engine based on Conceptual Graphs (CG) http://www.inria.fr/acacia/soft/corese. It enables us to load RDFS schemas and RDF annotations and to transform them into conceptual graph formalism. It then enables us to query the base of annotations thus created, by using the projection operator offered by the conceptual graph formalism.

Corese implements RDF, RDFS, some statements from OWL Lite and the SPARQL query language (Simple Protocol and RDF Query Language). Furthermore, Corese query language integrates original features such as approximate search, group, count, graph path. Approximate search consists of searching the best approximate answers to a query according to the ontology. Graph path enables to search the graph structure of RDF. Corese also integrates an RDF Rule Language based on the CG Rule model. The inference rule engine works in forward chaining.

Corese is a semantic web engine that enables us to design and develop semantic web applications; it is available for download. Corese is embedded in a Semantic Web Server (based on Tomcat) and called Sewese.

Corese benefited from an INRIA operation of software development (ODL) intended to improve quality of the implementation in order to support its diffusion and from an associate engineer.

5.1.2. Applications.

Corese has been applied in more than 20 applications at the INRIA. It is used as a search engine :

- for the RNRT KmP project on skills management,
- for the KmP-Drire project following this RNRT project with Telecom Valley,
- for the KmP-Philips project on intra-firm skills management with Philips,
- in the *Ligne de Vie* project on healthcare network,
- in the MEAT project on experiment memory on transcriptome analysis,
- in our co-operation with EADS on corporate research laboratory memory,
- in QBLS system for e-Learning,
- in SweetWiki semantic wiki,
- in the SevenPro IST project,
- in the e-WOK_HUB RNTL project,
- in the Palette project.

In the past, Corese was the cornerstone of four co-operations of the Acacia team:

- the IST project, CoMMA (Corporate Memory Management through Agents) [63], [64],
- the SAMOVAR project with Renault [66], [68], [67],
- the co-operative research action ESCRIRE [71],
- the Color action Aprobatiom with CSTB.

5.1.3. Diffusion.

- Corese was registered at APP.
- Corese was made available to:
  - Renault,
  - ATOS Origin,
  - T-Systems NOVA (Deutsche Telekom),
  - CSTB,
  - CSELT (Telecom Italia),

  - LIRMM,
  - M@inline team at ESSI,
  - CETU (Centre d'étude des tunnels du Ministère de l'Equipement).
  - University of Santiago Chili,
  - ENST Bretagne,
  - Tech-CICO team at Université Technologique de Troyes (UTT),
  - Facultad de Informatica, LSIIS,
  - Zuhlke Engineering AG, CH,
  - W3C Group on the Social Meaning of RDF Graphs, Deltek Systems, Inc. USA,
  - Galaad team at INRIA Sophia Antipolis,
  - the partners of the SevenPro IST project: Semantic Systems, etc.
- In 2006, Corese was presented in demonstration to :
  - the partners of SevenPro STREPS project,
  - the partners of Sealife STREPS project,
  - the partners of Palette IP project,
  - the partners of e-WOK_HUB RNTL project.
- The work on Corese was published in [24],[5], [3], [56].

5.2. Sewese

Keywords: *RDF*, *RDFS*, *SPARQL*, *Semantic Web Server*, *ontology*.

Participants: Fabien Gandon [correspondant], Priscille Durville, Marek Ruzicka, Cécile Guigard.

5.2.1. Description

Sewese is a generic factory to design and develop semantic web servers and portals. It is designed to embed Corese as semantic search engine and is based on Tomcat.

Sewese enables us to design semantic forms in order to edit predefined queries. An XSLT (the Extensible Stylesheet Language Transformations) based compiler generates a JSP form and a JSP for processing the form. Sewese enables to process query results by means of XSLT stylesheets. It manages a set of compiled stylesheets to improve performance.

Sewese is based on Tomcat filters to build a semantic web site including session, menu and content management. Sewese also includes a JSP Tag library for predefined processing such as graphic tags for RDFS ontology browsing and editing and for RDF annotation editing.

5.2.2. Diffusion

- Sewese was registered at APP.
- Sewese was made available to:
  - the partners of SevenPro STREPS project,
  - the partners of e-WOK_HUB RNTL project.
- In 2006, Sewese was presented in demonstration to :
  - the partners of SevenPro STREPS project,
  - the partners of Sealife STREPS project,
  - the partners of Palette IP project,
  - the partners of e-WOK_HUB RNTL project.

5.3. KmP

Keywords: *RDF*, *RDFS*, *Semantic Web Server*, *ontology*, *skills management*.

Participants: Priscille Durville, Sémi Gaieb, Fabien Gandon, Olivier Corby, Alain Giboin.

5.3.1. Description

The KmP System is a semantic web server based on Corese, and a real-scale application illustrating an "inter-corporate semantic web", with 20 pilot companies. It comprises:

- KmP inter-firms ontologies,
- KmP ontology-based interfaces, developed by following the scenario method adapted to the design of usable ontology-based interfaces,
- a semantic clustering algorithm adapted to user representation of concept similarity.

The KmP system was evaluated by the pilot companies, through scenario-based approach. A pre-industrialization of KmP is planned.

5.3.2. Applications

KMP has been adapted:

- for the KmP-Drire project following the RNRT project with Telecom Valley,
- for the KmP-Philips project on intra-firm skills management with Philips for which a new version has been developed using Sewese.

The work on KMP was published in [65], [62]

5.3.3. Diffusion

KM2 was presented in demonstration to :

- the partners of Sealife STREPS project,
- the partners of Palette IP project,
- the partners of e-WOK_HUB RNTL project.

6. New Results

6.1. Support to Modeling and Building of a Corporate Semantic Web

Keywords: *Assistance to the User*, *Co-operation*, *Cognitive Psychology*, *Cognitive Sciences*, *Communication*, *Corporate Memory*, *Corporate Semantic Web*, *Human-machine interaction*, *Knowledge Acquisition*, *Knowledge Engineering*, *Knowledge Management*, *Ontology*.

The objective of this action is to propose methodological and software support for the construction of a corporate memory, through a user-centered approach. We study in particular the construction of a corporate semantic Web and the construction of ontologies and annotations from human and textual sources of expertise or from databases. Moreover, we study how to handle multiple viewpoints or multiple ontologies and how to take into account the life cycle and the evolution of a corporate semantic web. We also study e-Learning as a specific scenario of knowledge management. Recently, we started to study how to tackle the context and privacy of the (possibly mobile) user and how to develop and use "Corporate Semantic Web Services".

6.1.1. Designing User-Adapted Semantic Web Applications

Participants: Sophie de Bonis, Olivier Corby, Rose Dieng-Kuntz, Priscille Durville, Fabien Gandon, Alain Giboin (resp.), Aurélie Girardot, Yann-Vigile Hoareau.

The goals are: (1) To propose methods and models to help the user-oriented design of Semantic Web applications; in particular, importing and adapting methods from the Human-Computer Interaction (or software ergonomics) and CSCW communities to the Semantic Web community, esp. the ontology engineering community. (2) To study practices of users and communities of users to inform the design of Semantic Web applications.

6.1.1.1. Adaptation of scenario-based methods to the design and evaluation of Semantic Web applications.

We continued our work on the adaptation of scenario-based methods to the design and evaluation of Semantic Web applications and of their underlying ontologies (Context: European projects Palette and SevenPro; RNTL project e-WoK HUB). In particular: To identify the various forms under which the partners of a project (user, requirements analyst, designer, developer, evaluator, etc.) represent scenarios and how these partners can pass from a representation to another so that they can understand each other, we elaborated a questionnaire based on the Crews model of a scenario [cf. Palette deliverable D.PAR.02]. As part of a research action aimed at designing an editor of multimedia scenarios for ontology-based applications, we specified interface components of the OntologyCreator tool, allowing performing the initial non formal steps of the ontology construction process.

6.1.1.2. Adaptation of the Alan Cooper's persona technique to the design of intranets.

The persona technique, a part of the Interaction Design methodology of Cooper, is used to model users of the systems to be designed. A persona is a fictional person created to represent a particular class of real users or system participants. A persona is an archetypal user, who resembles several people, but does not exactly match any one of them. Personas embody the key trends elicited from interviews of users, in terms of distinct sets of behavior patterns and goals [55]. We used and adapted the persona technique to inform the redesign of an intranet. Intranet personas were identified, and served to elicit recommendations for improving the intranet [50]. (Context: Project UsableIntranet2.)

6.1.1.3. Extension of the Alan Cooper's persona technique to represent communities.

The persona technique is intended to represent mainly individuals. However, when we are to design tools aimed at groups of people or communities, we need to represent such groups or communities. To extend the persona technique to the design of systems, we started a study of collective personas, or communities, which can help model particular and concrete groups of people or communities [48]. (Context: Project UsableIntranet2.)

6.1.1.4. Study of users' annotation practices for improving intranet search.

Intranets are a place where we can observe users' annotations practices, and the usage of tools supporting such practices. We performed a usage study of the Important Links functionality of an intranet, leading to a set of recommendations and mock-ups for improving the functionality [49]. The personas elaborated in [50] were successfully reused for this improvement task. (Context: Project UsableIntranet2.)

6.1.1.5. Study of users' search practices for adapting search algorithms to users' needs.

In order to adapt Web search algorithms to users' needs, we designed an experiment aiming at identifying the strategies used by scientific researchers to retrieve documents, and at comparing these search strategies and their results with the search strategies and results of the Latent Semantic Analysis (LSA) method and of the Corese method. This experiment is under development. (Context: Action COLOR Edccaeteras.)

6.1.2. Corporate memory and semantic web for the Transcriptome Analysis

Keywords: *Biochip experiments*, *Corporate memory*, *Natural Language Processing*, *Ontologies*, *Semantic Web*, *Semantic annotations*.

Participants: Khaled Khelif, Rose Dieng-Kuntz.

This work was carried out in the context of Khaled Khelif's thesis [22], [36] that illustrates the scenario of experiment memory for a scientific community.

The study of gene expression has been greatly facilitated by biochip technology. Biochips can assess tens of thousands of genes simultaneously and lead to a huge amount of information: for example, information about the roles played by particular genes in drug sensitivity and the effects of drugs on gene expression. In the framework of a collaborative project with biologists working on biochip experiments at IPMC (Institut de Pharmacologie Moléculaire et Cellulaire), we aim at assisting them in their experiments and facilitating their validation and interpretation of obtained results. Our objective is to propose methodological and software support for capitalization and valorisation of knowledge resulting from experiments and techniques to preserve and reuse data (structured documents, semantic information retrieval). We rely on the techniques of semantic web (semantic annotations, ontology...) and knowledge engineering. After studying biologists' needs, we proposed to build an experiment memory and to materialize it through a corporate semantic web. The main modules of this memory are:

- MeatOnto, a modular ontology composed of 3 subontologies: (1) UMLS (Unified Medical Language System) to describe the biomedical domain; (2) MGED (Microarray Gene Expression Data) covering the technical aspects of the biochip experiments and (3) DocOnto which describes (a) metadata about scientific articles and about annotations, (b) the structure of articles and links documents to UMLS concepts.
- MeatAnnot, a system for the automatic generation of ontology-based semantic annotations: starting from a scientific article in biology, it allows us to generate a structured semantic annotation, based on a domain ontology, and describing the semantic contents of this text. MeatAnnot relies on several NLP techniques (e.g. modules of GATE (General Architecture for Text Engineering), RASP (Robust Accurate Statistical Parsing) parser and a relation extraction grammar we wrote in JAPE); it extracts information from text, instantiates concepts and relationships of UMLS ontology and generates RDF annotations for the document.
- MeatSearch, the search module based on Corese: it enables biologists to use annotations. By using the query and rule languages of Corese, this system allows us to perform reasoning on the annotation base for retrieving relevant information.

The annotations generated by MeatAnnot were validated by biologists and obtained good scores: (82% of precision, 62% of recall and 96% of usefulness).

Our method can be generalized to any life science domain (e.g. chemistry, physics) having similar needs of support to validation and interpretation of experimental results.

The originality of this work consists of (a) the integration of metadata on annotations which gives new ways of reasoning and more information on the annotation base, (b) the use of several technologies (such as NLP, Ontologies, Semantic annotations, Corese) to build a real-world Corporate Semantic Web Application.

6.1.3. Construction of a multi-point of view Semantic Web

Keywords: *Multiple Viewpoints*, *Ontology*, *Ontology Matching*, *Semantic Web*.

Participants: Thanh-Le Bach, Rose Dieng-Kuntz.

This work is carried out in the context of Thanh-Le Bach's PhD [20]. The objective of this thesis is to allow the construction and the exploitation of a semantic Web in a heterogeneous organization comprising various sources of knowledge and various user categories, without eliminating heterogeneity but by making heterogeneity and consensus cohabit in the whole organization.

In the previous years, we had proposed three algorithms (ASCO1, ASCO2 and ASCO3) allowing us to align already existing ontologies represented in different ontology languages recommended by W3C for the semantic Web: RDF(S) for ASCO1 and OWL for ASCO2 and ASCO3. This year, we evaluated these algorithms through alignment tool evaluation campaigns, in particular I3CON (the Information Interpretation and Integration Conference) http://www.atl.external.lmco.com/projects/ontology/i3con.html and OAEI (Ontology Alignment Evaluation Initiative).

We also studied the problem of building new ontologies in a heterogeneous organization by taking into account different viewpoints, different terminologies of various users, groups or even communities in the organization. Such ontology, called multi-viewpoint ontology, enables to have both heterogeneity and consensus co-exist in a heterogeneous organization. We proposed a multi-viewpoint knowledge representation model, called MVP, and a multi-viewpoint ontology language, called MVP-OWL, which is an extension of the ontology language OWL, to allow the construction and the exploitation of the multi-viewpoint ontology in a corporate semantic Web.

6.1.4. Management of Corporate Semantic Web Evolution

Keywords: *Corporate Memory*, *Corporate Semantic Web*, *Evolution*, *Ontology Evolution*, *Semantic Annotation*.

Participants: Phuc-Hiep Luong, Rose Dieng-Kuntz.

This work is being carried out within the framework of Phuc-Hiep Luong's PhD, that, based on the analysis of the life cycle of a corporate semantic web (CSW), aims at solving some problems related to its evolution: evolution of each component (resources, ontologies and semantic annotations) as well as evolution of relations among these components.

In the dynamic world, changes in business, technologies and process of organisations often result in need of evolution of the CSW. This evolution may contain changes in components of a CSW which might affect the consistency in one part or in overall system. Within the scope of research, we have been concentrating on the ontology evolution, its influence on semantic annotations expressed with the vocabulary provided by the underlying ontology and the evolution of these semantic annotations.

We have made a review of some existing work on schema evolution in databases and in knowledge base systems. Several main approaches of the change management for distributed ontologies, existing methods and tools for ontology evolution and the relations between ontologies and semantic annotations have been reviewed as well. We have identified two essential approaches to ontology versioning [69] and to ontology evolution [74]. These two main approaches are compared in order to improve their weak points for our current research experiences.

We have made some propositions for managing evolution and especially for solving inconsistency resolution between semantic annotation and ontology when the ontology is modified. We have proposed an evolution management system CoSWEM [37] that aims at managing the evolution of each component, the evolutionary relation among components and the propagation of the ontology changes to the semantic annotations depending on this ontology. In this system, a rule-based approach is implemented in order to detect inconsistent annotations and to guide the process of solving these inconsistencies by applying correction rules and resolution procedures.

We have also constructed a model of consistency which includes some defined invariants and a mechanism of verification. Based on these consistency constraints, we proposed some inconsistency detection rules enabling to solve the detected inconsistencies of an annotation when its ontology changes, we have established all the possible solutions for each ontology change operation that might have an influence on the annotation consistency. These possible solutions have been called evolution strategies allowing users to select an appropriate way to repair inconsistent semantic annotations.

As further work, we will continue to refine and to formulate the consistency constraints, the inconsistency detection and correction rules as well as the evolution strategies for inconsistent semantic annotations. We will also work on a real scenario with evolving ontology based on RDF(S) and semantic annotations described in RDF language. We will try to formulate invariants of consistency and propagation rules with the help of rules and querying language of Corese semantic search engine.

6.1.5. Semantic Web for E-Learning

Keywords: *Annotations*, *E-learning*, *Ontologies*, *Pedagogical Resource Composition*, *Pedagogical Resource Retrieval*.

Participants: Sylvain Dehors, Catherine Faron-Zucker, Stéphanie Mevel, Rose Dieng-Kuntz, Alain Giboin.

This work takes place in the framework of Sylvain Dehors's PhD.

This work explores the potential applications of Semantic Web and knowledge management technologies for e-learning systems. It focuses on e-learning applications for accessing courses and particularly addresses the difficult problem of reusing existing resources in such e-learning systems.

Within this scope, we propose a methodology and an associated system (QBLS) inspired by knowledge management practices and relying on cutting-edge Semantic Web tools and formalisms. The proposal particularly develops three aspects: Reusing existing pedagogical resources through a process called semantization. In this process, pedagogical content is semi-automatically annotated with ontological concepts, from several points of view (domain, pedagogy, structure, etc.). This process aims at contextualizing the material with regard to the teacher's conceptualization and pedagogical strategy. It specifically offers answers to the complexity and difficulty of annotation by a human [33], [32], [34].

6.1.5.1. Exploiting annotated pedagogical resources in dynamic web interfaces.

We show how Semantic Web technologies efficiently perform useful inferences based on ontological knowledge to personalize and adapt courses. The interest of actual Semantic Web standards (OWL, RDF, SPARQL) is highlighted in a practical perspective, relying on the deployment of semantic search engine Corese.

6.1.5.2. Tracking learner's activity and analysis of this activity.

We explore the potential of graphics-based visualization and inferences to manually or automatically analyze activity traces on a semantized course. The proposed tools and methods for analysis take advantage of the semantics and underlying Semantic Web framework. The theoretical proposal is supported by our implementation of the Question Based Learning System where learning resources available on the web are reused, annotated and exploited in real world experiments using Semantic Web technologies. The practical examples mentioned in this work are illustrated by two experiments conducted at the EPU of Nice - Sophia Antipolis.

6.2. Information Retrieval in a Corporate Semantic Web

Keywords: *Conceptual Graphs*, *Corporate Memory*, *Information Retrieval*, *Knowledge Acquisition*, *Knowledge Engineering*, *Knowledge Management*, *Knowledge Server*, *OWL*, *Ontology*, *RDF*, *Semantic Web*, *Semantic Web Server*, *XML*.

We study the problems involved in the dissemination of knowledge through a knowledge server via Intranet or Internet: we consider the Web, and in particular the semantic Web, as a privileged means for the assistance to management of knowledge distributed within a firm or between firms. A knowledge server allows the search for information in a heterogeneous corporate memory, this research being intelligently guided by knowledge models or ontologies. It also allows the proactive dissemination of information by intelligent agents. We look further into the case of a memory materialized in the form of a corporate semantic Web, i.e. in the form of resources (such as documents) semantically annotated by RDF statements relating to an ontology.

6.2.1. Corese Semantic Web Engine

Participants: Virginie Bottollier, Olivier Corby [resp.].

Corese relies on the conceptual graph model to implement RDF/S. A new version of the conceptual graph projection algorithm of Corese has been designed. It takes advantage of a static graph index to project upon. The graph index has been extended to n-ary relations as well as the projection algorithm itself. Hence Corese now processes n-ary relations. An extension of SPARQL for n-ary relations is under design.

The projection algorithm also integrates smart backtrack. In case of failure on a query edge, the projection backtracks directly to an edge that may solve the failure and not systematically to the preceding edge as before. An edge may solve a failure if it is the latest edge that binds one of the variables of the failing edge.

The approximate projection algorithm has been extended to compute and test the similarity score of a subpart of a query. An extension to SPARQL syntax is available to retrieve the score of a given pattern: `score ?s { PATTERN } filter (?s >= .5)` . Several scores can be computed in one query and a score of 1 means perfect match.

The query compiler now performs query rewriting, for example in the case of a `?x = ?y` filter, we replace all occurrences of ?y by ?x in the query edges and filters. A set of such patterns are recognized and rewritten to speed up projection:
`?x` $\leq$ `?y && ?x` $\geq$ `?y` $\rightarrow$ `?x = ?y`
`?x = ?y && ?x != ?y` $\rightarrow$ `false`.

In the case of non connected edges carrying filters with equality of functions as shown below, an optimization is introduced:

```
select * where {
   ?x rdfs:label ?l1 . ?y rdfs:label ?l2 .
   filter (str(?l1) = str(?l2))}
```

In that case, search is optimized by sorting the candidate list and searching with dichotomy in the sorted list instead of searching through the whole list of candidates.

A set of optimizations has been integrated among which direct access to edges carrying constant values (URI or literal), new heuristics to sort the query edges before projection, e.g. prefer edges that have more filters with bound variables.

In addition to this, Corese has been improved on two main parts: the integration of standards (SPARQL) and the development environment. SPARQL [1] is a RDF query language designed by the W3C Data Access Working Group to access easily to RDF stores. Corese is now provided with a new JavaCC parser, based on SPARQL, with some additional functionalities (approximate search, path patterns, group by, etc.). SPARQL functionalities have been included in the core of Corese, such as construct, describe, ask, offset, etc. Corese RDF Rule Language has been adapted accordingly and is now SPARQL compliant.

On the other hand, the development environment has been improved: it has moved from CVS to subversion, to the Inria's forge and also from Java 1.4 to Java 1.5. A user manual is being written and a major version of the software (that contains the new SPARQL parser) is being released and distributed.

The Acacia team received a grant from Inria to hire an engineer to participate in the development of Corese.

A new release of Corese has been designed [2].

6.2.2. Sewese

Participants: Priscille Durville, Fabien Gandon [resp.].

We are designing and developing a new semantic web portal platform called Sewese: All semantic web applications using a semantic engine (like Corese) provide common functionalities that could be factorized into a semantic web application development platform. This is the goal of Sewese i.e. to provide reusable, configurable and extensible components in order to reduce the amount of time spent to develop new semantic web applications and to allow these applications to focus on their domain specificities. Sewese provides a set of functionalities like the generation of interfaces for requests, the edition and navigation, and the management of transverse functions of a portal (presentation, internationalization, security...). An ontology editor, a generic annotation editor and a basic rule editor are parts of the Sewese platform.

6.2.3. SweetWiki

Participants: Michel Buffa [resp.], Guillaume Ereteo, Fabien Gandon.

We designed, developed and are testing an innovative wiki engine leveraging semantic web technologies: SweetWiki.

[1] http://www.w3.org/TR/rdf-sparql-query
[2] http://www.inria.fr/acacia/soft/corese

SweetWiki is an example of an application reconciling two trends of the future web: a semantically-augmented web and a social web. Our example makes heavy use of semantic web concepts and languages to build a semantic wiki. We demonstrate how the use of such paradigms can improve navigation, search, and usability. By annotating semantically the resources of the wiki and by reifying the wiki object model itself, SweetWiki provides reasoning and querying capabilities. All the models are defined in OWL schemata capturing concepts of the wikis (wiki word, wiki page, forward and backward link, author, etc.) and concepts manipulated by the users (user folksonomy, external ontologies). These ontologies are exploited by an embedded semantic search engine (Corese) allowing us to support and ease the lifecycle of the wiki (e.g. restructuring pages), to propose new functionalities (e.g. semantic search, profile-based monitoring) and to allow for extensions (e.g support new media in pages, integrate legacy software).

Relying on semantic web technologies implies to pay attention to usability. In SweetWiki we paid special attention to preserve the essence of the wiki: their simplicity and their social dimension. Thus SweetWiki supports all the common wiki features such as easy page linking using WikiWords, versioning, etc. but also innovates, integrating a WYSIWYG editor extended to support social tagging functionalities masking the OWL-based annotation implementation. Users can freely enter tags and an auto-completion mechanism proposes existing ones by issuing queries to identify existing concepts with compatible labels. Thus tagging is both easy and motivating (real time display of the number of related pages) and concepts are collected as in folksonomies. Wiki pages are served directly in XHTML embedding semantic annotations ready to be reused by other semantic web agents [30], [29], [28], [23].

SweetWiki is one of the tools used in the Palette project and it serves as collaborative tool for the e-WOK_HUB consortium. An online version is available for public testing at:
http://argentera.inria.fr:8080/wiki.

6.2.4. *Edccaeteras*

Participants: Fabien Gandon [resp.], Alain Giboin, Yann-Vigile Hoareau.

Intuitively we all are inclined to say that the concept of “car” is closer to the concept of “truck” than to the concept of “plane”; however we also think that the concept of “car” is closer to the concept of “plane” than to the concept of “book”. In the information systems, it is important to us to be able to simulate these “intuitive distances” to improve search engines in the way they select relevant results (e.g. to control the constraint relaxation of a request) and sort them (e.g. to cluster answers).

The current work in the Edccaeteras COLOR action focuses on similarity measurement applied to information search and indexing. The objectives so far were to compare two methods of similarity measurement. The first method is based on distances defined over the graph structure of the ontology in Sewese. The second method is based on the similarity of words and documents represented as vectors in semantic spaces with the Latent Semantic Analysis (LSA, [70]). An experiment to provide natural queries is under development to evaluate the ability of each method to propose relevant answers for information retrieval. Using LSA, we have created different semantic spaces from corpora composed of titles and abstracts of research reports of INRIA (two spaces in French and two spaces in English with a lemmatised version for each one and one semantic space where the corpus has been modified with adding information corresponding to the sub-category relations the ACM98 thesaurus).

In a first experiment we calculate the similarity between the vector corresponding to the abstract and the vectors corresponding to the keyword lists of a report, evaluating the hypothesis that the target keywords list should be more similar to the abstract tested than other keyword lists.

In a second experiment, we calculate the similarity between a keywords list and all the abstracts composing the data-base (over 4000) evaluating the hypothesis that the keywords list tested should be more similar to its associated abstract than the other abstracts.

In a third experiment we calculate the similarity between an abstract and a set of keyword lists, we calculate the similarity between an abstract and a set of five hundred of individual keywords and we evaluate the hypothesis that the keywords that actually correspond to the abstract tested should be more similar than others.

The comparison of the results for the different spaces make it possible (a) to evaluate the effect of lemmatization, (b) to evaluate the effect of the subsumption information added in the corpora and (c) to optimize the parameters of the spaces in both French and English to make it possible to build a French-English semantic space [35], [27], [18].

6.2.5. Web Mining for Technological and Scientific Watch

Keywords: *Corporate Memory*, *Multi Agent System*, *Ontology*, *Semantic Annotations*, *Semantic Web*, *Technological Monitoring*, *Technological Watch*, *Web Mining*.

Participants: Tuan-Dung Cao, Rose Dieng-Kuntz.

This work was performed in the context of the PhD of Tuan-Dung Cao, in cooperation with the CSTB (Scientific and Technical Centre for Building) [31], [21]. The main objective of this thesis was to use the Semantic Web technologies, in particular ontologies, to develop a system for technology monitoring (OntoWatch). This system is guided by ontologies, in order to collect, capture, filter, classify and structure the Web content coming from several information sources in a scenario of assistance to the technological and scientific watch.

Previously, we modeled the CSTB's technological watch process relying on the generic model of monitoring proposed by Lesca. We identified the potential contributions of ontology in the various stages of the process then we built an ontology dedicated to the technological watch system. We developed an ontology, O'Watch, integrating part of an existing ontology (O'CoMMA) and vocabularies offered in thesauri of the CSTB domain. We analyzed the problems linked to the integration of a thesaurus into an ontology: this integration cannot be automatic since the hierarchical links in the CSTB thesaurus do not necessarily correspond to ontological subsumption links.

After that, we proposed several algorithms using an ontology to improve document search on the Web and to generate automatically semantic annotations in RDF format for these documents. The two first algorithms use the branches of the ontology to generate system queries and send them to Google. The third algorithm is based on the balanced choice between descendants of the original concepts in the user query in order to form a system query [31]. The generated annotations feed the annotation bases of the system on which the semantic search of information relies. These annotation bases can be organized according to various criteria: type of documents, type of information sources, etc.

Finally, we proposed a multi-agents architecture to implement the OntoWatch system. Among three subsocieties of agents respectively dedicated to ontologies, to semantic search, and to search and automatic annotation of documents on the Web, we focused in particular on the design of the last one.

6.3. Knowledge Management and Collaboration in Virtual, Professional Communities interacting through the Web

Keywords: *Documents*, *Ergonomics*, *Exchanges*, *Extraction*, *Interactions*, *Languages*, *Semantics*, *Servers*, *Webs*.

Participants: Olivier Corby, Rose Dieng-Kuntz, Fabien Gandon, Alain Giboin.

Since Acacia will soon reach its lifetime, we focused on the preparation of a new INRIA project, Edelweiss, aimed at offering models, methods and techniques for supporting knowledge management and collaboration in virtual communities interacting with information resources through the Web. Three main research directions are thought out: annotation of information resources, interaction design and knowledge graph-based representation. Among others, this new project research will result in an ergonomic graph-based and ontology-based platform, constituted of three components : an annotation toolkit, a knowledge graph toolkit and an interaction toolkit.

7. Contracts and Grants with Industry

7.1. KMP

Participants: Olivier Corby (co-resp), Priscille Durville, Sémi Gaïeb, Fabien Gandon, Alain Giboin (co-resp).

The KmP (Knowledge Management Platform) projects are a set of pluridisciplinary and user participatory projects aiming at designing systems for managing collective and individual competencies. A first two-year project, the RNRT KmP project, resulted in KmP-Corese, a prototype system based on Corese (see Acacia activity report 2005). The RNRT KmP project was followed up by two projects:

7.1.1. The KmP-Drire (or KmP-2) project

This one-year project aimed at pre-industrializing KmP-Corese, i.e., taking into account security and data storage aspects; designing an end-user interface to manage ontologies, and improving the user-friendliness of the current interfaces of the prototype. The KmP-2 project involved Acacia, Rodige (a CNRS-UNSA management research team), and the Telecom Valley association. Among the improvements made to the prototype were: migrating KmP-Corese on a new web server architecture, securing the access to the server, improving the interface for navigating in the ontology, and restructuring and homogenizing parameterizable Cascading Style Sheets (CSS). The KmP-2 project was funded by the DRIRE (Direction Régionale de l'Industrie de la Recherche et de l'Environnement) Provence-Alpes-Côte d'Azur.

7.1.2. The KmP-Philips (or KM2) project

This two-year project aimed at designing and validating a prototype supporting the strategic management of individual and collective competencies within a firm, namely Philips Semiconductors France. During this first year, the prototype has been implemented and tested. The second year will be devoted to getting and analyzing usage feedback of the prototype within the enterprise. The KmP-Philips project involved Acacia, Rodige and Philips Semiconductors. The project was funded by Philips Semiconductors (now called NXP).

7.2. UsableIntranet2

Participants: Michel Buffa, Olivier Corby, Sophie de Bonis, Sylvain Dehors, Rose Dieng, Fabien Gandon, Alain Giboin (resp), Aurélie Girardot.

UsableIntranet2 project, funded by ILOG Sophia Antipolis, is a six-month follow-up project to the INRIA Colors action UsableIntranet (see Acacia activity report 2005). As UsableIntranet, UsableIntranet2 deals with the usage-oriented evaluation and redesign of corporate intranets. It makes informatics specialists and usability specialists collaborate to identify ways to help informatics specialists effectively integrate the usage aspects in the intranet design process and improve intranet usability. Four teams are involved in UsableIntranet2, three academic teams, with pluridisciplinary and complementary competencies, and an industrial team: Acacia, M@inline (Multimedia @pplications Involving Non Linear Information for Networked Education, I3S Laboratory, UNSA, CNRS), PCE (Psychologie cognitive et ergonomique, Laboratoire de Psychologie Expérimentale et Quantitative (LPEQ) de l'UNSA), Webcore (ILOG, Sophia Antipolis). Two societies specialized in usability engineering participated also to the project, namely: LudoTIC and Dia-Logos.

The UsableIntranet group has been invited by ClubNet, a French association gathering intranet managers[3], to present the group's work during a thematic workshop organized by the association in April 2006. Presentations were also made by members of the group at the Intraweb Workshop (held in conjunction with the WWW'2006 Conference), and WikiSym'2006 (International Symposium on Wikis).

[3] http://www.clubnet.asso.fr

8. Other Grants and Activities

8.1. Regional Actions

8.1.1. MEAT Project

Participants: Khaled Khelif, Rose Dieng-Kuntz (resp.), Olivier Corby.

We collaborate with Pascal Barbry (IPMC), Rémi Bars (Bayer Crop Science) and Martine Collard (I3S) to build a memory of experiments on DNA chips (see section 6.1.2).

8.1.2. Laboratoire des usages de Sophia Antipolis

Participants: Michel Buffa, Olivier Corby, Sylvain Dehors, Fabien Gandon, Alain Giboin.

We take part in the Group « Usages » (leaded by Marc Relieu, ENST), with Bernard Senach (AxIS) and in the UsableIntranet2 group.

8.1.3. CSTB (French Scientific and Technical Center for Building)

Participants: Tuan-Dung Cao, Rose Dieng-Kuntz (resp.).

We collaborate with Bruno Fiès and Marc Bourdeau (CSTB) for Tuan-Dung Cao's PhD on *Exploitation of Semantic Web for Technological Watch* [31], [21].

8.1.4. CINDY, Pôle Cindynique of ENSMP

Participants: Thanh-Le Bach, Rose Dieng-Kuntz (resp.).

We collaborate with Franck Guarnieri (CINDY - Pole of Research and Formation on Danger and Risk Management of the École Nationale Supérieure des Mines de Paris, in Sophia Antipolis) for Thanh-Le Bach's PhD on *Construction of a multi-viewpoint Semantic Web*. We also have contacts for follow-up of the PhD of Denis Overal, PhD student at CINDY/ENSMP.

8.1.5. Competitivity Poles

- The e-WOK_HUB ANR RNTL project has been labelled by the Solutions Communicantes Sécurisées (SCS) competitivity pole.
- The Immunosearch project has been labelled by the PASS competitivity pole.
- Michel Buffa submitted the usable intranet-SCS project to the SCS competitivity pole, this project proposes to study and apply new collaborative approaches for organizations intranets.

8.2. National Actions

8.2.1. ANR RNTL project e-WOK_HUB

Participants: Mohamed Bennis, Olivier Corby, Rose Dieng-Kuntz [resp.], Priscille Durville, Fabien Gandon, Alain Giboin.

e-WOK_HUB is a 3 year ANR RNTL project, coordinated by the Acacia team, with IFP, BRGM, EADS, ENSMP, ENSMA and CRITT as partners. eWOK-Hub aims at building a set of communicating portals (the e-WOK Hubs), offering both: (a) web applications accessible to end-users through online interfaces, and (b) web services accessible to applications through programmatic interfaces As applicative objectives, e-WOK_HUB aims at enabling management of the memory of several projects on CO_2 capture and storage, with use of results of technological watch on the domain.

Acacia is responsible for WP2 on Generic Tools and Services.

8.2.1.1. Support to ontology creation

We interacted with IFP and BRGM in order to support the specification of their end-users scenarios, enabling to determine their needs on ontologies and on semantic annotations.

We specified and implemented a cooperative ontology editor, OntologyCreator, dedicated to support end-users in a cooperative process of ontology construction.

8.2.1.2. Management and composition tools of Web Services

The e-WOK_HUB architecture is intended to rely on a Web service-oriented architecture. Web Service is a standardized way of integrating applications over the Web. The objective of our work is to facilitate development and composition of web services. Thus, we studied the various existing tools to this aim. In particular, we studied the various applications servers, for example:

- Glassfish based on J2EE architecture and which facilitates the development and the deployment of the Web Services;
- The framework Spring, a light container for creating and deploying web services;

We also studied tools which are focused on the realization of the lifecycle of a Web service. First, we tested the usability of the development of the services by using Apache Axis, i.e. the deployment server for Web services, then we used Jaxws (Java API for XML Web Services), a project of annotations of the Java classes which generate descriptors of the Web services (WSDL files). We continued our approach to carry out a complete architecture which is based on semantic framework using ontologies and semantic descriptions of Web services. This overall architecture will be linked to Sewese and Corese.

8.2.2. Working Groups

Members of the Acacia team take part in several working groups:

- Rose Dieng-Kuntz is member of:
  - the board of the GRACQ (*Groupe de Recherche en Acquisition des Connaissances*) http://www.irit.fr/GRACQ.
  - the TIA Group (*Terminology and AI*) http://tia.loria.fr.
- Alain Giboin is member of:
  - the Group « Psychologie ergonomique » of the Département Recherche de la Société française de Psychologie. Founder member and secretary of this group since September 2005, he is also the Webmaster of the group website: http://www-sop.inria.fr/acacia/gtpe.

8.3. European Actions

8.3.1. Knowledge Web

Participants: Thanh-Le Bach, Olivier Corby, Sylvain Dehors, Rose Dieng-Kuntz (resp.), Fabien Gandon, Alain Giboin, Phuc-Hiep Luong.

We take part in the Knowledge Web Network of Excellence. This year, we took part in the workpackages WP2.2 Heterogeneity where we worked on ontology alignment, WP2.3 Dynamics where we worked on ontology evolution, WP3.2 and WP3.3 on Education.

Sylvain Dehors took part in the Knowledge Web general assembly in Trento in January 2006.

8.3.2. SeaLife

Participants: Khaled Khelif, Rose Dieng-Kuntz [resp.], Fabien Gandon, Olivier Corby.

SeaLife is a 3 year-long STREPS project, coordinated by Dresden University, with Edinburgh University, London College, Manchester University, Scionics as other partners; it started on April 2006.

The objective of SeaLife is the design and realisation of a semantic Grid browser for the Life Sciences, which will link the existing Web to the currently emerging eScience infrastructure [38]. The SeaLife browser will allow users to automatically link a host of Web servers and WebGrid services to the Web content they are visiting. This will be accomplished using eScience's growing number of WebGrid Services and its XML-based standards and ontologies. The browser will identify terms in the pages being browsed through the background knowledge held in ontologies. Through the use of Semantic Hyperlinks, which link identified ontology terms to servers and services, the SeaLife browser will offer a new dimension of context-based information integration.

This Sealife browser will be demonstrated within three application scenarios in evidence-based medicine, literature and patent mining, and molecular biology, all relating to the study of infectious diseases. The three applications vertically integrate the molecule/cell, the tissue/organ and the patient/population level by covering the analysis of high-throughput screening data for endocytosis (the molecular entry pathway into the cell), the expression of proteins in the spatial context of tissue and organs, and a high-level library on infectious diseases designed for clinicians and their patients.

In this project we take part in 6 among the 7 work packages and we are coordinator of the text mining and natural language processing work package. This year, our main contributions in this project are:

- Improvement of our method of annotation generation from text and integration of external sources (Uniprot) to enrich annotations;
- State of the art:
  - Work on a synthesis of annotation tools offering semi-automatic annotation generation capabilities;
  - Work on a synthesis of biomedical text mining techniques for annotation generation;
- Study of different Sealife use cases to define our collaboration with each partner,
- Participation in the writing of deliverable A2.D1 [40],
- Participation in the Sealife kick-off meeting, 10-11 April 2006, Dresden, Germany,
- Organization of the Sealife meeting, 13-14 November 2006, Sophia Antipolis, France.

Olivier Corby, Rose Dieng-Kuntz, Fabien Gandon and Khaled Khelif attended the SeaLife kick-off meeting in Dresden on April 10-11, 2006 and the SeaLife second general meeting organized by Acacia at INRIA Sophia Antipolis on November .

8.3.3. Palette

Participants: Rose Dieng-Kuntz [resp.], Adil El Ghali, Fabien Gandon, Alain Giboin, Amira Tifous, Olivier Corby.

Palette is a 3-year long integrated project, coordinated by ERCIM and EPFL, with partners such as Univ. Fribourg, CTI (Greece), Centre de Recherche Public Henri Tudor, University Abou Bekr Belkaid, University of Liège, EM Lyon, Groupe d'Analyse et de Théorie Economique (GATE CNRS), Center for Study of Education and Training (CSET), ePrep, Nisai, MindOnSite - Integral Coaching SA, LICEF Téluq, INRIA Rhône-Alpes.

As scientific objectives, Palette aims at offering information services, knowledge management services (based on an ontology dedicated to communities of practice) and mediation services for communities of practice (CoPs). CoPs are groups of people who share a passion for something that they know how to do, and who interact regularly in order to learn how to do it better. CoPs can be found within businesses, across business units or across company boundaries, still they differ from business or functional units, from teams and networks: people belong to CoPs at the same time as they belong to other organizational structures. CoPs can be considered as a means by which knowledge is owned in practice. Indeed, such groups allow the functions of creation, accumulation and diffusion of tacit and explicit knowledge in organizations.

As applicative objectives, Palette services will be adapted to CoPs in management, in engineering and in educational field.

Acacia is leader of the WP3 aimed at designing ontologies and ontology-based Services for Knowledge Management in Communities of Practice. In the context of the Palette project, knowledge management services are to be provided to CoPs to facilitate the efficient and effective management of their knowledge resources.

8.3.3.1. Construction of a generic ontology

Knowledge management services will rely on CoP-dependent ontologies to describe and represent the CoPs universe. The first step toward the development of these ontologies was to identify, specify, and organize generic concepts related to the notion of "community", forming a generic meta-model that will guide us in the CoP-dependent ontologies development. The main concepts identified enable us to describe a CoP in terms of: its actors; the competencies handled in it; the collaboration between the actors to enhance their learning; the activities performed by the CoP's members; and the lessons learnt from the members' experiences, and through which the CoP's best practices can be identified.

Our contributions to the generic ontology construction task (in particular, the model for Community, Actor, Competency and Lessons-learnt) are fully described in the Palette deliverable D.KNO.01 [47], and synthesized in the PAKM 2006 conference paper [39].

8.3.3.2. Construction of CoP-dependent ontologies

We are currently developing the CoP-dependent ontologies according to a methodology we elaborated for the Palette project:

- Data collection and scenarios analysis: for the building of a contextualized lexicon that contains the candidate-terms as well as their respective contexts of appearance.
- Terminological study: the analysis of the contextualized lexicon should lead to the identification of the vocabulary, which is the set of terms of the lexicon, each associated to its definition. The definition of a term is deduced from the information provided by the contextualized lexicon.
- Ontology structuring: which consists in identifying the terminological concepts and relations and organizing them, through the building of a concept-hierarchy and a relation-hierarchy [39].
- Ontology formalization: in which we determine the ontology's concepts and semantic relations (to which we attach their respective domain and range), translate them into RDFS formal ontology.

8.3.3.3. Design and development of Knowledge Management Services

The developed ontologies will be used to develop knowledge management services (KM services) for CoPs. This task is the main objective of the third work-package (WP3) of the Palette project and implies a strong interaction with other WPs, mainly:

- WP1 to gather information about CoPs;
- WP5 concerning integration issue, and the links between KM services and other proposed services in Palette (Information and Mediation).

To achieve this task we first specified the KM services (see deliverable D.KNO.03 [42]). We proposed an architecture of KM services based on a service oriented-architecture (SOA) containing two kinds of services (simple and complex ones) and a repository describing them. We also described a mechanism of services composition that enables us to build specific services for the Palette CoPs, using the simple KM services as building blocks. These building blocks realize the basic tasks of knowledge management, including: Knowledge creation, Ontology creation, Annotation, Collaborative knowledge creation, Knowledge retrieval and dissemination, Knowledge visualization and presentation, Knowledge evolution, Knowledge evaluation.

8.3.3.4. KM services, Mediation services and Information services interoperability

A critical issue in KM services development is their interoperability and integration with other Palette's services and with CoPs existing tools (the associated work to this issue holds in the WP1 and WP5). To deal with this issue the Palette philosophy advocates the use of W3C standards. We propose to use RDF/S for knowledge representation, and WSDL, SAWSDL, for services. The presentation of these standards and the

justification of our choices are described in the deliverable D.IMP.01 [46]. On the other hand, we contributed to the task of bridging the gap between the developers and the end-users, by clearly defining the notions of scenarios and use-cases, and we tried to formalize some of them describing the CoPs activities and the place of the developed services and tools in these activities. This task of clarifying the notion of scenario, and of elaborating a shared representation of this design artefact, was also undertaken in the context of the WP1, to which we also contributed (see the deliverable D.PAR.02 [41]).

8.3.4. SevenPro

Keywords: *Natural Language Processing*, *Ontology design for products*, *Semantic Web*, *Semantic annotations*.

Participants: Hacène Cherfi, Fabien Gandon, Rose Dieng-Kuntz [resp.], Olivier Corby, Alain Giboin.

SevenPro (Semantic Virtual Engineering Environment for Product Design) is a European STREPS project. The SevenPro project develops technologies and tools supporting deep mining of product engineering knowledge from multimedia repositories and enabling semantically enhanced 3D virtual reality (VR) interaction with product knowledge in integrated engineering environments. It aims at helping an engineer to design new objects by providing a 3D viewing of the object designed, informations on each part of the object (suggestions of other objects with similar or close properties could be performed) and information about repetitive design processes.

SevenPro is coordinated by Semantic Systems (Spain), and involves partners from industrial and academic areas. SevenPro project is carried out during 34 months, starting from January 2006, by a consortium composed of partners from five different EU countries:

1. Three centres of excellence with proven expertise in knowledge extraction, data mining and VR technologies: ACACIA (France), Technical university of Prague (Czech Republic), Fraunhofer institute (Germany). One major objective for these centres is to perform research, technology, and development (RTD) and disseminate results;
2. Two IT companies (high-tech small and medium enterprises: SMEs) specialised in Semantic and Virtual Reality for engineering technologies: Semantic Systems (Spain), and LivingSolids (Germany). The two companies are motivated for exploiting commercially the results, which will perform RTD and take the lead in deploying the technology in the testbeds and later on in the market;
3. Two users: one SME manufacturer of metal castings: Estanda (Spain) and one big engineering company: ItalDesign (Italy), both having their own engineering teams involved in the project. They will provide requirements and suited testbeds for the technology used in the SevenPro project.

The components and the whole engineering environment that are to be developed will be integrated and tested continuously in an iterative and incremental strategy.

Acacia is leader of WP02 on Knowledge Engineering and WP04 on Semantic Annotation of Corporate Repositories.

This year, we participated in two main WPs. Hacène Cherfi is WP leader in the Knowledge engineering (WP02) with formalization in RDF/S, and when necessary OWL, and Task leader in the WP03 for text annotation prototype.

8.3.4.1. WP02 – Knowledge Engineering

We designed the Generic Layer ontology for product design on the basis of Use Cases coming from real-life needs and difficulties facing the users during design processes. Use cases were identified by a questionnaire that we have elaborated and distributed to the users, and to all partners in SevenPro. On April, the questionnaire was first presented, and explained during a general meeting, held in INRIA Sophia Antipolis: the aims of the identification phase for the user needs was thus set. The questionnaire was refined with user feedback during Prague general meeting on June. We have also supplied the project with a server for the knowledge entered by users that enables access and queries to a knowledge base. The server was set up, and we aim at using it effectively to store our future front-end applications and our designed ontologies. A significant effort was

made, by ACACIA, to help partners to acquire Semantic Web technology and languages. More precisely, we had some requirements on RDF/S expressiveness to formalize some situations that frequently occur during an engineering product design. These situations are very innovative and might raise some Use Cases that supply the W3C with expressiveness needs. An investigation on the usefulness of the solutions that we have proposed will, probably, be subject to a scientific publication in the near future.

8.3.4.2. WP03 – Prototyping and user feedback

Part of the integration requires development of front-end tools, since components have to be integrated in an engineering environment. ACACIA is in charge of the current development of a text annotation prototype. We have presented, and agreed on, our prototype architecture during the Magdeburg (Germany) general meeting.

The approach is to extract the meaning from the documents themselves; in addition to use of other sources of semantic information. Ontologies come into play at this point, as they constitute a reference knowledge base for the corresponding annotations automatically added to the data. Indeed, the documents are so numerous that we cannot manually supply authors with metadata that suit their meaning and describe their published documents. The annotations are intended to be transparent to the user and rather used by software deployed on the Web (e.g., search engines, crawlers, Web services..).

In this context, natural language processing (NLP) techniques are useful and appropriate to analyse texts, and capture their meanings. Different off-the-shelf modules from existing NLP tools have to be gathered and arranged: (i) text cleaning to manage different text formats (MS Word, OpenOffice, PDF..); (ii) sentence splitting and chunking; (iii) lemmatisation, (iv) term and relation identification; (v) link to the concepts of an ontology. The testbed consists in real-world multilingual corpora. These corpora come from real-world user documentation. The prototype is intended to give first capabilities of NLP techniques to fulfil the knowledge identification within the user documents.

We contributed to the following deliverables: [43], [45], [44].
Olivier Corby and Rose Dieng-Kuntz attended the kick-off meeting in Bilbao, Spain, on January 16-17, 2006. The second general meeting was organized by Acacia at INRIA Sophia Antipolis and attended by Olivier Corby, Rose Dieng-Kuntz, Fabien Gandon and Alain Giboin on April 5-6, 2006. Fabien Gandon attended the third general meeting in Prague on June 13-15. Hacène Cherfi, Olivier Corby and Rose Dieng-Kuntz attended the fourth meeting in Magdeburg on September 25-26.

8.4. International Actions

8.4.1. W3C

Participant: Fabien Gandon.

We participate in several W3C working groups and interest groups. In particular we participated in the note release of the Semantic Web Best Practice working groups and we are editors and co-authors of two drafts of the GRDDL working groups (a mechanism to extract RDF from XML dialects):

- W3C Working Draft 2 October 2006: GRDDL Primer,
- W3C Working Draft 2 October 2006: GRDDL Use Cases: Scenarios of extracting RDF data from XML documents.

We take part in discussions on the specifications: W3C Working Draft 24 October 2006: Gleaning Resource Descriptions from Dialects of Languages (GRDDL) http://www.w3.org/2001/sw/grddl-wg/.

9. Dissemination

9.1. Animation of the Scientific Community

9.1.1. Programme committees

Michel Buffa was member of the following program committees:

- the first Intraweb workshop that took place during the WWW 2006 conference in Edinburg, Scotland,
- the forthcoming ACM Wikisym 2007 conference.

Olivier Corby was member of the following programme committees:

- IntraWebs'2006
- 15th International Conference on Knowledge Engineering and Knowledge Management (EKAW'2006),
- 13th ISPE International Conference on Concurrent Engineering: research and applications : Leading the Web to Concurrent Engineering (CE'2006), where he was track chair,

and reviewer for:

- 6th International Conference on Practical Aspects of Knowledge Management (PAKM'2006).

Rose Dieng-Kuntz was member of the following programme committees:

- 15th International Conference on Knowledge Engineering and Knowledge Management (EKAW'2006), Podevary, Czech Republic, October 2-6, 2006,
- 6th International Conference on Practical Aspects of Knowledge Management (PAKM'2006), Vienna, Austria, November 30 - December 1st, 2006,
- 13th ISPE International Conference on Concurrent Engineering: Research and Applications. Leading the Web to Concurrent Engineering (CE'2006), Juan-les-Pins, September 18-22, 2006, where she was track chair,
- 6èmes Journées francophones « Extraction et Gestion des Connaissances » (EGC'2006), Lille, January 17-20, 2006,
- 15e congrès francophone AFRIF-AFIA, Reconnaissance des Formes et Intelligence Artificielle (RFIA'2006), Tours, January 25-27, 2006,
- 17èmes journées francophones d'Ingénierie des connaissances, Nantes (IC'2006), June 28-30, 2006,
- 1st International Workshop on Building Technology Enhanced Learning solutions for Communities of Practice (TEL-CoPs'06) held in conjunction with the 1st European Conference on Technology Enhanced Learning, Crete, Greece, October 2, 2006,
- First International Conference on Knowledge Science, Engineering and Management (KSEM'06), August 5-8, 2006, Guilin, China,
- 8ème Colloque Africain sur la Recherche en Informatique (CARI'2006), November 6-9, Cotonou, Bénin.

She is member of the steering committee of the EKAW, COOP and PAKM conferences.

Fabien Gandon was member of the program committees or reviewer for:

- the following conferences: European Semantic Web Conference (ESWC'2006), Innovations in Information Technology (2006), Concurrent Engineering (CE'2006), Canadian Semantic Web Working Symposium (2006), IEEE/WIC/ACM Web Intelligence (2006),
- the following workshops: Knowledge Management and Organizational Memories (2006); Semantic Web Technologies for Ubiquitous and Mobile Applications (2006); Semantic Web Applications Theory and Practice (2006); Mobile Services and Ontologies (2006); Web Semantics (2006); Agent-Mediated Knowledge Management (AMKM'2006),

Fabien Gandon was Track chair for the 13th International Conference on Concurrent Engineering 2006.

Alain Giboin was member of the following programme committees:

- COOP'06, The Seventh International Conference on the Design of Cooperative Systems, Carry-le-Rouet, France, May 9-12, 2006, http://tech-web-n2.utt.fr/coop/. He is also member of the COOP'2006 steering committee,
- the Workshop Knowledge sharing in organizations, COOP'2006, The Seventh International Conference on the Design of Cooperative Systems, Carry-le-Rouet, France, May 9, 2006, http://tech-web-n2.utt.fr/coop/?rub=wskso,
- EPIQUE'2007, Quatrièmes journées d'étude en Psychologie ergonomique, September 2007, Nantes, France,
- Intrawebs 2006, a workshop held in conjunction with the WWW 2006 Conference in Edinburg, Scotland, May 23, 2006.

9.1.2. Journals and Publishers

Rose Dieng-Kuntz is:

- Co-editor of the Series *Frontiers in Artifical Intelligence and applications*, at IOS Press,
- Member of Editorial Board of *Revue d'Intelligence Artificielle*.

and was reviewer for the review I3, Information - Interaction - Intelligence.

Fabien Gandon is Editorial Board Member of "Electronic Commerce Research and Applications" journal, Elsevier. He was reviewer for the following journals:

- IEEE Transactions on Knowledge and Data Engineering
- International Journal of Human-Computer Studies - IJHCS,
- World Wide Web Journal,
- Knowledge-Based & Intelligent Engineering Systems AMKM special issue.

Alain Giboin was reviewer for the journal Le Travail Humain.

9.2. Organization of conferences and courses

- Rose Dieng-Kuntz was:
  - Local chair of the *19th ISPE International Conference on Concurrent Engineering: research and applications : Leading the Web to Concurrent Engineering (CE'2006)* [19],
  - Co-chair of the *ECAI'2006 workshop on Knowledge Management and Organizational Memories* [17],
  - Co-organizer of DEVINT'2006 *Quatrième journée "Déficients visuels et NTIC"*, Sophia Antipolis, France, 8 June 2006, http://www.essi.fr/devint2006/.
- Alain Giboin was member of the organizing committee of DeViNT'2006, Quatrième journée "Déficients visuels et NTIC", Sophia Antipolis, France, 8 June 2006.
- Fabien Gandon created and organized the workshop IntraWeb at WWW06, http://www-sop.inria.fr/acacia/WORKSHOPS/IntraWebs2006/.

9.3. Others

9.3.1. Nominations

Rose Dieng-Kuntz was nominated Chevalier de la Légion d'Honneur in France and Chevalier dans l'Ordre National du Lion in Senegal.

9.3.2. Scientific Councils and Evaluation tasks

Michel Buffa is

- member of the scientific council of the CNRT Télius,
- member of the Commission des spécialistes for the 27th section, at UNSA.

Rose Dieng-Kuntz is member of:

- International Advisory Board of Cooperation Unit of EPFL,
- Comité pour l'égalité entre les femmes et les hommes dans l'enseignement supérieur et la recherche, Ministry of Research.

Fabien Gandon was expert of the ANR 2006 commission.

Alain Giboin was reviewer for the ANR 2006 call for propositions.

Olivier Corby was reviewer for STIC-Tunisie collaboration at INRIA.

9.3.3. International Working Groups

Rose Dieng-Kuntz is chair of the IFIP Working Group on Knowledge Management.

9.3.4. Collective tasks

- Olivier Corby is member of: CDL (Commission for software development) at INRIA Sophia Antipolis.
- Fabien Gandon:
  - is a member of the CSD (Comité de Suivi Doctoral) of INRIA Sophia Antipolis,
  - is a member of the CCC (Comité pour la communication et les colloques) of INRIA Sophia Antipolis,
  - is the secretary of the CP (Comité des Projets),
  - reports to the DIRDRI on his standardization activities in the W3C.
- Alain Giboin is
  - member of the Cumir (Commission des Utilisateurs des Moyens Informatiques pour la Recherche). Co-animator, with Nicolas Tsingos, of a working group on the renewal of computer equipement at INRIA Sophia Antipolis,
  - member of the Comorale group (Communication interpersonnelle à l'INRIA Sophia Antipolis), contributing to the elaboration of an interview guide and of a questionnaire, to interviews, and to the analysis of the interviews.

9.3.5. Visits

The ACACIA team welcomed:

- Jean-Jacques Lévy, INRIA & Microsoft Research Center,
- Patrick Johnson (Dassault-Systèmes), Marc Vasseur and Jérôme Chailloux (Ercim).

9.4. Teaching

9.4.1. University

- The Acacia project is a welcoming team of the "École doctorale STIC of the Nice - Sophia Antipolis University (UNSA)".
- The members of the project gave the following courses:
  - Michel Buffa supervised two Master 1 projects about wikis, each involving 3 students: A visual search that uses wiki page thumbnails, Adding a synchronous editor to a wiki,
  - Michel Buffa and Fabien Gandon supervised 6 master students from the Ecole Polytechnique Universitaire Nice. All worked on SweetWiki improvements. Gaël Crova, Jeremy Passeron, Claire Lecompte (Master 2 level) helped finishing the first working prototype of SweetWiki during their year project. Nicolas Cazieux, Adrien Degeorges and Guillaume Ereteo helped prototyping new features for SweetWiki: semantic user profiling, keyword search of documents and improving the WYSIWYG editor during a mini project (Master 1 level),

    One of the students (Guillaume Ereteo) kept working on SweetWiki under our supervision during a six months training period, he helped consolidating SweetWiki robustness in order to get a first public version we put online in September 2006.
  - Olivier Corby, Catherine Faron-Zucker, Fabien Gandon and Alain Giboin are in charge of a course on Knowledge Engineering & Semantic Web. It's a one semester course during the last year of the curriculum at EPU (Ecole Polytechnique Universitaire de Nice - Sophia Antipolis), 45 hours. They also supervised several student projects.
  - Olivier Corby and Catherine Faron-Zucker taught a course on Semantic Web and Description Logics in a Research Master at UNSA,
  - Olivier Corby taught a course on RDF and Corese semantic search engine: 5 hours at UTT Troyes,
  - Sylvain Dehors did eight practical sessions at ESSI teaching XML and XSLT.
  - During this year, Sylvain Dehors supervised three internships: Leonid Syniukov who worked as a master student on the interaction design of QBLS during three months. He was a student of the ErgoNTIC Master in Nice. He supervised 4 second year students of Polytech'Nice during their mid-term three weeks project. They had to develop a Java Program to analyze log files generated by the activity of learners on an e-learning system. Stephanie Mevel made her summer two months internship after Polytech'Nice second year among the acacia team. She redeveloped a web-based tool to analyze the logs generated by the activity of the learners during the QBLS experiment.
  - Rose Dieng-Kuntz is responsible for:
    * the course on *Knowledge Capitalization and Economic Intelligence* (20h) in the framework of the Masters "Audit Informationnel et Stratégique" at the Institut d'Administration d'Entreprises, UNSA,
    * the course on *Knowledge Management* (15h) at the École Nationale Supérieure d'Informatique, Tunis, Tunisia.
  - Alain Giboin gave the following courses:
    * EPU, ESSI 3rd year, Module Interfaces graphiques homme-machine (GUI), Université de Nice - Sophia Antipolis http://www.essi.fr/~pinna/MODULEIHM/: contribution to the organization of the module, lectures, participation to tutorials, and assessment of students' GUI projects. Supervising the collaboration between the EPU-SI students and the students ergonomists who contribute also to the GUI projects (see below),

* Master Ergonomie des Nouvelles Technologies de l'Information et de la Communication (ErgoNTIC), Université de Nice - Sophia Antipolis http://www.unice.fr/master-ErgoNTIC/ : in charge of the Module Méthodes et Techniques de Conception et d'Évaluation des IHM, lectures, tutoring and training supervision (2005-2006). In 2006-2007 in charge of the Projet EPU with Anne-Marie Pinna-Déry (EPU-SI). The EPU project allows students ergonomists and students software engineers from the EPU-SI to work together as early as the learning phase, so preparing future collaborations when working together in enterprise,
* EPU, ESSI 1st year, tutoring of students' programming projects (ergonomics).

9.4.2. Theses

Current theses:

1. Laurent Alamarguy: *Ontologies and Semantic Relations Acquisition from Biomedical Corpora*, université de Nice - Sophia Antipolis.
2. Thanh-Le Bach: *Construction of a Multi-Viewpoints Semantic Web*, Ecole Nationale Supérieure des Mines de Paris [20].
3. Tuan-Dung Cao: *Exploitation of Semantic Web for Technological Watch*, Université de Nice - Sophia Antipolis, in collaboration with CSTB [21].
4. Sylvain Dehors: *Semantic Web and Knowledge Management for E-learning*, université de Nice - Sophia Antipolis.
5. Khaled Khelif: *Semantic Web and Experiment Memory for the Transcriptome Analysis*, université de Nice - Sophia Antipolis (in collaboration with IPMC and Bayer Crop Science) [22].
6. Phuc-Hiep Luong: *Management of a Corporate Semantic Web*, Ecole Nationale Supérieure des Mines de Paris.
7. Noureddine Mokhtari : *Extraction and exploitation of contextual, evolving semantic annotations for a virtual community*, université de Nice - Sophia Antipolis.

Rose Dieng-Kuntz was reviewer of the following theses:

- Oswaldo Castillo, « CSAO: pour la Construction d'un Système d'Apprentissage Opérationnel à partir d'une mémoire métier », defended at UTT (Université de Technologie de Troyes),
- Fayçal Azouaou, «Modèles et Outils d'Annotations pour une Mémoire Personnelle de l'Enseignant», defended at Joseph Fourier University, Grenoble,
- Kamel Slimani, « Système d'échange et de partage de connaissance pour l'aide à la Conception Collaborative », defended at Claude Bernard Lyon I University,
- Lylia Abrouk, « Annotation de documents par le contexte de citation basée sur une ontologie », defended at University Montpellier II.

Rose Dieng-Kuntz was president of the jury of the Habilitation à diriger les Recherches of Fabrice Guillet on « Qualité, Fouille et Gestion de Connaissances », defended at University of Nantes.

9.4.3. Training

We welcomed the following trainees:

- Guillaume Ereteo, "SweetWiki Semantic Wiki", from June 26 till September 26,
- Aurélie Girardot, "Etude ergonomique de la fonctionnalité "Liens importants" d'un intranet d'entreprise" (contract UsableIntranet-2), from May 1st till August 31st,
- Yann-Vigile Hoareau, "Expériences comparatives sur les Distances Conceptuelles (LSA vs. Ontologies) afin d'étayer l'élaboration de représentations et d'algorithmes de simulation" (action COLOR Edccaeteras), from August 1st till December 31st.

9.5. Participation to conferences, seminars, invitations

Members of the team took part in conferences and *workshops* (see the bibliography). In addition to these conferences,

Olivier Corby participated to “Hôpital Expo - Intermédica” in Paris, May 18th, and gave a talk on Knowledge Management and Semantic Web for Healthcare Network.

Rose Dieng-Kuntz presented the following talks as keynote speaker:

- « Gestion des Connaissances, Web sémantique et Graphes conceptuels », 12ème Conférence Langage et Modèles Objets (LMO’2006), Nîmes, March 22-24 2006.
- Knowledge Management through Organizational Semantic Webs. CAISE’2006 INTEROP Workshop On “Enterprise Modelling and Ontologies for Interoperability” (EMOI’2006), Luxembourg, June 5-6 2006.
- Knowledge, Competence, Cooperation Management through Community Semantic Webs, 19th IFIP World Computer Congress, Artificial Intelligence Theory and Pratice Conference, Santiago, Chile, August 21-25, 2006.

She was also invited speaker on:

- « Ontologies for Knowledge Management », “Research School : Ontologies, a smart way towards interoperability ?” Paris, April 13, 2006,
- « Le Web du Futur », Journée de l’Académie des Sciences, Sophia Antipolis, May 31, 2006,
- « Voyage d’une femme au pays de la science », Université de Cergy, octobre 12, 2006,
- « L’IA et le web sémantique », Colloque du 50ème Anniversaire de l’Intelligence Artificielle, Tunis, November 25, 2006,
- « Towards a World-Wide Web of Knowledge with the South », 2nd EPFL Scientific Cooperation and Development Conference, Lausanne, November 23, 2006,
- « Semantic Web for Knowledge Management in Biomedical Communities », Eurobio2006 (the Tenth European Biotech roads).

Fabien Gandon was:

- Invited speaker on *Web services in corporate semantic Webs* in W3C Seminar “Using Web services: from infrastructure to semantics”, on March 6, 2006, Palais Brongniart, Paris, France,
- Speaker at Aristote seminar, December 7, 2006, Ecole Polytechnique, Palaiseau http://www.aristote.asso.fr/sem/semnext.html.

Khaled Khelif participated in Eurobio2006 (the Tenth European Biotech Crossroads) where he presented demonstrations of MeatAnnot and MeatSearch, October 25, 2006, Paris, France.

10. Bibliography

Major publications by the team in recent years

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