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INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team ECOO

Environment for cooperation

Nancy - Grand Est

Theme : Distributed Systems and Services

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ECOO is a project of LORIA (UMR 7503), a joint venture between CNRS, INRIA, Université Henri Poincaré Nancy 1, Université Nancy 2 and Institut National Polytechnique de Lorraine. The project was stopped on September 30rd, 2009. The SCORE team has been created on October 1st, 2009 as a follow-up of the ECOO project.

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2. Overall Objectives

2.1. Overall Objectives

ECOO is interested in the development of cooperative, distributed, and process-aware Web Information Systems.

An Information System (IS) is a particular type of work system that uses information technology to capture, transmit, store, retrieve, manipulate, or display information, thereby supporting one or more work systems.

The advent of the web 2.0 has pushed new IS applications as electronic commerce, collaborative editing, e-learning, e-engineering, etc. A common characteristic of such applications is to be more cooperative, i.e. more human-centered, more creative by nature, and implicating more subtle machine mediated interactions, than traditionally.

Such applications are also distributed in space (people work in different locations), in time (people work at different time) and they cross organizational barriers, making difficult their coordination and crucial the problems of privacy and trust.

The ECOO objective is to support such applications. The work is organized in two main streams.

1. The axis entitled PROCESS ENGINEERING is interested in process-aware information systems that manage and execute operational processes involving people, applications, and information sources on the basis of process models. This includes integrating business processes with Web technologies and increasing the flexibility of existing process models to support creative cooperative applications.
2. The axis entitled COLLABORATIVE DISTRIBUTED SYSTEMS is concerned with the development of collaborative systems but with a scientific focus on data consistency in peer to peer architectures. Interactions between these two axes are mainly governed by shared issues, especially on awareness, coordination, and privacy and security management.

Privileged applications in our target are creative cooperative applications such as cooperative editing, collaborative knowledge building, service orchestration, in various domains such as Software Engineering, e-Commerce, e-Learning, Architecture-Engineering-Construction. It is a strategic objective for us to develop software and to experiment it “outside the laboratory”.

2.2. Highlights

- The LOGOOT algorithm [6] is a breakthrough for managing consistency of shared data on peer-to-peer networks. LOGOOT is a fundamental scientific result in the domain of distributed system and more specifically, in the domain of optimistic replication.
- Bonita is now supported by a new company, BonitaSoft[1]. The CEO of the company is a former ECOO member who helped to the developments of its first versions, Miguel Valdes Faura. BonitaSoft has raised 3M$in a first round of venture capital.
- The XWiki SAS company distributes the XWiki Concerto software [2] that includes our WOOT algorithm. This product is the result of the XWiki Concerto ANR project. This result is clearly a transfer from fundamental results on consistency management over unstructured peer-to-peer networks to industrials.
- DSMW [33] stands for “Distributed Semantic MediaWiki” [3]. It is an extension of SEMANTIC MEDIAWIKI and is distributed as free software from october 2009. It allows creating a social network of semantic MediaWiki servers and managing synchronization of content between servers. This extension is based on the LOGOOT algorithm to ensure eventual consistency on ontologies. DSMW

[1] http://www.bonitasoft.com/
[2] http://concerto.xwiki.org
[3] http://dsmw.org

is representative of our research process: providing new fundamental results, apply these results to build new innovative systems and then evaluate the added value by the end-user. Fundamental results, innovative systems and evaluation are all scientific contributions.

3. Scientific Foundations

3.1. Introduction

Collaborative systems involve humans and computers. They require to define how to share data and knowledge, how to communicate, how to coordinate, how to keep humans and computers aware about any changes in the system, how to secure the collaboration space, how to preserve privacy of participants, how to index information within the collaboration space.

Collaborative systems have to satisfy both distributed system constraints and human constraints. We have to build dependable and usable systems. Traditional models of data sharing or coordination fails to address issues in collaborative systems. The scientific challenge for ECOO is to propose models and algorithms that allow building collaborative systems that involves computers and humans. ECOO considers collaborative systems not as an application domain but as a research object.

There exist many scientific challenges in collaborative systems. The ECOO team focuses on two complementary dimensions:

1. Process modeling and enactment. This research direction mainly proposes advanced models for business process, workflow, knowledge building.
2. Data and knowledge sharing. This research direction relies on consistency and interaction models for data and knowledge sharing, interoperability aspects in data and knowledge sharing.

Both research directions have to validate their results with usage analysis in order to verify if users accept the system.

3.2. Process Engineering

3.2.1. Business Process Models - Workflow Models

An important research direction of ECOO concerns the coordination of a distributed team based on an explicit definition of working processes.

Traditional workflow models [71], if they seem a good starting point for this modeling activity, suffer from a lack of flexibility in both control flow and data flow definition and interpretation; they are too rigid to model the subtlety of interactions characterizing creative cooperative activities.

As a consequence, different approaches have been proposed to extend the traditional workflow approach towards cooperative applications. In this context, our main stream approach is to keep a traditional process description model but with a different semantic for integrating control and data flow flexibility.

Another emerging characteristic of our approach is the consideration that, in many applications, there is not one explicit process, but several interacting processes, potentially based on different models (functional, state-based, data-flow), and in some cases not explicitly defined.

3.2.2. Transactional Models for Processes

To be able to define properties of workflow executions, activities are generally considered as black boxes executing as ACID transactions. Unfortunately, ACIDity seems antagonistic with cooperation, cooperative processes being of long duration, of uncertain development, dynamically defined and mobile. Especially, the Isolation property seems problematic for interacting activities exchanging intermediate results in complex feedback loops. To overcome the limits of traditional transaction models, several well founded or exotic models have been proposed.

Regarding the transactional issue, in the vein of [76], and in the aforementioned objective of multi-model process integration, we are concerned with the concurrency control and atomicity of transactional processes. This can be sketched in a top-down or in a bottom-up perspective. For both perspectives, we are developing a transactional framework to provide active support for transactional activities composition and composition evaluation.

3.3. Data and Knowledge Sharing

3.3.1. Consistency Models for Distributed Collaborative Systems

Collaborative systems are distributed systems that allow users to share data. One important issue is to manage consistency of shared data according to concurrent access. Traditional consistency criteria such as locking, serializability, linearizability are not adequate for collaborative systems.

Causal consistency, eventual Consistency and Intention preservation (CCI) [77] are more suitable for developing middleware for collaborative applications.

We develop algorithms for ensuring CCI properties on collaborative distributed systems. Constraints on the algorithms are different according to the type of distributed system and type of data. The distributed system can be centralized, decentralized, GRID or peer-to-peer systems. The type of data can include strings, growable arrays, ordered trees, semantic graphs and multimedia data.

3.3.2. Optimistic Replication

Replication of data between different nodes of a network allows improving reliability, fault-tolerance, and accessibility. When the data are mutable, consistency between the different replicas must be ensured. Pessimistic replication is based on the principle of single-copy consistency while optimistic replication allows the replicas to diverge during a short time period. The consistency model for optimistic replication [75] is called eventual consistency, meaning that replicas are guaranteed to converge to the same value when the system is idle.

Our research focuses on the two most promising families of optimistic replication algorithms for ensuring CCI:

- the operational transformation (OT) algorithms [70]
- the algorithms based on commutative replicated data types (CRDT) [74]

Operational transformation algorithms are based on the application of a transformation function when a remote modification is integrated into the local document. Integration algorithms are generic, being parameterized by operational transformation functions which depend on replicated document types. The advantage of these algorithms is their genericity. These algorithms can be applied to any data type and they can merge heterogeneous data in a uniform manner.

Commutative replicated data types is a new class of algorithms initiated by WOOT [73]. They ensure consistency of highly dynamic content on peer-to-peer networks. Unlike traditional optimistic replication algorithms, they do not require to detect concurrency between operations in order to ensure consistency. CRDT algorithms rely on natively commutative operations defined on abstract data types such as lists or ordered trees. Thus, they do not require a merge algorithm or an integration procedure.

3.4. Usage Analysis

Cooperative work includes an important human dimension. A bad apprehension of this dimension leads inevitably to the rejection of any software solution on the field. A good study of actual usages before, during and after development is predominant.

Usage analysis is more a research topic in social sciences than in computer sciences. Our approach is to involve potential users early in the development process (participative design). Also, we ask specialists (psychologists, educationists), when possible, to conduct these analyses. We have had the opportunity to develop this strategy thanks to scientific and industrial relationships.

4. Application Domains

4.1. E-government

E-government is now a well established domain that provides its own requirements in the field of service and information management. From our perspective, mostly processes, e-government applications have very strong requirements regarding security, privacy and interoperability between different organizations, belonging potentially to different countries. One of the prominent contributions we have made in this domain is related to our collaboration with SAP on the relationship between processes, security policies and the problem of delegation that we considered as a important for organizational flexibility [25].

4.2. Crisis Management

Crisis management is a special case of e-government application as it involves mostly governmental agencies in coordination with other organizations like the Red Cross or other ONG. Moreover, it brings with it a lot of requirements that are very interesting for us in the domain of coordination: a crisis process shall be very flexible, adaptable and distributed. It is mostly human driven and can be critical. In this domain, we contributing in the ICrisis project and we are collaborating with SAP to define a new model of coordination that should support people involved in crisis resolution.

4.3. E-learning, Collaborative Knowledge Building

Collaborative knowledge building process is a distributed social process [64]. During this process, Knowledge is built by a constellation of communities, each community being a node in the knowledge building network. Each node in the network is autonomous and has its own knowledge that can be exchanged and negotiate with other communities. A peer-to-peer architecture is more compatible with social architecture of knowledge building processes [65]. In addition, knowledge is basically created by individuals involved in social process [61]. Therefore, it is fundamental to support personal knowledge building in a collaborative knowledge building environment.

We develop distributed semantic wikis (cf section 6.2.5 and section 5.5) for collaborative knowledge building. These environments support the distributed social process of knowledge building and support personal knowledge building.

4.4. Groupware Systems and CASE Tools

Software engineering can be seen as distributed collaborative systems. Software Forges are social software. They transform foreigners into collaborators, sometimes into developers. Forges are online services that allow instantiating, composing and managing collaborative services. Traditionally, provided collaborative services are version control systems, issue trackers, forums, mailing lists or wikis. We are applying our research results on coordination and data sharing into this context.

Libresource (cf 5.2) and Qualipso-Factory (cf 5.7) are forges developed within the Team. Bonita (cf 5.1) has been integrated with NovaForge [4], the forge from Bull.

4.5. Peer-to-Peer Overlay Networks

Replication algorithms are heavily used in structured peer-to-peer network. We are embedding our CRDT algorithm within nodes of a distributed hash table in order to tolerate partition failure within the DHT (cf section 6.2.3).

[4] http://www.novaforge.org/

4.6. Real-time Web

The real-time web is a set of technologies and practices which enable users to receive information as soon as it is published by its authors, rather than requiring a periodical checking for updates. In the context of Wiki 3.0 (cf section 8.2.2) project we apply our optimistic algorithms for allowing users to edit in real-time and integrate social interaction techniques such as chat and micro-blogging within wikis.

5. Software

5.1. Bonita Flexible Workflow Management System

Participants: François Charoy [contact], Oscar Barrios, Claude Godart.

The first version of the *Bonita* workflow management system has been released in 2004 with a LGPL license. A new version called *Nova Bonita* [5] has been released in 2008 with a LGPL license (Nova Bonita exploits the *Process Virtual Machine* [6]). Bonita is now directly supported by a startup company, BonitaSoft, created in 2009. The CEO of BonitaSoft is Miguel Valdes Faura, a former member of the ECOO team who contributed to the development of the first releases.

The Bonita workflow model is defined as a classical graph based one, but with an advanced execution model that allows different kinds of execution strategies: from classical and automatic, to less constrained and user driven. Another difference with classical models is that process definition can be dynamic: Bonita supports direct process instantiation and execution. A new process can be created by cloning another running or finished process and then adapted to specific needs. Process fragment importation is also possible. Bonita [7] is now implemented on the Process Virtual Machine and can be integrated in different kinds of applications. Bonita is embedded in several largely distributed software and has gained recently a lot of press coverage.

5.2. LibreSource: Services for Hosting Virtual Teams

Participants: Pascal Molli [contact], Jérôme Blanchard, François Charoy, Claude Godart, Gérald Oster.

LibreSource allows a virtual team to organize and its participants to cooperate. Its objective is in the vein of BSCW and SourceForge, but with an original object sharing model where copy convergence is based on the operational transformation approach which provides for a safe and generic synchronizer. In other words, LibreSource is not restricted to the synchronization of source code, but can apply to any type of data (XML for example) if the corresponding transformation operations are provided.

Another innovative point is the fact that the synchronizer can be distributed on several sites, thus providing for the modeling of (hierarchically organized) processes.

LibreSource also integrates traditional services for object sharing, communication, task management and group awareness.

LibreSource http://www.libresource.org/ is implemented on a J2EE application server. It is available on Jonas.

5.3. XWiki Concerto: Peer-to-Peer Extension of XWiki

Participants: Gérôme Canals [contact], Pascal Molli, Julien Maire, Gérald Oster, Claudia-Lavinia Ignat.

XWiki Concerto[8] is a peer-to-peer extension of the XWiki system, an open-source enterprise wiki. This extension is the result of the ANR XWiki Concerto. An XWiki Concerto network is an unstructured peer-to-peer network of XWiki servers where each server stores a copy of the replicated wiki pages. XWiki Concerto uses an epidemic propagation algorithm to broadcast changes on the overlay network, combined with the WOOT algorithm to merge concurrent changes. XWiki Concerto is scalable, and supports dynamic networks and disconnected operations.

[5] http://bonita.objectweb.org/
[6] http://www.onjava.com/pub/a/onjava/2007/05/07/the-process-virtual-machine.html
[7] http://www.bonitasoft.com/
[8] http://concerto.xwiki.org

5.4. Swooki: Unstructured Peer-to-Peer Semantic Wikis

Participants: Hala Skaf-Molli [contact], Pascal Molli, Gérôme Canals, Charbel Rahhal.

SWOOKI [9] is the first Peer to peer semantic wiki. It is implemented as a semantic extension of XWiki Concerto peer-to-peer wiki. SWOOKI combines the advantages of semantic wikis and peer-to-peer wikis. A SWOOKI network is a peer-to-peer network of SWOOKI servers where each server stores a copy of the replicated wiki pages and the semantic store. It adapts the WOOT algorithm to merge semantic data. SWOOKI can be downloaded at the address.

5.5. DSMW: Distributed Semantic MediaWiki

Participants: Hala Skaf-Molli [contact], Pascal Molli, Gérôme Canals, Jean-Philippe Muller, Charbel Rahhal.

DSMW [10] is an extension of SEMANTIC MEDIAWIKI (SMW). It allows creating a network of interconnected SMW servers that share common semantic wiki pages [33]. In DSMW, changes to shared pages are replicated to other servers on a publish/subscribe basis. The system manages the synchronization of the shared semantic pages when remote changes are integrated and ensures CCI consistency. CCI stands for Causality, Convergence, Intention. Correctness of DSMW relies on the LOGOOT algorithm [38]. The first version of DSMW has been released in October 2009 with a GPL License.

5.6. WikiTaaable

Participants: Hala Skaf-Molli [contact], Pascal Molli.

WIKITAAABLE [11] is a distributed collaborative knowledge building systems for cooking recipes. It integrates a case-based reasoning engine. It was designed to participate to CCC *Computer Cooking Contest*[12]. It is the vice-champion of the CCC. WIKITAAABLE uses SEMANTIC MEDIAWIKI as a central module to manage all data and knowledge used in the system. Making use of a semantic wiki has two major advantages: it enables humans and machines to rely on the same tool for representing and reasoning on shared knowledge and it provides users with user-friendly interfaces for browsing and editing knowledge.

5.7. QualiPSo Factory: Next Generation Forge

Participants: Pascal Molli [contact], Gérald Oster, Jérôme Blanchard, Christophe Bouthier.

The QualiPSo-Factory [13] is a next generation forge based on Service Oriented Architecture developed within the Qualipso European Project [14]. Forges transform foreigners into collaborators, sometimes into developers. Forges are online services that allow instantiation, composition and management of collaborative services. Traditionally, provided collaborative services are version control systems, issue trackers, forums, mailing lists or wikis. In the framework of the european QualiPSo project, we are designing and implementing the next generation of forges. It aims to a factory framework which allows to ease collaboration between forge users and allows developers to easily integrates new collaborative services. Our proposal relies on a software oriented architecture (SOA) and thereby allows composition of services. The current architecture provides core services such as security, notification, indexation, composition and naming which are externalized to other collaborative services.

[9] http://wooki.sf.net/
[10] http://dsmw.org
[11] http://taaable.fr
[12] http://www.wi2.uni-trier.de/ccc09/index.php
[13] http://qualipso.gforge.inria.fr/
[14] http://www.qualipso.org

6. New Results

6.1. Business Process Management - Service Oriented Computing

6.1.1. Introduction

Processes have received a lot of attention in the last decade and succeeded in proposing workflow solutions for office automation. The topic is subject again to a lot of interests carried by the expansion of business on the Web, but with the need to satisfy new application requirements and execution contexts. We are interested in different aspects of process engineering: the introduction of the flexibility requested to model the subtlety of user interactions in creative applications; modeling and implementing Quality of Services properties (time, security, ...constraints); composing existing process fragments of different nature and models; decentralizing a global process for a distributed execution with organizational constraints; process governance. Most of these aspects are considered in the frame of Web services and/or peer to peer architectures.

6.1.2. Task Delegation in Human-Centric Processes

Participants: François Charoy, Khaled Gaaloul.

One type of transparency and control supporting mechanism in human-centric decentralized collaboration is that of task delegation. In this objective we have deepened this concept in the context of human-centric collaborative workflows. In general, we investigate additional delegation requirements regarding the specification of advanced security and privacy mechanisms. It addresses the modeling and mapping of access rights to tasks and respective delegation and revocation of tasks. This work was conducted in the context of an R4eGov case study to identify the key distinguishing factors regarding collaboration as opposed to coordination. A Task Management system has been developed; it can be configured with different task models supporting different kinds of behaviors, including delegation among different organizations [24], [26], [42].

6.1.3. Composing Services with Time Constraints

Participants: Claude Godart, Nawal Guermouche, Olivier Perrin.

We propose a framework for analyzing the choreography compatibility of a set of services supporting asynchronous communications and taking into account data flow and constraints over data involved when exchanging messages. Especially, we consider timed properties that specify delays to exchange messages. By studying the possible impacts of timed properties on a choreography, we remarked that when the Web services are interacting together, implicit timed dependencies can be inferred and give rise to implicit timed conflicts.

As most related works study choreographies of synchronous messages, we propose new formal primitives and a model checking process to discover deadlocks in the context of asynchronous data exchanges [28], [27]. This work is implemented as an extension of the UPAAL environment.

6.1.4. Process Control Flow Decentralization and Distributed Enactment of Cross-Domain Service-Oriented Processes

Participants: Claude Godart, Walid Fdhila.

Web service paradigm and related technologies have provided favorable means for the realization of collaborative business processes. From both conceptual and implementation points of view, the business processes are based on a centralized management approach. Nevertheless, it is very well known that the enterprise-wide process management where processes may span multiple organizational units requires particular considerations on scalability, heterogeneity, availability and privacy issues, that in turn, require particular consideration on decentralization. For this purpose, we proposed a methodology for transforming a centralized process specification into a form that is amenable to a distributed execution and incorporated the necessary synchronization between different processing entities. The developed approach is applicable to a wide variety of service composition standards that follow the process management approach such as WS-BPEL. It has the advantage of being flexible that it computes the abstract constructs and provides a generalized approach to the decentralization of processes. Our approach [22], [23] is based on the computation of very basic dependencies between

process elements that provides a considerable level of understanding. The computation of basic dependencies has led, in turn, to the re-implementation of the semantics of a centralized specification with peer-to-peer interactions among the derived decentralized process specifications.

6.1.5. A Declarative Approach to Web Services Computing

Participants: Olivier Perrin, Ehtestam Zahoor.

Web services composition and monitoring are still highly active and widely studied research directions. Little work however has been done in integrating these two dimensions using an unified framework and formalism. Classical approaches introduce an additional layer for handling the composition monitoring and thus do not provide the important execution time violations feedback to the composition process. This year, we proposed the DISC framework which aims to provide a highly declarative event-oriented model to accommodate various aspects such as composition design and exceptions, data relationships and constraints, business calculations and decisions, compliance regulations, security or temporal requirements. Then, the same model is used for combining the control of the composition definition, its execution and the composition monitoring. We proposed a service oriented architecture with a flexible logic, including complex event patterns and choreographies, business oriented rules, and dynamic control of compositions. Advantages of this unified framework are the higher level of abstraction to design, execute, and reason upon a composition, the flexibility of the approach, and the ability to easily include non-functional requirements such as temporal or security issues. This work has been presented in [40], [39] and we are in the process of implement the DISC framework using the Discrete Event Calculus reasoner.

The DISC framework is both an extension and a complete rewrite of a previous work on a pattern based strategy, called Mashup Processing Network (MPN) for building and validating mashups [79]. The idea was based on both process patterns and on Event Processing Network. It was supposed to facilitate the creation, modeling and verification of mashups.

We also continued the previous work initiated within the Associate Team INRIA VanaWeb about the provisioning of Web services composition using constraints solvers. The approach consists in instantiating this abstract representation of a composite Web service by selecting the most appropriate concrete Web services. This instantiation is based on constraint programming techniques which allow matching Web services according to a given request. The proposal performs this instantiation in a distributed manner, i.e., the solvers for each service type are solving some constraints at one level, and they are forwarding the rest of the request (modified by the local solution) to the next services. When a service cannot provision part of the composition, a distributed backtrack mechanism enables to change previous solutions (i.e., provisions). A major interest of this approach is to preserve privacy: solutions are not sent to the whole composition, services know only the services to which they are connected, and parts of the request that are already solved are removed from the next requests [72].

6.1.6. Process Change Management

Participants: François Charoy, Karim Dahmen, Claude Godart.

In the continuation of work done previously on change management during process execution, we are conducting work on the governance of change at the business level and on its implications at the architecture and infrastructure level. Following the work of Karim Dahmen's Master thesis [69], we are working on the analysis of the impact of a business change, generated by process execution monitoring to the whole transformation chain, from the business level (e.g. process models) to the IT level (e.g. architecture).

6.1.7. Crisis Management Processes

Participants: François Charoy, Joern Franke.

As said before, crisis management is a very promising domain to investigate new approaches in the domain of high value, human driven activity coordination. Our work can benefit from a large amount of use cases and detailed accounts of previous dramatic events to analyze requirements and confront our proposals. We have already invalidated the use of BPM system to support such coordination and we have started to develop a model that should be ready for first experimentation during the coming year. This model is founded on a distributed network of activities with advanced governance rules at the activity level. This work is conducted as a cooperation with SAP Research Sophia Antipolis and partially funded by a CIFRE Grant.

6.2. Distributed Collaborative Systems - Collaborative Knowledge Building

6.2.1. Introduction

Distributed collaborative systems (DCS) facilitate and coordinate collaboration among multiple users who jointly fulfill common tasks over computer networks. The explosion of Web 2.0 and especially wiki systems showed that a simple distributed collaborative system can transform communities of strangers into a community of collaborators. This is the main lesson taught by Wikipedia. Even if many DCS are currently available, most of them rely on a centralized architecture and consequently suffer of intrinsic problems of centralized architectures: lack of fault tolerance, poor scalability, costly infrastructure, problems of privacy.

Our main work focused on migrating DCS to pure peer-to-peer architecture. It requires developing new algorithms in order to enable collaborative editing of complex data and massive collaboration.

This year, we made several contributions: we extended algorithms to manage complex data types such as semantic wikis, we developed an algorithm that scales in terms of number of sites and number of edits, we proposed a novel architecture for deploying wikis over structured peer-to-peer networks and we proposed an approach for easing group collaboration over shared workspaces.

6.2.2. Scalable Optimistic Replication Algorithms for Peer-to-Peer Networks

Participants: Pascal Molli, Pascal Urso, Stéphane Weiss.

Several collaborative editing systems are becoming massive: they support a huge number of users to obtain quickly a huge amount of data. For instance, Wikipedia is edited by 7.5 million of users and got 10 million of articles in only 6 years. However, most of collaborative editing systems are centralized with costly scalability and poor fault tolerance. To overcome these limitations, we aim to provide a peer-to-peer collaborative editing system.

Peer-to-peer systems rely on replication to ensure scalability. A single object is replicated a limited number of times in structured networks (such as Distributed Hash Tables) or a unbounded number of times in unstructured peer-to-peer networks. In all cases, replication requires to define and maintain consistency of copies. Most of the approaches for maintaining consistency do no support peer-to-peer constraints such as churn while the others rely on data "tombstones". In these approaches, a deleted object is replaced by a tombstone instead of removing it from the document model. Tombstones cannot be directly removed without compromising the document consistency. Therefore, the overhead required to manage the document grows continuously.

This year, we designed a new optimistic replication algorithm called LOGOOT [38] that ensures consistency for linear structures. LOGOOT tolerates a large number of copies, and does not require the use of tombstones. This approach is based on non-mutable and totally ordered object position identifiers. LOGOOT supports multiple strategies [45] to build these identifiers. The time complexity of LOGOOT is only logarithmic according to the document size. We evaluated and validated the LOGOOT scalability and compared it with tombstone-based solutions on real data extracted from Wikipedia. These data are all the modifications ever produced on thirty page among the most edited and longest pages of the Wikipedia.

6.2.3. Distributed Collaborative Systems over Peer-to-Peer Structured Networks

Participants: Pascal Molli, Gérald Oster, Sergiu Dumitriu.

The ever growing request for digital information raises the need for content distribution architectures providing high storage capacity, data availability and good performance. While many simple solutions for scalable distribution of quasi-static content exist, there are still no approaches that can ensure both scalability and consistency for the case of highly dynamic content, such as the data managed inside wikis. Last years, we studied and proposed solution based on unstructured peer-to-peer networks. If these results were promising, the chosen architecture implies that the whole content (whole wiki data) is replicated on every peer-to-peer node. In many cases, this assumption is not acceptable. Therefore, this year, we proposed a peer-to-peer solution for distributing and managing dynamic content over a peer-to-peer structured network. The proposed solution [58], [32] combines two widely studied technologies: Distributed HashTables (DHT) and optimistic replication. In our "universal wiki" engine architecture (UniWiki), on top of a reliable, inexpensive and consistent DHT-based storage, any number of front-ends can be added, ensuring both read and write scalability, as well as suitability for large-scale scenarios.

A first prototype has been implemented in collaboration with Rubén Mondéjar, a PhD student from Universitat Rovira i Virgili, Catalonia (Spain). The implementation is based on Damon [30], a distributed AOP middleware, thus separating distribution, replication, and consistency responsibilities, and also making our system transparently usable by third party wiki engines. Finally, UniWiki has been proved viable and fairly efficient in large-scale scenarios.

6.2.4. Easy Collaboration over Shared Workspaces

Participants: Claudia-Lavinia Ignat, Pascal Molli, Gérald Oster.

Existing tools for supporting parallel work feature some disadvantages that prevent them to be widely used. Very often they require a complex installation and creation of accounts for all group members. Users need to learn and deal with complex commands for efficiently using these collaborative tools. Some tools require users to abandon their favorite editors and impose them to use a certain co-authorship application. In [29], we proposed the DooSo6 collaboration tool that offers support for parallel work, requires no installation, no creation of accounts and that is easy to use, users being able to continue working with their favorite editors. User authentication is achieved by means of a capability-based mechanism. A capability is defined as a couple (object reference, access right). If a user possesses this capability he/she has the specified right to the referenced object. The system manages capabilities for publishing and updating shared projects. The prototype relies on the data synchronizer So6 (http://www.libresource.org/).

6.2.5. Distributed Collaborative Knowledge Building

Participants: Hala Skaf-Molli, Gérôme Canals, Pascal Molli, Charbel Rahhal, Pascal Urso, Stéphane Weiss.

Semantic wikis are new generation of wikis. They combine the advantage of Web 2.0 and Semantic Web. Existing semantic wikis are based on centralized architecture. This architecture is in contradiction with the distributed social process of knowledge building [64]. *The objective of this research is to build peer-to-peer semantic wikis for collaborative knowledge building.* We are working on the following problems:

- Building distributed Semantic Wikis for distributed collaborative knowledge building
- Knowledge personalization in distributed Semantic Wikis.
- Human-Computer collaboration for collaborative knowledge building.

We propose two approaches of peer-to-peer semantic wikis: SWOOKI approach and DSMW approach. Both approaches are based on optimistic replication algorithms. The main difference is the replication algorithm and the supported processes.

6.2.5.1. Collaborative Knowledge Building over Unstructured Peer-to-Peer Semantic Wikis

SWOOKI [15] is composed of a set of interconnected Semantic Wikis servers that forms the peer-to-peer network. Wikis pages and related semantic annotations are replicated over the network. Each peer offers all the services of a semantic wiki server. SWOOKI is built on unstructured peer-to-peer network. A peer can join and leave the network at each moment.

[15] http://wooki.sf.net/

Users collaborate to edit wiki pages and their related semantic annotations. A modification on a copy is executed locally, and then it is broadcasted to other peers in the network to be integrated locally at each node. The system is correct if it respects the CCI (*Causality, Convergence and Intention preservation*) consistency model.

To synchronize replicated semantic wiki pages, SWOOKI adapts the Synchronization algorithm WOOT [73]. WOOT is designed to synchronize linear structures such as wiki pages but it is not designed to synchronize non-linear structures such as Semantic data. Semantic data forms a RDF graph. We extend the WOOT algorithm to synchronize semantic data and to ensure the CCI consistency model on this data [43], [35]. SWOOKI integrates also algorithms that support an undo mechanism [34] for reverting any modification of any user at anytime. SWOOKI is the first peer-to-peer semantic wiki.

6.2.5.2. Collaborative Knowledge Building over Trusted Semantic Wikis Networks

The main objective of replication algorithms of SWOOKI are providing better performance and fault tolerance. Another interesting objective could be supporting collaborative modes that preserve the privacy of users. In this case, every user maintains her own semantic wiki server. She can decide to publish pages and integrated pages published by other users [33]. This is the principal of the DSMW approach. The collaboration in DSMW is based on the *publish/subscribe* model. The publication, the propagation and the integration of modifications are under the control of the user.

This mode of work can be generalized to communities. A community can maintain a semantic wiki server. The community can then decide to publish some pages to other communities and integrate pages published by other communities. These collaborative networks ensure autonomy of communities and preserve privacy of community. In addition, this is compatible with the social organization of knowledge networks.

To develop this system, we need algorithms to synchronize the network and algorithms to manage publication and integration of modifications. DSMW uses the LOGOOT [38] algorithm to synchronize the semantic wikis pages. LOGOOT is an optimized version of WOOT, it ensures the convergence and intention preservation if the causality is ensured.

DSMW uses the *publish/subscribe* to propagate modifications. We developed the DSMW ontology to formalize the *publish/subscribe* model and we developed the needed algorithms to populate this ontology [33]. We demonstrate that DSMW algorithms ensure the causality, therefore, LOGOOT ensures the convergence and intentions preservation in DSMW.

We have implemented these algorithms as an extension of SEMANTIC MEDIAWIKI. This first version of DSMW was released in October 2009 at the address http://www.dsmw.org.

6.2.5.3. Knowledge Personalization in Distributed Semantic Wikis

In semantic wikis, wiki pages are annotated with semantic data to facilitate the navigation, information retrieving and ontology emerging. Semantic data represents the shared knowledge base which describes the common understanding of the community. However, in a collaborative knowledge building process the knowledge is basically created by individuals who are involved in a social process [61]. Therefore, it is fundamental to support personal knowledge building in a differentiated way. Currently there are no available semantic wikis that support both personal and shared understandings. In order to overcome this problem, we propose a peer-to-peer collaborative knowledge building process and extend semantic wikis with personal annotations facilities to express personal understanding. In this work, we detail the personal semantic annotation model and show its implementation in distributed semantic wikis. We also detail an evaluation study which shows that personal annotations demand less cognitive efforts than semantic data and are very useful to enrich the shared knowledge base [36], [37], [44]. This is a joint research with the University la Plata, Argentina.

6.3. Computer-Supported Collaborative Learning

Participant: Jacques Lonchamp.

In the CSCL field the collaborative situation is constructed by teachers in order to produce specific interactions that trigger learning processes. Defining a collaborative learning situation is complex and multi-faceted. It may include a structured process, structured interaction protocols, structured artifacts and ad hoc monitoring processes.

For several years we have developed a generic CSCL kernel for supporting synchronous collaborative learning applications following the dual interaction space paradigm (task space and communication space), called Omega+. Its main characteristic is an explicit representation of the four facets evoked above [52].

This year our works concern the monitoring of synchronous collaborative learning processes (for coaching and self-guidance) [11], post mortem analysis of synchronous collaborative learning traces [10] and the relationships between these two aspects. These proposals are illustrated by experiments with real students working in small groups with Omega+ during object-oriented modeling courses.

6.4. Interoperability

Participants: Khalid Benali, Nacer Boudjlida.

In the area of inter enterprise cooperation we are faced to the classical matching problem due to the use of different models by the various cooperating enterprise. Even if this issue is a historical database problem tackled through schema integration approaches, this domain has been renewed in the context of web XML schema integration, or in MDA approaches, or ontology approaches for knowledge representation, or in enterprise modeling.

In the continuation of an initial work on semantic-based and model-based solutions for interoperability, Nacer Boudjlida and Dong Cheng applied and experienced the variety of semantic annotation types (structural, terminological and behavioral) [66], [68] in the frame of dynamic web services discovery [63], [67], [68] and for competence management systems [20].

Integration and model transformation techniques, as well as common ontologies definitions allow discovering and defining semantic correspondences between an enterprise knowledge and its collaborators' one. This allows performing an integration solution or a communication solution between their systems by using specific methods such as model driven engineering ones. This model driven engineering approach is now well accepted for interoperability between enterprises. Our approach for interoperability based on an MDA architecture uses meta models mapping to ensure interoperability of application models [62]. We define the interoperability between two applications through classification of identified mapping between their respective meta models.

Khalid Benali has contributed to a work for verifying the conformity of a process model [78].

7. Contracts and Grants with Industry

7.1. CIFRE Grant with SAP Research

Participants: François Charoy, Joern Franke.

Since several years, we are strengthening our relationships with SAP Research in the areas of process management and security. This collaboration has been formalized in 2008 by the funding of Joern Franke under a CIFRE contract to work on a PhD thesis on process models for crisis management (or crisis process managements systems).

7.2. CIFRE Grant with XWiki SAS

Participants: Pascal Molli, Gérald Oster, Sergiu Dumitriu.

Following the fruitful work of the ANR XWiki Concerto, we are continuing the collaboration with XWiki SAS company. The PhD thesis funded by this CIFRE contract investigates peer-to-peer software architecture enabling distributed collaboration over a peer-to-peer wiki. The proposed architecture is based on a structured peer-to-peer architecture. It allows running large-scale wiki usage scenarios on top of a reliable and inexpensive distributed network of peers.

8. Other Grants and Activities

8.1. Regional Actions

8.1.1. CyWiki Project

Participants: Hala Skaf-Molli, Pascal Molli, Gérôme Canals.

Partners: The partners of the project are Orpailleur (coordinator), ECOO and KIWI teams (LORIA-INRIA Nancy-Grand Est), ATILF and LISEC (Université de Nancy 2), NUTICE (Nancy Université).

CyWiki is a multi-disciplinary project funded by the EPST, Universités Lorraines.

The objective of the project is to build a software infrastructure for the collaborative and assisted transformation of textual content into formal and structured knowledge. The transformation process is a decentralized process in which both human agents and automatic agents (text-mining agents, classification agents) collaborate to build knowledge units (in the form of ontology elements). This knowledge can then be used to query and make reasoning about the content. The experimental and application domain of the project is education. The project will focus on the transformation of textual pedagogical resources into domain ontologies and annotations and metadata about the content of these resources.

8.1.2. CCO-MO Project

Participants: Hala Skaf-Molli, Pascal Molli.

Partners: The partners of the projects are EA 3942, CEREFIGE (Coordinator) and Codisant-G3C, LPUL (University Nancy2), 2L2S / ERASE EA 3478 (University Paul Verlaine-Metz), ECOO (LORIA-INRIA Nancy-Grand Est).

CCO-MO: Cartography of organizational skills and organizational memory based on semantic wikis.

The objective of this project is to build a distributed and dynamic cartography of organizational skills. The project focuses on the skills in the development and research departments of the enterprises and research laboratories in the Lorraine clusters of competitively. The aim of the project is to improve the current practices of knowledge building and dissemination within the Lorraine competitively clusters and enterprises.

Existing systems for cartography are based on up-down approach. In this approach, the experts define the ontologies that capture the knowledge of the enterprises and research centers. Some administrators can then instantiate these ontologies. In these systems, the user and the developer of the ontologies are different and evolving the ontologies is a very hard task. In this project, we want to apply the principal of Web 2.0 to cartography of the different skills in an organization. We want to deploy a peer-to-peer semantic wiki as an infrastructure for this purpose. In this context, each laboratory and each enterprise have their own semantic wiki. These semantic wikis contain the cartography of the enterprise or laboratory skills. The employees of the organization add these skills in a cooperative way. The knowledge bases will be augmented progressively by the contribution of each participant. And the organization can communicate and exchange their knowledge bases with other organization. The first step of the project is to experiment our ideas in the context of research laboratories then we conduct another experience in the enterprises.

This project is labeled MSH 2009.

8.1.3. WikiSem Project

Participants: Hala Skaf-Molli, Pascal Molli.

Partners: The participants of the project are: ECOO and Orpailleur teams.

WikiSem: A semantic wiki for knowledge management in case-based reasoning systems [16]..

This is an operation funded by the CPER MISN (Modeling, Information System and Numeric) of the TALC (Natural Language Processing and Knowledge) laboratory. TAAABLE is a case-based reasoning system to adapt Kitchen recipes. In TAAABLE editing the knowledge base is tedious and the feedback of the users is not managed. The objective of the project is to manage TAAABLE knowledge in a semantic wiki to allow the users and reasoning engine to edit the knowledge bases. This original combination helps to support the opportunistic knowledge acquisition.

In this project, we built WIKITAAABLE systems. The results of this project are published in [15], [21]. WIKITAAABLE is the vice-champion of the CCC *Computer Cooking Contest*[17] which took place in July at Seattle, USA.

8.2. National Actions

8.2.1. P2CeL Project

Participants: Hala Skaf-Molli, Pascal Molli.

Partners: The partners of the projects are KIWI (Coordinator) and ECOO teams (LORIA, INRIA Nancy-Grand Est), IAE CEREFIGE Nancy University, NUTICE (Nancy Université), ETIC (Université Paul Verlaine - Metz) and Ecole des Mines de Paris.

P2CeL - Collaborative Knowledge Construction and eLearning : an approach based on semantic Wikis

Wiki is a collaborative knowledge space which provides by its simple usage a new and democratic way for creating pages and cross links pages on the fly. Although semantic wikis could notify users about what could be interesting for them and act as a recommendation system which takes into account user tastes and habits.

Associated to semantic wikis, the social networking and recommendation system will bring a process of gathering and storing information from the learners, managing the content assets, analyzing current and past user interactive behavior and, based on the analysis, delivering the right content to each learner.

Based on the characteristics of semantic wikis, methods for social networking, methods for the evaluation of the pedagogical practices and the tools for knowledge management, the main objective of this project is to propose a new approach for collaborative knowledge construction in a pedagogical environment. The main reason is that there are many numerical resources and when students, teachers, use them, obtained knowledge coming from exchanges, collaborative works, adding new information is lost.

This project has four main steps :

- Definition of the Target groups
- Technical and methodological Implementation of the collaborative system
- Evaluation and adaptation
- Evolution of eLearning practices and deployment

The chosen pedagogical environment is Thermoptim. Thermoptim is a national eLearning platform in the field of thermodynamics.

This project is labelled ISC-CNRS 2009 and MSH 2009.

[16] http://wikitalc.loria.fr/dokuwiki/doku.php?id=operations:wikisem
[17] http://www.wi2.uni-trier.de/ccc09/index.php

8.2.2. Wiki 3.0

Participants: Claudia-Lavinia Ignat, Gérald Oster, Gérôme Canals, Pascal Molli.

Partners: The partners of the project are XWiki SAS, INRIA and Mandriva

The Wiki 3.0 project (dec. 2009 - nov. 2011) is financed by the call for projects "Innovative Web" launched by the French Ministry of Economy. The objective of this project is the development of an open-source platform based on XWiki (http://www.xwiki.org) that addresses the three major evolution axes of collaborative Web: real-time collaboration, social interaction integrated into the production (chat, micro-blogging, etc) and on demand scalability (cloud computing). This platform should be competitive with major editors of collaborative Web developed by Google such as Google Wave, IBM and Microsoft.

8.2.3. Icrisis

Participant: François Charoy.

Partners: Partners of the project are Laego Team of Ecole des Mines (Leader of the project), Beta-Nancy 2, LabPsyLor from Nancy 2 and UPV, Erpi from ESGI, LSG from ENSIC. Participants to the simulation come from the SDIS 54, the Nancy prefecture, France Bleu.

The ICRISIS project (funded by MEDD, 2007-2009) aims to produce a conceptual and technological framework to support and execute crisis simulations. It allows preparing, executing and analyzing crisis simulation involving students or professionals. Crisis management is a major concern in our society. It is very important to provide future and actual managers with a pedagogical framework to allow them to learn how to act and react in a highly unanticipated situation. Regarding ECOO, this project is a challenge because crisis management is a case where the limit of classical process management solutions is reached. Reactivity, adaptivity and flexibility, human interactions are in this context required to the extreme. During this year, we have started to define a language to express crisis scenario. Rather than taking a classical workflow approach, we took an event driven approach. A scenario is described as a sequence of events that are propagated to students under the control of the animation team. Multiple scenarios can be used to drive the experimentation. A prototype has been developed, but it is not yet integrated in the existing platform.

8.2.4. ADT Galaxy

Participant: François Charoy.

Partners: Contributors to this ADT are mainly research project-teams, including ADAM, ECOO, OASIS, ASCOLA, TUVALU, SARDES and TRISKELL, and the galaxy ADT is led and managed by the TUVALU team.

The galaxy ADT (Technology Development Action) contributes to make INRIA a value-added player in the SOA arena, by designing and developing an Open Framework for Agile and Dynamic Software Architecture. This ADT will work for INRIA and INRIA's research project-teams direct benefit, and aims at pre-assembling technological bricks from various teams, projects and preparing them to be transferred through the open source software channel. The goal of the galaxy ADT is to provide an IT agile platform, built on dynamic software architecture principles, and fitting for flexibility, dynamical reconfiguration, adaptability, continuity and autonomic computing. Fractal, SCA-Tinfi and GCM-ProActive are the major technologies which will be the technological drivers of this ADT. The different usage scenarios as well as the different tools which will be developed at infrastructure, application and business levels will demonstrate that this platform is able to support the design, modeling, deployment and execution of business processes. In the same time, the ADT will target the definition of a new common language to manipulate dynamically adaptive distributed SOA-based systems, encompassing application and middleware layers. This common language will take different forms, inherited from works done by several project-teams with their distinct skills, and illustrates a new kind of collaboration between teams, coupling research and development works.

8.3. Actions Funded by the EC

8.3.1. Project IP QualiPSo IST-FP6-IP-034763 (2006-2010)

Participants: Pascal Molli, Jérôme Blanchard, Christophe Bouthier, Gérald Oster.

Partners: Atos Origin, Bull, Engineering Ingegneria Informatica, Siemens, Telefonica I+D, Thales, European Dynamics, Mandriva, the Department for innovation and technologies of the Italian Presidency of the Council of ministers, Centro Ricerche Matematica Pura e Applicata, Fraunhofer Institute for Open Communication Systems, INRIA, Poznan Supercomputing and Networking Center, State University of Sao Paulo, South China University of Technology / Guangzhou Middleware Research Center, University of Bozen, University of Insubria, University Rey Juan Carlos.

The goal of the QualiPSo integrated project (No 034763) is to define and implement technologies, procedures and policies to leverage the Open Source Software development current practices to sound and well recognized and established industrial operations.

ECOO is involved in activity 7 whose goal is to specify and develop the QualiPSo factory, a collaborative platform. In particular, ECOO leads the 7.1 work package and has proposed and developed a novel service oriented architecture for the factory.

8.4. International Actions

8.4.1. Interop V-Lab

Participants: Nacer Boudjlida [responsible], Khalid Benali, François Charoy, Olivier Perrin, Hala Skaf-Molli.

Follow-up the INTEROP Network of Excellence, The INTEROP V-Lab (International Virtual Laboratory on interoperability, http://www.interop-vlab.eu/) has been officially created in Brussels on March 2007 as an international non-profit making association (serving the international interest). In this context, Nancy played also a leading role in the definition of the V-Lab and in the settlement of the so-called INTEROP V-Lab "pole" (a partner of the INTEROP V-Lab): the Grande Region pole. The Grande Region pole encompasses University of Namur, University of Paris I La Sorbonne, University Henri Poincaré Nancy 1 and University of Nancy 2). It is defined as a Scientific (International) Interest Group (Groupement d'Intérêt Scientifique or GIS). Its attachment to the INTEROP V-Lab has been achieved in may 2009.

8.4.2. Associate Team INRIA VanaWeb

ECOO is involved in the Associate Team INRIA VanaWeb (with UTFSM Valparaìso, Chili) which is interested in autonomous constraint solving concepts and their application to composition problems for Web services. The coordinators of this project are Carlos Castro (UTFSM Valparaìso, Chili) and Christophe Ringeissen (CASSIS).

8.4.3. Tunisie, eGov, INRIA-DGRST project

This project involves the ECOO LORIA team-project from Nancy, the SOC team from the IRIT lab in Toulouse and the SOIE team from ENSI in Tunis.

The Egov project is a franco-tunisian project funded by the DGRST and INRIA. Its goal is to combine multi-agent technology and workflow technology to enhance the flexibility of process execution involving multiple government agencies. During this year, we have started to study different dimensions of modeling of the Tunisian process for company registration, from a centralized point of view to a decentralized one. We have also started to work on the problem of communication and of security between the different partners of the cooperation. The complete process model has been developed and implemented on Bonita.

8.4.4. Semantic-based Support for Collaborative Design Activity, Stic-Amsud project

The participants pf this two-years (2008-2009) Stic-Amsud project are the LORIA ECOO and Orpailleur teams, the Lifia, University of La Plata (UNLP), (Argentina), The Intermidia lab at the SCC-Universidade de Sao Paulo (Brasil), and the COmputer science Dept. of the Universidad Tecnica federico Santa-Maria (UTFSM) in Valparaiso (Chile).

The goal of the project was to study the use of semantic technologies to better support computer-based collaborative design activities. The work was focused on studying the integration of knowledge extraction approaches based on combining NLP (Natural Language Processing) and FCA (Formal Concept Analysis) in a collaborative platform to support assisted collaborative construction of shared knowledge[14].

The project participants have written a book chapter [46] and, based on this document, have organized a one-day tutorial at the Webmedia conference. They have also organizes the 1st Semantic Web Spring School at UTFSM-Valparaiso (Chile) in October 2009.

8.4.5. Peer-to-Peer Semantic wikis for Distributed Knowledge Building, MINCyT Project

Participants: Hala Skaf-Molli, Pascal Molli.

The objective of the project is to offer concepts and mechanisms for the creation, manipulation and the emergence of shared knowledge in large communities. Our initial hypothesis is that the shared knowledge will emerge during collaborative editing of semantically annotated content shared by a community: members of a community work together to create shared annotated content that gradually move from an unstructured towards a structured and formalized content.

Our approach is to use a class of existing tools: semantic wikis. A wiki is an online asynchronous collaborative editor. It allows you to edit content through a web browser. A semantic wiki is an extension of traditional wikis by adding semantic capabilities. The semantic annotations can be imported from well-defined ontology. The aim of the project is to extend the working modes in semantic wikis for including:

- Capabilities to edit ontologies. This will transform the semantic wiki into a collaborative ontology editor.
- Peer-to-peer and optimistic replication capabilities. This allows supporting scalability and choosing knowledge propagation and integration by community.
- Mechanism to manage divergence and the different viewpoints.

The participants of the project are: ECOO and Orpailleur team from Loria and Lifia-UNLP (Argentina)

The results are published in [36], [37], [44].

The project is funded by international scientific cooperation program MINCyT (Argentine)/INRIA-CNRS (France)

8.4.6. Postdoctoral Cooperation

- Boualem Benatallah at University of New South Wales in Sydney, Australia, for two years.
- Ustun Yildiz has joined the Genome center of University of California in Davis in Bertram Ludascher's group.

8.4.7. Co-advisory of PhD Thesis

- PhD Thesis of Charbel Rahhal with University Lebanese of Beyrouth (2006-2009): collaborative editing processes for peer-to-peer networks (Pascal Molli and Hala Skaf-Molli).
- PhD Thesis of Hassina Talantikite and thesis of Abdelmalek Boudries with Béjaïa University, Algeria (Nacer Boudjlida)
- PhD Thesis of Salah Hamri with Constantine University, Algeria (Nacer Boudjlida).

9. Dissemination

9.1. Scientific Community Animation

- We have organized the 9th IFIP I3E conference on e-Business, e-Services and e-Society in Nancy (23-26 September 2009).
- Khalid Benali has been general chair of INFORSID 2009, and is or has been PC member of ICWIT 2009, IFIP I3E 2009, IFIP I3E 2010, I-ESA 2010, INFORSID 2010 and of several workshops. He has reviewed papers for IEEE Transactions on Systems, Man and Cybernetics and published a special issue of Document numérique (Hermès-Lavoisier).
- Nacer Boudjlida has been or is program committee member of I-ESA (International Conference on Interoperability of Enterprise Systems and Applications) 2009 and 2010, CAISE (Computer Assisted Information Systems) 2009, and 2010, and of several workshops. He organized a session at IFAC World Congress 2008.
- Gérôme Canals was the organization chair of the 9th IFIP I3E International Conference . He has been PC member of ICTTA (International Conference on Information and communication Technologies: from theory to application) 2008, and ACM Mobility 2009. Gérôme Canals is the co-chair of the ”Mobilité et Ubiquité” french national working group (GDR I3).
- François Charoy has been PC member of ICEBE (International Conference on Business Engineering) 2009, ICIW 2009, CTS 2008 and 2009, DG.O 2009 and of several workshops.
- Claude Godart was the general chair of IFIP I3E 2009. He has been program co-chair of the ”Software Engineering for e-Business” track in ICEBE 2008. He is member of the editorial board of ”Advance in enterprise systems” and ”International Journal of E-adoption” journals. He is editorial guest of a special issue of the ”World Wide Web journal”. He reviewed papers for ”Computer & Industrial Engineering”, ”Data and Knowledge Engineering”, ”IEEE Transactions on Service Computing”, ”IEEE Transactions on Systems, Man and Cybernetics”, ”Information Systems”, ”Information Systems Frontiers”, and ”World Wide Web” journals. He has been or is senior program committee member of BPM (Business Process Management) 2008 and 2009. He has been or is PC member of CAISE 2008 and 2009, CEC/EEE 2008 and 2009, Collaborative Computing (CollaborateComm) 2008, EDOC (The enterprise computing conference) 2008 and 2009, HPCC (High Performance Computing and Communications) 2009, Saint (Symposium on Applications and the Internet) 2008 and 2009, and SCC (Service Computing Conference) 2008.
- Claudia-Lavinia Ignat has been or is PC member of Group 2009, CDVE 2009, ICEBE 2009 and CDVE 2010. She reviewed papers for the ”Computer Supported Cooperative Work”, ”Cooperative Information Systems” and ”Information Sciences” journals.
- Jacques Lonchamp has been or is PC member of WBE (International Conference on Web-based Education) 2008, 2009 and 2010, CSEDU (International Conference on Computer Supported Education) 2009 and 2010, ICALT (International Conference on Advanced Learning Technologies) 2009 and 2010, ICWL 2009 (International Conference on Web-based Learning). He reviewed papers for ”Journal of Computer-Supported Collaborative Learning”, ”Computers & Education”, ”Interacting With Computers”, ”Internet and Enterprise Management”, ”International Journal of Distance Education Technologies”.
- Pascal Molli has been PC member of ICEIS (Conference on Enterprise Information Systems) 2008-2009-2010, LMO 2010, BDA 2009, COPS 2008-2009, ICCTA 2008, ENC (Mexican International Conference On Computer Science) 2008, ISIS (International Conference on Signal-Image Technology @ Internet-based Systems) 2008 and several workshops. He reviewed papers for ”IEEE Transactions on Parallel and Distributed Systems”, ”IEEE Transactions on Computers” and ”Computer Supported Cooperative Work”.
- Gérald Oster was a PC member of CoopIS 2009 (International Conference on Cooperative Information Systems) and few workshops. He reviewed papers for ISI (Ingénierie des Systèmes d’Information) journal.

- Olivier Perrin is or has been Program Committee member of BPM 2008 and 2009, SITIS 2008 and 2009, I3E 2009 and of several workshops. He reviewed papers for IEEE Transactions on Services Computing, Journal of Data Management, Information Systems Frontiers and Software and Systems Modeling journals. He co-supervised with Claude Godart the book entitled "Les processus métiers: Concepts, modèles et systèmes" [50].
- Hala Skaf-Molli is or has been PC member of Program DEXA 2009 (20th International Conference on Database and Expert Systems Applications), ICEIS 2009 (11th International Conference on Enterprise Information Systems), ICEIS 2008 (10th International Conference on Enterprise Information Systems), ICTTA 2008 (3rd International Conference on Information and Communication Technologies : from Theory to Applications). Hala Skaf-Molli has been co-organizer of the 4rd Semantic Wiki Workshop, co-located with the 6th European Semantic Web Conference. and the 3rd Semantic Wiki Workshop, co-located with the 5th European Semantic Web Conference. She has also reviewed paper of World Wide Web (journal), CollaborateCom (Conference) and Hawaii International Conference on System Sciences (Conference).

9.2. Commissions

- François Charoy is member of the Administration Council of University Henri Poincaré Nancy 1.
- Pascal Urso is member of the Scientific Council of University Henri Poincaré Nancy 1.
- Pascal Molli is member of the "Comité Technique Paritaire" of University Henri Poincaré Nancy 1.
- Gérôme Canals is member of the INRIA Nancy-Grand Est COMIPERS Engineers committee.
- Claudia-Lavinia Ignat is member of the INRIA Nancy-Grand Est COMIPERS researchers committee. She is member of the INRIA Nancy-Grand Est center committee.

ECOO members were member of the following PhD Commissions:

- Mohammed Issam Kabbaj, PhD thesis, Université de Toulouse, October 2009 (Khalid Benali)
- Charlotte Hug, PhD thesis, Université Joseph Fourier, Grenoble 1, October 2009 (Khalid Benali)
- Oum Oum Sack, PhD thesis, Université du Littoral, Calais, January 2009 (Claude Godart)
- Loïc Féjoz, PhD thesis, Université Henri Poincaré, Nancy 1, February 2009 (Claude Godart)
- Nizar Messaï, PhD thesis, Université Henri Poincaré, Nancy 1, March 2009 (Claude Godart)
- Ramy Ragab Hassan, PhD thesis, Université Blaise Pascal, Clermont-Ferrand, July 2009 (Claude Godart)
- Woralak Gondenfha, PhD thesis, University of New South Wales, July 2009 (Claude Godart)
- Gabriel Rodrigo Pedrosa, PhD thesis, Université Joseph Fourier, November 2009 (Claude Godart)

ECOO members were members of the following Habilitation Degree commission:

- Radu State, HDR, Université Henri Poincaré, Nancy 1, December 2009 (Claude Godart)
- Stéphane Genaud, HDR, Université Henri Poincaré, Nancy 1, December 2009 (Claude Godart)

9.3. Tutorials, Invited talks, Panels, Presentations

- Hala Skaf-Molli is co-organizer of the first and second "journées de la construction interdisciplinaire de l'industrie de la connaissance en Lorraine".
- Hala Skaf-Molli is organizer of First autumn school in Information Systems, in Homs, Syria.
- Pascal Molli made a presentation on "Distributed collaborative system" in First autumn school in Information Systems, in Homs, Syria.
- Pascal Molli made a presentation in "2ième journées de la construction interdisciplinaire de l'industrie de la connaissance en Lorraine".

- Pascal Molli was invited at the “Open World Forum 2009” on session dedicated to the “next generation forge”.
- Jérôme Blanchard was invited at the “fOSSa Conference – Free and Open Source Software Academic Conference”, November 17-18, 2009 to present the “next generation forges”.

9.4. Vulgarisation

- Claudia Ignat participated twice to the event organized by INRIA Nancy-Grand Est “Une journée avec un scientifique". In this event high-school students were invited to discover scientific research by spending a day among researchers while learning various aspects of the job.
- Interstices INRIA realised an interview with Claudia Ignat on collaborative tools “À propos des outils de travail collaboratif".

9.5. Teaching

ECOO members have important responsibilities and are leading teachers in several cursus in Nancy University (University Henri Poincaré Nancy 1, University Nancy 2 and INPL), at different levels, including third cycle (ESIAL, ESSTIN, research and professional masters).

- Nacer Boudjlida is the head of the Computer Science department of the Faculty of Sciences and technologies, UHP Nancy 1.
- Gérôme Canals is responsible for the professional licence degree ”Web programming”.
- Jacques Lonchamp is responsible for the professional licence degree ”Free and Open Source Software”.
- Claude Godart is responsible for the Computer Sciences department of ESSTIN. He is study director of the research master degree ”Distributed Services and Networks”.
- Khalid Benali is responsible for the professional Master degree speciality ”Distributed Information Systems” of MIAGE.
- Pascal Molli is co-responsible of the professional Master degree speciality ”Software Engineering” at the Lebanese University in Tripoli, Lebanon. He is also co-responsible of the professional Master degree speciality ”Software Engineering” at the University Henri Poincaré Nancy 1.
- Hala Skaf-Molli is co-responsible and co-fonder of the professional Master degree speciality ”Software Engineering” at the Lebanese University in Tripoli, Lebanon. She represents the University Henri Poincaré Nancy 1 in the submitted European project TEMPUS “Master’s degree in Enterprise Systems Engineering”, the evaluation results will be available in December.
- François Charoy is responsible of the Software Engineering specialisation at the ESIAL Engineering School of University Henri Poincaré Nancy 1.

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