INRIA

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team ECOO

Middleware for supporting cooperative work through Internet

Lorraine

THEME 3A

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1. Team

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.*

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2. Overall Objectives

Key words: *cooperation, coordination, collaboration, data consistency, data replication, transaction, workflow, synchronization, context based awareness, cooperative editing, distributed team, virtual enterprise, web service.*

The ECOO project is interested in the development of services for hosting distributed teams and virtual enterprises on Internet. Related services include data sharing, communication, task management and group awareness services.

The ECOO approach is characterized by its focus on coordination, a crucial problem due to the lost of natural awareness resulting from distribution in space and time.

Difficult research problems related to this problematic and considered by ECOO are :

- consistency maintenance of semantically linked data (modified in a multi-synchronous context)
- consistency maintenance of replications of the same data (modified in a multi-synchronous context)
- context based capture and visualization of a large set of data for awareness purpose.

Privileged applications in our target are creative cooperative applications like co-conception, co-engineering, cooperative editing ..., in various domains like Software Engineering, e-learning, Architecture-Engineering-Construction.

3. Scientific Foundations

3.1. Process modeling, Workflow.

An important research direction of ECOO concerns the coordination based on an explicit definition of working processes (workflow).

Traditional workflow models [27], if there 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; there are too rigid to model the subtlety of interactions characterizing creative cooperative activities. As a consequences, different approaches have been proposed to extend the workflow approach towards cooperative applications: the process as a resource for action, i.e. a guide but not a constraint; the process as an entity that can evolve dynamically following a set of evolution rules; evolving the process model with new operators for more flexible executions.

Our position consists in conserving a traditional process model but with a different semantics based, on the one hand on a new interpretation of control flow connectors thanks to anticipation, and on the other hand on encapsulation of activities in cooperative transactions. Another emerging characteristics of our approach is the consideration that several processes potentially based on different models must co-habit in a real application. In addition, they can initially ignore each other.

3.2. Cooperative transactions.

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 time duration, of uncertain development, dynamically defined, mobile ... Especially, the Isolation property seems problematic for interacting activities exchanging intermediate results in complex feedback loops. To surpass the limits of traditional transaction models, several well founded and exotic models have been proposed [24].

Regarding the transactional problematic, in the vein of [26], and in the aforementioned objective of multi-model process integration, we are concerned with the concurrency control 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 to transactional activities composition and composition evaluation

3.3. Software configuration and version management

One domain in which cooperative work is organized since a long time is software development. Tools like RCS or CVS are used since several years by thousands of software developers. We can even say that the

copy/modify/merge paradigm is one of the more concrete implementation of cooperative work at a large scale. However, we have to constat that this model, which synchronizes entity by entity, if it is highly operational, suffers from some weakness regarding consistency of shared data.

The copy/modify/merge paradigm has deeply influenced our view of cooperation and remains a first order underlying component of our cooperation view. But our objective is to integrate it in a more global vision for:

- better taking into account semantic links between two or more objects,
- better integrating asynchronous work phases with synchronous phases.

3.4. Real time (synchronous editors)

Synchronous editors allow to maintain as soon as possible the consistency of two or more copies of the same object that is concurrently modified at the same time by several users distributed through a network. Algorithms are founded on the fusion of execution traces.

We use trace fusion algorithms for everything that requests a synchronous view of several user's parallel work, including the synchronous visualization of divergence between users modifying asynchronously copies of the same object. We also extend these algorithms for assuring a soft and consistent transition from asynchronous to synchronous phases, especially for the reconciliation of divergent copies.

3.5. 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 terrain. A good study of current usages before development, during and after development is predominant

Usage analysis is more a research topic in human sciences than in computer sciences. Our approach is to implicate potential users early in the development process (participative design) and to implicate human scientists (psychologists, educationists) in our industrial contracts to conduct experiments.

4. Application Domains

Our work aims at supporting creative cooperative applications of various nature: co-design, co-engineering, e-learning, cooperative authoring for participants distributed in time, space and eventually in organizations.

It corresponds to enterprises cooperating through Internet to the design and/or development of a common product (cooperative software development, co-design and co-engineering in AEC ...). Educating the internet society (cooperation learning, cooperative learning and cooperative teaching) is also in our scope.

5. Software

5.1. Bonita : a flexible workflow management system.

Participants: François Charoy [responsable], Claude Godart, Adnène Guabtni, Miguel Faura Valdès.

The Bonita workflow model is defined on a classical graph based model, but with an advanced execution model that allows different kinds of execution strategies: from classical, automatic to less constrained, user driven process execution. Another difference with classical model is that process definition is 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 its specific needs. Process fragment importation is also possible.

Bonita is implemented on a J2EE application server. It is available on Jboss and Jonas. It provides a definition and an execution API available as a session bean and as Web services. Integration of external components can be done inside activities using the BeanShel scripting language. Bonita is available as an ObjectWeb project on the ObjectWeb forge (http://bonita.forge.objectweb.org) and as a component of the LibreSource project (http://www.libresource.org).

5.2. ToxicFarm : services for hosting virtual teams

Participants: Pascal Molli [responsable], François Charoy, Claude Godart, Sébastien Jourdain, Gérald Oster.

Toxic[5] allows a virtual team to organize, and its participants to cooperate. Its objective are in the vein of BSCW and SourceForge but with a particular focus on coordination.

Toxic Farm integrates services for object sharing, communication, task management and group awareness. Object sharing supports file versioning. Classical synchronous and asynchronous communication tools are integrated. Task management provides to-do-lists and flexible workflows. One characteristic of Toxic Farm is the provision of awareness, and especially state awareness in different visualization forms, including treemaps and hyperbolic trees.

ToxicFarm is developed with basic Web technologies (HTTP, PHP, Mysql ...) and can be easily deployed deployed. A simplified version of Toxic Farm is under development in the Coopera project

5.3. Coopera

Participants: François Charoy [responsable], Romain Chabbal, Claude godart, Pascal Molli, Marc Patten.

Coopera has the same objective than ToxicFarm, but with a simplified interface and architecture that put the power of version management at the range of almost everybody.

This result has been obtained thanks to several usage analyses: cooperation between several classrooms of several primary schools [14][16][7], continuing education of nurses distributed through France, foreign language learning, ...

Coopera http://coopera.loria.fr is developed with basic Web technologies (HTTP, PHP, Mysql ...) and can be easily deployed. It is developed in the frame of the RIAM Coopera project (cf. 7.2).

5.4. LibreSource : services for hosting virtual teams

Participants: Pascal Molli [responsable], Guillaume Bort, François Charoy, Claude Godart, Sébastien Jourdain, Gérald Oster.

LibreSource allows a virtual team to organize and its participants to cooperate. Its objective are in the vein of BSCW's, SourceForge's and Toxic Farm's, but with a particular focus on coordination and an original and more efficient object sharing strategy, resting on an original vision where copy convergence is based on the operational transformation approach which provides for a safe and generic synchronizer. LibreSource integrates services for object sharing, communication, task management and group awareness. Classical synchronous and asynchronous communication tools are integrated. Task management provides to-do-lists and flexible workflows (Bonita). LibreSource is implemented on a J2EE application server. It is available on Jboss and Jonas. It is developed in the frame of the RNTL PureSource project (cf 7.1).

5.5. SAMS : Synchronous, Asynchronous, MultiSynchronous editor

Participants: Pascal Molli [responsable], Sébastien Jourdain, Gérald Oster.

In the context of cooperative work, a team alternates divergence phases where each member works in insulation on copies of objects and convergence phases during which the group reconciles and validates data. To support this style of working, we propose the concept of SAMS environments. A SAMS environment allows team members to work in Synchronous, Asynchronous or Multi-Synchronous mode while ensuring the coherence of shared data. Users of SAMS environment can choose interaction mode according to their needs, and the environment will ensure the coherence of data. Sams is available freely at http://woinville.loria.fr/sams.

5.6. Libraries for visulalizing treemaps and hyperbolic trees

Participant: Christophe Bouthier [responsable].

The first Java library allows visualizing a large collection of data structured in tree maps that can be displayed to enhance one or another parameter (http://www.inria.fr/valorisation/logiciels/cooperation.fr.html).

The second library has the same objective but structures data in hyperbolic trees (http://www.inria.fr/valorisation/logiciels/cooper

These libraries are widely used for different applications, including references search by the *American National Library of Medicine* (cf. 7.4).

6. New Results

6.1. Transactional consistency

Participants: Kharim Baina, Khalid Benali, Julia Bitcheva, Sami Bhiri, François Charoy, Walid Gaaloul, Claude Godart, Olivier Perrin.

6.1.1. User-centric workflow. Anticipation.

We have completed an implementation, called Bonita, of the workflow model specified in [25], [6]. It is based on a classical graph based workflow model, but with an advanced execution model that allows different kinds of execution strategies: from classical, automatic to less constrained, user driven process execution. Moreover, an executing workflow can be changed dynamically to reflect process evolution. Another difference with classical model is that process definition is 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 its specific needs. Process fragment importation is also possible.

Bonita http://freshmeat.net/projects/bonita-workflow/is implemented on a J2EE application server. It is available on Jboss and Jonas. It provides a definition and an execution API available as a session bean and as Web services. Integration of external components can be done inside activities using the BeanShel scripting language. Bonita is available as an ObjectWeb project on the ObjectWeb forge (http://bonita.forge.objectweb.org) and as a component of the LibreSource project http://www.libresource.org.

6.1.2. Cross-organizational process definition and enactment.

For bypassing heterogeneous and monolithic aspects of process management with regards to enterprise constraints of privacy, we have chosen a process service oriented approach: *A process service is a service that abstracts a process fragment*. Process services enable enterprises to interconnect their processes by proposing the services they can achieve and by requesting services they want to out-source.

A first study, focusing on process definition and enforcement, has been developed in cooperation with FT R&D. Process interconnection is based on a meta-model for process services and contracts definition. Contracts makes it possible to express the obligations and the permissions of each partner and to deploy synchronization points as Web services [20][21]. A synchronization point is a cooperative activity that provides for cross-organizational activity execution, including process control and process tuning [11][4].

In a preliminary work, a pattern for the definition, the publishing, the search, the negotiation and the interconnection of process services has been defined [3][9][8]. It considers the interconnection of enterprise workflow processes as the management of a *« workflow of workflows »*.

6.1.3. Perspectives

Perspectives concern two complementing questions : how to support concurrency between processes that are long termed, interactive, having their proper internal control structure, and can instantiate from different models ? how to discover processes, and especially cooperation rules from logs of process executions when these processes are not explicitly defined. These two questions are related each to the other by the fundamental need to characterize and formalize cooperative interactions. Concerning concurrency between processes, the idea is, in opposition with the state of the art which mainly founds atomicity on isolation [26], to take advantage of the structure and the semantics of processes to increase the synergy and the parallelism between processes. Concerning, process discovery, the objective is to find out cooperation patterns and how processes are related each to others in a given application. We see the application of this research naturally in the coordination of multi-user creative applications where processes are more or less defined, of different nature, and of different

models. Cross-organizational process enactment, and especially transactional composition of Web services enter also in our target..

6.2. Operational transformations

Participants: Pascal Molli, Gerald Oster, Hala Skaf-Molli.

6.2.1. Automatic proving of transformation functions

Operational transformation is an approach that allows to build real-time groupware like shared editors. Algorithms like aDOPTed, GOTO, SOCT 2,3,4 are used to maintain the consistency of shared data. However these algorithms rely on the definition of transformation functions. If these functions are not correct then these algorithms cannot ensure the consistency of shared data. Proving the correctness of transformation functions even on a simple typed object like a String is a complex task. If we have more operations on more complex typed objects, the proof is almost impossible without a computer. This is a serious bottleneck for building more complex real-time groupware software. We propose to assist development of transformation functions with SPIKE [1] an automated theorem prover which is suitable for reasoning about functions defined by conditional rewrite rules. This approach requires specifying the transformation functions in first order logic. Then, SPIKE automatically determines the correctness of transformation functions. If correctness is violated, SPIKE returns counter-examples. Since the proofs are automatic, we can handle more (even complex) operations and develop quickly correct transformation functions [17][18].

6.2.2. Safe and generic synchronizers

Reconciliating divergent data is an important issue in concurrent engineering, mobile computing and software configuration management. Currently, a lot of synchronizers or merge tools perform reconciliation. However, they do not define what is the correctness of their synchronization. We propose to use a transformational approach as the basic model for reasoning about synchronization. We propose an algorithm and specific transformation functions that realize a file system synchronization. Unlike classic synchronizers, our synchronizer ensures properties of convergence, causality and intention preservation and is extensible to new data types [19].

6.2.3. Perspectives

Semantic constraints and Operational Transformation In the operational transformation approach, the convergence of data on different copies does not necessarily means a consistent state. But by accounting for the semantics of the application, we can reach a convergent and a consistent state. A common way to ensure semantic consistency is to define a set of constraints and to check these constraints. In order to integrate constraints in a system, it is necessary to answer the following questions: what is the language of description of the constraints? Where are the constraints imposed? on each site, in a central site? when are they checked? and how? what measures to take in case the constraints are violated? Moreover, in the context of replicated data, the consistency of the data not only depends on the local operations but also on the operations taken on the other copies. So it is necessary to determine the impact of semantic constraints on the operational transformation approach and vice-versa [23].

Synchronisation networks In groupware, data synchronization can be seen as an update propagation among different users. However, this propagation has its own rhythm. A group of developer synchronize their data often, the group of beta tester synchronize their data with the group of developer from times to times. Group of regular users synchronize their data with the group of beta tester every six month ...In the classical Operational Transformation, propagation of operation is a broadcast of locally executed operation to all others sites. We propose to structure the propagation of operations according to a network. This network is built incrementally by users and represents their own dataflow. This kind network can be nicely deployed on peer-to-peer networks and will represent a service a synchronization for P2P networks.

6.3. Group awareness

Participants: Christophe Bouthier, Gérôme Canals, Alicia Diaz.

[1] http://www.loria.fr/equipes/cassis/softwares/spike/

Group awareness models and mechanisms have a central situation in the cooperative applications that we are concerned with, because they interact directly with users and are largely responsible for tool acceptation. They allow each participant to be conscious of other participants activities, enhancing in this way the synergy, the coordination and the social links in the group.

Existing mechanisms are too general, as they do not take into account the role and the context of a user, and thus do not provide adapted and pertinent information. Also, they do not support project with an important number of participants. However, these characteristics are primordial in our application domain where roles, objects and groups can be numerous, and the organizational structure can be complex.

We develop two complementary approaches to face these questions: on the one hand advanced mechanisms for group awareness information visualization, and on the other hand, design of a group awareness model taking advantage of an explicit representation of users context for aggregating and adapting information.

6.3.1. Group awareness information visualization

We apply advanced visualization technology of tree diagram data for giving a concise and global representation of group awareness information. Two complementary techniques are combined:

- Treemap (see 5.6), allows to represent any tree diagram of data in a limited space; its interest is to provide a global view of data,
- Hypertree allows to represent a tree diagram on the unit disc of the hyperbolic space; its interest is to provide for efficient navigation in a large set of data.

This work has produced an open source visualization library that has been experimented in various domains : medical information (cf 7.4), programming, and knowledge (cf 7.4).

6.3.2. Group awareness and activity context

We use an explicit representation of activity context for on the one hand aggregating and filtering information at the source, and on the other hand for adapting offered information to each user characteristics. Information aggregation is based on Bayesian networks that allows to correlate low level events for abstracting a higher level information. The relationship between source and recipient is implemented by computing a distance between user's contexts. Depending on the distance, we can choose to delay awareness information, to transmit it in a peripheral vision or at the opposite in a very intrusive way.

We apply also this approach in the specific case of practice communities which share common knowledge. Activity context corresponds here to the knowledge and the point of view of a particular user. Bayesian networks are used for following the evolution of knowledge (divergence, convergence) of the different points of view, in the objective to make emerge new knowledge [13].

6.3.3. Perspectives

At short term, our objective is to experiment our mechanisms in the frame of the cooperative work environments developed in ECOO. In a first time, it is a technical integration work of these tools in the platforms; in a second time, it is to develop usage analyses for studying and comparing these mechanisms with regards to existing ones.

At middle term, we will extend adaptation properties of our tools for taking into account the usage context of the cooperation environment. This will allow to offer a continuous support of group awareness, especially for mobile activities disconnected from the usual working environment.

7. Contracts and Grants with Industry

7.1. RNTL Libresource : cooperative software development and community animation (2003-2005)

Participants: Pascal Molli [responsable], Guillaume Bort, François Charoy, Claude Godart, Sébastien Jourdain, Gérald Oster.

Project partners of LibreSource (formerly PureSource) are LORIA, the Artenum society and University Paris 7-Denis Diderot.

LibreSource allows a virtual team to organize and its participants to cooperate. Its objective are in the vein of BSCW's, SourceForge's and Toxic Farm's, but with a particular focus on coordination and an original object sharing technology. Object sharing rests on an original vision where copy convergence is based on the operational transformation approach that provides for a safe and generic synchronizer. LibreSource integrates services for object sharing, communicating, task management and group awareness. Classical synchronous and asynchronous communication tools are integrated. Task management provides to-do-lists and flexible workflows (Bonita). LibreSource is implemented on a J2EE application server. It is available on Jboss and Jonas.

7.2. RIAM Coopera : e-learning of cooperation, cooperative learning (2002-2004)

Participants: François Charoy [responsable], Romain Chabal, Claude Godart, Pascal Molli, Marc Patten, Miguel Valdes.

Partners of the Coopera project are the society Jeriko, specialist of interactive multimedia, the ECOO project of LORIA, psychologists from the Codisant project, University Nancy 2, and educationists from the Gr@mmsci laboratory, Université Bordeaux 3.

Coopera has the same objective than ToxicFarm, but with a simplified interface and architecture that put the power of version management at the range of almost everybody.

This result has been obtained thanks to several usage analyses: cooperation between several classrooms of several primary schools, continuing education of nurses distributed through France, foreign language learning project development, ...including non computer scientists.

Coopera http://coopera.loria.fr is developed with basic Web technologies (HTTP, PHP, Mysql ...) and can be easily deployed.

7.3. EAST EEA (2001-2004)

Participants: Olivier Perrin [responsable], Claude Godart, Frank Wynen.

The ITEA (Information Technology for European Advancement) EEA EAST project follows the french AEE project and gathers the main European car manufactures and their suppliers (Volvo, Audi, BMW, Fiat, Daimler Chrysler, Opel, PSA, Renault, SAAB, VW, Magneti Marelli, Bosch, Siemens VDO Automotive, Valeo, ZF). The main objective of the project is to provide an open embedded electronic architecture supporting both hardware and software components interoperability. A second objective is to manage a distributed development of such an architecture. Our task in the project is to study how a cooperative environment can help to develop an architecture, the work being distributed between several distributed partners. We have study both design and development processes, and tools able to support these processes. As underlined, these processes are hardly cooperative, and we proposed an approach to take into account these processes.

7.4. Visualizing and searching medical references with treemaps and hyperbolic trees (2002-2004)

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Participant: Christophe Bouthier [responsable].

The National Library of Medicine (USA) manages a large number of archives concerning medicine. Everybody can access these archives, but the number of documents is so important that the navigation in this document base is very hard. Even with a traditional search engine, the number of returned document is too high for being easily exploited. To surpass this limit, an interface based on our Tree Map and Hyperbolic Trees visualization libraries (cf. 5.6), and on a combination of both, is being developed.

7.5. Eureka Knowledge Valorization Matrix (2001-2003)

Participants: Gérôme Canals [responsable], Claude Godart, Abdelhalim Lahrlimi.

KVM is a Eureka (No 2432) project in which participates the French KAPPA society, the British Epistemologics society and projects of INRIA Lorraine (ECOO, MAIA and ORPAILLEUR) (http://www.loria.fr/projets/kvm/). Its objective project is to develop a framework for supporting the auditing processes of enterprise knowledge. The framework is built around the Bonita workflow management system that orchestrates the auditing process and integrates the different auditing tools: representation, structuring (tree diagrams) and codification of knowledge; navigation, search and visualization of knowledge and related audit information; cooperation tools for communicating and sharing knowledge.

The framework is developed with Web technology.

8. Other Grants and Activities

8.1. Regional actions

Ecoo participates to the CPER « Intelligence Logicielle (Software Intelligence) » in the axis « Qualité et sûreté Logicielle (Quality and Safety of software) ».

ECOO members have made several conferences in the frame of the LoriaTech programm : « XML for B to B » and « LibreSource : a new space for collaboration ».

We collaborate with psychologists of University Nancy 2 and the rectorship of Nancy for e-learning experimentations in the frame of the Coopera project.

8.2. National actions

Ecoo has participatedcto the « Action spécifique : accès aux données/Mobilité » of CNRS and to the working group 2.1 « Advanced DBMDS » of PRC I3.

We participate to several contracts with national enterprises (cf. RIAM Coopera, RNTL LibreSource, ITEA EAST, ITEA KVM).

Khalid Benali has organized Inforsid 03 in Nancy.

Gérôme Canals has been program committee member of BDA'03 and Inforsid'03.

Claude Godart has been program committee member of CITE'03.

8.3. European actions

8.3.1. Réseau thématique UEML (2001-2003), IST-2001-34229

Participants: Nacer Boudjlida [responsable], Khalid Benali.

Enterprise Modelling techniques and associated visual languages are very important and useful to support new approaches to business transformation and improvement in developing smart organisations and the networked organisations of the future. Visual Enterprise modelling, architecting, integration, operation and management are now providing new approaches to IT solutions development. The Main Objective of the UEML - Unified Enterprise Modelling Language project is to provide an unified and extendible modelling language. For this purpose, the project aimed at: *(i)* creating a European consensus on a common modelling language in order to facilitate inter-operability within the frame of on-going standardisation efforts. An initial common language representing this consensus has been defined in terms of a core set of modelling constructs. *(ii)* building an UEML demonstrator to promote, test, validate and improve the proposed Modelling Language Constructs. *(iii)* preparing the launching of a project to define, implement, and promote the complete UEML. All of these objectives have been fulfilled. Moreover, UEML resulted in a considerable set of classified enterprise modelling requirements.

8.3.2. Network of Excellence INTEROP (2004-2007)

Participants: Nacer Boudjlida [responsable], Khalid Benali, Sami Bhiri, François Charoy, Dong Chen, Walid Gaaloul, Claude Godart, Adnene Guabtni, Olivier Perrin.

Goals of Interop are :

- the emergence of a lasting European research community on interoperability of enterprise software applications,
- to create the conditions of an innovative and competitive Technology Transfer by bringing upstream conceptualisation of business-based interoperability,
- to achieve by the end of the project the integration process which will assemble knowledge components (Ontology, Enterprise Modelling, Architectures and Enabling Technologies) and prepare a lasting center of competence on Enterprise Interoperability with maximum research and audience.

8.3.3. Contracts

We participate also to several european contracts (ITEA EAST, KVM).

8.4. International actions

8.4.1. ARC Irex Grant UNSW-INRIA

We cooperate since several years with members of the Information Management Computer Sciences and Engineering schools of the University of New South Wales in Sydney on two main themes : transactional web services and awareness. This cooperation is partially founded by an Irex Grant of ARC (Australian Research Council).

Bouallem Benatallah, Senior Lecturer at Computer Sciences and Engineering school (UNSW à Sydnay) has visited ECOO from September to December 2003.

8.4.2. Co-directed theses

Thesis of Alicia Diaz with LIFIA, La Plata, Argentine : Knowledge sharing process in Communities of Practice.

Thesis of Claudia Ignat with ETH Zurich.

8.4.3. Contracts

Visualizing and searching medical references with the American Library of Medicine, ITEA EAST, Eureka KVM.

8.4.4. Conference program committees and organizations

Claude Godart has been program committee member of ICDE RIDE Workshop'03, VLDB TES Workshop'03, BPM'04, reviewer for Parallel and Distributed Databases journal.

Pascal Molli has been program committee member of ICEIS'03 and FIDJI'03.

8.5. Invitation, visiting professors

Bouallem Benatallah, Senior Lecturer at Computer Sciences and Engineering school, has visited LORIA from September to December 2003.

Kharim Baina has currently a post-doctoral position at University of new South Wales in Sydney since June 2003.

9. Dissemination

9.1. Scientific Community Animation

Khalid Benali is member of the recruitment committee of University Nancy 2.

Nacer Boudjlida is member of the recruitment committee of University Henri Poincaré Nancy 1.

Gérôme Canals is member of the direction board of PRC I3. He is members of the recruitment committee of University Nancy 2

Claude Godart is member of the external committee of the Sao Paulo program for Information Technologies in the Development of the Advanced Internet (Brazil). He is member of the recruitment committee of the CUNLUX « Centre Universitaire du Luxembourg ». He is member of the scientific Committee of ESSTIN and of the recruitment committee of University Henri Poincaré Nancy 1

9.2. Enseignement

ECOO members have responsibilities in several formations from University Henri Poincaré Nancy 1, University Nancy 2 and INPL, at different levels, including third cycle (DEA, ESIAL, ESSTIN, ISIAL, Mines).

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