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Team **SCORE**

Services and Cooperation

IN COLLABORATION WITH: Laboratoire lorrain de recherche en informatique et ses applications (LORIA)

RESEARCH CENTER
Nancy - Grand Est

THEME
Distributed Systems and Services

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Team SCORE

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Creation of the Team: October 01, 2009 .

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2. Overall Objectives

2.1. Overall Objectives

SCORE research domain is data centred service oriented computing and collaboration. With the raise of the Web as a platform, people consume applications as services from the web or from mobile apps. These applications are more cooperative, human centred and connected to social applications. They must cope with unprecedented load and their deployment in Cloud environment requires sophisticated architectures. Their users are distributed in space (people live in different locations), in time (people participate at different time) and they cross organizational barriers. Coordination is then more difficult and privacy and trust become key issues. New challenges appear every day. We have chosen to consider them regarding three dimensions that are primary for web and service based systems stakeholders :

1. The first dimension refers to management of collaborative data, a key aspect in the development of distributed collaborative systems.
2. The second dimension is concerned with assembling and coordinating high level services, involving people, applications, and information sources on the basis of process models.
3. The third dimension concerns non functional aspects of data and service management, and more particularly the security and trust dimensions that are basics to ensure a wide acceptance of the approaches that we advocate.

We consider these dimensions at a Web scale and when possible in contexts where there is no central authority. This raises many issues related to governance, compliance and security, trust and privacy but also to awareness and coordination. At this scale, we are also always facing the recurring problem of interoperability since we want to offer collaborators a flexibility concerning the chosen work models and technologies. We are tackling these dimensions in specific domains where they have strong interrelations:

- in software engineering where it is always difficult to find the best compromise between explicit and implicit coordination and where stands the difficulties related to collaborative software development.
- in crisis management where many organisations have to cooperate in a very ad-hoc way, share data and coordinate with a constantly changing goal, with very big issues at stake and with strong political emphasis.
- and in all domains where there is a strong need for cooperation;

3. Scientific Foundations

3.1. Introduction

Our scientific foundations are grounded on distributed collaborative systems supported by sophisticated data sharing mechanisms and an service oriented computing with an emphasis on orchestration and on non functional properties.

Distributed collaborative systems enable distributed group work supported by computer technologies. Designing such systems require an expertise in Distributed Systems and in Computer-supported collaborative activities research area. Besides theoretical and technical aspects of distributed systems, design of distributed collaborative systems must take into account the human factor to offer solutions suitable for users and groups. The Score team vision is to move away from a centralized authority based collaboration towards a decentralized collaboration where users have full control over their data that they can store locally and decide with whom to share them. The Score team investigated the issues related to the management of distributed shared data and coordination between users and groups.

Service oriented Computing [29] is an established domain on which the ECOO and now the Score team has been contributing for a long time. It refers to the general discipline that studies the development of computer applications on the web. A service is an independent software program with a specific functional context and capabilities published as a service contract (or more traditionally an API). A service composition aggregates a set of services and coordinate their interactions. The scale, the autonomy of services, the heterogeneity and some design principles underlying Service Oriented Computing open new research questions that are at the basis of our research. They spans the disciplines of distributed computing, software engineering and CSCW. Our approach to contribute to the general vision of Service Oriented Computing and more generally to the emerging discipline of Service Science has been and is still to focus on the question of the efficient and flexible construction of reliable and secure high level services through the coordination/orchestration/composition of other services provided by distributed organizations or people.

3.2. 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.

Causality, Convergence and Intention preservation (CCI) [32] 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 or peer-to-peer. The type of data can include strings, growable arrays, ordered trees, semantic graphs and multimedia data.

3.3. Optimistic Replication

Replication of data among different nodes of a network allows improving reliability, fault-tolerance, and availability. When data are mutable, consistency among 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 [31] 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 [27]
- the algorithms based on commutative replicated data types (CRDT) [30]

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 parametrized 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 [28] a first algorithm designed WithOut Operational Transformations. They ensure consistency of highly dynamic content on peer-to-peer networks. Unlike traditional optimistic replication algorithms, they can ensure consistency without concurrency control. 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. Business Process Management

Business Process Management (BPM) is considered as a core discipline behind Service Management and Computing. BPM, that includes the analysis, the modelling, the execution, the monitoring and the continuous improvement of enterprise processes is for us a central domain of studies.

A lot of efforts has been devoted in the past years to established standards business process models founded on well grounded theories (e.g. Petri Nets) that meet the needs of both business analyst but also of software engineers and software integrators. This has lead to heated debate as both points of view are very difficult to reconcile between the analyst side and the IT side. On one side, the business people in general require models that are easy to use and understand and that can be quickly adapted to exceptional situations. On the other side, IT people need models with an operational semantic in order to be able transform them into executable artifacts. Part of our work has been an attempt to reconcile these point of views, leading on one side to the Bonita product and more recently on our work in crisis management where the same people are designing, executing and monitoring the process as it executes. But more generally, and at a larger scale, we have been considering the problem of process spanning the barriers of organisations. This leads us to consider the more general problem of service composition as a way to coordinate inter organisational construction of application providing value based on the composition of lower level services [26].

3.5. Service Composition

More and more, we are considering processes as piece of software whose execution traverse the boundaries of organisations. This is especially true with service oriented computing where processes compose services produced by many organisations. We tackle this problem from very different perspectives, trying to find the best compromise between the need for privacy of internal processes from organisations and the necessity to publicize large part of them, proposing to distribute the execution and the orchestration of processes among the organisations themselves, and attempting to ensure non-functional properties in this distributed setting [25].

Non functional aspects of service composition relate to all the properties and service agreements that one want to ensure and that are orthogonal to the actual business but that are important when a service is selected and integrated in a composition. This includes transactional context, security, privacy, and quality of service in general. Defining and orchestrating services on a large scale while providing the stakeholders with some strong guarantees on their execution is a first class problem for us. For a long time, we have proposed models and solutions to ensure that some properties (e.g. transactional properties) were guaranteed on process execution, either through design or through the definition of some protocols. Our work has also been extended to the problems of security, privacy and service level agreement among partners. These questions are still central in our work. Then, one major problem of current approaches is to monitor the execution of the compositions, integrating the distributed dimension. This problem can be tackled using event-based algorithms and techniques. Using our previous results an event oriented composition framework DISC, we have obtain new results dedicated to the runtime verification of violations in services choreographies [6], [7], [12]

4. Application Domains

4.1. Introduction

Our research is inspired by potential problems and use cases from the real world. The rapid pace of technology evolution oblige us to adapt our perspective on some of the problems we consider. Recently, the raise of the "As a Service" movement has both validated our past work but also obliged us to rethink some of our directions. Then, we have chosen to apply our work to domains because we think that the problems that they exhibit resonate with our work. This is the case with Crisis Management and with Software Engineering that are in some ways extreme case for collaboration and service consumption. We are also exploring more general business oriented applications.

4.2. E-government

E-government is a well established domain that provides its own requirements in the field of service and information management. From our perspective, 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. This work resonate also with its current continuation in 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 NGO. 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 are collaborating with SAP to define a new model of coordination that should support people involved in crisis resolution.

4.3. Groupware Systems and Software Forge

Software engineering environment can be seen as distributed collaborative systems. Software Forges are social software (e.g. Github). They transform strangers into collaborators. Forges are online services that allow instantiating, composing and managing collaborative services. Traditionally, 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 foreseeing a forge, not as a monolithic framework but as a composition of services that can be deployed in a Cloud infrastructure.

5. Software

5.1. Wiki3.0

Participants: Luc André, Bogdan Flueraș, Claudia-Lavinia Ignat [contact], Gérald Oster.

In the context of the Wiki 3.0 project (<http://wiki30.xwikisas.com/>) (december 2009 - june 2012) sponsored by the call for projects “Innovative Web” launched by the French Ministry of Economy, SCORE team designed and integrated real-time editing features into the XWiki system (<http://www.xwiki.org>). We designed solutions for a raw text editor as well as for a WYSIWYG editor for XWiki pages. The real-time wiki editor has been released as an extension of XWiki (<http://extensions.xwiki.org/xwiki/bin/view/Extension/RealTime+Wiki+Editor>).

6. New Results

6.1. Collaborative Data Management

6.1.1. A Framework to Design Conflict-Free Replicated Data Types

Participants: Mehdi Ahmed-Nacer, Stéphane Martin, Pascal Urso.

Design new eventually consistent data types is difficult and error-prone as demonstrated by the numerous proposed approaches that fail to resolve conflicts for simple plain text document. Moreover, more the data type is complex, more conflicts types must be resolved. We have presented a layered approach to design new eventually consistent data types [21], [15]. This approach decouples eventual consistency management from data type constraints satisfaction. We compose one or several existing replicated data types which ensure eventual consistency, and adaptation layers to obtain a new eventually consistent data type. Each layer or replicated data type can be freely substituted by one providing the same interface. We have demonstrated that our approach is implementable and obtains acceptable performances. Our experiments and implementation are publicly available and re-playable (<https://github.com/score-team/replication-benchmark>).

6.1.2. *Enhancing Rich Content Wikis with Real-Time Collaboration*

Participants: Luc André, Claudia-Lavinia Ignat, Gérald Oster.

Wikis are one of the most important tools of Web 2.0 allowing users to easily edit shared data. WYSIWYG editors for wiki pages avoid the impediments of learning wiki syntax. However, wikis offer poor support for merging concurrent contributions on the same pages. Users have to manually merge concurrent changes and there is no support for an automatic merging. As real-time collaborative editing reduces the number of conflicts as the time frame for concurrent work is very short, we proposed extending wiki systems with real-time collaboration [23]. We propose an automatic merging solution adapted for rich content wikis. Our solution is integrated as an extension of XWiki system (<http://extensions.xwiki.org/xwiki/bin/view/Extension/RealTime+Wiki+Editor>).

6.1.3. *Rapid and Round-free Multi-pair Asynchronous Push-Pull Aggregation*

Participants: Claudia-Lavinia Ignat, Hyun-Gul Roh.

In the context of STREAMS project we investigated gossip-based dissemination mechanisms in peer-to-peer real-time collaboration adapted for consistency maintenance algorithms based on CRDT (Commutative Replicated Data Types). These dissemination mechanisms need to compute the size of the network and therefore a suitable rapid protocol that aggregates data over network is essential. Iterative aggregation protocols, especially push-pull style aggregations, generally need prior configurations to synchronize rounds over all nodes, and messages should be exchanged in a synchronous/blocking way in order to ensure accurate estimates in push-pull or push-sum protocols. We proposed a multi-pair asynchronous push-pull aggregation (MAPPA) [22], which frees the push-pull aggregations from the synchronization constraints, and therefore accelerates the aggregation speed. MAPPA is resilient to network churns, and thus suitable for dynamic peer-to-peer networks.

6.1.4. *Trustworthy contract based collaboration*

Participants: Claudia-Lavinia Ignat, Hien Thi Thu Truong.

Availability of trustworthy environments is one of the main conditions that would lead to a greater acceptance and reliance on collaborative systems. In the context of large scale multi-synchronous collaboration where users work in parallel on different streams of activities a "hard" security that would forbid many actions is unusable. We adopt instead a "soft" security where rather than adopting an a priori strict enforcement of security rules, access is given first to data without control but with restrictions that are verified a posteriori. We proposed a contract-based collaboration model [2], [4] where we establish and adjust trust in users based on detective enforcement of basic usage control requirements. Usage control requirements are specified as contracts. Contracts are specified by data owners when they share data in accordance with user trust levels. Observation of adherence to or violation of contracts is used to adjust trust levels. Our contract-based collaboration model allows the specification of contracts, merging of data and contracts and resolution of conflicting contracts. A trust metric for computing user trust levels was proposed based on auditing user compliance to the given contracts.

Multi-synchronous collaboration maintains multiple, simultaneous streams of activity which continually diverge and converge. These streams of activity are represented by means of logs of operations, i.e. user modifications. A malicious user might tamper his log of operations. At the moment of synchronization with other streams, the tampered log might generate wrong results. A trustworthy collaboration environment should detect if logs were tampered. We proposed a mechanism for establishment of trusted logs relying on hash-chain based authenticators [17], [18], [2]. Our solution ensures the authenticity, the integrity of logs, and the user accountability. We proposed algorithms to construct authenticators and verify logs. We proved their correctness and provided theoretical and practical evaluations.

6.1.5. *Distributed activity management in crisis situation*

Participants: François Charoy, Joern Franke.

Crisis management has been a very fruitful domain to investigate new approaches for high value, human driven activity coordination in a multi organisational setting. Our work benefits from a large amount of use cases and detailed accounts of previous dramatic events to analyse requirements and confront our proposals. This paper present the final part of this work on the problem of replication of activities between several workspaces [3]. We are now looking for new vehicles to continue this research at an international level.

6.2. Data Centered Service Oriented Computing

6.2.1. Business process distribution on a SaaS architecture

Participants: Walid Fdhila, Claude Godart, Elio Goettelmann, Samir Youcef.

The objective of this work is to support the deployment of a business process as a set of distributed services provided partially or totally off-premises or even in the cloud. Direct applications in our target are:

- A methodological approach for choreographies elicitation and monitoring [12].
- An algorithm for optimized service providers selection (including cloud) [11], [9], [10].

In this objective, we have deployed two approaches. A first is based on heuristics (*greedy* algorithm to compute an initial solution, combined with a *tabu search*) for optimizing the selection of services assigned to activities in a decentralized composite service, both in terms of the overall QoS of the composite service and the communication overhead; in output, the initial business process model is translated in a set of interconnected business process fragments.

A second approach uses operational research techniques for optimizing a cloud selection taking into account two conflicting objectives, namely: the execution time (makespan) and the overall cost incurred using a set of resources. We proposed in [9] three complementary approaches to deal with the matching and scheduling scientific workflow tasks in Cloud computing environments. An extension of this first study was presented in [11], [10]. More precisely, we have extended the three proposed approaches to consider: (i) the business workflows and (ii) the concurrent access to resources by multiple instances of a given process. To achieve this goal, we proposed to use a predictive models in order to estimate the availability of the used resources. We are currently working on the business processes execution in Cloud computing context taking into account workflow patterns such as *sequence*, *switch*, *multi-choice*, etc. patterns. Moreover, we plan to extend the proposed work to take into account others criteria like carbon emission and energy cost.

6.2.2. Alignment between Business Process and Service Architecture

Participants: François Charoy, Karim Dahman, 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 of an information system. Last year was devoted to the definition of the transformation rules that allowed to go from a business model to an IT model, i.e. a transformation between model based on different paradigms. During this year, a great deal of effort has been done in order to extend our work on Business to IT alignment management. Our goal is still to maintain this alignment at the lowest possible cost when the business process are changing. Further than that we are trying to describe and validated an engineering method to help designer to maintain this alignment. Karim Dahman has defended his PhD on this matter in october 2012.

6.2.3. Monitoring and violations detections of choreographies or distributed compositions of services

Participants: Aymen Baouab, Ehtesham Zahoor, Olivier Perrin, Walid Fdhila, Claude Godart.

The dynamic nature of the cross-organizational business processes poses various challenges to their successful execution. Services choreographies or distributed compositions of services help to reduce such complexity by providing means for describing complex systems at a higher level. However, this does not necessarily guarantee that erroneous situations cannot occur due to inappropriately specified interactions. In [7], [6], we propose an approach for decentralized monitoring of cross-organizational choreographies, using a runtime event-based approach to deal with the problem of monitoring conformance of interaction sequences. Our approach allows for an automatic and optimized generation of rules. After parsing the choreography graph into a hierarchy of *canonical* blocks, tagging each event by its block ascendancy, an optimized set of monitoring queries is generated. We evaluate the concepts based on a scenario showing how much the number of queries can be significantly reduced. These results use our previous results about event-based framework DISC [33].

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR ConcoRDanT ANR-10-BLAN-0208 (2010–2014)

Participants: Pascal Urso [contact], Mehdi Ahmed-Nacer, Claudia-Lavinia Ignat, Gérald Oster.

Partners: REGAL project-team (Inria Paris - Rocquencourt / LIP6, coordinator), CITI institute (Universidade Nova de Lisboa, Portugal), GDD team (University of Nantes) and SCORE team.

Website: <http://concordant.lip6.fr/>

Massive computing systems and their applications suffer from a fundamental tension between scalability and data consistency. Avoiding the synchronisation bottleneck requires highly skilled programmers, makes applications complex and brittle, and is error-prone.

The ConcoRDanT project (oct. 2010 – apr. 2014) investigates a promising new approach that is simple, scales indefinitely, and provably ensures eventual consistency. A Commutative Replicated Data Type (CRDT) is a data type where all concurrent operations commute. If all replicas execute all operations, they converge; no complex concurrency control is required. We have shown in the past that CRDTs can replace existing techniques in a number of tasks where distributed users can update concurrently, such as co-operative editing, wikis, and version control. However CRDTs are not a universal solution and raise their own issues (e.g., growth of meta-data).

The ConcoRDanT project engages in a systematic and principled study of CRDTs, to discover their power and limitations, both theoretical and practical. Its outcome will be a body of knowledge about CRDTs and a library of CRDT designs, and applications using them. We are hopeful that significant distributed applications can be designed using CRDTs, a radical simplification of software, elegantly reconciling scalability and consistency.

7.1.2. ANR STREAMS ANR-10-SEGI-010 (2010–2013)

Participants: Gérald Oster [coordinator], Luc André, Claudia-Lavinia Ignat, Pascal Urso, Hien Thi Thu Truong.

Partners: SCORE team (coordinator), ASAP project-team (University of Rennes 1 / Inria Rennes - Bretagne Atlantique), CASSIS project-team (Inria Nancy - Grand Est / Nancy University), REGAL project-team (Inria Paris - Rocquencourt / LIP6) and GDD team (University of Nantes / LINA)

Website: <http://streams.loria.fr/>

The STREAMS project (nov. 2010 – oct. 2013) proposes to design peer-to-peer solutions that offer underlying services required by real-time social web applications and that reduce the disadvantages of centralised architectures. These solutions are meant to replace a central authority-based collaboration with a distributed collaboration that offers support for decentralisation of services.

The STREAMS project aims to advance the state of the art on peer-to-peer networks for social and real-time applications. Scalability is generally considered as an inherent characteristic of peer-to-peer systems. It is traditionally achieved using replication technics. Unfortunately, the current state of the art in peer-to-peer networks does not address replication of continuously updated content due to real-time user changes. Moreover, there exists a tension between sharing data with friends in a social network deployed in an open peer-to-peer network and ensuring privacy. One of the most challenging issues in social applications is how to balance collaboration with access control to shared objects. Interaction is aimed at making shared objects available to all who need them, whereas access control seeks to ensure this availability only to users with proper authorisation. STREAMS project aims at providing theoretical solutions to these challenges as well as practical experimentations.

7.1.3. Wiki 3.0 (2009–2012)

Participants: Claudia-Lavinia Ignat [contact], Luc André, Gérald Oster, G r me Canals, Bogdan Flueraș.

Partners: XWiki SAS, SCORE team and Mandriva.

Website: <http://wiki30.xwikisas.com/>

The Wiki 3.0 project (december 2009 - june 2012) was sponsored by the call for projects “Innovative Web” launched by the French Ministry of Economy. The objective of this project was the development of an open-source platform based on XWiki (<http://www.xwiki.org>) that addressed 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. SCORE team was responsible with the design and integration of real-time editing features into the XWiki system. We designed solutions for a raw text editor as well as for a WYSIWYG editor for XWiki pages. The real-time wiki editor has been released as an extension of XWiki (<http://extensions.xwiki.org/xwiki/bin/view/Extension/RealTime+Wiki+Editor>).

7.1.4. ANR Kolflow (2011–2014)

Participant: G r me Canals.

Partners: GDD team (University of Nantes / LINA), Loria (Orpailleur and Score Teams), Silex Team (LIRIS, University of Lyon), Edelweiss (Inria Project).

Website: <http://kolflow.univ-nantes.fr/mediawiki/index.php>

Kolflow aims at building a social semantic space where humans collaborate with smart agents in order to produce knowledge understandable by humans and machines. Humans are able to understand the actions of smart agents. Smart agents are able to understand actions of humans. Kolflow targets the co-evolution of content and knowledge as the result of interactions of humans and machines.

7.1.5. FSN OpenPaaS (2012–2015)

Participants: Olivier Perrin, Ahmed Bouchami.

Partners: Samovar team (Telecom SudParis), SCORE team (Universit  de Lorraine, Loria), ARMINES (Ecole des Mines d’Albi), Brake France, Linagora.

Website: <http://www.open-paas.org>

The OpenPaaS project aims at developing a PaaS (Platform as a Service) technology dedicated to enterprise collaborative applications deployed on hybrid clouds (private/public). OpenPaaS is a platform that allow to design and deploy applications based on proven technologies provided by partners such as collaborative messaging system, integration and workflow technologies that will be extended in order to address Cloud Computing requirements. Available as an open-source Enterprise Social Network, the OpenPaaS project innovates both at the collaborative level and by its capacity to leverage heterogeneous cloud technologies at the IaaS level (Infrastructure as a Service). This project is funded under the French FSN umbrella (Fond National pour la soci t  Num rique).

7.2. International Initiatives

7.2.1. GIS Interop Grande Région

Participants: Nacer Boudjlida [responsible], Khalid Benali, François Charoy, Olivier Perrin, Claude Godart.

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 institutions that compose the Grande Region pole are University of Namur, University of Paris I La Sorbonne, University Lyon II, INSA Lyon, INSA Strasbourg, the former University Henri Poincaré Nancy 1 and the former University Nancy 2. The pole is legally 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. The role of the GIS is to animate regional scientific cooperation among the French GIS partners and Luxembourg (Henri Tudor Public Research center) and Belgium (University of Namur) as well as international cooperation since the INTEROP V-Lab encompasses lot of partners coming from the European Union and from China. Nacer Boudjlida is the head of the management committee of the INTEROP Grande Region and he is also a member of its scientific committee.

7.2.2. Associate Team Inria VanaWeb

SCORE is involved in the Associate Team Inria VanaWeb (with UTFSM Valparaíso, 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 Valparaíso, Chili) and Christophe Ringeissen (CASSIS).

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Valerie Shalin is an associate Professor in the Department of Psychology of Wright State University. She is a leading researcher in the domain of Human factors and she has a comprehensive expertise on empirical and analytic methods to support the design and evaluation of coordinated work. We are collaborating with her on an ongoing project that tries to understand the actual implications of real time collaboration.

8. Dissemination

8.1. Scientific Animation

- Khalid Benali has been PC member of french conferences (INFORSID'2012 (Montpellier, France)), international conferences (I-ESA'12 (Valencia, Spain), COLLA 2012 (Venice, Italy), SAINT 2012 (Izmir, Turkey), IWEI 2012 (Harbin, China), SYSCO 2012 (Sousse, Tunisie)), and workshops (MEDES 2012 (Addis Ababa, Ethiopia)).
- Nacer Boudjlida is a member of the *prime board* of the program committee of I-ESA'2010 and I-ESA'2012 (International Conference on Interoperability of Enterprise Systems and Applications). He regularly acts for several years as a PC member for many international conferences and workshops (CAiSE, COOP'IS, EMMSAD, SIIE, INFORSID, WWS, etc.).
- Nacer Boudjlida addressed a keynote at the 2011 Join-Med Workshop, Rabat, Morocco.
- Nacer Boudjlida performed an invited tutorial at the second IEEE Intern'l Workshop on Advanced Information Systems for Entreprises, IWAISE'2012, Contantantine, Algeria.

- G r me Canals is the co-chair of the "Mobilit  et Ubiquit " french national working group (GDR I3).
- Fran ois Charoy has been PC member of ICEBE (International Conference on Business Engineering) 2012, CTS 2012 (International Symposium on Collaborative Technologies and Systems), DG.O (International Conference on Digital Government Research) 2012, CEC 2012 (IEEE Conference on Commerce and Electronic Computing), ACIS (Australasian Conference in Information Systems) 2012 and of several workshops. He is member of the editorial board of the Service Oriented Computing and Applications Journal (Springer). He was co-chair of the Second Collaborative Technology for Coordinating Crisis Management Track at WETICE 2012
- Claude Godart is member of the editorial board of "Advance in enterprise systems" and "International Journal of E-adoption" journals, and member of the review board of the International Journal of Next Generation Computing. He has been or is program committee member of BPM (Business Process Management) 2012, BPMDS (Business Process Modelling, Development and Support) 2012, IEEE EDOC (The enterprise computing conference) 2012, CEC (IEEE Conference on Commerce and Enterprise Computing) 2012, IEEE CLOUD Computing 2012, IEEE ICWS (International Conference on Web Services) 2012, IEEE SCC (IEEE International Conference on Services Computing) 2012.
- Claudia-Lavinia Ignat is member of the editorial board of Journal of CSCW (Computer Supported Cooperative Work). She was part of the Reviewing Committee of the CTS 2011 (International Symposium on Collaborative Technologies and Systems) special issue of FGCS (Future Generation Computer Systems) journal. She has been or is PC member of GROUP (International Conference on Supporting Group Work) 2012, CDVE (International Conference on Cooperative Design, Visualization and Engineering) 2012 and 2013, ICEBE (International Conference on Business Engineering) 2012, AINA (International Conference on Advanced Information Networking and Applications) 2012 and the workshop IWCES (International Workshop on Collaborative Editing Systems) in 2012 and 2013.
- G rard Oster was a PC member of CoopIS 2012 (International Conference on Cooperative Information Systems) and MSOP2P 2013 (7th International Workshop on Modeling, Simulation, and Optimization of Peer-to-peer Environments).
- Olivier Perrin has been Co-Chair of the ICSOC PhD symposium, and Program Committee member of ICSOC 2012, WCE (Workshop on Capability based Engineering) workshop at WISE 2012, GRCIS workshop 2012. He was reviewer for BPM 2012. He reviewed in 2012 papers for IEEE Transactions on Services Computing, IEEE Transactions on Software Engineering, IEEE Transactions on the Web, Web Services Handbook, Journal of Intelligent Information Systems, and Software and Systems Modelling journals.
- Fran ois Charoy was member of the Administration Council of University de Lorraine until August 2012.
- 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. She is in charge of European affairs for Inria Nancy Grand-Est.
- G rard Oster is member of the Administration Council of TELECOM Nancy.
- G r me Canals is invited to the Administration Council of Lorraine University Institute of Technology (IUT Nancy Charlemagne) as head of department.
- Boudjlida Nacer is a member of the Council ("Conseil") of the Scientific and Technology Faculty (FST) of the University of Lorraine, a member of the directorial board of council of the scientific sector MIAE (Mathematics, Informatics, Automatic, Electronic), as he is a member of the council of the Science and Technology collegium of that FST.

8.2. Teaching - Supervision - Juries

8.2.1. Teaching

Permanent members of the Score team are leading teachers in their respective institutions. They are responsible of lecture in disciplines like software engineering, database systems, object oriented programming and design, distributed systems, service computing and even more advanced topics at all levels and in all kind of departments in the University. Most of the PhD Students have also teaching duties in the same institutions. As a whole, the Score team accounts for more than 2500 hours of teaching.

- Nacer Boudjlida was the head until June 2012 of the Computer Science department of the Faculty of Sciences and Technologies, University of Lorraine.
- G r me Canals is the head of the Computer science department of the Nancy University Institute of Technology (IUT Nancy Charlemagne), and is responsible for the professional licence degree "Web application programming" since sept. 2011.
- Jacques Lonchamp is responsible for the professional licence degree "Free and Open Source Software".
- Claude Godart is head of the Computer Science department of the engineering school ESSTIN of the *Ecoles d'ing nieurs er Cycles pr paratoire* at University of Lorraine. He is study director of the master degree *Distributed Services, Security and Networks* of the *Sciences and Technologies Collegium* at University of Lorraine.
- Khalid Benali is responsible for the professional Master degree speciality "Distributed Information Systems" of MIAGE and of its international branch in Morocco.
- Olivier Perrin is responsible of the Certificat Informatique et Internet (C2I) course for DEG collegium of University of Lorraine.
- Fran ois Charoy is responsible of the Software Engineering specialisation at the TELECOM Nancy Engineering School of University of Lorraine.
- G rald Oster is responsible of the 3rd year internship program at the TELECOM Nancy Engineering School of University of Lorraine.

We detail next the teaching activities for our permanent researchers in the tema:

Master: Claudia-Lavinia Ignat, Data replication and consistency maintenance, 15h lectures, M2, University of Lorraine

Master: Claudia-Lavinia Ignat, Java and distributed systems, 12h lectures and 24h exercise classes (Travaux dirig s), M1, ESSTIN, University of Lorraine

8.2.2. Supervision

PhD : Karim Dahman, Gouvernance et  tude de l'impact du changement des processus m tiers sur les architectures orient es services : une approche dirig e par les mod les, Universit  de Lorraine, 10/2012, Fran ois Charoy et Claude Godart

PhD : Hien Thi Thu Truong, Contract-based and Trust-aware Collaboration Model , Universit  de Lorraine, 12/2012, Pascal Molli et Claudia-Lavinia Ignat

PhD in progress : Luc Andr , R plication et Maintien de la Coh rence en Temps R el dans les R seaux Pair- -pair, started in 9/2011, Fran ois Charoy et G rald Oster

PhD in progress : Mehdi Ahmed Nacer, complex CRDT for optimistic replication, started in 9/2011, Fran ois Charoy et Pascal Urso

PhD in progress : Elio Goettelman, Ex cution en confiance de processus dans le cloud, started in 9/2011, Claude Godart

PhD in progress : Aymen Baouab, Gouvernance et supervision d centralis e des chor graphies inter-organisationnelles, started in 9/2009, Claude Godart, Olivier Perrin

PhD in progress : Ahmed Bouchami , S curit  des donn es collaboratives d'une plateforme PaaS, started in 11/2012, Olivier Perrin

PhD in progress : Adrien Devresse , Study of effective sharing and analysis of very large metadata repositories: application to the High Energy Physics computing community, started on 11/2011, Olivier Perrin

PhD in progress : Yongxin Liao, Title: Semantic annotations for systems interoperability in a PLM environment, University of Lorraine, started in November 2010, Advisors: Nacer Boudjlida (LORIA) and Hervé Panetto (CRAN).

PhD in progress : Badrina Gasmî, Title: Distributed Competence Management, Béjaïa University, Algeria, started in January 2011, Advisors: Nacer Boudjlida and Hassina Talantikite (U. of Béjaïa).

PhD in progress : Faïza Bouchaib, Title: Toward a Generic Model for Competence Management, Béjaïa University, Algeria, started in January 2011, Advisors: Nacer Boudjlida and Hassina Talantikite.

8.2.3. *Juries*

SCORE members were member of the following PhD defense committees:

- Hien Thi Thu Truong, PhD, Université de Lorraine, December 2012 (Claudia-Lavinia Ignat)
- Karim Benouaret, PhD, Université Claude Bernard Lyon 1, October 2012 (Claude Godart)
- Karim Dahman, PhD, Université de Lorraine, October 2012 (François Charoy and Claude Godart)
- Ahmed Gater, PhD, Université de Versailles St Quentin, June 2012 (Claude Godart)
- François Hantry, PhD, Université Claude Bernard Lyon 1, September 2012 (Claude Godart)
- Nguyen Ngoc Chan, PhD, Telecom Sud Paris, December 2012 (François Charoy)
- Issac Garcia Garza, PhD, Université de Grenoble, June 2012 (Olivier Perrin)
- Samir Sebahi, PhD, Université Claude Bernard Lyon 1, March 2012 (Olivier Perrin)
- Nicolas Boissel, PhD, Université de Toulouse, November 2012 (Olivier Perrin)
- M Mohamed Amine CHAABANE, PhD, Université de toulouse, september 2012 (Khalid Benali)
- M. Omar SAKA, PhD, Institut National des Sciences Appliquées de Lyon (INSA-Lyon), March 2012 (Khalid Benali)
- M. PENG Yong, PhD, Institut National des Sciences Appliquées de Lyon (INSA-Lyon), March 2012 (Khalid Benali)
- M. SU Ziyi, PhD, Institut National des Sciences Appliquées de Lyon (INSA-Lyon), March 2012 (Khalid Benali)
- Mr Brahim BATOUCHE, University of Le Havre (F) and Henri Tudor Public Research Center (CRPHT, Luxembourg) (Nacer Boudjlida)
- Khaled Aslan Almoubayed, University of Nantes, November 2012 (Gérald Oster)

SCORE members were members of the following Habilitation defense committee:

- Mme Selmin NURCAN, HDR, Université Paris 1 Panthéon Sorbonne, december 2012 (Khalid Benali)
- Mme Frédérick BENABEN, HDR, Institut National Polytechnique de Toulouse, October 2012 (Khalid Benali)
- HU (Habilitation Universitaire, equivalent to the French HDR) of Salah Baïna, December 2012, ENSIAS, University Mohammed V- Souissi, Rabat, Morroco (Nacer Boudjlida, reviewer and member of the defense committee)

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- [1] K. DAHMEN. *Gouvernance et étude de l'impact du changement des processus métiers sur les architectures orientées services : une approche dirigée par les modèles*, Université de Lorraine, October 2012.
- [2] H. T. T. TRUONG. *Contract-based and Trust-aware Collaboration Model*, Université de Lorraine, December 2012, <http://tel.archives-ouvertes.fr/tel-00769076>.

Articles in International Peer-Reviewed Journals

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- [4] H. T. T. TRUONG, C.-L. IGNAT, P. MOLLI. *A Contract-Extended Push-Pull-Clone Model For Multi-Synchronous Collaboration*, in "International Journal of Cooperative Information Systems", November 2012, vol. 21, n^o 3, p. 221-262 [DOI : 10.1142/S0218843012410031], <http://hal.inria.fr/hal-00761038>.
- [5] E. YAHIA, M. LEZOUCHE, A. AUBRY, H. PANETTO. *Semantics enactment for interoperability assessment in Enterprise Information Systems*, in "Annual Reviews in Control", April 2012, vol. 36, n^o 1, p. 101-117 [DOI : 10.1016/J.ARCONTROL.2012.03.008], <http://hal.inria.fr/hal-00671856>.

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- [6] A. BAOUAB, W. FDHILA, O. PERRIN, C. GODART. *Towards Decentralized Monitoring of Supply Chains*, in "The 2012 IEEE Nineteenth International Conference on Web Services (ICWS 2012)", Honolulu, United States, IEEE Service Computing, June 2012, <http://hal.inria.fr/hal-00718203>.
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- [20] M. AHMED-NACER, P. URSO, C.-L. IGNAT, G. OSTER. *Évaluation de l'occupation mémoire des CRDTs pour l'édition collaborative temps-réel mobile*, in "UbiMob - French-speaking Conference on Mobility and Ubiquity Computing - 2012", Anglet, France, Cépaduès Editions, June 2012, <http://hal.inria.fr/hal-00710258>.

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