Unité de Recherche en Informatique

Our primary mission is to conduct fundamental and applied research in the area of computer, communication and information sciences. Our goal is to push forward the scientific frontiers of these fields. Additionally, we provide support for the educational tasks at the academic and professional Bachelor and Master levels as well as for the PhD program.

The CSC Research Unit is divided into four laboratories with different research priorities (Advanced Software Systems, Communicative Systems, Intelligent and Adaptive Systems, Information Security). The CSC participates in two research programs which are supported by the university: Cell Communication (with the Life Sciences Dept.) and Security and Trust (with the Economics Dept.). Currently, the CSC includes 20 professors, 10 post-docs, more than 50 PhD candidates, and a number of research collaborators. Their research fields range from the investigation of the theoretical foundations to the development of interdisciplinary applications.

Currently, we instruct more than 200 students at the Bachelor and Master level, and try to encourage them through close supervision and advice. For the professional branches, we want to bridge the gap between theory and practice, whereas for the academic branches, we foster on a problem-oriented understanding of the theoretical foundations of computer science.

At the end of 2006, CSC went through a major change by merging with the LACS (Laboratory of Algorithmics, Cryptography and Security) of the Faculty of Law, Economics and Finance. This allows us to have in 2007 the largest research unit of University of Luxembourg and enables us to reach a critical mass in terms of research and focus on computer and information sciences at University of Luxembourg.

In 2006, CSC went through a fruitful recruitment campaign bringing in:

- Professor Leon van der Torre from CWI, Amsterdam
- Professor Simin Nadjm-Tehrani from the University of Linköping
- Professor Sjouke Mauw from the University of Eindhoven

Projets

Intitulé du projet de recherche: **Evo-Business**: Applying evolutionary computing for real-world

Référence : R1F104T01

Chef de projet : Pascal BOUVRY

Equipe des chercheurs : Christoph Schommer, Grégoire Danoy, Ben Schroeder

Domaine de recherche : Informatique

Durée du projet : 2004-2007

Partenaires : Olivier Boissier, Ecole des Mines de Saint-Etienne
Enrique Alba, University of Malaga

Objectifs : Emerging paradigms based on nature-inspired techniques such as eevolutionary computing have been successfully applied to academic problems. We propose in the evo-business project to validate these approaches on real-world problems and in particular for distributed optimisation and knowledge acquisition.

Résultats : We designed and implemented DAFO, a distributed framework for function optimisation. In DAFO, a set of co-evolutionary agents are trying to optimise their local cost functions while the coordination scheme between these agents, including potential reorganisation, is organized such that a global positive behaviour emerges, i.e. reaching a global optimum. We have tested and compared our solution on the ICP (Inventory Control Parameter) problem. The performance of dLCGA was opposed to the performance of a Simple GA, CCGA, LCGA. We also studied the opportunity to hybridise evolutionary algorithms with tabu search and demonstrated the superiority of this combination to more standard ones (e.g. EC+hill climbing) on the ICP problem. We start exploring a more complex problem due to its dynamicity, i.e. the optimisation of bypass UMTS links for partitioned ad-hoc networks. The objective in this context consists in bringing small world prosperities to these networks.

We went on implementing the ANIMA library. In ANIMA, we concern with data streams and the idea to manage associations between them in an adaptive memory. So, we are interested in finding trends or stable associations over time. A very first demonstration was done on the July

research day of the MINE working group using data from a retail and sports.

Results have been published into 3 international conferences.

Intitulé du projet de recherche: **SIM:** Secure Identity Management

Référence : RSF1040103

Chef de projet : Pascal Bouvry

Equipe des chercheurs : Riad Aggoune, Marcin Seredynski

Domaine de recherche : Informatique

Durée du projet : 2005-2007

Partenaires : Polish Acamy of Sciences (Mieczysław Kłopotek), CRP-TUDOR (Project Leader), KBL, SUN, Onetree Technologies

Objectifs : The part of UL consists in exploring the future of access control and in particular the use of trust management for securing ad-hoc networks.

Résultats : We have been studying the problem of broadcast on ad-hoc networks and the simulation of such networks (in coordination with the SoNi project) and the notion of trust on ad-hoc networks (in coordination with the Abasmus project).

Then we defined a mathematical model based on game-theory for modelling and studying the management of trust on ad-hoc networks. Local strategy of players is optimised using genetic algorithms. We included modelling real-world parameters such as battery level.

We have shown that having a few repeating interactions allow players to rapidly build trust and also avoid them suffering of constant selfish players.

The results have been published into 4 international conferences in 2006.

In 2007, we shall explore the use of swarm optimisation in the context of trust management and in particular ant colonies.

Intitulé du projet de recherche:	**SoNi:** Self-organized Network infrastructures
Référence :	R1F103T02
Chef de projet :	Pascal Bouvry
Equipe des chercheurs :	Steffen Rothkugel, Luc Hogie, Christian Hutter
Domaine de recherche :	Informatique
Durée du projet :	2003-2007
Partenaires :	Enrique Alba, University of Malaga Frédéric Guinand, University of le Havre
Objectifs :	The objective of Soni is to study emerging paradigms for self-organizing networks and study the need of new middleware layers.
Résultats :	We have been studying the problem of broadcast on ad-hoc networks and the simulation of such networks. A survey on ad-hoc network literature has been built. A full featured ad-hoc network simulator (MadHoc) has been designed and developed at UL. This simulator is focused on large city-wide hybrid networks with highly mobile devices using multi-hop communications. New mobility models, going much further than existing ones such as random way point, have been designed and implemented into Madhoc. In particular, we have a model simulating the behaviours of citizens and describing car traffic on highways. DFCN, a new broadcast algorithm for ad-hoc networks has been designed and validated. DFCN parameters have been fine-tuned using a multi-objective approach combined with new generation of meta-heuristics. This work was published into 2 international conferences in 2006. The PhD defence of Mr Luc Hogie, who performed his research in the context of SoNi project, is planned on April 18, 2007. Another approach for information dissemination in mobile multi-hop ad hoc networks is the usage of a directory service. The Ad hoc Directory Service (ADS), which has also been developed at UL, has been used to investigate in the areas of proactive, reactive as well as on demand information delivery using profile information.

Intitulé du projet de recherche: TESEGRAD: Techniques for Secure Grids and Ad-Hoc networks

Référence : RSF1040105

Chef de projet : Franck Leprevost (UL-FDEF part)
Pascal Bouvry (for the FSTC part)

Equipe des chercheurs : Riad Aggoune, Le Hoai Minh (PhD Student)

Domaine de recherche : Informatique

Durée du projet : 2005-2007

Partenaires : Franck Leprevost (Project Leader)
Franciszek Seredynski (Polish Academy of Sciences)
Le Thi Hoai An (University of Metz)
Telindus

Objectifs :

Started at the 2005 summer, the TESEGRAD project (Techniques for Secure Grids and Ad-Hoc Networks), aims at developing new tools and infrastructures for secure grid and ad-hoc computing. Existing tools face severe limitations that hinder their use in a truly distributed environment. This project explores two main axis. The first of them is the application of evolutionary computing to security and cryptography, while the second is anonymity on the Internet.

The first axis explores the use of evolutionary computing and hybrid approaches (exacts methods mixed with heuristic ones) for combinatorial optimization and search issues that appear in cryptology. In particular in 2006, we focused on using cellular automata (CA) for secret key cryptography and a distributed convex (DC) approach for the generation of high-quality s-boxes. This has resulted in proposing a new cryptosystem based on one-dimensional CA using radius 2 rules and in developing new algorithms for optimizing the imbalance and non-linearity of Boolean s-boxes that outperform existing solutions based on similar techniques. In 2007, we plan to extend the use of hybrid methods (e.g. mixing genetic and distributed convex approaches generation and explore cryptanalysis using DC.

Results of this work has been published into various international conferences

Intitulé du projet de recherche :	**SECAN-Lab** Interoperability Laboratory for Security in Ad-Hoc Networks
Référence :	R1F104T05
Chef de projet :	Thomas ENGEL
Equipe de chercheurs :	Uwe Roth
Domaine de recherche :	Computer Science
Partenaires :	Credit Suisse, Dresdner Bank, ESA, SES ASTRA, Siemens, P&T, RESTENA, VOXMobile

Objectifs:

In the SECAN-LAB the research is targeted towards the area of interoperability- and security-aspects of spontaneously created and self-organized wireless networks (MANETs = Mobile Ad-Hoc Networks).

Because of the spontaneous character of Ad-Hoc networks without any centralized infrastructure, participants of such networks depend on the friendliness of their neighbours, if a communication to a distant device is required. Security-mechanisms like encryption or PKIs are not suitable, if the delivery of data needs to be ensured. These technologies cannot guarantee the absence of malicious or unfair participants of the networks.

There are better ways to increase cooperation. Exclusions or motivations are two ways to go, but these techniques may have problems with definite identities. Therefore the SECAN-LAB focuses on trust-relations as a means to increase cooperation. Trust can be rated between direct neighbours as well as between devices in n-hop distance.

Other targets of research are the interoperability of different communication partners, the scalability of Ad-Hoc networks compared to its number of participants, the tolerance of the network to a certain amount of malicious and unfair participants and the linking of Ad-Hoc networks with wired LANs.

The lab focuses, beside theoretical analysis and development of solutions, on practical experiences with newest mobile devices, especially for securing 1:1-comunications in n-hop-distance.

Résultats:

In 2006 laboratory infrastructure has been finished with one admin-room, two laboratory rooms, one laboratory classroom and one server-room, equipped with a telecom interoperability test infrastructure (POTS, ISDN, GSM/GPRS, UMTS ...) provided by Siemens and P&T (worth 2.2mio€) and several Servers which provide storage, simulation facilities, the Wiki-system and our Website.

The SECAN-Lab continued its work on Trust&Security and Identity&Anonymity in wireless networks. The Trust-term is now well understood and the development of scenarios to proof the results are going on. Beside that, a new thread model was developed which gives the possibilities to model attacks inside an Ad-Hoc network.

Intitulé du projet de recherche : Mesh Sequencer Service Quality Enhancement and Cooperatively Enforced Reliability in Mesh Networks

Référence : R1F104T05

Chef de projet : Thomas ENGEL

Equipe de chercheurs : Volker Fusenig, Dagmara Spiewak, Eugen Staab

Domaine de recherche : Computer Science

Partenaires : Credit Suisse, Dresdner Bank, ESA, SES ASTRA, Siemens, P&T, RESTENA, VOXMobile

Objectifs: Wireless Mesh Networks (WMNs) are a rather new technology to deploy wireless networks. The concept is to install fixed wireless devices, usually called Mesh Nodes or Modes, in a certain region. These Modes are equipped with one or more wireless interfaces, which they use to communicate with each other. As such, the array of Modes forms a network that can be accessed by mobile devices by connecting to one of the Modes. Additional services, like Internet access can be delivered mobile devices in a multi-hop manner if one or more Modes provide additional gateway functionality or other capabilities. These Modes are denoted as Hot Spots (HS), where as the others are called Transient Access Points (TAPs).

An important issue is the achievable capacity, which may be provided from the Hot Spots to the mobile clients. The scalability of the capacity in WMNs is often doubted and considered as the big drawback where WMNs are considered as an optional networking strategy. The origin of this doubt is the potential loss of bandwidth in a wireless multi-hop communication as packets to be send need to access the same wireless media several times to be delivered from source to destination. Nodes on a multi-hop can only provide one third of the channels date rate because of this problem.

Résultats: In a first step the possible capacity of WMNs have been studied. Due to parallelism in the Mesh Network it might potentially be possible to masquerade the lost performance and to globally achieve a satisfying utilization.

Intitulé du projet de recherche : U-2010 Ubiquitous IP centric Government & Enterprise Next Generation Networks Vision 2010

Référence :	REF0106001 / REF0106002
Chef de projet :	Thomas ENGEL
Equipe de chercheurs :	Thomas Scherer Raphael Frank
Domaine de recherche :	Computer Science
Partenaires :	16 partners from 10 European Countries
Objectifs:	U-2010 is an Integrated Research Project of the European Research Frame Program coordinated by the University of Luxembourg. Its objective is to provide the most capable means of communication and the most effective access to information to everybody required to act in case of accident, incident, catastrophe or crisis, while using existing or future telecommunication infrastructures. The project will address the public safety issues by researching new emergency and crisis management solutions investigating on innovative and state-of-the-art communication technologies based on the current and new Internet technologies that could be put to use and realize this vision. Technologies in operations and under evaluation provide an enhancement of availability by, interconnecting existing services and networks, leveraging redundant communication channels, using automatic redirection and/or service transformation in case of failures, and using new research results in the area of wireless ad-hoc networks. U-2010 scenarios involve wireless hardware that might be placed temporary or permanently outside of buildings more or less unprotected, like Sensor nodes, Mobile Access Router, Mesh nodes, or Wireless Network backbones. This hardware needs to be identified by the users due to several reasons: Foreign sensor nodes may provide falsified information or foreign networking hardware may route confidential data possibly anywhere and may eavesdrop the entire communication. Although, completely excluding foreign networking hardware is unrealistic in crisis and emergency situations. Reasonable security features should be provided by the foreign networking hardware.
Résultats:	After collecting different user requirements, the preliminary network architecture was defined and validated by the European review committee. Numerous related projects and new cooperation's were set up in order to take advantage from their knowledge. The University of Luxembourg is currently developing a communication application which will play a central role in the first demonstration which will simulate a rescue operation for a fire in a tunnel.

Intitulé du projet de recherche : ESA Security Protocol for ESA Ground Segment

Référence : RAF105ESA

Chef de projet : Thomas ENGEL

Equipe de chercheurs : Daniel Fischer

Domaine de recherche : Computer Science

Partenaires : ESOC European Space Operations Centre (Darmstadt)

Objectifs: The importance of information security now applies to space communication systems. Together with the increasing usage of standardization, agencies start to formulate security requirements for many of their missions. Proprietary solutions so far lead to increasing development and maintenance costs.

Today, most missions are supported by point-to-point communication infrastructures. New generation of space missions will rely on next generation satellite networks and especially inter-satellite communication. Such kinds of networks cannot be supported by point-to-point protocols as they require more sophisticated networking features. Those networks also require more advanced security support where the primary goal is to secure access to network resources and provide identity management.

The project consists of several parts that together provide a guidance for the evolution of security systems from today's to next generation satellite networks.

Résultats: The current space link communication protocols, developed and maintained by the Consultative Committee for Space Data Systems (CCSDS) are analyzed and possibilities to include security features like telecomm and authentication and telemetry encryption are implemented. The participants of this project are actively involved in CCSDS security standardization as members of the CCSDS security working group.

Having investigated the security situation in point-to-point space links the project also investigates security challenged in next generation satellite networks. The unique network topology and space related environmental properties require adapted or new approaches in secure communications. A satellite communication network topology behaves like mixture of wired and ad-hoc networks and therefore requires a joint-venture of both approaches in order to achieve the desired objectives. In this project, special focus lies on the topics of identity and key management with respect to the limited resources of a satellite network. The project especially considers independent, non-trustable mobile ground terminals that are interconnected with the satellite network as such devices will become common in the next few years.

Intitulé du projet de recherche : Credit Suisse Component Oriented Security Systems Modelling

Référence : RAF0106003

Chef de projet : Thomas ENGEL

Equipe de chercheurs : Christoph Brandt

Domaine de recherche : Computer Science

Partenaires : Credit Suisse

Objectifs: Currently, the distributed systems the Credit Suisse Luxembourg is running their banking applications on are secured in a more or less

handcrafted manner. Best practice strategies, organizational rules, and technical mechanisms are in place. However, an overall security concept for distributed systems using constructive and formal methods being implemented by scalable and extendable tools is still not available. Therefore the overall security state of the existing environment is unknown and cannot be tested as such.
In this project, strategies using constructive and analytical methods are going to be tested for being suitable for this scenario. Additionally, concrete tool support is going to be evaluated.
In detail, security requirements are formulated and combined using logical calculus that is implemented using rule based programming like Prolog. At the bottom line, an end-to-end mathematical foundation to handle security issues is established. The daily use of the mathematical methods is happening by appropriate tools implementing these mathematical methods. One important aspect is to hide the mathematical complexity from the users, however enabling them to benefit of the methods' power.

Résultats:

First the importance of the interplay of different methods to establish an end-to-end mathematical ground for a sound reasoning about security is stressed out. Methods interplay means that security is not only about solutions regarding certain aspects of the presented scenario, but the scenario as a whole. Second, the selection of certain methods used in the project's context and the integration of the selected methods is discussed. It is not the primarily objective to develop new methods to treat security issues, but to develop, coming from the concrete scenario, requirements a sounds solution must match. Third, the integration of the selected methods is discussed.
Based on identified deficits possible customizations and further developments of the proposed methods are identified. Method integration encompasses the sound and complete back and forth connection of different methods, and their abilities to treat security issues relevant for the scenario of the Credit Suisse.

Intitulé du projet de recherche : **Dresdner Bank.** Secure Usage and Trust of Mobile Devices in Networks for International Banking Environments

Référence : RAF0106004

Chef de projet : Thomas ENGEL

Equipe de chercheurs : Michael Stieghahn

Domaine de recherche : Computer Science

Partenaires : Dresdner Bank

Objectifs: Over the last years mobile solutions got a tremendous significance within daily business. Employees want to have access to their data or they have to be reachable. Employees want to be up-to-date without add. Additional information or updates have to be given to an employee during the field work. IT departments cannot resist any longer introducing mobile solutions.

If mobile solutions are introduced into the existing network the security has to be maintained. Those devices introduce threats which not exist in the existing infrastructure, because mobile devices rely on a wireless connection.

The integration of mobile devices into an existing network draws some new security issues regarding the wireless connection and the location of a mobile device. Respectively, different preventive measures have to be provided to ensure the security of the existing network, but this can also improve the security of the existing infrastructure.

Résultats: In the first instance it was decided to introduce an intrusion detection and prevention system (IDS/IDP). Hence, different products (appliances) were chosen from the pre-selection for security and usability tests. In order to run the tests a test laboratory had to be set-up, which consists different server as targets and attacker devices from inside and from outside.

In the first step the usability was tested. Due to the fact that the appliances were able to provide a unified threat management (UTM), which not only enables the devices to monitor the traffic like a firewall or router or monitor traffic regarding to known attacks, but to also scan the traffic to malicious code like viruses, Trojan horses and back-door programs, an update of the databases/signatures had to be done after the installation.

The last step was to attack the server from outside and inside the network by a predefined set of attacks and to monitor the reaction of the appliances. Hereby, an important issue was whether an appliance could detect and prevent an attack.

Intitulé du projet de recherche : JRA5

Référence :

Chef de projet : Thomas ENGEL

Equipe de chercheurs : Stefan Winter

Domaine de recherche : Computer Science

Partenaires : Restena

Objectifs:

The goal of the JRA5 activity is to create an authentication and authorisation infrastructure, both for network roaming access (the "eduroam" sub-project) and for application-level identity federations (the "eduGAIN" sub-project).

Creating a world-wide roaming confederation is a challenging enterprise in several dimensions:

Technically

The infrastructure must scale to an at least European, maybe even worldwide level; it must also be secure for the end user and inherently make leakage of user credentials impossible

Politically

The different funding bodies and business models of possible participants need to be consulted and satisfied to actually allow the participants to join the infrastructure

Policy-wise

A contractual framework must be created to ensure legal safety for all participants and to make sure legal constraint with regards to logging etc. are met

User acceptance

The service must be relatively easy to use by the end users while still maintains security in the login process and during the user's session

Résultats:

Last year's efforts within JRA5 were mostly concentrated on the network roaming part. The main mile stones were:

- Definition of a confederation policy for Europe
- Providing guidelines for federation (in most cases national) policies
- Defining a scalable architecture to accommodate further growth
- Introducing a new protocol for the transport of user data
- Implementing a reference implementation for this protocol

Intitulé du projet de recherche : **CORRECT : rigorous stepwise development of Complex Fault TOlerant DistRibuted Systems : from ARchitEcural DesCription to**

Java ImplemenTation

Référence: R1F104T04

Chef de projet: Nicolas GUELFI

Equipe des chercheurs: -

Domaine de recherche: Computer Science (Software Engineering)

Durée du projet: 2004 – 2007

Patenaires: Alexander Romanovsky, University of Newcastle upon Tyne, Didier Buchs, University of Geneva, Henry Muccini, University of L'Aquila

Objectifs: The Software Engineering community is still addressing a challenging objective which consists in increasing quality while decreasing the time to market and the development cost of the software commissioned.
Reusability and evolution identify two key-words that seem to be part of the solution space to achieve this objective. Since these two key-words constitute intrinsic characteristics of the Software Product Lines (SPL) development approaches, we claim that these approaches may contribute significantly in the provision of a feasible solution to achieve a software development methodology that will incorporate cost/time reduction and quality increase capabilities.
Taking into consideration a family of products, instead of a unique product, implies taking into consideration variability mechanisms among products. Variation points represent software characteristic that make one product evolve/involve into another one.
In the context of the CORRECT project we aim at providing a rigorous methodology to develop fault-tolerant distributed concurrent product lines in the e-Health domain.

Résultats: The CORRECT methodology investigates a fusion of the Model Driven Engineering approach (taking FIDJI process as starting point) with the SPL development approach, introducing dependability issues since the beginning of the software life-cycle. In particular, to achieve dependability, we investigate fault-tolerance approaches and in particular Coordinated Atomic Action (CAA), to be used to structure the system at each abstraction level. CORRECT starts with a requirements elicitation phase in which we consider dependability attributes, dependability threats and dependability means (especially fault tolerance). This phase is then followed by an analysis phase in which the elicited requirements are formally specified to be able to reach a complete and consistent set of requirements assumptions.

Intitulé du projet de recherche :	**Architecting Software Systems using Model Transformation and Architectural Frameworks**
Référence :	FIDJI
Chef de projet :	Nicolas GUELFI
Equipe des chercheurs :	-
Domaine de recherche :	Computer Science (Software Engineering)
Durée du projet :	2004-2007
Partenaires :	Prof. Dr. Patrick Heymans (University of Namur, Belgium), Dr Olivier Biberstein (Berne University of Applied Sciences School of Engineering and Information Technology)
Objectifs :	The aim of this research project is to found a model-driven methodology that allows for the flexible development of distributed applications trough the use of Object Oriented Frameworks combined with model driven techniques so called: *Architectural Frameworks* and model transformations to support framework *instantiation*. This PHD Research project builds on the results of the FIDJI project and extends them.
Résultats :	In 2006, a particular attention has been devoted to the definition and validation of the early phases of the methodology (requirements elicitation and analysis). In particular a new template for the elicitation of software product lines [1] has been proposed in collaboration with the CORRECT team and integrated with the analysis phase [2] of the method. The remaining work was dedicated to the design phase and the writing of the doctoral dissertation. In 2007, FIDJI methodology will be fully detailed in the PhD dissertation of Gilles Perrouin which will be defending during the year. In addition, some of the contributions of the PhD will b submitted for publication in a scientific journal.

Intitulé du projet de recherche :	**RESIST** : Towards a Secured, Efficient Platform for the e-Commerce of Personalized Health Products

Référence : RFF1 04 01 02

Directeurs de projet : Nicolas Guelfi , Pierre Plumer (CRP Henri Tudor)

Chef de projet : Marcos Da Silveira

Equipe des chercheurs CRP : Jerry-David Baldacchino, Marc Seil, Anke Wienecke

Domaine de recherche : Computer Science

Durée du projet : 2006-2009

Objectifs : The works that have been developed at LASSY workgroup, particularly in RESIST project, contribute to collect and analysis the organization of the information in the Luxembourg's health system. The objectives of these works are to define an architectural framework to integrating medical and financial information, physical devices and e-services in a dynamic and distributed structure. Further, these works look for facilitating different levels of users to input (offer), follow (choose) and access (demand) health related data (services), improving the life's quality of patients and reducing costs and medical errors.

Résultats : RESIST project started in august 2006 and had finished the first phase of the project that include the state of the art. The main results had been detailed in the three technical reports delivered by the work team. In the first one (D1.1), the contribution of software engineering, in particular Model Based Architecture, into Healthcare systems had been analysed. Different concepts and methodologies of software modelling were studied and compared in the document. A service-oriented architecture approach named TAPAS seems to be the most appropriated to RESIST project. Deeply studies about the flexibility and the capability to satisfy the requirements of RESIST have been made. The second document (D1.3) concerns the security policies and the legislation about electronic health records. A selected list of security policies was studied in order to identify the existing constraint to guarantee confidentiality, integrity and availability. The last document (D.4) encloses technologies and standards related to healthcare systems. The main idea is to present emerging standards defined to increase the interoperability between commercial solutions for electronic health records managing.

Intitulé du projet de recherche : **SESAME**: Specification-based Testing of Safety-critical small-sized Embedded Systems

Référence :

Chef de projet : Nicolas GUELFI

Equipe des chercheurs : Benoît RIES

Domaine de recherche : Computer Science – Software Engineering

Durée du projet : 2006-2009

Partenaires : Aloyse Schoos, IEE, Luxembourg, Technology & Tools Department

Objectifs :

The objective is to develop an approach for specification-based testing adapted to the needs and the constraints of safety-critical small-sized embedded systems. This approach aims to improve the efficiency of activities performed by test engineers, particularly during tests based on systems specifications. This approach must be founded on sound theoretical background and must be usable by test engineers. In particular, it will be a question of proposing a transformation language allowing the simplification of system specification models in order to facilitate the selection of test cases to perform. This approach should be integrated in a semi-formal approach for the specification and test of embedded systems. The formalism used for this study will be selected with respect to the recent UML2 notation standardized by the OMG in order to express functional, behavioural, structural, and real time properties.

Résultats :

Description of the targeted systems. The typical targeted systems to take into account in the SESAME methodology are the ones of the partner company, namely safety-critical small-sized systems embedded in cars. Particular characteristics of dependable embedded systems have been studied.

Definition of the SESAME methodology. The aim of this activity was the study of basic concepts and techniques related to specification-based testing. A consequent number of references to academic results were identified. A number of trainings for the partner company (IEE) were held based on the results of this study and were a great opportunity to gather industrial feedback.

Study on modelling languages. This is an activity of particular importance for this project, because the specification-based testing is primarily depending on the specifications available. For the end-user, Real-time statecharts have been selected. And a coming task will be the definition of real-time statecharts in terms of a formal specification language, e.g. CSP-OZ-DC.

Intitulé du projet de recherche : TARGET : Optimal Adaptive Information Management over the Web

Référence : BFR 05/077

Chef de projet : Nicolas Guelfi

Equipe des chercheurs : Cédric Pruski

Domaine de recherche : Informatique

Durée du projet : 2006-2008

Partenaires : Université Paris-Sud XI (Orsay), INRIA Futurs

Objectifs :

Since the introduction of the World Wide Web by Tim Berners-Lee in the early Nineties, and more recently the definition and the promising results of the semantic Web, the interest for concepts and tools that can improve the representation and the extraction of Web information only increase. One of the main reasons is, thanks to the popularity of the WWW, the consequence of the increasing number of web pages that constitute the WWW, and the need of tools that allow the retrieval in a powerful and relevant way of Web data. Actually only Web search engines like Google, or Yahoo allow the users to search the Web and find these pages but as they index a huge amount of data, it becomes obvious that during a search a lot of unwanted pages slip among and pollute the most relevant results returned by the engines, what obliges the user to spend a lot of time to skim the results before reaching information that he is really interesting in, (this problem could be easily illustrated by entering a simple query in Google), so the definition of adapted concept allowing to construct an abstract model of the data contained in a Web page and the development of tools that will ease the extraction of the data from these structures will solve this problem of relevance of the results.

On a second plan, the transitory and evolutionary aspect of the data listed on a Web page as well as the evolution of user's behaviour must be taken into account for the construction of a dynamic and flexible structure which will be able to be adaptive to the nature of the data which it represents and to user's behaviour to make efficient information retrieval.

Résultats : The main contributions are:

- The proposition of new structures build upon ontologies for representing the Web (the W^3Graph) and its content (the WPGraph)
- The development of ASK a query language for extracting knowledge from the W^3Graph and WPGraph
- The proposition of query expansion rules based on ontologies

Intitulé du projet de recherche : DASCOM : Declarative Approaches to Software Complexity

Référence : R1F105K06

Chef de projet : Pierre Kelsen

Equipe des chercheurs : Christian Glodt, Elke Pulvermüller (since August 2006)

Domaine de recherche : Computer Science (Software Engineering)

Durée du projet : 2005-2008

Objectifs :

Software complexity is one of reasons why many software projects run over time and over budget. In this research project we focus on declarative approaches for managing complexity. We propose to study a class of declarative approaches that satisfy three criteria:
- Simplicity: the description language should be sufficiently simple so as to ease the practical adoption;
- Graphical notation: graphical models are easier to comprehend and manipulate in general than purely textual ones;
- Executable models: the models produced should not simply be a high-level description of lower level artifacts but rather allow actual simulation and execution.

Current approaches tend to use overly complex description languages or fail to produce executable models. The starting points of our approach are the EOP-models describes in the preceding FACTORS research project.

Résultats :

There are two major results for 2006:
- The modelling language of EOP-models up to know enabled platform-specific modelling since it was based on Java. In 2006 we realized that by replacing Java with an abstract language (we chose OCL) we can design platform-independent models that are executable. This aligns

our modelling language with approaches from model-driven architecture.

- The first public release of the DEMOS tool took place in May 2006 (see http://lassy.uni.lu/demos). This tool allows one to design declarative executable models using an Eclipse plug-in that provides graphical editing of an application, background code generation and immediate feedback on the syntactic validity of user supplied code snippets.

Intitulé du projet de recherche : HyWercs : Hybrid Wireless Network Communications

Référence : R1F105K11

Chef de projet : Steffen ROTHKUGEL

Équipe des chercheurs : Adrian ANDRONACHE
Christian HIEDELS

Domaine de recherche : Computer Science

Durée du projet : 2005-2008

Partenaires : Peter STURM, University of Trier, Germany

Objectifs : We assume a system model where ad-hoc network devices organize themselves in clusters. The clusterheads are in charge of keeping track of local devices and their interests. Clusterheads are chosen according to their weight that is calculated by a heuristic weight function. Parameters like available power, signal strength to the backbone network, topological relations etc. are taken into account by means of this function. Clusterheads can act as injection points. Injection points maintain a connection to the backbone network and request information related to the common interests shared by the devices in the cluster. The information about available interests is provided by the backbone via the clusterheads to all devices in an ad-hoc network. The mobile devices register the interests selected by their users at the clusterhead, thus allowing keeping track of local interest groups.

Résultats : As proof of concept the HyMN Application (Hybrid Multimedia Network) has been implemented prototypically. The HyMN ad-hoc network is organized in clusters. For this, a clustering algorithm, namely WACA, which uses a heuristic weight function, was designed. The WACA algorithm builds an ad-hoc network topology that fits the needs of the applications running on participating devices. One objective of WACA is to avoid network communication overhead during the clusterhead election and clustering process. Therefore, the election of a clusterhead is based solely on information available locally. In a dynamic environment—both in terms of node mobility as well as steadily changing device parameters—the clusterhead election process has to be re-invoked according to a suitable update policy. In situations where few parameters change—e.g. one new neighbor is recognized or the bandwidth of the current clusterhead is changed slightly—it is reasonable to keep the existing clusterhead instead of re-electing a new one. In order to achieve this, an add-on mechanism for WACA termed

king bonus was developed. The king bonus mechanism aims at avoiding superfluous clusterhead elections in mobile networks, thus augmenting the stability of the cluster topology.

Intitulé du projet de recherche: ABASSMUS : Agent-Based Adaptive and Secure Service Provisioning for Mobile Users

Référence : R1F104T03

Chef de projet : Steffen ROTHKUGEL

Équipe des chercheurs : Pascal BOUVRY, Matthias R. BRUST, Patrick GRATZ, Christian HOFF, Marcin SEREDYNSKI, Ulf WEHLING

Domaine de recherche : Computer Science

Durée du projet : 2004-2008

Partenaires : Enrique Alba, University of Malaga; Mieczysław Kłopotek, Franciszek Seredynski, Institute of Computer Science, Polish Academy of Sciences,Warsaw; Carlos H. C. Ribeiro, Instituto Tecnológico de Aeronáutica, São José dos Campos SP, Brazil; Peter Sturm, University of Trier

Objectifs : The ABASSMUS project aims at providing an integrative system architecture that combines the features and advantages of both infrastructure-based and ad-hoc networks.

Résultats :

M-Learning Extensions to CrePes

We studied mLearning extensions to CrePes, a programming environment tailored to the special needs of kids. We have investigated new usage scenarios mobile devices open up for the CrePes environment along with some associated technical aspects and examples for collaborative programming tasks.

Web Service Interface Syndication

We developed a concept called Web Service Interface Syndication that makes use of these meta-structures as well as the weak coupling provided by Web Service standards in order to provide services in a collaborative and self-organized way.

Reconciliation of Structured Data in Multihop MANETs

Data exchanged in MANETs might be updated on several mobile devices concurrently, finally leading to different versions. We have investigated approaches to reduce the communication overhead required for the dissemination of the data while increasing the consistency of the data at the same time.

Weighted Application-Aware Clustering Algorithm

WACA fosters efficient information dissemination within the ad-hoc neighborhood as well as limits the use of uplinks to the backbone network. Furthermore, we proposed the introduction of a so-called king bonus mechanism in order to optimize the clusterhead election process by stabilizing efficient clusterheads.

Cooperation Enforcement Mechanism in Ad hoc Networks

We introduced a new game based environment targeted to simulate the behavior of ad hoc networks. Next, two cooperation enforcement mechanism based on so called forwarding rules were developed. The exact rules were evolved using a genetic algorithm and the game based simulation environment.

Intitulé :	Flexible Energy Systems Management (FESM)
Référence :	R1F105K12
Chef de projet :	Juergen SACHAU
Equipe de chercheurs :	Ralf HOBEN, Stefan KÖNIG
Domaine de recherche :	Systems and Controls Engineering
Partenaires :	**---**
Durée du projet:	2006-2010
Objectifs:	Distributed monitoring databases together with standardized evaluation tools are the basis for supply quality management, system comparison and improvement of the whole variety of distributed power systems. Energy system informatics plays a key role ranging from embedded control to optimizing supervisory control and techno-economic design. The acquisition and use of operational data allows for continuous improvement taking into account the experience from system operation together with evolution of supply demand. The results will assist in the planning of national, regional and local frameworks and projects on Luxembourg's way to sustainable energy and transport with emphasis on renewable hydrocarbons. Instead of increasing financial compensations for emissions, investments are attracted in new industries and crafting, which are suited to compensate for the decreases in traditional industries. The systematic approach through all levels from national over regional to local scale, gives a transparent techno-economic framework applicable by most diverse policy making, planning, implementing and operating partners.

Résultats :

Within the objective of the FESM a core research topic in the direction of sustainable regional planning of decentralized biomass energy systems has been crystallized. Therefore, we first work on a possibility of a sustainable calculation of the available biomass potential. One of our principles is in the strategic approach, i.e. we try to elaborate models useable in every geographical area. Consequent to the sustainable character, we worked beside the analysis of the biomass potential on a strategic cost analysis and a risk analysis of the decentralized biomass energy systems. A core approach in the transition to sustainable energy infrastructures is the integration of energy management on both supply and demand side. Widespread use of decentral control allow advanced methods closing the cycle from design and implementation to monitoring in a continuous improvement process. We evaluated monitoring architectures to support this scenario, set up simulation environments and proposed seminars.

Intitulé : Realtime Automation Integrated Prototyping (RAIP)Flexible

Référence : R1F105K13

Chef de projet : Juergen SACHAU

Equipe de chercheurs : Nicolas BOIZOT, Kenn SEBESTA

Domaine de recherche : Systems and Controls Engineering

Partenaires : Université de Bourgogne

Durée du projet: 2006-2009

Objectifs:

The Realtime Automation Integrated Prototyping (RAIP) project studies better implementation of control loops for realtime applications. Integrated prototyping addresses the engineering challenge of coordinating multidisciplinary construction of hard- and software for complex systems under the pressure of a shortened time to market. The realtime power automation lab demonstrates advanced methods developed in energy conversion and control in an industry-ready context. Implementation into different industrial products and plants is made visible and the use of tools for target conversion demonstrated.

Résultats:

Reconstruction of non-measured data that is needed in order to apply an effective and precise control– namely the observation problem for the case of nonlinear systems. We focused on an observer called the

Adaptive-gain Kalman Filter which proposes a trade off between robustness-- the Extended Kalman Filter-- and fast convergence-- High-gain Kalman Filter. The mathematical proof of its properties and assessment of its performance in a realtime environment are essential to this study. Simulations and experimental tests, such as the control of motors, are also part of the development of the system. The study of nonlinear observers is profoundly linked to process modeling as the observability property depends on the process's mathematical model. In fact observers appear to be useful tools for modeling systems whose physical properties are not very well known or understood.
We also researched realtime control of electric motors in the domain of sustainable energies. Proper control of electric motors is essential to the modern needs of efficiency and performance in small packages. The research involved creation of a realtime laboratory, including communication and data analysis, and modeling of realtime systems, specifically high-efficiency, low-speed electric motors and generators that are well-adapted to wind turbines and electric vehicles. A case study involves the creation of a hybrid vehicle platform that, using GPS-based route planning, optimizes energy consumption over any given path.

Intitulé du projet de recherche: TRIAS : Logic of Trust and Reliability for Information Agents in Science

Référence: **R1F105K16**

Chef de projet: Christoph SCHOMMER

Equipe des chercheurs: Emil Weydert, Leon van der Torre, Jonathan Ben-Naim (PostDoc BFR-Oct 06), Mathijs de Boer (PhD PRP,Dec 06)

Domaine de recherche: Computer Science and Communication

Durée du projet: July 05 - June 08

Objectifs: Science is characterized by a large network of evolving heterogeneous knowledge sources of unknown and variable quality. This suggests intelligent agent systems for discovering, judging, and integrating relevant information. To estimate its reliability, agents have to evaluate the trustworthiness of the sources by exploiting different forms of incomplete and uncertain world knowledge. It is the goal of TRIAS, to
(1) Investigate and model the factors influencing reliability and trust in science

(2) Build a suitable agent logic of trust and belief with a reasonable semantics
(3) Develop inference methods for estimating trust from complex, incomplete and uncertain information
(4) Explore the potential of textmining for collecting relevant scientific meta-information.

Résultats:

- Basic ontology describing the factors relevant for reasoning about trust in science
- Fine-grained logical analysis of epistemic trust from a single-agent perspective
- Initial investigation of the hitherto neglected norm-logical dimension of trust
- Specification of Elementary Source Logic (with light source descriptions)
- Introduction and classification of an extended merging concept mapping conflicting source bases to epistemic ranking measures, also using simple trust information (Dr. Weydert: talk at 8th ADMW on Belief revision, belief merging, social choice)
- Methodology for analysing implicit/explicit nonmonotonic arguments in science (Dr. Weydert: talk at NMR 06: Nonmonotonic Reasoning in Science)
- Formal modelling of the content of a scientific survey text from a multi-agent view (Graduate course/seminar organized by Weydert, van der Torre, Schommer)
- Attitude mining for document filtering (TFE, student project, advisor Schommer)

Intitulé du projet de recherche: **ADAM** – Adaptive Information Memories

Référence: **R1F1K5017**

Chef de projet: Christoph SCHOMMER

Equipe des chercheurs: Ralph Weires

Domaine de recherche: Computer Science and Communication

Durée du projet: 10/2005 – 09/2007

Objectifs:

The objective of this work is to find new approaches to enhance existing Information Retrieval (IR) systems.

We currently deal with two main approaches. One of them is to include implicitly collected information about user preferences and behaviour into a typical web search engine and evaluate how to use this information for enhancing the search engine. More precisely, we observe what the users are doing in interaction with a search engine (i.e., which queries are being entered, which results are chosen, and how long these results are approx. viewed). This information can be of great value because it gives hints as to which of the results seem to be indeed relevant for the users. To store and process the gathered information, we use the ANIMA system that has previously been developed in the MINE group.

We want to enhance the results of the search engine by this way, e.g. by re-ranking them according to the information derived from the captured user interaction. Additionally, the collected information about entered queries can be used to suggest new search terms to users, allowing them to refine a search into the desired direction and possibly eliminating ambiguities that might exist for a query.

Another approach we're working on is to analyse web content for the purpose of generating FAQ (Frequently Asked Questions) documents. Specifically, we focus on a certain, limited document collection (the contents of an internet forum). We analyse the given data in order to find out about commonly asked questions and their answers (if possible). An automatically created FAQ repository like this could e.g. be helpful to find out about the most relevant topics in the forum, or for an administrator to manually create a refined version of an FAQ on the basis of the results given by the automatic analysis.

Résultats : For the first approach, we are currently working on collecting sample interaction data of search engine users. We need to get enough information of users to test if our approach is able to provide a substantial improvement of the search results.

Intitulé du projet de recherche : **ICC – Inventing Communities of Communication**

Référence : **R1F106K05 - RAF106002**

Chef de projet : Christoph SCHOMMER

Equipe des chercheurs : Leon van der Torre, Patrice Caire

Domaine de recherche : Computer Science and Communication

Durée du projet : 03/2006 - 02/2009

Partenaires : Dr. Detlev Goetz, Mathias Sliepen, City of Luxembourg

Objectifs :

In web-based systems like digital cities, it is quite important to deliver the information the user requires at a certain time. This is not only for customer binding or customer satisfaction but also for serving the citizens with information in a sense of a digital service - following by the grow of modern media. The aspect of conviviality in such platforms, especially in digital cities, however, is often not addressed as well as the question of what conviviality means.

The project ICC has started in April 1, 2006 and has been initiated by the University of Luxembourg in cooperation with the City of Luxembourg (e-city). For this, we have concerned with the recherche of what conviviality could be and how it can be threatened in the e-Luxembourg initative where the City of Luxembourg is involved in.

In 2006, possible research questions have been arised, especially to define natural and artificial conviviality, how to model the social concept of conviviality or how to apply such model to digital cities.

Résultats

We have created an online document ,see http://mine.uni.lu/icc.html and submitted conference papers to international conferences (Salamanca, Newcastle). Moreover, a presentation has been done and visits, for example at the MINE Research Days and talks at Computer Science Group/Internal Seminar Series. Participations on different academic and industrial events and places have taken place, for example at the Sony research center, and scientific visits establihsed (Prof. Pelachaud, Uni Paris).

Currently, our methodology is to follow two main approaches for conviviality in digital cities:

- We concern with conviviality as a *multi-agent problem* and are on creating an organizational model of e-conviviality.
- We concern with conviviality as a problem of learning the wishes and desires of the user; here, we have identified a way to learn the user's behaviour (non-obvious profiling).

Intitulé du projet de recherche : INTRA: Information Traffic Management and Computer network Protection

Référence : **R1F 103T01**

Chef de projet : Ulrich Sorger

Equipe des chercheurs : Foued Melakessou and Zdzislaw Suchanecki

Domaine de recherche : Computer Science

Durée du projet : **01.03.2004 – 28.02.2007**

Objectifs :

Year 2006 was last stage of the INTRA project. The goal of the project was the statistical analysis and modeling of computers network traffic. The motivation of the project was the lack of models that could realistically capture the basic features of Network traffic.

In the first stage of the project it was build a simple but realistic model of a network consisting of a single chain of nods. The modeled variable was the inter-arrival time between packets. The main result was the discovery of a multiplicative law of Network traffic. A consequence of a multiplicative law is the model of log-normal asymptotic distribution of inter-arrival times. The next stage was devoted to building models without the simplifying assumptions on the network traffic. The traffic models based on ARCH and GARCH time series models were proposed. It was also build a preliminary version of a traffic simulator.

The objective for the year 2006 was a further elaboration of the network traffic models and modeling the transmission and congestion processes. Another goal was a construction of an efficient traffic simulator and validation of theoretical models.

Résultats:

Among the results, for the reported period, is a description of the limiting behavior of transmission times. It was shown a predominant role of sub-exponential probability distributions. It was also given a qualitative explanation for the common appearance of long tails, long-range dependencies and self-similarity. An elaborated network traffic simulator has been used to the study of dependencies between network topology and routing protocols, and the efficiency of data transmission. A network topology generator has been developed on top of Scilab in respect with the Internet characteristics based on real measurements. It was also designed a new transmission protocol that increasing the routes diversity allows to avoid the weakness of TCP and UDP, and results in better congestions, smoothed traffic, and more secure connections.

Intitulé du projet de recherche : Individual and collective reasoning

Référence : R1F106L02

Chef de projet : Leon VAN DER TORRE

Equipe des chercheurs : Gabriella Pigozzi

Domaine de recherche : Intelligent Systems

Durée du projet :

Objectifs:

Aim of this project is to investigate aspects of individual and collective rationality and to develop formal approaches for their representation. In particular, we are interested both in the generalization of existing frameworks for individual agent reasoning to its collective counterpart, and in the study and representation of the interactions between agents in a group.

Examples of the first type of research questions are extensions of formal theories for belief change from one agent to multi-agent systems, the enlargement of procedures for the aggregation of individual judgments and preferences to form a collective decision on the same judgments and preferences, and the inquiry of how methods to revise a normative system can be generalized to merge several codes.

Examples of the second type of our research goals include the analysis of competing individual arguments in a group, the interactions between individual and group ontologies, the study of admissible coalitions in multi-agent systems, and semantics for agent communication languages.

Résultats:

- A framework to evaluate aggregation procedures of individual judgments into collective decisions (invited talk at the 1st Workshop on Logics and Collective decision Making, and poster at the 6th International Joint Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2007) by Pigozzi
- Initial investigation of the revision and merging of systems of norms (joint paper of Pigozzi and van der Torre, and talk at the Dagstuhl Seminar on Normative Multi-Agent Systems
- Model for belief revision of a goal-directed agent (joint paper of Pigozzi and van der Torre, and talk at the Dagstuhl Seminar on Normative Multi-Agent Systems)

- Role based semantics for agent communication languages (various papers by van der Torre)
- Ontologies of roles and organizations (various papers by van der Torre, organization of workshop on coordination and organization (CoOrg06))
- A logical architecture of normative systems (paper van der Torre presented at workshop on deontic logic in computer science)

Intitulé du projet de recherche: **e-FSTC** – Conception et expérimentation d'un dispositif de formation e-Learning pour les enseignements de la Faculté des Sciences, de la Technologie et de la Communication de l'Université du Luxembourg.

Référence: R1F105K21

Chef de projet: Denis ZAMPUNIERIS

Equipe des chercheurs: Damien GAROT, Nicolas CASEL, Elvira KACHAFOUTDINOVA Gaetan PECORARO, Marc EL ALAMI, David THILTGEN (étudiant stagiaire), Leonel DO ANDRE HILARIO, étudiant stagiaire

Domaine de recherche: e-Learning

Durée du projet: 2005.10.01 – 2008.09.30

Partenaires: ---

Objectifs: Ce projet de recherche et développement se situe dans la continuité des activités de l'équipe pluridisciplinaire (informaticiens, pédagogues, experts en ingénieries multimédia et de la formation) CICeL - Cellule d'Ingénierie et de Conseil en e-Learning, depuis ses premiers travaux en 2001. En capitalisant, fédérant et complétant l'ensemble des résultats produits précédemment, le but du projet est de concevoir, de mettre en oeuvre et d'expérimenter un dispositif de formation (partiellement) e-Learning complet et performant pour les enseignements (multilingues) de la Faculté des Sciences, de la Technologie et de la Communication de l'Université du Luxembourg.

Résultats : Cfr. le site web de la cellule : http://cicel.uni.lu

Intitulé du projet de recherche : **QUATTROPOLE** e-Learning

Référence:	RAQUATRO
Chef de projet:	Denis ZAMPUNIERIS
Equipe des chercheurs:	Alain GERARD, M. Marc EL ALAMI, Audrey LAURENT, étudiante stagiaire, Leonel DO ANDRE HILARIO, étudiant stagiaire
Domaine de recherche:	e-Learning
Durée du projet:	2004.01.01 - 2007.12.31
Partenaires:	- Villes de QuattroPole (Luxembourg, Metz, Sarrebruck et Trèves) - Ministère de l'Education Nationale, G-D. Luxembourg
Objectifs:	En partenariat avec des institutions d'enseignement des langues des Villes de QuattroPole, il s'agit de réaliser (analyses des besoins, conceptions d'une pédagogie appropriée et des contenus, production des modules multimédia interactifs en ligne) des cours e-Learning d'apprentissage de la langue luxembourgeoise, ainsi que le support informatique permettant la diffusion sur le Web et la gestion des enseignements basés sur ces cours.
Résultats:	La plateforme e-Learning d'apprentissage du luxembourgeois est disponible en ligne gratuitement à l'adresse http://www.elearning.lu

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D. Zampunieris. Implementation of a proactive learning management system, e-learn. In World Conference on E-Learning in Corporate, Government, Healthcare and Higher Education, Hawaii, USA, 2006.

D. Zampunieris. Implementation of efficient proactive computing using lazy evaluation in a learning management system, m-icte. In m-ICTE - International Conference on Multimedia and Information and Communication Technologies in Education, Seville, Spain, 2006.

Divers

REPRESENTATION

Pascal Bouvry:
- Head of the Computer Science and Research Unit
- Head of the ILIAS lab
- Head of the Intelligent Systems track of the MICS
- Head of the ISINOME track for DIA4
- Member of the administration board of CRP Henri Tudor
- Member of the FSTC Faculty Council
- Member of the ERCIM WG on Soft Computing
- Member of LIASIT executive board
- Expert for the COST program

Thomas Engel:
- Director of LIASIT (Luxembourg International Advanced Studies in Information Technologies)
- Member of the European Security Research Advisory Board (ESRAB), European Commission, Brussels
- Member of the European Security Taskforce (SecureIST), European Commission, Brussels

Coordinator of the European Integrated Project “u-2010” on Next Generation Networks for Crisis Management
Member of the Luxembourg Strategy Group for the European Space Agency (ESA)
Speaker of the Regional Group Trier/Luxembourg of the German Society for Computer Science (GI)
Head of the ComSys lab at the University of Luxembourg

Nicolas Guelfi: Member of the executive committee of the LIASIT (Luxembourg International Advanced Studies in Information Technologies) project
Representative for the University of Luxembourg at the administrative council of the Universtity Henri Poincaré, Nancy, France
Representative for the University of Luxembourg at the council of doctoral schools the Universtity Henri Poincaré, Nancy, France
Responsible of the Software Engineering Competence Center (LASSY)
Responsible of the track on Advance Sostware System specialization of the Master of Science, University of Luxembourg (ASSY)
Chairman of the ERCIM working group RISE: Rapid Integration of Software Engineering techniques

Pierre Kelsen: Member of the FSTC Faculty Council

Christoph Schommer: Director of Studies, MICS (Master of Science in Information and Computer Sciences)
Leitungsgremium der Gesellschaft für Informatik - Regionalgruppe Trier-Luxemburg

Leon van der Torre Member of executive committee ERCIM representing Luxembourg
Member of Domain committee ICT of COST representing Luxembourg
Responsible for priority P1 on security and reliability of University of Luxembourg

PARTICIPATION TO THE COMMUNITY

Pascal Bouvry:

Invited speaker, “Enhancing service level on multi-hop ad hoc networks by introducing the notion of trust and GA optimization of local strategies” for IEEE Joint 3rd International Conference on Soft Computing and Intelligent Systems and 7th International Symposium on advanced Intelligent Systems - SCIS-ISIS 2006 (Tokyo, Japan, Sep 2006)

H. M. Le, H. A. Le Thi, D. T. Pham, and P. Bouvry. A deterministic optimization approach for generating highly nonlinear balanced boolean functions in cryptography. In International Conference on High

Performance Scientific Computing (Modeling, Simulation and Optimization of Complex Processes), Hanoi, Vietnam.

Hoai Minh Le, Hoai An Le Thi, Tao Pham Dinh, and Pascal Bouvry. A dc programming approach for generating highly nonlinear balanced boolean function in cryptography. In Third International Conference on Computational Management Science, CWI, May 2006.

Organisation chair of **CAISE 2006**, the 18th conference on Advanced Information Systems Engineering, "Trusted Information Systems" (Luxembourg, June 2006)

Member of the International Program Committee for

- 15ième congrès francophone en Reconnaissance de Formes et Intelligence Artificielle, **RFIA** (Tours, France, January 2006)
- 21st IEEE International Parallel & Distributed Processing Symposium, The 9th International Workshop on Nature Inspired Distributed Computing, **IEEE IPDPS - NIDISC 2006** (Rhodos, Greece, April 2006)
- IEEE Congress on Evolutionary Computation - **CEC 2006** – special session on Information Security (Vancouver, July 2006)
- 10th International Conference on Knowledge-Based & Intelligent Information & Engineering Systems - **KES 2006** (Bournemouth, UK, Sep 2006)
- IEEE Joint 3rd International Conference on Soft Computing and Intelligent Systems and 7th International Symposium on advanced Intelligent Systems - **SCIS-ISIS 2006** (Tokyo, Japan, Sep 2006)
- International Symposium on Grid computing, high-performAnce and Distributed Applications - **GADA 2006** (Montpellier, France, Oct 2006)
- 1st workshop on Meta-Heuristics, **Meta 2006** (Tunisia, Nov 2006)

Thomas Engel

Member of the Scientific Committee of the "Best German Security Thesis" Award, CAST Förderpreis, November 11, 2006, TU Darmstadt

Nicolas Guelfi:

Program Chair of **EFTS 2006** International Workshop on Engineering of Fault-Tolerant Systems, 12 - 14 June 2006, Luxembourg, Luxembourg, http://efts2006.uni.lu

Program Chair and part of the editorial board of **RISE'2006** - Rapid Integration of Software Engineering Techniques, proceedings of the 3d International Workshop, Geneva, Switzerland, September, 2006, N. Guelfi, D. Buchs (Eds.), Lecture Notes in Computer Science, vol. 4401, Springer-Verlag, 2007.

Member of the International Program Committee for

- **IDM 2006** 2èmes journées sur l'Ingénierie Dirigées par les Modèles - Université des Sciences et Technologies de Lille 27-28 juin 2006 - http://planetmde.org/idm06
- **MDIES** 2nd International Workshop on Model-Driven Enterprise Information Systems (MDEIS'06) May 23-24, 2006 in conjunction with the 8th International Conference on Enterprise Information Systems (http:// www.iceis.org/) - Paphos, Cyprus
- **MOCA'06** - Fourth International Workshop on - Modelling of Objects, Components, and Agents - a satellite event of Petri Nets 2006 and ACSD 2006 - Turku, Finland, June 26, 2006 - http://www.informatik.uni-hamburg.de/TGI/events/moca06/
- **MOMPES** Joint Meeting of the 4th Workshop on Model-Based Development of Computer Based Systems (MBD) and 3rd International Workshop on Model-based Methodologies for Pervasive and Embedded Software (MOMPES 2006) within the 13th IEEE Int. Conf. on Engineering of Co
- **SELMAS** 5th International Workshop on Software Engineering for Large-Scale Multi-Agent Systems - SELMAS'06 "Building Dependable Multi-Agent Systems" - May 22-23, 2006- Shanghai – China- In conjunction with ICSE'06 – http://www.teccomm.les.inf.puc-rio.br/selmas2
- **DSN 2006** Workshop on Architecting Dependable Systems (WADS 2006), Philadelphia, Pennsylvania - USA, 27 June 2006 - http://www.cs.kent.ac.uk/wads
- **e-Society** :IADIS International Conference - e-Society 2006 - Dublin, Ireland - 13–16 July 2006

Pierre Kelsen:

DASCOM Two articles were presented at the ICSOFT 2006 and OOPSLA 2006 conferences (see details under publications).

Christoph Schommer:

ADAM Presentation of the project ideas at the ISS seminar series at the University of Luxembourg in January '06

Presentation of and discussion about the key ideas at the internal research days of the MINE group in March, July, and November 2006.

Visit of the annual 2006 ACM SIGIR conference on research and development in Information Retrieval, Seattle.

Leon van der Torre:

Guest editor. G. Boella, L. van der Torre, and H. Verhagen (eds). Computation and Mathematical Organizational Theory, Special issue on Normative Multiagent Systems, 12(2-3), 2006.

Guest editor. G. Boella and L. van der Torre (eds). Electronic Notes in Theoretical Computer Science (ENTCS) Procs. of the First International

Workshop on Coordination and Organisation (**CoOrg** 2005), 150(3):1–2, 2006.
PC co-chair. Workshop on ``Trustworthy Software'', Saarland University, Saarbruecken, Germany.
http://www.cs.uni-sb.de/Workshops/TrustworthySoftware/ Interregional workshop on trustworthy software, May 18+19, 2006.
PC co-chair. 2nd Intl Workshop on Coordination and Organisation (**CoOrg** 2006), Bologna, Italy. June 13, 2006.

Member of the International Program Committee for

- First International Conference on Knowledge Science, Engineering and Management (**KSEM'2006**), Guilin City, China. August 5-8, 2006.
- Poster track of the 17th European Conference on Artificial Intelligence Riva del Garda, Italy. August 28 - September 1, 2006.
- Fourth international Workshop on Programming Multi-Agent Systems (**PROMAS'06**) at the 5th Conference on Autonomous Agents and Multi-Agent Systems (**AAMAS'06**). Japan. May 9, 2006.
- Eighth Workshop on Game Theoretic and Decision Theoretic Agents (**GTDT'06**) at the 5th Conference on Autonomous Agents and Multi-Agent Systems (**AAMAS'06**). Japan. May, 2006.
- The subworkshop "Theory of NMR and Uncertainty" within Eleventh International Workshop on Non-Monotonic Reasoning **NMR'06** <http://www.cs.ucl.ac.uk/staff/a.hunter/nmr/>, the Lake District area of the UK, May 30 - June 1, 2006.
- Eighth International Workshop on Deontic Logic in Computer Science (**DEON'06** <http://www.cs.uu.nl/deon2006/>) Utrecht, the Netherlands, July 12014, 2006.
- The ECAI 2006 Workshop on Coordination, Organization, Institutions and Norms in Agent Systems (**COIN@ECAI**), Riva del Garda, Italy. August 2006.
- The Seventh Annual International Workshop "Engineering Societies in the Agents World" (**ESAW** 2006), Dublin. September 6-8 2006.
- Second International Workshop on Automated Specification and Verification of Web Sites (**WWV'06**). Cyprus, November 19, 2006.

PARTICIPATION TO DOCTORAL BOARDS

Pascal Bouvry:

- Member of the board of the Habilitation Thesis of Dr Damien Olivier, “Modélisation informatique de système à base d'interactions et détection

d'organisations. Modèle du vivant.", University of le Havre, December 12, 2006.

- Member of the board (vocal) of the PhD Thesis of Mr Gabriel Luque, "Resolución de Problemas Combinatorios con Aplicación Real en Sistemas Distribuidos", University of Malaga, May 18, 2006.

Thomas Engel:

- Member of the board of the PhD Thesis of Mr. Frank Losemann, "Konzernweites Zertifikatsmanagement – PKI Aspekte in der praktischen Anwendung", Universität Potsdam, January 2006
- Second evaluator/examinator in the board of the PhD Thesis defense of Mr. Wanjun Huang, "Temporary Binding for Dynamic Middleware Construction and Web Services Composition", Universität Potsdam, June 26, 2006.
- Member of the board of the PhD Thesis of Mr. Ji Hu, "A Virtual Machine Architecture for IT-Security Laboratories", Universität Potsdam, July 14, 2006

Nicolas Guelfi:

- Member of the board of PhD Thesis of Mr Jacques Klein, : "Behavioral Aspects and Weaving", November 2006; Location; University of Rennes 1, France

Leon van der Torre:

- Member of the board of PhD Thesis of Birna van Riemsdijk : "Cognitive Agent Programming: A Semantic Approach", October 2006; Location; Utrecht University, the Netherlands
- Member of the board of PhD Thesis of R. Agerri (2006). Motivational Attitudes and Norms in a unified Agent Communication Language for open Multi-Agent Systems: A Pragmatic Approach. November 2006. Location: Dept. of Computing, City University, London, UK.