



RESEARCH CENTER
Grenoble - Rhône-Alpes

FIELD

Activity Report 2012

Section Partnerships and Cooperations

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ARIC Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR HPAC Project

Participants: Claude-Pierre Jeannerod, Nicolas Louvet, Nathalie Revol, Damien Stehlé, Philippe Théveny, Gilles Villard.

“High-performance Algebraic Computing” (HPAC) is a four year ANR project that started in January 2012. The Web page of the project is <http://hpac.gforge.inria.fr/>. HPAC is headed by Jean-Guillaume Dumas (CASYS team, LJK laboratory, Grenoble); it involves AriC as well as the Inria project-team MOAIS (LIG, Grenoble), the Inria project-team PolSys (LIP6 lab., Paris), the ARITH group (LIRMM laboratory, Montpellier), and the HPC Project company.

The overall ambition of HPAC is to provide international reference high-performance libraries for exact linear algebra and algebraic systems on multi-processor architecture and to influence parallel programming approaches for algebraic computing. The central goal is to extend the efficiency of the LinBox and FGb libraries to new trend parallel architectures such as clusters of multi-processor systems and graphics processing units in order to tackle a broader class of problems in lattice cryptography and algebraic cryptanalysis. HPAC conducts researches along three axes:

- A domain specific parallel language (DSL) adapted to high-performance algebraic computations;
- Parallel linear algebra kernels and higher-level mathematical algorithms and library modules;
- Library composition and innovative high performance solutions for cryptology challenges.

8.1.2. ANR TaMaDi Project

Participants: Nicolas Brisebarre, Florent de Dinechin, Guillaume Hanrot, Vincent Lefèvre, Érik Martin-Dorel, Micaela Mayero, Jean-Michel Muller, Ioana Pasca, Damien Stehlé, Serge Torres.

The TaMaDi project (Table Maker’s Dilemma, 2010-2013) is funded by the ANR and headed by Jean-Michel Muller. It was submitted in January 2010, accepted in June, and started in October 2010. The other French teams involved in the project are the MARELLE team-project of Inria Sophia Antipolis-Méditerranée, and the PEQUAN team of LIP6 lab., Paris.

The aim of the project is to find “hardest to round” (HR) cases for the most common functions and floating-point formats. In floating-point (FP) arithmetic having fully-specified “atomic” operations is a key-requirement for portable, predictable and provable numerical software. Since 1985, the four arithmetic operations and the square root are IEEE specified (it is required that they should be correctly rounded: the system must always return the floating-point number nearest the exact result of the operation). This is not fully the case for the basic mathematical functions (sine, cosine, exponential, etc.). Indeed, the same function, on the same argument value, with the same format, may return significantly different results depending on the environment. As a consequence, numerical programs using these functions suffer from various problems. The lack of specification is due to a problem called the Table Maker’s Dilemma (TMD). To compute $f(x)$ in a given format, where x is a FP number, we must first compute an approximation to $f(x)$ with a given precision, which we round to the nearest FP number in the considered format. The problem is the following: finding what the accuracy of the approximation must be to ensure that the obtained result is always equal to the “exact” $f(x)$ rounded to the nearest FP number. In the last years, our team-project and the CACAO team-project of Inria Nancy-Grand Est designed algorithms for finding hardest-to-round cases. These algorithms do not allow to tackle with large formats. The TaMaDi project mainly focuses on three aspects:

- big precisions: we must get new algorithms for dealing with precisions larger than double precision. Such precisions will become more and more important (even if double precision may be thought as more than enough for a final result, it may not be sufficient for the intermediate results of long or critical calculations);
- formal proof: we must provide formal proofs of the critical parts of our methods. Another possibility is to have our programs generating certificates that show the validity of their results. We should then focus on proving the certificates;
- aggressive computing: the methods we have designed for generating HR points in double precision require weeks of computation on hundreds of PCs. Even if we design faster algorithms, we must massively parallelize our methods, and study various ways of doing that.

The various documents can be found at http://tamadiwiki.ens-lyon.fr/tamadiwiki/index.php/Main_Page.

8.2. International Initiatives

8.2.1. Inria Associate Teams

QOLAPS (Quantifier elimination, Optimization, Linear Algebra and Polynomial Systems) Associate Team between the Symbolic Computation Group at North Carolina State University (USA), the PolSys team at LIP6, Paris 6, and the AriC team. Participants: Nathalie Revol and Gilles Villard.

8.2.2. Participation in International Programs

Joint CNRS-Royal Society grant with Cong Ling (Imperial College, London). Participants: Guillaume Hanrot and Damien Stehlé.

CNRS Associate Team (PICS) with the Cryptography groups of Macquarie University (Christophe Doche and Igor Shparlinski) and Monash University (Ron Steinfeld). Participants: Nicolas Brisebarre, Guillaume Hanrot, Fabien Laguillaumie, Adeline Langlois and Damien Stehlé.

Merlion grant, co-funded by the French Embassy in Singapore and NTU (Nanyang Technological University), with the cryptography group of NTU (San Ling, Khoa Nguyen and Huaxiong Wang). Participants: Adeline Langlois and Damien Stehlé.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

Prof. Peter Kornerup (Odense University, Denmark): September 5–19.

Dr. Benoît Libert (Université de Louvain-la Neuve, Belgium), Inria invited researcher: May 28–July 13.

Prof. San Ling (Nanyang Technological University, Singapore), ENS Lyon invited professor: August 20–October 11.

Prof. Dave Saunders (University of Delaware, U.S.A.), ENS Lyon invited professor: April 15–July 25.

COMPSYS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. CNRS PEPS

Christophe Alias and Laure Gonnord initiated with the DART/Emeraude team at LIFL Laboratory (University of Lille) a CNRS PEPS (“Projets Exploratoire Premier Soutien”) called “HLS and real time” (8kEuros/year, during two years). The goal of this project is to investigate how to introduce real-time constraints in the high-level synthesis workflow.

8.1.2. Inria AEN

Compsys is part of an Inria Large Scale Initiative (AEN: action d’envergure nationale) that regroups eight teams: Camus, Regal, Alf, Runtime, Algorille, Parkas, Dali on “Large scale multicore virtualization for performance scaling and portability”.

8.1.3. French compiler community

The french compiler community is now well identified and is visible through its web-page <http://compilation.gforge.inria.fr/>. The “journées françaises de la compilation” were initiated in 2010 and are still animated by Fabrice Rastello and Laure Gonnord as a biannual event. Their local organization is handled alternately by the different research teams (Lyon in Summer 2010, Aussois in Winter 2010, Dinard in Spring 2011, St Hippolyte in Autumn 2011, Rennes in Summer 2012, Lyon/Annecy in Spring 2013).

8.2. International Research Visitors

8.2.1. Visits to International Teams (at least one month)

Paul Feautrier has been invited to spend the month of June 2012 at Colorado State University (CSU), Fort Collins, CO, USA, in prof. Sanjay Rajopadhye’s team. The work reported in Section 6.2 and accepted at PPOPP’13 [13] was initiated during this stay. Sanjay Rajopadhye and Tomofumi Yuki, both from CSU, have spent a few days in Paris and Lyon in December 2012. During this visit, we have initiated a sequel to this work, which will handle other parallel features of X10.

8.2.2. Informal Collaborations and Short-Term Visitors

Shorter visits (but at least a week) include exchanges (in both directions) with the groups of S. Rajopadhye (Colorado State University), of P. Sadayappan (Ohio State University), of J. Ramanujam (Louisiana State University), of L.-N. Pouchet (UCLA), all related directly or indirectly to polyhedral code optimizations.

Compsys has also regular contacts with Sebastian Hack (Saarland University, Saarbrücken, Germany), Benoît Dupont de Dinechin (Kalray, Grenoble), Christophe Guillon (STMicroelectronics), Fernando M. Q. Pereira (Federal University of Minas Gerais, Brazil) on back-end code optimizations.

Among french academic researchers, Compsys is particularly linked with people such as Albert Cohen (Inria Parkas team), Steven Derrien (Inria Cairn team), Alain Ketterlin (Inria Camus team), François Irigoien (Ecole des Mines de Paris).

Finally, taking the opportunity of the HdR defense of Fabrice Rastello [2] and the PhD defense of Quentin Colombet [1] on December 7, 2012, a “compilation day” was organized in Lyon on December 6, including talks by K. Pingali (University of Texas, Austin), E. Altman (IBM Yorktown), and V. Sarkar (Rice University).

CONVECS Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. FSN (*Fonds National pour la Société Numérique*)

8.1.1.1. *OpenCloudware*

Participants: Rim Abid, Hugues Evrard, Frédéric Lang, Gwen Salaün [correspondent], Lina Ye.

OpenCloudware (see <http://www.opencloudware.org>) is a project funded by the FSN. The project is led by France Telecom / Orange Labs (Meylan, France) and involves 18 partners, among which Bull, OW2, Thalès, Inria, etc. OpenCloudware aims at providing an open software platform enabling the development, deployment and administration of cloud applications. The objective is to provide a set of integrated software components for (i) modeling distributed applications to be executed on cloud computing infrastructures, (ii) developing and constructing multi-tier virtualized applications, and (iii) deploying and administrating these applications (PaaS platform) possibly on multi-IaaS infrastructures.

OpenCloudware started in January 2012 for three years and nine months. The main contributions of CONVECS to OpenCloudware are the formal specification of the models, architectures, and protocols (self-deployment, self-management, etc.) underlying the OpenCloudware platform, the automated generation of code from these specifications for rapid prototyping purposes, and the formal verification of the aforementioned protocols.

8.1.1.2. *Connexion*

Participants: Hubert Garavel [correspondent], Frédéric Lang, Raquel Oliveira.

Connexion (*CONtrôle commande Nucléaire Numérique pour l'EXport et la rénovatiON*) is a project funded by the FSN within the second call for projects “*Investissements d’Avenir — Briques génériques du logiciel embarqué*”. The project (see <http://www.cluster-connexion.fr>), led by EDF and supported by the *Pôles de compétitivité* Minalogic, Systematic, and *Pôle Nucléaire Bourgogne*, involves many industrial and academic partners, namely All4Tech, Alstom Power, Areva, Atos Worldgrid, CEA, CNRS/CRAN, Corys Tess, ENS Cachan, Esterel Technologies, Inria, LIG, Predict, and Rolls-Royce. Connexion aims at proposing and validating an innovative architecture dedicated to the design and implementation of control systems for new nuclear power plants in France and abroad.

Connexion started in April 2012 for four years. CONVECS will participate, in cooperation with the IIHM team of LIG, to study the application of CADP to specify and validate human-machine interfaces formally.

8.1.2. Competitvity Clusters

8.1.2.1. *Bluesky for I-Automation*

Participants: Hubert Garavel, Fatma Jebali, Jingyan Jourdan-Lu, Frédéric Lang, Eric Léo, Radu Mateescu [correspondent].

Bluesky for I-Automation is a project funded by the FUI (*Fonds Unique Interministériel*) within the *Pôle de Compétitivité* Minalogic. The project, led by Crouzet Automatismes (Valence), involves the SMEs (*Small and Medium Enterprises*) Mootwin and VerticalM2M, the LCIS laboratory of Grenoble INP, and CONVECS. Bluesky aims at bringing closer the design of automation applications and the Internet of things by providing an integrated solution consisting of hardware, software, and services enabling a distributed, Internet-based design and development of automation systems. The automation systems targeted by the project are networks of programmable logic controllers, which belong to the class of GALS (*Globally Asynchronous, Locally Synchronous*) systems.

Bluesky started in September 2012 for three years. The main contributions of CONVECS to Bluesky are the definition of the formal pivot language for describing the asynchronous behaviour of logic controller networks and the automated verification of the behaviour using compositional model checking and equivalence checking techniques.

8.1.3. Other National Collaborations

Additionally, we collaborated in 2012 with the following Inria project-teams:

- CONTRAINTES (Inria Paris-Rocquencourt): Grégory Batt,
- OASIS (Inria Sophia-Antipolis – Méditerranée): Eric Madelaine and Ludovic Henrio.

Beyond Inria, we had sustained scientific relations with the following researchers:

- Gaëlle Calvary and Sophie Dupuy-Chessa (LIG, Grenoble),
- Pascal Poizat (LIP6, Paris),
- Meriem Ouederni (IRIT, Toulouse),
- Dimitris Vekris (LACL, Paris-Est Créteil).

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. Sensation

Participants: Hubert Garavel, Radu Mateescu, Wendelin Serwe.

Sensation (*Self ENergy-Supporting Autonomous computaTION*) is the European project no. 318490 funded by the FP7-ICT-11-8 programme. The project (see <http://people.cs.aau.dk/~rrh/SENSATION>) gathers 9 participants: Inria (Triskell and Convecs teams), Aalborg University (Denmark), RWTH Aachen and Saarland University (Germany), University of Twente and Embedded System Institute (The Netherlands), STMicroelectronics (France), GomSpace (Denmark), and Recore Systems (The Netherlands). The main goal of Sensation is to increase the scale of systems that are self-supporting by balancing energy harvesting and consumption up to the level of complete products. In order to build such Energy Centric Systems, embedded system designers face the quest for optimal performance within acceptable reliability and tight energy bounds. Programming systems that reconfigure themselves in view of changing tasks, resources, errors and available energy is a demanding challenge.

Sensation started on October 1st, 2012 for three years. CONVECS contributes to the project regarding the extension of formal languages with quantitative aspects, studying common semantic models for quantitative analysis, and applying formal modeling and analysis to the case studies provided by the industrial partners.

8.2.2. Collaborations with Major European Organizations

The CONVECS team is member of the FMICS (*Formal Methods for Industrial Critical Systems*) working group of ERCIM (see <http://fmics.inria.fr>). R. Mateescu is currently the chairman of the FMICS working group and H. Garavel is member of the FMICS board, in charge of dissemination actions.

Hubert Garavel was appointed to a new Working Group within Informatics Europe: “Parallel Computing (Supercomputing) Education in Europe: State-of-Art”. This is a relatively small working group (about 10 people) with the following missions: to show the need for urgent changes in higher education in the area of computational sciences, to compose a survey of the current landscape of parallel computing and supercomputing education in Europe with respect to different universities and countries, and to prepare a set of recommendations on how to bring ideas of parallel computing and supercomputing into higher educational systems of European countries.

8.2.3. Other European Collaborations

In addition to our partners in aforementioned contractual collaborations, in 2012 we had scientific relations with several European universities and research centers, including:

- Saarland University (Alexander Graf-Brill, Ernst-Moritz Hahn, Arnd Hartmanns, Holger Hermanns, and Andrea Turrini),
- Oxford University (Ernst-Moritz Hahn, Marta Kwiatkowska, and Dave Parker),
- RWTH Aachen (Joost-Pieter Katoen and Viet Yen Nguyen),
- University of Twente (Freak van der Berg and Marielle Stoelinga),
- Technical University of Eindhoven (Anton Wijs).

H. Garavel participates in the DFG (*Deutsche Forschungsgemeinschaft*) transregional project AVACS (*Automatic Verification and Analysis of Complex Systems*, see <http://www.avacs.org>) and he attended two meetings held at Freiburg (Germany) in February 2012 and at Mannheim (Germany) in November 2012.

8.3. International Initiatives

H. Garavel is a member of IFIP (*International Federation for Information Processing*) Technical Committee 1 (*Foundations of Computer Science*) Working Group 1.8 on Concurrency Theory chaired successively by Luca Aceto and Jos Baeten.

8.3.1. Other International Collaborations

We had sustained scientific relations with Tevfik Bultan (University of California at Santa Barbara, USA).

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Pascal Poizat (LIP6, University Pierre et Marie Curie, Paris) visited us on March 26–27, 2012.
- Dimitris Vekris (LACL, University Paris-Est Créteil) visited us from April 23 to May 11, 2012.
- Meriem Ouederni (IRIT, Toulouse) visited us on June 4–15, 2012.
- The annual CONVECS seminar was held in Pont-en-Royans (France) on November 5–7, 2012. The following invited scientists attended the seminar:
 - Jérémy Buisson (University of Bretagne-Sud / VALORIA and Ecoles de St-Cyr Coëtquidan) gave on November 5, 2012 a talk entitled “*Vers un futur pi-ADL reconfigurable*”.
 - Sophie Dupuy-Chessa (LIG, Grenoble) gave on November 6, 2012 a talk entitled “*Qualité des interfaces homme-machine plastiques*”.
 - Massimo Zendri (STMicroelectronics) gave on November 6, 2012 a talk entitled “*Circuit Level Formal Verification in Industrial Environment*”.

POP ART Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. Inria Large Scale Actions

8.1.1.1. Inria Large Scale Action Synchronics: Language Platform for Embedded System Design

Participants: Gwenaël Delaval, Alain Girault [contact person, co-coordinator], Bertrand Jeannet, Xavier Nicollin, Peter Schrammel.

The SYNCHRONICS (Language Platform for Embedded System Design) project [mid-2008 to mid-2012] gathers 9 permanent researchers on the topic of embedded systems design: B. Caillaud (INRIA Rennes – Bretagne Atlantique), A. Cohen, L. Mandel, and M. Pouzet (Inria-Saclay and ENS Paris), G. Delaval, A. Girault, and B. Jeannet (INRIA Grenoble – Rhône-Alpes), E. Jahier and P. Raymond (VERIMAG).

SYNCHRONICS capitalizes on recent extensions of data-flow synchronous languages, as well as relaxed forms of synchronous composition or compilation techniques for various platform, to address two main challenges with a language-centered approach: (i) the co-simulation of mixed discrete-continuous specifications, and more generally the co-simulation of programs and properties (either discrete or continuous); (ii) the ability, inside the programming model, to account for the architecture constraints (execution time, memory footprint, energy, power, reliability, etc.).

8.1.2. ANR

8.1.2.1. ANR Asopt: Analyse Statique et OPTimisation

Participants: Bertrand Jeannet [contact person, coordinator], Peter Schrammel.

The ASOPT (Analyse Statique et OPTimisation) project [january 2009-july 2012]³⁵ brings together static analysis (Inria-POP ART, VERIMAG, CEA LMeASI), optimisation, and control/game theory experts (CEA LMeASI, Inria-MAXPLUS) around some program verification problems. POP ART is the project coordinator.

Many abstract interpretations attempt to find “good” geometric shapes verifying certain constraints; this not only applies to purely numerical abstractions (for numerical program variables), but also to abstractions of data structures (arrays and more complex shapes). This problem can often be addressed by optimisation techniques, opening the possibility of exploiting advanced techniques from mathematical programming.

The purpose of ASOPT is to develop new abstract domains and new resolution techniques for embedded control programs, and in the longer run, for numerical simulation programs.

The main results are 1. improved *numerical abstract domains* (in particular the MaxPLUS polyhedra and zonotopes-based abstract domains), and their combination with finite-types domains (using BDDs); 2. new *symbolic domains*, in particular for the accurate analysis of aliased expressions in data-structures and for precise interprocedural analysis in the presence of pointers to the call-stack; 3. improved *equation solving techniques*, with the generalization of the *policy iteration* approach and the widening of its applicability; 4. precise abstractions of full blocks of code, based either on quantifier elimination or on abstract acceleration.

Most of these contributions have been integrated into either the FIXPOINT library or the APRON/BDDAPRON libraries and they can be experimented on-line or off-line with the INTERPROC analyzer (see Section 5.5.5), which was the common experimental platform of the project.

8.1.2.2. ANR Vedecy: Verification and Design of Cyber-physical Systems

Participants: Gregor Goessler [contact person], Bertrand Jeannet, Sebti Mouelhi.

³⁵<http://asopt.inrialpes.fr/index.php>

The VEDECY project brings together hybrid systems and formal methods experts. Three partners are involved: Laboratoire Jean Kuntzmann (LJK), Inria POP ART, and VERIMAG.

VEDECY aims at pursuing fundamental research towards the development of algorithmic approaches to the verification and design of cyber-physical systems. Cyber-physical systems result from the integration of computations with physical processes: embedded computers control physical processes which in return affect computations through feedback loops. They are ubiquitous in current technology and their impact on lives of citizens is meant to grow in the future (autonomous vehicles, robotic surgery, energy efficient buildings, ...).

Cyber-physical systems applications are often safety critical and therefore reliability is a major requirement. To provide assurance of reliability, model based approaches and formal methods are appealing. Models of cyber-physical systems are heterogeneous by nature: discrete dynamic systems for computations and continuous differential equations for physical processes. The theory of hybrid systems offers a sound modeling framework for cyber-physical systems. The purpose of VEDECY is to develop hybrid systems techniques for the verification and the design of cyber-physical systems.

8.2. International Initiatives

8.2.1. Inria Associate Teams

8.2.1.1. AFMES

Title: Advanced Formal Methods for Embedded Systems

Inria principal investigator: Alain Girault

International Partner (Institution - Laboratory - Researcher):

University of Auckland (New Zealand) - Department of Electrical and Computer Engineering

Duration: 2010 - 2012

See also: <http://pop-art.inrialpes.fr/~girault/Projets/Afmes/>

Embedded systems are characterized by several constraints, such as determinism and bounded reaction time. Accordingly, design methods for embedded systems should, when possible, guarantee these properties by construction. This allows the shifting of the burden of checking these constraints from the programmer to the design method and the associated compilers and code generation tools. In order to achieve this, our goal is to improve the existing design methods in several key directions: (1) Incremental converter synthesis. (2) Programming language for adaptive computing (SystemJ and beyond) [15]. (3) Time predictable programming language and execution architectures [10], [12]. Together, these advanced methods will provide a higher level of safety in the design of embedded systems.

8.3. International Research Visitors

8.3.1. Visits of International Scientists

- Aditya Zutshi, PhD student at the University of Colorado Boulder (USA), visited POP ART from July to August 2012 and worked on the abstract acceleration of general linear loops with inputs.
- Partha Roop, Senior Lecturer at the University of Auckland (New Zealand) visited POP ART in March 2012 to work on the AFMES associated team.
- Eugene Yip, PhD student at the University of Auckland (New Zealand) visited POP ART from October to December 2012 to work on the AFMES associated team.

8.3.2. Visits to International Teams

- Bertrand Jeannot and Peter Schrammel visited the University of Colorado Boulder (USA) in February 2012 from the 3th to the 21th.
- Alain Girault visited the University of Auckland (New Zealand) to work on the AFMES Associated Team.
- Alain Girault visited the University of California Berkeley (USA) in August 2012 to work on time predictable programming languages and on parametric dataflow models of computation.

BIPOP Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

Participants: Guillaume James, Vincent Acary, Franck P erignon, Bernard Brogliato.

An IXXI project (institute for complex systems) has been accepted in November 2012. It concerns the study of nonsmooth mechanical systems with a particular focus on nonlinear waves, and nonlinear modes. Title: Ondes non lin aires dans les r eseaux granulaires et syst emes m ecaniques spatialement discrets.

8.1.1. ANR

- Project ChaSlim (01 October 2011–30 September 2015). Coordinated by Bernard Brogliato. Participants from BIPOP: V. Acary, O. Huber, B. Wang. Other partners: IRCCYN nantes and EPI NON-A from Inria Lille. Topic: reduction of chattering in sliding mode control (<http://chaslim.gforge.inria.fr/>)
- NSFC/ANR project Multiple Impact (01 january 2009 – 31 March 2012). Coordinated by B. Brogliato for the French side, and by C. Liu for the Chinese side. Participants from BIPOP: N.S. Nguyen.
- Project Saladyn (01 January 2009 –31 December 2012). Coordinated by V. Acary. Participants from BIPOP: F. P erignon, M. Br emond, B. Brogliato (<http://saladyn.gforge.inria.fr/>)
- Project Geolmi (January 2011– December 2014). Geometry and Algebra of LMI with Systems Control Applications. Participants from BIPOP: J. Malick (<http://homepages.laas.fr/henrion/geolmi/>)

8.1.2. Competitivity Clusters

- PSPC Project Romeo 2 (01 December 2012–01 December 2016). Topic: Development of a humanoid robot assistant and companion for everyday life. Participants from Bipop: P.-B. Wieber and D. Dimitrov.

8.2. International Initiatives

8.2.1. Participation In International Programs

- PHC Procope collaboration with DLR in Munich (Jan. 2012–Dec. 2013). Topic: Real-Time Optimization based Control of Bipedal Humanoid Robots. Participants from Inria: P.-B. Wieber, A. Herdt, J. Lafaye, D. Dimitrov.

MISTIS Project-Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

MISTIS participates in the weekly statistical seminar of Grenoble. F. Forbes is one of the organizers and several lecturers have been invited in this context.

S. Girard is at the head of the probability and statistics department of the LJK since september 2012.

7.2. National Initiatives

7.2.1. Competitvity Clusters

MISTIS is a partner in a three-year (2010-12) MINALOGIC project (I-VP for Intuitive Vision Programming) supported by the French Government. The project is led by VI Technology (<http://www.vitechnology.com>), a world leader in Automated Optical Inspection (AOI) of a broad range of electronic components. The other partners involved are the CMM (Centre de Morphologie Mathematiques) in Fontainebleau, and Pige Electronique in Bourg-Les-Valence. The overall goal is to exploit statistical and image processing techniques more intensively to improve defect detection capability and programming time based on existing AOI principles so as to eventually reach a reliable defect detection with virtually zero programming skills and efforts.

7.2.2. ARC Inria

Florence Forbes is coordinating the 2-year Inria ARC project AINSI (<http://thalie.ujf-grenoble.fr/ainsi>). AINSI stands for "Modeles statistiques pour l'Assimilation d'Informations de Neuroimagerie fonctionnelle et de perfuSion cerebrale". The goal is to propose an innovative statistically well-based solution to the joint determination of neural activity and brain vascularization by combining BOLD constrast images obtained in functional MRI and quantitative parametric images (Arterial Spin Labelling: ASL). The partners involved are Visages team from Inria in Rennes and Parietal in Saclay, the INSERM Unit U594 (Grenoble Institute of Neuroscience) and the LNAO laboratory from CEA NeuroSpin.

7.3. European Initiatives

7.3.1. FP7 Projects

7.3.1.1. HUMAVIPS

Title: Humanoids with audiovisual skills in populated spaces

Type: COOPERATION (ICT)

Defi: Cognitive Systems and Robotics

Instrument: Specific Targeted Research Project (STREP)

Duration: February 2010 - January 2013

Coordinator: Inria (France)

Others partners: CTU Prague (Czech Republic), University of Bielefeld (Germany), IDIAP (Switzerland), Aldebaran Robotics (France)

See also: <http://humavips.inrialpes.fr>

Abstract: Humanoids expected to collaborate with people should be able to interact with them in the most natural way. This involves significant perceptual, communication, and motor processes, operating in a coordinated fashion. Consider a social gathering scenario where a humanoid is expected to possess certain social skills. It should be able to explore a populated space, to localize people and to determine their status, to decide to join one or two persons, to synthesize appropriate behavior, and to engage in dialog with them. Humans appear to solve these tasks routinely by integrating the often complementary information provided by multi sensory data processing, from low-level 3D object positioning to high-level gesture recognition and dialog handling. Understanding the world from unrestricted s

7.4. International Research Visitors

7.4.1. Internships

MINWOO JAKE LEE (from Jun 2012 until Aug 2012)

Subject: Clustering or classification of high dimensional data in the presence of outliers

Institution: Colorado State University (United States)

El Hadji DEME (from Mar 2012 until May 2012)

Subject: Bias reduction in extreme-value statistics

Institution: Université Gaston Berger (Senegal)

Seydou-Nourou Sylla (from October 2012 to December 2012)

Subject: Classification for medical data

Institution: Université Gaston Berger (Senegal)

NANO-D Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

We have obtained a regional grant for a PhD student (ARC 2012). The PhD student will be co-advised by Jean-François Mehaut (LIG, Grenoble) and Benjamin Bouvier (IBCP, Lyon), and will develop algorithms for parallel adaptive molecular dynamics simulations.

7.2. National Initiatives

7.2.1. ANR

In 2012, NANO-D received funding from four ANR programs:

- **ANR JCJC**: 340,000 Euros over three years (2011-2014). This grant has been provided to S. Redon by the French Research Agency for being a finalist in the ERC Starting Grant 2009 call, and is for two PhD students and an engineer.
- **ANR MN**: 180,000 Euros over four years (2011-2015). This project, coordinated by NANO-D (S. Grudinin), gathers biologists and computer scientists from three research groups: Dave Ritchie at LORIA, Valentin Gordeliy at IBS (total grant: 360,000 Euros).
- **ANR PIRIBio**: 25,000 Euros over four years (2010-2013). We are participating in this project coordinated by Michel Vivaudou at IBS, with Serge Couzy at CEA/LCBM and Frank Fieschi at IBS.
- **ANR COSINUS**: 85,000 Euros over four years (2009-2012). This project, coordinated by NANO-D (S. Redon), gathers physicists, biologists and computer scientists from five research groups: Xavier Bouju and Christian Joachim at CEMES, Martin J. Field at IBS, Serge Couzy at CEA/LCBM, Thierry Deutsch and Frederic Lancon at CEA/SP2M (total grant: 380,000 Euros).

7.2.2. PEPS

Sergei Grudinin participates in the Cryo-CA PEPS project. Cryo-CA (Computational algorithms for biomolecular structure determination by cryo-electron microscopy) is a 2-years project, supported by the Projets Exploratoires Pluridisciplinaires (PEPS) program in the panel Bio-Maths-Info provided by CNRS (French National Centre for Scientific Research). The project started on the 01/09/2012. Its main goal is to develop computational algorithms for cryo-electron microscopy (cryo-EM).

The partners of the Cryo-CA project are: Inria Nancy / Team Orpailleur (David Ritchie); Inria Grenoble / Team NANO-D (Sergei Grudinin); and INSERM IGBMC/ Team Integrated structural Biology (Annick Dejaegere, Patrick Schultz, and Benjamin Schwarz).

The main scientific aim of this cross-disciplinary project is to develop computational algorithms to help experimentalists and molecular modelers to solve more rapidly and accurately the structures of macromolecular complexes using cryo-electron microscopy (cryo-EM) and integrative structural biomolecular modeling techniques. More specifically, this PEPS initiative aims to address two important challenges in single particle cryo-EM, namely particle picking and multi-dimensional structure fitting. In the longer term, a further driving aim of this project is to develop strong collaborations amongst the participating teams to position ourselves for a larger project proposal to ANR or ERC.

7.3. European Initiatives

7.3.1. FP7 Projects

7.3.1.1. ADAPT

Title: Theory and algorithms for adaptive particle simulation

Type: IDEAS

Instrument: ERC Starting Grant

Duration: September 2012 - August 2017

Principal Investigator: Stephane Redon

Coordinator: Inria (France)

7.4. International Research Visitors

7.4.1. Internships

Georgy CHEREMOVSKIY (from Jul 2012 until Oct 2012)

Subject: Development of Orientation-Dependent Potential Function for Computational Drug Design

Institution: Moscow Institute for Physics and Technology (Russian Federation)

NECS Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

The 12-months post-doctoral stay of Alireza Esna Ashari has been funded by Inria-Schneider Endowed Chair on Foundations of Component-based Design for Embedded Systems. A. Esna Ashari has been working on distributed estimation and fault detection using wireless sensor networks, under the supervision of F. Garin and A. Kibangou.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. ANR VOLHAND

VOLHAND (**VOL**ant pour personne âgée et/ou **HAND**icapée) is a project funded by the ANR (National Research agency). This project, started in October 2009, is a result of collaboration between C. Canudas de Wit and Franck Quaine/Violaine Cahouët (from the biomechanical team of GIPSA-Lab). The project aims at developing a new generation of Electrical power-assisted steering specifically designed for disabled and aged people. Our contribution is to work out new assisted laws that accommodate to the specific mechanical characteristics of this particular driver population. The consortium is composed by: LAMIH, CHRU, Fondation Hopale, GIPSA-Lab, INRETS and JTEKT. More information can be found on-line: <http://www.univ-valenciennes.fr/volhand/>.

8.2.2. PREDIT

8.2.2.1. MoCoPo

The MOCOPo project (Measuring and mOdelling traffic COngestion and POLLution) is funded by the French Ministry in charge of Transport (MEDDTL), through the PREDIT (Research and Innovation in Land Transport Program). The project began in January 2011 and will end up in December 2013. Various research institutes and universities, some teams of the MEDDTL and pollution measurements associations are involved in the project: LICIT (Transport and Traffic Engineering Laboratory, joint unit of IFSTTAR and ENTPE), LTE (Transports and Environment Laboratory, IFSTTAR), LEPSIS (Laboratory for Road Operations, Perception, Simulators and Simulations, IFSTTAR), IM (Infrastructures and Mobility Department, IFSTTAR), MACS (Monitoring, Assessment, Computational Sciences, IFSTTAR), Inria-NECS, Atmo Rhône Alpes, DIR-CE (Center-East Direction of Roads), LRPC Angers (Regional Laboratory of Angers), CERTU (Center for Cities and Urban Transportation), and CEREAs (Center of Teaching and Research in Atmospheric Environment, laboratory Ecole des Ponts ParisTech / EDF Research and Development). NeCS is particularly involved in tasks devoted to travel time estimation and prediction. For this purpose one post-doc (Fabio Morbidi) has been recently hired. More information can be found on-line: <http://mocopo.ifsttar.fr/>.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. FeedNetBack

Title: FeedNetBack

Type: COOPERATION (ICT)

Defi: Networked embedded and control systems

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2008 - January 2012

Coordinator: Inria (France)

Others partners: ETH Zurich (CH), Universidad de Sevilla (ES), KTH Stockholm (SE), Università di Padova (IT), Ifremer (FR), Videotec (IT), OMG (GB), Vitamib (FR).

See also: <http://feednetback.eu>

Abstract: The main objective of the FeedNetBack project is to generate a rigorous co-design framework that integrates architectural constraints and performance trade-offs from control, communication, computation, complexity and energy management. The goal is to master complexity, temporal and spatial uncertainties such as delays and bandwidth in communications and node availability. This approach enabled the development of more efficient, robust and affordable networked control systems that scale and adapt with changing application demands. The project extends the current scientific state-of-the-art in networked control and develops a set of software tools to support the co-design framework.

8.3.1.2. Hycon2

Title: Highly Complex and Networked Control Systems

Type: COOPERATION (ICT)

Defi: Engineering of Networked Monitoring and Control Systems

Instrument: Network of Excellence (NoE)

Duration: September 2010 - August 2014

Coordinator: CNRS (France)

Others partners: Inria (France), ETH Zurich (Switzerland), TU Berlin (Germany), TU Delft (Netherlands) and many others

See also: <http://www.hycon2.eu>

Abstract: Hycon 2 aims at stimulating and establishing a long-term integration in the strategic field of control of complex, large-scale, and networked dynamical systems. It focuses in particular on the domains of ground and aerospace transportation, electrical power networks, process industries, and biological and medical systems.

8.4. International Initiatives

8.4.1. Inria International Partners

- H. Fourati has started a new collaboration with the Kazakhstan National Technical University (KazNTU). He currently co-advises with Pr. Olga Shiryayeva in KazNTU, Zarina Samigulina PhD student in KazNTU. He also submitted an European project "LA STRADA" with two teams and an SME: Istituto per le Applicazioni del Calcolo "M. Picone" (Università di Roma), the Mathematical Modeling and Scientific Computing Research Group (University of Mannheim) and Karrus (SME).
- F. Garin has collaborations with University of Padova, Italy (S. Zampieri), University of Newcastle, Australia (D. Quevedo), with Lund University, Sweden (G. Como and E. Lovisari), and with KTH Stockholm, Sweden (D. Varagnolo)

8.4.2. Participation In International Programs

8.4.2.1. TeMP

TeMP (Tensor-based Information modelling and Processing) is a project funded in the framework of the French-Brazilian bilateral collaboration program (FUNCAP-Inria). It started from August 2011 for a duration of two years and is coordinated for the French part by A. Kibangou. This project aims to study, analyze, propose and evaluate new models and techniques for digital communication systems using tensors and multilinear algebra tools, through in-depth theoretical analysis of mathematical models, optimization algorithms, and computational simulations. Indeed, new models should be developed for generalizing existing tensor models in order to allow the modeling of a wider class of communication systems for more realistic propagation channels including the cooperation among multiple nodes of a communication network (users or sensors). Due to dynamic change of parameters, tensor-based filtering algorithms need to be developed for information retrieval systems in cooperative communication. These algorithms should be distributed for avoiding network vulnerability and for a better management of computation and storage resources.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Maria Guinaldo Losada, PhD Student, UNED, Madrid, Spain, 2 months visit (Oct. and Nov. 2012).
- André L.F. de Almeida, Associate Professor, UFC, Brazil, visit within the framework of the TeMP project (January 2012).
- Joao Cesar M. Mota, Professor, UFC, Brazil, visit within the framework of the TeMP project (January 2012).
- Zarina Samigulina, PhD student, Kazakhstan National Technical University (KazNTU), two weeks visit (November 2012).

8.5.2. Visits to International Teams

- H. Fourati spent two weeks in Kazakhstan National Technical University (KazNTU), Dec. 2012.
- F. Garin spent three weeks in Lund University during the LCCC focus period on Information and Control in Networks, Oct. 2012.
- A. Kibangou spent three weeks in UFC, Brazil, in two stays (May and Oct. 2012).
- C. Canudas de Wit visited universities of Berkeley (USA), Lund (Sweden), Madrid, Sevilla, and Valencia (Spain).

OPALE Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. Project "OMD2", Optimisation Multi-Disciplinaire Distribuée (Distributed Multidisciplinary Optimization)

This project funded by ANR deals with the development of a software platform devoted to Multidisciplinary Design Optimization (MDO) in the context of distributed computing.

The notion of optimization platform based on distributed and parallel codes is undertaken with a distributed workflow management system running on a grid infrastructure using the GRID5000 middleware from Inria.

Renault is the coordinator of this project, which involves also EMSE, ENS Cachan, EC Nantes, Université de Technologie de Compiègne, CD-Adapco, Sirehna, Activeon, and Inria project TAO, OASIS and OPALE. This contract provides the grant supporting two PhD theses (A. Zerbinati and L. Trifan)

8.1.2. Project "OASIS"

The OASIS project, Optimization of Addendum Surfaces In Stamping, is an R&D consortium (CS, Arcelor-Mittal, ErDF, Inria, UTC, EURODECISION, ESILV, NECS, DeltaCAD, SCILAB-DIGITEO) of the Pole Systemic Paris-Region dedicated to develop an optimal design framework (methods-software platforms-applications) for stamping processes. The EPI OPALE/Inria is the leader within the consortium for the Optimization work-package (one of six WP), the role of which is to develop efficient tools well adapted to Pareto front identification of the multicriteria-dependent stamping processes.

The OASIS project yields 2.4 Meuro total financial support (one Ph.D thesis, two post-doctoral positions and 12 months internship for OPALE).

8.1.3. Project "Bulbe"

This project is funded by the Ministry of Fishing and gathers OPALE Project-Team, K-Epsilon company (specialized in CFD for naval hydrodynamics) and PROFIL compagnie (naval architect). The objective is to design and optimize bow shapes for trawler ships, in order to reduce the fuel consumption during fishing campaigns. Our role is to construct an automated optimization loop to improve bow efficiency, on the basis of CFD tools provided by K-Epsilon company and naval architect recommendations.

8.1.4. Project "Memoria"

This project is funded by the National Foundation for Aeronautics and Space (FNRAE). The partners are the University of Toulouse Paul-Sabatier and the CERFACS. The objective is to study optimization methods under uncertainty in the context of aerodynamic problems.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. EXCITING

Title: Exact Geometry Simulation for Optimized Design of Vehicles and Vessels

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2008 - Mars 2012

Coordinator: Jozef Kepler universitet (Austria)

Others partners: SINTEF (SW), SIEMENS (GER), NTUA (GR), HRS (GR), TUM (GER), HYDRO (AUS), DNV (NOR)

See also: <http://exciting-project.eu/>

Abstract: The objective is to develop simulation and design methods and software based on the isogeometric concepts, that unify Computer-Aided Design (CAD) and Finite-Elements (FE) representation bases. Applications concern hull shape, turbine and car structure design.

8.2.1.2. GRAIN

Title: GReener Aeronautics International Networking

Type: CAPACITIES (TRANSPORTS)

Instrument: Coordination and Support Action (CSA)

Duration: October 2010 - December 2012

Coordinator: CENTRE INTERNACIONAL DE METODES NUMERICCS EN ENGINYERIA (Spain)

Others partners: AIRBUS (SP), ALENIA (I), EADS-IW (F), Rolls-Royce (UK), INGENIA (SP), NUMECA (B), U. SHEFFIELD (UK), U. BIRMINGHAM (UK), CIRA (I), VKI (B), AIRBORNE (NL), LEITAT (SP), CERFACS (F), U. CRANFIELD (UK), CAE (CN), GTE (CN), ARI (CN), FAI (CN), ASRI (CN), SAERI (CN), BIAM (CN), ACTRI (CN), BUAA (CN), NPU (CN), PKU (CN), NUAA (CN), ZJU (CN).

See also: <http://www.cimne.com/grain>

Abstract: The GReener Aeronautics International Networking (GRAIN) is a 24 month project co-funded by the 7th Framework Programme of the European Community (EC) and by the Chinese Ministry of Industry and Information Technology (MIIT). It is managed by the European Commission as a Coordination and Support Action. The main objectives of GRAIN are to identify and assess the future development of large scale simulation methods and tools needed for greener technologies reaching the Vision 2020 environmental goals. GRAIN will prepare the R&T development and exploitation with new large scale simulation tools used on distributed parallel environments to deeper understand and minimize the effects of aircraft/engine design on climate and noise impact. This objective can be met by supporting joint Europe-China networking actions for defining the necessary technologies to improve green aircraft performance.

8.2.1.3. MARS

Title: Manipulation of Reynolds Stress

Type: COOPERATION (TRANSPORTS)

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2010 - September 2013

Coordinator: CENTRE INTERNACIONAL DE METODES NUMERICCS EN ENGINYERIA (Spain)

Others partners: USFD (UK), AIRBUS (SP), FOI (SW), ALENIA (IT), DLR (GER), CNRS (FR), DASSAULT (FR), NUMECA (BEL), UNIMAN (UK), EADS (UK)

See also: <http://www.cimne.com/mars/>

Abstract: The objective is to study flow control devices for aeronautical applications. This project gathers twelve European partners and twelve Chinese partners for a common work that includes both experimental and numerical studies. Opale Project-Team is in charge of developing numerical algorithms to optimize flow control devices (vortex generators, synthetic jets).

8.2.1.4. TraM3

Title: TRaffic Management by Macroscopic Models

Type: IDEAS

Instrument: ERC Starting Grant (Starting)

Duration: October 2010 - September 2015

Coordinator: Inria (France)

See also: <http://www-sop.inria.fr/members/Paola.Goatin/tram3.html>

Abstract: The project intends to investigate traffic phenomena from the macroscopic point of view, using models derived from fluid-dynamics consisting in hyperbolic conservation laws. The scope is to develop a rigorous analytical framework and fast and efficient numerical tools for solving optimization and control problems, such as queues lengths control or buildings exits design.

8.2.2. Collaborations in European Programs, except FP7

Program: PHC Polonium

Project acronym: CROM3

Project title: Crowd Motion Modeling and Management

Duration: jan. 2011 - dec. 2012

Coordinator: P. Goatin (France), M.D. Rosini (Poland)

Other partners: ICM, Warsaw University (Poland)

Abstract: The aim of this collaboration is to provide new analytical and numerical tools for solving control and optimization problems arising in pedestrian traffic management. Our scope is to develop a rigorous analytical framework and fast and efficient numerical tools for solving optimization and control problems, such as buildings exits design. This will allow to elaborate reliable predictions and to optimize traffic fluxes. To achieve this goal, we will study in details the structure of the solutions of the partial differential equations modeling traffic dynamics, in order to construct ad hoc methods to tackle the analytical and numerical difficulties arising in this study.

8.2.3. Collaborations with Major European Organizations

Partner 1: organisme 1, labo 1 (pays 1)

Sujet 1 (max. 2 lignes)

Partner 2: organisme 2, labo 2 (pays 2)

Sujet 2 (max. 2 lignes)

8.3. International Initiatives

8.3.1. Inria Associate Teams

8.3.1.1. ORESTE

Title: Optimal REroute Strategies for Traffic managEment

Inria principal investigator: PaolaGoatin

International Partner (Institution - Laboratory - Researcher):

University of California Berkeley (United States) - Electrical Engineering and Computer Science (EECS) - Alexandre M. Bayen

Duration: 2012 - 2014

See also: <http://www-sop.inria.fr/members/Paola.Goatin/ORESTE/>

ORESTE is an associated team between OPALE project-team at Inria and the Mobile Millennium / Integrated Corridor Management (ICM) team at UC Berkeley focused on traffic management. With this project, we aim at processing GPS traffic data with up-to-date mathematical techniques to optimize traffic flows in corridors. More precisely, we seek for optimal reroute strategies to reduce freeway congestion employing the unused capacity of the secondary network. The project uses macroscopic traffic flow models and a discrete approach to solve the corresponding optimal control problems. The overall goal is to provide constructive results that can be implemented in practice. Both teams have actively contributed to recent advances in the subject, and we think their collaboration is now mature enough to take advantage of the associate team framework. The Inria team and its theoretical knowledge complement the Berkeley team, with its engineering knowledge anchored in practice.

8.3.2. Participation In International Programs

- Inria@SILICONVALLEY :

ORESTE Associated Team with UC Berkeley takes part to the program.

- LIRIMA Team ANO 2010-2014:

The agreement governing the creation of the International Laboratory for Research in Computer Science and Applied Mathematics (LIRIMA) was signed on 24th November 2009 in Yaoundé. LIRIMA enables cooperation between Inria research teams and teams in Africa (Sub-Saharan Africa and the Maghreb) to be reinforced. It is the continuation of the major operation undertaken by the SARIMA program (2004-08 Priority Solidarity Fund created by the French Ministry of Foreign & European Affairs).

The LIRIMA team ANO : Numerical analysis of PDEs and Optimization is a partnership between Opale project and the EMI engineering college, Rabat / National Centre for Scientific and Technical Research (CNRST) Morocco. The Team leader is Prof. Rajae Aboulaïch, EMI. Other french participants are the Project Commands at Saclay, Palaiseau and the team-project DRACULA at Inria Lyon.

The ANO team is composed of ten senior researchers from Morocco and ten senior researchers from France and more than fifteen PhD students.

The themes investigated are biomathematics (Models for plants growth, cardiovascular and cerebral diseases, cardio image segmentation), mathematical finance (optimal portfolio, risk management, Islamic finance), multiobjective optimization in structural mechanics, and vehicle traffic and crowd motion.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

8.4.1.1. Senior Researchers

Pr. Ellaia Rachid

Subject: Theory and algorithms for global and multiobjective optimization.

Institution: Ecole Mohammadia d'Ingénieurs (EMI) , Rabat (Morocco)

8.4.1.2. Internship

Bouthaina Yahyaoui, Asma Ghdami and Marwa Mokni

Subject: Multiobjective optimization of laminated composite Mindlin-Reissner plates

Institution: Institut Supérieur des Mathématiques Appliquées et d'Informatique, Kairouan, (Tunisia)

BAMBOO Project-Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. *InférenceGraphesRégulation*

- Title: Inférence de graphes de régulations génétiques à partir de données d'expression
- Coordinator: H. Charles
- BAMBOO participant(s): H. Charles, L. Brinza, M.-F. Sagot
- Type: Pré-Projet de Recherche de l'IXXI (2012-2013)
- Web page: Not available

7.2. National Initiatives

7.2.1. *ABS4NGS*

- Title: Solutions Algorithmiques, Bioinformatiques et Logicielles pour le Séquençage Haut Débit
- Coordinator: E. Barillot
- BAMBOO participant(s): V. Lacroix
- Type: ANR (2012-2015)
- Web page: Not available

7.2.2. *Adapthantroph*

- Title: Adaptation des insectes aux anthroposystèmes
- Coordinator: M. Harry
- BAMBOO participant(s): C. Vieira
- Type: ANR Génoplante (2009-2012)
- Web page: Not available

7.2.3. *Exomic*

- Title: Functional annotation of the transcriptome at the exon level
- Coordinator: D. Auboeuf (Inserm, Lyon)
- BAMBOO participant(s): V. Lacroix, M.-F. Sagot
- Type: INSERM Systems Biology Call (2012-2015)
- Web page: Not available

7.2.4. *ImmunSymbArt*

- Title: Immunity and Symbiosis in Arthropods
- Coordinator: D. Bouchon
- BAMBOO participant(s): F. Vavre
- Type: ANR Blanc (2010-2014)
- Web page: Not available

7.2.5. *Metagenomics of Bemisia tabaci*

- Title: Metagenomics of *Bemisia tabaci* symbiotic communities

- Coordinator: L. Mouton (LBBE, UCBL)
- BAMBOO participant(s): F. Vavre, M.-F. Sagot
- Type: Genoscope Project
- Web page: Not available

7.2.6. *MIRI*

- Title: Mathematical Investigation of "Relations Intimes"
- Coordinator: M.-F. Sagot
- BAMBOO participant(s): V. Acuña, C. Baudet, C. Gautier, V. Lacroix, P. Milreu, C. Klein, I. Nor, M.-F. Sagot, P. Simões
- Type: ANR Blanc (2009-2012)
- Web page: <http://pbil.univ-lyon1.fr/members/sagot/htdocs/team/projects/miri/miri.html>

7.2.7. *SpeciAphid*

- Title: Evolutionary genetics and mechanisms of plant adaptation in aphids
- Coordinator: Jean-Christophe Simon (IGEPP, INRA, Rennes)
- BAMBOO participant(s): H. Charles, Y. Rahbé
- Type: ANR (2012-2014)
- Web page: Not available

7.3. European Initiatives

7.3.1. *FP7 Projects*

7.3.1.1. *Microme*

- Title: The Microme Project: A Knowledge-Based Bioinformatics Framework for Microbial Pathway Genomics
- Coordinator: P. Kersey (EBI)
- European partners: Amabiotics (France), CEA (France), CERTH (Greece), CSIC (Spain), CNIO (Spain), DSMZ (Germany), EBI (UK), HZI (Germany), Isthmus (France), Molecular Nertwork (Germany), SIB (Switzerland), Tel Aviv Univ. (Israel), Université Libre de Bruxelles (Belgium), WTSI (UK), Wageningen Univ. (The Netherlands)
- BAMBOO participant(s): Anne Morgat
- Type: Collaborative Project. Grant Agreement Number 222886-2
- Web page: <http://www.microme.eu>

7.3.1.2. *SISYPHE*

- Title: Species Identity and SYmbiosis Formally and Experimentally explored
- Coordinator: M.-F. Sagot
- BAMBOO participant(s): Whole BAMBOO team
- Type: ERC Advanced Grant (2010-2015)
- Web page: <http://pbil.univ-lyon1.fr/members/sagot/htdocs/team/projects/sisyphe/sisyphe.html>

7.3.1.3. *Symbiox*

- Title: Role of the oxidative environment in the stability of symbiotic associations
- Coordinator: F. Vavre
- BAMBOO participant(s): F. Vavre
- Type: Marie Curie IOF for Natacha Kremer (2011-2014)

- Web page: Not available

7.3.1.4. SWIPE

- Title: Predicting whitefly population outbreaks in changing environments
- Coordinator: E. Zchori-Fein
- BAMBOO participant(s): F. Vavre
- Type: European ERA-NET program ARIMNET (2012-2015)
- Web page: Not available

7.3.2. Collaborations with Major European Organizations

Partner 1: Pierluigi Crescenzi, Univ. Florence, Italy

Algorithmic (graphs, trees, sequences), complexity

Partner 2: Ana Teresa Freitas and Susana Vinga, INESC-ID, IST Lisbon, Portugal

NGS, metabolism, small RNAs, motifs

Partner 3: Alberto Marchetti-Spaccamela, Univ. Rome La Sapienza, Italy

Algorithmic (graphs, trees), complexity

Partner 4: Nadia Pisanti and Roberto Grossi, Univ. Pisa, Italy

Algorithmic (graphs, trees, sequences)

Partner 5: Leen Stougie, Free Univ. Amsterdam and CWI, the Netherlands

Algorithmic (graphs, trees), complexity

7.4. International Initiatives

7.4.1. DISCO

- Title: Laboratoire International de Recherche en Bioinformatique
- Coordinators: E. Zucca (Italy)
- BAMBOO participant(s): Pierluigi Crescenzi (external member BAMBOO)
- Type: Ministero dell'Istruzione, dell'Università e della Ricerca
- Web page: <http://bart.disi.unige.it/DISCO/>

7.4.2. LIA project with Brazil: LIRIO

- Title: Laboratoire International de Recherche en Bioinformatique
- Coordinators: M.-F. Sagot (France), A. T. Vasconcelos (LNCC, Brazil)
- BAMBOO participant(s): BAMBOO Team
- Type: LIA CNRS
- Web page: <https://team.inria.fr/bamboo/en/cnrs-lia-laboratoire-international-associe-lirio/>

7.4.3. Inria-Faperj (Brazil) project: RAMPA

- Title: Bioinformatics for the Reconstruction and Analysis of the Metabolism of PARasites
- Coordinators: M.-F. Sagot (France), A. T. Vasconcelos (LNCC, Brazil)
- BAMBOO participant(s): Whole BAMBOO Team
- Type: Faperj-Inria
- Web page: Not available

7.4.4. Project within CIRIC

- Title: Omics Integrative Sciences

- Coordinators: Alejandro Maass (Chile), Anne Siegel and M.-F. Sagot (France)
- BAMBOO participant(s): BAMBOO Team
- Type: Communication and Information Research and Innovation Center (CIRIC)
- Web page: Not available

7.4.5. Inria International Partners

- Acronym: AMICI
- Title: Algorithms and Mathematics for Investigating Communication and Interactions intra- and inter-organisms
- Coordinators: M.-F. Sagot (France), A. Marchetti-Spaccamela (Univ. Rome, Italy), L. Stougie (Free Univ. Amsterdam and CWI, the Netherlands), P. Crescenzi, Univ. Florence, Italy), N. Pisanti (Univ. Pisa, Italy)
- BAMBOO participant(s): Whole BAMBOO Team
- Type: Inria International Partner
- Web page: <http://amici.dsi.unifi.it/amici/>

7.5. International Research Visitors

7.5.1. Visits of International Scientists

Andrea Marino, PhD student (Supervisor: Pierluigi Crescenzi), University of Florence, Italy, visit of 3 months and various visits of 1-2 weeks

Maria Cristina Motta, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, visit of 10 days

Susana Vinga, Professor, INESC-ID, IST Lisbon, Portugal, visit of 1 week

Arnaldo Zaha, Universidade Federal de Rio Grande do Sul, Porto Alegre, Brazil, visit of 10 days

BEAGLE Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR

- PAGDEG: Causes and consequences of protein aggregation in cellular degeneration, a three-year project (2009-2012), Call "PIRIBIO". Supervisor: A. Lindner (INSERM, Paris) ; Other participants: Y. Chen (ENS Paris), L. Moisan (Univ. Paris 5). Participants: Hugues Berry, Anne-Sophie Coquel
- Stochagene (2011-2014). Objective: identify the molecular basis of the stochasticity of gene expression in eukaryotic cells. Partners: CGPhyMC (Olivier Gandrillon, Lyon, Leader), Genethon (Andras Paldi, Evry). Participants: G Beslon, H Berry, Gael Kaneko
- Ancestrome: phylogenetic reconstruction of ancestral "-omes", a five-year project (2012-2016), call "Bioinformatics" of the "Investissements d'avenir". Supervisor: V. Daubin (CNRS, LBBE, Lyon) ; with Institut Pasteur, ENS Paris, ISEM (Univ Montpellier 2) Participant: E Tannier

7.1.2. CNRS

- H Berry participates to a PEPPII (Projets exploratoires pluridisciplinaires inter-instituts) called NeoBG: towards a biologically realistic theory of reinforcement learning, 2011-2012, Supervisor : B. Delord (Univ. P & M Curie, Paris). With Ph. Faure and L. Venance (College de France, Paris)
- Carole Knibbe coordinated in 2011 and 2012 a PEPPII (Projets exploratoires pluridisciplinaires inter-instituts) called "Analyser, simuler et expérimenter l'évolution des génomes bactériens". The aim of the project was to study the dynamics and the evolvability of bacterial genomes by combining "wet" evolution experiments, individual-based simulations, mathematical models and bioinformatics of real genomes. The total budget was 50 k€. The involved teams were, beside Beagle, Dynamics and evolution of the bacterial genome / Laboratoire Adaptation et Pathogénie des Microorganismes (LAPM, CNRS UMR5163, Grenoble), Modélisation mathématique et calcul scientifique / Institut Camille Jordan (ICJ, CNRS UMR5208, Lyon), Algorithmique et ordonnancement pour plates-formes hétérogènes distribuées / Laboratoire de l'Informatique du Parallélisme (LIP, CNRS UMR5668, Lyon), and Bioinformatique et génomique évolutive / Laboratoire de Biométrie et Biologie Evolutive (LBBE, CNRS UMR5558, Lyon)
- E Tannier participates to a PEPS (Projet exploratoire premier soutien) called C1P: algorithmics of 1D structures, 2012-2013. Supervisor: M. Raffinot (CNRS, LIAFA, Paris), involved teams from Marne-la-Vallée, Nantes, Marseille, Bordeaux, Lyon.

7.2. International Initiatives

7.2.1. Inria International Partners

- "Astrocytic regulation of neuronal network activity" 2012-2103, A Research Networks Program in Computational Neurosciences and Computational Cognitive Sciences of the High Council for Scientific and Technological Cooperation between France-Israel, with E Ben-Jacob and Y Hanein (Tel Aviv Univ, Israel). Supervisors: H. Berry (French side) and Y. Hanein (Israeli side).

7.3. International Research Visitors

7.3.1. Visits of International Scientists

- Nadia El-Mabrouk, professeure à l'université de Montreal, "chercheur invité" of Inria, October 1-12, 2012
- Jacques Rougemont (team leader) and Marion Leleu (researcher) of the Bioinformatics and Biostatistics Core Facility of EPFL (Ecole Polytechnique Fédérale de Lausanne). November 23, 2012.
- Thomas Höfer (Heidelberg) in May
- Kirsten HWJ ten Tusscher (Theoretical Biology/Bioinformatics, Utrecht University, Netherlands) in September

7.3.2. Visits to International Teams

- H. Soula is visiting professor in the Theunissen Lab of Auditory and Neuroscience during the academic year 2012-2013. Grant: CRCT CNU.
- Visit of C Rigotti to the team Bioinformatics and Biostatistics Core Facility of EPFL (Ecole Polytechnique Fédérale de Lausanne). March 8 and 9, 2012.

DRACULA Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

Collaboration with the Immune Lab of Jacqueline Marvel in Lyon (Immunité, Infection et Virus), one paper published together in 2012 and one grant obtained from the FINOVI foundation.

8.2. National Initiatives

8.2.1. ANR

Projects coordination by a member of Dracula

- + ANR (jeunes chercheurs) MADCOW "Modelling amyloid dynamics and computation output work: applications to Prion and Alzheimer's disease", 2008-2012.
Participants: Samuel Bernard, Fabien Crauste, Erwan Hingant, Laurent Pujo-Menjouet [Coordinator], Vitaly Volpert.
- + ANR (jeunes chercheurs) ProCell "Mathematical Methods for Erythropoiesis Modelling: from Proteins to Cell Populations", 2009-2013.
Participants: Samuel Bernard, Fabien Crauste [Coordinator], Olivier Gandrillon, Laurent Pujo-Menjouet, Emmanuelle Terry, Vitaly Volpert.
- + ANR BIMOD "Hybrid models of cell populations. Application to cancer modelling and treatment", 2010-2014.
Participants: Mostafa Adimy, Fabien Crauste, Vitaly Volpert [Coordinator].
- + ANR STOCHAGENE "Role of the chromatin dynamics on the stochasticity in gene expression in higher eukaryotic cells", 2011-2015.
Participant: Olivier Gandrillon [Coordinator].

Collaboration in other projects

- + Thomas Lepoutre participates in the ANR project (jeunes chercheurs) MODPOL "cell polarization modeling", 2011-2015, Vincent Calvez (ENS Lyon) [Coordinator].
- + Olivier Gandrillon participates in the ANR (Investissement d'Avenir) Iceberg "From population models to model populations: single cell observation, modeling, and control of gene expression", Gregory Batt (Inria) [Coordinator].

8.3. European Initiatives

8.3.1. Collaborations in European Programs

Program: PICS CNRS - RUSSIE

Project title: Mathematical modelling of blood diseases

Duration: 2010-2012

Participants: Samuel Bernard, Fabien Crauste, Laurent Pujo-Menjouet, Alen Tosenberger, Vitaly Volpert [Coordinator].

8.3.2. Collaborations with Major European Organizations

- University of Valladolid (Spain). Collaboration with Oscar Angulo, Juan Carlos Lopez-Marcos and Miguel Ange Lopez-Marcos, on the analysis of an age-structured model describing erythropoiesis, and its numerical resolution.
- Karolinska University Hospital of Stockholm (Sweden). Collaboration with Peter Arner, Mats Eriksson, Erik Arner, Mikael Rydén and Kirsty L. Spalding, on the study of dynamics of human adipose lipid turnover in health and metabolic disease.

8.4. International Initiatives

8.4.1. Participation In International Programs

8.4.1.1. M3CD

Program: **Euromediterranean 3+3**

Title: Mathematical Models and Methods in Cell Dynamics

Inria principal investigator: Mostafa Adimy

International Partners (Institution - Laboratory - Researcher):

Institut Pasteur de Tunis (Tunisia) - Slimane Ben Miled

Consiglio Nazionale delle Ricerche- Istituto per le Applicazioni del Calcolo Mauro Picone (Italy) - Istituto per le Applicazioni del Calcolo Mauro Picone - Roberto Natalini

Cadi Ayyad University (Morocco) - Populations Dynamics Laboratory - Moulay Lhassan Hbid

Duration: Jan 2012 - Dec 2015

The aim of this project is to establish a network working on mathematical and computational models in cell dynamics. This network consists of five groups which have already established close bilateral relations. Those are the Inria teams Bang and Dracula in Paris and Lyon, France, the team IAC-CNR in Rome, Italy, the laboratory of Mathematical Population Dynamics (LMDP) from the university of Marrakech in Morocco, and the team of Mathematical Modelling and Computing in Biology (MoMinBi) from the Pasteur Institute in Tunis. Modelling cell dynamics and related processes is one of the main subjects of interest for the partners for many years. The issues addressed in the present project can be divided into five parts:

- 1) Analysis of structured models in cell population dynamics ;
- 2) Dynamics of normal and pathological haematopoiesis ;
- 3) Dynamics of Darwinian adaptation, in particular by drug resistance in competing cell or parasite populations, healthy and pathological / pathogenic (cancer, bacteria, parasites) ;
- 4) Dynamics of chemical and physical determinants of filament formation and intracellular spatial organisation of the cytoskeleton conformation ;
- 5) Coupling of the molecular mechanisms of control of the cell division cycle and cell proliferation.

The first part has been developed for many years by all the partners in this project. It tackles issues related to cell dynamics and biological mechanisms, physiological and chemical properties of cells and cell populations. The other four aspects of the project have been studied in the past by the Inria teams "Bang" and "Dracula" (2, 4, 5) and the IAC-CNR team (Rome), or are a rapidly emergent theme in Bang (3, cell Darwinism) with possible and natural connections with the other teams, in particular IAC-CNR and MoMinBi in Tunisia. Themes (2, 4, 5) have also been initiated (for their fundamental part) in a recent collaboration between Dracula and the teams from Morocco and Tunisia. The objectives of the present project are to pursue and deepen the study of cell proliferation dynamics and cellular mechanisms using structured models that take into account some new structure variables. The development of computer models will also be investigated in this project. Training and research activities related to these topics are currently underway between the Inria teams and the teams from Marrakech and Tunis, and between the Italian team and Bang. Two co-supervised theses are currently in progress, a Spring school on this subject will be organised by the partners in 2012. This program comes at the right time to give a new impetus to this collaboration. It will lead to the establishment of a multi-site laboratory expertise in population dynamics modelling, especially in cellular dynamics. This project will also allow the teams from Morocco and Tunisia to use their knowledge on mathematics applied to cell dynamics.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Michal Komorowski - Institute of Fundamental Technological Research of Polish Academy of Science, Warsaw, Pologne - February 2012.
- Oscar Angulo - University of Valladolid, Spain - March 2012.
- Konstantinos Tzirakis - Institute of Applied and Computational Mathematics, Foundation for Research and Technology, Greece - April 2012.
- Thomas Höfer - German Cancer Research Center, Heidelberg - April 2012.
- John Lygeros - Automatic Control Laboratory, ETH Zurich, Switzerland - June 2012.
- Hassan Hbid - University of Marrakech - June 2012.
- Khalil Ezzinbi (chercheurs invités) - University of Marrakech - September 2012.
- Michael C. Mackey - McGill University, Montréal, Canada - September 2012.
- Marta Tyran-Kaminska - University of Silesia, Pologne - September 2012.
- Sergei Fedotov - School of Mathematics, The University of Manchester, UK - October 2012.
- Amira Kebir - Institut Pasteur de Tunis - December 2012.

IBIS Project-Team

7. Partnerships and Cooperations

7.1. Regional initiatives

Project name	Identification structurelle et paramétrique des réseaux de régulation bactériens
Coordinator IBIS participants Type Web page	E. Cinquemani E. Cinquemani, J. Geiselmann, H. de Jong, D. Stefan Funding PhD grant, Cluster ISLE, Région Rhône-Alpes http://cluster-isle.grenoble-inp.fr/
Project name	Motilité ou adhésion : comment les entérobactéries choisissent entre ces deux états physiologiques déterminants pour la virulence
Coordinator IBIS participants Type	S. Lacour J. Demol, O. Dudin, J. Geiselmann, J. Izard, S. Lacour, C. Pinel Grant, Cluster Infectiologie, Région Rhône-Alpes
Project name	Séminaire grenoblois des systèmes complexes
Coordinators IBIS participants Type Web page	S. Achard, O. François, A. Girard, E. Prados, S. Rafai, D. Ropers D. Ropers Funding by Institut des Systèmes Complexes de Lyon (IXXI) http://www.ixxi.fr/?page_id=114&lang=fr
Project name	Séminaire de modélisation du vivant
Coordinators IBIS participants Type Web page	O. Gandrillon D. Ropers Funding by GdR BIM http://cgphimc.univ-lyon1.fr/CGphiMC/Semovi/Semovi.php

7.2. National initiatives

Project name	ColAge – Lifespan control in bacteria: Natural and engineering solutions
Coordinator IBIS participants Type Web page	H. Berry G. Baptist, E. Cinquemani, J. Geiselmann, H. de Jong, J. Izard, S. Lacour, C. Pinel, D. Ropers Action d'Envergure Inria-INSERM (2008-2012) http://colage.saclay.inria.fr

Project name	GeMCo – Model reduction, experimental validation, and control for the gene expression machinery in <i>E. coli</i>
Coordinator IBIS participants Type Web page	M. Chaves G. Baptist, E. Cinquemani, J. Geiselmann, E. Grac, H. de Jong, J. Izard, S. Lacour, C. Pinel, D. Ropers ANR Blanc (2010-2013) http://www-sop.inria.fr/members/Madalena.Chaves/ANR-GeMCo/main.html
Project name	RESET – Arrest and restart of the gene expression machinery in bacteria: from mathematical models to biotechnological applications
Coordinator IBIS participants Type	H. de Jong G. Baptist, E. Cinquemani, J. Geiselmann, H. de Jong, J. Izard, S. Lacour, Y. Markowicz, C. Pinel, D. Ropers Bioinformatics call, Investissements d’Avenir program (2012-2016)
Project name	Fonction du système de régulation post-transcriptionnel CSR dans la dynamique de l’adaptation métabolique chez la bactérie modèle <i>Escherichia coli</i>
Coordinators IBIS participants Type Web page	M. Coccagn-Bousquet (INRA, LISBP), B. Enjalbert (INSA, LISBP), D. Ropers M. Morin, D. Ropers Contrat Jeune Scientifique INRA-Inria (2012-2016) http://www.inra.fr/les_hommes_et_les_femmes/rejoignez_nous/completer_sa_formation/le_recrutement_de_doctorants/cjs__1/inra_inria

7.3. International projects

Project name	French bioinformatics contribution to ICGC
Coordinator IBIS participants Type Web page	G. Thomas F. Rechenmann International Cancer Genome Consortium (ICGC) http://www.icgc.org/

The goal of ICGC (International Cancer Genome Consortium) is to obtain a comprehensive description of genomic, transcriptomic and epigenomic changes in 50 different cancer types. In France, INCa (French National Cancer Institute) contributes to this project and focuses on two types of cancer. The main idea is to sequence the human genome of normal and tumoral cells of a large set of patients and to compare these genomic sequences to identify the mutations which may explain the development of the cancers. Bioinformatics is clearly involved in the management, the analysis and the visualization of the huge sets of data and results. Bioinformatics of the French contribution is carried out at Lyon, in the context of the Synergie Lyon Cancer Foundation. François Rechenmann has joined this bioinformatics team and contributes to the organization of the data management and analysis workflow, under the leadership of prof. Gilles Thomas [12], [10].

7.4. International collaborations

IBIS has strong collaborations with the group of Giancarlo Ferrari-Trecate at the Computer Engineering & Systems Science Department of the University of Pavia (Italy) and the group of John Lygeros at the Automatic

Control Lab at ETH Zürich (Switzerland). This collaboration started with the FP6 project Hygeia, in which the above groups and IBIS (then HELIX) participated. Over the years, it has resulted in a dozen of co-authored papers and the co-supervision of a PhD thesis by Hidde de Jong and Giancarlo Ferrari-Trecate. Eugenio Cinquemani was a post-doctoral fellow at ETH in the framework of the Hygeia project, and joined the IBIS group as a research scientist in the fall of 2009.

7.5. International research visitors

Internship Supervisor Subject	Elif Köksal (Bogazici University, Turkey) E. Cinquemani Modeling, analysis, and identification of metabolic networks
Internship Supervisor Subject	Nicola Simeone (University of Pavia, Italy) E. Cinquemani Stochastic modeling and identification of bacterial regulatory networks

MOISE Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- E. Blayo is a member of the scientific committee of the regional Institut des Sciences Complexes (IXXI) <http://www.ixxi.fr>.
- E. Blayo is a member of the scientific committee of the Pôle Alpin Risques Naturels <http://www.risknat.org>.
- E. Blayo and M. Nodet are responsible for the workpackage "numerical modelling" within the regional project (Région Rhône-Alpes) "**Envirhonalp**" <http://www.envirhonalp.fr>.
- A. Rousseau leads the working group *Couplage Fluide/Vivant* in Montpellier for the study of coupled systems (fluid dynamics and life sciences) in nearshore regions. This research is funded by the Labex NUMEV in Montpellier.
- M. Nodet is involved in E. Maitre MSTIC project MENTOL about Optimal Transport.
- Nicolas Papadakis is responsible of the ASIOME project (Assimilation de Structures d'Images Océanographiques et Modélisation d'Erreurs) funded by the Pôle Mathématiques Sciences et Technologies de l'Information et de la Communication (MSTIC) of the Joseph Fourier University, Grenoble. and the LEFE/MANU program of INSU (CNRS). [6.3.4](#)

8.1.1. Collaborations with Various Regional Research Teams

- LEGI, MEOM team : [6.3.4](#) , [6.1.2](#) , [6.2.1](#) , [6.3.3](#) .
- LGGE Grenoble, Edge team (C. Ritz, O. Gagliardini, F. Gillet-Chaulet, G. Durand), see paragraphs [6.2.3](#) , [6.2.4](#) and [6.2.5](#) .
- LGGE, Statistical methodology, [6.4.1](#)
- LGGE, DatIce tool, [5.3](#)
- LTHE, Anne-Catherine Favre: multivariate extremal risk indicators, project "Soutien à l'Excellence et à l'Innovation Grenoble INP" MEPIERA (Méthodologies innovantes Pour l'Ingénierie de l'Eau et des Risques Associés)
- LTHE, Thierry Lebel, Théo Vischel: tracking of mesoscale convective systems,
- Building energy (G2ELab, Mathilde Grandjacques). : [6.4.1](#) , [6.4.2](#)

8.2. National Initiatives

8.2.1. Interactions with other Inria Project-Teams or Actions

Participants	Inria Project-Team	Research topic	Link
L.Debreu, E.Blayo	CLIME, FLUMINANCE	Multiscale data assimilation	6.2.1
N. Papadakis	MC2	Image segmentation and assimilation for tumor growth modeling	6.5.1
M. Nodet	SCIPOINT	Automatic differentiation	6.2.3
C.Prieur, Laurence Viry	GRAAL	Grid deployment for the study of West African Monsoon	6.4
C. Helbert, C.Prieur	STEEP	Sensitivity analysis for LUTI models	6.4
A. Rousseau	TOSCA	Stochastic Downscaling Method	
A. Rousseau	MODEMIC	Bioremediation of natural resources	6.6
A. Vidard M. Nodet F.X. Le Dimet	CLIME, FLUMINANCE	Image assimilation	6.3.3
A. Vidard, M. Nodet, E.Kazantsev	TROPICS	Ocean Adjoint Modelling	6.2.1 , 6.3.2
C. Prieur, A. Vidard, N. Papadakis	STEEP	Calibration of Land Use and Transport Integrated (LUTI) models.	6.8

8.2.2. Collaborations with other Research Teams in France

Participants	Research Team	Research topic	Link
N. Papadakis	(Labri, IMB, Bordeaux)	image processing problems (histogram equalization and image inpainting)	6.5.1
C. Prieur	IMT Toulouse, IFP Rueil, EDF, CEA Cadarache	Sensitivity analysis	6.4.1
C. Prieur	ISFA Lyon 1, Université de Bourgogne	Multivariate risk indicators	6.4.4
A. Rousseau	Institut de Mathématiques et de Modélisation de Montpellier (I3M)	Modelling and simulation of coastal flows	6.1
A. Rousseau	Laboratoire de Météorologie Dynamique (Ecole Polytechnique)	Stochastic Downscaling Method	
E.Blayo, A.Rousseau	LAMFA (Amiens), LAGA (Paris 13)	Coupling methods	6.1.2
A. Rousseau	IFREMER (Sète), UMR Ecosym (Montpellier)	Coupling fluids and life sciences	6.6
A. Vidard	Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique (Toulouse), Mercator-Océan (Toulouse), Laboratoire de Physique des Océans (Brest),	Ocean Data Assimilation	6.2.1
A. Vidard	LOCEAN (Paris)	Ocean Adjoint Modelling	6.2.1
A. Vidard	LPO (Brest), CERFACS	Ocean data assimilation	6.2.1
B.Lemieux	LSCE (Laboratoire des Sciences de l'Environnement et du Climat)	DatIce tool	5.3

8.2.3. Other National Initiatives:

- E. Blayo is the chair of the CNRS-INSU research program on mathematical and numerical methods for ocean and atmosphere LEFE-MANU. <http://www.insu.cnrs.fr/co/lefe>
- E. Blayo was a member of the 2012 ANR evaluation panel "Earth, Environment, Space".
- Nicolas Papadakis is involved in the SWOT-Ocean group in charge of the use of the high resolution data that will be provided by the future SWOT satellite (CNES/NASA mission). This work is realized in collaboration with Jacques Verron of the Laboratoire des Écoulements Géophysique et Industriels. [6.3.4](#)
- M. Nodet is PI of the project "Méthodes inverses en glaciologie" supported by INSU-LEFE.
- M. Nodet is involved in GDR Calcul and GDR Ondes.
- C. Prieur chairs GdR MASCOT NUM, in which are also involved M. Nodet, E. Blayo, A. Rousseau, C. Helbert, L. Viry, A. Janon, S. Nanty, J.-Y. Tissot and G. Chastaing. <http://www.gdr-mascotnum.fr/doku.php>
- L. Debreu is the coordinator of the national group COMODO (Numerical Models in Oceanography)
- A. Vidard leads a group of projects gathering multiple partners in France and UK on the topic "Variational Data Assimilation for the NEMO/OPA9 Ocean Model", see [6.2.1](#) .

8.2.4. ANR

- A 4-year ANR contract: ANR TOMMI (Transport Optimal et Modèles Multiphysiques de l'Image), see paragraphs [6.5.2](#) ,[6.3.3](#) .

- A 4-year ANR contract: ANR ADAGe (Adjoint ice flow models for Data Assimilation in Glaciology, see paragraph 6.2.3) .
- A 4-year ANR contract: ANR Geo-FLUIDS (Fluid flows analysis and simulation from image sequences: application to the study of geophysical flows, see paragraph 6.3.3) .
- A 4-year ANR contract: ANR COSTA-BRAVA (Complex Spatio-Temporal Dynamics Analysis by Reduced Models and Sensitivity Analysis)http://www.math.univ-toulouse.fr/COSTA_BRAVA/index.html
- CITIES ANR project (numerical models project selected in 2012). http://steep.inrialpes.fr/?page_id=46
- A 4 year ANR contract (2011-2015): ANR COMODO (Communauté de Modélisation Océanographique) on the thematic "Numerical Methods in Ocean Modelling". (coordinator L. Debreu) 6.1.3
- A. Vidard was the coordinator of the ANR VODA (Variational Ocean Data Assimilation for multi-scales applications) 4-year contract ended mid 2012.

8.3. European Initiatives

8.3.1. Collaborations with Major European Organizations

Partner: GDR-E CONEDP

Subject: Control of Partial Differential Equations.

Partner: University of Reading, Department of Meteorology, Department of Mathematics

Subject: Data assimilation for geophysical systems.

Partner: Vicent Caselles of the Pompeu Fabra University, Barcelona Spain

Subject: Image processing problems such as histogram transfer [18] or optical flow estimation. 6.5.1

Partner: European Centre for Medium Range Weather Forecast. Reading (UK)

World leading Numerical Weather Centre, that include an ocean analysis section in order to provide ocean initial condition fo the coupled ocean atmosphere forecast. They play a significant role in the NEMOVAR project in which we are also partner.

Partner: Met Office (U.K) National British Numerical Weather and Oceanographic service. Exceter (UK).

We do have a strong collaboration with their ocean initialization team through both our NEMO, NEMO-ASSIM and NEMOVAR activities. They also are our partner in the NEMOVAR consortium.

Partner: Marine Hydrographic Institute, Natinal Ac.Sci. Ukraine, Sevastopol.

We have a long term collaboration about data assimilation with the Black Sea. This collaboration is getting to a new level with their plan to adopt NEMO and NEMOVAR for their operational forecasting system. On our side, we will benefit from their expertise on the Black Sea dynamics, that is an excellent test case for our developments and methods.

Partner: British Antarctic Survey, Cambridge, UK,

Subject: Antarctic ice core chronology (AICC2012).

Partner: University of Copenhagen, Ice and Climate Group, Denmark

Subject: Antarctic ice core chronology (AICC2012).

Partner: University of Strathclyde (Glasgow, UK)

Subject: Quasi-second order analysis for the propagation and characterization of uncertainties in geophysical prediction 6.4.5

Partner: Institute of Numerical Mathematics, Russian Academy of Sciences

Subject: Quasi-second order analysis for the propagation and characterization of uncertainties in geophysical prediction 6.4.5

8.4. International Initiatives

8.4.1. Participation In International Programs

- F.-X. Le Dimet collaborates with Vietnamese Academy of Sciences (Institute of Mechanics, Hanoi) on the quality of water resources, that is an important problem for Vietnam (see 6.2.2)
- F.-X. Le Dimet collaborates with Florida State University on subjects of Identification of pollution (see 6.2.2) and Assimilation of Images (see 6.3.3).
- C. Prieur collaborates with Antonio Galves (University Sao Paulo) and Jose R. Leon (UCV, Central University of Caracas). She is a member of a USP-COFECUB project on the study of stochastic models with variable length memory (2010-2013) with University of Sao Paulo.
- C. Prieur is leader of a project ECOS Nord with Venezuela (2012-2015).

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Angie Pineda (invited 6 weeks in 2012 by C. Prieur through the ECOS Nord project),
- Jose R. León (invited 2 weeks in 2012 by C. Prieur through the ECOS Nord project).
- Victor Shutyaev, Institute of Numerical Mathematics, Russian Academy of Sciences, Moscow (invited for 2 weeks by F.-X. Le Dimet, see 6.4.5)
- Igor Gejadze, University of Strathclyde, Glasgow, UK (invited for 1 week by F.-X. Le Dimet, see 6.4.5)
- Nancy Nichols, University of Reading, invited for 1 week by A. Vidard and M. Nodet

8.5.2. Visits to International Teams

- F.-X. Le Dimet has been elected « Fellow of the American Meteorological Society », he is the second French scientist (after Michel Jarraud, General Secretary of the World Meteorological Organization) to get this distinction.
- F.-X. Le Dimet has been named « Adjunct Professor » at the Department of Mathematics at Florida State University, (USA) This nomination is valid from 2012 to 2016.
- F.X. Le Dimet has been invited to Caltech (USA) and Jet Propulsion Laboratory in May 2012 where he gave seminars on Assimilation of Images. Invited Speaker at the International Conference ACME in July 2012.

NUMED Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

Vincent Calvez is head of an ongoing ANR contract on cell mobility.

8.1.2. *Competitivity Clusters*

Vincent Calvez organizes a special semester on mathematical biology within Lyon mathematical and computer science LABEX Milion.

8.2. European Initiatives

8.2.1. *FP7 Projects*

8.2.1.1. *DDMoRE*

Title: DDMoRE

Duration: February 2011 - January 2016

Coordinator: Pfizer (United Kingdom)

8.3. International Initiatives

8.3.1. *Participation In International Programs*

8.4. International Research Visitors

8.4.1. *Visits of International Scientists*

8.4.1.1. *Internships*

Nuria BUIL-BRUNA (from Oct 2012 until Dec 2012)

Subject: Prediction of long-term clinical outcome in cancer patients based on the modeling of tumor size dynamic

Institution: University of Malaga (Spain)

8.4.2. *Visits to International Teams*

B. Ribba has visited UCSB in autumn.

STEEP Exploratory Action

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

CITiES (*Calibrage et validation de modèles Transport - usagE des Sols*)

Program: “Modèles Numériques” 2012, ANR

Duration: 2013 – 2016

Coordinator: Emmanuel Prados (STEEP)

Other partners: LET, IDDRI, IRTES-SET (“Systemes and Transports” lab of Univ. of Tech. of Belfort-Montbéliard), IFSTTAR-DEST Paris (formerly INRETS), LVMT (“Laboratoire Ville Mobilité Transport”, Marne la Vallée), VINCI (Pirandello Ingenierie, Paris), IAU Île-De-France (Urban Agency of Paris), AURG (Urban Agency of Grenoble), MOISE (Inria project-team)

Abstract: Calibration and validation of transport and land use models.

8.1.2. FRB (*Fondation pour la Recherche sur la Biodiversité*)

ESNET (Futures of ecosystem services networks for the Grenoble region)

Program: “Modeling and Scenarios of Biodiversity” flagship program, Fondation pour la Recherche sur la Biodiversité (FRB). This project is co-funded by ONEMA (*Office National de l’Eau et des Milieux Aquatiques*).

Duration: 2013 – 2016

Coordinator: Sandra Lavorel (LECA)

Other partners: EDDEN (UPMF/CNRS), IRSTEA Grenoble (formerly CEMAGREF), PACTE (UJF/CNRS), ERIC (Lyon 2/CNRS)

Abstract: This project explores alternative futures of ecosystem services under combined scenarios of land-use and climate change for the Grenoble urban area in the French Alps. In this project, STEEP works in particular on the modeling of the land use and land cover changes, and to a smaller extent on the interaction of these changes with some specific services.

8.2. European Initiatives

8.2.1. Collaborations in European Programs, except FP7

Program: European Space Agency call: “Camera-aided Mars Landing and Rendezvous Navigation System”

Project acronym: MREP Camera

Project title: Camera-aided Mars Landing and Rendezvous Navigation System

Duration: Apr 2012 – Dec 2013

Coordinator: EADS Astrium (France)

Other partners: DEIMOS (Portugal), TNO (Netherlands), Sodern (France), NGC Aerospace (France)

Abstract: Our main goal in this project is the 3D modeling of planetary surfaces and the detection of potential landing zones of space vessels.

8.2.2. Collaborations with Major European Organizations

Partner 1: organisme 1, labo 1 (pays 1)

Sujet 1 (max. 2 lignes)

8.3. International Initiatives

8.3.1. Inria International Partners

Universidad Central de Venezuela (Urban Department) and its spin-off Modelistica: The TRANUS model was developed there. Prof. Tomás de la Barra visited us in 2011 and is an associated partner of our ANR project CITiES.

8.3.2. Participation In International Programs

TRACER (*TRanus, Analyse de la Calibration et des Erreurs, Retours sur Grenoble et Caracas*)

Program: ECOS NORD Venezuela

Duration: 2012 – 2016

Coordinators: Laurence Tubiana (IDDRI), Tomás de la Barra (*Universidad Central de Venezuela*)

Other partners: IDDRI, STEEP, Universidad Central de Venezuela (Urban Institute)

Abstract: The objective of this project is to study robustness and calibration issues on the TRANUS land use model.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Juho Kannala, Feb+Mar 2012, Oulu University, Finland

8.4.2. Internships

Franco Pestarini (from Apr 2012 until Sep 2012)

Subject: Re-implementation of a land use / transport model

Institution: National University of Rosario (Argentina)

Martin Crespo (from Jul 2012 until Dec 2012)

Subject: Parameter optimization algorithm for a Transport/land use model via adjoint method.

Institution: Universidad Nacional de Rosario (Argentina)

8.4.3. Visits to International Teams

Anthony Tschirhard carried out his MSc project at UC Berkeley, under the supervision of Paul Waddell, the chief developer of the UrbanSim model.

AVALON Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. *FUI CompatibleOne Project, 2010-2012*

Participants: Laurent Lefevre, Julien Carpentier, Maxime Morel, Olivier Mornard.

The project CompatibleOne (Nov 2010-Nov 2012) funded by the Fonds Unique Interministériel (FUI) is dealing with the building of a Cloud architecture open software stack.

CompatibleOne is an open source project with the aim of providing interoperable middleware for the description and federation of heterogeneous clouds comprising resources provisioned by different cloud providers. Services provided by Inria participation (module COEES) should allow to act on the system's core by offering a scenario for the broker using energy constraints. These constraints should allow virtual machines placement and displacement using energy profile. Collected data must be available for CO and other systems for future researches. We took part in the analysis of the specification of the system. Mainly, we are in charge of the energy efficiency module. We also had participation in several modules like COMONS (monitoring module), ACCORDS (brokering module), EZVM (virtualization module) and CONETS (networking module). To make energy measurement, we used hardware probes and we studied software probes too. We evaluated several probes providers like Eaton and Schleifenbauer which provide smart PDU (Power Distribution Unit). We also evaluated IPMI board provided by DELL, our computers manufacturer, and OmegaWatt, a small company which provides custom hardware for energy measurement.

In this project, our work is focused on the design and provisioning of energy aware and energy efficient components in order to include energy aspects in QoS, SLAs and billing in clouds architectures. We lead the task T3.4 on energy management and will participate in activities on virtual machines design and migration [13].

7.1.2. *FSN XLcloud, 2012-2014*

Participants: Jean-Patrick Gelas, Laurent Lefevre, Francois Rossigneux.

Focused on high-performance computing, the XLcloud collaborative project sets out to define and demonstrate a cloud platform based on *HPC-as-a-Service*. This is designed for computational intensive workloads, with interactive remote visualisation capabilities, thus allowing different users to work on a common platform. XLcloud project's members design, develop and integrate the software elements of a High Performance Cloud Computing (HPCC) System.

Expected results of the projects include : Functional and technical specification of the XLcloud platform architecture, open source API of the XLcloud platform, implementation of algorithms for 3D and video streaming display, prototype of the XLcloud platform including the support of on-demand virtual clusters and remote visualisation service, use cases for validation, illustrating the performance and suggesting future improvements.

XLcloud aims at overcoming some of the most important challenges of implementing operationally high performance applications in the Cloud. The goal is to allow partners of the project to take leadership position in the market, as cloud service providers, or as technology providers. XLcloud relies on a consortium of various partners (BULL (project leader), TSP, Silkan, EISTI, Ateme, Inria, CEA List, OW2, AMG.Lab).

In this project, the Avalon team investigates the issue of energy awareness and energy efficiency in OpenStack Cloud based platforms.

7.1.3. ANR ARPEGE MapReduce (Scalable data management for Map-Reduce-based data-intensive applications on cloud and hybrid infrastructures), 4 years, ANR-09-JCJC-0056-01, 2010-2013

Participants: Frédéric Desprez, Gilles Fedak, Sylvain Gault, Christian Pérez, Anthony Simonet.

MapReduce is a parallel programming paradigm successfully used by large Internet service providers to perform computations on massive amounts of data. After being strongly promoted by Google, it has also been implemented by the open source community through the Hadoop project, maintained by the Apache Foundation and supported by Yahoo! and even by Google itself. This model is currently getting more and more popular as a solution for rapid implementation of distributed data-intensive applications. The key strength of the MapReduce model is its inherently high degree of potential parallelism.

In this project, the AVALON team participates to several work packages which address key issues such as efficient scheduling of several MapReduce applications, integration using components on large infrastructures, security and dependability, and MapReduce for Desktop Grid.

7.1.4. ANR grant: COOP (Multi Level Cooperative Resource Management), 3.5 years, ANR-09-COSI-001-01, 2009-2013

Participants: Frédéric Desprez, Cristian Klein, Christian Pérez.

The main goals of this project are to set up a cooperation as general as possible between programming models and resource management systems and to develop algorithms for efficient resource selection. In particular, the project targets the SALOME platform and the GRID-TLSE expert-site (<http://gridtlse.org/>) as an example of programming models, and PadicoTM, DIET and XtremOS as examples of communication manager, grid middleware and distributed operating systems.

The project is led by Christian Pérez.

7.1.5. ANR grant SPADES (Servicing Petascale Architectures and DistributEd System), 3.5 years, 08-ANR-SEGI-025, 2009-2012

Participants: Eddy Caron, Florent Chuffart, Frédéric Suter, Haiwu He.

Today's emergence of Petascale architectures and evolutions of both research grids and computational grids increase a lot the number of potential resources. However, existing infrastructures and access rules do not allow to fully take advantage of these resources. One key idea of the SPADES project is to propose a non-intrusive but highly dynamic environment able to take advantage of the available resources without disturbing their native use. In other words, the SPADES vision is to adapt the desktop grid paradigm by replacing users at the edge of the Internet by volatile resources. These volatile resources are in fact submitted via batch schedulers to reservation mechanisms which are limited in time or susceptible to preemption (best-effort mode).

One of the priorities of SPADES is to support platforms at a very large scale. Petascale environments are therefore particularly considered. Nevertheless, these next-generation architectures still suffer from a lack of expertise for an accurate and relevant use. One of the SPADES goal is to show how to take advantage of the power of such architectures. Another challenge of SPADES is to provide a software solution for a service discovery system able to face a highly dynamic platform. This system will be deployed over volatile nodes and thus must tolerate failures. SPADES will propose solutions for the management of distributed schedulers in Desktop Computing environments, coping with a co-scheduling framework.

7.1.6. ANR grant: USS SimGrid (Ultra Scalable Simulation with SimGrid), 3.8 years, ANR-08-SEGI-022, 2008-2012

Participants: Frédéric Desprez, Matthieu Imbert, Georges Markomanolis, Frédéric Suter.

The USS-SimGrid project aims at Ultra Scalable Simulations with SimGrid. This tool is leader in the simulation of HPC settings, and the main goal of this project is to allow its use in the simulation of desktop grids and peer-to-peer settings. The planned work is to improve the models used in SimGrid (increasing their scalability and easing their instantiation), provide associate tools for experimenters (result analysis assistants and test campaign managers), and increase the simulation kernel scalability by parallelization and optimization. The project also aims at producing a scientific instrument directly usable by a large community and is well adapted to the needs of various users.

7.1.7. ANR grant: *SONGS (Simulation Of Next Generation Systems)*, 4 years, ANR-12-INFRA-11, 2012-2015

Participants: Frédéric Desprez, Georges Markomanolis, Jonathan Rouzaud-Cornabas, Frédéric Suter.

The last decade has brought tremendous changes to the characteristics of large scale distributed computing platforms. Large grids processing terabytes of information a day and the peer-to-peer technology have become common even though understanding how to efficiently such platforms still raises many challenges. As demonstrated by the USS SimGrid project, simulation has proved to be a very effective approach for studying such platforms. Although even more challenging, we think the issues raised by petaflop/exaflop computers and emerging cloud infrastructures can be addressed using similar simulation methodology.

The goal of the SONGS project is to extend the applicability of the SimGrid simulation framework from Grids and Peer-to-Peer systems to Clouds and High Performance Computation systems. Each type of large-scale computing system will be addressed through a set of use cases and lead by researchers recognized as experts in this area.

Any sound study of such systems through simulations relies on the following pillars of simulation methodology: Efficient simulation kernel; Sound and validated models; Simulation analysis tools; Campaign simulation management.

7.1.8. ANR JCJC: *Clouds@Home (Cloud Computing over Unreliable, Shared Resources)*, 4 years, ANR-09-JCJC-0056-01, 2009-2012

Participants: Gilles Fedak, Bing Tang.

Recently, a new vision of cloud computing has emerged where the complexity of an IT infrastructure is completely hidden from its users. At the same time, cloud computing platforms provide massive scalability, 99.999% reliability, and improved performance at relatively low costs for complex applications and services. This project, lead by D. Kondo from Inria MESCAL investigates the use of cloud computing for large-scale and demanding applications and services over unreliable resources. In particular, we target volunteered resources distributed over the Internet. In this project, G. Fedak leads the Data management task (WP3).

7.1.9. Inria ADT *BitDew*, 2 years, 2010-2012

Participants: Gilles Fedak, José Saray.

ADT BitDew is an Inria support action of technological development for the BitDew middleware. Objectives are several fold : i/ provide documentation and education material for end-users, ii/ improve software quality and support, iii/ develop new features allowing the management of Cloud and Grid resources.

7.1.10. Inria ADT *Aladdin*, 4 years, 2008-2014

Participants: Simon Delamare, Frédéric Desprez, Matthieu Imbert, Laurent Lefèvre, Christian Pérez.

ADT ALADDIN is an Inria support action of technological development which supports the GRID'5000 instrument. Frédéric Desprez is leading this action (with David Margery from Rennes as the Technical Director).

7.1.11. Inria Large Scale Initiative *HEMERA*, 4 years, 2010-2013

Participants: Daniel Balouek, Christian Pérez, Laurent Pouilloux.

Hemera deals with the scientific animation of the GRID'5000 community. It aims at making progress in the understanding and management of large scale infrastructure by leveraging competences distributed in various French teams. Hemera contains several scientific challenges and working groups. The project involves around 24 teams located in all around France.

C. Pérez is leading the project; D. Balouek and L. Pouilloux are managing scientific challenges on GRID'5000.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. EDGI

Title: EDGI: European Desktop Grid Initiative

Type: CAPACITIES (Infrastructures)

Instrument: Combination of COLLABORATIVE PROJECTS and COORDINATION and SUPPORT ACTIONS (CPCSA)

Duration: June 2010 - May 2012

Coordinator: MTA SZTAKI (Hungary)

Others partners: CIEMAT, ES; Fundecyt, ES; University of Westminster, UK; Cardiff University, UK; University of Coimbra, PT; CNRS, FR, AlmerGrid, NL

See also: <http://edgi-project.eu/>

Abstract: The project EDGI will develop middleware that consolidates the results achieved in the EDGeS project concerning the extension of Service Grids with Desktop Grids in order to support EGI and NGI user communities that are heavy users of DCIs and require extremely large number of CPUs and cores. EDGI will go beyond existing DCIs that are typically cluster Grids and supercomputer Grids, and will extend them with public and institutional Desktop Grids and Clouds. EDGI will integrate software components of ARC, gLite, Unicore, BOINC, XWHEP, 3G Bridge, and Cloud middleware such as OpenNebula and Eucalyptus into SG → DG → Cloud platforms for service provision and as a result EDGI will extend ARC, gLite and Unicore Grids with volunteer and institutional DG systems. In this project, G. Fedak is the Inria representative and lead the JRA2 work package which is responsible for providing QoS to Desktop Grids.

7.2.1.2. PRACE 2IP

Title: PRACE – Second Implementation Phase Project

Type: Integrated Infrastructure Initiative Project (I3)

Instrument: Combination of Collaborative projects and Coordination and support action

Duration: September 2011 - August 2013

Coordinator: Thomas Lippert (Germany)

Others partners: Jülich GmbH, GCS, GENCI, EPSRC, BSC, CSC, ETHZ, NCF, JKU, Vetenskapradet, CINECA, PSNC, SIGMA, GRNET, UC-LCA, NUI Galway, UYBHM, CaSToRC, NCSA, Technical Univ. of Ostrava, IPB, NIIF

See also: <http://prace-ri.eu>

Abstract: The purpose of the PRACE RI is to provide a sustainable high-quality infrastructure for Europe that can meet the most demanding needs of European HPC user communities through the provision of user access to the most powerful HPC systems available worldwide at any given time. In tandem with access to Tier-0 systems, the PRACE-2IP project will foster the coordination between national HPC resources (Tier-1 systems) to best meet the needs of the European HPC user community. To ensure that European scientific and engineering communities have access to leading edge supercomputers in the future, the PRACE-2IP project evaluates novel architectures, technologies, systems, and software. Optimizing and scaling of application for Tier-0 and Tier-1 systems is a core service of PRACE.

Inria participates to Work Package 12 which is about novel programming techniques.

7.2.1.3. PaaSage

Title: PaaSage: Model-based Cloud Platform Upperware

Type: Seventh Framework Programme

Instrument: Collaborative project

Duration: October 2012 - September 2016 (48 months)

Coordinator: Pierre Guisset (GEIE ERCIM)

Others partners: SINTEF, STFC, HLRS, University of Stuttgart, Inria, CETIC, FORTH, be.wan, EVRY, SysFera, Flexiant, Lufthansa Systems, AG GWDG, Automotive Simulation Center Stuttgart e.V.

See also: <http://paasage.eu>

Abstract: PaaSage will deliver an open and integrated platform, to support both deployment and design of Cloud applications, together with an accompanying methodology that allows model-based development, configuration, optimization, and deployment of existing and new applications independently of the existing underlying Cloud infrastructures. Specifically it will deliver an IDE (Integrated Development Environment) incorporating modules for design time and execution time optimizations of applications specified in the CLOUD Modeling Language (CLOUD ML), execution-level mappers and interfaces and a metadata database.

7.2.2. Collaborations in European Programs, except FP7

Program: Celtic-Plus

Project acronym: SEED4C

Project title: Security Embedded Element and Data privacy for the Cloud.

Duration: 2012-2015

Coordinator: Bertrand Marquet (Alcatel-Lucent lab)

Other partners: Gemalto, ENSI Bourges, Inria, Wallix, VTT Technical Research centre of Finland, Mikkelin Puhelin Oyj, Cygate, Nokia Siemens Networks, Finceptum OY (Novell), Solacia, Innovallia Association, Nextel, Software Quality Systems, Ikusi, Vicomtech, Biscaytik

Abstract: SEED4C is a Celtic-Plus project: an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications and services focusing on a new "Smart Connected World" paradigm. Celtic-Plus is a EUREKA ICT cluster and is part of the inter-governmental EUREKA network.

The cloud security challenge not only reflects on the secure running of software on one single machine, but rather on managing and guaranteeing security of a computer group or cluster seen as a single entity. Seed4C focus is to evolve from cloud security with an isolated point or centralized points of enforcement for security to cloud security with cooperative points of enforcement for security.

Program: COST

Project acronym: COST IC804

Project title: : Energy efficiency in Large Scale Distributed Systems

Duration: 2009-2013

Coordinator: J.M. Pierson (IRIT)

Other partners: 26 research institute and countries

Abstract: The COST Action IC0804 proposes realistic energy-efficient alternate solutions to share IT distributed resources. As large scale distributed systems gather and share more and more computing nodes and Storage resources, their energy consumption is exponentially increasing. While much effort is nowadays put into hardware specific solutions to lower energy consumptions, the need for a complementary approach is necessary at the distributed system level, i.e. middleware, network and applications. This Action characterizes the energy consumption and energy efficiencies of distributed applications. Then based on the current hardware adaptation possibilities and innovative algorithms it proposes adaptive and alternative approaches taking into account the energy saving dimension of the problem. This Action also characterizes the trade-off between energy savings and functional and non-functional parameters, including the economic dimension. Deliverables includes workshop proceedings, books, good practice leaflets fostering consciousness rise at ICT researchers, scientists, managers and users levels. Finally, benefits addresses scientific and societal needs.

Program: COST

Project acronym: IC0805

Project title: Open Network for High-Performance Computing on Complex Environments (ComplexHPC)

Duration: 2009-2013

Coordinator: Emmanuel Jeannot (Inria Bordeaux - Sud Ouest)

Other partners: 26 research institute and countries

Abstract: The main objective of the Action is to develop an integrated approach for tackling the challenges associated with heterogeneous and hierarchical systems for High Performance Computing.

Program: Intelligent Energy in Europe

Project acronym: PrimeEnergyIT

Project title: PrimeEnergyIT: Efficient Data Centers

Duration: 2010-2012

Coordinator: B. Schappi (Austrian Energy Agency)

Other partners: organisme, labo (pays)

Abstract: The increasing use of powerful IT services in all public and private service sectors as for example administration, health services and entertainment has lead to a growing energy demand for centralized IT equipment in data centers and central IT units of companies. According to EU and US studies this trend will continue unless energy efficient technology and efficient operation of equipment is broadly implemented. Business-as-usual would lead to a doubling of energy consumption within a few years thereby also significantly increasing energy costs in data centers. The implementation of energy efficient technologies and optimized hardware operation however allows energy and cost savings of up to 60%. PrimeEnergyIT supports the market development and demand for energy efficient central IT hardware and infrastructure providing tools and services for IT and infrastructure managers, consultants and other relevant experts. The PrimeEnergyIT initiative is operated by an international consortium of national agencies and research institutions in cooperation with a number of associate partners from industry [44], [36].

7.3. International Initiatives

7.3.1. Participation In International Programs

7.3.1.1. Inria-UIUC-NCSA Joint Laboratory for Petascale Computing

Participants: Eddy Caron, Frédéric Desprez, Mohammed El Mehdi Diouri, Olivier Glück, Cristian Klein, Vincent Lanore, Laurent Lefevre, Christian Pérez, Jonathan Rouzaud-Cornabas.

The Joint Laboratory for Petascale Computing focuses on software challenges found in complex high-performance computers. The Joint Laboratory is based at the University of Illinois at Urbana-Champaign and includes researchers from the French national computer science institute called Inria, Illinois' Center for Extreme-Scale Computation, and the National Center for Supercomputing Applications. Much of the Joint Laboratory's work will focus on algorithms and software that will run on Blue Waters and other petascale computers.

7.3.1.2. *PICS CNRS 5473: Dimensioning through Simulation*

Participants: Frédéric Desprez, Georges Markomanolis, Frédéric Suter.

This International Scientific Collaboration Project with the University of Hawai'i at Manoa (2009-2012) aims at comparing, solidifying and integrating within a single framework, namely SimGrid, several approaches to dimension infrastructures thanks to simulation.

7.3.1.3. *GreenTouch*

Participants: Laurent Lefevre, Jean-Patrick Gelas.

GreenTouch is a consortium of leading Information and Communications Technology (ICT) industry, academic and non-governmental research experts dedicated to fundamentally transforming communications and data networks, including the Internet, and significantly reducing the carbon footprint of ICT devices, platforms and networks.

In this project, we explore the design of virtual home gateway at large scale [18], [29] and participate in the SEASON project.

7.4. International Research Visitors

7.4.1. *Visits of International Scientists*

- L. Lefevre: Hosting Teferi Assefa, PhD student from Addis Abeba University Ethiopia (from sept to dec. 2012) - Joint work on Virtualization of Virtual Home Gateways in link with the GreenTouch initiative.
- G. Fedak: Hosting Matei Ripenau, ENS Visiting Professor from University of British Columbia (Canada). Joint work on large-scale data management. Hosting Mircea Moca, lecturer University of Babes Bolaj, Romania. Joint work on scheduling for hybrid distributed infrastructure.

7.4.1.1. *Internships*

- F. Suter: Hosting 2 Short Term Scientific Missions in the context of the COST Action IC0805. H. Arabnejab (University of Porto, Portugal) and Z. Papazachos (University of Thessaloniki, Greece).
- G. Fedak: Hosting Asma Ben Cheick (Msc, Faculté des sciences de Tunis), 1 month, Haidau Andrei, University of Cluj-Napoca, 3 months.
- F. Desprez, J. Rouzaud-Cornabas: Hosting Jose Luis Lucas, PhD student from Madrid (Spain), 3 months. Joint work on the resource provisioning in Clouds taking into account performance and cost.

DANTE Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

The ESPAD (Embedded Sport Performance Analysis Data) is bio-mechanics / physiology logging project funded by FEDER. The goal is to contribute to the design of a distributed multi-sensor architecture that can be worn by an individual and that records bio-mechanical, physiological and environmental data.

8.2. National Initiatives

8.2.1. ANR

- The purpose of the SensLAB project is to deploy a very large scale open wireless sensor network platform. SensLAB's main and most important goal is to offer an accurate and efficient scientific tool to help in the design, development, tuning, and experimentation of real large-scale sensor network applications. The SensLAB platform is distributed among 4 sites and is composed of 1,024 nodes. Each location hosts 256 sensor nodes with specific characteristics in order to offer a wide spectrum of possibilities and heterogeneity. The four test beds are however part of a common global testbed as several nodes will have global connectivity such that it will be possible to experiment a given application on all 1K sensors at the same time.
- Equipex FIT (Futur Internet of Things) FIT is one of 52 winning projects in the Equipex research grant program. It will set up a competitive and innovative experimental facility that brings France to the forefront of Future Internet research. FIT benefits from 5.8 million grant from the French government Running from 22.02.11 to 31.12.2019. The main ambition is to create a first-class facility to promote experimentally driven research and to facilitate the emergence of the Internet of the future.
- As proposed by initiatives in Europe and worldwide, enabling an open, general-purpose, and sustainable large-scale shared experimental facility will foster the emergence of the Future Internet. There is an increasing demand among researchers and production system architects to federate testbed resources from multiple autonomous organizations into a seamless/ubiquitous resource pool, thereby giving users standard interfaces for accessing the widely distributed and diverse collection of resources they need to conduct their experiments. The F-Lab project builds on a leading prototype for such a facility: the OneLab federation of testbeds. OneLab pioneered the concept of testbed federation, providing a federation model that has been proven through a durable interconnection between its flagship testbed PlanetLab Europe (PLE) and the global PlanetLab infrastructure, mutualizing over five hundred sites around the world. One key objective of F-Lab is to further develop an understanding of what it means for autonomous organizations operating heterogeneous testbeds to federate their computation, storage and network resources, including defining terminology, establishing universal design principles, and identifying candidate federation strategies. On the operational side, F-Lab will enhance OneLab with the contribution of the unique sensor network testbeds from SensLAB, and LTE based cellular systems. In doing so, F-Lab continues the expansion of OneLab's capabilities through federation with an established set of heterogeneous testbeds with high international visibility and value for users, developing the federation concept in the process, and playing a major role in the federation of national and international testbeds. F-Lab will also develop tools to conduct end-to-end experiments using the OneLab facility enriched with SensLAB and LTE.

F-Lab is a unique opportunity for the French community to play a stronger role in the design of federation systems, a topic of growing interest; for the SensLAB testbed to reach an international visibility and use; and for pioneering testbeds on LTE technology.

- ANR RESCUE started in December 2010: Access and metropolitan networks are much more limited in capacity than core networks. While the latter operate in over-provisioning mode, access and metropolitan networks may experience high overload due to evolution of the traffic or failures. In wired networks, some failures (but not all) are handled by rerouting the traffic through a backup network already in place. In developed countries, backup networks are adopted wherever possible (note that this is generally not the case for the links between end users and their local DSLAM). Such a redundant strategy may not be possible in emerging countries because of cost issues. When dedicated backup networks are not available, some operators use their 3G infrastructure to recover some specific failures; although such an alternative helps avoid full network outage, it is a costly solution. Furthermore, availability of 3G coverage is still mainly concentrated in metropolitan zones. When no backup networks are available, it would be interesting to deploy, for a limited time corresponding to the period of the problem (i.e., failure or traffic overload), a substitution network to help the base network keep providing services to users.

In the RESCUE project (2010-2013), we investigate both the underlying mechanisms and the deployment of a substitution network composed of a fleet of dirigible wireless mobile routers. Unlike many projects and other scientific works that consider mobility as a drawback, in RESCUE we use the controlled mobility of the substitution network to help the base network reduce contention or to create an alternative network in case of failure. The advantages of an on-the-fly substitution network are manifold: Reusability and cost reduction; Deployability; Adaptability.

The RESCUE project addresses both the theoretical and the practical aspects of the deployment of a substitution network. From a theoretical point of view, we will propose a two-tiered architecture including the base network and the substitution network. This architecture will describe the deployment procedures of the mobile routing devices, the communication stack, the protocols, and the services. The design of this architecture will take into account some constraints such as quality of service and energy consumption (since mobile devices are autonomous), as we want the substitution network to provide more than a best effort service. From a practical point of view, we will provide a proof of concept, the architecture linked to this concept, and the necessary tools (e.g., traffic monitoring, protocols) to validate the concept and mechanisms of on-the-fly substitution networks. At last but not least, we will validate the proposed system both in laboratory testbeds and in a real-usage scenario.

<http://rescue.lille.inria.fr/>

- ANR PETAFLOW (Appel Blanc International) started in march 2010 and will end in october 2013. It is a collaborative project between the GIPSA Lab (Grenoble), MOAIS (Inria Grenoble), RESO (Inria Grenoble), the University of Osaka (the Cybermedia Center and the Department of Information Networking) and the University of Kyoto (Visualization Laboratory).

We aim at proposing network solutions to guarantee the Quality of Service (in terms of reliability level and of transfer delay properties) of a high speed, long-distance connection used in an interactive, high performance computing application. Another specificity of this application is the peta-scale volume of the treated data corresponding to the upper airway flow modeling.

<http://petaflow.gforge.inria.fr/>

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7

Program: Life Science Health Priority of the Sixth Framework Program

Project acronym: MOSAR

Project title: Mastering hOSpital Antimicrobial Resistance and its spread into the community.

Duration: 06 2008 - 07 2012

Coordinator: INSERM

Other partners: University of Antwerp, National Medicines Institute (NMI), August Pi i Sunyer biomedical research Institute (IDIBAPS), University Medical Center Utrecht (UMCU), University of Geneva Hospitals (UNIGE), Tel Aviv Medical Center (TASMC), Health Protection Agency (HPA), Medical school of Paris 12 University (UPVM), Pasteur Institute, Inserm-Transfert, Ingen Biosciences, Biologische Analysensystem GmbH (BAG), AmpTec GmbH, Array-On GmbH, Inria

Abstract: MOSAR brings together internationally recognized experts to address the issue of antimicrobial resistance in a comprehensive manner. MOSAR considers the major issue of antimicrobial resistance in the perspective of a complex system and not only through the prism of a single discipline.

To achieve its objectives MOSAR builds on advances generated by basic sciences, through dedicated and trans-disciplinary cooperation. This project integrates studies from epidemiology and basic laboratory sciences, clinical medicine, statistical sciences, behavioural sciences, and health economics. MOSAR network is structured into 10 interacting groups centered on the patients.

MOSAR focuses on major endemic and epidemic nosocomial pathogens such as Methicillin-resistant *Staphylococcus aureus* (MRSA), Vancomycin-resistant Enterococci (VRE), Extended-Spectrum Beta-Lactamases (ESBL) Enterobacteriaceae, and Carbapenem-resistant *Acinetobacter* spp, and in interventional trials in high-risk areas (Intensive Care Units, Surgery and Rehabilitation centers) of countries with high-level of resistance.

8.3.2. FP7 Projects

8.3.2.1. GEYSERS

Title: Generalised Architecture for dynamic infrastructure services

Type: COOPERATION (ICT)

Defi: The Network of the Future

Instrument: Integrated Project (IP)

Duration: January 2010 - march 2013

Coordinator: Interoute (Italy)

Others partners: Interoute (Italy), martel Martel GmbH (Switzerland), ADVA AG Optical Networking (Germany), SAP AG (Germany), Alcatel-Lucent Italia S.p.A. (Italy), Telefonica I+D (Spain), Telekomunikacja Polska S.A. (Poland), Instytut Chemii Bioorganicznej PAN, Poznan Supercomputing and Networking Centre (Poland), Nextworks s.r.l (Italy), Fundacio i2CAT, Internet i Innovacio Digital a Catalunya (Spain), Universiteit van Amsterdam (The Netherlands), University of Essex (UK), Research and Education Society in Information Technologies (Greece), Technical University of Braunschweig (Germany), Interdisciplinary Institute for BroadBand Technology VZW (belgium), Indian Institute of Technology (India), LYaTiss (France), ADVA Optica Networking Sp.zo.o. (Poland)

Abstract: GEYSERS's vision is to qualify optical infrastructure providers and network operators with a new architecture, to enhance their traditional business operations. Optical network infrastructure providers will compose logical infrastructures and rent them out to network operators; network operators will run cost-efficient, dynamic and mission-specific networks by means of integrated control and management techniques. GEYSERS's concept is that high-end IT resources at users' premises are fully integrated with the network services procedures, both at the infrastructure-planning and connection-provisioning phases. Following this vision, GEYSERS will specify and implement a novel optical-network architecture able to support 'Optical Network + Any-IT' resource provisioning seamlessly and efficiently. Energy-consumption metrics for the end-to-end service routing are part of this efficiency. GEYSERS proposes to:

- Specify and develop mechanisms that allow infrastructure providers to partition their resources (optical network and/or IT), compose specific logical infrastructures and offer them as a service to network operators. This will be done overcoming the current limitations of networks/domain segmentation, and will support dynamic and on-demand changes in the logical infrastructures
- Specify and develop a Network Control Plane for the optical infrastructure, by extending standard solutions (ASON/GMPLS and PCE), able to couple optical network connectivity and IT services automatically and efficiently, and provide them in 1 step, dynamically and on-demand, including infrastructure re-planning mechanisms.

These achievements will enable infrastructure providers, network operators and application providers to participate in new business scenarios where complex services with complex attributes and strict bandwidth requirements can be offered economically and efficiently to users and applications. GEYSERS's outcomes will be validated in an EU-wide optical network test-bed.

8.3.2.2. SAIL

Title: Scalable and Adaptive Internet Solutions

Type: COOPERATION (ICT)

Defi: The Network of the Future

Instrument: Integrated Project (IP)

Duration: August 2010 - January 2013

Coordinator: Ericsson (Sweden)

Others partners: Ericsson AB (Sweden), Alcatel-Lucent Deutschland (Germany), Nokia Siemens Networks OY(Finland), NEC Europe LTD (United Kingdom), France Telecom SA(France), Telefónica Investigación y Desarrollo (Spain), Telecom Italia (Italy), Portugal Telecom Inovation (Portugal), Swedish institute of Computer science (Sweden), Instituto Superior Tecnico Address (Portugal), Universitaet Paderborn (Germany), Aalto-Korkeakoulu ti (Finland), Kungliga Tekniska Hogskolan (Sweden), Fraunhofer Gesellschaft zur Forderung der angewandten Forschung (Germany),Universitaet Bremen (Germany), Hewlett-Packard Limited (United Kingdom), Fundacion Tecnalia Research and Innovation (Spain), Institut Telecom (France), Technion? Israel Institute of Technology (Israel), DOCOMO Communication Laboratoties Europe (Germany), The Provost Fellows & Scholars of the College of the Holy and undivided Trinity of Queen Elizabeth (Ireland), National ICT Australia Limited (Australia), Universidad de Cantabria (Spain), Lyatiss (France)

See also: <https://twiki.verkstad.net/bin/view/Main/WebHome>

Abstract: SAIL? objective is the research and development of novel networking technologies using proof-of-concept prototypes to lead the way from current networks to the Network of the Future. SAIL leverages state of the art architectures and technologies, extends them as needed, and integrates them using experimentally-driven research, producing interoperable prototypes to demonstrate utility for a set of concrete use-cases. SAIL reduces costs for setting up, running, and combining networks, applications and services, increasing the efficiency of deployed resources (e.g., personnel, equipment and energy). SAIL improves application support via an information-centric paradigm, replacing the old host-centric one, and develops concrete mechanisms and protocols to realize the benefits of a Network of Information (NetInf). SAIL enables the co-existence of legacy and new networks via virtualization of resources and self-management, fully integrating networking with cloud computing to produce Cloud Networking (CloNe). SAIL embraces heterogeneous media from fibre backbones to wireless access networks, developing new signaling and control interfaces, able to control multiple technologies across multiple aggregation stages, implementing Open Connectivity Services (OConS). SAIL also specifically addresses cross-cutting themes and non-technical issues, such as socio-economics, inclusion, broad dissemination, standardization and network migration, driving new markets, business roles and models, and increasing opportunities for both competition and cooperation. SAIL gathers a strong industry-led consortium of leading operators, vendors, SME,

universities and research centers, with a valuable experience acquired in previous FP7 projects, notably 4WARD. The impact will be a consensus among major European operators and vendors on a well-defined path to the Network of the Future together with the technologies required to follow that path.

8.4. International Initiatives

8.4.1. Participation In International Programs

Inria/FAPERJ Project CoDyN (Complex Dynamic Networks) between LNCC and DNET/Inria. The main goal of the CoDyN project is to lay solid foundations to the characterization of dynamically evolving networks, and to the field of dynamical processes occurring on large scale dynamic interaction networks.

PICS CNRS Combinatorial Structures for Complex Network Modeling DANTE is a member of a PICS project of the CNRS between the Academy of Science and Technology in Vietnam and the Laboratoire d'Informatique de Paris 6 (LIP6) and Université Claude Bernard Lyon 1 in France. The project started on January 2010 and will end in December 2012. Its goal is to design models of complex networks that are able to capture at the same time two of their most relevant properties : their heterogeneous degree distribution and their high local density. The goal is to provide very general models that do not make stronger assumptions on the structure of the graphs to be modeled. Our approach is based on the overlapping structure of cliques in complex networks and uses mainly tools coming from combinatorics, graph theory and statistics.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Phan Thi Ha Duong, Hanoi, Vietnam, May-June 2012.
- Renault Lambiotte, Namur, January 2012.
- Klaus Wehmuth, LNCC Brasil, April 2012.
- Prasan Kumar Sahoo, Chang Gung University, Taiwan, November 2012.

8.5.1.1. Internships

- Pranav Jindal, IIT Bombay, India, from May to July 2012

MESCAL Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. CIMENT

The CIMENT project (Intensive Computing, Numerical Modeling and Technical Experiments, <https://ciment.ujf-grenoble.fr/>) gathers a wide scientific community involved in numerical modeling and computing (from numerical physics and chemistry to astrophysics, mechanics, bio-modeling and imaging) and the distributed computer science teams from Grenoble. Several heterogeneous distributed computing platforms were set up (from PC clusters to IBM SP or alpha workstations) each being originally dedicated to a scientific domain. More than 600 processors are available for scientific computation. The MESCAL project-team provides expert skills in high performance computing infrastructures.

8.1.2. High Performance Computing Center

- The ICluster2, the IDPot and the new Digitalis Platforms

The MESCAL project-team manages a cluster computing center on the Grenoble campus. The center manages different architectures: a 48 bi-processors PC (ID-POT), and the center is involved with a cluster based on 110 bi-processors Itanium2 (ICluster-2) and another based on 34 bi-processor quad-core XEON (Digitalis) located at Inria. The three of them are integrated in the Grid'5000 grid platform.

More than 60 research projects in France have used the architectures, especially the 204 processors Icluster-2. Half of them have run typical numerical applications on this machine, the remainder has worked on middleware and new technology for cluster and grid computing. The Digitalis cluster is also meant to replace the Grimage platform in which the MOAIS project-team is very involved.

- The Bull Machine

In the context of our collaboration with Bull the MESCAL project-team exploits a Novascale NUMA machine. The configuration is based on 8 Itanium II processors at 1.5 Ghz and 16 GB of RAM. This platform is mainly used by the Bull PhD students. This machine is also connected to the CIMENT Grid.

- GRID 5000 and CIMENT

The MESCAL project-team is involved in development and management of Grid'5000 platform. The Digitalis and IDPot clusters are integrated in Grid'5000. Moreover, these two clusters take part in CIMENT Grid. More precisely, their unused resources may be exploited to execute jobs from partners of CIMENT project.

8.2. National Initiatives

8.2.1. "Action d'envergure"

- *HEMERA, 2010-2012*

Leading action "Completing challenging experiments on Grid'5000 (Methodology)"

Experimental platforms like Grid'5000 or PlanetLab provide an invaluable help to the scientific community, by making it possible to run very large-scale experiments in controlled environment. However, while performing relatively simple experiments is generally easy, it has been shown that the complexity of completing more challenging experiments (involving a large number of nodes, changes to the environment to introduce heterogeneity or faults, or instrumentation of the platform to extract data during the experiment) is often underestimated.

This working group explores different complementary approaches, that are the basic building blocks for building the next level of experimentation on large scale experimental platforms. This encompasses several aspects.

8.2.2. *ARC Inria*

- *Meneur 2011-2013:*

Partners: EPI Dionysos, EPI Maestro, EPI MESCAL, EPI Comore, GET/Telecom Bretagne, FTW, Vienna (Forschungszentrum Telekommunikation Wien), Columbia University, USA, Pennsylvania State University, USA, Alcatel-Lucent Bell Labs France, Orange Labs.

The goal of this project is to study the interest of network neutrality, a topic that has recently gained a lot of attention. The project aims at elaborating mathematical models that will be analyzed to investigate its impact on users, on social welfare and on providers' investment incentives, among others, and eventually propose how (and if) network neutrality should be implemented. It brings together experts from different scientific fields, telecommunications, applied mathematics, economics, mixing academy and industry, to discuss those issues. It is a first step towards the elaboration of a European project.

8.2.3. *ANR*

- *Clouds@home, 2009-2013*

The overall objective of this project is to design and develop a cloud computing platform that enables the execution of complex services and applications over unreliable volunteered resources over the Internet. In terms of reliability, these resources are often unavailable 40% of the time, and exhibit frequent churn (several times a day). In terms of "real, complex services and applications", we refer to large-scale service deployments, such as Amazon's EC2, the TeraGrid, and the EGEE, and also applications with complex dependencies among tasks. These commercial and scientific services and applications need guaranteed availability levels of 99.999% for computational, network, and storage resources in order to have efficient and timely execution.

- *SPADES, 2009-2012*

Partners: Inria GRAAL, Inria GRAND-LARGE, CERFACS, CNRS, Inria PARIS, LORIA

Petascale systems consisting of thousands to millions of resources have emerged. At the same, existing infrastructure are not capable of fully harnessing the computational power of such systems. The SPADES project will address several challenges in such large systems. First, the members are investigating methods for service discovery in volatile and dynamic platforms. Second, the members creating novel models of reliability in PetaScale systems. Third, the members will develop stochastic scheduling methods that leverage these models. This will be done with emphasis on applications with task dependencies structured as graph.

- *ANR SONGS, 2012-2015*

Partners: Inria Nancy (Algorille), Inria Sophia (MASCOTTE), Inria Bordeaux (CEPAGE, HiePACS, Run-Time), Inria Lyon (AVALON), University of Strasbourg, University of Nantes

The last decade has brought tremendous changes to the characteristics of large scale distributed computing platforms. Large grids processing terabytes of information a day and the peer-to-peer technology have become common even though understanding how to efficiently such platforms still raises many challenges. As demonstrated by the USS SimGrid project funded by the ANR in 2008, simulation has proved to be a very effective approach for studying such platforms. Although even more challenging, we think the issues raised by petaflop/exaflop computers and emerging cloud infrastructures can be addressed using similar simulation methodology.

The goal of the SONGS project (Simulation of Next Generation Systems) is to extend the applicability of the SimGrid simulation framework from Grids and Peer-to-Peer systems to Clouds and High Performance Computation systems. Each type of large-scale computing system will be addressed through a set of use cases and lead by researchers recognized as experts in this area.

Any sound study of such systems through simulations relies on the following pillars of simulation methodology: Efficient simulation kernel; Sound and validated models; Simulation analysis tools; Campaign simulation management.

8.3. European Initiatives

8.3.1. FP7 EDGI (*European Desktop Grid Initiative*)

Partners: SZTAKI insitute (Hungary), CIEMAT (Spain), Univ. Coimbra (Portugal), Univ Cardi (UK), Univ Westminster (UK), AlmereGrid (NL), IN2P3 (FR), Inria (GRAAL, MESCAL)

Years: 2010-2012

EDGI is an FP7 European project whose goal is to build a Grid infrastructure composed of "Desktop Grids", such as BOINC or XtremWeb, where computing resources are provided by Internet volunteers, and "Service Grids", where computing resources are provided by institutional Grid such as EGEE, gLite, Unicore and "Clouds systems" such asOpenNebula and Eucalyptus, where resources are provided on-demand. The EDGI infrastructure will consist of Service Grids that are extended with public and institutional Desktop Grids and Clouds.

8.3.2. FP7 Mont-Blanc project: *European scalable and power efficient HPC platform based on low-power embedded technology*

FP7 Programme: ICT-2011.9.13 Exa-scale computing, software and simulation

Mont-Blanc Partners: BSC (Barcelone), Bull, ARM (UK), Julich (Germany), Genci, CINECA (Italy), CNRS (LIRMM, LIG)

Duration: 3 Years from 1/10/2011

There is a continued need for higher compute performance: scientific grand challenges, engineering, geophysics, bioinformatics, etc. However, energy is increasingly becoming one of the most expensive resources and the dominant cost item for running a large supercomputing facility. In fact, the total energy cost of a few years of operation can almost equal the cost of the hardware infrastructure. Energy efficiency is already a primary concern for the design of any computer system and it is unanimously recognized that Exascale systems will be strongly constrained by power.

The analysis of the performance of HPC systems since 1993 shows exponential improvements at the rate of one order of magnitude every 3 years: One petaflops was achieved in 2008, one exaflops is expected in 2020. Based on a 20 MW power budget, this requires an efficiency of 50 GFLOPS/Watt. However, the current leader in energy efficiency achieves only 1.7n GFLOPS/Watt. Thus, a 30x improvement is required.

In this project, the partners believe that HPC systems developed from today's energy-efficient solutions used in embedded and mobile devices are the most likely to succeed. As of today, the CPUs of these devices are mostly designed by ARM. However, ARM processors have not been designed for HPC, and ARM chips have never used in HPC systems before, leading to a number of significant challenges.

8.3.3. Collaborations in European Programs, except FP7

- ESPON :

The MESCAL project-team participates to the ESPON (European Spatial Planning Observation Network) <http://www.espon.lu/> It is involved in the action 3.1 on tools for analysis of socio-economical data. This work is done in the consortium hypercarte including the laboratories LIG, Géographie-cité (UMR 8504) and RIATE (UMS 2414). The Hyperatlas tools have been applied to the European context in order to study spatial deviation indexes on demographic and sociological data at nuts 3 level.

8.4. International Initiatives

8.4.1. Inria Associated Teams

8.4.1.1. Cloud Computing at Home

Title: Cloud Computing over Internet Volunteer Resources

Inria principal investigator: Derrick Kondo

International Partner:

Institution: University of California Berkeley (United States)

Laboratory: Space Sciences Laboratory

Researcher: David P.

Duration: 2012 - 2013

See also: <http://mescal.imag.fr/membres/derrick.kondo/ea/ea.html>

Recently, a new vision of cloud computing has emerged where the complexity of an IT infrastructure is completely hidden from its users. At the same time, cloud computing platforms provide massive scalability, 99.999% reliability, and speedy performance at relatively low costs for complex applications and services. In this proposed collaboration, we investigate the use of cloud computing for large-scale and demanding applications and services over the most unreliable but also most powerful resources in the world, namely volunteered resources over the Internet. The motivation is the immense collective power of volunteer resources (evident by FOLDING@home's 3.9 PetaFLOPS system), and the relatively low cost of using such resources. We will address these challenges drawing on the experience of the BOINC team which designed and implemented BOINC (a middleware for volunteer computing that is the underlying infrastructure for SETI@home), and the MESCAL team which designed and implemented OAR (an industrial-strength resource management system that runs across France's main 5000-node Grid called Grid'5000).

8.4.2. Inria International Partners

- MESCAL has strong connections with both UFRGS (Porto Alegre, Brazil) and USP (Sao Paulo, Brazil). This year, Jean-François Méhaut visited both laboratories in July. The creation of the LICIA common laboratory (see next section) will make this collaboration even tighter.
- MESCAL has strong bounds with the University of Illinois Urbana Champaign, within the (Joint Laboratory on Petascale Computing (see next section). Slim Bouguerra is visiting JLPC for an extended period (one year).
- MESCAL also has long lasting collaborations with University of California in Berkeley and a new one with Google. Bruno Gaujal, Derrick Kondo and Arnaud Legrand visited Berkeley in 2012.

8.4.3. Participation In International Programs

8.4.3.1. Africa

- SARIMA and IDASCO / LIRIMA (Cameroon)

MESCAL takes part in the SARIMA (Soutien aux Activités de Recherche Informatique et Mathématiques en Afrique <http://www-direction.inria.fr/international/AFRIQUE/sarima.html>) project and more precisely with the University of Yaoundé 1. Cameroon student Blaise Yenké completed his PhD under the joint supervision of Professor Maurice Tchuenté. SARIMA also funded Adamou Hamza to prepare his Master Thesis during three months in the MESCAL project-team. SARIMA proposed J-F Méhaut to give a course on Operating System and Networks at Master Research Students. In addition, MESCAL participates in the IDASCO joint project with the University of Yaoundé 1. This is part of the international LIRIMA laboratory, whose goal to develop novel methods and tools for collecting and analyzing massive data sets from biological or environmental domains.

8.4.3.2. North America

- Google Derick Kondo has received a Google Research Award for 2011-2012 for his proposal on predicting idleness in data centers. The technical goal of the proposed work is to give probabilistic guarantees on when data centers are idle. The implication of such predictions is improved data center utilization, while reducing and amortizing monetary costs. The general goal of this award is to facilitate collaboration between Google Inc. and academic researchers. Google Inc. provides the award as an unrestricted gift without constraints on intellectual property.
- JLPC (Joint Laboratory on Petascale Computing) (with University of Illinois Urbana Champaign. Several members of MESCAL are partners of this laboratory, and have paid several visits to Urbana-Champaign. Slim Bougherra (Mescal Postdoc) is visiting JLPC for one year, starting Jan. 2012.

8.4.3.3. South America

- LICIA. The CNRS, Inria, the Universities of Grenoble, Grenoble INP and Universidade Federal do Rio Grande do Sul have created the LICIA (*laboratoire International de Calcul intensif et d'Informatique Ambiante*). On the French side, the laboratory is co-directed by Yves Denneulin and Jean-Marc Vincent.

The main themes are artificial intelligence, high performance computing, information representation, interfaces and visualization as well as distributed systems.

More information can be found on <http://www.inf.ufrgs.br/licia/>.

MOAIS Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

- **ANR grant REPDYN (2010-2012).** High performance computing for structure and fluid computing. Partners: Inria Rhône-Alpes, CEA, ONERA, EDF, LaMSID lab from CNRS and LaMCoS lab from INSA Lyon.
- **ANR/JST grant PETAFLOW (2010-2012).** France/Japan international program. Peta-scale data intensive computing with transnational high-speed networking: application to upper airway flow. Inria Rhône-Alpes, Gipsa-lab from UJF, NITC (Japan), Cyber Center of Osaka, DITS (Osaka) and the Visualization Lab of Kyoto.
- **ANR grant EXAVIZ (2011-2015).** Large Scale Interactive Visual Analysis for Life Science. Partners: Inria Rhône-Alpes, Université d'Orléans, the LBT lab from IBPC, the LIMSI from Université d'Orsay, and the CEMHTI labs from CNRS.
- **ANR HPAC (2012-2015).** High Performance Algebraic Computing. Coordinator: UJF (LJK/CASYS team). Partners: project-team MOAIS (Grenoble), project-team ARENAIRE (LIP, Lyon), project-team SALSA (LIP6, Paris), the ARITH group (LIRMM lab, Montpellier).
- **Equipex Kinovis (2012-2017).** 2.6 Meuros. Large scale multi-camera platform (extension of the Grimage platform to 60 cameras, depth and X-ray cameras). Coordinator E Boyer, LJK Inria MORPHEO team. Partners: Inria Rhône-Alpes and the LJK, LIG, LADAF and GIPSA labs.

8.1.2. Competitivity Clusters

- **CILOE, 2008-2012, Minalogic:** This project is to develop tools and high level interfaces for compute-intensive applications for nano and micro-electronic design and optimizations. The partners are: two large companies CS-SI (leader), Bull; three small size companies EDXACT, INFINISCALE, PROBAYES; and four research units Inria, CEA-LETI, GIPSA-LAB, TIMA. For Moais, the contract funds the PhD thesis of Jean-Noel Quintin.
- **SHIVA, Minalogic 2009-2012 contract.** This project aims at the development of a high throughput backbone ciphering that ensures a high level of security for intranet and extranet communications over internet. The partners are: CS-SI (leader); 1 small size companies: Easii-IC (support for Xilinx FPGA) IWall-Mataru (key management), Netheos (customizable FPGA for ciphering); INRIA; CEA-LETI (security certification); Grenoble-INP (TIMA lab, integration of cryptography on FPGA); UJF (LJK and Institut Fourier: open cryptographic protocols and handshake; VERIMAG: provable security). Within Inria, the MOAIS and the PLANET teams provide the parallel implementation on a multicore platform of IP-Sec and coordination with hardware accelerators (FPGAs and GPUs). The contract funds the PhD thesis of Ludovic Jacquin, coadvised by PLANET and MOAIS and a 1 year engineer (Fabrice Schuler, from 11/2010).
- **SoC-Trace, Minalogic 2011-2014 contract.** This project aims the development of tools for the monitoring and debug of multicore systems on chip. Leader: ST-Microelectronic. Partners: Inria (Mescal, Moais); UJF (TIMA, LIG/Hadas); Magilem, ProBayes. Moais contributes with technics and tools for visual aggregation of application traces. The contract funds 1 PhD thesis and 1 year engineer.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. VISIONAIR

Title: VISIONAIR

Type: CAPACITIES (Infrastructures)

Instrument: Combination of COLLABORATIVE PROJECTS and COORDINATION and SUPPORT ACTIONS (CPCSA)

Duration: February 2011 - January 2015

Coordinator: Grenoble-INP, France

Others partners: <http://www.infra-visionair.eu/members.html>

See also: <http://www.infra-visionair.eu/>

VISIONAIR European platform. With the Grimage platform, we participate to the European project Visionair which objective is to provide an infrastructure that gathers advanced visualization and interaction infrastructures. Visionair is led by Grenoble-INP (Frédéric Noel, G-Scop lab) and gathers 25 international partners from 12 countries; it has been funded in 2010 and start in Q1 2011.

8.2.2. Collaborations with Major European Organizations

- **ADT Vcore (2011-2013)**. Partners: Fraunhofer IGD (Darmstad), Inria IMAGINE and MOAIS (Grenoble), SHAMAN and MINT (Lille), VR4i (Rennes), IN SITU (Saclay), SED Sophia Antipolis. This project is currently an ADT Inria (funds IJD). Software infrastructure for advanced applications in augmented and virtual reality.

8.3. International Initiatives

8.3.1. Inria International Partners

MOAIS has a long term collaboration with several universities in Brazil, and in particular with UFRGS, Porto Alegre and USP, Sao Paulo. Several mobility grants support these collaborations:

- Inria Diode-A associated team (2006-2011),
- CNRS/Cnpq (2011-2013).
- Inria/Cnpq (2008-2010),
- Capes/Cofecub (2006-2007, 2008-2009, 2010-2012),
- Associated International Laboratory LICIA (<http://www.inf.ufrgs.br/licia>) funded by CNRS (since 2011).

This collaboration is important to get access to high quality students. Classically students pursue their PhD in our team full or half time in "co-tutelle" (double graduation). These PhDs are almost all funded by Brazil. Over the 2008-2012 period, 5 PhD students (3 from UFRGS, 2 from USP) were advised at Moais. Initially based on experimented researcher exchanges, the increase of fundings enabled to involve Master students that usually stay 2-4 months in our team and often come back later for a PhD.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Wieslaw Kubiak (memorial University, New Foundland, Canada), invited prof UJF (2 months)
- Joseph Peters (SFU Vancouver, Canada, contract INP VOLVIC (3 months)

8.4.1.1. Internships

Julio TOSS (from Apr 2012 until Sep 2012)

Subject: A new programming paradigm for GPU

Institution: Universidade Federal do Rio Grande do Sul (Brazil)

Nikhil BANSAL (from Jun 2012 until Sep 2012)

Subject: Multi-objective optimization strategies for parallel multi-users applications

Institution: IIT Delhi (India)

PLANETE Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

PFT (2011-2014) : DGCIS funded project, in the context of the competitiveness cluster SCS, whose aim is to provide to PACA region industrials wishing to develop or validate new products related to future mobile networks and services and M2M application, a networking infrastructure and tools helpful for development, test and validation of those products. Other partners : 3Roam, Audilog Groupe Ericsson, Ericsson, Eurecom, Inria, iQsim, MobiSmart, Newsteo, OneAccess, Orange Labs, Pôle SCS, ST Ericsson, Telecom Valley. Our contribution is centred around providing a test methodology and tools for wireless networks experimentation.

8.2. National Initiatives

ANR FIT (2011-2108): FIT (Future Internet of Things) aims to develop an experimental facility, a federated and competitive infrastructure with international visibility and a broad panel of customers. It will provide this facility with a set of complementary components that enable experimentation on innovative services for academic and industrial users. The project will give French Internet stakeholders a means to experiment on mobile wireless communications at the network and application layers thereby accelerating the design of advanced networking technologies for the Future Internet. FIT is one of 52 winning projects from the first wave of the French Ministry of Higher Education and Research's "Équipements d'Excellence" (Equipex) research grant programme. The project will benefit from a 5.8 million euro grant from the French government. Other partners are UPMC, IT, Strasbourg University and CNRS. See also <http://fit-equipex.fr/>.

ANR ARESA2 (2009-2012): The Planète team is involved in the ARESA2 project which aims at advancing the state of the art in Secure, Self-Organizing, Internet-Connected, Wireless Sensor and Actuator Networks (WSANs). These challenges are to be addressed in an energy-efficient way while sticking to memory-usage constraints. The partners are Inria, CEA-LETI, France Telecom R&D, Coronis Systems, LIG/Drakkar, Verimag and TELECOM Bretagne.

ANR pFlower (2010-2013): Parallel Flow Recognition with Multi-Core Processor. The main objective of this project is to take advantage of powerful parallelism of multi-thread, multi-core processors, to explore the parallel architecture of pipelined-based flow recognition, parallel signature matching algorithms. The project involves Inria (planete), Université de Savoie, and ICT/CAS (China).

Inria Mobilities (2011-2012): as a joint national project with CNIL (the French national committee of Information freedom). Platform for mobile devices privacy evaluation. This project strives to deploy an experimental mobile platform for studying and analyzing the weaknesses of current online (smartphone) applications and operating systems and the privacy implications for end-users. For instance, one of the objectives is to understand trends and patterns collected when they are aimed at obtaining general knowledge that does not pertain to any specific individual. Examples of such tasks include learning of commuting patterns, inference of recommendation rules, and creation of advertising segments.

Collaborative Action CAPRIS (2011-2014): the Collaborative Action on the Protection of Privacy Rights in the Information Society (CAPRIS), is an Inria national project, which goal is to tackle privacy-related challenges and provide solutions to enhance the privacy protection in the Information Society. His main tasks are the identification of existing and future threats to privacy, and the design of appropriate measures to assess and quantify privacy.

ANR CMON (2009-2012) : This project involves, in addition to Inria, Technicolor Paris Lab, LIP6, ENS and the Grenouille.com association. CMON stands for collaborative monitoring. It is an industrial research project that develops the technology needed to allow end-users to collaborate in order to identify the origin and cause of Internet service degradation. The main differentiating assumptions made in this project are that (i) ISPs do not cooperate together, and (ii) one cannot rely on any information they provide in order to diagnose service problems. Even more, CMON considers that these ISP will try to masquerade the user observations in order to make their service look better. The software designed in this project will be added to the toolbox currently provided by the Grenouille architecture. The hope is that such a project will encourage ISPs to improve their quality of service and will contribute to improve customer satisfaction.

See also <http://wiki.grenouille.com/index.php/CMON>.

ANR F-Lab (2011-2013): ANR funded project on the federation of computation, storage and network resources, belonging to autonomous organizations operating heterogeneous testbeds (e.g. PlanetLab testbeds and Sensors testbeds). This includes defining terminology, establishing universal design principles, and identifying candidate federation strategies. Other partners : UPMC, A-LBLF and Thales.

ANR Connect (2011-2012): ANR funded project on content centric Networking architecture. The aim is to propose adequate naming, routing, cache management and transmission control schemes for CCN based networks. Our contribution is centered on network traffic characterization video streaming and on the integration of the CCNx code in the ns-3 simulator. Other partners: UPMC, Alcatel Lucent, Orange R&D, IT.

ANR SCATTER (2011-2012): ANR funded project on Scalable Naming in Information Centric Networks. The goal of this activity is to evaluate the scalability of state of the art naming schemes both from the name resolution and routing points of view. The four main approaches that will be considered are: Content Centric Networking (CCN), Publish-Subscribe Internet Routing Paradigm (PSIRP), Network of Information (NetInf) and Data-Oriented Network Architecture (DONA). Other French partners: UPMC. International KIC partner: SICS.

8.3. European Initiatives

8.3.1. FP7 Projects

8.3.1.1. NOVI

Title: Networking innovations Over Virtualized Infrastructures

Type: COOPERATION (ICT)

Defi: CAPACITIES programme.

Instrument: Specific Targeted Research Project (STREP)

Duration: September 2010 - February 2013

Coordinator: NTUA (Greece)

Others partners: 13 european partners including GARR, ELTE, Cisco, etc.

See also: <http://www.fp7-novi.eu/>

Abstract: NOVI (Networking innovations Over Virtualized Infrastructures) research concentrates on efficient approaches to compose virtualized e-Infrastructures towards a holistic Future Internet (FI) cloud service. Resources belonging to various levels, i.e. networking, storage and processing are in principle managed by separate yet interworking providers. NOVI will concentrate on methods, information systems and algorithms that will enable users with composite isolated slices, baskets of resources and services provided by federated infrastructures.

8.3.1.2. Fed4Fire

Title: Federation for Future Internet Research and Experimentation

Type: COOPERATION (ICT)

Defi: FIRE programme.

Instrument: Integrating Project (IP)

Duration: October 2012 - October 2016

Coordinator: iMinds (Belgium)

Others partners: 17 european partners including iMinds, IT Innovation, UPMC, Fraunhofer, TUB, UEDIN, NICTA, etc.

See also: <http://www.fed4fire.eu/>

Abstract: Fed4FIRE will deliver open and easily accessible facilities to the FIRE experimentation communities, which focus on fixed and wireless infrastructures, services and applications, and combinations thereof. The project will develop a demand-driven common federation framework, based on an open architecture and specification. It will be widely adopted by facilities and promoted internationally. This framework will provide simple, efficient, and cost effective experimental processes built around experimenters' and facility owners' requirements. Insight into technical and socio-economic metrics, and how the introduction of new technologies into Future Internet facilities influences them, will be provided by harmonized and comprehensive measurement techniques. Tools and services supporting dynamic federated identities, access control, and SLA management will increase the trustworthiness of the federation and its facilities. A FIRE portal will offer brokering, user access management and measurements. Professional technical staff will offer first-line and second-line support to make the federation simple to use. The project will use open calls to support innovative experiments from academia and industry and to adapt additional experimentation facilities for compliance with Fed4FIRE specifications. A federation authority will be established to approve facilities and to promote desirable operational policies that simplify federation. A Federation Standardization Task Force will prepare for sustainable standardization beyond the end of the project. The adoption of the Fed4FIRE common federation framework by the FIRE facilities, the widespread usage by both academic and industrial experimenters, and the strong links with other national and international initiatives such as the FI-PPP, will pave the way to sustainability towards Horizon 2020.

8.3.1.3. OPENLAB

Title: OpenLab: extending FIRE testbeds and tools

Type: COOPERATION (ICT)

Defi: ICT 2011.1.6 Future Internet Research and Experimentation (FIRE)

Instrument: Integrated Project (IP)

Duration: September 2011 - January 2014

Coordinator: Université Pierre et Marie Curie (France)

Others partners: 18 European partners (including ETH Zurich, Fraunhofer, IBBT, TUB, UAM, etc.) and Nicta from Australia.

See also: <http://www.ict-openlab.eu/>

Abstract: OpenLab brings together the essential ingredients for an open, general purpose and sustainable large scale shared experimental facility, providing advances to the early and successful prototypes serving the demands of Future Internet Research and Experimentation. OpenLab partners are deploying the software and tools that allow these advanced testbeds to support a diverse set of applications and protocols in more efficient and flexible ways. OpenLab's contribution to a portfolio that includes: PlanetLab Europe (PLE), with its over 200 partner/user institutions across Europe; the NITOS and w-iLab.t wireless testbeds; two IMS telco testbeds that can connect to the public PSTN, to IP phone services, and can explore merged media distribution; an LTE cellular wireless testbed; the ETOMIC high precision network measurement testbed; the HEN emulation testbed; and the ns-3 simulation environment. Potential experiments that can be performed over the available infrastructure go beyond what can be tested on the current internet. OpenLab extends the facilities

with advanced capabilities in the area of mobility, wireless, monitoring, domain interconnections and introduces new technologies such as OpenFlow. These enhancements are transparent to existing users of each facility. Finally, OpenLab will finance and work with users who propose innovative experiments using its technologies and testbeds, via the open call mechanism developed for FIRE facilities.

8.3.1.4. FI-WARE

Title: Future Internet Ware.

Type: COOPERATION (ICT).

Defi: PPP FI: Technology Foundation: Future Internet Core Platform.

Instrument: Integrated Project (IP).

Duration: May 2011 - April 2014.

Coordinator: Telefonica. (Spain)

Others partners: SAP (Germany), IBM (Israel, Switzerland), Thales Communications (France), Telecom Italia (Italy), France Telecom (France), Nokia Siemens Networks (Germany, Hungary, Finland), Deutsche Telekom (Germany), Technicolor (France), Ericsson (Sweden), Atos Origin (Spain), Ingeneria Informatica (Italy), Alcatel-Lucent (Italy, Germany), Siemens (Germany), Intel (Ireland), NEC (United Kingdom), Fraunhofer Institute (Germany), University of Madrid (Spain), University of Duisburg (Germany), University of Roma La Sapienza (Italy), University of Surrey (United Kingdom).

See also: <http://www.fi-ware.eu/>.

Abstract: The goal of the FI-WARE project is to advance the global competitiveness of the EU economy by introducing an innovative infrastructure for cost-effective creation and delivery of services, providing high QoS and security guarantees. FI-WARE is designed to meet the demands of key market stakeholders across many different sectors, e.g., healthcare, telecommunications, and environmental services. The project unites major European industrial actors in an unique effort never seen before. The key deliverables of FI-WARE will deliver an open architecture and implementation of a novel service infrastructure, building upon generic and reusable building blocks developed in earlier research projects. This infrastructure will support emerging Future Internet (FI) services in multiple Usage Areas, and will exhibit significant and quantifiable improvements in the productivity, reliability and cost of service development and delivery - building a true foundation for the Future Internet.

8.3.2. EIT KIC funded activities

Our project team was involved in 2012 in **six activities** funded by the EIT ICT Labs KIC:

Title: **Fitting**, Future InterneT (of ThINGs) facility

Activity Number: 12340

Duration: 2011-2013

Coordinator: UPMC (France)

Others partners: Alcatel Lucent, Fraunhofer FOKUS, BME, IT, U. Paris XI.

Abstract: FITTING develops a testbed federation architecture that combines wireless and wired networks. Through FITTING, components and solutions developed in the projects OneLab2, PII and SensLAB are brought together to facilitate access. These components and devices complement each other – for instance SensLAB enhances the testbed federation by adding wireless sensors. FITTING addresses issues related to usability and accessibility of federated experimentation resources from multiple autonomous organizations. FITTING is a process of federating elements from various European and national initiatives into a global shared resource pool with a standardized interface to access them. Further, FITTING will adopt a user-driven (researchers, developers, students) approach with its running testbeds allowing experimentation with different technologies to meet the variety of

needs of a broad customer base. The FITTING activity is mentioned as a “success story” by the EIT ICT Labs KIC ¹. In fact, after an initial funding in 2010, the french partners succeeded to get the FIT Equipment of Excellence project accepted with a total budget of 5.8 MEuros to develop a testbed federation in France.

Mobile Privacy

This activity deals with privacy issues in mobile and geo-based systems.

Smart-Space Privacy

This activity deals with privacy issues in smart environments, with a particular issue on smart metering systems.

Software-Defined Networking (SDN)

The objective of this activity is to explore software-defined networking at different positions on the axis between basic flow-level processing (using OpenFlow for end-to-end flows) in controlled fixed networks and cooperation between mobile end nodes in the open wireless Internet (using opportunistic networking for resources communicated hop-by-hop).

Information-centric networking (ICN) experimentation

The goal of this activity is to define and implement an early validation environment for ICN proposals.

Seamless P2P video streaming for the web

In this activity, we will extend the current capabilities of the P2P network to distribute content to collaborators. We will analyze privacy concerns in this domain and propose design guidelines to mitigate them.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. COMMUNITY

Title: Message delivery in heterogeneous networks

Inria principal investigator: Thierry Turletti

International Partner (Institution - Laboratory - Researcher):

University of California Santa Cruz (United States) - School of Engineering - Katia Obraczka

Duration: 2009 - 2014

See also: <http://inrg.cse.ucsc.edu/community/>

During the first three years of the COMMUNITY associate team, we have explored solutions to enable efficient delivery mechanisms for disruption-prone and heterogeneous networks (i.e. challenged networks). In particular, we have designed the MeDeHa framework along with the Henna naming scheme, which allow communication in infrastructure and infrastructure-less networks with varying degrees of connectivity. We have also proposed efficient routing strategies adapted to environment with episodic connectivity that take into account the utility of nodes to relay messages. The various solutions have been evaluated using both simulations and real experimentations in testbeds located at Inria and UCSC. These solutions have demonstrated good performance in challenged networks. However, the ossification of the Internet prevents the deployment of such solutions in large scale. We have decided to extend our collaboration in two research directions: (1) the exploration of the software-defined networking paradigm to facilitate the implementation and large scale deployment of new network architectures to infrastructure-less network environments; and (2) the design of innovative information-centric communication mechanisms adapted to challenged networks.

¹ See <http://eit.europa.eu/kics1/stories-archiv/stories-single-view/article/fitting-from-eit-ict-labs-the-next-generation-testbeds.html>

8.4.1.2. SIMULBED

Title: SIMULBED: Large-Scale Simulation Testbed for Realistic Evaluation of Network Protocols and Architectures

Inria principal investigator: Walid DABBOUS

International Partner (Institution - Laboratory - Researcher):

Keio University (Japan) - Shonan-Fujisawa Campus - Osamu Nakamura

Duration: 2012 - 2014

See also: <http://planete.inria.fr/Simulbed>

Simulators and experimental testbeds are two different approaches for the evaluation of network protocols and they provide a varying degree of repeatability, scalability, instrumentation and realism. Network simulators allow fine grained control of experimentation parameters, easy instrumentation and good scalability, but they usually lack realism. However, there is a growing need to conduct realistic experiments involving complex cross-layer interactions between many layers of the communication stack and this has led network researchers to evaluate network protocols on experimental testbeds.

The use of both simulators and testbeds to conduct experiments grants a better insight on the behavior of the evaluated network protocols and applications. In this project, we focus on the design of SIMULBED, an experimentation platform that aims to provide the best of both worlds. Our project builds on the following state-of-the-art tools and platforms: the open source ns-3 network simulator and the PlanetLab testbed. ns-3 is the first network simulator that includes a mechanism to execute directly within the simulator existing real-world Linux protocol implementations and applications. Furthermore, it can be used as a real-time emulator for mixed (simulation-experimentation) network scenarios. PlanetLab is the well-known international experimental testbed that supports the development and the evaluation of new network services. It is composed of nodes connected to the Internet across the world, and uses container-based virtualization to allow multiple experiments running independently on the same node while sharing its resources.

The overall objective of the project is to make available to networking research community, the SIMULBED platform that will: (1) allow to conduct easily mixed simulation-experimentation evaluation of networking protocols and (2) scale up the size of the PlanetLab experimental testbed, while maintaining a high degree of realism and increasing controllability and reproducibility. We will use the NEPI unified programming environment recently developed in the Planète project-team to help in simplifying the configuration, deployment and run of network scenarios on the platform.

8.4.1.3. CLOUDY

Title: Secure and Private Distributed Data Storage and Publication in the Future Internet

Inria principal investigator: ClaudeCastelluccia

International Partners (Institution - Laboratory - Researcher):

University of California Berkeley (United States) - Electrical Engineering and Computer Science Department - Edward Lee

University of California Irvine (United States) - Donald Bren School of Information and Computer Sciences - Gene Tsudik

Duration: 2012 - 2014

See also: <http://planete.inrialpes.fr/cloudy-associated-team/>

Cloud computing is a form of computing where general purpose clients (typically equipped with a web browser) are used to access resources and applications managed and stored on a remote server. Cloud applications are increasingly relied upon to provide basic services like e-mail clients, instant messaging and office applications. The customers of cloud applications benefit from outsourcing the management of their computing infrastructure to a third-party cloud provider. However, this places

the customers in a situation of blind trust towards the cloud provider. The customer has to assume that the "cloud" always remains confidential, available, fault-tolerant, well managed, properly backed-up and protected from natural accidents as well as intentional attacks. An inherent reason for today's limitations of commercial cloud solutions is that end users cannot verify that servers in the cloud and the network in between are hosting and disseminating tasks and content without deleting, disclosing or modifying any content. This project seeks to develop novel technical solutions to allow customers to verify that cloud providers guarantee the confidentiality, availability and fault-tolerance of the stored data and infrastructure.

8.4.2. Participation In International Programs

- CIRIC: Our project-team was involved in the definition of the topics for the Network and Telecom R&D line of the (the Communication and Information Research and Innovation Center - CIRIC), the Inria research and innovation centre in Chili. In this context, we will extend our collaboration with Universidad Diego Portales, Chile.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Mostafa Ammar, Visiting Professor (one month in June 2012)

Subject: Investigating fundamental properties of wireless and mobile networks

Institution: Georgia Institute of Technology (United States)

Paul de Hert, Visiting Professor (one month in June 2012)

Subject: Benefits and limitations of the legal notion of "reasonable expectation of privacy"

Institution: Free University of Brussels (Belgium)

Katia Obraczka, Visiting Professor (one week in June 2012)

Subject: Communication in Heterogeneous Networks Prone to Episodic Connectivity

Institution: University of California at Santa Cruz (United States)

Marc Mendonca, Visiting PhD student (from Sep 2012 until Dec 2012)

Subject: Software-Defined Networking in Heterogeneous Networked Environments

Institution: University of California at Santa Cruz (United States)

Ilaria Cianci, Visiting PhD student (from Nov 2012 until Aug 2013)

Subject: Content Centric Networking

Institution: Politecnico di Bari, Italy

8.5.2. Visits to International teams

Mohamed Ali Kaafar, spending a sabbatical at NICTA Australia in Sydney (since February 2012)

Subject: Online Privacy Enhancing Technologies: measuring the risks and designing countermeasures

Thierry Turletti, Visiting researcher to University of California at Santa Cruz (one week in February 2012)

Subject: Community Associated team

Thierry Turletti, Alina Quereilhac and Frederic Urbani, Visitors to NICT, Japan (one week in December 2012)

Subject: Simulbed Associated team

8.5.2.1. Internships

Riccardo Ravaioli (from Mar 2012 until Aug 2012)

Subject: Is the Internet neutral or content-aware? Handling the question by measurements

Institution: Master Ubinet - Sophia Antipolis

Tessema Mindaye (from Mar 2012 until Aug 2012)

Subject: Increasing the space of applications for statistical traffic classification methods

Institution: Master Ubinet - Sophia Antipolis

Francisco Santos (from Mar 2012 until Aug 2012)

Subject: Content management in mobile wireless networks

Institution: EPFL - Lausanne

Lucia Gueguezian Odizzio (from May 2012 until Oct 2012)

Subject: Automatic IP address and routing table assignment for heterogeneous network topologies

Institution: Universidad de la Republica Oriental del Uruguay

Xuan-Nam Nguyen (from March 2012 until Aug 2012)

Subject: Software Defined Networking in Hybrid Networks

Institution: Université de Nice Sophia Antipolis (France)

Sumit BANSAL (from Feb 2012 until Jul 2012)

Subject: Attacks and Defenses for Secure Virtual Coordinate Systems

Institution: IIT Ropar (India)

ROMA Team

6. Partnerships and Cooperations

6.1. National Initiatives

6.1.1. ANR

ANR White Project RESCUE (2010-2014), 4 years. The ANR White Project RESCUE was launched in November 2010, for a duration of 48 months. It gathers three Inria partners (ROMA, Grand-Large and Hiepac) and is led by ROMA. The main objective of the project is to develop new algorithmic techniques and software tools to solve the *exascale resilience problem*. Solving this problem implies a departure from current approaches, and calls for yet-to-be-discovered algorithms, protocols and software tools.

This proposed research follows three main research thrusts. The first thrust deals with novel *checkpoint protocols*. The second thrust entails the development of novel *execution models*, i.e., accurate stochastic models to predict (and, in turn, optimize) the expected performance (execution time or throughput) of large-scale parallel scientific applications. In the third thrust, we will develop novel *parallel algorithms* for scientific numerical kernels.

6.2. International Initiatives

6.2.1. Inria Associate Teams

The ALOHA associate-team is a joint project of the ROMA team and of the Information and Computer science Department of the University of Hawai'i (UH) at Mānoa, Honolulu, USA. Building on a vast array of theoretical techniques and expertise developed in the field of parallel and distributed computing, and more particularly application *scheduling*, we tackle database questions from a fresh perspective. To this end, this proposal includes:

- a group that specializes in database systems research and who has both industrial and academic experience, the group of Lipyeow Lim (UH);
- a group that specializes in practical aspects of scheduling problems and in simulation for emerging platforms and applications, and who has a long experience of multidisciplinary research, the group of Henri Casanova (UH);
- a group that specializes in the theoretical aspects of scheduling problems and resource management (the ROMA team).

The research work focuses on the following three thrusts:

1. Online, multi-criteria query optimization
2. Fault-Tolerance for distributed databases
3. Query scheduling for distributed databases

6.3. International Research Visitors

6.3.1. Visits of International Scientists

Oliver Sinnen, senior lecturer at the Department of Electrical and Computer Engineering (ECE) of the University of Auckland, New Zealand, visited the ROMA team for three months (April-June, 2012). He worked with Loris Marchal and Frédéric Vivien on scheduling tree-shaped task graphs to minimize both the peak memory usage and the makespan (see Section 5.5).

6.3.2. 7th Scheduling for large scale systems workshop

The University of Pittsburgh (Rami Melhem), the ROMA team (Yves Robert and Frédéric Vivien) and the University of Hawai'i at Manoa (Henri Casanova) have organized a workshop in Pittsburgh, on June 28-30, 2012. The workshop focused on scheduling and algorithms for large-scale systems. This was the seventh edition of this workshop series, after Aussois in August 2004, San Diego in November 2005, Aussois in May 2008, Knoxville in May 2009, Aussois in May 2010, and Aussois in May 2011. The next workshop will be held in Schloss Dagstuhl in September 2013.

SARDES Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. *Automatique pour l'informatique autonome (CNRS PEPS)*

Participant: Eric Rutten.

This project is lead by Eric Rutten and funded by CNRS in the *programme Projet Exploratoire-Premier(s) Soutien(s) PEPS Rupture de l'INS2I 2011*. It concerns Control Techniques for Autonomic Computing, and intends to group researchers of different backgrounds (Architectures and FPGA, distributed systems and adaptative software, programming languages for reconfiguration, and control theory) to gather experiences and points of view on this multi-disciplinary topic.

<http://sardes.inrialpes.fr/~rutten/peps-api/>

7.1.2. *SocEDA (ANR Arpege project)*

Participants: Vivien Quéma, Baptiste Lepers.

The goal of SocEDA is to develop and validate an elastic and reliable federated SOA architecture for dynamic and complex eventdriven interaction in large highly distributed and heterogeneous service systems. Such architecture will enable exchange of contextual information between heterogeneous services, providing the possibilities to optimize/personalize the execution of them, according to social network information.

The main outcome of the SocEDA project will be a platform for event--driven interaction between services, that scales at the Internet level based on the proposed architecture and that addresses Quality of Service (QoS) requirements.

The project partners are Inria (ADAM in Lilles), EBM WebSourcing (FR), ActiveEon (FR), ARMINES (FR), France Telecom R&D (FR), CNRS (I3S and LIG), INSA Lyon, Thales Communications.

The project runs from October 2010 to September 2013.

7.1.3. *PiCoq (ANR project)*

Participants: Damien Pous, Jean-Bernard Stefani.

The goal of the PiCoq project is to develop an environment for the formal verification of properties of distributed, component-based programs. The project's approach approach lies at the interface between two research areas: concurrency theory and proof assistants. Achieving this goal relies on three scientific advances, which the project intends to address:

- Finding mathematical frameworks that ease modular reasoning about concurrent and distributed systems: due to their large size and complex interactions, distributed systems cannot be analysed in a global way. They have to be decomposed into modular components, whose individual behaviour can be understood.
- Improving existing proof techniques for distributed/modular systems: while behavioural theories of first-order concurrent languages are well understood, this is not the case for higher-order ones. We also need to generalise well-known modular techniques that have been developed for first-order languages to facilitate formalisation in a proof assistant, where source code redundancies should be avoided.
- Defining core calculi that both reflect concrete practice in distributed component programming and enjoy nice properties w.r.t. behavioural equivalences.

The project partners include Inria (Sardes), LIP (Plume team), and Université de Savoie. the project runs from November 2010 to October 2014.

The ANR PiCoq is in the programme ANR 2010 BLAN 0305 01: <http://sardes.inrialpes.fr/collaborations/PiCoq/>.

7.1.4. *Project MyCloud (ANR project)*

Participants: Amit Sangroya, Sara Bouchenak, Damian Serrano-Garcia.

The objective of the MyCloud project is to define and implement a novel cloud model: *SLAaaS* (*SLAaware Service*). The *SLAaaS* model enriches the general paradigm of Cloud Computing, and enables systematic and transparent integration of service levels and SLA to the cloud. *SLAaaS* is orthogonal to IaaS, PaaS and SaaS clouds and may apply to any of them. The MyCloud project takes into account both the cloud provider and cloud customer points of view. From cloud provider's point of view, MyCloud proposes autonomic SLA management to handle performance, availability, energy and cost issues in the cloud. An innovative approach combines control theory techniques with distributed algorithms and language support in order to build autonomic elastic clouds. Novel models, control laws, distributed algorithms and languages will be proposed for automated provisioning, configuration and deployment of cloud services to meet SLA requirements, while tackling scalability and dynamics issues. On the other hand from cloud customer's point of view, the MyCloud project provides SLA governance. It allows cloud customers to be part of the loop and to be automatically notified about the state of the cloud, such as SLA violation and cloud energy consumption. The former provides more transparency about SLA guaranties, and the latter aims to raise customers' awareness about cloud's energy footprint.

The project partners are Inria (Sardes is the project coordinator), Grenoble; LIP6, Paris; EMN, Nantes; We Are Cloud, Montpellier; Elastic Grid LLC, USA.

The project runs from November 2010 to October 2013.

7.1.5. *Famous (ANR project)*

Participants: Eric Rutten, Xin An.

The FAMOUS project (FASt Modeling and Design FLOw for Dynamically ReconfigURable Systems) intends to make reconfigurable hardware systems design easier and faster, by introducing a complete methodology that takes the reconfigurability of the hardware as an essential design concept and proposes the necessary mechanisms to fully exploit those capabilities at runtime. The tool under development in this project is expected to be used by both industrial designers and academic researchers, especially for modern application system specific design such as smart cameras, image and video processing, etc.

The project partners are Inria (Sardes in Grenoble and DaRT in Lille), Université de Bretagne Sud, Université de Bourgogne, Sodius.

The project runs from December 2009 to November 2013.

7.1.6. *REVER (ANR project)*

Participants: Barbara Petit, Jean-Bernard Stefani.

The REVER project aims to develop semantically well-founded and composable abstractions for dependable distributed computing on the basis of a reversible programming model, where reversibility means the ability to undo any program execution and to revert it to a state consistent with the past execution. The critical assumption behind REVER is that by combining reversibility with notions of compensation and modularity, one can develop systematic and composable abstractions for dependable programming.

The REVER workprogramme is articulated around three major objectives:

- To investigate the semantics of reversible concurrent processes.
- To study the combination of reversibility with notions of compensation, isolation and modularity in a concurrent and distributed setting.
- To investigate how to support these features in a practical (typically, object-oriented and functional) programming language design.

The project partners are Inria (Sardes in Grenoble and Focus in Bologna), Université de Paris VII (PPS laboratory), and CEA (List laboratory).

The project runs from December 2011 to November 2015.

7.1.7. CtrlGreen (ANR project)

Participants: Fabienne Boyer, Noël De Palma, Eric Rutten, Soguy Mak-Kare Gueye.

The goal of the CtrlGreen project is to develop the control techniques and software infrastructure required to build energy-efficient data centers. Because resource management must meet performance, dependability and scalability objectives and as well as service level agreements, energy-efficiency must be considered as a multi-criteria control problem. CtrlGreen aims to develop an autonomic system approach, where multiple control loops may coexist and coordinate. Specifically, the work will proceed along four directions:

- The study of reactive control techniques including synchronous languages and discrete controller synthesis to program, verify and synthesize coordinating controllers.
- The development of a controllable platform that can provide system level support for the deployment and integration of the required controllers.
- The study of several green data center scenarios that involve the coordination between several controllers at different levels (hardware, operating system and middleware) and targeting different objectives (performance, availability, energy efficiency, etc).
- Experiments with an industrial data center to evaluate CtrlGreen techniques in a real world environment, with multiple running applications.

The project partners include Eolas, Inria Rennes, INPT/IRIT Toulouse, LIG (Sardes) and ScalAgent. The project runs from January 2012 to December 2014.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. PLAY

Title: Pushing dynamic and ubiquitous interaction between services Leveraged in the Future Internet by Applying complex event processing

Type: COOPERATION (ICT)

Defi: Internet of Services, Software & Virtualisation

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2010 - September 2013

Coordinator: FZI (Germany)

Others partners: EBM WebSourcing (Fr), Inria (OASIS and SARDES) (Fr), France Telecom (Fr), ICCS (Gr), Ecole des Mines Albi (Fr), CIM (Serbia).

See also: <http://www.play-project.eu/>

Abstract: The goal of PLAY is to develop and validate an elastic and reliable federated SOA architecture for dynamic and complex, event-driven interaction in large highly distributed and heterogeneous service systems. Such architecture should enable the exchange of contextual information between heterogeneous services, providing the possibilities to optimize/personalize the execution of them, resulting in the so called situational-driven adaptivity.

The main outcome will be a FOT (federated open trusted) Platform for event-driven interaction between services, that scales at the Internet level based on the proposed architecture and that addresses Quality of Service (QoS) requirements. The platform will comprise in particular:

- A federated middleware layer: a peer-to-peer overlay network combined with a publish/subscribe mechanism, that has the task to collect events coming from the heterogeneous and distributed services.
- A distributed complex event processor: an elastic, distributed computing cloud based engine for complex processing/combining of events coming from different services in order to detect interesting situations a service should react on.

SOCRATE Team (section vide)

URBANET Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- ARC 7 PhD Grant on Urban mobility measurement for citizen-oriented services cartography. Participants: Trista Lin (PhD), Marco Fiore, Hervé Rivano, Fabrice Valois. In collaboration with Frédéric Le Mouel (CITI) and Lyon Urbanism Agency.
- ARC 7 animation grant for organizing the "Digital Cities days".
- BQR INSA 3 years project on "Network architecture for Buildings and Energy" (ARBRE). Participants: Hervé Rivano, Fabrice Valois. In collaboration with CETHIL (energetic modeling), LIRIS (database management) and EVS (social science).

8.2. National Initiatives

8.2.1. ANR

- ANR Verso ECOScells 10/2009-12/2012
Participants: Anis Ouni, Hervé Rivano, Fabrice Valois
The objective of ECOScells is to study energy efficient microcells networks. Hervé Rivano is leader for Inria side and of the work package focusing on energy efficient wireless backhauling.
- ANR ARESA2 03/2010-08/2013.
Participants: Alexandre Mouradian, Isabelle Augé-Blum, Fabrice Valois
The partners in the ANR ARESA2 project are: Orange Labs, Coronis, Inria, LIG, Télécom Bretagne, VERIMAG. Our contributions focus on: resiliency of routing protocols in WSN; how to exploit the heterogeneity in wireless multi-hop network; real-time and QoS support in routing protocols for WSN. This project will end in August 2013. Alexandre Mouradian (Ph.D student) is funded by ARESA2.

8.2.2. Pôle ResCom

- Ongoing participation (since 2006)
Communication networks, working groups of GDR ASR, CNRS (<http://rescom.inrialpes.fr>). Hervé Rivano is member of the scientific committee of Rescom.

8.3. International Initiatives

8.3.1. Inria International Partners

- Universidade Federal do Ceara (Brazil): Joint publication [6] with Claudia Linhares Sales on proportional coloring for wireless mesh networks.
- University of Waterloo (Canada): Collaboration with Catherine Rosenberg on optimization of wireless mesh networks.
- Politecnico di Torino (Italy): Multiple publications [4], [5], [7], [18] co-authored with members of the Telecommunication Networks Group.
- Universidade Federal de Minas Gerais (Brazil): Collaboration with Pedro Vaz de Melo on mobility analysis [26].
- Ecole Polytechnique Fédérale de Lausanne (Switzerland): Collaboration with Florian Huc on proportional coloring for wireless mesh networks [6].

- A new collaboration started with Université of Yaoundé 1 into the LIRIMA framework. Fabrice Valois works with Prof. Maurice Tchuenta and a joint Ph.D. thesis started: the research topics of M. Rodrigue Domga Komguem focus on the use of wireless sensor networks for intelligent transport systems (ITS).

8.4. International Research Visitors

8.4.1. Visits of International Scientists

Delia Ciullo (04/2012)

Subject: Sleep Mode Effectiveness in Cellular Networks

Institution: Politecnico di Torino (Italy)

Catherine Rosenberg (06/2012)

Subject: Resource Allocation, Transmission Coordination and User Association in Heterogeneous Cellular Networks

Institution: University of Waterloo (Canada)

Prasan Kumar Sahoo (11/2012)

Subject: Wireless Sensor Networks: Applications and Research Issues

Institution: University Chang Gung (Taiwan)

8.4.2. Visits to International Teams

- Marco Fiore visited with monthly frequency the Telecommunication Networks Group of the Politecnico di Torino, Italy. The cooperation focused on the topics of content download in vehicular environments and mobile user position verification.
- Marco Fiore visited the Hamilton Institute, Ireland, on October 2012. He gave an invited talk and discussed possible cooperation between UrbaNet and the Hamilton Institute.
- In last August, in the frame of the "Saisons Croisées France-Afrique du Sud", with the collaboration of the French Foreign Office and with the support of the Inria foreign office, Fabrice Valois participated to a common workshop on the use of wireless sensor networks for South-African applications. This workshop was held in Stellenbosch University, and was organized jointly by the communications group of Stellenbosch University and the Inria project FUN (Dr. Nathalie Mitton). In this context, Fabrice Valois gave lectures and participated to a tutorial on Senslab. In September, a project proposal was submitted with these collaborators. Last November, a new research meeting was held in Inria Lille, hosted by the FUN team.
- In November, Hervé Rivano, Fabrice Valois, Razvan Stanica and Quentin Lampin participated to the Wireless Days conference in Dublin, Ireland. As Dublin academic institutions are very active in the area of urban networking and applications, we extended our stay and met with research teams from the Hamilton Institute and Dublin City University, as well as with French Embassy staff, to discuss possible collaborative activities.

E-MOTION Project-Team (section vide)

EXMO Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR Datalift

Program: ANT-ContInt

Project acronym: Datalift

Project title: Datalift

Instrument: platform

Duration: September 2010 - March 2014

Coordinator: Inria Exmo/François Scharffe

See also: <http://www.datalift.org>

Abstract: EXMO coordinates with LIRMM the DATALIFT project whose goal is to produce a platform for publishing governmental data as linked data [17]. EXMO is particularly involved in the generation of links between datasets (see §6.2).

7.2. European Initiatives

7.2.1. FP7 SEALS

Title: Semantic Evaluation At Large Scale

Type: CAPACITIES (Infrastructures)

Defi: Scientific Data Infrastructure

Instrument: Combination of COLLABORATIVE PROJECTS and COORDINATION and SUPPORT ACTIONS (CPCSA)

Duration: June 2009 - June 2012

Coordinator: Universidad Politecnica de Madrid (ES)

See also: <http://seals-project.eu>

Abstract:

EXMO is a partner of the SEALS European commission infrastructure project whose goal is to provide the infrastructure for evaluating semantic technologies. Jérôme Euzenat has been vice-coordinator in charge of the research area.

More particularly, EXMO has been in charge of providing an infrastructure for evaluating ontology matching systems and algorithms, to be aggregated in the SEALS platform. This task involves:

- designing evaluation campaigns, including identifying criteria, metrics, datasets, and tools to be used in each campaign,
- designing and implementing services for automatic evaluation of systems and algorithms,
- analysing the results of evaluation campaigns and using them to produce detailed reports on both the effectiveness of the testing methodologies, and the systems that have been tested.

This year we have prepared the second SEALS evaluation campaign and designed a fully automated evaluation process (see §6.1.1).

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Riccardo Albertoni (Universidad Politecnica de Madrid) visited EXMO from October 15th to October 22nd, 2012 working on similarity measures and their application to linked data.

Alexander Borgida (Rutgers University) visited EXMO from April 29th to May 11th, 2012 mostly working on weighted alignment semantics.

Jorge Gracia (Universidad Politecnica de Madrid) visited EXMO from June 4th to July 3rd, 2012, working more particularly on multilingual ontology/instance matching;

Daniel Vila (Universidad Politecnica de Madrid) visited EXMO from April 23rd to July 23rd, 2012 working on data interlinking and multilingual instance matching.

7.3.2. Internships

Thinh Dong (2nd year master «Master Informatique: Fondements et Ingénierie» option «Knowledge Information System», U. Nice Sophia-Antipolis, 2012) on «Query generation from expressive ontology alignments».

IMAGINE Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. *BQR Intuactive 06/2011-12/2012*

Participants: Rémi Brouet, Marie-Paule Cani, Jean-Claude Léon.

The Intuactive project is a collaboration between our research group, the conception group of G-scop lab, and the HCI group of LIG lab. The goal is to develop and compare 2D vs 3D interaction for selecting, placing and editing 3D shapes. The project is funded by Grenoble-INP and provides the grant for Rémi Brouet's PhD.

8.1.2. *BQR INP IDEAL (04/2009 - 03/2012)*

Participant: Jean-Claude Léon.

3D models, coming for instance from engineering fields, are often 'idealized', or 'simplified' (topologically speaking), in order to be used for simulation. The goal of this project IDEAL, funded by Grenoble-INP, is to study these models, in particular the most general ones which are called 'non-manifolds' and which are not handled by current software. We collaborate in this project with the University of Genova in Italy (Leila De Floriani).

8.1.3. *BQR INP "Modèles multirésolutions de fissures" (04/2009 - 09/2012)*

Participants: Marie Durand, François Faure.

A project on the simulation of fracture propagation in concrete structures has started, funded by INP Grenoble. The purpose is to develop a mixed, dynamic model of structures, using finite elements everywhere excepted near crack fronts, where a discrete model is applied. This goes beyond the ANR Vulcain project because we want to dynamically switch between finite element and discrete models. Bui Huu Phoc has started a Ph.D. in October, co-tutored by Frederic Dufour and Vincent Richefeu, from the L3S-R CNRS laboratory, and François Faure from EVASION.

8.1.4. *LIMA 2 "Loisirs et Images" (2007 - 2013)*

Participants: Marie-Paule Cani, François Faure, Damien Rohmer.

LIMA 2 (Loisirs et Images) is a Rhône-Alpes project in the ISLE cluster (Informatique, Signal, Logiciel Embarqué) focussed on classification and computer graphics. This project funded the PhD for Lucian Stanculescu with Raphaëlle Chainé (LIRIS) and Marie-Paule Cani. A research seminar is planned in January 2013 in Lyon. Thibaut Weise from EPFL will be invited as an international speaker.

8.1.5. *Scenoptique (12/2012 - 03/2014)*

Participant: Rémi Ronfard.

In October 2011, we started a collaboration with Theatre des Celestins in Lyon on the topic of interactive editing of rehearsals. This research program is funded by the Region Rhone Alpes as part of their CIBLE project, with a budget for a doctoral thesis (Vineet Gandhi) and three large sensor video cameras. Theatre des Celestins is interested in novel tools for capturing, editing and browsing video recordings of their rehearsals, with applications in reviewing and simulating staging decisions. We are interested in building such tools as a direct application and test of our computational model of film editing, and also for building the world's first publicly available video resource on the creative process of theatre rehearsal. Using state-of-the-art video analysis methods, this corpus is expected to be useful in our future work on procedural animation of virtual actors and narrative design. The corpus is also expected to be shared with the LEAR team as a test bed for video-based action recognition.

8.1.6. PERSYVAL

Participant: Rémi Ronfard.

We received a doctoral grant from LABEX PERSYVAL, as part of the research program on authoring augmented reality (AAR) for PhD student Adela Barbelescu. Her thesis is entitled *directing virtual actors by imitation and mutual interaction - technological and cognitive challenges*. Her advisors are Rémi Ronfard and Gérard Bailly (GIPSA-LAB).

8.2. National Initiatives

8.2.1. ANR RepDyn (01/2010-12/2012)

Participants: Marie Durand, François Faure.

We will participate to the ANR RepDyn project, starting at the beginning of 2010, in collaboration with CEA, EDF, Laboratoire de Mécanique des Structures Industrielles Durables (LaMSID), and ONERA. The purpose of this project is to enhance the performance of discrete elements and fluid computations, for the simulation of cracks in nuclear reactors or planes. Our task is to propose GPU implementations of particle models, as well as load balancing strategies in the context of multi-core, multi-GPU hardware. Marie Durand has started a PhD thesis on this task.

8.2.2. ANR ROMMA (01/2010-12/2013)

Participants: François Faure, Jean-Claude Léon, Stefanie Hahmann.

The ANR project ROMMA has been accepted in 2009 and started in January 2010. The partners of this project are academic and industry experts in mechanical engineering, numerical simulation, geometric modeling and computer graphics. There are three academic members in the consortium: the LMT in Cachan, G-SCOP and LJK (EVASION and MGMI teams) in Grenoble. There are four industrial members: EADS, which coordinates the project, SAMTECH, DISTENE and ANTECIM. The aim of the project is to efficiently and robustly model very complex mechanical assemblies. We are working on the interactive computation of contacts between mechanical parts using GPU techniques. We will also investigate the Visualization of data with uncertainty, applied in the context of the project.

8.2.3. ANR SOHUSIM (10/2010-09/2014)

Participants: Ali Hamadi Dicko, François Faure.

Sohusim (Soft Human Simulation) is a ANR Project which started on October 1st 2010. It is done in collaboration between: EVASION (Inria), Fatronik France (TECNALIA), DEMAR (Inria), HPC PROJECT and the CHU de Montpellier.

This project deals with the problem of modeling and simulation of soft interactions between humans and objects. At the moment, there is no software capable of modeling the physical behavior of human soft tissues (muscles, fat, skin) in mechanical interaction with the environment. The existing software such as LifeMod or OpenSim, models muscles as links of variable length and applying a force to an articulated stiff skeleton. The management of soft tissues is not taken into account and does not constitute the main objective of this software.

A first axis of this project aims at the simple modeling and simulation of a passive human manipulated by a mecatronics device with for objective the study and the systems design of patient's manipulation with very low mobility (clinic bed). The second axis concentrates on the detailed modeling and the simulation of the interaction of an active lower limb with objects like orthosis, exoskeleton, clothes or shoes. The objective being there also to obtain a tool for design of devices in permanent contact with the human who allows determining the adequate ergonomics in terms of forms, location, materials, according to the aimed use.

Dicko Ali Hamadi is a Ph.D. student within EVASION team. His works turns around the problems in SOHUSIM project. He is co-tutored Olivier Palombi in IMAGINE.

8.2.4. *FUI Dynam'it (01/2012 - 02/2014)*

Participant: Francois Faure.

2-year contract with two industrial partners: TeamTo (production of animated series for television) and Artefacts Studio (video games). The goal is to adapt some technologies created in SOFA, and especially the frame-based deformable objects [31], [30] to practical animation tools. This contract provides us with the funding of two engineers and one graphical artist during two years.

8.2.5. *ANR CHROME (01/2012 - 08/2015)*

Participant: Rémi Ronfard.

Chrome is a national project funded by the French Research Agency (ANR). The project is coordinated by Julien Pettré, member of MimeTIC. Partners are: Inria-Grenoble IMAGINE team (Remi Ronfard), Golaem SAS (Stephane Donikian), and Archivideo (Francois Gruson). The project has been launched in september 2012. The Chrome project develops new and original techniques to massively populate huge environments. The key idea is to base our approach on the crowd patch paradigm that enables populating environments from sets of pre-computed portions of crowd animation. These portions undergo specific conditions to be assembled into large scenes. The question of visual exploration of these complex scenes is also raised in the project. We develop original camera control techniques to explore the most relevant part of the animations without suffering occlusions due to the constantly moving content. A long-term goal of the project is to enable populating a large digital mockup of the whole France (Territoire 3D, provided by Archivideo). Dedicated efficient human animation techniques are required (Golaem). A strong originality of the project is to address the problem of crowded scene visualisation through the scope of virtual camera control, as task which is coordinated by Imagine team-member Rémi Ronfard.

Three phd students are funded by the project. Kevin Jordao is working on interactive design and animation of digital populations and crowds for very large environments. His advisors are Julien Pettré and Marie-Paule Cani. Quentin Galvanne is working on automatic creation of virtual animation in crowded environments. His advisors are Rémi Ronfard and March Christie (Mimetic team, Inria Bretagne). Julien Pettre. Chen-Kin Lim is working on crowd simulation and rendering of the behaviours of various populations using crowd patches. Her advisors are Rémi Ronfard and March Christie (Mimetic team, Inria Bretagne). Julien Pettre.

8.2.6. *Action3DS (Caisse des dépôts) (10/2011 - 09/2014)*

Participant: Rémi Ronfard.

Action3DS is a national project funded by Caisse des Dépôts, as part of the *Investissements d'avenir* research program entitled *Technologies de numérisation et de valorisation des contenus culturels, scientifiques et éducatifs*.

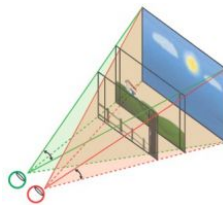


Figure 18. Illustration of the stereoscopic camera system.

The project is coordinated by Thales Angénieux (Patrick Defay). Partners are Inria (Rémi Ronfard), Lutin Userlab (Charles Tijus), LIP6 (Bernadette Bouchon-Meunier), GREYC (David Tschumperlé), École nationale supérieure Louis Lumière (Pascal Martin), Binocle (Yves Pupulin), E2V Semiconductors and Device-Alab.

The goal of the project is the development of a compact professional stereoscopic camera for 3D broadcast and associated software. Rémi Ronfard is leading a work-package on real-time stereoscopic previsualization, gaze-based camera control and stereoscopic image quality.

The project is funding PhD student Inigo Rodriguez who is working on learning-based camera control for stereoscopic 3D cinematography. His advisor is Rémi Ronfard.

8.2.7. *AEN MorphoGenetics (10/2012 - 09/2015)*

Participant: François Faure.

3-year collaboration with Inria teams Virtual Plants and Demar, as well as INRA (Agricultural research) and the Physics department of ENS Lyon. The goal is to better understand the coupling of genes and mechanical constraints in the morphogenesis (creation of shape) of plants. Our contribution is to create mechanical models of vegetal cells based on microscopy images. This project funds the Ph.D. thesis of Richard Malgat, who started in October, co-advised by François Faure (IMAGINE) and Arezki Boudaoud (ENS Lyon).

8.2.8. *PEPS SEMYO (10/2012 - 09/2014)*

Participant: François Faure.

2-year collaboration with Inria team DEMAR (Montpellier) and Institut de Myologie (Paris) to simulate 3D models of pathological muscles, for which no standard model exist. The main idea is to use our mesh-less frame-based model to easily create mechanical models based on segmented MRI images.

8.2.9. *MSTIC Adamo (03/2012 - 12/2013)*

Participant: Olivier Palombi.

8.3. European & International Initiatives

8.3.1. *ERC Grant Expressive (04/2012-03/2017)*

Participants: Marie-Paule Cani, Stefanie Hahmann, Jean-Claude Léon.

To make expressive and creative design possible in virtual environments, the goal is to totally move away from conventional 3D techniques, where sophisticated interfaces are used to edit the degrees of freedom of pre-existing geometric or physical models: this paradigm has failed, since even trained digital artists still create on traditional media and only use the computer to reproduce already designed content. To allow creative design in virtual environments, from early draft to progressive refinement and finalization of an idea, both interaction tools and models for shape and motion need to be revisited from a user-centred perspective. The challenge is to develop reactive 3D shapes – a new paradigm for high-level, animated 3D content – that will take form, refine, move and deform based on user intent, expressed through intuitive interaction gestures inserted in a user-knowledge context. Anchored in Computer Graphics, this work reaches the frontier of other domains, from Geometry, Conceptual Design and Simulation to Human Computer Interaction.

8.3.2. *PhD grant from USM (University Sains Malaysia) (11/2011 - 10/2014)*

Seou Ling NG: PhD supervisor: Stéfanie Hahmann: geometric modelling.

8.3.3. *PhD grant from USM (University Sains Malaysia) (08/2012 - 07/2015)*

Chen Kim Lim: PhD supervisor: Marie-Paule Cani: crowd modelling, animation.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Nicolas Szilas (University of Geneva): Interactive Storytelling: Models, Architecture and Approach (26/04/2012).
- Karan Singh (University of Toronto): Artist and Perception driven Interactive Graphics (10/05/2012).
- Alla Sheffer (University of British Columbia): Geometry in action (24/05/2012).
- Jarek Rossignac (Georgia Tech): The Beauty of a Motion: Mathematical Definition, Robust Implementation and Applications to Design and Animation (07/06/2012).
- Michael Gleicher (University of Wisconsin-Madison): From Art and Perception to Visualization, Video, and Virtual Reality (12/06/2012).
- Michael Wand (Max-Planck-Institut): Shape Analysis with Correspondences (06/07/2012).
- Ladislav Kavan (ETH Zurich): 3D Virtual Characters: Skinning, Clothing, and Weird Math (12/07/2012).
- Niloy J. Mitra (University of College London): Smart Geometry: In Search of Geometric Simplicity (25/10/2012).
- Mathieu Desbrun (California Institute of Technology): The Power of Duals: from Poisson to Blue Noise (20/12/2012).

LEAR Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. *QUAERO Project*

Participants: Mohamed Ayari, Matthijs Douze, Dan Oneata, Danila Potapov, Alessandro Prest, Jerome Revaud, Cordelia Schmid, Franck Thollard, Heng Wang.

Quaero is a French-German search engine project supported by OSEO. It runs from 2008 to 2013 and includes many academic and industrial partners, such as Inria, CNRS, the universities of Karlsruhe and Aachen as well as LTU, Exalead and INA. LEAR/Inria is involved in the tasks of automatic image annotation, image clustering as well as large-scale image and video search. See <http://www.quaero.org> for more details.

8.1.2. *ANR Project Qcompere*

Participants: Guillaume Fortier, Cordelia Schmid, Jakob Verbeek.

This three-and-a-half year project started in November 2010. It is aimed at identifying people in video using both audio (using speech and speaker recognition) and visual data in challenging footage such as news broadcasts, or movies. The partners of this project are the CNRS laboratories LIMSI and LIG, the university of Caen, Inria's LEAR team, as well as two industrial partners Yacast and Vecsys Research.

8.1.3. *ANR Project Physionomie*

Participants: Frédéric Jurie [University of Caen], Jakob Verbeek.

Face recognition is nowadays an important technology in many applications ranging from tagging people in photo albums, to surveillance, and law enforcement. In this 3-year project (2013–2016) the goal is to broaden the scope of usefulness of face recognition to situations where high quality images are available in a dataset of known individuals, which have to be identified in relatively poor quality surveillance footage. To this end we will develop methods that can compare faces despite an asymmetry in the imaging conditions, as well as methods that can help searching for people based on facial attributes (old/young, male/female, etc.). The tools will be evaluated by law-enforcement professionals. The participants of this project are: Morpho, SensorIT, Université de Caen, Université de Strasbourg, Fondation pour la Recherche Stratégique, Préfecture de Police, Service des Technologies et des Systèmes d'Information de la Sécurité Intérieure, and LEAR.

8.2. European Initiatives

8.2.1. *FP7 European Project AXES*

Participants: Ramazan Cinbis, Matthijs Douze, Zaid Harchaoui, Dan Oneata, Danila Potapov, Cordelia Schmid, Jakob Verbeek.

This 4-year project started in January 2011. Its goal is to develop and evaluate tools to analyze and navigate large video archives, eg. from broadcasting services. The partners of the project are ERCIM, Univ. of Leuven, Univ. of Oxford, LEAR, Dublin City Univ., Fraunhofer Institute, Univ. of Twente, BBC, Netherlands Institute of Sound and Vision, Deutsche Welle, Technicolor, EADS, Univ. of Rotterdam. See <http://www.axes-project.eu/> for more information.

8.2.2. *FP7 European Network of Excellence PASCAL 2*

Participants: Zeynep Akata, Adrien Gaidon, Zaid Harchaoui, Thomas Mensink, Cordelia Schmid, Jakob Verbeek.

PASCAL (Pattern Analysis, Statistical Modeling and Computational Learning) is a 7th framework EU Network of Excellence that started in March 2008 for five years. It has established a distributed institute that brings together researchers and students across Europe, and is now reaching out to countries all over the world. PASCAL is developing the expertise and scientific results that will help create new technologies such as intelligent interfaces and adaptive cognitive systems. To achieve this, it supports and encourages collaboration between experts in machine learning, statistics and optimization. It also promotes the use of machine learning in many relevant application domains such as machine vision.

8.2.3. *ERC Advanced grant Allegro*

Participant: Cordelia Schmid.

The ERC advanced grant ALLEGRO will start beginning of 2013 for a duration of five year. The aim of ALLEGRO is to automatically learn from large quantities of data with weak labels. A massive and ever growing amount of digital image and video content is available today. It often comes with additional information, such as text, audio or other meta-data, that forms a rather sparse and noisy, yet rich and diverse source of annotation, ideally suited to emerging weakly supervised and active machine learning technology. The ALLEGRO project will take visual recognition to the next level by using this largely untapped source of data to automatically learn visual models. We will develop approaches capable of autonomously exploring evolving data collections, selecting the relevant information, and determining the visual models most appropriate for different object, scene, and activity categories. An emphasis will be put on learning visual models from video, a particularly rich source of information, and on the representation of human activities, one of today's most challenging problems in computer vision.

8.3. International Initiatives

8.3.1. *Inria Associate Teams*

- **Hyperion:** Large-scale statistical learning for visual recognition, 2012–2014
Despite the ever-increasing number of large annotated image and video datasets, designing principled and scalable statistical learning approaches from such big computer vision datasets remains a major scientific challenge. In this associate team we collaborate with two teams of University of California Berkeley, headed respectively by Prof. Jitendra Malik and Prof. Nourredine El Karoui. It will allow the three teams to effectively combine their respective strengths in areas such as large-scale learning theory and algorithms, high-level feature design for computer vision, and high-dimensional statistical learning theory. It will result in significant progress in domains such as large-scale image classification, weakly-supervised learning for classification into attributes, and transfer learning.

8.3.2. *Inria International Partners*

- **Microsoft Research NY:** Zaid Harchaoui has been collaborating since the fall 2010 with Miro Dudik, formerly from Yahoo! Research (until Spring 2012), and now in the recently setup Microsoft Research New York lab, on lifted coordinate descent algorithms for large-scale learning. This collaboration lead to several published papers, including an oral presentation at CVPR 2012. Zaid Harchaoui has visited Microsoft Research NY for one week in the fall 2012. We intend to pursue this fruitful collaboration in the coming years.
- **UC Berkeley:** This collaboration between Bin Yu, Jack Gallant, Yuval Benjamini (UC Berkeley), Ben Willmore (Oxford University) and Julien Mairal (Inria LEAR) aims to discover the functionalities of areas of the visual cortex. We have introduced an image representation for area V4, adapting tools from computer vision to neuroscience data. The collaboration started when Julien Mairal was a post-doctoral researcher at UC Berkeley and is still ongoing, involving a student from UC Berkeley working on the extension of the current image model to videos.

- **UC Berkeley, Institut Curie:** In a collaboration between Jean-Philippe Vert, Elsa Bernard (Institut Curie), Laurent Jacob (UC Berkeley) and Julien Mairal (Inria LEAR) we aim to develop novel efficient optimization techniques for identification and quantification of isoforms from RNA-Seq data. Elsa Bernard was a master student between April and August 2012. She was co-advised by Jean-Philippe Vert, Laurent Jacob and Julien Mairal. Elsa Bernard has now started her PhD at Institut Curie and the collaboration is still ongoing.
- **ETH Zürich:** We collaborate with V. Ferrari, junior professor at ETH Zürich, and recently appointed as assistant professor at University of Edinburgh. V. Ferrari and C. Schmid co-supervised a PhD student (A. Prest) on the subject of automatic learning of objects in images and videos [3], [9], [20]. A. Prest was bi-localized between ETH Zürich and Inria Grenoble.

8.3.3. Participation In International Programs

- **France-Berkeley fund:** The LEAR team was awarded a grant from the France-Berkeley fund for the project with Pr. Jitendra Malik (EECS, UC Berkeley) on "Large-scale learning for image and video interpretation". The award amounts to 10,000 USD for a period of one year. The funds are meant to support scientific and scholarly exchanges and collaboration between the two teams.

MAVERICK Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. ANR BLANC: ALTA

Participants: Nicolas Holzschuch, Cyril Soler.

We are funded by the ANR research program "Blanc" for a joint research project with two other Inria research teams, REVES in Sophia-Antipolis and iPARLA in Bordeaux. The goal of this project is studying light transport operators for global illumination, both in terms of frequency analysis and dimensional analysis. The grant started in October 2011, for 48 months.

7.1.2. ANR jeune chercheur: SimOne

Participants: Fabrice Neyret, Cyril Soler, Manuel Vennier.

We are funded by the ANR research program "jeune chercheur" (grants for young research leaders, obtained by Eric Bruneton) for a joint research project with the EVASION Inria project-team. The goal of this project is to develop "Scalable Interactive Models Of Nature on Earth" (including shape, motion and illumination models for ocean, clouds, and vegetation). The grant started in December 2010, for 36 months.

7.1.3. ANR CONTINT: RTIGE

Participants: Eric Bruneton, Jean-Dominique Gascuel, Nicolas Holzschuch, Fabrice Neyret.

RTIGE stands for Real-Time and Interactive Galaxy for Edutainment. This is an ANR CONTINT (Contents and Interactions) research program, for a joint research project with the EVASION Inria project-team, the GEPI and LERMA research teams at Paris Observatory, and the RSA Cosmos company. We aim at integrating our results for digital planetariums. The grant started in December 2010, for 48 months.

7.1.4. ANR COSINUS: ROMMA

Participants: Georges-Pierre Bonneau, François Jourdes.

The ANR project ROMMA has been accepted in 2009. It started in January 2010 for a duration of 4 years. The partners of this project are academic and industry experts in mechanical engineering, numerical simulation, geometric modeling and computer graphics. The aim of the project is to efficiently and robustly model very complex mechanical assemblies. We work on the interactive computation of contacts between mechanical parts using GPU techniques. We also investigate the Visualization of data with uncertainty, applied in the context of the project.

7.1.5. ANR CONTINT: MAPSTYLE

Participants: Joëlle Thollot, Hugo Loi.

The MAPSTYLE project aims at exploring the possibilities offered by cartography and expressive rendering to propose original and new cartographic representations. Through this project, we target two types of needs. On the one hand, mapping agencies produce series paper maps with some renderings that are still derived from drawings made by hand 50 years ago: for example, rocky areas in the series TOP25 (to 1/25000) of the French Institut Géographique National (IGN). The rendering of these rocky areas must be automated and its effectiveness retained to meet the requirements of hikers safety. On the other hand, Internet mapping tools allow any user to become a cartographer. However, they provide default styles that cannot be changed (GeoPortal, Google Maps) or they are editable but without any assistance or expertise (CloudMade). In such cases, as in the case of mobile applications, we identify the need to offer users means to design map styles more personalised and more attractive to meet their expectations (decision-making, recreation, etc.) and their tastes. The grant started on October 2012, for 48 months.

7.2. International Initiatives

7.2.1. Participation In International Programs

We had an internship funded by the REUSSI program. Pascal Grosset is PhD student at the university of Utah. He stayed in Maverick from May to July 2012.

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Professor Charles Hansen has started in November 2011 a visit of six month in the Maverick team. His six-months visit is funded by the University of Grenoble. Charles D. Hansen received a BS in computer science from Memphis State University in 1981 and a PhD in computer science from the University of Utah in 1987. He is a professor of computer science at the University of Utah an associate director of the SCI Institute. From 1989 to 1997, he was a Technical Staff Member in the Advanced Computing Laboratory (ACL) located at Los Alamos National Laboratory, where he formed and directed the visualization efforts in the ACL. He was a Bourse de Chateaubriand PostDoc Fellow at Inria, Rocquencourt France, in 1987 and 1988. His research interests include large-scale scientific visualization and computer graphics.

7.3.1.1. Internships

Pascal Grosset visited from May to July 2012, funded by Inria internship (REUSSI). He worked on a psychometric experiment in order to evaluate the benefit of depth of field to improve depth perception in direct volumetric rendering. His work has been accepted for publication at IEEE Pacific Visualization [15].

7.3.2. Visits to International Teams

Eric Heitz is currently visiting the computer graphics group at the university of Montreal, funded by the explor'adoc program from region Rhône-Alpes, from August 2012 to February 2013.

MORPHEO Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR

8.1.1.1. ANR project *Morpho – Analysis of Human Shapes and Motions*

Morpho is aimed at designing new technologies for the measure and for the analysis of dynamic surface evolutions using visual data. Optical systems and digital cameras provide a simple and non invasive mean to observe shapes that evolve and deform and we propose to study the associated computing tools that allow for the combined analyses of shapes and motions. Typical examples include the estimation of mean shapes given a set of 3D models or the identification of abnormal deformations of a shape given its typical evolutions. Therefore this does not only include static shape models but also the way they deform with respect to typical motions. It brings a new research area on how motions relate to shapes where the relationships can be represented through various models that include traditional underlying structures, such as parametric shape models, but are not limited to them. The interest arises in several application domains where temporal surface deformations need to be captured and analyzed. It includes human body analyses but also extends to other deforming objects, sails for instance. Potential applications with human bodies are anyway numerous and important, from the identification of pathologies to the design of new prostheses. The project focus is therefore on human body shapes and their motions and on how to characterize them through new biometric models for analysis purposes. 3 academic partners will collaborate on this project: the Inria Rhône-Alpes with the Perception team and the Evasion team, the GIPSA-lab Grenoble and the Inria-Lorraine with the Alice team. Website: <http://morpho.inrialpes.fr/>.

8.1.2. Competitivity Clusters

8.1.2.1. *FUI project Creamove*

Creamove is a collaboration between the Morpheo team of the Inria Grenoble Rhône-Alpes, the 4D View Solution company specialised in multi-camera acquisition systems, the SIP company specialised in multi-media and interactive applications and a choreographer. The objective is to develop new interactive and artistic applications where humans can interact in 3D with virtual characters built from real videos. Dancer performances will be pre-recorded in 3D and used on-line to design new movement sequences based on inputs coming from human bodies captured in real time.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. *project RE@CT*

Program: FP7 ICT STREP

Project acronym: RE@CT

Project title: IMMERSIVE PRODUCTION AND DELIVERY OF INTERACTIVE 3D CONTENT

Duration: 12/2011 - 12/2013

Coordinator: BBC (UK)

Other partners: Fraunhofer HHI (Germany), University of Surrey (UK), Artefacto (France), OMG (UK).

Abstract: RE@CT will introduce a new production methodology to create film-quality interactive characters from 3D video capture of actor performance. Recent advances in graphics hardware have produced interactive video games with photo-realistic scenes. However, interactive characters still lack the visual appeal and subtle details of real actor performance as captured on film. In addition, existing production pipelines for authoring animated characters are highly labour intensive. RE@CT aims to revolutionise the production of realistic characters and significantly reduce costs by developing an automated process to extract and represent animated characters from actor performance capture in a multiple camera studio. The key innovation is the development of methods for analysis and representation of 3D video to allow reuse for real-time interactive animation. This will enable efficient authoring of interactive characters with video quality appearance and motion. The project builds on the latest advances in 3D and free-viewpoint video from the contributing project partners. For interactive applications, the technical challenges are to achieve another step change in visual quality and to transform captured 3D video data into a representation that can be used to synthesise new actions and is compatible with current gaming technology.

8.3. International Initiatives

8.3.1. Inria Associate Teams

The Morpheo team from the Inria Grenoble Rhône-Alpes is associated with the Matsuyama lab. at the University of Kyoto. Both entities are working on the capture of evolving shapes using multiple videos and the objective of the collaboration is to make progress on the modeling of dynamic events using visual cues with a particular emphasize on human gesture modeling for analysis purposes. To this aim, the collaboration fosters exchanges between researchers in this domain, in particular young researchers, through visits between the two teams.

8.3.2. Inria International Partners

Simon Courtemanche and Lionel Reveret collaborate with Pr. Kry from University McGill (Montreal) on physical simulation of 3D character. Simon Courtemanche has spent 6 months with Pr Kry at McGill University thanks to an explora'doc regional grant. During this stay, motion capture experiments have been done on specific climbing wall equipped with force and torque sensors.

PERCEPTION Team

8. Partnerships and Cooperations

8.1. European Initiatives

8.1.1. FP7 Projects

8.1.1.1. HUMAVIPS

Title: Humanoids with audiovisual skills in populated spaces

Type: COOPERATION (ICT)

Defi: Cognitive Systems and Robotics

Instrument: Specific Targeted Research Project (STREP)

Duration: February 2010 - January 2013

Coordinator: Inria (France)

Others partners: CTU Prague (Czech Republic), University of Bielefeld (Germany), IDIAP (Switzerland), Aldebaran Robotics (France)

See also: <http://humavips.inrialpes.fr>

Abstract: Humanoids expected to collaborate with people should be able to interact with them in the most natural way. This involves significant perceptual, communication, and motor processes, operating in a coordinated fashion. Consider a social gathering scenario where a humanoid is expected to possess certain social skills. It should be able to explore a populated space, to localize people and to determine their status, to decide to join one or two persons, to synthesize appropriate behavior, and to engage in dialog with them. Humans appear to solve these tasks routinely by integrating the often complementary information provided by multi sensory data processing, from low-level 3D object positioning to high-level gesture recognition and dialog handling. Understanding the world from unrestricted s

8.2. International Research Visitors

8.2.1. Visits of International Scientists

8.2.1.1. Internships

Charlotte CLARK (from Apr 2012 until Jul 2012)

Subject: Piecewise Planar Reconstruction of a Scene from Depth Data

Institution: Massachusetts Institute of Technology (United States)

Siva KUMAR (from May 2012 until Jul 2012)

Subject: Visual Matching Using Kernel Canonical Correlation Analysis

Institution: IIT Delhi (India)

Ravi Kant MITTAL (from May 2012 until Jul 2012)

Subject: Finding Audio Visual Objects (AVO) with the Kinect

Institution: IIT Delhi (India)

Christopher STOCK (from May 2012 until Aug 2012)

Subject: Detection of keypoints on 2D manifolds

Institution: Harvard University (United States)

PRIMA Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. *EquipEx AmiQual4Home - Ambient Intelligence for Quality of Life*

Participants: Stan Borkowski, Sabine Coquillart, Joelle Coutaz, James Crowley [correspondant], Alexandre Demeure, Thierry Fraichard, Amaury Nègre, Patrick Reigner, Dominique Vaufreydaz.

Ambient Intelligence, Equipment d'Excellence, Investissement d'Avenir

The AmiQual Innovation Factory is an open research facility for innovation and experimentation with human-centered services based on the use of large-scale deployment of interconnected digital devices capable of perception, action, interaction and communication. The Innovation Factory is to be composed of a collection of workshops for rapid creation of prototypes, surrounded by a collection of living labs and supported by a industrial innovation and transfer service. Creation of the Innovation Factory has been made possible by a 2.140 Million Euro grant from French National programme "Investissement d'avenir", together with substantial contributions of resources by Grenoble INP, Univ Joseph Fourier, UPMF, CNRS, Schneider Electric and the Commune of Montbonnot. The objective is to provide the academic and industrial communities with an open platform to enable research on design, integration and evaluation of systems and services for smart habitats.

The core of the AmiQual Innovation Factory is a Creativity Lab composed of a collection of five workshops for the rapid prototyping of devices that integrate perception, action, interaction and communications into ordinary objects. The Creativity Lab is surrounded by a collection of six Living Labs for experimentation and evaluation in real world conditions. The combination of fabrication facilities and living labs will enable students, researchers, engineers, and entrepreneurs to experiment in co-creation and evaluation. The AmiQual Innovation Factory will also include an innovation and transfer service to enable students, researchers and local entrepreneurs to create and grow new commercial activities based on the confluence of digital technologies with ordinary objects. The AmiQual Innovation Factory will also provide an infrastructure for participation in education, innovation and research activities of the European Institute of Technology (EIT) KIC ICTLabs.

The AmiQual Innovation Factory is a unique combination of three different innovation instruments: (1) Workshops for rapid prototyping of devices that embed perception, action, interaction and communication in ordinary objects based on the MIT FabLab model, (2) Facilities for real-world test and evaluation of devices and services organised as open Living labs, (3) Resources for assisting students, researchers, entrepreneurs and industrial partners in creating new economic activities. The proposed research facility will enable scientific research on these problems while also enabling design and evaluation of new forms of products and services with local industry.

The AmiQual Innovation Factory will enable a unique new form of coordinated ICT-SHS research that is not currently possible in France, by bringing together expertise from ICT and SHS to better understand human and social behaviour and to develop and evaluate novel systems and services for societal challenges. The confrontation of solutions from these different disciplines in a set of application domains (energy, comfort, cost of living, mobility, well-being) is expected to lead to the emergence of a common, generic foundation for Ambient Intelligence that can then be applied to other domains and locations. The initial multidisciplinary consortium will progressively develop interdisciplinary expertise with new concepts, theories, tools and methods for Ambient Intelligence.

The potential impact of such a technology, commonly referred to as "Ambient Intelligence", has been documented by the working groups of the French Ministry of Research (MESR) [35] as well as the SNRI (Stratégie Nationale de la Recherche et de l'Innovation).

8.1.2. INRETS Intelligent Urban Spaces Platform

Participants: Claudine Combe, James Crowley [correspondant], Lukas Rummelhard.

Visual detection and tracking of pedestrians, Intelligent Urban Space

The project ANR-07-TSFA-009-01 CIPEBUS ("Carrefour Intelligent - Pôle d'Echange - Bus) has been proposed by INRETS-IFSTTAR, in collaboration with Inria, Citilog, Fareco, and the city of Versailles. The Objective of the CIPEBUS project is to develop an experimental platform for observing activity in a network of urban streets in order to experiment with techniques for optimizing circulation by context aware control of traffic lights.

Within CipeBus, Inria has developed a real time multi-camera computer vision system to detect and track people using a network of surveillance cameras. The CipeBus combines real time pedestrian detection with 2D and 3D Bayesian tracking to record the current position and trajectory of pedestrians in an urban environment under natural view conditions. The system extends the sliding window approach to use a half-octave Gaussian Pyramid to explore hypotheses of pedestrians at different positions and scales. A cascade classifier is used to determine the probability that a pedestrian can be found at a particular position and scale. Detected pedestrians are then tracked using a particle filter.

The resulting software system has been installed and tested at the INRETS CipeBus platform and is currently used for experiments in controlling the traffic lights to optimize the flow of pedestrians and public transportation while minimizing the delay imposed on private automobiles.

8.1.3. FUI 3Dlive

Participants: Frédéric Devernay, Sylvain Duchêne, Matthieu Volat.

3Dlive (<http://3dlive-project.com>) is a collaborative project, supported by French Ministry of Industry, and involving 3 industry and research clusters: Images & Reseaux (Brittany and Pays-de-la-Loire regions), Imaginove (Rhône-Alpes region), Cap Digital (Paris region). The objectives of this project are to create expertise in France for the live filming and transmission of 3D stereo contents, and to help French industry and universities to be major global 3D actors. 3Dlive won the *Loading the Future* trophy from the Images & Reseaux cluster in 2011. The consortium consists of:

R&D/industry:

Orange Labs (project leader), Technicolor (3D R&D), Thomson Video Networks (encoders) and Thales Angenieux (optics).

Small companies:

AMP (TV shooting) and Binocle (specific 3D HW & SW manufacturer).

University labs:

Inria/PRIMA and Institut Telecom.

The role of PRIMA within this project is to develop new algorithms for real-time processing of stereoscopic video streams. This includes:

stereoscopic video rectification and geometric adjustments.

view interpolation, and extraction of stereoscopic metadata for the adaptation of the stereoscopic content to the projection screen.

These algorithms rely on view- and scale- invariant feature extraction, feature matching, dense stereoscopic reconstruction, and computer graphics techniques (matting, and accelerated processing and rendering using the GPU).

8.1.4. FUI PRAMAD

Participants: Wafa Benkaouar, Claudine Combe, Dominique Vaufreydaz [correspondant].

Pramad is a collaborative project about *Plateforme Robotique d'Assistance et de Maintien à Domicile*. There are seven partners:

R&D/industry:

Orange Labs (project leader) and Covéa Tech (insurance company),

Small companies:

Wizarbox (game designer) and Robosoft (robot).

Academic labs:

Inria/PRIMA, ISIR (Paris VI) and Hôpital Broca (Paris).

The objectives of this project are to design and evaluate robot companion technologies to maintain frail people at home. Working with its partners, PRIMA research topics are:

social interaction,

robotic assistance,

serious game for frailty evaluation and cognitive stimulation.

8.1.5. Large-scale initiative action PAL

Participants: Rémi Barraquand, Thierry Fraichard, Patrick Reignier, Dominique Vaufreydaz.

The 12 Inria Project-Teams (IPT) participating in a Large-scale initiative action Personally Assisted Living (PAL <http://pal.inria.fr>) propose to work together to develop technologies and services to improve the autonomy and quality of life for elderly and fragile persons. The goal of this program is to unite these groups around an experimental infrastructure, designed to enable collaborative experimentations.

PAL is organized around 12 IPT:

Coprin, Demar, E-Motion, Flowers, Lagadic, Lagadic-Sophia, Maia, Phoenix, Prima, Pulsar, Reves and Trio.

The role of PRIMA within this project is to develop new algorithms mainly along two research axes:

assessing frailty degree of the elderly,

social interaction.

8.2. European Initiatives

8.2.1. Collaborations in European Programs

Program: CATRENE - Communication and digital lifestyle

Project acronym: AppsGate

Project title: Applications Gateway

Duration: September 2012 to March 2015

Coordinator: ST Microelectronics

Other partners: Pace, Technicolor, NXP, Myriad France SAS, 4MOD Technology, HI-IBERIA Ingeniería y Proyectos, ADD Semiconductor, Video Stream Network, SoftKinetic, Optrima, Fraunhofer, Vsonix, Evalan, University UJF/LIG, and Institut Telecom

Abstract:

AppsGate will develop an Open Platform to provide integrated home applications to the consumer mass market. The set-top box is the primary point of entry into the digital home for television services including cable TV, satellite TV, and IPTV. AppsGate will transform the set-box into a residential gateway, capable of delivering multiple services to the home, including video, voice and data. The AppsGate project is putting together chip suppliers, consumer electronics OEMs and service providers to demonstrate an advanced Set Top Box that provides a home gateway for applications in the areas of entertainment, home automation, energy management and healthcare.

This project aims at developing an Open Platform to provide integrated home applications to the consumer mass market. The set-top box is the primary point of entry into the digital home for television services including cable TV, satellite TV, and IPTV. This device has evolved beyond its historical role as a simple black box sitting on top of a large TV set into a device that supports a variety of functions, notably interactive television applications. Another interesting development is the concept of residential gateway, which is a complex device capable of delivering multiple services to the home, including video, voice and data.

Both the set-top box and the residential gateway can be combined into a unique platform to deliver the same rich experience to multiple users in different rooms. When various devices are connected to this platform and multiple applications are seamlessly integrated together, the concept of application gateway or AppsGate is born. This new platform, which offers the prospect of unprecedented business opportunities, is the focus of the project.

8.2.2. Collaborations with EIT KIC ICTlabs

ICTLabs is the KIC for ICT (<http://eit.ictlabs.eu/ict-labs/>) ICTlabs is set up as a network of 6 "co-location" centers in Helsinki, Stockholm, Berlin, Paris, Eindhoven and Trento. The Paris node is run by Inria with partners Alcatel Lucent, Orange, University Paris Sud Institut Telecom.

PRIMA actively participates in the thematic actions: Smart Spaces, Smart Energy Systems and Health and Well Being.

ICTLabs Action Line Smart Spaces (ASSP) Activity 11547 : PI3 - Pervasive Information interfaces and interaction.

With activity PI3 we have constructed and released an "Attention Recognition Module"

ICTLabs Action Line Smart Spaces (ASSP) Activity 12201 : TIK - The Interaction Toolkit

PRIMA coordinates the Activity TIK. This activity will deliver a standard library of tools for human computer interaction for smart Spaces.

ICTLabs Action Line TSES - Smart Energy Systems Activity 12201 : Activity 11831 Open SES Experience Labs

PRIMA has constructed a testbed that integrates information from multiple environmental sensor to detect and track people and recognize their activity.

ICTLabs Action Line THWB Health and Wellbeing, IActivity 12100 "Affective Computing".

PRIMA has constructed a embedded software system for mobile computing that can detect and track faces, and measure the physiological parameters of Valence, Arousal and Dominance in order to recognize and stimulate human emotion.

8.3. International Initiatives

8.3.1. Inria International Partners

Starting with the PERSPOS project (BQR Grenoble INP 2008-2009) PRIMA has a long standing collaboration the MICA center (UMI 2954 CNRS). Our current goal is to develop the concept of "large-scale" perceptive space that is an intelligent environment which will be deployed on a large surface containing several buildings (as a university campus for example). The user is assumed to wear one or many mobile intelligent wireless devices (telephone, Smartphone, PDA, notebook). Using these devices, one can use many different applications (read emails, browse the Internet, file exchange, etc.). By combining the concepts of large-scale perceptive environments and mobile computing, we can create intelligent spaces to propose services adapted to individuals and their activities. Our collaboration is focussing the user location within such a smart space.

Tracking people in smart environments remains a challenging fundamental problem. Whether it is at the scale of a campus, of a building or more simply of a room, we can dynamically combine several localization levels (and several technologies) to allow a more accurate and reliable user localization system. This collaboration was concrete with the Ph.D. thesis from Han Yue (started in November 2008). This thesis was co-supervised between Grenoble INP and Hanoi Polytechnical Institute.

8.4. International Research Visitors

8.4.1. Internships

Marco Polo Cruz Ramos (from Dec. 2011 until May 2012)

Subject: Design of Interaction Systems for Mobile Robots Collaboration.

Institution: Tecnológico de Monterrey (Mexico).

Thomas FISCHER (from Feb. 2012 until Dec 2012).

Subject: Design of a Robot Companion.

Institution: University of Buenos Aires (Argentina).

WAM Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. *Investissements d'avenir*

CLAIRE

Title: Community Learning through Adaptive and Interactive multichannel Resources for Education

Call: Technologies for e-education

Duration: March 2012 - February 2014

Coordinator: [SimpleIT](#)

Others partners: LIRIS

See also: <http://www.projet-claire.fr/>

Abstract: Project CLAIRE aims at developing an open-source tool for collaborative authoring in an e-learning environment (Learning Content Management System), targeting teachers and students in high-school and universities. Its innovative features include:

- a platform for collaborative structured editing of rich media and semantic content, e.g.: tools for generating interactive evaluation tests
- processes for continuous enhancement of content, e.g.: social annotation, behavior analysis, accessible multi-support publishing (web, PDF, ODT, LaTeX, smartphones, tablets).

7.1.2. *ANR*

Codex

Title: Efficiency, Dynamicity and Composition for XML: Models, Algorithms, and Systems

Call: Emerging Domains program (DEFIS)

Duration: March 2009 - June 2012

Coordinator: Inria Saclay-Île-de-France

Others partners: Inria Lille-Nord-Europe (MOSTRARE), University Paris Sud, Sorbonne - University Paris 7 (PPS), Centre universitaire de Blois (LI - Université F. Rabelais Tours), Innovimax SARL.

See also: <http://codex.saclay.inria.fr/>

Abstract: Codex seeks to push the frontier of XML technology innovation in three interconnected directions.

- Languages and algorithms: prototypes are developed for efficient and expressive XML processing, in particular advancing towards massively distributed XML repositories.
- Codex considers models for describing, controlling, and reacting to the dynamic behavior of XML corpora and XML schemas with time.
- The project proposes theories, models and prototypes for composing XML programs for richer interactions, and XML schemas into rich, expressive, yet formally grounded type descriptions.

Typex

Title: Typeful certified XML: integrating language, logic, and data-oriented best practices

Call: Programme Blanc

Duration: January 2012 - December 2014

Coordinator: PPS (CNRS - Paris 7 Diderot)

Others partners: LRI (Orsay)

See also: <http://typex.lri.fr>

Abstract: The highly ambitious and final goal of this project is to produce a new generation of XML programming languages stemming from the synergy of integrating three approaches into a unique framework:

- a logical approach based on solvers
- a programming language approach
- a data-oriented approach

7.1.3. Competitvity Clusters

Autonomy

Title: High-tech to serve people with disabilities

Call: Global competitiveness cluster Minalogic, 6th call for R&D projects

Duration: March 2010 - June 2012

Coordinator: ST Microelectronics

Others partners: ST-Ericsson, Raisonance, Grenoble University, IVèS

See also: <http://autonomie.minalogic.net/>

Abstract: The goal of the project is to develop high-tech tools to improve autonomy for people with disabilities. These tools are integrated in mobile devices such as cell phones or special-purpose devices, to improve the quality of life of people with disabilities. These devices access remote dedicated services to help geolocation and guiding. They take advantage of the latest advances in embedded systems: cameras, audio, video, compass, accelerometer, gyroscope. Two major application areas are addressed: software tools on cell phones for sight disabled people, and guiding and information tools for moving around in a city.

7.2. European Initiatives

7.2.1. FP7 Projects

7.2.1.1. VENTURI

Title: immersiVe ENhancemenT of User-woRld Interactions

Type: Cooperation (ICT)

Call: FP7-ICT-20111.5 Networked Media and Search Systems

Instrument: Specific Targeted Research Project (STREP)

Duration: October 2011 - September 2014

Coordinator: Fondazione Bruno Kessler (Italy)

Others partners: Fraunhofer Heinrich Hertz Institute (Germany), ST Microelectronics (Italy), ST-Ericsson (France), Metaio (Germany), e-Diam Interactive (Spain), Sony-Ericsson (Sweden)

See also: <https://venturi.fbk.eu/>

Abstract: Venturi aims to create a pervasive Augmented Reality paradigm, where available information will be presented in a user- rather than device-specific way. The goal is to create an experience that is always present whilst never obstructing. Venturi will exploit, optimize and extend current and next generation mobile platforms; verifying platform and QoE performance through life-enriching use cases and applications to ensure device-to-user continuity.

7.2.2. Collaborations with Major European Organizations

EPFL, MEDIA group (Switzerland)

We have been working jointly for years on XML editing, more specifically on the template-driven approach. This collaboration was recently extended to XML processing [2].