



RESEARCH CENTER  
Paris - Rocquencourt

FIELD

Activity Report 2012

# Section highlights of the Team

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## **ABSTRACTION Project-Team**

### **2.2. Highlights of the Year**

Antoine Miné was the program cochair and the local organizer of the 19th international static analysis symposium (SAS 2012) in Deauville, September 11–13 2012 and Radhia Cousot is the program chair the 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL 2013) in Roma, January 23–25 2013.

## **AOSTE Project-Team**

### **2.2. Highlights of the Year**

Aoste underwent its periodical Inria evaluation, as part of the Real-Time Embedded theme, in its eighth year of existence. Evaluation was very positive.

**CASCADE Project-Team (section vide)**

**CONTRAINTEs Project-Team (section vide)**

**DEDUCTEAM Team (section vide)**



## **FORMES Team**

### **2.2. Highlights of the Year**

- The automated termination prover HOT developed by Frédéric Blanqui won the 2012 termination **competition** in the category “higher-order rewriting union beta”.

## **GALLIUM Project-Team**

### **2.2. Highlights of the Year**

Xavier Leroy was awarded the **2012 Microsoft Research Verified Software Milestone Award** in recognition of his work on the CompCert C verified compiler.

## **MUTANT Project-Team**

### **2.2. Highlights of the Year**

The **Antescofo** software and programming language was featured in more than 15 world-premier creations and 30 events worldwide, including its premiers with *New York Philharmonics*, *Orchestre de Paris*, and prestigious venues in USA, Japan, Turkey, Poland, England and more. See website for more details.

**PARKAS Project-Team (section vide)**

**PL.R2 Project-Team (section vide)**

## POLSYS Project-Team

### 2.2. Highlights of the Year

- In [4], we obtain an algorithm to solve Boolean systems with an expected complexity of  $O(2^{0.792 n})$  breaking the  $2^n$  barrier.
- In [10], we propose an algorithm to solve a variant of the Quantifier Elimination Problem for which the output formula is *almost equivalent* to the input formula. The complexity of this algorithm is much better than other algorithms and can solve previously untractable problems.
- In [25], we improve the complexity of Index Calculus Algorithms in Elliptic Curves by means of Gröbner basis techniques and we analyze the complexity of this new approach by using the multi-homogeneous structure of the equations.

## **PROSECCO Project-Team**

### **2.2. Highlights of the Year**

This year, we published 5 articles in international journals and 11 articles in peer-reviewed international conferences, including prestigious conferences such as CCS (1), CRYPTO (1), and CSF (2). In addition to these, we published 1 HDR thesis, 3 master's theses, 4 technical reports, and 5 workshop papers. We also have 4 articles already accepted for publication in international conferences in 2013.

We released updates to 3 verification tools and released 3 new software packages. We discovered and reported major security vulnerabilities in dozens of commercial software packages, hardware devices, and websites.

Of our work published in 2012, we would like to highlight the following:

- Our paper in CRYPTO 2012 [22] describing new attacks on cryptographic hardware devices, which got significant interest from both the cryptographer community and from the press.
- Our work on generating implementation code from verified models of cryptographic protocols [26], [27].
- Our work on formally analyzing web application security using automated verification tools, which uncovered major attacks in popular websites and web browsers [21], [24], [20].

## **SECRET Project-Team**

### **2.2. Highlights of the Year**

- Extensive study of the hash function proposal Keccak, which has been chosen as the winner of the SHA-3 competition. The analysis of the algebraic properties of Keccak due to C. Boura and A. Canteaut is the best known result on the new hash function standard.
- Design of a variant of the McEliece public-key cipher based on a moderate density parity-check codes (MDPC). This family of codes leads to public keys with a reasonable size and does not weaken the underlying security proof.
- Construction of spatially coupled quantum LDPC codes which performs well under iterative decoding almost up to the coherent capacity of the quantum channel.



**CAD Team (section vide)**

**CLASSIC Project-Team (section vide)**

## **GAMMA3 Project-Team**

### **2.2. Highlights of the Year**

**Paul-Louis George : Inria - Dassault Systèmes 2012 Innovation Award winner:**

Team leader of the Gamma3 project team (Inria, Troyes University of Technology), Paul-Louis George is one of the inventors of the GHS3D volume mesh, a software used throughout the world by players in the industry, researchers and academics. Integrated in several software for 3D calculations by finished elements, GHS3D helps obtain simulations which are particularly reliable and high performing. A success based on teamwork undertaken over the long term and which is now being rewarded with the innovation award.

## **MATHRISK Team**

### **2.6. Highlights of the Year**

Creation of the Mathrisk Project Team.

**MICMAC Project-Team (section vide)**

## **SIERRA Project-Team**

### **2.2. Highlights of the Year**

- Rodolphe Jenatton (former PhD student, graduated in 2011) received two thesis prizes (Fondation Hadamard and AFIA).
- Francis Bach received the Inria young researcher prize.
- Monograph published in the collection *Foundations and Trends in Machine Learning*: “Optimization with sparsity-inducing penalties”.

## **BANG Project-Team**

### **2.2. Highlights of the Year**

The ERC Starting Grant allocated to M. Doumic-Jauffret in 2012 will sustain a long term programme in mathematical biology. The many faces of the subject imply modelling of biopolymer size repartition, applications to prion (and other neurodegenerative) diseases, inverse problems, numerical simulations in biology and a strong interaction with biologists.

**CLIME Project-Team (section vide)**



**POMDAPI Project-Team (section vide)**

## **REO Project-Team**

### **2.2. Highlights of the Year**

- Marc Thiriet et al. were awarded the "JBSE Paper of the Year 2010" for their article [6].
- New european project (FP7-PEOPLE Marie-Curie Action: "Initial Training Networks") REVAM-MAD about Retinal Modeling, Measurement and Diagnosis (Jean-Frédéric Gerbeau, Working Package leader)
- New ANR project EXIFSI (ANR JCJC) about fluid-structure interaction (Miguel Fernández, Principal Investigator)

## **SISYPHE Project-Team**

### **2.2. Highlights of the Year**

The feedback scheme for quantum systems proposed by Mazyar Mirrahimi and his co-authors have been very successful in some important physical experiments. After the preparation and stabilization of a small number of photons in a cavity in 2011 with the group of Serge Haroche, Nobel Prize for Physics (2012) at ENS Paris ([9], [8], [17]), some new results have been obtained by Mazyar and his PhD student, Zaki Leghtas with the groups of Robert Schoelkopf and Michel Devoret at Yale University [74], [75], [77], [78]. In particular, they have proposed a new method to autonomously correct for errors of a logical qubit induced by energy relaxation. This proposal directly addresses the task of building a hardware-efficient and technically realizable quantum memory.

## **ARLES Project-Team**

### **2.2. Highlights of the Year**

During this year, while we have pursued our research on advanced service-oriented architectures and related middleware solutions for next generation networking environments, we have also made advances over our initial progress in research on several new subjects, called for by the ongoing drastic evolution of the networking environment:

- Dynamic interoperability among networked systems towards making them eternal, by way of on-the-fly generation of connectors based on adequate system models. This research is part of a major European collaborative project within the Future and Emerging Technology program of the EC FP7-ICT (§ 6.2 , § 7.2.1.1 ), which was successfully completed in November 2012 with the highest rating of “Excellent progress (the project has fully achieved its objectives and technical goals for the period and has even exceeded expectations)”.
- Interaction paradigm abstractions and service oriented middleware for choreographies in the ultra-large scale future Internet. This research is also part of a major European collaborative project within the Software and Service Architectures and Infrastructures programme of the EC FP7-ICT (§ 6.4 , § 7.2.1.2 ).

**GANG Project-Team (section vide)**

## HIPERCOM Project-Team

### 2.2. Highlights of the Year

- **Habilitation à Diriger des recherches:** Emmanuel Baccelli got his HDR entitled "IP-Disruptive Wireless Networking: Integration in the Internet", from the University Pierre et Marie Curie - Paris VI, December 2012.
- **PhD Thesis:** During year 2012, four PhD theses were defended:
  - **Salman Malik**, "Evaluation et Optimisation des Réseaux Sans Fil Denses", University Pierre et Marie Curie - Paris VI, November 2012, with Philippe Jacquet as adviser.
  - **Yacine Mezali**, "Algorithme de Géolocalisation Intérieure par Différenciation de Signaux WiFi", University Pierre et Marie Curie - Paris VI, March 2012, with Philippe Jacquet as adviser.
  - **Iskander Banaouas**, "Analyse et Optimisation des Protocoles d'Accès dans les Réseaux sans fil Ad Hoc", University Pierre et Marie Curie - Paris VI, February 2012, with Paul Muhlethaler as adviser.
  - **Ana Cristina B. Kochem Vendramin**, "Cultural GrAnt: um protocolo de roteamento baseado em inteligência coletiva para redes tolerantes a atrasos", Federal Technological University of Paraná, June 2012, with Anelise Munaretto Fonseca, Myriam R. De B. da Silva Delgado and Aline Carneiro Viana as co-advisers.
- **PEMWN 2012**, Performance Evaluation and Modeling of Wireless Networks is the workshop held in conjunction with the NoF 2012 conference (Network of the Future) : The HIPERCOM team actively contributed to the technical and practical organization of the PEMWN 2012 workshop held in Tunis in November 2012. Pascale Minet and Leila Saidane from ENSI (Tunis) were co-general chairs. Cedric Adjih and Paul Muhlethaler were members of the program committee. Christine Anocq was in charge of the registration.
- **Demonstration of OCARI:** The HIPERCOM team and more precisely, Cedric Adjih, Ichrak Amdouni, Ines Khoufi, Pascale Minet and Ridha Soua made a presentation and a demonstration of the routing protocol and the coloring algorithm of OCARI, an energy-efficient wireless sensor network supporting determinism, at:
  - the EPRI international workshop organized by EDF, Chatou, April 2012,
  - the ICSSEA international conference in Paris, October 2012.
- **Vulgarisation of computer science:** The HIPERCOM team and more precisely, Cedric Adjih, Ichrak Amdouni, Ines Khoufi and Ridha Soua explained the principles of communication and routing in wireless sensor networks to undergraduates and students.

**RAP Project-Team (section vide)**

## **REGAL Project-Team**

### **2.2. Highlights of the Year**

: Tegawendé F. Bissyandé (LaBRI, Bordeaux), Laurent Réveillère (LaBRI, Bordeaux), Julia Lawall (Regal) and Gilles Muller (Regal) received the best paper award at ASE 2012 for their work on *Diagnosys: Automatic Generation of a Debugging Interface to the Linux Kernel*.

BEST PAPER AWARD :

[24] **27th IEEE/ACM International Conference on Automated Software Engineering (ASE 2012)**. T. F. BISSYANDÉ, L. RÉVEILLÈRE, J. LAWALL, G. MULLER.



## **TREC Project-Team**

### **2.2. Highlights of the Year**

F. Baccelli was awarded the Simons Math+X Chair to further develop Wireless Stochastic Geometry.

M. Lelarge was the recipient of the 2012 ACM SIGMETRICS Rising Star Researcher Award. <http://www.sigmetrics.org/risingstar-2012.shtml>

## **ALPAGE Project-Team**

### **2.2. Highlights of the Year**

- A statistical parsing architecture for Italian using MELT in a pre-processing step has obtained the best results in the EVALITA shared task on Italian parsing [35] (cf. 5.7).
- Two different instances of Alpage parsing architectures were ranked 2nd and 3rd at the SANCL shared task on parsing user-generated content, organized by Google [38] (cf. 5.7 and 6.4).
- Release of two freely available out-of-domain treebanks for French: the SequoiaBank focusing on well-edited texts such as Wikipedia, Europarl, ...; the French Social Media Bank, focusing on noisy user-generated content (Facebook, Twitter, ...), the latter being the first available dataset for Facebook in any language – cf 6.4.

## AXIS Project-Team

### 2.2. Highlights of the Year

- Y. Lechevallier was scientific chair of the most important francophon conference in Knowledge Management and Extraction (EGC) in 2012 [39].
- Creation of the association **France Living Labs** (May): the french network of living labs (labelled by ENoLL) has decided with a majority in 2011 (after the 5th wave) to create an association due to their growing number in order to promote the French Living Labs and to facilitate user-driven open innovation at a national level. ICT Usage Lab (cf. section 6.1.8 ) is co-founder of France Living Labs with 20 other founders such as CNED, competitiveness clusters (Cap Digital, Image et reseaux), Lorraine Smart cities living Lab, Universcience, Urban Living Lab, etc. (cf. section 6.2.4 ). ICT Usage Lab is represented officially by B. Trousse (Inria) as permanent representative and A. Zarli (CSTB) as suppleant in the administration council.
- B. Trousse was elected President of France Living Labs.
- This year, AxIS experiments its Action-Research approach with more than ten workshops with citizen and/or professionals (in the context of three contracts TIC TAC, ELLIOT and ECOFAMILIES) and mainly for the two first steps of a living lab process - the co-creation and/or exploration steps. Such an experience was very fruitful to identify the main research problems in deploying a living lab process and in designing and evaluating user experience in order to support user behaviour changes (cf. section 5.5 ).
- The ACM SIGSOFT 2012 Impact Paper Award has been attributed to Th. Despeyroux and his co-authors for a paper published in 1989: “CENTAUR: the system” [72].

## **IMARA Project-Team**

### **2.2. Highlights of the Year**

G rard Le Lann has been **awarded the Willis Lamb Prize** by the French Acad mie des Sciences in November 2012, for his work on distributed, resilient, and real-time systems and networks.

BEST PAPER AWARD :

**[36] ICVES 2012 - IEEE International Conference on Vehicular Electronics and Safety.** H. LI, F. NASHASHIBI.

**IMEDIA2 Team (section vide)**

**SMIS Project-Team (section vide)**

## **WILLOW Project-Team**

### **2.2. Highlights of the Year**

- + I. Laptev was awarded a Junior ERC Grant, starting in Jan 2013.
- + J. Sivic and I. Laptev (together with C. Schmid, Inria Grenoble) co-organized one week summer school on visual recognition and machine learning <http://www.di.ens.fr/willow/events/cvml2012/>. The school has attracted 181 participants from 34 countries.
- + J. Ponce became a senior member of the Institut Universitaire de France.
- + J. Ponce was awarded a US patent for the PMVS software developed in collaboration with Yasutaka Furukawa.