



RESEARCH CENTER  
**Rennes - Bretagne-Atlantique**

FIELD

Activity Report 2016

# Section Highlights of the Team

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**ANJA Team (section vide)**

## **ASAP Project-Team**

### **4. Highlights of the Year**

#### **4.1. Highlights of the Year**

Anne Marie Kermarrec has been named an ACM Fellow “for her contributions to large-scale distributed computing.”

George Giakkoupis was the General Chair of the 35th ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2016).

Michel Raynal renewed his appointment as an Adjunct Professor at the University of Hong Kong.

##### **4.1.1. Awards**

BEST PAPERS AWARDS :

[30] **IEEE IC2E'16**. S. DELBRUEL, D. FREY, F. TAĪANI.

[27] **The International Conference on Networked Systems NETYS**. N. CHILUKA, A.-M. KERMARREC, J. OLIVARES.

## **ASCOLA Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

This year the team has produced major results in the domains of the foundations of computer science as well as capacity management for large-scale distributed software systems.

Concerning the foundations of computer science, we have presented new results on the provably correct execution of programs that are only partially typed [22] and generalized the use of dependent types with side effects [26].

As to distributed systems, we have introduced a new cloud model that provides QoS-levels and SLA as first-class citizens of cloud-based systems [19]. Furthermore, we have provided new mechanisms for the privacy-preserving storage of data of a user over clouds managed by different cloud providers [30].

## ASPI Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

Frédéric Cérou and Arnaud Guyader have received the **prize** of the best recent paper published in the journal *Annales de l'Institut Henri Poincaré, Probabilités et Statistiques* for their joint paper [3] in collaboration with Gérard Biau (université Pierre et Marie Curie). This paper analyzes ABC (approximate Bayesian computation) — a family of computational techniques which offer an almost automated solution in situations where evaluation of the likelihood is computationally prohibitive, or whenever suitable likelihoods are not available — from the point of view of  $k$ -nearest neighbor theory and it explores the statistical properties of its outputs. The paper discusses in particular some asymptotic features of the genuine conditional density estimate associated with ABC, which is an interesting hybrid between a  $k$ -nearest neighbor and a kernel method.

## **CAIRN Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

Our work on accuracy evaluation and optimisation for fixed point arithmetic was presented during a tutorial "Fixed-point refinement, a guaranteed approach towards energy efficient computing" at HiPEAC Conference in January 2016 [60].

Members of CAIRN got six papers accepted at IEEE/ACM Design Automation and Test in Europe for 2017, one of the major events in design automation.



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

## CIDRE Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

### 5.1.1. Awards

Mounir Assaf, a former PhD student, has received the "prix de thèse du GDR GPL" in June 2016. His PhD thesis is entitled "évaluation des fuites d'information dans les logiciels critiques" and has been defended in 2015.

Emmanuelle Anceaume has received the Most Prolific Author Award during the NCA conference.

BEST PAPERS AWARDS :

[28] **9th International Conference on Security of Information and Networks (SIN 2016)**. D. SUBRAMANIAN, G. HIET, C. BIDAN.

[24] **Symposium on Network Computing and Applications**. Y. MOCQUARD, B. SERICOLA, S. ROBERT, E. ANCEAUME.

## **DIONYSOS Project-Team**

### **5. Highlights of the Year**

#### **5.1. Highlights of the Year**

Pierre L'Ecuyer received the 2016 ACM SIGSIM Distinguished Contributions Award.

BEST PAPERS AWARDS :

[75] **Symposium on Network Computing and Applications**. Y. MOCQUARD, B. SERICOLA, S. ROBERT, E. ANCEAUME.

[49] **International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWIM 2016)**. M. BOUZOITA, Y. HADJADJ-AOUL, N. ZANGAR, G. RUBINO, S. TABBANE.

## **DIVERSE Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

H2020 project accepted in the call ICT-10-2016 'Software Technologies', as coordinator.

**The book “Engineering Modeling Languages” has been published by CRC Press.** This book, co-authored by Benoit Combemale, Robert B. France, Jean-Marc Jézéquel, Bernhard Rumpe, Didier Vojtisek and Jim Steel, is the result of our respective expertise in model-driven engineering and software language engineering.

### **5.1.1. Awards**

Silver Medal of the CNRS for Jean-Marc Jézéquel.

Second position for the ACM Student Research Competition: Thomas Degueule.

## **DYLISS Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

The first main novelty in 2016 is the release of our first methods and tools based on semantic web technologies. These methods enable the pre-processing of heterogeneous data prior to their integration in the toolboxes developed by the team. Methods for the transparent integration and querying of heterogeneous data (AskOmics) as well as the user-friendly tracable reconstruction of metabolic networks (PADmet package) have been developed in collaboration with our main partners (INRA Rennes, University of Chile, Station biologique de Roscoff) to facilitate the comparison of phenotypes accross several species or several strains.

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

## GENSCALE Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

- **Colib'read Workshop, Nov 7-8 th, Institut Curie, Paris.** GenScale organized a two-day workshop to present the main results of the Colib'read ANR (2013-2016, Coordinator P. Peterlongo) to the scientific community.
- **GATB Programming days.** In 2016, GenScale organized two Genome Analysis Toolbox (GATB) trainings days in Rennes (June 15 th) and Paris (Nov. 9 th). Each event gathered 15 persons who learned how to use the GATB library to design efficient NGS tools.

## **HYBRID Project-Team**

### **5. Highlights of the Year**

#### **5.1. Highlights of the Year**

- Two new permanent staff have joined our team this year: Ronan Gagne (Research Engineer, Univ. Rennes 1), Ferran Argelaguet (CR2 Inria Research Scientist).
- There has been an outstanding total of six PhD Theses defended this year by members of Hybrid.
- Our team organized, together with MimeTIC team, a press conference in Paris on the "6-Finger Illusion" in May 2016, followed by a huge media coverage.

##### **5.1.1. Awards**

- Paper and demo "When the Giant meets the Ant: An Asymmetric Approach for Collaborative and Concurrent Object Manipulation in a Multi-Scale Environment" [35] obtained the Second Prize at the IEEE 3DUI Contest 2016.
- Project MANDARIN received the "Economical Impact Award 2016" from ANR (French National Research Agency).
- Project PREVIZ received a "Loading the Future' Trophy 2016" from Images et Réseaux French Competitivity Cluster.



## **HYCOMES Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

Team members have made a significant step towards the definition of a formal semantics of multimode DAE systems, their structural analysis and the generation of simulation code. In particular, impulsive behavior at mode changes are handled correctly [19] (see Section 7.1 for full details). This semantics has been implemented, in part, in the SunDAE prototype software (Section 6.1).

## **I4S Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

- In 2016, uncertainty quantification for modal analysis has been transferred to ARTeMIS software [http://www.svibs.com/newsletter/newsletter\\_2016\\_09.aspx](http://www.svibs.com/newsletter/newsletter_2016_09.aspx).
- In 2016, a patent has been filed by N. Berrabah and Q. Zhang, jointly with EDF and Inria [46].
- PEDAL-LORA monitoring sensor has been awarded by the European Railway Cluster Prize in railway innovation.

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

## KERDATA Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

### 5.1.1. Awards

SC16: Best Student Paper Finalist. The paper entitled *Týr: Blob Storage Meets Built-In Transactions* presented by Pierre Matri at the **Supercomputing** (SC16) Conference was one of the 7 papers selected for the Best Student Paper award.

This work was carried out in the context of the **BigStorage** project, under the supervision of Alexandru Costan, Gabriel Antoniu, **María Pérez**, and **Jesús Montes**.

There were 442 submissions, and 81 accepted papers.

ACM Graduate Student Research Competition SC16. Nathanaël Cherié received the third prize in the SC16 **ACM Student Research Competition** for his work on optimizing the algorithms for the MPI collective *Scatter* and *AllGather* routines on the Dragonfly topology [1].

This work was carried out at the Argonne National Laboratory in the context of the **JLESC**, under the supervision of **Matthieu Dorier**, **Rob Ross**, Shadi Ibrahim, and Gabriel Antoniu.

As many as 62 posters were submitted for the Student Research Competition, out of which 14 have been selected in the Graduate category. After the presentation of their posters, 4 students have been invited to make a presentation of their work in front of a jury.

### 5.1.2. 9 papers in international journals

This year the team published 9 papers in high-quality journals including *ACM Transactions on Parallel Computing*, *IEEE Transactions on Parallel and Distributed Systems*, *Future Generation Computer Systems*, *Concurrency and Computation: Practice and Experience* and *IEEE Transactions on Cloud Computing*.

BEST PAPERS AWARDS :

[25] **IEEE ACM SC16 - The International Conference for High Performance Computing, Networking, Storage and Analysis 2016**. P. MATRI, A. COSTAN, G. ANTONIU, J. MONTES, M. S. PÉREZ.

## **LACODAM Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

- This year, we are extremely proud to have a total of 4 papers accepted at the IJCAI conference, the rank A+ conference on Artificial Intelligence.
- Another highlight of this year is that following the end of the former team, namely Dream, we could propose in 2016 a new team project, namely Lacodam, and follow smoothly all steps of the Inria project-team creation protocol. While the team is not officially created as of December 2016, our project has been positively evaluated both by Inria members and by international experts, and is thus likely to be created in early 2017.

## LAGADIC Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

- Eric Marchand and Fabien Spindler co-authored with Prof. Hideaki Uchiyama (Kyushu Univ., Japan) a survey on pose estimation for augmented reality published in IEEE Trans. on Visualization and Computer Graphics [33].
- The second edition of the Springer Handbook of Robotics has been released this year. It contains an extended version of the chapter on visual servoing co-authored by François Chaumette, Prof. Seth Hutchinson (UIUC, Illinois) and Prof. Peter Corke (QUT, Brisbane, Australia) [77].

### 5.1.1. Awards

- The ANR project ENTRACTE, of which Julien Pettré is partner, has received the “ANR Grand Prix du Numérique 2016”. The project is about anthropomorphic action planning and understanding: <http://www.agence-nationale-recherche.fr/?Project=ANR-13-CORD-0002> (see also Section 9.2.3).
- Paper [71] has been selected as one of the five finalists for the ICARCV’2016 Best Paper Award.
- Lagadic is a member of the five finalist teams for the KUKA Innovation Award (<https://www.kuka.com/en-de/press/events/kuka-innovation-award>), together with the RIS group at LAAS (coordinator), the University of Siena, Italy, and the Seoul National University, South Korea. The goal is to address search and rescue operations in regions which are difficult to access or dangerous following disasters. For this, the team will explore the collaboration between a quadrotor UAV and a KUKA lightweight arm for cooperative transportation and manipulation of rigid objects (e.g., long bars), with a final peg-in-hole task to be demonstrated live at the Hannover fair during spring 2017.

## **LINKMEDIA Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

LINKMEDIA ranked first at the TRECVID 2016 Hyperlinking international benchmark [12].

LINKMEDIA is selected as the organizer of the IEEE Workshop on Information Forensics and Security in 2017.

LINKMEDIA deeply involved in the winning bid for the organization of the ACM Conf. on Multimedia in 2019.

## MIMETIC Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

This year, we feature four of the team’s research results as specific highlights, in particular due to their high publication impacts.

Our work entitled “Validation of an ergonomic assessment method using Kinect data in real workplace conditions“ ([15] by Pierre Plantard, Hubert PH Shum, Anne-Sophie Le Pierres and Franck Multon) has been accepted in the journal Applied Ergonomics. This publication is very important for future works in ergonomics as it demonstrates the relevance of the Kinect data correction for in-site (on a real workstation in factories) in an ergonomic purpose.

A State of the art paper, “Muscle-Based Control For Character Animation” has been published in Computer Graphics Forum ([6] by Ana Lucia Cruz Ruiz, Charles Pontonnier, Nicolas Pronost and Georges Dumont). It presents an organized review of over a decade of research in muscle-based control for character animation, its fundamental concepts and future directions for development. The core of this review contains a classification of control methods, tables summarizing their key aspects, and popular neuromuscular functions used within these controllers.

Our work entitled “Perceptual Effect of Shoulder Motions on Crowd Animations” ([11] by Ludovic Hoyet, Anne-Hélène Olivier, Richard Kulpa and Julien Pettré ) has been accepted and presented in SIGGRAPH 2016, the premier and most selective computer graphics scientific event, and published in ACM Transaction on Graphics. It explores how local interactions between walkers are perceived by users when secondary shoulder motions are displayed, and demonstrates the benefits of such secondary animations in large-scale crowd scenarios.

Two papers exploring the effects of the avatar’s representation on users’ sense of “virtual embodiment” (i.e., the extent to which we accept an avatar to be our representation in the virtual environment) were published in Frontiers in Robotics and AI [10] and in IEEE VR [19], resulting from a collaboration between Ludovic Hoyet (MimeTIC), and Ferran Argelaguet and Anatole Lécuyer (Hybrid). This work paves the way to further collaborations on understanding how we accept virtual characters as our own representation in virtual environments.

### 5.1.1. Awards

This year, the ANR Entracte led by CNRS/LAAS received the best price for ANR Project in November 2016 in Paris (“Grand prix du Numérique des 10ans de l’ANR”, [link](#)).

The ANR Jeune Chercheur project Cinecitta, led by Marc Christie, has also been awarded one of the 10 “iconic” projects (*projets emblématiques*) for the 10 years of the ANR, and will be presented at the 10 years celebration of the ANR in December 2016.



## **MYRIADS Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

- The PaaSage European project was successfully completed in November 2016 with an excellent rating from the reviewers. The PaaSage project developed a model-based, cross-cloud development and deployment platform that overcomes platform heterogeneity while enabling dynamic, fully-automated application scaling and cloud bursting. The main Myriads contribution is the Adapter subsystem, responsible for supporting dynamic, cross-cloud application adaptation.

### **5.1.1. Awards**

- Baptiste Goupille-Lescar won the prize of the organizing committee of MMS Challenge 2016 (INSA Science Day).
- Anna Giannakou won the "Most Promising Experiment" award at the Grid'5000 winter school in February 2016 for her work "Towards Self Adaptable Security Monitoring in IaaS Clouds".

## PACAP Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

André Seznec was elevated as an ACM Fellow in December 2016 with the citation: “For contributions to branch prediction and cache memory design”.

André Seznec won the three tracks of the 5th Championship on Branch Prediction.

### 5.1.1. Awards

Sajith Kalathingal, Sylvain Collange, Bharath Swamy and André Seznec received the Best Paper award of the SBAC-PAD 2016 conference.

Damien Hardy, Isabelle Puaut, Yiannakis Sazeides won the best paper award of the Embedded Systems Software track at DATE 2016: Probabilistic WCET estimation in presence of hardware for mitigating the impact of permanent faults. Design, Automation and Test in Europe. Dresden, Germany, March 2016.

Aswinkumar Sridharan and André Seznec won the best paper award for “Discrete Cache Insertion Policies for Shared Last Level Cache Management on Large Multicores” at the 30th IEEE International Parallel & Distributed Processing Symposium, May 2016, Chicago.

For his PhD thesis [10] “Increasing the Performance of Superscalar Processors through Value Prediction”, Arthur Perais received:

- Prix de thèse Fondation Rennes 1, 1er Prix de l'école doctorale MATISSE;
- Prix de thèse Gilles Kahn, accessit.

BEST PAPERS AWARDS :

[46] **5th JILP Workshop on Computer Architecture Competitions (JWAC-5): Championship Branch Prediction (CBP-5)**. A. SEZNEC.

[45] **5th JILP Workshop on Computer Architecture Competitions (JWAC-5): Championship Branch Prediction (CBP-5)**. A. SEZNEC.

[36] **International Symposium on Computer Architecture and High-Performance Computing (SBAC-PAD)**. S. KALATHINGAL, S. COLLANGE, B. NARASIMHA SWAMY, A. SEZNEC.

[35] **Design, Automation and Test in Europe**. D. HARDY, I. PUAUT, Y. SAZEIDES.

[48] **30th IEEE International Parallel & Distributed Processing Symposium**. A. SRIDHARAN, A. SEZNEC.

## PANAMA Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

### 5.1.1. Awards

Antoine Deleforge (new PANAMA team member), Florence Forbes (MISTIS team) and Radu Horaud (PERCEPTION team) received the 2016 Hojjat Adeli Award for Outstanding Contributions in Neural Systems for their paper [70].

A. Deleforge, F. Forbes, and R. Horaud, “Acoustic space learning for sound-source separation and localization on binaural manifolds,” *International journal of neural systems*, vol. 25, no. 01, 2015, <https://hal.archives-ouvertes.fr/hal-00960796>

The Award for Outstanding Contributions in Neural Systems established by World Scientific Publishing Co. in 2010, is awarded annually to the most innovative paper published in the previous volume/year of the International Journal of Neural Systems.

## **SERPICO Project-Team**

### **5. Highlights of the Year**

#### **5.1. Highlights of the Year**

##### **5.1.1. *New projects***

The 4 year-ANR-DALLISH proposal (PRC / Challenge 7 / Topic 5), coordinated by the Serpico Team-Project, has been accepted in September 2016.

The CytoDI Associated Team, in collaboration with University of Texas, SouthWestern Medical Center, Dallas (TX, USA) started in January 2016.

## **SIROCCO Project-Team**

### **5. Highlights of the Year**

#### **5.1. Highlights of the Year**

##### **5.1.1. Awards**

C. Guillemot has been granted an ERC advanced grant for a project on computational light fields imaging.

## SUMO Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

**Start-up creation.** Christophe Morvan (Ass. Prof. Univ. Paris Est Marne la Vallée) has been hosted by Sumo for several years for his research activities. In 2016, he created Open Agora with two other computer scientists. The company develops a software suite to help the decision process in large structures. It offers tools to structure discussions, voting mechanisms, and automated argument summaries. The company will maintain connections with the team for the development of GAGs (Guarded Attributed Grammars) that are instrumental in the automated summary tools.

**New team member.** Nicolas Markey (DR CNRS) recently joined the team, after several years in LSV (*Laboratoire Spécification et Vérification*), Cachan. Nicolas will reinforce the activities of the team in the modeling and analysis of timed systems, abstraction techniques and game theory.

**TACOMA Team (section vide)**

## TAMIS Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

### **New major release of Plasma Lab**

**Participants:** Axel Legay, Sean Sedwards, Louis-Marie Traonouez.

We have released version 1.4.0 of our Plasma Lab software. This new version introduces a new command line interface for launching Plasma Lab. Besides the Graphical Interface, most of Plasma Lab functionalities are now available directly from the command line. Additionally the new version includes a new algorithm for cross entropy minimization using importance sampling. It allows to estimate the probabilities of rare events.

### **Fault injection proof-of-concept**

**Participants:** Axel Legay, Jean-Louis Lanet, Thomas Given-Wilson, Nisrine Jafri.

Creation of a proof of concept to show that formal verification can be used to discover fault injections induced by hardware attacks.

### **Creation of LHS platform**

**Participants:** Jean-Louis Lanet, H el ene Le Bouder, Ronan Lashermes.

Entry into service of the LHS platform that can be used to monitor systems, inject faults, or reason on ransomware.

### **Taler Systems startup creation**

**Participants:** Jeffrey Burdges, Florian Dold, Christian Grothoff, Marcello Stanisci.

A startup, Taler Systems S.A. was formally created, and we started the contractual paperwork required. An interview was given to RWGV-Genossenschaftsblatt (an internal publication of a large group of German banks).

### **Contract with CISCO**

**Participants:** Axel Legay, Fabrizio Biondi, Thomas Given-Wilson.

Signature of a major research collaboration contract between Tamis and CISCO to work on malware analysis. The collaboration will fund 3 engineers, trips to visit CISCO and participate to conferences on the topic, as well as a powerful servers to store and analyse malware.

### **Awards**

Axel Legay received the first Parnass award.

Christian Grothoff became an Ashoka fellow.



## TASC Project-Team

# 5. Highlights of the Year

## 5.1. Highlights of the Year

### 5.1.1. Awards

Award at the [MiniZinc Challenge 2016 solver competition](#) in the Fixed category (Bronze). The aim of the challenge is to start to compare various constraint solving technology on the same problems sets. The focus is on finite domain propagation solvers. An auxiliary aim is to build up a library of interesting problem models, which can be used to compare solvers and solving technologies.

## **TEA Project-Team**

# **5. Highlights of the Year**

## **5.1. Highlights of the Year**

In 2016, TEA was successfully evaluated, one year after its creation. The team started fruitful collaborations with UC San Diego, with Mitsubishi R&D, with ASTRI, to elaborate our research program on system composition, verification, and simulation toward novel applications perspectives in codesign, operating system design, factory automation, robotics.

## VISAGES Project-Team

### 5. Highlights of the Year

#### 5.1. Highlights of the Year

##### 5.1.1. Awards

- In 2015, the Neurinfo platform obtained an “Emergence” label from the IBISA agency, this label has been upgraded in 2016 as a “platform of Excellence” and sustained by IBISA in 2016 and onward. The IBISA label is a national label for technological platforms awarded by the GIS IBISA on an annual basis.