



RESEARCH CENTER

FIELD

**Networks, Systems and Services,
Distributed Computing**

Activity Report 2015

Section Highlights of the Team

Edition: 2016-03-21

DISTRIBUTED SYSTEMS AND MIDDLEWARE

1. ASAP Project-Team 5
2. ATLANMODELS Team 6
3. CIDRE Project-Team 7
4. COAST Project-Team (section vide) 8
5. CTRL-A Team 9
6. MIMOVE Team 10
7. MYRIADS Project-Team 11
8. REGAL Project-Team 12
9. SCALE Team 13
10. SPIRALS Project-Team 14
11. WHISPER Project-Team 15

DISTRIBUTED AND HIGH PERFORMANCE COMPUTING

12. ALPINES Project-Team 16
13. AVALON Project-Team 17
14. HIEPACS Project-Team 18
15. KERDATA Project-Team 19
16. MESCAL Project-Team (section vide) 20
17. MOAIS Project-Team (section vide) 21
18. ROMA Project-Team 22
19. STORM Team 23
20. TADAAM Team (section vide) 24

DISTRIBUTED PROGRAMMING AND SOFTWARE ENGINEERING

21. ASCOLA Project-Team (section vide) 25
22. DIVERSE Project-Team 26
23. FOCUS Project-Team 27
24. INDES Project-Team (section vide) 28
25. PHOENIX Project-Team 29
26. RMOD Project-Team 30
27. TACOMA Team (section vide) 31

NETWORKS AND TELECOMMUNICATIONS

28. COATI Project-Team 32
29. DANTE Project-Team 33
30. DIANA Project-Team 34
31. DIONYSOS Project-Team 35
32. DYOGENE Project-Team 36
33. EVA Team 37
34. FUN Project-Team 39
35. GANG Project-Team 40
36. INFINE Team 41
37. MADYNES Project-Team 42

38. MAESTRO Project-Team	43
39. MUSE Team (section vide)	44
40. RAP Project-Team (section vide)	45
41. SOCRATE Project-Team	46
42. URBANET Team	47

ASAP Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Anne-Marie Kermarrec created the Mediego Startup in April 2015

Michel Raynal was accepted as a new member of the Academia Europaea.

4.1.1. Awards

Fabien André and Anne-Marie Kermarrec received the Award "Prix du magazine la recherche" in Computer science for the Eurosys 2014 paper "Archiving cold data in warehouses with clustered network coding"[\[1\]](#).

ATLANMODELS Team

5. Highlights of the Year

5.1. Highlights of the Year

"Software Modernization Revisited: Challenges and Prospects" appears in IEEE Computer Magazine. Based on our past and present experience in software migration projects, this article puts the focus on some important factors/challenges to take into consideration when dealing with such projects and propose corresponding recommendations to maximize the chance of success. In this respect, it notably presents some concrete findings we have made while collaborating with our partners during the 3 years of the ARTIST EU project.

CIDRE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

This year, beside the continuation of the work we realized on intrusion detection, privacy, or trust management (see below), we started to investigate new areas, namely malware analysis and hardware security.

A classical problem in dynamic analysis of malware is to be able automatically execute functions / methods of applications under monitoring. Dynamic analysis is helpful only if a malicious action has been observed, unfortunately some malicious functionality might be hidden or was trimmed for not executing when being called under certain circumstances / in certain environments. We have developed a new approach in the automatic triggering of suspicious code [25]. In few words, our approach consists in identify suspicious code and modifying the bytecode of the infected application in order to force the execution of the suspicious code. We have implemented GroddDroid a tool dedicated to the automatic triggering of Android malware. This work has received the Best Paper award at the 10th International Conference on Malicious and Unwanted Software.

We have initiated this year different research activities in the domain of hardware security. Our goal is not to protect devices against hardware attacks such as side-channels but to use hardware mechanisms to strengthen the software stack against traditional software attacks. In this context, we are particularly interested in software/hardware co-design approaches. More precisely, we want to focus on two challenges :

- We want to use formal methods to evaluate the security guarantees provided by hardware platforms, which combine different CPUs, chipsets and memories;
- We want to investigate how dedicated hardware could be used to monitor the whole software stack (from the firmware to the user-mode applications).

The first challenge is the main objective of a bilateral research project with the French national agency for computer security (ANSSI) started in January 2015. We supervise the PhD of Thomas Lethan in the context of this project. The second challenge is studied in a bilateral research project with HP Inc Research Labs. This project started in 2012 but has been extended this year. The main objective of this extension is to propose an approach combining software instrumentation and external monitoring by a dedicated hardware to detect intrusions in UEFI firmware. The second challenge is also studied in the HardBlare collaborative project started in October 2015. The goal of this project is to use a dedicated co-processor to enforce Dynamic Information Flow Control on the main CPU.

This year, we also contributed in the organization and program committee of two major events of our communities:

- the 19-th edition of OPODIS, the International Conference on Principles of Distributed Systems (<https://opodis2015.irisa.fr>) was organized in Rennes, December 14-17th, with Emmanuelle Anceaume as the general chair of the conference ;
- Nicolas Prigent was the program chair of the 12th IEEE International Symposium on Visualization for Cyber Security (VizSec) that took place in Chicago, Illinois, USA on the 26th of October, 2015.

5.1.1. Awards

Our work on GroddDroid has received the best paper award at 10th International Conference on Malicious and Unwanted Software .

BEST PAPERS AWARDS :

[25] **10th International Conference on Malicious and Unwanted Software**. A. ABRAHAM, R. ANDRIAT-SIMANDEFITRA RATSISAHANANA, A. BRUNELAT, J.-F. LALANDE, V. VIET TRIEM TONG.

COAST Project-Team (section vide)

CTRL-A Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Community

We have been invited to participate to the organization of events, which highlight our active presence in the scientific life in the two domains which we are bridging :

- autonomic computing: Eric Rutten is PC co-chair of the 3rd IEEE International Conference on Cloud and Autonomic Computing, CAC 2015 (<http://autonomic-conference.org/>) [19], Part of FAS* - Foundation and Applications of Self* Computing Conferences, Collocated with: The 9th IEEE Self-Adaptive and Self-Organizing System Conference, The 15th IEEE Peer-to-Peer Computing Conference ; and PC member, as well as workshops chair, of the 12th IEEE International Conference on Autonomic Computing, ICAC 2015 (<http://icac2015.imag.fr/>), the two major conferences on the topic.
- control: Eric Rutten is organizer of a Special Session on Dependable Discrete control for adaptive and reconfigurable computing systems at the 5th IFAC international workshop on Dependable Control of Discrete Systems , DCDS (<http://www.gdl.cinvestav.mx/dcds2015>) ; he is on the IFAC Technical Committee 1.3 on Discrete Event and Hybrid Systems, (<http://tc.ifac-control.org/1/3/>) and on the IEEE Control Systems Society Discrete Event Systems Technical Committee (<http://discrete-event-systems.ieeecss.org>).

5.1.2. Invited keynote talk

Eric Rutten was invited to give a talk at the 11th International Conference on Distributed Computing and Internet Technology (ICDCIT-2015) [13] and at the seminar of the College of Information and Computer Sciences (CICS), University of Massachusetts Amherst, USA, 28 sept.2015.

MIMOVE Team

5. Highlights of the Year

5.1. Highlights of the Year

On Wednesday July 8, 2015, Inria announced the launch of SoundCity, a mobile application to measure your personal exposure to noise pollution. The project is developed in the context of CityLab@Inria by the MiMove and CLIME teams, further involving collaboration with French and California startups. The project is supported by the City of Paris smart city initiative and Bernard Jomier, deputy mayor responsible for health, disability, and relations with Paris public hospital system. Noise pollution, which lowers quality of life and harms health, is a serious environmental challenge in almost every major city. The noise levels found in most cities today can interfere with memory and learning, disturb sleep, and contribute to heart disease. In Paris, the urban ecology agency and the Bruitparif association⁰ currently rely on monitoring stations and computer simulations to understand noise exposure of citizens. SoundCity aims to complement these data with personal sound level exposure measurements collected with smartphones. SoundCity will also help citizens be more aware and engaged with noise in their environments. More at <http://www.inria.fr/en/centre/paris/news/launch-of-soundcity-mobile-application>.

⁰<http://www.bruitparif.fr>

MYRIADS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Christine Morin has been made Knight of the French legion of Honour by decret of the President of French Republic (December 31, 2014) for her contribution to Higher Education and Research. Antoine Petit, President of Inria, presented her with the insignia on February 24th, 2015.
- The HARNESS European project was successfully completed in September 2015. Although the final evaluation report is still pending, the verbal comments by project reviewers were very positive. The HARNESS project has developed a new generation cloud computing platform that integrates heterogeneous hardware (FPGAs, GPGPUs, programmable routers, etc.) and networking resources in order to provide vastly increased performance for a broader array of applications. With HARNESS, cloud providers can profitably manage specialized hardware and network technologies much as they do today's commodity resources, and software engineers can seamlessly integrate them into the design of their cloud-hosted applications.

REGAL Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

- *Garbage collection for big data on large-memory NUMA machines.* We developed NumaGiC, a high-throughput garbage collector for big-data algorithms running on large-memory NUMA machines. This result, a collaboration with the Whisper team, has been presented at ASPLOS 2015 [49].
- *Explicit consistency.* We propose an alternative approach to the strong-vs.-weak consistency conundrum, *explicit consistency*. This result has been presented at EuroSys 2015 [80]. We have also developed a new sound logic for proving the correctness of a distributed database under concurrent updates. This result is published at POPL 2016 [50].
- *The weakest failure detector of implement eventual consistency.* We found the weakest failure detector to implement an eventually consistent replicated service. This theoretical result has been presented at PODC 2015 [46].

4.1.1. Awards

Gauthier Voron obtained best paper award at system track of Compas'2015.

BEST PAPERS AWARDS :

[64] **Conférence en Parallélisme, Architecture et Système, (COMPAS'15).** V. GAUTHIER, G. THOMAS, P. SENS, V. QUEMA.

SCALE Team

5. Highlights of the Year

5.1. Highlights of the Year

Workshops and Conférence organization

- Organisation of a workshop on active object languages in September 2015

SPIRALS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

In 2015, we are particularly proud that our project-team received four awards. We are all the more proud of the fact these awards have been granted to PhD students and to young engineers involved in transfer activities.

Clément Quinton received the Best thesis award from the CNRS GDR GPL (*Génie de la programmation et du logiciel*). Clément Quinton PhD thesis [82] proposes an innovative solution for configuring and deploying software systems on cloud computing environments with software product lines and ontologies. The work of Clément Quinton led to the implementation of the Saloon software system (see Section 6.3) and contributed to the FP7 PaaSage project (see Section 9.3).

Maria Gomez Lacruz received an award in the **ACM Best Student Research Competition** for her paper [26] at the ACM MobileSoft conference on mobile software engineering and systems. Maria Gomez Lacruz proposes a solution for detecting buggy applications with a recommendation system that learns from software available on mobile application stores.

Gérard Paligot received two awards at the STAF Transformation Tool Contest for his work on the Spoon (see Section 6.4) library for Java source code analysis and transformation. The two awards were in the categories Java refactoring, and Java annotation processing live, respectively.

Nicolas Petitprez received the Bpifrance award in the *Création d'entreprise innovante* contest in the category *Emergence*. This award is linked to the work of Nicolas Petitprez and Martin Monperrus towards the creation of the Makitoo start-up company that is planned to be launched in 2016. This transfer project is built around the Spoon (see Section 6.4) library for Java source code analysis and transformation.

BEST PAPERS AWARDS :

[26] **2nd ACM International Conference on Mobile Software Engineering and Systems**. M. GOMEZ, R. ROUVOY, M. MONPERRUS, L. SEINTURIER.

WHISPER Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The main highlight of the year is the continuous spreading of Coccinelle within the developer community of the Linux kernel. We submitted the first patches to the Linux kernel based on Coccinelle in 2007. Since then, over 4500 patches have been accepted into the Linux kernel based on the use of Coccinelle, including around 3000 by over 500 developers from outside our research group. Another testimonial of the impact of our work is the visit of Greg Kroah-Hartman in March and April 2015, as an Inria invited researcher. Kroah-Hartman is one of the leading developers of the Linux kernel, and at the time only one of two developers employed by the Linux Foundation, with the other being Linus Torvalds. Greg participated in the activities of the Whisper team around the use of Coccinelle and research projects related to the Linux kernel, and he is a convinced ambassador of our research work.

Our work on Remote Core Locking (RCL) [10] was accepted in ACM Transaction in Computer Systems (TOCS) which is the most prestigious journal in systems. RCL is currently one of the most efficient locks for multicore architectures.

ALPINES Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. *FreeFem++*

We have released a version of FreeFem++ (v 3.42) which introduces new and important features related to high performance computing:

- improved interface,
- improved interface with PETSc library,
- improved interface with HPDDM (see above).

This release enables, for the first time, end-users to run the very same code on computers ranging from laptops to clusters and even large scale computers with thousands of computing nodes.

5.1.2. *Invited talk Supercomputing 2015*

Laura Grigori was an Invited speaker at the ACM/IEEE Supercomputing'15, International Conference for High Performance Computing, Networking, Storage, and Analysis, Austin, November 2015, http://sc15.supercomputing.org/schedule/event_detail?evid=inv103. This is the major conference of high performance computing, attended by 12,000 people. A blog can be found at <http://sc15blog.blogspot.com/2015/10/sc15-invited-talk-dr-laura-grigori.html>.

5.1.3. *SIAM Lecture Note book*

Frédéric Nataf, with V. Dolean and P. Jolivet, published a SIAM lecture note book on domain decomposition methods. The four draft versions on HAL <https://hal.archives-ouvertes.fr/ce1-01100932> were downloaded more than 2 300 times.

5.1.4. *SIAM SIAG on Supercomputing*

Laura Grigori was elected the Chair of the SIAM SIAG on Supercomputing (SIAM special interest group on supercomputing) for the period of January 2016 - December 2017. She was nominated by a Committee and elected by the members of this SIAG.

AVALON Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. VHGW Demo on Green-Touch Final Meeting

GreenTouch was founded five years ago with the ambitious goal to improve energy efficiency of communications and data networks by a factor of 1,000.

Avalon was invited to give one of the 15 demonstration of key technology to reduce power consumption. The VHGW (Virtual Home Gateway) demonstration gives a proof of concept and focuses on the main challenges related to the virtualization of home gateways through dense service aggregation and precise energy management.

5.1.2. Dissemination

Laurent Lefevre has given an invited keynote talk on "Towards energy proportional clouds, data centers and networks: the holy grail of energy efficiency ?", in IEEE Online Greencomm Conference, November 10, 2015

5.1.3. Awards

BEST PAPERS AWARDS :

[26] **CloudTech'2015**. D. BALOUEK-THOMERT, E. CARON, P. GALLARD, L. LEFÈVRE.

HIEPACS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

The paper entitled “Task-based multi frontal QR solver for GPU-accelerated multicore architectures” by Emmanuel Agullo (Inria, France); Alfredo Buttari (CNRS - IRIT Toulouse, France); Abdou Guermouche (Université de Bordeaux, France); Florent Lopez (Université Paul Sabatier, France) received the best paper award at HiPC 2015 .

BEST PAPERS AWARDS :

[28] **High Performance Computing-HiPC**. E. AGULLO, A. BUTTARI, A. GUERMOUCHE, F. LOPEZ.

KERDATA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Gilles Kahn honorary award of the SIF and the Academy of Science: 2nd prize for Matthieu Dorier in 2015.

The **Gilles Kahn Honorary Award** is given every year to at most the 3 best PhD theses in Computer Science in France and is jointly delivered by the *Société Informatique de France* (SIF) and the French Academy of Science. The candidates are judged on all aspects of their PhD work, including fundamental contributions to industrial transfers, publication impact, teaching, mentoring, and scientific dissemination activities. A Grand Prize and two *ex aequo* Accessit Prizes are given. Matthieu Dorier was given one of the latter.

PhD award of the Fondation Rennes 1: 2nd prize for Matthieu Dorier in the Matisse Doctoral School in 2015.

The **Rennes 1 Foundation PhD award** from the Fondation Rennes 1 is given every year to 8 outstanding new doctors from the 4 doctoral schools associated with the University of Rennes 1 (2 awards per doctoral school). The candidates are judged on the innovative aspects of their PhD thesis, "innovative" being understood in the sense of impact on socioeconomic development and technology transfers.

5.1.2. 5 International Journals

This year the team published 5 papers in high-quality journals including IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Cloud Computing, Future Generation Computer Systems (2), World Wide Web.

MESCAL Project-Team (section vide)

MOAIS Project-Team (section vide)

ROMA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Yves Robert co-edited with Thomas Hérault (University of Tennessee, Knoxville) the book *Fault-Tolerance Techniques for High-Performance Computing* [38], which was published in May by Springer.

The version 5.0.0 of MUMPS was released in February 2015.

STORM Team

5. Highlights of the Year

5.1. Highlights of the Year

STORM received an H2020 FETHPC Grant for taking part in the INTERTWinE European project to be run from Oct. 2015 to Sep. 2018, to promote interoperability between multiple runtime systems and application support layers.

TADAAM Team (section vide)

ASCOLA Project-Team (section vide)

DIVERSE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

“Multi-tier diversification in Web-based software applications” appears in IEEE Software Magazine. This paper emphasizes a new type of software monoculture in Internet applications and introduces the idea of diversification in space and time at multiple levels of the software stacks. We experiment with a realistic Internet application to demonstrate the feasibility of multi-tier diversification. This experiment highlights the challenges that are ahead of software engineers if they want to systematically break the applicative monoculture of Internet applications.

The book “Globalizing Domain-Specific Languages” appears in the LNCS series. This book, edited by Benoit Combemale, Betty H.C. Cheng, Robert B. France, Jean-Marc Jézéquel, Bernhard Rumpe is the result of the Dagstuhl seminar organized by the GEMOC initiative in October 2014.

5.1.1. Awards

Ten years most influential paper award at MODELS’15 for the pioneering paper about the Kermeta meta-language⁰ [117]

P.-A. Muller, F. Fleurey, J.-M. Jézéquel
Weaving executability into object-oriented meta-languages
Proc of MODELS/UML, p. 264-278, 2005.

⁰<http://www.cnrs.fr/ins2i/spip.php?article1733>

FOCUS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Ugo Dal Lago won the 2015 award of ‘Best Young Researcher in Theoretical Computer Science’ given by the Italian Chapter of the EATCS (European Association for Theoretical Computer Science).
- Ornella Dardha, former Focus PhD student, now at Glasgow University, won the award for ‘Best Italian 2015 PhD Thesis in Theoretical Computer Science’ given by the Italian Chapter of the EATCS.
- The Focus constraint programming solver, called *sunny-cp*, won the ‘2015 MiniZinc Challenge’, <http://www.minizinc.org/challenge.html>, an annual competition of constraint programming solvers in the open category (the most challenging), featuring all the most efficient solvers in the world.
- Fabrizio Montesi, external collaborator in Focus, won the EAPLS (European Association for Programming Languages and Systems) ‘Best PhD Dissertation Award 2014’.

BEST PAPERS AWARDS :

[44] **Proceedings of 6th IPM International Conference on Fundamentals of Software Engineering (FSEN 2015)**. D. HIRSCHKOFF, J.-M. MADIOT, X. XU.

INDES Project-Team (section vide)

PHOENIX Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

HomeAssist 500.

We are launching a massive deployment of HomeAssist in the homes of 500 older adults. This experiment will take the form of a randomized controlled trial and will be done over a period of 12 months. More details are given in Section [8.1.2](#) .

RMOD Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Pharo 4.0 has been released in April 2015.
- Moose 5.1 has been released in June 2015.
- The Synectique company, a spin-off of the RMod group with two members actively participating, got selected on the i-Lab 2015 contest (category: Creation and Development). 364 projects were submitted in this category and 54 got selected (<15%). This will allow the young company to expand its activities by hiring young developers and a sales person.
- Papers published at PLDI and OOPSLA, two important conferences of our field.

5.1.1. Awards

- The paper : **First Analysis of String APIs: the Case of Pharo [36]** got a price at **IWST 15 International Workshop On Smalltalk Technologies**.
- A paper of Martin Dias [25] was a candidate for best paper (part of the best 5) at **SANER** <http://saner.soccerlab.polymtl.ca/doku.php?id=en:awards>
- Markiyan Rizun got the third price at **ESUG 2015** for his **Rewrite tool**.

TACOMA Team (section vide)

COATI Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Bi Li, former PhD student of COATI, is recipient of the Chinese government award for outstanding self-financed students abroad, edition 2014, for her PhD thesis entitled "Tree Decompositions and Routing Problems".

Fatima Zahra Moataz received the best student paper award of the conference ALGOTEL 2015.

BEST PAPERS AWARDS :

[51] **ALGOTEL 2015 — 17èmes Rencontres Francophones sur les Aspects Algorithmiques des Télécommunications.** F. ZAHRA MOATAZ.

DANTE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. *MOSAR results published*

The joint analysis of carriage and Close proximity interactions (CPIs) showed that CPI paths linking incident cases to other individuals carrying the same strain (i.e. possible infectors) had fewer intermediaries than predicted by chance ($P < 0.001$), a feature that simulations showed to be the signature of transmission along CPIs. Additional analyses revealed a higher dissemination risk between patients via healthcare workers than via other patients. In conclusion, *S. aureus* transmission was consistent with contacts defined by electronically collected CPIs, illustrating their potential as a tool to control hospital-acquired infections and help direct surveillance [19], [18].

5.1.2. *Time-varying social networks*

. We introduce a temporal network model with adjustable community structure and emergent weight-topological correlations via the extension of the activity-driven time-varying network model. The model takes into account: i) reinforcement processes to model memory-driven interaction dynamics of individuals; ii) focal and cyclic closure to capture patterns responsible for the emerging community structure; iii) a node removal process. Using this temporal network model we demonstrate the effect of the scalable community structure and social reinforcement on information spreading, which co-evolves with the time-varying interactions [16].

5.1.3. *Stationarity for graph signals*

In a series of published works [14], [40], [36], [24], we formalised the concept of stationarity for graph signals. First, we had to introduce a new definition of graph-shift operator that, in contrast to the current alternatives, is isometric. Then, based on this operator preserving the L^2 -norm of graph signals, we were able to rigorously characterise the statistical property of wide sense stationarity for graph signals. Stationarity is a central concept in the theory of signal and image processing but was still lacking for graph signals. This contribution should now foster the development of a mathematically sound framework for graph signal processing.

5.1.4. *Awards*

FIT IoT Lab and OneLab received the best demo award at TRIDENTCOM 2015, 10th EAI International Conference on Testbeds and Research Infrastructures for the Development of Networks & Communities, Vancouver, Canada, June 24–25, 2015.

DIANA Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

A second session of the Python MOOC by Arnaud Legout and Thierry Parmentelat has been programmed in 2015 and it was also a very big success: 9615 persons registered to the course, out of them 1487 qualified for the final attestation of achievement. This session is innovative in its form as well, since it introduced ipython notebooks as medium for complementing videos; this medium has allowed to add runnable/editable programs fragments inside written material, so that students can readily run and or modify the numerous examples that illustrate the languages' concepts. Arnaud and Thierry are preparing a sequel that will address python3; they also hope to be able to leverage on the notebooks technology, and to widen the spectrum of their day-to-day usages beyond educational purposes, and in particular towards research-oriented activities like runnable papers. For more details on this MOOC see <https://www.france-universite-numerique-mooc.fr/courses/inria/41001S02/session02/about>

4.1.1. Awards

Our paper Automating ns-3 Experimentation in Multi-Host Scenarios, got the Best Paper Award at the ns-3 Workshop (WNS3), May 2015, Barcelona, Spain. The NEPI experiment management framework is capable of automating deployment, execution, and result collection of experiment scenarios that combine ns-3 with multiple hosts in various ways, reducing the burden of manual scenario setup. The awarded paper describes the internals of the NEPI framework and demonstrates its usage for ns-3 multi-host scenarios with three example cases: a) running parallel simulations on a cluster of hosts, b) running distributed simulations spanning multiple hosts, and c) integrating live and simulated networks.

BEST PAPERS AWARDS :

[18] WNS3 2015. A. QUEREILHAC, D. SAUCEZ, T. TURLETTI, W. DABBOUS.

DIONYSOS Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Awards

Pierre L'Ecuyer was named titan of simulation at the 2015 Winter Simulation Conference.

We had one best short paper award in 2015 on a novel access mechanism for M2M communications in LTE-Advanced Networks (see [6.4](#)).

BEST PAPER AWARD :

[60] 18th ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (MSWIM). M. BOUZOUITA, Y. HADJADJ-AOUL, N. ZANGAR, G. RUBINO, S. TABBANE.

DYOGENE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Stochastic networks and stochastic geometry conference dedicated to François Baccelli on his 60th birthday

This three day event <http://www.di.ens.fr/~blaszczy/FB60/> brought together about twenty invited talks given by leading researchers working on modeling and performance evaluation of computer/communication systems. Mathematical foundations of their work involve, but are not limited to, wireless stochastic geometry, information theory, discrete event dynamical systems, max-plus algebra, stationary-ergodic framework for stochastic networks. It was a wonderful occasion to celebrate the 60th birthday of François Baccelli, who has inspired the development of this field for almost 40 years. The organizers are grateful to all speakers and participants.

Awards

- Ana Busic and Sean Meyn received jointly a Google Faculty Research Award for their research on Distributed Control for Renewable Integration in Smart Communities.

<http://googleresearch.blogspot.com/2015/02/google-faculty-research-awards-winter.html>

The Applied Probability Society of INFORMS presents a 2015 Best Publication Award to Mohsen Bayati, Marc Lelarge and Andrea Montanari for their paper

BEST PAPERS AWARDS :

[] **Annals of Applied Probability**. M. BAYATI, M. LELARGE, A. MONTANARI.

EVA Team

5. Highlights of the Year

5.1. Highlights of the Year

Awards

1. **Thomas Watteyne** and Brett Warneke (Linear Technology) received the IPSO CHALLENGE 2015 People's Choice Award with the project "HeadsUp! : Monitoring the Post-surgery Position of Retinal Detachment Patients". 3 December 2015.
2. Danny Hughes, Nelson Matthys, Fan Yang, Wilfried Daniels (KU Leuven, Belgium) and **Thomas Watteyne** received Third Place in the IPSO CHALLENGE 2015, with the project "MicroPnP: Harnessing the Power of IPv6 for Ultra Low Power, Zero-configuration IoT Networks". 2 December 2015.
3. **Thomas Watteyne** elevated to IEEE Senior Member. August 2015.

Meeting & Seminars

TUTORIALS AND KEYNOTES

1. **Keynote** address by **Thomas Watteyne**.
Nuts and Bolts for Industrial IoT Middleware. ACM/IFIP/USENIX Middleware conference (Middleware), 7-11 December 2015, Vancouver, Canada.
2. **Tutorial** organized by Inria-EVA.
OpenWSN & OpenMote: Hands-on Tutorial on Open Source Industrial IoT. Thomas Watteyne, Xavier Vilajosana, Pere Tuset. IEEE Global Telecommunications Conference (GLOBECOM), San Diego, CA, USA, 6-10 December 2015.
3. **Tutorial** organized by Inria-EVA.
OpenWSN Tutorial [presented by Xavi Vilajosana] Workshop Internet Of Things / Equipex FIT IoT-LAB, Lille, France, 15 October 2015.
4. "Demi-heure de la science" presentation by **Thomas Watteyne**.
Wireless In the Woods: Monitoring the Snow Melt Process in the Sierra Nevada. 3 September 2015, Rocquencourt, France.
5. **Keynote** address by **Thomas Watteyne**.
The Rise of the Industrial IoT. International Conference on Ad Hoc Networks (AdHocNets), 31 August - 2 September 2015 San Remo, Italy.
6. **Invited Professor Leila Saidane**, from ENSI, Tunisia. She stayed in the EVA team from 18 November to 18 December 2015 to prepare common publications and identify further research directions.

STANDARDIZATION

1. **Standardization** meeting co-chaired by Inria-EVA
6TiSCH working group meeting at IETF 94, 1-6 November 2015, Yokohama, Japan.
2. **Standardization** meeting co-chaired by Inria-EVA
6TiSCH working group meeting at IETF 93, 19-24 July 2015, Prague, Czech Republic.
3. **Hackathon** organized by Inria-EVA.
OpenWSN/6TiSCH Hackathon, Czech Republic, 19 July 2015.
4. **Interop event** organized by ETSI and Inria-EVA
First ETSI 6TiSCH plugtest (interop event) in Prague, Czech Republic, 17-18 July 2015.
5. **Standardization** meeting co-chaired by Inria-EVA

6TiSCH working group meeting at IETF 92, 22-27 March 2015, Dallas, TX, USA.

ORGANIZATION OF WORKSHOPS AND CONFERENCES

1. **PEMWN 2015** international conference on Performance Evaluation and modeling in Wired and wireless Networks, cochaired by Leila Saidane, **Pascale Minet** and Farouk Kamoun, held in Hammamet, Tunisia, November 2015.
2. **Workshop** organized by Inria-EVA.
Inria-DGA day on “Software Defined Network (SDN) & MANET” in Paris, October 2015.

INVITED PROFESSORS AND CELEBRATIONS

1. **Pascale Minet** and **Paul Muhlethaler** were invited to celebrate the 30 years of ENSI, Tunisia in November 2015.
2. **Leila Saidane**, professor at ENSI, Tunisia, stayed within the EVA team one month to initiate new common research directions.

FUN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Inauguration of the FIT IoT Lab Lille's platform with its first robots open to the community.
- Full description of the TraxNet communication stack in the framework of our collaboration with TRAXENS, with real in situ experiments on the container ships Bougainville and America Vespucci. (3 pending patents)
- The FIT facility has been proposed as an "Infrastructure de Recherche" (Infrastructure for Research) by the CD TGIR.

5.1.1. Awards

The TRACAVERRRE project has been nominated for the Prix de l'Innovation VINCI 2015.

GANG Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Roads

COMPUTATION OF ROAD NETWORK DIAMETER

Based on the algorithms presented in [5], Laurent Viennot has computed the diameter and radius of the worldwide road network. The diameter of a graph is the distance between two points that are furthest apart one from another. The interesting distance notion in a road network is often travel time. Finding the worldwide road network diameter thus amounts to find two points such that the travel time from one to another is maximal. Once such a pair of points is identified, we can compute the shortest path between them to obtain somehow the longest road trip in the world. Computing the diameter of a general graph usually requires to compute all pairwise distances, which is impractical for such a big graph. However, the team has developed heuristics that appear to work fast on many practical graphs including road networks. Thanks to OpenStreetMap data, the team has thus been able to compute the world road diameter (and the diameter of various restricted parts of the network). The results can be visualized on <https://who.rocq.inria.fr/Laurent.Viennot/road/>.

Erc

NEW ERC CONSOLIDATOR GRANT

Amos Korman has received an ERC Consolidator Grant, entitled “Distributed Biological Algorithms (DBA)”, which started in May 2015. The goal of this interdisciplinary project is to demonstrate the usefulness of an algorithmic perspective in studies of complex biological systems. It focuses on the aspect of collective behavior, demonstrating the benefits of applying distributed computing techniques to establish algorithmic insights into the behavior of biological ensembles.

Highpapers

WORK ON DISTRIBUTED COMPUTING

The team has published a number of papers on Distributed Computing theory at high-profile venues. A subjective selection of these results includes: an almost-tight bound on the space complexity of set agreement [29], a study of the power of randomization in proof-labeling schemes [22] (both published at PODC’15), and a characterization of convergence in an important class of population protocols [28] (published at ICALP’15 track A).

INFINE Team

4. Highlights of the Year

4.1. Highlights of the Year

1. In collaboration with Charles Bordenave (CNRS, Toulouse) and Marc Lelarge (Inria) we proved the so-called « spectral redemption conjecture » formulated by physicists in 2013, suggesting that a novel spectral method for community detection would perform non-trivial detection under optimal conditions. This has been presented in the IEEE FOCS conference, one of the top two theoretical computer science conferences.
2. In collaboration with Freie Universitaet Berlin we have further developed RIOT, which now aggregates open source contributions from 120+ people (and counting) from all over the world, coming both from academia and from industry.

4.1.1. Awards

Aline Viana was awarded the PEDR in 2015, the Inria award for research excellence.

MADYNES Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The Madynes team got involved this year in some new funded collaborations:

- in HUMA, funded at the french national level (FUI)
- in Orange and Inria laboratory “<I/O Lab>”

The *Alérion* spin off is definitively on track (<http://www.alerion.fr>).

MAESTRO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Project P11 “Data Communication Network Performance” with ALSTOM Transport (see §8.1.3) that was originally planned until May 2015 was extended for one additional year.
- The demonstration “Quantum random walk in networks” made at Bell Labs Future X days (Openday), Paris, France , on 10-11 June 2015 was the subject of an article in the journal *Industries & Technologies* titled “Une méthode quantique pour prédire l’évolution des réseaux”. (Link for subscribers only: <http://www.industrie-techno.com/une-methode-quantique-pour-predire-l-evolution-des-reseaux.38856>.)
- Giovanni Neglia was invited to give a 20-hour PhD course on Complex Networks at the Univ. of Pisa, Italy, on 23-27 March 2015.
- 2015 is the 7th year of official collaboration with Indian institutions (IISc and IIT Mumbai).

MUSE Team (section vide)

RAP Project-Team (section vide)

SOCRATE Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. FIT/CortexLab Interference Alignment Demo on Green-Touch Final Meeting

Join GreenTouch in New York City on June 18th to celebrate the announcement of its final results. GreenTouch was founded five years ago with the ambitious goal to improve energy efficiency of communications and data networks by a factor of 1,000.

Socrate was invited to give one of the 15 demos of key technology to reduce power consumption. The demo gives a proof of concept and focuses on the main challenges related to interference alignment, namely the knowledge of the interference footprint and the scheduling algorithms to make use of the interference information to maximize the spectral efficiency. A wireless network is emulated on CorteXlab (<http://www.cortexlab.fr>), a controlled hardware facility located in Lyon, France with remotely programmable radios and multi-node processing capabilities. During the live demo, a control laptop is remotely connected to the facility, deploying software on the radios and launching an interference alignment scenario and collecting real-time performance feedback. The efficiency gain of interference alignment is then shown for various experimental conditions that can be tuned from the control laptop.

4.1.2. Awards

The article *Code generators for mathematical functions* received the best paper award of the 22d IEEE Symposium on Computer Arithmetic, Jun 2015, Lyon, France; and

The article *A parallel unbalanced digitization architecture to reduce the dynamic range of multiple signals* [28] was one of the best student paper award finalists of the 1st URSI Atlantic Radio Science Conference (URSI AT-RASC), 2015, May 2015, Gran Canaria, Spain.

Samir Perlaza was granted with a Marie Skłodowska-Curie Individual Fellowship (2015-2016) by the European Commission and he was elevated to *IEEE Senior Member* in June 2015.

BEST PAPERS AWARDS :

[13] **22d IEEE Symposium on Computer Arithmetic**. N. BRUNIE, F. DE DINECHIN, O. KUPRIANOVA, C. LAUTER.

URBANET Team

5. Highlights of the Year

5.1. Highlights of the Year

Awards

- The project "Mobile Traffic Signatures in the Urban Landscape" (participants: Angelo Furno, Razvan Stanica, Marco Fiore) was selected among the 10 finalists (from more than 200 submissions) of the Telecom Italia Big Data Challenge- <http://www.telecomitalia.com/tit/en/bigdatachallenge/news-social/tim-big-data-challenge-2015-finalisti.html>.