



RESEARCH CENTER

FIELD

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

Activity Report 2013

Section Contracts and Grants with Industry

Edition: 2014-03-20

DISTRIBUTED SYSTEMS AND SERVICES	
1. ACES Project-Team	5
2. ADAM Project-Team	6
3. ARLES Project-Team (section vide)	7
4. LOGNET Team	8
DISTRIBUTED SYSTEMS AND MIDDLEWARE	
5. ASAP Project-Team	9
6. ATLANMOD Project-Team	10
7. CIDRE Project-Team	11
8. MYRIADS Project-Team	13
9. REGAL Project-Team	14
10. SCORE Team (section vide)	15
DISTRIBUTED AND HIGH PERFORMANCE COMPUTING	
11. ALGORILLE Project-Team (section vide)	16
12. ALPINES Team	17
13. AVALON Team (section vide)	18
14. CEPAGE Project-Team (section vide)	19
15. GRAND-LARGE Project-Team (section vide)	20
16. HIEPACS Project-Team	21
17. KERDATA Project-Team	22
18. MESCAL Project-Team	23
19. MOAIS Project-Team	24
20. ROMA Team	25
21. RUNTIME Project-Team	26
DISTRIBUTED PROGRAMMING AND SOFTWARE ENGINEERING	
22. ASCOLA Project-Team	27
23. FOCUS Project-Team (section vide)	28
24. OASIS Project-Team (section vide)	29
25. PHOENIX Project-Team (section vide)	30
26. RMOD Project-Team	31
27. TRISKELL Project-Team	32
NETWORKS AND TELECOMMUNICATIONS	
28. COATI Project-Team	34
29. DANTE Team	35
30. DIANA Team	36
31. DIONYSOS Project-Team	37
32. DYOGENE Project-Team	38
33. FUN Project-Team	39
34. GANG Project-Team	40
35. HIPERCOM2 Team	41
36. MADYNES Project-Team	42

37. MAESTRO Project-Team	43
38. RAP Project-Team	45
39. SOCRATE Project-Team	46
40. URBANET Team	47

ACES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Energy saving mechanisms in smart homes using ambient computing principles

- Partner : EDF - R&D
- Starting: 01/06/2010, ending : 01/10/2013

This project is funded by EDF group, leading energy producer in Europe. It started in June 2010 and ended in October 2013. Its goal is to study the use of ambient computing principles for the management of electricity consumption in residential habitat. It focusses on two main objectives: (1) to define scenarios based on home people activities, and (2) to propose an implementation of these scenarios using ambient computing mechanisms studied in the Aces project.

Most existing smart home solutions were designed with a technology-driven approach. That is, the designers explored which services, functionalities, actions and controls could be performed exploiting available technologies. This led to solutions for human activity recognition relying on wearable sensors, microphones or video cameras. Those technologies may be difficult to deploy and get accepted in real-world households, because of convenience and privacy concerns. Many people have concerns on carrying equipments or feeling observed or recorded while living their private life. This could seriously impact the acceptability of the smart home system or reduce its diffusion in real households. To avoid such kind of issues, we designed our system with an acceptability-driven approach. That is, we selected technologies that respond to the constraints of a real-world deployment of the future smart home system, namely, convenience and privacy concerns. We decided to take a very conservative approach, choosing technologies that are as unobtrusive as possible, in order to explore the frontiers of what can be done in a smart home with a very limited instrumentation. Following the same considerations, the adopted technologies and techniques had to guarantee a fast and easy configuration, ultimately allowing a plug-and-play deployment. All these aspects have been studied and experimented using a hardware/software platform maintained by Sylvain Roche. This platform integrated results of two PhDs defended in 2013 (Michele Dominici and Bastien Pietropaoli), and has been used for a demonstration in June 2013 at EDF. A part of software developments is now published under apache licence (see [4.1.1](#)) and used by the team.

The new results in 2013 are presented in section [5.2](#).

ADAM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. France Telecom

Participants: Rémi Druilhe, Laurence Duchien [correspondant], Romain Rouvoy, Lionel Seinturier, Amal Tahri.

DigiHome is a contract with France Telecom to study the adaptation of software systems in distributed digital home environments. These environments and their extensions (vehicles, holiday homes, work at home) are now invaded by a multitude of communicating objects dedicated to content management, viewing multiple video streams, or information sharing within a community network. These objects offer services with capacities of configuration and remote administration, and advanced interactions with the end-user or between devices or services. Given the lack of universality of proposals from IT and device companies and the lack of interoperability of these devices and services, it becomes necessary to offer a virtual environment named Extended Digital Home to encompass and unify these proposals and make life easier for the inhabitants. First, we will propose a unified model for integrating devices and services inside and outside the home with a continuum between private and public lives. Second, we will study an energy model to save energy in this extended environment. Overall, the goal of this project will be to propose to design a model for a cloud inside home and to provide some means to reduce the energy using on media devices. First results have been published in [73] and [63]. This contract is complemented by two contracts, which are the CIFRE contract associated to Rémi Druilhe PhD thesis [11] and the CIFRE contract associated to Amal Tahri PhD thesis.

7.2. Kaliterre

Participants: Aurélien Bourdon, Romain Rouvoy [correspondant].

Web Energy Archive (WEA) is a project funded by the French Environment and Energy Management Agency (ADEME) to archive the energy consumption of Web sites that are accessible on the Internet. The objective of this project is to constitute an international referential on the evolution of the Web energy consumption. The adopted methodology focuses on the quality of experience and measures the energy consumed by users when they browse a specific website. The benefit of this approach is that it is representative of Internet usages and takes into account the variety of Web browsers and computer architectures. The software solution developed by this project will build on the [HTTP Archive project](#), initiated by Google, and will extend it with consumption measures that will be collected by our PowerAPI library. The objective of this collaboration is to port our solution to the Windows operating system.

7.3. ip-label

Participants: Nicolas Haderer, Christophe Ribeiro, Romain Rouvoy [correspondant].

This collaboration aims at transferring APISENSE[®] in the industry by investigating the deployment of this platform as a solution to monitor the quality of the GSM signal in the wild. The objective is to provide developers and stakeholders with a feedback on the quality of experience of 3G connection depending on their location.

7.4. dooApp

Participant: Martin Monperrus [correspondant].

The collaboration with dooApp aims at studying a bi-directional automated link between the specifications and standards they work with (from AFNOR, ISO) and their code base in order to facilitate and automate software evolutions.

ARLES Project-Team (section vide)

LOGNET Team

7. Bilateral Contracts and Grants with Industry

7.1. myMed

Participants: Luigi Liquori, The Mymed Team.

Because of the rich founding of the interreg Alcotra myMed contract, also during 2013, we have started few collaborations under the form of “Contrat de prestations”. Without going too much into détails:

- Ludotic: “IHM for myMed”.
- David Da Silva, “autoentrepreneur”, “conception et implémentation de 3 social applications myMed”.
- Sonya Marcarelli “ “autoentrepreneur”, “porting of the social applications the Apple Store”.
- GIR MARALPIN: “mounting a critical mass for myMed in the euroregion AlpMed”.

ASAP Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Technicolor

Participants: Fabien André, Anne-Marie Kermarrec.

We have a contract with Technicolor for collaboration on large-scale infrastructure for recommendation systems . In this context, Anne-Marie Kermarrec is the PhD advisor of Fabien André since November 2013. Fabien André will work on efficient algorithms for heterogeneous data on large-scale platforms.

7.2. Orange Labs

Participants: Ali Gouta, Anne-Marie Kermarrec.

We have had a contract with Orange Labs for collaboration on peer-assisted approaches for caching and recommendation in streaming applications. In this context, Anne-Marie Kermarrec has been the PhD advisor of Ali Gouta since 2012.

7.3. Web Alter-Egos Google Focused Award

Participants: George Giakkoupis, Anne-Marie Kermarrec, Nupur Mittal, Javier Olivares.

Duration: Sep. 2013 - Sep. 2015; Coordinator: Inria and EPFL.

This project addresses the problem of extracting the alter-egos of a Web user, namely profiles of like-minded users who share similar interests, across various Internet applications, in real time and in the presence of high dynamics. Beyond their intrinsic social interest, the profiles of alter-egos of a user are crucial to identify a personalized slice of the Internet that can be leveraged to personalize the Web navigation of that user. The expected outcome of the project is a generic architecture of a Web-Alter-Ego service that can run on various devices and use, as well as be used for, various Web applications.

ATLANMOD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. WebRatio

AtlanMod has helped WebRatio and the University of Trento in the definition (to be provided as an answer to the corresponding OMG RFP) of IFML, a modeling language for designing user interaction flows (not limited to the Web). Such a language should be: Extremely compact (no useless overhead), Effective (allows to model exactly what users want), Efficient (grants high reusability of model fragments), Easy to learn (very low learning curve), Comprehensive (covers most of the user interaction needs), Open and extensible (for covering any ad-hoc logic) and Platform independent (addressing any type of user interface device).

For more information about IFML - Interaction Flow Modeling Language see ⁷.

7.1.2. IBM

IBM is funding a PhD Thesis on the topic of reverse engineering of business rules from COBOL systems (see the new results section for more details).

⁷<http://www.ifml.org/>

CIDRE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **DGA contract (2012-2013): “CAPALID”**

The CAPALID project aims at building a state of the art of off-the-shelf solutions for supervision systems in distributed environments. We first realized a state of the art of the research activities for intrusion detection systems (probes), correlation systems and visualization systems. On a second phase, we defined an assessment methodology of these types of tools. Finally, this methodology was applied by Amossys, our partner in the project, to evaluate the best off-the-shelf tools that have been retained in the context of the project. This study is led in cooperation with Amossys, a SME located in Rennes.

- **Technicolor contract (2011-2014): “Data Aggregation in Large Scale Systems”**

The theme of this contract focuses on the management of massively distributed data sets. Briefly, our goal is to provide a lightweight yet continuous flow of aggregate and relevant data from a very large number of distributed sources to a management system. Collaborative data aggregation are relevant mechanisms that could help in securely providing digests of information. However, an important aspect that we want to preserve is the privacy of the aggregated information. This is of particular interest for Telco operators or software/hardware providers in order to smoothly manage the current state of their deployed platforms, allowing accordingly to develop new applications based on quick reactions/optimizations to identify and handle services inconsistencies.

This study is conducted in cooperation with the Inria project Dionysos.

- **HP contract (2013-2014): “Firmware Security”**

The work we have conducted on the automatic instrumentation of C programs in order to detect intrusions has led to the implementation of the approach within the Frama-C framework under the form of a plugin called SIDAN (see above). A part of this contract for HP consists in adapting and improving this plugin for a real-word code provided by HP, in order to harden their source code.

Another aspect of this work consists in developing a knew intrusion detection mechanism at the hardware level to protect the firmware (i.e. BIOS or UEFI) level. This mechanism must take into account industrial constraints provided by HP. Thomas Letan has been hired as an engineer to design and implement a proof-of-concept of such mechanism. In 2013, he focused his work on studying state-of-the-art and comparing existing approaches using metrics adapted to HP constraints.

7.2. Bilateral Grants with Industry

- **Amossys: “Evaluation of Intrusion Detection Mechanisms”**

The PhD of Georges Bossert is done in the context of a Cifre contract with the SME Amossys (<http://www.amossys.fr/>). His work consists in proposing new approaches for protocol reverse-engineering. He developed Netzob, a tool dedicated to this task. The goal is to use this tool to generate realistic traffic during IDS assessment. In 2013, Georges has developed two important improvements of the protocol inference process he previously proposed. First, he improved the message format reverse engineering phase. Unlike previous work, our approach uses contextual information and its semantic definition as a key parameter in both the processes of message clustering and field partitioning. We can also detect complex linear and nonlinear relationships between value, size and offset of message fields using correlation-based filtering. Besides, our multi-step pre-clustering phase reduces the required computation time of the main clustering phase. These results

have been presented in an article that is under review. The second aspect of his work consisted in enhancing the grammar inference phase. He proposed a new approach that combines passive and active algorithms to infer protocol grammars. This approach also relies on grammar decompositions. Thus, he decreased inference time by using an action-based sequential decomposition and we took into account background noise by using a parallel decomposition. G.Bossert is also currently writing his PhD manuscript, with his defense being expected for mid 2014.

- **Orange Labs: “Data Persistence and Consistency in ISP Infrastructures”**

Pierre Obame is doing his PhD thesis in the context of a cifre contract with Orange Labs at Rennes. Pierre Obame has proposed a distributed storage system called Mistore, dedicated to users who access Internet via a Digital Subscriber Line (DSL) technology. This system aims at guaranteeing data availability, persistence, and low access latency by leveraging millions of home gateways and the hundreds of Points of Presence (POP) of an Internet Service Provider (ISP) infrastructure. Pierre Obame has also proposed a mathematical framework for defining both strong and weak consistency criteria within the same formalism. Both weak and strong consistency criteria are offered by Mistore to its clients when they manipulate their data.

- **DGA-MI: “Security Events Visualization”**

The PhD of Christopher Humphries on visualization is done in the context of a cooperation with DGA-MI. The objective is to propose new visualization mechanisms dedicated to the analysis of security events, for instance for forensic purposes. The tool ELVis presented earlier in this documents is the most recent contribution to this contract. It should be extended this year to allow the unified manipulation of multiple data sources.

- **DGA-MI: “Alerts Correlation Taking the Context Into Account”**

The PhD of Erwan Godefroy is done in the context of a cooperation with DGA-MI. This PhD started in November 2012. The current work consists in the automatic generation of alert correlation rules in the context of deployed distributed systems. The correlation rules aim at being used by our GnG correlation system.

MYRIADS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. EDF R&D (2010-2013)

Participants: Stefania Costache, Christine Morin, Nikos Parlavantzas.

The objective of our collaboration with EDF R&D is to design a resource management system for private clouds that provides support for different application SLAs while maximizing the resource utilization of the infrastructure. Stefania Costache's PhD work [11] is funded through a CIFRE grant with EDF R&D. In 2013, we have completed the implementation of the Merkat prototype and evaluated it with realistic applications provided by EDF R&D and with task farming and batch scheduling environments such as Condor and Torque [23], [22].

REGAL Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- Metaware Technologies, 31,250 euros for the development of Coccinelle. Metaware offers software renovation services. It is using Coccinelle to modernize a large legacy C application for a client.
- Orange Lab, 90,000 euros for 3 PhD Students (CIFRE), Raluca Diaconu, Guthemberg Da Silva Silvestre, and Koutheir Attouchi
- Renault, 60,000 over 3 years (2013 - 2016) for a CIFRE. In the context of a Cifre cooperation with Renault, we are supervising the PhD of Antoine Blin on the topic of scheduling processes on a multicore machine for the automotive industry. The goal is to allow real-time and multimedia applications to cohabit on a single processor. The challenge here is to control resource consumption of non real-time processes so as to preserve the real-time behavior of critical ones. As part of this cooperation, we will use the Bossa DSL framework for implementing process schedulers that we have previously developed.

6.2. Bilateral Grants with Industry

6.2.1. Joint PhD: CRDTs for Large-Scale Storage Systems, with Scality SA

We are starting a research project (CIFRE: industrial PhD) with the French start-up company **Scality**, on CRDTs for large scale storage systems.

Storage architectures for large enterprises are evolving towards a hybrid cloud model, mixing private storage (pure SSD solutions, virtualization-on-premise) with cloud-based service provider infrastructures. Users will be able to both share data through the common cloud space, and to retain replicas in local storage. In this context we need to design data structures suitable for storage, access, update and consistency of massive amounts of data at the object, block or file system level.

Current designs consider only data structures (e.g., trees or B+-Trees) that are strongly consistent and partition-tolerant (CP). However, this means that they are not available when there is a network problem, and that replicating a CP index across sites is painful. The traditional approaches include locking, journaling and replaying of logs, snapshots and Merkle trees. All of these are difficult to scale using generic approaches, although it is possible to scale them in some specific instances. For instance, synchronization in a single direction (the Active/Passive model) is relatively simple but very limited. A multi-master (Active/Active) model, where updates are allowed at multiple replicas and synchronization occurs in both directions, is difficult to achieve with the above techniques.

Our previous work has shown that many storage indexing operations commute; this enables a the highly-scalable CRDT approach. For those that do not, Red-Blue-Purple approach (Section 5.3.6) appears promising.

The objective of the joint research will be to design new algorithms for object, block and file storage systems. Note that these three kinds of systems, although related, support different kinds of operations, and have different consistency requirements.

SCORE Team (section vide)

ALGORILLE Project-Team (section vide)

ALPINES Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

BPI France (ex OSEO) supports our work on superresolution methods in acoustics. It enabled us to establish a collaboration with Laboratoire d'Acoustique du Mans (LAUM).

AVALON Team (section vide)

CEPAGE Project-Team (section vide)

GRAND-LARGE Project-Team (section vide)

HIEPACS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

ASTRIUM Space Transportation research and development contract:

- Design of a parallel version of the FLUSEPA software (Jean-Marie Couteyen (PhD); Jean Roman).

CEA Cadarache (ITER) research and development contract:

- Peta and exaflop algorithms for turbulence simulations of fusion plasmas (Fabien Rozar (PhD); Guillaume Latu, Jean Roman).

EDF R & D - SINETICS research and development contract:

- Design of a massively parallel version of the SN method for neutronic simulations (Moustapha Salli (PhD); Pierre Ramet, Jean Roman).

TOTAL research and development contracts:

- Parallel hybrid solver for massively heterogeneous manycore platforms (Stojce Nakov (PhD); Emmanuel Agullo, Luc Giraud, Abdou Guermouche, Jean Roman).
- Parallel elastodynamic solver for 3D models with local mesh refinement (Yohann Dudouit (PhD); Luc Giraud and Sébastien Pernet at ONERA).
- Novel approaches to express fundamental algorithms using constructs that ensure their performance and scalability (G. Bosilca, visiting senior scientist).

KERDATA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Microsoft: Z-CloudFlow (2013-2016). In the framework of the Joint Inria-Microsoft Research Center, this project is a follow-up to the A-Brain project (see below). The goal of this new project is to propose a framework for the efficient processing of scientific workflows in clouds. This approach will leverage the cloud infrastructure capabilities for handling and processing large data volumes. In order to support data-intensive workflows, the cloud-based solution will: adapt the workflows to the cloud environment and exploit its capabilities; optimize data transfers to provide reasonable times; manage data and tasks so that they can be efficiently placed and accessed during execution. The validation will be performed using real-life applications, first on the Grid5000 platform, then on the Azure cloud environment, access being granted by Microsoft through a "Azure for Research Award" received by Gabriel Antoniu. The project will also provide funding for a PhD thesis to start in 2014. It is being conducted in collaboration with the Zenith team from Montpellier (led by Patrick Valduriez).

Microsoft: A-Brain (2010–2013). In the framework of the Joint Inria-Microsoft Research Center. See details in Section 4.1 . To support this project, Microsoft provided 2 million computation hours on the Azure platform and 10 TB of storage per year. The project funded a complementary expertise mission for Radu Tudoran (*Mission complémentaire d'expertise*, 3 years, started in October 2011).

MESCAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

7.1.1. Real-Time-At-Work

RealTimeAtWork.com is a startup from Inria Nancy-Grand Est created in December 2007. Bruno Gaujal is a scientific partner and a founding member of the startup. Its main target is to provide software tools for solving real time constraints in embedded systems, particularly for superposition of periodic flows. Such flows are typical in automotive and avionics industries who are the privileged potential users of the technologies developed by <http://www.RealTimeAtWork.com>.

7.1.2. ADR Selfnets with Alcatel

Selfnets is an ADR (*action de recherche*) of the common laboratory between Inria and Alcatel Lucent Bell Labs. Bruno Gaujal is co-leading the action with Vincent Roca. Selfnets is mainly concerned with self-optimizing wireless networks (Wifi, 3G, LTE). Eight Inria teams are participating in Selfnets. As for MESCAL, we mainly work on recent mobile equipment (e.g., using the norm IEEE 802.21) that can freely switch between different technologies (vertical handover). This allows for some flexibility in resource assignment and, consequently, increases the potential throughput allocated to each user. We develop and analyze fully distributed algorithms based on evolutionary games that exploit the benefits of vertical handover by finding fair and efficient user-network association schemes.

MOAIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Contract with Bull (2013–2016). Multiobjective scheduling on supercomputer towards exascale. Associated to a CIFRE PhD grant (David Glesser, started in 4/2013). Partners: Inria - LIG Moais, Bull

7.2. Bilateral Grants with Industry

- Contract with EDF (2010-2013). High performance scientific visualization. Funds 1 postdoc and 1 PhD (Mathias Ettinger). Partners: Inria (MOAIS and EVASION), EDF R&D
- CEA: Collaboration with CEA (2012): Europlexus Parallelization with KAAPI. Partners: Inria Rhône-Alpes and CEA Saclay (CEA funds the PhD of Marwa Sridi started in 4/2013).

ROMA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Related to evolutions of the MUMPS solver (see Section 5.1), and in order to continue funding two engineers while working on the design of a consortium of industrial users, we worked on the following contracts with industry, that were managed by CERFACS and INPT, respectively:

- Total/Hutchinson. In this contract, we worked more specifically on numerical aspects related to rank detection and null-space computations. This feature will be available in a future version of the solver.
- ESI-Group. We worked on modified pivoting strategies for hard symmetric indefinite problems. The proposed solutions could be validated by the industrial partner. This feature will be available in the next release of our package.

RUNTIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

SAMSUNG We have signed a contract with the Samsung company to work on the *Generation of Parallel Patterns based programs for hybrid CPU-GPU architectures* from october 2012 to september 2013.

7.2. Bilateral Grants with Industry

STMicroelectronics STMicroelectronics is granting the CIFRE PhD Thesis of Paul-Antoine Arras on *The development of a flexible heterogeneous system-on-chip platform using a mix of programmable processing elements and hardware accelerators* from October 2011 to October 2014.

TOTAL TOTAL is granting the CIFRE PhD thesis of Corentin Rossignon on *Sparse GMRES on heterogeneous platforms in oil extraction simulation* from april 2012 to march 2015.

CEA CEA is granting the CIFRE PhD thesis of Emmanuelle Saillard (2012-2015) on *Static/Dynamic Analysis for the validation and optimization of parallel applications* and Grégory Vaumourin (2013-2016) on *Hybrid Memory Hierarchy and Dynamic data optimization for embedded parallel architectures*

CEA - REGION AQUITAINE CEA together with the Aquitaine Region Council is funding the PhD thesis of Marc Sergent (2013-2016) on *Scalability for Task-based Runtimes*.

ASCOLA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Cooperation with SIGMA group

Participants: Thomas Ledoux, Simon Dupont.

In 2012, we have started a two-fold cooperation with Sigma Group (<http://www.sigma.fr>), a software editor and consulting enterprise. The cooperation consists in a joint (a so-called Cifre) PhD on eco-elasticity of software for the Cloud and the sponsorship of several engineering students at the MSc-level.

As a direct consequence of the increasing popularity of cloud computing solutions, data centers are amazingly growing and hence have to urgently face with the energy consumption issue. The aim of Simon Dupont's PhD, started in November 2012, is to explore the *software elasticity* capability in Software-as-a-Service (SaaS) development to promote the management of SaaS applications that are more flexible, more reactive to environment changes and therefore self-adaptive for a wider range of contexts. As a result, SaaS applications become more elastic and by transitivity more susceptible to energy constraints and optimization issues. In 2013, we presented our first results at ECOCITY, the World Summit on sustainable cities (<http://www.ecocity-2013.com/en>) and at NEM Summit (<http://nem-summit.eu>).

FOCUS Project-Team (section vide)

OASIS Project-Team (section vide)

PHOENIX Project-Team (section vide)

RMOD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Resilience FUI

Participants: Nicolas Petton [Correspondant], Stéphane Ducasse, Damien Cassou.

Contracting parties: Nexedi, Morphom Alcatel-Lucent Bell Labs, Astrium Geo Information, Wallix, XWiki, Alixen, Alterway, Institut Télécom, Université Paris 13, CEA LIST.

Resilience's goal is to protect private data on the cloud, to reduce spying and data loss in case of natural problems. Resilience proposes to develop a decentralized cloud architecture: SafeOS. Safe OS is based on replication of servers. In addition a safe solution for documents should be developed. Sandboxing for Javascript applications should be explored.

There is a plethora of research articles describing the deep semantics of JavaScript. Nevertheless, such articles are often difficult to grasp for readers not familiar with formal semantics. In our first report, we propose a digest of the semantics of JavaScript centered around security concerns. This report proposes an overview of the JavaScript language and the misleading semantic points in its design.

7.2. SafePython FUI

Participants: Damien Cassou [Correspondant], Jean-Baptiste Arnaud, Stéphane Ducasse.

Contracting parties: CEA, Evitech, Inria, Logilab, Opida, Thales, Wallix.

Beyond embedded computing, there is not so much research and development on the verification of software safety. Recently, some tools have been created for languages such as JAVA, SQL, VB or PHP. Nevertheless, nothing exists for Python even though this language is growing fast. SafePython's goal is to provide code analysis tools applicable to Python programs. This project will define a subset of Python that the developers will have to use to have their programs analyzed.

7.3. Generali France

Participants: Nicolas Anquetil [Correspondant], Stéphane Ducasse, Guillaume Larcheveque, Muhammad Bhatti, Camille Teruel.

Contracting parties: Synectique, Generali Assurances <http://www.generali.be>.

RMoD is looking into providing a software solution to Generali France for its software maintenance. The goal is to support decision making by providing quality metrics and software dependance information. The partner needs tools for parsing their legacy code (in a specific, not well-known language) and help in assessing quality and identifying dead code or code duplication. This should serve as an essential element of decision support in the continuing evolution of an important software system of the partner.

7.4. Pharo Consortium

We launched the Pharo Consortium. It has 13 members, 6 academic partners and 3 sponsoring companies. Inria supports the consortium with one full time engineer starting in 2011. More at <http://consortium.pharo.org>.

TRISKELL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. VaryMDE

Participants: Benoit Combemale, Olivier Barais, Mathieu Acher, Jean-Marc Jézéquel, João Bosco Ferreira Filho, Suresh Pillay, David Mendez Acuna.

MDE, Variability Management, Software Language Engineering.

This bilateral collaboration is between the Triskell team and the MDE lab at Thales Research & Technology. This partnership explores variability management both in modeling and metamodeling (i.e., design and implementation of software languages), and enrolls 4 faculty members and 2 PhD students from the Triskell team. This year, we keep working on the CVL usage in the Thales context.

Project duration: 2011-2014

Triskell budget share: 284 keuros

7.2. Sodifrance

Participants: Emmanuelle Rouillé, Benoit Combemale, Olivier Barais, Jean-Marc Jézéquel.

Software Process, Intentional-Driven Development, Process Execution

Since October 2010, we have a collaboration with Sodifrance, Rennes. In this project we investigate the support (capitalization, definition, execution, and adaptation) of software processes in the context of model driven development (MDD). The purpose of this work is twofold:

- automate the tool configuration and the dynamic adaptation of MDD CASE tools.
- support an automated verification of models, according to the requirements for each activity of the process.

In this context, Jean-Marc Jézéquel acts as Ph.D advisor for Emmanuelle Rouillé, also supervised by Benoit Combemale and Olivier Barais.

Project duration: 2010-2013

Triskell budget share: 25 keuros

7.3. Zenexity

Participants: Julien Richard-Foy, Olivier Barais, Jean-Marc Jézéquel.

Web engineering, Domain Specific Languages

In this project with the Zenexity company we investigate the new architecture model for efficient web development on top of the play framework (a web framework developed by Zenexity).

In this context, Jean-Marc Jézéquel and Olivier Barais act as Ph.D advisor for Julien Richard Foy.

Project duration: 2011-2014

Triskell budget share: 20 keuros

7.4. Technology transfer

Since mid 2011 the Triskell team is designing and implementing the DAUM platform that integrates a large range of technologies, ranging from wireless low cost sensors to clouds made of rugged field miniservers. Our application use case is a tactical decision system designed in cooperation with a large firefighter department of 3,500 firefighters. This platform is being used as a real life testbed for our results on dynamic, continuous design of distributed pervasive systems. It is also used as a concrete cooperation support within the Marie Curie Initial Training Network *Relate*.

By combining *models@runtime* techniques and component-based techniques, we have shown how we can apply model driven engineering to design large-scale, distributed, heterogeneous and adaptive systems.

Until october 2013 the DAUM platform was funded by an Inria Technology Development activity. In 2013 Triskell was granted for a specific funding (one year of engineer salary) to prepare the transfer of DAUM to the industry and prepare the creation of a startup focused on tools and applications for tactical information and decision systems on the field. The startup planned will involve seven members of the Triskell team.

COATI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Contract CIFRE with Orange Labs, 02/2011 - 01/2014

Participants: Jean-Claude Bermond, Sébastien Félix.

"Convention de recherche encadrant une bourse CIFRE" on the topic *Smart Transports: optimisation du trafic dans les villes*.

7.1.2. Contract CIFRE with KONTRON, 11/2011 - 10/2014

Participants: Michel Syska, Mohamed Amine Bergach.

"Convention de recherche encadrant une bourse CIFRE" on the topic *Graphic Processing Units for Signal Processing* with joint supervision with AOSTE project.

7.1.3. ADR Network Science, joint laboratory Inria / Alcatel-Lucent Bell-labs France, 01/2013 - 12/2015

Participants: David Coudert, Aurélien Lancin, Bi Li, Nicolas Nisse.

COATI is part of the join laboratory Inria / Alcatel-Lucent Bell-labs France within the ADR Network Science and works on the fast computation of topological properties (hyperbolicity, covering, etc.) [36].

DANTE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- A bilateral contract has been signed between the DANTE Inria team and **ACT750** to formalise their collaboration in the context of churn prediction.
- A bilateral contract has been signed between the DANTE Inria team and **KRDS** to formalise their collaboration in the context of Facebook marketing / cascade analysis.
- A bilateral contract has been signed between the DANTE Inria team and **HiKoB** to formalise their collaboration in the context of the 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 euros million grant from the French government Running from 22.02.11 – 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.

7.2. Inria Alcatel-Lucent Bell Labs joint laboratory

Participants: Isabelle Guérin Lassous, Paulo Gonçalves, Thomas Begin, Éric Fleury.

Network Science

The main scientific objectives of network science are:

- to design efficient tools for measuring specific properties of large scale complex networks and their dynamics;
- to propose accurate graph and dynamics models (*e.g.*, generators of random graph fulfilling measured properties);
- to use this knowledge with an algorithmic perspectives, for instance, for improving the QoS of routing schemes, the speed of information spreading, the selection of a target audience for advertisements, etc.

The ADR will focus on:

- Network sampling
- Epidemics in networks
- Search in networks
- Clustering of networks
- Detecting network central nodes
- Network evolution and anomaly detection

DIANA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **ADR on Content Centric Networking (2013-2016):**
The goal of this study in the context of the Inria - Alcatel Lucent Bell Labs laboratory is to work on the definition and the experimental evaluation of ICN mechanisms that use monitoring data to optimize network resource management and user Quality of Experience in today's networks. Massimo Gallo started his post-doc working on this topic early 2013. He was hired by AL-BL in march so he resigned from his post-doc position. The collaboration is currently in stand-by.

DIONYSOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Cifre contract on Small Cell Networks

Participants: Adlen Ksentini, César Viho, Btissam Er-Rahmadi.

This is a Cifre contract (2013-2016) including a PhD thesis supervision, done with Orange Labs, on cooperation and self-* small cell networks. The aim is to define architectures and protocols for deploying small cell networks in AMEA (Africa, Middle East and Asia) countries.

7.2. Cifre contract on LOCARN: Low Opex and Capex Architecture for Resilient Networks

Participants: Adlen Ksentini, Bruno Sericola, Yassine Hadjadj-Aoul, Damien Le Quééré.

This is a Cifre contract (2012-2015) including a PhD thesis supervision, done with Orange Labs, on evaluating and developing a new plug-and-play routing protocol (called Low Opex and Capex Architecture for Resilient Networks – LOCARN), which do not require any network management or configuration.

7.3. Data aggregation for large-scale distributed networks

Participants: Bruno Sericola, Romaric Ludinard.

This is a 3-year (2011 – 2014) bilateral project with Technicolor R & D, France, on data aggregation for large-scale distributed networks. Along with the ubiquity of data and computing devices, comes the complexity of extracting and gathering relevant information for management purposes. The very distributed nature of sources of data (be they partially local applications at the user end, or hardware as gateways), as well as their ever increasing number prohibit a systematic and exhaustive gathering on a single (or few) central server for offline analysis. In this context, collaborative data aggregation, where some computing resources collaborate securely to provide digests, appears as an interesting application for both scalability and efficiency. Moreover, collecting information at a large scale poses the problem of privacy and data aggregation may allow preserving the privacy while collecting data.

7.4. IPChronos

Participants: Adlen Ksentini, Yassine Hadjadj-Aoul, Bruno Sericola, Pantelis Frangoudis.

We are working in the 3-year (September 2011 – September 2014) FUI Project IPChronos, where the main focus is in the use of the IEEE 1588 synchronization protocol over IP. Our contribution focuses on developing analytical models to estimate, based on the IEEE 1588 protocol, the end-to-end delay. IPChronos is led by ORALIA SPECTRACOM, and the partners are IPlabel and our team.

7.5. Celtic QuEEN

Participants: Sofiene Jelassi, Pantelis Frangoudis, Gerardo Rubino.

QuEEN (Quality of Experience Estimators in Networks) is a large 3-year Celtic project going from end 2011 to end 2014. Its objectives are to develop automatic QoE measurement modules for Web services and applications, and to organize these measurement modules as a network of cooperative agents in order to allow each agent to take advantage of the measurements done by the others. Dionysos is involved in most of the activities of the project, and it is expected that QuEEN will benefit from our experience in developing the PSQA technology. QuEEN involves many companies and academic institutions (22 European partners); the project leader is Orange Labs, in Sophia Antipolis.

DYOGENE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CRE Inria-Orange

“Distribution of the SINR in real networks”

participants: B Błaszczyszyn, M. K. Karray (Orange Labs) and H.P. Keeler (hired by Inria as a research engineer) started 01/11/2013, ends 01/11/2014

7.2. Bilateral Grants with Industry

7.2.1. Alcatel Lucent

The collaboration with Alcatel Lucent (France) went on with the postdoctoral position of Chandramani Singh, funded by the Alcatel–Lucent/Inria joint lab. This materilized into two publications on the game theoretic analysis of Spatial Aloha, including one paper to appear in the Proceedings of Infocom’14.

7.2.2. Qualcomm

The collaboration with Qualcomm (USA) led to a new line of research on the analysis of MAC protocols in Vehicular Networks. This materilized into a publications on the analysis of CSMA in dense Vehicular Networks that appeared in the Proceedings of IEEE Infocom’13, and in the hiring of Tien Viet Nguyen in the team of T. Richardson at Qualcomm NJ.

7.2.3. CIFRE Orange

PhD: Miodrag Jovanović

supervisorss: Bartek Błaszczyszyn, M.K. Karray

7.2.4. CIFRE Technicolor

PhD: Mathieu Leconte

supervisors: Marc Lelarge, Laurent Massoulié

title: Load-balancing and resource-provisioning in large distributed systems

FUN Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Etineo Partnership

Participants: Roudy Dagher, Fadila Khadar, Nathalie Mitton [correspondant].

EtiPOPS focuses on portability and flexibility of GOLIATH on several hardwares and in different environments (indoor and outdoor) through the deployment of different applications such as geolocalization. In order to favor the portability, designed solutions in EtiPOPS will respect on-going communication standards which will allow a greater interoperability between heterogeneous hardwares.

6.2. France Telecom partnership

Participants: Nathalie Mitton, Tahiry Razafindralambo [correspondant], Dimitrios Zormpas.

This collaboration aims to investigate rural networks and to deploy efficiently and dynamically such networks.

6.3. Traxens partnership

Participants: Natale Guzzo, Nathalie Mitton [correspondant].

This collaboration aims to set up a full protocol stack for TRAXENS's guideline.

GANG Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Radiocéros

Participant: Fabien Mathieu.

A contract has been signed between Inria, RadioCeros and the ARITT Center. Gang has provided a feasibility study on the subject of the use of Peer-to-peer mechanisms for high quality Internet radio.

6.1.2. Alcatel

Participants: François Durand, The-Dang Huynh, Leonardo Linguaglossa, Fabien Mathieu, Laurent Viennot.

Gang has a strong collaboration with Alcatel-Lucent. Fabien Mathieu has moved from Gang to Alcatel-Lucent in May 2013. We focus on three aspects of networks :

- François Durand is funded through an ADR with the LINCS for studying voting systems and how they can be used to take distributed decision in multipartite networks.
- The-Dang Huynh is funded through a CIFRE PhD. for developping pagerank techniques in the context of social networks.
- Leonardo Linguaglossa is funded through an ADR with Inria in the context of the joint laboratory for studying the feasibility of information centric networking with a special focus on routing aspects.

HIPERCOM2 Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. OCARI2

Participants: Ichrak Amdouni, Pascale Minet, Cédric Adjih, Ridha Soua.

Partners: EDF, Inria.

The OCARI (Optimization of Ad hoc Communications in Industrial networks) project, funded by ANR, started in February 2007 and ended in 2010, EDF the coordinator decided to continue the project that deals with wireless sensor networks in an industrial environment. It aims at responding to the following requirements which are particularly important in power generation industry and in warship construction and maintenance:

- Support of deterministic MAC layer for time-constrained communication,
- Support of optimized energy consumption routing strategy in order to maximize the network lifetime,
- Support of human walking speed mobility for some particular network nodes, (e.g. sinks).

The development of OCARI targets the following industrial applications:

- Real time centralized supervision of personal dose in electrical power plants,
- Condition Based Maintenance of mechanical and electrical components in power plants as well as in warships,
- Environmental monitoring in and around power plants,
- Structure monitoring of hydroelectric dams.

To meet the requirements of supported applications (remote command of actuators, tele-diagnostic...), new solutions are brought to manage several communication modes, ranging from deterministic data transfers to delay tolerant transfers. A key issue is how to adapt routing algorithms to the industrial environment, taking into account more particularly limited network resources (e.g.; bandwidth), node mobility and hostile environment reducing radio range. The OCARI project aimed at developing a wireless sensor communication module, based on IEEE 802.15.4 PHY layer. In 2013, Inria took part with EDF to the specification of a simplified OCARI stack for a porting to a 32 bit platform.

MADYNES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry: Inria-EDF Strategic action MS4SG

Participants: Laurent Ciarletta, Yannick Presse.

Vincent Chevrier and Julien Vaubourg (MAIA team, LORIA) are external collaborators.

The MS4SG (multi-simulation for smart grids) project is part of a strategic action between Inria and EDF. It is a joint work between the Madynes and MAIA teams from Inria-NGET and EDF R&D.

The aim of the project is to provide primitives based on AA4MM in order to enable the multi-modeling and the multi-simulation of smart-grids.

Smart grids are energy power grids (electricity) endowed with smart capabilities because of the use of information and communication technologies. It can be seen as a combination of at least 3 layers : the power grid, the network used to collect information and control the system and an Information System. In Smart-grids, power/electricity utilities and distributors have to deal with multiple and variable sources of energy and of errors, the mandatory integration of smaller energy providers and a very variable set of users, while maintaining the necessary quality of service. All this at a scale than can be as big as a country. The IT+Network layers add the needed « smart » to allow dynamic adaptation of the different components and help forecast and therefore pilot the entire system. Smart grids correspond to new challenges because it is needed to re-think the way electricity is supplied to customers.

The idea behind MS4SG is to use simulation to help develop and evaluate future grids architectures, novel supervision techniques and to eventually control these systems. Instead of building a « super simulator ». Our approach is stemming from our AA4MM work, and consists in integrating simulators (and models) coming from at least the following initial different domains: electrical networks, communication networks and information systems. As these domains can influence each other, smart-grids can be considered as a kind of complex system and we are faced with multi-modeling and multi-simulation issues. Models in these simulators (and therefore simulators) are heterogeneous (at least equation based and event based models). In addition, each domain has developed its own set of software that should ideally be reused.

MAESTRO Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

MAESTRO members are involved in the Inria Alcatel-Lucent Bell Labs joint laboratory and participate in several ADRs (Action de Recherche/Research Action). The joint laboratory consists of three ADRs in its first phase (2008–2012) and six ADRs in its second phase (starting October 2012).

6.1.1. ADR “Semantic Networking” (January 2008 – April 2013)

Participants: Sara Alouf, Eitan Altman, Konstantin Avrachenkov, Oussama Habachi, Philippe Nain, Marina Sokol.

Coordinators are Isabelle Guérin Lassous (Inria project-team RESO) for Inria and Ludovic Noirie for Alcatel-Lucent.

The new paradigm of “semantic networking” for the networks of the future brings together “flow-based networking”, “traffic-awareness” and “self-management” concepts to get “plug-and-play” networks. The natural traffic granularity is the flow. MAESTRO’s task is to elaborate on the scheduling of flows in routers having in mind the fairness among flows with different round-trip times. A joint Inria Alcatel-Lucent patent has been filed in 2009 (inventors for Inria: S. Alouf, K. Avrachenkov, D. Carra, P. Nain). Two other patents (inventors for Inria: S. Alouf, K. Avrachenkov, A. Blanc) were filed in 2010 but withdrawn later by Alcatel-Lucent.

6.1.2. ADR “Self-Organized Networks in Wireless” (October 2012 –)

Participants: Eitan Altman, Majed Haddad, Manjesh Kumar Hanawal, Nessrine Trabelsi.

Coordinators are Bruno Gaujal (head of Inria project-team MESCAL) for Inria and Laurent Rouillet for Alcatel-Lucent.

This ADR is a follow-up of the ADR “Self Optimizing Wireless Networks” from the first phase. Two joint Inria Alcatel-Lucent patents have been filed during the first phase, one in 2011 (inventors for Inria: E. Altman, S. Ramanath) and one in 2012 (inventors for Inria: E. Altman). Two joint Inria Alcatel-Lucent patents have been filed during the second phase, in 2013 (inventors for Inria: E. Altman, M. Haddad).

Majed Haddad and Eitan Altman have been working with Alcatel-Lucent on mobility issues in cellular networks. Various models have been proposed and developed in close collaboration with the business unit of Alcatel-Lucent.

6.1.3. ADR “Network Science” (January 2013 – January 2016)

Participants: Konstantin Avrachenkov, Jithin Kazhuthuveetil Sreedharan, Philippe Nain, Giovanni Neglia, Marina Sokol.

Coordinators are Philippe Nain and Konstantin Avrachenkov for Inria and Philippe Jacquet for Alcatel-Lucent.

“Network Science” aims at understanding the structural properties and the dynamics of various kind of large scale, possibly dynamic, networks in telecommunication (e.g., the Internet, the web graph, peer-to-peer networks), social science (e.g., community of interest, advertisement, recommendation systems), bibliometrics (e.g., citations, co-authors), biology (e.g., spread of an epidemic, protein-protein interactions), and physics. The complex networks encountered in these areas share common properties such as power law degree distribution, small average distances, community structure, etc. Many general questions/applications (e.g., community detection, epidemic spreading, search, anomaly detection) are common in various disciplines and will be analyzed in this ADR “Network Science”.

6.2. Bilateral Grants with Industry

6.2.1. “Data Communication Network Performance” (December 2013 – December 2015)

Participants: Sara Alouf, Konstantin Avrachenkov, Philippe Nain, Giovanni Neglia.

Contractor: ALSTOM Transport (<http://www.alstom.com/transport/>)

Participants: Pierre Cotelle, Pierre Dersin, Sébastien Simoens.

The objective of this study is to build a simulation platform and develop an evaluation methodology for predicting Quality of Service and availability of the various applications supported by the data communication system of train networks.

P. Nain is responsible for Inria.

RAP Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Contracts

- CRE with Orange Labs “ Dynamical Optical Networking in the Internet”. Contract on bandwidth allocation algorithm in optical networks. Duration 2 years starting from 01/01/12.
- CELTIC-Plus Saser “Safe and Secure European Routing” submitted. RAP participates in the section on optical networks. Participants include Orange labs, Alcatel-Lucent, Telecom Institute, ENSSAT as well as a number of German laboratories. Duration three years.
- ANR Project “CONNECT: Content-Oriented Networking: a New Experience for Content Transfer”. The proposal submitted to the VERSO programme has been accepted. The planned starting date is January 2011 and the project is scheduled to last 2 years. The lead partner is Alcatel-Lucent Bell Labs France and the other partners are RAP, Inria/PLANETE, Orange LABs, TelecomParisTech, UPMC.
- PGMO project “Systèmes de véhicules en libre-service: Modélisation, Analyse et Optimisation” with G-Scop (CNRS lab, Grenoble) and Ifsttar. From 1 to 3 years. Starting at 1/10/2013.
- The ANR Boole contract (Models for random Boolean functions and applications) has been transferred from the Algorithms project, and the funding will last until August 2013.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Emanuele Leoncini.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Renaud Dessalles.

5.2. Bilateral Grants

- A bilateral project PHC Tournesol funded by Campus France (formerly Egide) will cover the costs of exchanges between *Nicolas Broutin* and Stefan Langerman (FNRS, UL Brussels). The topic of the collaboration is coloration of random hypergraphs for channel assignment in networks.

SOCRATE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Socrate has strong collaborations with Orange Labs (point to point collaboration) and Alcatel Lucent through the Inria-ALU common lab and the Green Touch initiative. Socrate also works in collaboration with Siradel, a french worldwide company working on wireless system simulations, Sigfox a young french compagny deploying the first cellular network operator dedicated to M2M and IoT, and HIKOB a start-up originated from the Citi laboratory providing sensor networks solutions. A bilateral cooperation supports the PhD of Laurent Maviel, and Siradel is a member of the Ecoscell ANR project in which Socrate is involved.

Socrate started in September 2011 a strong bilateral cooperation with the Euromedia group about Body Area Networks in which Tanguy Risset, Guillaume Villemaud and Jean-Marie Gorce are involved and the project supports the thesis of Matthieu Lauzier.

A collaboration started in 2013 with Bosch on arithmetic for automotive embedded platforms. It involves Florent de Dinechin and members of the AriC team.

Florent de Dinechin received a donation of two ZedBoard platforms from the Xilinx University Program.

URBANET Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- A new bilateral collaboration between Orange Labs and Inria UrbaNet started on July 2013. For 3 years, we will investigate how to adapt service level agreements (SLA) concept to wireless sensor networks. The goal is to share a WSN infrastructure to several clients and applications. This approach is quite new because related work mainly view WSN as a data-centric architecture dedicated for only one application. We extend this limitation, and during this work, we aim at building a telecommunication operator point of view in WSN.