# Activity Report 2015

# Section Contracts and Grants with Industry

# ANTIQUE Project-Team  (section vide)

<p style="text-align:center"><span style="color:red">**AOSTE Project-Team**</span></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. Kontron CIFRE

This contract, ended in April 2015, provided partial support for the PhD thesis of Mohamed Bergach. It was extended until the end of September with a direct collaborative contrat funded by Kontron until the PhD defense [16]

The topic is to study how to efficiently implement various sizes of the FFT (Fast Fourier Transform) algorithm on multicore and GP-GPU architectures from the range of processors used at Kontron, in order to understand in a second phase how to best allocate several such algorithms in parallel, as part of a single application, in the most efficient way (regarding performance but also power consumption and thermal constraints).

### 8.1.2. Airbus CIFRE

This contract, started on March 2014, provides full support for the PhD thesis of Cristian Maxim. The thesis concerns the statistical timing analysis while different variability factors are taken into account. This method is built on top of existing statistical approaches while proving appropriate programs for training these methods and thus learning from the history of the execution.

### 8.1.3. CNES/Airbus DS

Financing comes here through the CNES R&T programme, which has partly funded the post-doctorate of Raul Gorcitz (Sep 2013-Aug 2015) and the acquisition of an industry-grade evaluation platform based on TTEthernet and VxWorks 653.

The objective of our collaboration with Airbus Defence and Space and the CNES is to determine how the design and implementation of embedded software and system/network configuration can be largely automated in an aerospace context, while preserving an assurance level superior to that of the Ariane 5 flight program. We are exploring the novel algorithms developed and implemented in the Lopht tool.

# CASCADE Project-Team  (section vide)

**CRYPT Team  (section vide)**

# DEDUCTEAM Team  (section vide)

<p style="text-align:center;color:red;font-weight:bold;">GALLIUM Project-Team</p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. *The Caml Consortium*

**Participants:**  Xavier Leroy [ **contact** ], Damien Doligez, Didier Rémy.

The Caml Consortium is a formal structure where industrial and academic users of OCaml can support the development of the language and associated tools, express their specific needs, and contribute to the long-term stability of Caml. Membership fees are used to fund specific developments targeted towards industrial users. Members of the Consortium automatically benefit from very liberal licensing conditions on the OCaml system, allowing for instance the OCaml compiler to be embedded within proprietary applications.

The Consortium currently has 12 member companies:

- Aesthetic Integration
- Bloomberg
- CEA
- Citrix
- Dassault Aviation
- Dassault Systèmes
- Esterel Technologies
- Jane Street
- LexiFi
- Microsoft
- OCamlPro
- SimCorp

For a complete description of this structure, refer to http://caml.inria.fr/consortium/. Xavier Leroy chairs the scientific committee of the Consortium.

### 8.1.2. *Scientific Advisory for OCamlPro*

**Participant:**  Fabrice Le Fessant.

OCamlPro is a startup company founded in 2011 by Fabrice Le Fessant to promote the use of OCaml in the industry, by providing support, services and tools for OCaml to software companies. OCamlPro performs a lot of research and development, in close partnership with academic institutions such as IRILL, Inria and Univ. Paris Sud, and is involved in several collaborative projects with Gallium, such as the Bware ANR, the Vocal ANR and the Secur-OCaml FUI.

Since 2011, Fabrice Le Fessant is a scientific advisor at OCamlPro, as part of a collaboration contract for Inria, to transfer his knowledge on the internals of the OCaml runtime and the OCaml compilers.

# MUTANT Project-Team (section vide)

<span style="color:red">**PARKAS Project-Team**</span>

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

Technology Transfer Project, partly funded by the TETRACOM grant and by Kalray.

## 7.2. Bilateral Grants with Industry

Polly Labs initiative. Fully funded by ARM.

# PI.R2 Project-Team  (section vide)

## POLSYS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

**Gemalto.** Gemalto is an international IT security company providing software applications, secure personal devices such as smart cards and token, POLSYS is currently working with Gemalto – thanks to a CIFRE PhD grant – on the security analysis of code-based cryptosystems (Participants: J.-C. Faugère, L. Perret, F. Urvoy de Portzamparc).

## 7.2. Industrial Transfer

Until the mid 2000's, multivariate cryptography was developing very rapidly, producing many interesting and versatile public-key schemes. However, many of them were soon successfully cryptanalysed (a lot have been done in this group). As a consequence, the confidence in multivariate cryptography cryptosystems declined. It seems that there have emerged new important reasons for renewal of the interest in a new generation of multivariate schemes. In the past two years, the algorithms for solving the Discrete Logarithm Problem over small characteristic fields underwent an extraordinary development. This clearly illustrates the risk to not consider alternatives to classical assumptions based on number theory. In parallel, two of the most important standardization bodies in the world, NIST and ETSI have recently started initiatives for developing cryptographic standards not based on number theory, with a particular focus on primitives resistant to quantum algorithms. An objective here is then to focus on the design of multivariate schemes.

The team is now involved in the industrial transfer of post-quantum cryptography. The project is supervised by SATT-LUTECH. SATT Lutech specializes in the processing and transfer of technologies from research laboratories of its shareholders: Inria, CNRS, University of Technology of Compiègne, National Museum of Natural History, Institute Curie, Université Panthéon-Assas, Paris Sorbonne University and National School of Industrial Creation).

The team has recently developed, in partnership with a mobile application development company (WASSA), an Android app for smartphones (Samsung G5 type) that uses multivariate cryptography. The application has been tested mid-November in a series of experiments supervised by DGA and French Minsitry of Defense. The experiment gathered a total of hundred participants from various operational units. This is a first milestone in the maturation project whose goal is to create a start-up.

PROSECCO Project-Team

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Grants with Industry

The miTLS project received a grant from Mozilla for work on TLS 1.3. Catalin Hritcu received a PhD grant from Microsoft Research.

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Grants with Industry

- **Thales** $(02/14 \rightarrow 01/17)$
  *Funding for the supervision of Julia Chaulet's PhD.*
  30 kEuros.

# 6. Bilateral Contracts and Grants with Industry

## 6.1. Bilateral Contracts with Industry

- Dassault Aviation, *Extraction de la topologie et simplification des détails géométriques*, P. Laug et H. Borouchaki, 66 k-euros, 2013-2015.

<span style="color:red">**MATHERIALS Project-Team**</span>

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Contracts and grants with Industry

Many research activities of the project-team are conducted in close collaboration with private or public companies: CEA, SANOFI, IRDEP, EDF, IFPEN. The project-team is also supported by the Office of Naval Research and the European Office of Aerospace Research and Development, for multiscale simulations of random materials. All these contracts are operated at and administrated by the École des Ponts.

<p align="center"><span style="color:red">**MATHRISK Project-Team**</span></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

- Consortium PREMIA, Natixis - Inria
- Consortium PREMIA, Crédit Agricole CIB - Inria

## 8.2. Bilateral Grants with Industry

- Chaire X-ENPC-UPMC-Société Générale "Financial Risks" of the Risk fondation : A. Alfonsi, B. Jourdain, B. Lapeyre
- A. Sulem: Research Grant for the project "*Stochastic Control of Systemic Risk*", awarded by the scientific council and Professional Fellows of Institut Europlace de Finance (EIF) and Labex Louis Bachelier with A. Minca (Cornell University).
- R. Elie with Arthur Charpentier:

  Chaire with COVEA on digital impact in actuarial activities (2015-2018).

# MOKAPLAN Project-Team  (section vide)

# QUANTIC Project-Team (section vide)

<p align="center" style="color:red"><strong>SIERRA Project-Team</strong></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

Microsoft Research: "Structured Large-Scale Machine Learning". Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challenges faced by machine learning in the "big data" era: structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites (Paris and Grenoble) and four MSR sites (Cambridge, New England, Redmond, New York). Project website: http://www.msr-inria.fr/projects/structured-large-scale-machine-learning/.

## 8.2. Bilateral Grants with Industry

- A. d'Aspremont, IdR EMMA, Euroclear – Institut Louis Bachelier.
- A. d'Aspremont, IBM Faculty Award.
- A. d'Aspremont and F. Bach, IdR AXA "Machine Learning", chaire Havas-ILB, Economie des Nouvelles Données.
- A. d'Aspremont and F. Bach, Comité de pilotage, chaire Havas – Dauphine "Economie des nouvelles données".
- S. Lacoste-Julien (with J. Sivic and I. Laptev in Willow project-team), Google Research Award "Structured Learning from Video and Natural Language".

## ANGE Project-Team

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

- A research contract with SAUR (company managing water supplies) was negotiated in 2015. It deals with the modelling and the simulation of saline stratification in a dam reservoir of the Vilaine river in Brittany.
- ANGE appealed to SciWorks Technologies to transfer Freshkiss3D in a user-friendly tool for a larger diffusion to potential industrial partners. The joint development will result in an advanced easy-to-use software.

## 8.2. Bilateral Grants with Industry

P. Ung's PhD was funded by EDF, CNRS, AMIES (French agency for mathematics in interaction with companies and the society) and ANTEA–group and ended in late 2015. A collaboration with EDF for a new PhD grant in 2016 is currently under consideration.

<span style="color:red">**ARAMIS Project-Team**</span>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. Air-Liquide Medical Systems

**Participants:** Mario Chavez [Correspondant], Xavier Navarro.

Project title: Real-time characterisation of respiratory states from EEG

Founded in 2014

Amount: 370 K€

Coordinator: Thomas Similowski

Other partners: UPMC, Inserm UMR 1158

Abstract: The project aims at developing a real-time brain computer interface (BCI) for the monitoring of respiratory states from scalp EEG data of healthy volunteers and patients, recorded at the laboratory, hospital ward, operating room or intensive care units..

## CLIME Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- Clime is partner with IRSN (http://www.irsn.fr/), the French national institute for radioprotection and nuclear safety, for uncertainty estimation of dispersion simulations. The collaboration aims at better estimating emission sources, at improving operational forecasts for crisis situations and at estimating the reliability of forecasts. The work is derived at large scale (continental scale) and small scale (a few kilometers around a nuclear power plant).

- Clime takes part to an Inria innovation lab with the group SETH (Numtech http://www.numtech.fr/). The objective is to (1) transfer Clime work in data assimilation, ensemble forecasting and uncertainty estimation, with application to urban air quality, (2) identify the specific problems encountered at urban scale in order to determine new research directions.

# LIFEWARE Project-Team  (section vide)

# MAMBA Project-Team  (section vide)

# MYCENAE Project-Team  (section vide)

<p style="text-align:center; color:red;">**REO Project-Team**</p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. CIFRE convention

**Participants:** Céline Grandmont, Nicolas Pozin, Irène Vignon-Clementel.

CIFRE convention and contract with Air Liquide Santé International in the context of the ANRT on "Multiscale lung ventilation modeling in health and disease", for the PhD thesis of Nicolas Pozin (March 2014 - February 2017).

<span style="color:red">**SERENA Team**</span>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

A one-year contract with the IFP Energies Nouvelles department of Applied mathematics on "Etudes d'estimations d'erreur a posteriori sur des maillages généraux" ("Study if a posteriori error estimates on general meshes) within the *contrat-cadre* between Inria and IFP Energies Nouvelles has been concluded and started.

## 8.2. Bilateral Grants with Industry

ANDRA is funding the Ph.D. thesis of S. Ali Hassan (an agreement that is part of an *accord cadre* between Inria and ANDRA).

<div align="center">

**ALPINES Project-Team**

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# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

- Contract with Total, February 2015 - February 2018, that funds the PhD of Hussam Al Daas on enlarged Krylov subspace methods for oil reservoir and seismic imaging applications. Supervisor, L. Grigori.

<p style="text-align:center"><span style="color:red">**DYOGENE Project-Team**</span></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. CRE with Orange

One year CRE contract titled "Détermination de la distribution des conditions radio validée avec les données terrain pour les outils de dimensionnement" (Determining the distribution of the radio channel conditions validated by the real data for network dimensioning tools) between Inria and Orange Labs have been signed in 2015. It is a part of the long-term collaboration between TREC/DYOGENE and Orange Labs, represented by M. K. Karray, for the development of analytic tools for the QoS evaluation and dimensioning of operator cellular networks. Arpan Chattopadhyay was hired by Inria as a post-doctoral fellow thanks to this contract.

## 8.2. MSR-Inria Joint Lab

- Social Information Networks and Privacy
  Online Social networks provide a new way of accessing and collectively treating information. Their efficiency is critically predicated on the quality of information provided, the ability of users to assess such quality, and to connect to like-minded users to exchange useful content.

  To improve this efficiency, we develop mechanisms for assessing users' expertise and recommending suitable content. We further develop algorithms for identifying latent user communities and recommending potential contacts to users.

- Machine Learning and Big Data
  Multi-Armed Bandit (MAB) problems constitute a generic benchmark model for learning to make sequential decisions under uncertainty. They capture the trade-off between exploring decisions to learn the statistical properties of the corresponding rewards, and exploiting decisions that have generated the highest rewards so far. In this project, we aim at investigating bandit problems with a large set of available decisions, with structured rewards. The project addresses bandit problems with known and unknown structure, and targets specific applications in online advertising, recommendation and ranking systems.

<p style="text-align:center; color:red;">**EVA Team**</p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. CNES

**Participants:** Ines Khoufi, Pascale Minet, Erwan Livolant.

Partners: CNES, Inria.
Following the SAHARA project that ended in 2015, CNES decided to fund a study about the use of wireless sensor networks in space environment. This new project started in November 2015 and will end in November 2016.

## 8.2. Bilateral Grants with Industry

### 8.2.1. Gridbee CIFRE

**Participants:** Thomas Watteyne, Jonathan Muñoz.

- Title: km-scale Industrial Networking
- Type: CIFRE agreement
- Period: Nov 2015 - Oct 2018
- Coordinator: **Thomas Watteyne**
- Goal: CIFRE agreement with Gridbee (http://www.gridbeecom.com/) to apply 6TiSCH-style scheduling on top of long-range IEEE802.15.4g radios. Implementation of those solutions on OpenWSN.

### 8.2.2. SAGEM

**Participants:** Paul Muhlethaler, Gerard Le Lann.

This work aims at improving the reliability of some SAGEM communications systems. A few "altruist" algorithms using the inherent broadcast capabilities of wireless transmission have been analyzed.

<p style="color:red; text-align:center; font-weight:bold">GANG Project-Team</p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Collaboration with Bell Labs

Gang has a strong collaboration with Bell Labs (Alcatel-Lucent / Nokia). We notably collaborate with Fabien Mathieu and Diego Perino who are former members of GANG that have joined Alcatel-Lucent. A Cifre grant allowed to fund the PhD thesis of The-Dang Huynh to study ranking techniques and their application to social networks. An ADR (joint research action) is dedicated to content centric networks and forwarding information verification. The PhD thesis of Leonardo Linguaglossa is funded by this contract. We also collaborate with Ludovic Noirie on voting systems.

This collaboration is developed inside the Alcatel-Lucent and Inria joint research lab.

# MIMOVE Team  (section vide)

<span style="color:red">**MUSE Team**</span>

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- "Improving the quality of recommendation using semi-structured user feedback" CIFRE contract with Technicolor for thesis of Sara el Aouad from May 2014 to April 2017.
- "Crowdsourced Home Network Diagnosis" CIFRE contract with Technicolor for thesis of Diego da Hora from February 2014 to January 2017.
- "Exploiting Network Content-awareness to provide novel added value services" contract under the Inria-Alcatel Lucent Bell Labs common Lab (ADR ICN) to fund the doctoral thesis of Giuseppe Scavo from November 2013 to October 2016.

## 7.2. Bilateral Grants with Industry

- "Collaborative Home Network Troubleshooting", Comcast grant, from December 2015.

<p style="text-align:center; color:red;">**RAP Project-Team**</p>

# 5. Bilateral Contracts and Grants with Industry

## 5.1. Bilateral Contracts with Industry

- Contrat de recherche externalisé avec ORANGE SA "Scheduling Global OS". Duration three years 2014-2016.
- *Christine Fricker* is the leader of 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. From 1/10/2013 to 30/9/2016.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Renaud Dessalles.
- PhD grant from Fondation Sciences Mathématiques de Paris for Wen Sun.
- PhD grant from Brazilian Government for Guilherme Thompson.

<p style="text-align:center"><span style="color:red">**REGAL Project-Team**</span></p>

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *Joint industrial PhD with Orange Labs and Renault*

- Orange Lab, 30,000 euros for 1 PhD Students (CIFRE), Ralucca Diaconu
- Renault, 60,000 over 3 years (2013 - 2016) for a CIFRE. In the context of a Cifre cooperation with Renault, we are supervising with Whipser 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.

### 7.1.2. *Joint industrial PhD: CRDTs for Large-Scale Storage Systems, with Scality SA*

This year, we continued the joint CIFRE (industrial PhD) research of Tao Thanh Vinh, with the French start-up company <span style="color:red">Scality</span>, as described above (under "Large-Scale File Systems").

The objective of this research is to design new algorithms for file and block storage systems, considering both the issues of scaling the file naming tree to a very large size, and the issue of conflicting updates to files or to the name tree, in the case of high latency or disconnected work. Preliminary results were published at Systor 2015 [58].

### 7.1.3. *EMR CREDIT, with Thales.*

Franck Petit and Swan Dubois participate to the creation of the EMR (Equipe Mixte de Recherche) *CREDIT*, (Compréhension, Représentation et Exploitation Des Interactions Temporelles) between LIP6/UPMC and Thales.

Nowadays, networks are the field of temporal interactions that occur in many settings networks, including security issues. The amount and the speed of such interactions increases everyday. Until recently, the dynamics of these objects was little studied due to the lack of appropriate tools and methods. However, it becomes crucial to understand the dynamics of these interactions. Typically, how can we detect failures or attacks in network traffic, fraud in financial transactions, bugs or attacks traces of software execution. More generally, we seek to identify patterns in the dynamics of interactions. Recently, several different approaches have been proposed to study such interactions. For instance, by merging all interactions taking place over a period (e.g. one day) in a graph that are studied thereafter (evolving graphs). Another approach was to built meta-objects by duplicating entities at each unit of time of their activity, and by connecting them together.

The goal of the EMR is to join both teams of LIP6 and Thales on these issues. More specifically, we hope to make significant progress on security issues such as anomaly detection. This requires the use of a formalism sufficiently expressive to formulate complex temporal properties. Recently, a vast collection of concepts, formalisms, and models has been unified in a framework called Time-Varying Graphs. We want to pursuit that way. In the short run, the challenges facing us are: (1) refine the model to capture some interaction patterns, (2) design of algorithms to separate sequences of interactions, (3) Identify classes of entities playing a particular role in the dynamics, such as bridges between communities, or sources and sinks.

### 7.1.4. *Joint industrial PhDs: data sharing in mobile networks and automatic resizing of shared I/O caches, with Magency*

<span style="color:red">Magency</span> organizes large events during which participants can use mobile devices to access related data and interact together.

The thesis of Lyes Hamidouche concerns efficient data sharing among a large number of mobile devices. Magency brings traces captured during real events (data accesses and user mobility). We are jointly working on the design of algorithms allowing a large number of mobile devices to efficiently access remote data.

Magency also runs servers. A server is used before an event in order to be prepared and tested, and then, during the event to serve the numerous mobile devices accesses. Many servers are run on a single physical machine using containers. Using this configuration, the memory is partitioned, leading to poor performances for applications that need a large amount of memory for caching purpose. In the context of Damien Carver's PhD thesis, we are designing kernel-level mechanisms that automatically give more memory to the most active containers, leveraging the expertise acquired during Maxime Lorrillere's PhD thesis.

## WHISPER Project-Team

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

Julia Lawall participates in the OSADL project SIL2LinuxMP (http://www.osadl.org/SIL2LinuxMP.sil2-linux-project.0.html). This project aims at the certification of the base components of an embedded GNU/Linux RTOS running on a single-core or multi-core industrial COTS computer board.

Together with Julien Sopena from REGAL, we are collaborating with Renault, in the context of the PhD of Antoine Blin (CIFRE), on hierarchical scheduling in multicore platforms for real-time embedded systems. This work is a dissemination of our previous research on the Bossa domain-specific language [6].

<p style="text-align:center;color:red;font-weight:bold;">ALPAGE Project-Team</p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Contracts with Industry

Alpage has developed several collaborations with industrial partners. Apart from grants described in the next section, specific collaboration agreements have been set up with the following companies:

- Verbatim Analysis (license agreement, transfer agreement, "CIFRE" PhD (contract ended in Dec 2014), see section 4.3 ),
- Lingua et Machina (DTI-funded engineer, see section 4.4 ),
- viavoo (PhD of Marion Baranes, employed at viavoo, started in 2012 and defended in Oct 2015 about the automatic normalisation of noisy texts),
- Yseop ("CIFRE" PhD of Raphael Salmon started in 2012 about automatic text generation)
- CEA-List (PhD of Quentin Pradet on the annotation of semantic roles in specific domains (defense in Feb 2015).
- Proxem (consulting)

<p style="text-align:center"><span style="color:red">**RITS Project-Team**</span></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

- Valeo Group: a very strong partnership is under reinforcement between Valeo and Inria. Several bilateral contracts were signed to conduct joint works on Driving Assistance. Valeo financed the PhD thesis of G. Trehard under the framework of Valeo internal project "V50" and is currently a major financing partner of the "GAT" international Chaire / JointLab. Technology transfer is also a major collaboration topic between RITS and Valeo.

<p style="text-align:center"><span style="color:red">**SMIS Project-Team**</span></p>

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

The SMIS project has a long lasting cooperation with Gemalto, the world's leading providers of microprocessor cards. Gemalto provides SMIS with advanced hardware and software smart card platforms which are used to validate numbers of our research results. In return, SMIS provides Gemalto with requirements and technical feedbacks that help them adapting their future platforms towards data intensive applications. While no bilateral contract exists between Gemalto and SMIS, we are partners in several projects. Meanwhile, we are developing partnerships with SMEs capable of building ad-hoc hardware prototypes conforming to our own design.

### 7.1.1. Cozy Cloud bilateral contract (Dec 2014 - Nov. 2015)

Partners: Cozy Cloud, Inria-SMIS
SMIS funding: 50k€.
Many personal data end up today on servers where they can be scrutinized by companies and governmental agencies. To face this situation, the most emblematic initiative is the Personal Cloud paradigm. Roughly speaking, the Personal Cloud is an architecture which gives users the ability to store their complete digital environment, synchronize it among various devices and share it with other users and applications under their control. It reflects the expectation of the individuals for the emergence of privacy-by-design next-generation storage and computing services. Cozy Cloud is a French startup providing such a personal Cloud platform. The Cozy product is a software stack that anyone can deploy to run his personal server in order to host his personal data and web services. Cozy defines itself as the "Android of personal servers". While centralizing all personal data in the holder's hand is a natural way to reestablish his control on his privacy, this represents an unprecedented threat in case of attacks by an intruder, especially for individuals who are not security experts. The objective of this bilateral contract is typically to address this issue by integrating the PlugDB solution into the Cozy stack. Roughly speaking, the Cozy data system will be modified in such a way to store only encrypted files and each file access will be intercepted and routed to PlugDB. PlugDB will act as a doorkeeper for the whole individual dataspace by managing the files' metadata, the access control rules defined on these metadata, the decryption keys and the user/application authentication.

### 7.1.2. Cozy Cloud CIFRE contract (Oct 2014 - Sept 2017)

Partners: Cozy Cloud, Inria-SMIS
SMIS funding: 30k€.
In relation with the bilateral contract mentioned above, a CIFRE PhD thesis has been started by Paul Tran Van. The objective is to capitalize on the Cozy-PlugDB platform to devise new access and usage control models to exchange data among devices of the same user (devices may have different levels of trustworthiness) and among different users. A particular focus will be put on the enforcement of the access and usage control rules in this thesis.

<p align="center" style="color:red"><strong>WILLOW Project-Team</strong></p>

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Facebook AI Research Paris: Weakly-supervised interpretation of image and video data (Inria)

**Participants:**  Jean Ponce, Minsu Cho, Ivan Laptev, Josef Sivic.

We will develop in this project (Facebook gift) new models of image and video content, as well as new recognition architectures and algorithms, to address the problem of understanding the visual content of images and videos using weak forms of supervision, such as the fact that multiple images contain instances of the same objects, or the textual information available in television or film scripts.

## 8.2. Google: Learning to annotate videos from movie scripts (Inria)

**Participants:**  Josef Sivic, Ivan Laptev, Jean Ponce.

The goal of this project is to automatically generate annotations of complex dynamic events in video. We wish to deal with events involving multiple people interacting with each other, objects and the scene, for example people at a party in a house. The goal is to generate structured annotations going beyond simple text tags. Examples include entire text sentences describing the video content as well as bounding boxes or segmentations spatially and temporally localizing the described objects and people in video. This is an extremely challenging task due to large intra-class variation of human actions. We propose to learn joint video and text representations enabling such annotation capabilities from feature length movies with coarsely aligned shooting scripts. Building on our previous work in this area, we aim to develop structured representations of video and associated text enabling to reason both spatially and temporally about scenes, objects and people as well as their interactions. Automatic understanding and interpretation of video content is a key-enabling factor for a range of practical applications such as content-aware advertising or search. Novel video and text representations are needed to enable breakthrough in this area.

## 8.3. Google: Structured learning from video and natural language (Inria)

**Participants:**  Simon Lacoste-Julien, Ivan Laptev, Josef Sivic.

People can easily learn how to change a flat tire of a car or assemble an IKEA shelve by observing other people doing the same task, for example, by watching a narrated instruction video. In addition, they can easily perform the same task in a different context, for example, at their home. This involves advanced visual intelligence abilities such as recognition of objects and their function as well as interpreting sequences of human actions that achieve a specific task. However, currently there is no artificial system with a similar cognitive visual competence. The goal of this proposal is to develop models, representations and learning algorithms for automatic understanding of complex human activities from videos narrated with natural language.

## 8.4. MSR-Inria joint lab: Image and video mining for science and humanities (Inria)

**Participants:**  Leon Bottou [Facebook], Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

This collaborative project brings together the WILLOW and LEAR project-teams with MSR researchers in Cambridge and elsewhere. The concept builds on several ideas articulated in the "2020 Science" report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project we propose will focus on fundamental computer science research in computer vision and machine learning, and its application to archaeology, cultural heritage preservation, environmental science, and sociology, and it will be validated by collaborations with researchers and practitioners in these fields.

In October 2013 a new agreement has been signed for 2013-2016 with the research focus on automatic understanding of dynamic video content. Recent studies predict that by 2018 video will account for 80-90% of traffic on the Internet. Automatic understanding and interpretation of video content is a key enabling factor for a range of practical applications such as organizing and searching home videos or content aware video advertising. For example, interpreting videos of "making a birthday cake" or "planting a tree" could provide effective means for advertising products in local grocery stores or garden centers. The goal of this project is to perform fundamental computer science research in computer vision and machine learning in order to enhance the current capabilities to automatically understand, search and organize dynamic video content.