

2014

SystemX
INSTITUT DE RECHERCHE
TECHNOLOGIQUE

**ACTIVITY
REPORT**

IRT SystemX
Boosting digital
transformation

Overview



Institut de Recherche Technologique (IRT)
SystemX
Nano-INNOV site
8, avenue de la Vauve
91120 PALAISEAU, France
Tel. +33 (0)1 69 08 05 68
www.irt-systemx.fr

Coordination
Virginie Boisgontier and Aurélie Bourrat

Photo credits
Gil Le Fauconnier / SystemX Technological Research Institute (IRT)

Design and Layout
www.maiffret.net

Print
Snel

Editorial



By Pascal Cléré
President,
SystemX Technological
Research Institute (IRT)

The document that you are about to read is the 2014 version of the SystemX Technological Research Institute (IRT) activity report, which I am very pleased to present to you. This handbook reports on the work and highlights of the previous year and I encourage you to read through this carefully to find out more about the progress of the institute's activities and its significant impact within the Paris-Region ecosystem in the field of digital systems engineering.

As you know, the primary task of SystemX is to accelerate the digital transformation of industry in order to manage the impact of digital technology on production lines, from design through to product development. Advanced manufacturing, embedded systems,

“By combining scientific excellence and industrial skills, and by co-locating resources in one place, the work performed as part of SystemX research projects has allowed us to deliver initial results quickly, and to confirm the approaches chosen by the institute in terms of its procedures.”

autonomous transport, energy management, cybersecurity and *cloud computing* are at the core of SystemX issues, and reinforced by the plans for the “New Industrial France” (NFI) implemented by the government.

In terms of objectives for the year 2014, in addition to the rapid collection of initial results, we

were also aiming to establish a robust scientific base. With the recently announced establishment of the Scientific and Technological Management Board, this will involve the design and implementation of the scientific strategy for SystemX in line with our research programs and projects, as well as ensuring its promotion nationally and internationally. The Board will also contribute to the successful integration of the institute in the academic ecosystem, and will ensure the quality of SystemX production and scientific activities.

Our objectives for the consolidation of skill bases in digital systems engineering, the implementation of technological reference platforms and European and international recognition will be established by the end of 2015, when our first triennial evaluation will be carried out by the French Research Agency (*ANR, Agence Nationale de la Recherche*), which will clearly measure the expected economic impact of our work. It should be noted that the SystemX power base today represents 300 partners, 120 projects and 1000 individuals, and constitutes a structural reform of technological research in France.

2015 will represent the year of maturity for our institute, maturity that we will acquire thanks to all of you involved every day in this great project: research engineers and PhD students, industrial and academic partners, founding members. And I know that I can count on your commitment to face the challenges that the institute must overcome!

Highlights



By Eric Perrin-Pelletier
Chief Executive Officer,
SystemX Technological
Research Institute (IRT)

Very specifically, we are progressing rapidly with the three objectives to be met by the end of the 2015, firstly in terms of the consolidation of our skill bases in digital engineering systems, then the implementation of technology reference platforms, and lastly, European and international recognition.

Our digital engineering skills gathered at the end of 2014 around 13 research projects, which will be reinforced from the beginning of 2015 with two additional projects. These projects confirm the strategic focus of the IRT, which, in line with the plans for a New Industrial France, support technology transfer for future industry topics, the importance of the Digital Engineer, autonomous transport and intelligent territories as well as electrical power networks (smart grids) and the cybersecurity of infrastructures.

In terms of technology platforms, we can count six to date. On these reference platforms, the teams at SystemX achieve the integration of the technological "bricks" developed in the projects, and provide the basis for releasing results, while contributing to a national and international visibility of research activities (see box opposite):

Finally, in regards to European and international recognition, two huge measures were implemented during 2014. In the first place, the setting up of the Scientific and Technological Board will allow the institute to raise its profile from a scientific perspective.

In fact, one of the major tasks of this board is to prepare the national and international foundations of SystemX by leveraging IRT's academic partners as well as the ecosystem of Paris-Saclay University as a whole. Secondly, the IRT Association, or French Institutes of Technology (FIT), whose establishment was announced last October during the second IRT Forum and will be formalized on March 12, 2015, aims to allow all Institutes of Technology to strengthen the appeal of the IRT model and to facilitate its influence both nationally and internationally.

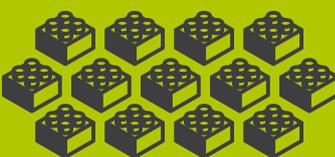
In conclusion, SystemX Technological Research Institute (IRT), now well established on Paris-Saclay University's campus, welcomes the formal establishment of the Paris-Saclay University, bringing together a unique set of scientific skills which positions the campus at a global level for the first time. The further association with Paris-Saclay SATT (Technological Transfer Acceleration Companies), will accelerate the deployment of public research results among industrial players.

- **The "Forge"**, a collaborative software engineering platform which brings together project tools with the aim of controlling software lifecycles and guaranteeing their quality, continuity and technological transfer, while supplying effective and dimensioned on-demand tools to handle data-intensive computing, and mass processing and storage in secure cloud mode.
- **TREC**, Multicore and Critical realtime embedded execution platform.
- **KUBIK**, an engineering and modeling platform for systems, providing decision support for system architects, evaluation and testing of critical elements.
- **MOST**, a platform for modeling, optimization and multi-modal transport monitoring.
- **Dr SIHMI**, a simulated driving platform for HMI (human-machine interaction).
- **VITAL**, The latest intelligent platform for the analysis of multilingual data.

Profile and Key Figures

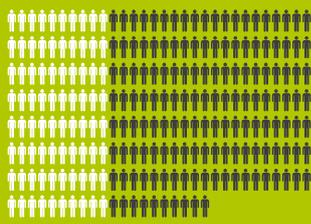
Creation
 **31**
 October, 2012

Partners
 **55**  **14**
 Industrial Academic

Projects

13 Research projects

Financing

41^M€
 €20.5m of industrial financing

Collaborators

 + 250 collaborators which includes 80 of their own resources

Patents

 7 patents

Publications
 **35+**

Lines of research

- Usage and collaboration
- Modeling and optimization
- Simulation and infrastructure

Technological issues

-  SMART ENERGY MANAGEMENT
-  CYBERSECURITY
-  CLOUD COMPUTING
-  ADVANCED MANUFACTURING ("FACTORY OF THE FUTURE")
-  EMBEDDED SOFTWARE AND SYSTEMS
-  CONNECTED AND AUTONOMOUS VEHICLES

Platforms and equipments

<p>FORGE</p> <p>Collaborative software engineering platform which brings together project tools with the aim of controlling the software lifecycle and guaranteeing its quality, continuity and technological transfer, but also supplying effective and dimensioned means on demand which can handle data-intensive computing, mass data processing and storage in <i>secure</i> cloud mode.</p>	<p>TREC</p> <p>Multicore and Critical realtime embedded execution platform.</p>	<p>MOST</p> <p>Platform for modeling, optimization and multimodal transport supervision.</p>
<p>KUBIK</p> <p>Engineering and modeling platform for systems, providing decision support for system architects, the evaluation and testing of critical elements.</p>	<p>Dr SIHMI</p> <p>Simulated driving platform for HMI (human-machine interaction).</p>	<p>VITAL</p> <p>Latest intelligent platform for the analysis of multilingual data.</p>

Scientific and Technological Board



Interview with Daniel Krob
Science and Technology Director,
SystemX Technological Research Institute (IRT)

What is the Scientific and Technological Board?

SystemX Technological Research Institute (IRT) develops innovative R&D products, involving academic and industrial partners in the field of Digital Systems Engineering. In order to strengthen its task of technological transfer, SystemX decided to put in place a Scientific and Technological Board to integrate the scientific dimension better within the institute, while the latter positions itself to serve the institute's projects and programs.

What is the role of the Scientific and Technological Board?

The role of the Scientific and Technological Board is to supervise, in close cooperation with the management team, the scientific strategy of SystemX Technological Research Institute (IRT). In backing the launch of new projects, it will enable scientific challenges to be identified and structured and to provide scientific answers to industrial issues.

It will contribute to the institute's scientific activities to support and accompany its growth from a scientific perspective, and to develop its relations with public research and higher education partners. Lastly, it will develop the international positioning of the institute and any necessary scientific partnerships, thereby promoting its status.

How will it work operationally?

Specifically, the Scientific and Technological Board will be organized around three scientific focuses, which will structure all the research activities and technological transfer around the following scientific subject areas: "integration", "models" and "simulation & infrastructure". The scientific boundaries of each of these subject areas will be ever-changing in their nature, to take into account the requirements of the institute's projects and partners as closely as possible.

The Scientific and Technological Board will also hold close discussions with the Scientific and Technological Council, with which it will be the natural point of contact; with research programs and projects, to which it will supply the necessary scientific expertise to optimize the institute's transfer dynamic; and with SME training programs and relationships, with which it will interact to develop the skills of scientists.

Biography

Former student of Ecole Normale Supérieure, PhD (88) and Habilitation (91) in Computer Science, Daniel Krob, 53, is the new Scientific & Technological Director of IRT SystemX. He is also a professor at Ecole Polytechnique in Computer Science and President of the Center of Excellence on Systems Architecture, Management, Economy & Strategy (CESAMES). International expert in many scientific areas, he is the author of around 100 scientific publications & communications, 4 books and 3 patents, in theoretical computer science, algebraic & enumerative combinatorics, mobile communications algorithms and systems engineering. He was the former responsible of the Dassault Aviation – DCNS – DGA – Thales chair "Engineering of Complex Systems" of Ecole Polytechnique (2003-2015). In February 2014, he was elected INCOSE Fellow, a recognition awarded by INCOSE (International Council on Systems Engineering) to researchers or professionals whose contribution to the theory or practice of complex systems engineering is particularly significant worldwide. He is the only French person to be distinguished in this way, and shares this recognition with only 66 experts around the world.

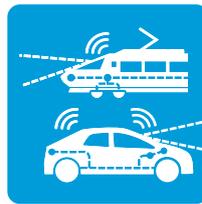
Technologies and Tools Program



Paul Labrogère
Technologies and Tools
Program Director,
SystemX Technological
Research Institute (IRT)

The design and production launch process of complex systems involves a large number of industry experts using different languages and specific tools. In a world where competition is increasingly tough, it is necessary to have the tools and methods available to allow swift marketing of quality products at competitive costs. Furthermore, such systems consist of a large number of heterogeneous subsystems, the interaction of which can show emergent behaviors capable of leading to unwanted situations.

DIGITAL ENGINEERING TECHNOLOGIES AND TOOLS



Embedded systems



Design and Simulation Tools



Cloud Computing and Networking

Today, several obstacles can hinder best practice in quality system engineering. The most significant obstacles include:

- strong compartmentalization between the different professions involved in the product lifecycle,
- fast-evolving technologies,
- increasing quality control requirements in design flows,
- difficulties in managing the development processes rationally and optimally.

All of these issues require the possession of a certain number of skills. In particular, a system approach needs to model and simulate in order to provide decision-making methods and aids. This new paradigm also means new methods and new tools for controlling the reliability and security of systems. The "Technologies & Tools" program gathers together the research projects related to embedded systems, design and simulation tools, networks and Cloud Computing by applying a cross-functional approach to engineering models for the performance, reliability and security of complex systems.

Embedded Systems	Design and Simulation Tools	Cloud Computing and Networking	Other projects
<p>ELA Automotive Electronics and Software</p>	<p>SIM Engineering and Multi-disciplinary Simulation</p>	<p>ARE Network Architecture Project 2014</p>	<p>TOICA Overall Thermal Integrated Conception of Aircraft</p>
<p>FSF Safe and Reliable Embedded Systems</p>	<p>ROM Model Reduction and Multiphysics Optimization</p>		<p>FELIN Future LTE Equipment integrated with Virtualization</p>
<p>ISE ITS Security Project 2014</p>	<p>APA Parallel Algorithmics</p>		
<p>OAR OpenAltaRica Project 2014</p>			

Highlights 2014

1. In addition to the ELA project (Automotive Electronics and Software), the Technologies and Tools program launched a project on the security of intelligent transport systems called ISE (ITS SEcurity). Tomorrow's vehicles will be connected and communicate with their environment (vehicles and road infrastructure), enabling the development of new ITS (Intelligent Transport System) applications to improve traffic management, road safety, convenience and mobility services. The goal of this new project is to design safe vehicles plus a security management system for communications, and to define a framework for the validation and certification of global ITS system security.
2. The OpenAltaRica project was also launched in 2014 in the area of "Embedded Systems". This project, which will run over five years, aims to develop an integrated software platform dedicated to the risk analysis of complex systems (aircraft, trains, nuclear plants, etc.) based on AltaRica 3.0, a high-level modeling language. This project addresses two major scientific and technological challenges:
 - a. Increase modeling process productivity;
 - b. Facilitate the integration of risk analyses with other complex system engineering activities, taking into account that each field has its own modeling formalisms.

The platform will include tools to enable the use of models from different engineering disciplines (physical architecture analysis, functional, etc.).
3. Within the "Cloud Computing and Networks" subject area, the Technologies and Tools program also launched the "Network Architecture" project with the challenge of creating technical elements of the Internet of the future, which will allow the continuous development of new services for the communication and distribution of content in the most favorable technological and economic conditions. It has already integrated an international *testbed* by managing the Paris NDN node of the NSF NDN project.
4. Through external collaborations, SystemX is involved in two other projects, which are:
 - a. FELIN (Future LTE Equipment integrated with Virtualization): SystemX provides a connection with the French automotive sector (Renault, PSA Peugeot Citroën, Valeo, Continental, etc). Started in November 2014, for a period of 36 months, this structuring R&D project for competition (PSPC) is a €56 million project, funded with €23 million via Bpifrance under a future investment program, and coordinated by the General Commission for Investment (CGI). It has received the backing of the Directorate General for Enterprise (DGE) as well as the Paris-Region and Minalogic competition centers.
 - b. TOICA (Thermal Overall Integrated Conception of Aircraft): This project has a three-year duration and a global budget of €26.5 million, bringing together 32 partners with Airbus as project manager and SystemX, naturally associated via the SIM project. TOICA examines the thermal performance of aircraft and the necessary complex management systems required.

In terms of perspectives for the year 2015, the "Technologies and Tools" program will focus on launching a new project on the subject of "Collaborative Systems Engineering" (ISC), implementing an assessment and testing platform and allowing co-simulation issues to be examined as part of large defense projects.

ELA

AUTOMOTIVE ELECTRONICS AND SOFTWARE

PROJECT PROFILE

Project manager: **Witold Klauedel**

Project duration: **36 months**

Industrial partners:

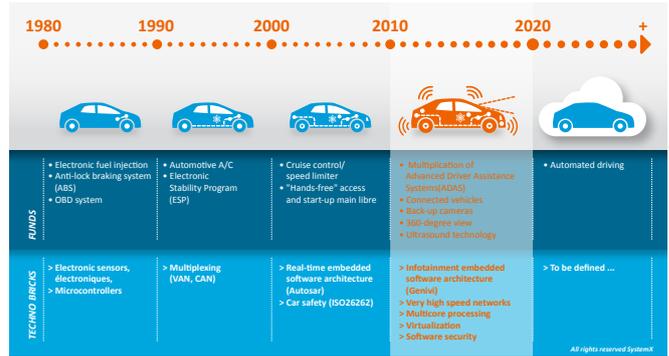
- Continental
- Intempora
- Open Wide
- Oppida
- PSA Peugeot Citroën
- Renault
- Valeo

Academic partners:

- CEA
- ESTACA
- Institut Mines-Télécom
- Université Paris-Sud

Theses:

- *High integrity virtualization for multi-core platform*
- *Defining a metric of embeddability for computer vision algorithms applied to the ADAS*
- *Hierarchical scheduling for applications and virtual machines with multiple criticality in embedded ECUs*
- *Road obstacle detection based on dense stereovision for highway driving assistance systems*
- *Methods for multicore realtime embedded application design in automotive*



The ELA project, Automotive Electronics and Software, aims to meet the new technological and economic challenges of the connected car and driver assistance systems (ADAS). Its primary task is to offer a new embedded electronic architecture in the car and to choose, adapt or develop its technological components. The car, today, can no longer be isolated from its environment. The latter is more and more communicative, constantly evolving and beginning to find new usage models, which are, however, paired with new threats. The car must be prepared to evolve while maintaining its operational safety at controlled cost. Current embedded architectures are still not capable of meeting this challenge. Part of the ELA project will address this challenge and give a fresh boost to French engineering by gathering together academic partners and industrial suppliers in one place: SystemX.

FSF

SAFE AND RELIABLE EMBEDDED SYSTEMS

PROJECT PROFILE

Project manager: **Elie Soubiran**

Project duration: **36 months**

Industrial partners:

- Alstom Transport
- Apsys
- Esterel Technologies
- Oppida
- Scaleo Chip

Academic partners:

- CEA
- Inria
- Institut Mines-Télécom
- University of Paris-Sud

Theses:

- *Definition of an execution platform for Mixed Criticality Systems integrating fault tolerance services in a multicore context*
- *Multiple-objectives architecture optimization by composition of model transformations*
- *Theorem Prover-Based Testing for Real-Time and Safety Critical Systems*

The FSF project seeks to encourage the emergence of an industry around execution platforms for railway systems, both for intercity lines and urban transport lines. Production volumes in comparison with development costs mean that it is necessary to opt for greater generic design within these systems, and to achieve broader integration of COTS (Components Off The Shelf), for both hardware and software. COTS software products are typically real-time operating systems or middleware *components*. The COTS hardware components studied within the scope of the project are essentially *system-on-a-chip* commodities for critical embedded systems that incorporate multi-core processors.

The project is also focusing on the tooling for system and software development, analysis and validation. More specifically, the interfacing of tools and their integration into an industrial design process compatible with CENELEC rail standards is being evaluated. To give one example, the coupling of formal security-of-operation analysis tools and system specification tools provides added value for both product ranges. Another example lies in the specialization of compilation and execution tools for railway systems on the FSF executive platform.



Highlights 2014

During 2014, the FSF project focused on feasibility work. The main lines of research defined in the investigation phase (2013) were examined, then prototypes and models were developed and presented at numerous public demonstrations.

Demonstrations :

- Future@SystemX 2014
- Presentation to CGI (General Commission for Investment).
- Presentation to Alstom Belgium teams (Charleroi)
- "Webconf Innovation" Alstom Transport
- Convention of the Systematic Paris Region Cluster 2014
- IRT Forum 2014

ISE

ITS SECURITY

PROJECT
2014

PROJECT PROFILE

Project manager: **Brigitte Lonc**

Project duration: **36 months**

Industrial partners:

- Opentrust
- Oppida
- PSA Peugeot Citroën
- Renault
- Trialog
- Valeo

Academic partners:

- Institut Mines-Télécom

Tomorrow's vehicles will be connected and will communicate with their environment (vehicles and road infrastructure), requiring the development of new ITS (Intelligent Transport System) applications to improve traffic management, road safety, convenience and mobility services. This automotive revolution poses new technological and economic challenges: the design of interoperable co-operative vehicles, a safety management system for communications, as well as the preparation of reliable and secure systems for future connected autonomous vehicles. These communication systems V2V/V2I (Vehicle-to-Vehicle/Vehicle-to-Infrastructure) will require digital security for public confidence.

SystemX has launched a new project in this subject area. The ISE project (ITS Security) started on July 1, 2014 and will continue for three years. The primary objective of the ISE project is to implement the security management infrastructure of these co-operative ITS systems. This is a major issue, because ITS systems must be capable of processing thousands of messages exchanged per second, in complete confidence, by providing strong personal data protection in accordance with national law and European Directives. The trusted infrastructure (PKI, Public Key Infrastructure) developed as part of the project must therefore be hugely scalable in order to be able to distribute billions of digital identifiers to embedded ITS stations. Furthermore, the ISE project's secondary objective is to define the operation of test systems to enable the security certification of ITS co-operative systems.

Highlights 2014

The ISE project participated in various events in France related to Intelligent Transport Security (ITS) and to issues and challenges concerning the security and protection of private information in connected vehicle systems.

- SystemX seminar led by Dr Huei-Ru Tseng (ITRI) on the subject of 'Insights on V2X Telematics: Latest Developments on Vehicle-to-Infrastructure (V2X) from ITRI Taiwan'
- ITS Stakeholder Form organized by ATEC ITS France, Mines ParisTech, Moveo and Topos Aquitaine
- Seminar *Cybersecurity and Privacy (CySeP) Winter School*, October 27-31, 2014, Stockholm, Sweden

OAR

OPENALTARICA



PROJECT PROFILE

Project manager: **Michel Batteux**

Project duration: **60 months**

Premium:

- **AltaRica Association**
- **Apsys**
- **Safran Group**
- **Thales**

Participants:

- **Airbus Defense & Space**
- **Esterel Technologies**
- **PSA Peugeot Citroën**
- **Renault**
- **Siemens**

Thesis:

- ***Probabilistic verification of AltaRica 3.0 model properties***

The OpenAltaRica project, launched in October 2014, aims to develop an integrated software platform dedicated to the risk analysis of complex systems (aircraft, trains, nuclear plants, etc.) based on AltaRica 3.0, a high-level modeling language. Beyond the creation of the platform, with its tools linked to the design and processing of AltaRica 3.0 models, OpenAltaRica faces two scientific and technological challenges:

- Increase modeling process productivity. In order to enable efficient use, the OpenAltaRica platform will contain component model libraries and modeling frameworks, as well as learning material (training aids, specific Q/R, etc.);
- Facilitate the integration of risk analyses with other complex system engineering activities, taking into account that each field has its own modeling formalisms. The platform will include tools to enable the use of models from different engineering disciplines (physical architecture analysis, functional, etc.).

The OpenAltaRica project is an open project within SystemX Technological Research Institute (IRT) and it will gradually unite a community of industrial and academic experts using all the tools, models and processes on the platform, the latter playing a role in becoming references in matters of risk modeling for complex systems based on AltaRica 3.0. Eventually, the objective will be to port the platform to open source for an even wider distribution of these risk modeling technologies. For the time being, the project already counts eight industrial partners with three levels of involvement: user, participant and premium.

Highlights 2014

The project commenced in October and priority has been given to the key technical focuses linked to smooth project progress, and a more theoretical focus linked to an aspect of AltaRica 3.0 model processing.

First and foremost are aspects concerning the development of the OpenAltaRica platform, which will contain a set of tools in the form of software and documents. The two areas of focus are:

- On the one hand, methods and tools which will allow members of the OpenAltaRica project team to implement different components of the platform (software or document tools), as well as to validate experimentally, through test cases, the OpenAltaRica platform generated.
- On the other hand, the adoption of the first versions of tools supplied by the AltaRica Association as Intellectual Property. These first versions are prototype tools which provide the basis of the OpenAltaRica platform.

Secondly, we are looking at aspects concerning project communication. In fact, in addition to the development of the OpenAltaRica platform, the project must also unite the community around this field of models-based risk analysis. The two focus areas are:

- Firstly, the communication tools which will allow the whole community to familiarize itself with the progress of and/or take part in the project. Different kinds of solutions are targeted: a showcase website, dedicated forum, bug management, etc.
- Secondly, communications made about the project through seminars, conferences or workshops:

- **Lambda-Mu 19 conference which was held in Dijon on October 12-23, 2014;**
- **IMBSA conference in Munich, Germany, from October 27-29, 2014.**

Participation in these events has also established contacts with new potential partners, or the strengthening of existing ones, from the perspective of both financial backers as well as community members.

SIM

ENGINEERING AND MULTI-DISCIPLINARY SIMULATION

PROJECT PROFILE

Project manager: **Yves Baudier**

Project duration: **36 months**

Industrial partners:

- Airbus Defense & Space
- Airbus Group
- Esterel Technologies
- Renault

Academic partners:

- Centrale-Supélec
- ENSTA ParisTech
- Supméca

Theses:

- *Multi-physics interaction modeling in design architecture: application to thermal case*
- *Theory and Methodologies for System Synthesis Based on Collaborative Multi-scale Multi-physics Simulation and Estimation*
- *Using Systems Engineering Methods to Support Multidisciplinary Collaborative Model Development Process*
- *Collaboration Through Simulation Process*
- *Theoretical modeling and associated processes for model architects in a multiphysics simulation environment*
- *Formalization and Validation of Complex Systems Architectures and associated Requirements within a Model Based Systems Engineering approach*

The SIM project aims to devise "vehicle architecture" tools and "model-based" multidisciplinary collaboration methods, for the engineering of future vehicles (hybrid cars, more electric aircraft), encompassing environmental issues, energy efficiency, passenger comfort and safety.

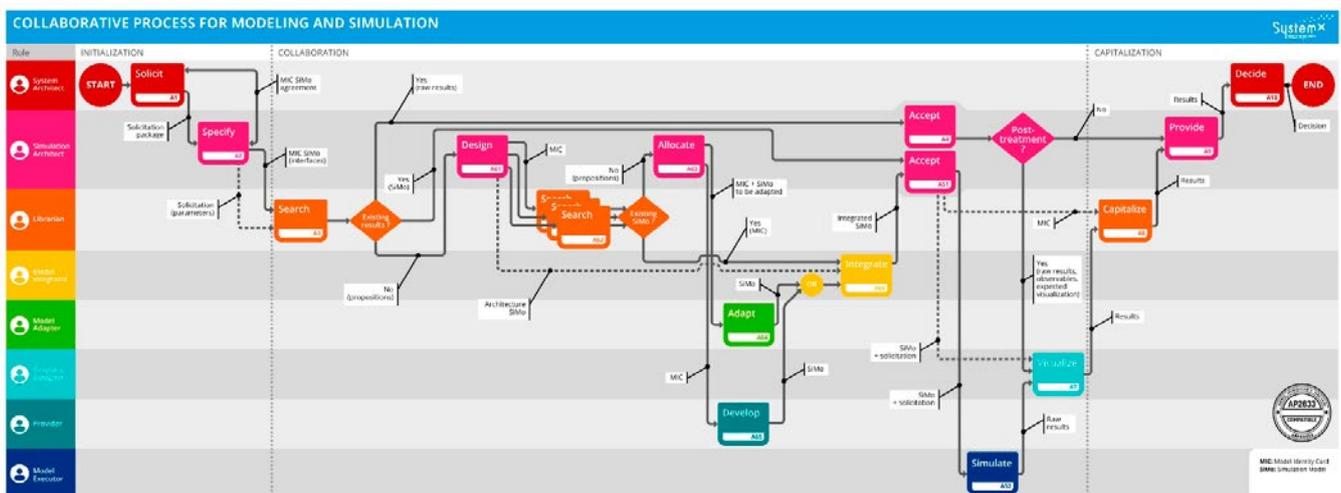
A particularly important challenge for the industry is:

- to set up a large number of interoperable, multi-system, multi-physical and multi-scale behavioral modes;
- to construct model hierarchies enabling the visualization of the physical behavior of a system (vehicle or vehicle subassembly);
- to collaborate between architect/integrator and supplier of subsystems in an integrated structure while sharing models. For example, to be able to construct a functional and behavioral architecture of a hybrid vehicle with reduced environmental impact, based on interoperable, multi-system, multi-physical and multi-scale models, in a multi-company environment (capable of integrating models produced by partners/subcontractors), and to do this with a guaranteed quality standard (representative as opposed to real).

The setting up of "system architecture" tools based on different kinds of behavioral models is a key point, and today still a real challenge to be addressed effectively to allow the performance analyses and multidisciplinary optimizations necessary in system design.

Highlights 2014

- 1st Scientific Day of the RISEGrid (EDF/Supélec) Institute: SIM project presentation by Yves Baudier.
- Paris NAFEMS Conference: SIM project presentation by Yves Baudier.
- Goknür Sirin won the "Innovation Design Simulation Challenge" of the ASME (*the American Society of Mechanical Engineers*). Internationally preselected with seven other candidates for their PhD work, she presented her work on "the organization and architecture of simulation models in the design of complex systems" brilliantly during the IDETC (*International Design and Engineering Technical Conferences*) multi-conference, held in Buffalo.



ROM

MODEL REDUCTION AND MULTIPHYSICS OPTIMIZATION

PROJECT PROFILE

Project manager: **Yves Tourbier**

Project duration: **36 months**

Industrial partners:

- Airbus Group
- Cenaero
- Distene
- ESI Group
- Renault
- Safran Group

Academic partners:

- Centrale-Supélec
- Inria
- Supméca
- Université Versailles
Saint-Quentin-en-Yvelines
(UVSQ)

Theses:

- *Surface shape optimization under vibro-acoustic and endurance criteria*
- *Shape optimization of composite structures*
- *Aerodynamic or structure cost functions sensitivities calculation regarding the design parameters*
- *Methodology for the generation of dynamic reduced models; Application to the variable blade system of an aircraft engine*
- *Bayesian Optimization in high dimension*
- *"Collaborative filtering" for choosing an optimization method*

The ROM project aims at improving the processes for the designing of complex systems, so as to reduce costs (to be halved) and lead times (to be divided by four). This project addresses complex systems that require very long computing times and a very big design space. It addresses the automobile and aerospace markets. One challenge of the ROM project is to find technical solutions that optimize the integration of digital simulation and that enhance the management of simulation models within design processes, and to improve their quality. Finally, it aims to enhance digital simulation models, properly manage their precision, and better integrate them into the digital design process.

Highlights 2014

- Study Day "Mathematical and Mechanical Modeling" at the Versailles Mathematics Laboratory (LMV) at the UVSQ.
- IRT Forum 2014.
- PGMO COPI 14 Conference.

APA

PARALLEL ALGORITHMS

PROJECT PROFILE

Project manager: **Antoine Petitot**

Project duration: **36 months**

Industrial partner:

- ESI Group

Academic partner:

- Centrale-Supélec

Thesis:

- *Domain decomposition methods on parallel architectures for car crash simulation*

The challenge today is to be able to optimize the use of massively parallel machines with more than 20,000 cores and/or allocated over separate geographical sites. The latter have interconnection technologies with a limited bandwidth per core, and greater latency. For better use of these new parallel architecture, software programs are forced to increase their degree of parallelism. The classic algorithms are not well suited to such a number of cores, because most of them need regular and frequent synchronization. This is why asynchronous algorithms appear as an attractive alternative today.

The goal of the APA project is to analyze and develop new asynchronous algorithms which have undergone little development and also seen few applications to date. This is mainly due to the fact that the existing asynchronous algorithms are less efficient than the classic algorithms in situations where communications are not the main constraint.

With the emergence of machines which have more than 200,000 cores, or are allocated over different sites, these algorithms are now becoming more interesting, since they avoid the need for regular and frequent synchronization -- so long as new, reliable and functioning asynchronous algorithms can be developed.

The APA project is based on two main tasks:

- The development of new mathematical methods and digital algorithms to enable the efficient use of modern supercomputers with multicore (supercomputers) and/or networked architectures (Cloud Computing).
- The experimental development of digital algorithms for the resolution of very large linear systems. The methods considered will be based on domain decomposition and will be systematically applicable to issues generated by the ESI Group VPS application. The intended platforms will be modern supercomputers featuring a very large number of cores and/or networked cores (Cloud).

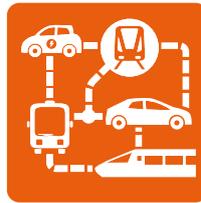
Systems of Systems Program



François Stephan
 Systems of Systems
 Program Director,
 SystemX Technological
 Research Institute (IRT)

The objectives of the "Systems of Systems" program cover several challenges that manufacturers must confront. Environmental issues have pointed up several important domains for which a systems of systems approach is necessary, including transport systems, energy management, water management, urban planning, safety, and others. Optimization of resource usage is becoming a key consideration in all markets: whoever can prove that their product or system achieves this will have a crucial advantage.

SYSTEMS OF SYSTEMS



Multimodal Transport



Security and Multimedia



Energy Management

Today, big French companies and corporations are investing heavily in systems of systems engineering, with the aim of accomplishing this optimization goal.

More specifically, a system of system consists of subsystems that fulfill all or some of the following attributes: the components are heterogeneous, have a relative autonomy, are distributed location-wise, are interconnected and/or in interaction, can be social and economic factors and, in some cases, can be natural elements.

The Systems of Systems program addresses the concepts of integration, interoperability and, above all, capacity augmentation and scalability, as regards the following three themes: multimodal transport, safety and multimedia, and energy management.

Multimodal Transport	Security and Multimedia	Energy Management	Another project
<p>MIC Modeling - Interoperability - Cooperation</p>	<p>IMM Multimedia Multilingual Integration</p>	<p>SCE Smart City Energy Analytics Project 2014</p>	<p>IN2RAIL Optimization of power consumption for future rail transport</p>
<p>LRA Localization - Augmented Reality</p>	<p>EIC Environment for Interoperability and Integration in Cybersecurity Project 2015</p>		
<p>SVA Simulation of Autonomous Vehicle Safety Project 2015</p>	<p>SIP PLM Interoperability & Standards</p>		

Highlights 2014

- 1 In 2014, the "Systems of Systems" project launched its first research project in the energy sector, the SCE (Smart City Energy analytics) project, aimed at developing an open platform for the analysis of energy data in the city, involving technology suppliers, system integrators, energy and transport services, operators and university research entities. This experimental platform will enable the testing of different strategies of energy management and possibly the appearance of new economic models.
- 2 The "Systems of Systems" program took over the responsibility for coordinating the "security" line of the plan for the New Industrial France (NFI) "autonomous vehicle", by defining, with the French ecosystem concerned, the first version of the associated roadmap. In parallel, the "Systems of Systems" program has prepared and built a research project entitled SVA (Simulation for the Security of Autonomous Vehicles); its operational launch took place in February 2015. The project will aim, through a research and simulation platform, to facilitate the validation and security of the system represented by the autonomous vehicle, on the basis of simulations.
- 3 In 2014, the "Systems of Systems" program continued its work with the Systematic Paris Region Cluster, in coordination with the New Industrial France (NFI) "Cybersecurity" plan, with regard to defining a research project entitled EIC (Environment for interoperability and integration in cybersecurity), whose operational launch took place in February 2015. The project will focus on addressing the complexity and growing complexity of computer security threats to IT infrastructures with a search and experimentation platform, enabling the coupling of cybersecurity technologies to be evaluated by means of innovative case studies: *smart grids*, connected objects and their environment, advanced factories, business information systems, and new associated services.
- 4 IN2RAIL: European project dedicated to the optimization of energy consumption of future railway transport, in which SystemX is involved via the SCE project.

In 2015, the "Systems of Systems" program will focus on launching new search projects in addressing mobility and energy use in the city of the future, the integration of systems for urban resilience, and a trusted platform for the management of connected objects and services.

MIC

MODELING - INTEROPERABILITY - COOPERATION

PROJECT PROFILE

Project manager: **Lionel Scremin**

Project duration: **42 months**

Industrial partners:

- Alstom Transport
- Artelys
- IDIT
- Renault
- SNCF
- The Cosmo Company

Academic partners:

- CEA
- IFSTTAR
- Inria
- Université Pierre et Marie Curie (UPMC)

Theses:

- *Positioning and sizing of an electric vehicle car sharing system in a multimodal transport environment*
- *Modeling of Multimodal transportation systems of large networks*
- *Supervision in Multimodal Transportation Systems*
- *Dynamic rerouting in multimodal transportation networks*

The MIC project launched in 2013 is focused on the domain of multimodal transport, whose challenge is to optimize multimodal mobility by finding an effective performance balance in terms of transport time, cost, energy consumption and access to transport.

This project has a twofold aim:

- to design modeling and simulation tools to enable the optimization and supervision of multimodal transport networks (transport time, cost, energy consumption and accessibility);
- to develop system models managing vehicles and transport infrastructure in order to improve global performances of network.

The design and development of a technical demonstrator are also envisaged for testing the relevance of the solutions developed from the perspective of technology suppliers, transport operators and commuters, while assessing the economic models/patterns.

The beginning of 2014 has been marked by a six-month extension of the project and its expansion to four new contributors:

- SNCF: introduction of the use of a Transilien rail line;
- The CoSMo Company: complex system modeling;
- Artelys: statistics and optimization of the four-stage movement model;
- IDIT (Institute of International Transport Law and Logistics): modeling of contractual transport relations.

Highlights 2014

- Organization of three days with project partners: Alstom in January, Renault in April and SNCF in September.
- Publication of four scientific articles in 2014.
- Demonstrations organized during the annual event Future@SystemX (March 6, 2014), the internal event MIC@SystemX (June 17, 2014) and the IRT Forum in Nantes (October 20-21, 2014).
- Presentations dedicated to delegations and visits to SystemX (DGCIS, Ile-de-France region, RATP, etc.) or externally (DRIEA, Institut VeDeCom, response to the call for tender from the Grand Paris Express, etc.).



LRA

LOCALIZATION - AUGMENTED REALITY

PROJECT PROFILE

Project manager: **Sabine Langlois**

Project duration: **36 months**

Industrial partners:

- Alstom Transport
- Assystem
- Oktal
- Renault
- Sysnav
- Valeo

Academic partners:

- CEA

Theses:

- *Designing cooperation principles for autonomous driving system*
- *Augmented Reality adaptative Human-Machine Interface for autonomous automotive driving*

The LRA project is aimed at the automotive sectors, for the development of autonomous and connected vehicles, and rail transport, in terms of evolutionary signaling solutions, in a context where a major change in localization technologies and driver/vehicle/environment

interactions will result from the automated driving of a transport vehicle. The combination of Localization and Augmented Reality ensures performance and operational safety at a lower cost for automotive and railway vehicles.

Localization for guidance is today, to a large extent, achieved by GPS for cars, and by expensive and environmentally sensitive sensors for rail. Furthermore, new driver assistance modalities such as running a car in autonomous mode (which allows the driver to delegate the driving to the vehicle) impose a need to rethink human-machine interaction. The goal of the LRA project is to give the driver a localization system in the event of breakdown, and to broaden the possibilities of driver interaction with the vehicle thanks to augmented reality. The technological challenge of the project is based on the growing complexity of localization and driving assistance systems, with the emergence of new sensor and HMI (Human-Machine Interface) technologies and at a lower cost.

Highlights 2014

- A driving simulator has been installed at SystemX. On the subject of augmented reality (which moves through stages of localization, perception potentially based on image analysis, and recognition), a demonstration has been prepared which outlines the elements of the problem to be resolved (real object to be localized, detected and recognized; perspective to be localized; annotation to be positioned according to sufficient momentum) and the errors to be reduced. This demonstration was carried out during the IRT Forum 2014.



IMM

MULTIMEDIA MULTILINGUAL INTEGRATION

PROJECT PROFILE

Project manager: **Olivier Mesnard**

Project duration: **36 months**

Industrial partners:

- Bertin Technologies
- Capgemini
- Exalead
- Ministry of Defense
- OVH.com
- Systran
- Temis
- Vecsys
- Vocapia Research

Academic partners:

- CEA
- Inria
- Laboratoire National de métrologie et d'Essais (LNE)
- Université Pierre et Marie Curie (UPMC)

Theses:

- *Real-Time analysis of diffusion processes on large scale social networks*
- *Towards coherent probabilistic knowledge bases*

The IMM project falls within the context of an increase in the data produced and disseminated in the world, with the volume doubling every year. The project must respond to the need for the development of tools to help a supervisory user to extract knowledge from an unstructured data stream (mainly text and audio), that is useful at a given time for producing a report or taking a decision.

The studies to be undertaken will notably address upscaling, support for multiple information items within the links and nodes of the network, support for its dynamic aspect, and the development of visualization tools suitable for large-scale networks. The domains of usage targeted are contingency management, cybersecurity and strategic monitoring.

Highlights 2014

- 2014 was taken up with bringing together all those involved in the infrastructure and to obtain initial results: these are represented by the initial version of a platform and a first demonstrator. The most visible dominant activities were those of development and integration. A presentation of these initial results and of demonstrator was made during the IRT 2014 Forum.



SIP

PLM INTEROPERABILITY & STANDARDS

PROJECT PROFILE

Project manager: **Nicolas Figay**

Project duration: **36 months**

Industrial partners:

- Airbus Group
- Boost Conseil
- Datakit

Academic partners:

- Université Paris 8
- Université Technologique de Compiègne (UTC)

Theses:

- *Contribution to the establishment of an interoperability approach in the context of extended PLM*
- *Simulation software interoperability in a collaborative, multi-disciplinary and multi-organizational environment*

The SystemX Technological Research Institute (IRT) addresses the new challenges faced by manufacturers through the PLM Interoperability & Standards (SIP) project: to facilitate the emergence of collaborative digital technology in the manufacturing industry (aerospace, automotive, rail, etc.). To address these challenges, the SIP project envisages setting up a methodology and testing platform to accelerate the implementation of PLM Interoperability & Standards (Product Life-cycle Management) throughout the ecosystem at a controlled cost.

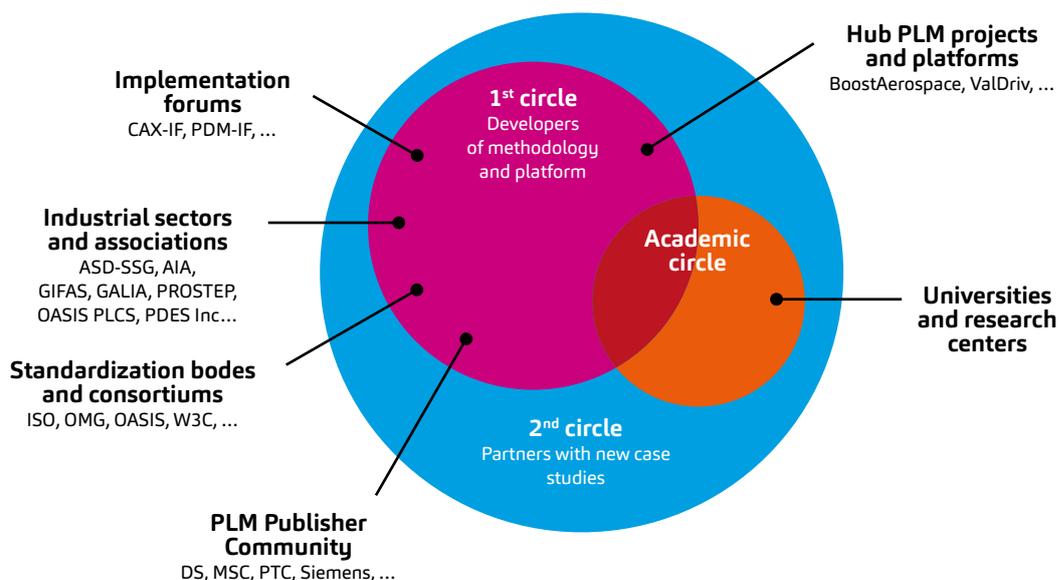
The problem addressed by the SIP project involves:

- The performance and the competitiveness of large groups, such as SME partners, which depends increasingly on their capacity to "connect efficiently" to the PLM network;
- PLM interoperability, based on standards which recognize rapid change and which represent a growing strategic interest for manufacturers.

The results of the SIP project, in particular the *testbed* for evaluation of standards and their implementation, must be integrated into the standardization landscape in such a way to understand the industrial challenges associated with standards and to navigate the evolution of these standards based on agreed implementation targets, with the level of maturity required. Thus the SIP project must be an engine to create a community around its platform.

An initial circle of partners is necessary to establish the architecture of the *testbed*, and validate it on the first industrial cases. A second circle of broader partnership then has to be formed quickly, so as to feed the first version of the platform with new cases and, in particular, to implement a desired transversal extension, both for cases within a particular industry and for cases covering multiple industries. The university circle is composed of universities and laboratories interested in the subject. Some are members of the first circle, while others are being regularly consulted and informed by the universities of the first circle.

SIP ecosystem





This means that the testbed has to both feed and be fed by:

- manufacturers wanting to test the usability of a standard within their business processes;
- software companies wanting to test the implementation of a standard within their system on cases of industrial usage, or wanting to know how to implement a standard;
- academics, for testing new methods and systems of interoperability, drawing on industrial study cases provided within the platform;
- industry bodies and standardization organizations working on the same types of standard as the cases covered within the platform;
- the other existing PLM collaborative platforms.

Highlights 2014

Our work during 2014 raised the profile of the project, both at the level of the scientific community as well as the PLM standards ecosystem.

External connections and participation with the PLM standards ecosystem (L5.X) via project partner networks:

- Links with professional associations (ASD-SSG, GALIA).
- Links with normalization bodies (ISO-TC4-SC4).
- Links with international counterparts (National Institute of Standards and Technologies, NIST).
- Links with solution providers:
 - Participation and implications on the implementation forums CAX-IF and LOTAR.
 - Assembly of an implementation forum dedicated to PDM-to-PDM exchanges called PDM-IF: contribution to the writing of the "white paper" describing the objectives and proposed approach (use of methodology and SIP platform).
 - Ongoing assembly of an SIP partnership with JOTNE and MSC Software.
- Links with training bodies:
 - Ongoing assembly of an SIP partnership with AIP-PRIMECA.

Demonstrations:

- First draft demonstration presented to Future@SystemX on 6 March 2014.
- Organization of the SIP@SystemX Day on 5 September 2014 with all project partners.

SCE

SMART CITY ENERGY ANALYTICS

PROJECT
2014

PROJECT PROFILE

Project manager: **Amira Ben Hamida**

Project duration: **48 months**

Industrial partners:

- Alstom Grid
- Alstom Transport
- Artelys
- Ecogelec
- G2 Mobility
- GDF Suez
- OVH.COM
- Sherpa Engineering
- The Cosmo Company

Academic partners:

- CEA
- Centrale-Supélec
- IFSTTAR

Theses:

- *Management of a smart urban grid*
- *Data-mining tools for spatio-temporal energy data analysis*

The management of energy is a major concern for cities, in particular for environmental reasons. With energy in transition toward the objective of gradually integrating new, renewable energy sources into the overall mix, energy production, transport and distribution networks, referred to as "*grids*", are going to evolve from a vertical architecture in a predictable regime to an increasingly more horizontal mesh architecture, "*peer- to peer*", and increasingly less predictable. It is therefore essential for cities to adopt more intelligent management in order to best manage consumption, but also energy production.

In such a development, the management of data becomes a major challenge for electricity suppliers, in order to capitalize on the exponential growth of data produced by different stakeholders related to energy: data on individual energy consumption, on human mobility, electric vehicles, availability and production of renewable energy sources, etc.

Thanks to new "Big Data" technologies and their capacity to extract the meaning of behaviors within global and local capacities, it will become possible to create interaction between buildings, districts, public transport and electric vehicles taking into account grid constraints. City stakeholders will become more "intelligent" due to their capacity to measure and act appropriately.



The Smart City Energy analytics (SCE) project, launched in October 2014, seeks to develop an open platform for the analysis of data combining technology suppliers, system integrators, energy and transport services, operators and university research entities. This platform will enable the testing of different strategies for energy management and possibly the emergence of new economic models.

The project is based on four key areas of focus:

- Collection/analysis/improvement of heterogeneous data quality (sensors, social networks, etc.);
- Energy performance modeling of systems in place;
- Decision aids through innovative, reliable and relevant recognition/ visualization tools;
- Development of *business* models.

Challenges

- To define and choose the architecture and technology for data collection and analysis;
- To research new strategies with regard to data visualization as an aid to decision-making;
- To evaluate the potential of technological elements developed by different cases and to integrate them;
- To ensure secure interoperability with other city infrastructures (transport, lighting, buildings).

Strategy for Competiveness and Growth



Gaëlle Berthomieu
Training and SMEs Relations
Programs Manager, SystemX
Technological Research Institute (IRT)

Engineering Training

The SystemX training program intends, firstly, to support digital systems engineering training by further education and research institutions, in accordance with the needs of industrial companies and corporations, and in association with the research projects underway at SystemX. Secondly, to contribute to the development of the lines of expertise necessary for training engineering adapted for students.

A Skills Observatory in Engineering of Complex Systems

SystemX has set up a professions, skills and systems engineering training observatory, which will identify all the training needs in this field.

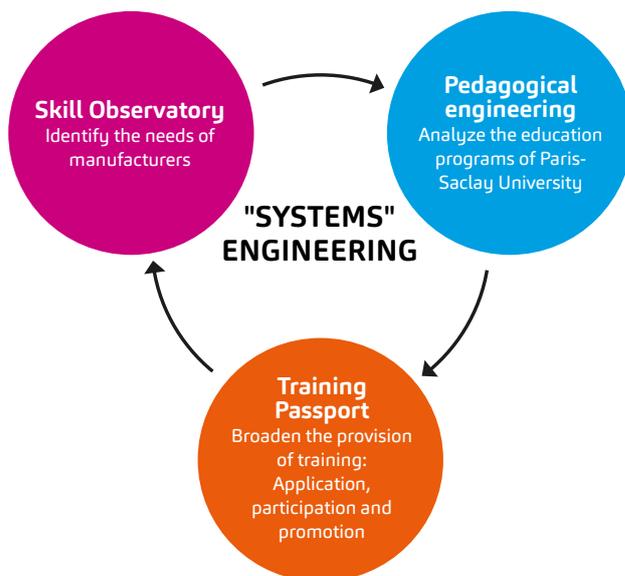
This observatory will be established on the basis of the following elements:

- the collection of the skill and competence needs of SystemX's business partners;
- analysis of the training offered by the Paris-Saclay University in these same skills.

This cross-sectional study, between the expressed needs of the ecosystem's companies

and the offer of training courses within the scope of the future Paris-Saclay University in 2014, will enable us to identify the first study fields required to complete this training offer. An initial questionnaire was addressed to a panel of almost 100 people, as partners of SystemX. This panel comprised human resources managers, innovation directors, technical directors, operations managers and project managers at SystemX. The questionnaire was prepared on the basis of two studies previously carried out in the subject area: the study of consolidated skills by the Systematic Paris Region Cluster in 2006 and the frame of reference by AFIS (French Association of System Engineering), dated 2011, on the profession of system architect. The processing of the initial results is under consideration and will be unveiled during 2015.

SystemX Technological Research Institute (IRT) Training Program:



Serving students through pedagogical engineering

SystemX is working with the doctoral school of the Paris-Saclay University in order to define a catalog of training courses for SystemX PhD students. The IRT also confirmed its involvement in the STIC (Science and Technologies of Information, and Communication) doctoral school and a collaboration with the "Interfaces" doctoral school is under consideration.

In addition, the institute has also deployed a comprehensive range of internships which involve either the intake of individual trainees into R&D projects, or the hosting of trainees within the CREE projects (Research Student Company Cooperation – Coopération Recherche Etudiants Entreprise in French).

A CREE project enables the putting into practice of multidisciplinary skills around an industrial problem. It groups together a set of three students who will work together as a "system" team.

An internship in a CREE project corresponds to an end-of-studies internship project for students and lasts for a period of 5 to 6 months. Each student has a specific goal corresponding to an internship subject and provides the "system" team with a specific set of skills (systems, software, simulation, IT, marketing, etc.). The CREE projects offer a unique working environment to student interns, notably thanks to the proximity to SystemX's research projects and the close relationships with many partner companies and academic laboratories

"CREE" program launch in 2014

Launched in 2014, this CREE program accommodates about 30 interns working on themes such as cloud computing, intensive computation, driving simulation and modeling, simulation and optimization of digital models. Below are examples of internship subjects:

- Reduction and optimization of simulation models with the creation of a human-machine interface;
- Production of a demonstrator of a web service with digital optimization;
- Definition of the future architecture reference of the *private* cloud;
- Definition and implementation of intermediate sized intensive computing platform;
- Implementation of an automobile driving simulator in order to evaluate the usage of driving assistance.

In 2015, five new "CREE" teams comprising 3-4 students will be launched. The subject files have been defined by the existing R&D project teams and based on work to be performed in terms of technological reference platforms.

Serving PhD students through training engineering

A "training passport" for SystemX PhD students has been prepared in cooperation with some Paris-Saclay PhD graduate schools and the doctoral school of the Paris-Saclay University, as well as the IRT group. The aim is to complete and showcase the skills of the research

institute's PhD students in order to facilitate their employability within the industry. It is based around four subject areas:

- The personal and professional development of PhD students;
- Oral and written communication;
- Multidisciplinary and multicultural project management;
- Innovation and entrepreneurship.

Serving SME through the distribution of technology.



In December 2014, SystemX launched the SAAS Academy whose aim is to support software companies in their transformation into *Cloud stakeholders*. In terms of objectives, the SAAS Academy will accompany over three years some 600 French software companies in their transition to the Cloud, through a series of awareness and coaching sessions in 13 French regions. Unique in Europe, this initiative, steered by the largest stakeholders of the Cloud ecosystem in France, is part of 10 proposed measures by the NFI plan for Cloud Computing.

The development of the digital economy and its positive effect on the competitiveness of all industrial sectors is essentially based on the capacity of France to promote the creation and development of software companies capable of supporting these ambitions. The growth of start-up development in this field is a major issue, however the migration of all companies towards the economic and technological models compatible with Cloud and SaaS (Software as a Service) is fundamental. In fact, with 3,000 software companies, France has a potential breeding ground for considerable growth. The SAAS Academy intends to address this issue.

On the initiative of private stakeholders (OVH, Intel, IBM, HP, Microsoft, VMware and Crayon), the SAAS Academy program is fully in line with

the "Plan Cloud Computing" recommendations of 34 plans of the NFI (New Industrial France), which identified the transformation of software companies towards SaaS and Cloud as one of the 10 priority action plans for the roadmap validated in the Interministerial Steering Committee in June 2014. With the support of the AFPC (French Association of Competitive Clusters), ATN+ (Digital Transition Association Plus), Digital Syntec, AFDEL (French Association of Software companies and Internet Solutions), EuroCloud, BPIFrance and the DGE (Directorate General for Enterprise), and the Ministry of Economy, Industry and Digital Technology, the SAAS Academy has the objective of making 600 companies aware of this subject area, and implementing a coaching program with at least 120 of them over the same period.

The SAAS Academy will also meet senior executives throughout France, at "awareness sessions" for a dozen people capable of discussing the business issues concerned. These sessions will be followed, for the executives involved, by in-depth coaching on the questions of economic and sales models, technological architecture and development funding. At the end of five years of coaching, the executives will be equipped with the specific elements to complete a business plan, to implement a technical PoC (Proof of Concept), and the possibility of accessing "one-stop" financing (banking, capital, repayable advances). The SAAS Academy will provide follow-up on the implementation of these operations. The first awareness sessions started on January 14, 2015 and the first coaching sessions were scheduled for April 2015.

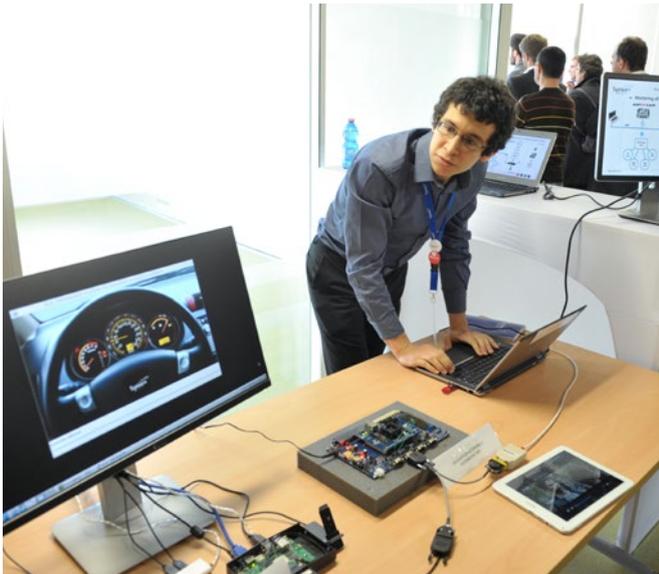
Simulation Academy

Under the NFI "Simulation" plan, in partnership with Teratec, Genci and other stakeholders, an awareness and training program is under consideration for 2015.

Visibility and Promotion

Throughout 2014, SystemX focused on promoting and highlighting its overall work program through numerous communication actions. The year was marked by four highlights:

March 6, 2014: Future@SystemX



SystemX presented an annual activity report on its 10 ongoing research projects. Almost 400 individuals participated in this event, a real technological showcase.

June 24, 2014: Convention of the Systematic Paris Region Cluster



Within the framework of the Annual Convention of the Systematic Paris Region Cluster, SystemX was given the opportunity to present some of its work, in an exhibition area dedicated to the demonstration of around 20 collaborative R&D initiatives.

October 20 and 21 2014: 2nd National IRT Forum

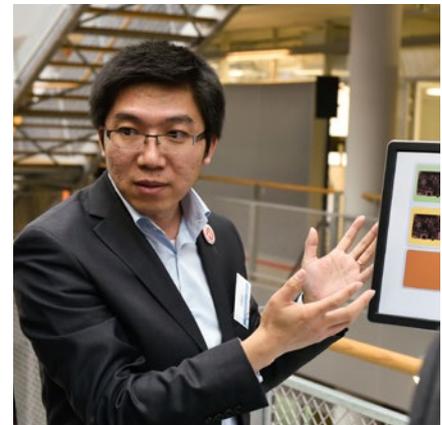


This took place in Nantes, attended by Louis Schweitzer, General Commissioner for Investment, Jean-Marc Ayrault, former Prime Minister, under the leadership of the Jules Verne IRT. On the agenda were demonstrations illustrating the technologies developed by each institute, roundtable discussions with the participation of large industrial and academic stakeholders involved, a focus on the students invited to discover the world of R&D, etc. An event which demonstrated the significant impact of IRTs in economic development and innovation, and which saw the announcement of the creation of the IRT Association.

December 2, 2014: STIC Forum Paris-Saclay



This is an annual meeting of the academic community of STIC (Science and Technologies of Information and Communication) which is structured around conferences, workshops and meetings. This offered an opportunity for PhD students in the STIC field and SystemX to present their work through posterboard sessions.



In addition to these highlights, SystemX also attended the TERATEC Forum at the beginning of July, alongside partners of the Systematic Paris Region Cluster, then at the CSD&M Conference 2014 (Complex Systems Design & Management) steered by the CESAMES Association (Center of Excellence In Architecture, Management and Economics of Systems) with which SystemX has established a partnership contract, and finally at the 1st edition of the conference Smart Manufacturing Paris-Saclay (SMPS), whose objective was to gather together the Ile-de-France ecosystem of the Factory of the Future sector and to build on the strengths of the region and its stakeholders.

In 2015, SystemX will undertake communication activity in close support of the institute's global strategy. Also, make a note in your diary that SystemX will lead the AFIS workshop (French Association of System Engineering) on October 7 and 8, 2015 as part of its partnership with the association of the same name, the French "chapter" of INCOSE (International Council on Systems Engineering).

News 2014

Corporate events

December 2, 2014	Forum STIC Paris-Saclay	Palaiseau
November 28, 2014	Smart Manufacturing Conference Paris-Saclay	Versailles
November 12-14, 2014	CSD&M 2014	Paris
October 20 and 21, 2014	2nd National IRT Forum	Nantes
July 1 and 2, 2014	Teratec Forum	Palaiseau
June 24, 2014	Systematic Convention Paris-Region	Paris
May 15 and 16, 2014	ScilabTEC 2014	Palaiseau
March 6, 2014	Future@SystemX	Palaiseau

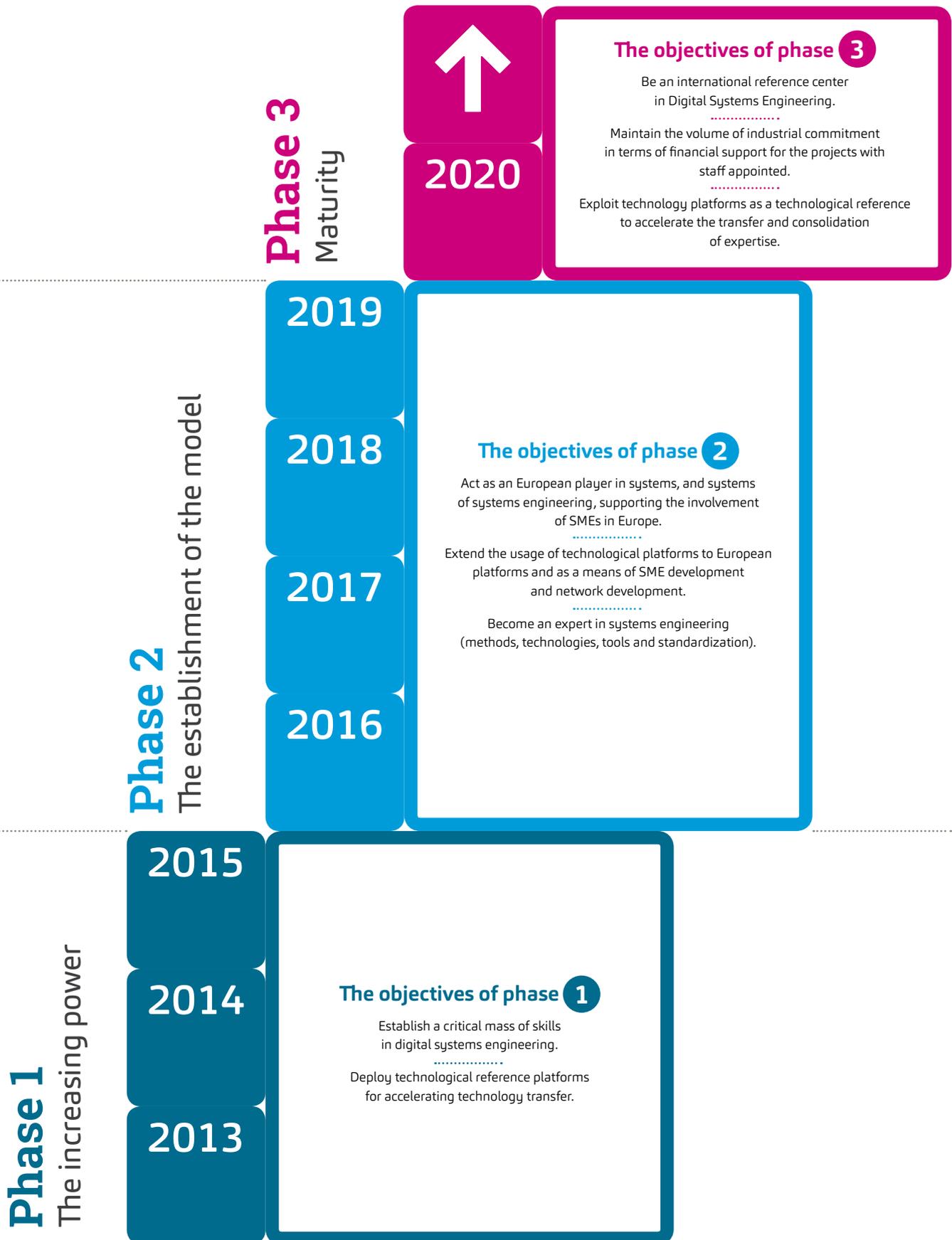
International delegations and seminars

October 2, 2014	4 th Seminar@SystemX : <i>Trading off bandwidth for memory in a future information-centric Internet</i> - James Roberts, SystemX Technological Research Institute (IRT), France	
July 29, 2014	3 th Seminar@SystemX: <i>Latest developments in Vehicle-to-Infrastructure (V2X) from ITRI Taiwan</i> - Huei-Ru Tseng, Industrial Technology Research Institute, Taiwan	
July 1, 2014	2 th Seminar@SystemX: <i>The visualization of information for understanding and interacting with data</i> - Jean-Daniel Fekete, Inria, France	
June 18, 2014	Gabon Delegation	
May 23, 2014	Singapore Delegation	
April 17, 2014	1 st Seminar@SystemX : <i>The role of value-driven decision making in systems engineering and design</i> - Chris Paredis, GeorgiaTech, GA, USA	
January 8, 2014	Taiwan Delegation	

Press releases

November 27, 2014	Autonomous vehicle: SystemX launches ISE project
November 12, 2014	The CoSMo Company at the heart of the Smart City Energy analytics (SCE) project, conducted in SystemX Technological Research Institute (IRT)
October 23, 2014	The technological research institutes, two years after...
October 16, 2014	SystemX launches the SCE – Smart City Energy analytics project
June 26, 2014	SystemX Technological Research Institute (IRT)'s MIC project enters into a second execution phase
May 22, 2014	SystemX launches the APA (Parallel Algorithmics) project on digital simulation
May 6, 2014	SystemX launches the ARE project – "Network Architecture", a new open innovation project on the strategy of network innovation
April 3, 2014	SystemX launches the LRA project – "Localization - Augmented Reality": a double challenge for cars and railway
March 6, 2014	SystemX presents its annual activity report 2013
January 28, 2014	SystemX launches its SIP (PLM Interoperability & Standards) project

2015 and beyond...



Publications

A brief description of car sharing integration within a multimodal transport system	A. Carlier, F. Tschirhart, F. Da Silva, F. Stephan, O. Thoni, A. Munier-Kordon, M. Abid, L. Scremin, L. Couturier	
A business process modeling approach for collaborative modeling & simulation problems	L. Roa Castro, J. Stal-Le Cardinal	
A Mathematical Programming Approach to Multi-Cloud Storage	M. Hadji	CLOSER 2015
A multiclass vehicular dynamic traffic flow model for main roads and dedicated lanes/roads of multimodal transport network	K.S. Sossoe, J-P. Lebacque	
A Virtual Machine Repacking in Clouds: Faster Live Migration Algorithms	M. Hadji, P. Labrogère	SIGCOMM 2014
Adaptation of RUN to Mixed-Criticality Systems	R. Gratia, T. Robert, L. Pautet	
An Implementation Relation and Test Framework for Timed Distributed Systems	C. Gaston, R. M. Hierons, P. Le Gall	ICTSS 2013
An Overview Of Collaborative Simulation On Design Process	L. Roa Castro, J. Stal-Le Cardinal	
Analyzing cacheable traffic in ISP access networks for micro CDN applications via content-centric networking	C. Imbrenda, L. Muscariello, D. Rossi	
Architecture Models Refinement for Fine Grain Timing Analysis of Embedded Systems	E. Borde, L. Pautet, S. Rahmoun	RSP 2014
Optimal scaling of synchronous machines on the operating cycle for hybrid vehicle applications	S. Küttler, K. El Kadri Benkara, G. Friedrich, A. Abdelli, F. Vangraefschèpe	
Dynamic Manufacturing Network, PLM Hub and Business Standards Testbed	Figay et al. 2014	In Enterprise Interoperability VI (pp. 453-463), Springer International Publishing
Dynamic Resource Allocation in Clouds: Smart Placement with Live Migrations	M. Hadji	DNAC 2013
Enhanced Cluster Computing Performance through Proportional Fairness	T. Bonald, J. Roberts	Performance 2014
Fast Iron Losses Model Taking into Account the Control Laws for Optimal Sizing of IPMSM	S. Küttler, K. El Kadri Benkara, G. Friedrich, A. Abdelli, F. Vangraefschèpe	
Feasibility Study in the use of contract-based approaches to deal with safety-related properties in CPS	D. Cancila, E. Soubiran, R. Passerone	De-CPS 2014
Featherweight OCL: A Proposal for a Machine-Checked Formal Semantics for OCL 2.5	A. D. Brucker, F. Tuong, B. Wolf	Archive of Formal Proof
Impact of the field weakening on the iron losses in the stator of an internal permanent magnet synchronous machine	S. Küttler, K. El Kadri Benkara, G. Friedrich, A. Abdelli, F. Vangraefschèpe	
Improving profit through cloud federation	S. Rebai, M. Hadji, D. Zeghlache	IEEE CCNC 2015

Interoperability of simulation applications for dynamic network enterprises based on cloud computing – Aeronautics application	Ottino et al. 2014	CE2014
Mathematical Programming Approach for Revenue Maximization in Cloud Federations	M. Hadji, D. Zeglache	IEEE TCC Journal, 2015
Meta-Programming in Isabelle/HOL The Case of UML	D. Longuet, F. Tuong, B. Wolf	DigiCosme 2014
Mixed-criticality in Railway Systems: A Case Study on Signaling Application	A. Cohen, V. Perrelle, D. Potop-Butucaru, E. Soubiran, Z. Zhan	Workshop on Mixed Criticality for Industrial Systems 2014
Multi-Resource Fairness: Objectives, Algorithms and Performance	T. Bonald, J. Roberts	Sigmetrics 2015
On the Semantics of Object-oriented Data Structures and Path Expressions	A. D. Brucker, D. Longuet, F. Tuong, B. Wolf	OCL 2013
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