IN PARTNERSHIP WITH:
Université des sciences et technologies de Lille (Lille 1)

Activity Report 2012

Project-Team ADAM

Adaptive Distributed Applications and Middleware

IN COLLABORATION WITH: Laboratoire d'informatique fondamentale de Lille (LIFL)

RESEARCH CENTER
Lille - Nord Europe

THEME
Distributed Systems and Services

Table of contents

1. Members **1**
2. Overall Objectives **2**
2.1. Introduction 2
2.2. Highlights of the Year 2
3. Research Program **3**
3.1. Introduction 3
3.1.1. Aspect-Oriented Software Development (AOSD) 3
3.1.2. Component-Based Software Engineering (CBSE) 3
3.1.3. Context-Aware Computing (CAC) 4
3.2. Two Research Directions 4
3.2.1. Adaptable Component Frameworks for Middleware 4
3.2.2. Distributed Application Design for Adaptive Platforms 5
4. Application Domains **5**
4.1. Introduction 6
4.2. Electronic Commerce 6
4.3. Embedded Systems 6
4.4. Health Care Information Systems 6
4.5. Information Systems for Terrestrial Transport 7
5. Software and Platforms **7**
5.1. Introduction 7
5.2. AppliIDE 7
5.3. CALICO 7
5.4. Fractal 8
5.5. FraSCAti 8
5.6. PowerAPI 9
5.7. SPACES 9
6. New Results **9**
6.1. Software Product Lines 9
6.2. Software Evolution 10
6.3. Green Middleware 10
6.4. Human-Competitive Software Engineering 10
6.5. Reconfigurable Middleware 10
7. Bilateral Contracts and Grants with Industry **11**
8. Partnerships and Cooperations **12**
8.1. Regional Initiatives 12
8.2. National Initiatives 12
8.2.1. ANR 12
8.2.2. Competitivity Clusters 13
8.2.3. Inria 14
8.3. European Initiatives 14
8.4. International Initiatives 15
8.4.1. Inria Associate Teams 15
8.4.2. Inria International Partners 16
8.4.2.1. OW2 16
8.4.2.2. ERCIM Working Group on Software Evolution 16
8.4.2.3. University of Los Andes, Bogota, Colombia 16
8.5. International Research Visitors 16
9. Dissemination **17**
9.1. Scientific Animation 17

9.2. Teaching - Supervision - Juries 19
9.2.1. Teaching 19
9.2.2. Supervision 20
9.2.3. Juries 20
9.3. Popularization 21
10. Bibliography **21**

Project-Team ADAM

Keywords: Software Engineering, Adaptive Systems, Ambient Computing, Aspect Oriented Programming, Component Programming, Self-adaptation

Creation of the Project-Team: 2008 January 01.

1. Members

Research Scientists

Philippe Merle [Junior Researcher (CR1), Inria, vice-head of project-team]
Christophe Gransart [Research Associate (CR1), IFSTTAR, external collaborator]

Faculty Members

Laurence Duchien [Professor, University Lille 1, project-team leader, HdR]
Martin Monperrus [Associate Professor, University Lille 1]
Romain Rouvoy [Associate Professor, University Lille 1]
Lionel Seinturier [Professor, University Lille 1, IUF, HdR]
Jean-Marc Geib [Professor, University Lille 1, external collaborator, HdR]

Engineers

Aurélien Bourdon [Expert Engineer, FUI EconHome]
Gwenael Cattez [Recent Graduate Engineer, ADT Adapt]
Antonio de Almeida Souza Neto [Expert Engineer, FP7 EasySOA, until 30 September 2012]
Michel Dirix [Expert Engineer, FP7 EasySOA, until 30 September 2012]
Christophe Munilla [Expert Engineer, FP7 EasySOA, until 31 August 2012]
Nicolas Petitprez [Expert Engineer, FUI Macchiato]

PhD Students

Benoit Cornu [Contrat doctoral Lille 1, since 1 October 2012]
Rémi Druilhe [CIFRE Orange Labs]
Alexandre Feugas [Inria CORDI-S]
Nicolas Haderer [Contrat doctoral Lille 1]
Gabriel Hermosillo [ATER, until 31 August 2012]
Jonathan Labéjof [CIFRE Thales until 31 August 2012, Expert Engineer FUI EasySOA since 1 October 2012]
Matias Martinez [Erasmus Mundus]
Rémi Mélisson [CIFRE Orange Labs, until 31 July 2012]
Adel Noureddine [Inria/Région Nord-Pas de Calais FUI EconHome]
Russel Nzekwa [ANR SALTY]
Fawaz Paraiso [Inria/Région Nord-Pas de Calais ANR SoceEDA]
Clément Quinton [FUI EconHome]
Marc Sango [IFSTTAR, since 1 October 2012]

Post-Doctoral Fellows

Nabil Djarallah [ANR SocEDA, since 1 March 2012]
Daniel Romero [ATER until 31 August 2012, Expert Engineer ANR YourCast since 1 September 2012]

Administrative Assistant

Christelle Gasperini [Inria]

Others

Gabriel Tamura [Visiting Scientist, U. Icesi, Cali, Colombia, October 2012]
Norha Villegas [Visiting Scientist, U. of Victoria, Canada, October 2012]
Patrick Heymans [Visiting Scientist, U. Namur, Belgium, until 30 April 2012]
Anthony Da Costa Maia [L3 MIAGE Intern, U. Lille 1, 1 March 2012 to 31 July 2012]

Daniel René Fouomene Pewo [Master Intern, U. of Yaoundé, Cameroun, 1 March 2012 to 31 October 2012]
Maxence G. de Montauzan [L3 MIAGE Intern, U. Lille 1, 1 March 2012 to 31 July 2012]
Diego Mendez [Master Intern, UNICEN, Argentina, 1 June 2012 to 30 November 2012]
Sébastien Poulmane [Master Intern, U. Lille 1, 1 June 2012 to 31 August 2012]

2. Overall Objectives

2.1. Introduction

With the increasing need of self-managed systems and the emergence of multi-scale environments, software developers have to cope with variability. Software must be developed to be adapted and reconfigured automatically on heterogeneous platforms in accordance with the unavoidable evolution of information and communication technologies. Therefore, the adaptation is now considered as a first-class problem that must be taken into account throughout the entire software life-cycle.

An *adaptive system* is a software-intensive system that can adjust and respond to changes in its environment, evolving requirements, removal of obsolete technologies or introduction of new technologies, and new knowledge. The objective of the ADAM project-team is to provide a set of paradigms, approaches and frameworks based on advanced software engineering techniques, such as *Component-Based Software Engineering* (CBSE), *Aspect-Oriented Software Development* (AOSD), or *Context-Aware Computing* (CAC), to build distributed adaptive software systems evolving in multi-scale environments and to take into account the adaptation all along the software life-cycle. We propose to follow two research directions: the definition of adaptable component frameworks for middleware and the design of distributed applications for adaptive platforms.

2.2. Highlights of the Year

We highlight two results that are of particular interest with respect to our annual activity. Both of them deal with the reconfiguration of software systems and are related to PhD theses that have defended in 2012. The first one is concerned with the application of the notion of reconfiguration to software processes in service-oriented architectures. The second one deals with the formalization of quality of service contracts in reconfigurable software systems.

Gabriel Hermosillo's PhD thesis [11], that was defended on 5 June 2012, deals with reconfigurable middleware, and has provided a solution for dynamically reconfiguring business processes in service-oriented architectures. So far, our results in terms of reconfiguration were mainly in terms of fine-grained artefacts, such as components. This thesis has demonstrated that this property can be achieved for coarse-grained artefacts, such as business processes. This opens interesting perspectives, especially in terms of industrial impact, since many complex workflow activities in IT systems are expressed as business processes with stringent needs for adaptation to evolving execution conditions. Furthermore, the thesis demonstrated that the domains of Complex Event Processing (CEP) [107] can be integrated in a comprehensive framework where events and their processing rules are the triggering conditions for process adaptation. This has resulted in the development of the CEVICHE framework that was the topic of several major publications [104], [103], [114] in addition to the thesis manuscript itself.

Gabriel Tamura's PhD thesis [12], that was defended on 28 May 2012, deals with the reliable preservation of quality of service (QoS) contracts in component-based software systems under changing conditions of execution. In response to this challenge, the presented contribution is twofold. The first one is a model for component-based software applications, QoS contracts and reconfiguration rules as typed attributed graphs, and the definition of QoS-contracts semantics as state machines in which transitions are performed as software reconfigurations. Thus, we effectively use (formal) models at runtime to reliably reconfigure software applications for preserving its QoS contracts. More specifically, we show the feasibility of exploiting design patterns at runtime in reconfiguration loops to fulfill expected QoS levels associated to specific context conditions. We realize this formal model through a component-based architecture and a reference

implementation that can be used to preserve the QoS contracts of executed middleware applications. The second contribution is the characterization of adaptation properties to evaluate self-adaptive software systems in a standardized and comparable way. By its own nature, the adaptation mechanisms of self-adaptive software systems are essentially feedback loops as by defined in control theory. Thus, it is reasonable to evaluate them using the standard properties used to evaluate feedback loops, re-interpreting these properties for the software domain. We define the reliability of our formal model realization in terms of a subset of the characterized adaptation properties, and we show that these properties are guaranteed in this realization. This has resulted in the development of the QoS-CARE framework that was the topic of several major publications [66], [67], [63], [127] in addition to the thesis itself.

3. Research Program

3.1. Introduction

In order to cope with our objective, we will consider software paradigms that will help us in our approach at the various levels of our life-cycle of adaptive systems, but also in the tools themselves for their composition. We will also study these paradigms in the middleware and application design in order to extend them and to have a better understanding. These extensions will be formalized as much as possible.

3.1.1. Aspect-Oriented Software Development (AOSD)

In modern software engineering, language constructs are classified according to how they recombine partial solutions for subproblems of a problem decomposition. Some constructs (*e.g.*, methods and classes) recombine partial solutions using classic hierarchical composition. Others recombine the partial solution using what is known as crosscutting (a.k.a. aspectual) composition. With crosscutting composition, two partial solutions (called aspects) are woven into each other in a way that is dictated by so-called pointcut languages. The necessity of crosscutting composition is the main motivation for the AOSD [87], [105] paradigm. The challenge will be first to study new expressive pointcut languages in order to have a better description of composition locations in adaptable software. The second objective will be to extend and to integrate new techniques of weaving at design time, but also at run time in order to compose software safely. The third objective will be to go beyond simple aspects as persistence and logging services. We plan to study complex aspects such as transactions or replication and to control their weaving in order to master the evolution of complex software.

3.1.2. Component-Based Software Engineering (CBSE)

In a post-object world [101], software components [110] are, with other artifacts such as aspects, one of the approaches that aims at overcoming the limitations of objects and providing more flexibility and dynamicity to complex applications. For that, software components present many interesting properties, such as modularity, encapsulation, and composability. Yet, many different component models and frameworks exist. A survey of the literature references more than 20 different models (including the most well-known, such as EJB [86] and CCM [85]), but the exact number is certainly closer to 30. Indeed, each new author proposes a model to address her/his own need related to a particular execution environment (from grid computing to embedded systems) or the technical services (from advanced transactions to real-time properties), which must be provided to the application components. These different component models seldom interoperate and their design and implementation are never founded on a common ground. The research challenge that we identify is to define and implement solutions for adaptive software components. These components will be adaptive in the sense that they will be able to accommodate execution environments of various granularities (from grid computing, to Internet-based applications, to mobile applications, to embedded systems) and incorporate on-demand different technical services. This challenge will be conducted by designing a micro-kernel for software components. This micro-kernel will contain a well-defined set of core concepts, which are at the root of all component models. Several concrete software component models will then be derived from this micro-kernel.

3.1.3. Context-Aware Computing (CAC)

In adaptive systems, the notion of "*context*" becomes increasingly important. For example, mobile devices sense the environment they are in and react accordingly. This is usually enabled by a set of rules that infer how to react given a certain situation. In the Ambient/Ubiquitous/Pervasive domain [1], CAC is commonly referred to as the new paradigm that employs this idea of context in order to enmesh computing in our daily lives [113]. Many efforts that exist today focus on human-computer interaction based on context. On the one hand, computational models, middleware, and programming languages are being developed to take the inherent characteristics of multi-scale environments into account, such as connection volatility, ambient resources, etc. An important challenge is to bridge the gap between the domain level and the computational level. The former is concerned with the expected behavior of the system from a user's viewpoint, such as how and when a system responds to changes in the context, when information can be made public, etc. On the other hand, the computational level deals with the inherent and very stringent hardware phenomena of multi-scale environments. Nevertheless, both levels have to coexist: the computational level needs to be steered by the concepts, behavior and rules which exist at the domain level, whereas the domain needs to adapt to the specificities of the ever changing environment that is monitored and managed by the computational level. In order to address this challenge, we first intend to investigate representations at the domain level of concepts such as user profile, local positioning information and execution context [126]. Furthermore, a mapping has to be devised between these concepts and generic concepts at the computational level, the latter being as independent as possible from concrete platforms or languages. This mapping has to be bidirectional: the computational level needs to be steered by the concepts, behavior and rules that exist at the domain level, whereas the domain needs to adapt to the particulars of the ever-changing environment that is monitored and managed at the computational level. Furthermore, the mapping has to be dynamic since the changes have to be propagated between the levels at run time. An explicit domain level is not only useful for bridging the aforementioned gap, but also for designing and developing open task-specific languages at the domain level, which allow users to dynamically adapt the behavior of the applications in multi-scale environments in well-defined ways.

We will base the design approach of the future implementation prototype on Model Driven Engineering (MDE). The goal of MDE [122] consists of developing, maintaining and evolving complex software systems by raising the level of abstraction from source code to models. The latter is in our case the domain level, which will be connected to the computational level by means of MDE techniques. One added benefit of MDE is that it provides means for managing model inconsistencies.

3.2. Two Research Directions

We propose to follow two research directions to foster software reuse and adaptation. The first direction, that could be coined as the spatial dimension of adaptation, will provide middleware platforms to let applications be adapted to changing execution contexts. The second direction, the so-called temporal dimension of adaptation, will provide concepts and artifacts to let designers specify evolvable applications.

3.2.1. Adaptable Component Frameworks for Middleware

As a cornerstone of next generation software, adaptation is a property which must be present throughout the entire life cycle, from design to execution. We develop then a vision where adaptation is not only a property that is desirable for end-user applications, but also for the middleware platform that executes these applications. Until now, middleware is a rather specialized activity where each new environment forces the development of a corresponding platform, which is specific to the given environment. This has led to a large number of platforms (from Web Services, to EJB, to CORBA, to ad hoc middleware for embedded systems). Although at a high level, solutions for communication interoperability often exist between these platforms, they stay loosely coupled and separated. Furthermore, the concepts which are at the core of these platforms and their architectures are too different to allow, for example, sharing technical services.

[1] These terms are more or less equivalent.

The research challenge that we propose here is to define and develop middleware and associated services which could be adapted to a broad range of environments from grid computing, to Internet-based applications, to local networks, to mobile applications on PDA's and smart phones, to embedded systems. The benefits of that are twofold. First, it enables the easier deployment of mobile applications in different environments by taking advantage of the common ground provided by adaptable middleware. Second, middleware is a rapidly changing domain where new technologies appear frequently. Yet, up to now, each new technological shift has imposed a complete re-development of the middleware. Having a common ground on which middleware is built would help in such transitions by fostering reuse. In terms of industrial output, the impact of these results will also be helpful for software editors and companies to adapt their products more rapidly to new and emerging middleware technologies.

This research challenge has close links with MDE and product line families. We believe that the added value of our proposal is to cover a more integrated solution: we are not only interested in middleware design with MDE technologies, but we also wish to integrate them with software component technologies and advanced programming techniques, such as AOP. We will then cover a broad spectrum of middleware construction, from design (MDE) to implementation (CBSE) to application development (AOP).

3.2.2. Distributed Application Design for Adaptive Platforms

Considering adaptation in the first design steps of an application allows for its preparation and follow-up during the entire life-cycle. As mentioned previously, some software paradigms help already in the design and the development of adaptable applications. AOSD proposes separation of concerns and weaving of models in order to increase the mastering and the evolution of software. MDE consists of evolving complex software systems by raising the level of abstraction from source code to models. Several programming approaches, such as AOP or reflective approaches, have gained in popularity to implement flexibility. Other approaches, such as CBSE, propose compositional way for reuse and compose sub-systems in the application building. Finally, context-aware programming for mobile environment proposes solutions in order to consider context evolution. Overall, the objective of these approaches is to assist the development of applications that are generic and that can be adapted with respect to the properties of the domain or the context.

The research challenge that we propose to address here is similar to static points of variation in product line families. We plan to study dynamic points of variation in order to take into account adaptation in the first design steps and to match this variation. The first research challenge is the introduction of elements in the modeling phase that allow the specification of evolution related properties. These properties must make it possible to build safe and dynamic software architectures. We wish to express and validate properties in the entire software life cycle. These properties are functional, non-functional, static, behavioral, or even qualitative properties. We also want to be able to check that all the properties are present, that the obtained behavior is the expected one, and that the quality of service is not degraded after the addition or the withdrawal of functionalities. We will base our approach on the definition of contracts expressed in various formalisms (*e.g.*, first order logic, temporal logic, state automata) and we will propose a composition of these contracts.

The second challenge will be to implement design processes that maintain coherence between the various stages of modeling in a MDE approach of the applications, as well as maintaining coherence between the phases of modeling and implementation. To do so, we will design and implement tools that will enable traceability and coherence checking between models, as well as between models and the application at execution time.

Finally, we will introduce context information in the development process. At the modeling level, we will represent concepts, behavior and rules of adaptive systems to express adaptation abstraction. These models will be dynamic and connected to implementation levels at the computational level and they will consider context knowledge. The goal is to bridge the gap between the computational level and the domain level in adaptive systems by synchronization of models and implementations, but also by representation of such common knowledge.

4. Application Domains

4.1. Introduction

The ADAM project-team targets the software engineering of adaptive service-oriented applications and middleware. The application domain covered by ADAM is broad and spans from distribution applications to middleware. In all these cases, adaptability is the property which is sought: applications and middleware must be adaptable to new execution contexts, they must react to changes in the environment and they must be able to discover and integrate new services.

The ADAM project-team produces software and middleware building blocks. This explains why the application domain is broad, yet targeting applications where adaptability is the key requirement. This includes electronic commerce, embedded systems, health care information systems, and terrestrial transport information systems. These domains are in direct relation with our currently funded activities. They act as testbeds for the solutions that we propose in terms of middleware services, middleware platforms, runtime kernels, component libraries, languages design or domain modeling.

4.2. Electronic Commerce

Applications in the domain of electronic commerce are by essence distributed. They involve many different participants with heterogeneous information systems which cannot be changed. The challenge is then to provide an adaptation layer to be able to compose and let these systems interoperate. In the context of the ANR TLog SCOrWare, the ICT SOA4All and the FUI CAPPUCINO projects, our activities in this domain will aim at supporting service-oriented architectures. We want to have adaptive architectures that can be composed and orchestrated seamlessly. In this domain, the business relationship with customers is vital and many different usage scenarios must be supported. Customers are roaming, and the services must be kept operational across different devices. This puts some constraints on the server tier where technical services must be adapted to manage, for instance, long lasting transactions. The application server infrastructure must then provide a support for adapting technical services.

4.3. Embedded Systems

Embedded systems form a domain where adaptation is a key requirement. The design and the implementation of modern embedded software uses advanced software engineering techniques such model-driven development or software component frameworks. In this domain, we are involved in several projects, such as the ANR TLog Flex-eWare, and the FUI MIND projects. Several challenges must be addressed here. For example, when a model-driven developed application is adapted, designers have to ensure that the models and the operational level are kept synchronized. The co-evolution of these two levels is one of the challenges that we are addressing. A second challenge is related to software components that need to be customized in order to fit the requirements imposed by constrained environments. It is, for example, a matter of providing component frameworks that can accommodate various granularities of services.

4.4. Health Care Information Systems

Health care information systems form a third application domain in which the ADAM project-team is involved, for instance through demonstrators which will be implemented in the context of the ANR TLog FAROS project. The challenge here is to provide a distributed infrastructure where information will be available to medical staff wherever they are. This imposes to be able to provide this information on many different devices (from high resolution screens to embedded devices on the scene of an accident), while ensuring the privacy of the medical data of a patient (several level of data access must be granted depending on the categories of medical staff). Given the vital role of such an information system, we want to provide guarantees that the services will be highly available and trustworthy. We envision to provide a service-oriented architecture which will be extended to support software contracts and multi-scale environments.

4.5. Information Systems for Terrestrial Transport

Information systems for terrestrial transport are also a domain that we are relying on, to apply our research activities in accordance with the ANR ARA REVE project and the INRETS collaboration. Applications are here characterized by frequent disconnections, poor quality network links, and high mobility. We want to provide an infrastructure where the technical services, and among others the communication services, can be adapted to support new requirements. One of the paths that we propose to investigate is to include such a scenario in the general context of the adaptiveness of component frameworks.

5. Software and Platforms

5.1. Introduction

We report on the major software systems that are developed by our research group. FRASCATI, PowerAPI, SPACES relate to the first research direction. AppliIDE and CALICO relate to the second one. Finally, FRACTAL is a general purpose component framework that serves as a foundation for most of our work around reconfigurable middleware.

5.2. AppliIDE

Participants: Laurence Duchien, Clément Quinton [correspondant].

AppliIDE is directly connected to the work of Carlos Parra's PhD thesis [116] and Ubinov ADT's work which covers the definition and implementation of a Context-Aware Dynamic Software Product Line (DSPL) named CAPucine. It provides a set of tools for the selection of features, metamodel transformation and code generation for mobile applications [119]. The current implementation of ApplIDE addresses transformation from CAPucine metamodel towards SCA metamodel, and Spoon EMF metamodel. The transformations were formerly written with Acceleo tool, which is a dedicated language for transformation, enhancing the readability. ApplIDE metamodels are based on the Eclipse Modeling Framework. Code generators are all written in Acceleo.

Inria Evaluation Committee Criteria for Software Self-Assessment: A-3, SO-3, SM-3, EM-2, SDL-2. ApplIDE is registered with the APP (Agence pour la Protection des Programmes) under reference IDDN.FR.001.500004.000.S.A.2010.000.10600.

5.3. CALICO

Participants: Laurence Duchien [correspondant], Antonio de Almeida Souza Neto.

CALICO is an agile development framework for the design and evolution of safe component-based and service-oriented software that has been developed in the context of Guillaume Waignier's PhD thesis [128].

Agile software development relies on an iterative and incremental development cycle that allows the software architect to iterate between the design of the architecture and the debug of the software in its execution context. At each iteration, the architect can evolve its software and check the consistency of its evolution through the execution of static and dynamic analysis tools. During the design and the evolution of the system, the architect can use a set of metamodels to specify the structure of the architecture and its various quality of services requirement. During the deployment, CALICO instantiates the system on the target runtime platform from the models specified and keeps them synchronized with the software during its execution. Through this means, the architect has a conceptual view, which allows him to reason on the critical software properties during its evolution. Moreover, in order to check these evolutions, CALICO provides a unifying framework, which allows reuse of many static analysis tools of software architectures and dynamic debugging tools, that were scattered in different existing platforms. Thus, each change can be statically analyzed on the conceptual view before being propagated to the software system. Dynamic analyses are based on data values available during the execution only. The capture of these values is done through automatic instrumentation of the software system.

Globally, CALICO enables reliable evolution even if the underlying platforms do not natively provide this support. The current version handles four component-based and service-oriented platforms (FRASCATI, FRACTAL, OPENCCM, OPENCOM). Moreover, the benchmarks that we have performed show that CALICO is usable for the design and development of safe applications up to 10,000 components and services, which corresponds to the maximal load of most runtime platforms.

Inria Evaluation Committee Criteria for Software Self-Assessment: A-3, SO-4, SM-3, EM-3, SDL-4. CALICO is an open source software available at http://calico.gforge.inria.fr.

5.4. Fractal

Participants: Philippe Merle [correspondant], Romain Rouvoy, Lionel Seinturier.

FRACTAL is a modular, extensible, and reflective component framework. The FRACTAL toolchain can be used to design, implement, deploy and reconfigure any kind of software and middleware system. FRACTAL has initially been designed by both Inria and France Telecom R&D.

Inria Evaluation Committee Criteria for Software Self-Assessment: A-4, SO-4, SM-3-up, EM-3-up, SDL-4-up, DA-3, CD-4, MS-4, TPM-4. FRACTAL is a project of the OW2 consortium for open-source middleware. Web site: http://fractal.ow2.org. License LGPL. Some of the research activities around FRACTAL [91], [90], [124] are on top cited publications of the CBSE research community [109]. The ADAM project-team members are among the top committers of the project with 33.8% of all commits and they are the principal contributors for several modules including AOKell [124], Fraclet, the Inria ODL F4E [95], [96], Juliac, Koch. Philippe Merle is the leader of the OW2 FRACTAL project.

5.5. FraSCAti

Participants: Philippe Merle [correspondant], Christophe Munilla, Romain Rouvoy, Lionel Seinturier.

FRASCATI is a service-oriented component-based middleware platform implementing OASIS *Service Component Architecture* (SCA) specifications.The main originality of OW2 FRASCATI is to bring FRACTAL-based reflectivity to SCA, *i.e.*, any FRASCATI software component is equipped with both the SOA capabilities brought by SCA and the reflective capabilities (*i.e.*, introspection and reconfiguration) brought by FRACTAL. Various micro-benchmarks have shown that FRASCATI reflectivity is achieved without hindering its performance relative to the de facto reference SCA implementation, *i.e.*, Apache Tuscany. Non-functional concerns (logging, transaction, security, etc.), so called intents in SCA terms, are also programmed as FRASCATI components and are (un)woven on business components dynamically at runtime, this is based on aspect-oriented concepts defined in FAC [117]. OW2 FRASCATI supports various implementation technologies (SCA Composite, Java, WS-BPEL, Spring Framework, OSGi, Fractal ADL, native C library, Apache Velocity templates, and seven scripting languages as BeanShell, FScript, Groovy, JavaScript, JRuby, Jython, XQuery) for programming services or integrating legacy code, various binding protocols (SOAP, REST, JSON-RPC, UPnP, HTTP servlets, Java RMI, JMS, JGroups) and interface definition languages (WSDL, Java, WADL) for interoperating with existing services. OW2 FRASCATI provides management tools like standalone, Web-based, and JMX-based graphical consoles and a dedicated scripting language for reconfiguring SCA applications. The whole OW2 FRASCATI platform is itself built as a set of reflective SCA components.

Inria Evaluation Committee Criteria for Software Self-Assessment: A-4-up, SO-4, SM-4-up, EM-3-up, SDL-4-up, DA-4, CD-4, MS-4, TPM-4. FRASCATI is a project of the OW2 consortium for open-source middleware. Web site: http://frascati.ow2.org. 208 Kloc (mainly Java). Registered with the APP (Agence pour la Protection des Programmes) under reference FR.001.050017.000.S.P.2010.000.10000. License: LGPL. Embedded into several industrial software systems: EasySOA, Petals Link EasyViper, EasyBPEL, EasyESB, OW2 PEtALS, OW2 Scarbo. Various demonstrators built during funded projects: ANR SCOrWare, FP7 SOA4All, ANR ITEmIS, ANR SALTY, ANR SocEDA, FUI Macchiato, FUI EasySOA, ADT Galaxy and ADT Adapt. Main publications: [19], [123], [111], [112], [98], [97].

5.6. PowerAPI

Participants: Aurélien Bourdon, Adel Noureddine, Romain Rouvoy [correspondant].

PowerAPI is a Scala-based library for monitoring energy at the process-level. It is based on a modular and asynchronous event-driven architecture using the Akka library. PowerAPI differs from existing energy process-level monitoring tool in its pure software, fully customizable and modular aspect which let users precisely define what they want to monitor, without plugging any external device. PowerAPI offers an API which can be used to express requests about energy spent by a process, following its hardware resource utilization (in terms of CPU, memory, disk, network, etc.). Its applications cover energy-driven benchmarking [52], energy hotspots and bugs detection [53], [75] and real-time distributed system monitoring.

PowerAPI is registered with the APP (Agence pour la Protection des Programmes) under reference IDDN.FR.001.400015.000.S.P.2012.000.10000. License: AGPL.

5.7. SPACES

Participants: Russel Nzekwa, Daniel Romero [correspondant], Romain Rouvoy, Lionel Seinturier.

SPACES is a context mediation middleware that follows the *REpresentational State Transfer* (REST) principles [100]. The current implementation of SPACES is based on the COSMOS context framework [93], [121] and the COMANCHE web server [91]. Both COSMOS and COMANCHE are based on the FRACTAL component model and the JULIA implementation [91].

The main features of the current SPACES implementation are presented below:

1. *Ubiquitous connectors*: SPACES defines connectors that encapsulate the distribution concern. These connectors expose the COSMOS context nodes as REST resources with logical associated URLs, and enable interactions between consumers and producers via different communication protocols and the discovery of the available context sources. The current SPACES implementation supports interaction using the HTTP and twitter [108] protocols. For discovery, the implementation uses the Service Location Protocol (SLP) [102].
2. *Context Representation*: Following the REST principles, SPACES supports multiple representations of the context information: JSON [94], XML and Java serialization.
3. *Quality of context (QoC) information*: The QoC properties are incorporated as service attributes in the SLP advertisements of the context information.
4. *Context selection*: The restrictions in terms of QoC of the required context information are expressed as LDAP filters [125]. SPACES benefits from the LDAP based queries of SLP to select the context providers.

We use XStream 1.3.13 [89] and JSON-lib 2.2.34 [88] to serialize context information as XML and JSON documents. For SLP and twitter we employ jSLP 1.0.0 [120] and twitter-4j 2.0.6 [129].

SPACES is registered with the APP (Agence pour la Protection des Programmes) under reference IDDN 10-500002-000.

6. New Results

6.1. Software Product Lines

In terms of Software Product Lines [92], we work in four different directions. First, we define a SPL framework for Cloud Computing called SALOON [62] to face challenges in terms of application configuration, cloud platform configuration [59] and deployment automation [58]. Second, we use Dynamic Software Product Lines (DSLP) for mobile applications [21], in order to support self-adaptation of context-aware applications in ubiquitous environments [56] and Wireless Sensor Networks (WSNs) [36]. In both cases, Constraint Satisfaction Problem (CSP) techniques are used in order to find a suitable configuration for the

current environment state and to deal with contradictory dimensions (e.g., accuracy and energy saving) in the decision making process. Third, in the YourCast project [76], we work in a Composite SPL for Broadcasting System by identifying the main issues that we need to deal with when defining such kind of SPL. Finally, we define an operator to compute syntactic and semantic differences between feature models [24].

6.2. Software Evolution

The adaptive software paradigm supports the definition of software systems that are continuously adapted at run-time. An adaptation activates multiple features in the system, according to the current execution context (*e.g.*, CPU consumption, available bandwidth). However, the underlying approaches used to implement adaptation are ordered, *i.e.*, the order in which a set of features are turned on or off matters. Assuming feature definition as etched in stone, the identification of the right sequence is a difficult and time-consuming problem. We propose here a composition operator that intrinsically supports the commutativity of adaptations [50]. Using this operator, one can minimize the number of ordered compositions in a system. It relies on an action-based approach, as this representation can support preexisting composition operators as well as our contribution in an uniform way. This approach is validated on the Service-Oriented Architecture domain, and is implemented using first-order logic.

6.3. Green Middleware

The energy consumption of ICT is widely acknowledged as continuously growing over years and its carbon footprint can now be compared to the avionics domain. While green computing has emerged as a new research area concerned with the optimization of the energy consumption of large-scale systems, such as datacenters, our project-team investigates the analysis of the energy consumption from a software engineering point of view. In particular, we developed e-Surgeon, a middleware framework to estimate the power consumption of legacy software at various levels of granularity. With respect to this objective, the first result we obtained in [52] relates to an evaluation of the impact of programming languages and programming styles on the energy consumption of applications. While the current trend in application servers is to adopt interpreted languages (*e.g.*, JavaScript, Python) on the server side, our preliminary results highlight that these languages impose a large overhead to the energy consumption of the resulting system. In [53], this preliminary result is further investigated by identifying energy hotspots within legacy application servers. To do so, we automatically instrument the code of the application server to analyze how the energy is consumed by the application server under various stress scenarios. Our results show that the energy is mostly consumed by a restricted number of classes and methods of these application servers, thus giving hints to software developers on candidate snippets for optimization.

6.4. Human-Competitive Software Engineering

Frequently asked questions (FAQs) are a popular way to document software development knowledge. As creating such documents is expensive, we have invented an approach for automatically extracting FAQs from sources of software development discussion, such as mailing lists and Internet forums, by combining techniques of text mining and natural language processing. We applied the approach to popular mailing lists and carried out a survey among software developers to show that it is able to extract high-quality FAQs that may be further improved by experts. This research has been published at the International Conference on Software Engineering (ICSE'2012 [40]), the flagship conference in the domain. This work takes place in our line of research on "human competitive software engineering", where we try to replace manual tasks requiring costly human skills (such as documentation writing or bug fixing) by automated or semi-automated approaches.

6.5. Reconfigurable Middleware

In the context of our collaboration with the Thales company, especially via the PhD of Jonathan Labéjof defended on 20 December 2012, we obtained some results in the domain of reconfigurable message-oriented middleware (MOM). MOM are a particular class of middleware systems that promote asynchronous

communications and weak coupling between communicating entities. They are of particular interest for the design of Systems of Systems (SoS). In this context, we worked on a method for reconfiguring quality of service properties in MOM. The idea is to be able change the properties of communication channels without stopping these channels. We obtained this by defining a bijection between the characteristics of these channels and a component-based software architecture for which we already have means of reconfiguration with our previous results on the FRASCATI platform (see Section 5.5). By this way, reconfiguring the quality of service of a channel is akin to reconfiguring its associated component-based software architecture. This result has been applied to MOM platforms that conform to the OMG DDS standard.

This result has been the topic of a patent application [106] that was filled in Europe in July 2011 and in the US in July 2012. The results were also presented in the SCDI workshop at the EDOC 2012 conference [44].

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Thales This contract is associated to the CIFRE PhD thesis of Jonathan Labéjof between ADAM and the Thales company. The goal of the project is to study the evolution of heterogeneous service-oriented architectures. We address two problems. First, we study some various forms of support for heterogeneity in service architectures in terms of communication protocols and software component personalities. Second, we propose solutions for systems which are agile and respond smoothly to changes in their execution contexts. Overall, the goal of this project is to propose to design a model for adaptability, a runtime infrastructure and to provide some means by which these two levels can be causally connected and kept consistent.
Participants: Jonathan Labéjof, Philippe Merle, Lionel Seinturier.

France Telecom DigiHome is a contract with France Telecom to study the adaptation of software systems in distributed digital home environments. These environments and their extensions (vehicles, holiday homes, work at home) are now invaded by a multitude of communicating objects dedicated to content management, viewing multiple video streams, or information sharing within a community network. These objects offer services with capacities of configuration and remote administration, and advanced interactions with the end-user or between devices or services. Given the lack of universality of proposals from IT and device companies and the lack of interoperability of these devices and services, it becomes necessary to offer a virtual environment named Extended Digital Home to encompass and unify these proposals and make life easier for the inhabitants. First, we will propose a unified model for integrating devices and services inside and outside the home with a continuum between private and public lives. Second, we will study an energy model to save energy in this extended environment. Overall, the goal of this project will be to propose to design a model for a cloud inside home and to provide some means to reduce the energy using on media devices. First results have been published in [115] and [99]. This contract is complemented by a second one, which is the CIFRE contract associated to Rémi Druilhe PhD thesis.
Participants: Rémi Druilhe, Laurence Duchien, Romain Rouvoy, Lionel Seinturier.

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

8. Partnerships and Cooperations

8.1. Regional Initiatives

Adapt is a local ADT (Action de Développement Technologique) of the Inria Lille - Nord Europe Center and aims at building a demonstrator of our ADAM software technologies in the application domain of smart digital homes. Firstly, this demonstrator will show adaptive and reflective capabilities of FraSCAti (see Section 5.5), *i.e.*, supporting various implementation languages (*e.g.*, Java, WS-BPEL, scripting languages, template technologies) to develop business components, supporting various remote communication protocols (*e.g.*, SOAP, REST, JMS, JGroups) to access and expose services, supporting various non functional properties, deploying business components on demand, and reconfiguring business applications/components/services at runtime. Secondly, these capabilities will be illustrated on several ambient intelligence scenarios, *e.g.*, Fire Emergency and Home Automation. Thirdly, this demonstrator will integrate our recent and future scientific results in the domains of dynamic software product lines, autonomic computing, control loops, complex event processing, energy control, etc. Gwenael Cattez (recent graduated engineer) has been recruited in the context of this ADT.
Participants: Gwenael Cattez, Philippe Merle.

8.2. National Initiatives

8.2.1. ANR

SALTY is a 36-month ANR ARPEGE project started in November 2009 and involving University of Nice, Deveryware, EBM WebSourcing, Inria ADAM, MAAT-G France, Thales, University Paris 8 and University Paris 6. The main objective of the SALTY project is to provide an autonomic computing framework for large-scale service-oriented architectures and infrastructures. The SALTY project will result in a coherent integration of models, tools and runtime systems to provide a first end-to-end support to the development of autonomic applications in the context of large-scale SOA in a model-driven way, including never-covered aspects such as the monitoring requirements, the analysis (or decision-making) model, and an adaptation model tackling large-scale underlying managed components. The project will be validated by two large use-cases: a neurodegenerative disease study for exploring the capacity of grid infrastructures and a path tracking application for exploiting the different positioning methods and appliances on a fleet of trucks.
Participants: Laurence Duchien, Russel Nzekwa, Romain Rouvoy, Lionel Seinturier.

SocEDA is a 36-month ANR ARPEGE project started in November 2010 and involving EBM WebSourcing, ActiveEon, EMAC, I3S, LIG, LIRIS, Inria ADAM, France Telecom and Thales Communications. The goal of SocEDA is to develop and validate an elastic and reliable federated SOA architecture for dynamic and complex event-driven interaction in large highly distributed and heterogeneous service systems. Such architecture will enable exchange of contextual information between heterogeneous services, providing the possibilities to optimize/personalize their execution, according to social network information. The main outcome will be a platform for event-driven interaction between services, that scales at the Internet level based on the proposed architecture and that addresses Quality of Service (QoS) requirements.
Participants: Nabil Djarallah, Gabriel Hermosillo, Fawaz Paraiso, Romain Rouvoy, Lionel Seinturier.

MOANO (Models & Tools for Pervasive Applications focusing on Territory Discovery) is a 36-month project of the ANR CONTINT program which started in January 2011. The partners are LIUPPA/University of Pau and Pays de L'Adour, University of Toulouse/IRIT, University of Grenoble/LIG, University of Lille/LIFL/Inria. While going through a territory, mobile users often encounter problems with their handheld computers/mobiles. Some locally stored data become useless or unnecessary whereas other data is not included in the handheld computer. Some software

components, part of the whole applications can become unnecessary to process some information or documents that the user did no plan to manage during his mission. In order to answer such difficulties, our project has three operational studies which are i) to enlarge the communication scale, ii) to provide people without computer-science skills with a toolset that will enable them to produce/configure mapping applications to be hosted on their mobile phone and iii) to process all the documents of interest in order to make their spatial and thematic semantics available to mobile users.
Participants: Nabil Djarallah, Laurence Duchien, Nicolas Petitprez.

YourCast (Software Product Lines for Broadcasting Systems) is a 18-month ANR Emergence project that started in 2012 and that involves University of Nice Sophia Antipolis, Valorpaca and Inria ADAM. The project aims at defining an information broadcasting system by a dedicated software product line which will be used in schools or events, such as gatherings of scouts.
Participants: Laurence Duchien, Daniel Romero.

8.2.2. Competitivity Clusters

Macchiato is a 36-month project of the competitivity cluster PICOM (Pôle des Industries du COMmerce), which has started in January 2011. The partners of this project are Auchan (leader), University of Bordeaux/LABRI, Inria, and the Web Pulser SME. The Macchiato project aims at rethinking the design of e-commerce sites to better integrate the Internet of Things and facilitate online sales. In addition to setting up an infrastructure and a common application base, this challenge needs to refocus the design of e-commerce sites on the concept of "single electronic cart". We believe that including the next generation of e-commerce sites will enable to offer a personalized offer to consumers by adapting the content and form of the web sites to their preferences and needs and will allow them to manage their purchases uniformly with a single electronic cart [118].
Participants: Nabil Djarallah, Laurence Duchien, Nicolas Petitprez, Romain Rouvoy.

EasySOA is a 24-month project funded by FUI and labelized by the Systematic competitivity cluster for Open Source Software. The project started in 2011. The partners of this project include Open Wide (leader), Bull, Easyfab, Inria, Nuxeo, Talend. The EasySOA goal is to add an open, light, agile layer on top of "traditional" SOA, thanks to an online, social and collaborative approach, involving all actors of the SOA process. Beyond cartography and documentation, it helps gathering and fast-prototyping the business needs, and eases the transition to final implementations in the existing SOA solution.
Participants: Antonio de Almeida Souza Neto, Michel Dirix, Jonathan Labéjof, Philippe Merle, Christophe Munilla.

EconHome is a 30-month project funded by FUI and labelized by the Minalogic and Systematic competitivity clusters. The project started in 2011. The partners of this project include Sagemcom, Orange, STMicroelectronics, ST-Ericsson, SPiDCOM, Utrema, COMSIS, DOCEA, CEA, ETIS. The project aims at reducing the energy consumption of home and middleware networks. The target is to reduce of at least 70% the energy consumption of devices such as residential gateways, set top boxes, CPL plugs. Two axes are investigated: the optimization of the energy consumption of individual devices with innovative low power and sleep modes, and the optimization of the overall network with innovative techniques, such as service migration and energy aware service feedbacks to the user.
Participants: Aurélien Bourdon, Rémi Druilhe, Laurence Duchien, Adel Noureddine, Romain Rouvoy, Lionel Seinturier.

Hermes is a 36-month project funded by FUI and labelized by the PICOM (Pôle des Industries du COMmerce) competitivity cluster which has started in November 2012. The goal of the project is to define a modular and context-aware marketing platform for the retail industry. The focus is put on the interactions with customers in order to extract and mine relevant informations related to shopping habits, and on a multi-device, cross-canal, approach to better match customer usages.
Participants: Laurence Duchien, Romain Rouvoy, Lionel Seinturier.

8.2.3. Inria

ARC SERUS (Software Engineering for Resilient Ubiquitous Systems) is founded by the Inria collaboration program. The partners are Inria ADAM, Inria PHOENIX and TSF-LAAS (CNRS). Resilience is defined as the ability of a system to stay dependable when facing changes. For example, a building management system (*e.g.*, anti-intrusion, fire detection) needs to evolve at runtime (*e.g.*, deployment of new functions) because its critical nature excludes interrupting its operation. Resilience concerns occur in various application domains such as civil systems (civil protection, control of water or energy, etc.) or private systems (home automation, digital assistance, etc.). The objectives of this project is to propose a design-driven development methodology for resilient systems that takes into account dependability concerns in the early stages and ensures the traceability of these requirements throughout the system life-cycle, even during runtime evolution. To provide a high level of support, this methodology will rely on a design paradigm dedicated to sense/compute/control applications. This design will be enriched with dependability requirements and used to provide support throughout the system life-cycle.
Participants: Laurence Duchien, Alexandre Feugas, Lionel Seinturier.

ADT AntDroid (2012–2014) is a technology development initiative supported by Inria that aims at pushing the results of Nicolas Haderer's PhD thesis into production. AntDroid therefore focuses on deploying and disseminating the *Bee.sense* software platform to the public and to support the users of the platform. Bee.sense is a distributed platform dedicated to crowd-sensing activities. Bee.sense exploits the sensors of mobile devices that are shared by participants to observe physical or behavioral phenomenons. The challenges related to the development of such a platform encompasses user privacy and security, battery preservation, and user accessibility.
Participants: Romain Rouvoy, Nicolas Haderer.

8.3. European Initiatives

8.3.1. FP7 Projects

Program: FP7 ICT

Project acronym: PaaSage

Project title: Model Based Cloud Platform Upperware

Duration: October 2012–September 2016

Coordinator: ERCIM

Other partners: ERCIM (Fr), SINTEF (No), STFC (UK), U. of Stuttgart (De), Inria (Fr), CETIC (Be), FORTH (El), Be.Wan (Be), EVRY Solutions (No), SysFera (Fr), Flexiant (UK), Lufthansa Systems AG (De), Gesellschaft fur wissenschaftliche Datenverarbeitung mbh Gottingen (De), Automotive Simulation Center Stuttgart (De).

Abstract: Cloud computing is a popular and over-hyped concept in ICT. The concept of infinitely scalable elastic resources changing without complex systems administration and paying only for resources used is attractive. These benefits are not immediately realizable. Within organisation benefits are realizable at considerable cost. IaaS (Infrastructure as a Service) public CLOUDs have different interfaces and conditions of use thus for an organisation to 'scale out' requires considerable investment using skilled technical staff. The business need is to allow organisations to "scale out" from their private CLOUD to public CLOUDs without a technical chasm between. This cannot easily be achieved. Aligned with the EU strategic direction of an open market for services, SOA (service-oriented architecture) offers a way to virtualize across heterogeneous public CLOUDs and organizational private CLOUDs. It opens a market for European SMEs to provide services to be utilized (and paid for) by business applications and for all organisations to benefit from a catalogue of services that can be used across the environment. PaaSage will deliver an open and integrated platform, to support both deployment and design of Cloud applications, together with an accompanying

methodology that allows model-based development, configuration, optimisation, and deployment of existing and new applications independently of the existing underlying Cloud infrastructures. Specifically it will deliver an IDE (Integrated Development Environment) incorporating modules for design time and execution time optimisation of applications specified in the CLOUD Modeling Language (CLOUD ML), execution-level mappers and interfaces and a metadata database.
Participants: Laurence Duchien, Romain Rouvoy, Lionel Seinturier.

Program: FP7 FET
Project acronym: DIVERSIFY
Project title: More software diversity. More adaptivity in CAS.
Duration: 36 months
Coordinator: Inria
Other partners: SINTEF (Norway), Trinity College Dublin (Ireland), University of Rennes 1 (France)
Abstract: DIVERSIFY explores diversity as the foundation for a novel software design principle and increased adaptive capacities in CASs. Higher levels of diversity in the system provide a pool of software solutions that can eventually be used to adapt to unforeseen situations at design time. The scientific development of DIVERSIFY is based on a strong analogy with ecological systems, biodiversity, and evolutionary ecology. DIVERSIFY brings together researchers from the domains of software-intensive distributed systems and ecology in order to translate ecological concepts and processes into software design principles.
Participant: Martin Monperrus.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. SEAS

Title: Middleware for Sensor as a Service
Inria principal investigator: Romain Rouvoy
International Partner (Institution - Laboratory - Researcher):
University of Oslo (Norway) - Department of informatics
Duration: 2010–2012
See also: http://seas.ifi.uio.no
Middleware for Sensor as a Service (SeaS) is a collaboration initiative that intends to contribute to the vision of the Future Internet as an open-source middleware platform, based on robust Web standards, breaking existing IT silos and leveraging the development of innovative hybrid service-oriented architectures spanning from Wireless Sensor Networks to Ubiquitous and Cloud Computing. Given that one of the objectives of Europe is to develop the convergence of IT networks (being it mobile or fixed) and the fact that many of the upcoming mobile devices are integrating services (from phones down to sensors and radio frequency identification), we believe that one of the challenges for the next generation society will consist in enabling a distributed middleware platform for the dynamic provision of hybrid services and the scalable dissemination of data. In particular, we believe that the sensor capabilities can be reflected as a service accessible from the Internet or any IT system using standard Web protocols. The resulting services will be hybrid in the sense that they will reflect the wide diversity of sensor devices available nowadays, but we aim at providing a uniform solution to leverage the development of applications on top of physical or virtual sensors. This platform includes not only the sensor level (description, discovery, communication, reconfiguration...), but also the platform level services (dissemination, storage, query, adaptation...) that are required for enabling such a vision. The resulting platform will bring additional opportunities for the development of innovative service-based systems by exploiting the emergence of Wireless Sensor Networks (WSN), Ubiquitous Computing, and Cloud Computing environments.

8.4.2. Inria International Partners

8.4.2.1. OW2

OW2, previously ObjectWeb, is an international consortium to promote high quality open source middleware. The vision of OW2 is that of a set of components which can be assembled to offer high-quality middleware systems. We are members of this consortium since 2002. Philippe Merle is the leader of both FRACTAL and FRASCATI projects, which are hosted by this consortium. Philippe Merle and Lionel Seinturier are members of the Technology Council of OW2.
Participants: Philippe Merle, Romain Rouvoy, Lionel Seinturier.

8.4.2.2. ERCIM Working Group on Software Evolution

The Working Group (WG) on Software Evolution is one of the working groups supported by ERCIM. The main goal of the WG is to identify a set of formally-founded techniques and associated tools to support software developers with the common problems they encounter when evolving large and complex software systems. With this initiative, the WG plans to become a Virtual European Research and Training Centre on Software Evolution.
Participant: Laurence Duchien.

8.4.2.3. University of Los Andes, Bogota, Colombia

The ADAM project-team has a long term collaboration since 2005 with this university. Over the years, four PhD thesis (Carlos Noguera, Carlos Parra, Daniel Romero, Gabriel Tamura) have been defended in our team with students who obtained their MSc in this university. The first three were full French PhD, whereas the last one was a co-tutelle with this university. Professor Rubby Casallas from University of Los Andes is frequently visiting our team. The most recently defended PhD thesis, that of Gabriel Tamura, deals with QoS (quality-of-service) contract preservation in distributed service-oriented architectures. A formal theory to perform, in a safe way, the process of self-adaptation in response to quality-of-service (QoS) contracts violation has been proposed. The results have been published in [67], [66] and in the PhD thesis document itself [12].
Participant: Laurence Duchien.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Patrick Heymans (1 January 2012 to 30 April 2012).

Subject: Software and Information Systems Engineering, Requirements Engineering, Software Product Lines, Software Evolution.

Institution: University of Namur (Belgium).

Gabriel Tamura (October 2012).

Subject: Software architecture, dynamic software adaptation, and engineering of self-adaptive software systems.

Institution: University ICESI (Cali, Colombia).

Norha Villegas (October 2012).

Subject: Application of software engineering models, techniques and architectures to the development of self-adaptive and self-managing systems.

Institution: University of Victoria, Canada.

8.5.1.1. Internships

Diego Mendez (from June 2012 until November 2012).

Subject: Characterization of API Usage Diversity for Driving API-based Software Repair.

Institution: National University of the Center of the Buenos Aires Province (Argentina).

Daniel René Fouomene Pewo (from May 2012 until October 2012).

Subject: Elastic solution to tolerate peak load of users and queries generated by the so-called Slashdot effect.

Institution: University of Youndé (Cameroun).

Maxence G. de Montauzan (from March 2012 until July 2012).

Subject: An Empirical Study of Exception-Handling Design Strategies In Open-Source Applications.

Institution: University Lille 1 (France).

Anthony Da Costa Maia (from March 2012 until July 2012).

Subject: Extracting Knowledge from the Q&A Website StackOverflow at Debug Time.

Institution: University Lille 1 (France).

Sébastien Poulmane (from June 2012 until August 2012).

Subject: Integrating third-party sensors in the Bee.sense platform.

Institution: University Lille 1 (France).

9. Dissemination

9.1. Scientific Animation

Laurence Duchien served in the following scientific animations actions.

- Chair of the 3ème Journées du GDR CNRS GPL, Rennes, June 2012,
- Chair of the 4ème Journée Lignes de Produits, Lille, November 2012,
- Member of the Editorial Board of Lavoisier TSI,
- Member of the following PC committees:
  - 7th International Symposium on Software Engineering for Adaptive and Self-Managing Systems, (SEAMS), Zürich, Switzerland, June 2012,
  - 15th International ACM SIGSOFT Symposium on Component Based Software Engineering (CBSE), Bertinoro, Italy, June 2012,
  - Joint 10th Working IEEE/IFIP Conference on Software Architecture & 6th European Conference on Software Architecture (WICSA/ECSA), Helsinki, Finland, August 2012,
- Reviewer for the following journals: Elsevier Journal of System and Software, Springer Software and System Modeling, Elsevier Science of Computer Programming,
- Reviewer for the LNCS book Models@runtime.

Philippe Merle served in the following scientific animation actions.

- PC member of the 11th Workshop on Adaptive and Reflective Middleware (ARM), Montréal, Canada, December 2012,
- PC co-chair of the 1ère Conférence en Ingénierie du Logiciel (CIEL), Rennes, June 2012.

Adel Noureddine served as Organization Chair of the 9th MajecSTIC conference that was held in Lille in October 2012. MajecSTIC is the national conference for PhD students and young researchers in Information and Communication Technologies and covers topics from Computer Science to Electrical Engineering.

Romain Rouvoy served in the following scientific animations actions.

- Member of the steering committee of the IFIP International Conference on Distributed Applications and Interoperable Systems,
- Member of the following PC committees:
  - 27th International ACM Symposium on Applied Computing - 7th Track Dependable and Adaptive Distributed Systems (DADS), March 2012,
  - 1st Nordic Symposium on Cloud Computing & Internet Technologies (NordiCloud), August 2012,
  - 8th International Conference on the Quality of Information and Communications Technology (QUATIC) - Track Quality in Cloud Computing, September 2012,
  - 2nd International Workshop on Adaptive Services for the Future Internet (WAS4FI), September 2012,
  - 1st International Workshop on Self-Aware Internet of Things (Self-IOT), September 2012,
  - 6th International Workshop on Middleware Tools, Services and Run-time Support for Networked Embedded Systems (MidSens), December 2012,
  - 7th International Workshop on Middleware for Next Generation Internet Computing Workshop (MW4NG), December 2012,
  - 11th International Workshop on Adaptive and Reflective Middleware (ARM), December 2012,
- Reviewer for the following journals: Elsevier Science of Computer Programming, Elsevier Information and Software Technology, IEEE Software, Springer Journal of Internet Services and Applications, Wiley Journal of Software: Evolution and Process, Lavoisier TSI.

Lionel Seinturier served in the following scientific animations actions.

- Guest co-editor of a special issue of the Elsevier Science of Computing journal on Software Evolution, Adaptability and Maintenance,
- Member of the editorial board of the ISTE-Wiley series of books on Computer Science and Information Technology and editor for the Software Engineer domain of this series,
- PC Chair of the 2nd IEEE International Workshop on Advanced Information Systems for Enterprise (IWAISE),
- Member of the following PC committees:
  - 4th IEEE International Conference on Service-Oriented Computing and Applications (SOCA), Taipei, December 2012,
  - 38th Euromicro Conference on Software Engineering and Advanced Applications (SEAA), MOCS Track & DANCE workshop, Cesme, Turkey, September 2012,
  - IEEE International Workshop on Future Green Communications (FGC), Paris, April 2012,
  - 6ème Conférence francophone sur les architectures logicielles (CAL), Montpellier, May 2012,
- Reviewer for the following journals: Elsevier Science of Computer Programming, Elsevier Journal of Systems Architecture, Central European Journal of Computer Science, Lavoisier TSI.

Martin Monperrus served as:

- Referee for ACM Transactions on Software Engineering and Methodology (TOSEM), Elsevier Science of Computer Programming (SCP), IEEE Transactions on Software Engineering (TSE), Wiley Software Practice and Experience (SPE)
- External Referee for International Conference on Foundations of Software Engineering (FSE), ICSE New Ideas and Emerging Results Track (ICSE NIER), European Conference on Modeling Foundations and Applications (ECMFA)

9.2. Teaching - Supervision - Juries

9.2.1. Teaching

Permanent members teach the following courses.

Laurence Duchien heads the research program in Master of Computer Science at University Lille 1. She heads the Carrières et Emplois service and is referent for the professional insertion in the PhD program in Computer Science at PRES University Lille Nord de France. She teaches the following courses.

Software Project Management, 50h, Level M2, Master MIAGE, University Lille 1,

Design of distributed applications, 42h, Level M1, Master of Computer Science, University Lille 1,

Object-Oriented Design, 42h, Level M2, Master of Computer Science, University Lille 1,

Software Product Lines, 6h, Level M2, Master of Computer Science, University Lille 1,

Research and Innovation Initiation, 22h, Level M2, Master of Computer Science, University Lille 1,

Tutoring Internship, 22h, Level M2, Master of Computer Science, University Lille 1.

Martin Monperrus teaches at the University Lille undergraduate and graduate courses. In particular:

Introduction to programming, 48h, Level L1, Licence of Computer Science, UFR IEEA, University Lille 1,

Object-oriented design, 39h, Level L3, Licence of Computer Science, UFR IEEA,

Automated software engineering, 40h, Level M2, Master of Computer Science speciality IAGL, UFR IEEA, University Lille 1.

Romain Rouvoy heads the IAGL specialty of the Master of Computer Science at the University Lille 1. He supervises the Agil-IT Junior Enterprise and gives the following courses at the University Lille 1:

Initiation à la Programmation, 48h, Level L1, Licence of Computer Science, UFR IEEA, University Lille 1,

Conception d'Applications Réparties, 42h, Level M1, Master of Computer Science, UFR IEEA, University Lille 1,

Qualité du Logiciel, 30h, Level M2, Master of Computer Science speciality MIAGE, UFR IEEA, University Lille 1,

Infrastructures et Frameworks Internet, 8h, Level M2, Master of Computer Science speciality IAGL, UFR IEEA, University Lille 1,

Innovation & Initiation à la Recherche, 14h, Level M2, Master of Computer Science speciality IAGL, UFR IEEA, University Lille 1,

Intergiciels Orienté Services, 50h, Level M2, Master of Computer Science speciality IPI-NT, UFR IEEA, University Lille 1,

Suivi de projets, 60h, Level M2, Master of Computer Science, UFR IEEA, University Lille 1,

Suivi d'alternants, 60h, Level M2, Master of Computer Science, UFR IEEA, University Lille 1.

Lionel Seinturier heads the E-Services specialty of the Master of Computer Science at the University Lille 1. He gives the following graduate courses at the University Lille 1.

Conception d'applications réparties, 18h, M1, University Lille 1,

Infrastructures et frameworks Internet, 6h, M2, University Lille 1.

9.2.2. Supervision

PhD : Gabriel Hermosillo, Towards Creating Context-Aware Dynamically-Adaptable Business Processes Using Complex Event Processing, University Lille 1, 5 June 2012, Laurence Duchien & Lionel Seinturier.

PhD : Gabriel Tamura, QoS-CARE: Un Système Fiable pour la Préservation de Contrats de Qualité de Service à travers de la Reconfiguration Dynamique, University Lille 1 & University Los Andes, Bogota, Colombia, 28 May 2012, Laurence Duchien.

PhD in progress : Benoit Cornu, Automated Runtime Software Repair, October 2012, Lionel Seinturier & Martin Monperrus.

PhD in progress : Rémi Druilhe, Réduction de l'emprunte énergétique dans la maison numérique, October 2010, Laurence Duchien & Lionel Seinturier.

PhD in progress : Alexandre Feugas, Maintien de la qualité de service au cours de l'évolution d'applications orientées services, October 2010, Laurence Duchien.

PhD in progress : Nicolas Haderer, AntDroid: Opportunistic Mobile Sensing of User Activities, October 2010, Lionel Seinturier & Romain Rouvoy.

PhD in progress : Jonathan Labéjof, R* - Réflexivité au service de l'évolution des systèmes de systèmes, October 2009, Lionel Seinturier & Philippe Merle. To be defended on 20 December 2012.

PhD in progress : Matias Martinez, Automated Program Repair at Development and Runtime, October 2011, Laurence Duchien & Martin Monperrus.

PhD in progress : Adel Noureddine, Software Engineering for Green Autonomic Systems, October 2010, Lionel Seinturier & Romain Rouvoy.

PhD in progress : Russel Nzekwa, Building Feedback Control Loops for Self-Adaptive Very-Large-Scale Environments, October 2009, Lionel Seinturier & Romain Rouvoy.

PhD in progress : Fawaz Paraiso, Interopérabilité des environnements middleware de cloud computing, October 2011, Lionel Seinturier & Philippe Merle.

PhD in progress : Clément Quinton, Migration d'applications dans les environnements middleware de cloud computing, October 2011, Laurence Duchien.

PhD in progress : Marc Sango, Composants logiciels, boucle de contrôle et adaptation pour applications safety critical dans le domaine ferroviaire, October 2012, Laurence Duchien & Christophe Gransart.

9.2.3. Juries

Laurence Duchien was in the following HDR examination committee:

- Thierry Geraud, University Marne-la-Vallée, June 2012 (chair).

Laurence Duchien was in the following PhD examination committees:

- Nabil Fakhfakh, University of Malaga, Spain, January 2012 (referee),
- Gabriel Tamura, University Lille 1 & University Los Andes, Bogota, Colombia, May 2012 (director),
- Gabriel Hermosillo, University Lille 1, June 2012 (director),
- Michal Malohlava, Charles University, Prague, September 2012 (referee),
- Takoua Ben Rhoula Aouina, University Paris 11, November 2012 (referee),
- Loic Petit, University of Grenoble, December 2012 (examiner).

Philippe Merle was in the PhD examination committee of Jonathan Labéjof, University Lille 1, December 2012 (co-advisor).

Lionel Seinturier was in the following PhD examination committees:

- Gabriel Tamura, University Lille 1 & University Los Andes, Bogota, Colombia, May 2012 (examiner),
- Gabriel Hermosillo, University Lille 1, June 2012 (co-director),
- Sandrines Santilles, Märladalen University, Sweden, June 2012 (opponent),
- Ali Hassan, Telecom Bretagne, September 2012 (referee),
- Mohamed Lamine Boukhanoufa, University Paris 11, September 2012 (examiner),
- Jonathan Labéjof, University Lille 1, December 2012 (director).

9.3. Popularization

Nicolas Petitprez participated to Salon de la Vente à distance that was held in Lille from October 23 to 25, 2012. Inria held a booth in this exhibition that is dedicated to professionals from the retail industry. Nicolas demonstrated the results and the prototype that has been developed in the context of the FUI Macchiato (see Section 8.2) project.

Laurence Duchien participated to a panel on Mobile computing for Banking applications that was held in April 2012 in Paris.

Aurélien Bourdon gave several demonstrations of the PowerAPI software library (see Section 5.6), especially for the Recherche, Innovation, Creation (RIC) day that was held on 6 October 2012 in Lille and that targets graduate students from the M.Sc and Computer Engineering programs. He also gave this demonstration during visits such as the one of Michel Cosnard, CEO of Inria, and the one of Jean-François Pauwels, vice-president for research at University Lille 1. Finally the demonstration was also played during workshops dedicated to green computing, such as Eco-conception des logiciels un outil novateur pour le pilotage des projets informatiques in October 2012, and Rencontre Inria Industrie in March 2012.

10. Bibliography

Major publications by the team in recent years

[1] S. HENSS, M. MONPERRUS, M. MEZINI. *Semi-Automatically Extracting FAQs to Improve Accessibility of Software Development Knowledge*, in "ICSE - 34th International Conference on Software Engineering", Zurich, Suisse, March 2012, pp. 793-803 [*DOI :* 10.1109/ICSE.2012.6227139], http://hal.inria.fr/hal-00681906

[2] N. MOHA, Y.-G. GUÉHÉNEUC, L. DUCHIEN, A.-F. LE MEUR. *DECOR: A Method for the Specification and Detection of Code and Design Smells*, in "IEEE Transactions on Software Engineering", January 2010, vol. 36, n^{o} 1, pp. 20-36, Rank (CORE) : A+, http://hal.inria.fr/inria-00538476

[3] N. MOHA, Y.-G. GUÉHÉNEUC, A.-F. LE MEUR, L. DUCHIEN, A. TIBERGHIEN. *From a Domain Analysis to the Specification and Detection of Code and Design Smells*, in "Formal Aspects of Computing", 2010, vol. 22, n^{o} 3-4, pp. 345-361, http://hal.inria.fr/inria-00512135

[4] M. MONPERRUS, M. EICHBERG, E. TEKES, M. MEZINI. *What Should Developers Be Aware Of? An Empirical Study on the Directives of API Documentation*, in "Empirical Software Engineering", December 2011, vol. 17, n^{o} 6, pp. 703-737 [*DOI :* 10.1007/s10664-011-9186-4], http://hal.inria.fr/hal-00702183

[5] M. MONPERRUS, M. MEZINI. *Detecting Missing Method Calls as Violations of the Majority Rule*, in "ACM Transactions on Software Engineering and Methodology", November 2011, vol. 22, n^{o} 1, to appear, http://hal.archives-ouvertes.fr/hal-00702196

[6] A. NOUREDDINE, A. BOURDON, R. ROUVOY, L. SEINTURIER. *Runtime Monitoring of Software Energy Hotspots*, in "ASE - The 27th IEEE/ACM International Conference on Automated Software Engineering - 2012", Essen, Germany, September 2012, pp. 160-169 [*DOI :* 10.1145/2351676.2351699], http://hal.inria.fr/hal-00715331

[7] C. PARRA, X. BLANC, A. CLEVE, L. DUCHIEN. *Unifying design and runtime software adaptation using aspect models*, in "Science of Computer Programming", January 2011, vol. 76, n° 12, pp. 1247-1260 [*DOI :* 10.1016/J.PHYSLETB.2003.10.071], http://hal.inria.fr/inria-00564592

[8] L. SEINTURIER, P. MERLE, R. ROUVOY, D. ROMERO, V. SCHIAVONI, J.-B. STEFANI. *A Component-Based Middleware Platform for Reconfigurable Service-Oriented Architectures*, in "Software: Practice and Experience", May 2012, vol. 42, n° 5, pp. 559-583 [*DOI :* 10.1002/SPE.1077], http://hal.inria.fr/inria-00567442

[9] A. TAHERKORDI, F. LOIRET, R. ROUVOY, F. ELIASSEN. *A Generic Component-based Approach for Programming, Composing and Tuning Sensor Software*, in "The Computer Journal", February 2011, vol. 54, n° 2, pp. 1-19 [*DOI :* 10.1093/COMJNL/BXQ102], http://hal.inria.fr/inria-00563687

[10] A. TAHERKORDI, F. LOIRET, R. ROUVOY, F. ELIASSEN. *Optimizing Sensor Network Reprogramming via In-situ Reconfigurable Components*, in "ACM Transactions on Sensor Networks", May 2013, vol. 9, n° 2, pp. 1-37, http://hal.inria.fr/hal-00658748

Publications of the year

Doctoral Dissertations and Habilitation Theses

[11] G. HERMOSILLO. , *Towards Creating Context-Aware Dynamically-Adaptable Business Processes Using Complex Event Processing*, Université des Sciences et Technologie de Lille - Lille I, June 2012, http://hal.inria.fr/tel-00709303

[12] G. TAMURA. , *QoS-CARE: Un Système Fiable pour la Préservation de Contrats de Qualité de Service à travers de la Reconfiguration Dynamique*, Université des Sciences et Technologie de Lille - Lille I and Universidad de Los Andes, May 2012, http://hal.inria.fr/tel-00713345

Articles in International Peer-Reviewed Journals

[13] A. CLASSEN, M. CORDY, P. HEYMANS, P.-Y. SCHOBBENS, A. LEGAY. *Model Checking for Software Product Lines with SNIP*, in "International Journal on Software Tools for Technology Transfer (STTT)", 2012 [*DOI :* 10.1007/S10009-012-0234-1], http://hal.inria.fr/hal-00717956

[14] P. HEYMANS, Q. BOUCHER, A. CLASSEN, A. BOURDOUX, L. DEMONCEAU. *A Code Tagging Approach to Software Product Line Development: An Application to Satellite Communication Libraries*, in "International Journal on Software Tools for Technology Transfer", June 2012 [*DOI :* 10.1007/S10009-012-0242-1], http://hal.inria.fr/hal-00718296

[15] P. HEYMANS. *Introduction to the RE'11 special issue: requirements in motion*, in "Requirements Engineering Journal", 2012, vol. 17, n° 2, pp. 79-81 [*DOI :* 10.1007/S00766-012-0156-1], http://hal.inria.fr/hal-00718546

[16] J. MATHIEU, C. JOUVRAY, F. KORDON, A. KUNG, J. LALANDE, F. LOIRET, J. NAVAS, L. PAUTET, J. PULOU, A. RADERMACHER, L. SEINTURIER. *Flex-eWare: a Flexible MDE-based Solution for Designing and Implementing Embedded Distributed Systems*, in "Software: Practice and Experience", 2012, vol. 42, n° 12, pp. 1467-1494 [*DOI :* 10.1002/SPE.1143], http://hal.inria.fr/inria-00628310

[17] R. MATULEVICIUS, H. MOURATIDIS, M. NICOLAS, E. DUBOIS, P. HEYMANS. *Syntactic and Semantic Extensions to Secure Tropos to Support Security Risk Management*, in "J.UCS Journal of Universal Computer Science", March 2012, vol. 18, n° 6, pp. 816-844, http://hal.inria.fr/hal-00718134

[18] D. ROMERO, G. HERMOSILLO, A. TAHERKORDI, R. NZEKWA, R. ROUVOY, F. ELIASSEN. *The DigiHome Service-Oriented Platform*, in "Software: Practice and Experience", 2012 [*DOI :* 10.1002/SPE.1125], http://hal.inria.fr/inria-00563678

[19] L. SEINTURIER, P. MERLE, R. ROUVOY, D. ROMERO, V. SCHIAVONI, J.-B. STEFANI. *A Component-Based Middleware Platform for Reconfigurable Service-Oriented Architectures*, in "Software: Practice and Experience", May 2012, vol. 42, n° 5, pp. 559-583 [*DOI :* 10.1002/SPE.1077], http://hal.inria.fr/inria-00567442

Articles in Non Peer-Reviewed Journals

[20] L. DUCHIEN, Y. LEDRU. *Défis pour le Génie de la Programmation et du Logiciel GDR CNRS GPL*, in "Technique et Science Informatiques (TSI)", March 2012, vol. 31, n° 3, pp. 397-413, http://hal.inria.fr/hal-00712942

[21] C. PARRA, C. QUINTON, L. DUCHIEN. *CAPucine: Context-Aware Service-Oriented Product Line for Mobile Apps*, in "ERCIM News", January 2012, vol. 88, pp. 38-39, http://hal.inria.fr/hal-00655405

Invited Conferences

[22] N. HADERER, M. NUÑEZ DEL PRADO CORTEZ, R. ROUVOY, M.-O. KILLIJIAN, M. ROY. *Campagne de collecte de données et vie privée*, in "3ème Journées du GDR CNRS GPL", Rennes, France, 2012, pp. 253-254, http://hal.inria.fr/hal-00711609

[23] P. HEYMANS. *Visual Effectiveness of Modeling Notations (Invited tutorial)*, in "Yearly Summer School of IFI / University of Zurich", Zurich, Germany, 2012, http://hal.inria.fr/hal-00718139

International Conferences with Proceedings

[24] M. ACHER, P. HEYMANS, P. COLLET, C. QUINTON, P. LAHIRE, P. MERLE. *Feature Model Differences*, in "CAiSE - 24th International Conference on Advanced Information Systems Engineering - 2012", Gdańsk, Poland, June 2012, http://hal.inria.fr/hal-00713849

[25] A. BARTEL, J. KLEIN, M. MONPERRUS, Y. LE TRAON. *Automatically Securing Permission-Based Software by Reducing the Attack Surface: An Application to Android*, in "IEEE/ACM International Conference On Automated Software Engineering", Germany, September 2012, pp. 274-277, http://hal.inria.fr/hal-00726196

[26] A. BARTEL, J. KLEIN, M. MONPERRUS, Y. LE TRAON. *Dexpler: Converting Android Dalvik Bytecode to Jimple for Static Analysis with Soot*, in "ACM SIGPLAN International Workshop on the State Of the Art in Java Program Analysis (SOAP 2012)", Beijing, China, June 2012, pp. ACM ISBN 978-1-4503-1490-9/12/06, http://hal.inria.fr/hal-00697421

[27] Q. BOUCHER, E. K. ABBASI, A. HUBAUX, G. PERROUIN, M. ACHER, P. HEYMANS. *Towards More Reliable Configurators: A Re-engineering Perspective*, in "International Workshop on Product Line Approaches in Software Engineering (PLEASE)", Zurich, Switzerland, IEEE, June 2012, pp. 29-32 [*DOI :* 10.1109/PLEASE.2012.6229766], http://hal.inria.fr/hal-00718278

[28] Q. BOUCHER, G. PERROUIN, J.-C. DEPREZ, P. HEYMANS. *Towards Configurable ISO 29110-compliant Software Development Processes for Very Small Entities*, in "12th European System, Software & Service Process Improvement & Innovation Conference", Vienne, Austria, Springer, June 2012, pp. 169-180 [*DOI :* 10.1007/978-3-642-31199-4_15], http://hal.inria.fr/hal-00718281

[29] Q. BOUCHER, G. PERROUIN, P. HEYMANS. *Deriving Configuration Interfaces from Feature Models: A Vision Paper*, in "Sixth International Workshop on Variability Modelling of Software-Intensive Systems", Leipzig, Germany, ACM, January 2012, pp. 37-44 [*DOI :* 10.1145/2110147.2110152], http://hal.inria.fr/hal-00718286

[30] M. CORDY, A. CLASSEN, P. HEYMANS, P.-Y. SCHOBBENS, A. LEGAY. *Managing Evolution in Software Product Lines : A Model-Checking Perspective*, in "6th International Workshop on Variability Modelling of Software Intensive Systems", Leipzig, Saxe, Germany, ACM, January 2012, pp. 183-191, http://hal.inria.fr/hal-00718216

[31] M. CORDY, A. CLASSEN, G. PERROUIN, P.-Y. SCHOBBENS, P. HEYMANS, A. LEGAY. *Simulation-Based Abstractions for Software Product-Line Model Checking*, in "34th International Conference on Software Engineering, ICSE 2012", Zurich, Switzerland, M. GLINZ, G. MURPHY, M. PEZZE (editors), June 2012, pp. 672-682, http://hal.inria.fr/hal-00718047

[32] M. CORDY, P. HEYMANS, P.-Y. SCHOBBENS, A. LEGAY. *Behavioural Modelling and Verification of Real-time Software Product Lines*, in "16th Software Product Line Conference", Salvador de Bahia, Brazil, ACM, September 2012, http://hal.inria.fr/hal-00718157

[33] M. DE MONTAUZAN, M. MONPERRUS. *Une seule manière d'utiliser les exceptions ? Une étude empirique de 21 applications Java*, in "9ème édition de la conférence MAnifestation des JEunes Chercheurs en Sciences et Technologies de l'Information et de la Communication - MajecSTIC 2012", Lille, France, L'association Manifestations Scientifiques des Jeunes Chercheurs, October 2012, http://hal.inria.fr/hal-00745301

[34] X. DEVROEY, M. CORDY, G. PERROUIN, E.-Y. KANG, P.-Y. SCHOBBENS, P. HEYMANS, A. LEGAY, B. BAUDRY. *A Vision for Behavioural Model-Driven Validation of Software Product Lines*, in "International Symposium On Leveraging Applications of Formal Methods, Verification and Validation", Amirandes, Heraclion, Greece, October 2012, http://hal.inria.fr/hal-00726121

[35] X. DEVROEY, M. CORDY, G. PERROUIN, E.-Y. KANG, P.-Y. SCHOBBENS, P. HEYMANS, A. LEGAY, B. BAUDRY. *Towards Behavioural Model-Driven Validation of Software Product Lines*, in "5th International Sympoisum on Leveraging Applications of Formal Methods", Héraklion, Crète, Greece, October 2012, http://hal.inria.fr/hal-00718180

[36] N. GAMEZ, D. ROMERO, L. FUENTES, R. ROUVOY, L. DUCHIEN. *Constraint-based Self-adaptation of Wireless Sensor Networks*, in "2nd International Workshop on Adaptive Services for Future Internet", Bertinoro, Italy, September 2012, pp. 20-27, http://hal.inria.fr/hal-00739236

[37] N. GENON, P. CAIRE, H. TOUSSAINT, P. HEYMANS, D. MOODY. *Towards a More Semantically Transparent i* Visual Syntax*, in "18th International Working Conference on Requirements Engineering for Software Quality (REFSQ 2012)", Essen, Germany, Springer, 2012, vol. 7195, pp. 140-146, http://hal.inria.fr/hal-00718136

[38] J. GILLAIN, P. HEYMANS, I. JURETA, S. FAULKNER, M. SNOECK. *Product Portfolio Scoping Optimization Based on Features and Goals*, in "16th Software Product Line Conference", Salvador de Bahia, Brazil, ACM, September 2012, http://hal.inria.fr/hal-00718165

[39] J. GREENYER, A. SHARIFLOO, M. CORDY, P. HEYMANS. *Efficient Consistency Checking of Scenario-Based Product Line Specifications*, in "Requirements Engineering Conference", Chicago, United States, April 2012, http://hal.inria.fr/hal-00718476

[40] S. HENSS, M. MONPERRUS, M. MEZINI. *Semi-Automatically Extracting FAQs to Improve Accessibility of Software Development Knowledge*, in "ICSE - 34th International Conference on Software Engineering", Zurich, Switzerland, March 2012, pp. 793-803 [*DOI :* 10.1109/ICSE.2012.6227139], http://hal.inria.fr/hal-00681906

[41] P. HEYMANS, M. ACHER, R. MICHEL, P. COLLET, P. LAHIRE. *Languages and Tools for Managing Feature Models*, in "3rd International Workshop on Product Line Approaches in Software Engineering", Zürich, Switzerland, 2012, http://hal.inria.fr/hal-00718325

[42] P. HEYMANS, R. MICHEL, V. GANESH, A. HUBAUX. *An SMT-based Approach to Automated Configuration*, in "10th International Workshop on Satisfiability Modulo Theories (SMT)", Manchester, United Kingdom, 2012, pp. 107-117, http://hal.inria.fr/hal-00718335

[43] A. HUBAUX, D. JANNACH, C. DRESCHER, L. MURTA, T. MANNISTO, P. HEYMANS, K. CZARNECKI, T. NGUYEN, M. ZANKER. *Unifying Software and Product Configuration: A Research Roadmap*, in "Proceedings of the Workshop on Configuration (ConfWS)", Montpellier, France, 2012, http://hal.inria.fr/hal-00718241

[44] J. LABÉJOF, A. LÉGER, P. MERLE, L. SEINTURIER, H. VINCENT. *R-MOM: A Component-Based Framework for Interoperable and Adaptive Asynchronous Middleware Systems*, in "SCDI - The First International Workshop on Service and Cloud Based Data Integration - 2012", Beijing, China, EDOCW2012, Springer, September 2012, vol. 16, pp. 204-213 [*DOI :* 10.1109/EDOCW.2012.35], http://hal.inria.fr/hal-00710623

[45] M. MAHAUX, P. HEYMANS. *Improvisational Theater for Information Systems: An Agile, Experience-Based, Prototyping Technique (Tutorial)*, in "24th International Conference on Advanced Information Systems Engineering (CAiSE), 2012", Gdańsk, Poland, June 2012, http://hal.inria.fr/hal-00718371

[46] M. MAHAUX, P. HEYMANS. *Improvisational Theater for Information Systems: Breathing Collaboration and Creativity into Your Developments (Tutorial)*, in "6th International Conference on Research Challenges in Information Science (RCIS), 2012", Valencia, Spain, May 2012, http://hal.inria.fr/hal-00718375

[47] M. MAHAUX, P. HEYMANS. *Integrating Creativity and Sustainability in RE Education (Poster)*, in "First International Workshop on Requirements Engineering for Sustainable Systems (RE4SuSy) held in conjunction with REFSQ, 2012", Essen, Germany, March 2012, http://hal.inria.fr/hal-00718383

[48] M. MAHAUX, A. MAVIN, P. HEYMANS. *Choose your Creativity: Why and How Creativity in Requirements Engineering Means Different Things to Different People*, in "18th International Working Conference on

Requirements Engineering for Software Quality (REFSQ), 2012", Essen, Germany, March 2012, pp. 101-116, http://hal.inria.fr/hal-00718368

[49] O. MANGIN, B. BARAFORT, E. DUBOIS, P. HEYMANS. *Designing a Process Reference Model for Information Security Management Systems*, in "12th International SPICE Conference on Process Improvement and Capability Determination", Palma de Mallorca, Spain, Springer, May 2012, pp. 129-140, http://hal.inria.fr/hal-00718197

[50] S. MOSSER, M. BLAY-FORNARINO, L. DUCHIEN. *A Commutative Model Composition Operator to Support Software Adaptation*, in "8th European Conference on Modelling Foundations and Applications", Lyngby, Denmark, SPRINGER LNCS, July 2012, pp. 4-19, http://hal.inria.fr/hal-00689706

[51] S. MOSSER, L. DUCHIEN, C. PARRA, M. BLAY-FORNARINO. *Using Domain Features to Handle Feature Interactions*, in "Variability Modelling Software-Intensive Systems (VAMOS)", Leipzig, Germany, ACM Conference Proceedings Series, January 2012, pp. 101-110, http://hal.inria.fr/hal-00653044

[52] A. NOUREDDINE, A. BOURDON, R. ROUVOY, L. SEINTURIER. *A Preliminary Study of the Impact of Software Engineering on GreenIT*, in "First International Workshop on Green and Sustainable Software", Zurich, Switzerland, June 2012, pp. 21-27, http://hal.inria.fr/hal-00681560

[53] A. NOUREDDINE, A. BOURDON, R. ROUVOY, L. SEINTURIER. *Runtime Monitoring of Software Energy Hotspots*, in "ASE - The 27th IEEE/ACM International Conference on Automated Software Engineering - 2012", Essen, Germany, September 2012, pp. 160-169 [*DOI :* 10.1145/2351676.2351699], http://hal.inria.fr/hal-00715331

[54] F. PARAISO, N. HADERER, P. MERLE, R. ROUVOY, L. SEINTURIER. *A Federated Multi-Cloud PaaS Infrastructure*, in "5th IEEE International Conference on Cloud Computing", hawaii, United States, June 2012, pp. 392 - 399 [*DOI :* 10.1109/CLOUD.2012.79], http://hal.inria.fr/hal-00694700

[55] F. PARAISO, G. HERMOSILLO, R. ROUVOY, P. MERLE, L. SEINTURIER. *A Middleware Platform to Federate Complex Event Processing*, in "Sixteenth IEEE International EDOC Conference", Beijing, China, Springer, September 2012, pp. 113-122, http://hal.inria.fr/hal-00700883

[56] C. PARRA, D. ROMERO, S. MOSSER, R. ROUVOY, L. DUCHIEN, L. SEINTURIER. *Using Constraint-based Optimization and Variability to Support Continuous Self-Adaptation*, in "27th ACM Symposium on Applied Computing (SAC'12), 7th Dependable and Adaptive Distributed Systems (DADS) Track", Trento, Italy, March 2012, pp. 486-491, http://hal.inria.fr/inria-00632269

[57] N. PETITPREZ, R. ROUVOY, L. DUCHIEN. *Connecting your Mobile Shopping Cart to the Internet-of-Things*, in "12th IFIP International Conference on Distributed Applications and Interoperable Systems (DAIS'12)", Stockholm, Sweden, K. M. GÖSCHKA, S. HARIDI (editors), LNCS, Springer, June 2012, vol. 7272, pp. 236-243 [*DOI :* 10.1007/978-3-642-30823-9_21], http://hal.inria.fr/hal-00684780

[58] C. QUINTON, L. DUCHIEN, P. HEYMANS, S. MOUTON, E. CHARLIER. *Using Feature Modelling and Automations to Select among Cloud Solutions*, in "PLEASE - 3rd International Workshop on Product LinE Approaches in Software Engineering - 2012", Zurich, Switzerland, June 2012, pp. 17-20, http://hal.inria.fr/hal-00695401

[59] C. QUINTON, R. ROUVOY, L. DUCHIEN. *Leveraging Feature Models to Configure Virtual Appliances*, in "CloudCP - 2nd International Workshop on Cloud Computing Platforms - 2012", Bern, Switzerland, April 2012, vol. 2, pp. 1-6, http://hal.inria.fr/hal-00674379

[60] R. ROUVOY, P. MERLE. *Rapid Prototyping of Domain-Specific Architecture Languages*, in "International ACM SIGSOFT Symposium on Component-Based Software Engineering (CBSE'12)", Bertinoro, Italy, M. LARSSON, N. MEDVIDOVIC (editors), ACM, June 2012, pp. 13-22 [*DOI :* 10.1145/2304736.2304741], http://hal.inria.fr/hal-00690607

National Conferences with Proceedings

[61] P. HEYMANS, M. ACHER, R. MICHEL. *Next-Generation Model-based Variability Management: Languages and Tools (Tutorial)*, in "CIEL (Conférence en IngénieriE du Logiciel)", Rennes, France, 2012, http://hal.inria.fr/hal-00718339

[62] C. QUINTON, L. DUCHIEN. *Vers un Outil de Configuration et de Déploiement pour les Nuages*, in "JLdP - Journée Lignes de Produits", Lille, France, November 2012, pp. 83-94, http://hal.inria.fr/hal-00747319

Scientific Books (or Scientific Book chapters)

[63] R. DE LEMOS, H. GIESE, H. A. MULLER, M. SHAW, J. ANDERSSON, L. BARESI, B. BECKER, N. BENCOMO, Y. BRUN, B. CUKIC, R. DESMARAIS, S. DUSTDAR, G. ENGELS, K. GEIHS, K. GOESCHKA, A. GORLA, V. GRASSI, P. INVERARDI, G. KARSAI, J. KRAMER, M. LITOIU, A. LOPES, J. MAGEE, S. MALEK, S. MANKOVSKII, R. MIRANDOLA, J. MYLOPOULOS, O. NIERSTRASZ, M. PEZZE, C. PREHOFE, W. SCHÄFER, R. SCHLICHTING, B. SCHMERL, D. SMITH, J. SOUSA, G. TAMURA, L. TAHVILDARI, N. VILLEGAS, T. VOGEL, D. WEYNS, K. WONG, J. WUTTKE. *Software Engineering for Self-Adaptive Systems: A Second Research Roadmap*, in "Software Engineering for Self-Adaptive Systems", Dagstuhl Seminar Proceedings, Springer, 2012, vol. 7475, pp. 1-26, http://hal.inria.fr/inria-00638157

[64] A. PLSEK, F. LOIRET, M. MALOHLAVA. *Component-Oriented Development for Real-Time Java*, in "Distributed, Embedded and Real-time Java Systems", A. J. HIGUERA-TOLEDANO (editor), Springer, January 2012, pp. 265-292, http://hal.inria.fr/hal-00669013

[65] D. ROMERO, L. DUCHIEN, L. SEINTURIER. *Adaptation des plates-formes intergicielles*, in "L'adaptation dans tous ses état", P. LOPISTEGUY, D. RIEU, P. ROOSE (editors), Cépaduès, January 2012, http://hal.inria.fr/hal-00746564

[66] G. TAMURA, N. VILLEGAS, H. MÜLLER, J. SOUSA, B. BECKER, M. PEZZE, G. KARSAI, S. MANKOVSKII, W. SCHÄFER, L. TAHVILDARI, K. WONG. *Towards Practical Runtime Verification and Validation of Self-Adaptive Software Systems*, in "Software Engineering for Self-Adaptive Systems 2", R. DE LEMOS, H. GIESE, H. MÜLLER, M. SHAW (editors), LNCS, Springer, August 2012, vol. 7475, pp. 108-132, http://hal.inria.fr/hal-00709943

[67] N. VILLEGAS, G. TAMURA, H. MÜLLER, L. DUCHIEN, R. CASALLAS. *DYNAMICO: A Reference Model for Governing Control Objectives and Context Relevance in Self-Adaptive Software Systems*, in "Software Engineering for Self-Adaptive Systems 2", LNCS, Springer, August 2012, vol. 7475, pp. 265-293, http://hal.inria.fr/hal-00713315

Books or Proceedings Editing

[68] O. BARAIS, L. DUCHIEN (editors). , *Actes des 4èmes journées du GDR Génie de la Programmation et du Logiciel, Rennes, 2012*, Université de Rennes, June 2012, 256 p. , http://hal.inria.fr/hal-00713033

Research Reports

[69] E. ABGRALL, Y. LE TRAON, M. MONPERRUS, S. GOMBAULT, M. HEIDERICH, A. RIBAULT. , *XSS-FP: Browser Fingerprinting using HTML Parser Quirks*, arxiv, November 2012, http://hal.inria.fr/hal-00753926

[70] A. BARTEL, J. KLEIN, M. MONPERRUS, K. ALLIX, Y. LE TRAON. , *Improving Privacy on Android Smartphones Through In-Vivo Bytecode Instrumentation*, University of Luxembourg, April 2012, n° ISBN: 978-2-87971-111-9, http://hal.inria.fr/hal-00700319

[71] A. BARTEL, J. KLEIN, M. MONPERRUS, Y. LE TRAON. , *Automatically Securing Permission-Based Software by Reducing the Attack Surface: An Application to Android*, University of Luxembourg, March 2012, n° ISBN: 978-2-87971-107-2, http://hal.inria.fr/hal-00700074

[72] B. BAUDRY, M. MONPERRUS. , *Towards Ecology Inspired Software Engineering*, Inria, May 2012, n° RR-7952, http://hal.inria.fr/hal-00694276

[73] N. HADERER, R. ROUVOY, L. SEINTURIER. , *AntDroid: A distributed platform for mobile sensing*, Inria, February 2012, n° RR-7885, 27 p. , http://hal.inria.fr/hal-00671164

[74] C. HENARD, M. PAPADAKIS, G. PERROUIN, J. KLEIN, P. HEYMANS, Y. LE TRAON. , *Bypassing the Combinatorial Explosion: Using Similarity to Generate and Prioritize T-wise Test Suites for Large Software Product Lines*, arxiv, November 2012, Technical Report, http://hal.inria.fr/hal-00756084

[75] A. NOUREDDINE, A. BOURDON, R. ROUVOY, L. SEINTURIER. , *e-Surgeon: Diagnosing Energy Leaks of Application Servers*, Inria, January 2012, n° RR-7846, http://hal.inria.fr/hal-00652992

[76] D. ROMERO, M. BLAY-FORNARINO, P. COLLET, L. DUCHIEN, P. RENEVIER, S. URLI. , *Current situation facing the needs of the scenarios from the deliverables I2.1.1 and I2.2.1*, ANR YourCast Project Deliverable, July 2012, http://hal.inria.fr/hal-00750128

Scientific Popularization

[77] S. MOSSER. , *La Thèse ...*, NA, February 2012, http://hal.inria.fr/hal-00669772

Other Publications

[78] A. BOURDON, L. SEINTURIER, R. ROUVOY. , *[Projet Econ'Home] Spécification d'une interface ergonomique rendant compte de la consommation des équipements à l'utilisateur final*, February 2012, Spécification d'une interface ergonomique rendant compte de la consommation des équipements à l'utilisateur final, dans le cadre du projet Econ'Home. Livrable L5.5, http://hal.inria.fr/hal-00716865

[79] A. BOURDON, L. SEINTURIER, R. ROUVOY. , *[Projet Econ'Home] Spécification de l'architecture (monitoring et notification) et protocole de routage IP économe en énergie.*, February 2012, Spécification de l'architecture (monitoring et notification) et protocole de routage IP économe en énergie dans le cadre du projet Econ'Home. Livrable L5.7, http://hal.inria.fr/hal-00716869

[80] M. DIRIX, A. DE ALMEIDA SOUZA NETO, P. MERLE. , *FraSCAti Studio : création en ligne de services et déploiement dans les nuages*, June 2012, http://hal.inria.fr/hal-00696196

[81] A. FEUGAS, S. MOSSER, L. DUCHIEN. , *Un processus de développement pour contrôler l'évolution des processus métiers en termes de QoS*, June 2012, http://hal.inria.fr/hal-00711412

[82] M. MARTINEZ, M. MONPERRUS. , *Mining Repair Actions for Automated Program Fixing*, June 2012, http://hal.inria.fr/hal-00696590

[83] F. PARAISO, G. HERMOSILLO, R. ROUVOY, P. MERLE, L. SEINTURIER. , *Distributed Complex Event Processing Engine*, June 2012, http://hal.inria.fr/hal-00695560

[84] C. QUINTON, L. DUCHIEN, R. ROUVOY. , *Choisir son Nuage à l'Aide des Modèles de Caractéristiques*, June 2012, http://hal.inria.fr/hal-00713080

References in notes

[85] , *CORBA Component Model*, OMG, February 1999, http://www.omg.org

[86] , *Enterprise Java Beans*, Sun Microsystems, 1997, http://java.sun.com/

[87] R. E. FILMAN, T. ELRAD, S. CLARKE, M. AKSIT (editors). , *Aspect-Oriented Software Development*, Addison-Wesley, 2005

[88] , *json-lib*, 2009, http://json-lib.sourceforge.net

[89] , *XTream*, 2009, http://xstream.codehaus.org

[90] É. BRUNETON, T. COUPAYE, M. LECLERCQ, V. QUÉMA, J.-B. STEFANI. *An Open Component Model and Its Support in Java*, in "Component-Based Software Engineering", I. CRNKOVIC, J. STAFFORD, H. SCHMIDT, K. WALLNAU (editors), Lecture Notes in Computer Science, Springer Berlin / Heidelberg, 2004, vol. 3054, pp. 7-22, 10.1007/978-3-540-24774-6_3, http://dx.doi.org/10.1007/978-3-540-24774-6_3

[91] É. BRUNETON, T. COUPAYE, M. LECLERCQ, V. QUÉMA, J.-B. STEFANI. *The* FRACTAL *Component Model and its Support in Java*, in "Software: Practice and Experience – Special issue on Experiences with Auto-adaptive and Reconfigurable Systems", August 2006, vol. 36, n^{o} 11-12, pp. 1257–1284, John Wiley & Sons [*DOI :* 10.1002/SPE.767], http://fractal.objectweb.org/doc/pub/SPE06.pdf

[92] P. CLEMENTS, L. NORTHROP. , *Software Product Lines Practices and Patterns*, Addison-Wesley, 2002

[93] D. CONAN, R. ROUVOY, L. SEINTURIER. *COSMOS : composition de noeuds de contexte*, in "Techniques et Sciences Informatiques", 2008, vol. 27, n^{o} 9-10, pp. 1189–1224, http://hal.inria.fr/inria-00330574

[94] D. CROCKFORD. , *RFC 4627 - The application/json Media Type for JavaScript Object Notation (JSON)*, IETF, 2006, IETF RFC, http://tools.ietf.org/html/rfc4627

[95] Y. DAVIN. *A la découverte du modèle de composants Fractal*, in "Programmez!", October 2009, n^{o} 123, pp. 1-3, http://hal.inria.fr/hal-00669779

[96] Y. DAVIN. , *F4E: A Fractal Development Environment for Eclipse*, April 2009, Fractal Poster Session at OW2 Annual Conference (OW2'09), http://www.ow2.org/view/Events2009AnnualConference/Session8

[97] C. DEMAREY, D. FOURNIER. *FraSCAti, prenez le contrôle sur vos applications*, in "Programmez", December 2010, http://hal.inria.fr/inria-00531342

[98] C. DEMAREY, D. FOURNIER. *SOA facile avec SCA*, in "Programmez", November 2010, n^{o} 135, http://hal.inria.fr/inria-00531338

[99] R. DRUILHE, A. MATTHIEU, L. DUCHIEN, R. ROUVOY. , *La réduction de la consommation d'énergie dans les environnements domestiques répartis*, May 2011, http://hal.inria.fr/inria-00591771

[100] R. T. FIELDING. , *Architectural Styles and the Design of Network-based Software Architectures*, University of California, Irvine, 2000, http://www.ics.uci.edu/~fielding/pubs/dissertation/fielding_dissertation.pdf

[101] R. GABRIEL, M. DEVOS, B. FOOTE, G. STEELE, J. NOBLE. , *Objects Have Failed*, November 2002, Object-Oriented Programming, Systems, Languages and Applications (OOPSLA'02), Seattle, USA

[102] E. GUTTMAN, C. PERKINS, J. VEIZADES, M. DAY. , *Service Location Protocol, Version 2, RFC 2608*, June 1999, http://tools.ietf.org/html/rfc2608

[103] G. HERMOSILLO, L. SEINTURIER, L. DUCHIEN. *Creating Context-Adaptive Business Processes*, in "The 8th International Conference on Service Oriented Computing", États-Unis San Francisco, California, Dec 2010, http://hal.inria.fr/inria-00508988

[104] G. HERMOSILLO, L. SEINTURIER, L. DUCHIEN. *Using Complex Event Processing for Dynamic Business Process Adaptation*, in "Proceedings of the 7th IEEE 2010 International Conference on Services Computing (SCC 2010)", États-Unis Miami, Florida, IEEE Computer Society, Jul 2010, pp. 466 -473, http://hal.inria.fr/inria-00482578

[105] G. KICZALES, J. LAMPING, A. MENDHEKAR, C. MAEDA, C. LOPES, J.-M. LOINGTIER, J. IRWIN. *Aspect-Oriented Programming*, in "Proceedings of the 11th European Conference on Object-Oriented Programming (ECOOP'97)", Lecture Notes in Computer Science, Springer, June 1997, vol. 1241, pp. 220–242

[106] J. LABÉJOF, P. MERLE, A. LÉGER, L. SEINTURIER. , *Data Distribution System Based on the Exchange of Asynchronous Messages*, July 2011, n^{o} 11 02295, patent no. 11 02295, http://hal.inria.fr/hal-00659548

[107] D. C. LUCKHAM. , *The Power of Events: An Introduction to Complex Event Processing in Distributed Enterprise Systems*, Addison-Wesley Longman Publishing Co., Inc., 2002

[108] K. MAKICE. , *Twitter API: Up and Running Learn How to Build Applications with the Twitter API*, O'Reilly Media Inc, 2009

[109] J. MARAS, L. LEDNICKI, I. CRNKOVIC. *15 years of CBSE Symposium - Impact on the research community*, in "Proceedings of the 15th ACM SIGSOFT International Symposium on Component-Based Software Engineering (CBSE'12)", Lecture Notes in Computer Science, Springer-Verlag, June 2012

[110] M. D. MCILROY. , *Mass Produced Software Component*, Report on the NATO Software Engineering Conference, 1968, pp. 138–150

[111] P. MERLE, R. ROUVOY, L. SEINTURIER. *A Reflective Platform for Highly Adaptive Multi-Cloud Systems*, in "10th International Workshop on Adaptive and Reflective Middleware (ARM'2011) at the 12th ACM/IFIP/USENIX International Middleware Conference", Lisbonne, Portugal, December 2011, pp. 1-7, http://hal.inria.fr/inria-00628643

[112] P. MERLE, R. ROUVOY, L. SEINTURIER. *FraSCAti: Adaptive and Reflective Middleware of Middleware*, in "12th ACM/IFIP/USENIX International Middleware Conference", Lisbonne, Portugal, December 2011, http://hal.inria.fr/hal-00650608

[113] T. P. MORAN, P. DOURISH. *Introduction to This Special Issue on Context-Aware Computing*, in "Human-Computer Interaction", 2001, vol. 16, n^{o} 2–4, pp. 87–95

[114] S. MOSSER, G. HERMOSILLO, A.-F. LE MEUR, L. SEINTURIER, L. DUCHIEN. *Undoing Event-Driven Adaptation of Business Processes*, in "8th International Conference on Services Computing (SCC'11)", Washington DC, United States, IEEE, 2011, pp. 234-241, Rank (CORE): A., http://hal.archives-ouvertes.fr/hal-00587660

[115] R. MÉLISSON, D. ROMERO, R. ROUVOY, L. SEINTURIER. *An SCA-based approach for Social and Pervasive Communications in Home Environments*, in "Scientific Annals of Computer Science", 2011, vol. 21, n^{o} 1, pp. 151-173, http://hal.inria.fr/inria-00607404

[116] C. PARRA. , *Towards Dynamic Software Product Lines: Unifying Design and Runtime Adaptations*, Université des Sciences et Technologie de Lille - Lille I, March 2011, http://hal.inria.fr/tel-00583444

[117] N. PESSEMIER, L. SEINTURIER, T. COUPAYE, L. DUCHIEN. *A Component-Based and Aspect-Oriented Model for Software Evolution*, in "International Journal of Computer Applications in Technology (IJCAT)", 2008, vol. 31, n^{o} 1-2, pp. 94-105, http://hal.inria.fr/inria-00269895

[118] N. PETITPREZ, R. ROUVOY, L. DUCHIEN. *Macchiato : vers un système de panier unique pour le e-commerce*, in "Journée Services", Villeneuve d'Ascq, France, June 2011, http://hal.inria.fr/inria-00614969

[119] C. QUINTON, C. DEMAREY, N. DOLET, L. DUCHIEN. *AppliDE : modélisation et génération d'applications pour smartphones*, in "Journées sur l'Ingénierie Dirigée par les Modèles (IDM'11)", Lille, France, June 2011, pp. 41-45, http://hal.inria.fr/inria-00617565

[120] J. S. RELLERMEYER. , *JSLP project, Java Service Location Protocol*, 2009, http://jslp.sourceforge.net

[121] R. ROUVOY, D. CONAN, L. SEINTURIER. *Software Architecture Patterns for a Context Processing Middleware Framework*, in "IEEE Distributed Systems Online (DSO)", June 2008, vol. 9, n^{o} 6, 12 p. , http://hal.inria.fr/inria-00286616

[122] D. C. SCHMIDT. *Model-Driven Engineering*, in "IEEE Computer", February 2006, vol. 39, n^{o} 2

[123] L. SEINTURIER, P. MERLE, D. FOURNIER, N. DOLET, V. SCHIAVONI, J.-B. STEFANI. *Reconfigurable SCA Applications with the FraSCAti Platform*, in "Proceedings of the 6th IEEE International Conference on Service Computing (SCC'09)", September 2009, pp. 268–275, http://hal.inria.fr/inria-00397856

[124] L. SEINTURIER, N. PESSEMIER, L. DUCHIEN, T. COUPAYE. *A Component Model Engineered with Components and Aspects*, in "Proceedings of the 9th ACM SIGSOFT International Symposium on Component-Based Software Engineering (CBSE'06)", Västeras, Sweden, Lecture Notes in Computer Science, Springer, June 2006, vol. 4063, pp. 139–153

[125] M. SMITH, T. HOWES. , *RFC 4515 - Lightweight Directory Access Protocol (LDAP): String Representation of Search Filters*, IETF, 1996, IETF RFC, http://tools.ietf.org/html/rfc4515

[126] T. STRANG, C. LINNHOFF-POPIEN. *A Context Modeling Survey*, in "Workshop on Advanced Context Modelling, Reasoning and Management at the Sixth International Conference on Ubiquitous Computing (UbiComp)", 2004

[127] G. TAMURA, R. CASALLAS, A. CLEVE, L. DUCHIEN. *QoS Contract-Aware Reconfiguration of Component Architectures Using E-Graphs*, in "7th International Workshop on Formal Aspects of Component Software", Guimaraes, Portugal, M. LUMPE, L. BARBOSA (editors), LNCS, October 2010, vol. 6921, pp. 34-52, http://hal.inria.fr/inria-00525438

[128] G. WAIGNIER. , *Canevas de développement agile pour l'évolution fiable de systèmes logiciels à composants et orientés services*, Université des Sciences et Technologie de Lille - Lille I, January 2010, http://hal.inria.fr/tel-00457590

[129] Y. YAMAMOTO. , *Twitter4J*, 2009, http://yusuke.homeip.net/twitter4j/en/