1 General presentation

Scientific and Technological Project

The Adele team works in Software Engineering, more precisely on two main topics: domain specific engineering environments, and dynamic applications. In both cases, the team emphasizes real industrial issues, and adopts a model based approach. A domain specific environment is an environment which "knows" the tools, methods, procedure and conventions shared by a group of persons, when performing specific tasks. Based on this knowledge, a Computer Aided Domain Specific Environment (CADSE) can assist and automate the work to be performed in that specific domain. Our technology allows to generate a CADSE from a number of models describing the knowledge, its know how and behavior in a specific domain; and to build large scope and full fledge engineering environments from a composition of such specific environments.

The increasing complexity of an open world made of a large and unpredictable amount of interconnected devices and machines, requires zero management distributed applications. Future applications must be dynamic, autonomic and pervasive, which represents a serious challenge. We address this challenge from basic service platforms (OSGi in our case), high level dynamic platforms (on top of OSGi, like iPOJO and SAM), and environments for the design, implementation and maintenance of such demanding applications. We experiment our solution in different domains like home office, electric networks etc.

Un environnement spécifique domaine est un environnement qui « connaît » les outils, méthodes, procédés et conventions partagés par un groupe de personnes pour un ensemble de taches (appelé un domaine). Basé sur cette connaissance, un CADSE (Computer Aided Domain Specific Environment) peut assister et/ou automatiser les taches à effectuer dans ce domaine. Notre technologie permet de générer un CADSE à partir d’un ensemble de modèles décrivant les connaissances, savoir-faire et le comportement attendu dans un domaine ; et de bâtir des environnements à large spectre par composition de CADSES.
élémentaires.
La complexité croissante d’un « monde ouvert » constitué d’un nombre imprévisible d’appareils et de machines interconnectés impose de concevoir des application « zéro administration » qui de plus ne doivent d’être autonomes, dynamiques et pervasives, ce qui constitue un sérieux défi. Nous abords ce défi à tous ses niveaux d’abstraction, depuis les plate formes à service « basiques » (OSGi), les plates formes dynamiques évolutées (iPOJO et SAM), pour finalement proposer des environnements pour la conception, développement et la maintenance de telles applications.

Team History
The Adèle team (Atelier de DEveloppement LogiciEl) was created in the early 80s with syntactic editors as the primary research topic, and program repository as a secondary topic. The program repository soon became the Adèle configuration manager.

The original point of Adèle was a very innovative way to automatically build configurations based on a semantic selection of components satisfying some functional and non functional characteristics. In order to validate this mechanism, the Adèle system was extended to include all the features required for a real Software Configuration Management (SCM) system. This early Adèle version was sold to the airspace industry and was used to develop the Airbus A320 software, and later on the other Airbus and a number of flying and non flying pacific or not systems. Along the years, the Adèle system was rebuilt and enhanced a number of times, still emphasizing the large and high end systems. Along the years we have addressed virtually all the dimensions of Software Configuration Management, among others active data bases, hierarchical automatic configuration, workspace control, cooperative work, process support, versioning, interoperability and architecture, SCM/PDM (Product Data Management) integration to mention the most salient.

In the late 80s and early 90s, Adèle was considered among the three or four best SCM systems on the market (cf. the OVUM reports). This success made that Adèle was sold to a number of big companies and our publications on the topic made that we are considered among the best experts in the area.

In 1993 Adèle was bought by Dassault Systems for which we developed the largest cooperative environment of that time, with 1000 engineers in concurrence, 1 million files and a tera byte of data. In 1995, the product becoming too big for a tiny academic team, Adèle right and ownership was sold to Dassault Systems, and a common laboratory was created in Grenoble. The work on the Adèle SCM system stopped in the 2000, with more than 10 000 licences sold to industry. Nevertheless the experience and the style of work established during these 20 years of work are still applied to all the works performed in the team.

In the 80s and early 90s SCM was clearly the almost unique topic. In the 90s, a major research topic, in parallel with SCM, was process support. We have developed successive versions of the APEL process support tool, used in many projects and in experimental exploitation. From the mid 90s, an underlying line of work has been related to interoperability. This topic manifests in different results, from process interoperability, to environment and tool interoperability, until CADSEs and CADSE generators. During the Dassault Systèmes collaboration, in the mid 90s, we started our work on components models and run time support. This work was rapidly focusing on service platforms (with OSGi), and more recently, its extensions toward dynamic and autonomic platforms, with as a long term goal, the “future ideal dynamic platform”.

2 Team Composition

As by September 2009.

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Post-docs, engineers and visitors

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### Past team members


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3 Research Themes

Provided the ever growing amount of technology and expertise needed, and the ever increasing pressure to improve productivity, predictability and quality, there is a need to provide software engineering environments that really help software engineers in their tasks. But to really be helpful, an environment should have simultaneously a detailed knowledge of the task to support (it should be focused), and a global knowledge of the different tasks to support, over the complete life cycle (it should be wide scope). The solution we adopted is to develop a technology in which focused environment can be generated, based on a set of models, and in which wide scope environment can be produced by composition of more focused environments, based on model composition techniques. To be realistic, the approach not only must satisfy efficiency and scalability issues, but it must also be capable to reuse existing tools and environments, and to support the evolution of the tasks, the technology, the methods and the environment itself. The approach raises a number of new issues in different domains as presented in 3.1. The evolution toward even more independence between the parts that constitute an application and even more dynamism calls for new programming models, new platforms and new tools. We have investigated, and contributed, to the emergence of the so called Service Oriented Architecture (SOA). Most specifically we have implemented and influenced OSGi, which is the de facto industrial standard for dynamic applications and gateways. This experience gives us the expertise to envision the future “ideal” platform for dynamic and autonomic applications. In parallel we are investigating how, above such a platform, can be designed and developed, based on high level models, the future demanding dynamic and distributed applications. This work is shortly sketched in 3.2

3.1 Engineering environments

It is widely accepted that, in software engineering, the major improvements in productivity, predictability and quality are due to the availability of CASE tools and SE environments. But the support an environment can provide is proportional to the knowledge it has of the task to perform (methods, tools, conventions, libraries, architectures etc.). This knowledge does not necessarily cover a complete business area but any domain defined as an engineering area in which a class of stakeholders is performing the same activity again and again; “the same” meaning that there are significant similarities among these activities. Therefore the concept of domain is very large; it covers partial or complete business activities, but also any engineering activity in which can be identified a set of practices, tools and conventions shared by a group of persons. Domains can refer either to a subset of the business, to some technology, to a phase of the life cycle (design, develop, deploy etc.), or any mixture of the above. They are all Computer Aided Domain Specific Environments (CADSEs).

For that reason, many tools and environment today, like IDE, SCM systems, design systems, administration systems and so on can be seen through the unifying concept of CADSE, allowing envisioning a systematic Software Engineering approach for
their design, development, composition and evolution which is the overall topic of our work. Indeed, despite their differences, all CADSEs rely on two fundamental aspects:

1. the knowledge of the targeted domain, which is embedded in the environment, and
2. a mechanism for using this domain specific knowledge for the tasks at hand.

The more specialized, the more automated an environment can be; but being very narrow the environment cannot automate and guide the user when performing related activities. Therefore, the broader the coverage, the more supportive in term of method and guidance an environment can be. The logical consequence is that a real development should be supported by a number of different CADSEs, each one tailored for a given kind of stakeholder, in a given phase of the life cycle, performing a given task in a given company. This (hypothetic) proliferation of CADSEs would raise a number of additional questions like: what are the relationships between CADSEs? How to compose and reuse CADSEs? How to support concurrent engineering which involves different CADSEs? and so on. Instead of proposing a unique and heavy large scope environment, like in product line or software suites, we propose an approach in which each CADSE is a composition unit which exposes its functionality (as a set of models), and which targets a well defined scope of functionalities. A large scope CADSE is a composition of more specialized CADSEs, independently designed, developed and maintained. Provided each CADSE is built based on a set of models which are conform to the same set of metamodels with well known semantics, it is possible to define the concepts, techniques and methods, based on metamodel and model composition, needed for composing different CADSEs in different cases. The approach should solve a number of issues:

- Supply chains can be built assembling the CADSEs supporting the business performed in the different suppliers contributing to a complex product.
- Large scope business CADSEs (like Product lines) can be built assembling a number of CADSEs addressing each one a different sub-set of the business.
- Large scope CADSEs in all domains can be built assembling a number of CADSEs addressing each one a different phase of the software life cycle.
- Technical CADSEs can be reused in all domains which rely on that technique (IDE, component model, middleware etc.).
- CADSE evolution (fixes, extensions, adaptations) can be handled versioning each CADSE individually and making evolve the configuration.

**List of participants:** Jacky Estublier, German Vega, Stephane Chomat, Etienne Gandille, Gabriel Pedraza, Idrissa Dieng, Thomas Leveque, Diana Moreno, Marc Quast.

**Major results Oct. 2006-Oct. 2009:** The first CADSE we have developed was operational in 2001. We realized that developing a CADSE is not an easy task, even with explicit models. Therefore we have developed CADSEg, a CADSE for developing other CADSEs. CADSEg was used to generate a number of simple CADSEs, then to rebuild the complete Melusine CADSE (a rather complex one); and recently to generate itself. Once CADSEg available, late 2006, in a matter of a few months, a number of CADSEs have been developed. Among the CADSEs that have been developed we can mention DOCOSOC a complete composition environment for Schneider Electric [43]; FOCAS, an environment for the orchestration of service based applications [79], an iPOJO, a Service Abstract Machine, a Think / Fractal environment and so on.

**Perspectives:** The approach consists, fundamentally, in reusing (sic) the principles and approaches (abstraction, encapsulation, separation of concern, composition and reuse) which made the success of Software Engineering in general, replacing the nature of the parts (from code to models), changing the granularity and abstraction level (from component to CADSE) and changing the composition technology (from procedure call to model and metamodel composition). More generally, we believe that the approach could be extended from CADSE construction to any software construction and most Software Engineering activities, contributing to the more general field of Model Driven Engineering.

**3.2 Dynamic applications**

In a diverse domains, including automation, building management, and power distribution, we are currently investigating ways to use the Internet to exploit data embedded in smart devices. Several business and technical challenges complicate the ability to develop and manage such services; putting e-services in place in an industrial context requires providers to build large-scale
distributed systems in complex, heterogeneous environments in which site topologies, network addresses, security policies are dynamic and differ from one customer to the next. Most services also have stringent requirements regarding security and evolvability. For instance, most customers own their industrial installations and won’t open extra connections to allow e-services. Their security policies must be used as they are. Similarly, industrial customers must be able to regularly change their installations, despite the presence of e-services. Moreover, remote exploitation of embedded data presents technical challenges regarding complexity, dynamism, and security. In order to address such complex requirements, we believe that three aspects should be carefully worked out: ” Run-time platforms allowing dynamic and autonomic behaviors. These platforms can be placed at different architectural levels, from powerful IT servers down to resource constrained embedded devices, ” Mediation middleware allowing secure, scalable and dependable data exchange between IT servers and embedded devices,” Tools providing support and guidance in all the life-cycle phases of these applications (see CADSEs above).

3.2.1 Service Oriented Computing

We believe that the service orientation provides the level of flexibility required by modern applications. It however comes with many issues in terms of heterogeneity and complexity. Today, SOC is technology - driven. Developers deal with numerous technologies for describing, publishing and composing services. The adoption of a service-oriented approach makes more difficult the work of a developer. He/she has both to solve complex domain-specific problem and handle the complexity of the technical solution to this problem. Also, service composition turns out to be complex for several reasons. An autonomic management framework for building and executing pervasive applications has been designed. The framework is based on a Service Oriented Component technology, iPOJO, which was extended with support for monitoring and effector touch-points. Hierarchical autonomic management architecture was devised on top of this platform to facilitate the creation of autonomic solutions with multiple levels of abstraction and authority.

3.2.2 Mediation middleware

Mediation is the process of integrating disparate information sources in a timely fashion. Mediation software aims to collect data from different places and present it to business applications in a usable form. Applying mediation to the integration of business applications and field devices raises challenging new issues, not least because we’re dealing with a public, heterogeneous network in the Internet, whereas devices are often located in private places (plants, buildings, offices, or houses) governed by very heterogeneous - and generally inflexible - policies regarding network management, security, and so on. To do so, we use loosely coupled services which help provide the flexibility and adaptability that applications need to keep up with industrial e-services changing requirements. We also seek to dynamically use the available resources on both the IT and operational sides, distributing operations over a network of business and operational machines to create the most effective mediation chains. The challenge is placing the mediation operations at the best locations for reducing the communication load and increasing the detection rate of important information (to generate alarms, for instance).

3.2.3 Autonomic computing

Autonomic Computing is a relatively new research domain that aims at enabling computer systems to manage themselves. The goal is to progressively automate administrative tasks, in order to facilitate and to minimize human interventions on running computer applications. The initial Autonomic Computing experiments and results indicate that the important, ambitious goals of autonomic management applications require complex, adaptable processing capabilities that prove extremely difficult to conceive and implement. This is a natural consequence of the very purpose that autonomic management systems must serve: absorb the complexity of currently manual management tasks and leave simplified, intuitive and high-level interfaces for human administrators.

Our research goal is to provide reusable architectures, frameworks and methodologies that facilitate the development and maintenance of complex, adaptable autonomic management applications for administering large-scale, distributed software systems. The main preoccupations consist of: i) the decomposition of autonomic management logic into reusable and replaceable parts; and ii) the integration of the individual parts for producing globally coherent and dependable administrative behaviors.

Decomposition can be applied to the internal logic of a single Autonomic Manager, or in distributing the logic to multiple collaborating Autonomic Managers. A single Autonomic Manager may be organized into multiple layers, featuring progressive abstraction and/or authority levels. The goal is to separate simple, reactive mechanisms with limited knowledge, from sophisticated reasoning mechanisms holding a more general system view. The second decomposition axis consists in assigning a different Autonomic Manager to each individual resource. It is particularly convenient when different managed
resources belong to separate administrative authorities, as it is typically the case in pervasive applications. This allows autonomic management applications to scale up and to address the continual adaptation and evolution of autonomic management logic because individual managers can be dynamically added, updated and removed when components are dynamically added, updated and removed.

The second major preoccupation when developing autonomic management systems consists of integrating the various functional parts into a reliable, coherent whole. Integration generally involves the concepts of communication, collaboration and control. We adopt a flexible, dynamic integration solution, based on:

- Topic-based communication, using publish-subscribe interaction model. This means that components are loosely-coupled and can be easily modified and reconnected at runtime.
- Decentralized control, where each autonomic component acts independently for achieving its individual goals, while collaborating with neighboring components for contributing to global coherence.
- Opportunistic collaborations, where component interactions are spontaneously formed depending on current execution contexts, administrative system states, incoming data and available knowledge.

When adopting such solutions, a trade-off must be made between absolute system control and system flexibility and survivability. We intend to pursue the following directions for better understanding and trying to alleviate the risks involved:

- Studying and developing general mechanisms and/or formal proofs for guaranteeing essential system properties at the global level (e.g. safety, minimum service and security).
- Developing intuitive tools that help human administrators understand the overall system behavior (e.g. global models showing different system facets at different abstraction levels; and, intuitive facilities for modifying the autonomic system).
- Tools for facilitating the development of appropriate testing environments for thoroughly examining and assessing the management system’s behavior during extensive experimental scenarios.
- Supporting the development of autonomic systems of various types, with diverse complexity levels, flexibility requirements and control capabilities. This will enable the creation of simple, predictable Autonomic Managers for accurately resolving limited administrative problems, and the development of increasingly complicated Autonomic Managers for dealing with more complex, volatile situations.


Major results Oct. 2006-Oct. 2009: The major and more visible result are directly related to our activity around OSGi, the world wide de facto standard for dynamic applications. Our team developed OSCAR, the first OSGi open source implementation, and is at the origin of the Apache Felix project (Richard Hall). The Humberto Cervantes thesis (thèse UJF) became the Dynamic Service part of the OSGi R4 specification. iPOJO, designed and developed in the team, which is also an Apache project, is becoming widely used and may be integrated in future OSGi specifications. We are an important contributor of many open source software around OSGi, in the Apache foundation. For domain specific environment, we developed for Schneider the Docosoc environment which has been experimented by Schneider. We have developed the HOmega dynamic platform for home office, and we have developed SAM, a high level dynamic platform which are used in many research projects.

Perspectives: This work opens many perspectives in many dimensions; and raises many issues. More than a decade will be needed to reach satisfactory solutions, but since these solutions are needed by industry, no doubt that much effort will be invested in these areas.

As an example consider only the issue of adaptive systems: a trade-off must be made between absolute system control and system flexibility and survivability. We intend to pursue the following directions for better understanding and trying to alleviate the risks involved:

- Studying and developing general mechanisms and/or formal proofs for guaranteeing essential system properties at the global level (e.g. safety, minimum service and security).
- Developing intuitive tools that help human administrators understand the overall system behavior (e.g. global models showing different system facets at different abstraction levels; and, intuitive facilities for modifying the autonomic system).
• Tools for facilitating the development of appropriate testing environments for thoroughly examining and assessing the management system’s behavior during extensive experimental scenarios.

• Supporting the development of autonomic systems of various types, with diverse complexity levels, flexibility requirements and control capabilities. This will enable the creation of simple, predictable Autonomic Managers for accurately resolving limited administrative problems, and the development of increasingly complicated Autonomic Managers for dealing with more complex, volatile situations.

3.3 Synergy

The two lines of work presented above (roughly speaking the CADSE and Services teams), are not at all independent. Indeed CADSE technology is implemented on top of iPOJO, because it requires much flexibility and dynamic capabilities; and service tools are developed using CADSE because they require advanced and specialized environments. The team is organized and managed in order to improve, foster and control this synergy.

The Service team which is involved in iPOJO development, dynamic and autonomic applications and the domotic platform (all iPOJO experts), require dedicated CADSEs. We are developing iPOJO CADSEs, and the current work involves the definition and development of CADSEs dedicated to the design, development and deployment of autonomic applications. This is expected to be a long term work. Our research plans are showing an increased coordination and synergy between the different expertises present in the team. This is not by chance; it is the result of many years of work.

As explained in the introduction, the topics we are addressing require wide expertise, both horizontally (large number of topics, from meta modeling to middleware), and vertically (large coverage of technology expertises). The CADSE team is more expert in modeling, interoperability, evolution control (versioning) and environments; the Service team is more expert middleware and technology, service platform, dynamic and autonomic platforms. We believe that real solutions to the addressed issues (roughly large scale dynamic and autonomic applications) require solving simultaneously many related challenges. To mention a few: dynamic service platforms, autonomic managers, dynamic and continuous deployment, distribution and heterogeneity, autonomous application modeling, model driven engineering, evolution control of model driven engineering project, life cycle control, environment support and so on.

We have been working hard in the last years to build the expertise and the technology required to reach our goal which is to really contribute to the field of engineering environments and large scale autonomic and dynamic applications. We believe that our team can address the problem in most of its dimensions.

4 Application domains and social, economic or interdisciplinary impact

Our work on CADSE targets the software designers and developers, which constitutes a large community, which large financial impact. Our work on dynamic systems, and autonomic applications has much more social and social impact, since it clearly targets a society where millions of (mostly invisible) machines will dynamically connect and collaborate to fill complex and often unpredictable tasks; hopefully for the sake and wellbeing of their humans users. This raises not only difficult technical and scientific challenges, but also formidable ethical issues.

5 Contracts, grants and collaborations

Provided its style of work, the Adele team seeks industrial contacts in order to know the real issues, and to develop real solutions that can be tried in real setting (if not operational). For that reason we always have many industrial contracts.

5.1 European and International Contracts, grants and collaborations

ITEA S4ALL: Services for All. Gateway for service orchestration.

ITEA ANSO: Autonomic Network for SOHO users.

STREP SEEMP: Single Employment Market Place.
Starting date : 01/2006; end date 06/2008. Financing : 107 K€.
ITEA SODA: Service-Oriented Device.


ITEA SemBySem: Service Management by Semantics.

ITEA OSAMI: Open Source Ambient Intelligence Commons.

MAE ECOS: Collaboration with Colombia. Distributed choreography.
Starting date: 1/2009; end date 12/2011.

MAE LAFMI: Collaboration Franco Mexicaine.
Starting date: 2007

5.2 Industry and National contracts and grants

ANR SelfXL: Self-management of compleX and Large scale systems.

Minalogic SmartElectricity: SmartElectricity

MINEFI Pise: Pise

MINEFI Mind: Mind

Carnot CoTeDom: Composition de services Domotiques

IMAG Mapping:

Industry Schneider:

IMAG IPoTest: IPOJO services Testing.

CIFRE St Microelectronique: Thomas Leveque.

CIFRE Bull: Walter Rudametkin.

CIFRE St: Thomas Leveque.

CGI MODESI: Agilite pour les SI.

ITEA SINARI:
Starting date: 12/2010; end date 12/2012...
6 Visibility, Scientific and Public Prominence

6.1 Contribution to the Scientific Community

Organisation of Conferences and Workshops

Program committee members

- **IDM : Ingénierie des Modèles.** 2006
- **JFDLPA** 2ème Journée Francophone sur le Développement de Logiciels Par Aspects (JFDLPA 2005) 15 septembre 2005 Lille
- **OOPSALA 2005**
- **ICSE** International Conference Software Engineering. Shanghai. 2006
- **ESEC/FSE** Septembre Lisbonne, Portugal. 2006
- **SCM.** Software Configuration Management. Septembre. Lisbonne Portugal. 2006
- **SPW Software Process Workshop.** Pekin. Mai Shanghai. 2006
- **SOAS 2006**
- **ECOOP 2006**
- **ECOOP 2007**
- **ICSP 2007**
- **ICSE 2007.** Mineapolis.
- **ESEC/FSE 2007**
- **SERA 2008**
- **ICSC 2008**
- **SoSym 2008**
- **SOAS 2009**
- **ICSP 2009**
- **CVSM 2009**

And many others we forget. We are also reviewers for most of the top level journals in our area like IEEE Software and IEEE TSE (the problem is to kindly reject solicitations for PC membership and reviews, not to get them).

International expertise

- **FP6, Selection commite.** J. Estublier 2005.
- **FP7, reviewer project Suceede.** J. Estublier 2008-2010
- **FP7, reviewer project Secse.** P. Lalanda

Personal Awards

- Jacky Estublier: ACM IEEE for "Outstanding contribution".

7 Software and Research Infrastructure

Software Publication and platforms

**Felix:** An OSGi implementation, in Apache. The team (through Richard Hall) is the major contributor of this project, this is a major OS OSGi implementation used in countless operational projects and products all over the world.

**iPOJO:** Injected Plain Old Java Object. An Apache project. Through code injection, turns usual Java programs in OSGi services. Provides extensible container capability to OSGi including automatic connection capability and many others. Significantly simplifies writing and maintenance of OSGi code. Operational and used in many projects.

**CADSEg:** Open source software, in LIG forge. It allows generating a software engineering environment from a set of models.
SAM: Service Abstract Machine, in LIG forge. This platform subsumes most current SOA platforms (including OSGi, iPOJO, Web Service, Upnp, DPWS, SNTP), allowing high level development of heterogeneous SOA applications. Used as a vehicle in different projects, inside the team and in international research projects.

HOmega: A dynamic home office platform. Used in different projects.

CILIA: A dynamic mediation framework.

OW2 AspireRFID: Middleware and tools to build RFID-based applications. With the Aspire FP7 project.

OW2 eCOM: COM is a multi-language pedagogical platform to teach/learn enterprise technologies and related ones.

Supervision of Educational Programs
(by members of the team)

• Philippe Lalanda: director for M2PGI satges, and for Software engineering in M1 and MOSIG.

Teaching

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8 Industrialization and technology transfer

Consulting Activities

• P. Lalanda: Scientific Consultant for France Telecom, Schneider, FimeSys.
• J. Estublier: Scientific Consultant for ANVAR.

9 Perspectives for the research team

Our activity falls into the major challenges of the LIG laboratory: Intelligent buildings and infrastructure and software. More specifically, the planned research activities include:

Service platform: Service platform. iPOJO is a success, and even if most of the research issues have been addressed we will maintain an activity on iPOJO, because we need to be capable to make evolve the product to address the new issues that, undoubtedly, we will find. The original developer (C. Escoffier) and a contractual engineer (P. Bardin) are working on this topic full time. We expect to maintain the effort on iPOJO at least a couple of years.

Domotic platform: The result reached on the domotic platform, and the fact it became a research vehicle (the iPOTest test project, autonomic managers, dynamic architecture, and so on) and the fact it has strong potential makes that we will further develop and productify the platform. The original developer (J. Bourcier) is mainly in charge of this work. This line of activity is expected to last a few years, at least, in relationship with the dynamic platform work.

Dynamic platform: Defining, developing and instrumenting an “ideal” platform for the support of dynamic and autonomic applications is a long term goal of our team. It is too early to say what it will be, and even what should be its functionalities. For that reason we are conducting a number of work closely related to this end; most notably iPOJO, the domotic platform, the autonomic managers the Service Abstract Machine. We expect from these experiments to gradually understand, build and experiment that platform. We expect that line of work to last for some years.

Test of dynamic services: This work, in collaboration with the Vasco team, and on top of the domotic platform, is a prospective activity. It addresses difficult and long term issues and it is not considered as critical to us. Depending on the results of the first phase under way (December 2009) we will decide on the future of this line of work.
Mediation platforms and RFID: This line of work addresses important and difficult problems; it was started in the context of Schneider and France Telecom, and it is actually continued in the frame of an European IP program, on RFID middleware. We consider mediation platforms as a special case that our "ideal" platform should "naturally" support. For that reason we are working on the design and development of the infrastructure needed for mediation applications. This activity will last at least a couple of years. Didier Donsez is primarily in charge of this line of work.

Autonomic managers: It is currently unclear what are the concepts, architecture and functionalities expected from autonomic managers. We are experimenting with large scale distributed applications, based on iPOJO. This work is clearly preliminary, even if the current experiments are rather promising. A. Diaconescu is primarily in charge of this line of work.

Abstract Service platform and interoperability: We believe that future work needs service platform of high level, extensible, and subsuming the actual service platforms, including iPOJO. With this goal in mind we have developed SAM (Service Abstract Machine), developed in iPOJO, and making interoperate, in a transparent way, service executed on their native platform, currently iPOJO, OSGi, J2EE, SNTP and WS. This platform is also a research vehicle; it is at the base of the CADSE work, and support the work on composite, executable architecture and open heterogeneous environments [80].

Semantic and dynamic composites: The nature of service based applications requires rethinking the very concept of application and composite. Indeed, in service based applications, it is the service which is the central concept, not the piece of code that implements it. Composite must provide large flexibility for dynamic service selection, multiple instantiation, sharing and so on. Service selection should be based on the semantic characteristics of the services required, and on the constraints and compatibilities with the other service collaborating in the application. The first prototype is available now [82], but experimentation and large improvements are expected in the next 2 years.

Open environment support: The nature of service based application is such that the services selected for an application may be available "by chance" because instantiated by third parties (like Web Service), or they have to be deployed and instantiated on demand for the needs of a particular application. This mixture of services, potentially overlapping, deployed and managed by different persons, for different reasons, on different machines raises new interesting and difficult issues that ubiquitous computing and "machine societies" will have to face [78]. This topic is at the heart of the SAM run time.

Executables architectures and dynamic applications: We are evaluating the idea in which the architecture of a dynamic application can be seen as a program executed by a dynamic platform. This "program" expresses, in intention, what should be the architecture and the nature of the "components" of the application at any time during its execution. The platform is in charge of executing that program i.e. to ensure the correct execution of the application. We expect to be able to perform our first experiments in the near future.

Multiple life cycle support interoperability: We have developed the technology for composing CADSEs, and currently, all our CADSE are a composition of highly reusable CADSEs [77]. Nevertheless, some aspects cannot be merged or extended (but only fully redefined), as for example eclipse mapping or builders. Many extensions are required in our composition technology. This is the enabling technology for the homogeneous support of the different life cycles.

Architecture and meta level support: Our experiments in Domain Specific Engineering environments have shown that, too often the metamodel is very simple, and therefore useless, or too detailed and therefore with little flexibility and usability. It turns out that developers often need to define concepts in order to perform their job. The current MDA technology requires, in this case, to extend the metamodel and to regenerate the tools and environment; which is clearly inconvenient. To solve this issue, we have extended our CADSEs for the support of dynamic metamodel extensions, in the same level as model definitions. This technology (close to power types) provides many interesting features, but raises many questions.

Generalized versioning: The same technology as above (groups) allows us to generalize the the concept of version, to almost any entity (model, metamodel, files, composites etc), and at any level of abstraction, in a transparent way for developers. For usability reasons, our versioning is compatible and interoperate with the SVN data bases used by the client, as well as the specialized repositories like those provided by Maven. This work is under way, we expect the result during the year 2009.
10 Publications

International peer reviewed journal [ACL]

Philippe Lalanda. E-services infrastructure in power distributionIEEE Internet Computing June 2005

National peer-reviewed journal [ACLN]


International peer-reviewed conferences with proceedings [ACTI]

Didier Donsez, Kiev Gama and Walter Rudametkin. Developing Adaptable Components using Dynamic Languages. 35th EUROMICRO Conference on Software Engineering and Advanced Applications (SEEA)
Stéphanie Chollet and Philippe Lalanda. An extensible Abstract Service Orchestration Framework IEEE 7th International Conference on Web Services (ICWS 09)
Lydie Du Bousquet, Ajitha Rajan, Catherine Oriat, Jean-Luc Richier and German Vega Service specification and validation in the context of the home 10th International Conference on Feature Interactions in Telecommunications and Software Systems (ICFI 2009)
Kiev Gama, Walter Rudametkin and Didier Donsez. Using Fail-stop Proxies for Enhancing Services Isolation in the OSGi Service Platform. Workshop of the 9th International Middleware Conference 2008 2008-12-01


Kiev Gama and Didier Donsez. A Diagnostic Tool for Locating OSGi Stale References. 34th EUROMICRO Conference on Software Engineering and Advanced Applications 2008-09-03

Stéphanie Chollet and Philippe Lalanda. Security specification at process level. IEEE International Conference on Services Computing (SCC’08) 2008-07-08


Levent Gurgen, Claudia Roncancio, Cyril Labbé, André Bottaro and Vincent Olive. SSStreaMWare: a service oriented middleware for heterogeneous sensor data management. 5th IEEE International Conference on Pervasive Services (ICPS 2008) 2008-07-01


Stéphanie Chollet, Philippe Lalanda and André Bottaro. Transparently adding security properties to service orchestration. 3rd International IEEE Workshop on Service Oriented Architectures in Converging Networked Environments (SOCNE 08) 2008-03-17

Clément Escoffier, Johann Bourcier, Philippe Lalanda and Jian-qi Yu. Towards a home application server. 5th IEEE Consumer Communications and Networking Conference (CCNC) 2008-01-01

Lionel Touseau, Humberto Cervantes and Didier Donsez. An Architecture Description Language for Dynamic Sensor-Based Applications. 5th International IEEE Consumer Communications & Networking Conference (CCNC’08) 2008-01-07

Jacky Estublier and German Vega; Reconciling Software Configuration Management and Product Data Management; ESEC/FSE; September 2007, Dubrovnic, Croatia

Antonin Chazalet and Philippe Lalanda; A Meta-Model Approach for the Deployment of Services-oriented Applications; Proc. 5th IEEE International Conference on Services (SCC’07), July 2007, Salt Lake City, USA

Cristina Marin and Philippe Lalanda; Automated SOC development for the power distribution industry; 5th IEEE International Conference on Industrial Informatics INDIN 2007, July 2007, Vienna, Austria.

Colombe Hérault, Gael Thomas, Philippe Lalanda; A distributed service-oriented mediation tool; IEEE International Conference on Services (SCC 2007), Application and Industry Track, July 2007, Salt Lake City, USA

Cristina Marin and Philippe Lalanda; DoCoSOC - Domain Configurable Service-Oriented Computing; 2007 International Conference on Services Computing, July 2007, Salt Lake City, USA

André Bottaro, Johann Bourcier, Clément Escoffier and Philippe Lalanda; Autonomic Context-Aware Service Composition; 2nd IEEE International Conference on Pervasive Services (ICPS’07); July 2007, Istanbul, Turkey


Jacky Estublier and Sergio Garcia. Concurrent Engineering support in Software Engineering. ASE Tokyo September 2006, Tokyo, Japan


Mikael Desertot, Didier Donsez and Philippe Lalanda. A Dynamic Service-Oriented Implementation for Java EE Servers. Published 3th IEEE International Conference on Service Computing, SCC’06. September 2006, Chicago, USA.


Philippe Lalanda, Antonin Chazalet and Vincent Lestideau. Deployment of software services in the power distribution context. 4th International IEEE Conference on Industrial Informatics, INDIN06. August 2006, Singapore


Philippe Lalanda and Johann Bourcier. Towards autonomic residential gateways. ICPS’06 : IEEE International Conference on Pervasive Services 2006 June 2006, Lyon, France


André Bottaro and Anne Gérodolle. Extended Service Binder: Dynamic Service Availability Management in Ambient Intelligence. First Workshop on Future Research Challenges for Software and Services. April 2006, Vienna, Austria


Mikael Desertot, Humberto Cervantes and Didier Donsez. FROGi: Fractal components deployment over OSGi. 5th International Symposium on Software Composition SC’06. March 2006, Vienna, Austria

Mikael Desertot, Si-Hoang Do, Didier Donsez and Marc Bui. Mobile Agents Platforms over OSGi. 4th International Conference on Computer Sciences, Research Innovation and Vision for the Futur, RIVF’06. February 2006, Ho Chi Minh, Vietnam


Jacky Estublier, German Vega and Anca Daniela Ionita. Composing Domain-Specific Languages for Wide-scope Software Engineering Applications. Published at MoDELS. October 2005, Montego Bay, Jamaica


Jacky Estublier and German Vega. Reuse and Variability in Large Software Applications. Published in Proc ESEC/FSE. September 2005, Lisboa, Portugal


Jean Marie Favre. Megamodelling and Etymology - A Story of Words: From MED to MDE via MODEL in five milleniums. Appeared in DROPS 04101, Published by IBFI. 2005, Dagstuhl, Germany.


André Bottaro. Réalising the Plug-n-Play Dream on the Home Network. OSGi Developer Conference (EclipseCon’07). March 2007, Santa Clara, USA.

**Oral communications, without proceedings, in international or national events (e.g. tutorials, courses in summer schools,...) [COM]**


Anne Gérodolle and André Bottaro. OSGi et le projet IST Amigo. Atelier OSGi des 3ème Journées Francophones Ubiquité et Mobilité (UbiMob). September 2006, Paris, France

Lionel Seinturier, Nicolas Pessemier, Clement Escoffier, Didier Donsez. Towards a Reference Model for Implementing the Fractal Specifications for Java and the .NET Platform. 5th Fractal Workshop July 2006, Nantes, France


Lionel Seinturier, Nicolas Pessemier, Clement Escoffier, Didier Donsez. Towards a Reference Model for Implementing the Fractal Specifications for Java and the .NET Platform. 5th Fractal Workshop July 2006, Nantes, France


André Bottaro, Anne Gérodolle and Sylvain Marié. Combining OSGi technology and Web Services to realize the plug-n-play dream in the home network. OSGi Community Event. June 2007, Munich, Germany.


National peer-reviewed conferences with proceedings [ACTN]

J.M.Favre. Concepts fondamentaux de l'IDM - De l'Ancienne Egypte à l'Ingénierie des Langages. 2èmes Journées sur l'Ingénierie Dirigée par les Modèles, IDM06. June 2006, Lille, France


Didier Donsez. Courtage et déploiement dynamiques de composants pour infrastructure déquipements UPnP, Ubimob'06, 3e Journées Francophones Mobilité et Ubiquité. 5 - 8 September 2006, Paris, France


Anca Daniela Ionita, Jacky Estublier and German Vega. Domaines Réutilisables Dirigés par les Modèles. Published in IDM05. July 2005, Paris, France

Cristina Marin, Didier Donsez and Philippe Lalanda. Approche IDM pour le développement des services basés capteurs. Published in IDM05. June 2005, Paris, France


Scientific books and book chapters [OS]


Book or Proceedings editing [DO]

**Doctoral Dissertations and Habilitations Thesis [TH]**


S. Garcia. Ingénierie Coopérative : Céline. PhD, Université Joseph Fourier. Décembre 2006


Cristina Marin. Une approche orientée domaine pour la composition de services. Université Joseph Fourier. 27 Mai 2008.

Antonin Chazalet. Déploiement d’applications à services sur des environnements déxécution à services : Une approche dirigée par les modèles. Université Joseph Fourier. 21 Novembre 2008.


Clement Escoffier. iPOJO : Un modèle à composant à service flexible pour les systèmes dynamiques. Université Joseph Fourier. 3 décembre 2008

André Bottaro. Home SOA : Composition contextuelle de Services dans les Réseaux d’Équipements pervasifs. Université Joseph Fourier. 12 décembre 2008


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