Ecole Doctorale STIC

Sciences & Technologies de l'Information et de la Communication

ED STIC - Proposition de Sujets de Thèse

pour la campagne d'Allocation de thèses 2011

Titre du sujet :	Integrated and autonomic Deployment and Management for SaaS composite applications
Mention de thèse :	Informatique
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Description du sujet :

Seulement disponible en anglais...

English version:

This subject takes place in the large context of (multi-)Cloud-based infrastructures for hosting large-scale possibly complex composite applications in the Cloud. Being complex, the applications targetted in this work are assumed to be supported by a component-based approach.

The deployment of such applications in distributed settings is not easy and has already partly been addressed before (e.g. [1]). Deployment could be made efficient and resilient to possible failures, specially in heterogeneous and multi-cloud environements, by adopting a distributed approach.

Due to both the intrinsic dynamicity of SOA based applications, and the expected associated Quality of Service, monitoring and management of the whole software stack, from the hosting infrastructure layer up to the SaaS one must be tackled. Management may trigger some unforeseen deployment operations, initiated by reconfigurations triggered from the application level, but also autonomically triggered by the runtime in order to fulfill some QoS criterion (e.g. improve traditional parameters like service execution time, but also other aspects like expenses related to cloud nodes hiring, or consumed energy, etc.).

The starting point of this research is to take as assumption the fact that deployment, monitoring and management required by a given application are very inter-related, and would benefit to be considered as a whole. Moreover, the layer in charge of monitoring and management has itself to be deployed in a way that closely follows the effective architecture of the service-based application. Additionnally, this layer could benefit from a flexible and customizable approach (adopting e.g. a component-based for non-functional concerns [3]).

Architecture Description Languages (ADLs) associated to component models library for instantiating and reconfiguring component-based applications have been around for a while. More recently, dynamic ADLs have been explored (see e.g. [2]) with the aim to add more expressivity to ADL languages: this way, an ADL file becomes in fact a program, possibly executed in a distributed and parallel manner, expressing how to conduct the effective deployment of the component-based application on possibly non predefined and non static hosting infrastructures.

The goal of this work is to extend these kinds of ideas around dynamic ADLs. More precisely, the aim is to study how a dynamic ADL could integrate all needed deployment and autonomic management features required by SaaS applications, taking care of transversal concerns like efficiency and fault-tolerance in the process.
The needed runtime support to execute such new expressive language will itself be a non trivial distributed, parallel, robust tool that needs to be co-deployed on demand, just in time, in order to take care of the application layer needs.

Due to its foreseen complexity, this tool will have to be designed itself using a well featured distributed and autonomic programming approach, capable to run on heterogeneous multi-cloud environments. The adequate technology to prototype such a tool is the distributed component-based framework named GCM (Grid Component Model)[3][5], whose reference implementation is available in the ProActive platform (www.inria.fr/proactive), and which is currently being extended for being SCA compliant.

A concrete goal will be to define a GCM-based solution for this tool, that we could name "Hyper deployer and manager". And to experiment and validate it in the deployment of complex, heterogeneous, widely distributed applications. In particular, the candidate will do its research in close cooperation with an engineer appointed to work on an industrial use-case; in this use-case,

our targetted component-based application is in fact a middleware supporting RFID-based environments, itself designed as a component-oriented application based around a messaging bus interconnecting its legacy application server components.

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[1] Areski Flissi and Philippe Merle. A Generic Deployment Framework for Grid Computing and Distributed Applications. In OTM Confederated International Conferences, Grid computing, high performAnce and Distributed Applications (GADA 2006), volume 4276 of Lecture Notes in Computer Science, Springer, 2006

[2] Christophe Taton, Vers l'auto-optimisation dans les systèmes autonomes, PhD thesis, Grenoble University, 2008

[3] C. Ruz, F. Baude, B. Sauvan,
Flexible adaptation loop for component-based SOA applications , ICAS 2011, to appear

[4] Cristian Ruz, Francoise Baude, Bastien Sauvan, Adrian Mos, Alain Boulze, Flexible SOA Lifecycle on the Cloud using SCA, submitted, March 2011

[5] F. Baude, D. Caromel, C. Dalmasso, M. Danelutto, V. Getov, L. Henrio, and C. Pérez
GCM: A grid extension for Fractal autonomous distributed components.
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