UBIVERTEX - Letter of Intention

Institute/Company

Name: INRIA / Ecole Normale Superieure de Lyon Country: France

Activity domain:

Number of employees: X <50 ☐ <250 ☐ > 500

Name of the department/research team: LIP / Laboratory RESO

Scientific contact

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Challenge descriptions:

The INRIA RESO team will benefit from the platform from the UBIVERTEX project on the following research fields :

Network virtualisation

Cloud networking is about the interconnection of clouds and networking within the cloud landscape, having in mind elastic resource allocation as a fundamental property of Cloud services. It is therefore necessary to be able to express the performance and the elasticity characteristics of complex virtual infrastructures service requests (the requested set of interconnected resources).

Considering a Video on demand service as a use case, RESO will try an approach called probabilistic provisioning based on large deviations theory (notice that we are not considering traffic prediction based on dynamic time series models). Provided we can come up with an appropriate mathematical model (Markovian or more generally any mixing process will work) to describe the time variability of the amount of a particular type of resource (bandwidth, CPU, storage...) needed by a given application, large deviations theory allows for deriving the extreme observable deviations from a nominal (almost sure) value. Then, we could use these bounds as the worse (rare) case to cope with, and provision the corresponding resource accordingly: a nominal value with a (realistic) safety margin kept available on demand upon large deviations occurrence.
To test and validate our theoretical approach, we are developing, in connection with Grid'5000, an experimental testbed that allows for simulating the video on demand users behavior and thus, generates different profiles of servers workloads.

Energy profiling of large scale applications in virtual machines:

Green IT as recently emerged as a new research domain. Various researches focus on

how to reduce the energy consumption of large-scale infrastructures (data centers, grids, clouds) and by this way how to improve the energy efficiency of these systems. Our current works show that understanding and modelizing energy consumption of large-scale systems infrastructure and applications are complex tasks depending on various contexts (location, usage...). We plan to work on the energy efficiency aspects of large scale applications deployed in a large set of virtual machines. Understanding the impact of applications on energy usage is a mandatory step in order to propose energy efficient alternatives. Profiling solutions will be proposed to link applications behaviour and features with their corresponding energy usage information.

Green virtualized environments (GVE) :

By monitoring and exposing energy usage of virtualized infrastructures, we plan to work on the design of Green virtualized environments where users and administrators can express their policies in terms of energy efficient management of large scale set of virtual resources. These GVE should be able to handle such requests and exchange information between main software components (schedulers, resource managers...) and resources infrastructures (electrify grid provider, cooling infrastructure...).

Type of commitment (internship, Phd grant, engineering staff): permanent people, Phd students, engineers

Number of persons involved in these challenges: 8

Signature of Scientific Contact: Laurent Lefèvre	Signature of the Legal Representative: Paulo Goncalves Head of RESO Team
	
Date: 11 Sept 2011	Date: 11 Sept 2011