UBIVERTEX - Letter of Intention

Institute : University Paul Sabatier

Name: IRIT   Country: FRANCE

Activity domain: Distributed Systems group

Number of employees: 20 in the group, >600 in the whole laboratory

Name of the department/research team: IRIT/ASTRE

Scientific contact

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Challenges descriptions:

The ASTRE team at IRIT is concerned with large scale distributed systems. The topic of virtualization is a core building block in our research. The research challenges we will address thanks to the UBIVERTEX platform will be:

1 - system virtualization, in particular autonomic systems. Handling at large scale a virtualized environment can not be any longer done manually. The need for autonomic systems is obvious. In that direction, we aim at developing solutions based on recent works on the architectures of the autonomic systems for the management of hosting centers (clouds); the programming models allowing for defining policies for the administration of such; the underlying virtualization technologies allowing to put them in action.

2 – storage virtualization, in particular in its scalability dimensions. Storage virtualization addresses the problem of mobilizing and sharing heterogeneous storage resources geographically distributed by aggregating these physical storage resources in logical volumes. The virtualization layer allows the data to be accessed seamlessly, with respect to some performance or reliability constraints, leading for instance to data split. Side effect like security (when data is split over different physical disks, how to ensure encryption/decryption mechanisms assuring confidentiality), power consumption and reliability characteristics (somehow contradictory) have also to be studied in this new paradigm.

3 – energy consumption optimization. Following preceding works on large scale systems such as grids and CDN, we aim at pushing the theoretical and experimental works under virtualized environment. This goes through measuring and deriving from mathematical models and actual experiments with appropriate equipments the energy consumption of virtualized environments, particularly the energy evaluation of each virtual machine. This task is not easy since the energy is spent on the actual machines and the

virtual machines might evolve (demands, migrations, ...) during time. Previous works show that mathematical modeling based on low level actual machines is feasible, but nothing yet has demonstrated its strength on virtual machines.

We aim also at integrating the energy consumption evaluation and prediction in autonomic decision systems to provision dynamically a virtualized infrastructure so as to optimize the energy efficiency and to reduce the energy demand of the platform. Leverages such as dynamic virtual machines provisioning, migration and adaptation, together with their interference with some actual machines leverages (DVFS, sleep modes) are on the roadmap.

Type of commitment (internship, Phd grant, engineering staff):
Funded by different French ANR projects (SOP, SELFXL) and European FP7 project (CoolEmAll), the ASTRE team (will) fund internships, PhD grants and Engineers on the development of these topics.
Moreover one engineer is dedicated by the IRIT laboratory on related topics: virtualized storage, hardware platforms and energy consumption measurements.

Number of persons involved in these challenges: 8 permanent researchers, 1 Engineer, 7 PhD (currently), and 1 PostDoc (currently).

Signature of Scientific Contact:	Signature of the Head of the Institute:
Date: 08/09/2011	Date: