Accounting, Pricing and Billing in inter-Cloud environment

This PhD aims to the design and to the evaluation of new accounting, billing and pricing strategies for elastic services in a multi-cloud environment. In single Cloud environment, computing requests are generated randomly by the end-users and submitted to a Web portal managed by a Cloud Service Provider (CSP). When a CSP receives a client request (or job), a resource allocation algorithm is activated in order to determine where physically this request will be served. Typically, the resource allocation consists in assigning on-the-fly a certain number of Virtual Machines (VM) and memory disk space able to satisfy the jobs generated by the end-users. Different Physical Machines (PM) may host the single or multiple VMs required to satisfy a given job. The Virtualization concept inherent to Cloud Computing is related to the fact these PMs are geographically distributed at different sites (called clusters) in the Internet. More precisely, a CSP has in charge to assign to each job the right number of required VMs, all the VMs required by a given job being located on the same cluster. Globally, the PMs used by the various jobs may be located at remote sites. In terms of taxonomy, accounting, pricing and billing are three different but complementary concepts that target to charge the end-users to the benefit of both the Cloud Service Provider (CSP) while guaranteeing the Quality of Experience (QoE) of the end-users. If there is still some work to do for specifying the accounting and pricing strategies in single Cloud environment, the originality of this thesis is to focus of the multi-Cloud (or federated Cloud) environment. Basically, the problem consists in determining the PMs on which the number of required VMs will be activated to satisfy a job, but in knowing that the geographical localization of the PMs may be chosen between various CSPs. A form of analogy can be established between the concept of multi-Cloud and the concept of inter-domain in networking. In this matter, the standardization of the SLAs is mandatory in order to enable interoperability between different CSPs. Our objective is to design accounting and pricing strategies suited to the multi-Cloud environment.

The efficiency of the accounting, pricing and billing strategies for Cloud Computing is still an open research problem in the sense it has to consider the multi-tenant nature of the business relationships between the Cloud Service Provider and its sub-contractants on one side, and its customers on the other side. In this thesis, we extend the generality of this problem to the federated-cloud environment. One of the challenges of the thesis is to contribute with the other industrial partners of the Easi-Cloud project to the specification of such business models in taking into account Service Level Agreements (SLA). The achieved investigations will necessitate the development of a simulation tool and the specification of performance evaluation scenarios. The obtained simulation results will have to be compared and interpreted in order to propose the most suited solution for each type of scenario.

Since it is included in the Easi-Clouds European project, this thesis will be carried out in close relationship with the German partners of the project. It will necessitate the writing of deliverables and the participation to multiple international meetings.