

## ETSCC005 - Amazon Elastic Compute Cloud (EC2) vs in-House HPC Platform: a Cost Analysis

### Abstract

While High Performance Computing (HPC) centers continuously evolve to provide more computing power to their users, we observe a wish for the convergence between Cloud Computing (CC) and HPC platforms, with the commercial hope to see CC infrastructures to eventually replace in-house facilities. If we exclude the performance point of view where many previous studies highlight a non-negligible overhead induced by the virtualization layer at the heart of every Cloud middleware when running a HPC workload, the question of the real cost-effectiveness is often left aside with the intuition that, most probably, the instances offered by the Cloud providers are competitive from a cost point of view. In this article, we wanted to assert (or infirm) this intuition by analyzing what composes the Total Cost of Ownership (TCO) of an in-house HPC facility operated internally since 2007. This TCO model is then used to compare with the induced cost that would have been required to run the same platform (and the same workload) over a competitive Cloud IaaS offer. Our approach to address this price comparison is three-fold. First we propose a theoretical price - performance model based on the study of the actual Cloud instances proposed by one of the major Cloud IaaS actors: Amazon Elastic Compute Cloud (EC2). Then, based on the HPC facility TCO analysis we propose a hourly price comparison between our in-house cluster and the equivalent EC2 instances. Finally, based on the experimental benchmarking on the local cluster and on the Cloud instances we propose an update of the former theoretical price model to reflect the real system performance. The results obtained advocate in general for the acquisition of an in-house HPC facility, which balances the common intuition in favor of Cloud Computing (CC) platforms, would they be provided by the reference Cloud provider worldwide.

**Index terms**—Computers and information processing, Cloud computing, High performance computing, Engineering management, Economics, cost.