
Reusability of Autonomic Controllers in High Performance Computing

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Résumé

High Performance Computing systems are subject to dynamical variations occurring in e.g., the execution of the jobs, the quantity of IO, the network consumption, etc. Such systems thus need Autonomic management with online regulation. In our work, we consider High Performance Computing (HPC) systems, and more particularly CiGri, a system harvesting idle resources in a computing grid. It submits jobs from Bag-of-Tasks applications with the lowest priority to the clusters in order to maximize their use. This harvesting introduces perturbations for the premium users of the cluster, e.g., degraded performances of the fileserver. Therefore, the submission must be regulated in a feedback loop with a Control Theory approach. The design of such a controller can involve considerable competence and work, and it is highly desirable that it can be as reusable as possible, adaptable to different contexts where it is instantiated. In this paper we propose to study the relationship between this reusability and the techniques of adaptive control, by describing an approach involving classical PID control and Model-Free Control (MFC), and performing experimental validation and comparison in the use-case of CiGri, evaluating several criteria and in particular their reusability and adaptivity to variations.

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