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HLogP: A Scheduling Model for the Execution of MPI Aplications in Grid Environments

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In order to execute MPI applications efficently in grid environments, MPI processes need to be allocated appropriately to the resources available. Devising efficent process allocations requires a scheduling model which is sufficiently accurate to reflect the performance characteristics of the target system. It is still unclear if existing parallel program computing performance models are appropriate for grid environments. To date no model has been proposed for scheduling parallel applications in grids, due principally to the difficulty of taking in consideration characteristics such as the heterogenity of both computation and communication resources. This work proposes one such model for scheduling MPI applications in computational grids. The parameters of the model capture these heterogenous characteristics, enabling efficent schedules to be obtained. Due to the dynamic behaviour of grid environments, the model needs to be calibrated before the application is executed (for static scheduling) and during execution (for dynamic scheduling). A tool is presented which efficiently calibrates the parameters of the proposed model for use by static and dynamic grid schedulers. In addition, this work also comments on the observation that, in some cases, the two existing grid enabled implementations of MPI exhibit quite differing behavious.

Keywords: computational grids, modeling, MPI applications, task (process) scheduling.