

Self-scheduling for a Heterogeneous Distributed Platform

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Abstract. We discuss schedulers for a heterogeneous distributed platform, designed to execute a variety of tasks in a non-dedicated environment. The platform uses and controls a large number of non-dedicated heterogeneous computational resources in a local network. Several self-scheduling algorithms have been adapted to take into account the computational capacity of each workstation of the network. To evaluate the schedulers we use the platform to execute a software tool for molecular docking of a set of 1000 molecules in the 4UDC protein. We analyze the performance of the self-scheduling algorithms and their impact on the execution time of the application.

Keywords. Heterogeneous distributed system, Task scheduling, Self-scheduling, Resilient distributed computing

1. Introduction

Task scheduling is an important factor in the development of a heterogeneous distributed software platform. To optimally use the resources, task scheduling should find a trade-off between load imbalance and communication cost. A static scheduler defines the task allocation at compilation time, has a low overhead but typically achieves a poor load balance in a dynamic environment. Dynamic scheduling uses adaptive strategies to allocate tasks at execution time and thus can achieve a better load balance at the expense of interaction and communication. Self-scheduling adaptive strategies have been introduced to solve parallel loop scheduling problems in homogeneous shared-memory systems, where the loops can be handled as independent tasks [1], but they can also be used in other contexts.

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