
Adaptive Parallelism for Coupled, Multithreaded Message-Passing Programs

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Abstract

We studied multithreaded message passing (MT-MP) programs developed by coupling independently developed and maintained libraries with differing preferred degrees of threading (aka thread-level heterogeneity). The challenge is to execute such programs in a manner that maximizes both application performance and resource utilization. We explored new ways to structure, execute and analyze coupled MT-MP programs showing that appropriately reconfigurable execution environments can yield significant performance improvements. Our approach uses programmable facilities with modest overheads to dynamically reconfigure runtime environments for compute phases with differing threading factors and affinities. For a majority of our test workloads, our performance results show speedups greater than 50% over the static, under-subscribed baseline.

Keywords: Adaptive Runtimes, Dynamic Parallelism, Multithreaded Message Passing, Coupled Applications

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