Using Utilization Profiles in Allocation and Partitioning for Multiprocessor Systems

John D. Evans
Robert R. Kessler

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Department of Computer Science
University of Utah
Salt Lake City, UT 84112 USA

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Abstract

The problems of multiprocessor partitioning and program allocation are interdependent and critical to the performance of multiprocessor systems. Minimizing resource partitions for parallel programs on partitionable multiprocessors facilitates greater processor utilization and throughput. The processing resource requirements of parallel programs vary during program execution and are allocation dependent. Optimal resource utilization requires that resource requirements be modeled as variable over time. This paper investigates the use of program profiles in allocating programs and partitioning multiprocessor systems. An allocation method is discussed. The goals of this method are to (1) minimize program execution time, (2) minimize the total number of processors used, (3) characterize variation in processor requirements over the lifetime of a program, (4) to accurately predict the impact on run time of the number of processors available at any point in time and (5) to minimize fluctuations in processor requirements to facilitate efficient sharing of processors between partitions on a partitionable multiprocessor. An application to program partitioning is discussed that improves partition run times compared to other methods.