

Unstructured Adaptive (UA) NAS Parallel Benchmark, Version 1.0

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NASA Technical Report NAS-04-006

July 2004

Abstract

We present a complete specification of a new benchmark for measuring the performance of modern computer systems when solving scientific problems featuring irregular, dynamic memory accesses. It complements the existing NAS Parallel Benchmark suite. The benchmark involves the solution of a stylized heat transfer problem in a cubic domain, discretized on an adaptively refined, unstructured mesh.

1 Introduction

The NAS Parallel Benchmarks (NPB) [1, 2] were originally formulated to measure the performance of high-performance computer systems, especially parallel machines, when applied to computational problems of importance to the scientific community in general, and to NASA in particular. Despite the relatively limited scope of the eight problems that made up NPB, the benchmarks became quite popular and have been widely used by researchers, computer vendors/buyers, and software tool developers. Since their initial release as paper-and-pencil specifications in 1991, and as source code implementations (in MPI) in 1995 [2], it has become increasingly clear that the NPB problems lack in the area of irregular and dynamically changing memory accesses, which may defeat the hardware and software support for memory traffic in modern computer architectures. The original NPB featured applications with

*Employees of Computer Sciences Corporation. This work was supported by the NASA Computing, Information, and Communications Technology (CICT) program, and performed under Task Order A61812D (ITOP Contract DTTS59-99-D-00437/TO #A61812D) awarded to Advanced Management Technology Incorporated.

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