Panel: “Benchmarking for Real-Time High-Performance Computing”

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Abstract

The motivation, organization, and discussion questions for the panel session “Benchmarking for Real-Time High Performance Computing” are described.

1 Motivation

There is growing interest in applying general purpose high performance computers to applications that have real-time requirements (signal processing, command and control, modeling and simulation, multimedia, databases). Traditional benchmarks and notions of scalability drawn from scientific parallel computing may not be relevant when timing requirements are imposed from outside the system. Different application domains impose their own additional requirements. For example, embedded real-time computers must meet real-time requirements within strict size, weight, and power requirements. This panel will consist of representatives from industry, academia, and government and will examine the benchmarking problem for scalable high performance computers from the standpoint of their potential use in real-time applications.

2 Organization

Since benchmarking can be a controversial subject, the panel will discuss the problem from various viewpoints: vendors, technologists, and users. Representing the vendors are two companies well known for their focus on real-time applications. Concurrent Computer Corporation provides real-time solutions for a variety of applications including, for example, simulation and training. Mercury Computer Systems, represented by Arlan L. Pool, markets high performance computers for real-time embedded signal processing.

Representing the technologists are: John Drummond, NRAJ, who has been evaluating real-time operating systems for mission critical applications; Nick Kamenoff, Monmouth University, who co-authored the Hartstone and the Distributed Hartstone real-time benchmarks; and Richard Metzger, Rome Laboratory, who is currently the technical point of contact for ARPA-sponsored efforts at the Honeywell Technology Center and at the MITRE Corporation that are developing benchmarks applicable to real-time embedded scalable high performance computing.

Marc Campbell, Northrup-Grumman Corporation, will represent the user perspective. Northrup-Grumman Corporation is the prime contractor for the Joint Surveillance Target Attack Radar System (Joint STARS), an airborne command and control system that must operate in real-time.

3 Questions

Listed below are some questions the moderator will use to focus the discussion:

1. What difference does “real-time” make? In terms of benchmarking methodology, e.g., meeting real-time as well as functional specifications? In terms of benchmarking metrics, e.g., worst-case versus average-case performance?

2. How important is measuring resource “utilization” especially for embedded real-time applications, e.g., sustained MFlop/s as a percentage of theoretical peak performance?

3. What aspects from traditional scalable high performance computing benchmarks transfer well to the real-time case? Any especially relevant notions of scalability?

4. What role will low-level real-time operating system assessments play in the overall real-time benchmarking effort? Kernel-level assessments? Compact application assessments?

5. Will the different real-time domains (e.g., signal processing, event-driven systems, time-driven systems, ...) have specific benchmarking requirements?

6. Is there hope for standardizing the real-time benchmarking process similar to what the Transaction Processing Performance Council has done with their TPC-A, B, C Benchmarks for database processing? In the case of particular real-time domains? What could be the rallying application?