Daniel D. McCracken Computational Sciences Seminar Series

Wednesday 3:00 p.m., April 7, 2004

Black Hall, Room 152

Dr. David Mizell, Cray, Inc.

Cray's Cascade Project: Towards Sustained Petaflop Computing

Abstract: In the late 1980s, a wide variety of parallel computer systems entered the market. There were shared-memory, bus-based systems, distributed-memory, hypercube systems, SIMD machines, and more. By the early 1990s the market had more or less settled upon distributed-memory, commodity processor systems with rectangular mesh interconnection networks: "clusters". The Department of Energy's ASCI program built some huge versions of these for the national laboratories, and smaller-budget research institutions often home-built their own "Beowulf clusters." The default choices of programming language was C or Fortran together with the MPI standard message-passing library. By the end of the century, it was becoming apparent to many high-performance computer users that there were significant limits to what could be achieved with this computing paradigm. Many important scientific codes ran at around 1on the ASCI clusters. Much of this inefficiency was due to the increasing discrepancy between processor speed and memory bandwidth or network bandwidth. Bandwidth had become the most precious resource in the system.

DARPA's High Productivity Computer Systems (HPCS) program is aimed at prototyping a new generation of supercomputer systems that achieve higher efficiency on a wider variety of applications. Its goal is to produce one or more supercomputer systems which perform in the petaflops range and are much easier to program than current-generation supercomputers. I will describe how Cray's Cascade project, part of the DARPA program, uses several strategies designed to optimize use of memory bandwidth and tolerate the latencies inherent to memory and network accesses. I will explain how this architectural approach is also aimed at making the Cascade system much easier to program and tune for optimal performance than current supercomputer systems.

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For more info. please contact: Drs Glasby 963 2123, or Kovalerchuk 963 1438