Computer Science Research Lecture

Presented by the Departments of Computer Science of

Union College
and
Rensselaer Polytechnic Institute

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On the Future of High Performance Computing: How to Think for Peta and Exascale Computing

In this talk we examine how high performance computing has changed over the last 10-years and look toward the future in terms of trends. These changes have had and will continue to have a major impact on our software. Some of the software and algorithm challenges have already been encountered, such as management of communication and memory hierarchies through a combination of compile-time and run-time techniques, but the increased scale of computation, depth of memory hierarchies, range of latencies, and increased run-time environment variability will make these problems much harder.

We will look at five areas of research that will have an important impact on the development of software and algorithms.

We will focus on the following themes:

- Redesign of software to fit multicore and hybrid architectures
- Automatically tuned application software
- Exploiting mixed precision for performance
- The importance of fault tolerance
- Communication avoiding algorithms

The community provides everything from operating system components to compilers and advanced math libraries. As an international community, however, we have only loosely coordinated activities and plans for development. The new rapidly changing technologies in multicore, power consumption, GPGPUs, and memory architectures creates an opportunity for the community to work together and build an international program to design, build, and deliver the software so critical to the science goals of our institutions. To help plan how the international community could build a partnership to provide the next generation of HPC software to support scientific discover, we will discuss the International Exascale Software Project's Roadmap.

Monday, April 2, 2012, 4:00 PM
Bio Tech Auditorium@ RPI
Reception at 3:30 PM

Please contact Sharon Simmons at simmos2@cs.rpi.edu or 276-8291 for information or directions.