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TUTORIAL I

Using Multicore Chips for Scientific Computing

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TUTORIAL DESCRIPTION

In this tutorial we review the status of generally available multicore chips including mainline chips from AMD and Intel as well graphics units from IBM (Cell) and NVIDIA. We discuss programming models and relation of these to those familiar on traditional distributed and shared memory parallel machines. We look at performance issues emphasizing those like memory bandwidth and shared cache usage that are distinct from those that dominate traditional large scale parallel applications. We discuss relation of multicore, cluster and Grid computing and examine role of services in unifying them. Examples from the SALSA project http://www.infomall.org/salsa will be used to illustrate ideas. The application focus will be linear algebra and data mining but other areas such as solution of differential equations will be discussed.

TUTORIAL OUTLINE

- Introduction to Multicore Chips
- Programming Models
- Relation to Other High Performance Distributed and Parallel Machines
- Performance of Multicore Systems
- Relation to Cluster and Grid computing
- Multicore Projects and Applications
- Conclusions on State of the Art and Future Directions

TARGET AUDIENCE

The target audience includes researchers, students, and practitioners who are interested in learning more about multicore design, development and use.

REQUIRED BACKGROUND

Knowledge of computer architecture and organization fundamentals. Knowledge of scientific computing.

TUTORIAL DURATION

The tutorial material will be presented in a 2 to 3-hour session.

INSTRUCTOR BIOGRAPHY

Geoffrey C. Fox (8122194643, gcf@indiana.edu, http://www.infomall.org).
Professor Fox received a Ph.D. in Theoretical Physics from Cambridge University **a**nd is now professor of Computer Science, Informatics, and Physics at Indiana University. He is director of the Community Grids Laboratory of the Pervasive Technology Laboratories at Indiana University. He previously held positions at Caltech, Syracuse University and Florida State University. He has published over 550 papers in physics and computer science and been a major author on four books. Professor Fox has worked in a variety of applied computer science fields with his work on computational physics evolving into contributions to parallel computing and now to Grid and multicore chip systems. He has worked on the computing issues in several application areas – currently focusing on Defense, Earthquake and Ice-sheet Science and Chemical Informatics. He is involved in several projects to enhance the capabilities of Minority Serving Institutions.