News

Press Releases
Event Announcements
CCT Weekly
Grants and Funding
Student News
Archived News

LSU CCT Explores New HPC Storage Hierarchy

Data intense computations are important for not only for STEM (science, technology, engineering, and mathematics) and commercial applications, but also for emerging knowledge management and understanding of the computational problems of tomorrow. The uncertainties of access latency times combined with overheads and the need to exploit data-access parallelism for throughput require a new strategy to enable persistent storage in the Exascale era.

IT Consultant Maciej Brodowicz, along with Professor Thomas Sterling, both with the LSU Center for Computation & Technology, received a two-year, $299,998 award from the National Science Foundation for their project, “Dynamic Data Path Management for Asynchronous Vertical Storage Hierarchy.”

The research will forge new understanding, concepts, and methods for realizing advanced, persistent storage management and processing. Two innovative system classes, one an advanced parallel file system, PVFS2, and the other a unique execution model, ParalleX, will be merged as an exploratory vehicle for establishing a new paradigm for mass storage at extreme scale.

“A new relationship between ephemeral storage and persistent objects is necessary to unify their association and manage the asynchrony of operation while achieving high efficiency. This project will develop a new paradigm of computation that integrates these abstract and physical requirements of persistence in combination with execution in a single model,” said Brodowicz.

A new execution model will achieve two goals. First, it will unify the semantics of ephemeral and mass storage to support a single abstraction of data manipulation, and incorporate an integration of metadata and synchronization to manage asynchrony and uncertainty of response time as well as logical conflicting accesses. Second, it will also support dynamic data path management for asynchronous vertical storage hierarchy, removing the burden from the users for programmability and exploiting adaptive runtime, event-driven techniques for enhanced efficiency and scalability.

“As high performance computing systems grow in complexity, so does their memory hierarchy,” said Brodowicz. “The management of vertical transport of data from secondary storage through non-volatile random-access memory, distributed main memory, layers of cache and scratch pad memories and register sets demands innovation providing a single strategy of dynamic control of the entire data path in the context of asynchrony. ParelleX, an experimental execution model, will be extended to embrace secondary storage through a unification of semantics of execution data and persistent objects.”

Clemson University will conduct a complementary project. Combining the research from LSU with that of Clemson will permit early experimentation and testing of these important but unproven concepts.

For more information on this or other research at the LSU Center for Computation & Technology, visit: http://www.cct.lsu.edu/.

Publish Date:
09-12-2011

LSU
Center for Computation & Technology
2003 Digital Media Center • Telephone: +1 225/578-5890 • Fax: +1 225/578-8957