Optimizing Data Movement in Multiprocessors: Research Overview

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Abstract
Communication is a fundamental overhead that can reduce performance in parallel computing systems. For any non-trivial computation, data must be communicated among concurrent threads, and threads must synchronize to make sure that producers and consumers of data are properly coordinated. A major focus of my research has been to investigate mechanisms that move data where it's needed, as soon as it's needed (or before), to reduce communication overhead.

This talk will highlight three such mechanisms, developed with my students over the past 15 years. The first (Slipstream-MP) uses extra processor resources to execute future instructions to prefetch data into a shared cache. The second uses prediction to reduce and recover from conflicts and rollbacks in a hardware transactional memory system. Finally, the third mechanism selectively copies cache lines to mitigate overheads of virtual machine migration. The common themes among these studies will be used to illustrate current and future challenges in parallel computer architecture.

Biography of Speaker
Dr. Greg Byrd is a Professor and Associate Head of the Department of Electrical and Computer Engineering at North Carolina State University, in Raleigh, NC. He graduated from Clemson in 1984, with a BS in Computer Engineering. He then earned MS and PhD degrees in Electrical Engineering from Stanford University. Prior to joining NC State, Dr. Byrd worked at the NC Supercomputing Center, and for a startup company that developed high-speed network encryption devices. He is a member of the Academy of Outstanding Teachers at NC State, and is a Senior Member of the IEEE, where he serves on the Computer Society's Board of Governors and Publication Board.