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MPI+MPI: USING MPI-3 SHARED MEMORY AS A MULTICORE PROGRAMMING SYSTEM FOR EXTREME SCALE SYSTEMS

William Gropp

Thomas M. Siebel Chair in Computer Science
University of Illinois Urbana-Champaign

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ABSTRACT: MPI is widely used for parallel programming and enables programmers to achieve good performance. MPI also has a one-sided or put/get programming model. In MPI-3, this one-sided model was greatly expanded, including new atomic read-modify-write operations and new ways to synchronize one-sided communication. In addition, MPI-3 adds direct access to memory shared between processes. This talk discusses some of the opportunities and challenges in making use of this feature to program multicore processors, and alternatives using hybrid programming models such as MPI and threads.

BIOGRAPHY: William Gropp received his B.S. in Mathematics from Case Western Reserve University in 1977, a MS in Physics from the University of Washington in 1978, and a Ph.D. in Computer Science from Stanford in 1982. He held the positions of assistant (1982-1988) and associate (1988-1990) professor in the Computer Science Department at Yale University. In 1990, he joined the Numerical Analysis group at Argonne, where he was a Senior Computer Scientist in the Mathematics and Computer Science Division, a Senior Scientist in the Department of Computer Science at the University of Chicago, and a Senior Fellow in the Argonne-Chicago Computation Institute. From 2000 through 2006, he was also Deputy Director of the Mathematics and Computer Science Division at Argonne. In 2007, he joined the University of Illinois at Urbana-Champaign as the Paul and Cynthia Saylor Professor in the Department of Computer Science. From 2008 to 2014 he was the Deputy Director for Research for the Institute of Advanced Computing Applications and Technologies at the University of Illinois. In 2011, he became the founding Director of the Parallel Computing Institute. In 2013, he was named the Thomas M. Siebel Chair in Computer Science. His research interests are in parallel computing, software for scientific computing, and numerical methods for partial differential equations. He has played a major role in the development of the MPI message-passing standard. He is co-author of the most widely used implementation of MPI, MPICH, and was involved in the MPI Forum as a chapter author for MPI-1, MPI-2, and MPI-3. He has written many books and papers on MPI including "Using MPI" and "Using MPI-2". He is also one of the designers of the PETSc parallel numerical library, and has developed efficient and scalable parallel algorithms for the solution of linear and nonlinear equations. With the other members of the PETSc core team, he was awarded the SIAM/ACM Prize in Computational Science and Engineering in 2015. Gropp is a Fellow of ACM, IEEE, and SIAM, and a member of the National Academy of Engineering. He received the Sidney Fernbach Award from the IEEE Computer Society in 2008, in 2010, and the SIAM-SC Career Award in 2014.

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