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Debra Hensgen

Associate Professor
(408) 656-4074
hensgen@cs.nps.navy.

Research Areas

Parallel and distributed heterogeneous computing, particularly software architectures for resource management and tools that aid applications in using concurrency effectively.

Research Descriptions

Professor Hensgen is one of the Principal Investigators for the Management System for Heterogeneous Networks (MSHN) Project, sponsored by DARPA under its Quorum Project. This research for MSHN is conducted by several faculty members here at NPS (Hensgen, Kidd, and Irvine), staff and students here at NPS, as well as researchers at NRaD, Purdue, and the University of Southern California. The goal of MSHN is to deliver good end-to-end quality of service to users in environments where both the heterogeneous resources and user set are dynamically changing. MSHN will serve a mixture of applications ranging from compute-intensive to I/O-intensive to interactive and real-time. Professor Hensgen's main area of research within the MSHN project is prioritized management of the multiple shared resources. In particular, it is extremely important to carefully model various classes of shared computing resources which differ greatly from other resources which we typically share.

In addition to the MSHN project, Professor Hensgen and some of her students participate in NRaD's SmartNet project, a scheduling advisor for heterogeneous computing resources. SmartNet has been used within DoD for compute-intensive jobs and the NPS team is currently investigating something similar for communication-intensive jobs.

With her students, Professor Hensgen has also built Graze, a graphical, performance debugger for parallel computing and Concurra, a software system that generates multi-

threaded applications whose concurrency is provably correct and which are free from deadlock. One of her current students is investigating the use of Graze to monitor Java programs as well as its use in determining when certain compiler directives should be used with automatically parallelizing compilers. This will be useful to applications being written for FLEETNUMERIC and the Pacific Disaster Center.

Relevance To DoD/DoN

Dr. Hensgen's research is relevant in the long range to DoD as well as very immediately. In particular, one component of the MSHN project applies directly to adaptive communication-intensive applications. Ideas developed in this research are being applied in the Joint Task Force - Advanced Technology Demonstration project that focuses on the ability to support planning in military and civilian emergencies. In addition, some of the heterogeneous scheduling technology she helped to develop is being applied to scheduling of virtual ATM channels in the Battlefield Awareness and Data Dissemination Project. Smart scheduling of these heterogeneous channels is necessary in order to guarantee timely information to the warfighter through the WFA (Warfighter Associate workstation).

Recent Publications

Moore, Hensgen, Charley, Wilsey, and Krishnaswamy, "Graze: A Tool for Performance Visualization and Analysis", International Conference on Parallel Processing, 1995.

Freund, R., Kidd, T., Hensgen, D., Moore, L., Campbell, M., Halderman, M., and Gherrity, M., "SmartNet: A Scheduling Framework for Heterogeneous Computing," Proceedings for the Third International Symposium on Parallel Architectures, Algorithms and Networks, Beijing, China, June 12-14, 1996, pp. 514-521.

Moore, Janakiraman, Hensgen, Armstrong, Kidd, Lima, Kussow, Halderman, Freund, Wallace, and Peterson, "System Software Developers Desperately Need Better Simulation Tools", Western Simulation Multiconference, Phoenix, Arizona, January 12-15, 1997.

N.B. Abu-Ghazaleh, P. A. Wilsey, X. Fan, and D. A. Hensgen, "Synthesizing Variable Instruction Issue Interpreters for Implementing Functional Parallelism on SIMD Computers", *IEEE Transactions on Parallel and Distributed Systems*, April 1997.