THE ASCI PROGRAM:
USHERING IN THE ERA OF TERASCALE SCIENTIFIC SIMULATIONS

Paul Messina
US DOE/NNSA
Paul.messina@ns.doe.gov

ABSTRACT

Thanks to the U.S. Department of Energy's Accelerated Strategic Computing Initiative (ASCI), the high-performance computing industry as well as computational modeling and simulation have been reinvigorated. ASCI is a mission-based activity whose goal is to enable the use of computer simulation to assess the state of the nuclear weapons stockpile without resorting to nuclear testing. Such simulations are extremely complex and will require computers orders of magnitude more powerful than the largest systems in place today.

ASCI has already put in place three systems with formidable computing power (over 3 Teraflops) as well as huge memories, and plans additional systems culminating with a 100 Teraflops machine in the year 2004. In addition to computing platforms, the ASCI program is addressing the software environments that are needed to use such large systems effectively and the visualization and storage facilities that will be needed to "see and understand" the output from the simulations that will be run on the ASCI machines, as well as to archive the results.

The pace of development of the ASCI computers is greatly accelerating the availability of systems that will enable calculations of staggering complexity and size. While these developments are required to meet the requirements of the ASCI mission, the resulting systems will be of great value to virtually all high-end scientific computing applications. The ASCI machines are built by aggregating large numbers of standard commercial systems and the software environment is designed to be as portable as possible across different makes of computers. Many of the algorithms, programming methodologies, and software tools developed for ASCI applications will benefit scientific and engineering applications in general.

This talk will describe the hardware and software technologies that are being developed by ASCI and its partners and the types of applications that are enabled by those technologies. As usual, the most important, difficult, and interesting developments are in the software, both applications and system software and tools.