ASCI White Arrives

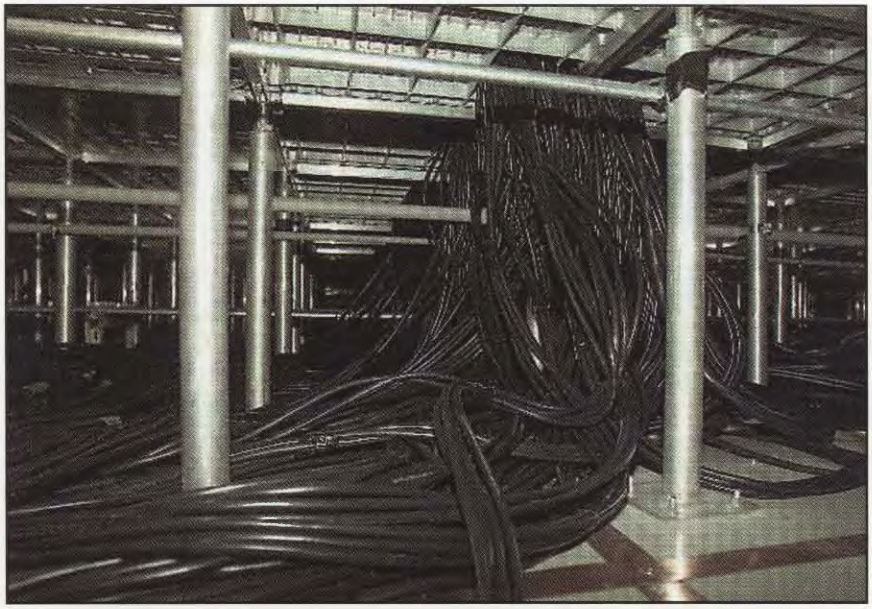
During the summer of 2000, 28 moving vans carried the pieces of the world's fastest supercomputer, called ASCI White, from IBM's development facilities in Poughkeepsie, New York, to Livermore. To accommodate the sheer physical size of this massively parallel machine, together with its wiring and cooling system demands, the Laboratory had doubled the size (and the underfloor space) of the computer room in Building 451.

This latest addition to the Laboratory's computing resources was deployed in three parts, all of which shared versions of IBM's RS/6000 SP hardware technology. ASCI White consists of 8,192 central processor units clustered into 512 nodes. Intended for large, highly parallel batch jobs, the machine demonstrated a processing speed of 12.3 teraops (trillion operations per second), about 3 times more than any other available computer at that time.

ASCI White's arrival marked the successful third step in a five-stage plan by the Department of Energy to sponsor development of a 100-teraops supercomputer by 2004. Launched in 1995 as the Accelerated Strategic Computing Initiative (ASCI), this collaboration of Livermore, Los Alamos, and Sandia national laboratories with U.S. industry and academia was later renamed the Advanced Simulation and Computing program. The goal was to significantly improve capabilities to simulate with high resolution the performance of weapons in the nation's nuclear stockpile. ASCI, and hence the White machine, is one of the cornerstones of the Stockpile Stewardship Program of the National Nuclear Security Administration.

Effective use of a computer like ASCI White required sophisticated software and network support. Laboratory innovations to transfer and store the massive data sets generated by ASCI White simulation runs—and to analyze that data visually—enhanced the practical value of this machine. Locally designed tools enabled the efficient parallel storage of vast output files. And local software (called a terascale browser) displayed data visualizations on wall-size screens to allow faster interpretation of results and bug detection.

ASCI White's benefits were soon evident. Use of the machine for pioneering scientific simulations began even as component upgrades continued on ASCI White's nodes. By the spring of 2002, scientists at Livermore and Los Alamos, using separate approaches to parallel code development for ASCI White, successfully completed two of the most refined computer simulations ever attempted, the first full-system three-dimensional modeling of a nuclear weapon explosion. Livermore's simulation alone used more than 1,024 White processors and took 39 wall-clock days to run. The Los Alamos work, executed remotely at Livermore by using a secure network connection to New Mexico, took over 120 days. High-bandwidth connections to Los Alamos and Sandia, coupled with extensive user support services at Livermore, have allowed this machine to be used effectively by all three laboratories.



The ASCI White supercomputer needed a floor with an extra 2 feet underneath it to accommodate airflow, switches, and 40 miles of cable connecting all the computer nodes.