ASCI UPDATE

November 2000

Los Alamos National Laboratory Completes the First Three-Dimensional Nuclear Weapon Secondary Explosion Simulation

The first three-dimensional simulation of a nuclear weapon secondary explosion was completed in April 2000 by Los Alamos National Laboratory, seamlessly run on supercomputing platforms both at Los Alamos and at Sandia National Laboratories. This remarkable achievement was completed by Los Alamos a full eight months ahead of the DOE/NNSA milepost schedule.

The simulation contained hundreds of millions of mesh elements and ran for a total of 1,016 hours on the Blue Mountain supercomputer at Los Alamos and ASCI Red at Sandia. The simulation ran from January 29, 2000 through April 16, 2000 on an average of 2,020 processors for 820 hours on the Los Alamos Blue Mountain platform. A restart file was generated at Los Alamos, transferred to the Sandia ASCI Red platform, and the problem was completed there using 2,048 processors for 196 hours. This transfer was necessary because of the heavy directed stockpile work simulation load on the Blue Mountain platform at that time. The problem generated a total of 14.75 terabytes of data (the book collection in the Library of Congress represents approximately 21 terabytes of data), and a total of 5.3 terabytes of data was transferred to Los Alamos from Sandia in six days for post-processing activities.

The Burn Code Review Panel, chaired by John Birely, reviewed this milepost achievementand said in their final report, “The panel unanimously congratulates the Los Alamos Crestone Project for exceeding the performance goals of the CY 2000 3D Secondary Burn Code milepost, and doing so eight months ahead of schedule.” This application achievement, ahead of the DOE/NNSA milepost schedule, represents a further enhancement in the tools that already contribute to stockpile stewardship and is a harbinger of the simulation capability that will be available on the 30 teraOPS system and its successors.

The Los Alamos Crestone project team. From left to right, Raymond Alcouffe, Patrick Fay, Robert Oakes, Michael Clover, Robert Weaver, Michael Gittings, and Robert Greene. The Blue Mountain super computer at Los Alamos is in the background.

In the News...

End of an era...Intel will stop supporting ASCI Red at the end of this calendar year, and full responsibility for maintaining ASCI Red will transition to Sandia. Intel and Sandia began partnering in the early 1990s and enjoyed a long, successful relationship in supercomputing.

Another goodbye...Paul Messina, Deputy Assistant Secretary for Advanced Simulation and Computing for the Department of Energy’s Defense Programs made his farewell tour of the weapons labs during the first week of December. He will return to the California Institute of Technology (Caltech).

More from SC2000... Lawrence Livermore and Sandia national laboratories collaborated with the University of Chicago and garnered a Gordon Bell Award at SC2000. Using FLASH, a code developed at the University of Chicago, the team simulated nuclear burning fronts in supernovae and ran the simulations on ASCI Red.

More on these stories in future newsletters...

Who’s Who in ASCI V&V Program

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ASCI Q – The Next Generation

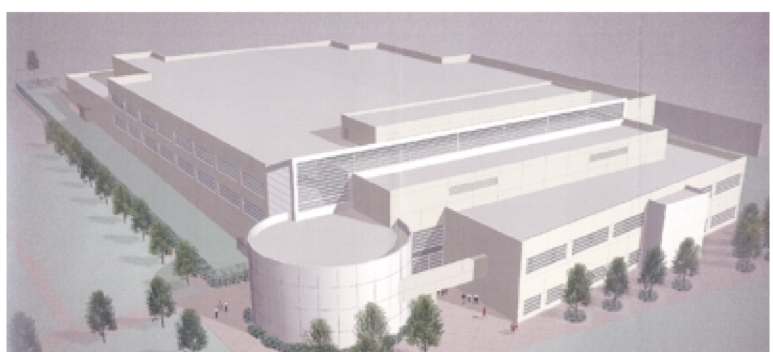
The U. S. Department of Energy’s National Nuclear Security Administration (NNSA) announced in August of this year that it selected Compaq Corporation to build the world’s fastest and most powerful supercomputer, a 30 teraOPS (30 trillion operations per second) system named "Q." The contract is valued at more than $200 million, and the supercomputer will be housed in the new Strategic Computing Complex (SCC) at the NNSA’s Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico. Initial deliveries began in September 2000, and the complete system is expected to be operational by 2002.

ASCI Q, named to follow LANL’s tradition of alphabetical names for computers, will have 11,968 processors, 12 terabytes of memory and 600 terabytes of disk storage. It will be about two and one-half times as powerful as today’s most powerful supercomputer, ASCI White at Lawrence Livermore National Laboratory in Livermore, California. It would require approximately 20,000 of today’s state-of-the-art PCs, which are capable of about 1.5 gigaOPS, working very closely together to match the peak performance of ASCI Q.

“The nation’s security mission historically has required the fastest computers available and now has, once again, accelerated the evolution of technical computing,” said NNSA Administrator General John A. Gordon. “Our new partnership with Compaq will give us an exceptionally powerful system for developing the simulation capability needed for stockpile stewardship. The ASCI simulation milestones recently achieved also show what dramatic advances in simulation capability can be achieved by skilled and dedicated teams using terascale computers.”

“Compaq is proud to work with the U. S. Department of Energy and the Los Alamos National Laboratory to support the Accelerated Strategic Computing Initiative,” said Michael Capellas, Compaq’s President and CEO. “This is a great example of how technology can serve national interests—in this case, a better understanding of aging nuclear weapons. It also underscores Compaq’s commitment to deliver the technology and services necessary to meet the world’s most advanced computing requirements.”

The contract with Compaq represents significant progress in the DOE’s efforts to move stewardship of the nation’s nuclear weapons from its 50-year foundation in nuclear testing to one based on science and simulation. ASCI Q is the NNSA’s fifth machine in the sequence of high-performance computers, operating systems, and software applications as a part of its Stockpile Stewardship Program, with a goal of reaching 100 teraOPS in 2004.



This building, with a machine room floor as large as a football field (43,000 square feet), is large enough to house two of these machines. Vents in the floor will flood the cabinets housing the processors with cooling air chilled by recirculated, treated wastewater from a lab sewage plant.

The ASCI Update is written and published monthly by the Los Alamos, Sandia, and Lawrence Livermore national laboratories, with contributions from the Department of Energy. This newsletter, along with past editions, may be viewed on the web: www.sandia.gov/ASCI. Comments or inquires should be sent to ASCI@sandia.gov. SAND 2000-2828.