ASCI UPDATE

July 2001

Bill Reed, ASCI Program Director at NNSA, and Sandia's Senior Vice President Tom Hunter work together on the Corridor ribbon cutting.

Sandia Visualization Corridor Unveiled

The ASCI/VIEWS Visualization Corridor, the premier scientific visualization facility at Sandia National Laboratories/NM, was opened this month for production use. The VIEWS Corridor—the name suggesting a wide path through which large quantities of data can flow—was conceived and built by Sandia's VIEWS team. It is for production use by Applications code development teams and weapon systems analysts and for supporting further research and development of scalable rendering and display technologies. The 2,500 square foot facility is located within Sandia's Building 880 with the Central Computing Facility and is close to most of its potential users.

The facility features three wall-sized rear-projection display screens, custom-constructed by Stewart Filmscreen Corp., of Torrance, CA. At 13 feet long and 10 feet high, the display screens may be the largest individual pieces of glass in New Mexico. The screens were installed through an open wall during remodeling of the building, and if they are ever removed or replaced, an access port built in the roof will allow screens to be lifted in or out with a crane.

Arrays of high-performance high-resolution digital projectors (1280 x 1024 pixel resolution) provide the screen images. The projectors are custom built from BARCO Simulation Products and were installed and configured by Applied Technology, Inc. of Layton, UT, the primary systems integrator for the VIEWS Corridor. The phase one installation consists of a stack of 16 projectors arranged in a 4 x 4 array behind the center screen, with individual projectors for the left and right screens. When the system is configured so that the images never overlap and every available pixel is displayed, the aggregate resolution of the 4 x 4 array is 20 megapixels. The digital projectors behind the screens are sufficiently bright that the extremely high-resolution images are easily discernable in ambient light conditions, and users can work in the environment with their books, papers, computers, and other devices and interact normally with one another.

Sixteen additional projectors are planned with even higher resolution (1600 x 1200 pixel resolution) along with another array of 16 more 1280 x 1024 projectors for a total of three projector arrays with an overall display resolution of 69 megapixels. This capability will support a major VIEWS milestone—a technically aggressive goal—but the result for users will be very large, very bright, and very detailed computer display images.

In the News...

The Burn Code Review was held at LANL on July 16-17 and at LLNL on July 17-19. The Burn Code Writing Session will be held at Sandia August 2-3.

Mike Vahle has replaced Dona Crawford as Sandia's new ASCI Program Director. Welcome aboard, Mike.

Who's Who in ASCI VIEWS...

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Behind the screens: 16 projectors arranged in a 4x4 array.

The computer cluster that drives the images is one of the first designed for graphics rendering and image display. Building on Sandia's expertise in scalable high-performance computing, the VIEWS team has fielded a cluster of 64 Compaq SP750 workstation computers interconnected with a high bandwidth, low latency, communications fabric. Each computer has a low cost GeForce2 commodity graphics adapter. Software created by the VIEWS scalable rendering team leverages the data interconnect and the GeForce graphics to perform scalable parallel rendering of graphics data into images. Rendering rates on large data that are over ten times greater than that of the previous visualization systems and are a fraction of the cost. Plans are underway to move the VIEWS Corridor's 64-node rendering cluster into the classified partition and to assemble a new unclassified render cluster.

The VIEWS Corridor provides access to many other classified and unclassified resources for display: workstations, video teleconferencing, VHS and DVD, and media creation and editing equipment. Automated video and audio matrix switching support both the unclassified and classified sources, and a variety of display modes are available. This broad spectrum of capabilities and the sophisticated control systems make the ASCI/VIEWS Visualization Corridor first and foremost a user facility that is available around the clock to support ASCI programs and users.

Still on Top

TOP500, the computer performance list published twice a year by the University of Tennessee and the University of Mannheim, Germany, gives four of the top six supercomputer rankings to machines operating at the Department of Energy's National Nuclear Security Administration defense laboratories. Numbers one and four are the IBM machines ASCI White and Blue Pacific at Lawrence Livermore National Laboratory in California. ASCI Red, an Intel machine at Sandia National Laboratories, New Mexico, placed third. ASCI Blue Mountain, an SGI machine at Los Alamos National Laboratory in New Mexico placed sixth.

The goal of ASCI is to meet science-based simulation requirements of the Stockpile Stewardship Program by developing the high-fidelity numerical simulation tools required by the scientists and engineers charged with ensuring the safety, reliability, and credibility of the nuclear deterrent without underground testing. A 10-year goal of this program is to deploy an integrated weapons simulation capability running on a computer capable of 100-trillion calculations per second. That speed is necessary to simulate the complex three-dimensional physics that occur in nuclear weapons.

Secretary of Energy Spencer Abraham stated that ASCI "is the backbone of our stockpile stewardship program. This independent ranking confirms our technology leadership to support our nuclear stockpile. Many skeptics labeled this technology advancement 'impossible' just five years ago."

In 1999, the first-ever three-dimensional simulation of a nuclear weapon primary explosion was successfully completed by Lawrence Livermore on the IBM Blue Pacific. This simulation required about 0.3 terabytes of memory and ran for 20 days. Shortly after, Sandia National Laboratories successfully completed the first-ever three-dimensional computer simulations of a weapon system exposed to hostile nuclear radiation and blast environments using the Intel Red. Then, in April 2000, Los Alamos National Laboratory completed a three-dimensional prototype secondary burn simulation on the SGI Blue Mountain. The simulation required over 2000 processors, generated nearly 15 terabytes of data, and ran for over a month.

Before ASCI supercomputers, none of the world's computers had been able to meet the speed and memory required for three-dimensional simulations. "This three-dimensional simulation capability is a key advance in our science-based work," stated NNSA Administrator John Gordon. "Only with 3D full physics simulation capability, which incorporates the complex physics required to model weapon performance, aging, and safety, can we ensure the nation's nuclear deterrent in the absence of underground testing."

Supercomputing technology being developed for complex nuclear weapons simulations will also help advance pharmaceutical research, aerospace, combustion, and global climate modeling.

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.