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Lawrence Livermore Laboratory Supercomputer Sets New World Record

Qbox may sound like the name of the latest video game, but it is in fact a state-of-the-art computer application that NNSA scientists use to simulate complex materials at molecular and atomic levels.

Running on the world's fastest supercomputer – NNSA's BlueGene/L at Lawrence Livermore National Laboratory – Qbox recently set a new world record for a scientific application with a sustained performance of 207.3 trillion floating operations per second (teraflops). Running such applications at these speeds for sustained periods of time is important to NNSA's researchers because it allows them for the first time to model materials and simulate chemical, biological and physical processes in unprecedented detail.

FASTER THAN A SPEEDING BULLET: Doug East of the Lawrence Livermore National Laboratory Advanced Simulation and Computing program and Barbara Atkinson of the Livermore Computation Directorate talk in front of the record-holding BlueGene/L supercomputer.

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W76: Pantex production technicians are highly trained to work on each weapons program. See pages 4 and 5 for more on NNSA's Pantex Plant.

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Megaports Program Coming To Jamaica And Egypt

A Declaration of Principles (DOP) has been signed with the governments of Jamaica and Egypt to help thwart smuggling of nuclear and other radioactive material. The DOPs were cosigned by U.S. Customs and Border Protection (CBP) and NNSA.

The documents cover implementation of CBP's Container Security Initiative and NNSA's Megaports Initiative, as both programs continue working together to stop nuclear material from being smuggled to U.S. ports. Two previous joint DOE-CBP declarations of principles have been signed with the Sultanate of Oman and the government of Honduras.

NNSA Administrator Linton F. Brooks stated, "Protecting global shipping lanes from being used by terrorists to smuggle nuclear materials is critical for U.S. national security and the national security of our international partners. Cooperating with the

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Lawrence Livermore Supercomputer Sets New World Record

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The record code run, studying how molybdenum atoms behave under pressure, represents one of only a handful of "predictive science" simulations achieving this size: 1,000 molybdenum atoms. "Predictive" simulations allow researchers to understand how complex systems behave over time, where it was previously only possible to get brief snapshots at a smaller scale.

The three-dimensional supercomputer simulations and analyses conducted by NNSA's Advanced Simulation and Computing program are the cornerstones of NNSA's effort to ensure the safety, security and reliability of the nation's aging nuclear stockpile in the absence of underground testing.

Supercomputers such as BlueGene/L allow NNSA's scientists to simulate at the atomic level materials and processes important to nuclear weapons and their performance. The "Q" in Qbox is for "quantum," a reference to the detailed quantum mechanical descriptions of electrons that are the principal focus of this type of code. Thanks to codes such Qbox, NNSA scientists are able to better understand the nature of nuclear materials and how they behave in performance conditions of extreme temperature and pressure.

ASCI Red, World's First Teraflop Supercomputer, Put To Rest At Sandia

The world's first teraflop computer, known as ASCI Red, has been decommissioned at Sandia National Laboratories in New Mexico where it was still one of the world's 500 fastest parallel-processing machines nine years after it went into service.

"I've never buried a computer before," said Justin Rattner, Intel chief technology officer, to 30 people from Sandia and the Intel Corp. who gathered at Sandia in June to pay their respects. Sandia VP Rick Stulen eulogized, "ASCI Red broke all records and most importantly ushered the world into the teraflop regime. It still holds the record for the longest continuous rating as the world's fastest computer, four years running."

Megaports Program Coming To Jamaica

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governments of Jamaica and Egypt will enable our countries to further international nonproliferation efforts and better protect our countries and our allies against nuclear terrorism."

NNSA's Megaports Initiative is aimed at preventing illicit shipments of nuclear and other radioactive material through the global maritime system. NNSA works with foreign partners to install specialized radiation detection equipment and enhance the capabilities to detect, deter and interdict illicit shipments of nuclear and other radioactive materials at international ports. The Megaports Initiative is currently operational in six countries, and at various stages of implementation and negotiations with approximately 30 other countries around the world.

U.S. Customs and Border Protection is the unified border agency within the Department of Homeland Security charged with the management, control and protection of our nation's borders at and between the official ports of entry. CBP is charged with keeping terrorists and terrorist weapons out of the country while enforcing hundreds of U.S. laws.

SRS Makes 200th Shipment Of LEU

As part of its highly enriched uranium (HEU) blend down program, the Savannah River Site (SRS) has made its 200th shipment of low enriched uranium (LEU) to the Tennessee Valley Authority (TVA) via an interagency agreement with NNSA. This program is a key part of NNSA's nonproliferation effort to keep nuclear material safe from terrorists.

Preparation and shipping of the material was accomplished safely and efficiently, resulting in a program that is currently six months ahead of schedule. Final shipments are scheduled for 2007, with a total of 288 trailers shipped.

SRS is blending down approximately 11.9 metric tons of HEU into 179 metric tons of LEU. Processing the uranium from HEU to LEU makes the material safer and less attractive for terrorist use in a nuclear weapon.

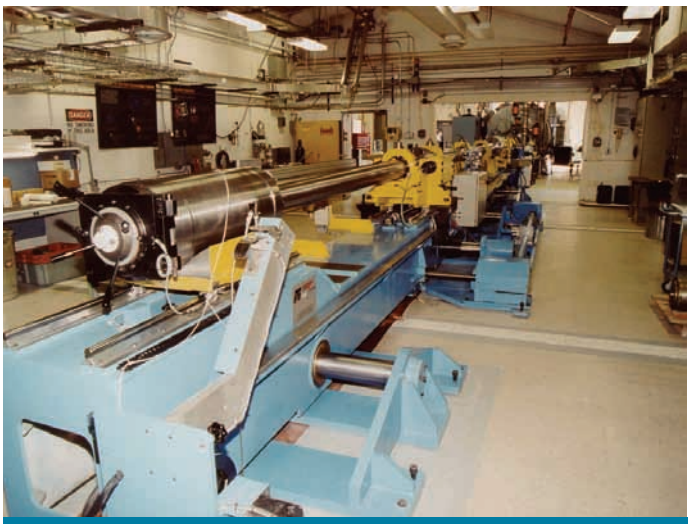
"Not only are we making the world a safer place by disposing of the nation's excess nuclear material, we are also providing a valuable and needed energy product, electricity, in the process," said Sterling Franks, director of the Office of Fissile Material Disposition at SRS.

Savannah River Manager Jeff Allison said, "I am particularly proud of our Savannah River team, which has done an excellent job achieving this milestone safely and efficiently."

TVA is processing the LEU material into reactor fuel for use in two reactors at the Brown's Ferry facility in Erwin, Tenn., which is producing commercial electrical power for customers throughout the Southeast.

LANL And LLNL Team Up To Put The "J" In JASPER

Scientists from Lawrence Livermore National Laboratory (LLNL) and Los Alamos National Laboratory (LANL) have redefined the "J" in JASPER, an acronym for the Nevada Test Site's two-stage Joint Actinide Shock Physics Experimental Research gas gun.



TOP GUN: The Nevada Test Site's JASPER gun.

After 54 experiments by LLNL, shot 55 was the first "joint" experiment by the two laboratories using the gun. That shot involved plutonium that is only used in a weapon system of LANL design.

Experiments conducted at JASPER complement subcritical experiments also conducted at the Nevada Test Site. Data gathered from these experiments on plutonium help NNSA scientists ensure the continued safety and reliability of the nation's nuclear weapons stockpile.

The basic concept of the gas gun is to propel a projectile into a target at extremely high velocities, often exceeding five miles per second. This is all done in the span of about 90-feet.

For LANL, these speeds result in higher stress levels, high shock pressures, temperatures and strain rates to the plutonium target that in turn translates into data that is close to that of a nuclear test. LANL had conducted similar experiments on the same material using the gas gun at TA-55 in Los Alamos, but at lower stress levels.

JASPER: How It Works

JASPER consists of a first-stage breech containing gunpowder and a pump tube filled with hydrogen gas and a second-stage evacuated barrel for guiding the high-velocity projectile to a target containing the plutonium. Hot gases from the burning propellant drive a heavy piston down the pump tube, compressing the gas. At sufficiently high pressures, the gas eventually breaks a rupture valve and enters the narrow barrel, propelling a projectile, housed in the barrel, toward the target.

When the projectile hits the target, it produces a high-pressure shock wave. In a fraction of a microsecond, the shock wave reverberates through the target. Diagnostic equipment, triggered by the initial wave, measures the properties of the shocked material inside the target during this extremely brief period. The target is disintegrated by the impact of the projectile and contained within a primary confinement chamber. A second confinement chamber protects workers as a safety precaution in the unlikely event that the primary system fails.

A MILLION HOURS: Monica Lewis and Gerald Potter give a "thumbs up" to the BWXT Y-12 construction team, still working without a lost-time injury. Y-12 construction recently celebrated one million hours worked without a lost-time injury. The injury-free million hours stretched over two years of construction activity at the Y-12 National Security Complex.

Pantex Boosts Efficiency, Maintains Safety And Security

In information technology, throughput is the rate at which a computer or network sends or receives data. At NNSA's Pantex Plant, throughput means more nuclear weapons disassembly and inspection work is getting done. In fact, production work at the plant is not only increasing, but it's ahead of schedule.

"BWXT Pantex has been able to increase production throughput by improving resource allocation and production efficiency. This has been accomplished while maintaining safety and security at the facility," said Dan Swaim, BWXT Pantex president and general manager.

Pantex has a long-term mission to maintain the nation's nuclear weapons stockpile and dismantle weapons retired by the military. Much of Pantex's future workload includes life extension programs designed to increase the longevity of weapons in the stockpile.

"It is essential that the entire nuclear weapons complex works together to achieve the efficiency improvements we have begun to experience at Pantex," said Dan Glenn, manager of the NNSA Pantex Site Office. "Much has been accomplished and more opportunities remain. I look forward to continuously improving our management processes while also maintaining our focus on the safety and security aspects of our important work."

Every year, the NNSA determines the number of deliverables or units that must be completed. This year's goal is 839. Pantex is approximately 90 units or one month ahead of the baseline schedule for May. This gives the company June through September to complete the remaining 273 scheduled units. Pantex expects to surpass this goal.

Pantex is continuing this trend from FY 2005. During the fiscal year, Pantex completed more disassembly and inspection units than had been completed in the past 13 years. This success resulted in more than $1 million in efficiencies. These funds were applied to work not planned or budgeted in FY 2005.

Pantex is continuing to optimize the use of resources to ensure Pantex facilities and manpower are used in the most efficient manner. The company has increased the projected production capacity for FY 2008 from 800 to approximately 1,200 units per year.

With key authorization enhancements, such as multi-unit operations that will allow for increased workflow, the Pantex of today can continue to meet the stockpile needs of the future.

W56: The W56, one of the larger weapons in the nation's stockpile, is being dismantled at the Pantex site.

Innovation Pushes Capacity

The idea is that innovative thinking can accomplish higher production goals. Dan Swaim, BWXT Pantex president and general manager, believed that a new approach was needed to ensure Pantex facilities and manpower were used in the most efficient manner, thereby increasing capacity. Swaim organized a team to develop this new approach.

B83: Production technicians move a B83 into position to begin work.

"Production capacity is not just a Manufacturing Division issue," said Swaim. "Every division has a hand in the success of the plant, and has valuable insight into needed improvements."

The team relied heavily on subject-matter experts from across the plant. This ensured the new plan accurately reflected production capacity and provided details about the methodologies used to determine capacity. It also examined the effect of workload variation.

Dan Glenn, manager of the NNSA Pantex Site Office, said, "By taking the initiative to research the true capacity of the plant and incorporate a number of modeling tools, Pantex has changed the way work is planned and performed at the site."

The plant's current production capacity is 800 units per year. In order to challenge that capacity and increase it to 1,200, Pantex looked at the data projected in the workload model. Categories of work and workload mix (e.g., evaluation, Life Extension Programs, and dismantlement) are major factors in determining Pantex production capacity.

Pantex used a number of tools to develop options that will increase the plant's capacity. Some of these tools include the Long-Range Production Planning Model to project resource requirements and staffing levels, the Long Term Operating Plan, and the recently developed Master Production Plan that integrates projects and goals in support of production needs. These tools help Pantex understand the relationships between projects and minimize impacts to production objectives. In addition, other planning tools developed by the Manufacturing Division provide an overview and analysis of the effect of multi-shift operations.

By working closely to incorporate these initiatives into the current work plan, Pantex and the NNSA will ensure the plant is prepared to meet the coming workload challenges.

"It is essential that the entire nuclear weapons complex works together to achieve the efficiency improvements we have begun to experience at Pantex."

Dan Glenn
Pantex Site Office Manager

President Bush directed that the size of the nuclear weapons stockpile be reduced by nearly 50 percent by 2012, which will result in the smallest stockpile since the Eisenhower administration.

Y-12 Building A Better Birdcage

Building a better birdcage? Engineers at the Y-12 National Security Complex have done just that by designing an advanced birdcage. These containers, not intended for parakeets or canaries, are used to safely store enriched uranium during production activities at the Oak Ridge, Tenn. facility.

Birdcages have been used at Y-12 for decades to store and transport enriched uranium during production activities. The containers resemble old-fashioned birdcages, hence the name.

Y-12's newest version of the birdcage has improved features that enhance safety and security. The advanced design has applications across the DOE complex in any activity involving the processing of enriched uranium.

The monolithic birdcage—so dubbed because the new design can be manufactured from a small number of components machined from solid metal—must meet stringent strength and reliability requirements.

NOT FOR CANARIES: A Y-12 worker welds one of the 65 pieces of metal required to complete a "birdcage" (inset) for storage of enriched uranium.

"Birdcages are essential to the Y-12 production process. The physical design provides needed spacing between materials being stored or moved. The structure provides the spacing as well as the container to hold the material. Their primary function is to ensure materials are safely and securely stored and transported," said Phillip Jacobs of BWXT Y-12. "Significant benefits can be realized from machining monolithic components rather than welding together many smaller individual sheet-metal parts."

EVERYTHING'S IN MOTION: That's what more than 850 middle school students at Brittany Hill Middle School in Blue Springs, Mo. realized during Honeywell's dynamic hip-hop science education concert. Honeywell FM&T manages NNSA's Kansas City Plant. A limber Brittany Hill student jumps off a springboard into a huge Velcro wall to illustrate inertia.

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Contributors include: Keith Bagley, Office of Secure Transportation; Laura Bailey, BWXT Pantex; Don Johnson, Lawrence Livermore Lab; Tami Moore, Sandia Site Office; Darwin Morgan, Nevada Site Office; Norma Restivo, Bechtel Nevada; Nicole Ross, Kansas City Plant; Neal Singer, Sandia Labs; Bill Taylor, DOE Savannah River; Ed Vigil, Los Alamos Lab; Steve Wyatt, Y-12 Site Office

Sandia Begins Demolition Of 1960s-Era Lab Building

Sandia National Laboratories (SNL) in New Mexico has successfully started its second major decontamination and decommissioning (D&D) project under the Facilities and Infrastructure Recapitalization Program (FIRP).

"The demolition of excess buildings allows for the construction of facilities that are needed to meet critical mission goals," according to Bruce Scott, NNSA associate administrator, Infrastructure and Environment.

The goal of NNSA's Facilities and Infrastructure Recapitalization Program is to restore, rebuild and revitalize the physical infrastructure of NNSA's nuclear weapons complex.

Demolition of the 67,839 square feet Sandia building started in April and is continuing. Since the building was constructed in 1961, it has served as a laboratory and administrative building for personnel supporting various SNL programs.

There were over 20,000 injury-free man-hours of pre-demolition prep work, including characterization, decontamination, abatement, selective demolition and utility isolation. The first floor of Building 806 was occupied by employees until January 17. By allowing the first floor to stay occupied the work on the other floors had to be done in phases creating many challenges such as keeping the building in near operational conditions during the initial phases of D&D.

COMING DOWN: Demolition efforts are underway for a 1960s-era building at Sandia National Laboratories in New Mexico.

OST Eastern Command Upgrades Its Facilities

A new 25,000 square foot Secure Transportation Complex will open this fall near Oak Ridge, Tenn., to serve the Eastern Command of NNSA's Office of Secure Transportation (OST).

The mission of OST is the safe, secure transportation of nuclear weapons, weapon components, and category 1 and 2 special nuclear materials. OST maintains two other federal agent commands in Amarillo, Texas and Albuquerque, NM.

GOING UP: A new administrative and classroom building for the Office of Secure Transportation's Eastern Command is under construction in Tennessee.

The Eastern Command has been in existence in one form or another since 1976. Known as the Southeastern Courier Section until recently, the name was changed when OST received "office" status. The command has previously maintained offices at NNSA's Y-12 Plant.

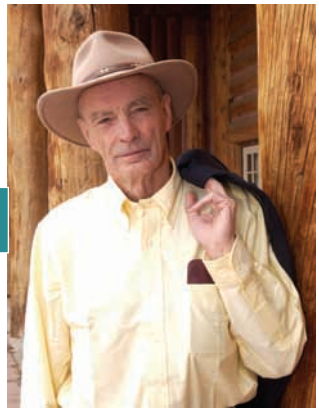
The new facility, which will be adjacent to an OST vehicle maintenance facility, will provide administrative, maintenance, storage, classroom, and information technology resources in support of the OST mission. Though vehicles and agent equipment will be stored there, at no time will any mission-related cargos reside at this location.

Some expansion is also taking place at the Eastern Command's training facility. The Oak Ridge Area Office has approved a land use agreement that will allow the command to manage about 380 acres adjacent to the live-fire range. This property will allow the addition of more training buildings, maneuver areas, a confidence course, and a running track.

Boyer, Colgate Receive Los Alamos Medal

Los Alamos National Laboratory technical staff member Keith Boyer and senior laboratory fellow Stirling Colgate are recipients of the 2006 Los Alamos Medal. The medal is the highest honor given by the laboratory. Recipients are evaluated on achievements that have helped to change the course of science.

Boyer has served Los Alamos for 55 years and is recognized as the intellectual force behind the lab's entry into magnetic fusion, nuclear rocketry, laser isotope separation and inertial fusion.



Stirling Colgate

Boyer received his doctorate in nuclear physics from MIT. He is credited with introducing and leading dramatic advances in science and engineering and was involved in producing the first neutrons from a thermal plasma, co-inventing the electron beam carbon-dioxide laser and advancing x-ray lasers for high resolution microscopy.

Colgate's association with Los Alamos began when he was a student at the Los Alamos Ranch School until it was closed by the government in the early 1940s. He received his doctorate in physics from Cornell University and worked at Lawrence Livermore and New Mexico Institute of Mining and Technology.

Keith Boyer

He joined Los Alamos in 1976 and worked in the Theoretical Division. He is recognized for leading the nuclear diagnostics of the nation's largest weapons test and for negotiating the cessation of high-altitude and outer space nuclear tests. Colgate also inspired the inertial fusion and astrophysics programs at Los Alamos and Lawrence Livermore and contributed basic science to fusion ignition and burn, plasma confinement and shock wave physics.

NNSA's Kansas City Plant Receives Two Prestigious Environmental Awards

The Kansas City Plant has received two prestigious environmental accolades – the Federal Electronics Challenge (FEC) Award and the Federal Electronics Recycling and Reuse Challenge (FERRC) Award.

REDUCE, REUSE, RECYCLE: The NNSA's Kansas City Plant had a head start on the recycling challenge. Since 1998, it has been donating computers to hundreds of Kansas City area schools to help enhance students' math, science and technology education.

The plant received the FERRC award for its outstanding environmental stewardship efforts. The award recognizes federal employees and facilities for leading by example and recycling, reusing or donating used computers and other electronic equipment to local schools or hurricane relief efforts in the gulf area.

The Office of the Federal Environmental Executive and the U.S. Environmental Protection Agency gave the plant the FEC Bronze Award for purchasing greener electronic products, reducing impacts of electronic products during use and managing obsolete electronics in an environmentally safe way. Together with the FEC, the Kansas City Plant is helping to lead the response to the new challenges posed by complex waste streams.