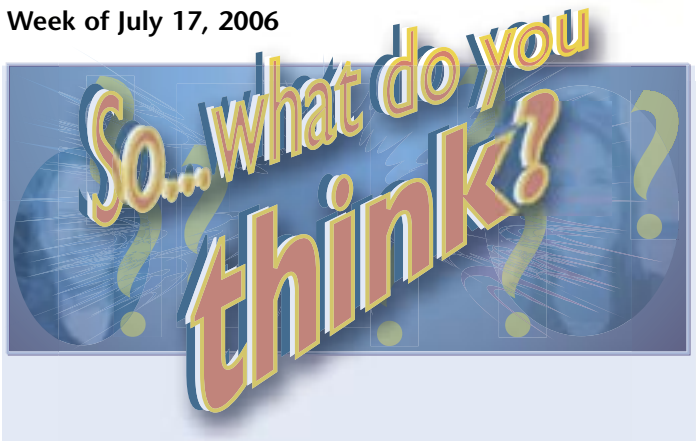
Los Alamos NATIONAL LABORATORY EST.1943

NewsLetter

Week of July 17, 2006

Vol. 7, No. 15



Q: Laboratory employees are frequently asked to volunteer their personal time to help with school and community projects in Northern New Mexico (science fair judges, tutors, Habitat for Humanity, etc.). In what ways have you volunteered your time and professional skills, and how has the volunteering affected you?

Reyna Martinez of Leadership and Development Training (CT-LDT)

I volunteered to assist mentally challenged adults. The experience made me understand how it is a challenge for them to get through each day doing very minor things. I really admire these individuals for that and no longer take the little things for granted.

Kay Birdsell of Hydrology, Geochemistry, and Geology (EES-HGG)

I was a girl scout leader for eight years. I also give hydrology demonstrations at schools and for the Expanding Your Horizons workshop. It's great fun to teach kids about the environment.

Shellie Sanchez of the Office of Counterintelligence (OC)

I currently am a foster parent of four children. I have a three, five, ten, and 14-year-old in my home. I think it is great to take time to give back to the community.

Daisy Brumby of Field Services Operations (HR-OPS)

I volunteered for Human Resources' Hurricane Katrina effort and made daily bank deposits of donations from the sale of purple bracelets. I was in a position to enable other people to help and that was a great experience.

Los Alamos NewsLetter
P.O. Box 1663
Mail Stop C177
Los Alamos, NM 87545

Nonprofit Organization
U.S. Postage Paid
Albuquerque, NM
Permit No. 532

LALP-06-001

Laboratory captures five 2006 R&D 100 Awards

by Hildi Kelsey

Nontoxic explosives, a computer visualization tool, charged-particle optics code, nanofabrication process and computer-language compiler earned the Laboratory five 2006 R&D 100 awards. These latest awards presented by R&D Magazine bring the Laboratory's total to 103 since 1978.

"I am proud to be part of an organization brimming with so much talent and ingenuity," said Laboratory Director Mike Anastasio. "These awards further demonstrate the innovation and creativity of our staff and their ability to translate abstract concepts into real-world technology."

The R&D 100 Awards program honors significant commercial promise in products, materials, or processes developed by the international research and development community. Each year, Illinois-based R&D Magazine recognizes the world's top 100 scientific and technological advances with awards for innovations showing the most significant commercial potential. The Laboratory screens Lab technologies that are potential candidates and submits entries to the magazine. R&D Magazine uses technical experts to judge the submissions and officially presents the awards during a ceremony in October.

'These awards further demonstrate the innovation and creativity of our staff and their ability to translate abstract concepts into real-world technology.'
— Laboratory Director Mike Anastasio

"I congratulate the researchers who have won these awards, which highlight the power and promise of DOE's investments in science and technology," Secretary of Energy Samuel W. Bodman said. "Through the efforts of dedicated and innovative scientists and engineers at our national laboratories, DOE is helping to enhance our nation's energy, economic and national security."

The five Laboratory technologies honored this year are

- Green Primaries
- PixelVizion
- MICHELLE
- Energetic Neutral Atom Beam Lithography & Epitaxy (ENABLE)
- Trident

The award winners, along with the other technologies nominated for this year's R&D 100 awards, are featured on pages 3 through 8.

For Your Safety

Richard Naranjo of the Chief Security Office (CSO) unpacks boxes in his new third floor office of the National Security Sciences Building at Technical Area 3. *Photo by LeRoy N. Sanchez*

On the move …

Planning an office move? Occupational Medicine (OM) has some simple guidelines to make the move a safe one.

• Don't pack boxes that are too heavy, over sized, or awkward to lift safely.

• Use assist devices (hand carts, lift gates, dollies) whenever possible.

• Wear appropriate (closed toe) shoes.

• Avoid bending or twisting while lifting or carrying items (move the feet, not just shoulders).

• Avoid reaching and/or pulling items.

• When lifting items off surfaces lower than the waist, squat to lift — do not bend over to lift.

• Ask for help — *handyman@lanl.gov*, property management representative, facilities manager.

• If moving in the heat of the day, remember to stay hydrated, wear sunscreen and/or a hat (being dehydrated or overheated can contribute to injuries).

• Pay attention to the surroundings — packing and moving can create tripping hazards.

• Above all, allow adequate time to make the move and stay safe.

Los Alamos NATIONAL LABORATORY EST. 1943

NewsLetter

The *Los Alamos NewsLetter*, the Laboratory bi-weekly publication for employees and retirees, is published by the Communications Office in the Communications and Government Relations (CGR) Division. The staff is located at 135 B Central Park Square and can be reached by e-mail at *newsbulletin@lanl.gov*, by fax at 5-5552, by regular Lab mail at Mail Stop C177 or by calling the individual telephone numbers listed below. For change of address, call 7-3565. To adjust the number of copies received, call the mailroom at 7-4166.

Editor:
Jacqueline Paris-Chitanvis, 5-7779

Associate editor:
Steve Sandoval, 5-9206

Production editor:
Denise Bjarke, 7-3565

Graphic designer:
Edwin Vigil, 5-9205

Staff photographer:
LeRoy N. Sanchez, 5-5009

Los Alamos National Laboratory is a multidisciplinary research institution engaged in strategic science on behalf of national security. The Laboratory is operated by a team composed of Bechtel National, the University of California, BWX Technologies and Washington Group International for the Department of Energy's National Nuclear Security Administration.

Los Alamos enhances national security by ensuring the safety and reliability of the U.S. nuclear stockpile, developing technologies to reduce threats from weapons of mass destruction, and solving problems related to energy, environment, infrastructure, health and global security concerns.

NNSA National Nuclear Security Administration

Printed on recycled paper. Please recycle.

Laboratory reaffirms commitment to region

Foundation breaks ground on new facility

Laboratory Director Mike Anastasio, far left, helps break ground on the Los Alamos National Laboratory Foundation's new facility in Española. Anastasio said a strong, vibrant community is key to the Laboratory's success. He said the Lab will continue to partner with the foundation to build a better future by providing opportunity through education for residents of Northern New Mexico. Also shown, left to right, are Foundation Board Treasurer Diana MacArthur; Española Mayor Joseph Maestas; Sen. Pete Domenici, R-N.M.; Laboratory Foundation Executive Director Susan Herrera; Rep. Tom Udall, D-N.M.; and David Schutz of Great Northern Development Co., the general contractor on the project. Established in 1997, the foundation has awarded more than 1,400 community and education outreach grants totaling more than $19 million to nonprofits and schools serving Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, Santa Fe, and Taos counties. Inset: Architect's rendering of the new 6,600-square-foot facility includes offices for foundation staff members as well as employees of the Lab's Math and Science Academy, a 100-seat auditorium and a 50-seat classroom. The facility is scheduled to open in 2007. *Images courtesy of Andrea Multari, Los Alamos National Laboratory Foundation*

Bowles named scientific adviser for Governor Richardson

by Erika Martinez

Tom Bowles

Laboratory Fellow and former Lab Chief Science Officer Tom Bowles is the new scientific adviser to Gov. Bill Richardson.

As science adviser, Bowles will provide counsel and assistance to Governor Richardson and members of the state government on science and technology matters.

"I am excited about being able to expand my interest in promoting science and technology," Bowles said. "My experience as chief science officer is going to be put to good use in a wider forum."

Bowles said that one of his first efforts would be to assist the governor in evaluating alternative methods to integrate high technology across multiple policy areas. Bowles will serve as the governor's point of connection to New Mexico's major research universities that are exploring efficient ways to advance science and technology collaborations. He also will assist industry to better couple advances in science and technology at the national labs and universities into the public.

"New Mexico is becoming a national leader in the high tech field and Tom Bowles will help further this progress," the governor said in a news release. "Our high-tech industry and national labs can work together to become a job creation dynamo for New Mexico."

"I feel New Mexico should be a model for science and technology for the country," said Bowles. "We have a lot going for us — very strong R&D efforts at the two national labs and three research universities, great natural resources, a strong economy, and a governor who understands S&T, having served as the Secretary of Energy.

"I am looking forward to working with a broad range of people from the state, the labs, the universities, and industry to effect positive change," Bowles said.

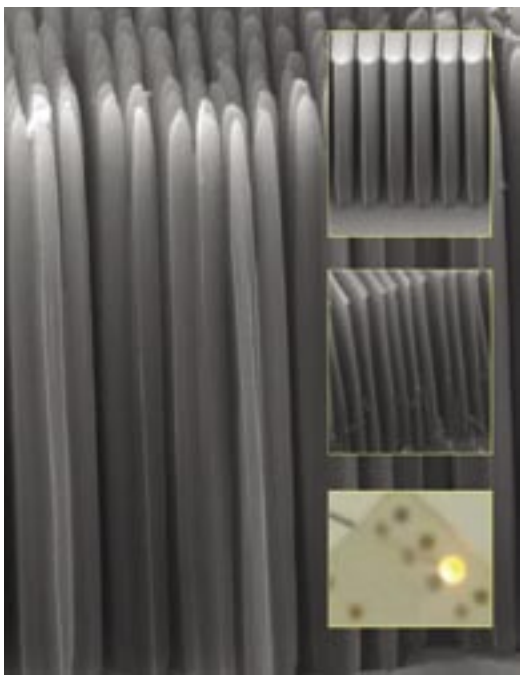
In deciding to accept the appointment, Bowles said he first had to ensure that his responsibilities as chief scientist would be covered. With Dave Sharp becoming Los Alamos' new chief scientist, representation of science issues at the Lab is in good hands, he said.

Bowles said he owes much of his success to his wife and daughter, who played a big role in his decision to accept the position. He also thanked former Lab Director Bob Kuckuck for recommending him to the governor. The support of Lab Director Mike Anastasio and Terry Wallace, acting director of the Principal Associate Directorate for Science, Technology and Engineering (PADSTE) also was integral in receiving the appointment, he said.

"I am heartened by the response of many staff at the Lab who view this as an opportunity for both the state and the Lab," Bowles expressed. "I have always been open to new experiences and this one is likely to be the most challenging one I have ever faced."

Bowles will be on a change-of-station; the appointment is for one year with the opportunity to remain as the governor's scientific adviser for up to three years. Bowles said he will remain close in contact with the Lab.

AWARD WINNERS



ENABLE:
Energetic neutral atom beam lithography/ epitaxy

ENABLE, or energetic neutral atom beam lithography/epitaxy, comprises a dual-function nanofabrication technology that is capable of both growing thin films and etching high-aspect-ratio nanostructures. It is unique in that its low-temperature operation spares the activation of diffusive and other unwanted surface chemical changes that are drawbacks of existing nanofabrication processes. Because its precise high-aspect-ratio nanoscale etching and rapid high-quality thin-film growth capabilities can be readily combined, ENABLE technology is theoretically capable of fabricating details down to 1 nanometer or less in size, giving it greater versatility than current nanofabrication processes.

Applications
- Wide bandgap semiconductors
- Solid-state lighting
- Ultraviolet and blue light-emitting diodes and lasers
- Multicolor flat-panel display technologies
- Room-temperature spintronic-based devices
- Photovoltaic devices
- Photonic crystal devices
- High-quality dielectrics (super capacitors)
- High-capacity microbatteries
- NEMS and MEMS structures
- Micro- and nanofluidics
- Nanowires

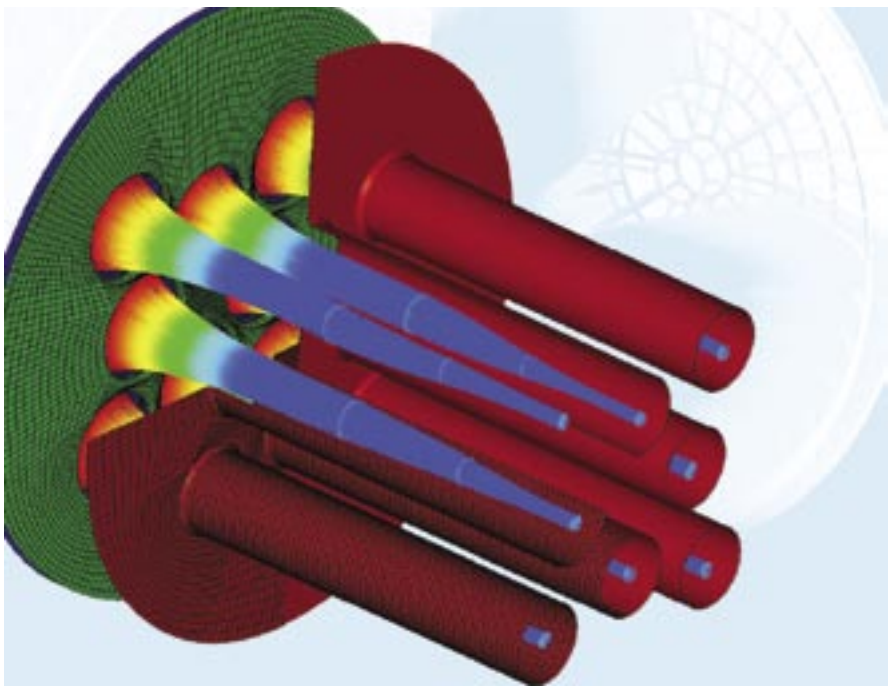
Team members: Mark Hoffbauer and Alexander Mueller of Advanced Chemical Diagnostics and Instrumentation (CHEM-ACDI) and former Lab employee Elshsan Akhadov

Green primaries:
Enviro-friendly energetic materials

Green Primaries are designed to replace the ubiquitous lead-based primary explosives that pollute human tissues and the environment with neurotoxic lead residues and have been doing so for nearly 400 years. Nontoxic both in their manufacture and detonation products, Green Primaries also are superior to lead primaries and all other current experimental substitutes in that they are insensitive to spark and can be manufactured in several variants. These chemical variations exhibit differences in explosive energy and in impact and friction sensitivity, making Green Primaries adaptable to diverse explosive and transportation requirements. Green Primaries are more environmentally friendly through the elimination of heavy-metal residues and are safer to manufacture because they pose no danger for explosion during the manufacturing process.

Applications
- Civilian ammunition — both hunting and law enforcement
- Military ammunition and explosive devices
- Mining, excavating, and demolition detonators
- Projectile propellants
- Industrial motors, actuators, and valves
- Gas generators
- Pyrotechnics
- Miniaturized explosive systems

Team members: My Hang Huynh, Ernest Hartline, Dennis Montoya, Herbert Harry, Kien-Yin Lee, Jose Archuleta, Edward Roemer, Kenneth Laintz, Scott Kinkead, Victor Sanders, Anna Giambra, and Lloyd Davis of HE Science and Technology (DE-2); Gartung Cheng of the U.S. Army Armament Research, Development and Engineering Center, Armaments Engineering and Technology Center; and Modi Wetzler of Lawrence Berkeley National Laboratory



MICHELLE:
A software tool for three-dimensional modeling of charged-particle-beam devices

MICHELLE simulates the operation of a wide variety of charged-particle-beam devices. To perform a simulation, MICHELLE calculates the electrostatic fields, the magnetostatic fields, and the particle trajectories in the device under steady-state or slowly varying field conditions. MICHELLE can model intense or relativistic particle beams, particle injection into the device volume, and secondary electron emission produced by particle collisions with the device walls. MICHELLE's calculational space can be decomposed into as many as 9 million volume elements, providing unprecedented spatial resolution for this type of code. MICHELLE can calculate up to 200,000 particle trajectories, which also is unprecedented. It is the only code that provides accurate simulations of several advanced guns and collectors used in high-power microwave tubes. Physical insight provided by these simulations has saved years of trial and error in the laboratory and led to longer-lasting microwave tubes for defense-radar systems, more cost-effective tubes for satellite-communication systems, and higher-power tubes for particle-accelerator and deep-space communication systems.

Applications
- Simulate the operation of gridded, multibeam, sheet-beam, and annularbeam electron guns for high-power microwave tubes,

continued on Page 4

AWARD WINNERS

continued from Page 3

• multibeam and multistage depressed electron collectors for high-power microwave tubes,
• complete (gun-to-collector) high-power microwave tubes,
• ion thrusters for deep-space missions, and
• beam transport in particle accelerators.

Team member: Eric Nelson of Scientific Visual and Computational Geometry (X-3-SVCG); Baruch Levush of the Naval Research Laboratory; and John Petillo, Kenneth Eppley, Dimitrios Panagos, Paul Blanchard, Warren Krueger, Tom McClure, and Alfred Mondelli of the Science Applications International Corp.; John DeFord, Ben Held, and Liya Chernyakova of Simulation Technology and Applied Research Inc.; Norman Dionne of Raytheon; Stan Humphries Jr. of Field Precision; Jim Burdette of L-3 Communications, Electron Technologies Inc.; Mark Cattelino of Communications and Power Industries; and Richard True of L-3 Communications, Electron Devices

PixelVizion:
An NPU-embedded visualization accelerator for large data sets

As imaging and video technology continues to advance, the need to process, analyze, sort, and manipulate large data sets has grown tremendously. The image compositing function has become a visualization bottleneck. PixelVizion is the first Network Processor Unit (NPU)-based computer visualization tool that addresses this bottleneck. It brings single-pass network data transmission and on-the-fly image compositing that yields an order-of-magnitude increase in interactive response times. PixelVizion is a hardware-assisted, lossless, highly scalable, high-frame-rate solution to the visualization bottleneck of image compositing. It composites extremely large volumes of data at rates that are 10 to 20 times faster than those of current compositing technologies. As a cost-effective, commercial, off-the-shelf solution, PixelVizion removes the need for an expensive network interconnect and accommodates a variety of software rendering packages.

Applications
• Orthopedics, rehabilitation, and sports science
• Virtual medical training
• Specialized diagnostic imaging
• Virtual skin grafting
• Weather patterns
• Large-scale scientific problems
• Animation and special effects
• Video game graphics
• Film postprocessing

Team members: Carolyn Connor Davenport, David DuBois, Andrew DuBois, Parks Fields, Fredie Marshall, and Stephen Poole of System Integration (HPC-9); Laura Monroe and David Pugmire, of HPC Environments (HPC-8); and Alfred Torrez of Scientific Software Engineering (HPC-12)

Trident

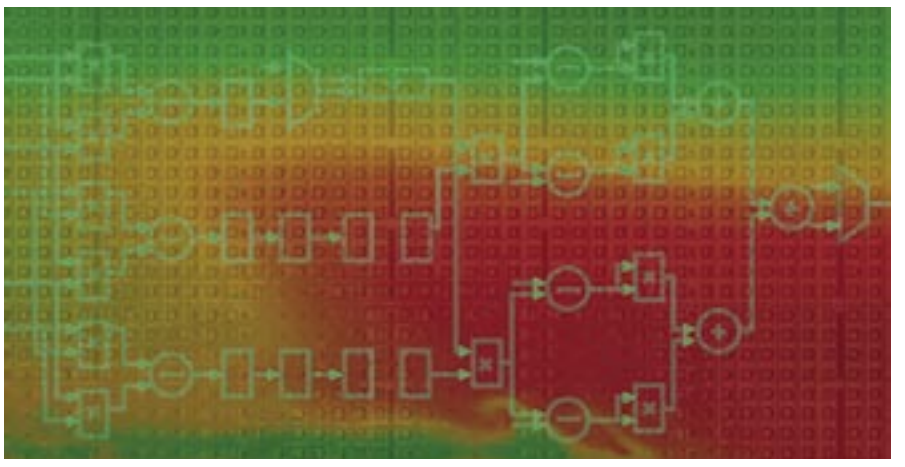
Reconfigurable-logic arrays already accelerate computation 10 to 100 times in many important applications — but to be maximally useful, this technology must be accessible to scientists developing new applications. Most application developers have relatively little hardware-design experience.

Trident provides accessibility. It is a high-level language compiler that supports floating-point data types and operations. It translates scientific algorithms that use floating-point mathematics into hardware circuits mapped onto reconfigurable-logic arrays.

Put another way, Trident accepts C language input containing floating-point calculations and translates this language into field-programmable-gate-array hardware. It allows computational scientists to explore partitioning their code between software and hardware.

Applications
• Translates scientific algorithms in C containing floating-point mathematics into field-programmable-gate-array hardware. Without a compiler such as Trident, the reconfigurable hardware is not accessible to the computational scientist.
• In the future, combined with tools to locate computationally intensive regions, Trident may be used to identify blocks of code suitable for acceleration through the use of reconfigurable-logic arrays.

Team members: Justin Tripp, Kristopher Peterson, and Maya Gokhale of Advanced Computing; Christine Ahrens of Scientific Software Engineering (HPC-12); and former Lab employees Jeffrey Poznanovic and Neil Steiner



PAST WINNERS

1978
• Diamond Machining of Optics
• Electronic Identification System
• Electronic Device for Treating Tumors — Hyper Thermic Cancer Treatment

1980
• Wee Pocket Radiation Detector
• Portable Multichannel Analyzer

1981
• Radio Frequency Quadrapole Linac

1982
• WC Field Computer System

1983
• Transuranic Waste Assay System

1984
• Superconducting Magnetic Energy System

1985
• BHTP — A Unique Scintillation Compound

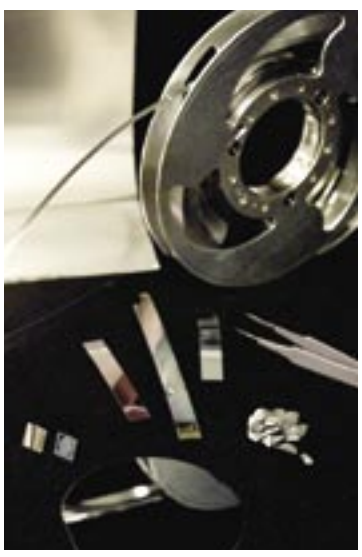
1986
• Aurora Laser Beam Alignment System

1988
• Optical Microrobot Single-Cell Manipulator/Analysis System
• Nuclear Material Solution Assay System
• 32-Stepper Motor Position Controller
• Mobile Beryllium Monitor
• HTMS Reference Electrode
• Oriented, Highly Anisotropic Conducting Polymer
• Photoinjector for RF Linac Accelerators
• Lattice Gas Algorithm

1989
• Fourier Transform Flow Cytometer
• Noncontact Superconductor Screening
• Conductive Lattices

OTHER NOMINATIONS

ACSi:
Aligned-crystalline silicon films on non-single-crystalline substrates



The aligned-crystalline silicon (ACSi) film deposition process achieves high-performing, near-single-crystalline silicon films on low-cost, large-area, nonsingle-crystalline substrates by using ion-beam-assisted deposition (iBeam) texturing. No other technology combines the high performance of single-crystalline silicon wafers with the low cost of amorphous and polycrystalline silicon films on non-single-crystalline substrates. By providing a means to improve the performance (or reduce the cost) of silicon-based devices, such as solar cells and flat-panel displays, the ACSi technology promises to fundamentally alter the semiconductor industry.

The ACSi process promises to vastly improve the quality of silicon-based products — offering high quality at a price comparable to lower-quality products currently available. The process also offers the option of manufacturing these products on a flexible substrate — leading to the development of durable solar cells that could be wrapped around a building or used as roofing shingles; curved or flexible TV monitors or computer screens, and electronic billboards of nearly any conceivable size, expanding market possibilities to new flexible electronic products.

Applications

Silicon (in either amorphous, polycrystalline, or single-crystalline form) is the most widely used material in the semiconductor industry, with multibillion-dollar applications in

- solar cells (films and wafers) and
- flat-panel displays (such as TV and computer monitors, mobile-phone and PDA displays, and electronic billboards).

Team members: Alp Findikoglu, Woong Choi, and Vladimir Matias of the Superconductivity Technology Center (MPA-STC)

Converting infiniBand to high-performance computing

Developed for storage area networks, InfiniBand was a latecomer to a market already dominated by other products. As a result, sales of the technology lagged. It did, however, capture the attention of the national laboratories, which saw it as a potentially superior interconnect for supercomputing clusters. Taking the initiative, the labs pushed for additional development, communicated their needs in annual workshops, provided test-bed clusters larger than any available in the private sector, offered financial support through Department of Energy/National Nuclear Security Administration "Path-Forward" contracts, and organized the OpenIB Alliance, comprising InfiniBand vendors and developers and the DOE laboratories. These efforts resulted in an entirely new market — and a new future — for InfiniBand.

Applications

InfiniBand can now be used as an interconnect for clustered supercomputers used for

- solving classified weapons validation and verification problems,
- pursuing basic research,
- modeling epidemiological and pharmaceutical problems,
- supporting oil and natural gas exploration,
- simulating aircraft performance, cockpit procedures, weapons systems, and battlefield maneuvers, and
- modeling aerospace problems.

Team members: Thomas Boorman, Stephen Poole, Parks Fields of System Integration (HPC-9); Alfred Torrez of Scientific Software Engineering (HPC-12); Matthew Leininger and Mitch Sukalski of Sandia National Laboratories; William Boas and Mark Seager of Lawrence Livermore National Laboratory; Jim Ryan of OpenIB Alliance; Roland Dreier and Shawn Hansen of Cisco Inc.; Dotan Barak, Jack Morgenstein, and Michael Tsirkin of Mellanox Technologies; Fabian Tillier and Ranjit Pandit of SilverStorm Inc.; and Hal Rosenstock and Asaf Somekh of Voltaire Inc.

EnergyFit:
Cool fast reliable computing

EnergyFit is software that automatically reduces the energy consumption of a processor in a computing system by as much as 70 percent with minimal impact on performance. In addition to reducing energy bills, EnergyFit ultimately lowers temperatures in computer systems, which in turn leads to better reliability. That is, as per Arrhenius' equation, for every 10°C decrease in temperature, the long-term reliability of the electronics in the system doubles. By reducing the thermal envelope of processors, EnergyFit allows the footprint of a data center to be shrunk, lowering the total cost of ownership and providing an environmentally friendly solution that can generate sustainable revenue.

Applications

- Supercomputing centers
- Financial data centers
- Laptops
- Desktop computers

continued on Page 6

PAST WINNERS

1990
- Coolahoop
- Universal Process for Fingerprint Detection
- Fast Agarose Gel Electrophoresis (FAGE)
- Solid-State NO2 Sensor
- Upconversion Solid-State Laser
- A Broadband (ABB) Mw Absorption Spectrometer for Liquid Media
- MdS2/SC Composites (Molybdenum Disilicide/Silicon Carbide)

1991
- Semi-Insulator Detector
- Optical High-Acidity Detector
- Resonant Ultrasonic Inspection (RUI)
- Single Molecule Detector

1992
- Thermal Neutron Multiplicity Counter
- Plastic Laser Dye Rods
- Cryogenic Diamond Turning
- Portable Laser Spark Surface Mass Analyzer (PLASSMA)
- Zeeman Refractive Index Detector
- Animated Display of Inferred Tongue, Lip, and Jaw Movements During Speech

1993
- Selenium-Based Reagents for the Evaluation of Chiral Molecules
- Phase-Sensitive Flow Cytometry
- Ultrafast Infrared Spectrometer
- Mini Elastic Backscatter Lidar

1994
- Ultrasensitive Ultrasonic Transducer
- Telemetric Heat Stress Monitor
- Optical Biopsy System
- Lattice Boltzmann Permeameter
- Directed Light Fabrication of Complex Metal Parts
- Bartas Iris Identification

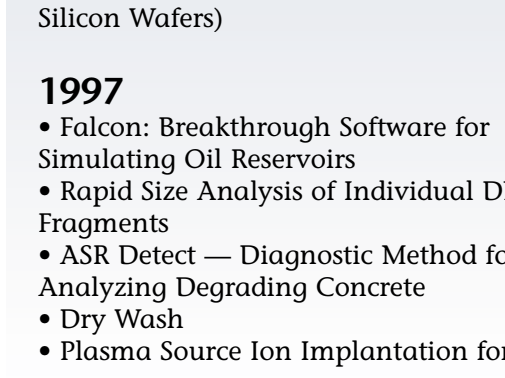
1995
- The Indigo-830
- ARS Chemical Fill Detector
- Hydride-Dehydride Recycle Process
- HIPPI-SONET Gateway
- Microsensor for VOCs
- Polymer Filtration System

OTHER NOMINATIONS

continued from Page 5

- Data-center servers
- Internet service providers
- Search-engine farms
- Sensor networks
- Embedded processing systems (e.g., cell phones, automobiles, airline reservation systems, multimedia portable players, network routers on the Internet, video-gaming consoles such as Sony PlayStation Portable, or anything that has an embedded processor).

Team members: Wu-chun Feng of Advanced Nuclear Technology (N-2) and Chung-Hsing Hsu of Advanced Computing (CCS-1)



File Scrub:
Review, cleansing, and trusted transfer tools for files

File Scrub and File Scrub Trusted Copy are security software applications designed to review files for the identification and elimination of sensitive information. Both File Scrub applications detect and remove hidden data in a review process designed to prevent the inadvertent or intentional release of sensitive materials, resulting in a cleansed file. File Scrub Trusted Copy (formerly know as Multi- Platform Trusted Copy, or MPTC) also provides the user with a consistent and regimented workflow for the transfer of the cleansed file to a removable medium for distribution outside classified and closed work environments.

Both File Scrub products search for user-supplied keywords and phrases, enabling a careful review of files to ensure organizational data security protocols. File Scrub then creates an encrypted log containing information about who conducted the review and when, what was found, and what information is contained in the newly created cleansed version of the file. By running on a comprehensive set of operating system platforms (Solaris, Linux, Microsoft Windows, and Apple Macintosh OS X), both products permit the simplification of training requirements and the maximization of existing resources.

Applications

- Review of government and corporate files for hidden, classified, and sensitive data before releasing the documents to other agencies, the public, and the news media.
- Protection against inadvertent release of personal private information such as medical, legal, and financial information.

Team members: Rebecca Michelsen Space Data Systems (ISR-3); Karen Bintz, Brent Cline, Keith Lindsay, Nicholas Lundgaard, Esther Martinez, Danny Quist, Larry Risinger, and Nabil Schear of Applied Electromagnetics (IAT-2); Sheila Molony and Kathy Valdez of Communication, Arts, and Services (IRM-CAS); and former Lab employee Stephanie Lyon

EPD 1.0:
Multifunctional element detector for immediate response

The Element Presence Detector (EPD 1.0) merges the multiple-element characterization of atomic emission spectroscopy (AES) with the low power and gas consumption of a novel microwave-induced plasma. The result is the first multifunctional, portable, and affordable analytical instrument to characterize air particles, liquids, and surface particles on site and in real time. Because other AES instruments require thousands of watts to operate and weigh up to 800 pounds, they are confined to the laboratory and occupy valuable bench space. These analytical instruments, which primarily perform only solution analyses, deliver analytical results only after the fact through complex sample collection, digestion, and analysis. In contrast, this portable EPD 1.0 instantly notifies workers of safety or quality concerns at the workplace, enabling prompt corrective action at a substantially lower cost than can be obtained with inductively coupled, plasma-based instruments.

Applications

- On-site hazardous air particulate monitoring for manufacturing facilities
- In-line quality control for industrial processes
- Laboratory analysis
- On-site element characterization, such as underground water source monitoring and environmental air quality monitoring.

Team members: Yixiang Duan of Chemical Sciences and Engineering (CHEM-CSE), Doruk Aytulu of the Technology Transfer Division (TT-DO), and Daryl Ehrmantraut of Elemetric Instruments LLC

Kokopelli air sampler

Kokopelli is a revolutionary air sampler that collects particulates directly into a laboratory-analysis well plate — virtually eliminating the possibility of cross contamination as the samples are retrieved, transported to an analysis laboratory, and loaded into an analysis instrument. The simplicity of the engineering design enhances its reliability in the field. The flexibility in its sampling schemes allows the operator to select among a wide variety of modes, including sampling on triggers and collecting

PAST WINNERS

1996
- TRACER (Transportable Remote Analyzer for Characterization and Environmental Remediation)
- PLASMAX (Plasma Mechanical Cleaner for Silicon Wafers)

1997
- Falcon: Breakthrough Software for Simulating Oil Reservoirs
- Rapid Size Analysis of Individual DNA Fragments
- ASR Detect — Diagnostic Method for Analyzing Degrading Concrete
- Dry Wash
- Plasma Source Ion Implantation for Enhancing Materials Surfaces
- High Performance Storage

1998
- Cyrax™ — Portable, 3-D Laser-Mapping and Imaging System
- Low-Smoke Pyrotechnics
- SOLVE — Creating 3-D Pictures of Protein Molecules from X-Ray Diffraction Spots
- Underground Radio

1999
- Acoustic Stirling Heat Engine
- Atmospheric Pressure Plasma Jet
- CHEMIN: A Miniaturized X-Ray Diffraction and X-Ray Fluorescence Instrument
- PREDICT — A New Approach to Process Development
- Real-Time, Puncture-Detecting, Self-Healing Materials
- REED-MD: A Computer Code for Predicting Dopant Density Profiles in Semiconductor Materials
- The Sulfur Resistant Oxymitter 4000™

2000
- ANDE: Advanced Nondestructive Evaluation System
- Electroexploded Metal Nanoparticles

variable-duration samples. Finally, Kokopelli can be operated remotely via a cellular modem or Internet link. Thus, it is suitable for longterm, unattended operations.

Applications

The device can be remotely adjusted to vary the sample volume and duration.

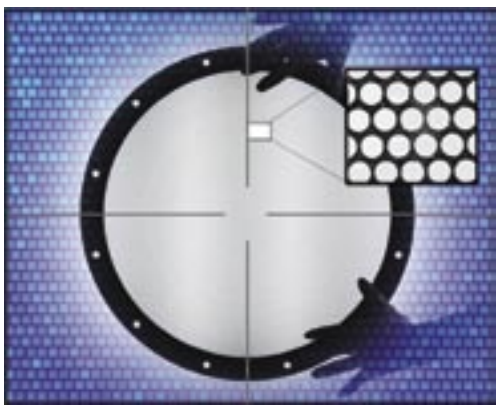
• Flexibility in its sampling schemes allows the operator to select among a wide variety of sampling modes, including sampling on triggers and collecting variable-duration samples.

• Kokopelli's flexibility makes it ideal for longterm surveillance in both civilian and military applications.

• It can be deployed outdoors at high-risk or high-traffic locations such as at stadiums, national parks, mass-transit systems, city streets or parks, livestock feedlots, poultry farms, and military installations.

• It also can be used to monitor indoor air quality in facilities such as hospitals, cruise ships, airports or airliners, sports arenas, manufacturing facilities, and embassies.

Team members: Alonso Castro, Kathryn Creek, Percy Martinez, Adam Gauss, and Daniel Coughlin of Applied Modern Physics (P-21); Murray Moore, Paul Dimmerling, and Trevor Kennedy of Health Physics Measurements; Perry Gray of Risk Analysis and Decision Support System (D-6); Chris Roybal and Alex Salazar of the Physics Division (P-DO); Richard Stein of Advanced Nuclear Technology (N-2); Norman Doggett of Genomic Sequencing and Computational Biology (BIO-GSCB); Martin Piltch of Materials Technology-Metallurgy (MST-6); and former Lab employees Ricky Lopez, Kyle Richardson, Jay Sherman, and Robert Carpenter



Large-area grid and scintillator assembly for high-energy radiography

The scatter-rejection grid and attached scintillator are part of a flash-radiography camera system at the Los Alamos Dual-Axis Radiographic Hydrotest facility, where researchers assess the implosion symmetry of chemical explosions with mock nuclear components. The scatter-rejection grid is the first to operate successfully for any application using megavolt radiography. The grid is composed of 137,000 precisely aligned, 0.9-mm-diameter holes penetrating a 40-cm-thick cylinder of tungsten constructed from 120 cast layers. The scintillator is similarly composed of photo-etched stainless steel layers, stacked to form a matrix loaded with long Lu2SiO5:Ce scintillating crystals. As part of a digital camera system, the precisely aligned grid and scintillator matrix allow researchers to image an item as thin as a piece of aluminum foil through a foot or more of steel. By taking advantage of the wide dynamic range now available with solid-state imaging devices, they are perfect for imaging low-contrast features inside thick objects.

Applications

• Flash radiography — producing still images and million-frame/second X-ray movies of rapidly moving objects at very high contrast

• Nondestructive testing — examining manufactured items for weld defects or casting voids

• Gamma-ray spectroscopy — rejecting Compton scatter from radioisotope sources

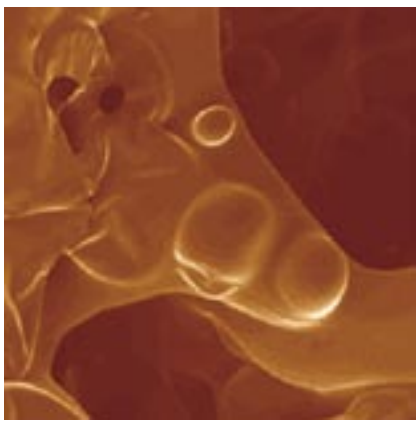
• Nuclear resonance fluoroscopy — detecting landmines and "dirty bombs" from a distance

• Medical therapy — reducing scattered radiation from a surgical "gamma knife"

• Balloon-borne astronomy — assisting gamma-ray imaging of the universe.

Team members: Scott Watson, Steve Balzer, and David Bowman of Hydrodynamics (HX-3); Chuck Lebeda of Transport Applications (X-1-TA); Michael Appleby of Mikro Systems Inc.; and Louis Perna and Dave Krus of Bicron (Saint-Gobain)

Multifunctional nano-architectures



Derived from the highest-energy polyazido precursors synthesized in the laboratory, a variety of ultrapure nanomaterials of diverse architectures can be produced quickly and inexpensively. Controlled pyrolyses of tetrazine- and triazine-derivative compounds are performed under mild conditions requiring no vacuum systems, no extraction, no carbonization, no purification, and generating no toxic byproducts. The results are carbon nanospheres and nanopolygons and diamond-hard carbon nitrides of multiple, reproducibly generated nano-architectures suitable for a diversity of research and manufacturing applications.

Applications

• Fillers for high-performance automotive tires

• Pigmentation and protective coatings

• Electrical and thermal conductivity control

• Diamond-hard surface coatings on tools

• Lithium ion battery anodes

• Microelectromechanical gas and humidity sensors and hydrogen-storage devices

• Shock-absorbent structural reinforcements and elastic membranes

• Filtration reagents

• Biocompatible implant coatings

• Nanomaterials for miniaturized electronics and biological sensor/response mimics.

continued on Page 8

PAST WINNERS

2001

• Free-Space Quantum Cryptography

• SCORR — Supercritical CO2 Resist Remover

• Tandem-Configured Solid-State Optical Limiter

2002

• GENIE: Evolving Feature-Extraction Algorithms for Image Analysis

• HDF5 — Hierarchical Data Format

2003

• CARISS: Integrated Elemental and Compositional Analysis

• BASIS: High-Confidence Biothreat Detection and Characterization

• FIRETEC: A Physics-Based Wildfire Model

• Flexible Superconducting Tape

• FlashCTTM

• Green Destiny

• PowerFactoRE: A Suite of Reliability Engineering Tools for Optimizing the Manufacturing Process

• Super-Thermite Electric Matches

2004

• Clustermatic

• Confocal X-ray Fluorescence Microscope

• mpiBLAST: A High-Speed Software Catalyst for Genetic Research

• Plasma-Torch Production of Spherical Boron Nitride Particles

• 10-Gigabit Ethernet Adapter: Speed Really Changes Everything

2005

• CartaBlanca

• MESA: Measuring Enzyme-Substrate Affinities

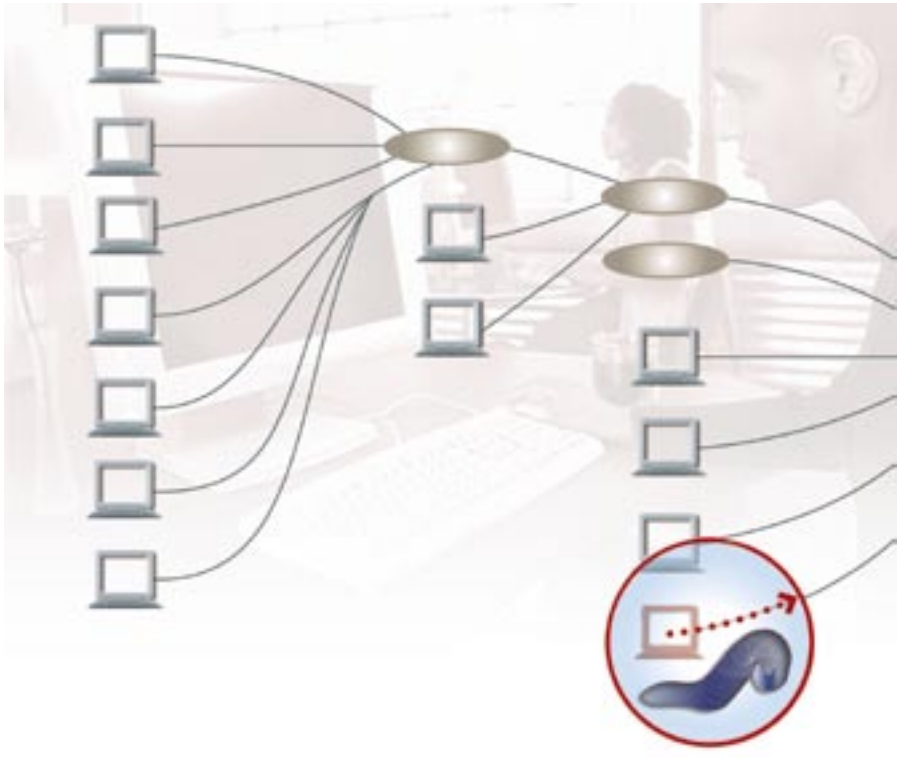
• nanoFOAM: A Metal-Nanofoam Fabrication Technique

• NESSUS

OTHER NOMINATIONS

continued from Page 7

Team members: My Hang Huynh, Edward Roemer, Jose Gil Archuleta, Ernest Hartline, Dennis Montoya, Herbert Harry of HE Science and Technology (DE-2); Modi Wetzler of Lawrence Berkeley National Laboratory; Thomas Meyer of University of North Carolina at Chapel Hill; and Richard Gilardi of Naval Research Laboratory



NARQ:
Network automated response and quarantine

NARQ, Network Automated Response and Quarantine, is a software program that instantaneously quarantines computing devices that are infected with malicious self-replicating programs ("worms"). NARQ's innovative network mapping capability locates devices every 15 minutes. By enabling technicians to organize connections between switches without having to physically trace wires, NARQ automatically removes threats to a network without disrupting other systems. This capability increases productivity and saves operating costs by developing detailed physical interconnects. NARQ is a robust, generic program that can be used with different hardware vendors, integrating easily with a variety of products.

Applications
- Immediately locates all devices on a network
- Plans and optimizes the topological arrangement of the network
- Provides computer policy enforcement
- Provides network engineering and troubleshooting.

Team members: Daniel Quist of Applied Electromagnetics (IAT-2); and Michael Fisk and Eugene Gavrilov of Network Engineering (CTN-5)

ParaView

ParaView is an open-source, scalable, multi-platform, parallel visualization framework, built on top of the popular Visualization Toolkit (VTK) and currently used by more than 30 laboratories and universities worldwide. The goal of this three-lab project is to develop scalable parallel processing tools with an emphasis on distributed memory implementations. ParaView includes parallel algorithms, infrastructure, I/O, support, and display devices and requires all software developed to be delivered open source. The combination of ParaView and high-performance graphics hardware has opened up a new level of interactivity with large data sets, helping researchers around the world better visualize many types of data — from global climate modeling to intricate fluid dynamic simulations. As the world's most scalable visualization platform, ParaView leverages cutting-edge parallel rendering algorithms and uses the leading technology in commodity PC clusters and graphics hardware to interactively visualize some of the world's largest data sets.

Applications
- Scientific visualization and analysis of thermal, mechanical, particle, fluid flow, radiation transport, and transient dynamics simulation results
- Visualization tasks as varied as network traffic analysis and geographic exploration
- Global climate modeling, intricate fluid dynamic simulations, weapons verification, and astrophysics studies.

Team members: James Ahrens, John Patchett, Patrick McCormick and Nehal Desai of Advanced Computing (CCS-1); Kristi Brislawn, Lee Ankeny of Scientific Software Engineering (HPC-12); Brian Wylie and Ken Moreland of Sandia National Laboratories; Berk Geveci and Charles Law of Kitware; and Jerry Clarke of the U.S. Army Research Laboratory

ReLocATE:
Reconfigurable logic accelerated traffic engine

ReLocATE is a hybrid software/hardware package compatible with traffic simulation suites such as the Los Alamos Transportation Analysis and Simulation System (TRANSIMS) now in use by the U.S. Department of Transportation. It uses super-computing clusters and reconfigurable logic, speeding up traffic simulation by dividing road data into two categories: simple two-lane roads and more complex, multilane road segments and intersections. Simulation of the simple two-lane roads is then done through the use of field-programmable gate arrays. Microprocessors handle the rest.

ReLocATE can perform 390,000 street updates per second per node, accelerating traffic simulation by 3.2 times real time, making it a far more useful tool during emergencies in large cities. Simulations that once took days can now be done in eight hours. This product is a revolutionary step, demonstrating next-generation implementation of super-computing applications: special purpose processors (e.g., reconfigurable logic) combined with microprocessors to produce a system with unparalleled computing power and capacity.

Applications
- Emergency Evacuations: ReLocATE's speed — combined with TRANSIMS' data — makes it possible to try out scenarios, quickly find the best approach, and implement a maximally efficient traffic plan even in a very large city.
- Urban Planning: ReLocATE is valuable on a day-to-day basis. When used with TRANSIMS, it can assist with routine transportation planning, providing fast answers to complex development questions ranging from the most efficient routes for new highways to the impact proposed routes will have on neighborhoods.

Team members: Maya Gokhale and Justin Tripp of Advanced Computing (CCS-1); Anders Hansson and Matthew Nassr of Discrete Simulation Sciences (CCS-5); Henning Mortveit of Virginia Polytechnic Institute and State University