



Proudly Operated
by **Battelle** Since 1965

Energy Smart Data Center

By integrating software, hardware, sensors, energy flow, and heat management technologies, the Pacific Northwest National Laboratory's Energy Smart Data Center is driving supercomputer energy efficiency to unprecedented levels.

SMARTER ENERGY EFFICIENT COMPUTING IN LESS SPACE

Industries, countries and people have benefited directly from the increased productivity due to faster computing. Yet, the computing industry must be more proactive concerning all aspects of energy consumption—including cooling—to live in a world with finite energy resources. Even with increased emphasis on energy efficiency, the energy demands of a typical data center are doubling every four years. Analyst firm, IDC, estimates that \$29 billion was spent on powering and cooling IT systems in 2006, a third of that going to cooling alone. Powering and cooling costs are quickly becoming major obstacles to the future of high-performance computing. Computing performance is improving at a rapid pace, and the size of the components is reducing just as fast. These tiny objects pack quite a punch in heat generation though, necessitating the need for more efficient heat removal processes and technologies.

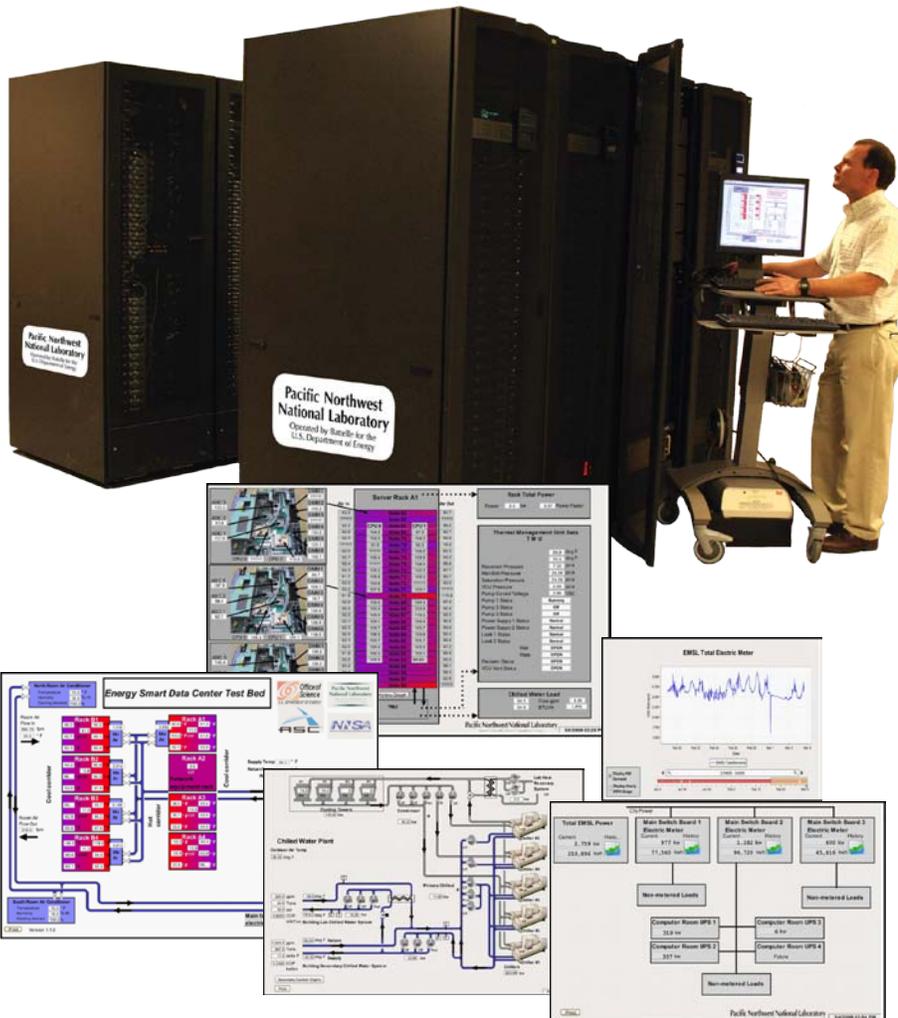
ENERGY SMART DATA CENTER

Researchers at the Pacific Northwest National Laboratory (PNNL) are evaluating computer servers' power consumption and next-generation cooling technologies through the Energy Smart Data Center. Through specialized instrumentation, the data center provides instant feedback on energy use, including the monitoring of air temperature, fluid temperature, and flow rate among the racks of computers. The information collected can then be used by PNNL, along with its customers and partners, to design the most energy-efficient approaches to power and cooling. The Energy Smart Data Center employs state-of-the-art supercomputer technology, characteristic in size and energy consumption of supercomputers used in typical data centers, making it an ideal testbed for independent evaluation and validation of new technologies and equipment.

▶ BENEFITS

Our clients benefit from the Energy Smart Data Center's ability to:

- ▶ administer impartial evaluations of new technologies and equipment related to supercomputing energy consumption
- ▶ offer a unique capability based on PNNL's combination of research insight, production facility deployment expertise, and independent testbed evaluation
- ▶ support new product research related to conserving energy in supercomputers and data centers
- ▶ advance scientific research that will lead to a new generation of power-dense, energy-efficient supercomputers
- ▶ improve cost-saving technologies related to supercomputer energy consumption
- ▶ provide a fully integrated program that addresses the critical power and heat-management issues facing leadership-class computing.



ABOUT PNNL

Pacific Northwest National Laboratory is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, national security, and the environment. PNNL employs 4,000 staff, has a \$855 million annual budget, and has been managed by Ohio-based Battelle since the Lab's inception in 1965.

For more information about ESDC, visit <http://ESDC.pnl.gov>.

General Inquiries:

Moe Khaleel, Program Manager
MSIN K9-80
Phone: (509) 375-2438
moe.khaleel@pnl.gov

Technical Inquiries:

Andrés Márquez
Principal Investigator
MSIN K7-90
Phone: (509) 372-4457
andres.marquez@pnl.gov

Pacific Northwest
National Laboratory
P.O. Box 999
Richland, WA 99352

www.pnl.gov



Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by **Battelle** Since 1965