



**SUPERCOMPUTING CONFERENCE 2004**

## Red Storm System Raises Bar on Supercomputer Scalability

**A Collaboration between Sandia National Laboratories and Cray, Inc.**

Commissioned by the U.S. Department of Energy and National Nuclear Security Administration to address computing and simulation requirements, Cray and Sandia National Laboratories are jointly producing the Red Storm supercomputer system. Red Storm is a massively parallel processing (MPP) supercomputer with a distributed memory, multiple instruction, and multiple data (MIMD) architecture to provide exceptional computational power. Not only one of the world's fastest supercomputers, it offers ease of use, system balance, sustained performance, and reliability.

### Unique Architecture

Red Storm can scale from a single cabinet to hundreds of cabinets—ranging up to tens of thousands of processors. The system combines:

- High-volume commodity processors (AMD Opteron™);
- A custom high-performance, 3D-mesh interconnect system;
- Linux/Catamount software engineered to produce high parallel efficiency on a wide variety of scientific and engineering applications.



Red Storm leverages knowledge gained from years of supercomputing experience with successful Sandia and Cray systems, such as the ASCI Red and the Cray T3E™ supercomputers.

#### Performance Goals

In addition to meeting system scalability, reliability, and resiliency requirements, one of Red Storm's main goals is achieving performance balance among the:

- Processor speed;
- Communications bandwidth between processors and memory;
- Communications bandwidth between processors;
- Communications I/O bandwidth to file systems and external network.



Red Storm platform in the Supercomputing Annex at Sandia National Laboratories in Albuquerque, New Mexico.

#### Key features

The Red Storm system at Sandia includes the following features:

- 41.5 teraOPS (theoretical peak performance);
- Minimum aggregate system memory bandwidth of 55 TB/s;
- High-speed, high-bandwidth, 3D, mesh-based Cray interconnect with minimum sustained aggregate interconnect bandwidth of 100 TB/s;
- High-performance I/O subsystem (minimum sustained file system bandwidth of 100 GB/s to 240 TB of parallel disk storage and sustained external network bandwidth of 50 GB/s);
- Flexible partitioning for classified and unclassified computing;
- Air-cooled; small footprint/low power (relative to comparably performing systems).



The home of Red Storm, The Supercomputing Annex at Sandia National Laboratories.

#### New Red Storm Facility

The Supercomputing Annex (SCA) facility at Sandia supports the Red Storm system. The 135 ft. x 150 ft. (20,250 ft<sup>2</sup>) computer room has a large clear span of expandability to meet future requirements. The computer floor consists of a 36 in. raised floor, providing a large cooling air supply plenum to support the system. The facility has 3.6 MW of available power via 24 installed 150 KW power-distribution units and two 1,000-ton chillers with up to 40 air handlers for system cooling. The SCA can support doubling both the power and chiller capacity for future expansion.

*For more information on the Red Storm System at Sandia National Laboratories, contact Bill Camp, [wjcamp@sandia.gov](mailto:wjcamp@sandia.gov), 505-845-7655 or Jim Tomkins, [jltomki@sandia.gov](mailto:jltomki@sandia.gov), 505-845-7249.*

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