Employing the world's fastest supercomputers to support national defense and research

Lawrence Livermore National Laboratory (LLNL), a National Nuclear Security Administration (NNSA) research laboratory, develops and applies world-class science and technology to enhance U.S. defense, reduce the global threat from terrorism and weapons of mass destruction, and address scientific problems of national importance, including climate change, energy, and biological medicine. LLNL delivers outstanding computer science expertise, world-class high-performance capabilities, and creative technology and software solutions through three distinct programs.

Mission-Directed Computing
asc.llnl.gov

To support the nation's shift in emphasis from test-based confidence to simulation-based confidence (NNSA's Stockpile Stewardship Program), LLNL employs some of the world's most powerful supercomputers—three have ranked number one on the TOP500 list—including Sequoia, the 20-petaFLOP/s third-generation IBM BlueGene system. Through NNSA's Advanced Simulation and Computing (ASC) Program, computer simulation capabilities are developed to analyze and predict the performance, safety, and reliability of nuclear weapons and to certify their functionality. ASC integrates the work of three Defense programs laboratories (Los Alamos, Lawrence Livermore, and Sandia National Laboratories) and university researchers nationally into a coordinated program administered by NNSA.
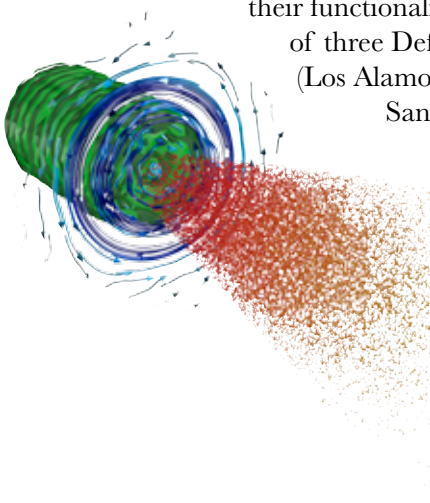
Supercomputers Currently Supporting the Nation

SEQUOIA
#3 Top500, June 2014
20 petaFLOP/s peak
IBM BlueGene/Q

VULCAN
#9 Top500, June 2014
5 petaFLOP/s peak
IBM BlueGene/Q

ZIN
#47 Top500, June 2014
970 teraFLOP/s peak
Appro

CATALYST
High Performance Data Analytics
323 terabytes combined memory/NVRAM
"Smallest system to run the largest demonstrated Graph500 problem size 40"
Cray

Livermore Computing—The Support Staff Who Enable Supercomputing Success for National Scientists and Researchers
computing.llnl.gov

Livermore Computing (LC) delivers a balanced high performance computing (HPC) environment with constantly evolving hardware resources and a wealth of expertise in porting, running, and tuning large-scale scientific applications. Users have access to multiple petaFLOP/s of compute power, massive shared parallel file systems, powerful data analysis platforms, and archival storage capable of storing hundreds of petabytes of data. LC staff who support this first-class computational infrastructure include HPC system administrators, software developers, and specialized support staff with knowledge ranging from the systems and network level to the development environment and end user-application level. LC staff strive to enable efficient and effective use of the computing center through consulting, training, documentation, and round-the-clock operational support.

Institutional Computing
computing.llnl.gov/mic

LLNL's Multiprogrammatic and Institutional Computing (M&IC) Program brings tailored, cost-effective HPC computing services to LLNL programs and scientists, to p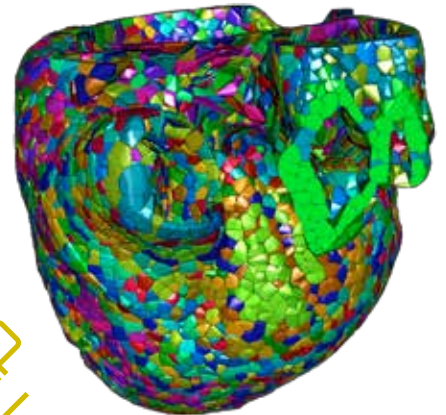ush the limits of computing and its application to simulation science. LLNL programs and projects can co-invest in the equipment required to meet internal strategic capability computing demand. The M&IC Program grants researchers, independent of programmatic connection, access to computer time at no cost for the Laboratory Directed Research and Development (LDRD) program. A special category of institutional computing is the Grand Challenge Program, which allocates significant resources to push the boundaries of HPC and simulation. Through M&IC efforts, LLNL has become a premier laboratory in simulation science, which has resulted in world-class scientific insight and has facilitated the recruitment and retention of top talent in engineering, the physical sciences, and computation.

Collaborative Computing
hpcinnovationcenter.llnl.gov

Through its High Performance Computing Innovation Center (HPCIC), LLNL makes its HPC resources and expertise available to American industry to boost competitiveness in the global economy and ensure U.S. leadership in technology innovation. The HPCIC connects companies with computational science and computer science experts, on demand, to help them solve their toughest challenges. It provides cost-effective access to some of the world's largest HPC systems, including Catalyst, and rapidly assembles expert teams to develop, prove, and deploy high-impact solutions across a broad range of industries and applications.

HIGH PERFORMANCE COMPUTING
INNOVATION CENTER