NCSA

ACCELERATING SCIENCE, ENGINEERING, AND PRODUCTIVITY

The National Center for Supercomputing Applications (NCSA) was founded in 1986 to provide the nation's scientists and engineers with the supercomputing resources and expertise needed for scientific and engineering breakthroughs. Since that time NCSA has enabled researchers around the nation to help fight pandemics, improve weather forecasts, design new materials, and explore the universe.

BLUE WATERS

NCSA is the home to the Blue Waters petascale computing system. This extraordinary computer operates at 1 quadrillion (or 1 million billion) arithmetic operations per second and manages and analyzes truly massive amounts of data (millions of billions of bytes). Scientists use Blue Waters to address many pressing science, engineering and societal problems:

- Help the city of Los Angeles prepare for the next major earthquake on the San Andreas fault in Southern California.

- Advance the ability of weather forecasts to predict the location, occurrence, and intensity of severe storms.

- Provide an atomic-level view of how viruses invade cells.

XSEDE

Scientists, engineers, and scholars from a broad range of areas—many of them at colleges and universities—use advanced digital resources and services every day. Supercomputers and data collections along with applications and tools are critical to the success of these researchers.

NCSA leads the Extreme Science and Engineering Discovery Environment (XSEDE), a nationwide infrastructure of computer, data, and visualization systems. XSEDE is a single virtual system that scientists can use to interactively share supercomputing resources, collections of data, digital services, and expertise.

XSEDE is using the national communications infrastructure provided by Internet2 to integrate these national resources with those available on university campuses to ensure that the benefits of access to these capabilities flow to faculty and students throughout the nation.

INDUSTRY

In its more than 25 years of collaboration with industry, NCSA has worked with more than one-third of the Fortune50®—enabling them to use advanced computing technology to improve existing products and design new products. These companies span a number of sectors, including manufacturing, oil & gas, biomedical & life sciences, finance, and agriculture. Current partners include Boeing, BP, Caterpillar, John Deere, Dow, ExxonMobil, GE, Procter & Gamble, Rolls-Royce, and John Zink, as well as many smaller companies and technology vendors.

NCSA was a founding member of the National Digital Engineering and Manufacturing Consortium (NDEMC), a public-private consortium focused on bringing the benefits of high-performance computing to small- and medium-size manufacturers. Because of the successes of NDEMC, it has become a model for a number of other innovative programs to revitalize America's manufacturing capability, including the proposed National Network for Manufacturing Innovation.

As part of its industrial program, NCSA deployed iFORGE, a high-performance computer designed to address the most pressing problems faced by NCSA's industry partners. Industry partners can also scale up to run their codes on the Blue Waters supercomputer.

BIG DATA

NCSA is also at the forefront of data-intensive research.

- NCSA and its collaborators provide a data management framework for the Dark Energy Survey, which is using the world's largest digital camera to undertake the largest galaxy survey ever attempted. This framework processes, calibrates, and archives the massive amounts of data—quadrillions of bytes over the lifetime of the survey—that will be collected for the DES.

- NCSA is embarking on a $10 million effort to develop software to manage and make sense of vast amounts of digital data. While technology has made is easy for everyone to create and share vast amounts of digital data—including images, video, and audio—searching, sorting, accessing and understanding that data is very challenging. Among the major issues: lack of metadata (the data about the data that describe when and how and by whom is was produced) and difficulty of access data in outdated formats. The NCSA team will develop services to make the contents of uncurated data collections accessible.

- The Large Synoptic Survey Telescope will use an 8.4-meter telescope and 3-gigapixel camera to produce a wide-field astronomical survey of the universe that tracks its changes over time; in addition to probing the mysteries of dark energy and dark matter, LSST is designed to detect exploding supernovae, potentially hazardous near-Earth asteroids, and distant Kuiper Belt Objects. LSST will collect tens of terabytes of data every night, which will be processed, calibrated, and archived by NCSA.

To learn more about NCSA visit www.ncsa.illinois.edu

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