Argonne NATIONAL LABORATORY

News Release

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FOR IMMEDIATE RELEASE

Argonne extends advanced computing expertise to tackle wide array of scientific challenges with SciDAC2

ARGONNE, Ill. (Nov. 16, 2006) — Argonne National Laboratory has been awarded approximately $25 million over the next five years for more than a dozen projects under the Department of Energy's "Scientific Discovery through Advanced Computing" (SciDAC) program. Designed to ensure that the United States maintains a leadership role in science and technology, these projects will bring together some of the nation's top researchers from national laboratories and universities to create the software and infrastructure needed to help scientists effectively use the next generation of supercomputers in tackling complex scientific challenges.

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SciDAC – add one

The SciDAC program was initiated in 2001 to create the high-performance computing software tools needed to advance scientific discovery using terascale supercomputers. Now entering its second cycle, SciDAC will address the computational science challenges and opportunities posed by petascale computers capable of performing quadrillions of calculations per second. This unprecedented speed and performance will change the nature of scientific questions that can be addressed via simulation in every scientific field.

Argonne is recognized as a world leader in designing robust algorithms, scalable numerical libraries and Grid middleware. Argonne also spearheads critical developments in systems software—including parallel programming tools, programming models, operating runtime systems, and high-performance input/output and data-management tools—that enable effective use of petascale systems. Argonne will leverage this experience and expertise in the following areas to accelerate research in each of the three main components of the SciDAC-2 program—centers for enabling technologies, SciDAC institutes, and science applications:

Center for Enabling Distributed Petascale Science (CEDPS):

Both simulation science and experimental science are poised to produce enormous quantities of data. This data is useful, however, only if it can be accessed and analyzed. CDEPS will create the technical innovations necessary for large and often distributed communities to access data so that it can be shared and translated into knowledge.

SciDAC – add two

Scaling the Earth System Grid to Petascale Data Center for Enabling Technologies

Current efforts in climate modeling and climate science are generating massive amounts of data that are distributed across the globe. This project will address projected scientific needs for data management and analysis and will support the major Intergovernmental Panel on Climate Change assessment in 2010.

Towards Optimal Petascale Simulations (TOPS)

Multiscale, multirate scientific and engineering applications in the SciDAC portfolio possess resolution requirements that are practically inexhaustible and demand execution on the highest-capability computers, soon reaching the petascale. The goals of TOPS are the development, testing, and dissemination of solver software.

Center for Technology for Advanced Scientific Component Software (TASCS)

The TASCS project will enhance software quality and usability by creating a component ecosystem of off-the-shelf components.

Scientific Data Management Center for Enabling Technologies

This project will improve the scientific data management framework to address the scalability and complexity challenges presented by hardware and applications at the petascale.

Center for Scalable Application Development Software

This project focuses on software tools for increasing the productivity of scientific application development on high-end computing systems. The center will emphasize the research and technical challenges associated with effective utilization of such systems, the development and maintenance of open-source shared software infrastructures, and education and outreach.

Modeling Multiscale, Multiphase, Multicomponent Subsurface Reactive Flows Using Advanced Computing

The ability to model multiscale subsurface processes is essential for obtaining accurate predictive capability of contaminant transport. This project is aimed at developing a next generation of massively parallel, multiphase, multicomponent reactive flow and transport code based on a successful prototype.

A Scalable and Extensible Earth System Model for Climate Change Science

The model developed in this project will incorporate new processes necessary to predict future climates based on the specification of greenhouse gas emissions. The model will fully simulate the coupling between the physical, chemical, and biogeochemical processes in the climate system.

A Data Domain to Model Domain Conversion Package (DMCP) for Sparse Climate Related Process Measurements

This program will advance climate simulation capabilities by developing models for processing spatially sparse climate data sets by using the latest available statistical modeling techniques and knowledge of relevant physical and chemical processes.

Low-Energy Nuclear Physics National High-Performance Initiative: Building a Universal Nuclear Energy Density Functional

This project seeks to create a unified theory of nuclear structure and reactions by developing a Universal Nuclear Energy Density Functional to predict nuclear properties and reactions with unprecedented accuracy and clearly defined uncertainties. Achieving this goal will require theoretical, algorithmic, and computational developments that will take advantage of new computer resources including petascale architectures

SciDAC – add four

Framework Application for Core-Edge Transport Simulations (FACETS)

The FACETS project will provide a multiphysics parallel framework application that will enable whole-device modeling for the U.S. fusion program and will provide the modeling infrastructure needed for ITER, the next step fusion containment device. FACETS will be highly flexible, through the use of modern computation methods including component technology and object-oriented design, and will take advantage of the latest supercomputer hardware

Combinatorial Scientific Computing and Petascale Simulations (CSCAPES)

The CSACPES institute will focus on providing advanced new capabilities in load balancing and parallelization toolkits for petascale computers, accelerating the development of new automatic differentiation capabilities, and advancing the state of the art in sparse matrix software tools.

Performance Engineering Research Institute (PERI)

PERI will focus on development of tools for performance modeling and prediction, as well as automatic performance optimization and performance engineering of high-profile applications. Education and outreach are important complementary efforts.

SciDAC Institute for Ultrascale Visualization

This institute will bring together leading experts from visualization, high-performance computing, and science application areas to make parallel visualization technology a commodity. Achieving this goal will require extracting meaning from huge datasets, hundreds of terabytes or more, and creating a comprehensive parallel visualization suite that is portable across platforms.

SciDAC – add five

SciDAC research projects are collaborative efforts involving teams of mathematicians, computer scientists, and computational scientists working on major software and algorithm development for application to problems in the scientific computing core programs, namely, Basic Energy Sciences, High Energy Physics, Nuclear Physics, Advanced Scientific Computing Research, Fusion Energy Sciences, and Biological and Environmental Research. Research funded under the SciDAC program addresses the interdisciplinary problems inherent in ultrascale computing, problems that cannot be addressed by a single investigator or small group of investigators. For more information on SciDAC, see http://www.scidac.gov/

The nation's first national laboratory, Argonne National Laboratory conducts basic and applied scientific research across a wide spectrum of disciplines, ranging from high energy physics to climatology and biotechnology. Argonne has worked with numerous federal agencies and other organizations to help advance America's scientific leadership and prepare the nation for the future. Argonne is managed by UChicago Argonne, LLC for the U.S. Department of Energy's Office of Science.

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