Abstract

The Federal agencies that participate in the Networking and Information Technology Research and Development (NITRD) Program coordinate their IT R&D activities both to support critical agency missions and to maintain U.S. leadership in high-end computing, advanced networking, high-quality and high-confidence software, information management, and related information technologies. NITRD also supports R&D on the socieconomic implications of IT and on development of a highly skilled IT workforce. The NITRD Program's collaborative approach enables agencies to leverage strengths, avoid duplication, and increase the interoperability of research accomplishments to maximize the utility of Federal R&D investments.

The Supplement to the President's FY 2005 Budget summarizes FY 2004 NITRD accomplishments and FY 2005 plans, as required by the High-Performance Computing Act of 1991. The document serves as a directory of today's NITRD Program, providing detailed descriptions of its coordination structures and activities as well as extended summaries of agencies' current R&D programs in each of the seven NITRD Program Component Areas. The FY 2005 supplement highlights in particular the myriad formal and informal multiagency collaborative activities that make the NITRD Program a uniquely successful effort of its kind within the Federal government.

The NITRD Program is a top-priority R&D focus of the President's FY 2005 Budget.

Cover Design and Imagery

The cover's graphic design is the work of James J. Caras of NSF's Design and Publishing Division.

Front-cover images, clockwise from top left: 1) Visualization of brain fiber tracts and fractional anisotropy isosurface in a DT-MRI scan; developed by computational scientists with the NIH/BISTI Program of Excellence for Computational Bioimaging and Visualization at the University of Utah's Scientific Computing and Imaging Institute. *Credit: Gordon Kindlmann, Dr. David Weinstein. http://www.sci.utah.edu/stories/2004/sum_tensorfields.html*
2) In a project that has won awards internationally, Tufts University mathematician Bruce Boghosian and University of London chemist Peter Coveney used the NSF-supported TeraGrid – including 17 terabytes of computational, storage, and visualization resources at ANL, NCSA, PSC, and SDSC – and linked sites in the U.K. to simulate the behaviors of amphiphilic fluids, or surfactants. The work produced the discovery of a fleeting fluid state that is structurally a gyroid (pictured), a shape associated with solids. *http://www.psc.edu/science/physics.html*
3) New high-speed chipset designed by engineers at NOAA, NASA, and DoD and produced by Northrup Grumman and others as a first of its kind, hardened for the extreme conditions of space applications; the set is able to transmit data at 100 Mbps between satellite sensors and ground stations; it will be applied in the joint NOAA-DoD National Polar-Orbiting Environmental Satellite System (NPOESS) to become operational in 2009.

Back-cover images, clockwise from top: 1) Step from a simulation of a proton beamline interacting with surrounding electrons. The accelerator modeling project in DOE/SC's SciDAC initiative develops such simulations to better understand beamline behavior and to optimize performance. The representation for particles in these simulations is a 6D dataset composed of 3 spatial and 3 phase dimensions. Image shows trajectories of electrons selected interactively with a box widget in the projection of the last simulation step along the z direction. The proton beam is rendered as volume density data. The trajectories are rendered as splines colored by the magnitude of the velocities. *Credit: Andreas Adelmann, LBNL* **2)** Test simulation image of the interaction of strong shocks with material surfaces in fluid phases, a key focus of the Virtual shock physics Test Facility (VTF) at the CalTech Center for the Simulation of Dynamic Response in Materials supported by DOE/NNSA's ASC program. The center's goals are to: facilitate simulation of a variety of phenomena in which strong shock and detonation waves impinge on targets consisting of various combinations of materials, compute the subsequent dynamic response of the target materials, and validate these computations against experimental data. *http://www.cacr.caltech.edu/ASAP/*
3) On June 30, 2004, after seven years and a billion miles, NASA's Cassini-Huygens spacecraft reached Saturn and began sending close-up image data. This view of the planet's rings from the inside out shows primarily the outer turquoise A ring, with an icy composition. The reddish bands are inner rings composed of smaller, "dirtier" particles than the A ring; the single red band in the A ring is known as the Encke gap. The image was taken with the Ultraviolet Imaging Spectrograph instrument, which is capable of resolving the rings to show features up to 97 kilometers (60 miles) across, roughly 100 times the resolution of ultraviolet data obtained by the Voyager 2 spacecraft. *Credit: NASA/JPL/University of Colorado*