# SDSC receives $1.5 million NSF grant for ATM high-speed network connection to DOE and NASA

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SAN DIEGO SUPERCOMPUTER CENTER

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Multi-agency sprint toward the NREN: SDSC RECEIVES $1.3 MILLION NSF GRANT FOR ATM MOH-SPEED NETWORK CONNECTION TO DOE AND NASA

The San Diego Supercomputer Center was awarded a three-year, $1.5 million grant from the National Science Foundation to work with the Department of Energy and the National. Aeronautics and Space Administration to bring the nation one step closer to its electronic data highway--the National Research and Education Network (NREN)--by deploying a new experimental network. Based on the high-speed transmission of fixed-length "cells:* the asynchronous transfer mode network--called ATM--is considered a significant advance in high-speed networking technology. The ATM network will be provided for DOE and NASA by Sprint, Inc.. as part of a planned commercial offering, beginning next year with funding from the Federal High Performance Computing and Communications (HPCC) Act.

"This is a wonderful opportunity for NSF to explore this new and emerging high-speed communications technology and to collaborate with other federal agencies supporting HPCC objectives," says Hans-Werner Braun, SDSC principal scientist and PI for the SDSC ATM connection project. "This connection will provide the initial interface between the NSFNET, a T3 packet-switching network, and the ATM network," he adds, "and it puts us in a great position to compare the two networking environments in collaboration with DOE and NASA." Braun and his Applied Networking Research group plan to leverage their resources on network performance and traffic characterization from another NSF-funded project with the ATM connection project. [T3 speed is equivalent to 45 million bits per second (Mbps) or about 600 pages of text per second.]

"Collaboration with other federal agencies on networking efforts has been a goal of NSF since the beginning of our program," says Stephen Wolff, director of NSF's Division of Networking and Communications Research and Infrastructure. "Augmenting our broad infrastructural efforts in support of R&D with a connection to the new DOE-NASA national ATM effort is a major step forward and is sure to lead to fundamental advances in communications engineering."

ATM technology is considered the precursor to a broadband technology called B-ISDN. B-ISDN is expected to support future multi-media universal transmission and will be capable of simultaneously carrying voice, data, and video communications traffic as well as bandwidth-intensive applications such as the transfer of high-definition TV images and links for networks with high-capacity LANs. 'This project can potentially contribute to better understanding of both B-ISDN and ATM, it can enhance the nations's telecommunications infrastructure, and it can broaden the potential of science and engineering research in Grand Challenge research," says Braun.

SDSC is an especially appropriate site for this project according to Wolff. "With the NSF being close to re-competing its network services for the NSFNET, it is important that this project be located at one of the strategic

locations for NSF interests for network access, in this case, one of our national supercomputing centers," he adds. 'This is a unique project in support of a multi-agency NREN effort."

This project puts SDSC in a unique position to compare the different networking environments with many opportunities for new research projects," says Sid Karin, director of SDSC. Adds George Polyzos, professor of computer science and engineering at UM: "As a member of the UCSD faculty interested in advanced network technologies, this is a great opportunity to collaborate on a leading-edge project."

SDSC networking staff members have a proven track record in research, design, and implementation of large scale wide-area computer networks (Braun is former PI of the NSFNET project). Its ANR group is active in several investigative efforts and closely collaborates with the UCSD Computer Science and Engineering department in advanced networking research. SDSC is also a key player in the CASA research testbed, part of the gigabit-per-second testbed initiative sponsored by NSF and DARPA. In addition, SDSC's parent company, General Atomics, is one of DOE's ESnet backbone sites.

The ATM connection project is funded for three years, with more than 80% of the budget dedicated to circuit expenses. Access speeds will initially be at 45 Mbps (T3) and may be optionally moved to 155 Mbps and 622 Mbps during the course of the project. This would be a total speed-up of more than 400 times the current bandwidth. By early 1994, up to 22 DOE sites and 11 NASA nationwide sites also are expected to be connected to the network. Under the federal I-IPPC initiative, however, by the turn of the century information is slated to zoom over the nation's highways at 3 billion bits (gigabits) per second.

As well as research activities, the ATM connection project has great infrastructure application because of its being the initial connection between the operational NSFNET and ESnet and NSI, DOE and NASA's networks. Other issues include IP routing and addressing in an ATM environment, network management, and the practicality of cell-switched architectures as an evolutionizing step from the current NSFNET packet- switching paradigm. It is believed that the transition from current T3 networking environments to gigabit architectures will require the application of fast packet cell-switching technologies. According to DOE surveys, fast-packet technology has significant advantages, including very high bandwidth, reduced cost, minimal transit delay, support for both asynchronous and synchronous traffic, and protocol independence.

The overall DOE-NASA ATM network project is a $50 million contract for five years. Four companies will work on the technology: Sprint will provide fiber-optic communications; TRW, the new broadband access ATM switches; Cisco, the network routers; and Digital Equipment Corp., the network management software.

SDSC is a national laboratory for computational science and engineering, encompassing leading-edge research and development activities for academia, industry, and government. In addition to its research activities, SDSC provides to U.S. industry and and academia, education, training, and consulting services, as well as access to high-performance computing and communications resources. The center, established in 1985 in cooperation with the National Science Foundation, is administered and operated by General Atomics at the University of California, San Diego.

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