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Enhancing Research

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The goal of the National Supercomputing Center for Energy and the Environment is to facilitate the discovery and evaluation process for researchers, scientists, and government entities, according to NSCEE Director Joe Lombardo.

Enhancing Research

UNLV's National Supercomputing Center provides research support

From air quality forecasting to medical informatics, UNLV's National Supercomputing Center for Energy and the Environment (NSCEE) provides users from 24 states and three countries with the most advanced high-performance computing system in Nevada.

More than 200 scientific projects related to global atmospheric modeling and fossil energy research have been supported by the NSCEE since the center was established in 1989.

Initially, the center was designed to study nuclear waste isolation, disposal, and transmutation in conjunction with the Department of Energy's work associated with the Yucca Mountain Nuclear Repository project, located

approximately 100 miles northwest of Las Vegas. In 1989, the U.S. Congress appropriated \$10 million for the purchase and development of the supercomputing facility to be operated exclusively by UNLV.

The NSCEE has since grown to partner with 14 affiliates and now addresses a much wider range of national scientific challenges.

The NSCEE occupies approximately 5,000 square feet on the third floor of the Thomas T. Beam Engineering Complex. The center's central computing system is an SGI® Onyx® 3800 visualization system with InfiniteReality3™ graphics supported by more than 200 terabytes of storage.

This system, with high-band-width CC-NUMA architecture, combines

supercomputing and visualization technologies to support 3-D graphics and video streaming in real time, according to Joseph Lombardo, the center's director.

"Our program capabilities currently span the entire sequence of turning raw data into practical knowledge that ultimately makes the discovery and evaluation process easier for researchers, scientists, and government entities," Lombardo says.

An example of just one of several major research projects under way at the NSCEE is the Air Quality Forecasting Research Initiative. UNLV faculty and students work in collaboration with the Department of Energy, the Environmental Protection Agency, and the National Oceanic

and Atmospheric Administration to develop and assess techniques for investigating multidimensional atmospheric flows, assessing air quality and wind fields, and related chemical interactions dealing with arid lands in the Southwest.

With the aid of UNLV's supercomputer, the Regional Atmospheric Modeling System formulates daily predictions of weather for the entire Southwestern region of the United States. Future efforts will include developing computational techniques that can be used to predict three-dimensional wind fields over the Las Vegas valley. Accurate wind field prediction is necessary for urban air quality assessments, severe weather and flooding forecasting, and emergency response planning associated with hazardous material released into the atmosphere.

An additional venture of the NSCEE is the Advanced Computing in Environmental Sciences initiative associated with the EPSCoR Ring True II project. The primary mission of the initiative is to elevate environmental science research and education in Nevada to a new level of excellence. The program is fostering research activities in such areas as complex modeling of groundwater flow, hydrochemistry, and floods; climate data analysis; atmospheric and air-quality modeling; applications of geographic information systems; remote sensing; and research and development of algorithms for high-performance computing and scientific visualization.

"Because of our involvement with the Advanced Computing in Environmental Sciences initiative, new computing and scientific visualization capabilities are helping to remove limitations experienced by Nevada environmental researchers in applications of advanced numerical modeling and other data-intensive research techniques," Lombardo says.

E-Records Technology

UNLV helps develop sophisticated electronic records management system

New statutory and regulatory directives are leading federal agencies to recognize a tremendous need for integrated electronic records management and archiving systems capable of maintaining huge amounts of data.

In a unique public-private partnership, UNLV and Quest Technology are working to create just such a system for the U.S. Department of Energy (DOE).

With an initial grant in 2000 of \$1.4 million from the DOE and other federal appropriations provided with the support of U.S. Sen. Harry Reid, university researchers are working to develop an electronic records system that will provide a highly efficient method for processing massive amounts of medical information.

The project will help the DOE manage information in areas such as occupational medicine, industrial hygiene, and radiation exposure.

Under the guidance of Dr. Stephen Rice, associate vice president of research and economic development at UNLV, two research teams, composed of several faculty members and both undergraduate and graduate students, are actively focused on this project.

The first team, led by UNLV computer science professor Dr. Angelo Yfantis, is working to automate the recognition of forms and hand-written information. The second team, led by School of Computer Science Director Dr. Hal Berghel, is developing cybersecurity techniques. The innovations produced by these teams will then be integrated with software designed and developed by Quest Technology to create the new "enterprise records system."

Once existing DOE information is processed using the e-records technology, it will then be centrally housed at the UNLV National Supercomputing Center for Energy and the Environment.

According to Rice, this highly technical but user-friendly approach to medical records management allows for easy access of information while enhancing the timely and secure exchange of critical data between individuals and organizations.

"The implications of this project are highly significant," Rice notes. "In the event of an epidemic outbreak, for example, crucial medical information can be made instantly available to health care and government officials throughout the world in just a matter of minutes."

The project is the largest externally sponsored research effort currently under way at UNLV; it has garnered approximately \$23.4 million in funding during the last five years. Rice notes that it serves as an example of how higher education, industry, and government are working together to find solutions to some of today's most challenging human-service issues.