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Science Drives CyberTools

The following is the second in a series on the recent $9 million National Science Foundation EPSCoR grant to a team of researchers from nine Louisiana universities to develop new CyberTools enabling significant advances in science and engineering. The participating institutions are Louisiana State University, LSU Health Sciences Center-New Orleans, Louisiana Tech University, Southern University-Baton Rouge, Tulane University, Tulane University Health Sciences Center, University of Louisiana-Lafayette, University of New Orleans, and Xavier University. With matching funds of $3 million from the Board of Regents Support Fund and $3.2 million from the participating institutions, the total of the three-year award is over $15.2 million.

What It's All About

Cyberinfrastructure. Most know and use its end products. Few realize it is the technology and network systems that have infiltrated every aspect of today's modern world.

It's what makes it possible for the farmer who uses a global positioning system to pinpoint fertilization needs in his fields; for consumers to pay their monthly bills online with a few keystrokes; for researchers to develop and simulate new data-driven hurricane storm surge predictions.

The focus of the NSF EPSCoR Research Infrastructure Improvement (RII) award is on cyberinfrastructure, specifically on the development of CyberTools to help investigators effectively utilize the requisite cyberinfrastructure at a level that would not otherwise be possible.

That makes it yet another giant step forward for Louisiana and its researchers — one that was initiated by the State's recent significant cyberinfrastructure research investment dubbed the Louisiana Optical Network Initiative (LONI).

The high-speed optical network connects supercomputers at the State's major universities and research centers and links Louisiana to one of the nation's most advanced computing infrastructures, the National LambdaRail.

Recognizing that the CyberTools cannot be built in isolation from the scientific projects they are designed to aid, the project has two components: two major scientific thrusts comprised of four scientific projects.

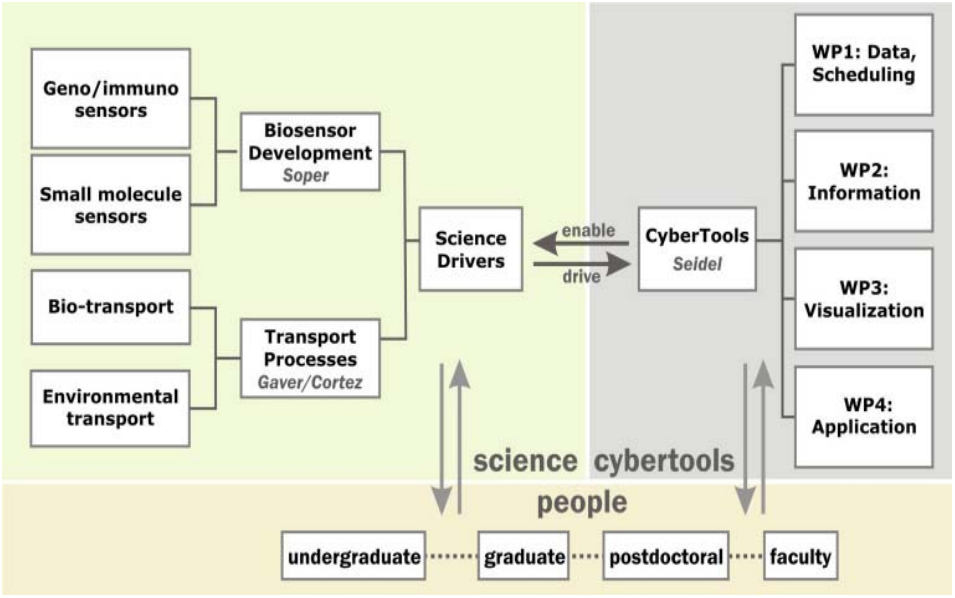
The RII science and CyberTools projects will be developed in tandem by close-knit teams from the nine participating institutions. The science and engineering projects will be led by Dr. Ricardo Cortez, Tulane University Center for Computational Science Director, in collaboration with Dr. Donald Gaver, Chair, Tulane Biomedical Engineering Department; and Dr. Steven Soper, Director, Louisiana Center for BioModular Multi-Scale Systems.

Dr. Edward Seidel, Director, LSU Center for Computation and Technology and lead scientist on cyberinfrastructure, NSF EPSCoR RII project, will oversee the development of CyberTools and their integration into the science and engineering projects.

The project's Principal Investigator, Dr. Michael Khonsari, is the Louisiana EPSCoR Project Director and Board of Regents Associate Commissioner for Sponsored Programs Research and Development.

The CyberTools component will be explained in the next newsletter. Targeted science driver highlights follow.

Research Infrastructure Improvement Flowchart



The Science Drivers

The RII project targets the development and implementation of cyberinfrastructure components in two important broad areas: biosensing and transport processes.

Biosensing

This collaborative team of chemical, biochemical, engineering and computational science researchers will design, test and manufacture miniaturized antibody-based sensors for the detection of chemical elements associated with a variety of chemical and biochemical targets.

The goal is to advance sensor and molecular analysis technologies through the development of more effective geno/immuno sensors and small molecule sensors.

Geno/immuno sensors are low-cost, easily deployable platforms that can be used for disease diagnosis, population screening and environmental monitoring. Because they provide information about the presence of biological or chemical agents, they are also a valuable detection tool in counteracting bioterrorism.

Small molecule sensors Currently, technology is primarily limited to detecting agents of high molecular weight. This grant

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Check Out Four New Louisiana EPSCoR RFPs

Louisiana EPSCoR has released four RFPs. All are open to applicants from either a State public institution of higher education or one that is a member of the Louisiana Association of Independent Colleges and Universities. Details on each are available at www.laregents.org/.

The **Pilot Funding for New Research (Pfund)** supports science and engineering faculty in their exploration of novel research. Tenure-track faculty can use the funding to sharpen their research focus and develop cutting-edge techniques. Tenured faculty can use it to demonstrate an innovative or novel concept that investigates new areas requiring a shift in their current research direction. Up to $10,000 per award is available. The expected start date is May 1, 2008; funds must be expended by June 30, 2009. ***Deadline: 3:30 p.m., February 1, 2008.***

Planning Grants for Major Initiatives provides assistance to research teams that have successfully competed in submitting a pre-proposal and *received an invitation to submit a full proposal* from a federal agency for a major initiative, such as an NSF Science and Technology Center, etc. Up to $30,000 is available for three-year federal grant proposals of at least $750,000 in annual funding levels and up to $20,000 for three-year grants of at least $500,000 in annual funding levels. ***Deadline: anytime until June 30, 2010.***

The **Preliminary Planning Grants for Major Initiatives** program provides up to $10,000 to research teams in the process of developing a proposal or a required pre-proposal to a federal funding agency for a large-scale research and/or education program. The proposals to federal competitions must meet the following criteria: 1) total federal funding is at least $1 million and 2) the award will establish a multidisciplinary project. ***Deadline: any time until June 30, 2008.***

Regional Grant Writing Workshop grants of up to $5,000 are available to a hosting university for the support, including travel, of the workshop presenter(s) and for workshop materials. The workshop must include faculty from at least one other institution in the region. ***Deadline: any time until June 30, 2010.***

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will enable researchers to develop a new generation of biosensors that can detect potential hazards at lower molecular weights, making them more effective counter-terrorism tools.

Transport Processes

BioTransport Scientists will create the necessary infrastructure to develop more effective geno/immuno and small molecule sensors through investigations of biotransport phenomena. Examples include molecular dynamic simulations and computational fluid mechanics to analyze and solve problems involving fluid flows of various transport processes. Tools developed in conjunction with this research could also enable breakthroughs in biosensor evolvement.

Environmental Transport Using high-performance and grid computing facilitated by LONI, processes such as storm surge forecasting, emergency response information, and evaluations of storm impact on coastal environments will be investigated.

While there are many isolated models to study the massive erosion of Louisiana's low-lying coastal areas, for effective modeling researchers need to link different models together and combine different modeling elements.

Using historic and real-time data employed in modeling the coast, the researchers will automate the creation of complex visualizations, combining such multiple elements as storm surge, sediment deposit, and water salinity.

Based on emergency storm simulations, new software will be developed to automatically trigger and control event-driven, emergency response simulations during approaching hurricanes across distributed computing environments.

These advanced models will allow researchers to better plan restoration strategies, improve ecological forecasting, determine better placement of future sensors, control water diversion for salinity, and predict/control harmful algal blooms. They will also be useful for other data- and event-driven, dynamic application systems.

"In addition to conducting research, the NSF EPSCoR project will integrate faculty development activities within the project's two components," notes Dr. Khonsari.

"It will develop and increase the knowledge, skill-sets and careers of a wide spectrum of individuals, ranging from post-doctoral fellows to junior faculty and undergraduate and graduate students. A diverse outreach program will also be available.

"This comprehensive, ambitious project will serve as the catalyst through which post-Katrina/Rita Louisiana will regain and elevate the trajectory of its research and development enterprise," he adds.

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