2008

# COMPONENTS

## CENTER FOR COMPUTATION AND TECHNOLOGY

# LSU Center for Computation and Technology

**Components**
**2008-09 Volume 4**

The Center for Computation & Technology is an interdisciplinary research center that advances LSU's Flagship Agenda and promotes economic development for the state by using computational science applications to aid research and develop solutions that benefit academia and industry. CCT is an innovative research environment, advancing computational sciences, technologies and the disciplines they touch. Researchers at the CCT use the advanced cyberinfrastructure – high-speed networks, high-performance computing, advanced data storage and analysis and hardware and software development – available on campus to enable research in many different fields. By uniting researchers from diverse disciplines, ideas and expertise are disseminated across LSU departments to foster knowledge and invention.

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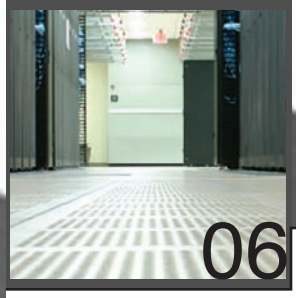
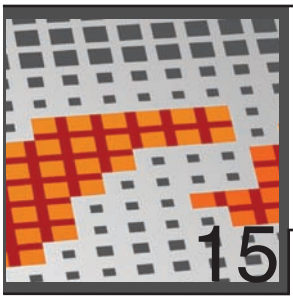
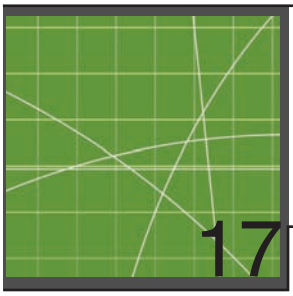


















# Message from Ed Seidel

What, exactly, is cyberinfrastructure? This word was coined to encompass all aspects of modern computation, from computing, networking, and data systems to software and algorithm development, and to acknowledge the tremendous impact such systems will have not just on 21st century science, but on all aspects of life. Researchers, educators, industry leaders and artists are increasingly relying on today's technology to enable breakthroughs that were impossible just a few years ago.

I have spent much of my career working to advance science through development and use of cyberinfrastructure, and have focused particularly on this area since I came to LSU five years ago to lead the Center for Computation & Technology. In that time, the CCT has transformed research and education through applications of cyberinfrastructure across disciplines.

We have helped establish a statewide high-speed network, the Louisiana Optical Network Initiative, which makes Louisiana a leader in optical network environments. In fact, Calit2's Larry Smarr remarked that our efforts are an inspiration, and said he frequently refers to Louisiana as the model California and others should be using. A recent National Science Foundation report speaks of the "Louisiana Model" pointing the way for other states. This is quite a compliment, and shows how the advances here are being noticed around the country and even internationally.

Our faculty and researchers continue to achieve success in many areas – grants, awards, papers, conferences and publications, among others. In the past year, two of our faculty members, Gabrielle Allen and Stephen David Beck, have led campus-wide multidisciplinary hiring initiatives that will bring renowned faculty to LSU and establish new and exciting curricula and research projects in the coming years, and our remarkable progress in the last five years will make LSU attractive to the best possible candidates worldwide.

In February, faculty and staff at the CCT oversaw LONI's integration onto the NSF's TeraGrid through its centerpiece computer, Queen Bee. This allows us to become a bigger part of national research efforts through the cyberinfrastructure we've developed in state, aligning our local computing environment with the national backbone.

Earlier this year, the CCT also welcomed its first executive director, Jarek Nabrzyski. Jarek worked for more than 10 years at the Poznan Supercomputing and Networking Center in Poland, where he managed the scientific applications department. He has an extensive research background in grid and high-performance computing as well as networking, and I am pleased to (at last!) have someone with his experience and expertise in a leadership role at the center.

Knowing that such great progress has been made, and will continue to develop at the CCT, was a factor in a big decision I made in June, when I accepted the position as the National Science Foundation's Director of the Office of Cyberinfrastructure. In this role, I have a unique opportunity to oversee advances in supercomputing, high-speed networking, data storage and software---and applications that take advantage of it---on a national level.

I began my new position in September, and I will serve as director of that office for at least the next two years. During this time, I am maintaining my CCT affiliation at LSU, and I still return to the center frequently to offer advice for strategic goals and research. It has been a pleasure to watch the CCT grow and thrive in the past five years, and it is an honor to have a position that allows me to continue my research work in advancing cyberinfrastructure on a national level while continuing my work here at LSU.

I have touched on only a few of the many accomplishments CCT faculty, staff and students have achieved in the past year, but the stories in this year's edition of "Components" focus on cyberinfrastructure in particular, and discuss some of the innovative ways the CCT is applying it to research. I hope you enjoy this issue and learn more about the many ways cyberinfrastructure is impacting the future of business and academia.

**Ed Seidel, Ph.D.**
**Director, National Science Foundation's Office of Cyberinfrastructure**
**Outgoing Director, LSU Center for Computation & Technology 2003-2008**

# Welcome from CCT Interim Leadership

In the five years since its inception, the LSU Center for Computation & Technology has grown and transformed in ways that are truly remarkable. We have helped LSU recruit top researchers and faculty from around the world, led numerous projects, hosted multiple conferences and events and, perhaps most importantly, established ourselves as a leader in the application of cyberinfrastructure to all areas of academic research.

While the CCT is always undergoing changes, the past year has been particularly significant. This summer, the National Science Foundation selected our director, Edward Seidel, to lead its Office of Cyberinfrastructure. While we are sorry to see Ed leave his role at the CCT, we are honored that the National Science Foundation selected one of our own for this position, and we are very excited about the new opportunities he will be spearheading for researchers across the country.

So, what do these changes mean for the center? Prior to Ed's departure, the University formed a transition team that would develop a new leadership plan for CCT. This team recommended that LSU begin an international search for a new director, and also recommended establishing an interim director to lead the center during this search.

In mid-September 2008, the University asked us to jointly serve as the CCT's interim leadership team. Dr. Stephen David Beck, Director of the CCT Lab for Creative Arts & Technologies and Professor of Composition and Computer Music at the LSU School of Music will serve as interim director. Dr. Jorge Pullin, Horace Hearne Chair in Theoretical Physics at the LSU Department of Physics and Astronomy, and Director of the Horace Hearne Institute for Theorectical Physics will be interim co-director.

We feel privileged that the University has given us the opportunity to lead the Center for Computation & Technology during this upcoming, transformative period. As we begin our leadership tenure, we look forward to working with faculty across campus to create new opportunities that pair our cutting-edge computing resources and technologies with the top-tier researchers here at LSU to enable breakthroughs across all areas of academics.

We are confident the center will not only maintain the incredible momentum that has been built up throughout the past five years, but we will exceed it. In next year's edition of Components, we look forward to bringing you even more stories of the scientific discovery, creativity, economic development and research opportunities the CCT has created for LSU, Louisiana and the worldwide scientific community.

**Stephen David Beck, Ph.D.**
**CCT Interim Director**

**Jorge Pullin, Ph.D.**
**CCT Interim Co-Director**

# Cyberinfrastructure

**In the late 19th century, perhaps no invention revolutionized American society more than the railroad system. Trains brought people together quickly and transformed business, agriculture and academia in ways not previously possible. People were no longer confined to one location and could work efficiently with others across the country. Railroads, and the possibilities they brought, enabled new ways of thinking and doing business.**

# Connectivity, Commerce, Computation, Creativity and Collaboration for the Future

Today, both industry and research are undergoing similar, major transformations and people are collaborating to solve complex problems in innovative ways through 21st century-cyberinfrastructure, which brings researchers together, allowing creative breakthroughs in all academic fields.

"Cyberinfrastructure today is much broader than supercomputing systems," said Ed Seidel, director of the National Science Foundation's Office of Cyberinfrastructure. "It encompasses software, application development, networks, data, analysis, visualization, algorithms, sensors, collaborative technologies, and so on. Most importantly, it involves, or rather requires, teams of researchers to use it to solve complex problems facing science and society alike."

Researchers are harnessing the computing power available within today's cyberinfrastructure to enable breakthroughs in all fields, studying issues that previously could not be solved because of a lack of technology, such as using black hole simulations to study Einstein's theory of relativity, generating predictions in emergency events such as hurricanes by using rapid-response models, and modeling complex biological science to discover new information about the genetic makeup of a species.

As scientists gain access to more data than ever and cyberinfrastructure becomes a critical aspect of education and business, researchers must develop ways to use it to its full potential.

## The President's Information Technology Advisory Committee Report

In 2005, the President's Information Technology Advisory Committee, or PITAC, released a report on the state of computational science in the United States. That report noted cyberinfrastructure has become the new frontier in science, and the advances it makes possible are an integral part of research, education and business. To realize future opportunities, people must depend on cyberinfrastructure.

But, the PITAC report also noted that despite the advances cyberinfrastructure can bring, most research and business entities do not have structures in place to use it effectively. To address this critical issue, PITAC recommended that universities make cyberinfrastructure a priority. The report also suggested researchers move away from a singular focus and begin working collaboratively, in multi-disciplinary teams.

## The Center for Computation & Technology: Advancing Cyberinfrastructure-Based Research in Louisiana

Louisiana has made significant investments to develop cyberinfrastructure in the state, beginning in 2001 with the Governor's Information Technology Initiative, which invests $25 million annually in Louisiana's top five research institutions. Louisiana State University used funding from this initiative to create the Center for Computation & Technology.

The Center for Computation & Technology, or CCT, is an innovative, interdisciplinary research environment, advancing computational science, technologies and the disciplines they touch. CCT advances LSU's Flagship Agenda and promotes local and statewide economic development by using computational applications to aid research and develop solutions that benefit academia and industry.

"CCT is a collaborative environment where computational scientists work alongside engineers, artists and others to developing research agendas that share expertise and technologies across LSU departments," said CCT Interim Director Stephen David Beck. "By bringing people together across disciplines, we can broaden our focus and develop innovative ways to address problems."

Researchers at CCT are organized into broad, interdisciplinary "focus areas," each led by a CCT

faculty member. Together, these focus areas use the advanced cyberinfrastructure available on campus to enable breakthroughs in many academic fields, from physics to computer science to art and animation.

nect researchers across Louisiana and the world, expanding existing partnerships and creating new ones so we can develop the computational tools needed to support research statewide," Katz said.

**"Through the CyD group, we want to involve not only the LSU research community, but to connect researchers across Louisiana and the world, expanding existing partnerships and creating new ones so we can develop the computational tools needed to support research statewide," Katz said.**

Some current research projects underway at the CCT include grid computing, which connects many computers together through a network for increased computational power to solve large-scale problems; coastal modeling projects that study more accurately forecasting hurricane effects and develop models to better plan restoration strategies and improve ecological forecasting; hardware and software development; and high-performance computing applications for arts, humanities, and social sciences.

## Cyberinfrastructure Development

The Cyberinfrastructure Development, or CyD, division within CCT designs, develops and prototypes cyberinfrastructure systems and software for LSU's current and future researchers, including users of LSU's supercomputing systems.

"This group's efforts allow CCT to align with other supercomputing centers and acquire additional supercomputing resources for researchers across Louisiana," Seidel said. "It enables CCT to further develop one of the most comprehensive, advanced computing environments anywhere for applications from many disciplines."

Daniel S. Katz, CCT's director for Cyberinfrastructure Development, is leading the division's efforts to develop new computing technologies, which are critical to many areas of research in academia, such as computer architecture, visualization, coastal modeling and astrophysics, and industry, such as restoring the Gulf coast and petroleum engineering.

"Through the CyD group, we want to involve not only the LSU research community, but to con-

**Some of CyD's major responsibilities include:**

• Leading the CCT performance group, which focuses on using the best existing tools to benchmark and optimize applications, and to model applications and architectures.

• Working with application scientists and engineers to help them make better use of current resources and to understand their future resource requirements.

• Testing software, including acting as initial users of software that the CCT's high-performance computing group will operate.

• Helping CCT's research community develop and deliver software to outside users.

• Working with the CCT's high-performance computing group to ensure operations policies and acquisitions meet user requirements.

• Developing partnerships across the state as well as with peer research centers and industry to enhance the capabilities CCT makes available to users.

• Working with CCT focus areas and other divisions to develop an integrated scientific computing environment that encompasses computing, storage, networking and visualization resources.

For more information on CyD's activities, please visit http://www.cct.lsu.edu/cyd.

## High-Performance Computing

The CCT has partnered with LSU's Information Technology Services to provide LSU researchers with high-performance computing resources, a central point to access these resources, and user expertise. The people who make up this partnership manage LSU's supercomputers, create user accounts, and provide customer service and support.

Through the high-performance computing collaboration, faculty across campus gain access to the cyberinfrastructure they need to conduct groundbreaking research in a variety of areas.

LSU researchers have access to the University's supercomputer, Tezpur. Named for one of the world's hottest peppers, Tezpur is an integral part of research for all CCT focus areas.

## Louisiana Optical Network Initiative

The Louisiana Optical Network Initiative, or LONI, is a high-speed, fiber optic network that links supercomputers at the state's major research institutions -- Louisiana State University, Louisiana Tech University, LSU Health Sciences Center in New Orleans, LSU Health Sciences Center in Shreveport, Southern University, Tulane University, University of Louisiana at Lafayette and University of New Orleans-- allowing computation speeds greater than 1,000 times the rate previously possible and enabling greater connectivity and faster collaboration.
LONI links Louisiana researchers to their national counterparts through connections to the National LambdaRail and Internet2. Ten percent of the cycles from LONI's centerpiece computer, Queen Bee, are reserved specifically to aid business and economic development.

In 2004, former Gov. Kathleen Babineaux Blanco committed $40 million to fund LONI for a 10-year period. Since that time, LONI has grown and added additional connections.

Four Mississippi universities -- Jackson State University, Mississippi State University, University of Mississippi and University of Southern Mississippi – are LONI customers who use the LONI network to conduct economic development-oriented project research at those sites, and to connect Mississippi to Internet2.

More than 100 Louisiana not-for-profit hospitals also are gaining high-speed connections through LONI, which will enable doctors to transmit patient information digitally in microseconds instead of hours or days. Through a $15.9 million grant that the Federal Communications Commission (FCC) awarded to the Louisiana Department of Health and Hospitals in November 2007, the participating hospitals are upgrading their network connections so they can access LONI, which will provide them with an unprecedented ability to share patient information.

In February 2008, LONI was integrated into the TeraGrid, and LONI began allocating half of Queen Bee's cycles to the national user community.

## Innovative Solutions for Research and Industry

Now that Louisiana has made great investments in cyberinfrastructure, the next steps are to develop research projects that effectively use the advanced technology in Louisiana to further academics and to create more opportunities for business and industry so the state can fully capitalize on these investments.

On the research front, a team of LONI partner universities has created a state-of-the-art research collaborative that will enhance Louisiana's scientific and economic development capacity.

This project, called LONI Institute, is funded through the Louisiana Board of Regents' Post-Katrina Support Fund Initiative, as well as from matching funds from all universities involved.

The LONI Institute is a collaboration of researchers among the six LONI sites that creates a multi-disciplinary environment, with CCT as its central hub. Each university is in the process of hiring two new faculty members and one new computational scientist, who will work as members of this virtual institute. In June 2008, Betty Rodriguez-Milla became the LONI Institute's first scientific coordinator. In this role, she will coordinate research activities through the LONI Institute from LSU.

The LONI Institute faculty and staff will conduct research primarily in biology, materials science and computational sciences. The computational scientists will work with both the LONI Institute faculty and other Louisiana faculty members, in projects that are peer-selected by a LONI Institute Projects Committee that is led by Daniel S. Katz. The institute will use the advanced resources of LONI to drive research and education, which will lead to economic development for the state.

**Jarek Nabrzyski, CCT Executive Director, is principal investigator for the LONI Institute project. "LONI and its LONI Institute and Cybertools projects are unique worldwide in their approach to building cyberinfrastructure and fostering multidisciplinary research," Nabrzyski said.**

"The projects committee help us choose how to best use the computational scientists' skills to meet the needs of the state," Katz said.

For more information on the LONI Institute, please visit www.institute.loni.org.

Through initiatives like the LONI Institute, researchers will have more opportunities to partner with business and industry, an area the PITAC report noted is crucial for future economic development.

The Council on Competitiveness echoed this finding in its High-Performance Computing Survey. In that survey, nearly all of the respondents said that because of its unique ability to solve complex problems, cyberinfrastructure is necessary for business survival. But, most respondents also agreed companies do not use high-performance computing resources as effectively as they could to solve problems.

One key obstacle the respondents noted is a lack of computational scientists who can apply cyberinfrastructure to problems in business and seek solutions. The report recommends researchers should be more aggressive in partnering with industry to spur economic development. Industries that depend on computational sciences include petro-chemical, aerospace, manufacturing, pharmaceutical and many others.

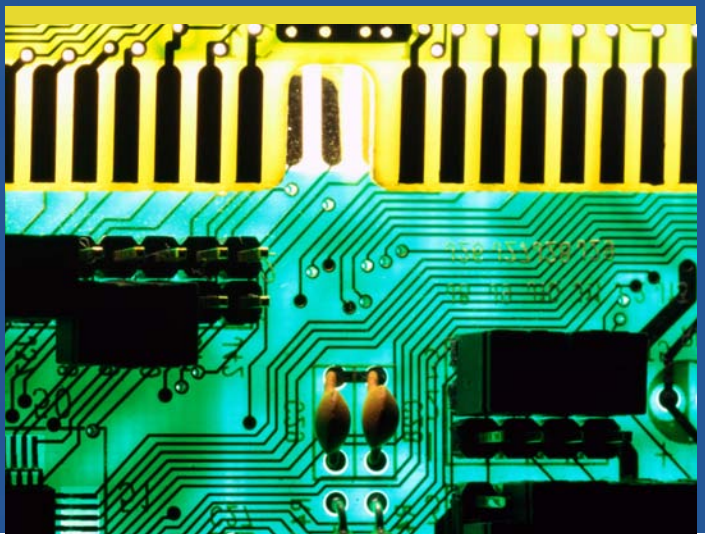
"I believe that workforce development is the most important aspect of cyberinfrastructure to be addressed in the coming years," Seidel said. "Future scientists and researchers should pay close attention to this new environment as it emerges."

## Global Collaboration

As scientists access more data and have better computing resources, they will need to work with partners around the world to develop and use cyberinfrastructure.

Because of cost, machine room space and energy requirements, there will only be a small number of sites in the world that can operate next-generation computing systems, but the problems researchers face in developing the algorithms, software and applications that can effectively utilize hundreds of thousands of compute cores are severe. To make the most of available resources, researchers must invest more in these areas, and pull together international resources to solve problems.

**"At the CCT, we constantly look for new ways to collaborate locally, nationally and even internationally to solve complex problems through computational science," Beck said. "As we enter a new era of scientific discovery, we are developing projects and research that will establish the CCT as a leader in advancing cyberinfrastructure."**



## Connecting the Campus

In addition to developing new systems and software for LSU's current and future researchers, CCT's Cyberinfrastructure Development, or CyD, group, which is led by Daniel S. Katz, Ph.D., also works with researchers in departments across campus to help them access and understand the University's existing high-performance computing resources so they can use this technology to solve complex problems.

A recent example of this is Joohyun Kim, Ph.D., an IT researcher with CCT's CyD group who helped a graduate student in LSU's School of Veterinary Medicine by providing information about available high-performance computing, or HPC, resources specifically for bioinformatics tools. Kim is now collaborating with the student to conduct an advanced analysis of DNA sequences.

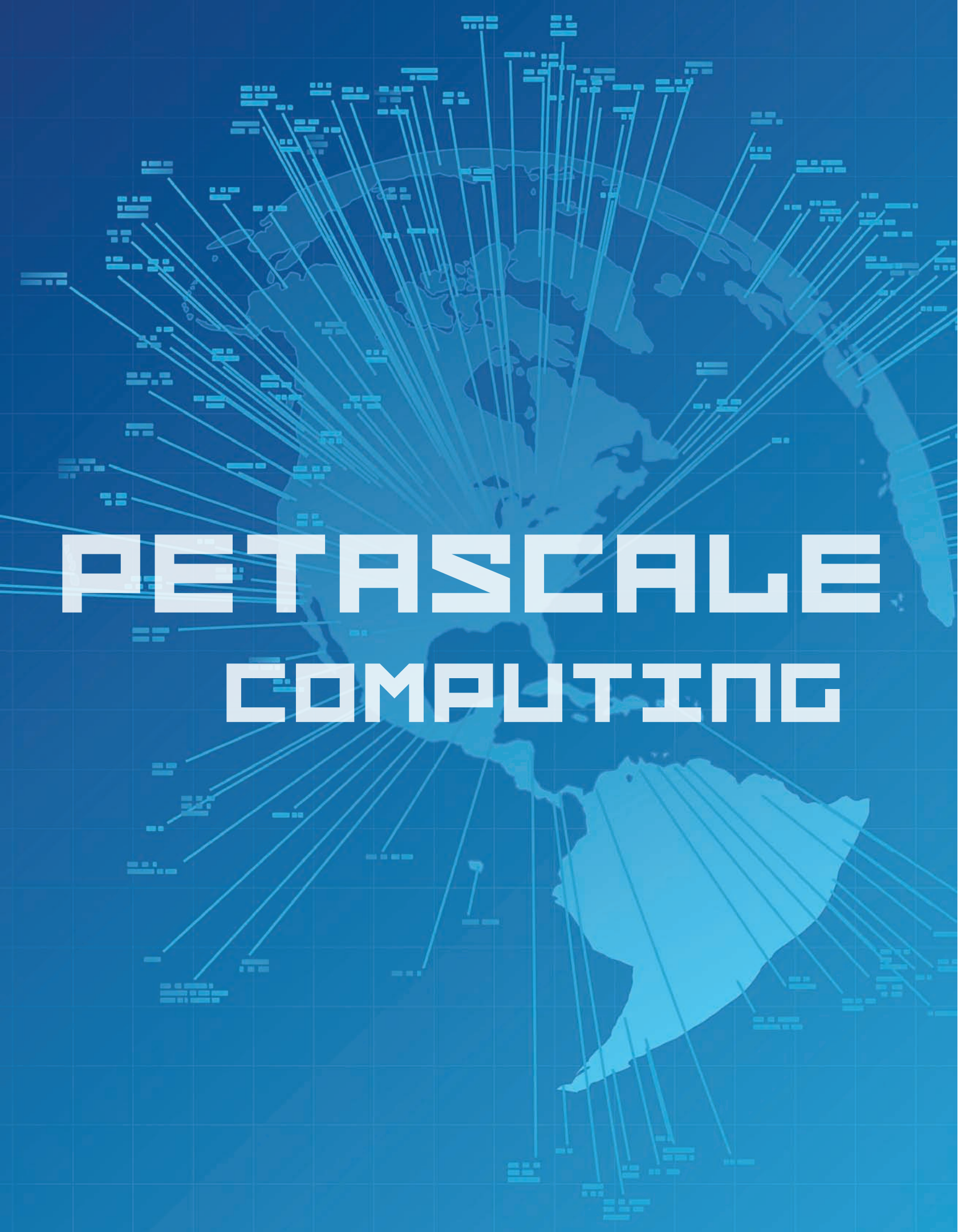
Arun Iyer, a graduate student in Professor Konstantin Gus Kousoulas' Division of Biotechnology and Molecular Medicine at the LSU vet school, made an initial attempt to study the evolutionary history of his experimental data of a West Nile virus with 75 other known West Niles virus genome sequences, each comprising about 11,000 base pairs. Initially, he successfully carried out analysis with ClustalW (a software package often used for this purpose) using the Neighbor-joining algorithm. He then wanted to try other algorithms to see if they would give different results. His next choice was the Maximum Likelihood (ML) with a resampling technique, the Bootstrapping. For this calculation, he used the PHYML package, but it turned out that his desktop computer was not powerful enough to complete the calculations for his relatively large data set.

Iyer talked with Kim, who suggested two solutions for achieving his goal, reliable analysis beyond the NJ approach. One was to pursue his ML Bootstrapping calculations using the more powerful HPC resources that CCT provides to campus researchers, and the other was to find more efficient algorithms, in particular, ones based on Bayesian approach. These algorithms have the capability to provide comparably greater accuracy while using less computing power and, more importantly, can provide insightful theoretical assessments. While the first approach was not successful because of the memory intensive implementation of PHYML, Kim and Iyer learned a very important lesson about the compute requirements of this type of calculation. The second approach generated the anticipated output and made it possible for Iyer to compare the new results with his initial sequence.

Starting with West Nile virus data, Iyer was able to extend and apply his development for another data of a bacterial system, and his paper on bacterial phylogeny is currently under review for the Anaerobe journal. His paper about the West Nile virus research also is under review for the Virus Genes journal.

By partnering with the CCT to access HPC resources such as these bioinformatics tools, Professor Kousoulas' group, which is one of leading research groups on viral diseases such as West Nile and their vaccine developments, can enhance their strengths in state-of-the-art drug discovery efforts.

This is a small example in a growing list of collaborative work between CCT and life sciences researchers. Further collaboration between these groups will enhance CCT's understanding of the needs of biologists and will enable them to better explore the resources CCT has to offer.


PETASCALE
COMPUTING

# CCT Researchers Developing Tools, Applications for Next-Generation Supercomputing

The worldwide scientific research community is anticipating the arrival of petascale computing, the next generation of supercomputers that will enable better research and allow breakthroughs that are not possible with current high-performance computing systems.

As an example of the power petascale machines would have, it would take hundreds of thousands of home computers plus advanced networking and data storage connections to equal the current supercomputing power in Louisiana through LSU's supercomputers and the Louisiana Optical Network Initiative machines. When the research community gains petascale capabilities, this will represent the processing power of 200,000-500,000 home computers.

tively use these computing environments. CCT and partners at The Institute for Advanced Computing Applications and Technologies at the University of Illinois at Urbana-Champaign and NVIDIA Corporation are working on a project to upgrade graphics processor units, or GPUs, from the NVIDIA Tesla series to make these GPUs compatible for petascale computing.

Researchers from both universities will develop application communities in key engineering and scientific areas, including computational biophysics, astrophysics and computational fluid dynamics, along with emerging disciplines that rely on high-performance computing, such as digital arts and humanities.

**When the research community gains petascale capabilities, this will represent the processing power of 200,000-500,000 home computers.**

## Blue Waters: Breaking Through the Limits

LSU is part of the Great Lakes Consortium for Petascale Computation, which will play an integral role in Blue Waters, the National Science Foundation's first sustained petascale supercomputer. The Blue Waters project is headquartered at the University of Illinois Urbana-Champaign's National Center for Supercomputing Applications, or NCSA, which is a collaborative partner with the CCT on many endeavors.

When Blue Waters deploys in Illinois in 2011, it will be among the most powerful scientific computing machines available worldwide.

## Petascale-Class Graphics Processor Units

When using petascale systems such as Blue Waters, researchers will need massive, fine-grained parallel computing capabilities to effec-

## ParalleX: Next-Generation Parallel Computing Architecture

Through CCT's Advanced Computer Architecture Laboratory, LSU Department of Computer Science Professor Thomas Sterling is leading a group of researchers to investigate how parallel computing environments can run effectively on large-scale machines.

The group is working on ParalleX, a next-generation model for parallel computing. The ParalleX research group is investigating advanced parallel computer architecture and programming environments to eliminate constraints and program petascale-class machines in ways that incorporate multiple elements effectively.

ParalleX is designed make areas such as synchronization, scheduling, manual data layout and messaging more efficient for researchers.

Also, the ParalleX group is exploring how computing environments should be monitored as systems get bigger and are able to process more data rapidly. Sterling notes that historically, as computing systems get bigger, computer architecture has transformed.

"With ParalleX, we are preparing a computational model for petascale-class machines that will enable researchers to use this technology to their advantage," Sterling said. "We hope that our research will lay the groundwork for future computer architecture design."

## Improved Data Management Through PetaShare

As researchers rely more on cyberinfrastructure, they are encountering unprecedented amounts of data that need to be sorted, stored and analyzed. This means researchers need more effective data scheduling, management and storage tools.

CCT and LSU Department of Computer Science Assistant Professor Tevfik Kosar is addressing this problem through the PetaShare project. In 2006,

"With ParalleX, we are preparing a computational model for petascale-class machines that will enable researchers to use this technology to their advantage," Sterling said. "We hope that our research will lay the groundwork for future computer architecture design."

## Connections Through Cactus

Researchers in the CCT's Cactus Computational Toolkit group are developing the new algorithms, tools and visualization capabilities needed for petascale computing and beyond.

Since petascale computing will allow scientists to make complex, high-resolution models of physical processes including climate change, hurricane behavior, oil extraction from reservoirs and astrophysical black hole collisions and gamma ray bursts, these models will need to run effectively on petascale computing architectures so scientists can better understand and use them. This involves leveraging many-core processors, hardware accelerators and new programming paradigms --- scaling to hundreds of thousands of processors.

The Cactus Framework already provides an advanced parallel programming environment and community toolkits for collaborative problem solving, so LSU researchers are developing new applications to make it run models effectively on petascale machines.

Cactus is funded by National Science Foundation, Department of Energy, NASA and the Department of Defense. Researchers developed Cactus at LSU and the Albert-Einstein-Institute in Berlin.

Kosar received a $1 million grant from the National Science Foundation to create advanced data archival, processing and visualization capabilities.

Kosar and the PetaShare research group, which LSU's Center for Computation & Technology leads along with Louisiana Tech University, University of New Orleans, Tulane University and University of Louisiana-Lafayette, are developing new systems to store and schedule data.

The PetaShare group is allocating additional storage at the LONI partner sites to develop these improved data management systems, with plans to expand the completed system to universities and research institutions worldwide.

**For more information on progress in petascale computing, please visit:**

***Great Lakes Consortium for Petascale Computation:**
**http://www.greatlakesconsortium.org/**

***Blue Waters**
**http://www.ncsa.uiuc.edu/BlueWaters/**

**•Petascale computing**
**http://www.ncsa.uiuc.edu/BlueWaters/**

# HPC

## University-Industry Partnership Opportunities

Does your business need unique solutions? Could your company benefit from research and computational science expertise?

Learn how the LSU Center for Computation & Technology's research efforts and advanced cyberinfrastructure can benefit your company.

The Council on Competitiveness recommends businesses partner strongly with research centers like the CCT to pair researchers with resources and develop breakthroughs that benefit both.

Current CCT projects are developing applications that could benefit industry as well as academia.

Learn about the Louisiana Optical Network Initiative, or LONI, and its potential to expand your business connectivity.

Discuss the advantages of partnering with a research center like the CCT.

Discover how scientific research breakthroughs enable economic development.

Contact us to learn more:
225-578-4012
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www.cct.lsu.edu

# Louisiana Optical Network Initiative Joins **TeraGrid** as Newest Resource Provider

Leaders at the state's major research institutions have spent the past four years transforming the Louisiana Optical Network Initiative, or LONI, into an infrastructure that makes Louisiana one of the most well connected places in the world.

During the past year, LONI joined the TeraGrid and began contributing computing power as part of this national cyberinfrastructure. TeraGrid is a National Science Foundation-funded research collaboration that incorporates high-performance computing resources from 11 partner sites across the country to create an integrated, persistent computational resource.

Currently, TeraGrid resources include more than 750 teraflops of computing capability and more than 30 petabytes of online and archival data storage, with rapid access and retrieval across high-speed, fiber optic networks. TeraGrid researchers can access more than 100 discipline-specific databases. With this combination of resources, the TeraGrid is the world's largest, most comprehensive distributed cyberinfrastructure for open scientific research.

"This partnership further demonstrates the major impact that LONI is having in advancing Louisiana's stature in the national research community," said LONI Management Council Chairman Les Guice.

LONI centers around a 50-teraflop supercomputer called "Queen Bee," located in the state Information Systems Building in downtown Baton Rouge. As a TeraGrid provider, LONI contributes one half of Queen Bee's computational cycles to support the national research community. In exchange, the NSF provides funding for additional support of the machine and the new set of users, as well as funding for additional network connections from LONI to the other 10 TeraGrid resource providers.

The TeraGrid partnership allows LONI researchers to make use of national supercomputing capabilities.

"The TeraGrid partnership helps support our local supercomputing resources while contributing to a backbone of national cyberinfrastructure, and it helps our Louisiana users make use of other national resources," said Daniel S. Katz, director for Cyberinfrastructure at the CCT, who oversaw Queen Bee's integration into the TeraGrid.

**"This partnership further demonstrates the major impact that LONI is having in advancing Louisiana's stature in the national research community," said LONI Management Council Chairman Les Guice.**

The National Science Foundation, or NSF, selected LONI in September 2007 to become a new TeraGrid resource provider, officially welcoming the network to the TeraGrid on Oct. 1, 2007. LONI connects supercomputers at Louisiana State University, Louisiana Tech University, LSU Health Sciences Center in New Orleans, LSU Health Sciences Center in Shreveport, Southern University, Tulane University, University of Louisiana at and University of New Orleans.

CCT staff completed the work necessary to integrate Queen Bee in late 2007, and the first national TeraGrid users began accessing Queen Bee in February 2008.

LONI is one of 11 NSF TeraGrid providers. The others are Indiana University; National Center for

Atmospheric Research; National Center for Supercomputing Applications; National Institute for Computational Sciences; Oak Ridge National Laboratory; Pittsburgh Supercomputing Center; Purdue University; San Diego Supercomputer Center; Texas Advanced Computing Center; and the University of Chicago/Argonne National Laboratory.

## First-Year Research

During its first year on the TeraGrid, LONI has furthered research in interesting and innovative science disciplines. Below is a list of key projects that used Queen Bee cycles:

•Calculating the equation of state at nonzero nuclear matter density for primordial, early-universe-forming plasma at a resolution never previously attained, which will help physicists understand better how the early universe formed. (The MILC collaboration, led by Ludmila Levkova and Carleton DeTar -- University of Utah)

•Modeling 3-D multi-angle simulations of supernova stars. (Christian D. Ott, Adam Burrows, Luc Dessart, Eli Livne)

•Creating a numerical technique to more accurately and effectively use spherical grids for research in areas of general relativistic astrophysics, including neutron stars, X-ray binaries, active galactic nuclei, and black hole simulations. (Burkhard Zink, Erik Schnetter, Manuel Tiglio)

•Studying how magnetic fields affect the gravitational waves resulting from a collision between two binary stars; previous visualizations showed the simulation without taking the magnetic aspects into account. (Matthew Anderson, Eric W. Hirschmann, Luis Lehner, Steven L. Liebling, Patrick M. Motl, David Neilsen, Carlos Palenzuela, Joel E. Tohline)

•Steven Brandt, a researcher with CCT, wrote a new software package for the TeraGrid called AmieGold available at: http://software.teragrid.org/tgcdb/amiegold.tar. AmieGold provides a bridge between AMIE and Gold, so users at different TeraGrid sites can install both programs simultaneously and add their systems to the TeraGrid quickly and easily.

Please visit http://www.teragrid.org

# CCT Researchers Part of Statewide Team Creating **CyberTools** to Build Better **Cyberinfrastructure**

After developing one of the most advanced computing and networking environments available in academia, Louisiana researchers now are creating new tools for high-performance computing, advanced networking and data management to use the state's cyberinfrastructure to its full potential.

In late November 2007, a team of faculty representing nine Louisiana universities received a $9 million National Science Foundation, or NSF, grant to develop "CyberTools," a set of work packages and applications that will enable further advances in science and engineering research.

**With matching funds of $3 million from the Louisiana Board of Regents Support Fund and $3.2 million from the participating institutions, the total CyberTools award is more than $15.2 million for a three-year period.**

The State of Louisiana's Experimental Program to Stimulate Competitive Research Committee, which includes LSU, Tulane University, Tulane University Health Sciences Center, University of Louisiana-Lafayette, LSU Health Sciences Center – New Orleans, Louisiana Tech University, University of New Orleans, Southern University and Xavier University, submitted the NSF Research Infrastructure Improvement Proposal that created CyberTools in May 2007.

Lead researchers at each of the partner institutions are overseeing the development of CyberTools and their integration into current projects. In addition to university researchers, nearly 20 undergraduate students are working with the faculty involved to gain valuable, hands-on experience in this cutting-edge project.

## Building CyberTools

Through the CyberTools project, close-knit teams of faculty from each of the participating research institutions are developing a set of critical work packages that will provide them better access to the Louisiana Optical Network Initiative, or LONI.

The CyberTools work packages are in four key areas: Scheduling and Data Services, Information Services and Portals, Visualization Services and Application Services and Toolkits.

With the work packages as basic building blocks for the CyberTools project, scientists can use LONI more effectively for research by enabling scheduling to share computational, networking, data and visualization resources, allowing better data management, easing development of complex simulation codes and improving visualization.

With CyberTools, researchers on the project can collaborate in key application areas of science and engineering, focusing on two areas in particular – biosensing and transport processes.

The biosensing research group is developing more effective geno/immuno sensors – low-cost, easily deployable platforms that can be used for medical diagnosis, population screening and environmental monitoring. Through CyberTools, research teams are creating sensors that are more sensitive and can detect biological or chemical agents at a lower molecular weight, making them more effective counter-terrorism and disease surveillance tools.

This research group also is developing a LONI work environment that allows better access to high-throughput screening. This kind of screening is an advanced research tool used primarily by biological and chemical scientists that allows researchers to conduct millions of biochemical, genetic or pharmacological tests in a short period of time and in a more effective manner with better results than traditional screening techniques. The CyberTools work packages allow scientists to access this technique by farming the screenings out across LONI.

The CyberTools transport processes research group looks at biotransport and hurricane/storm surge modeling. In biotransport, scientists collaboratively develop the necessary infrastructure to study phenomena such as molecular dynamic simulations and computational fluid mechanics of transport processes in living tissues in more advanced ways than previously possible.

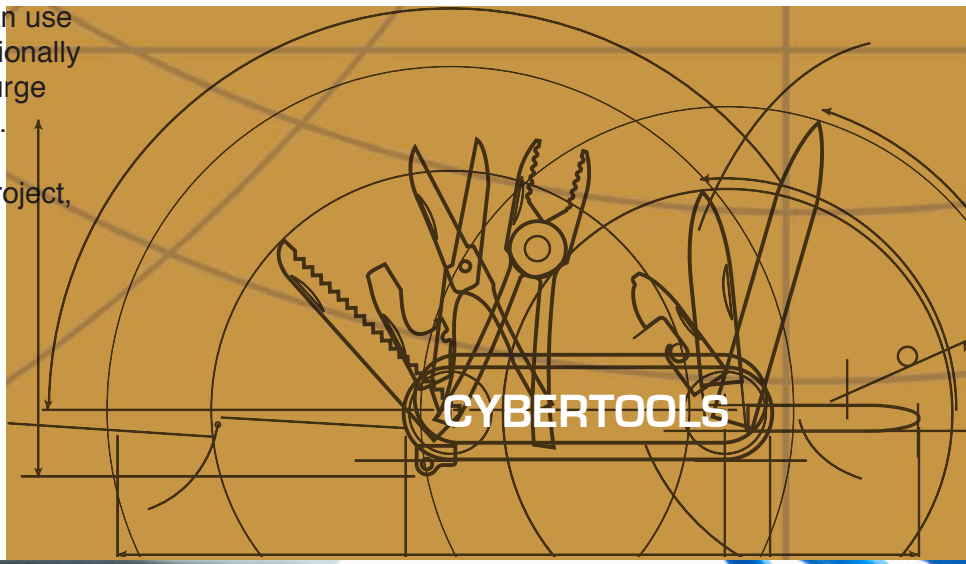
Through hurricane/storm surge modeling, researchers are using CyberTools to build better forecasting models that combine elements of existing models and create multi-layer visualizations looking at storm surge, water salinity, sediment deposit and many other aspects at one time. With this data available, scientists can use CyberTools to focus on the urgent and regionally significant problem of emergency storm-surge forecasting during approaching hurricanes.

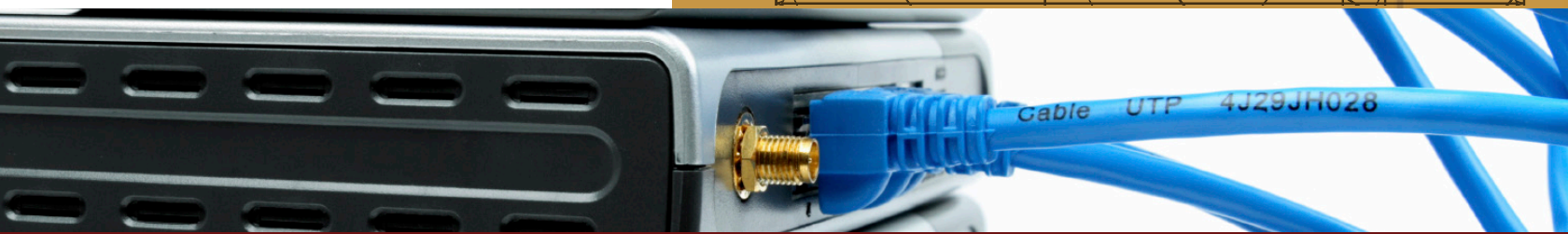
For more information on the CyberTools project, please visit www.cybertools.loni.org.

## Education & Outreach

In addition to conducting research at the university level, the CyberTools participants are implementing education and outreach activities for K-12 students and the public at large to help them understand the advanced cyberinfrastructure available in Louisiana and show how it is transforming research.

In July 2009, CCT will host a weeklong summer camp for high school students, in which they will work side-by-side with CyberTools project researchers to conduct visualizations, assemble hardware, write codes and conduct other hands-on experiments. For more information about this activity, visit http://www.cct.lsu.edu/CyberToolsCamp09




For more information on the CyberTools project, please visit www.cybertools.loni.org.


ELECTRONIC
ARTS
EA

# LSU, State and City Partners Lure Gaming **Giant** Electronic Arts Inc. to Baton Rouge

A combination of lucrative tax incentives, talented workforce, strong educational foundation and teamwork among state, city and University partners convinced Electronic Arts Inc. in Fall 2008 to do business in Baton Rouge.

Electronic Arts Inc., or EA, is the world's leading independent video game developer and publisher. EA's games include Madden NFL, Tiger Woods PGA Tour, NCAA Football, and more.

EA decided to build its North American quality assurance and testing center in LSU's South Campus complex. This center creates 20 full-time jobs and more than 200 part-time jobs, many of which will be occupied by LSU students, with an annual payroll of $5.7 million throughout the next two years.

At the test center, workers will play EA's upcoming sports titles to test them before they hit the market. Since quality control is a popular track to future jobs in the video game industry, EA and LSU officials hope this endeavor will provide a path to keep more trained, talented graduates in state.

Louisiana Gov. Bobby Jindal announced EA's plans to build in Louisiana during an Aug. 20 press conference with several state, city and University dignitaries, including Louisiana Economic Development Secretary Stephen Moret, LSU Vice Chancellor for Research and Economic Development Brooks Keel and East Baton Rouge Parish Mayor-President Kip Holden.

**"This is a big step forward in establishing Louisiana as the place to do digital media and entertainment," Gov. Jindal said.**

Gov. Jindal noted a combination of several factors convinced EA to locate its testing center in Baton Rouge, notably the state's tax incentive package for entertainment companies, strong partnerships among key agencies and future education and training opportunities through LSU, particularly the AVATAR initiative.

AVATAR: Arts, Visualization, Advanced Technologies and Research is a new multidisciplinary hiring initiative that CCT Interim Director and LSU School of Music Professor Stephen David Beck is leading for the campus. AVATAR will bring in as many as twelve new faculty and will create new curricula in digital media to train LSU students for jobs in this industry.

Vice Chancellor Keel said the AVATAR initiative was instrumental in bringing EA's testing center

to Louisiana, and feels a combination of the educational and business efforts between the two will create future opportunities for faculty recruitment, staff recruitment and workforce development at LSU.

"The idea is to get students trained in a new and exciting field so they will stay in Louisiana," Keel said.

Secretary Moret particularly credits Baton Rouge Area Digital Industries Consortium Executive Director Stacey Simmons for the EA facility. Through the consortium, Simmons promotes Louisiana as an ideal place for economic development in this growing industry to companies worldwide.

Based on the success of Red Stick, CCT has embarked upon new endeavors that will boost research in this area and strengthen Louisiana's workforce base in digital industries. LSU, along with the Baton Rouge Area Chamber, Baton Rouge Area Foundation and East Baton Rouge Parish Mayor-President's Office, created the Baton Rouge Area Digital Industries Consortium in June 2007. The consortium members work together to promote opportunities for digital industries in the state's capital city, promoting the aggressive tax incentives that make Louisiana a lucrative place to do business.

"This consortium represents a partnership among the leading education and economic development groups in our city, who have worked hard throughout the past several years to boost digital industries in Louisiana," said Baton Rouge Area Digital Industries Consortium Executive Director Stacey Simmons. "We are finally starting to see the benefits of this effort, and I think within the next few years, the combination of our efforts and the state's aggressive tax incentive packages will make Baton Rouge one of the top cities to locate video game companies, animation studios and other digital media-based businesses."

**"We're not stopping here," Moret said. "We're going to be leveraging this victory to develop other ones."**

EA began moving into the South Campus complex and posting jobs in September 2008. For information on job opportunities with the EA center in Baton Rouge, please visit www.jobs.ea.com.

For more information on the education and job opportunities available through the AVATAR initiative, please visit www.avatar.lsu.edu.

Several initiatives the CCT is leading to develop a strong digital media industry in Louisiana were key factors in EA's decision to locate its quality control and testing center in Baton Rouge.

CCT researchers are developing new projects in animation, scientific visualization, computational sciences and other emerging art forms.

In April 2008, CCT hosted the fourth annual Red Stick International Animation Festival, the largest festival of its kind in the United States, which highlights the intersections among art, technology and computational science. Each year, Red Stick draws renowned animators, video game developers and other industry professionals to Baton Rouge to host lectures, workshops, and other events for aspiring artists, programmers and entrepreneurs.

**For more information on the consortium's activities, please visit www.bradic.org.**

As Red Stick and the consortium attract new digital businesses to Louisiana, two CCT faculty members are leading University-wide multidisciplinary hiring initiatives to boost research efforts.

CCT and Department of Computer Science Professor Gabrielle Allen is leading a multidisciplinary hiring initiative in computational sciences that will recruit new faculty with research interests in scientific visualization, which is important for scientists who use high-performance comput-

ing to simulate and analyze complex problems such as black hole collisions, hurricane formation and the flow of oil and gas through underground reservoirs.

**"Visualization is a true intersection of art and science, where we can use new technologies to give new insight into complex science problems," Allen said.**

For more information on the computational sciences initiative, please visit http://www.mhi.lsu.edu/computationalscience.

AVATAR establishes a university-wide faculty focus on the intersections among art, technology and computation, creating new research areas in virtual environments, digital art, electro-acoustic music, animation, video game design, scientific visualization and more.

"A crucial part of developing industry in our area is developing new technologies and a talented work force that will empower the next generation of video game developers, animators and digital artists to succeed right here," Beck said. "AVATAR will build off successes we have seen through the Red Stick festival and will create working relationships with EA and other digital companies that make it possible to spin off emerging technologies and establish new businesses, as well as prepare students in the area for a career in video gaming, animation or other forms of digital art."

AVATAR will bring faculty to LSU to conduct research primarily in intelligent and responsive systems -- video games, training systems and simulation visualizations -- and collaborative digital media arts.

AVATAR supports economic development in the state through new technologies, leveraging of generous state tax incentives for digital media and providing new curricula to train a talented work force for one of Louisiana's vibrant and growing industries.


EA Sports Representatives Meet with LSU Students to Discuss Job Possibilities in the Video Game Industry.

# LSU Broadcasts Live with High-Definition Courses

The Center for Computation & Technology is helping LSU lead the way for education in the 21st century, offering two courses taught via video streaming to give students broader choices in their college curricula.

The LSU Department of Computer Science offers both courses, using networking and high-definition, or HD, access capabilities through the CCT to export and import them.

LSU Department of Computer Science Professor Thomas Sterling pioneered this teaching method in the Spring 2007 semester after working with a team of researchers from the CCT, MCNC in North Carolina and Masaryk University in the Czech Republic to develop HD streaming and Access Grid applications for educational purposes.

Sterling's course, CSC 7600 --High-Performance Computing: Models, Methods and Means, was the first of its kind in the United States. Sterling taught the course at LSU and broadcast it across the 10-Gigabit-per-second Louisiana Optical Network Initiative, or LONI, to sites in Louisiana, Arkansas, North Carolina and the Czech Republic.

Sterling taught the course a second time in the Spring 2008 semester, with four additional universities – Louisiana Tech University, University of Arkansas-Fayetteville and Little Rock campuses and Masaryk University in the Czech Republic -- participating.

Sterling teaches the course at LSU, broadcasting it in real-time to the partner sites. The students at those schools take the course through LSU, following Sterling's syllabus with professors on site at each partner school to monitor coursework. Students receive course credit through their home universities.

After the first run of the course, Sterling and LSU researchers received National Science Foundation funding to distribute the material through other media, including a DVD series and iPods containing the lectures.

"This teaching method gives college students more options than they ever had before," Sterling said. "Previously, students were limited to taking whatever courses their universities offered, and if a professor at that university did not teach a certain course, the students just did not have access to it. Now, we are leveling the playing field in college education, and making a subject available to a much broader audience."

Sterling's course will return for a third semester in January 2009.

In addition to exporting original courses to other locations, LSU offers the reverse setup to give students more options in their curricula. Students are able to take the University of Illinois – Chicago's video game design class, offered at LSU as both a computer science course (CS 4700) and an arts course (ART 4020.)

Jason Leigh, a computer science professor at University of Illinois-Chicago, or UIC, and director of the UIC Electronic Visualization Laboratory, teaches the course from Chicago and broadcasts it via LONI to students at LSU, who follow the same syllabus and requirements as the UIC students.

Through HD streaming access, the students attend Leigh's class in real time each week. LSU Department of Computer Science Professor Gabrielle Allen and School of Music Professor Stephen David Beck monitor the students' work and progress.

LSU offered the video game design course for the first time during the Fall 2007 semester, and it was so successful, the University has offered it each semester since.

For the last class of each semester, the students at LSU and UIC compete with each other in a video game marathon across the high-speed

networks. Throughout the class, students work in teams as companies, designing an original video game. For the final class, students get to showcase their games, which involve concepts they learn throughout the semester. LSU teams won first place in the game competition in both the Fall 2007 and Spring 2008 semesters.

Allen noted the new opportunities available to students through HD streaming capabilities give them better advantages for course offerings.

"In organizing these two classes we have an opportunity to rethink how to provide the best education to our undergraduate and graduate students, not just at LSU but across the nation," Allen said.

"We have a chance to offer a broad, deep and up-to-date curricula in computer science, making some of our classes available externally and bringing some excellent teachers at other universities right into our classrooms here."

Beginning in Fall 2008, CCT helped LSU establish a single classroom dedicated to HD-streamed courses, both exported and imported. CCT refurbished Room 202 in Coates Hall, making it capable for videoconferencing, HD access, video streaming and other necessary procedures to better house classes such as the video game design and high-performance computing courses.

With the new classroom available, LSU will explore offering more courses using this setup.

## CCT Hosts Educators from Across the Country for SC 08 Summer Workshop

The LSU Center for Computation & Technology, in conjunction with the Supercomputing Conference 2008 Education Program, hosted a week-long workshop on "Integrating Computational Science into the Undergraduate Curriculum."

SC08 sent educators to teach this workshop, which took place June 8-14 on the LSU campus.

Participants from colleges, universities and even elementary and secondary education institutions attended the workshop to learn new techniques, new curricula and new applications to further computational science education in all disciplines. The workshop is part of the Supercomputing Conference's national efforts to advance computational science as part of college undergraduate curricula.

The participating faculty members were from different research backgrounds, including biology, chemistry, environmental science and music, and all attended the workshop to learn how they can bring computational research into their classrooms.

The instructors demonstrated new computational science tools and techniques to use with students, such as wikis, moodles, mashups, programming and data sharing. The instructors lectured in the mornings, and participants worked on their own projects and interest areas in the afternoons, with one-on-one help from the instructors.

For more information on this workshop, please visit http://www.cct.lsu.edu/SC08educate.

# **CCT** Cultural Computing Focus Area Establishes **Campus-Wide** Research Group on **Virtual Environments**

Today's college students do not limit their communication to the real world. Instead, they use a variety of virtual environments such as Second Life, Multiverse and Croquet to talk with each other online using 3-D avatars.

As students embrace these new portals for interaction, researchers are beginning to study how these networks can help them collaborate in ways they previously could not. The Center for Computation & Technology's Cultural Computing Focus Area has created a campus-wide research group to look at emerging virtual environments and see what potential they hold for interdisciplinary research.

The Virtual Worlds Research Group involves faculty from different departments across LSU who are interested in seeing how this technology can enhance the traditional classroom structure. The group is testing various scenarios, including hosting classes and holding office hours in these networks, creating methods for students to display original work in virtual environments and simultaneously hosting lectures, concerts and other events in real time and in virtual worlds. The group is also exploring how virtual worlds can be used to better understand the complex world of high performance computing, supercomputers and high-speed networks.

Interim Director and LSU School of Music Professor Stephen David Beck , who heads the Cultural Computing Focus Area at CCT, created this research group as an outgrowth of his research at the CCT, which focuses on how emerging computer applications impact the arts and humanities.

"As Second Life and other virtual environments become more popular, they will have implications for computational science, social science, business, the arts, mass communication and many other areas," Beck said. "This research group offers an opportunity for us to experience these changes together."

The Virtual Worlds Research Group formed at the end of the Spring 2008 semester and beginning in Fall 2008 began hosting monthly meetings to discuss on-going projects, explore collaborations and coordinate research activities in this domain on campus.

One tool the Virtual Worlds Research Group will use to explore how virtual environments can aid academia and research is the newly created LSU Virtual Campus in Second Life, which researchers and students within the CCT Cultural Computing Focus Area spent the Spring 2008 semester creating.

In Second Life, LSU is located on an island, Nicholson Hall backs up to a beach retreat and the Quad houses a fountain and seating area where professors and students can meet. They can also explore an immersive visualization of Hurricane Katrina, hear live concerts from the School of Music, and explore oceanographic data on the "dead zone" from the Gulf of Mexico.

LSU architecture students Paulo Perkins and David Hebert worked with the Cultural Computing Focus Area to create the virtual campus, ensuring the campus' buildings and structure retained a familiar feel.

"In visiting other university virtual campuses in Second Life, we noticed many of the students did not feel the campus was the same," Beck said. "That sense of connectivity is very important to students who may feel uncomfortable in a virtual environment, so we wanted to keep roughly the same elements and design as LSU in real life."

The Second Life campus is mainly limited to buildings of the Quad and the second quadrangle behind Thomas and David Boyd Halls. Since all locations in Second Life are on islands, LSU features oceanfront property in the design.

The campus features Memorial Tower, which users can scale with their avatars for an aerial view of the campus. Class and teaching space is available in Dodson Auditorium, and Atkinson Hall offers a display area where students can showcase original art they design for Second Life.

Nicholson Hall is home to CCT's Visualization Laboratory, which features an immersive environment to study coastal modeling, hurricane simulations and other areas of scientific visualization. The Greek Amphitheatre sits behind Coates Hall, and will be the site of live concerts streamed into Second Life from the School of Music.

"In the future, LSU in Second Life could develop as a way for professors to host classes that experiment with traditional course structure, and it will become a way students can test how to digitally capture and recreate original work," Beck said.

Users who already have Second Life installed can get a free avatar to explore the LSU Virtual Campus.

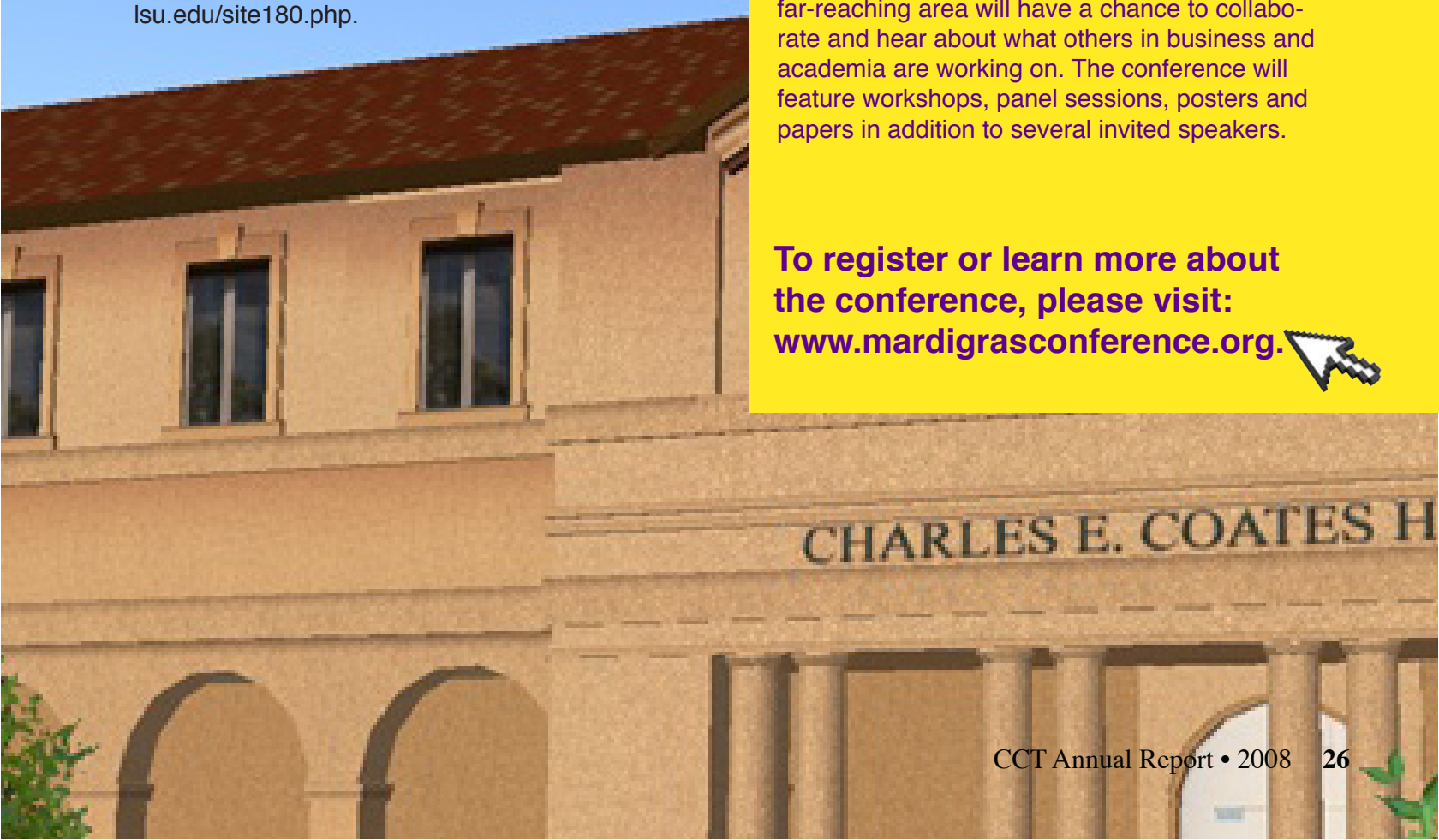
To reach LSU's virtual campus, go to http://slurl.com/secondlife/LSU%20CCT/212/184/22.

For more information on the Virtual Worlds Research Group at LSU, please visit http://www.cct.lsu.edu/site180.php.

## 16th annual Mardi Gras Conference

The CCT Cultural Computing Focus Area and the LSU Virtual Worlds Research Group will explore this topic in-depth at the 16th annual Mardi Gras Conference. The conference, which will take place Feb. 19-21, 2009, in Baton Rouge, will focus on "Virtual Worlds: New Realms for Culture, Creativity, Commerce, Computation and Communication." The conference, which brings together individuals working with virtual worlds in diverse areas such as computer science, information systems, accounting, management, psychology, sociology, philosophy, music, mass communication and many others, marks the first occasion where people working in this broad and far-reaching area will have a chance to collaborate and hear about what others in business and academia are working on. The conference will feature workshops, panel sessions, posters and papers in addition to several invited speakers.

**To register or learn more about the conference, please visit: www.mardigrasconference.org.**



# CCT 2008 Education and Research Highlights

•The National Science Foundation selected CCT Director Ed Seidel as director of its Office of Cyberinfrastructure, where he oversees advances in supercomputing, high-speed networking, data storage and software development on a national level. Seidel began his position Sept. 1, 2008, retaining his faculty positions and CCT affiliation at LSU.

•Anshul Tandon, who worked with Professor Thomas Sterling's group at the CCT, was the sole University medalist at Summer 2008 commencement, graduating with a 4.0 GPA. He has accepted a job with Google.

•LSU named 100 outstanding research and creative faculty as its first group of University "Rainmakers," selecting those who are nationally and internationally recognized for innovative research and creative scholarship, who compete for external funding at the highest levels and who attract and mentor exceptional graduate students. Ten faculty members of the Center for Computation & Technology are included among the first group of LSU Rainmakers. They are:

•Ed Seidel •Jagannathan 'Ram' Ramanujam •Joel Tohline •Jorge Pullin •Sitharama Iyengar •Rudy Hirschheim
•Stephen David Beck •Sue Brenner •Sumanta Acharya •Thomas Sterling

• The journal "Classical and Quantum Gravity" chose the article "A multi-block infrastructure for three-dimensional time-dependent numerical relativity" by CCT researchers Erik Schnetter, Peter Diener, Ernst Nils Dorband and Manuel Tiglio as one of its "Highlights of 2006 and 2007."

•Ed Seidel was selected as a 2007 Fellow of the American Physical Society

•Daniel S. Katz, CCT and LSU Department of Electrical and Computer Engineering, gave the keynote address at the Latin American Conference of High-Performance Computing in August 2007. He also is associate editor for a new publication, "International Journal of Grid and High Performance Computing."

•Joel Tohline, CCT and LSU Department of Physics & Astronomy professor, was named as an American Association for the Advancement of Science (AAAS) Fellow. Election as a fellow is an honor bestowed upon AAAS members by their peers in recognition of their efforts toward advancing science applications deemed scientifically or socially distinguished.

•LSU students won first place in the video game course competition in both the Fall 2007 and Spring 2008 semesters. In Fall 2007, Kevin Kolz, Jason Harang, Kyle Nunez and John Lewis of the game "Psychic Ball Roller" won, and in Spring 2008, Joshua Wascom and Nicholas Scheurich won for their game, "Aristeia."

•Susanne C. Brenner, CCT and LSU Department of Mathematics professor, has been re-appointed as Associate Editor of the SIAM Journal of Numerical Analysis. This will be her fourth three-year term for this journal.

•Elena Caraba, a CCT student researcher and mathematics major, was a University medalist in the Spring 2008 semester

•The Association for Information Systems (AIS) named CCT and E.J. Ourso College of Business Professor Rudy Hirschheim an AIS fellow. The AIS Fellow award recognizes individuals who have made outstanding contributions to the information systems discipline in terms of research, teaching, and service.

•The LSU Computer Science department sent three teams from LSU to attend the Bearing Point-Hattiesburg Global Development Center Third Annual Programming Contest, sponsored by Bearing Point, Inc., where they competed against teams from University of Southern Mississippi, University of Alabama at Birmingham, University of South Alabama and University of New Orleans. The competitors on two of the teams were CCT undergraduate students. Team 1, which finished first, consisted of Ian Wesley-Smith, Razvan Carbunescu and Michael Miceli. All three students are CCT research students and this team finished first overall, with four problems solved in four hours. Team 2 consisted of Riley Andrews, Chris Miceli and Rodrigo Farnham. Chris Miceli is a CCT research student and this team was fourth overall with four problems solved. Team 3 consisted of: Jason Kincl, Adrian Guillory and Matthew Gavin. Jason and Matthew are CCT students working in the HPC and IT groups respectively. This team came in 11th overall, with two problems solved. Isaac Traxler and Josh Abadie of CCT's high-performance computing group coached all three teams.

•Bijaya Karki, Ph.D., CCT and LSU Department of Computer Science, won the 2008 Phi Kappa Phi non-tenured faculty award in the natural and physical sciences.

•Shantenu Jha, CCT and Department of Computer Science, and Daniel S. Katz, CCT and Department of Electrical and Computer Engineering, were co-authors of the International Supercomputing Conference 08 Outstanding Paper, "Distributed I/O with Para

•The National Science Foundation selected Daniel S. Katz, CCT and LSU Department of Electrical and Computer Engineering, as TeraGrid GIG (Grid Infrastructure Group) Director of Science, where he will work with the national user community to ensure TeraGrid is adequately serving their needs and fulfilling its responsibilities as the backbone of U.S. cyberinfrastructure.

•Several CCT faculty and students were honored at the 2008 College of Basic Sciences Honors Convocation for outstanding work in the previous academic year, including:

•College of Basic Sciences Graduate Teaching Award – Thomas Sterling

•Dr. Greg Hussey College Achievement Award - Anshul Tandon

•Award of Excellence - Razvan Carbenuscu

•Award of Distinction - Carrie Butler

•Student Research Award Winners – Kevin Kolz and Alex Nagelberg, both of whom work with Gabrielle Allen.

## CCT Laboratories

CCT houses several laboratories to conduct research in various elements of cyberinfrastructure development, including hardware, software, applications and networking.

### Tangible/Visualization Laboratory

Research Lead: Brygg Ullmer

This laboratory conducts research projects in tangible and embedded interaction, an emerging field that manipulates physical objects (e.g., paper, blocks, furniture and clothing) to make them interfaces for digital information. This field has important implications for many businesses, including video conferencing, health care, entertainment, consumer products, software applications, and beyond. The laboratory also experiments with scientific visualization, which creates 3-D and other animations or simulations of scientific events including biomedical processes, natural disasters and astrophysical occurrences.

### Advanced Computer Architecture Laboratory

Research Lead: Thomas Sterling

The Advanced Computer Architecture Laboratory develops hardware and programming environments for large-scale systems. This group is currently working on ParalleX and graphics processor unit testing for petascale machines.

### Telepresence Laboratory

Research Lead: Andrei Hutanu

The Telepresence Laboratory explores and tests applications for high-definition video through advanced networking, including videoconferencing, high-definition video streaming and real-time connections. This laboratory is integral to the high-definition capability classroom the CCT created in Coates Hall on the LSU campus, as well as to the two high-definition-streamed courses the Department of Computer Science offers.

### Laboratory for Creative Arts & Technologies

Research Lead: Stephen David Beck

Researchers within CCT's Cultural Computing Focus Area use the Laboratory for Creative Arts & Technologies to explore high-performance computing applications for the arts and humanities. The laboratory is leading projects in digital media and established the ICAST immersive audio sound theater, one of only a handful of large-scale loudspeaker orchestras in the United States, for electro-acoustic music research.

### LaNet Laboratory

Research Lead: Jay Park

The LaNet group researches a plethora of topics in networking, including protocols, modeling and analysis, sensor networks, wireless networks, network simulator development and network measurement.

### Tier 2 Visualization Laboratory

Research Lead: Jinghua Ge

This scientific visualization-focused laboratory is a resource for faculty across the LSU campus who need advanced visualization assistance. The laboratory features a large-scale visualization wall to project images. Faculty from any discipline can use the laboratory to collaborate with researchers who have experience in advanced scientific visualization for assistance with projects.

# CCT-Sponsored Conferences and Events 2007-08

Digital Media Education Forum
Dates: November 1-2, 2007
Attendees: 75
Location: LSU campus

15th Annual Mardi Gras Conference:
Distributed Computing
Dates: January 30-February 2, 2008
Attendees: 100
Location: Hilton Capital Center, downtown Baton Rouge

Workshop on Automating the Development of Scientific Computing Software
Dates: March 5-7, 2008
Attendees: 40
Location: LSU campus

Finite Element Circus and Rodeo
Dates: March 7-8, 2008
Attendees: 100
Location: LSU campus

4th Annual Red Stick International Animation Festival
Dates: April 16-19, 2008
Attendees: 4,000
Location: Downtown Baton Rouge Arts District – Shaw Center for the Arts, Manship Theatre, Old State Capitol, Louisiana Art & Science Museum

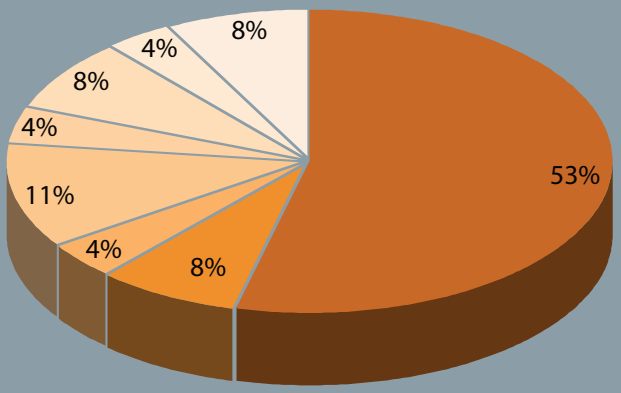
SC08 Summer Education Workshop:
Integrating Computational Science into the Undergraduate Curriculum
Dates: June 8-14, 2008
Attendees: 15
Location: LSU campus

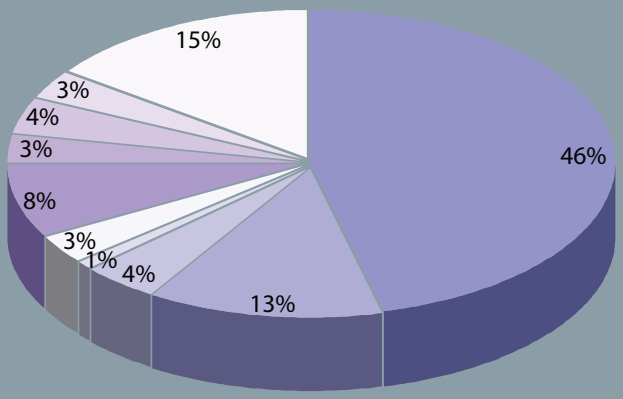
# Lectures 2007-08

IT Eminent Lecture Series
Sponsored by CCT in partnership with LSU Department of Computer Science
Location: LSU campus
Speakers Fall 2007-Summer 2008: 4

# CCT Lectures

Sponsored by CCT and held on LSU campus
Speakers Fall 2007-Summer 2008: 35
CCT Colloquium Series – 21
CCT Distinguished Lecture – 1
Computing the Arts & Humanities Lecture Series – 1
Digital Media Speaker Series – 4
Frontiers of Scientific Computing Lecture Series – 6
Visions for Quantitative Biology Lecture Series – 2



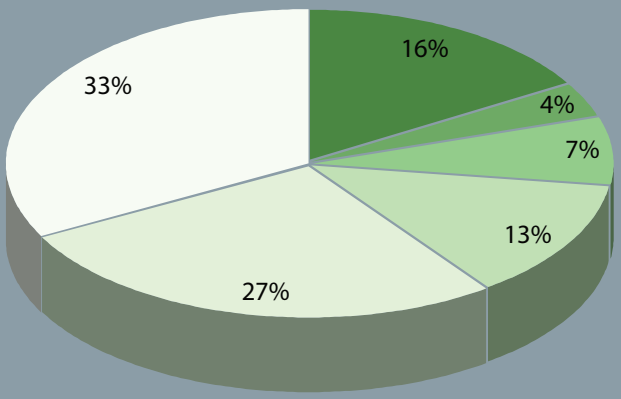



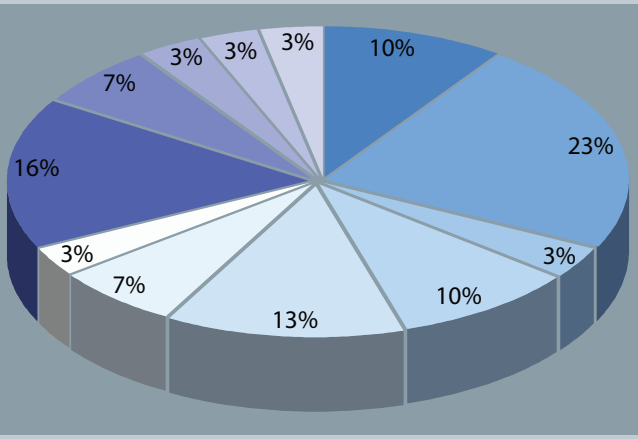

## CCT Graduate Assistants by Department for 2008

- Computer Science
- Electrical & Computer Engineering
- Electrical Engineering
- Information Systems & Decision Sciences
- Mechanical Engineering
- Music
- Petroleum Engineering
- Physics

## CCT Investment Summary 2007-08

- Salary
- Other/Fringe
- Graduate Students
- Undergraduate students
- Travel
- Operating Services
- Telecommunications
- Supplies
- Professional Services
- Capital Outlay



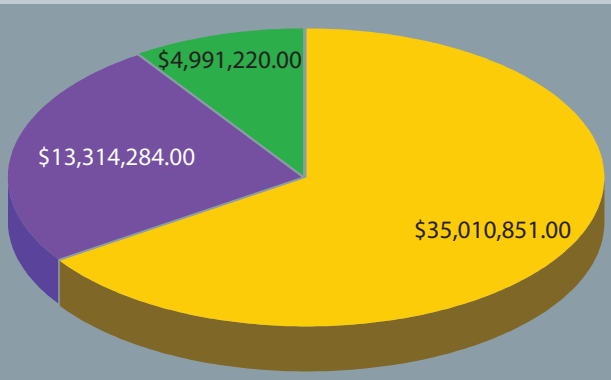




## CCT Professional Staff for 2008

- Administrative
- Baton Rouge Digital Industries Consortium
- Business/ISDS
- Postdoctoral Researchers
- Research Scientist
- Technical

## CCT Faculty by Department for 2008

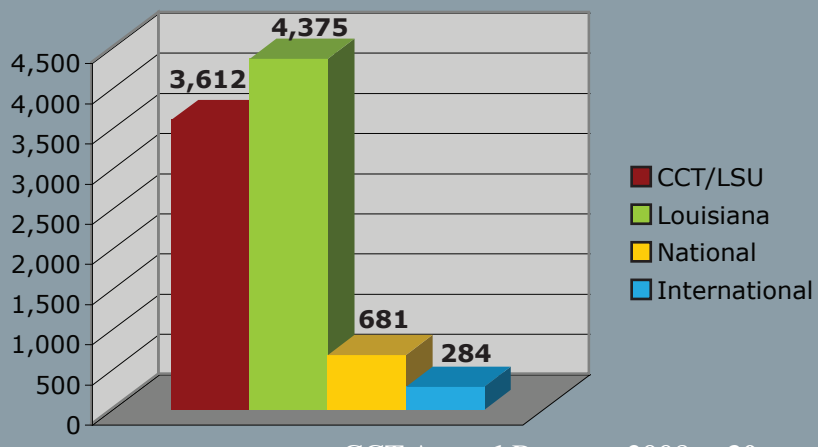
- Mathematics
- Computer Science
- Mass Communication
- Information Systems and Decision Science
- Electrical & Computer Engineering
- Petroleum Engineering
- Music
- Physics
- Mechanical Engineering
- Environmental Engineering
- Finance
- Oceanography & Coastal Sciences (WBI)




## External Funding By Source

- Federal
- State
- Other

## Total Event Participation 2007-2008



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# COMPONENTS | 2008

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