

# impact



Using eight Sony Playstation 3 units, Dr. Frank Mueller has built a supercomputing cluster capable of high-performance computing.

## NC State Engineer Creates First Academic PS3 Computing Cluster

### Dr. Frank Mueller releases the power of the Playstation3 for science and education

We've all seen the commercials for the blade servers touting the plug-in ease with the ability to organize data for an entire company. But at what price? At NC State University, Dr. Frank Mueller imagined using the power of the new Sony Playstation 3 (PS3) to create a high-powered computing environment for a fraction of the cost.

Mueller, an associate professor of computer science, has built a supercomputing cluster capable of both high-performance computing and running the latest in computer gaming. His cluster of eight Sony PS3 machines – the first such academic cluster in the world – packs the power of a small supercomputer,

but at a fraction of the cost.

"Clusters are not new to the computing world," says Mueller. "Places like Google, the stock market, automotive design companies and scientists use clusters, but this is the first academic computing cluster built from PS3s."

"Scientific computing is just number crunching, which the PS3s are very good at given the Cell processor and deploying them in a cluster," says Mueller. "Right now one limitation is the 512 megabyte RAM memory constraint, but it might be possible to retrofit more RAM. We just haven't cracked the case and explored that option yet." Another problem lies in limited speed for double-precision calculations required by scientific applications, but announcements for the next-generation Cell processor address this issue.

"In the computing world there is a list of the top 500 fastest computers," says Mueller. Currently the fastest is BlueGene/L, a super-computer with over 130,000 processors at Lawrence Livermore National Laboratory. The PS3 cluster at NC State does not break (See PS3 Cluster page 4)

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### A message from department head, Dr. Mladen Vouk

"Impact" is the perfect name for our new bi-annual publication, designed especially for business and academic leaders, because that is what you expect, and that is what we do everyday here in the Department of Computer Science at NC State University. As we enter our 40th year, please join us in celebrating our rich history of positively impacting industry, technology, and people.



The Renaissance Computing Institute (RENCI) at NC State features a 14 x 8-foot visualization wall

## Renaissance Computing Institute at NC State Opens

The Renaissance Computing Institute (RENCI) at NC State University celebrated its official grand opening on Friday, March 23, 2007 with an open house showcasing its technologies and early collaborations with NC State researchers.

Founded in 2004 as a major collaboration among Duke University, NC State University, the University of North Carolina at Chapel Hill, and the state of North Carolina, RENCI brings together researchers from all disciplines to address the state's most challenging multidisciplinary problems. By applying technological expertise and world-class computing, networking, visualization and data resources to these issues, RENCI strives to create a collaborative 21st-century, problem-solving environment that will spur economic growth and lead to the next generation of transformative discoveries.

With the opening of RENCI at NC State, faculty and staff on the NC State campus now have access to RENCI resources, staff and collaborators and have the opportunity to contribute to these ongoing research projects. Members of the NC State community also will take the lead on new multidisciplinary research efforts that utilize RENCI's visualization, computing and data resources and leverage the campus' expertise in agriculture, environmental sciences, physics, engineering, computer science and other fields. ▲

NC State is among the 25 "Most Connected Campuses" in the nation, according to the editors of *The Princeton Review*. Criteria including the breadth of the computer science curriculum; the sophistication of campus technology, including streaming media of classes and extracurricular offerings; availability of school-owned digital cameras and equipment for student use; wireless Internet access on campus; and support for handheld

## New Strategic Advisory Board Members Named

We are pleased to announce the addition of four new members to the department's Strategic Advisory Board (SAB):

**Sidd Chopra** (CSC B.S. '88) – President & Founder of Analytrix LLC.

**Gail Kramer** (CSC B.S. '85) – VP, Business Intelligence Clients w/ SAS Institute

**Eric Wagner** – Senior Director, NAS Solutions w/ EMC Corporation

**Mark Wyatt** (CSC B.S. '80) – VP, IT Business Applications w/ Duke Energy

The SAB is a cornerstone of the computer science department's strategic planning efforts.

## Faculty Impact

**Dr. Ana (Annie) Antón**, Associate Professor of Computer Science, has been appointed to serve on the Department of Homeland Security Data Privacy and Integrity Advisory Committee. She was also among 80 of the nation's brightest and gifted young engineers selected to participate in the 12th annual U.S. Frontiers of Engineering Symposium by the National Academy of Engineering.

**Dr. Donald Bitzer**, Distinguished University Research Professor of Computer Science, has been inducted into the *Consumer Electronics Hall of Fame* by The Consumer Electronics Association for his efforts in advancing television technology.

**Dr. Frank Mueller**, Associate Professor of Computer Science, and **Theresa-Marie Rhyne**, Director of the Center for Visualization & Analytics, have been recognized by the ACM as Senior Members for 2006.

**Dr. Peng Ning**, Associate Professor of Computer Science, served as a guest editor for the Feb. '07 issue of *The Journal of Computer Security* featuring articles on security for ad hoc and sensor networks research.

**Daniel A. Reed**, Director of RENCI, Chancellor's Eminent Professor and Vice-Chancellor for IT at UNC-CH, and adjunct professor for the NC State department of computer science, has been appointed to the President's Council of Advisors on Science and Technology.

**Dr. Carla Savage**, Professor of Computer Science, was featured in the December 2006 issue of *Notices of the American Mathematical Society*. In addition to the feature article entitled "The Search for Simple Symmetric Venn Diagrams", the work of Savage and her colleagues was featured on the magazine's cover.

**Dr. Laurie Williams**, Associate Professor of Computer Science, has received an Outstanding Teaching Award from the NC State Office of the Provost, and named to the Academy of Outstanding Teachers.

**Dr. Michael Young**, Associate Professor of Computer Science, has been named the new Editor-in-Chief of the *Journal of Game Development*.

## Team goes uptown in DARPA Urban Challenge

The Insight Racing team will field a driverless Lotus Elise (shown below), provided by Lotus Engineering, to compete in the 2007 DARPA Urban Challenge.

The product of a collaboration among NC State, Insight Technologies Inc., Lotus Engineering Inc. and the Advanced Vehicle Research Center (AVRC), the technology that will guide the Elise through city streets may one day revolutionize not only the way the military performs missions but also the way that commuters drive to work each day.

**This is the only team representing the state of North Carolina in the DARPA Urban Challenge.**

"The College of Engineering is excited about being a part of this event," said Dr. Louis Martin-Vega, dean of the College of Engineering at NC State. "Our students will be able to use their engineering skills to solve real-world problems that will one day help save lives."

Entered as one of the 78 Track B teams — *and the only team representing North Carolina* — in the 2007 Grand Challenge, the Insight Racing team hopes to advance to the final Urban Challenge event in November 2007.

The team placed 12th out of a field of 196 applicants in the 2005 DARPA Grand Challenge. ▲



From left - Dr. Bob Fornaro, Blake Lucas, Josiah Gore, John Streicher, Eric Helms, Hunter Davis, and Margaret Heil

## Project Team Wins IEEE International Competition

For the second year in a row, an NC State Computer Science Senior Design Center project team has won the IEEE's Computer Society International Design Competition (CSIDC).

Multidisciplinary Senior Design Center project team members **Hunter Davis** (CSC), **Eric Helms** (CSC/PY), **Josiah Gore** (CSC), and **Blake Lucas** (CSC/EE/CPE), took the \$20,000 top prize in the CSIDC 2006 World Finals held in Washington, DC on June 30-July 2.

The theme of the 2006 competition was Preserving, Protecting and Enhancing the Environment. The NC State team's project application, SunRay, uses ray-tracing combined with a numerical model of solar radiation to calculate UV exposure for any 3D graphics image. This image can be of a plant, animal, or human form.

The SunRay system collects real-time atmospheric data from a USDA-maintained sensor network as input to model calculations. Depletion of stratospheric ozone has created the potential for increased levels of dangerous UV radiation to strike the surface of the earth. SunRay is a research tool that provides detailed simulated solar exposure data that is accurate and easy for a scientist to use. The goal of the tool is to assist the scientific community so that it can more effectively provide a convincing rationale to encourage the need for policy changes oriented toward protecting the environment.

The students also won the Microsoft Software Engineering Award (\$2,000) for the project that exemplified "the best use of good software engineering principles to the design and testing of their prototype."

NC State mentors for this project were **Dr. Robert Fornaro** and **Ms. Margaret Heil** (director & associate director of the Computer Science Senior Design Center). **Mr. John Streicher** (National Oceanic and Atmospheric Administration) also served as a mentor to the team.

Over 300 teams from universities around the world submitted applications to this competition; 133 of these teams submitted reports to the judging panel. The top ten teams were selected based on a written final report submitted to the competition in the middle of April. Once at the World Finals, teams were required to demonstrate their product, trade-show style, and to deliver a formal presentation to an international panel of 10 judges.

**NC State is the only university in the US to have won this prestigious competition, and the only university worldwide to have won in consecutive years.**

Our 2005 team won the top prize for their system, NEAT: Networks for Endangered Animal Tracking. In the CSIDC 2003 World Finals, an NCSU CSC Senior Design Center team placed third with their Diet Download project. ▲

# Celebrating 40 Years of Computer Science Leadership

Please join us in the Fall of 2007 as we celebrate 40 Years of academic leadership in Computer Science at NC State University.

From our humble beginnings in Harrelson Hall in the Fall of 1967, to the recent transition into EBII, our modern new high-tech state-of-the-art teaching and research facility on Centennial Campus, the NC State department of computer science has been a leader in the production of computer science talent and technology.

In recognition of this milestone event in the life of our department, several celebratory events and activities are planned in the fall including a Leadership Speakers Series, a Geek-a-thon computer restoration weekend for students, and a Homecoming Tailgating Party for our alumni. The capstone event will be a Special Technical Symposium on October 25th featuring special keynote speaker, Steve Wozniak, co-founder of Apple Computer and honorary NC State alumnus.

For more information, consult our 40th Year Celebration web page at [http://www.csc.ncsu.edu/department/40th\\_year.php](http://www.csc.ncsu.edu/department/40th_year.php)

## PS3 Cluster continued from page 1

into the top 500, but Mueller estimates that with approximately 10,000 PS3 machines anyone could create the fastest computer in the world - albeit limited by single-precision capabilities and networking constraints.

The Sony PS3 allows the Linux operating system to be installed, and IBM designed the programming environment for programming the

Cell processor (including eight vectorization units), which combined tremendous computing power within a single PS3. According to Mueller, each PS3 unit contains six operational special-purpose cores for number crunching and one general-purpose core that is two-way multithreaded in his configuration, so the eight machines clustered have 64 logical processors, providing plenty of number-crunching ability in addition to running the latest games.

"January 3, 2007 is the 'birthdate' of this cluster," says Mueller. "Of course, here at NC State we will use it for educational purposes and for research. We are working with scientists to determine the needs and how our cluster can be used to their benefit, and our computer science faculty is already using the cluster to teach classes in operating systems, with parallel systems, compilers and gaming likely to follow." ▲

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