

New data transfer protocol may boost bandwidth efficiency

The new Binary Increase Congestion Transmission Control Protocol (BIC-TCP), developed by NC State computer scientists, will be particularly useful for financial institutions, scientists, and others who need to get volumes of real time data every day.

While high-speed Internet has plenty of bandwidth available, managing traffic requires balancing the needs of high volume data pushers against individuals downloading music and other low-volume users. Increasing the window to allow more data through may help the high-end users but can crowd out the others.

BIC resolves this “by scaling its window increase function to be more aggressive without diminishing the fairness properties of TCP too much,” says Dr. Injong Rhee, assistant professor, who developed the new protocol along with colleagues Dr. Khaled Harfoush, assistant professor, and post-doc-



Dr. Injong Rhee, associate professor

toral student Dr. Lisong Xu.

“Basically, we view congestion control as a search problem where congestion control needs to find the fair and efficient transmission rate (or target rate) for the end-to-end path” on which the current connection is running.

He explains BIC: Using binary search – a

Continued on page 6

With post-doctoral research Barnes continues working toward her goals



Dr. Donald Bitzer, Distinguished University Research Professor, has been inspiring students, from undergraduates through postdocs, for over 50 years. He currently has 10 students working with him, including Dr. Tiffany Barnes (above). Read about his views on creativity in education on page 7.

Sometimes it just works out that what you like to do is also what you’re good at.

That’s what Dr. Tiffany Barnes (’03) discovered as she advanced through high school and later college at North Carolina State University, earning her bachelor’s and master’s degrees in math and computer science and a doctorate in computer science.

Now a postdoctoral researcher, Barnes is continuing her research while helping to share both her knowledge and excitement about the possibilities in computer science, especially for other women.

With Dr. Donald Bitzer, Distinguished

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Kudos

Xinyuan Wang, doctoral student advised by Dr. Douglas Reeves, advanced to the national Grand Finals of the Association of Computing Machinery (ACM) Student Research Competition.

He had placed second in the graduate division of ACM’s Special Interest Group Computer Science Education (SIG-SCE) student competition in March.

Neha Jain, in the Accelerated Bachelor’s/Master’s program, was selected to receive a Google Anita Borg Scholarship.

Matthew Vail, senior, received the Fall 2004 Cisco Systems Undergraduate Information Assurance Scholarship.

Martin Davidsson and Ryan Sturmer are student winners of the International Challenge for Eclipse (ICE) contest. Dr. Laurie Williams won in the teacher category based on her students’ entries.

Dr. George Rouskas was named to NC State’s Academy of Outstanding Teachers and received the Alcoa Foundation Engineering Research Achievement Award.

Chris Franklin won the first Game Boy Advantage competition held by NC State’s Game Developers’ Club.

Machon Gregory received NC State’s Brotherhood Award.

Kevin Vaughan and Michael Daly received honorable mention in Epic Games’ Make Something Unreal Contest in April 2004.

Inside this issue

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- Alumni: on digital imaging, teamwork, p. 10, 11

Personnel notes

Faculty appointments, changes

Dr. Dennis Bahler, associate professor, named interim undergraduate program director, effective February 2004

Dr. Karl Branting is leaving academia for a full time position in the artificial intelligence lab of BAE Systems in Columbus MD.

Dr. Richard Mayr joins the department as assistant professor, beginning August 1.

Mayr received his Ph.D. from TU-Munich in Germany. His research in formal methods focuses on model checking, semantic equivalences, term rewriting, theorem provers, and tableau methods. He has published eight papers in refereed journals and 23 other refereed papers.

Mladen Vouk, professor, named interim department head, effective July 1, 2004

Staff appointments, changes

Jennifer Anderson, faculty secretary, Centennial Campus, Venture I and III

Jennifer Craddock, advanced to research facilitator.

Missy Seate, accounting clerk, department office.

Gary Stelling, systems program adminis-

Bitzer honored by his alma mater

Dr. Donald Bitzer, professor, received the Alumni Award for Distinguished Service from his alma mater, the University of Illinois at Urbana-Champaign.

The award recognizes his significant contributions to the field of computer science, including his pioneering work in computer-assisted education that helped to make the PLATO system known worldwide.

Bitzer realized early in its development that a display with memory was needed to make the system successful. He and his colleagues developed an electronic display in which each pixel on the screen glowed like a little neon sign. The plasma panel served as both a display and a storage device, accepting digital information directly from the computer and storing it on the panel, solving the scalability problem that plagued the use of

trator, retired February 2004

John Stone, electrical technician IV, started October 2003

NSF CAREER Awardees

Dr. Khaleed Harfoush, assistant professor, and **Dr. Laurie Williams**, assistant professor, both received NSF Early CAREER Awards this spring.

They bring the total NSF CAREER Award recipients in the computer science department to 12, an unprecedented departmental total for the college.

The CAREER Awards are the highest honor bestowed on young faculty members. Awardees are selected on the basis of creative, career-development plans that effectively integrate research and education within the context of the mission of their institution.

Harfoush and Williams join the following in the department's list of CAREER award recipients:

- | | |
|--------------------|------------------|
| Annie Antón | George Rouskas |
| Vincent Freeh | Munindar Singh |
| Christopher Healey | Peter Wurman |
| James Lester | R. Michael Young |
| Frank Mueller | |
| Injon Rhee | |

cathode ray tubes in computer display monitors.

This invention enabled the development of today's large-screen flat-panel televisions and earned for Bitzer the 2002 Scientific and Technology Emmy Award from the National Academy of Television Arts and Sciences. [Abstracted from a University of Illinois Urbana-Champaign publication.]

Tharp named to accreditation commission

Dr. Alan Tharp, professor, has been named to the Computing Accreditation Commission of ABET, the Accreditation Board for Engineering and Technology, Inc. Accreditation is a voluntary, non-governmental process of peer review for academic programs.

Technical papers

Computer science faculty members' technical papers are posted online at <http://www.csc.ncsu.edu/research/>

Injong Rhee, Jangwon Lee: Distributed Scalable TDMA Scheduling Algorithm

Injong Rhee, Jangwon Lee: Energy-efficient Route-aware MAC protocols for Diffusion-based Sensor Networks

Laurie Williams, William Krebs, Lucas Layman: Extreme Programming Evaluation Framework for Object-Oriented Languages Ver. 1.3

Laura E. Jackson, Matthias F. Stallmann: Directional p-Median in Two Dimensions is NP-Complete

Anita Nagarajan, Jaydeep Marathe, Frank Mueller: Detailed Cache Coherence Characterization for Open MP Benchmarks

Neha Jain, Annie Antón, William H. Stuf ebeam, Qing-feng He: Security and Privacy Requirements Analysis Tool Software Requirements Specification Ver. 1.06

Jie Su, Douglas S. Reeves: Replica Placement with Latency Constraints in Content Distribution Networks

Nachiappan Nagappan, Laurie Williams, Mladen Vouk, Jason Osborne: Initial Results of Using In-Process Testing Metrics to Estimate Software Reliability

Qinglin Jiang, Douglas S. Reeves, Peng Ning: Certificate Recommendations to Improve Robustness of Webs of Trust

Laurie Williams, Lucas Layman, William Krebs, Annie Antón: Exploring the Use of a Safe Subset of Extreme Programming: An Industrial Case Study

Aravindh Anantaraman, Kiran Seth, Kaustubh Patil, Eric Rotenberg, Frank Mueller: Exploiting VISA for Higher Concurrency in Safe Real-Time Systems



Read about Computer Science Achievers online at http://epartners.ncsu.edu/alumni_spotlight.html

Building project 'on schedule'

Construction for the new Computer Science-Computer and Electrical Engineering building is under way on Centennial Campus, with completion anticipated by summer 2005, according to David Lombardi, building construction and management specialist for the College of Engineering.

"Structural steel will be going up shortly," he said in early May. The building will provide 210,000 gross square feet of space for classrooms, research areas and offices, says Ron Hartis, director of operations for the computer science department.

The \$35 million facility is funded by the University of North Carolina Higher Education Bond Referendum,



Construction site photo May 11, 2004. More photos and details online at http://www.csc.ncsu.edu/departments/facilities/newbldg_info.php.

and is the second phase in the relocation of the College of Engineering to Centennial Campus.

Naming opportunities for the new

building are outlined in the Corporate Relations section of the computer science department's Website, <http://epartners.ncsu.edu/>.

Faculty study expanding role for laptops in the classroom

Five computer science faculty members are participating in the College of Engineering's Laptops for Enhancing Teaching program, a part of the COE's student owned computing initiative.

Each faculty member received a laptop computer for use in developing meaningful ways to incorporate laptops in classroom instruction.

Dr. James Lester, associate professor, says "it will be great to take advantage of the laptop to do inclass interactive demonstrations of the algorithm and data structures" that his students are learning.

Dr. David McAllister, professor, says the laptop will enable him to run his "Mathematica notebooks without having to constantly worry about Mac to PC conversions and to be able to do realtime" multimedia illustrations.

Also participating are Drs. George Rouskas, Munindar Singh and Ting Yu. Read more about this project online at www.csc.ncsu.edu/news/

Communications notes

Visitors to the computer science department's Website will find a few changes under way.

The site is being refreshed by Webmaster Carlos Benevente to conform with accessibility guidelines and to improve navigation with the addition of links by user group and other features.

Anna Rzewnicki, associate director of external relations, has been adding news and features stories, providing Web visitors insight about the department. New Alumni and Corporate Relations links have been created, and those pages are being updated. The Corporate Relations link includes information about ePartners and other corporate partnership opportunities.

This summer, a new e-newsletter will be launched, with a related Web page providing links to alumni and news sites not only within the department, but on the college's and university's Websites as well.

Your feedback is welcome. Please submit comments about the Web-

site by e-mail to Benevente at help@csc.ncsu.edu. Submit news and feature suggestions to Rzewnicki at rzewnicki@csc.ncsu.edu. While checking out the Website – <http://www.csc.ncsu.edu/> – don't forget to update your alumni information.

Information kiosk coming

Visitors to the computer science department's Withers Hall offices on main campus will soon find a new desktop kiosk providing calendar notes, maps and other useful information.

The interface for the kiosk is being created by Computer Service Partners, the company formed by alumnus and computer science Strategic Advisory Board member Bill Riddick.

Research brochure online

The latest edition of the Department of Computer Science's Research Brochure is available online at <http://www.csc.ncsu.edu/research/brochure/2003/brochure.pdf>.

Applied learning

Co-ops, international exchanges provide practical experience

Nearly 70 computer science students this academic year are gaining real-world experience through North Carolina State University's Cooperative (Co-op) Education Program.

Two others are heading overseas through NC State's chapter of IAESTE, the International Association for the Exchange of Students for Technical Experience.

Three of the Co-op Program students – Stephanie Lynch and Michael Ramirez, both juniors, and Ken Marker, a senior – are continuing their ongoing co-op assignments, while Neha Jain, also a senior, has moved into a computer science department research support position.

Lauren Wellborn and Keith Crawford, both juniors, opted for an international experience, which will allow them to travel as well as put their knowledge to work.

Wellborn will be working with DHI Water and Environment in Copenhagen, developing algorithms and software for water resources allocation and reservoir operation, involving stochastic analysis and optimization methods.

Crawford is headed for Lima, Peru, where he will be working with Pacific Consulting Network, doing Web application development using Java.

Ramirez will again be working as team leader for an ongoing project with the Space and Naval Warfare Systems (SPAWAR) Command. Based in San Diego, SPAWAR is the U.S. Navy's chief engineer for command, control, communications, computer and intelligence systems. Ramirez, a scientific aide, is



Stephanie Lynch, left; Neha Jain; Vickie Williams, co-op assistant director; and Michael Ramirez

team leader for a sensor integration systems design project, working in Charleston, SC. He began working on the project in the summer after his freshman year.

When asked how he manages as a student leading three full-time staff members, he acknowledged some initial skepticism on the part of his team. "But I have a love for this type of work and I think I'm a fairly decent leader, so with a combination of the two, we've now meshed," he says.

Lynch is heading back for a third semester with the Department of Defense (DOD) at Ft. Mead, MD. She met a recruiter for the agency while serving as an ambassador during a minority career fair at NC State.

Her assignments have varied with each stint, Lynch says. "The first time, I worked on a database for deployment services, developing a system for matching needs and wants of the personnel. In her second assignment, she served on a help desk for a DOD database that provided information about different countries. She'll learn about her assignment for this summer when she arrives.

Lynch says the Co-op Program is providing her valuable work experience that will help as she begins her fulltime job search. She's also begun building her

professional network, another valuable asset for launching her career. "Even if I don't get selected (for a position with her current agency) I now have people I can contact."

Marker is returning to IBM in the Research Triangle Park, where he has worked four semesters in pervasive software testing.

"Testing is a great way to gain experience with a wide variety of technologies," he says. "I'm working with many different server hardware and software platforms and testing many cutting edge software applications."

Jain, who now is in the computer science department's combined bachelors/masters degree program, has completed her co-op experience.

She worked last summer and fall with Sony Ericsson's mobile communications unit, setting up flashing stations where new software was put in the GSM phones. SIM (Subscriber Identity Module) cards were used to simulate environments for testing purposes. She also trained the new co-op students to use new phones and equipment and worked with a diverse group of people.

Jain is now completing research that she's been working on with Dr. Annie Antón, associate professor of software engineering, regarding the Health Insurance Portability and Accountability Act (HIPPA). Later this summer, she will begin working as Antón's research assistant.

Related links

Computer science news & features: <http://www.csc.ncsu.edu/news/>.

NC State's Cooperative Education Program: http://www.ncsu.edu/co-op_ed/



Lauren Wellborn and Keith Crawford

24 Senior Design team projects presented at Posters & Pies

For over 10 years, computer science undergraduates have been pulling together all they've learned to complete projects posed to them through the capstone CSC 492 course.

They're led in their efforts by Dr. Robert Fornaro, professor and director of the Senior Design Center.

"The center was created to help students develop the teamwork, leadership, and communication skills that are essential for today's increasingly competitive global workforce," Fornaro says.

"As the technology industry continues to grow and advance, the analysis and problem solving skills that our students master will be increasingly valuable, and they will help set our students apart as they meet potential employers," he says.

"The projects and mentorship support of our sponsors are a very important part of the total education that we provide here at NC State."

Sponsoring companies or units within NC State provide a software problem or project-in-process for the student teams to analyze and resolve, working with a company mentor. Duke Energy and Fujitsu are among the first sponsoring companies. [Read more about sponsorship involvement on page 9.]

During the 2003-04 academic year, a total of 165 students worked on 42 sponsored projects through this course.



Katherine Raynor explains her team's SafeSPACES project to a Posters & Pies guest.

Student projects were presented at the April 27 Posters & Pies, attended by



Lauren Shupp explains the Table PC project, sponsored by Network Appli-ance, to Posters & Pies visitors.



Three of the Tavve Software Voice Activated Wi-Fi Alarm Clock team members talk with mentor James C. Tetterton (B.S., '00) second from left. Team members are Kristina Honeycutt, Greg Cymbalski and Derek Osterhoudt. Tetterton is completing his master's in computer science. Student team member Charles Hart was not available for the photo.

about 300 parents, students, sponsors and other guests, including several Raleigh television reporters.

This spring, the lineup included computer science students providing software support for three multidisciplinary teams developed through the College of Engineering's new Engineering Entrepreneurs Program.

Other projects this semester ranged from software for a new voice-activated alarm clock being developed by Tavve Software to software linking tablet PCs for interactive classroom use.

One Senior Design team was formed to enter the Fifth Annual Computer Society International Design Competition. The theme for this year's competition is 'Making the World a Safer Place.'

The NC State team advanced to the semifinals with its project, SafeSPACES. Their software will enable schools to track their students, including what school bus they are on and who picked them up from school.

At earlier demonstrations, several school principals were interested in the project, says Katherine Raynor, one of the team members. Also on her team are Robert Hopkins, Luke Lenzen and Stephen Maddox.

Last year, a Senior Design team advanced to third place worldwide in the finals for its Diet Download project.

On the SDC staff are Margaret Heil, associate director; Carol Miller, faculty advisor; Kelly Potter, technical communication advisor; Ben Tilley, laboratory manager; Steve Bento, faculty advisor; and John Stone, technical support.

For information about sponsoring a project, contact Ken Tate, ePartners program director, tate@csc.ncsu.edu; phone: 919-513-4292.



Nearly 400 attending annual ACM/AITP Pig Pickin'

A roasted pig, platters of fried chicken, a selection of vegetarian options and plenty of beverages ... those were the fixin's for a relaxing spring evening at Pullen Park, marking the end of NC State's Dead Week.

The pie was actually for the pie toss, so only a select few got a taste of the banana cream, but everyone else enjoyed the laughter, sunshine and a chance to unwind. The 10th annual picnic was presented again by ACM/AITP, with vegetarian food added this year by members of Women in Computer Science. ePartner Cisco returned as corporate sponsor, joined by the College of Engineering's E-Council, and Microsoft provided prizes.



Faculty, staff honored

Students did more than toss pies at willing faculty members. Following a bit of volleyball, water balloon tossing and lots of dining, they recognized the following faculty and staff members for their service to computer science students in the past year.

Joyce Hatch, CSC coordinator of advising and lecturer – and long-time chef for the annual pig pickin' – was selected as the Most Helpful Staff Member in recognition of her outreach to all students. Her response on receiving the award: "You are the awesome people."

Receiving the 2004 Best Lecturer Award was Carla Savage, professor.

The 2004 Most Helpful Faculty Member Outside of Class award went to Dana Lasher, director of student services and EPA faculty member.

Dr. Alan Tharp received a plaque in recognition of his 11 years of service as head of the computer science department.



Michael Young, assistant professor, and Rocky McMahan, adjunct instructor, above, were among the willing pie toss targets.

Two receive Bitzer Creativity Awards

The 2004 Bitzer Creativity Awards, presented to two computer science students at the Pig Pickin', recognized those students for their ability to 'think outside the box'.

David Schlorff showed his creativity by beating the record for the fewest machine instructions in coding a solution for the CSC 236 programming

course taught by Dana Lasher. His creative thinking shown in other courses landed him a spot on an NSF-funded research project on cluster analysis led by his nominator Dr. Robert Funderlic, professor of computer science, and Dr. Moody Chu, professor of mathematics.

Jesse Lovelace was nominated by Julie Starr, instructor, "because he's always

coming up with ideas for new software to write." Examples of his work include the NNIM Messenger, which is now the GNU Messenger, a secure messaging system; Crafty, a TCP/IP packet creation tool; and such open source projects as MString, Virtual Turntable and Hashish, a powerful cross-platform hash calculation tool.

Barnes

continued from page 1

University Research Professor, she's engaged in cutting-edge research applying her computer science skills in the field of genetics.

Advancing bioinformatics

Barnes recently presented a poster at the Biomedical Engineering Research Review held at UNC Chapel Hill, reporting on her work with Lalit Ponnala, an NC State electrical engineering doctoral student, in signal processing and its applications in genetics.

This is one aspect of bioinformatics being explored by the collaborative Statistical Genetics and Bioinformatics research group which includes Bitzer, researchers in various departments at NC State and industry partners.

Bioinformatics involves analyzing extremely large data sets gathered from genetics research, including DNA sequences and expressions from DNA microassays.

In addition to Bitzer, other participating computer science faculty are Dr. Jon Doyle, SAS Institute Professor of Computer Science; Dr. Steffen Heber, assistant professor, and Dr. Mladen Vouk, professor of computer science.

In addition to her work with this group, Barnes is teaching a course in applied discrete math – “the math you need to do computer science.” She teaches one oncampus session with Bitzer and another through the college's distance education program.

In that class, she's using what she learned through her doctoral research, in which she was developing statistical methods to make online tutorials adaptive for the learner, enabling them to automatically adjust to the learner.

Encouraging girls

Related links

Girls on Track: <http://ontrack.ncsu.edu/>

Computer Science Summer Camp: <http://www.engr.ncsu.edu/summerprograms/csc.html>

From magic tricks to searching for magic medical bullets Bitzer keeps creativity at the forefront

If you stop in to see Dr. Donald Bitzer in his Daniels Hall office, chances are you'll find him in an animated discussion with one or more of his students.

You may also get treated to a card trick, as Bitzer is a member of the Order of Merlin and uses magic to help explain some of the complex principles covered in his courses. He's even taught professional magicians a trick or two over the years at International Brotherhood of Magicians' meetings.

“Creativity,” Bitzer says, “is thinking out of the box.” That applies whether you're creating new magic tricks or developing techniques that may lead to a magic bullet for fighting cancer.

Madhup Mishra (M.S. '04) is one of his students who ‘gets’ the creativity that Bitzer is promoting. He had no trouble shifting gears during his recent thesis defense: instead of simply reviewing his research and findings on coding sequence detection and free energy periodicity in prokaryotes, Mishra was challenged to discuss how they might be used in future research. It's that kind of creativity that Bitzer says he hopes to encourage in students through the endowed Bitzer Creativity Award that he established at NC State several years ago.



Madhup Mishra, right, makes a last-minute review of presentation charts with his research advisor, Dr. Donald Bitzer, prior to his master's thesis defense.

to explore engineering

Barnes also is working on an ongoing project with Vouk, aimed at encouraging more young women to continue studies in math and technical fields.

The core of that project, initially funded by the National Science Foundation, is a Girls on Track summer camp for girls in grades seven to nine. It is offered in the last two weeks of June at Meredith College in Raleigh.

Barnes and Vouk are collecting data about the camp participants, tracking the choices they make in their courses of study and, ultimately, their careers. They've collected data for four years now and will be following their first group of camp participants as they enter college. One of their goals is

to determine if programs such as Girls on Track help encourage more young women to stay in math and technology.

COE Computer Science Summer Camp

This summer, Barnes is also assisting with a computer science camp – one of several COE camps offered for high school juniors and seniors interested in technology. She's working with Mike Etheridge to develop sessions that will give prospective undergraduates a sense of what computer scientists do and help them understand what they might experience as computer science majors at NC State.

Professor, former student collaborating again

...Part of team developing new JIT signaling protocol

A new Just-in-Time (JIT) signaling protocol, which will yield ultra-fast network connections, was developed jointly by the MCNC Research & Development Institute (MCNC-RDI) and several members of NC State's computer science and other engineering faculty.

At a recent demonstration, their work drew the praise of the FCC's technology chief for its potential to enhance today's network infrastructure.

On the JIT team with Dr. George Rouskas and Dr. Harry Perros, professors of computer science, and Dr. Paul Franzon, professor of computer and electrical engineering, is Dr. Iliia Baldine (Ph.D. '98), who was Rouska's doctoral student.

The protocol they are developing together "works to speed up the controls and connections" required by the Internet's "millions and billions of users," Rouskas says.

"The typical approach is to incorporate this in the software that imple-

BIC-TCP

Continued from page 1

technique used to search for an item in a database – allows the window increase to be logarithmic; it increases faster when the target rate is far away from the current transmission rate, but slows down as the current rate gets closer to the target. This ensures the stability of control while allowing the protocol to become friendlier to existing TCP traffic. Combining this search technique with additive increase allows the protocol to increase its window (or rate) faster when there is a lot of available bandwidth.

BIC, one of many TCP variants under development, received considerable media attention worldwide when initial test results were released earlier this year. Those results from testing at the Stanford Linear Accelerator Center gave it top ranking in all categories of stabil-



Dr. Iliia Baldine (with MCNC) and Dr. George Rouskas, associate professor

ments the protocol," he says. "Unfortunately, doing this at the software side is very slow compared to moving it to the hardware."

The scientists have stripped down the signaling and control protocol so that it can be implemented at the hardware level. They expect it would be applied at the router level by major Internet service providers.

The JIT protocol is now in the proof of concept stage, and was recently demonstrated for the Federal Communi-

ity, scalability and fairness. Vigorous third-party testing continues.

BIC is currently implemented in the latest version of Linux, Rhee says, noting that the code is available upon request.

"We are continuing to improve the protocol," he says. "This is still in the very early stages and needs a lot of improvement, like any protocol out there, but seems to be very promising.

"Time and peer review will determine whether this is the one to use. Every protocol has its good and bad points. Eventually, I think all of this will converge to a standard, taking the good points from all and converging into a nice, effective and lasting solution to using the high bandwidth that's available to us."

ations Commission (FCC).

Baldine, who is responsible for the project's protocol design documents and oversees the software side of implementation, says he found it easy to transition from his graduate student-professor relationship with Rouskas to a peer relationship.

"From the beginning, I found ours to be a very friendly, productive and goal oriented relationship ... we continue to be productive," Baldine says.

The fruits of their efforts were evident at a demonstration that Baldine arranged at the Advanced Technological Demonstration Network (ATDNet) in Washington, D.C., an optical network designed to allow developers to demonstrate their protocol devices.

JIT signaling, embedded in the hardware, enabled connections at five microseconds, compared to a few seconds for software-based signaling.

"So we are talking about a million times faster than any comparable protocol in software," Rouskas says.

Edmond J. Thomas, FCC chief of the Office of Engineering and Technology, says, "JIT not only has the potential to enhance today's network infrastructure but the technology also could potentially improve efficiency for applications bound by limited resources, such as the wireless spectrum.

"This protocol is yet another example of technological innovation which could result in more efficient use of the radio spectrum and hopefully lead to new and affordable services for the American public," Thomas says.

"We are still working on enhancing the protocol," Rouskas says, "adding functionality and enhancing quality of service."

Companies find value in Senior Design Project sponsorship

Red Hat sponsored four this year. Fujitsu came back for its seventh year, as did Duke Energy.

Over a dozen other companies, all computer science ePartners, enjoyed the benefits of being involved in the computer science department's Senior Design Center which manages the Senior Design Project capstone software class.

In fact, in the 10 years since Dr. Robert Fornaro launched the class, over 500 students have worked with more than 70 companies on sponsored projects.

Red Hat sponsored four teams working on various aspects of current company projects, including the launch of the Red Hat Network.

At Fujitsu, Vice President and CIO Gene Senecal says the sponsored project program "is truly a win, win, win for everyone.

"Students get a glimpse of the real world, working on real problems with real business meaning. They get to experience the same pressures and challenges they will soon encounter when they graduate," Senecal says.

"Those who have participated in this program have universally said that (it) afforded them the best opportunity during their academic life to prepare themselves for the future," he says.

Senecal adds that the benefits of such corporate involvement accrue to the university as a whole as well.

"NCSU benefits from having a strong and effective component as part of its curriculum. The community and industry benefit in that the students coming out of this program are better prepared to meet the challenges of the real world.

"The sponsors and mentors receive a tremendous sense of satisfaction knowing that they have been instrumental in shaping today's program, and helping to further someone's education.

Senecal says he has found his years of involvement with the program to be personally as well as professionally rewarding.

"From the very beginning, the program presented by Dr. (Robert) Fornaro and Ms. (Margaret) Heil showed tremendous potential and promise.

"Working together with them over the past several years, helping to shape the program to what it looks like today, seeing the effects the program has had on the students, and witnessing the pride of the mentors with every successful class that goes through this program is reward in and of itself," he says.

"We truly believe the efforts, like those made by Fujitsu Transaction Solutions and the other sponsors, are an investment in our community, our future.

"Given the economic and resource pressures faced by our universities today, the private sector and citizenry have an ever increasing responsibility to 'step up to the plate' and to invest in programs such as this wherever and whenever they can. We need to support our institutions of higher learning to help position them to meet the needs of the students – needs that are required for success in an increasingly competitive global marketplace."

Welcome to new ePartners

New computer science's ePartners are Insurance Systems Group, ePartner, and Corporate Friends Expert Process Solutions, Bowe Bell and Howell, NC Zoological Society and Tekelec.

There currently are seven Super ePartners, 10 ePartners, and 35 Corporate Friends in the ePartners program.

In the past academic year, such friends of the department have helped support computer science research and teaching with over \$250,000 in unrestricted cash gifts and over \$8 million in total contributions.

Named corporate partnership opportunities available ... to fit all needs & budgets

Companies wanting to establish a stronger corporate alignment with the computer science department – without breaking their budget – have a growing list of affordable 'named' partnership opportunities available to consider, says Ken Tate, director of the ePartners Program

"With a department of our size, there are many programs, events, and initiatives that take place each year which touch and impact thousands of lives," he says. "Whether a company provides \$250 to help sponsor a student group meeting or \$5,000 to sponsor a senior design project, they can be assured that they are helping to enhance the educational experience of our students."

What do companies receive for their support? Tate says the value of such sponsorships can go deeper than the 'named' recognition. Many sponsors identify top talent for future hiring needs and establish stronger relationships with key faculty.

"Many named sponsorships may qualify corporate affiliates for recognition under our ePartners Program, which provides an extensive portfolio of benefits," he adds.

A sampling of named sponsorships at various levels:

- \$250, student organization meetings
- \$500, recruiting events or print communications projects
- \$1,000, annual sponsorship of the Women in Computer Science organization or a year-end student organization dinner
- \$2,500, diploma ceremonies, Posters & Pies, or the departmental newsletter
- \$5,000, senior design projects, the e-newsletter, speakers series, etc.

For a complete list of partnership opportunities, call Tate at 919-513-4292 or visit the ePartners Website, <http://epartners.ncsu.edu/>.

From Raleigh to Singapore and back,

Krueger builds career – and businesses – with digital imaging

If you use Macromedia's Fireworks for creating Web graphics, you're benefiting from the digital imaging talents of Richard Krueger (MS '89) and his brother, Fred Krueger.



Richard Krueger, at his new company, Skinux

Together, they formed Fauve Software in 1992, about the time when digital imaging was “just opening up,” Richard Krueger says.

He was always interested in digital photography, “but there were not many programs that did digital art” back in the early '90s, Krueger says.

A lot has happened in the dozen years since launching Fauve. One is that software and hardware prices have dropped significantly, making them more accessible to more users. Another is the evolution of mark-up languages for the Web, allowing for better ‘discussions’ between software modules.

A third is that computers are no longer simply work stations; they are increasingly becoming the base of individuals’ entertainment centers.

Using his experience in digital graphics, Krueger aims to help businesses capitalize on these changes by creating graphical computer-user interfaces – or skins – with a unique look and feel that reflect the company’s branding or marketing messages. Individuals can also use products being developed at his new company, Skinux, to personalize their computer-user interfaces.

Getting to this point requires tracing

Krueger’s professional career. It began in Raleigh, where he took positions at IBM and then SAS after graduating in 1984 with an undergraduate degree in mathematics and computer science from Cornell University. He earned his master’s in computer science at NC State while working in Raleigh.

In 1990, he and his wife Joy, an artist, went to the University of Singapore, where he had a position teaching and doing research in 3-D graphics visualization and medical graphics.

The Asian economy “was taking off, and they got into making computer components, memory chips,” Krueger says. “It was a dynamic place, but the university was wanting.” With government funding, the university drew faculty and researchers from throughout the world, creating “a high-tech embassy” environment.

Krueger and his wife came back to the States in 1992, and he started Fauve Software in Raleigh with his brother. At the time, digital imaging was changing from being a high end specialty and becoming more accessible.

“A whole new era of digital imaging was opening up,” he says. “We decided to come up with a natural media paint program that worked like water colors on the (computer) screen.”

They released their product, Matisse, for \$99 per package in 1993. “It was very successful; the right product at the right time,” he says.

They then developed xRes, a second digital graphics product that they sold to San Francisco-based Macromedia in 1995, where it evolved into Fireworks.

Both remained with Macromedia in San Francisco a few years, Richard as director of engineering-imaging and Fred as vice president of imaging. In the late 1990’s, the company was sold and Richard Krueger decided to move on.

In 1997, he returned to Raleigh. “I built a house and started this company

as a hobby,” he says. For the first three years, he had no customers and simply wrote software, working mostly by himself, although he did have investors calling to be part of his new venture.

By 2000, though, following the Internet crash, investor sources dried up and he realized that he “had to start making a living,” he says. “Being in technology, I was heavily invested in it. I think everyone got burned. It had reached such a level of craziness.”

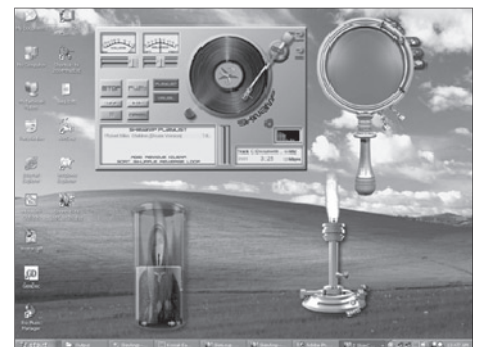
When Krueger incorporated Skinux in 2000, he “had a business plan and one other guy” working with him. He also had lots of people calling and sending him their resumes, people who had been ‘burned’ when the tech bubble burst at the turn of the century.

He’s taking a different tact with Skinux. “I decided that I did not want to run this on the ‘90s tech company model,” Krueger says. Instead, he’s vowed not to go after venture capital and “not spend beyond what I take in.”

Many have told him, “you’re not going to grow, not take it to the next level,” he says. His response: “I saw so many take it to the next level, to bankruptcy court. It’s not a pretty picture.”

Now, with two full time and three part-time employees, he has a growing list of clients, including major corporations.

“Our customers are people who want to upgrade an existing interface, such as



This screen shot shows a sampling of the Skinux ‘skins,’ including a zoom and music player.

Krueger

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x3D, which decided to ‘spruce up’ its interface. We gave it a new look.”

Krueger began forming the idea for Skinux while still at Macromedia.

“I figured the next big thing in imaging would be to use image editing techniques to construct user interfaces – skins – which are much more designed than existing interfaces,” he says. He envisions companies could incorporate marketing and branding messages in the stylized skins.

“We can build different interfaces very quickly and they are fully scalable,” he says.

Also, as computers have advanced beyond merely being tools for doing a job to multimedia entertainment centers, “customers and software companies that sell to them are demanding user interfaces that transcend the traditional Graphical User Interface,” he states in an online white paper.

He compares this to the auto industry, which expanded from the initial black Model T’s to today’s plethora of colors, shapes, sizes, and options designed to provide unique driving experiences. Krueger sees the same desire for individuality growing among computer users.

They “want a designed appearance that distinguishes the consumer or the vendor, rather than the native computer operating system.” Just as individuals create a ‘look’ for themselves through their style of clothing, “consumers want the ‘look and feel’ of their software to reflect their age group, tastes and even their cultural outlook on life.”

Skinux’s Skin User Interface aims to fill this need using techniques and features available through digital imaging software, including transparency and scalability. Such interfaces can be made interactive and are more intuitive for the user, Krueger says.

His technology can also be used to create control panels and launchers, in-

Teamwork, ongoing education on this CSC entrepreneur’s career path

With a background in math and science, Bill McKinnon (Ph.D., ‘97) was drawn first to engineering, then, after ‘a chance encounter’ with an undergraduate professor, to telecommunications.



Bill McKinnon

The career-focusing impact of that one professor has been replicated by many individuals on McKinnon’s professional work teams.

“People are the most important thing in a company,” he says. And to remain valuable, McKinnon stresses the role of continued learning and enthusiasm.

The corporate culture at his first job in research and development “quickly helped me to understand how skills can become stale and obsolete. This convinced me to pursue my graduate degrees and, generally, to continue to leverage my skills and experiences into new opportunities.

“These days, we see a lot of the lower level positions being moved off shore,” he says. “It’s a natural progression and evolution for skills to be devalued over time. With the global economy, you have to be concerned about that.”

But McKinnon cautions against “getting too wrapped up in it, especially for those coming out in their 20’s. As long as they have skills, they will be marketable.

He also stresses the value of teamwork, noting that the patents that include his name were the “product of the work of several people,” for whom he served as team leader.

Other people were also integral in his decision to start his own business, ChanneLogics – a data-over-cable network management products company. He started it after seeing friends launch their own businesses.

The concept evolved from work he did while at the Georgia Tech, where he helped manage an interdisciplinary center focused on ‘last mile’ networking issues.

“In the late ‘90’s, data-over-cable technologies were emerging as viable options,” he says. “In a cable network, though, the bandwidth must be shared between dozens or hundreds of subscribers, leading me to the question of how to insure the viability of the end user’s experience.”

His exploration of that question led to the launch of ChanneLogics in 2000. Within a few years, the board of directors decided it was time to sell.

“Based on the vision of the board, and where the technology was headed, we felt that having a banner like ‘Scientific-Atlanta’ on the product would be the best way to promote the technology to its fullest and also garner the greatest return on the investments that were made in the company.”

The company was sold to Scientific Atlanta in 2003, and McKinnon is now evaluating new opportunities.

cluding control panels for scanners and point of sale terminals; games; and in emulation and simulation software.

Skinux skins, written in C++, are not dependent on any particular windowing system or operating system manu-

facturer. “Skinux is the first truly cross platform skinning solution for Microsoft Windows and Linux systems,” he states.

Related link: <http://www.skinux.com/>

News clips

Read news clippings online at <http://www.engr.ncsu.edu/news/homepage/innews.htm>

Jeff Leinbach (B.S. '04) was featured in a News & Observer Q&A on technology graduates.

The JIT signaling protocol, developed by Dr. George Rouskas, professor, and MCNC, has been covered by Light Reading and other publications.

The Triangle Tech Journal reported on work by Christopher Healey, associate professor, and Laura Tateosian, Ph.D. student, incorporating Impressionist painting techniques human perception and psychology to develop a computer visualization system for large complex data sets.

The work by Dr. Injong Rhee, associate professor, and colleagues on BIC-TCP has been covered by technology media worldwide.

Dr. Carla Savage's work with former student Chip Killian, on solving a mathematical problem with Venn diagrams, was featured in a front page article in the journal Science and in SIAM News.

Dr. Michael Young, assistant professor, was featured in a News and Observer Q&A about his storytelling and gaming research.

Dr. Dennis Rodman, professor, was quoted in a March 21 New York Times article about the authenticity of a Hussein tape.

Raleigh's WNCN TV and News 14 covered the Spring Posters &

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Staying Connected ... win a new mini-iPod!

A lot is happening at NC State's Department of Computer Science – exciting research, new courses, a new building, and faculty, student and alumni accomplishments.

We want to get our news out to our alumni and friends as effectively as possible, and are in the process of making improvements to our communication vehicles.

To help us better *connect* with you, we invite you to take part in a brief online survey, which you will find on the computer science department's Website at www.csc.ncsu.edu/news-survey/.

Participants will have a chance to win one of four Mini iPods, provided in part by Apple Computer. Those who complete the survey by June 30, 2004, will be eligible for the prize drawings.

In the meantime, we are moving ahead with enhancing the department's monthly e-newsletter and expanding its distribution to all computer science alumni as well as our ePartners, faculty, staff and students. This effort is supported by a \$5,000 grant from SAS Institute's Publication Marketing Group. The e-newsletter, including an online edition, will begin distribution this summer. To reach you, we need your current email address. Please take a minute to update your contact information online at http://www.csc.ncsu.edu/alumni/alumni_update.php. Updating your contact information will also assure that you continue to receive the **Connected** biannual print newsletter and other department communications.