The Link

Center Helps Safeguard New Inland Port

The rise in Asian imports has overwhelmed western U.S. ports. To ease congestion and promote economic activity in the region, KC SmartPort, a nonprofit economic development group in Kansas City, MO, is guiding the development of an inland port in the metro area. The inland port means, for example, that goods can arrive at Lazaro Cardenas, Mexico, and would be loaded onto railcars headed to Kansas City.

Ph.D. students Eric Howell (foreground) and Daniel Fokum explain ITTC technology being evaluated for the SmartPort project. Tags, like the one held by Howell, could provide real-time data as goods travel through the supply chain.

ITTC has partnered with KU's Transportation Research Center (KUTRI) and KC SmartPort to create a trusted passageway.

ITTC-developed sensors will collect and distribute in-transit data, allowing greater visibility along the supply chain. Sensors will monitor the location and integrity of the freight along with other critical factors. Access to timely updates will enable early detection of possible anomalies.

"Currently, asset tracking is often a disjointed and difficult process, as information vacuums prevent the steady flow of information," says **Victor Frost,** principal investigator on the project and ITTC director. "ITTC is developing technology that will provide accurate, real-time sensor data, which is an important aspect of an information clearinghouse."

A clearinghouse will consolidate all relevant data, including real-time sensor reports, safety regulations, and government records, leading to greater efficiency throughout the supply chain.

"A collaborative effort with a strong research center, such as ITTC, will result in a better product for the logistics industry," says **Chris Gutierrez**, president of KC SmartPort. ◼

FCC Overseer Surveys Wireless Projects

In August, Federal Communications Commission (FCC) Commissioner **Michael Copps** was the featured speaker at the Rural Broadband Round Table Summit organized by State Rep. **Tom Sloan,** and held at KU's Dole Institute of Politics. During his remarks, Copps emphasized that companies, both in urban centers and rural areas, must have access to broadband services to remain competitive.

After the summit, Rep. Sloan arranged for Copps to visit ITTC, where he was briefed on wireless technology that could enable high-

bandwidth applications such as on-demand television and high-speed Internet. While wireless communication devices can carry signals the last mile, their ubiquity, especially in cities, is taxing the radio frequency (RF) spectrum

CNSL Director **Gary Minden** has developed technology that rapidly finds and accesses available spectrum. The KU Agile Radio momentarily exploits empty pockets within prime spectrum to carry data.

Director's News

In the late 1990s ITTC was formed with the purpose of becoming a world-class research center. The timeline inserted into this issue of *The Link* details the roots and accomplishments in the first decade of ITTC. The Center has grown into the originally envisioned, prominent, state-of-the-art research facility. ITTC investigators are helping shape federal programs; leading collaborative, innovative projects; and developing industry standards.

ITTC investigator **Ron Hui** is returning full time to the University after directing the Photonics and Device Technologies Program within the National Science Foundation (NSF) for two years. Hui is the fourth ITTC faculty member to serve as a federal program manager.

Director Victor Frost

EECS Professors **Joe Evans, Glenn Prescott**, and **Gary Minden** have overseen programs at NSF, NASA, and DARPA, respectively. These program managers help decide which projects in their program are funded; thus they play a major role in shaping national investments in research.

Evans was a member of the planning group for the NSF Global Environment for Network Innovation (GENI), and Minden made contributions to the group as well. GENI is being developed to allow experiments on a wide variety of problems in communications, networking, distributed systems, cyber-security, and networked services and applications. Evans presently serves as the co-chair for the GENI Substrate Working Group, and Minden continues contributing to the project.

An ITTC feasibility study was cited in comments submitted to the Federal Communications Commission's *Proceedings on Unlicensed Operation in the TV Broadcast Band* last spring. Evans led research that evaluated effects of secondary-user transmissions from proposed wireless devices on consumer digital television (DTV) receiver performance in the TV band.

As the article on page 1 denotes, FCC Commissioner **Michael Copps** visited ITTC to learn about our wireless research. He is the second FCC commissioner to examine, first-hand, ITTC research and development. In 2004, then FCC Chairman **Michael Powell** came to the Center after he attended the Rural Broadband Summit.

While numerous ITTC researchers organize significant workshops, no other junior investigator has done it quite as often as **Xue-wen Chen**. In the last two years the BCLSL researcher has co-chaired three conferences and will also co-chair the International Workshops on Machine Learning in Biomedicine and Bioinformatics to be held in Cincinnati this December. The Association for Machine Learning and Applications is one of the key organizers of the conference.

We also have a strong commitment to transferring our technology out of the Center. CSDL Director **Perry Alexander** is leading the Rosetta standard process. The standard ensures that different computer-based systems can use the system-level design language Alexander developed. Rosetta software enables the development of faster, stronger, and more efficient electronics.

These are just a few examples of how ITTC researchers are influencing the future of technology. First-rate researchers and facilities have positioned the Center to continue making substantial contributions well into the future. ■

Veatros Matures

Veatros, LLC, a University of Kansas start-up company, was acquired recently by DivX, Inc., a digital media company whose technologies enable the easy creation and sharing of video, pictures, and other media. Veatros technology will perform enhanced video and discovery searches that will help better manage users' media collections.

John and **Susan Gauch**, former ITTC investigators, created Veatros in 2002 with assistance from ITTC. At ITTC five years earlier, the Gauches developed the digital video processing technology VidWatch to continuously monitor television broadcasts. The initial application of VidWatch was to prevent foreign cable stations from using more allotted commercial time than they had actually purchased.

"Veatros benefited from incubating the technology with support from ITTC," says John Gauch. "We were able to focus on development and new applications for the inventions for several years while the market for our technologies developed. Now we are thrilled to work with DivX on a mature implementation."

Earlier this year, Susan Gauch accepted a position as department head and Rodger S. Kline Endowed Chair in Computer Science and Computer Engineering at the University of Arkansas. John Gauch accepted a position as professor in the same department. ■

Blunt Wins Air Force Young Investigator Award

ITTC investigator **Shannon Blunt** has received a U.S. Air Force Young Investigator Award. Blunt will receive $100,000 annually for three years in support of his radar-embedded communications project, which will enable a new form of high-speed covert communication.

Blunt's intra-pulse radar-embedded communication system will allow soldiers behind enemy lines to send secure messages using existing radio signals. Dispatches will "piggyback" on primary transmissions from high-powered radar that also hide the covert messages. Intended receivers will be able to recover the hidden signal, while eavesdroppers will be unaware of the signal's existence. In addition, future radar systems may utilize these covert "side-channels" of information to effectively make the radar intelligent about its surroundings, thereby improving numerous aspects of sensing performance.

Preliminary tests have shown the possibility of Blunt's intra-pulse radar-embedded communication technology to operate with data rates 1,000 times faster than current radar-embedded communication systems. Current systems require hundreds to even thousands of radar pulses to convey just one communication symbol. While very secure, these approaches are quite slow. The new system will embed a communication symbol into each individual radar pulse while offering the same level of security, thus substantially increasing the data rate.

The multidisciplinary nature of ITTC allows Blunt, an expert in radar and communication signal processing, to collaborate with other specialists in radar, communications, and radio frequency identification (RFID). RFID readers query tags and then "listen" for a response. Blunt says that a similar communication exchange could be applicable to his system. Communication will be developed to fit the requirements of existing radar modes of operation. The challenge becomes designing a system where each piece can thrive.

"I am extremely honored to receive this award," says Blunt. "Such collaborative research would not be possible without the resources and facilities of ITTC." ■

Photo by Jill Hummels

ITTC investigator Shannon Blunt, left, works on calculations with U.S. Navy intern and Ph.D. student Tom Higgins. Blunt recently earned a prestigious Air Force Young Investigator Award.

FCC Overseer Surveys Wireless Projects

Minden also updated Copps on the federally funded National Radio Testbed project, which examines current spectrum efficiency, searches for unused spectrum, and evaluates wireless technologies.

ITTC investigator **Joseph Evans** presented research on the feasibility of utilizing unused areas of spectrum wedged between licensed TV channels, known as white spaces. Currently, broadband devices are not allowed to use this licensed spectrum, but Copps and other FCC officials are considering allowing unlicensed wireless devices to operate in white spaces.

ITTC research determined the operating parameters for unlicensed devices within the TV band. The findings were cited in comments submitted to the FCC's *Proceedings on Unlicensed Operation in the TV Broadcast Bands* last spring. ■

ITTC Director Victor Frost (left) explains what makes the KU-Tag unique to FCC Commissioner Michael Copps. Copps visited the Center in August.

Achievements and Acclaim

ITTC Earns High Marks in KTEC Peer Review

ITTC received an extremely positive evaluation from an independent review team assembled by the Kansas Technology Enterprise Corporation (KTEC). The team visited ITTC in May to conduct the independent review of the Center. As ITTC is a KTEC Center of Excellence, its effectiveness with respect to its research and economic development activities are examined by IT researchers from nationally recognized institutions. ∎

Perrins Edits IEEE Communications Journal

CNSL investigator **Erik Perrins** will serve as an editor for *IEEE Transactions on Communications*. He will review articles within his area of expertise, "Modulation and Signal Design." ∎

Conference Honors Chandran's Student Paper

ITTC graduate research assistant **Prashanth Chandran** won second place in the graduate division of the student paper program held in conjunction with the International Telemetering Conference (ITC) 2007. He is working under the direction of **Erik Perrins**. ∎

ITTC Students Win, Place at SoE Poster Event

In the recent KU School of Engineering's student poster competition, ITTC graduate research assistant and U.S. Air Force Major **Geoff Akers** won first place in the Ph.D. division with his "Simulated Radar Data and Moving Target Indication" entry. The ITTC research was completed with EECS Associate Professor **Jim Stiles**.

   Levi Pierce took second place in the Master's division. He presented the "Determining the Ideal Rotational Conformation of DNA Wrapped Around a Nucleosome" poster, which showcased research led by **Terry Clark**. ∎

Provost Speaks at ITTC Industry Advisory Board

ITTC held its annual Industry Advisory Board (IAB) meeting in June. Honored guest speaker KU Provost and Executive Vice Chancellor **Richard Lariviere** led a lengthy discussion on how to improve interactions between the University and industry. The 24 IAB members present provided numerous suggestions that will help guide ITTC R&D activities.

   ITTC Director **Victor Frost** reviewed the first 10 years of activities within the Center, which included $55 million in research expenditures. Highlighting the Center's promising future, Frost noted the increasing number of Ph.D. students at ITTC.

   Keith Braman, director of technology commercialization, then updated IAB members on continuing research and new projects.

Additionally, Braman focused on technology transfer opportunities. The day concluded with the student poster session. Twenty-nine posters were included and can be found at: www.ittc.ku.edu/techreview 2005/posters2007.phtml. ∎

KU Provost and Executive Vice Chancellor **Richard Lariviere** was the guest speaker at ITTC s Industry Advisory Board in June.