



# ALUM Matters

A newsletter for alumni of the Department of Computer Science



## Henning Schulzrinne leads VoIP revolution

**P**ROFESSOR HENNING SCHULZRINNE (Ph.D. '92) is currently serving as chair of the Department of Computer Science at Columbia University (New York) and director of the Internet Real-Time (IRT) Laboratory which focuses on supporting interactive applications in the Internet. Columbia's CS Department has about 34 faculty members, with particular strengths in areas from computer graphics and vision to networks, security, and machine learning. "We are fortunate to have two other UMass Amherst alumni on our faculty, Professor Dan Rubenstein (Ph. D. '00) and Professor Vishal Misra (Ph. D. '00)," noted Schulzrinne. Rubenstein, Misra, and Schulzrinne were all advised at UMass Amherst by Distinguished Professors Jim Kurose and Don Towsley.

Much of Schulzrinne's research has focused on the development of protocols and algorithms for voice-over-IP (VoIP) and other multimedia applications. VoIP, the transmission of voice and other multimedia over packet networks such as the Internet, started being developed seriously in the early 1990s, although first experiments date back to the early days of the Internet, in the 1970s. Only

in the 1990s did workstations achieve sufficient processing power and low-delay audio input and output. For example, Schulzrinne developed his first audio tool in the late 1980s on a Sun SPARCstation that had just been acquired by the Computer Network Research Group at UMass Amherst. The replacement of traditional analog and circuit-switched digital phone systems is now well underway; "it appears likely that traditional telephone systems will disappear, at least for long-distance transmission and larger enterprises, over the next decade," predicted Schulzrinne. The next challenge is to support VoIP over both cellular and IEEE 802.11 ("WiFi") wireless networks; Schulzrinne and his research group have been working recently on algorithm enhancements and new protocols to significantly enhance the capacity of 802.11 networks.

For several years, Schulzrinne has realized that the transition to a packet-based telephone infrastructure also requires upgrades to the public safety communications infrastructure. For example, the 911 calling system is still based on 1970s technology and has difficulty dealing with cell phones and, now, VoIP. "We

are working with Texas A&M University and public safety answering points to build a next-generation Internet protocol-based 911 system that is hopefully more robust and cheaper to maintain than the existing one," added Schulzrinne.

Another current project tries to extend data connectivity where traditional wired and wireless networks have not reached or that provide only spotty coverage. This includes dense urban environments and such places as the New York City subway, as well as rural areas in developing countries and disaster areas. The 7DS project ("seven degrees of separation") allows the distribution of data by copying it between mobile nodes that meet each other, e.g., by sharing the same subway car. Messages, containing web pages or encrypted email messages, are passed around until they reach the desired destination or an access point.

VoIP is for traditional phone calls, but can also be embedded in a variety of applications that do not look like telephones at all. For example, the IRT Laboratory has been working with the Federal Aviation Administration on a project to build a new training facility for their air traffic controllers. The project uses standard multimedia protocols, such as IP multicast, streaming control protocols and signaling, but simulates radio interactions between pilots and controllers. Other VoIP problems under study include the prevention of phone spam (called "spit") and the integration of rich presence information, geographic location, and telephony services, so that nuisances like phones ringing in movie theaters and telephone tag can be eliminated.

Unlike most other academic research labs, the IRT lab tries to not just publish papers and produce systems prototypes,

but also to contribute to standardization. “Almost all modern networks run on standardized protocols. Thousands of papers are published each year in networking; unfortunately, most are ignored by industry and one cannot simply rely on good work making it into practice based on its quality alone,” remarked Schulzrinne. He has been an active technical contributor to the Internet Engineering Task Force (IETF), the standardization body for Internet protocols. Among other efforts, he co-authored the Session Initiation Protocol (SIP) and Real-Time Transport Protocol (RTP) which form the foundation of most standards-based VoIP systems today. For example, Vonage, Yahoo, and Microsoft Messenger all use these protocols internally. The Real-Time Streaming Protocol (RTSP), another standard, is now used by Real and other streaming media software. The base protocols are largely patent-free, allowing their spread in both open source and proprietary software.

A few years ago, Schulzrinne served on the Internet Architecture Board (IAB), the Internet architecture advisory council for the IETF. “My first visit to the IETF came about when Jim Kurose organized a trip to the IETF meeting that took place in Cambridge in the summer of 1992,” said Schulzrinne.

After graduating from UMass Amherst, Schulzrinne spent 18 months at AT&T Bell Labs, as it was then called, working as a postdoc on Transputer-based network emulators, copyright protection, and the daunting task of trying to convince AT&T that their circuit switches were headed for the recycling bin of history. His visa regulations then required a return to Germany, where he put in a two-year stint at GMD Fokus, now part of the Fraunhofer Institute, in Berlin.

Schulzrinne’s research on real-time multimedia started with a DARPA DARTnet research project in Kurose’s and Towsley’s lab. DARTnet was an early dedicated research network con-

necting research institutions across the United States at the blazing speed (for the time) of 1.5 Mbs. It provided a test platform for developing one of the first network audio clients, NeVoT.

In 2004, Schulzrinne was named one of the 50 most powerful people in networking by *Network World*, the only academic on the top 50 list. He has also received the New York City Mayor’s Award for Excellence in Science and Technology and the VON (Voice on the Net) Pioneer Award. In 2005, at the IEEE Infocom Conference, both Schulzrinne and Kurose accepted the 2005 Award for Exemplary Service to the Community.

“Throughout my career, I have looked to Jim and Don for advice and try to model my graduate student interactions and their emphasis on high-quality, relevant work after their example,” concluded Schulzrinne.

More about Schulzrinne’s research can be found at [www.cs.columbia.edu/IRT](http://www.cs.columbia.edu/IRT).

## Alumni Connections

**Amos Wetherbee** (B.S. ’05) received a competitive three-year Department of Homeland Security Graduate Research Fellowship. He is currently a graduate student at Johns Hopkins University.



**Amos Wetherbee**

received the Best Paper Award at ICAPS 2005. ICAPS is the premier international conference on automated planning and scheduling. Hansen received the award with his student Rong Zhou for their paper “Beam-Stack Search: Integrating Backtracking with Beam Search.”

**Eric Hansen** (Ph.D. ’98), former student of Professor Shlomo Zilberstein,

In the last few years **Jeff Bonar** (Ph.D. ’85) has been building JumpStart Wireless, a software company that he founded to create mass-market wireless software. JumpStart Wireless uses a unique expert system approach to automatically create all the major components of a wireless application: device user interface, over-the-air communication, server logic, and existing enterprise integration. JumpStart applications automatically include security, provisioning, device independence, replication of data to/from device/server, self-healing capabilities, and so on. Industrial strength applications that take months to build with conventional approaches are created and deployed in a matter of days. JumpStart has a rapidly expanding customer base, focused currently on construction, field service, and facility management. Several software companies use JumpStart technology to create products they sell directly to their customers.

“During my visit to UMass Amherst, I was struck by how much of what I learned there has made its way into the work I do now,” said Bonar. “The expert system approach and cognitive task analysis that went into the design of a wireless user interface came directly

from my graduate work. Perhaps most important, my dissertation work led to the high level specification language that allows our customers to say what they want rather than figure out how to program it directly.”

Anyone interested in learning more about Bonar’s company should go to his website at [www.jumpstartwireless.com](http://www.jumpstartwireless.com) or his blog at [wirelessbusiness.blogs.com](http://wirelessbusiness.blogs.com). “I am always looking for interns and new employees,” added Bonar. “I remade some connections with my UMass Amherst colleagues during the reunion day and look forward to doing some work together at some point.”

### In memoriam

**Patrick E. Bell** (B.S. ’04), 23, of Worcester, formerly of Greenfield, MA died on June 19th at the Metro West Medical Center in Framingham shortly after competing in a triathlon in Ashland. Patrick was a computer software engineer for the EMC Corp. of Southboro. He was a member of the Society of Engineers. Patrick was an accomplished triathlete and a member of the Vortex Racing Triathlon Development Team.