



**The Information Science & Technology Center**

*ISTeC.ColoState.edu*

**Colorado State University's Information Science and Technology Center  
(ISTeC)**

***presents two lectures by***



**Dr. Don Towsley**

**Department of Computer Science  
University of Massachusetts at Amherst**

**ISTeC Distinguished Lecture**

**in conjunction with the  
Electrical and Computer Engineering Department and  
Computer Science Department Seminar Series**

**“The Internet is Flat: A Brief History of  
Networking in the Next Ten Years”**

**Monday, October 22, 2007**

Reception: 10:30 a.m.

Lecture: 11:00 – 12:00 noon

LSC Room 228



**Joint Electrical and Computer Engineering Department  
and Computer Science Department Special Seminar  
*sponsored by ISTeC***

**“Multipath Routing, Congestion Control and  
Dynamic Load Balancing”**

**Tuesday, October 23, 2007**

Lecture: 9:30 – 10:30 a.m., Natural Resources Room 109

## ABSTRACTS

### **“The Internet is Flat: A Brief History of Networking in the Next Ten Years”**

The current Internet consists of ten to twenty thousand different interconnected autonomous networks. In many cases these networks have negotiated cumbersome bilateral and multilateral agreements that constrain how data is allowed to flow from source to destination. For example, universities can communicate with each other through the Abilene network but must rely on other networks to communicate with non-academic entities such as Google. These agreements generally impose a loose hierarchy on the Internet with respect to the flow of data and information. The recent development of peer-to-peer file sharing technology, however, has the unintended developed effect of relaxing and voiding these agreements. This has resulted in a "flattening" of the Internet. In this talk we peer into a crystal ball and examine the implications that peer-to-peer (p2p) technology may have on the Internet over the next ten years. In particular, we examine the effects of p2p on economics for Internet service providers (ISPs), and the impact on how they manage and engineer their networks. We focus on one p2p technology, "swarming," as exemplified by BitTorrent, and examine how it will flatten the Internet by becoming the core of a new data transfer architecture over the next ten years. Last, we present a research agenda centered on swarm technology to make this happen.

### **“Multipath Routing, Congestion Control and Dynamic Load Balancing”**

Combining transport-layer congestion control with multi-path routing is a cross-layer approach that provides performance benefits over treating the layers separately. We phrase this as an optimization problem, examine the case of data transfers, and show how a coordinated controller gives strictly better performance than an uncoordinated controller, which sets up parallel paths. For fixed demands, and the case of random-path selection, we show how coordinated control also achieves better load balancing than greedy least-loaded path selection. Load balancing is further improved if sessions continue to improve their paths through random path reselection during their lifetimes.

This work is joint with Peter Key and Laurent Massoulie.

## SPEAKER BIOGRAPHY

Dr. Don Towsley (<http://www-net.cs.umass.edu/personnel/towsley.html>) holds a B.A. in Physics (1971) and a Ph.D. in Computer Science (1975) from University of Texas. He is currently a Distinguished Professor at the University of Massachusetts - Amherst in the Department of Computer Science. He has held visiting positions at IBM T.J. Watson Research Center, Yorktown Heights, NY; Laboratoire MASI, Paris, France; INRIA, Sophia-Antipolis, France; AT&T Labs - Research, Florham Park, NJ; and Microsoft Research Lab, Cambridge, UK. His research interests include networks and performance evaluation.

He currently serves as Editor-in-Chief of IEEE/ACM Transactions on Networking, and on the editorial boards of Journal of the ACM and IEEE Journal on Selected Areas in Communications, and has previously served on numerous other editorial boards. He was Program Co-chair of the joint ACM SIGMETRICS and PERFORMANCE '92 conference and the Performance 2002 conference. He is a member of ACM and ORSA, and Chair of IFIP Working Group 7.3.

He has received the 2007 IEEE Koji Kobayashi Award, the 2007 ACM SIGMETRICS Achievement Award, the 1998 IEEE Communications Society William Bennett Best Paper Award, and numerous conference/workshop best paper awards. Last, he has been elected Fellow of both the ACM and IEEE.

**To arrange a meeting with the speaker**, please contact Prof Ricky Kwok at (970)491-6018 or [Ricky.Kwok@colostate.edu](mailto:Ricky.Kwok@colostate.edu)

**ISTeC (Information Science and Technology Center)** is a university-wide organization for promoting, facilitating, and enhancing CSU's research, education, and outreach activities pertaining to the design and innovative application of computer, communication, and information systems. For more information please see [ISTeC.ColoState.edu](http://ISTeC.ColoState.edu).