

ICCCN 2008 Distinguished Invited Speakers

Prof. Chang Wen Chen (IEEE Fellow, SPIE Fellow)

University at Buffalo, State University of New York, USA



Title: Technical Challenges in Video Coding for Future Digital Entertainment

Abstract:

This talk will present some technical challenges in high definition video coding and processing to meet the paradigm shifting trends for future digital entertainment for consumers. Traditional consumer video services have been in the broadcasting mode, from terrestrial TV, to satellite and cable services, in which a single encoder is able to serve millions of decoders. The design principle has been the simple decoder of volume sets at the expense of very complicated encoder. The proliferation of mobile devices with video capture capabilities in the recent years has resulted in a paradigm shift trends that require simple encoder for the mobile devices. The burden of the performance has now shifted to decoder that resides at consumer's home to manage volumetric video captures with desktop computers. This paradigm shift thus created an opportunity for new algorithm development and processor architecture design to meet the challenges in more complicated video decoding. In this talk, we will present examples of new video coding schemes based on the principles of distributed source coding. Some detailed analysis and simulation results will be shown to demonstrate that distributed source coding based approach is indeed promising for video decoding and processing for future digital entertainment.

Bio:

Chang Wen Chen joined the University at Buffalo, State University of New York in 2008 as Professor of Computer Science and Engineering. He was Allen Henry Endowed Chair Professor of Electrical and Computer Engineering at the Florida Institute of Technology from 2003 to 2007. He was on the faculty of Electrical Engineering Dept at the University of Rochester from 1992 to 1996, on the faculty of Electrical and Computer Engineering Dept at the University of Missouri-Columbia from 1996 to 2003. He also served as the Head of Interactive Media Group at David

Sarnoff Research Labs in Princeton from 2000 to 2002, managing multi-million dollar research projects in video coding and wireless video communications.

Currently, he is the Editor-in-Chief for *IEEE Trans. Circuits and Systems for Video Technology*. He has been an Associate Editor for several IEEE Transactions and Journals. He has served as Conference Chair for numerous IEEE and SPIE conferences related to mobile and wireless multimedia communications and signal processing. His current research interests include reliable and secure multimedia communications over mobile wireless channels; digital video coding, processing, analysis, and embedded implementation; medical image analysis and biomedical information processing; distributed source coding and digital signal processing for communications; and collaborative signal processing and data aggregation for sensor networks. His research is supported by NSF, DARPA, Air Force, NASA, Whitaker Foundation, and Kodak.

He received his BS from University of Science and Technology of China in 1983, MSEE from University of Southern California in 1986, and Ph.D. from University of Illinois at Urbana-Champaign in 1992. He was elected an IEEE Fellow for his contributions in digital image and video processing, analysis, and communications, and elected an SPIE Fellow for his contributions in electronic imaging and visual communications.

Mr. Hiroshi Inamura

DoCoMo Communications Laboratories USA, Inc.



Title: Insights into Handset Technologies for Broadband Cellular Systems

Abstract: Current cellular handsets are far from old ones in 1980s. Those have been highly miniaturized and efficiently empowered in communication speed and processing power so that those meet the recent rapid evolution of wireless technologies and a variety of applications. Especially in Japan, cellular broadband wireless is taking a commonplace, where HSPA technologies have been deployed in

nation-wide and 3G-LTE is also coming very soon around 2010. In this presentation, we firstly survey a couple of major technologies, such as wireless access technologies, antenna and circuit technologies, micro processors, software technologies in such a broadband country. Secondly we discuss the future issues to be tackled in view of cellular phone terminal implementation and its applications.

Bio:

Mr. Hiroshi Inamura has been working for NTT DoCoMo, Inc. since 1999. He joined DoCoMo Communications Laboratories USA in 2006 and managing Mobile Device Laboratory. His research interests are in the area of networking software and wireless access systems on handsets. Hiroshi participated in the IETF and OMA standardization activities and he received an achievement award from the Information Processing Society of Japan for his contribution to the standardization of mobile multimedia protocols in 2004. From 1994 to 1995, he was a visiting researcher in the Department of Computer Science, Carnegie Mellon University. He received B.S. and M.S. degree in Keio University, Japan.

Prof. P.R. Kumar (IEEE Fellow, NAE Member)

Franklin W. Woeltje Professor, Department of Electrical and Computer Engineering
Research Professor, Coordinated Science Laboratory
University of Illinois, Urbana-Champaign, USA



Title: Wireless networking: From communication to sensing and actuation

Abstract: In wireless networks, there is no a-priori notion of links - transmitting nodes simply radiate energy. In sensor networks, nodes can both compute and wirelessly communicate. In networked control, nodes can also act on their environment.

We address the issue of organizing principles and architecture for these three different types of emerging systems which may possibly be at the cusp of a take-off, and provide an overview of experimental efforts in the Convergence Lab at the University of Illinois.

Bio:

P. R. Kumar obtained his B. Tech. degree in Electrical Engineering (Electronics) from I.I.T. Madras in 1973, and the M.S. and D.Sc. degrees in Systems Science and Mathematics from Washington University, St. Louis in 1975 and 1977, respectively. From 1977-84 he was a faculty member in the Department of Mathematics at the University of Maryland Baltimore County. Since 1985 he has been at the University of Illinois, Urbana-Champaign.

He has worked on problems in game theory, adaptive control, stochastic systems, simulated annealing, neural networks, machine learning, queueing networks, manufacturing systems, scheduling, and wafer fabrication plants. His current research interests are in wireless networks, sensor networks, and networked embedded control systems.

He received the Donald P. Eckman award of the American Automatic Control Council in 1985, the IEEE Field Award in Control Systems in 2006, and the Fred W. Ellersick Prize of the IEEE Communications Society in 2007.

Mr. Ronald Luijten

IBM Research Laboratory, Zurich, Switzerland



Title: OSMOSIS: the IBM and Corning optical switch demonstrator

Abstract:

A crucial part of any high-performance computing system is its interconnection network. In the OSMOSIS project, Corning and IBM have jointly developed an optical demonstrator using optical packet switching with electronic control. Starting from the core set of requirements, we present the system design considerations and show how it impacts the practical implementation. Leveraging these insights, a hardware demonstrator is being completed. It has 64 ports each running at 40Gbps in

a single stage arrangement. It can be directly cascaded to a fat-tree yielding 2048 ports with only 2 levels. Details of the resultant hardware as well as performance will be shown.

Bio:

Ronald P. Luijten received his Masters of Electronic Engineering with honors from the University of Technology in Eindhoven, Netherlands in 1984. In the same year he joined the systems department at IBM's Zurich Research Laboratory in Switzerland. He has designed various communication chips, including PRIZMA switches and ATM adapter chip sets, the latter culminating in a 15-month assignment at IBM's networking development laboratory in La Gaude, France as lead-architect, in 1994-95. He manages the IBM server technologies research team in Zurich since 1997, which completed the OSMOSIS optical switch demonstrator in close collaboration with Corning, inc. for the US DOE at the end of 2007. Ronald's research interests are in datacenter interconnect system performance and design. His current a focus is on traffic use patterns for HPC interconnect fabrics with the Barcelona Supercomputer Center and data center interconnect fabrics for digital libraries. His team also works on standardizing congestion control within Ethernet 802.1Qau. He holds more than 20 patents, and has co-organized 5 IEEE ICCCN conferences.

Prof. Kia Makki

Lucent Technology Professor, Telecommunications and Information Technology Institute, College of Engineering, Florida International University, USA



Title: Multicast Routing in Communication Networks

Abstract: Explosive growth of point-to-multipoint multimedia traffic such as broadcasting, multi-party conferencing, multi-party game, etc. has increased the demand for multicast in the current Internet. Many newly emerging multimedia applications are of a multicast nature and have very strict quality of service (QoS) requirements. Previous work on this topic, however, have several weaknesses that prevent them from being successfully applied to a realistic networking environment. Also, IP (Internet Protocol) multicast is highly limited in its implementation as the

current IP network is resistant to fundamental changes which are necessary for multicast. Our goal in this talk is to investigate the performance of some of the existing algorithms and identifying their shortcomings and discuss ways of providing efficient multicast routing algorithms which have high practical value in realistic networking environments.

Bio:

Dr. Kia Makki received his Ph.D. in computer science from the University of California, Davis, and two M.S. degrees from The Ohio State University and West Coast University. He is currently a Lucent Technology Professor with tenure and the Co-Director of the Telecommunications and Information Technology (IT2) and he had been Associate Dean of the College of Engineering at the Florida International University. Previously he was a tenured faculty with an O'Krepki Chair Professorship at the University of Louisiana, Lafayette, the Director of the Center for Telecommunications Studies, and the Co-Director of the NOMAD and Advanced Computer Laboratory which is partially funded by NSF, NSA, NASA, US DOT, DoD/DISA, IBM, Cisco, Homeland Security, FDOT/DOT, and other companies. His technical interests include mobile and wireless communication networks, sensor networks, network security and privacy, multicasting and optical telecommunications. He has numerous publications in refereed Journals, conferences and book chapters and his work has been extensively cited in books and technical papers. Dr. Makki has been Associate Editor, Editorial Board Member, Guest Editor of several International Journals including Editorial Board Member of several telecommunication journals. Dr. Makki has been involved in numerous conferences as a Steering Committee Member, General Chair, Program Chair, Program Vice-Chair and Program Committee Member. His current professional activities include Steering Committee Member of the IEEE International Conference on Computer Communications and Networks, and Steering Committee Member of the ACM International Conference on Information and Knowledge Management. He has been Technical Program Co-Chair of the IEEE INFOCOM 2005 conference. He has received Outstanding Achievements Awards from the IEEE International Conference on Computer Communications and Networks, and ACM conferences for his technical contributions. He is currently the Executive General Chair of IEEE Globecom 2010, Co-General Chair of the NSF Int. Workshop on Theoretical and Algorithmic Aspects of Sensor and Ad-hoc Networks (WTASA'07) and Co-General Chair of the Int. Conference on Information Society 2008. He is a member of University Accreditation Commission. Dr. Makki is the Co-Author of four well received books on Mobile and Wireless Internet, Mobile and Wireless Network Security and Privacy, Sensor and Ad-Hoc Networks: Theoretical and Algorithmic Aspects and Developing an Infrastructure for Mobile and Wireless Systems.

Dr. K. K. Ramakrishnan

DMTS, AT&T Labs - Research, USA



Title: Cooperative use of P2P and Multicast for Video-on-Demand

Abstract: IPTV delivers video content over an IP infrastructure with the potential to enrich the viewing experience of users by integrating multiple applications along with the video delivery. At AT&T Labs Research, we have been working on mechanisms to make IPTV distribution more robust, responsive and efficient. As viewership moves to a predominantly on-demand mode, distribution of content in large scale is of interest. I will talk about a scheme we have been prototyping that cooperatively uses peer-to-peer and multicast mechanisms for scalable and efficient Video-on-Demand distribution. (Work done in collaboration with several of my colleagues at AT&T Labs Research, Univ. of Maryland)

Bio:

Dr. Ramakrishnan joined AT&T Bell Labs in 1994 and has been with AT&T Labs-Research since its inception in 1996. Prior to 1994, he was a Technical Director and Consulting Engineer in Networking at Digital Equipment Corporation. Between 2000 and 2002, he was at TeraOptic Networks, Inc., as Founder and Vice President.

At AT&T Labs-Research, K. K. is involved in several technical and strategic activities in networking and information distribution. He has published over 100 papers and has over 80 patents issued. His contributions on congestion control, channel access protocols, network interfaces, operating system support for network I/O, signaling and IP Telephony have been adopted and implemented in the industry. K.K.'s current work is on a range of topics including information distribution, multimedia content distribution and protocols designed to be robust against failures and losses across multiple layers.

K.K. is an IEEE Fellow and an AT&T Fellow, recognized for his contributions to communications networks, including congestion control, traffic management and VPN services. His work on the "DECbit" congestion avoidance mechanism was recognized in the 1995 retrospective issue of ACM Sigcomm Computer Communication Review as one of the 16 most important papers published over the

previous 25 years in ACM Sigcomm publications. The work once again recently received the ACM Sigcomm Test of Time Paper Award in 2006.

K.K. has been on the editorial board of the IEEE/ACM Transactions on Networking and IEEE Network Magazine and has been a member of the National Research Council Panel on Information Technology for NIST. He is the General Chair and Technical Program Chair of several recent workshops and conferences on communications and protocols. He has participated in numerous standards bodies working on communication networks.

K. K. received his MS from the Indian Institute of Science (1978), an MS (1981) and Ph.D. (1983) in Computer Science from the University of Maryland, College Park, Maryland, USA.

Prof. George N. Rouskas

Professor, North Carolina State University, USA



Title: A composable network architecture for enabling cross-layer interactions

Abstract:

For more than thirty years, the Internet architecture has evolved incrementally to address the demands and requirements presented by a continuously changing environment of heterogeneous users, service needs, economic factors, and threats. Recently, as the shortcomings and limitations of today's Internet architecture have become increasingly evident, many in the networking community are convinced that resolving the present "impasse" is impossible without redesigning the Internet "from scratch," based on new core principles and without being constrained by the existing architecture and protocols. In this talk, we will present our work for the Net SILOs project, funded by NSF FIND, on a new network architecture that overcomes the limitations of layering by introducing the concept of a per-flow "silo" of fine-grained services that can be viewed as a generalization of the traditional layer stack. SILO takes a holistic view of network design with emphasis on facilitating cross-layer

interactions, and represents a complete departure from current philosophy and practice; in that sense, it is a truly clean-slate architecture. Our goal with the SILO project is not to design the "next" system, or even the "best next" system, but rather a system that can sustain continuing change. To this end, the SILO architecture provides built-in mechanisms to incorporate new services and compose them into silos, making it possible to incorporate new innovations organically and gracefully without the need for patches or add-ons. We will also describe the architecture of the SILO software prototype that is available for download from the project website (<http://net-silos.net/>).

Bio:

George N. Rouskas is a Professor of Computer Science at North Carolina State University. He received the Ph.D. and M. S. degrees in Computer Science from the College of Computing, Georgia Institute of Technology, Atlanta, GA, in 1994 and 1991, respectively, and his undergraduate degree in Computer Engineering from the National Technical University of Athens (NTUA), Athens, Greece, in 1989. During the 2000-2001 academic year he spent a sabbatical term at Vitesse Semiconductor, Morrisville, NC, and in May 2000, December 2002, and July 2006 he was an Invited Professor at the Laboratoire de Méthodes Informatiques, University of Evry, France.

Dr. Rouskas received the 2004 ALCOA Foundation Engineering Research Achievement Award, and the 2003 NCSU Alumni Outstanding Research Award. He is a recipient of a 1997 NSF Faculty Early Career Development (CAREER) Award and of the 1994 Graduate Research Assistant Award from the College of Computing, Georgia Tech. Dr. Rouskas is especially proud of his teaching awards, including his induction in the NCSU Academy of Outstanding Teachers in 2004, and the Outstanding New Teacher Award he received from the Department of Computer Science in 1995.

Dr. Rouskas founded and serves as co-editor-in-chief of Optical Switching and Networking (OSN), an Elsevier journal. He has served on the editorial boards of the IEEE/ACM Transactions on Networking, Computer Networks, and Optical Networks, and he was a co-guest editor for the IEEE Journal on Selected Areas in Communications, Special Issue on Protocols and Architectures for Next Generation Optical WDM Networks, published in October, 2000. He was general co-chair of IEEE BROADNETS 2007, technical program co-chair of the Networking 2004 conference, general co-chair of the IEEE LANMAN 2005 workshop, program chair of the IEEE LANMAN 2004 workshop, and program co-chair of the Traffic Grooming workshop 2004. He is a senior member of the IEEE, a member of the ACM, and a member of the Technical Chamber of Greece.

Professor Ness B. Shroff (IEEE Fellow)

Ohio Eminent Scholar in Networking and Communications,

Professor of ECE and CSE, The Ohio State University, USA



Title: Cross-Layer Design for Wireless Networks

Abstract:

The success of the layered architecture has been its ability to provide modularity and transparency. However, optimizing within layers is insufficient to obtain the orders-of-magnitude performance gains necessary to fuel major growth in next-generation wireless services. To achieve these performance gains, it is imperative that network protocols and designs are engineered by jointly optimizing across the layers (cross-layer design). Unfortunately, the Achilles heel of cross-layer design is its potential to destroy modularity, hence making the overall system fragile. In this talk, we will demonstrate that intelligently designed cross-layer solutions are able to extract efficiency, and yet maintain a high degree of modularity and robustness to imperfect decision-making. Our approach will be to cast cross-layer design problems as appropriate network optimization problems, and show that the resultant protocols can be viewed as optimizers. We will describe recent results and the challenges in developing fully distributed optimal cross-layer design solutions for multi-hop wireless networks. We will also describe some of the potential opportunities and difficulties in integrating network coding with optimization based techniques to further improve the cross-layer performance gains.

Bio:

Ness B. Shroff received his Ph.D. degree from Columbia University, NY in 1994 and joined Purdue university immediately thereafter as an Assistant Professor. At Purdue, he became Professor of the school of Electrical and Computer Engineering in 2003 and director of CWSA in 2004, a university-wide center on wireless systems and applications. In July 2007, he joined The Ohio State University as the Ohio Eminent Scholar of Networking and Communications, and chaired Professor of ECE and CSE.

His research interests span the areas of wireless and wireline communication networks. He is especially interested in fundamental problems in the design, performance, control, and security of these networks. His research is funded by various companies such as Motorola, Intel, Hewlett Packard, Nortel, AT&T, BAE

systems, and L. G. Electronics; and government agencies such as the National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), Indiana Dept. of Transportation (INDoT), Army Research Office (ARO), Air Force of Scientific Research (AFOSR), and the Indiana 21st Century fund.

Dr. Shroff is an editor for IEEE/ACM Trans. on Networking and the Computer Networks Journal, and past editor of IEEE Communications Letters. He has served on the technical and executive committees of several major conferences and workshops. He was the technical program co-chair of IEEE INFOCOM'03, the premier conference in communication networking. He was also the conference chair of the 14th Annual IEEE Computer Communications Workshop (CCW'99), the program co-chair for the symposium on high-speed networks, Globecom 2001, and the panel co-chair for ACM Mobicom'02. Dr. Shroff was also a co-organizer of the NSF workshop on Fundamental Research in Networking, held in Arlie House Virginia, in 2003. In 2008, he will serve as the technical program co-chair of ACM Mobihoc 2008 and the general chair of IEEE WICON 2008.

Dr. Shroff is a fellow of the IEEE. He received the IEEE INFOCOM 2006 best paper award, the IEEE IWQoS 2006 best student paper award, the 2005 best paper of the year award for the Journal of Communications and Networking, the 2003 best paper of the year award for Computer Networks, and the NSF CAREER award in 1996 (his INFOCOM 2005 paper was also selected as one of two runner-up papers for the best paper award).

Prof. Mukesh Singhal (IEEE Fellow)

Gartner Group Endowed Chair in Networking, University of Kentucky, USA



Title: A New Model for Robust Routing in Large Mobile Ad Hoc Networks

Abstract: This talk will present a new model of routing in ad hoc networks which allows fast and efficient repairs of broken routes. When a node on a route moves out or fails, instead of discarding the old route and rediscovering a new one, the model allows a quick, efficient repair of the route in a localized manner.

We present an instantiation of the model where two well-known routing protocols, DSR and AODV, are combined into one hierarchical routing protocol.

The results of an extensive simulation study shows that our protocol exhibits the performance advantages of both DSR and AODV and scales well to large ad hoc networks with more than 1000 nodes.

Bio:

Mukesh Singhal is Gartner Group Endowed Chair in Networking, in the Department of Computer Science at the University of Kentucky. He received a Bachelor of Engineering degree in Electronics and Communication Engineering with high distinction from University of Roorkee, Roorkee, India, in 1980 and a Ph.D. degree in Computer Science from University of Maryland, College Park, in May 1986. His current research interests include wireless networks and mobile computing, computer networks, operating systems, database systems, distributed systems, performance modeling, and computer security. He has published over 140 refereed articles in these areas. He has coauthored two books titled "Advanced Concepts in Operating Systems", McGraw-Hill, New York, 1994 and "Readings in Distributed Computing Systems", IEEE Computer Society Press, 1993. He is a Fellow of IEEE. He is currently serving in the editorial board of "IEEE Trans. on Knowledge and Data Engineering" and "Computer Networks". He is also serving as a book series editor for a book series on Distributed Computing Systems for the Oxford University Press. He served as the Program Chair of the 6th International Conf. on Computer Communications and Networks, 1997 and of the 17th IEEE Symposium on Reliable Distributed Systems, 1998. He is currently serving as the Program Director of Operating Systems and Compilers program at National Science Foundation.

Prof. Jie Wu

Distinguished Professor, Department of Computer Science and Engineering, Florida Atlantic University
Program Director, NSF



Title:

Mobility in Ad Hoc Wireless Networks: Friend or Foe

Abstract:

Ad hoc wireless networks are multi-hop networks in which mobile nodes cooperate to maintain network connectivity. These networks perform various functions including routing. In this presentation, two opposing views of mobility in ad hoc wireless networks are presented. One view casts mobility as an undesirable feature. This view normally represents an ad hoc wireless network as a connected graph where path information needs to be properly maintained to ensure message delivery. Another view considers mobility as a desirable feature which can increase network capacity and even assist the routing process. We offer our views on these two approaches and discuss some recent discoveries regarding mobility-mitigation mechanisms, including buffer zones and view consistency.

Finally, we present several future applications of wireless networks and their potential role in the network science and engineering.

Bio:

Jie Wu is a Distinguished Professor at the Department of Computer Science and Engineering, Florida Atlantic University and a Program Director at National Science Foundation. He has published over 400 papers in various journals and conference proceedings. His research interests are in the areas of wireless networks and mobile computing, routing protocols, fault-tolerant computing, and interconnection networks. Dr. Wu was on the editorial board of IEEE Transactions on Parallel and Distributed Systems and was a co-guest-editor of IEEE Computer and Journal of Parallel and Distributed Computing. He served as the program co-chair for MASS 2004, program vice-chair for ICDCS 2008, and program vice-chair for ICPP 2000. He was also general chair for MASS 2006 and is general chair for IPDPS 2008.

He is the author of the text "Distributed System Design" published by the CRC press. He was also the recipient of the 1996-1997 2001-2002, and 2006-2007 Researcher of the Year Award at Florida Atlantic University.

Dr. Wu has served as an IEEE Computer Society Distinguished Visitor and is the Chairman of IEEE Technical Committee on Distributed Processing (TCDP).

Prof. Guoliang (Larry) Xue

Professor of Computer Science and Engineering, Arizona State University, USA



Title: Multiconstrained QoS Routing: Advances and Challenges

Abstract:

A fundamental problem in quality of service (QoS) routing is to find a path between a specified source-destination node pair that satisfies K additive QoS constraints, where $K \geq 2$ is a constant integer. This problem is known to be NP-hard, and has been heavily studied for the case of $K=2$, where the two QoS parameters denote cost and delay, respectively. Existing approaches to this problem can generally be divided into two classes: simple heuristics that does not provide performance guarantees, or sophisticated approximation algorithms that provide worst case performance guarantees but are complicated for implementation. In this talk, we will present some recent advances for solving the general problem with $K \geq 2$ QoS constraints. These include faster $(1+\epsilon)$ -approximation algorithms, and a class of K -approximation algorithms which run as fast as the well-known shortest path algorithms. We will also look at the challenges and opportunities along this line of research.

Bio:

Guoliang (Larry) Xue is a Professor of Computer Science and Engineering at Arizona State University. He received the PhD degree in Computer Science from the University of Minnesota in 1991. He has held previous positions as Assistant/Associate Professor of Computer Science at the University of Vermont. His research interests include quality of service routing, resource allocation in wireless networks, and relay node placement in wireless sensor networks. He currently serves on the editorial boards of Computer Networks, IEEE Network Magazine, and IEEE Transactions on Wireless Communications. More information can be found at <http://optimization.asu.edu/~xue>.