Special Issue on Advances in Communications and Networking – II

Guest Editorial

During the past decade, we have witnessed the deployment and evolvement of broadband networks and mobile networks growing at an unprecedented pace, which has enabled many new applications and services, ranging from IPTV to telepresence, from interactive online games to cloud computing, and from mobile video streaming to mobile social networks. This imposes many challenges and leads to the rising demand for many aspects of computer networks and communications, including greater network bandwidth, more reliable and secure network connection, more optimal resource allocation across the network, more efficient cross-layer network architecture design, and higher quality of service and experience by consumers.

The twentieth International Conference on Computer Communication Networks (ICCCN) is one of the leading international conferences for presenting novel ideas and fundamental advances in the fields of computer communications and networks. It covers a very wide range of topics including next-generation computer network architectures and protocols (broadband, sensor networks, optical and grid networking, wireless ad hoc networks, mesh networks), network algorithms and performance evaluation, content networking and multimedia delivery technologies, network security and privacy, as well as Internet applications and services. In 2011, the main conference attracted a record 452 submissions of which 134 high quality regular papers (also a record) were accepted for presentation.

In view of the success of ICCCN 2011, this special issue on the advances in communications and networking is dedicated to this conference. We invited the authors of the very top papers to submit full journal papers by extending the conference version with a substantial amount of new content, including new analytical and experimental results and more thorough discussions. These extended papers, to appear in two issues of the journal, have been separately reviewed to ensure that they have met the journal's standards. In the following, we briefly summarize the papers included in this special issue.

Design of efficient network algorithms is one of the fundamental issues in computer networking. There are five papers in this area addressing the analysis, measurement, and simulation tools for evaluating the behavior and performance of complex communication networks.

In "*Scalable network emulation - the NET approach*", A. Grau, K. Herrmann, and K. Rothermel develop a Network Emulation Testbed (NET) system which is able to achieve high scalability by combining efficient node virtualization and adaptive virtual time.

In "*Authenticated quality-of-service signaling for virtual networks*", R. Bless, M. Röhricht, and C. Werle present a Virtual Link Setup Protocol (VLSP) that is designed as a modular extension to a standardized state-of-the-art signaling protocol suite. They use these signaling protocols to ensure an authenticated on-demand setup of virtual links with the establishment of Quality-of-Service guarantees in the underlying substrate.

Redundancy detection is widely used in the storage, management, and transmission of digital content. In "*Low-overhead dynamic sampling for redundant traffic elimination*", E. Halepovic, C. Williamson, and M. Ghaderi propose a dynamic sampling algorithm for redundant content detection algorithm, which is self-configuring and can precisely match the specified sampling rate. Furthermore, it offers byte savings comparable to the static algorithm, with very low additional processing overhead.

In "*Performance isolation in network and computing systems with multiple inputs*", J. Brassil proposes a novel analytical measure of performance isolation for shared resource systems serving multiple traffic flows or computing workloads. By basing the proposed isolation measure on well-known results from network calculus, he demonstrates how isolation metrics can be calculated for flows traversing both individual system elements and networks of those elements.

Proactive failure management is a crucial technology to characterize system behaviors and forecast failure dynamics in the cloud. In "*Ensemble of Bayesian predictors and decision trees for proactive failure management in cloud computing systems*", Q. Guan, Z. Zhang, and S. Fu present an unsupervised failure detection method using an ensemble of Bayesian models, which achieves high true positive rate and low false positive rate for proactive failure management based on experiments in an institute-wide cloud computing system.

Although new wireless network technologies and video delivery mechanisms such as IEEE 802.11 (Wi-Fi) and the 3G and 4G cellular systems are becoming strong alternatives to their wired counterparts, reliable communication in wireless networks is still very challenging and critical. In "*Prioritized information recovery for wireless link-layer communication*" S. Soltani and H. Radha develop Prioritized Automatic Code Embedding (PACE) link-layer protocol to achieve preferred data recovery order across connections, while maintaining stable and reliable data flows over wireless networks.

The area of computer communications and networking being so broad, we can only cover a limited number of papers in this special issue. However, these papers have addressed a good range of topics from network architecture to algorithms, emulations, and security, from the study of multimedia delivery architecture to biometrics. We hope these papers included in the special issue will provide readers with insight into the state-of-the-art technologies, challenges,

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and trends concerning next generation network architectures, protocols, applications, and services. We also hope they can be a catalyst for further research in improving communications and networking through scientific and technological innovation.

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Keywords

Special Issue; Advances in Communications and Networking; Computer Networks; Network Architecture; Network Algorithms; Network Security; Multimedia delivery architecture; Biometrics Protection; Mobile Networks; Ad-Hoc Networks; Optical Networks; Network Virtualization Technologies

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Fan Zhai received his Ph.D. in Electrical and Computer Engineering from Northwestern University, Evanston, IL, USA, in 2004. He is currently with Texas Instruments, where he leads the video processing algorithm development and the video processing subsystem architecture and roadmap at the DSP Systems Department. His primary research interests include image and video signal processing and compression, multimedia communications and networking, and multimedia analysis. He is the co-author of Joint Source-Channel Video Transmission (Morgan & Claypool, 2007) and he has authored more than thirty publications in the area of video compression and communications. He also holds eleven granted/pending US patents in the area of video processing. He is an IEEE senior member.

Ibrahim Matta received his Ph.D. in computer science from the University of Maryland at College Park in 1995. He is an associate professor of computer science at Boston University. His research involves transport and routing protocols for the Internet and wireless networks; feedback-based control design and analysis; architectures for protocol design and large-scale traffic management; modeling and performance evaluation. He published over 100 refereed technical papers, and was guest co-editor of three special journal issues. He received the National Science Foundation CAREER award in 1997. His current projects include recursive network architectures, energy-efficient network design and protocols, and formal methods for safe compositions of network services. In 2011, he was the Technical Program Chair of the IEEE ICCCN 2011 Track on Network Algorithms and Performance Evaluation, Co-chair of the IEEE Computer Communications Workshop (CCW) 2011, and Co-chair of the NSF/PNNL CyberCARD 2011 Track on Trustworthy Cyber-Physical Systems and Infrastructures. He served on many program committees, including for ICNP, CoNEXT, INFOCOM and MobiCom. He was on the Editorial Board of the Computer Networks Journal. His prior service includes General Chair of WiOpt'06, Technical Program Co-chair of ICNP'05, Internet Co-chair of INFOCOM'05, Publication Chair of INFOCOM'03, co-organizer and Technical Program Co-chair of the EU-US NeXtworking'03. He is a senior member of both the ACM and the IEEE.

George N. Rouskas is a Professor of Computer Science at North Carolina State University. He received the Diploma in Computer Engineering from the National Technical University of Athens (NTUA), Athens, Greece, in 1989, and the M.S. and Ph.D. degrees in Computer Science from the College of Computing, Georgia Institute of Technology, Atlanta, GA, in 1991 and 1994, respectively. His research interests include network architectures and protocols, optical networks, network design, and performance evaluation. He is co-editor of the book "Next-Generation Internet Architectures and Protocols" (Cambridge University Press, 2011), author of the book "Internet Tiered Services" (Springer, 2009), and co-editor of the book "Traffic Grooming for Optical Networks" (Springer 2008). He is founding co-editor-in-chief of the Optical Switching and Networking Journal, he is on the editorial board of the IEEE/OSA Journal of Optical Communications and Networking, and he has served on the editorial boards of IEEE/ACM Transactions on Networking, Computer Networks, and Optical Networks. He is the TPC co-chair for ICCCN 2011, and he has served as TPC or general chair for numerous conferences, including the IEEE GLOBECOM 2010 ONS Symposium, BROADNETS 2007, IEEE LANMAN 2004 and 2005, and IFIP NETWORKING 2004. He is a recipient of a 1997 NSF AREER Award, the 2004 ALCOA Foundation Engineering Research Achievement Award and the 2003 NCSU Alumni Outstanding Research Award, and he was inducted in the NCSU Academy of Outstanding Teachers in 2004. He is an Distinguished Lecturer for the IEEE Communications Society in 2010-2011.