Special Issue on Advances in Communications and Networking – I

# 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.

Due to the growing deployment of broadband networks and mobile networks, network security has gained increased awareness. There are three papers falling into this area.

In "*A Scalable DDoS Detection Framework with Victim Pinpoint Capability*", H. Liu, Y. Sun and M. Kim investigate issues related to effectively defending against distributed denial of service (DDoS) attacks in the Internet. They propose a fine-grained DDoS detection scheme based on the Bidirectional Count Sketch (BCS) structure to counter the threat of DDoS attacks. Their approach employs a two-level model to reduce both the size of the search space and time, and further make identification of specific victims possible in the high-speed network environment.

P. Harmer, M. Temple, M. Buckner, and E. Farquhar study how to use Radio Frequency (RF) air monitoring to augment conventional bit-level security at WAPs (Wireless Access Points) to improve communication security in the 4G mobile networks (including existing WiFi and emerging 4G 802.16 WiMAX and LTE variants) in "*4G Security using Physical Layer RF-DNA with DE-optimized LFS Classification*". In this work, Differential Evolution (DE) is used to optimize the performance of a Learning From Signals (LFS) classification engine operating within an RF "Distinct Native Attribute" (RF-DNA) fingerprinting process.

The widespread application of biometrics recognition has brought some new problems related to both privacy and security. In "*A Fuzzy Vault Scheme for Ordered Biometrics*", L. Wu, P. Xiao, S. Yuan, S. Jiang, and C. W. Chen investigate how biometric template should be protected. Their approach is a novel fuzzy vault scheme that can effectively utilize the ordered characteristics of biometric features. In this scheme, they develop ordered fuzzy vault encoding and decoding processes in order to utilize the ordered information of the features.

Network Diversity Multiple Access (NDMA) is a new approach to handle media access collisions by combining a multipacket detection scheme with time diversity. In "*Performance of Hybrid ARQ for NDMA Access Schemes with Uniform Average Power Control*", F. Ganhão, M. Pereira, L. Bernardo, R. Dinis, R. Oliveira, and P. Pinto further improve the performance by extending NDMA with a hybrid-ARQ technique, i.e., the Hybrid-ARQ NDMA (H-NDMA) access mechanism.

In "*Multi-interface Extension to a Scalable Video Streaming Architecture*", Tiia Sutinen and Helena Rivas investigate how to adaptively and intelligently allocate network resources in heterogeneous multi-access environments and ensuring sufficient perceived service quality for the end users. They tackle this problem by proposing an adaptive video streaming architecture exploiting the novel scalable video coding technology. In addition, they propose a multi-interface streaming extension to the architecture to allow dynamic and concurrent usage of the available access networks in the video service delivery.

The future Internet evolution is driven by applications that require simultaneous real-time access to multiple heterogeneous IT resources interconnected by high-speed optical networks. In "*A Service Oriented Framework for Efficient Resource Orchestration in Future Optical Networks*", C. E. Abosi, R. Nejabati, and D. Simeonidou propose a service oriented architectural framework tailored to the needs of future Internet applications. The framework introduces the capability to orchestrate the provisioning of distributed heterogeneous resources owned by multiple providers.


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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, 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.

We thank all the authors for their high-quality contributions to this special issue. We would like to send our sincere thanks to the staff at the JCM Academy Publisher for their efficient job in handling the manuscripts. Our genuine gratitude also goes to the Associate Editor-in-Chief of the JCM Journal of Communications, Dr. Haohong Wang, for his assistance with this special issue.

**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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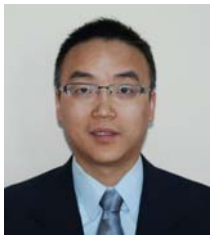

**Fan Zhai** received his Ph.D. in Electrical and Computer Engineering from Northwestern University, Evanston, IL, USA, in 2004. He is currently with Texas Instruments, where he leads the video processing algorithm development and the video processing subsystem architecture and roadmap at the DSP Systems 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.

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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.