Editorial for WICON 2010 on "Recent advances in wireless internet"

Yan Zhang · Chonggang Wang · Hsiao-Hwa Chen ·
Mahmoud Daneshmand

Welcome to this special issue of the ACM/Springer Mobile Networks and Applications (MONET). This special issue is devoted to the topic of the latest research and development on wireless Internet. Wireless Internet is quickly emerging as a reality, thanks to the fast evolution of many wireless access technologies. Convergence of heterogeneous wireless networks and the next generation Internet further brings wireless Internet into a variety of application scenarios which provide mobile users with a wide range of highly demanding services, such as high speed data and real-time multimedia delivery. On the other hand, it is of critical importance to obtain a fundamental understanding of wireless Internet architectures and explore new services and solutions in order to achieve the ultimate goal of wireless Internet access anytime anywhere

The aim of this special issue is to present a collection of high-quality research papers that report the latest research advances in wireless Internet communications, networks, systems, services, and applications. The whole special issue includes the extended papers in the 5th Annual International Wireless Internet Conference (WICON 2010), which was held in March 2010 (http://www.wicon.org/2010/). In this special issue, we selected 6 papers. The selected papers covered the following important topics in the field of wireless Internet: cognitive radio, wireless sensor networks, multimedia communications, and vehicular networks. A detailed overview of the selected works is given below.

The first paper, *Joint Spectrum Allocation and Relay Selection in Cellular Cognitive Radio Networks*, presents a cross-layer framework that jointly considers spectrum allocation and relay selection with the objective of maximizing the minimum traffic demand of secondary users in a cognitive radio network cell. This cross-layer design problem is formulated as a Mixed Integer Linear Programming (MILP) and a low complexity heuristic algorithm is proposed to solve the problem. In addition, a spectrum allocation is studied among several cells with the objective of maximizing the overall minimum throughput of all cells while ensuring each individual cell's minimum throughput requirement.

The second paper, *Joint Optimization of Power, Packet Forwarding and Reliability in MIMO Wireless Sensor Networks*, investigates the reliable packet forwarding in Wireless Sensor Networks (WSNs) with the multiple-input multiple-output (MIMO) and orthogonal space time block codes (OSTBC) techniques. The objective is to propose a cross-layer optimized forwarding scheme to maximize the Successful Transmission Rate (STR) while satisfying the given end-to-end power consumption constraint. The channel coding, power allocation, and route planning are jointly considered to significantly improve the transmission quality in terms of STR. The joint optimization design is

Y. Zhang (✉)
Simula Research Laboratory and University of Oslo,
Oslo, Norway
e-mail: yanzhang@simula.no

C. Wang
InterDigital Communications,
King of Prussia, PA, USA

H.-H. Chen
National Cheng Kung University,
Tainan, Taiwan

M. Daneshmand
AT&T Labs Research,
Florham Park, NJ, USA

formulated as a global deterministic optimization and also a local stochastic optimization issues. Results have shown that the distributed scheme is able to provide sufficiently accurate prediction of the global optimization. In addition, the proposed scheme can clearly reduce the Symbol Error Rate (SER) and achieve higher STR compared with two existing energy-efficient routing protocols, in which joint design is not considered.

The third paper, *Enhanced Active Queue Management for Multi-hop Networks*, provides valuable new insights into the queuing mechanisms in wireless mesh networks and studies the QMMN algorithm (Queue Management for Multi-hop Networks), which tends to improve throughput, fairness and reduce global synchronization problems. An Enhanced QMMN (EQMMN) algorithm is also proposed to solve the problem of fairness between flows and eventually improve TCP throughput at wireless access points. Results show that EQMMN algorithm has higher performance with respect to throughput (TCP) and fairness index compared to QMMN algorithms.

The fourth paper, *A Genetic Algorithm Approach to Multi-Agent Itinerary Planning in Wireless Sensor Networks*, shows that using Mobile Agents (MAs) in wireless sensor networks (WSNs) can help to achieve the flexibility of over-the-air software deployment on demand. In MA-based WSNs, it is crucial to find out an optimal itinerary for an MA to perform data collection from multiple distributed sensors. However, using a single MA brings up the shortcomings such as large latency, inefficient route, and unbalanced resource (e.g. energy) consumption. Then a novel genetic algorithm based multi-agent itinerary planning (GA-MIP) scheme is proposed to address these drawbacks. The extensive simulation experiments show that GA-MIP performs better than the prior single agent algorithms in terms of the product of delay and energy consumption.

The fifth paper, *A Resource Allocation Framework for Scalable Video Broadcast in Cellular Networks*, provides an analysis of video broadcast streaming services for different combinations of layered coding and AL-FEC, using a realistic LTE PHY layer. Results show that the scalable content adaptation given by Scalable Video Coding (SVC) and the scheduling flexibility offered by the 3G-LTE MAC-layer provide a good match for enhanced video broadcast services for next generation cellular networks. The proposed solution is compared to baseline algorithms and broadcast systems based on H.264/AVC streaming solutions. The authors emphasize the system quality improvement brought by the solution and discuss implications for a wide-scale practical deployment.

The sixth paper, *The Impact of Infostation Density on Vehicular Data Dissemination, investigates* the role of Infostations in vehicle networks by acting as gateways to the Internet and by extending network connectivity. In this context, the paper studies an important issue "What is the minimum number of infostations that need to be deployed in an area in order to support vehicular applications". Optimizing infostation density is vital to understanding and reducing the cost of deployment and management. In particular, the authors examine the required infostation density in a highway scenario using different data dissemination models. Efficient techniques are proposed to improve dissemination performance and reduce the required infostation density.

In conclusion, this issue of MONET offers a groundbreaking view into the recent advances in wireless Internet. We believe that this issue offers both academic and industry appeal- the former as a basis toward future research directions, and the latter toward viable commercial applications.

We hope you will enjoy reading the great selection of papers in this issue.
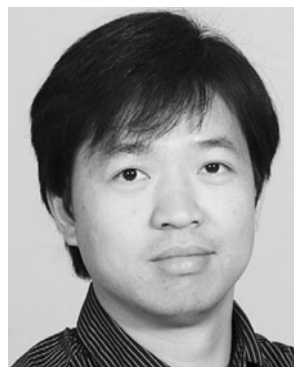
Prof. Yan Zhang received a PhD degree from Nanyang Technological University, Singapore. From August 2006, he is working with Simula Research Laboratory, Norway. He is currently senior research scientist at Simula Research Laboratory, Norway. He is an Associate Professor (part-time) at the University of Oslo, Norway. He is a regional editor, associate editor, on the editorial board, or guest editor of a number of international journals. He is currently serving the Book Series Editor for the book series on "Wireless Networks and Mobile Communications" (Auerbach Publications, CRC Press, Taylor & Francis Group). He serves as organizing committee chairs for many international conferences, including AINA 2011, WICON 2010, IWCMC 2010/2009, BODYNETS 2010, BROADNETS 2009, ACM MobiHoc 2008, IEEE ISM 2007, CHINACOM 2009/2008. His research interests include resource, mobility, spectrum, energy, and data management in wireless communications and networking. Email: yanzhang@simula.no
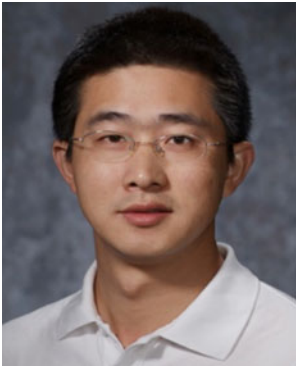
Dr. Chonggang Wang is currently with InterDigital Communications. Before joining InterDigital Communicaitons, he had conducted research with NEC Laboratories America, AT&T Labs Research, University of Arkansas and HongKong University of Science and Technology. His research interests include future Internet, machine-to-machine (M2M) communications, and wireless networks. He has published more than 80 journal/conference articles and book chapters. He is on the editorial board for several journals/magazines including IEEE Communications Magazine and ACM/Springer Wireless Networks. He has served as a TPC member for numerous IEEE conferences including ICNP, INFOCOM, GLOBECOM, ICC and WCNC. He received his Ph.D in computer science from Beijing University of Posts and Telecommunications.

Prof. Hsiao-Hwa Chen (hshwchen@ieee.org) currently is a Distinguished Professor in Department of Engineering Science, National Cheng Kung University, Taiwan, and he was the founding Director of the Institute of Communications Engineering of the National Sun Yat-Sen University, Taiwan. He received BSc and MSc degrees from Zhejiang University, China, and PhD degree from University of Oulu, Finland, in 1982, 1985 and 1990, respectively, all in Electrical Engineering. He has authored or co-authored over 400 technical papers in major international journals and conferences, six books and more than ten book chapters in the areas of communications, including the books titled "Next Generation Wireless Systems and Networks" (512 pages) and "The Next Generation CDMA Technologies" (468 pages), both published by John Wiley and Sons in 2005 and 2007, respectively. He has been an active volunteer for IEEE various technical activities for over 22 years. Currently, he is serving as the Chair for IEEE ComSoc Communications and Information Security Technical Committee. He served as the Chair for IEEE ComSoc Radio Communications Committee from 2007 to 2008. He served or is serving as conferences/symposia/workshops chair/co-chair of many major IEEE conferences, including VTC, ICC, Globecom and WCNC, etc. He served or is serving as Associate Editor or/and Guest Editor of numerous important technical journals. He is serving as the Editor (Asia and Pacific) for Wiley's Wireless Communications and Mobile Computing (WCMC) Journal and Wiley's International Journal of Communication Systems. He is the founding Editor-in-Chief of Wiley' Security and Communication Networks journal (**www.interscience.wiley.com/journal/security**). He is also an adjunct Professor of Zhejiang University, China, and Shanghai Jiao Tong University, China. Professor Chen is a recipient of the Best Paper Award in IEEE WCNC 2008, and a recipient of IEEE Radio Communications Committee Outstanding Service Award in 2008. He is a Fellow of IEEE, a Fellow of IET and a Fellow of BCS.

Dr. Mahmoud Daneshmand is a Distinguished Member of Technical Staff, AT&T Labs Research; Executive Director of University Collaborations Program and Assistant Chief Scientist of the AT&T Labs; Adjunct Professor of CS at the Stevens Institute of Technology. He has more than 35 years of teaching, research & publications, and management experience in academia and industry including Bell Laboratories, AT&T Labs, and University of California at Berkeley, University of Texas at Austin, Tehran University, Sharif University of Technology, National University of Iran, New York University, and Stevens Institute of Technology. He has published more than 70 journal/conference papers and book chapters. Co-authored two books, and has given several keynote talks, and served as general chair and TPC chair of many IEEE conferences. His current areas of teaching and research include Artificial Intelligence; Knowledge Discovery and Data Mining; Complex Networks Analysis, Sensor Networks and RFID Systems reliability & performance and data mining of sensor and RFID data. He has a PhD and MA in Statistics from the University of California, Berkeley, and MS and BS in Mathematics from the University of Tehran.