



ELSEVIER

Contents lists available at ScienceDirect

# Ad Hoc Networks

journal homepage: [www.elsevier.com/locate/adhoc](http://www.elsevier.com/locate/adhoc)

## Editorial

### Advances in Ad Hoc Networks (II)

Ad hoc networks, which include a variety of autonomous networks for specific purposes, promise to enable a broad range of civilian, commercial, and military applications. These networks were originally envisioned as collections of autonomous mobile or stationary nodes that dynamically auto-configure themselves into a wireless network without relying on any existing network infrastructure or centralized administration. With the significant advances achieved in the last decade, the concept of ad hoc networks now assumes an even broader scope, referring to the many types of autonomous wireless networks designed and deployed for a specific task or function, such as wireless sensor networks, vehicular networks, home networks, and so on. In contrast to the traditional wireless networking paradigm, such networks are all characterized by sporadic connections, highly error-prone communications, distributed autonomous operation, and fragile multi-hop relay paths.

The various forms of ad hoc networks have led to significant new and interesting research challenges and problems, attracting substantial attention from academia, industry, and government. The new wireless networking paradigm necessitates reexamination of many established concepts and protocols, and calls for developing new understanding of fundamental problems such as interference, mobility, connectivity, capacity, and security, among others. While it is essential to advance theoretical research on fundamental and practical research on efficient policies, algorithms and protocols, it is also critical to develop useful applications, experimental prototypes, and real-world deployments to achieve immediate impact on society for the success of this wireless networking paradigm.

The annual International Conference on Ad Hoc Networks (AdHocNets) aims to provide a forum that brings together international researchers and practitioners to showcase recent research advances in ad hoc networks. AdHocNets 2010, the second edition of this event, was held in Victoria, Canada, in August 2010. This special issue includes a collection of five outstanding research papers selected through a rigorous review process from 41 papers in the technical program of AdHocNets 2010.

The papers included in this special issue cover a range of topics and report the recent research advances in ad hoc networks. In the first paper, “Duty Cycle Learning Algorithm (DCLA) for IEEE 802.15.4 Beacon-Enabled Wireless Sensor Networks”, Alberola and Pesch propose a duty cycle learning algorithm (DCLA) for IEEE 802.15.4 beacon-enabled wireless sensor networks, which adapts the duty cycle during run time without the need for human intervention to minimize power consumption while balancing reliability and delay constraints. DCLA has low memory and processing requirements, making it suitable for typical wireless sensor platforms. Simulation results show that DCLA achieves the best overall performance for either constant or event-based traffic when compared with existing IEEE 802.15.4 duty-cycle adaptation schemes.

In the second paper, “QoS for Wireless Sensor Networks using CoSenS: Enabling Service Differentiation in the MAC Sub-Layer,” Nefzi and Song study the service differentiation problem in wireless sensor networks and propose CoSenS, a simple and scalable MAC solution, to provide service differentiation at the MAC sub-layer. CoSenS is based on CSMA/CA and also uses the fixed priority or earliest-deadline-first policy on top of CSMA/CA. Simulation results show that CoSenS can better adapt to dynamic traffic and improve the performance of the IEEE 802.15.4 protocol in terms of throughput and end-to-end delay.

The third paper, “Reproducing Consistent Wireless Protocol Performance across Environments,” by Kwon, et al. considers the problem of obtaining comparable protocol performance when the test and deployment environments differ in RF propagation environment and/or internode spacing. To achieve comparable protocol behavior in the two settings, the concept of “link usage spectrum” is proposed, and based on the hypothesis that the link usage spectrum is a gross predictor for network performance, it is shown how to replicate in the test setting the link usage spectrum of the protocol that is expected in the deployment setting via experiments and simulations in multiple indoor and outdoor propagation environments.

The fourth paper, “Using Fuzzy Logic for Robust Event Detection in Wireless Sensor Networks,” by Kapitanova et

al. demonstrates that using fuzzy values instead of crisp ones can significantly improve the accuracy of event detection. It also shows that the fuzzy logic approach provides higher detection precision than two well-established classification algorithms. To address the problem of storing the large fuzzy logic rule-base in a sensor node with limited memory, several techniques are proposed to help reduce the size of the rule-base by more than 70%, while preserving the level of event detection accuracy.

In the last paper, “Accelerating Signature-Based Broadcast Authentication for Wireless Sensor Networks,” Fan and Gong propose an efficient technique to accelerate the signature verification in wireless sensor networks through the cooperation among sensor nodes. By allowing some sensor nodes to release the intermediate computation results to their neighbors during the signature verification, a large number of sensor nodes can accelerate their signature verification process significantly.

The papers included in this special issue represent recent significant research advances in ad hoc networks. We hope that the readers will find this collection timely and informative, and that the special issue will become an important reference for researchers and practitioners in the area.

The authors thank all the authors for their contributions to this special issue. We are grateful to all reviewers for their time and efforts in carefully reviewing all the papers and providing valuable review comments. We would also like to thank Prof. Ian F. Akyildiz, the editor-in-chief of the *Ad Hoc Networks* journal, for providing the opportunity to accommodate this special issue. We thank Devaprakash Kothandapani, the journal manager, Jie Chen, the content development coordinator, and all other production staff for their support during the publication process.

Guest Editors

Jun Zheng

National Mobile Communications Research Laboratory,  
Southeast University, Nanjing, Jiangsu 210096, PR China  
E-mail address: junzheng@seu.edu.cn

David Simplot-Ryl

INRIA Research Centre Lille – Nord Europe,  
Université Lille 1, 59658 Villeneuve d’Ascq,  
France

E-mail addresses: David.Simplot-Ryl@inria.fr

Shiwen Mao

Department of Electrical and Computer Engineering,  
Auburn University, Auburn, AL 36849-5201,  
USA

E-mail addresses: smao@ieee.org

Baoxian Zhang

College of Computing and Communication Engineering,  
Graduate University of Chinese Academy of Sciences,  
19A Yuquan Road, Beijing 100049, China  
E-mail addresses: bxzhang@gucas.ac.cn

Available online 24 June 2011

## 1. Editors’ biographies



**Jun Zheng** (junzheng@seu.edu.cn) received the PhD degree in electrical and electronic engineering from The University of Hong Kong, Hong Kong, in 2000. He is a Full Professor at the National Mobile Communications Research Laboratory, Southeast University (SEU), Nanjing, Jiangsu, China. Before joining SEU, he was with the School of Information Technology and Engineering, University of Ottawa, Ottawa, ON, Canada. He has co-edited (chief editor) the book *Wireless Sensor Networks: A Networking Perspective* (New York: Wiley-IEEE Press, 2009), and has published over 100 technical papers in refereed journals and magazines, and peer-reviewed conference proceedings. His research interests include mobile communication networks, wireless sensor networks, and mobile ad hoc networks, focused on network architectures and protocols.

He serves as Editor in Chief of *ICST Transactions on Mobile Communications and Applications*. He also serves as an Associate Technical Editor of *IEEE Communications Magazine*, an Editor of *IEEE Communications Surveys & Tutorials*, and an editorial board member of several other refereed journals, including *Elsevier Ad Hoc Networks Journal* and *Wiley Wireless Communications and Mobile Computing*. He has co-edited ten special issues for different refereed journals and magazines, including *IEEE Communications Magazine*, *IEEE Network*, and *IEEE Journal on Selected Areas in Communications*, all as Lead Guest Editor. He has served as the founding General Chair of AdHocNets’09, General Chair of AccessNets’07, and TPC or Symposium Co-Chair for several international conferences and symposia, including ICST AdHocNets 2010, IEEE GLOBECOM’08, ICC’09, GLOBECOM’10, and ICC’11. He has also served as a TPC member for a number of international conferences and symposiums. He is a senior member of the IEEE.

He serves as Editor in Chief of *ICST Transactions on Mobile Communications and Applications*. He also serves as an Associate Technical Editor of *IEEE Communications Magazine*, an Editor of *IEEE Communications Surveys & Tutorials*, and an editorial board member of several other refereed journals, including *Elsevier Ad Hoc Networks Journal* and *Wiley Wireless Communications and Mobile Computing*. He has co-edited ten special issues for different refereed journals and magazines, including *IEEE Communications Magazine*, *IEEE Network*, and *IEEE Journal on Selected Areas in Communications*, all as Lead Guest Editor. He has served as the founding General Chair of AdHocNets’09, General Chair of AccessNets’07, and TPC or Symposium Co-Chair for several international conferences and symposia, including ICST AdHocNets 2010, IEEE GLOBECOM’08, ICC’09, GLOBECOM’10, and ICC’11. He has also served as a TPC member for a number of international conferences and symposiums. He is a senior member of the IEEE.



**David Simplot-Ryl** (David.Simplot-Ryl@inria.fr) received the Graduate Engineer degree in computer science, automation, electronic and electrical engineering, MSc and PhD degrees in computer science from the University of Lille 1, France, in 1993 and 1997, respectively. In 1998, he joined the Fundamental Computer Science Laboratory of Lille (LIFL) at the University of Lille

France, where he is currently professor. He receives the Habilitation degree from University of Lille, France, in 2003.

His research interests include sensor and mobile ad hoc networks, mobile and distributed computing, embedded operating systems, smart objects and RFID technologies.

Recently, he mainly contributes to international standardization about RFID tag identification protocols in partnership with Gemplus and TagSys companies. From 2009 to 2011, he was member of the Institut Universitaire de France. He is involved in numerous international conferences and workshops (e.g., recently AdHocNets 2010, IEEE MASS 2010–2011, IEEE INFOCOM 2011–2012) and in editorial activities (e.g., special issue in *IEEE Network Magazine* or associate editor of *IEEE Transactions Parallel and Distributed Systems*). In the INRIA Lille – Nord Europe research centre, he served since 2008 to 2011 as scientific officer in charge of the development and the evaluation of research activities of the research centre. He is now director of the INRIA centre in Lille.



**Shiwen Mao** (smao@auburn.edu) received the Ph.D. degree in Electrical and Computer Engineering from Polytechnic University (now Polytechnic Institute of New York University), Brooklyn, NY in 2004. He was a Research Scientist at Virginia Tech, Blacksburg, VA from 2003 to 2006. Currently, he is an Associate Professor in the Department of Electrical and Computer Engineering

at Auburn University, Auburn, AL, USA.

His research interests include performance analysis, optimization, and algorithms for wireless networks, with current focus on cognitive radio networks, free space optical networks, and multimedia communications. His research has been, and is supported by the NSF, DOD, and industry. He received Auburn Alumni Engineering Council Faculty Research Award—Junior Award and two Auburn Author Awards from Auburn University Libraries and the Graduate School in 2011. He received the US National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award in 2010. He is a co-recipient of the 2004 *IEEE Communications Society Leonard G. Abraham Prize in the Field of Communications Systems*, and the *Best Paper Runner-up Award of The Fifth International ICST Conference on Heterogeneous Networking for Quality, Reliability, Security and Robustness (QShine)* in 2008. He is on the Editorial

Board of *IEEE Transactions on Wireless Communications*, *Elsevier Ad Hoc Networks Journal*, *Wiley International Journal of Communication Systems*, and *ICST Transactions on Mobile Communications and Applications*. He also chairs the Interest Group on Cross-layer Design for Multimedia Communications of IEEE Communications Society's Technical Committee on Multimedia Communications for the term of 2010. He is a member of Tau Beta Pi, Eta Kappa Nu, and a Senior Member of the IEEE.



**Baoxian Zhang** (bxzhang@guca-s.ac.cn) is currently a Full Professor with the College of Computing and Communication Engineering of Graduate University of Chinese Academy of Sciences (GUCAS), Beijing, China. He received his BS, MS, and PhD degrees in electrical engineering from Northern Jiaotong University (Now Beijing Jiaotong University), China, in 1994, 1997,

and 2000, respectively. Before joining GUCAS, he was a Research Scientist with the School of Information Technology and Engineering, University of Ottawa, Ottawa, ON, Canada from 2002 to 2005.

He has served as a Guest Editor of a special issue on Network Coding for Wireless Communication Networks for *IEEE Journal on Selected Areas in Communications*, a special issue on Underwater Wireless Sensor Networks for *Wiley Wireless Communications and Mobile Computing*, and a special issue on Recent Advances in Wireless Networks for *ACM Mobile Networks and Applications*. He has served as Symposium Co-Chairs of CHINACOM'08 Advances in Internet Symposium and IWCMC'09 Cross-Layer Optimized Wireless Networks Symposium. He has also served on technical program committees for many international conferences and symposia, including IEEE GLOBECOM, ICC, and WCNC. He has published over 100 refereed technical papers in archival journals and conference proceedings. His research interests include network architecture, protocol and algorithm design, wireless ad hoc and sensor networks, and performance evaluation. He is a member of the IEEE.