Guest Editorial

Winston K.G. Seah

Victoria University of Wellington,
New Zealand
E-mail: winston.seah@ecs.vuw.ac.nz

Yuan Zhang

University of Jinan,
China
E-mail: yzhang@ujn.edu.cn

Shuhua Lai

Georgia Gwinnett College,
USA
E-mail: slai@ggc.edu

Biographical notes: Winston K.G. Seah received the DrEng from Kyoto University, Kyoto, Japan, in 1997. He is currently Professor of Network Engineering in the School of Engineering and Computer Science, Victoria University of Wellington, New Zealand. Prior to this, he has worked for more than 16 years in mission-oriented research, taking ideas from theory to prototypes, most recently, as a Senior Scientist in the Institute for Infocomm Research, Singapore. His latest research interests include wireless sensor networks powered by ambient energy harvesting, wireless multi-hop networks, and mobility-enhanced protocols/algorithms for networked swarm robotics and sensing applications in terrestrial and oceanographic networks.

Yuan Zhang is currently sponsored by China Scholarship Council as a Visiting Scholar at Department of Computer Science, Georgia State University, USA. He also serves as an Associate Professor at University of Jinan, China. He received the MS in Communication Systems and PhD in Control Theory and Engineering both from Shandong University, China, in 2003 and 2012 respectively. As the first author or corresponding author he has published more than 20 peer-reviewed technical papers in archival journals and conference proceedings, including *IEEE Communication Letters*, *Elsevier Ad Hoc Networks*, etc. His research interests are wireless networks and mobile computing, currently focusing on wireless sensor networks and smartphone sensing.

Shuhua Lai received his PhD in Computer Science at the University of Kentucky in 2006. Now he is an Associate Professor at the Georgia Gwinnett College. His research interests include computer graphics, information security and computer networks. He has published numerous peer-reviewed journal and conference papers in these areas. He also served as editor or program committee member in some well-known national or international research conferences. He has been awarded several research grants by National Science Foundation and Department of Homeland Security.

Wireless networks in ad hoc mode have been comprehensively studied so far in terms of communication protocols. Despite the achievements made in the research community, application-oriented research involving testbeds and implementation are more desirable to help realise adaptive ubiquitous services. The wide variety of possible applications presents vastly varying requirements and characteristics and raises a number of critical issues to be addressed during the design of wireless network protocols. In recent years, to meet the general trend towards diversification, new medium access control, routing, power management, and data gathering protocols have been designed specifically for emerging applications. However, much more work is required in the optimisation of different network parameters to address the realistic requirements and constraints of the target domain. Application-specific goals must be considered in the protocol stack development to reconcile the requirements. Until there are more widespread and longer-term deployments of applications using ad hoc wireless networks, the performance requirements and resulting cost/performance tradeoffs will not be well understood.

This special issue presents a collection of papers discussing advances in wireless protocol design from the

application and services perspective. It includes revised and substantially extended versions of invited papers from the *International Conference on Advanced Engineering Materials and Wireless Communications (AEMWC2012)* held in Jinan, China, 13–15 November, 2012, and submissions from the open call. From a total of 44 submissions, six manuscripts were eventually selected after a rigorous review process and revisions by authors to address reviewers' comments.

Firstly, we have two papers on applications for mobile devices participating in wireless ad hoc networks. Liu et al. propose 'LARES: latency-reduced neighbour discovery for contagious diseases prevention' which exploits the proliferation of smartphones and ease of recording contacts for contagious disease prevention. The authors formulate the contact recording problem as a low-power asynchronous neighbour discovery problem and used it as the basis of their proposed group-based cooperative neighbour discovery protocol. Diaz et al. propose a multimedia-oriented application layer protocol that takes into account the multimedia services offered by wireless ad hoc network nodes to select the best node to provide the required multimedia service. The goal is to provide the best quality of experience and service to the nodes participating in the ad hoc network.

Next, we have two papers addressing routing protocols. Ho et al. in 'Congestion avoidance routing for MANETs' present a novel technique to avoid congestion by rerouting packets dynamically to avoid traffic congestion in mobile ad hoc networks. This scheme is specifically targeted at greedy routing protocols, namely, connectionless approach (CLA) and contention-based forwarding (CBF), to address the packet loss problem. In 'Modelling energy efficiency of OR protocols in wireless networks', Mazumdar et al. analysed the energy efficiency of opportunistic routing protocols using discrete time Markov chains, taking into account the energy consumed in exchanging control packets, data packet transmission including retransmission and reception. The research presented in these two papers show the trend in routing techniques that exploit the broadcast characteristic of wireless communications.

Last, but not least, we have two papers on mobile sensor networks and low-powered wireless devices, like sensors, using the IEEE802.15.4 technology. Jia et al. studied the problem of redeploying mobile sensors to achieve a line-based barrier, which is a linear deployment of equally spaced sensors to provide a barrier between two boundaries. They first provide a theoretical analysis of an optimal deployment based on a random deployment, followed by a distributed deployment strategy to achieve the goal of a line-based barrier cover. Then, using a semi-Markov chain model, Chong et al. present a mathematical analysis of the IEEE802.15.4 association procedure and show that the initial number of simultaneously associating devices is recommended to be smaller than 47. At the boundary of 47 devices, energy consumption is observed to increase abruptly, and these results can be useful for designing networks using the IEEE802.15.4 technology.