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EDITORIAL

Special Issue on Broadband Wireless Networking

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Wireless communication revolution has made fundamental changes to the communications society and human life. Faster, cheaper, and more power-efficient alternatives are rapidly evolving for wide area, indoor and short-range wireless communications. In addition to ultra-high bit rates, ubiquitous coverage via heterogeneous access, low cost, and machine-to-machine and sensor networks, the Wireless World Research Forum (WWRF) names the following characteristics of future wireless systems:

- Users are in control through intuitive interactions with applications, services, and devices.
- Services and applications are personalized, ambient-aware, and adaptive (I-centric); ubiquitous from the point of view of the user.
- Seamless services are provided to users, groups of users, communities, and machines (autonomously communicating devices) irrespective of place and network, and with agreed quality-of-service (QoS).
- Users, application developers, service and content providers, network operators, and manufactures can efficiently and flexibly create new services and business models based on the component-based architecture of the wireless world.

Recent developments in broadband high-speed networks, peer-to-peer networks, wireless and mobile networks, and grid computing have also brought about new challenging problems. This special issue consists of eight papers addressing recent cutting edge research and state-of-the-art technology in broadband wireless communications. The special issue is timely and valuable for future analysis, implementation and experiments.

In the first paper "A macro model of frequently changing mobile networks to perform flow and access control," Maxemchuk and Zhou present a model for mobile ad hoc networks that combines the individual nodes into a super node and performs flow control on the super node. Flow control algorithms are applied to the model and admission control is performed within a super node based on the flows that are assigned by the flow control algorithms.

In the second paper "Efficient resource allocation for policy-based wireless/wired Interworking," Cheng et al. discuss efficient resource allocation techniques for a policy-based wireless/wired interworking architecture, where QoS provisioning and resource allocation is driven by the service level agreement (SLA). An engineered priority resource sharing scheme is proposed for a voice/data integrated wireless domain, where the policy rules may allow cellular-only access or cellular/WLAN interworked access.

Peer discovery is crucial to the peer-to-peer data delivery in IEEE 802.15.3 wireless personal area networks (WPANs). In the paper "Third-party handshake protocol for efficient peer discovery and route optimization in IEEE 802.15.3 WPANs," Yin and Leung propose a third-party handshake protocol, 3PHP, for fast and reliable peer discovery and connection re-establishment with full connectivity support. The 3PHP scheme achieves fast peer discovery in all cases using only a single round of control frame exchange.

In the paper "Design and evaluation of multichannel multirate wireless networks," Niranjan, Pandey, and Ganz propose a new architecture and algorithm for a multirate wireless network which provides high network throughput and efficiency. The architecture takes advantage of multiple non-overlapping frequency channels to overcome the performance degradation due to interference between low data rate links and high data rate links. The multichannel enhancement benefits network throughput, channel efficiency, and network efficiency in multirate wireless networks.

In the paper "Adaptive binary splitting: A RFID tag collision arbitration protocol for tag identification" by Myung and Lee, an adaptive binary splitting (ABS)

protocol for passive radio frequency identification (RFID) tags has been proposed and evaluated. To reduce collisions and identify tags efficiently, ABS uses information which is obtained from the last processes of tag identification. Simulation results show that ABS largely diminishes the identification delay.

The last three papers focus on wireless sensor networks. In the paper "Energy saving mechanisms in sensor networks," Wang and Xiao provide a survey on energy efficient scheduling mechanisms in sensor networks that have different design requirements than those in traditional wireless networks. These mechanisms are classified based on their design assumptions and design objectives. In the paper "Faster lanes, longer lifetimes: activity management in interconnected 802.15.4 sensor clusters," Misic et al. investigate and compare the implementation of activity management in 802.15.4 beacon enabled cluster tandem interconnected by master–slave bridge. Bridge is implemented using the GTS and CSMA-CA access modes, respectively. In the paper "Battery-aware routing for streaming data transmissions in wireless sensor networks," Ma and Yang study the effect of battery behaviour on routing for streaming data transmissions in wireless sensor networks. An on-line computable energy model is given to mathematically model battery discharge behaviour. A battery-aware routing (BAR) protocol is presented to schedule the routing in wireless sensor networks. The routing protocol is sensitive to the battery status of routing nodes and avoids energy loss. It is shown that the proposed battery-aware protocol can save a significant amount of energy.

In closing, the guest editors would like to acknowledge the contribution of many experts who participated in the review process and provided helpful suggestions to the authors on improving the content and presentation of the papers. The advice and support from MONET's editor-in-chief, Dr. Imrich Chlamtac, and the Editorial Assistant Mr. Chris Simpson are greatly appreciated.

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Xuemin (Sherman) Shen received a B.Sc. (1982) degree from Dalian Maritime University, China, and M.Sc. (1987) and Ph.D. (1990) degrees from Rutgers University, New Jersey, all in electrical engineering. Currently, Dr. Shen is with the Department of Electrical and Computer Engineering, University of Waterloo, Canada, where he is a professor and the Associate Chair for Graduate Studies. His research focuses on mobility and resource management in interconnected wireless/wireline networks, UWB wireless communications systems, wireless security, and ad hoc and sensor networks. He is a co-author of three books, and has published more than 200 papers and book chapters in wireless communications and networks, control, and filtering. He was Technical Co-Chair for the IEEE GLOBECOM'03, ISPAN'04, QShine'05, IEEE Broadnets'05, and WirelessCom'05, and is Special Track Chair of the 2005 IFIP Networking Conference. He serves as Associate Editor for IEEE Transactions on Wireless Communications; IEEE Transactions on Vehicular Technology; Computer Networks; ACM/ Springer Wireless Networks; Wireless Communications and Mobile Computing (Wiley); and International Journal of Computer and Applications. He has also served as Guest Editor for IEEE JSAC, IEEE Wireless Communications, and IEEE Communications Magazine. Dr. Shen received the Outstanding Performance Award from the University of Waterloo in 2002 and 2004, for outstanding contribution in teaching, scholarship and service, and the Premier's Research Excellence Award (PREA) in 2003 from the Province of Ontario, Canada, for demonstrated excellence of scientific and academic contributions.
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Y. Thomas Hou obtained his B.E. degree from the City College of New York in 1991, the M.S. degree from Columbia University in 1993, and the Ph.D. degree from Polytechnic University, Brooklyn, New York, in 1998, all in Electrical Engineering. From 1997 to 2002, He was a researcher at Fujitsu Laboratories of America, IP Networking Research Department, Sunnyvale, California. Since Fall 2002, he has been an Assistant Professor at Virginia Tech, the Bradley Department of Electrical and Computer Engineering, Blacksburg, Virginia. His current research interests include resource (spectrum) management and networking issues for SDR-enabled wireless networks, optimization and algorithm design for wireless ad hoc and sensor networks, and video communications over dynamic ad hoc networks. In recent past, he also had work on scalable architectures, protocols, and implementations for differentiated services Internet, service overlay networking, video streaming, and network bandwidth allocation policies and distributed flow control algorithms. He has published over 100 journal and conference papers in the above areas and is a recipient of the 2004 IEEE Communications Society Multimedia Communications Best Paper Award, the 2002 IEEE International Conference on Network Protocols (ICNP) Best Paper Award, and the 2001 IEEE Transactions on Circuits and Systems for Video Technology (CSVT) Best Paper Award. He is a member of ACM and a senior member of IEEE.
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