Guest Editorial
Multihop Wireless Mesh Networks

WE ARE PLEASED to present this Special Issue on Multihop Wireless Mesh Networks. Since its inception, the IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS (J-SAC) has been bringing together a tremendous and rich diversity of authors from universities, government, and industry. We are confident that the mesh networks material contained within will be a valuable source for the research community.

The goal of this Special Issue was to collect cutting edge research achievements in the field of mesh networks. We solicited papers that, rather than generically addressing multihop wireless networks, specifically dealt with research issues arising in wireless mesh network environments. The scope of this issue includes all aspects of mesh networks, including protocol design and analysis, performance analysis, system implementation and measurement, and cross-layer design.

Of the 94 papers submitted in response to the Call for Papers, 18 papers were selected for publication. A first "quick review" phase was dedicated to screen out the papers considered out of the goal of this Special Issue. Somehow against our expectation, a large number of papers (more than 60) was admitted to the full review process, this perhaps being an indicator of the extreme interest of the research community in the field of mesh networking. Each paper that passed the quick review phase was rigorously reviewed by at least three referees. The accepted papers were chosen through a highly competitive process and are truly representative of the state-of-the-art in mesh networking research. The topics reflect the current interests of the networking community; these include traditionally important networking disciplines, as well as newly emerging and exciting areas of research including the following:

- homogeneous/heterogeneous mesh network architectures;
- capacity and scalability issues in mesh networks;
- network autoconfiguration and/or planning solutions;
- interworking between mesh networks of different logical domains;
- cross-layer design;
- medium access control (MAC) schemes;
- error control schemes;
- routing;
- QoS support;
- security;
- use of advanced antenna technologies (MIMO, beam forming, etc.);
- broadcasting and multicasting;
- performance analysis;
- wireless mesh network testbed design and measurements.

The 18 papers chosen in the selection process are the following:

1. Joint Channel Assignment and Routing for Throughput Optimization in Multiradio Wireless Mesh Networks
2. Distributed Channel Assignment and Routing in Multiradio Multichannel Multihop Wireless Networks
3. Quality-Aware Routing Metrics for Time-Varying Wireless Mesh Networks
4. DCMA: A Label Switching MAC for Efficient Packet Forwarding in Multihop Wireless Networks
5. An Efficient IEEE 802.11 ESS Mesh Network Supporting Quality-of-Service
6. A Distributed End-to-End Reservation Protocol for IEEE 802.11-Based Wireless Mesh Networks
7. D-Mesh: Incorporating Practical Directional Antennas in Multichannel Wireless Mesh Networks
8. Distributed Turbo Coding With Soft Information Relaying in Multihop Relay Networks
9. Fair Allocation of Subcarrier and Power in an OFDMA Wireless Mesh Network
10. Resource Allocation for OFDMA Relay Networks With Fairness Constraints
11. Capacity and QoS for a Scalable Ring-Based Wireless Mesh Network
12. Low-Latency Broadcast in Multirate Wireless Mesh Networks
13. A Cross-Layer Optimization Framework for Multihop Multicast in Wireless Mesh Networks
14. Cross-Layer Optimized Video Streaming Over Wireless Multihop Mesh Networks
15. Backbone Topology Synthesis for Multiradio Mesh Networks
16. Gateway Placement Optimization in Wireless Mesh Networks With QoS Constraints
17. Integrated Radio Resource Allocation for Multihop Cellular Networks With Fixed Relay Stations
18. Performance Optimizations for Deploying VoIP Services in Mesh Networks

As editorial policy, we have decided to accept papers mostly based on their absolute technical quality, rather than on the specific topics covered. As such, we have voluntarily included in this Special Issue, papers providing a different view and/or solution of a similar research problem. Despite this, we were lucky to find that these 18 selected papers touch most of the current research issues in the field of mesh networking. As a very rough classification, papers 1–4 cover forwarding/routing issues in single and/or multichannel mesh networks, papers 5–7 tackle medium access control issues, papers 8–11 propose cross-layer resource allocation mechanisms, papers 12–14 tackle network

(broadcast, multicast) and application services (streaming) over mesh networks, papers 15–16 investigate topology/design issues, and papers 17–18 tackle practical mesh networking issues such as one-hop relay nodes and voice-over-Internet protocol (VoIP) deployments.

This Special Issue is the result of the diligence, dedication, cooperation, and hard work of many people. We would particularly like to thank the reviewers for their timely and detailed reports. We are also grateful to Prof. N. Maxemchuk, Editor-in-Chief, for having supported our proposal, to Prof. D. Lee, the Senior Editor who has continuously assisted us in the various phases of this Special Issue, and to the staff of IEEE J-SAC who helped us in editing this Special Issue.

We are honored to have served as Guest Editors of the IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS (J-SAC), Special Issue on Multihop Wireless Mesh Networks. We wish all readers an excellent and memorable read.

Enjoy!

GIUSEPPE BIANCHI
University of Roma Tor Vergata
Rome 18-00173, Italy
giuseppe.bianchi@uniroma2.it

SHYAM S. CHAKRABORTY
LMF Ericsson, Ltd.
Nomadic Laboratory
FIN 02420 Jorvas, Finland
Shyam.Chakraborty@Ericsson.com

XINGANG GUO
Intel Corporation
Communications Technology Laboratory
Hillsboro, OR 97124USA
xingang.guo@intel.com

EDWARD KNIGHTLY
Rice University
Department of Electrical and Computer
    Engineering
Houston, TX 77005-1892 USA
knightly@ece.rice.edu

D. LEE, *J-SAC Board Representative*

Giuseppe Bianchi received the "Laurea" (Dr.Eng.) degree in electronic engineering from the Polytechnic of Milan, Milan, Italy, in 1990, and a Specialization degree in information technology from Cefriel, Milan, in 1991.

He has been an Assistant Professor at the Polytechnic of Milan from 1993 to 1998, and an Associate Professor, first at the University of Palermo (1998–2004), and then at the University of Roma Tor Vergata (2004–2006). He became Full Professor in 2006. He spent 1992 as a Visiting Researcher at Washington University, St. Louis, MO, and 1997, as Visiting Professor at Columbia University, New York. His research activity (documented in more than 100 papers in peer-refereed international journals and conferences) includes design and performance evaluation of broadband and wireless networks.

Dr. Bianchi has Co-Chaired the ACM Workshops WMI 2001 and WMASH 2003/2004, and the IEEE Conference QoS-IP 2005. He has extensively participated in several research projects, and he is currently leading the National (Italian) Project PRIN-TWELVE (service differentiation in 802.11 networks), and the European Project IST-DISCREET (privacy in pervasive environments).

Shyam S. Chakraborty received the M.Tech. degree from the Indian Institute of Technology (IIT), Delhi, India, and the Dr.Tech. degree from Helsinki University of Technology (HUT), Helsinki, Finland.

He is a Docent at the Department of Electrical and Communication Engineering, HUT, Visiting Professor at AIT, Bangkok, Guest Professor with the WING Group, Aalborg University, and Guest Researcher at TU-Berlin. He is presently with Ericsson Corporate Research, Finland.

Prof. Chakraborty is the recipient of an Academy Research Fellowship from the Academy of Finland.

Xingang Guo received the B.S. degree from Tsinghua University, Beijing, China, in 1992, and the Ph.D. degree from the University of Texas, Austin, in 2000, both in computer science.

He has been with the Communications Technology Laboratory, Intel Corporation, since 2001. Presently, he is a Research Manager in the area of wireless communication and protocol design. His research interests are in high-performance communication systems and platform design and integration, and high-performance mobile system for high-density wireless networks.

Dr. Guo has served on the Technical Program Committee for several international conferences including ACM WMASH 2004/2005/2006 (International Workshop on Wireless Mobile Applications and Services on WLAN Hotspots), and IEEE RWS 2005/2006 (Radio and Wireless Symposium).

Edward Knightly (S'91–M'96–SM'04) received the B.S. degree from Auburn University, Auburn, AL, in 1991, and the M.S. and Ph.D. degrees from the University of California at Berkeley, in 1992 and 1996, respectively.

He is a Professor of Electrical and Computer Engineering at Rice University, Houston, TX. His research interests are in the areas of mobile and wireless networks and high-performance and denial-of-service resilient protocol design.

Dr. Knightly received the National Science Foundation CAREER Award in 1997, and the Sloan Fellowship in 2001. He is an Associate Editor of the IEEE/ACM TRANSACTIONS ON NETWORKING. He served as Technical Co-Chair of IEEE INFOCOM 2005 and served on the program committee for numerous networking conferences including ICNP, INFOCOM, IWQoS, MobiCom, and SIGMETRICS.