THE FUTURE OF WI-FI


Edward Au


Minho Cheong


Chiu Ngo


Carlos Cordeiro


Weihua Zhuang

This feature topic is a continuation of our November 2014 feature topic on the Future of Wi-Fi. In this second part of the feature topic, five papers selected from a pool of high-quality submissions are introduced. We hope our readers will find these articles useful for understanding recent developments and for inspiring their own work.

Our feature topic begins with an article entitled "802.11 WLAN: History and New Enabling MIMO Techniques for Next Generation Standards," by Kim and Lee. It examines the IEEE 802.11 standard that defines wireless local area networks (WLAN). A detailed technical overview of the WLAN system and recent developments focusing on multiple-input multiple-output (MIMO) technologies are also presented.

The next article, entitled "Emerging Technologies for WLAN" by Jones and Sampath, reviews a few key features of the published IEEE 802.11ac-2013 amendment, and potential emerging technologies being considered in a few amendments that are under development, including IEEE 802.11ah, IEEE 802.11ai, and IEEE 802.11ax. Further, the authors present channel measurement and prototype performance data to demonstrate the gains of MIMO and MU-MIMO, which are two important features of IEEE 802.11ac, in an indoor environment.

The third article of this feature topic focuses on Wi-Fi based indoor positioning, which has recently attracted increasing attention from both academia and industry. Yang and Shao illustrate in their article "WiFi-Based Indoor Positioning" their proposed approach and compare its performance with a few existing mechanisms in terms of cost, complexity, and system performance.

The last two articles continue to cover another very popular topic from Part I of our feature topic: the interworking of Wi-Fi and cellular systems. The first article is contributed by Zhang *et al.* and is entitled "Coexistence of Wi-Fi and Heterogeneous Small Cell Network Sharing Unlicensed Spectrum." The authors examine the potentials and challenges associated with coexisting Wi-Fi systems and heterogeneous cellular networks sharing the unlicensed spectrum. The authors also present a network architecture that can be applied in small cells to exploit unlicensed spectrum used by Wi-Fi systems. In the second article, "Enhanced Capacity & Coverage by Wi-Fi LTE Integration," Ling *et al.* discuss a few solutions that integrate Wi-Fi with LTE access networks, in order to enable Wi-Fi networks to serve more users with higher throughput demands and as an effective traffic offload solution for cellular operators, all coming with the benefits of using the unlicensed spectrum.

BIOGRAPHIES

EDWARD AU [SM] (edward.ks.au@gmail.com) is a senior staff member at Marvell Technology Group, where he is responsible for product certification and standardization of Wi-Fi. He chairs several technical task groups related to location, power saving, and smart grid technologies in the Wi-Fi Alliance and a study group on next generation 60 GHz in IEEE 802.11. He has a strong research record having published tens of papers and patents. He also serves as editor of various IEEE journals, and served as a Track/Symposium Co-Chair of IEEE conferences. He is the recipient of 2013 Top Editor Award of *IEEE Transactions on Vehicular Technology*.

MINHO CHEONG [SM] is a Managing Director at Newracom, Inc., ETRI's spin-off company that develops solutions for the Korea Wi-Fi ecosystem. Dr. Cheong was a project leader, special fellow, and head of delegates of IEEE 802 at ETRI, and worked on R&D on 4G systems, multi-Gbps nomadic systems, and next generation WLAN. He was the coordinator of Korea's standardization for next generation WLAN, Chair of the VHT Working Group at TTA, and PHY co-chair and functional requirements editor of IEEE 802.11ac and IEEE 802.11ah. His research interests include OFDM, MIMO, and interference cancellation, on which he has filed over 100 patents. He was appointed as "Nation-wide Outstanding Research Group" by the Prime Minister of Korea in 2007. He was the recipient of the Silver Prize in a "Human-Tech. Thesis Contest" in 2004 and the Grand Prize in "DSP Design Contest" in 1997.

CHIU NGO [SM] is head of the Standards and Technology Enabling group, Samsung Electronics Silicon Valley R&D Center. As a senior director, he leads Samsung's U.S. standardization activities in connectivity, content, and service delivery for consumer electronics. He has actively participated in various standardization organizations and holds Samsung's position on several Boards of Directors. He has co-authored more than 40 published papers and holds more than 150 U.S. patents He is a Chartered Engineer of IET.

CARLOS CORDEIRO [SM] is a principal engineer in the Platform Engineering Group within Intel Corporation, USA. He is the overall lead of Intel's standardization programs in Wi-Fi and in the area of short-range multi-Gbps wireless systems using millimeter frequencies. In the Wi-Fi Alliance, Dr. Cordeiro is a member of the Board of Directors and serves as the technical advisor, in addition to chairing the technical task group on 60 GHz. He was the technical editor to the IEEE 802.11ad standard. Due to his contributions to wireless communications, he received several awards including the prestigious Global Telecom Business 40 under 40 in 2012 and 2013, the IEEE Outstanding Engineer Award in 2011, and the IEEE New Face of Engineering Award in 2007. He is the co-author of two textbooks on wireless published in 2006 and 2011, has published about 100 papers in the wireless area alone, and holds over 30 patents. He has served as an editor for various journals.

WEIHUA ZHUANG [F] has been with the University of Waterloo, Canada, since 1993, where she is a professor and a Tier I Canada Research Chair in Wireless Communication Networks. Her current research focuses on resource allocation and QoS provisioning in wireless networks, and on smart grid. She is a co-recipient of several best paper awards from IEEE conferences. Dr. Zhuang was the editor-in-chief of *IEEE Transactions on Vehicular Technology* (2007-2013), and the Technical Program Symposia Chair of the IEEE Globecom 2011. She is a Fellow of the Canadian Academy of Engineering, a Fellow of the Engineering Institute of Canada, and an elected member of the Board of Governors and VP–Mobile Radio of the IEEE Vehicular Technology Society. She was an IEEE Communications Society Distinguished Lecturer (2008–2011).