

IMPROVING SPECTRAL EFFICIENCY OF 4G AND BEYOND

Dear readers,
This is the second issue of 2014, and I hope that all of you are already enjoying the spring season of the year.

This issue consists of two major parts, as well as some columns. The first part of this issue is a Feature Topic (FT), "Enhancing Spectral Efficiency for LTE-Advanced and Beyond Cellular Networks," co-edited by Shaowei Wang, Yan Xin, Shanzhi Chen, Weiye Zhang, and Chonggang Wang. I really appreciate the great effort of the entire Guest Editorial team for this FT, who worked extremely hard in order to select high-quality papers from a fairly large number of submissions due to the fact that the topics covered by this FT are very hot. The response received by the Call for Papers for this FT was overwhelming. It was indeed not easy for the Guest



HSIAO-HWA CHEN

Editors to handle the reviews of all submissions in a very timely manner to reach the publication deadline for this FT. Long Term Evolution-Advanced (LTE-A) is a name for the fourth generation (4G) mobile cellular standard, which has been selected by most countries around the world as a mainstream standard for the upcoming generation of wireless communications. LTE-A prototyping systems have been tested, and trial services have been conducted in some countries. Successful worldwide deployment of LTE-A systems will come very soon, and will be another important milestone in telecommunications history in terms of its capacity and the variety of its services. We are looking forward to it eagerly. The main issue covered in this FT is ways to improve the spectral efficiency of the 4G and beyond wire-

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less communication systems, which is indeed a very pressing issue faced by all people working in wireless communications in the world. This is because we have a serious radio spectrum shortage problem for implementing wireless communications everywhere, even though we have already tried very hard to make use of many other means to overcome the radio spectrum shortage problem, such as cognitive radio and multiple-input multiple-output (MIMO) systems. Therefore, in this context, the publication of this FT is timely and can serve as a useful reference to the wireless communications community. I hope you all like the nine excellent articles included in this FT.

The second part of this issue features four open call articles. Taking this opportunity, I would like to let you know that all four Open Call articles were accepted very recently, due to the zero backlog Open Call paper queue of this magazine. Now, we are able to publish all accepted Open Call papers in the next immediate issue. In this way, the submission-to-publication turnaround time for this magazine has been significantly shortened.

The first article in the Open Call section in this issue is "Congestion Control for Differentiated Healthcare Service Delivery in Emerging Heterogeneous Wireless Body Area Networks" by Sabato Manfredi. In this article, the author proposes a healthcare data traffic control scheme over heterogeneous wireless body area networks to avoid traffic congestion and ensure quality of service (QoS) requirements in terms of service reliability and responsiveness. In particular, a proportional fair allocation control strategy at each healthcare terminal device/router is employed to regulate the rate of data flow proportional to the information priority, which can be associated with both the bandwidth requirements for reliable communications of vital signals and the levels of emergency in specific emergency care units, clinical service stations, and outbreak/disaster situations. Afterward, the author also makes an effort to present a congestion control scheme based on adaptive fairness criterion that can deal with different and dynamic healthcare scenarios. The article illustrates a simulator environment that has been built to validate the effectiveness of the proposed schemes.

The next Open Call article in this issue is contributed by Lu Lu *et al.*, called "Opportunistic Transmission Exploiting Frequency- and Spatial-Domain Degrees of Freedom." In this article, the authors provide a comprehensive survey on the opportunistic radio transmission schemes for wireless applications, where some existing users/systems have to be protected, while at the same time newcomers can transmit whenever the radio resource is available. Several schemes exploiting the transmission opportunities in the frequency and spatial domains are investigated. Some practical considerations, potential applications, and possible future research topics are discussed.

The third Open Call article, authored by Tongtong Li *et al.*, is "*N*-Hop Networks: A General Framework for Wire-

less Systems." In this article, the authors introduce a unified framework for quantitative characterization of different types of wireless networks. First, they revisit the evolutionary path of centralized, ad hoc, and hybrid networks, and then discuss the trade-off between structure-ensured reliability and efficiency, and ad hoc enabled flexibility. Motivated by the fact that the number of hops for a basic node in a network to reach a base station or a sink has a direct impact on the network capacity, delay, efficiency, and their evaluation techniques, the authors introduce a concept of *N*-hop networks, which may serve as a generic framework including most of the existing network models. The use of this proposed framework can also make it easier to analyze network performance. In addition, the proposed hierarchical structure enables easier tracking of user accountability and malicious nodes, and at the same time provides a flexible platform for privacy protection.

The fourth article in the Open Call article section is "Emerging Technologies and Research Challenges for 5G Wireless Networks," co-authored by Woon Hau Chin *et al.* The authors in this article make their effort to identify several emerging techniques, which might change and redefine future generation telecommunications standards, some of which have already been adopted in the Third Generation Partnership Project (3GPP) LTE system. At the end of the article, the authors also take a look at some of the open research topics in this direction.

In addition to the FT and Open Call article sections, this issue also includes two columns: "Industry Perspectives: IEEE 802 Standards for TV White Space," edited by Kuor-Hsin Chang; and "Spectrum Policy: Meeting Mobile Demand with a Combination of Spectrum Alternatives," Guest Edited by Peter Rysavy. I hope you will enjoy reading them.

BIOGRAPHY

HSIAO-HWA CHEN [S'89, M'91, SM'00, F'10] (hshwchen@mail.ncku.edu.tw) is currently a Distinguished Professor in the Department of Engineering Science, National Cheng Kung University, Taiwan. He obtained his Ph.D. degree in telecommunication engineering from the University of Oulu, Finland, in 1991. From 2001 to 2003, he served as the founding director of the Institute of Communications Engineering of National Sun Yat-Sen University, Taiwan, which was the first telecommunication research institute established in Southern Taiwan. This institute has graduated a large number of telecommunications postgraduate degree holders in Taiwan. He has authored or co-authored over 300 technical papers in major international journals and conferences, six books, and more than 10 book chapters in the areas of telecommunications, including the books *Next Generation Wireless Systems and Networks* and *The Next Generation CDMA Technologies* (Wiley, 2005 and 2007). He has been an active volunteer for various IEEE technical activities for over 25 years. He has served as General Chair, TPC Chair, and Symposium Chair for many international conferences. He has served or is serving as an Editor and/or Guest Editor for numerous major technical journals. He served as Chair of the IEEE ComSoc Communications and Information Security Technical Committee from 2010 to 2012, and Chair of the IEEE ComSoc Radio Communications Committee from 2007 to 2008. He was the recipient of the best paper award at IEEE WCNC 2008 and the 2008 IEEE Radio Communications Committee Outstanding Service Award. He is an elected BoG member of IEEE Communications Society. He is a Fellow of IET and BCS.