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Editorial: MAC for the Next Generation Networks in Unlicensed Band

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Editorial:

In recent years, both cellular networks and wireless local area networks (WLAN) have paid great attention to the next-generation networks in unlicensed bands (UB-NGNs) in order to keep up with ever-increasing wireless traffic demands. UB-NGNs include, for example, MuLTEfire, Licensed-Assisted Access (LAA), LTE-u in cellular networks, IEEE 802.11ax, 802.11ay, and more. Media access control or multiple access control (MAC) is indispensable for wireless networks. MAC tries to ensure multiple users can share wireless resources efficiently, fairly and systematically. However, since unlicensed bands are open and free, the MAC for UB-NGNs faces challenges not seen in networks in licensed bands. UB-NGNs are currently in development, and the design and optimization of MAC technology for UB-NGNs is an urgent need. Therefore, this special issue focuses on MAC technology for UB-NGNs.

This special issue features six selected papers with high quality. The first article, "Concept and Analysis of Capacity Entropy for Uplink Multi-user Media Access Control for the Next-generation WLANs," proposes the concept of capacity entropy for multi-user access (CEM) to quantitatively measure the joint carrying capacity of scheduled access and random access for wireless networks. The CEM of the upcoming next-generation WLAN, IEEE 802.11ax, is modeled and analyzed. The proposed concept of CEM will pave a new technical way to investigate the optimization of the joint carrying capacity for next-generation WLANs.

The second article, titled "Performance of Splitting LTE-WLAN Aggregation," focuses on the LTE-WLAN aggregation (LWA) networks and the LTE-to-WLAN ratio problem. This article proposes an LTE-to-WLAN ratio selection rule. Then, the adaptive LWA routing procedure can be easily implemented in the Radio Resource Management (RRM) and the Packet Data Convergence Protocol (PDCP) layer at the LTE eNB.

The third article, titled "Throughput Analysis of 3GPP Licensed-Assisted Access Using Multiple Carriers," deals with LAA. It proposes an analytical model that captures performance of an eNB utilizing multiple carriers in terms of the number of successful channel accesses, to be used in enhancing data rates. The model lays essential foundations for further performance optimization in practical LAA deployment.

MmWave networks are another important type of unlicensed band network. In the next article, titled "Device-to-Device Communications Enabled Multicast Scheduling with the Multi-Level Codebook in mmWave Small Cells," the authors look to optimize multicast service in order to improve mmWave network performance. An efficient multicast scheduling scheme for small cells in the mmWave band, called MD2D, is proposed. Several algorithms are designed and simulations demonstrate that MD2D achieves the best performance compared with other existing state-of-the-art schemes.

The fifth article, titled "Data-Driven Power Allocation for Medium Access Control in LTE-U Coexisting with Wi-Fi," investigates the power allocation problem in LTE-u system. The aim is to maximize system throughput while limiting the worst interference outage probability, given only a limited number of samples of the interference channel's gain. The equivalence between OMA mode and NOMA mode for uplink scenarios is proved.

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Finally, vehicular ad hoc networks (VANETs) are a relatively new type of wireless network. To guarantee the timely dissemination of safety related information in VANETs, the last article, "Identifying Transmission Opportunity through Transmission Power and Bit Rate for Improved VANET Efficiency," proposes a joint adaptation of transmission power and bit rate (JATB) algorithm to search for the optimal transmission power and bit rate to guarantee the packet success rate and to minimize end-to-end delay and minimize busy time.

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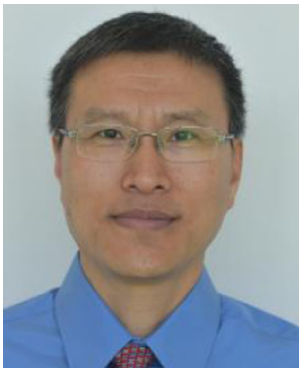

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