Standardization of wireless technologies is a continuous process, and even established standards are updated and modified in response to changes in the technology and the marketplace. One such example is the successful IEEE 802.11 standard for wireless local area networks (WLANs), which was originally designed for 1 and 2 Mb/s traffic, and is now being upgraded to support 600 Mb/s in 802.11n and being considered as a high-throughput (up to 1 Gb/s) wireless interface for the nomadic scenarios of the next generation of wireless systems. Similarly, enhancements to the IEEE 802.16 standard for wireless metropolitan area networks (WMANs) are being considered to develop a mobile air interface with support for up to 100 Mb/s in high mobility scenarios. This continuous evolution of the IEEE 802.11 WLAN and 802.16 WMAN standards is made possible with new innovation and contribution from both academia and industry. Given the rapid growth of these technologies, it is important to understand what new application scenarios have triggered the recent developments within WLAN and WMAN standards, how they are evolving, the technological challenges they face, and the opportunities for both the industry and research communities. In this issue, from a large number of submissions, we have selected five key articles for inclusion, which provide the reader with ongoing developments in these standards, technology roadmaps, current research challenges, and comprehensive evolution of these technologies, as well as deployment experience and application requirements.

The first article, by V. Genc et al., entitled “IEEE 802.16j Relay-Based Wireless Access Networks: An Overview,” focuses on the upcoming IEEE 802.16j standard, which is adding relay capabilities to IEEE 802.16 systems. The authors provide an overview of this relay-based technology, describing its different modes of operation, its framing structures, and the network entry procedures, and also consider the issues in designing such systems.

In their article entitled “OFDMA vs. SC-FDMA Performance Comparison in Local Area IMT-A Scenarios,” G. Berardinelli et al. focus on the possible uplink technologies for local area scenarios supporting very high data rates in order to meet the International Mobile Telecommunications-Advanced (IMT-A) requirements. The authors discuss the suitability of using orthogonal frequency-division multiple access (OFDMA) or SC-FDMA in the uplink by considering as target performance metrics the PAPR and multi-user diversity gain. The authors further propose a new channel-aware scheduling algorithm for SC-FDMA.

The third article, by R. Jain et al., entitled “System Level Modeling of IEEE 802.16e Mobile WiMAX Networks: Key Issues,” provides a comprehensive system-level modeling of IEEE 802.16e Mobile WiMAX. The Application Working Group at the WiMAX Forum has developed a standard simulation methodology that describes the key features to be simulated. In this article the authors present a summary of the simulation methodology, and discuss the key issues and common mistakes in simulating various features of network configuration, and the physical, media access control (MAC), and application layers.

In the next article we shift directions to another important area, handoff and security aspects in WLANs. The article, entitled “Secure Handover in Enterprise WLANs: CAPWAP, HOKEY, and IEEE 802.11r,” by T. C. Clancy, provides a high-level introduction to three emerging protocols to support fast mobile handover between access points in WLAN scenarios. The author provides details of these protocols, and compares their relative security properties, performance, and use cases.

While the previous articles address WLAN or WMAN standards individually, the last article provides an integrating view of these two standard technologies. In the final article, entitled “Handover Management in Integrated WLAN and Mobile WiMAX Networks,” A. Pontes et al. discuss the integration of IEEE 802.11 WLANs and IEEE 802.16 WMANs, focusing mainly on the handover management aspects. The authors provide an informative description of architectures, futuristic application scenarios such as the envisioned heterogeneous multihop wireless networks (HMWNs) and moving networks, as well as related research issues. The authors also discuss the IEEE 802.21 standard, a new emerging
standard aimed at providing a framework for media independent handover (MIH) among heterogeneous networks.

The guest editors wish to express thanks to the many contributors to this special issue, including the many reviewers whose critical comments helped the authors improve the presentation and quality of these articles. In closing, we would like to thank Dr. Abbas Jamalipour, Editor-in-Chief, for his continuing support and guidance over timely publication of this special issue. We hope you like this special issue and find it useful and enlightening.

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