

Editorial

Convergence of Heterogeneous Wireless Networks for 5G-and-Beyond Communications: Applications, Architecture, and Resource Management

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Evolving fifth-generation- (5G-) and-beyond communication networks are envisioned to provide services with massive connectivity, ultrahigh data-rate, ultralow latency, much improved security, very low energy consumption, and high quality of experience. 5G-and-beyond communication systems not only will be more advanced but also are expected to be more complex in comparison with legacy systems. To achieve the goals of 5G-and-beyond communication systems, convergence of the heterogeneous wireless technologies has emerged as one of the key solutions. This entails convergence of not only the radio frequency (RF) technologies, but also the optical and RF/optical wireless technologies. The optical spectrum is considered as an emerging solution for the development of future high capacity optical wireless communication (OWC) networks. It offers unique advantages, such as huge unregulated optical spectrum and inherent security. Therefore, future networks are anticipated to adopt a multitier RF/optical architecture comprising macrocells, microcells, different types of licensed small cells, optical attocells, OWC networks, and relays. The future 5G-and-beyond systems, instead of being a single wireless access network, will be a “network of networks.” The seamless integration among

heterogeneous wireless, optical and RF/optical wireless networks, demands paradigm shifts in such a way that different networks collaborate with each other so as to achieve the desired goals of the 5G-and-beyond communications. In order to attain full convergence of the heterogeneous networks, many technical issues need to be resolved.

The motivation behind this special issue has been to solicit cutting-edge research relevant to applications, architecture, and resource management of heterogeneous wireless networks for 5G-and-beyond communications. This special issue invited papers that address such issues. Following a rigorous review process (including a second review round), six outstanding papers have been finally selected for inclusion in the special issue. The accepted papers cover a wide range of research subjects in the broader area of convergence of heterogeneous wireless networks to meet the demand of 5G-and-beyond communications systems.

The paper “*Network-Assisted Optimal Datalink Selection Scheme for Heterogeneous Aeronautical Network*” by D. Wang et al. focuses on datalink selection mechanism in heterogeneous aeronautical network. The authors proposed a priority distinction selection algorithm by constructing

multiuser multiobjective optimization problem to maximize the number of users accessing their optimal datalinks and minimize the modification of the users' access requests.

The paper by J. Myung et al. entitled "*Threshold Secret Sharing Transmission against Passive Eavesdropping in MIMO Wireless Networks*" proposes a threshold secret sharing scheme for secure communications in multiple input and multiple output wireless networks. In their novel scheme, the base station divides the secret data into a number of parts using a polynomial-based approach and transmits the divided data to the legitimate user by beamforming with multiple spatial dimensions.

The paper "*An Implementation Approach and Performance Analysis of Image Sensor Based Multilateral Indoor Localization and Navigation System*" by M. Shahjalal et al. investigates the implementation issues for indoor mobile robot localization and navigation systems. The authors proposed an indoor navigation and positioning combined algorithm and further evaluate its performance for the feasibility of real-implementation. They developed an Android application to support data acquisition from multiple simultaneous transmitter links.

The paper by K. Shim et al. entitled "*Exploiting Opportunistic Scheduling for Physical-Layer Security in Multitwo User NOMA Networks*" addresses the opportunistic scheduling in multitwo user nonorthogonal multiple access (NOMA) systems consisting of one base station, multiple near users, multiple far users, and one eavesdropper. The authors introduced a user selection scheme, called best-secure-near-user best-secure-far-user scheme to improve the secrecy performance. Additionally, the authors proposed a descent-based search method to find the optimal values of the power allocation coefficients that can minimize the total secrecy outage probability.

The paper "*Fuzzy Based Network Assignment and Link-Switching Analysis in Hybrid OCC/LiFi System*" by M. Khalid et al. proposes a hybrid optical camera communications and light fidelity architecture to improve the quality-of-service (QoS) of users. The authors present a network assignment mechanism for such hybrid systems. A dynamic link-switching technique is proposed which includes switching provisioning based on user mobility and detailed network switching flow analysis. Fuzzy logic is used to develop their proposed mechanism. A time-division multiple access is also adopted to ensure fairness in time resource allocation while serving multiple users using the same light-emitting diode in the hybrid system.

The paper by M. R. Bosunia and S.-Ho Jeong entitled "*Efficient Content Delivery for Mobile Communications in Converged Networks*" proposes a content-centric networking based content delivery mechanism for 4G and 5G heterogeneous converge networks. The authors described a mobility management scheme to support the content diversity and network diversity by leveraging the abundant computation resources in the mobile network. In addition, this paper analyzes the existing approaches with respect to mobility and evaluates the performance of their seamless content delivery mechanisms in terms of content transfer time, throughput, and data transmission success ratio.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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