

MOBILE COMMUNICATIONS AND NETWORKS



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Technologies and solutions for mobile networks continuously evolve with new features bringing important improvements in terms of e.g., performance, coverage, and operational efficiency. At the same time, they may imply new challenges, some of them are addressed by the articles selected for this issue of the Mobile Communications and Networks series, including: the coexistence between a cell-free system with the existing cellular system; the increased signaling delay for the control plane procedures when satellites are integrated in radio access networks; how to guarantee transparency, monitorability and accountability in case of resource and infrastructure sharing; and information security in the context of integrated sensing and communication.

The first article, “How Will Cell-Free Systems Be Deployed?,” proposes a transitional system, called cell-free and legacy coexistence network (CLCN), in order to bridge the gap between traditional cellular networks and cell-free networks. The proposal enables the co-existence between cell-free nodes and cellular nodes, while aiming to achieve uniform user experience by also taking practical constraints into account. These nodes are proposed to be locally integrated where a cellular node manages the integration while a cell-free node may be connected with one or more cellular nodes depending on the need. Evaluation results are provided to demonstrate the performance benefits particularly in terms of improved uniform user experience.

Multi-operator operations, where the network resources are shared by different operators, bring interesting challenges. One important challenge is assuring the accountability and transparency of multiple vendors in such environments. For this, the article titled “BEAT: Blockchain-Enabled Accountable and Transparent Network Sharing in 6G,” targets a transparent, monitorable and accountable resource and infrastructure sharing architecture for next generation networks, based on blockchain and smart contracts. The authors present the architecture of their solution, its orchestration and operation processes. Through simulation evaluations, the low memory and CPU overhead of the solution are depicted, which shows the feasibility of such an enforcement approach for service level agreements (SLAs).

Satellite communications bring complementing capabilities for cellular communications (e.g., global coverage and resilience), while facing the challenge of being integrated into cellular communications due to critical issues such as long propagation delays and high mobility. The third article, “Space Mobile Networks: Satellite as Core and Access Networks for B5G,” proposes an innovative way of integrating satellites in modern cellular communication solutions of 5G and beyond. A new network architecture is defined, called space mobile network (SMN), where satellites are applied for both radio access network and core network by provisioning network functions. Besides, tunnel-based session establishment method and cluster-based handover method are proposed to reduce session establishment and handover times, respectively.

Information security in integrated sensing and communication (ISAC) is the focus of the fourth article, “Towards Multi-Functional 6G Wireless Networks: Integrating Sensing, Communication and Security.” The inclusion of information signaling in the sensing waveform presents a unique opportunity in the security design for ISAC, due to conflicting design objectives between

sensing (e.g., to better illuminate the target) and communications (e.g., to reduce eavesdropping). After an introduction of the existing ISAC and physical layer security design solutions, the authors investigate sensing-aided secure ISAC techniques, including illustration of some hardware-efficient secure ISAC design. Open challenges and future work are also summarized.

The four articles in this issue of the series offer some interesting examples of solutions to enable features that could bring important improvements in the future generation of the mobile technologies. We trust the readers will find some inspiring ideas, and we would like to thank the authors of the articles for their excellent contributions.

As always, we would also like to thank the Editor in Chief, Associate Editor in Chief and the editorial staff for their support and assistance, and the team of reviewers for their meticulous and precious efforts in assessing the articles and suggesting many useful improvements.

BIOGRAPHIES

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