OPTICAL COMMUNICATIONS AND NETWORKS


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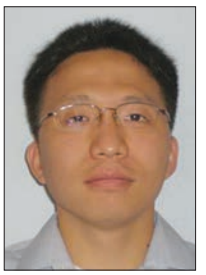
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This is the first issue in 2020 of the Optical Communications and Networks Series (OCNS). This series presents articles on the latest developments in this key technology field, which offers unprecedented communication capacity and cost-effective interconnection capability to support a variety of bandwidth-hungry wireline and wireless applications. In this issue, we have selected three contributions that address (i) optical underlay network slicing, (ii) resource allocation in optically connected data centers, and (iii) joint radio-frequency (RF) and lightwave wireless communication and power transfer protocols.

The first paper, "5G Oriented Optical Underlay Network Slicing Technology and Challenges" by S. Huang *et al.*, introduces an optical underlay virtualization function framework as a key enabling technology for 5G end-to-end (E2E) network slicing, including topology, bandwidth and control plane virtualization function. Also, two data plane candidates recently proposed in ITU-T for optical underlay virtualization, (i) Mobile Optimized Optical Transport Network and (ii) Slicing Packet Network, are summarized. Finally, several significant challenges that need to be addressed to fully realize the vision of optical underlay network slicing and then E2E slicing are investigated.

The second paper, "Disaggregated Data Centers: Challenges and Tradeoffs" by R. Lin *et al.*, presents and analyzes various network architectures for disaggregated data centers. One of the key findings of this paper is that resource disaggregation improves the resource utilization in data centers, even though the bandwidth provided by the state-of-the-art optical transmission and switching technologies is not always sufficient for fully disaggregated data centers. Therefore, this paper calls for further advances in optical communications to enable fully disaggregated data centers and as such benefits from the potential energy reduction that would be induced by resource disaggregation.

Finally, the third paper of the series, "Collaborative RF and Lightwave Power Transfer for Next-Generation Wireless Networks" by H. Tran *et al.*, presents a novel collaborative RF and lightwave power transfer technology which entirely exploits the efficacy of both the RF and lightwave bands to cope with the expectations of next-generation wireless networks, such as longer device lifetimes and higher data rates. More specifically, the authors introduce a basic transceiver architecture and four collaborative communication and power transfer protocols for distinct scenarios and showed that supplemental performance gains can be achieved. They also discuss several future research directions to foster continuous advancement in this interesting area.

In summary, these three articles offer a good set of important recent results illustrating the progress in the area of optical communication and networking. As OCNS editors, we hope that the *IEEE Communication Magazine* readers will find these articles interesting, and we will endeavor to continue doing our best selecting similar informative papers for future OCNS issues. We would finally like to thank all the authors who submitted articles to this series, the diligent reviewers for their high-quality reviews with valuable feedbacks and comments to the authors, and the publication staff of *IEEE Communications Magazine* including the Editor-in-Chief for their great support.

BIOGRAPHIES

MOHAMED-SLIM ALOUINI [F'09] (slim.alouini@kaust.edu.sa) received his Ph.D. degree in electrical engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA in 1998. He served as a faculty member at the University of Minnesota, Minneapolis, and then at Texas A&M University at Qatar, Education City, Doha, before joining King Abdullah University of Science and Technology (KAUST), Thuwal, Makkah Province, Saudi Arabia, as a professor of electrical engineering in 2009. His current research interests include the modeling, design, and performance analysis of wireless communication systems.

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