

OPTICAL COMMUNICATIONS AND NETWORKS



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As the second issue in 2020 of the Optical Communications and Networks Series (OCNS), this series selects articles that cover interesting advances on devices, systems and networks regarding optical communications and networking. We are pleased to witness active innovations in this area, which will make the data exchange and processing in the future Internet more adaptive, application-aware, and cost-effective.

For this issue, we have selected four contributions that address (i) interleaved data converter architectures for future high-speed fiber optical communications; (ii) improved modulation designs for visible light communications; (iii) new bandwidth allocation schemes for supporting green fog integration in next-generation optical access networks; and (iv) a techno-economic study on optical network disaggregation employing open-source software business models.

The first article, “Data Converter Interleaving: Current Trends and Future Perspectives” by C. Schmidt *et al.*, presents and compares interleaved digital-to-analog and analog-to-digital converter architectures in both the electrical and optical domains. Their analysis helps to bridge the emerging bandwidth gaps between state-of-the-art CMOS data converters and requirements of next-generation high-speed fiber-optic communication systems.

The second article, “Improving the Modulation Designs for Visible Light Communications with Signal-Dependent Noise” by Q. Gao *et al.*, presents recent progress in novel modulation designs for single-carrier and multi-carrier visible light communication (VLC) systems under signal-dependent noise. An important observation in this paper is that the widely adopted minimum Euclidean distance (MIN-ED) based designs can be far from optimal when signal-dependent noise exists. Two new concepts, namely the rotated MIN-ED and the distance range, are illustrated in this paper, the adoption of which leads to significant performance gains. Future directions of the topic, such as distance spectrum-based modulation, joint modulation and pre-coding design, and machine learning-enabled modulation, are also discussed.

The third article, “Centralized vs. Decentralized Bandwidth Allocation for Supporting Green Fog Integration in Next-Generation Optical Access Networks” by A. Helmy *et al.*, presents a comparative study of the bandwidth allocation schemes for the integration of fog computing with passive optical networks (PONs), from the perspectives of energy-efficiency, network performance, and associated deployment costs.

Finally, the fourth article, “A Techno-Economic Study of Optical Network Disaggregation Employing Open-Source Software Business Models for Metropolitan Area Networks” by J. Hernández *et al.*, presents a first attempt to model optical WDM disaggregation from a techno-economic point of view. It compares the legacy network architecture against two disaggregated scenarios, partial and total, and includes a deep analysis of the hardware cost, software development and integration effort required in each case. The conclusions of the article suggest that medium to large size telecom operators, with some thousands of Metro nodes, can achieve cost savings between 15 and 25 percent if moving toward a partial or total disaggregation scenario.

As the OCNS editors, we hope that *IEEE Communications Magazine* readers will find these articles interesting and informative. We will continue to do our best to select similarly outstanding papers for our future OCNS issues. We would like to thank all the authors for submitting their important results to this series, the reviewers for their high-quality reviews that provide valuable feedback and comments to the authors, and the publication staff members as well as the Editor-in-Chief of *IEEE Communications Magazine* for their guidance and support.

BIOGRAPHIES

ZUQING ZHU [SM'12] (zqzhu@ieee.org) received his Ph.D. degree from the University of California, Davis, CA, USA in 2007. He is currently a full professor at the University of Science and Technology of China. Prior to that, he worked in the Service Provider Technology Group of Cisco Systems, San Jose, California. His research focuses on optical networks. He is a Senior Member of OSA, and an Associate Editor of *IEEE Transactions on Network and Service Management* and *Optics Express*.

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