

# Introduction to the OFC 2018 Special Issue

Jane M. Simmons

**Abstract**—This special issue includes extensions of invited and top-scored optical networking papers that were presented at the Optical Fiber Communication (OFC) Conference, held in San Diego, CA, March 11–15, 2018. We present an overview of the array of topics covered in the papers, tied in with some historical perspectives on OFC.

Welcome to the *Journal of Optical Communications and Networking* (JOCN) OFC 2018 Special Issue. Published over two months (January and February 2019, Vol. 11, Nos. 1 and 2), the special issue includes extensions of invited and top-scored optical networking papers that were presented at OFC 2018. The OFC Technical Committee worked with the JOCN Editor to determine which authors were eligible to participate in this issue. The authors were required to include significant new material as compared to their OFC paper. All papers underwent the usual JOCN peer-review process. All of the authors, reviewers, editors, and JOCN staff are acknowledged for their diligence in producing this high-quality special issue.

OFC has often been the conference where the seeds of major advancements in optical networking have been planted. For example, an OFC 2009 paper on “spectrum-sliced elastic optical paths” was one impetus to the elastic optical networking (EON) paradigm shift. Several of the papers in this special issue address EONs in some fashion, focusing on the more efficient use of spectrum as networks evolve. At OFC 2013, one of the plenary speakers introduced much of the optical networking community to software defined networking (SDN). Although this paradigm as it relates to the optical layer was initially met with some skepticism, SDN now permeates much of the research in optical networking, including several papers in this special issue. The first phase of SDN addressed programmability of the control plane; the ability to program the forwarding engine has been identified as the next game-changing evolution. One language developed for this purpose, P4, is explored in a paper here. The ultimate goal of these tools is to endow carriers and enterprises with better control of their networks. This is embodied in the broader trend towards open networks (e.g., network function virtualization, disaggregated architectures), another theme present in a number of papers here.

Capacity limits of a fiber (discussed at least as early as OFC 2008) are a challenge faced by some carriers and

enterprises, especially those that own or rent just one or two fiber pairs across their network. One proposed solution, space division multiplexing (SDM) based on multi-core and/or few-mode fiber, is a double-edged sword in the scabbard of optical network architects. On the one hand, SDM may offer a greater degree of freedom (i.e., space), while at the same time it may restrict routing flexibility (e.g., wavebands imposed due to high levels of cross-talk). Taking advantage of the spatial and spectral dimensions of an SDM-based EON is explored in one of the special-issue papers. Another approach to expanding the available capacity is to extend beyond the C-band portion of the spectrum and utilize the L-band. One of the papers proposes an analytic methodology for estimating quality of transmission (QoT) in a C+L system.

Three of the hottest optical networking topics are: the application of machine learning to optical networks; the evolution of edge optical networks, especially related to converged fiber-wireless fronthaul solutions; and low-margin and open networks based on accurate estimates of QoT. All of these subjects are addressed by multiple papers in this special issue. One of the current focus areas related to data centers is the optimal role of optics vs. electronics; an interesting cost analysis, including the impact of integrated optics is presented in one paper here. [Note that JOCN published a full special issue on data centers in July 2018, and on machine learning in October 2018; and will publish a special issue dedicated to latency in edge optical networks in Spring 2019 and to low-margin optical networks in Fall 2019].

Of course, predicting the future is a tough business, and some researchers guessed wrongly in the OFC 2000 timeframe when they averred that line-rates much greater than 10 Gb/s would never be realized due to the number of optical impairments that increase with line-rate. However, advancements such as coherent technology and advanced digital signal processing (DSP) have completely changed the landscape, with 100 Gb/s backbone systems currently being deployed and even higher line-rates expected in the future. Don't bet against technology! The application of coherent technology and advanced DSP has now turned to access networks (with different motivations than in backbone networks), as addressed in several papers here.

As you read the papers in this special issue, bring enthusiasm (and an open and probing mindset). Look for the nuggets in each paper that will drive the optical networking field forward. We look forward to the progress that will be on display at future installments of OFC.

Jane M. Simmons, Editor-in-Chief, JOCN

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The author is with Monarch Network Architects, Holmdel, New Jersey 07733, USA (e-mail: jsimmons@monarchna.com).

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