Elastic Optical Networks: Introduction

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***Abstract*—This short introductory paper sets the scene for this special edition of the *Journal of Optical Communications and Networking*, which is focused on elastic optical networks (EONs). A brief overview of the field is given, followed by a summary of the five invited papers. This special edition is designed to provide a review of current EON technology.**

Since the introduction of the elastic spectrum concept by M. Jinno of NTT in 2008, the subject has grown enormously with hundreds of papers being published annually. Next-generation core optical transport will follow the elastic optical network (EON) paradigm, taking advantage of (1) flexibility at the transceiver and (2) efficient utilization of optical spectrum.

The first is powered by transponders capable of generating multiple modulation formats at variable symbol rates so that transmission can cope with dynamic traffic conditions and prevent network-blocking scenarios.

The latter has been made possible by significant advances in the field of wavelength-selective switches, which are now capable of switching optical slices well below 50 GHz (which was the typical value for earlier fixed-grid DWDM systems). This made possible the realization of flexible ROADM architectures for EONs.

In general, EON architectures provide several benefits, including higher spectral efficiency and system capacity, and reduced network costs. Consequently, we believe it was appropriate to announce a *Journal of Optical Communications and Networking* special edition now to take stock of technologies that are starting to be used in real network deployments.

This call attracted topics ranging from pure data plane experiments to network design and optimization, with themes ranging from advanced hybrid modulation schemes to hardware realization of transmission up to 100 GBd. An important number of contributions present a clear industrial footprint, while some papers are more tutorial-like.

Among all manuscripts, we identified five invited papers, which describe important and general concepts of EONs. For instance, two of them address the fabrication of novel engineered optical cables, namely, "Large-Area Low-Loss Fibers and Advanced Amplifiers for High-Capacity Long-Haul Optical Networks" and "Optical Fibers for Flexible Networks and Systems," where the authors described the potential of the latest fiber technology to enable high-capacity flexible optical networks. Next, the paper entitled "Elastic Optical Networking in the Microsoft Cloud" deals with the current data explosion, discussing the challenges and opportunities for a leading actor in the telecommunications sector when adopting the elastic paradigm. The last two invited papers introduce two different aspects. The first, entitled "Flexible Optical Cross-Connects for High Bit Rate Elastic Photonic Transport Networks," investigates new flexible optical switching solutions with ultra-fine spectral granularity. Finally, "Impact of Client- and Line-Side Flexibility in the Lifecycle of Next-Generation Transport Networks" performs a realistic techno-economic comparison between architectures based on fixed and flexible client- and line-side elements.

Overall, this has been a call for papers intended to stimulate discussion on the relative benefits of EON as compared with other network architectures, with a clear focus on realistic implementable solutions of the different elements composing next generation optical networks.

We hope you will enjoy reading it.

Yours sincerely,
Antonio and Andrew

Manuscript received June 14, 2016; published June 28, 2016 (Doc. ID 268458).

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http://dx.doi.org/10.1364/JOCN.8.00EON1

1943-0620/16/07EON1-01