

Photonic Networks and Devices Feature: Introduction

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Abstract

This feature issue, based on the OSA Photonic Networks and Devices (NETWORKS) meeting, part of the Advanced Photonics Congress, showcases the latest progress across the photonic network ecosystem from physical-layer devices to network management solutions.

Intro

Physical-layer advances in photonic networks have been enabled by recent developments in coherent digital signal processing, advanced modulation formats, and error correction. The relentless demands on transport network capacity is forcing researchers to look towards and beyond 1 Tb/s and at highly-integrated photonic platforms in both Silicon and Indium Phosphide. Such technologies contribute to the continuous capacity increase on standard single mode fibers. However, a capacity leap for optical-fiber communications will likely come from massively parallel space-division multiplexing systems using specialty fibers, which has the potential to drive additional device integration and new functionality of network elements. Considering short reach interconnects, we are also witnessing the deeper penetration of optics into data centers with research aimed at connecting servers using passive optical interconnect architectures for minimal power consumption.

With increasing demands on the capacity, agility and reliability of optical networks, incorporating devices such as flexible transponders that need to be controlled to maximize throughput in mesh core networks and fiber extending all the way to the home, network control and management becomes more complex. To meet these challenges, the management of transport networks is being transformed by the advent of software-defined networks (SDN) and transport SDN. Besides the separation of data and control plane that is characteristic of SDN, researchers are integrating service design to further advance network flexibility and functionality. An emerging application space that benefits from such sophisticated network management is data-center interconnection where large amounts of data need to be transported between geographically-separated locations.

The NETWORKS conference and in turn this special issue aims to bring together researchers and engineers from the physical layer and network management communities that intersect in today's applications of photonic networks. While there is a tendency of researchers to be isolated in their respective area and technology sector, the reality is that developments in the physical and management layers are interconnected and a "multi-layer" approach is needed for symbiotic advancement. One afternoon at the conference, we had a lively discussion that covered solutions to achieve sustainable growth of optical network capacity, followed by a discussion of the benefits and impediments to the

widespread adoption of open network operating and transmission systems. We hope that this interplay of ideas from diverse communities of networking researchers comes out in this special issue.