ADVANCES IN OPTICAL COMMUNICATIONS

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The global optical communications industry has continued to show progress through the first half of 2013. Although optical access network deployments have been slower, we have been witnessing steady progress in fiber-based broadband access network growth. Communications service providers have continued their deployment of high-speed (100G and beyond) transport networks, and have been participating in field trials of higher-speed optical transport network equipment and systems. However, such progress in global deployments has not been fast enough to support service innovation growth. Thus, since the beginning of 2013, there has been more focus and attention on network functions virtualization (NFV) and software-defined networking (SDN) to provide service providers with the tools for more effective operation and management of optical communications networks.

In this issue, we have selected three contributions that address interdomain wavelength path control in wavelength-switched optical networks, maximizing data rates in visible light communications, and heterogeneous optical-wireless networks virtualization in support of cloud and mobile cloud services.

In the first contribution, "Interdomain Wavelength Path Control for Translucent Wavelength-Switched Optical Networks: From Rationales to Experiments," Lei Liu, Takehiro Tsuritani, Itsuro Morita, Ramon Casellas, Ricardo Martinez, Raül Muñoz, and Munefumi Tsurusawa propose two strategies to improve interdomain path computation and light path establishment in a multidomain translucent wavelength-switched optical network (WSON). Both approaches are experimentally demonstrated and quantitatively evaluated. A translucent WSON with sparse 3R regenerators promises to guarantee the signal quality of an optical connection for a metro or core network. This is largely due to the fact that a translucent WSON can achieve performance comparable to that of an all-electronic switching (i.e., opaque) network with far lower cost and substantial reduction in power consumption. Because of these very significant advantages, recent research and standardization efforts have been focused on translucent WSONs. However, in most cases, intradomain issues have been addressed, while issues pertinent to multidomain translucent WSONs have remained open. In view of this current status, the authors set out to describe feasible and efficient solutions for supporting a multidomain translucent WSON as well as to obtain valuable insight into the proposed strategies through experiments that may be beneficial for potential industrial deployment of translucent optical networks.

In the second contribution, "Visible Light Communications Using Organic Light Emitting Diodes," Paul Anthony Haigh, Zabih Ghassemlooy, Sujan Rajbhandari, and Ioannis Papakonstantinou present an overview of recent advances in organic visible light communications (OVLC) that uses organic photonic components as the link transmitter, receiver, or both. Recent developments in organic light emitting diode (OLED) technology have enabled high-efficiency and high-brightness devices that can be used for data transmission as in conventional visible light communications (VLC) systems. Such systems utilize the visible wavelength range of the electromagnetic spectrum (370–780 nm). In this contribution, the authors demonstrate an OVLC link using an OLED with 93 kHz bandwidth (BW) as the source and a silicon photodetector with 5 MHz BW and a 10 dB gain as the receiver. They examine a wide range of modulation schemes and equalization techniques implemented to maximize data rates that are achievable to 2.7 Mb/s.

In the third contribution, "Virtualization of Heterogeneous Wireless-Optical Network and IT Infrastructures in Support of Cloud and Mobile Cloud Services," Anna Tzanakaki, Markos P. Anastasopoulos, Georgios S. Zervas, Bijan Rahimzadeh Rofoee, Reza Nejabati, and Dimitra Simeonidou propose a next generation ubiquitous converged infrastructure to support cloud and mobile cloud computing services. The proposed infrastructure facilitates interconnection of fixed and mobile end users with data centers through a heterogeneous network integrating optical metro networks, based on time-shared optical network technology, and wireless access networks, based on Long Term Evolution (LTE) access technology. In order to support the infrastructure as a service (IaaS) paradigm, the proposed architecture adopts the concept of virtualization across the technology domains involved. Planning of virtual infrastructures (VIs) by considering jointly the presence of all network technology domains and the IT resources is proposed, with the aim to offer globally optimized VIs in terms of energy consumption and resource requirements. The holistic VI planning approach proposed ensures allocation of the required resources across all technology domains to support not only the volume of service requests, but also their specific characteristics such as end users' mobility. The modeling results show that both the volume and characteristics of services have a direct impact on the energy consumption and resource requirements of all the technology domains of the planned VIs.

We take this opportunity to express our appreciation to all authors and reviewers for their contributions to this OCS issue.