

Preface

All optical networks (AON) have attracted attention because of the advantages of high capacity, long distance transmission, and low energy consumption. Recent advances in adaptive optical transmission and switching technologies coupled with programmable devices have enabled the possibility of all optical networks that can be provided and reconfigured flexibly and dynamically. Meanwhile, the emerging software-defined networking (SDN) and network function virtualization (NFV) paradigms are completely reshaping the concept of all optical networks, with a strong impact on flexibility and programmability requirements for optical network architectures, switching nodes and transmission systems. This continuously evolving scenario leads to a number of research and development challenges that need to be addressed.

This special focus of *SCIENCE CHINA Information Sciences* is devoted to covering the recent advances in all optical network architecture, data and control plane, network virtualization, inter/intra datacenter optical network. We accepted six contributed papers with novel results and techniques that are developed by the research groups in the field as follows:

In “Prospects of research issues in multi-dimensional All Optical Networks”, a multi-dimensional all optical switching network architecture is reviewed from different optical switching domains (i.e., time-division-multiplexing domain, frequency-division-multiplexing domain, and space-division-multiplexing domain) and different network planes (i.e., data plane, control plane, and application plane). Several testbeds of AON with their compositions and functions are introduced, and some potential applications are reported.

In “Hardware-programmable optical networks”, a hardware programmable optical node function framework and architecture according to incoming dynamic traffic requests for future multi-dimensional optical networks is introduced, and some programmable functions such as dynamic power equalization and optical debugging are verified in the testbed.

“Investigation on static routing and resource assignment of elastic all-optical switched intra-datacenter networks” proposes a routing and spectrum/IT resource assignment (RSIA) by considering the state-of-the-art technique of elastic optical network. It formulates integer linear programming models for both anycast and multicast scenarios, and they are shown to achieve more efficient datacenter network resource utilization as compared to unicast scenario.

“Pricing the spare bandwidth: towards maximizing data center’s profit” proposes a novel utility function to represent tenant’s valuation of data center services, and a suitable tariff to charge for the usage of DCN bandwidth resources. The authors demonstrate the proposed tariff through both theoretical analysis and simulations. In “Designs of low insertion loss optical router and reliable routing for 3D optical network-on-chip”, a novel insertion loss and high scalable optical router structure is proposed for 3D optical network-on-chip (ONoC), and the improvement of insertion loss ratio and transmission latency are verified.

In “Lightpath blocking analysis for optical networks with ROADM intra-node add-drop contention”, the impact of ROADM intra-node contention is analyzed in terms of blocking performance under several traffic models.

Finally, we would like to express our sincere appreciation to all the authors for submitting their manuscripts. Moreover, we express our deepest gratitude to all the anonymous reviewers for delivering

high-quality and timely review comments. We also thank *SCIENCE CHINA Information Sciences* Editorial Office for the scrupulous service and supports during the whole process of this special focus.

Guest Editors: Yuefeng JI

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