GUEST EDITORIAL

This special issue of the *Journal of High Speed Networks* is dedicated to Optical Networks. Its goal is to present the state-of-the-art of the emerging practical solutions to optical networking. The primary focus of this issue is, therefore, on documenting experimental approaches and network architectures. Many of the submitted papers have received highly positive reviews, but only six of them could be included in this issue. Some of the best papers not included here, will therefore be published in future regular issues of the *Journal of High Speed Networks*.

The six papers of this special issue offer a wide description of current issues in the field of optical networking, spanning from general Wavelength Division Multiplexing (WDM) network design considerations, to specific protocol solutions for single-hop WDM packet switched networks, multi-hop WDM virtual networks, wavelength routing in square grid topologies and implementation of ATM switching matrix for Gigabit traffic.

The first paper "Multiwavelength Optical Networks: Design Considerations" by M. J. O'Mahony presents and discusses a number of practical limitations encountered in the design of optical networks, with special emphasis on design issues associated with the development of an all-optical transport network testbed funded by the European RACE program, Project R2028-Multiwavelength Transport Network: MWTN.

The second paper "Scalable High-Speed Protocols for WDM Optical Star Networks" by D. Guo *et al.* proposes scalable conflict-free media-access protocols making use of a novel architecture, called parallel queuing, for WDM optical passive star networks. The processing and hardware resource requirements for the proposed solution are low and the control signaling demand is significantly reduced by using a small number of parallel queues in each station. An original wormhole scheduling technique is introduced to compensate the relatively slow laser-filter tuning speed, thus decreasing the overhead of tuning operations and relieving the electronic processing bottleneck.

The third paper "Algorithms for Optimized Node Arrangements in ShuffleNet Based Multihop Lightwave Networks" by S. Banerjee and B. Mukherjee exploits the lightwave technology capabilities in order to construct optimized regular multihop networks when traffic flow among the network nodes is asymmetric and subjected to changes in time. In particular, under the assumptions that the network nodes must be connected in a virtual regular interconnection pattern (ShuffleNet) and that the node positions in the virtual network can be adjusted by properly tuning the node (optical) transceivers, the authors propose efficient heuristic algorithms to resolve the node placement problem under dynamically changing patterns of offered load.

The fourth paper "Square Grid Topologies for Wavelength-Routing All-Optical Networks" by M. Ajmone Marsan *et al.* explores the possibility of adopting square lattice regular topologies for the realization of wavelength routing all-optical networks communication networks. The very limited processing capabilities presently allowed by optical technologies, which constrain the design of all-optical networks to the utilization of simple components, are carefully taken into consideration in formulating the proposed network architecture. The paper shows that simple wavelength switches are sufficient to implement the proposed wavelength-routing networks, and provides some hints about the components suitable for this purpose.

The fifth paper "The Supercomputer Supernet: A Scalable Distributed Terabit Network" by L. Kleinrock *et al.* describes a new network solution that attempts to overcome the cable layout problems (bundles of cables/fibers) currently affecting conventional supercomputer interconnection networks consisting of

crossbar modules which are connected by point-to-point links to create physical distributed mesh topologies. The proposed scheme replaces the point-to-point links with an all-optical interconnect system and employs asynchronous pipeline crossbar switches used to interconnect multi-channel WDM fiber optic links to a star or tree physical topology. WDM channels supporting time division multiplexing are established between modules, thus defining a dense virtual interconnection topology, which is dynamically reconfigurable, responding to changing traffic patterns. Circuit-switched service for real-time traffic applications is also provided via a pool of channels set aside for direct end-to-end connections between crossbars.

The final paper "Design and Implementation of a Gigabit ATM Photonic Switching Matrix" by J. M. Gabriagues *et al.* describes an high performance ATM photonic switching matrix consisting of an all-optical self-routing network electrically controlled, developed under the support of the Commission of the European Communities in the framework of the RACE project no. 2039 "ATMOS: ATM Optical Switching". The matrix internal architecture is based on wavelength encoding for cell routing, multiplexing and output queuing. Key optical components comprising the matrix are described in detail, determining their physical constraints and impact on the proposed switching architecture. A rack-mounted demonstrator consisting of a 4×4 matrix supporting a 2.5 Gbit/s input/output rate is described showing good results in terms of bit error rate, hardware integration and system reliability.

We take this opportunity to express our thanks to the Editor-in-Chief, Deepinder Sidhu and the Editorial Board of the *Journal of High Speed Networks*, for allowing us to edit this special issue.

We would also like to express our sincere thanks to all the authors who submitted papers. Finally we would like to express our appreciation to all referees for their diligent and timely efforts and their substantive comments on the quality and appropriateness of the submitted papers.

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