

# Optics in the Data Center: Introduction to the Feature Issue

**W**eb services and cloud computing are significantly changing the function and scale of the data center. How will this change of scale be reflected in the architecture and interconnection network in the data center? Performance gains in computer systems are increasingly achieved through interconnecting large numbers of parallel processor nodes, and the inevitable demands on communication bandwidth are extremely challenging for many mission-critical applications. The computer backplane or the switch/router backplane is looming as one of the primary bottlenecks to information transfer. Conventional telecom/datacom transceiver technology is too costly, bulky, and power hungry to support the scale of deployment required. A new class of optimized short-reach, low-power, and low-cost optical interconnect must therefore be developed to enable next-generation large-scale systems.

The collection of papers in this special feature on Optics in the Data Center presents a range of the leading research in this domain from both academe and industry with a particular focus on the critical questions of scalability and energy efficiency. The invited papers in the issue are “Large Port Count High-Speed Optical Switch Fabric for Use Within Datacenters”

by A. Wonfor, H. Wang, R. V. Penty, and I. H. White and “A Scalable Space–Time Multi-plane Optical Interconnection Network Using Energy-Efficient Enabling Technologies” by O. Liboiron-Ladouceur, P. G. Raponi, N. Andriolli, I. Cerutti, M. S. Hai, and P. Castoldi. The submitted papers are “Building Data Centers With Optically Connected Memory” by D. Brunina, C. P. Lai, A. S. Garg, and K. Bergman; “Scalable Photonic Interconnection Network With Multiple-Layer Configuration for Warehouse-Scale Networks” by T. Sakano and S. Yamamoto; “Roadmapping ICT: An Absolute Energy Efficiency Metric” by M. C. Parker and S. D. Walker; “Energy-Efficient Error Control for Tightly Coupled Systems Using Silicon Photonic Interconnects,” by X. Zheng, P. Koka, M. O. McCracken, H. Schwetman, J. G. Mitchell, J. Yao, R. Ho, K. Raj, and A. V. Krishnamoorthy; and “Buffering and Flow Control in Optical Switches for High Performance Computing” by X. Ye, R. Proietti, Y. Yin, S. J. B. Yoo, and V. Akella.

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