

## Scalable and Modular High-Radix All-to-All Interconnects

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**Abstract** – We discuss 2D/3D heterogeneously integrated computing systems that exploit modular integration of energy-efficient 3D-electronic-photonics-ICs and their interconnections through all-to-all, contention-less, and arbitration-free wavelength routing in cyclic Arrayed-Waveguide-Grating-Routers (AWGRs). Silicon photonic interposers with integrated electronics form building blocks of 3D-EPICs, which allow scaling of the interconnections of 3D-EPICs to more than 1 million compute nodes, equivalent to 1 ExaFlop/s computing.

**Bio** – S. J. Ben Yoo is a Professor of Electrical Engineering at University of California at Davis (UC Davis). His research at UC Davis includes 2D/3D photonic integration for future computing, communication, imaging, and navigation systems, micro/nano systems integration, and the future Internet. Prior to joining UC Davis in 1999, he was a Senior Research Scientist at Bellcore, leading technical efforts in integrated photonics, optical networking, and systems integration. His research activities at Bellcore included the next-generation Internet, reconfigurable multiwavelength optical networks (MONET), wavelength interchanging cross connects, wavelength converters, vertical-cavity lasers, and high-speed modulators. He led the MONET testbed experimentation efforts, and participated in ATD/MONET systems integration and a number of standardization activities. Prior to joining Bellcore in 1991, he conducted research on nonlinear optical processes in quantum wells, a four-wave-mixing study of relaxation mechanisms in dye molecules, and ultrafast diffusion-driven photodetectors at Stanford University (BS'84, MS'86, PhD'91, Stanford University). Prof. Yoo is Fellow of IEEE, OSA, and a recipient of the DARPA Award for Sustained Excellence (1997), the Bellcore CEO Award (1998), the Mid-Career Research Faculty Award (2004 UC Davis), and the Senior Research Faculty Award (2011 UC Davis).