

Designing Nanophotonic Interconnection Networks

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Technology scaling will soon enable high-performance processors with hundreds of cores integrated onto a single die, but the success of such systems could be limited by the corresponding chip-level interconnection networks. There have been many recent proposals for nanophotonic interconnection networks that attempt to provide improved performance and energy-efficiency compared to electrical networks. In this tutorial, I will describe our approach for designing such networks, which is based on thinking of the design at three levels: the architectural level, the microarchitectural level, and the physical level. In designing our own networks, we use an iterative process that moves between these three levels of design to meet application requirements given our technology constraints. At each level, I will give examples from the literature and illustrate some of the design trade-offs. The talk will conclude by discussing some general design themes that can be applied when designing future networks.

Christopher Batten has been an assistant professor in the School of Electrical and Computer Engineering at Cornell University since January 2010. He is a member of the Computer Systems Laboratory, which works on hardware and software techniques for improving the cost, performance, programmability, reliability, and energy efficiency of future computer systems. Professor Batten received his Ph.D. in electrical engineering and computer science from the Massachusetts Institute of Technology in 2009. From 2007 to 2009, he was a visiting scholar in the new Parallel Computing Laboratory at the University of California at Berkeley. Professor Batten received his M.Phil. in engineering as a Churchill Scholar at the University of Cambridge in 2000, and received his B.S. in electrical engineering from the University of Virginia in 1999.