System and Application Considerations When Designing HPC Networks and Potential Photonic Impacts

Ian Karlin

Lawrence Livermore National Laboratory

Karlin1@llnl.gov

Abstract – A high bandwidth low latency interconnect is critical to HPC application performance and a significant fraction of a systems cost. Balancing a system for applications requires understanding application bottlenecks and the cost/performance tradeoffs of network topologies and technologies. In this talk, I will present some of our work to understand our application network requirements and how it has influenced procurement decisions. I will then discuss how silicon photonics can impact our system level decisions by enabling new topologies, current applications and emerging machine learning and data analytics workloads. Throughout the talk I will cover how the cost of current technologies, in particular optical cables, are driving us to certain design points and where those design points may be sub-optimal.

Bio – Ian Karlin is a computer scientist at Lawrence Livermore National Laboratory. His work focuses on application and computer system performance with a current emphasis on how best to balance systems for overall application throughput. He is the deputy leader of the Institutional Center of Excellence project aimed at porting LLNL applications to the unclassified version of the Sierra system. He also is the co-lead for the LLNL CORAL-2 benchmark team and the LLNL Technical representative for the Intel PathForward contract. Past achievements include best paper awards at Cluster 2015, IPDPS 2013 and the LLNL Deputy Director of Science and Technology Excellence in Publication Award for the best Math/Computer Science paper in 2015