

## **Title: Building High-speed Datacenter Networks in the Post-Moore's Law Era**

### **Abstract:**

The bandwidth demand within modern datacenters keeps growing exponentially: Applications keep getting more distributed and resources (e.g., storage) keep getting disaggregated demanding more bandwidth. However, with the slowdown in Moore's law and the end of Dennard scaling, packet switches have hit a performance wall, making it extremely difficult to meet the rising bandwidth demand in a cost and power effective manner.

In this talk, I will present a new network design, called Shoal, which is a purely circuit-switched network with the potential to provide unlimited bandwidth scaling at low power, low cost, and high performance. Shoal leverages recently commercialized fast electrical circuit switches that could reconfigure within nanoseconds as its building block, and proposes a fully de-centralized, traffic agnostic circuit scheduling mechanism that could operate at nanosecond timescales. Further, Shoal proposes a novel congestion control mechanism that leverages the physical fabric to achieve both bounded worst-case network throughput and queuing. Using an FPGA-based prototype, testbed experiments, and large-scale simulations, we demonstrate that Shoal achieves comparable or better performance, in terms of both throughput and latency, than several recent packet-switched network designs at significantly lower power and cost.

Looking beyond, Shoal's mechanisms can also run on top of optical circuit switches that are data-rate agnostic. And as the reconfiguration latency of optical circuit switches improves in the future, one could potentially leverage Shoal to design a network fabric that provides unlimited bandwidth scaling at low power, low cost and high performance.