



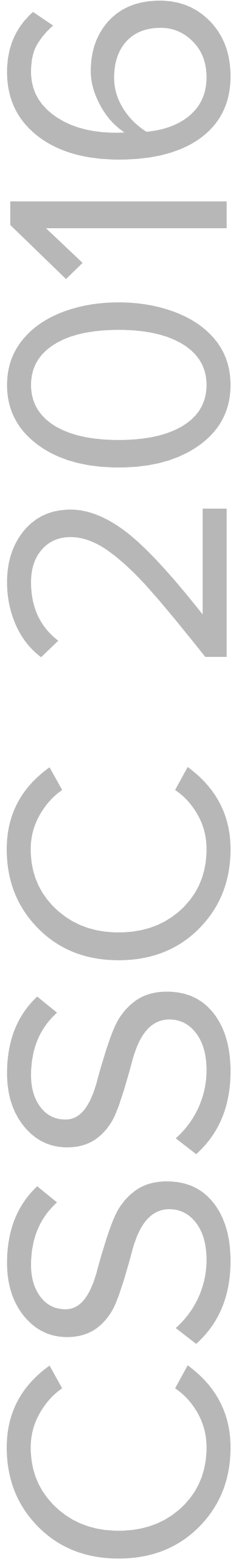
RESEARCH PRESENTATION

Taylor Groves

Student Union Building, Ballroom A

Thursday, April 7, 2016 1:55 pm - 2:15 pm

**NiMC: Characterizing and Eliminating
Network-Induced Memory Contention**



Remote Direct Memory Access (RDMA) is expected to be an integral communication mechanism for future exascale systems – enabling asynchronous data transfers, so that applications may fully utilize all CPU resources while simultaneously sharing data amongst remote nodes. In this paper we examine network-induced memory contention (NiMC), the interactions between RDMA and the memory subsystem when applications and out-of-band services compete for memory resources and NiMC's resulting impact on application-level performance. For a range of hardware technologies and HPC workloads, we quantified NiMC and show that NiMC's impact grows with scale resulting in up to 3X performance degradation at scales as small as 8K processes even in applications that previously have been shown to be performance resilient in the presence of noise. We also evaluated three potential techniques to reduce NiMC's performance impact, namely hardware offloading, core reservation and software-based network throttling. While all three of these solutions show promise, we provide guidelines that help select the best solution for a given environment.