**Leveraging both Intra- and Inter-node Heterogeneity in Stencil Solvers**

Donnie Newell, Kevin Skadron

With the advent of GPU’s the compute power available to domain scientists has seen exponential growth, but efficient utilization remains a problem. Additionally, many research labs possess computing clusters that contain heterogeneous nodes of widely varying performance capabilities. Stencil calculations are commonly used to approximate partial differential equations in various engineering and physical science domains. Previous solutions for solving stencils on heterogeneous clusters only perform load balancing at the physical node level. This work extends the load balancing approach by considering individual accelerators and processors within a physical node as equal nodes in the cluster. This provides a more accurate view of the cluster topology and, consequently, provides a greater level of control to the load balancer in order to efficiently distribute the workload. This feature is implemented as a template for use in the SL Domain-Specific Language. We compare results from our approach to a naïve homogeneous load balancer as well as the heterogeneous method that ignores intra-node topology.