



Grappa: Bridging the gap between mass-market clusters and irregular applications

Jacob Nelson, Brandon Myers, Brandon Holt, Preston Briggs, Luis Ceze, Mark Oskin
University of Washington

<http://sampa.cs.washington.edu/grappa>

Simon Kahan
Pacific Northwest National Laboratory

Mass-market computer systems are designed to exploit spatial locality via cache and local memory to achieve high efficiency. Unfortunately, in irregular applications like graph analysis, spatial locality is often difficult--if not impossible--to express.

To fit very large graphs in memory and get high bandwidth to the data, the system is scaled up to many nodes. To minimize communication between nodes, the graph must be partitioned so that few edges join two vertices on different nodes. *Natural graphs* are difficult to partition well, so as system size grows, communication becomes the bottleneck and performance degrades.

Grappa is a latency-tolerant runtime for mass-market clusters that mitigates this degradation, allowing graph processing to scale up even in the presence of diminishing locality and increasing latency. Grappa works by:

- exploiting fine-grained task parallelism to tolerate the increasing latency
 - aggregating remote references from disparate tasks to make better use of diminishing bandwidth at scale.

The application developer need only express parallelism, not decide when and how to exploit it.

