CS533 Initial Project Proposal

Dhawal Seth* Karthik GR† Sandeep Dasgupta ‡

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We want to use Charm++ [http://charm.cs.uiuc.edu/] adaptive runtime system to maximize performance of parallel applications under a given power budget. Newer systems such as Intel Sandybridge allows user to constrain the power consumption by its compute cores and DRAM. This facilitates software controlled, optimized power allocation to the compute nodes based on the application running on them. We want to pursue a project in this direction.

Following is a specific idea that we are planning to explore: It has been empirically observed that under the same power cap, different nodes yield different application performance. This can be due to several design factors: difference in chip designs, different in component assembly by the machine vendor, location of the node in the data center, difference in component design such as fans, etc. This difference in the design causes load imbalance across nodes despite same allocated power and equal compute load. Charm++ is based on over-decomposition and allows dynamic object migration across processes. We want to use this feature of Charm++ to achieve load balance in the presence of such heterogeneity in the nodes.

*Electronic address: dseth3@illinois.edu
†Electronic address: gooli2@illinois.edu
‡Electronic address: sdasgup3@illinois.edu