Identification of Power Consumption Pattern from Performance Counters

CS5352 Course Project, Spring 2021

[This project accepts two students.]

**Contact**

Ghazanfar Ali ([ghazanfar.ali@ttu.edu](mailto:ghazanfar.ali@ttu.edu))

**Description**

HPC applications power consumption is highly dependent on type and usage pattern of node resources. Our underlying hypothesis is that whenever memory utilization is disproportionate to core utilization, it may lead to bad code or bad application design and causing unnecessary power utilization. You are supposed to develop a methodology to understand such a pattern and come up with a generic model to identify such disparity in resource utilization using performance counters. We have performance data from 19 applications. We expect to validate this model with the performance data of these applications.

1. Write tiny kernels on HPC nodes and collect CPU power usage, memory power usage, CPU utilization, memory utilization, and memory I/O.
2. Analysis of the data and develop a model.
3. Validation of model with more generic benchmark applications.

**Requirements**

* Knowledge of big data analysis and plotting
* Knowledge of HPC performance counters

**References**

1. HPAS: An HPC Performance Anomaly Suite for Reproducing Performance Variations (<http://www.bu.edu/peaclab/files/2019/06/ates_icpp19.pdf>)
2. HPC Performance Monitoring System: Enabling insight via job-specific analysis <https://arxiv.org/pdf/1909.11704.pdf>
3. https://docs.python.org/3/tutorial/