Performance of Future HPC systems will be Limited by Costs of Scaling Power

Overcoming the gap requires a breakthrough in energy management and increased collaborative research between HW vendors and the HPC SW community

If nothing is done, HPC Community may fall short of 2018-2020 Exascale performance goals by an estimated 2-3x margin due to prohibitive costs of scaling power

Primary Contributions

- Hierarchical scalable runtime for globally optimizing HW power and performance control knobs
- Open source extensible runtime is provided as an infrastructure for collaboration and accelerated research
- Includes example plug-ins which guide HW to better use of limited power for significant performance benefits

GEOPM Interfaces & HPC System Stack Integration

Feedback-guided control system:
- Can operate with a configurable objective function
- Collects feedback from app/libs via GEOPM APIs
- Tunes power caps, DVFS settings, etc

Hierarchical Design & Communication Mechanisms

Future Work

- Spin up further collaborations with the community
- Research new energy optimization strategies via GEOPM’s plugin framework
- Integrate with emerging power-aware scheduling functions in workload managers (e.g. SLURM)
- Explore tuning power-performance knobs in SW libraries/runtime or application layer of HPC stack

Call for Collaboration

The authors are seeking collaboration to explore tuning power-performance knobs in software libraries/rtimes like MPI or OpenMP as well as knobs in the library application layer of the HPC stack.