Proposed optimal symbiotic management using direct phase identification in OpenCl

- Instead of using performance counters (PC) to identify phases of execution as in standard power management, OpenCl provides an alternative more direct way to identify phases.
  - No need for learning as in PC-based methods
  - No overhead for PC monitoring
  - No phase detection errors as in case of PC-based decisions
- Direct phase analysis from OpenCL leads to 15% less power consumption compared to PC-based method under the same runtime.

Research questions and action plan for project:

1. How to capture and automate phase detection in OpenCl?
2. How to aggregate phases from different concurrent applications?
3. How to determine best GPU/CPU scheduling, CPU DVFS and GPU DVFS to maximize energy efficiency based on application characteristics?
4. How to co-ordinate scheduling and DVFS to reduce hot spots and eliminate thermal emergencies?
5. How to create an API with OpenCL application/driver to pass information from power management system and OS?