Energy Efficient High Performance Computing Working Group

Vision

Economically-feasible and performance-maximizing energy efficient high performance computing

Mission

The purpose of the Energy Efficient High Performance Computing Working Group (EEHPCWG) is to drive the implementation of energy conservation measures and energy efficient design in high performance computing (HPC) facilities. The responsibilities of the group lie in proactively working toward the following goals:

- *Reduce expenditure and curb environmental impact through increased energy efficiency in HPC centers.*
- *Drive the IT Industry to become leaders in energy efficiency as they are in computing performance*
- *Develop and disseminate best practices for maximizing energy efficiency in high performance computing facilities and equipment*
- *Serve as a forum for sharing of information (peer-to-peer exchange) and collective action*

Professionals from the high performance computing sector will come together to share information, develop best practices and define and influence the path forward for industry.

Background and Rationale

Demand for HPC is growing in both the public and private sectors. It is also highly energy-intensive. The Federal government is required by the Energy Independence and Security Act of 2007 (EISA) to reduce energy intensity in all facilities, including laboratories and industrial buildings, by 30% by 2015. The increasing need for HPC and the attendant energy intensity threatens to derail the progress toward this and other legislative goals. Through meeting mandated energy reductions, the Federal government is poised to lead by example in energy efficiency.

The IT industry is responding to the demand for more powerful equipment, and consequently, creating increasingly energy intensive products. However, as profit-maximizing entities, businesses have a clear need for energy efficient

computing due to the uncertainties in energy markets. The EEHPCWG will target both public and private HPC owners, operators and users to increase collective knowledge and stimulate demand for energy efficient HPC.

Definition

- IDC's definition – all scientific and technical computing
- Or focus on scientific super computers
- Super Computers top 500 (example)
- Flops per square foot (high productivity density)
- Key is bandwidth of interconnects typically accomplished by close proximity of servers – thus driving density and causing challenges

- HPC vs. Enterprise and other data centers
  - Forerunner of IT industry
- Cloud computing/data centers – how do they fit in
  - Complimentary but different than HPC
  - Therefore are we after large scale computing or HPC
  - May look more and more alike as time goes on

Operation

The full EEHPCWG shall meet approximately every other month. DOE FEMP and its contractors are responsible for all scheduling, logistics and communications, as well as maintaining a website housing work products and other documents related to the operation and mission of the group.
The EEHPCWG will also form subgroups in order to better accomplish specific missions. Each subgroup will have their own vision and scope, related to the group's overall mission. Sub-Groups are as follows.

- **SC 09 &10 Sub Group**
  - *Vision*: Increased focus on energy efficiency at Super Computing Conference & increased visibility of the EEHPC Working Group.
  - *Chairs*: Open
  - *Scope*: Get members of the Energy Efficient HPC Working Group involved in SCXX. Encourage SCXX participants to work with the HPC Working Group.
  - *Duration*: Evaluate in 2011

- **Metrics and Benchmarking for Super Computing Infrastructure**
  - *Vision*: A consensus on specific clear and accessible data center infrastructure metrics to facilitate continued improvement of energy performance without compromising mission
  - *Chairs*:
    - Otto VanGeet, NREL
    - Bill Tschudi, LBNL
  - *Scope*:

        - Encourage development and utilization of infrastructure efficiency metrics and benchmarking
        - Develop key energy performance metrics for HPC facilities (infrastructure) **Adapt/use industry standard metrics, e.g. PUE/DCiE**
        - Promote utilization of waste heat
        - Address internal and external fans
        - Address internal and external power supplies
        - Discuss air management metrics.
        - Collect and share benchmark data for HPC centers
    - *Duration*: To be evaluated in July 2011

- **Metrics and Benchmarking for Super Computing IT Equipment**
    - *Vision*: Consensus on specific, clear and accessible supercomputing IT metrics to facilitate continued improvement of energy performance without compromising mission
    - *Chairs*:
        - John Shalf, LBNL
        - Bill Tschudi, LBNL
    - *Scope*
        - *Develop energy performance metrics for HPC computing and take them to the Energy Efficient HPC Working Group for concurrence.*
        - *Explore using computing performance metrics to benchmark HPC facilities*
        - *May share recommendation with industry organizers, e.g. GreenGrid, for their consideration and possible adoption.*
    - *Duration*: To be evaluated in 2011

Priorities

Energy efficient design guidelines and specifications for super computer centers
The Working Group will serve as a forum for discussing and distributing information about design guidelines and specifications. While the group may not specifically create these guidelines and specifications, group members are encouraged to share pertinent documents, such as the one being developed by LBNL and FEMP.

Best practices, case studies, and lessons learned in design of super computer centers
The Working Group will promote collaboration between members to share case studies, best practices and lessons learned. Any member of the group with a case study or lessons learned is encouraged to share with the group and the rest of the high performance computing community

Computer center infrastructure energy performance metrics and benchmarking
The Working Group will work towards forming a consensus on appropriate metrics and benchmarks for measuring data center infrastructure energy performance.

HPC/SC energy performance metrics and benchmarking
The Working Group will work towards forming a consensus on appropriate metrics and benchmarks for tracking the energy performance on high performance computing and supercomputing IT.

SC09 technical program (energy efficiency)
The Working Group will for a sub-group to offer input into the SC09 conference technical program.

Membership
The Energy Efficient High Performance Computing Working Group is open to all interested parties.

Updates and Termination
This charter will be updated as necessary to reflect current sub groups, operating procedures and priorities.