Energy Efficient High Performance Computing Working Group
2/14/17 Meeting Report

INTRODUCTION

The EE HPC WG held a meeting on 2/14/17. This Working Group is composed of members representing major Federal departments and independent agencies, private sector representatives, and members of the academic community. More information can be found at the working group's website, https://eehpcwg.llnl.gov/ .

NEXT MEETING: Tuesday April 11th, 9:00-10:00AM Pacific Time

Introductions and Announcements: ***Natalie Bates, EE HPC WG & Anna Maria Bailey, LLNL***

- We are delighted to announce that Jim Laros will assume responsibility as Co-Lead for the EE HPC WG Systems Sub-Group. James H. Laros III is from the Scalable Computer Architectures department in the Center for Computing Research at Sandia National Laboratories. James has a broad background in HPC in the areas of systems software and computer architectures. James serves as the Chief architect for the Alliance for application Performance at EXtreme scale (APEX) Crossroads system and is the project lead for Sandia's Advanced Architecture Testbed project. James was the lead author of the High Performance Computing – Power Application Programming Interface Specification. James has been actively involved with Systems Sub-Group Teams and has shown both technical and team leadership in these roles. Please help us to welcome Jim in his new position.

  Erich Strohmaier is passing the baton as Systems Co-Lead. Erich has been a leader for the Systems Sub-Group since its inception in 2009. He was especially instrumental in a collaborative effort with the EE HPC WG, the Top500 and the Green500 to develop a methodology for measuring power while running a workload. A special recognition and thanks to Erich for his contribution to the EE HPC WG.

  John Schalf will remain as Systems Sub-Group Co-Lead with Jim Laros.

- The Energy Efficient HPC Working Group Dashboard Team is being reconvened and is soliciting members who are interested in participating. As a participant, your responsibilities could range from actively participating in preparing documents and doing research, to just getting copied on the minutes.

  Ben Radhakrishnan will be the technical lead for this team. Ben is a professor in the School of Engineering and Computing at National University and is affiliated with Lawrence

Berkeley National Laboratory. He has been a leader with the Dashboard Team since its inception.

The Dashboard Team has published guidelines on general recommendations for selecting energy efficiency elements of HPC data center dashboards. A dashboard is a display that is used to provide critical feedback to the users. Carefully selecting the elements to be displayed on the energy dashboard is important, as energy management is a shared responsibility of all stakeholders: operations managers, facilities managers, and system administrators.

The reconvened team goals are twofold:
- to continue to refine the guideline on general recommendations for selecting energy efficiency elements of HPC center dashboards,
- to research and investigate the extension potentials of furthering the use of dashboard technology for HPC centers to predict energy consumption and energy management.

Conferences Sub-group Update: ***Torsten Wilde, Leibniz Supercomputing Centre (LRZ, Germany) & Michael Patterson, Intel***

SC17
SC17 will be held in Denver, Colorado from November 12 through the 17th. The EE HPC WG is planning on having a presence again at SC17. We have already reserved space on the floor for a booth. We have made a submission for an all day workshop. We may be submitting another panel and, of course, we will be making several BoF submissions.

IMPORTANT SUBMISSION DEADLINES:
Panel: Closes Apr 24, 2017
BoF: Closes Jul 31, 2017

ISC17
ISC17 will be held in Frankfurt, Germany from June 18th through the 22nd. The EE HPC WG may participate in three ISC17 events; a tutorial, a panel and a BoF. Submissions and planning are underway.

HPPAC
The High Performance Power Aware Computing Workshop, held in conjunction with the IPDPS conference, will be held in Orlando, Florida on May 29th.

Other Conferences:
The EE HPC WG website has a links and events page with many other conferences and workshops listed that have an HPC energy efficiency focus.
https://eehpcwg.llnl.gov/pages/events.htm

Infrastructure Sub-Group Update: ***David Grant, ORNL and Dave Martinez, SNL***

LIQUID COOLING CONTROLS TEAM:

Background: The Liquid Cooling Controls Team is defining data inputs for dynamic controls to manage a facility control system. They have identified a short list of data inputs that would be provided by the facility and/or the system vendor that are focused on the compute system. These data elements and their characteristics are being described for a particular use case; that of dynamic controls for a facility control system. Each data input is described with a name and the unit of measurement. There are also characteristics of the measurement; where it is taken, whether the measurement capability is provided by the facility or the IT system or either one, the frequency with which the measurement is taken and the accuracy of the measurement capabilities. Finally, there is a priority component of each data input. It is the intention of this team to publish the results of this as a guideline for sites to use when designing dynamic facility controls for liquid cooling systems.

News: The Liquid Cooling Controls Team has solicited broader feedback on these data inputs and is doing a final review of the feedback prior to publishing the guidelines.

DASHBOARD TEAM:

Background: The Dashboard Team has published guidelines on general recommendations for selecting energy efficiency elements of HPC data center dashboards. A dashboard is a display that is used to provide critical feedback to the users. Carefully selecting the elements to be displayed on the energy dashboard is important, as energy management is a shared responsibility of all stakeholders: operations managers, facilities managers, and system administrators.

News: This team is starting to research/investigate the extension potentials of furthering the use of dashboard technology for HPC centers to predict energy consumption and energy management (e.g. use of other tools such as Tableau for energy intelligence and prediction). Ben Radhakrishnan is heading this effort. Anyone interested should contact either Natalie or Ben.

TUE TEAM:

Background: The TUE Team has published a paper that defines two new metrics; iTUE and TUE that account for infrastructure elements that are a part of the HPC system (like cooling and power distribution). This is an improvement over PUE.

News: There isn't any news from the TUE Team.

LIQUID COOLED COMMISSIONING TEAM:

Background: The Liquid Cooling Commissioning Team has published a guideline that establishes the fundamentals for liquid-cooled commissioning and develops a comprehensive approach to commissioning liquid-cooled systems. It includes examples from different data center sites and the various approaches utilized in commissioning liquid-cooled solutions.

News: There isn't any news from the Liquid Cooled Commissioning Team.

LIQUID COOLING (Wx) GUIDELINE TEAM:

Background: The original Liquid Cooling Team was dub'ed the Wx Team. This Team worked collaboratively with the American Society of Heating, Refrigerating and Air-Conditioning Engineers Technical Committee 9.9 (ASHRAE TC 9.9) to develop guidelines for warmer liquid-cooling temperatures to guide future supercomputer procurements, and to facilitate the design of warmer temperature cooling systems. ASHRAE TC 9.9 (with EE HPC WG collaboration) authored a book that describes classes of typical infrastructure design and the recommended ranges for water supply temperature in each of those classes.

News: There isn't any news from the Wx Team.

High Voltage and DC- Potential New Team:

Background: For most HPC centers, power goes through multiple conversions in alternating current (AC) with a final conversion to direct current (DC) within power supplies in the HPC system. There may be opportunities for energy efficiency and reduced operational costs with fewer conversions including DC conversion at a higher voltage within the HPC center.

News: There isn't any news from the High Voltage and DC-Potential New Team.

Systems Sub-group Update: ***Natalie Bates, EE HPC WG***

SYSTEM WORKLOAD POWER MEASUREMENT METHODOLOGY:

Background: The Green500, Top500 and the Energy Efficient HPC Working Group have developed a methodology for measuring power while running a workload, such as High Perfomance Linpack (HPL). The methodology defines three quality levels; essentially a "good", "better", "best" with Level 3 having the highest quality. Version 1 was published in 2012. Since then, the EE HPC WG, Green500 and the Top500 have been soliciting, collecting, reviewing and responding to feedback from the broader community. This has resulted in publication of Version 2 in 2015. Version 2 includes some editorial improvements and minor changes, but was mostly focused on fixing some major issues and concerns with V1. Major issues affect the outcome, the way it is done, the intended result. There have been multiple sites that have used the Version 2 Methodology and provided feedback for changes.

News: The feedback will be collated, documented in a repository and evaluated as to the severity of the proposed changes. A report will be published documenting the results of this review.

HPC AND GRID INTEGRATION:

Background: This team is analyzing data from major supercomputing centers in Europe and the United States about their electricity contracts and relationships with their electricity service providers. The goal of this study is to determine the structure of the contracts that exist between supercomputing centers and electricity service providers. The team is identifying the influence that this interaction (contractual interaction) may have on demand response participation. This information is used to understand the degree to which supercomputing centers have, and manage, flexibility toward grid operation. The information will be further used to identify barriers and opportunities in a demand response-participation context.

News: This Team is targeting submission of a paper to SC17.

ENERGY AND POWER AWARE JOB SCHEDULING AND RESOURCE MANAGEMENT:

Background: This team has kicked off in high-gear with both great participation as well as immediate work commencing on the initial goal of writing a whitepaper capturing the inventory of sites that are using energy and power aware job scheduling and resource management tools with large-scale implementations in a production and/or pre-production (technology development) environment.

News: The team is has developed an interview for gathering information and has completed interviews with Riken and the Tokyo Institute of Technology in Japan, CEA in France, Kaust in Saudi Arabia and LRZ in Germany. More interviews are planned for other sites.

RFP CONSIDERATIONS:

Background: The EE HPC WG is maintaining a document that reflects 'best practices' for including energy efficiency as an important consideration when writing procurement documents for supercomputer acquisitions.

News: No news to report.

PARTICIPANTS INCLUDED

Name	Organization
Andrea Bartolini	ETH
Natalie Bates	EE HPC WG
Anita Cocilova	LLNL
Bob Conroy	OSIsoft
Donny Cooper	TOTAL E&P Research and Technology
Vladimir Getov	University of Westminster
David Grant	ORNL
Glen Hanna	Intel
Sid Jana	Intel
Andree Jacobson	Jacobson Consulting
Beth Kaspar	LANL
Greg Koenig	KPMG
Stephanie Labasan	LLNL
Jim Laros	SNL
Thomas Leung	GE Global Research
Ian Lumb	Univa
Matthias Maiterth	Intel
Dave Montoya	LANL
Ben Radhakrishnan	National University
Michael Ressl	Hitachi Cable
Dale Sartor	LBNL
Filip Stanek	IT4Innovations
Torsten Wilde	Leibniz Supercomputing Centre (LRZ, Germany)
Andrew Younge	SNL