

Energy Efficient High Performance Computing Working Group
4/8/14 Meeting Report

INTRODUCTION

The EE HPC WG held a meeting on 4/8/14. 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, <http://eehpcwg.lbl.gov>.

NEXT MEETING: June 10th, 9:00-10:00AM Pacific Time

NEXT WEBINAR: June 5th, 8:00-9:00AM Pacific Time
Michael Patterson, Intel will talk about "The End of Warm Water Cooling"

Introductions and Announcements: *Natalie Bates, EE HPC WG*

- On Thursday, April 10th a webinar was presented where Thomas Schulthess from the Swiss National Supercomputing Center and Robin Goldstone from LLNL presented their experiences with using a higher quality power measurement methodology while running HPL for the November'13 Green500 List.
- There is an extension of the Better Buildings Challenge for data centers that is open to anyone in the United States who is interested in improving their data center energy efficiency.

Conferences Sub-group Update: *Anna Maria Bailey, LLNL*

- **News on EE HPC WG participation in upcoming Conferences**
- **SC'14**
 - The 5th Annual SC'14 EE HPC WG workshop was accepted for all day Monday, November 17th.
 - The Demand Response Team is submitting a paper to SC'14 State of the Practice track.
 - SC'14 panel submissions closed April 25th.
- **ISC'14**
 - The Workload Power Measurement Team has a BoF accepted for ISC'14.
 - The TUE Team made a BoF submission to ISC'14, but it was not accepted.
 - Natalie Bates is moderating a panel with the title "Breaking Paradigms to Meet the Power Challenges." This panel will explore two examples of breaking such paradigms; these are "center location" and "commodity processors."
 - John Shalf and David Donofrio from Berkeley as well as Alex Ramirez from Barcelona will hold a BoF to explore SoCs as more energy efficient components than commodity processors for future supercomputers.
 - Marie Christine Sawley, Simon McIntosh-Smith and Natalie Bates will hold a BoF on the application perspective of energy efficiency measurement capabilities and benchmarks.

- Axel Auweter from LRZ will be presenting a paper on “A Case Study on Energy Aware Scheduling on SuperMUC”
- **OTHER**
 - NLIT 2014 – National Laboratories IT 2014 June 29th – July 2nd – San Francisco
 - The EE HPC WG has been invited to make a presentation on the EE HPC WG at the ASHRAE TC9.9 meeting to be held in Seattle in late June. They would like to hear about the EE HPC WG goals, members, activities and collaborations with other groups. Michael Patterson and/or Bill Tschudi will attend and present.
 - Florent Parent from is helping Suzanne Talon from Calcul Quebec to prepare a keynote presentation that will be given at the Data Center Dynamics Conference in Montreal in May. She will mention their participation in the EE HPC WG.

Update on EE HPC WG participation in recent Conferences

- The 5th Annual European HPC Infrastructure Workshop was held last week and there was a lot of EE HPC WG activity.
 - Bill Kramer from NCSA was the keynote speaker and he mentioned their participation in both the power measurement methodology and the liquid cooling commissioning teams.
 - Natalie Bates followed his presentation with an overview of the EE HPC WG.
 - Michael Patterson’s presentation took a deeper look at TUE as well as Liquid Cooling Inlet Temperature Guidelines.
 - Herbert Huber from LRZ and Ladina Gilly from CSCS also mentioned their active participation in the EE HPC WG for several of the team activities.
 - The workshop resulted in ~7 new members and several of them committed to active participation in some of the teams.
- The power measurement methodology paper was nominated as one of two Best Paper Candidates for the SPEC/ACM International Conference on Performance Engineering. This is great recognition. Wu Feng said that Tom Scogland did an excellent job presenting the paper!
- Chung-Hsing Hsu from ORNL presented a seminar at Virginia Tech on the EE HPC WG as well as the TUE metric. Very interesting presentation!

The EE HPC WG website Links and Events page lists many upcoming Conferences and Workshops that have an HPC Energy Efficiency Focus

Future Conferences: (more details at <http://eehpcwg.lbl.gov/events-and-links>)

Infrastructure Sub-Group Update: *William Tschudi, LBNL*

LIQUID COOLED COMMISSIONING TEAM UPDATE: The Liquid Cooling Commissioning Team has collected and reviewed best practices and lessons learned for commissioning of liquid cooling infrastructure. The ultimate goal is to improve the commissioning process for delivering a liquid cooling infrastructure that works when the HPC system is installed.

The Team has written a document that is intended to provide some general guidance and recommendations for those who are writing commissioning plans. The Team has five ‘lessons learned’ documents that help to illustrate the general guidance and recommendations. The goal is to have closer to 10 lessons learned- SO PLEASE LET NATALIE KNOW IF YOU ARE INTERESTED. The ‘lessons learned’ can be anonymous if necessary.

CONTROLS TEAM LAUNCH: We announced at the last meeting that the Controls Team had been conceived as an extension of the Liquid Cooling Commissioning Team. Since then, it has been expanded to include all controls, not just for cooling systems. It is still primarily infrastructure focused, but will include the interface between systems and infrastructure too.

There are lessons learned and best practices evolving from implementing and operating supercomputer centers with complex infrastructure systems and the highly variable demands placed upon these systems with today's supercomputers. This team will focus on sharing designs, challenges and best practices for integrated control systems in order to determine if there are universal learnings.

The initial team output will be a short report documenting their findings and making recommendations for next steps.

Marriann Silveira from Lawrence Livermore National Laboratory will provide technical leadership for this team. She will draw upon LLNL's experiences as the initial basis for the team. This team is especially looking for members who have had experience implementing and operating integrated control systems.

Please contact Natalie Bates if you are interested in joining this team.

TUE TEAM: The TUE Team has developed two new metrics; iTUE measures and TUE. iTUE carefully differentiates the “infrastructure” elements that are a part of the HPC system (like cooling and power distribution). TUE is iTUExPUE and is a metric that allows for comparing infrastructure energy efficiency between sites. (PUE is an effective metric to use for a single site, but should not be used for intra-site comparison.)

We made a BoF submission to ISC'14 that would provide a forum for exchanging experience with using TUE, but the BoF was not accepted. However, we still plan on making a BoF submission for SC'14.

There is strong and broad interest in benchmarks and workloads for a variety of purposes, including as a potential special case of TUE measurement. Natalie will talk more about this in the Systems Update.

ENERGY REUSE EFFECTIVENESS: The Energy Re-use Effectiveness Team in collaboration with The Green Grid has developed a standard metric for measuring the contribution of re-using heat generated by HPC systems for other useful purposes.

There is no new information to report on this activity. Anyone interested in sharing your experiences or testing the ERE metric should contact Natalie.

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

SYSTEM WORKLOAD POWER MEASUREMENT METHODOLOGY: The EE HPC WG along with the Green500, Top500 and Green Grid have developed a standard methodology for measuring system power while running a workload. The team developed the methodology, refined it through both alpha and beta testing and collaborated with the Green500 List to ensure adoption as an enhancement to the Green500 run rules. The team is now developing outreach and other tools for broader adoption of the measurement methodology. The ultimate goal is to have broad use of the highest quality energy and power measurement methodology for all of their system workload energy efficiency benchmarking activities.

As mentioned in the Conferences Update, this Team presented a paper at the SPEC/ACM International Conference on Performance Engineering. I am delighted to announce that the paper was nominated as a candidate for Best Paper. Tom did a terrific job presenting the paper!

Again, as mentioned in the Conferences update, this Team's ISC'14 BoF submission was accepted. The organizers are Wu Feng, Green500 and Virginia Tech, Erich Strohmaier, Top500 and LBNL and Natalie Bates, EE HPC WG.

Is there anyone who knows of a system that will be making a Green500 or Top500 submission for June'14?

HPC AND GRID INTEGRATION: The Demand Response Team is investigating how HPC centers have, can and should engage more actively with the Grid electricity providers. The Team has collected information from 11 US-based SC sites that are on the Top100 list. This includes LLNL, LANL, ORNL, LBNL, ANL, Purdue, SDSC, NCSA, NOAA, Intel and WPAFB. This is an investigative activity with the ultimate goal of educating the HPC DOE Facility and Operations Managers about HPC and grid integration opportunities and challenges.

This Team is submitting a paper to the State of the Practice track for SC'14. The paper was sent to the EE HPC WG for review.

PROCUREMENT CONSIDERATIONS: The RFP Team has a whitepaper that recommends procurement document requirements that target more energy efficient HPC systems. The intention is to raise the bar and extend the requirements with a yearly update of the whitepaper. The 2013 focus is on measurement capabilities.

The Team has been honing the measurement capability requirements based on feedback from the vendor webinars as well as input at SC13. This process is complete and the final document is posted on the EE HPC WG website. The Team has started to work on the 2014 update.

SW UPDATE

A solicitation to the EE HPC WG requested proposals for software teams. There were six respondents who made very thoughtful proposals. Some of the common themes are benchmarks, APIs, tools. Steve Poole and I will be getting back w/these respondents.

PARTICIPANTS INCLUDED

Name	Organization
Anna Maria Bailey	LLNL
Natalie Bates	EE HPC WG
Bill Brantley	AMD
Jacob Combs	Sonoma State University
Garr Di Salvo	ARUP
Chung-Hsing Hsu	ORNL
Nick Johnson	University of Edinburgh

Sunny Lam	Intel
Rod Mahdavi	LBNL
Steve Martin	Cray
Ram Naggapan	Intel
Joshua Ryan New	ORNL
Greg Pautsch	Cray
Marriann Silveira	LLNL
John Sines	LLNL
Dennis Symanski	EPRI
Bill Tschudi	LBNL
Ralph Wescott	PNNL

EEHPC WG