

**Minutes of the  
Advanced Scientific Computing Advisory Committee Meeting  
September 3, 2013  
Teleconference**

Because of the urgency of a new charge and travel difficulty for many ASCAC members, this meeting was planned as an abbreviated teleconference with the primary purpose of receiving and discussing the new charge regarding the top technical approaches to advance the Department's exascale goals. A roll call established that a quorum of Committee members was in attendance via telephone.

**ASCAC members present:**

Roscoe C. Giles (Chair)  
Marsha Berger  
Vincent Chan  
Jacqueline Chen  
Jack J. Dongarra  
Sharon C. Glotzer  
Susan L. Graham

Tony Hey  
Gwendolyn L. Huntoon  
John Negele  
Linda R. Petzold  
Vivek Sarkar  
Victoria White

**ASCAC members absent:**

Vinton G. Cerf  
Barbara M.P. Chapman

Juan Meza  
Dean N. Williams

About 20 others participated in the conference call including the Designated Federal Officer, Christine Chalk and the acting Associate Director of the Office of Science for Advanced Scientific Computing Research, Barbara Helland.

The meeting was called to order by the chairman, **Roscoe Giles**, at 12:05 a.m. EDT. He announced that the purpose of this meeting was to discuss a new charge and get comments and input from ASCAC as to how to proceed.

Barb Helland then provided some background to explain charge. From discussions within the Department it became clear that we need to focus our exascale effort. We will start by identifying top 10 challenges where we should be focused. The specific request is to create a list of 10 tech approaches that will enable development of system that will achieve the Department's exascale goals. Need final report by November for budget process.

Roscoe Giles then provided some background on the process. Bob Lucas convened a group to produce list of technical approaches to advance Exascale in August – as a kinds of follow-on to the DARPA group he was involved in some years ago. It seems practical for that group to serve as the seed of an ASCAC sub-committee to address this new charge. That way they can start with the results and materials developed by that group. That is why I have asked Bob to chair the

ASCAC subcommittee to address our new charge. However, we can use this meeting to decide if we want to augment the members of that group and provide thoughts and direction on where we should be by our October ASCAC meeting.

An ASCAC member commented that it is important to think about what the charge does/should include. The charge seems to be all about hardware and software with no mention of mathematic or algorithmic challenges yet math and algorithms might be the most important hurdle.

Chairman Giles noted that the Interim report should be delivered before the October meeting but with the compressed timescale our goal is a week before meeting.

Bob Lucas commented that the his group came from diverse expertise – including University, Private sector, National Lab, and an ASCAC member. He acknowledged that they, as a group, are somewhat hardware centric. He stated that he will look to ASCAC suggestions to address that and to identify who he should invite to augment his subcommittee to include software/mathematics perspective. Some suggestions of expertise that might be added were:

- System design
- End to end integration
- Hardware technology – important industrial base in US to be able to provide components
- Software technology – some from vendors but DoE customers have augmented vendor tech with their own
- Algorithms

Bob Lucas noted that the beginnings of a Top ‘10’ list were not a surprise

1. Data movement
  - a. Photonics
  - b. Non-volatile RAM, resistive RAM, computing near memory
2. Resilience – error rates go up as devices get small.
3. Instruction sets – takes more energy to issue instruction than to actually perform instruction.
4. Concurrency
5. Program Abstractions – new memory hierarchy new methods, are we going to hide that behind C or Fortran.
7. X-stack
8. Network (ties back to data movement)
9. Algorithms – communication avoidance, resilient algorithms
10. Applications – e.g. 200 x 10<sup>6</sup> lines of code, how evolve to exascale platform
11. Execution models

Comments were then offered from ASCAC members

- Missing reps on committee from Los Alamos or Livermore. Need someone on committee who really understands issues at National Labs with applications.
- NNSA, SC co-design centers have been focusing on subsets of applications. Representation from that group suggested.
- Need expert on 'big data' issues=> data integrity, provenance etc. Suggest person from the meeting on synergies between exascale and big data.
- List of +10 will likely expand to 20 with input. Suggest getting input from community- Leave space for thoughtful consideration about top 10 by avoiding saying explicitly what the top 10 are in October.
- Report gives challenges but challenges must be things for which there is a possible solution. Ones we do pick are the ones we believe could contribute in the time frame of now and end of decade. They have to be plausible.
- Relationship of output of committee and all previous work? This is like reassessment, look at forecasts. We are on the path to exascale which is partly defined in a series of reports and work done so far. The evaluation is: are we still on right path and what the most important investments are.
- As we think of expanding committee, want people to represent not their organization but their knowledge and expertise. We are not interested in special interest representation. Need broader community perspective.

Comments were then offered open to the public

- How far thinking is charge?

Response from Barbara Helland was "8ish year time frame".

There being no further comments, Chairman Giles stated that everyone should email and further suggestions to Bob Lucas with a copy to Christine Chalk, ASCAC DFO, and the ASCAC chair. He noted that he will also be talking with Barb and Bill to clarify the Department's expectations and timeline for the report. The meeting was then formally adjourned.