

ASCAC Exascale Top 10 Subcommittee

Nov 18, 2013

Subcommittee Members

James Ang	Sandia National Laboratories
Keren Bergman	Columbia University
Shekhar Borkar	Intel
William Carlson	Institute for Defense Analyses
Laura Carrington	University of California, San Diego
George Chiu	International Business Machines
Robert Colwell	Defense Advanced Projects Research Agency
William Dally	Nvidia
Jack Dongarra	University of Tennessee
Al Geist	Oak Ridge National Laboratory
Gary Grider	Los Alamos National Laboratory
Jeffrey Hittinger	Lawrence Livermore National Laboratory
Adolfy Hoisie	Pacific Northwest National Laboratory
Dean Klein	Micron
Peter Kogge	University of Notre Dame
Richard Lethin	Reservoir Labs
Robert Lucas	University of Southern California
Vivek Sarkar	Rice University
Robert Schreiber	Hewlett Packard
John Shalf	Lawrence Berkeley National Laboratory
Thomas Sterling	Indiana University
Rick Stevens	Argonne National Laboratory

Additional Contributors

Ron Brightwell	Sandia National Laboratory
Paul Coteus	International Business Machines
Scott Hemmert	Sandia National Laboratory
Jon Hiller	Science and Technology Associates
K. H. Kim	International Business Machines
Harper Langston	
Sven Leyffer	
Ruud Haring	International Business Machines
Rich Murphy	Micron
Rob Ross	Argonne National Laboratory
Clayton Webster	
Stefan Wild	Argonne National Laboratory

Top 10 Technical Challenges

Energy efficient circuit, power and cooling technologies

High performance interconnect technologies

Advanced memory technologies to dramatically improve capacity and bandwidth

Scalable system software that is power and resilience aware

Data management software that can handle the volume, velocity and diversity of data

Programming environments to express massive parallelism, data locality, and resilience

Reformulating science problems and refactoring solution algorithms for exascale

Ensuring correctness in face of faults, reproducibility, and algorithm verification

Mathematical optimization and uncertainty quantification for discovery, design, and decision

Software engineering and supporting structures to enable scientific productivity

Outline of Report

Existing

Executive Summary

Introduction

 Subsuming Co-Design and Integration

Energy Efficiency

High Performance Interconnect Technology

Advanced Memory Technologies

Scalable System Software

Programming Systems

Data Management

Creating Exascale Algorithms

Algorithms for Discovery, Design, and Decision

Resilience and Correctness

Scientific Productivity Challenges

Finds and Recommendations

Acknowledgements

Bibliography

Proposed

Executive Summary

Findings and Recommendations

Energy Efficiency

High Performance Interconnect Technology

Advanced Memory Technologies

Scalable System Software

Programming Systems

Data Management

Creating Exascale Algorithms

Algorithms for Discovery, Design, and Decision

Resilience and Correctness

Scientific Productivity Challenges

Co-Design and System Integration

Acknowledgements

Bibliography

Status

There exists an 87 page draft
87 pages as of 8 PM Sunday
Page count includes the bibliography

Most of the technical material for the Top 10 is included
Contributions were still being made as of last night

Our goal has been to have the penultimate version by the end of November
November has more than 18 days

I plan to reduce the number of authors to three in the next few days
This will allow for editorial consistency
I plan to trim material, and make it more concise