ASCR@40: An Update on the ASCAC Subcommittee Documenting ASCR Impacts

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Reminder of the charge

- Steve Binkley charged the ASCAC with producing a report that assesses and documents the historical accomplishments of the Advanced Scientific Computing (ASCR) program and its predecessors over the past four decades.
  - Highlight outstanding examples of major scientific accomplishments that have shaped the fields of ASCR research
  - Identify the lessons learned from these examples to motivate ASCR investment strategies in the future
  - Illuminate the guiding strategies and approaches that will be key to ensuring future U.S. leadership in the full range of disciplines stewarded by ASCR
  - Inform the investment strategy of the Office of Science
- The report should provide technical details as needed for context but should be primarily concerned with the essence of each story as it relates to the larger progress of science
- In Spring of 2019, request expanded to encompass two documents, one more technical and one more broadly accessible

Status of these two documents

- Detailed history document
  - Mature document shared with ASCAC
  - Soliciting further feedback from ASCAC and the community
  - Anticipate that further content revisions will be minor

- Accessible document
  - Articles are mature
  - Design and layout underway

Subcommittee members

- Buddy Bland, ORNL
- Jon Bashor, LBL
- Jackie Chen, SNL
- Phil Colella, LBNL
- Tiffani Conner, ORAU
- Eli Dart, LBNL
- Jack Dongarra, UT & ORNL
- Thom Dunning, PNNL
- Ian Foster, UC & ANL
- Richard Gerber, LBL
- Bruce Hendrickson, LLNL, Chair
- Wendy Huntoon, KINBER
- Bill Johnston, LBNL (ret.)
- Paul Messina, ANL, Former Chair
- Jim Pool, Caltech (ret.)
- John Sarrao, LANL
- Jeff Vetter, ORNL

Red = Inadvertently omitted at last ASCAC meting

Final history document outline w/ section owners

Executive Summary (All)

1. Introduction & document description (Hendrickson)
2. Accomplishments
   i. Computational science (Chen, Dunning, Sarrao)
   ii. Applied mathematics (Colella, Dongarra)
   iii. Computer science (Foster)
   iv. Computer architecture (Vetter, Hendrickson)
   v. Facilities (Bland, Gerber, w/ Laura Wolf (ANL))
3. Impact on industry (Bashor)
4. Impact on workforce & education (Hendrickson)
5. Broader achievements and contributions (Sarrao, Dongarra)
   i. High-impact workshops and reports sponsored by ASCR
6. Lessons learned and recommendations for the future (Hendrickson)
7. Appendices
   i. Charge letter
   ii. Contributors

Changes since last ASCAC update in September

- Found confirmation that von Neumann was indeed the force behind the creation of the mathematics program – ASCR's distant progenitor
- Reworked the introduction and computational science sections to emphasize software and integrated impact (Berzins)
- Substantially reorganized architecture section including new content on ASCR's role in invention of instruction level parallelism (Lethin)
- Added discussion of spectral deferred correction methods to math section
- Added new "challenge" around changing roles for computing in science
- Comprehensively cleaned-up document for consistency and clarity (Bashor and Conners)

High-level lessons

1. A compelling and consistent vision can drive scientific revolutions
2. Diverse funding models are required for diverse and impactful outcomes
3. Workforce investments have been critical
4. Partnerships are essential
5. Testbeds and platform access funding models are important

Challenges in the coming years

1. Technology disruptions are inevitable
2. Funding balance is essential for sustained impact
3. Software support model is needed to preserve investments
4. Broader partnerships will be required
5. A sought-after workforce will complicate staffing
6. New roles for computing in science will present opportunities for and new demands on ASCR

Anticipated timeline

- Next 2 months:
  - Gather and respond to any additional feedback and input
  - Gather additional imagery
  - Then focus on design and layout

- By next ASCAC meeting:
  - Detailed document will have a draft layout
  - Accessible document will be complete and ready for printing

- We will update status at next ASCAC meeting

Questions?

Accessible, impact-centric document

- Structured around exemplar impact stories, 3-4 pages each
  - Bill Cannon is overseeing the writing of this document
  - Articles written by professional tech writers
  - “Shepherd” from committee for each article
- Current set includes:
  - Delivering on the promise of computational science (Dunning, Sarrao)
  - Mathematics is the critical enabler (Colella)
  - To out-compute is to out-compete (Bashor)
  - Connectivity changes everything (Johnston)
  - Petaflops for the people (Gerber)
  - When decisions matter (Hendrickson)
  - Knowledge from data (Foster)
  - Developing the nation’s computing workforce (Bashor)
  - Rules of the road for HPC (Vetter)