The National Strategic Computing Initiative

Office of Science and Technology Policy

December, 2015

Executive Order 13702
July 29, 2015

EXECUTIVE ORDER

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CREATING A NATIONAL STRATEGIC COMPUTING INITIATIVE

By the authority vested in me as President by the Constitution and the laws of the United States of America, and to maximize benefits of high-performance computing (HPC) research, development, and deployment, it is hereby ordered as follows:

The NSCI is a whole-of-government effort designed to create a cohesive, multi-agency strategic vision and Federal investment strategy, executed in collaboration with industry and academia, to maximize the benefits of HPC for the United States.

How did we get here?

- ***Initiatives and Investments in NIT R&D to Achieve America's Priorities*** (2010 PCAST Recommendations)
  - *"Recommendation 7-10: NSF, DARPA, and DoE should invest in a coordinated program of basic research on architectures, algorithms, and software for next generation HPC systems. Such research should not be limited to the acceleration of traditional applications, but should include work on systems capable of (a) efficiently analyzing vast quantities of both numerical and non-numerical data, (b) handling problems requiring real-time response, and (c) accelerating new applications…"*
- ***Initiatives and Investments in NIT R&D to Achieve America's Priorities and Advance Key NIT Research Frontiers*** (2012 PCAST Recommendations)
  - *"Recommendation 8: NSTC should lead an effort by NSF, DoE, DOD, member agencies of the Intelligence Community, and other relevant Federal agencies to design and implement a joint initiative for long-term, basic research aimed at developing fundamentally new approaches to high performance computing."*

Agency Roles

- **Lead Agencies**
  - Dept. Defense
  - Dept. Energy
  - NSF
- **Foundational R&D Agencies**
  - IARPA
  - NIST
- **Deployment Agencies**
  - NASA, NOAA, FBI, DHS, NIH

Strategic Objectives

(1) Accelerating delivery of a capable exascale computing system that integrates hardware and software capability to deliver approximately 100 times the performance of current 10 petaflop systems across a range of applications representing government needs.

(2) Increasing coherence between the technology base used for modeling and simulation and that used for data analytic computing.

(3) Establishing, over the next 15 years, a viable path forward for future HPC systems even after the limits of current semiconductor technology are reached (the "post-Moore's Law era").

(4) Increasing the capacity and capability of an enduring national HPC ecosystem by employing a holistic approach that addresses relevant factors such as networking technology, workflow, downward scaling, foundational algorithms and software, accessibility, and workforce development.

(5) Developing an enduring public-private collaboration to ensure that the benefits of the research and development advances are, to the greatest extent, shared between the United States Government and industrial and academic sectors.

NSCI Timeline

- **July 29, 2015 – Executive 13702 Order Issued**
  - "To ensure accountability for and coordination of research, development, and deployment…there is established an NSCI Executive Council"
  - "The Executive Council shall, within 90 days of this Order, establish an implementation plan…"
- **July 30, 2015 – NSCI Private Roundtable (Academia, Private Sector, Government) at the White House**
- **August 26, 2015 – Inaugural meeting of the NSCI Executive Council**
- **September 15, 2015 – RFI on Science Drivers for Capable Exascale issued**
- **October 20-21, 2015 – White House NSCI Workshop (Academia, Private Sector, Government)**
- **October 27, 2015 – Executive Council delivers Implementation Plan to co-Chairs**
- **Next: President's FY 2017 budget (after budget formulation, passback…)**
- **Further private sector engagement, annual plan requirements**

Related Initiatives

- **Materials Genome Initiative**
- **Advanced Manufacturing Initiatives**
- **The National Nanotechnology Initiative**
- **The BRAIN Initiative**
- **Precision Medicine Initiative**
- **The National Big Data R&D Initiative**
- **National Photonics Initiative**

NSCI Workshop

A *White House Workshop on the National Strategic Computing Initiative* was held October 20-21, 2015, with around 250 participants representing industry, government, academia, and other organizations. During the workshop, many individual opinions were expressed. Several ideas emerged that could potentially inform the NSCI implementation:

- The evolutionary path for HPC is more uncertain than during the previous decades. There will be different ways of coupling simulation with data analytics.
- There is reason to be optimistic for convergence of analytics and HPC in the long term – but diversity of approach is key in the short term.
- A number of hardware technology and architectural innovations will be attempted to overcome physical limitations for charge-based CMOS. NSCI must accommodate this breadth of choice and avoid any premature down select of technology.
- Although existing clouds lack the performance required to satisfy the most demanding HPC applications, they have already proved suitable for a number of scientific workloads. Clouds could be a viable model for NSCI broad deployment.
- Deeper engagement with the industrial (non-computing) sector will be key to achieve broad deployment and advance the Nation's economic competitiveness.

What Would Success Look Like for NSCI?

- **Strive for convergence of numerically intensive and data-intensive computing**
  - Applications routinely combine large-scale modeling and big data
- **Keep the U.S. at the forefront of HPC capabilities**
  - U.S. home to world's most capable machines
  - Rich ecosystem of deployed machines, vendors, users, and research programs
- **Streamline HPC application development**
  - Software development would no longer hinder HPC usage
- **Make HPC readily usable and accessible**
  - HPC available to small companies and individual researchers
  - Ubiquitous expertise in modeling & simulation and data analytics
- **Establish hardware technology for future HPC systems**
  - Hardware capabilities would continue along Moore's Law path
  - Systems and software adapt to new hardware characteristics


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