

The National Strategic Computing Initiative



Office of Science and Technology Policy

June, 2016

Executive Order 13702

July 29, 2015

EXECUTIVE ORDER

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.”*

NSCI intent

- **National**
 - “Whole-of-government” and “whole-of-Nation” approach
 - Public/private partnership with industry and academia
- **Strategic**
 - Leverage beyond individual programs (a key “platform” technology)
 - Long time horizon (decade or more)
- **Computing**
 - HPC = most advanced, capable computing technology available in a given era
 - Multiple styles of computing and all necessary infrastructure
 - Scope includes everything necessary for a fully integrated capability
 - Theory and practice, software and hardware
- **Initiative**
 - Above baseline effort
 - Link and lift efforts

Enhance U.S. strategic advantage in HPC for
economic competitiveness and scientific discovery

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.

Key Themes Derived from Strategic Objectives

- **Strive for convergence of numerically intensive and data-intensive computing (S.O. #2)**
- **Keep the U.S. at the forefront of HPC capabilities (S.O. #1, #4, and #5)**
- **Streamline HPC application development (S.O. #4)**
- **Make HPC readily usable and accessible (S.O. #5)**
- **Establish technology base for future HPC systems (S.O. #3)**

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**

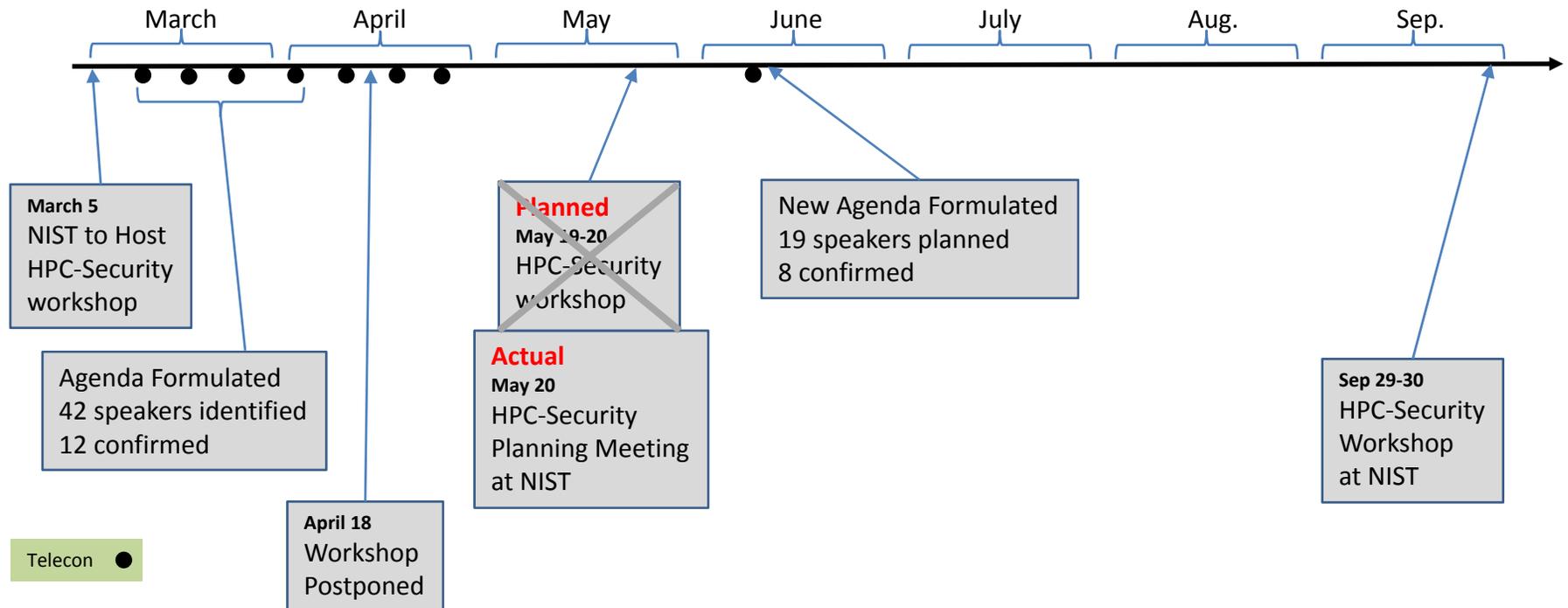
What Would Success Look Like for NSCI?

- **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 tools would simplify initial programming effort and reduce resources required to migrate to new systems
- **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

Security for HPC?

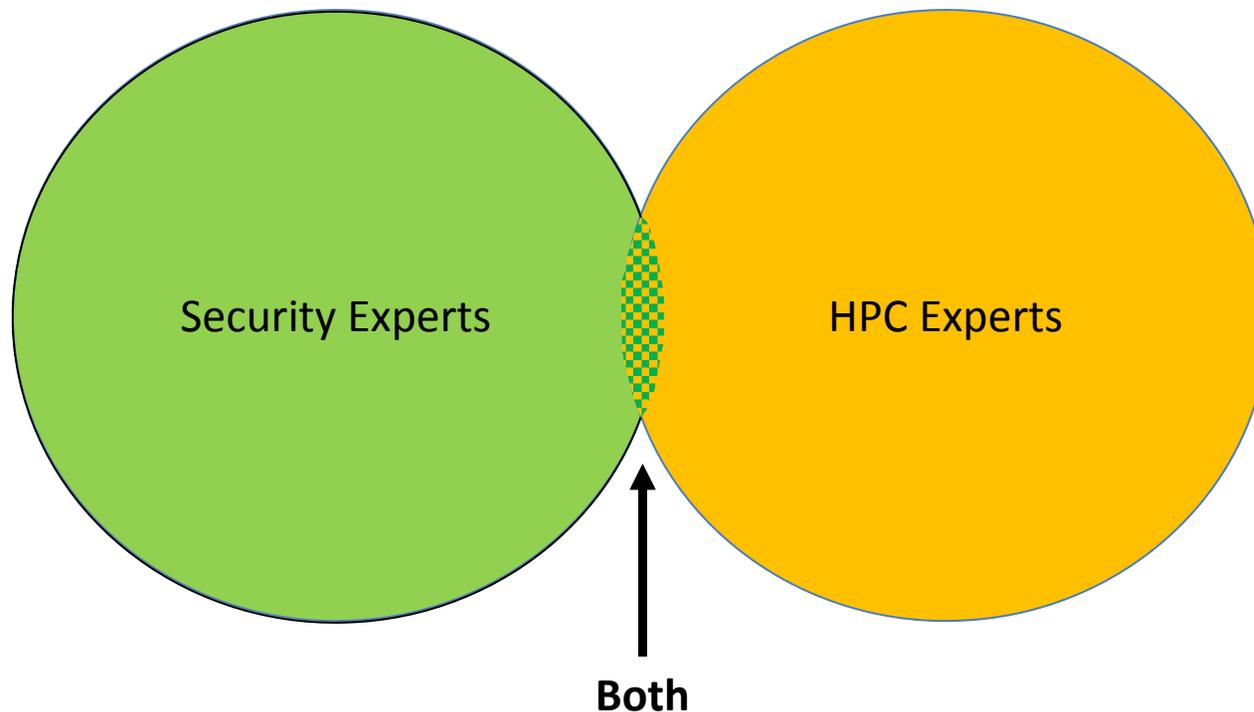
- **Not included in EO (to my embarrassment!)**
- **Raised as an issue at first Executive Council meeting**
- **Established as a cross-cutting sixth objective**
 - A critical factor for success in other objectives

NIST will Host an HPC Security Workshop



- **Workshop organizing group: NSA, NIST, NSF, DOE, OSTP**

Key Realization from the May 20 Planning Meeting



- The community of 'both' needs to be built.
- NIST intends to facilitate this through a series of workshops (not just one).

New Agenda

NSCI: High-Performance Computing Security Workshop

WHEN: Sep. 29-30, 2016 Start Time: 8:30am End Time: 6:00pm	WHERE: NIST Gaithersburg 100 Bureau Drive Gaithersburg, MD 20899
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AGENDA

Thursday, Sep. 29, 2016 Building 101, Green Auditorium		
		Topic
8:30 – 8:40	Chuck Romine (NIST)	Welcome to NIST and the Information Technology Laboratory
8:40 – 8:50	Will Koella (NSA)	Workshop Goals: (presentation)
8:50 – 9:10	Chuck Romine (NIST)	HPC Expert on Why Security Matters
9:10 – 9:30	Sean Peisert (Berkeley Lab)	Security Expert on Why HPC Matters
9:30 – 9:50	TBD	HPC Current Use and Practice: HPC Center <ul style="list-style-type: none"> what's the application, user community, system architecture how to trade usability against security? what to worry/not-worry about wrt security
9:50 – 10:10	Networking Break	
10:10 – 10:30	Buddy Bland (Oak Ridge)	HPC Current Use and Practice: USG <ul style="list-style-type: none"> what's the application, user community, system architecture why is HPC needed in this use case? how to trade usability against security? what to worry/not-worry about wrt security
10:30 – 10:50	TBD	HPC Current Use and Practice: Industry <ul style="list-style-type: none"> what's the application, user community, system architecture why is HPC needed in this use case? how to trade usability against security? what to worry/not-worry about wrt security
10:50 – 11:00	Matt Barrett (NIST)	The NIST Security Framework for Critical Information Systems (presentation) <ul style="list-style-type: none"> might cause some shared terminology we can explain that all the areas are needed
11:00 – 11:20	TBD	Threats to HPC Today and Tomorrow (presentation) <ul style="list-style-type: none"> establish a shared view stories of attacks note Boeing attack.
11:20 – 12:40	Breakout Session: "HPC Security Best Practices: Strengths and Weaknesses" <ul style="list-style-type: none"> multiple rooms, same topic 	

New Agenda

12:40 – 1:40	Break for Lunch
1:40 – 3:00	Breakout Session: Open Science and the Insider Threat: Can They Be Reconciled? <ul style="list-style-type: none"> multiple rooms, same topic
3:00 – 3:20	Networking Break
3:20 – 4:40	Breakout Session: What New Hardware/Software Features and Architectural Structures Would Revolutionize Security for HPC? <ul style="list-style-type: none"> E.g., what is current HW cutting edge, and what is on the way Multiple rooms, same topic
4:40 – 5:00	Announcements and Feedback
adjourn	
5:00 – 5:30	Hotwash (just organizers)

Friday, Sep. 30, 2016 Building 101, Green Auditorium		
8:30 – 8:40	TBD	Announcements. Feedback Forms Distributed.
8:40 - 10:10	Breakout Group Report Outs	
10:10 – 10:40	TBD	Security opportunity/challenge of high performance computing (keynote)
10:40 – 11:00		Networking Break
11:00 – 11:20	<u>Angelos Keromytis</u> (DARPA)	System and Application Monitoring (presentation)
11:20 – 12:00	TBD (moderator)	Panel. HPC monitoring: how detailed can it be? What problems would fine-grained monitoring solve? Can data provenance be maintained through monitoring?
12:00 - 1:00	Break for Lunch	
1:00 – 1:10	TBD	Agency Perspective: NSA
1:10 – 1:20	<u>Robinson Pino</u>	Agency Perspective: DOE
1:20 – 1:30	TBD	Agency Perspective: NSF
1:30 – 1:40	TBD	Agency Perspective: NIST
1:40 – 1:50	TBD	Agency Perspective: DOD

New Agenda

1:50 – 2:00	TBD	Agency Perspective: OSTP
2:00 – 2:30	TBD	Panel. Revisit: <ul style="list-style-type: none">• HPC Perspective on Why Security Matters• Security Perspective on Why HPC Matters Panelists nominated by organizers based on previous sessions.
adjourn		

The End

