

National Strategic Computing Initiative



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National Strategic Computing Initiative

Executive Order Signed July 29, 2015



- National
 - “Whole of government” approach
 - Public/private partnership with industry and academia
- Strategic
 - Leverage beyond individual programs
 - Long time horizon (decade or more)
- Computing
 - HPC as advanced, capable computing technology
 - Multiple styles of computing and all necessary infrastructure
 - Scope includes everything necessary for a fully integrated capability
- Initiative
 - Above baseline effort
 - Link and lift efforts

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



NSCI Executive Order calls on NSF to play a leadership role



Scientific discovery advances



The broader HPC ecosystem for scientific discovery



Workforce development

Co-lead with DOD and DOE



The Government's Role in NSCI

- DOD + DOE
 - Capable exascale program
 - Analytic computing to support missions: science and national security
- NSF
 - Scientific discovery
 - Broader HPC ecosystem
 - Workforce Development
- IARPA + NIST
 - Future computing technologies
- NASA, FBI, NIH, DHS, NOAA
 - Deployment within their mission contexts





NSCI Objectives

1. Accelerate delivery of a capable exascale computing system (hardware, software) to deliver approximately 100X the performance of current 10PF systems across a range of applications reflecting government needs
2. ***Increase coherence between technology base used for modeling and simulation and that used for data analytic computing.***
3. ***Establish, over the next 15 years, a viable path forward for future HPC systems in the post Moore's Law ...***
4. ***Increase the capacity and capability of an enduring national HPC ecosystem, employing a holistic approach ... networking, workflow, downward scaling, foundational algorithms and software, and workforce development.***
5. Develop an enduring public-private partnership to assure that the benefits .. are transferred to the U.S. commercial, government, and academic sectors

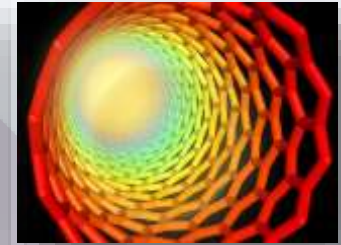
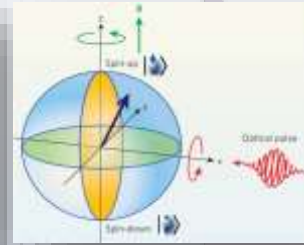
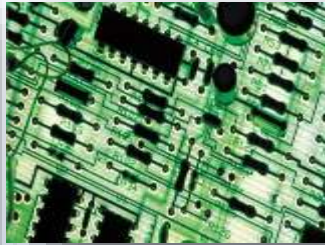
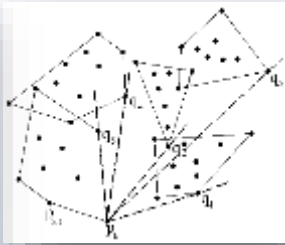


Next Steps for NSCI

- Executive Council
 - Co-chaired by the Directors of OSTP and of OMB
 - Membership representing participating agencies to be designated by the Director of OSTP
- Implementation Plan
 - To be established within 90 days (of July 29, 2015)
 - And annually thereafter for 5 years



3. Establish, over the next 15 years, a viable path forward for future HPC systems in the post Moore's Law era



Happening now

- Multi-core and many-core processors
- Domain-specific integrated circuits
- Energy-aware computing
- Hierarchical memories
- High-speed Interconnects

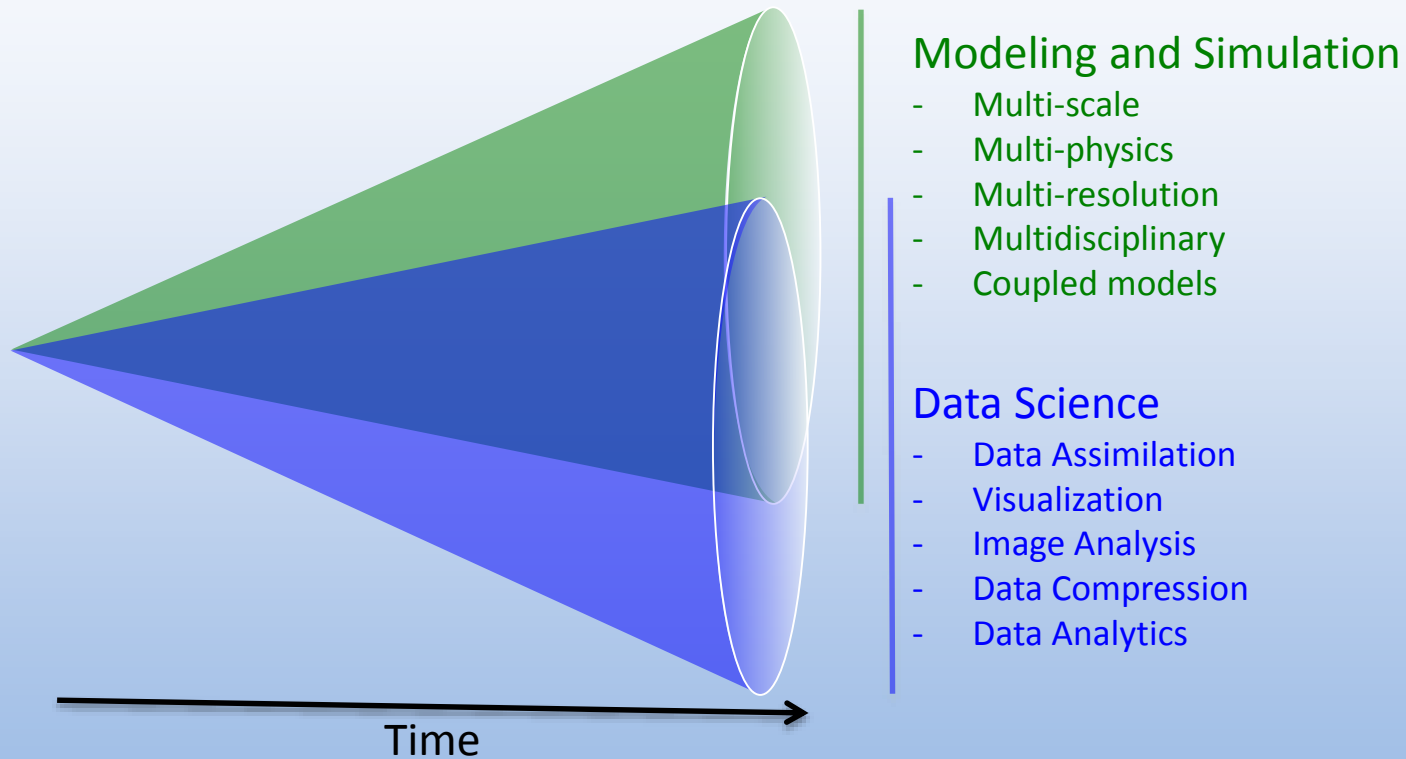
Longer term

- Usable parallelism, concurrency, and scalability
- Resiliency at scale
- Decreased power consumption
- Architectures that reduce data movement
- New materials (e.g., carbon nano-tubes, graphene-based devices)
- Non-charge transfer devices (e.g., electron spin)
- Bio, nano, and quantum devices

**NSF Role: Support foundational research
(leadership by ENG, CISE, MPS, and BIO)**



2. Increase coherence between technology base used for modeling and simulation and that used for data analytic computing



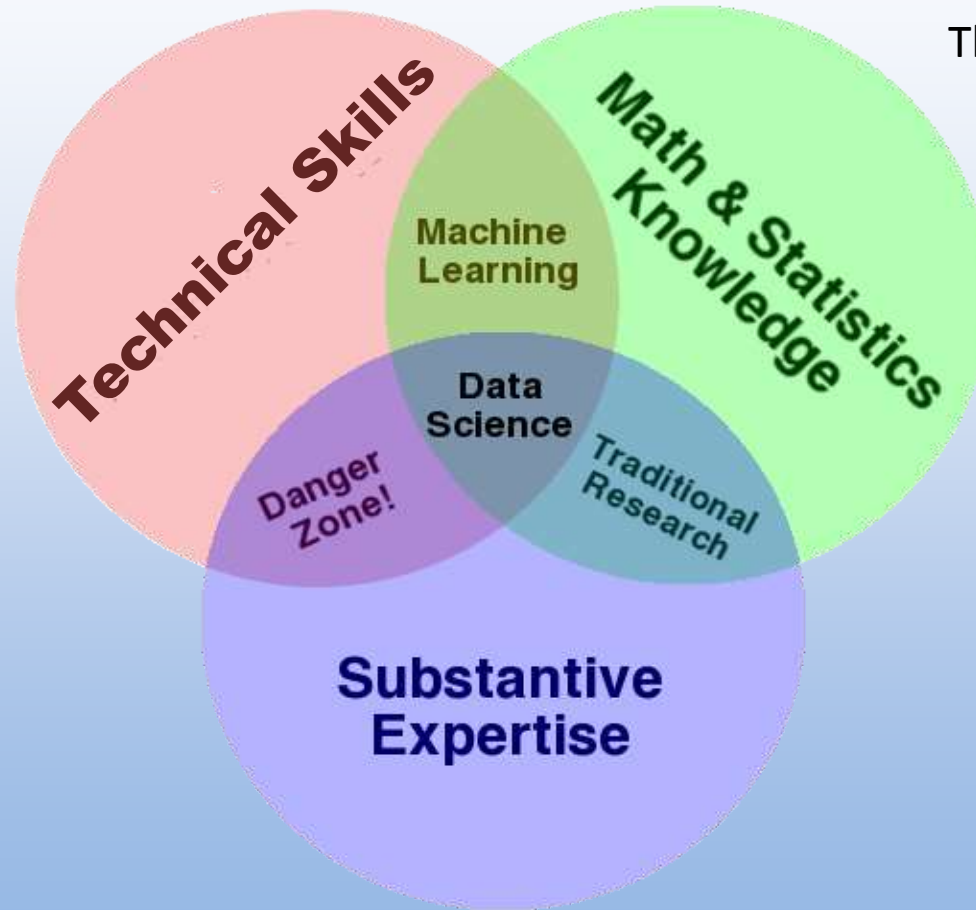
NSF Role: Support foundational research and research infrastructure within and across all disciplines (across all NSF directorates)



Data Science : EmergingInherently multidisciplinary

Engineering Practice

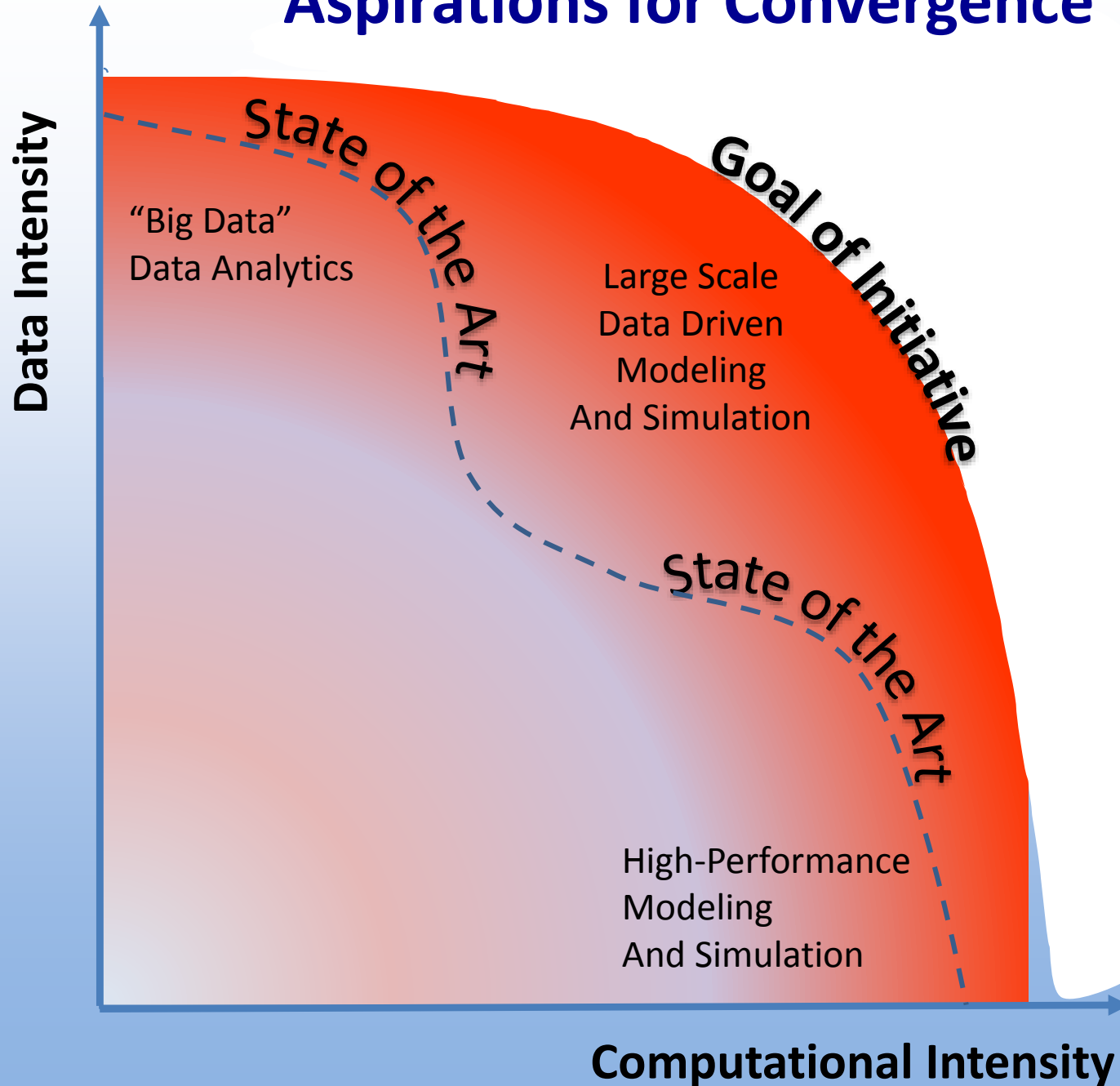
Theoretical Foundation



Domain Knowledge



Aspirations for Convergence



2. Increase synergy between technology base used for modeling and simulation and that used for data analytic computing

4. Increase the capacity and capability of an enduring national HPC ecosystem, employing a holistic approach ... networking, workflow, downward scaling, foundational algorithms and software, and workforce development.

- NSF Role:
 - Research Priorities:
 - Computationally and Data Intensive Science and Engineering Frontiers
 - Discovery-motivated computational investments:
 - Cyberinfrastructure: people, software, technology
 - Collaborations likely: interagency, public sector, industry, international
 - Re-use, agility, sustainability
- Directorates: All



The conduct of science is changing

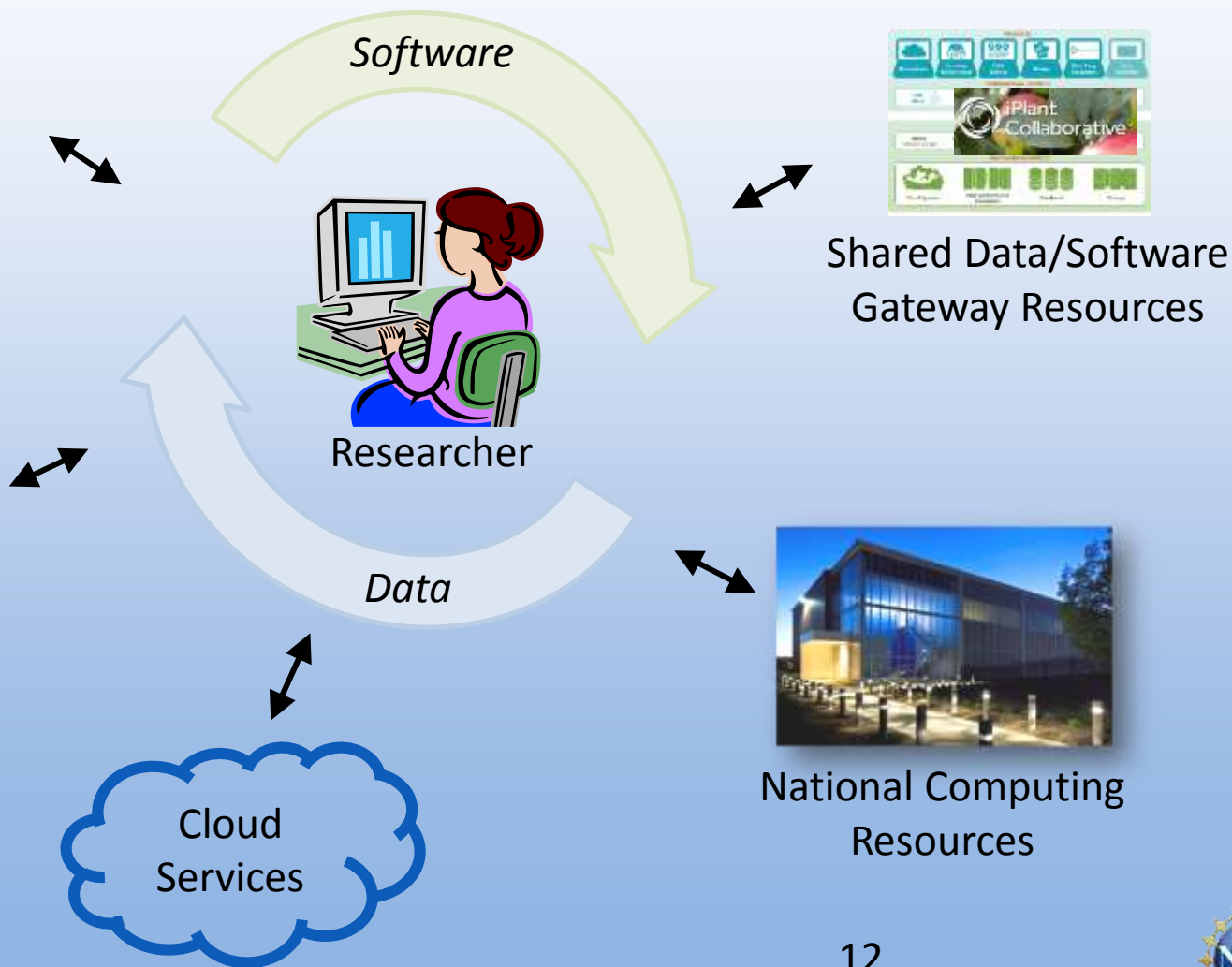
Revolution in the scientific workflow: many interfaces to shared CI services



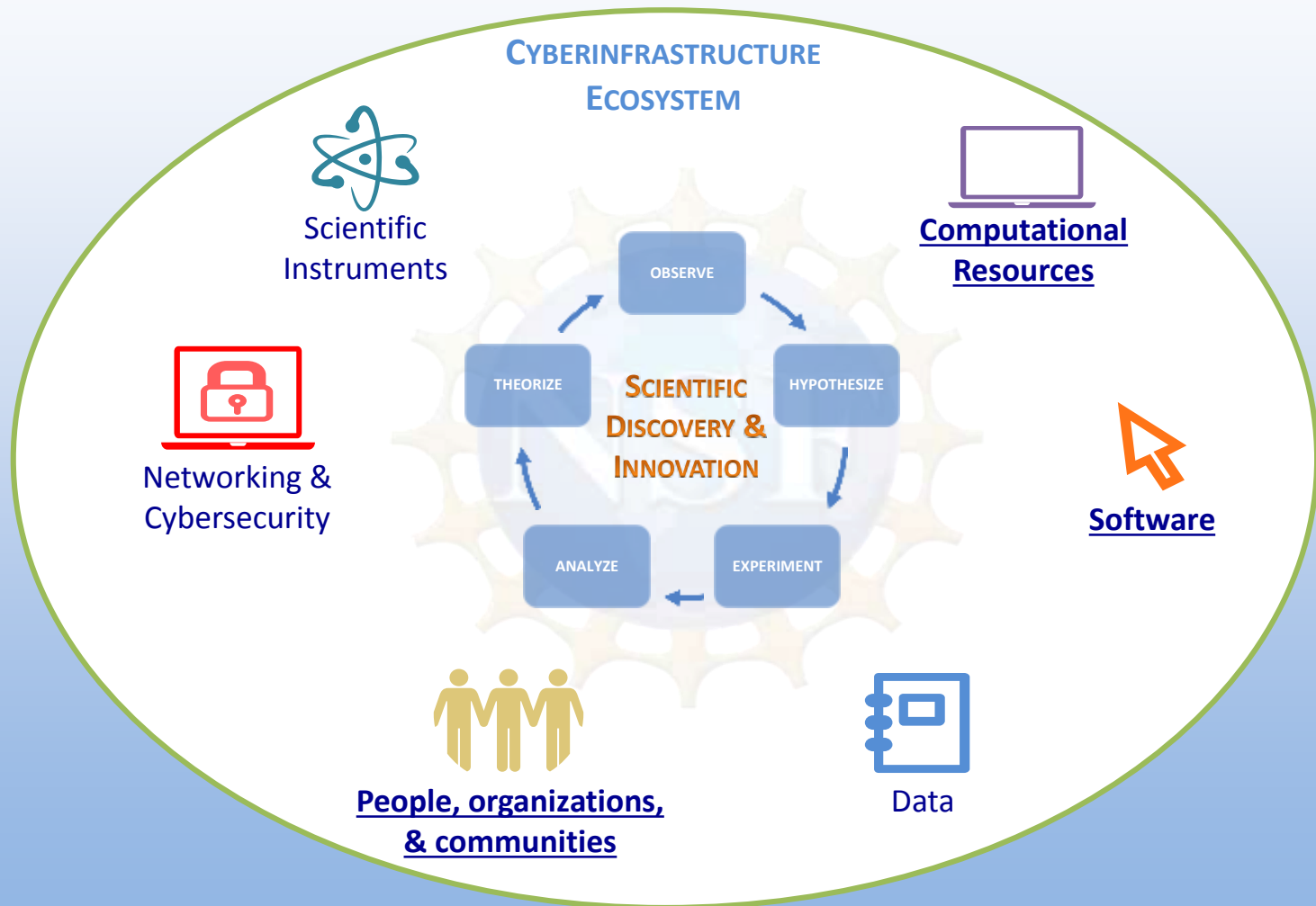
Large Facilities



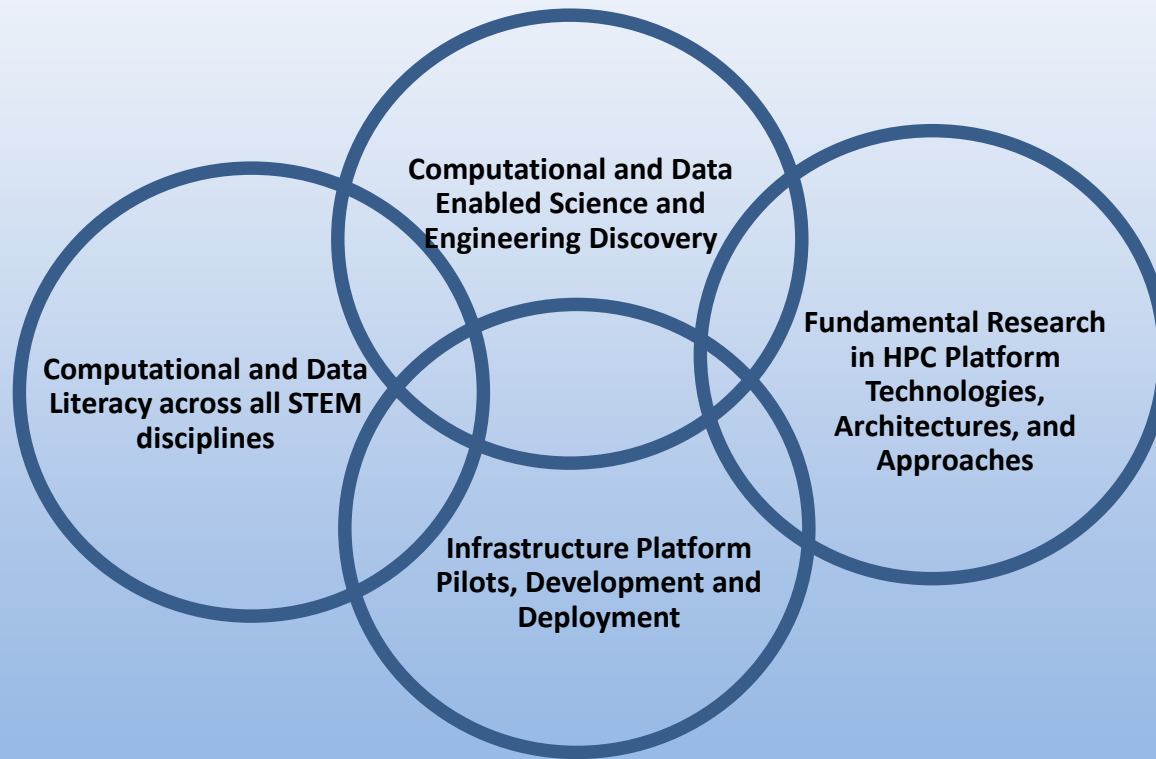
Collaboration Networks



NSF embraces an expansive view of cyberinfrastructure motivated by scientific priorities, the changing conduct of science and informed by technology advances

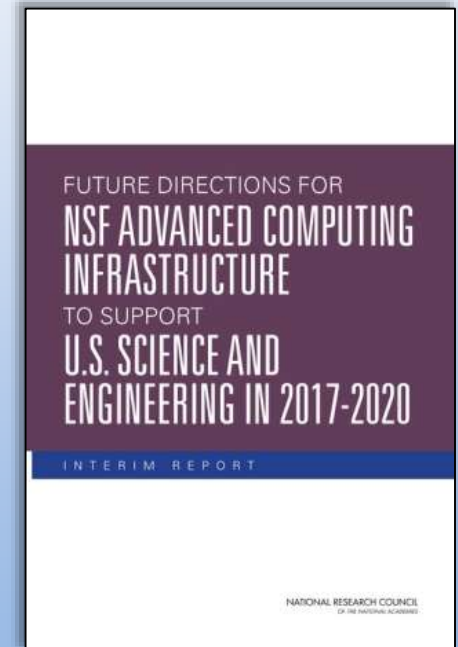


NSF role in NSCI: Enduring Computational Ecosystem for Advancing Science and Engineering



NSF Implementation

- Community Input
 - NSF Advisory Committee(s) engagement
 - NSF-Wide Cyberinfrastructure Advisory Committee (ACCI)
 - Directorate ACs: MPS, CISE, ...
 - National Academies Study completion
- NSF-wide activity
 - CI Council
 - ACI, Heads of Directorates
 - Cross-Directorate Working Group
 - MPS & CISE/ACI Co-chair/leads



Discussion, Questions?

