



Transforming Science in the 21st Century: Vision for a National Cyberinfrastructure Ecosystem



"To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..."



Manish Parashar

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Directorate for Computer & Information Science
& Engineering

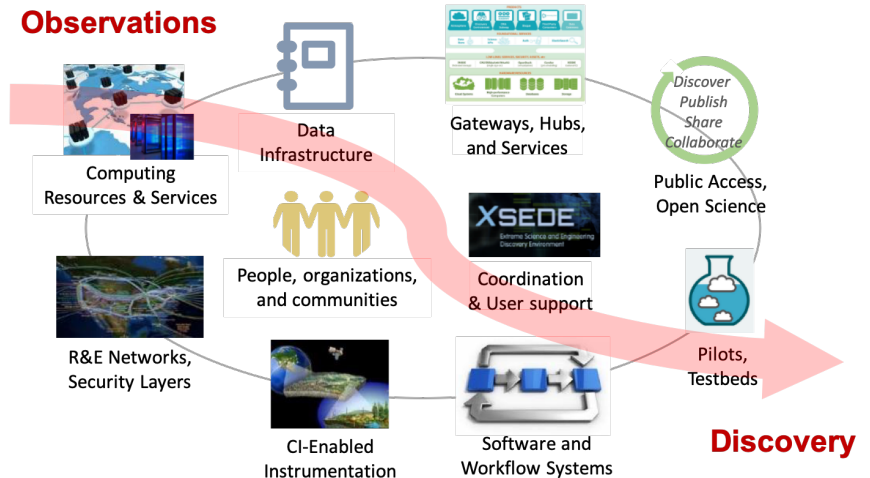
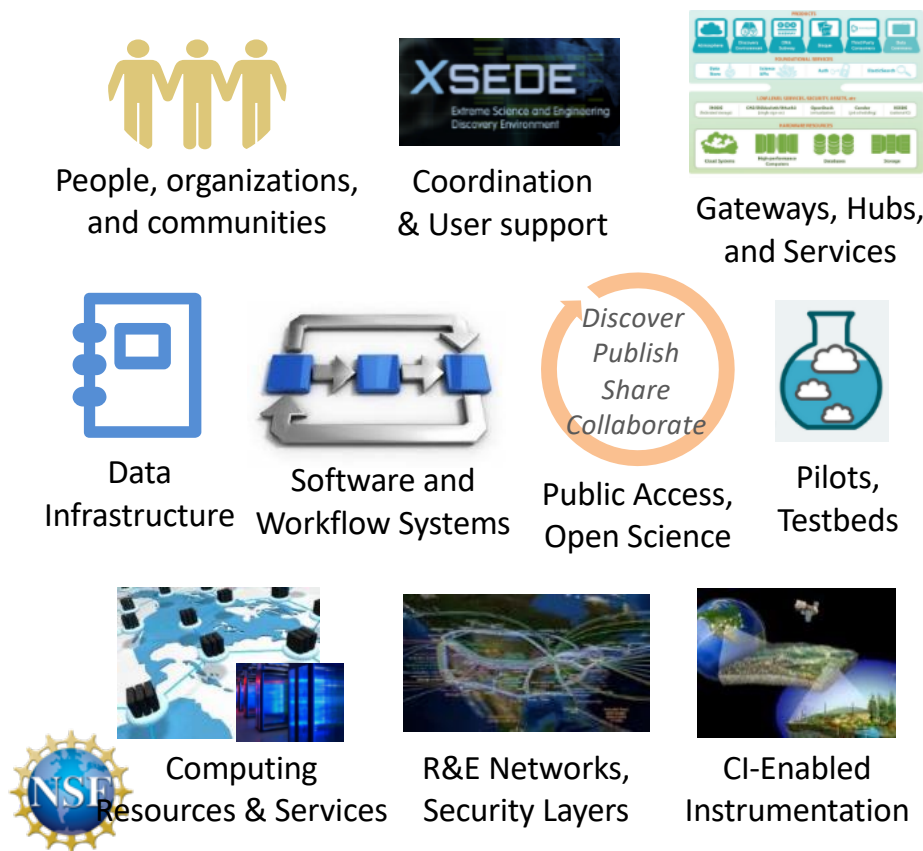
National Science Foundation

NAS Astro2020

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NSF Office of Advanced Cyberinfrastructure (OAC)

*Foster a cyberinfrastructure ecosystem to transform science and engineering research...
through Research CI and CI research*



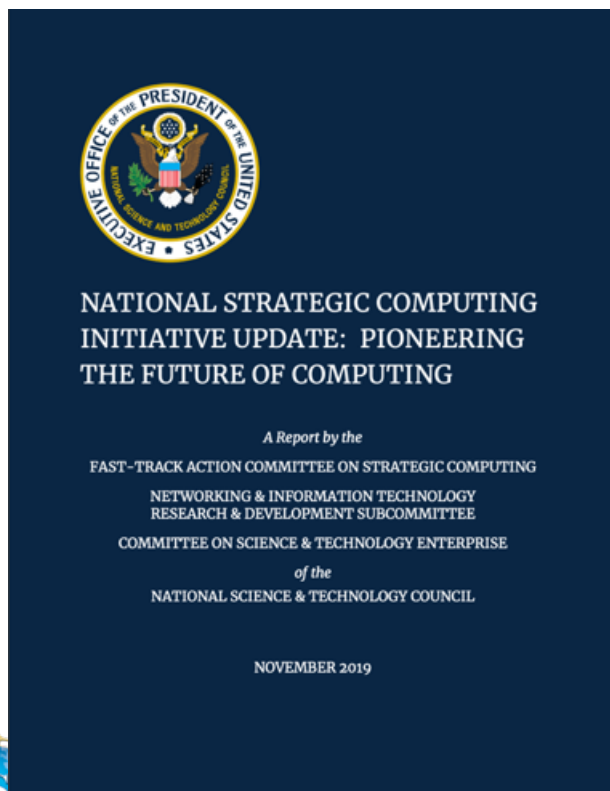
Rapid (disruptive) changes in S&E and CI landscapes →

Our cyberinfrastructure ecosystem must evolve!

NSF's vision for a National Cyberinfrastructure
Ecosystem for Science and Engineering in the 21st
Century

<http://go.usa.gov/xm8bU>

National Strategic Computing Initiative Update: Pioneering the Future of Computing



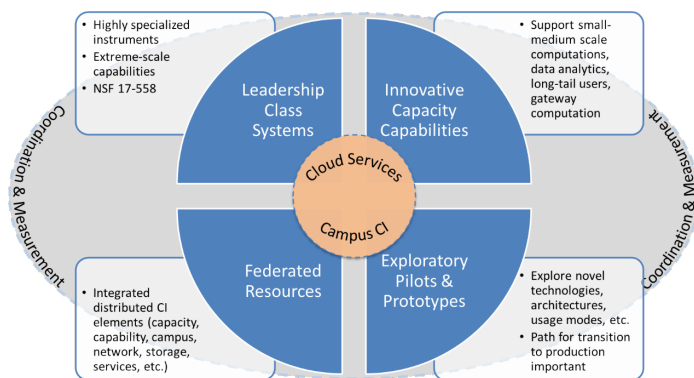
Goal: Realize a *computing ecosystem* that combines heterogeneous computing systems with the networking, software, data, and expertise required to support U.S. scientific and economic leadership, national security and defense

Three re-focused objectives:

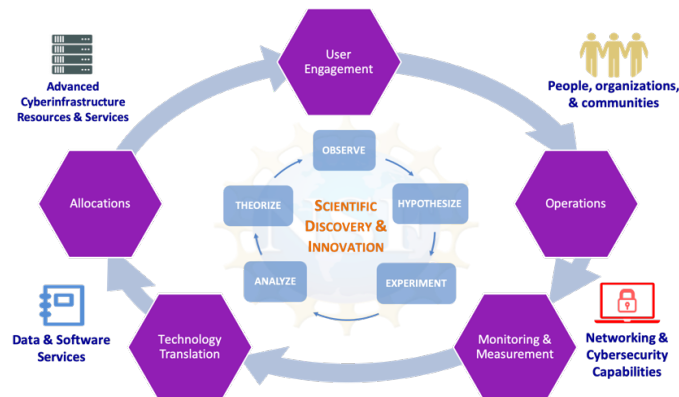
- Pioneer new frontiers of digital and non-digital computation to address the scientific and technological challenges and opportunities of the 21st century
- Develop, broaden, and advance the Nation's computational infrastructure and ecosystem
- Forge and expand partnerships for the future of computing to ensure American leadership in science, technology, and innovation

NSF's vision for a National Cyberinfrastructure Ecosystem for Science and Engineering in the 21st Century

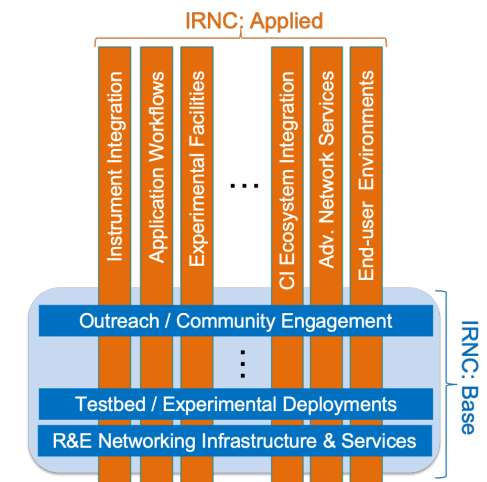
Community-informed blueprints provide implementation strategies for different elements of the CI ecosystem



Computational Ecosystem



CI Coordination Services



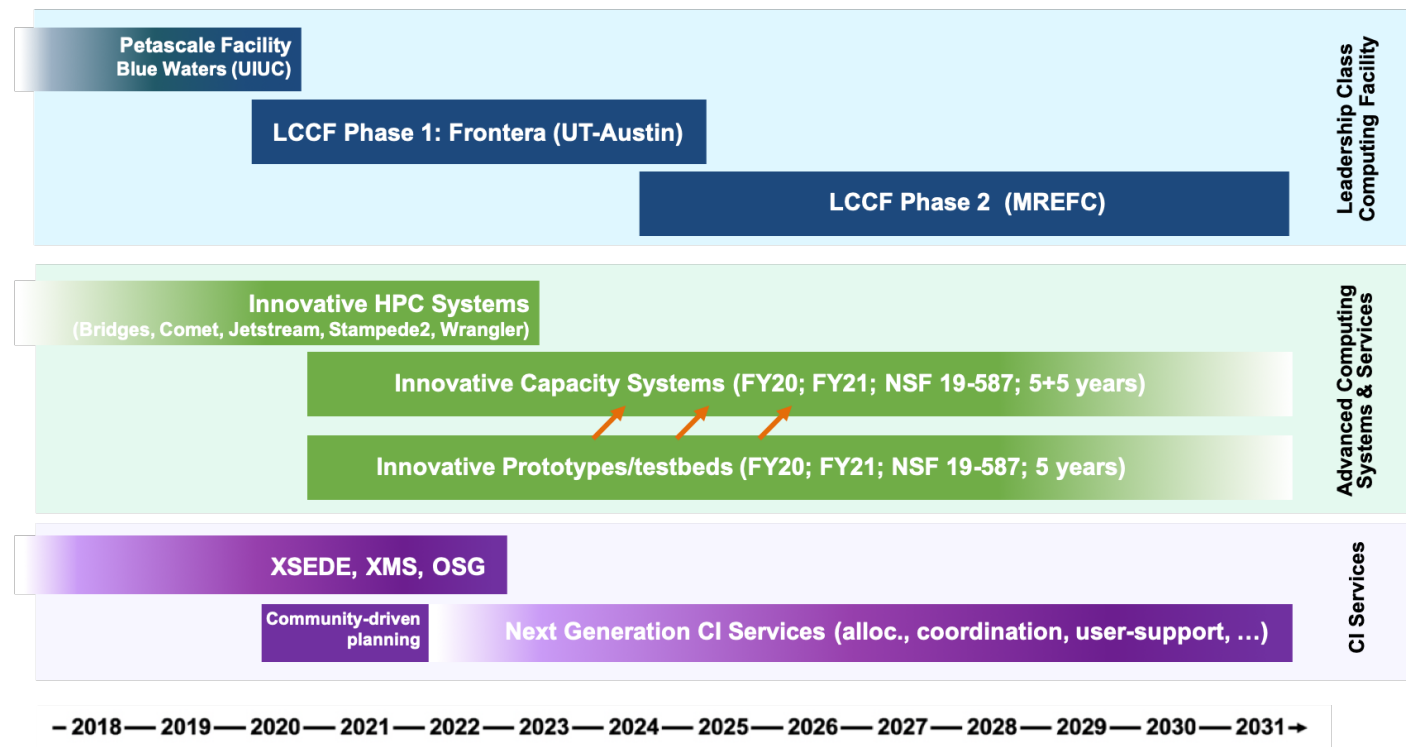
International R&E Networking

More information at: <http://go.usa.gov/xm8bU>



Computational Blueprint

Implement extensions and enhancements to current investments and new programs and opportunities in 2019 and beyond.



NSF Computational Ecosystem: Recent Investments

Leadership Class Computing Facility (LCCF)

Phase I: Computation for the Endless Frontier

- A leadership-class computational instrument with the broadest utility for all of S&E applications
- The largest CPU system on a US academic campus
- A national asset that complements other leadership-class computing investments in the US research ecosystem

Phase II is expected to an NSF Major Facility with at least 10x capability



Advanced Computing Systems & Services (ACSS)

EXPANSE

Capacity System

Bridges-2

- Expanse: Computing without Boundaries – Cyberinfrastructure for the Long Tail of Science
- Bridges-2: Scalable Converged Computing, Data, and Analytics for Rapidly Evolving Science and Engineering Research



Exploratory System

Ookami (狼)

- Ookami: A high-productivity path to frontiers of scientific discovery enabled by exascale system technologies

Clouds, Campus CI, and the NSF CI Ecosystem

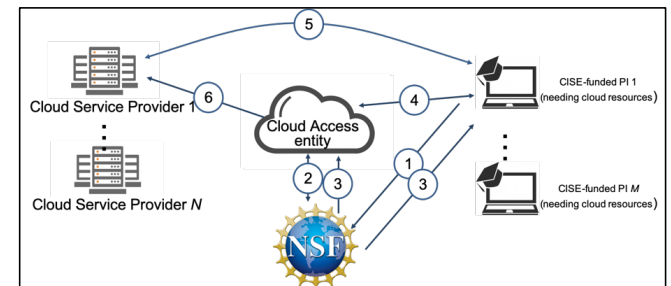
- CISE CloudAccess
 - Explore models for providing (CISE) researchers access to Cloud services

CloudBank, UCSD, UC B, UW, PI, M. Norman

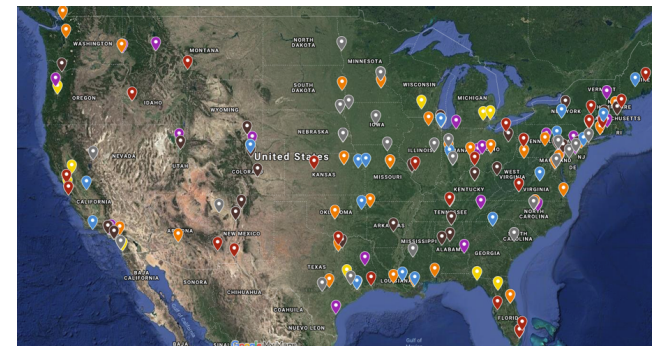
- Exploring Clouds for Acceleration of Science (ECAS)
 - Explore clouds as platforms for leading edge science

Internet2, PI, H. Pfeffer

- CC*: Clouds and Campus Computing
 - Federate campus CI
 - Integrate Cloud services/expertise into campus CI

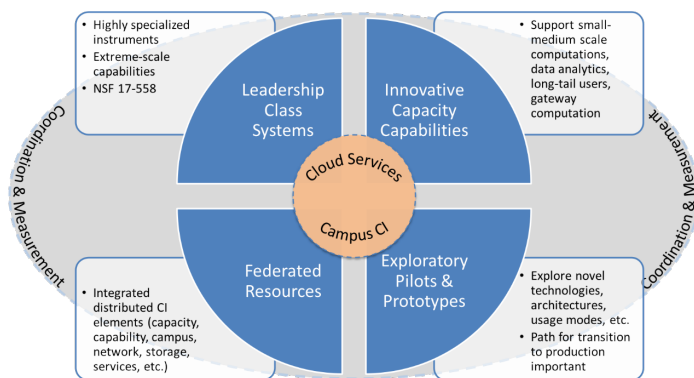


www.internet2.edu/ecas

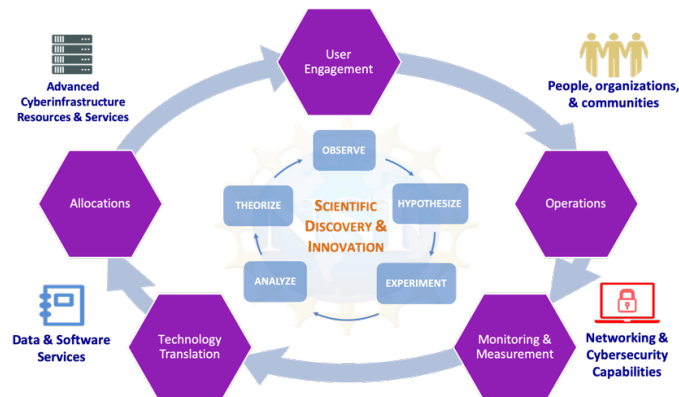


NSF's vision for a National Cyberinfrastructure Ecosystem for Science and Engineering in the 21st Century

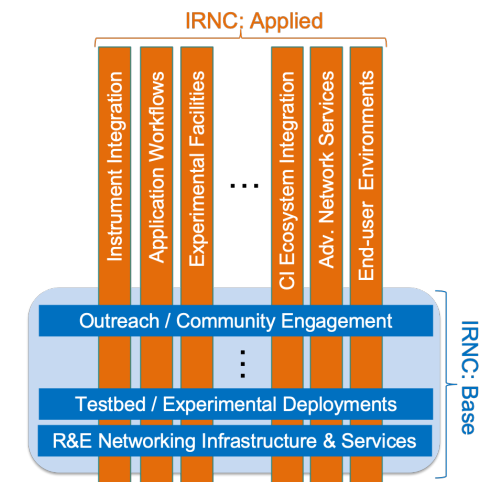
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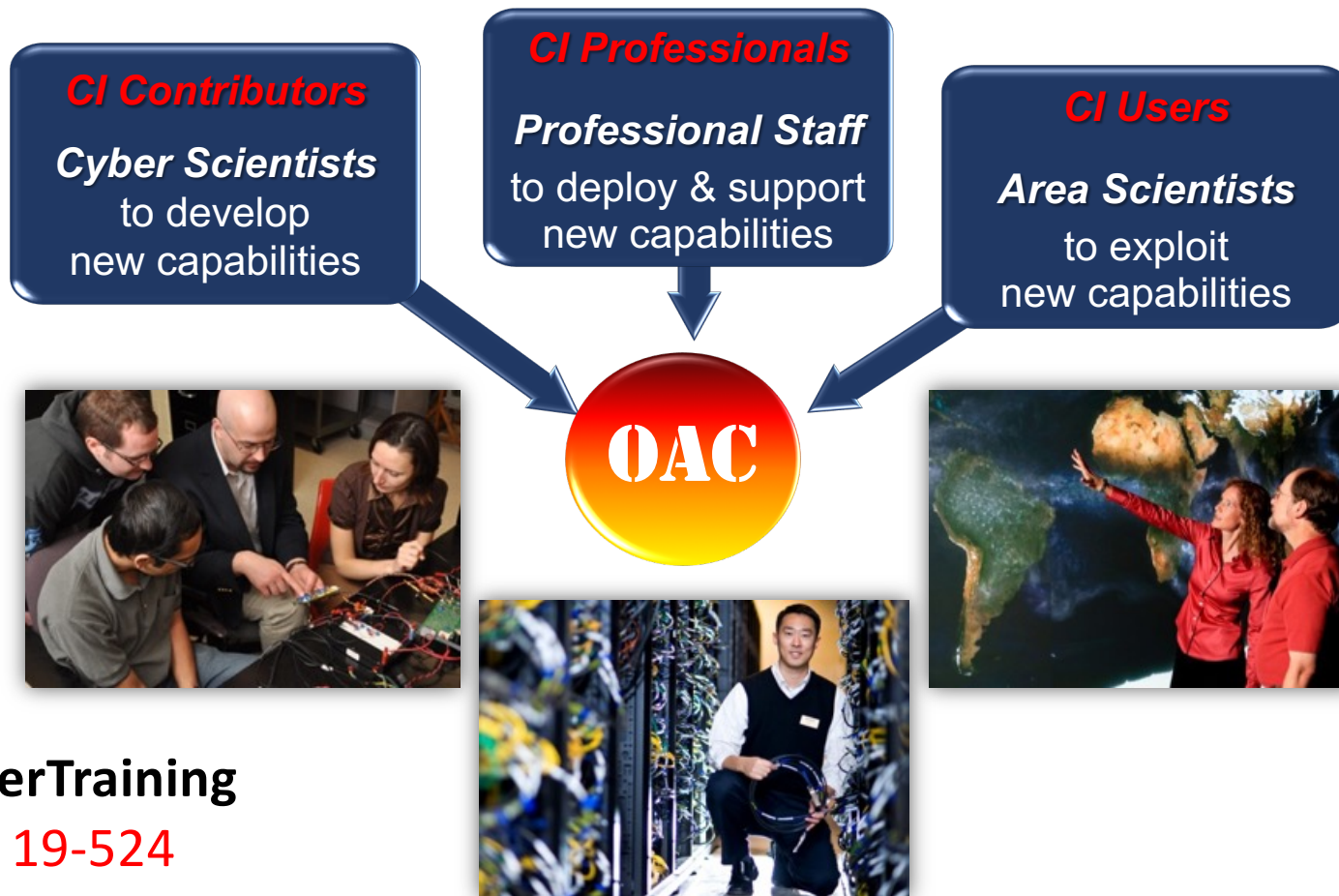
International R&E Networking

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Learning and Workforce Development

Communities of Concern



CyberTraining

NSF 19-524



Conclusion

- Science and society are being transformed by compute and data – a connected, robust and secure cyberinfrastructure ecosystem is essential
- Rapidly changing application requirements; resource and technology landscapes
 - Our cyberinfrastructure ecosystem must evolve in response
- NSF/OAC strives to build a cyberinfrastructure ecosystem aimed at transforming science



"Make no little plans; They have no magic to stir men's blood ..."

Daniel H. Burnham, Architect and City Planner Extraordinaire, 1907.

*"If you want to travel fast, travel alone;
if you want to travel far, travel together"*

African Proverb.

THANKS!

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