

# Cyberinfrastructure for Sustained Scientific Innovation (CSSI)

An Integrated Data-Software Solicitation for 2018

Webinars: February 23, 2018  
February 27, 2018



Vipin Chaudhary, Amy Walton, Rajiv Ramnath  
Office of Advanced Cyberinfrastructure  
Directorate for Computer & Information Science & Engineering

# Purpose of this Webinar

- Orient potential proposers
- Summarize the CSSI program and review criteria
- Answer questions
- Improve the quality of proposals

## Webinar Outline

- CSSI program description
- Overview of solicitation (NSF 18-531)
- Questions from the community

# NSF CSSI

- Program description
- Participating organizations
- Directorate specific priorities

# CSSI Program

- Supports the development and deployment of robust, reliable and sustainable data and software cyberinfrastructure
- Brings innovative capabilities towards sustained scientific innovation and discovery
- Provides a cross-directorate opportunity to advance common approaches to sustain and innovate research cyberinfrastructures.
- Follows accepted data management and software development practices

# CSSI: Integration of Data and Software

- Cyberinfrastructure for Sustained Scientific Innovation (CSSI) integrates two major and long-running NSF program solicitations:
  - Data Infrastructure Building Blocks (DIBBs), and
  - Software Infrastructure for Sustained Innovation (SI2)
- The integrated result is a useful way to:
  - Enable funding opportunities that are flexible and responsive to evolving and emerging needs in integrated data and software cyberinfrastructure
  - Minimize multiple / overlapping / redundant submissions
  - Encourage integrated and science-driven evaluations of submissions
  - Recognize disciplinary and interdisciplinary advances in software and data infrastructure under previous solicitations

# CSSI Program Guiding Principles

- **Science-driven:** Promotes science excellence, enabling fundamentally new scientific advances; benefits science and engineering communities beyond initial participants.
- **Innovative:** Emphasizes unique NSF contributions; builds the capability, capacity, and cohesiveness of a national CI ecosystem; considers both human and technical aspects of the CI.
- **Collaborative:** Fosters partnerships and community development; actively engages CI experts, specialists and scientists working in concert with the domain scientists who are users of CI.
- **Leveraged:** Builds on existing, recognized capabilities.
- **Strategic:** Includes management plans and metrics that encourage measurement of progress and sharing of results.
- **Sustained:** Results in widely accessible long-term community cyberinfrastructure.

*The project must explicitly address these principles, which translate into solicitation-specific criteria*

# Participating NSF Organizations

## **Office of Advanced Cyberinfrastructure (OAC)**

- Vipin Chaudhary
- Amy Walton
- Rajiv Ramnath

## **Directorate for Biological Sciences (BIO)**

- Division of Biological Infrastructure
  - Peter McCartney

## **Directorate for Computer & Information Science & Engineering (CISE)**

- Division of Computing and Communication Foundations
  - Sol Greenspan
- Division of Information and Intelligent Systems
  - Sylvia Spengler

## **Directorate for Education & Human Resources (EHR)**

- Division of Research on Learning in Formal and Informal Settings
  - John C. Cherniavsky

## **Directorate for Engineering (ENG)**

- Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET)
  - Ronald Joslin
  - Christina Payne
- Division of Civil, Mechanical and Manufacturing Innovation (CMMI)
  - Joanne D. Culbertson
- Division of Electrical, Communications and Cyber Systems (ECCS)
  - Jenshan Lin

## **Directorate for Geosciences (GEO)**

- Division of Atmospheric & Geospace Sciences
  - Subhashree Mishra
- Division of Earth Sciences (GEO/EAR)
  - Marc Stieglitz

## **Directorate for Mathematical & Physical Sciences (MPS)**

- Division of Astronomy
  - Nigel Sharp
- Division of Chemistry
  - Evelyn Goldfield
  - Lin He
- Division of Materials Research
  - Daryl W. Hess
- Division of Mathematical Sciences
  - Christopher Stark
  - Yong Zheng
- Division of Physics
  - Vyacheslav (Slava) Lukin
  - Bogdan Mihaila

## **Directorate for Social, Behavioral & Economic Sciences (SBE)**

- Division of Social and Economic Sciences
  - Cheryl Eavey

# National and NSF-wide Priorities

The CSSI solicitation is responsive to national and NSF-wide objectives, as well as priorities in science areas across the Foundation.

This solicitation welcomes proposals that are responsive to the objectives of two major initiatives:

- ***National Strategic Computing Initiative (NSCI)***  
(<https://www.nsf.gov/nsci/>) aimed at sustaining and enhancing the U.S. scientific, technological, and economic leadership position in high-performance computing (HPC) research, development, and deployment.
- ***Harnessing the Data Revolution (HDR)***  
([https://www.nsf.gov/about/congress/reports/nsf\\_big\\_ideas.pdf](https://www.nsf.gov/about/congress/reports/nsf_big_ideas.pdf)) aimed at fundamental data science research, research data cyberinfrastructure, and the development of a 21st century data-capable workforce.

Please review NSCI and HDR materials for priority areas.



# Specific Program Priorities - OAC

- Enable new science and engineering not previously possible
- Include innovation as an integral component of the project
- Build on existing community CI services, and leverage cyberinfrastructure from other OAC efforts
- Develop interdisciplinary and omni-disciplinary components

# Directorate Specific Priorities - BIO

The **Directorate for Biological Sciences (BIO)** is primarily interested in the CSSI program as a means to collaborate with other NSF directorates to support proposals that impact a multidisciplinary community that includes BIO-supported researchers.

PIs wishing to submit projects that focus primarily on biological sciences should submit to the Advances in Biological Informatics program (ABI; see NSF 15-582).

# Directorate Specific Priorities - CISE

The divisions within the **Directorate of Computer and Information Science and Engineering (CISE)** are interested in software or data engineering and infrastructure projects that support research in all areas that sustain progress in CISE research areas or that advance and adapt CISE research to impact the data and software sustainability needs of other scientific disciplines.

Please see the division-level descriptions in the solicitation for complete details.

# Directorate Specific Priorities - EHR

The **Directorate for Education and Human Resources** is interested in fostering novel, transformative, multidisciplinary approaches that address the use of large data sets and/or learning analytics to create actionable knowledge for improving STEM teaching and learning environments (formal and informal) in the medium term, and to revolutionize learning in the longer term.

# Directorate Specific Priorities - ENG

The **Directorate of Engineering (ENG)** seeks proposals for innovative software and data infrastructure that enable major advances in fundamental research funded by the divisions.

ENG will support proposals that give the engineering research community broad and sustained access to HPC and data and software platforms and technologies that support emerging research opportunities.

The goal is to broaden the use of advanced computing and data by the ENG research community to enhance research productivity and open new pathways to discovery.

Please see the division-level descriptions in the solicitation for complete details.

# Directorate Specific Priorities - GEO

The **Directorate for Geosciences (GEO)** is interested in atmospheric and geospace science, earth science, ocean science, and polar science.

The directorate welcomes proposals that focus on:

- real- and near-real-time archiving and manipulation of sensor and other field-based data, including experimental and/or simulation data;
- seamless discovery, access, and transfer of data and metadata across data resources and centers that are supported by GEO;
- “leverage-through-sharing” of existing investments in university, federal, and commercial computing and infrastructure;
- engaging community models for the assimilation and use of data for initialization, state estimation, or sensitivity analysis; and
- encouraging the development or reuse of computational techniques.

Please see the division-level descriptions in the solicitation for complete details.

# Directorate Specific Priorities - MPS

The **Directorate for Mathematical and Physical Sciences (MPS)** appreciates that software and data cyberinfrastructure enable scientific advances and discovery across MPS.

- In all MPS disciplines, there is need for cyberinfrastructure to support innovative scientific inquiry based on software and data that are findable, accessible, reusable, provenance traceable, and sustainably maintainable.
- Data cyberinfrastructure may additionally combine the elements of algorithms, software, computation, networks, task automation, or custom hardware to support data-centric approaches to MPS science.
- Data may be derived from experiment, observation, or computation, and may be diverse in kind consistent with science across MPS.

Please see the division-level descriptions in the solicitation for complete details.

# Directorate Specific Priorities - SBE

The **Directorate for Social, Behavioral, and Economic Sciences (SBE)** is interested in proposals that support the Directorate's research priorities, such as those outlined in SBE 2020 ([https://www.nsf.gov/sbe/sbe\\_2020/](https://www.nsf.gov/sbe/sbe_2020/)).

- SBE is particularly interested in using CSSI to support projects building on other infrastructure activities such as
  - Metadata for Long-standing Large-Scale Social Science Surveys (META-SSS) ([http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=504705](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504705)) and
  - Resource Implementations for Data Intensive Research in the Social, Behavioral and Economic Sciences (RIDIR) ([http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=505168&org=SES&from=home](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505168&org=SES&from=home)).
- SBE also welcomes innovative approaches to big data problems in SBE-focused domains consistent with NSF's Harnessing the Data Revolution.
- SBE encourages proposals that further the goals of SBE and at least one other participating NSF directorate.



# The NSF 18-531 Solicitation

- 2018 classes of investment
- PI eligibility
- Review criteria

# CSSI Umbrella

NSF 18-531

Investment Class	Description
<b>Elements</b>	Small groups that will create and deploy robust capabilities for which there is a demonstrated need that will advance one or more significant areas of science and engineering.
<b>Framework Implementations</b>	Larger, interdisciplinary teams organized around the development and application of common infrastructure aimed at solving common research problems faced by NSF researchers in one or more areas of science and engineering, resulting in a sustainable community framework serving a diverse community or communities.

<b>Planning Grants for Community Cyberinfrastructure</b>	Focus on the establishment of long-term capabilities in cyberinfrastructure, which would serve a research community of substantial size and disciplinary breadth.
--	---

<b>Community Cyberinfrastructure Implementations</b>	Focus on the establishment of long-term hubs of excellence in cyberinfrastructure and technologies, which will serve a research community of substantial size and disciplinary breadth.
--	---

# CSSI Investment Classes

NSF 18-531

Investment Class	Data	Software
<b>Elements</b>	<i>Data Elements</i>	<i>Software Elements</i>
<b>Framework Implementations</b>	<i>Data Frameworks</i>	<i>Software Frameworks</i>

<b>Planning Grants for Community Cyberinfrastructure</b>	<i>Planning Grants for Community Data Cyberinfrastructure</i>	<i>Planning Grants for Community Software Cyberinfrastructure</i>
<b>Community Cyberinfrastructure Implementations</b>	<i>Community Data Cyberinfrastructure Implementations</i>	<i>Community Software Cyberinfrastructure Implementations</i>

# Relation of Prior Program Investment Classes to CSSI

NSF 18-531

Investment Class	Data	Software
<b>Elements</b>	<i>Data Elements</i> <b>DIBBs Pilot Demonstrations</b>	<i>Software Elements</i> <b>SSE</b>
<b>Framework Implementations</b>	<i>Data Frameworks</i> <b>DIBBs Early Implementations</b>	<i>Software Frameworks</i> <b>SSI</b>

<b>Planning Grants for Community Cyberinfrastructure</b>	<i>Planning Grants for Community Data Cyberinfrastructure</i> <b>New</b>	<i>Planning Grants for Community Software Cyberinfrastructure</i> <b>Software Conceptualizations</b>
<b>Community Cyberinfrastructure Implementations</b>	<i>Community Data Cyberinfrastructure Implementations</i> <b>New</b>	<i>Community Software Cyberinfrastructure Implementations</i> <b>Software Innovation Institutes (S2I2)</b>

# Budget by Investment Class, NSF 18-531

Investment Class	Data	Software	Budget
<b>Elements</b>	<i>Data Elements</i>	<i>Software Elements</i>	<i>Up to \$600K Up to 3 years</i>
<b>Framework Implementations</b>	<i>Data Frameworks</i>	<i>Software Frameworks</i>	<i><b>\$600K - \$5M</b> (\$200K-\$1M/yr) 3-5 years</i>

# Anticipated Number of Awards

Investment Class	Anticipated Awards
Elements	<i>Up to <b>15</b> awards, pending availability of funds</i>
Framework Implementations	<i>Up to <b>13</b> awards, pending availability of funds</i>

# Anticipated Amount of Funding

Investment Class	Anticipated Funding
Elements	<i>Up to <b>\$9M</b>, pending availability of funds</i>
Framework Implementations	<i>Up to <b>\$25M</b>, pending availability of funds</i>

# Schedule

- All proposals to NSF 18-531 *have the same deadline - April 18, 2018*

- **Schedule:**

Solicitation Issued:	January 2018
Proposals Due:	April 18, 2018
Review:	May-July 2018
Announcement of Awards:	Fall 2018

# PI Eligibility

- **Proposals may only be submitted by:**
  - Universities and Colleges
  - Non-profit, non-academic organizations
  - NSF-sponsored federally funded research and development centers (FFRDCs) may apply, provided that that they are not including costs for which federal funds have already been awarded or are expected to be awarded.
- **Limit on Number of Proposals per PI/Co-PI/Senior Personnel: 1**
  - An individual may participate as Principal Investigator, co-Principal Investigator or other Senior Personnel in at most one full proposal in a given calendar year across all categories of proposal
  - In the event that any individual exceeds this limit, any proposal submitted to this solicitation with this individual listed as PI, co-PI, or Senior Personnel after the first proposal is received at NSF will be returned without review. No exceptions will be made.

**See solicitation for details**



# CSSI Cover Sheet

- **NSF Unit of Consideration (program):**
  - Data Element/Frameworks should choose “DATANET”
  - Software Element/Frameworks should choose “Software Institutes”
- **Proposal Title**
  - Proposal titles should begin with “Element:” or “Framework:”, followed by “Data” or “Software”.
  - Responsiveness to NSCI: additionally prefix title with “NSCI”.
  - Responsiveness to HDR: additionally prefix title with “HDR”.
  - Examples
    - *Element:Data:HDR:MyProjectTitle*
    - *Element:Software:MyProjectTitle*
    - *Framework:Software:NSCI:MyProjectTitle*

# Supplementary Documents (1)

- **Data Management Plan**
  - Standard NSF requirement
  - The reviewers pay close attention to the Data Management Plan
- **Postdoctoral Trainee Mentoring Plan** (if project includes such trainees)
- **Management and Coordination Plan** (for Framework Implementation proposals) should include:
  - the specific roles of the PI, co-PIs, other senior personnel and paid consultants at all institutions involved
  - how the project will be managed across institutions and disciplines
  - identification of the specific coordination mechanisms that will enable cross-institution and/or cross-discipline scientific integration
  - pointers to the budget line items that support these management and coordination mechanisms
- **Letters of Collaboration**, if any (see details in solicitation)

# Supplementary Documents (2)

## Project Personnel and Partner Institutions

- Provide current, accurate information for all personnel and institutions involved in the project
- The list must include all PIs, Co-PIs, Senior Personnel, Consultants, Collaborators, Sub-awardees, Postdocs, advisory committee members, and writers of letters of collaboration
- NSF staff will use this information in the merit review process to manage conflicts of interest
- See details in the solicitation

# Single Copy Documents

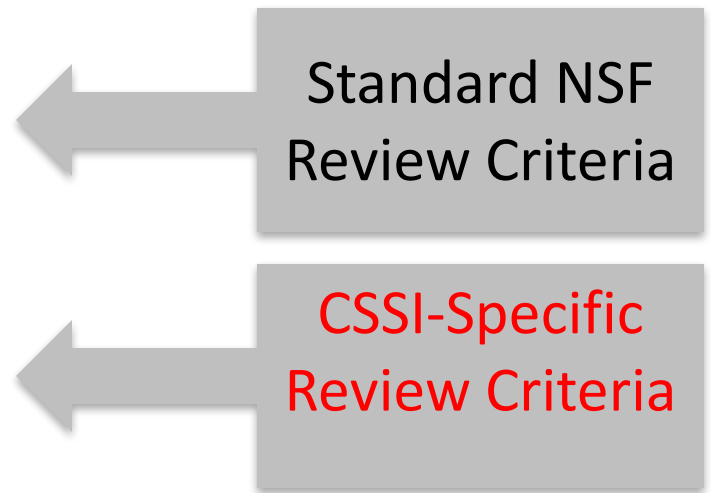
## Collaborators and Other Affiliations

- Provide information as specified in the NSF proposal guide
- A completed spreadsheet for each PI, co-PI, or senior personnel
  - spreadsheet template found at <https://www.nsf.gov/cise/collab/>
- NSF staff use this information in the merit review process to help manage reviewer selection
- Note the distinction between requirement on previous slide (on Additional Documents - 2)
- See details in the solicitation

# NSF Review Criteria

Reviewers and review panel will address:

- Intellectual Merit,
- Broader Impacts, and
- **CSSI Specific Review Criteria**



in their reviews, panel discussions, and panel summaries

# Standard NSF Review Criteria

When evaluating NSF proposals, reviewers will consider:

- What the proposers want to do?
- Why they want to do it?
- How they plan to do it?
- How they will know if they succeed?
- What benefits would accrue if the project is successful?

These issues apply both to the technical aspects of the proposal (intellectual merit) and the way in which the project may make broader contributions (broader impacts)

# CSSI-Specific Review Criteria

- To what extent is the proposed project science-driven?
- To what extent is the proposed project innovative?
- To what extent does the proposed project involve close collaborations among stakeholders?
- To what extent does the proposed project build on existing, recognized capabilities?
- How well described are the project plans, and system and process architecture?
- How well does the project address the achievement of sustained and sustainable impacts?

# A Competitive CSSI Proposal Will:

- Identify science and engineering challenges where the proposed cyberinfrastructure enables fundamental new science advances, and describe how the proposed project fosters partnerships and community development that will have a significant impact on science and engineering research
- Indicate how the proposed cyberinfrastructure builds capability, capacity and cohesiveness of a national CI ecosystem; and
- Provide a compelling discussion of the cyberinfrastructure's potential use by a wider audience and its contribution to a national cyberinfrastructure.



# Questions?

# Questions and Answers (1)

- If I am the PI on a proposal to NSF 18-531:
  - Can I be the PI on any other proposal to NSF 18-531? NO
  - Can I be a co-PI on any other proposal to NSF 18-531? NO
  - Can I be Senior Personnel on any other proposal to NSF 18-531? NO
- If I am a co-PI on a proposal to NSF 18-531:
  - Can I be the PI on any other proposal to NSF 18-531? NO
  - Can I be a co-PI on any other proposal to NSF 18-531? NO
  - Can I be Senior Personnel on any other proposal to NSF 18-531? NO
- If I am Senior Personnel on a proposal to NSF 18-531:
  - Can I be the PI on any other proposal to NSF 18-531? NO
  - Can I be a co-PI on any other proposal to NSF 18-531? NO
  - Can I be Senior Personnel on any other proposal to NSF 18-531? NO

***An individual may participate as PI, co-PI, or other Senior Personnel on at most one proposal across the Elements and Framework Implementations for this solicitation.***

***In the event that any individual exceeds this limit, any proposal submitted to this solicitation with this individual listed as PI, co-PI, or Senior Personnel after the first proposal is received at NSF will be returned without review.***

<https://www.nsf.gov/pubs/2018/nsf18531/nsf18531.htm>

# Questions and Answers (2)

- When are proposals due?
  - **April 18, 2018.**
  - Proposals must be received by **5 p.m. submitter's local time.**
  - Failure to submit by 5 p.m. submitter's local time will result in the proposal not being accepted.
- How do I submit a proposal to this program?
  - Please carefully read and follow the instructions provided in the solicitation itself (<https://www.nsf.gov/pubs/2018/nsf18531/nsf18531.htm>) and the NSF *Proposal & Award Policies & Procedures Guide (PAPPG)* available at ([https://www.nsf.gov/pubs/policydocs/pappg18\\_1/index.jsp](https://www.nsf.gov/pubs/policydocs/pappg18_1/index.jsp)). If you need additional help preparing and submitting your proposal, we recommend that you contact your institution's Sponsored Projects Office.
- Do I need to use Grants.gov or Fastlane to apply?
  - You may use either Grants.gov or Fastlane.

# Questions and Answers (3)

- ***What types of organizations organizations are allowed to submit proposals?***
  - ***Universities and Colleges*** - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in, the US acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
  - ***Non-profit, non-academic organizations***: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.
  - ***NSF-sponsored federally funded research and development centers (FFRDCs)***, provided that they are not including costs for which federal funds have already been awarded or are expected to be awarded.
- ***How can other organizations (e.g., industry, international partners) participate?***
  - Organizations eligible to serve as subawardees are all organizations eligible under the guidelines of the *NSF Proposal & Award Policies & Procedures Guide (PAPPG)*.

# Questions and Answers (4)

- ***How can a proposal integrate industry collaboration into the project?***
  - Industry participants may be included as a subaward within the proposal.
  - Industry investigators may serve as co-PIs or senior personnel on a proposal. (See PAPPG, Part I, E.3).
  - Industry participants may be (unfunded) collaborators.
  - Industry participation should be integrated through the management plan.
- **Can a foreign organization submit a proposal?**
  - NSF rarely provides support to foreign organizations. NSF will consider proposals for cooperative projects involving US and foreign organizations, provided support is requested only for the US portion of the collaborative effort.

# Questions and Answers (5)

- **What is the difference between a data and a software proposal submission?**
  - The data proposal (either a Data Element or a Data Framework proposal) has data attributes as the core enabler for the success of the project.
  - The software proposal (either a Software Element or a Software Framework proposal) has software attributes as the core enabler for the success of the project.
  - There are obvious areas of overlap; proposers are encouraged to clearly identify where they expect to make major contributions.
- **How do CSSI proposals differ from Computational and Data-Enabled Science and Engineering (CDS&E) proposals?**
  - CDS&E emphasizes research in, rather than the development of, cyberinfrastructure systems.
  - CSSI focuses upon development of data and software systems that support research.
- **How are data proposals to CSSI different from BIGDATA proposals?**
  - Data proposals to CSSI focus upon innovative, use-inspired and user-tested infrastructure that contributes to future discovery across communities.
  - BIGDATA focuses on research challenges in the foundations of data science, and development of innovative applications.

<https://www.nsf.gov/pubs/2018/nsf18531/nsf18531.htm>

# On behalf of the National Science Foundation and the CSSI team

***THANK YOU!***

Questions?

- Now
- [vipchaud@nsf.gov](mailto:vipchaud@nsf.gov), or 703-292-2254
- [awalton@nsf.gov](mailto:awalton@nsf.gov), or 703-292-4538
- [rramnath@nsf.gov](mailto:rramnath@nsf.gov), or 703-292-4776

These slides, an audio recording, and a script of this webinar are available at <http://www.nsf.gov/events/>