

Campus Cyberinfrastructure (CC*)

PROGRAM SOLICITATION

NSF 22-582

REPLACES DOCUMENT(S):

NSF 21-528



National Science Foundation

Directorate for Computer and Information Science and Engineering
Office of Advanced Cyberinfrastructure

Full Proposal Deadline(s) (due by 5 p.m. submitter's local time):

June 27, 2022

IMPORTANT INFORMATION AND REVISION NOTES

This special CC* solicitation introduces two new areas on regional computing and data storage, and for this solicitation only removes all previous CC* areas.

Innovating and migrating proposal preparation and submission capabilities from FastLane to Research.gov is part of the ongoing NSF information technology modernization efforts, as described in Important Notice No. 147. In support of these efforts, research proposals submitted in response to this program solicitation must be prepared and submitted via Research.gov or via Grants.gov, and may not be prepared or submitted via FastLane.

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) ([NSF 22-1](#)), which is effective for proposals submitted, or due, on or after October 4, 2021.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Campus Cyberinfrastructure (CC*)

Synopsis of Program:

The Campus Cyberinfrastructure (CC*) program invests in coordinated campus-level networking and cyberinfrastructure improvements, innovation, integration, and engineering for science applications and distributed research projects. Science-driven requirements are the primary motivation for any proposed activity.

Cognizant Program Officer(s):

Please note that the following information is current at the time of publishing. See program website for any updates to the points of contact.

- Kevin L. Thompson, telephone: (703) 292-4220, email: kthomps@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 15 to 23

The estimated number of awards per program area is as follows: 10-15 Data Storage awards; and 5-8 Regional Computing awards.

Anticipated Funding Amount: \$10,000,000 to \$15,000,000

pending availability of funds and quality of proposals received.

Each program area will support awards pursuant to the following budget and duration:

1. Data Storage awards will be supported at up to \$500,000 total for up to 2 years; and
2. Regional Computing awards will be supported at up to \$1,000,000 total for up to 2 years.

Eligibility Information

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

There are no restrictions or limits.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
 - Full Proposals submitted via Research.gov: *NSF Proposal and Award Policies and Procedures Guide (PAPPG)* guidelines apply. The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.
 - Full Proposals submitted via Grants.gov: *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov* guidelines apply (Note: The *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide).

B. Budgetary Information

- **Cost Sharing Requirements:**

Inclusion of voluntary committed cost sharing is prohibited.
- **Indirect Cost (F&A) Limitations:**

Not Applicable
- **Other Budgetary Limitations:**

Not Applicable

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

June 27, 2022

Proposal Review Information Criteria

Merit Review Criteria:

National Science Board approved criteria. Additional merit review criteria apply. Please see the full text of this solicitation for further information.

Award Administration Information

Award Conditions:

Standard NSF award conditions apply.

Reporting Requirements:

Standard NSF reporting requirements apply.

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I. INTRODUCTION

Campuses today face challenges across multiple levels of cyberinfrastructure (CI), where meeting the needs of scientific research and education goes far beyond the networking layer in capacity and services, and extends to computing, data services, secure and trustworthy systems, and especially human expertise, collaboration and knowledge sharing. Recognition of the "data driven" nature of scientific advancement and discovery has led to an increased focus in addressing the data challenges posed by the NSF research and education community.

In recent years, NSF has addressed the growing requirements of the NSF community, and provided opportunities to innovate, in networking infrastructure through the CC* program, which invests in innovative, coordinated, and secure campus, multi-campus and multi-institution CI components. The Campus Cyberinfrastructure-Network Infrastructure and Engineering (CC-NIE) program in 2012 and 2013 focused on campus networking upgrades and re-architecting, and innovative development and integration of new networking capabilities in support of driving scientific application requirements. Subsequent years saw the program expand beyond data networking to address a broader set of CI needs at the campus level, including computing, storage, multi-institution integrated CI, and learning and workforce development.

Subsequent years saw the program expand beyond data networking to address a broader set of CI needs at the campus level, including computing, storage, multi-institution integrated CI, and learning and workforce development.

This CC* solicitation invests in specific areas that have emerged as challenges and opportunities in coordinated campus and regional CI resources in support of science applications and distributed research projects. Science-driven requirements are the primary motivation for any proposed activity.

CC* awards made via this solicitation will be supported in two program areas:

1. Data Storage awards will be supported at up to \$500,000 total for up to 2 years; and
2. Regional Computing awards will be supported at up to \$1,000,000 total for up to 2 years.

In FY 2020, the program was aligned with NSF's vision for a holistic CI ecosystem outlined in "Transforming Science Through Cyberinfrastructure: NSF's Blueprint for a National Cyberinfrastructure Ecosystem for Science and Engineering in the 21st Century" (see <https://www.nsf.gov/cise/oac/vision/blueprint-2019/>). Key changes focused on the aggregation and integration of CI investments at the campus level, with the goal of helping campuses drive toward a 21st-century realization of an integrated CI for enabling science. This solicitation has 2 program areas, each of which is a new and different area than seen in previous CC* solicitations. Program area one addresses science-driven needs in data storage resources intra-campus, and externally. Program area two addresses shared computational CI capacity needs at the regional level, focused on building and applying capacity to those institutions most in need.

II. PROGRAM DESCRIPTION

Program-wide Criteria

Science-driven requirements are the primary motivation for any proposed activity. Proposals will be evaluated on the strength of the science enabled (including research and education) as drivers for proposed investment and innovation in campus CI.

A common theme across all aspects of the CC* program is the critical importance of the partnership among campus-level CI experts, including the campus Information Technology (IT)/networking/data organization, contributing domain scientists, research groups, and educators necessary to engage in, and drive, new campus CI capabilities and approaches in support of scientific discovery. Proposals should reflect and demonstrate this partnership on campus. Proposals will be evaluated on the strength of institutional partnerships, as they are expected to play a central role in developing and implementing the eventual campus CI upgrades.

All proposals submitted to the CC* program, must include a Campus CI plan within which the proposed CI improvements are conceived, designed, and implemented in the context of a coherent campus-wide strategy and approach to CI that is integrated horizontally intra- campus and vertically with regional and national CI investments and best practices. This Campus CI plan must be included as a Supplementary Document and is limited to **no more than 5 pages**.

Further, proposals are expected to address within the Campus CI plan the sustainability of the proposed work in terms of ongoing operational and engineering costs. Since security and resilience are fundamental issues in campus CI, the Campus CI plan should address the campus-wide approach to cybersecurity in the scientific research and education infrastructure, including the campus approach to data and privacy.

The website, <http://fasterdata.es.net/campusCIplanning/>, offers a number of Campus CI plans provided by existing CC* program awardees as examples. Proposals addressing a multi-institution or regional activity and approach to coordinated and integrated CI may submit a Campus CI plan representing the multi-institution group or region.

All proposals submitted to CC* are expected to address the relevant cybersecurity issues and challenges related to their proposed activities. Depending on the type of proposal, these issues may include, but are not limited to: data integrity, privacy, network security measures, federated access and identity management, and infrastructure monitoring.

As a campus CI program, funded activities should represent ongoing opportunities for student engagement, education, and training. Proposals that demonstrate opportunities to engage students directly in the design, deployment, operation, and advancement of the funded CI activities, consistent with the required Campus CI plan, are encouraged. Note that NSF encourages Research Experiences for Undergraduates (REU) supplement proposals on active awards as well.

Program Areas

This solicitation welcomes proposals in two program areas: (1) Data Storage: and (2) Regional Computing. These are described in detail below.

(1) Data Storage

A significant challenge, if not bottleneck, to CI-enabled research and education is the limited access to data storage and associated services across campuses. While cloud services continue to provide data services for parts of the research community, data restrictions on some data sets combined with expensive egress data movement charges do not allow this to be a universal solution. Meanwhile, the ability of research projects across disciplines to gather ever more data and increased tools to analyze data put increasing pressure on storage and management.

This program area promotes coordinated approaches in scientific storage and data management at the campus level and incentivizes multi-campus and national resource sharing. Awards in this area reflect NSF principles and guidance in the community's stewardship of data from NSF funded research, and particularly aim at supporting the data lifecycle. As described below for the Data Management Plan, proposals are expected to adhere to the FAIR principles and guidance from NSF as described in the Dear Colleague Letter (DCL) on Effective Practices for Data: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf19069

This program area supports campus data storage needs for scientific data. Campuses may request up to \$500,000 in data storage and associated hardware.

It is expected that campus-wide storage needs are addressed in the proposal; a proposal focusing on a single science domain or project use will not be considered for funding.

All proposals in this program area must address:

- Scientific and engineering projects and their research and education storage needs, describing project-specific scenarios for scientific data generation, storage, and management;
- Features, capabilities, and software platforms representing the proposed storage resources and services; and
- Plans to manage the resource, data sets, and usage while ensuring adherence to FAIR principles and equitable access.

All proposals should consider expected outcomes and explain the compelling need for proposed storage capacity and capability in light of the current state of available storage resources and the expected enabling benefits of the proposed resources to the identified science drivers and applications.

NSF encourages proposals in this program area from under-resourced institutions and strong preference will be given to proposals demonstrating a compelling need for access to data storage resources, including institutions lacking necessary data storage resources on campus.

The proposal may request funding for the acquisition of a shared, high-performance network-connected data storage resource available to scientific users on campus and outside of campus.

Proposals must include in the Project Description:

- A summary table of the science drivers and their data storage environments - these requirements should be specified in clear terms reflecting a specific understanding of the required storage resources and environment, for example, storage type, data movement characteristics and data curation approach as part of a scientific workflow profile;
- The platform architecture and open source software/platform;
- An open source-based approach to storage system monitoring, measurement, management, and instrumentation;
- A sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to storage resources;

- High-Performance Network Connectivity and Specification - see below for more details; and
- A description of the storage system as a Shared Resource Intra-campus and Inter-campus - see below for more details

Itemized vendor quotes as part of the budget is required for all proposals in this program area.

High-Performance Network Connectivity and Specification: Proposals must describe the network connectivity of the proposed storage resource, both intra-campus (for example, the campus network path(s) connecting the resource with the researchers and driving science applications on campus), and inter-campus (for example, showing the network path connecting with the regional exchange point or Internet2). Proposals should include a network diagram showing the connected topology of the proposed cluster resource. Proposals should include in their plans the deployment of a PerfSonar based network performance measurement capability to initially measure achievable end-to-end network performance for scientific data flows between the resource and relevant end points of researchers.

The Storage system as a Shared Resource Intra-campus and Inter-campus: Interoperability is required with a national and federated data sharing fabric such as PAtH/OSDF (see: <http://www.opensciencegrid.org/about/osdf>). At least 20% of the disk/storage space on the proposed storage system must be made available as part of the chosen federated data sharing fabric.

Staffing required to configure, operate, and support data management and access of the storage resource is an acceptable component of the budget at up to 25% of the overall budget request.

Management of the system and planned data sets should be discussed in the proposal and may also be addressed as part of the Data Management Plan (see below).

Tangible metrics addressing measures of success should be included.

Proposals should discuss the storage system in the larger context of campus CI and a vision inclusive of supporting shared resources and computing at the campus level.

Any resources requested must be "on premises" which may include placement at an off-campus data center with a pre-existing role in campus research computing and storage. For data archival, burst, or other purposes, proposals may include a component cost associated with cloud storage and storage services.

A data management approach and plan must be documented and provided as a supplementary document of no more than 3 pages. The data management plan should include the campus approach to data lifecycle management, data sharing, and adherence to the FAIR (findable, accessible, interoperable, and reusable) principles. Proposals are strongly encouraged to reference NSF's DCL on Effective Practices for Data: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf19069

Campuses with a science DMZ are expected to address its use in the proposal. No data transfer or data management software license fees are allowed as part of the request.

Proposals should also address the long-term plan for archival storage and sustainability. Proposals may address these topics in the Project Description, Data Management Plan, or the Campus CI Plan.

Only Institutions of Higher Education are eligible to submit proposals in this program area.

Proposals in this area are required to have titles that begin with "CC* Data Storage:" followed by the title of the project.

Summary of Program Area One proposal requirements.

Proposals are required to:

- address scientific and engineering projects and their research and education storage needs, describing project-specific scenarios for scientific data generation, storage, and management.
- address features, capabilities, and software platforms representing the proposed storage resources and services.
- Proposals are required to address plans to manage the resource, data sets, and usage while ensuring adherence to FAIR principles and equitable access.
- include a summary table of the science drivers and their data storage environments.
- describe the platform architecture and open-source software/platform.
- describe an open source-based approach to storage system monitoring, measurement, management, and instrumentation.
- include a sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to storage resources.
- describe how the data storage system is connected via high performance network connectivity, including a network topology showing how the system is connected to the campus network.
- include complete itemized vendor quotes with the budget.
- describe the storage system as a shared resource intra-campus and inter-campus via interoperability with a national and federated data sharing fabric, with 20% or more of the disk/storage space committed to extramural scientific uses.
- deploy the system "on premise" which may include placement at an off-campus data center with a pre-existing role in campus research computing and storage.
- document a data management approach and plan, included as a supplementary document of no more than 3 pages.
- include a Campus CI plan as a Supplementary Document, limited to no more than 5 pages (see Section II. Program-wide Criteria above for more information).
- have titles that begin with "CC* Data Storage:" followed by the title of the project.
- be submitted by an Institution of Higher Education.

(2) Regional Computing

Program area two promotes coordinated approaches in scientific computing at the regional level through investments in computing clusters serving scientific computing needs spanning a state or region's small and under resourced institutions.

This area solicits proposals led by established regional and state research and education data networks and data network-based consortia. Example entities are listed as members of the national regional networks consortium called the Quilt (see <https://www.thequilt.net/about-us/the-quilt-participants/>). For areas of the US without a state or regional level coordinating entity and associated structure and network infrastructure, proposals will be accepted from self-declared

leadership universities. An institution may also lead a proposal in regions with an established Regional Optical Network (RON) with documented coordination with the RON.

It is expected that multi campus-wide computing needs are addressed in the proposal; a proposal focusing on a single campus, a single science domain or a single project use will not be considered for funding.

All proposals submitted to this area must address:

- Scientific and engineering projects and their research and education computing needs, describing project-specific scenarios for scientific computing tied to the proposed computing resources;
- Features, capabilities, and software platforms representing the proposed computing resources; and
- Scientific computing codes expected to run on the resources.

All proposals should consider expected outcomes and explain the compelling need for proposed computing resource in the context of the current state of available computing resources and the expected enabling benefits of the proposed resources to the identified science drivers and applications.

The proposal may request funding for the acquisition of a shared, high-performance network-connected compute resource available to scientific computing users across a defined set of campuses. Storage is one component of an integrated compute cluster - A storage component is allowed for up to 25% of the overall budget request. Staffing required to configure and operate the shared resource is an acceptable component of the budget for up to 25% of the overall budget request. The proposal is expected to document long term commitment to operations and maintenance (O&M) past the lifetime of the award - or describe the strategy for sustaining availability of the resource. Costs associated with software license fees are not allowed.

Proposals must include in the Project Description:

- A summary table of the science drivers and their computing environments—these requirements should be specified in clear terms reflecting a specific understanding of the required computing resources and environment, for example, CPU/GPU type, compute job profile parameter ranges, core count ranges per job, times to completion or as part of a composition or scientific workflow profile;
- The platform architecture specifying cluster components, including compute node type and count, per-node memory, interconnect fabric, storage, and open-source software/platform;
- An open source-based approach to cluster monitoring, measurement, management, and instrumentation;
- A sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to computational resources;
- A High-Performance Network Connectivity and Specification—see below for more details; and
- A description of the cluster as an Inter-campus - see below for more details.

Proposals are encouraged to consider open-source virtualization technologies.

Inclusion of itemized vendor quotes accompanying the budget is required for all proposals in this program area.

High-Performance Network Connectivity and Specification: Proposals must describe the network connectivity of the proposed computing resource, and how it is connected to users across multiple campuses. Proposals should include a network diagram showing the connected topology of the proposed cluster resource. Proposals should include in their plans the deployment of a PerfSonar based network performance measurement capability to initially measure achievable end-to-end network performance for scientific data flows between the resource and relevant end points of researchers.

The Cluster as a Shared Resource Inter-campus: Proposals should describe (1) their approach to sharing the proposed computing resource across the science drivers and researchers across the identified institutions; (2) how the resource will be accessed by research groups across multiple institutions; and (3) how the resource is coordinated with other external resources allowing the institutions' researchers to seamlessly access computing resources at other sites and campuses, regional and national computing resources, and/or production cloud resources, if appropriate.

Proposals are required to commit to a minimum of 20% shared time on the cluster and describe their approach to making the cluster available as a shared resource external to the state/region and the set of institutions being primarily served. Proposals are strongly encouraged to address this requirement by joining the Partnerships to Advance Throughput Computing (PATH) campus federation (<https://opensciencegrid.org/campus-cyberinfrastructure.html>) and adopting an appropriate subset of PATH services to make the cluster available to researchers on a national scale.

NSF expects to make awards in 2022 under the Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS) solicitation (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf21555). Awards in this program area are expected to work cooperatively with ACCESS award activities and services arising from these awards. Specifically, award terms and conditions for awards in this area will include adoption and use of ACCESS services through Track 4 of the ACCESS program: Monitoring and Measurement Services, toward improved visibility and understanding of shared scientific computing usage and needs at a national scale.

Tangible metrics addressing measures of success should be included.

Additional proposal preparation guidance for this area can be found in Section V.A. Proposal Preparation Instructions.

Institutions of Higher Education and Non-profit, Non-academic Organizations are eligible to submit proposals in this program area.

Proposals in this area are required to have titles that begin with "CC* Regional Computing:" followed by the title of the project.

Summary of Program Area two proposal requirements:

Proposals are required to:

- address scientific and engineering projects and their research and education computing needs, describing project-specific scenarios for scientific computing tied to the proposed computing resources.
- address features, capabilities, and software platforms representing the proposed computing resources.
- address scientific computing codes expected to run on the resources.
- include a summary table of the science drivers and their computing environments. These requirements should be specified in clear terms reflecting a specific understanding of the required computing resources and environment (for example, CPU/GPU type, compute job profile parameter ranges, core count ranges per job, times to completion), or as part of a composition or scientific workflow profile.
- describe the platform architecture specifying cluster components, including compute node type and count, per-node memory, interconnect fabric,

- storage, and open-source software/platform.
- describe an open source-based approach to cluster monitoring, measurement, management, and instrumentation.
- describe a sustainability plan addressing the institution's commitment to providing an ongoing level of sustained access to computational resources.
- describe how the cluster is connected via high-performance network connectivity, including a network topology showing how the cluster is connected to the campus network.
- provide a description of the cluster as a shared resource intra-campus and inter-campus, with 20% or more of the cycles committed to extramural scientific uses.
- include complete itemized vendor quotes with the budget.
- include a Campus CI plan as a Supplementary Document, limited to no more than 5 pages (see Section II. Program-wide Criteria above for more information).
- be submitted by Institutions of Higher Education or Non-profit, Non-academic Organizations.
- have titles that begin with "CC* Regional Computing:" followed by the title of the project.

III. AWARD INFORMATION

Approximately \$10 million-\$15 million will be made available in FY 2022 to support 15-23 awards, subject to the availability of funds.

IV. ELIGIBILITY INFORMATION

Who May Submit Proposals:

Proposals may only be submitted by the following:

- Institutions of Higher Education (IHEs) - Two- and four-year IHEs (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Special Instructions for International Branch Campuses of US IHEs: If the proposal includes funding to be provided to an international branch campus of a US institution of higher education (including through use of subawards and consultant arrangements), the proposer must explain the benefit(s) to the project of performance at the international branch campus, and justify why the project activities cannot be performed at the US campus.
- 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.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or co-PI:

There are no restrictions or limits.

Additional Eligibility Info:

Institutions of Higher Education may submit proposals to any of the requested areas.

Non-profit, Non-academic Organizations may submit to program area two Regional Computing only.

Collaborative proposals submitted as simultaneous submission of proposals from different organizations, with each organization requesting a separate award are not allowed. Collaborative proposals submitted as a single proposal, in which a single award is being requested (with subawards administered by the lead organization) are allowed.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Preparation Instructions: Proposers may opt to submit proposals in response to this Program Solicitation via Research.gov or Grants.gov.

- Full Proposals submitted via Research.gov: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal and Award Policies and Procedures Guide* (PAPPG). The complete text of the PAPPG is available electronically on the NSF website at: https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg. Paper copies of the PAPPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov. The Prepare New Proposal setup will prompt you for the program solicitation number.
- Full proposals submitted via Grants.gov: Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted

in accordance with the *NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov*. The complete text of the *NSF Grants.gov Application Guide* is available on the Grants.gov website and on the NSF website at: (https://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

See PAPPG Chapter II.C.2 for guidance on the required sections of a full research proposal submitted to NSF. Please note that the proposal preparation instructions provided in this program solicitation may deviate from the PAPPG instructions.

Proposals are encouraged to review the NSF/CISE Data Management Guidance for CISE Proposals and Awards available at https://www.nsf.gov/cise/cise_dmp.jsp

For program area one Data Storage proposals:

Proposals in this area require titles that begin with "CC* Data Storage:" followed by the title of project.

Refer to Section II. Program Description, for additional information about requirements for CC* proposals. In particular, a Campus CI plan must be included, with a limit of up to 5 pages, as a Supplementary Document.

For program area two Regional Computing proposals:

Proposals in this area require titles that begin with "CC* Regional Computing:" followed by the title of project.

Refer to Section II. Program Description, for additional information about requirements for CC* proposals. In particular, a Campus CI plan must be included, with a limit of up to 5 pages, as a Supplementary Document.

If appropriate, proposals in this area are allowed to have their Campus CI plan represent a multi institutional or regional CI plan, as opposed to a single campus. These plans have an opportunity to convey a future vision of intercampus cyberinfrastructure in support of distributed scientific research and education.

B. Budgetary Information

Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

Budget Preparation Instructions:

Budgets should include travel funds for the project principal investigators and other team members as appropriate from all collaborating institutions to attend annual Principal Investigators' meetings.

C. Due Dates

- **Full Proposal Deadline(s)** (due by 5 p.m. submitter's local time):

June 27, 2022

D. Research.gov/Grants.gov Requirements

For Proposals Submitted Via Research.gov:

To prepare and submit a proposal via Research.gov, see detailed technical instructions available at: https://www.research.gov/research-portal/appmanager/base/desktop?_nfpb=true&_pageLabel=research_node_display&_nodePath=/researchGov/Service/Desktop/ProposalPreparationandSubmission.html. For Research.gov user support, call the Research.gov Help Desk at 1-800-673-6188 or e-mail rgov@nsf.gov. The Research.gov Help Desk answers general technical questions related to the use of the Research.gov system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. Comprehensive information about using Grants.gov is available on the Grants.gov Applicant Resources webpage: <https://www.grants.gov/web/grants/applicants.html>. In addition, the NSF Grants.gov Application Guide (see link in Section V.A) provides instructions regarding the technical preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

Proposers that submitted via Research.gov may use Research.gov to verify the status of their submission to NSF. For proposers that submitted via Grants.gov,

until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements, for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF Program Officer, and usually by three to ten other persons outside NSF either as *ad hoc* reviewers, panelists, or both, who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with oversight of the review process. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal and/or persons they would prefer not review the proposal. These suggestions may serve as one source in the reviewer selection process at the Program Officer's discretion. Submission of such names, however, is optional. Care is taken to ensure that reviewers have no conflicts of interest with the proposal. In addition, Program Officers may obtain comments from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards. A flowchart that depicts the entire NSF proposal and award process (and associated timeline) is included in PAPPG Exhibit III-1.

A comprehensive description of the Foundation's merit review process is available on the NSF website at: https://www.nsf.gov/bfa/dias/policy/merit_review/.

Proposers should also be aware of core strategies that are essential to the fulfillment of NSF's mission, as articulated in https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf22068 *Leading the World in Discovery and Innovation, STEM Talent Development and the Delivery of Benefits from Research - NSF Strategic Plan for Fiscal Years (FY) 2022 - 2026*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

One of the strategic objectives in support of NSF's mission is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions must recruit, train, and prepare a diverse STEM workforce to advance the frontiers of science and participate in the U.S. technology-based economy. NSF's contribution to the national innovation ecosystem is to provide cutting-edge research under the guidance of the Nation's most creative scientists and engineers. NSF also supports development of a strong science, technology, engineering, and mathematics (STEM) workforce by investing in building the knowledge that informs improvements in STEM teaching and learning.

NSF's mission calls for the broadening of opportunities and expanding participation of groups, institutions, and geographic regions that are underrepresented in STEM disciplines, which is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

A. Merit Review Principles and Criteria

The National Science Foundation strives to invest in a robust and diverse portfolio of projects that creates new knowledge and enables breakthroughs in understanding across all areas of science and engineering research and education. To identify which projects to support, NSF relies on a merit review process that incorporates consideration of both the technical aspects of a proposed project and its potential to contribute more broadly to advancing NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF makes every effort to conduct a fair, competitive, transparent merit review process for the selection of projects.

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.
- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These "Broader Impacts" may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.
- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.

These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d(i). contains additional information for use by proposers in development of the Project Description section of the proposal). Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to 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, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to
 - a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 - b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

Broader impacts may be accomplished through the research itself, through the activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. NSF values the advancement of scientific knowledge and activities that contribute to achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and other underrepresented groups in science, technology, engineering, and mathematics (STEM); improved STEM education and educator development at any level; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a diverse, globally competitive STEM workforce; increased partnerships between academia, industry, and others; improved national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education.

Proposers are reminded that reviewers will also be asked to review the Data Management Plan and the Postdoctoral Researcher Mentoring Plan, as appropriate.

Additional Solicitation Specific Review Criteria

All CC* projects will be reviewed with careful attention to the following:

- *The extent to which the work provides a needed capability required by science, engineering and education.*
- *The expected impact on the deployed environment described in the proposal, and potential impact across a broader segment of the NSF community.*
- *A Project Plan addressing clear goals and milestones resulting in a working system in the target environment.*
- *Tangible metrics to measure the success of the system.*
- *Where applicable, how resource access control, federated identity management, and other cybersecurity related issues and community best practices are addressed.*
- **A Cyberinfrastructure (CI) plan:** *To what extent is the planned cyberinfrastructure likely to enhance capacity for discovery, innovation, and education in science and engineering? How well does the plan as presented position the proposing institution(s) for future cyberinfrastructure development? How well does the cyberinfrastructure plan support and integrate with the institutions' science and technology plan? Are IPv6 deployment and InCommon Federation addressed? Are the activities described in the proposal consistent with the institution's cyberinfrastructure plan?*

B. Review and Selection Process

Proposals submitted in response to this program solicitation will be reviewed by Ad hoc Review and/or Panel Review.

Reviewers will be asked to evaluate proposals using two National Science Board approved merit review criteria and, if applicable, additional program specific criteria. A summary rating and accompanying narrative will generally be completed and submitted by each reviewer and/or panel. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

After scientific, technical and programmatic review and consideration of appropriate factors, the NSF Program Officer recommends to the cognizant Division Director whether the proposal should be declined or recommended for award. NSF strives to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. Large or particularly complex proposals or proposals from new awardees may require additional review and processing time. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director acts upon the Program Officer's recommendation.

After programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications. After an administrative review has occurred, Grants and Agreements Officers perform the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

Once an award or declination decision has been made, Principal Investigators are provided feedback about their proposals. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers or any reviewer-identifying information, are sent to the Principal Investigator/Project Director by the Program Officer. In addition, the proposer will receive an explanation of the decision to award or decline funding.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See Section VI.B. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award notice, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award notice; (4) the applicable award conditions, such as Grant General Conditions (GC-1)*; or Research Terms and Conditions* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award notice. Cooperative agreements also are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC) and the applicable Programmatic Terms and Conditions. NSF awards are electronically signed by an NSF Grants and Agreements Officer and transmitted electronically to the organization via e-mail.

*These documents may be accessed electronically on NSF's Website at https://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-8134 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer no later than 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). No later than 120 days following expiration of a grant, the PI also is required to submit a final project report, and a project outcomes report for the general public.

Failure to provide the required annual or final project reports, or the project outcomes report, will delay NSF review and processing of any future funding increments as well as any pending proposals for all identified PIs and co-PIs on a given award. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project-reporting system, available through Research.gov, for preparation and submission of annual and final project reports. Such reports provide information on accomplishments, project participants (individual and organizational), publications, and other specific products and impacts of the project. Submission of the report via Research.gov constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report also must be prepared and submitted using Research.gov. This report serves as a brief summary, prepared specifically for the public, of the nature and outcomes of the project. This report will be posted on the NSF website exactly as it is submitted by the PI.

More comprehensive information on NSF Reporting Requirements and other important information on the administration of NSF awards is contained in the NSF *Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter VII, available electronically on the NSF Website at https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg.

VIII. AGENCY CONTACTS

Please note that the program contact information is current at the time of publishing. See program website for any updates to the points of contact.

General inquiries regarding this program should be made to:

- Kevin L. Thompson, telephone: (703) 292-4220, email: kthompso@nsf.gov

For questions related to the use of FastLane or Research.gov, contact:

- FastLane and Research.gov Help Desk: 1-800-673-6188
- FastLane Help Desk e-mail: fastlane@nsf.gov
- Research.gov Help Desk e-mail: rgov@nsf.gov

For questions relating to Grants.gov contact:

- Grants.gov Contact Center: If the Authorized Organizational Representatives (AOR) has not received a confirmation message from Grants.gov within 48 hours of submission of application, please contact via telephone: 1-800-518-4726; e-mail: support@grants.gov.

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF [Grants Conferences](#). Subscribers are informed through e-mail or the user's Web browser each time new publications are

issued that match their identified interests. "NSF Update" also is available on [NSF's website](#).

Grants.gov provides an additional electronic capability to search for Federal government-wide grant opportunities. NSF funding opportunities may be accessed via this mechanism. Further information on Grants.gov may be obtained at <https://www.grants.gov>.

Related Programs:

NSF Advisory Committee for Cyberinfrastructure Task Force on Campus Bridging, *Final Report*, March 2011. Available from: https://www.nsf.gov/cise/oac/taskforces/TaskForceReport_CampusBridging.pdf

Reference material on the "Science DMZ" concept is available at: <http://fasterdata.es.net/fasterdata/science-dmz/>

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency created by the National Science Foundation Act of 1950, as amended (42 USC 1861-75). The Act states the purpose of the NSF is "to promote the progress of science; [and] to advance the national health, prosperity, and welfare by supporting research and education in all fields of science and engineering."

NSF funds research and education in most fields of science and engineering. It does this through grants and cooperative agreements to more than 2,000 colleges, universities, K-12 school systems, businesses, informal science organizations and other research organizations throughout the US. The Foundation accounts for about one-fourth of Federal support to academic institutions for basic research.

NSF receives approximately 55,000 proposals each year for research, education and training projects, of which approximately 11,000 are funded. In addition, the Foundation receives several thousand applications for graduate and postdoctoral fellowships. The agency operates no laboratories itself but does support National Research Centers, user facilities, certain oceanographic vessels and Arctic and Antarctic research stations. The Foundation also supports cooperative research between universities and industry, US participation in international scientific and engineering efforts, and educational activities at every academic level.

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See the *NSF Proposal & Award Policies & Procedures Guide* Chapter II.E.6 for instructions regarding preparation of these types of proposals.

The National Science Foundation has Telephonic Device for the Deaf (TDD) and Federal Information Relay Service (FIRS) capabilities that enable individuals with hearing impairments to communicate with the Foundation about NSF programs, employment or general information. TDD may be accessed at (703) 292-5090 and (800) 281-8749, FIRS at (800) 877-8339.

The National Science Foundation Information Center may be reached at (703) 292-5111.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <https://www.nsf.gov>

- **Location:** 2415 Eisenhower Avenue, Alexandria, VA 22314

- **For General Information** (NSF Information Center): (703) 292-5111

- **TDD (for the hearing-impaired):** (703) 292-5090

- **To Order Publications or Forms:**
 - Send an e-mail to: nsfpubs@nsf.gov
 - or telephone: (703) 292-8143

- **To Locate NSF Employees:** (703) 292-5111


PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a

party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See [System of Record Notices](#), NSF-50, "Principal Investigator/Proposal File and Associated Records," and NSF-51, "Reviewer/Proposal File and Associated Records." Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

Suzanne H. Plimpton
Reports Clearance Officer
Policy Office, Division of Institution and Award Support
Office of Budget, Finance, and Award Management
National Science Foundation
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	National Science Foundation, 2415 Eisenhower Avenue, Alexandria, Virginia 22314, USA Tel: (703) 292-5111, FIRS: (800) 877-8339 TDD: (703) 292-5090 or (800) 281-8749					Text Only