

# Computer and Network Systems (CNS): Core Programs, Large

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## PROGRAM SOLICITATION NSF 22-511



National Science Foundation

Directorate for Computer and Information Science and Engineering  
Division of Computer and Network Systems

**Submission Window Date(s)** (due by 5 p.m. submitter's local time):

January 04, 2022 - January 18, 2022

### IMPORTANT INFORMATION AND REVISION NOTES

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The CNS Core Programs, Large category was previously folded in to the CISE Core Programs solicitation [NSF 19-589](#). Because CNS was the only division data-contras within CISE accepting proposals in this category, this proposal category has been issued as its own solicitation with CNS-specific requirements.

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

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#### General Information

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**Program Title:**

Computer and Network Systems (CNS): Core Programs, Large

**Synopsis of Program:**

CISE's Division of Computer and Network Systems (CNS) supports research and education projects that take a system-oriented approach to the development of novel computing and networking technologies, or to the enhancement of existing systems in any of several dimensions, or that explore new ways to make use of existing technologies. This solicitation invites proposals tackling ambitious problems in computing and networking that are well suited to an integrated systems-oriented approach. Teams should consist of two or more investigators (PI, co-PI(s), or other Senior Personnel) with complementary skillsets, and a team of students and/or postdoctoral researchers.

Proposals can have total budgets from \$1,200,001 - \$3,000,000 with durations up to five years.

**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.*

- Erik Brunvand, Point of Contact, CNS Core, telephone: (703) 292-8950, email: [cns-core@nsf.gov](mailto:cns-core@nsf.gov)
- Ann C. Von Lehmen, Point of Contact, CNS Core, telephone: (703) 292-4756, email: [cns-core@nsf.gov](mailto:cns-core@nsf.gov)

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

- 47.070 --- Computer and Information Science and Engineering

#### Award Information

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**Anticipated Type of Award:** Continuing Grant

**Estimated Number of Awards:** 1 to 4

**Anticipated Funding Amount:** \$3,000,000 to \$12,000,000

Dependent upon the quality of proposals received, and the availability of funds.

## Eligibility Information

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### 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:

By the submission deadline, any PI, co-PI, or other senior project personnel must hold either:

- a tenured or tenure-track position,
- a primary, full-time, paid appointment in a research or teaching position

at a US-based campus of an organization eligible to submit to this solicitation (see above), with exceptions granted for family or medical leave, as determined by the submitting organization. Individuals with appointments at for-profit non-academic organizations or at overseas branch campuses of US IHEs are not eligible.

### Limit on Number of Proposals per Organization:

There are no restrictions or limits.

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

An individual may not participate as PI, co-PI, or Senior Personnel in more than two proposals submitted in response to this solicitation. Note that limits on participation apply only to this solicitation, and do not carry over from other solicitations that have limits.

**These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently** Any proposal that exceeds this limit at the time of submission for any PI, co-PI, or Senior Personnel will be returned without review. **No exceptions will be made.**

## Proposal Preparation and Submission Instructions

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### A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
  - Full Proposals submitted via FastLane: *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](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](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

- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

January 04, 2022 - January 18, 2022

## Proposal Review Information Criteria

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**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**

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**Award Conditions:**

Additional award conditions apply. Please see the full text of this solicitation for further information.

**Reporting Requirements:**

Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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**I. INTRODUCTION**

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The Division of Computer and Network Systems (CNS) supports research and education activities that lead to novel or enhanced computing and networking technologies, or that explore new ways to make use of existing technologies. CNS seeks to develop a better understanding of the fundamental properties and tradeoffs involved in computer and network systems as well as the abstractions and tools used in designing, building, measuring, and using them. This solicitation seeks proposals tackling ambitious problems in computing and networking that are well suited to an integrated systems-oriented approach.

**II. PROGRAM DESCRIPTION**

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The CNS Core (CNS Core) program [[Program Webpage](#)] supports research that advances computer and network systems, develops a better understanding of the fundamental properties and tradeoffs involved, as well as the abstractions and tools used in designing, building, measuring, and using them.

Current and future systems need to satisfy various requirements, both generic and purpose-driven. General *system* requirements include security, reliability, manageability, usability, and sustainability, as well as cost-effectiveness and fitness for purpose. Depending on the context, other requirements may include performance, privacy-preservation, scalability, responsiveness, and survivability.

This solicitation solicits innovative research that considers technology trends and emerging challenges, while emphasizing a *systems* focus and awareness of the types of requirements mentioned above. This solicitation recognizes the interdependency and blurring of boundaries among computing, storage, and networking (sub)systems and the research associated with them. As such, specific sub-programs are not called out. It is *not* the intent to limit the scope of the program, compared to previous solicitations. Rather, the intent is to encourage cross-fertilization among areas of CNS research. Project descriptions must be comprehensive and well-integrated, and should make a convincing case that the collaborative contributions of the project team will be greater than the sum of each of their individual contributions. Rationale must be provided to explain why a budget of this size is required to carry out the proposed work.

Research of interest for this solicitation will:

- Explore fundamental principles and create innovative technologies, protocols, and systems that define the future or—harness current and emerging technologies, trends, and applications;
- Produce practical abstractions, techniques, tools, artifacts, or datasets that address/enhance both general and functional requirements such as those

outlined above;

- Reflect a clear understanding of what each component does and how it interfaces with the rest of the system and the environment;
- Disseminate artifacts in such a way that others can repeat, reproduce, validate, or otherwise verify the results.

A hallmark of systems research is the investigation and understanding of design tradeoffs that must be navigated when designing and implementing systems against the requirements above. Proposals that expose underlying principles or tradeoffs having predictive value that extends across different domains are especially encouraged. Proposers should identify and describe the systems considered, the objectives or capabilities envisioned, and their expected contribution in the context of the overall system requirements. Three especially important exemplar requirements are:

- **Secure by design:** How can one ensure integrity and confidentiality of networked systems and data? How can one enhance abstractions, delineate permissible actions, enforce compliance, and establish security defaults in design processes that anticipate vulnerabilities and provide defense against unforeseen attacks from adversaries?
- **Robustness:** How can systems—existing and future—be made more adaptable and resilient to natural and anthropogenic hazards (e.g., weather events, malware, and sabotage), as well as other normal or expected events, such as component failures, misconfigurations, and overloads? What innovative approaches would enable one to ensure system robustness and to identify, communicate, and mitigate system anomalies in real-time for outages at both small and large scale?
- **Manageability:** What new architectures and protocols, measurement and monitoring capabilities are needed to support a growing set of diverse applications? How can these measurements and monitoring capabilities aid in overall system management? What are novel approaches to enable comprehensive, pervasive, accurate, and usable measurement capabilities, near real-time system analytics, and systems management when the systems are massive and at the scale of the Internet? What innovations are needed to enable truly autonomous systems, which are self-managing by definition?

In general, any topic having to do with augmenting, understanding, enhancing, or transforming computing and communication systems undertaken from a systems point of view is within scope.

Issues that reside primarily at the device or application level and that are highly context-specific **will not be considered a good fit** for this program. Projects at the scale supported by this solicitation that focus exclusively or primarily on cybersecurity threats and countermeasures may be a better fit for the [Secure and Trustworthy Cyberspace \(SaTC\) Frontiers](#) program. Projects focused primarily on design or enhancement of sensing and control systems that interact with the physical world may be a better fit with the [Cyber-Physical Systems \(CPS\) Frontiers](#) program.

**Results Dissemination Plan:** Proposals submitted to this solicitation must describe plans to ensure that the research results produced will be made available to the extent necessary to validate the findings independently, as described in the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) Chapter XI.D.4.

**Project Validation Plan:** Proposers are required to include a project validation plan in the Project Description that describe the underlying setup, processes, mechanisms, and metrics to assess success of the proposed research. Proposers may validate hypotheses using simulations, emulations, testbeds, or a combination of these. Proposers are encouraged to use, when appropriate, the wide array of available community infrastructure testbeds and cloud computing resources as part of their validation plan (see below for details). The proposal must make clear the intended level of abstraction at which the underlying research will be validated.

## ACCESS TO EXPERIMENTAL RESEARCH INFRASTRUCTURE

PIs are encouraged to consider utilizing NSF-supported research infrastructure (such as the [Platforms for Advanced Wireless Research](#), [FABRIC](#), [Chameleon](#), [CloudLab](#), and [CISE Community Research Infrastructure projects](#)) when formulating their research plans and submitting proposals. Descriptions of the capabilities of each system and their availability can be found at their websites: <https://advancedwireless.org/>, <https://fabric-testbed.net/>, <https://www.chameleoncloud.org/>, <https://cloudlab.us/>, and <https://www.ccrivo.org/projects/>.

## CloudBank OPTION FOR CLOUD COMPUTING RESOURCES

Proposals may request cloud computing resources to use public clouds such as Amazon Web Services (AWS), Google Cloud Platform (GCP), IBM Cloud, and Microsoft Azure. Cloud computing resources described in proposals may be obtained through an external cloud access entity ([CloudBank](#)) supported by NSF's [Enabling Access to Cloud Computing Resources for CISE Research and Education \(Cloud Access\) program](#).

The PIs using CloudBank for cloud credits do not incur any indirect cost. Furthermore, the CloudBank portal allows the PI to track cloud credit usage in real-time.

Proposers should describe the request in a Supplementary Document no longer than two pages with (a) anticipated annual and total costs for accessing the desired cloud computing resources, based on pricing currently available from the public cloud computing providers; and (b) a technical description of, and justification for, the requested cloud computing resources. The NSF Budget should not include any such costs for accessing public cloud computing resources via CloudBank.org. The total cost of the project, including this cloud computing resource request from CloudBank.org, may not exceed the budget limit described in this solicitation.

Funds allocated to CloudBank services cannot be reallocated for other purposes nor can non-CloudBank funds be reallocated for additional CloudBank services. Therefore, proposers should consider their needs over the lifespan of the proposal. Proposers may contact CloudBank (see <https://www.cloudbank.org/faq>) for consultation on estimating the costs for using cloud computing resources.

If incorporating this request into the proposal, a proposer should include "CloudAccess" (one word without space) as a keyword on the Project Summary page, at the end of the Overview section (before the section on Intellectual Merit).

See Section V.A. Proposal Preparation Instructions, Supplementary Documents, for more information on how to describe the cloud computing resource request as well as the associated budget.

**Data Management Plan:** The data management plan must also describe steps to ensure that relevant software and hardware artifacts, data and the results are available (for a reasonable time) beyond the end of the project lifecycle. For details, see the Directorate for Computer & Information Science & Engineering (CISE) Data Management Plan at [https://www.nsf.gov/cise/cise\\_dmp.jsp](https://www.nsf.gov/cise/cise_dmp.jsp).

## REPRODUCIBILITY AND SHARING

In the interest of completeness and transparency, PIs must describe, as part of their Data Management Plans, how they will provide access to well-documented datasets, modeling and/or simulation tools, and codebases to support reproducibility/replicability of their methods and results for a reasonable time beyond the

end of the project lifecycle. See the NSF PAPPG Chapter XI.D.4 as well as the Dear Colleague Letter "Encouraging Reproducibility in Computing and Communications Research" available at [https://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf17022](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf17022).

**Collaboration Plan:** Projects submitted under this solicitation are well suited to two or more investigators (PI, co-PI and/or other Senior Personnel) and several students and/or postdoctoral researchers. Since the success of collaborative research efforts is known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, **a Collaboration Plan is required**, even when the investigators are affiliated with the same institution. Up to two pages are allowed for Collaboration Plans and they must be submitted as a document under Supplementary Documents. The length and level of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project, and should include any proposed collaboration with industry and international partners, and any other unpaid collaborators on the project. Collaboration Plans and proposed budgets should demonstrate that key personnel, and especially lead PIs, have allocated adequate time for both their individual technical contributions and the leadership of collaborative activities necessary to realize the synergistic effects of larger-scale research. **If a project does not include a Collaboration Plan, that proposal will be returned without review.** Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

## BROADENING PARTICIPATION IN COMPUTING

CISE has long been committed to Broadening Participation in Computing (BPC). The underrepresentation of many groups—including women, Blacks and African Americans, Hispanics and Latinos, American Indians, Alaska Natives, Native Hawaiians and Other Pacific Islanders, and persons with disabilities—in computing deprives large segments of the population of the opportunity to be creators of technology and not only consumers. Ending underrepresentation will require a range of measures, including institutional programs and activities as well as culture change across colleges, departments, classes, and research groups. With this solicitation, CISE is continuing the BPC pilot effort started in 2018 encouraging the research community to engage in meaningful BPC activities. This pilot builds on many of the programs, research, and resources created through CISE's past and ongoing investments in BPC, and it aligns with the recommendations of the Strategic Plan for Broadening Participation produced by the CISE Advisory Committee in 2012."

Each project must include a BPC plan at the time of submission, which will be separately reviewed and must be approved by time of award. Proposers are encouraged to use the resources available at the NSF-funded BPCnet Resource Portal (<https://bpcnet.org>). BPCnet provides BPC project and departmental plan templates, suggested activities, and opportunities for consultant services. BPC plans must be included as a supplementary document that is up to 3-pages long and include roles for all PIs and co-PIs. PIs from institutions with departmental BPC plans verified by BPCnet.org should refer to the Proposal Preparation Instructions for further guidance.

A meaningful BPC plan can answer positively to the following five elements:

1. Context: Does the plan describe a goal using institutional or local data?
2. Intended population(s): Does the plan identify the characteristics of participants from an underrepresented group listed above, including school level (e.g., African-American undergraduates or female high-school students)?
3. Strategy: Does the plan describe activities that address the goal(s) and intended population(s)? Is there a clear role for each PI and co-PI?
4. Preparation: Does the plan describe how the PI is prepared (or will prepare or collaborate) to do the proposed work?
5. Measurement: Is there a plan to measure the outcome(s) of the activities?

All PIs and co-PIs are expected to participate in BPC activities in a manner aligned with their personal contexts, interests, and skills. More information regarding BPC, including metrics for BPC activities and examples, can be found at <https://www.nsf.gov/cise/bpc>.

## III. AWARD INFORMATION

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Up to \$12 million to support up to 4 awards, pending the quality of proposals received and the availability of funds.

Estimated program budget, number of awards and average award size/duration are subject to the availability of funds.

## IV. ELIGIBILITY INFORMATION

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### 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:

By the submission deadline, any PI, co-PI, or other senior project personnel must hold either:

- a tenured or tenure-track position, or
- a primary, full-time, paid appointment in a research or teaching position

at a US-based campus of an organization eligible to submit to this solicitation (see above), with exceptions granted for family or medical leave, as determined by the submitting organization. Individuals with primary appointments at for-profit non-academic organizations or at overseas

branch campuses of US IHEs are not eligible.

**Limit on Number of Proposals per Organization:**

There are no restrictions or limits.

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

apply only to this solicitation, and do not carry over from other solicitations that have limits.

**These eligibility constraints will be strictly enforced treat everyone fairly and consistently.** Any proposal that exceeds this limit at the time of submission for any PI, co-PI, or Senior Personnel will be returned without review. **>No exceptions will be made.**

**Additional Eligibility Info:**

For IHEs and non-profit, non-academic organizations with international branch campuses, this solicitation restricts eligibility to research activities using the facilities, equipment, and other resources of the campuses located in the US only.

Further, subawards are not permitted to international branch campuses of US-based proposing organizations eligible to submit to this solicitation.

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## V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

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### A. Proposal Preparation Instructions

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the general guidelines contained in the *NSF Proposal & Award Policies & 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](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](mailto:nsfpubs@nsf.gov). Proposers are reminded to identify this program solicitation number in the program solicitation block on the NSF Cover Sheet For Proposal to the National Science Foundation. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.
- 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](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](mailto:nsfpubs@nsf.gov).

In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

Collaborative Proposals. All collaborative proposals submitted as separate submissions from multiple organizations must be submitted via FastLane. PAPPG Chapter II.D.3 provides additional information on collaborative proposals.

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.

PIs and co-PIs are encouraged to report demographic information on the "My Profile" page within Research.gov, available at <https://www.research.gov/accountmgmt/#/user/profile>.

**Proposal Titles:**

Proposal titles should begin with "CNS Core", followed by a colon, followed by "Large", then the title of your project: as in **CNS Core: Large: Title**.

If you submit a proposal as part of a set of collaborative proposals, the title of the proposal should start with the words "Collaborative Research", followed by a colon, then "CNS Core", followed by a colon, then "Large", followed by a colon, and then the title of your project. For example, if you are submitting a collaborative set of proposals then the title of each would be **Collaborative Research: CNS Core: Large: Title**.

**Project Summary:**

The Project Summary consists of an overview, a statement on the intellectual merit of the proposed activity, a statement on the broader impacts of the proposed activity, and a set of keywords.

All proposals must include 3-6 keywords that describe the general area(s) of the investigation, to assist in identifying reviewers with appropriate knowledge and expertise to review the proposal. *The list of keywords should be the last paragraph of the Overview section of the Project Summary.*

The keywords should describe the main scientific/engineering areas explored in the proposal. Keywords should be prefaced with "Keywords" followed by a colon and each keyword set should be separated by semicolons. Keywords should be of the type used to describe research in a journal submission and may include technical areas of expertise necessary to review the proposal. PIs submitting to this program are encouraged to identify the area of their primary proposed research contributions by including one or both of the following in their set of keywords: **Computing Systems** and/or **Networking Systems**.



For example, they might appear as, **Keywords: energy-aware computing; distributed systems; memory systems, network programmability; NextG network; Computing Systems.**

If cloud computing resources are being requested from CloudBank, then the keyword "CloudAccess" (one word without space) should be included at the end of the Overview section (before the section on Intellectual Merit) on the Project Summary page.

#### **Project Description:**

**Length of Project Description** - Describe the research and education activities to be undertaken in **up to 20 pages**. **Proposals that exceed this limit will be returned without review.**

#### **Budget:**

The total budget of the project, including any cloud computing resource request from CloudBank, may not exceed the budget limits described in this solicitation. The total cost of the cloud computing resources requested from Cloudbank should not be included in the NSF budget, and should be specified only in the associated supplementary document (see below for additional instructions).

*Example: Consider a proposal to category XYZ, which limits the total proposal budget to \$500,000. If a PI wishes to request \$20,000 in cloud computing resources through CloudBank, then his/her proposal should request, as part of the proposal budget, no more than \$480,000. The remaining \$20,000 for cloud computing resources should be specified in the Supplementary Document. If a proposal is a collaborative project with two PIs from two different organizations, then each PI may request cloud computing resources separately through independent Supplementary Documents as long as the total budget (on the budget pages plus in the Supplementary Documents) does not exceed \$500,000.*

#### **Supplementary Documents:**

In the Supplementary Documents section, upload the following information where relevant:

**1. A list of Project Personnel and Partner Organizations (required)** (Note: In collaborative proposals, the lead organization should provide this information for all participants):

Provide current, accurate information for all personnel and organizations involved in the project. NSF staff will use this information in the merit review process to manage reviewer selection. The list **must** include all PIs, co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members. This list should be numbered and include (in this order) Full name, Organization(s), and Role in the project, with each item separated by a semi-colon. Each person listed should start a new numbered line. For example:

- Mary Smith; XYZ University; PI
- John Jones; University of PQR; Senior Personnel
- Jane Brown; XYZ University; Postdoctoral Researcher
- Bob Adams; ABC Community College; Paid Consultant
- Susan White; DEF Corporation; Unpaid Collaborator
- Tim Green; ZZZ University; Subawardee

**2. Data Management Plan (required):**

Proposals must include a Supplementary Document of no more than two pages labeled "Data Management Plan." This Supplementary Document should describe how the proposal will conform to NSF policy on the dissemination and sharing of research results.

See NSF PAPPG Chapter II.C.2.j for full policy implementation.

For additional information on the Dissemination and Sharing of Research Results, see: <https://www.nsf.gov/bfa/dias/policy/dmp.jsp>.

For specific guidance for Data Management Plans submitted to the Directorate for Computer and Information Science and Engineering (CISE) see: [https://www.nsf.gov/cise/cise\\_dmp.jsp](https://www.nsf.gov/cise/cise_dmp.jsp).

See also the guidance on Reproducibility and Sharing in the Program Description section above.

**3. Cloud Computing Resources (if applicable):**

If requesting cloud computing resources through CloudBank.org include a description of your requests (not to exceed 2 pages) that includes: (1) the words "Cloud Computing Resources" (and the name of the institution in the case of a collaborative proposal), followed by the title of the proposal and the PI name/institution; (2) the total cost of computing resources, with yearly breakdown; (3) which public cloud providers will be used; and (4) a technical description and justification of the request, along with how the cost was estimated. For collaborative proposals, the CloudAccess keyword must be included in the project summary, and at least one proposal within the collaborative should include the supplementary document. In cases where more than one institution is requesting CloudBank services, each institution should include their own supplementary document.

**4. Collaboration Plans:**

Note: In collaborative proposals, the lead organization should provide this information for all participants.

Since the success of collaborative research efforts called for in this solicitation are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, **all projects must include a Collaboration Plan of up to two pages** even when the investigators are affiliated with the same institution. The length of and degree of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project and should include any proposed collaboration with industry and international partners, and any other unpaid collaborators on the project. Where appropriate, the Collaboration Plan might include: 1) the specific roles of the project participants in all organizations involved, including collaborative industry partners; 2) information on how the project will be managed across all the investigators, organizations, and/or disciplines; 3) identification of the specific coordination mechanisms that will enable cross-investigator, cross-organization, and/or cross-discipline scientific integration (e.g., yearly conferences, graduate student exchange, project meetings at conferences, use of the grid for videoconferences, software repositories, etc.); and 4) specific references to the budget line items that support collaboration and coordination mechanisms. **If a proposal does not include a Collaboration Plan of up to two pages, that proposal will be returned without review.**

### 5. Broadening Participation in Computing (BPC) Plans:

Each project must include a BPC plan as a supplementary document at the time of submission. Such a plan should begin with the heading "Broadening Participation in Computing (BPC) Plan" and address the elements as described in the program description. Each proposal must include either:

- A project BPC plan (1 – 3 pages) describing their planned BPC activities; or
- For those projects where all participating institutions have Departmental BPC Plans verified by BPCnet: a 1-page project plan and an associated verified departmental plan (per institution). The 1-page project plan must describe the specific roles of the PI and co-PIs, their preparation and what aspects of the Departmental plan their strategies focus on.

### 6. Other supplementary documents:

Documentation of collaborative arrangements of significance to the proposal through Letters of Collaboration (if applicable): A letter of collaboration from any entity not receiving funds from the project budget should be provided at the time of submission of the proposal. Such letters should explicitly state the nature of the collaboration as documented in the Collaboration Plan, appear on the organization's letterhead and be signed by the appropriate organizational representative. These letters must not otherwise deviate from the restrictions and requirements set forth in the NSF PAPPG Chapter II.C.2.jj.

**Please note that letters of support may not be submitted.** Such letters do not document collaborative arrangements of significance to the project, but primarily convey a sense of enthusiasm for the project and/or highlight the qualifications of the PI or co-PI. **Reviewers will be instructed not to consider these letters of support in reviewing the merits of the proposal.**

### Single Copy Documents:

#### *Collaborators and Other Affiliations Information (required):*

Proposers should follow the guidance specified in Chapter II.C.1.e of the NSF PAPPG.

#### *Suggested reviewers (optional):*

To increase the diversity of the reviewer pool, CISE actively encourages each proposer to include a list of suggested reviewers (including email addresses and organizational affiliations) whom they believe are especially well qualified to review the proposal and are not conflicted with project personnel. Suggestions for reviewers from groups underrepresented in computing are especially encouraged. Proposers should follow the guidance in the PAPPG Chapter II.C.1.b.

### Submission Checklist:

In an effort to assist proposal preparation, the following checklist is provided as a reminder of the items that should be checked before submitting a proposal to this solicitation. This is a summary of the requirements described above. For the items marked with (RWR), the proposal will be returned without review if the required item is noncompliant at the time of proposal submission.

- The last line of the Overview section of the Project Summary must consist of the word "Keywords" followed by a colon and between 3-6 keyword sets, separated by semi-colons (including one or both of Computing Systems and Networking Systems).
- The proposal title should comply with the requirements under Proposal Preparation Instructions above.
- (RWR) The total budget **must not** exceed \$3,000,000, including any potential cloud credits, and excluding funds for any embedded REU supplements. For separately-submitted collaborative proposals, this is the total across all participating organizations.
- (RWR) The Project Description is limited to no more than 20 pages.
- (RWR) The Project Description must include a project validation plan.
- (RWR) A Collaboration Plan (up to two pages) must be provided as a Supplementary Document. The Collaboration Plan should include all organizations participating, not a separate plan for each organization.
- Letters of collaboration should be included as supplementary documents from any project partner not receiving funds from the project budget.
- If requesting public cloud resources through CloudBank, a supplementary document of up to two pages must be provided, and the 'CloudAccess' keyword should be specified in the Project Summary.
- (RWR) A BPC plan is required as a Supplementary Document with a title clearly identifying it as such. Collaborative proposals should submit one BPC plan, as described in the proposal preparation instructions.

**Proposals that do not comply with the requirements marked as RWR will be returned without review.**

## B. Budgetary Information

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### Cost Sharing:

Inclusion of voluntary committed cost sharing is prohibited.

## C. Due Dates

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- **Submission Window Date(s)** (due by 5 p.m. submitter's local time):

January 04, 2022 - January 18, 2022

## D. FastLane/Grants.gov Requirements

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### For Proposals Submitted Via FastLane:

To prepare and submit a proposal via FastLane, see detailed technical instructions available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the NSF Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The NSF Help Desk answers general technical questions related to the use of the FastLane and Research.gov systems. 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](mailto: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 FastLane 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

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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/](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 *Building the Future: Investing in Discovery and Innovation - NSF Strategic Plan for Fiscal Years (FY) 2018 – 2022*. 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

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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

For proposals submitted to this solicitation, reviewers will be asked to:

- Comment on the extent to which the project scope justifies the level of investment requested, and the degree to which the Collaboration Plan adequately demonstrates that the participating investigators will work synergistically to accomplish the project objectives.
- Comment on whether key personnel, and especially lead PIs, have allocated adequate time for both their individual technical contributions and the leadership of collaborative activities necessary to realize the synergistic effects of larger-scale research.
- Comment on whether the Broadening Participation in Computing (BPC) plan meaningfully addresses the five elements of a BPC Plan: (1) the context of the proposed activity, (2) intended population(s), (3) strategy, (4) preparation, and (5) measurement.
- Consider to what extent does the proposal align with the topics, aspects, and methods laid out in the [Program Webpage](#)?
- Comment on how well does the proposed work address one or more of the following?
  - Secure-by-design systems;
  - Systems robustness;
  - Manageability of the system under consideration; and/or
  - Fundamental understanding of the system or system component.
- Comment on how well does the proposal describe a project validation plan that assesses and, where appropriate, quantifies the research outcomes?
- Consider how well does the proposal describe research dissemination plans to ensure that the research results can be validated independently?

## B. Review and Selection Process

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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.

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## VII. AWARD ADMINISTRATION INFORMATION

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### A. Notification of the Award

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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

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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](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](mailto: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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

#### Special Award Conditions:

Awardees will be required to attend any PI meetings and will be required to participate in a common evaluation.

CISE plans to conduct an evaluation of BPC activities. This evaluation may be conducted by a third-party, working in coordination with and on behalf of NSF. Awardees must participate in this evaluation and provide information about project outcomes to support it.

### C. Reporting Requirements

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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](https://www.nsf.gov/publications/pub_summ.jsp?ods_key=pappg).

Awardees must report BPC activities and outcomes in the Special Reporting Requirements section of annual reports submitted to NSF.

## VIII. AGENCY CONTACTS

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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:

- Erik Brunvand, Point of Contact, CNS Core, telephone: (703) 292-8950, email: [cns-core@nsf.gov](mailto:cns-core@nsf.gov)
- Ann C. Von Lehmen, Point of Contact, CNS Core, telephone: (703) 292-4756, email: [cns-core@nsf.gov](mailto:cns-core@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](mailto:fastlane@nsf.gov).  
Research.gov Help Desk e-mail: [rgov@nsf.gov](mailto: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](mailto:support@grants.gov).

## IX. OTHER INFORMATION

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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>.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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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](mailto: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  
Alexandria, VA 22314

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