

NSF CAMPUS CYBERINFRASTRUCTURE (CC*) PROGRAM OVERVIEW AND TEMPLATES FOR THE PROJECT SUMMARY AND PROJECT DESCRIPTION

Prepared for Xavier University of Louisiana

INTRODUCTION

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Founded in 2003, Hanover has over 300 employees, including a high-caliber staff of researchers, survey experts, analysts, statisticians, and grant professionals. Hanover provides grant development and strategic advising support to education and healthcare organizations. Our grants professionals deliver customized proposal review, revision, and production support, while also helping to align their needs and strategic priorities to funding trends and federal, state, and foundation grant opportunities.

Xavier University of Louisiana (XULA) has sought Hanover's assistance in providing proposal development and review tasks to support its pending application to the National Science Foundation's (NSF) Computer & Information Science & Engineering (CISE) directorate's Campus Cyberinfrastructure (CC*) program ([NSF 18-508](#)).

The following memo provides a brief overview of the CC* funding mechanism as well as the Network Design and Implementation for Small Institutions program area within the larger CC* mechanism. It also includes templates for the Project Summary and Project Description components of the application as well as a link to sample five-page Campus Cyberinfrastructure (CI) plan, which is required as a component of the proposal.

Securing funding from the NSF is highly competitive, and successful grant seeking requires the development and submission of substantially rigorous and merited proposals. NSF proposals must contain sufficiently technical descriptions of innovative and important science, be responsive to the funding mechanism, and provide compelling responses to the two NSF-wide merit review criteria namely: (a) *intellectual merit* (i.e., impact on field) and (b) *broader impacts* (i.e., societal impact that results from both the research and implementation). The proposals must also be responsive to the priorities of the funding directorate or division as well as compliant with both the [NSF Proposal & Award Policies & Procedures Guide](#) (PAPPG) and the specific requirements of the funding opportunity announcement ([NSF 18-508](#)).

This memo is organized into two main sections:

1. Brief overview of NSF CC* mechanism and the Design and Implementation for Small Institutions program area, and
2. Templates for the one-page Project Summary and 15-page Project Description.

1. OVERVIEW OF CC* MECHANISM AND NETWORK DESIGN AND IMPLEMENTATION FOR SMALL INSTITUTIONS PROGRAM AREA

CAMPUS CYBERINFRASTRUCTURE (CC) PROGRAM*

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.

The Campus Cyberinfrastructure (CC*) program invests in innovative, coordinated, and secure campus, multi-campus and multi-institution cyberinfrastructure (CI) components. The 2017 CC* solicitation refocuses on networking capacity, capability and innovation, while continuing to address the challenges of applying CI expertise to enabling science. These investments are intended to exhibit demonstrable higher levels of performance, reliability and predictability for science applications and distributed research projects. Learning and workforce development (LWD) in CI is explicitly addressed in the program. Science-driven requirements are the primary motivation for any proposed activity.

CC* awards will be supported in four areas:

1. Data Driven Networking Infrastructure for the Campus and Researcher awards will be supported at up to \$500,000 total for up to two years;
2. Network Design and Implementation for Small Institutions awards will be supported at up to \$750,000 total for up to two years;
3. Network Integration and Applied Innovation awards will be supported at up to \$1,000,000 total for up to two years; and
4. Network Performance Engineering and Outreach awards will be supported at up to \$3,500,000 total for up to four years.

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 investment and innovation in data networking infrastructure, innovation and engineering.

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 networking capabilities and approaches in support of scientific discovery. Proposals across the program 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 network and data infrastructure upgrades.

All proposals to the CC* program must include a Campus Cyberinfrastructure (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 intracampus 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 five 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 plan should include the campus status and plans with respect to federated identity and specifically InCommon, including: if the campus is registered with InCommon as supporting the Research and Scholarship (R&S) Entity Category to streamline integration with research applications (see [link](#)); and if the campus meets the InCommon Baseline Expectations for Trust in Federation (see [link](#)). The plan should also describe campus IPv6 deployment.

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.

NETWORK DESIGN AND IMPLEMENTATION FOR SMALL INSTITUTIONS PROGRAM

Program Area Overview: This area supports smaller institutions with fundamental challenges to address in networking infrastructure and resources. Guidance for proposals is similar to the Data Driven Networking Infrastructure for the Campus and Researcher area but with fewer required components as described below.

This area now allows for proposals capturing the needs of multiple under-resourced institutions. Proposals to this area, as in previous years, are welcome to focus on a single institution for campus networking improvements. However, ***proposals are encouraged to consider an expanded impact across more than a single institution, and preference will be given to proposals whose broader impacts encompass multiple institutions.*** The maximum allowed award size for this area is commensurate with such an opportunity. Proposals addressing a set of institutions may choose to apply an alternative design framework to the conventional single institution context and consider an aggregation model where some or all associated resources and services (Science DMZ) are centralized at a regional level.

Proposals submitted to this area should address scientific research and education needs for improved research and education (R&E) networking connectivity on campus and/or externally. Networking improvements described in the proposal can focus on equipment and wireless or fiber/wired connectivity needed within a campus and between research and education buildings. Plans can also focus on upgrading an institution's connectivity to the national research and education community. Proposals may also point to a need to redesign their campus network to

better support academic data flows, such as the Science DMZ approach (see <http://fasterdata.es.net/fasterdata/science-dmz/> for more information).

Focus: *Proposals in this area should focus on establishing their institutions' science research and education needs and aspirations, and discuss how that translates to the need for greater connectedness and investment in network capacity.* Institutions whose missions are primarily education-focused may choose to present their scientific needs in the context of network-enabled education activities and distance education. Proposals are encouraged to discuss research and education drivers with specific descriptions.

Proposals may wish to consider the application of new wireless technologies as an element of their engineering approach to network-based challenges in enabling scientific research and education - this may include, for example, multi-gigabit or environment-constrained technologies to connect campuses in rural areas, or existing campus networks to new instrumentation, resources, or communities relevant to the proposing institution. Note that any wireless solution proposed should address research and education needs as the singular priority, as opposed to a general campus wireless network.

Requirements: Proposals in this area are not required to present a complete technical design and may choose to defer technical solutions and equipment purchases to the second year of activities. Therefore, vendor quotes are not required for this program area. Under this scenario, the year one annual report is required to provide these details with NSF approval, prior to expenditures in year two. NSF approval of the annual report is also subject to a successful review before the end of the first year of the technical design developed. Equipment is not expected to be fully specified in the budget; however, equipment choices will be specified in the annual report and review.

Proposals in this area are required to partner with a leadership institution in their jurisdiction or region, and at a minimum are expected to actively participate in CC*-related community events and engineering exchanges, especially in the first year while developing the technical solution. The leadership entity is expected to be experienced in high performance R&E networking and well-resourced to be capable of actively working with the proposing institution on designing and making operational the proposed networking improvements. The partnering institution's engagement activities may be supported in the proposal and included as a sub-award or non-lead proposal.

Proposals will be evaluated mainly on the strength of the science use cases presented – including research and education - and their quantification. Proposals will also be evaluated on the strength of institutional partnerships as they are expected to play a central role in developing and implementing the eventual network upgrades.

2. CC* PROGRAM SUMMARY AND FULL PROPOSAL TEMPLATES

Per the [NSF Proposal & Award Policies & Proposal Guide](#) (PAPPG), a successful proposal should present the (1) objectives and scientific, engineering, or educational significance of the proposed work; (2) suitability of the methods to be employed; (3) qualifications of the investigator and the grantee organization; (4) effect of the activity on the infrastructure of science, engineering and education, if applicable; and (5) amount of funding required. It should present the intellectual merit and broader impacts of the proposed project clearly and should be prepared with the care and thoroughness of a paper submitted for publication. Sufficient information should be provided to enable reviewers to evaluate the proposal in accordance with the two merit review criteria established by the National Science Board; namely Intellectual Merit (*i.e.*, potential to advance knowledge and relevant field(s)) and Broader Impacts (*i.e.*, potential to benefit society or achieve societal goals).

The requisite instructions are contained in [Chapter II](#) of the PAPPG. Conformance is required and will be strictly enforced unless an authorization to deviate from standard proposal preparation requirements has been approved. NSF will not accept or will return without review proposals that are not consistent with these instructions. It is important that all proposals conform to the proposal preparation instructions contained in the PAPPG. ***Please note that the proposal preparation instructions provided in the program solicitation deviate from the PAPPG instructions. When that occurs, the instructions in the program solicitation take precedence over the PAPPG.***

The following templates are for the two main components of any NSF research proposal, namely the one-page Project Summary and the 15-page Project Description.

PROJECT SUMMARY (ONE PAGE)

The Project Summary consists of three sections: (1) an overview, (2) a statement on the intellectual merit of the proposed activity, and (3) a statement on the broader impacts of the proposed activity. The overview includes a description of the activity that would result if the proposal were funded and a statement of objectives and methods to be employed. The statement on intellectual merit should describe the potential of the proposed activity to advance knowledge. The statement on broader impacts should describe the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes.

The Project Summary should be written in the third person, informative to other persons working in the same or related fields, and, insofar as possible, understandable to a scientifically or technically literate lay reader. It should not be an abstract of the proposal. The PAPPG recommends the following structure for the one-page project summary:

1. **Overview** – This section, about 1/2 page in length, should include (a) a *description of the activity that would result if the proposal were funded* **and** (b) a *statement of the research and outreach objectives* (this is a common omission) *and methods to be employed*.

2. Statement on intellectual merit – The statement on intellectual merit should describe the potential of the proposed activity to advance knowledge in about 1/4 page.
3. Statement on broader impacts – The statement on broader impacts should describe, in roughly 1/4 page, the potential of the proposed activity to benefit society and contribute to the achievement of specific, desired societal outcomes. As noted previously, these outcomes should not be limited to the outreach components or involvement of underrepresented groups.

Applicants enter the Project Summary in the NSF FastLane system into three text boxes (one for each section) that must be completed prior to proposal submission. The total character count of the text boxes cannot exceed 4,600 (including spaces). The total number of lines entered for the three text boxes cannot exceed 51 (including blank lines between paragraphs). However, there is no limit on the characters that can be entered per box. The 4,600-character limit and 51-line limit for the Project Summary are to ensure that the document meets the one-page limit. If use of [special characters](#) is necessary, the proposer must check a box on the Project Summary page and upload it as a supplementary document called Project Summary with Special Characters.

CC PROJECT DESCRIPTION (15 PAGES)*

The 15-page NSF Project Description should provide a clear statement of the work to be undertaken and must include the objectives for the period of the proposed work and expected outcomes. It should outline the general plan of work, including the broad design of activities to be undertaken, and, where appropriate, provide a clear description of rationale and procedures for successful implementation.

Proposers should address what they 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. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified. These issues apply to both the technical aspects of the proposal and the way in which the project may make broader contributions.

All CC* projects will be reviewed with careful attention to the following: (1) The extent to which the work provides a needed capability required by science, engineering and education; (2) The expected impact on the deployed environment described in the proposal, and potential impact across a broader segment of the NSF community; and (3) Where applicable, how resource access control, federated identity management, and other cybersecurity related issues and community best practices are addressed.

Based on review of the PAPPG and CC* funding notice, Hanover recommends the following structure for the 15-page Project Description:

1. Vision, Goals, and Objectives – Introduce the institution, partners, and regional research and education environment and deficiencies. Describe the institutional and collective priorities for research and how this project includes coordinated and secure campus, multi-campus,

and multi-institution cyberinfrastructure components. Articulate the overarching vision, goals, and specific objectives for the proposed CC* Network Design initiative. Be sure to articulate how the proposed project will support the needs of scientific research and education that goes far beyond the networking layer in capacity and services and extends to computing, data services, secure and trustworthy systems, and especially the human expertise, collaboration, and knowledge sharing.

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

2. Research Drivers – Describe the specific scientific research and education needs for improved research and education (R&E) networking connectivity on campus and/or externally. Proposals are encouraged to provide, in the Project Description, a summary table of the science drivers and their network requirements. These requirements may be specified in terms of throughput ranges or as part of a composition or workflow profile for repeating cycles of scientific data movement.
3. Context – Provide an overview of how the proposed networking improvements will focus on equipment and wireless or fiber/wired connectivity needed within a campus and between research and education buildings to support research and education.
 - a. Partnerships and Collaboration – All proposals in this area must document explicit partnerships or collaborations with the campus Information Technology (IT)/networking organization, as well as one or more domain scientists, research groups, and educators in need of the new network capabilities. Partnership documentation from personnel not included in the proposal as PI, Co-PI, or Senior Personnel should be in the form of a letter of collaboration located in the Supplementary Documents section of the proposal.
 - b. Campus CI Plan – Provide a brief (e.g., roughly half-page) summary of the requisite CI Plan (see note below). Describe 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 networking capabilities and approaches in support of scientific discovery. Proposals across the program 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 network and data infrastructure upgrades.

If appropriate, proposals in this area are allowed to have the 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 inter-campus cyberinfrastructure in support of distributed scientific research and education.

- c. Network Diagram – Proposals are required to include, in the Project Description, a conceptual or functional network diagram of the proposed network upgrades and are

encouraged to include the context of end system and user connectivity. Proposals are encouraged to document current utilization in the context of the proposed upgrades.

4. Network Management Plan – Proposals are required to include, in the Project Description, a network management plan addressing responsibilities, support, and roles. The plan should spell out how science data flows will be supported.
5. Project Plan – Proposals must include, in the Project Description, a project plan addressing clear goals and milestones resulting in a working system in the target environment. Proposals are encouraged to address end-to-end networking performance in considering metrics of success. If a proposal chooses to discuss design of a proposed Science DMZ, NSF encourages adoption of guidance found on the ESnet website as referenced above, including security considerations in the design of the Science DMZ at: <http://fasterdata.es.net/science-dmz/science-dmz-security/>. Proposals are encouraged to describe an approach to end-to-end network performance measurement based on the perfSonar framework with associated tool installation and use; proposals may describe an alternative approach to perfSonar with sufficient justification. Proposers are encouraged to reference the following community website for more information on perfSonar: <http://fasterdata.es.net/performance-testing/perfsonar/>. Any budget request for professional services, such as IT staff support, must be documented in coordination with the institution's campus IT or CIO organization.
6. Intellectual Merit – ***The Project Description must contain, as a separate section within the narrative, a section labeled “Intellectual Merit.”*** The Project Description should provide a clear statement of the work to be undertaken and must include the objectives for the period of the proposed work and expected significance; the relationship of this work to the present state of knowledge in the field, as well as to work in progress by the PI under other support.
7. Broader Impacts – ***The Project Description must contain, as a separate section within the narrative, a section labeled “Broader Impacts.”*** This section should provide a discussion of the broader impacts of 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 the achievement of societally relevant outcomes. Such outcomes include, but are not limited to: full participation of women, persons with disabilities, and underrepresented minorities 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 US; and, enhanced infrastructure for research and education.

8. Timeline – In this section, you want to help the reviewers “see” the project timeline. Hanover recommends that you include a GANTT chart-type timeline with lines for all major activities with quarterly resolution to show the progression of the project during the award period.
9. Results of Prior NSF Support – The purpose of this section is to assist reviewers in assessing the quality of prior work conducted with current or prior NSF funding. If any PI or co-PI identified on the proposal has received NSF support with a start date in the past five years (including any current funding and no cost extensions), information on the award is required for each PI and co-PI, regardless of whether the support was directly related to the proposal or not. In cases where the PI or any co-PI has received more than one award (excluding amendments to existing awards), they need only report on the one award that is most closely related to the proposal. Support includes not just salary support, but any funding awarded by NSF. NSF awards such as standard or continuing grants, Graduate Research Fellowship, Major Research Instrumentation, conference, equipment, travel, and center awards, etc., are subject to this requirement.

The following information must be provided:

- (a) NSF award number, amount and period of support;
- (b) Title of the project;
- (c) Summary of the results of the completed work, including accomplishments, supported by the award. The results must be separately described under two distinct headings: Intellectual Merit and Broader Impacts;
- (d) Listing of the publications resulting from the NSF award (a complete bibliographic citation for each publication must be provided either in this section or in the References Cited section of the proposal); if none, state “No publications were produced under this award.”
- (e) Evidence of research products and their availability, including, but not limited to: data, publications, samples, physical collections, software, and models, as described in any Data Management Plan; and
- (f) If the proposal is for renewed support, a description of the relation of the completed work to the proposed work.

If the project was recently awarded and therefore no new results exist, describe the major goals and broader impacts of the project. Note that the proposal may contain up to five pages to describe the results. Results may be summarized in fewer than five pages, which would give the balance of the 15 pages for the Project Description.