US Ignite

PROGRAM SOLICITATION
NSF 15-508

National Science Foundation

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

Directorate for Engineering
Division of Civil, Mechanical and Manufacturing Innovation

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

January 21, 2015

IMPORTANT INFORMATION AND REVISION NOTES

Any proposal submitted in response to this solicitation should be submitted in accordance with the revised *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) (NSF 15-1). The PAPPG is consistent with, and, implements the new Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance) (2 CFR § 200). NSF anticipates release of the PAPPG in the Fall of 2014 and it will be effective for proposals submitted, or due, on or after December 26, 2014. Please be advised that proposers who opt to submit prior to December 26, 2014, must also follow the guidelines contained in NSF 15-1.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

US Ignite

Synopsis of Program:

US Ignite is an Administration initiative seeking to promote US leadership in the development and deployment of next-generation gigabit applications with the potential for significant societal impact. The primary goal of US Ignite is to break a fundamental deadlock: there is insufficient investment in gigabit applications that can take advantage of advanced network infrastructure because such infrastructure is rare and dispersed. And conversely, there is a lack of broad availability of advanced broadband infrastructure for open experimentation and innovation because there are few advanced applications and services to justify it. US Ignite aims to break this deadlock by providing incentives for imagining, prototyping, and developing public sector gigabit applications, and by leveraging and extending this network testbed across US college/university campuses and cities.

This solicitation builds on the experience gained from initial US Ignite activities to further engage the US academic research and non-profit communities along with local cities, municipalities, and regions in exploring the challenges of developing and applying next-generation networking to problems of significant public interest and benefit. In particular, this solicitation has two tracks: the first encourages the development of applications in national priority areas that explore new uses for networks, giving rise to novel networking and application paradigms; and the second expands and enhances the ecosystems in which these applications will evolve and be evaluated.

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.

- Joseph B. Lyles, Program Director, CISE/CNS, telephone: (703) 292-8950, email: jlyles@nsf.gov
- Bruce Kramer, Program Director, ENG/CMMI, telephone: (703) 292-5348, email: bkramer@nsf.gov
- Wendy Nilsen, Program Director, CISE/IIS, telephone: (703) 292-2568, email: wnilsen@nsf.gov

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

- 47.041 --- Engineering
- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 6 to 10

Subject to the availability of funds, NSF expects to award up to eight Track 1 projects and up to two Track 2 projects.

Track 1 proposals may request up to $600,000 for up to three years. Track 2 proposals may request up to $6,000,000 for up to three years.

Anticipated Funding Amount: $10,000,000

Up to $10 million to support both Track 1 and Track 2 projects. The number of awards and average award size/duration are subject to the availability of funds.

Eligibility Information

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may participate as PI, Co-PI, or Senior Personnel in **no more than two proposals** submitted in response to this solicitation. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not required
- **Preliminary Proposal Submission:** Not required
- **Full Proposals:**
  - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
  - 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: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=grantsgovguide)

B. Budgetary Information

- **Cost Sharing Requirements:** Inclusion of voluntary committed cost sharing is prohibited.
- Indirect Cost (F&A) Limitations:Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

  January 21, 2015

Proposal Review Information Criteria

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

Award Administration Information

Award Conditions: Standard NSF award conditions apply.

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

In June 2012, the White House Office of Science and Technology Policy (OSTP) and NSF, in partnership with other Federal agencies, announced US Ignite, an initiative seeking to promote US leadership in the development and deployment of next-generation gigabit applications with the potential for significant societal impact. The primary goal of US Ignite is to break a fundamental deadlock: there is insufficient investment in gigabit applications that can take advantage of advanced network infrastructure because such infrastructure is rare and dispersed. And conversely, there is a lack of broad availability of advanced broadband infrastructure for open experimentation and innovation because there are few advanced applications and services to justify it. US Ignite aims to break this deadlock by providing incentives for imagining, prototyping, and developing public sector gigabit applications, and by leveraging and extending this network testbed across US college/university campuses and cities.

The US Ignite initiative effort has multiple aspects. First, NSF is engaging the academic research community in developing applications that explore new uses for networks, giving rise to new networking and application paradigms. Prior to this solicitation, NSF issued Dear Colleague Letters (DCLs) (see NSF 12-085 and NSF 13-121) expressing interest in EArly-concept Grants for Exploratory Research (EAGER) proposals in support of the US Ignite effort. Second, US Ignite, Inc., a 501(c)(3) partnership, is working with cities and companies to encourage and foster development and deployment of ecosystems of next-generation networking. Finally, in two cities, Chattanooga and Kansas City, the Mozilla Foundation is using prizes and very small grants to catalyze development of gigabit applications.

Over the last two years, several NSF projects funded under these two DCLs have yielded novel ideas and applications in a variety of sectors, including advanced manufacturing, clean energy, transportation, cyberlearning, health information technology, and public safety/emergency preparedness. These projects have in turn demonstrated the potential societal impact of broad use of ultra-fast, software-defined networks. For example, one NSF EAGER project has resulted in operational improvements in emergency response communications. Another project has generated a commercial product addressing health and wellbeing. Additionally, NSF has funded workshops, community activities within and across cities, and prize contests to build community ecosystems supporting continuous application innovation for advanced network testbeds. This solicitation builds on the experience gained from these activities to further engage the US academic research and non-profit communities in exploring the challenges of developing and applying next-generation networking to problems of significant public interest and benefit.

II. PROGRAM DESCRIPTION

In the last decade, CISE's investments in research infrastructure, particularly networking research infrastructure, have demonstrated the value of developing and using shared infrastructure for accelerating research and education. For example, since 2007, CISE has supported the Global Environment for Network Innovations (GENI), laying the foundation for a unique national virtual laboratory for at-scale networking experimentation. Over 300 networking researchers spanning more than 60 universities throughout the US have contributed to developing and prototyping GENI. GENI currently has over 700 unique users each quarter using the infrastructure for research and education experimentation. Key features of GENI are resource slicing and deep programmability with configurations defined by declarative specifications and a rich authorization infrastructure. More than 50 "GENI racks," small computing clusters with access to national software-defined advanced networking infrastructures, have been deployed in campuses and cities throughout the US. Recently, driven by the data communication needs of the domain sciences as well as the potential and opportunity to move advances enabled by GENI and related efforts onto campus environments, NSF established the Campus Cyberinfrastructure – Infrastructure, Innovation and Engineering (CC*IIE) program. CC*IIE seeks improvements and re-engineering at the campus level to leverage dynamic network services and support both a range of scientific data transfers and GENI-like experimental infrastructure. To date, the CC*IIE program has made awards to approximately 120 institutions widely spread across

the United States.

Beginning in June 2012, US Ignite has sought to leverage NSF's investments in networking research infrastructure, notably in GENI and CC*IIE, by integrating academic campuses that have GENI technology with research backbone networks and numerous broadband cities across the nation. Through US Ignite, NSF and other Federal agencies are exploring next-generation networking at scale, and creating a national innovation ecosystem that will have profound, long-term social and economic impacts.

This solicitation builds on the experience gained from initial US Ignite activities to further engage the US academic research and non-profit communities along with local cities, municipalities, and regions in exploring the challenges of developing and applying next-generation networking to problems of significant public interest and benefit. In particular, this solicitation has two tracks: the first (Track 1) builds on, and expands, the activities explored by the US Ignite Dear Colleague Letters (DCLs) described above, enabling development of applications in national priority areas that explore new uses for networks, giving rise to novel networking and application paradigms; and the second (Track 2) seeks to expand and enhance the ecosystems in which these applications will evolve and be evaluated.

Track 1: US Ignite Applications: Moving Novel Gigabit Applications into Practice

In Track 1 of this solicitation, we seek proposals for innovative applications that leverage or enhance advanced networking technologies (i.e., gigabit throughput, software-defined networking, advanced wireless), and that address national priority areas. Thus, a US Ignite project responsive to this track must accomplish each of the following:

a. Pursue a public sector application in one or more areas of national priority to include: advanced manufacturing, education and workforce, energy, transportation, healthcare, and public safety/emergency preparedness.

b. Leverage or enhance one or more advanced networking technologies such as gigabit throughput, software-defined networks, or advanced wireless. NSF anticipates that the combination of novel applications and advanced networking will inform one or more research questions in the domains of networking, networked systems, or networked applications, which will in turn inform and improve our understanding of how to design, deploy, manage, support, or use advanced networking capabilities. Proposals should link the implementation of the application to the exploration and assessment of any identified research question(s).

c. Identify one or more anchor institution(s) (e.g., a school, campus, health care facility, public safety entity, library, museum, or city), and demonstrate, and perform early evaluations of, the application in the context of the chosen anchor institution(s) in order to maximize the ability to transition the application to practice and widespread adoption.

Track 2: Igniting a National Ecosystem: Scaling Up Smart and Connected Cities and Regions

Experience with US Ignite over the last two years has shown that local communities and regions are sources of considerable innovation. In Track 2 of this solicitation, we seek to continue and expand the involvement of local communities and regions in furthering this innovation. Specifically, we seek proposals that facilitate the involvement of citizens and community organizations in building and experimenting with multiple advanced networking applications addressing national priorities. Furthermore, we seek proposals that support mechanisms and processes needed to share and scale up innovations by transferring applications that have been shown to be useful in one US Ignite city/region to other US Ignite cities/regions. As part of this effort, we encourage interoperability and common solutions in data infrastructure. A key goal of Track 2 is to support mechanisms that will enable cities and regions to develop a smart and connected national ecosystem supporting applications of advanced networking such as those developed in Track 1.

I. *Community building:* NSF seeks proposals that will build communities of practice, "Living Labs," in multiple cities and regions with potential sharing of gigabit applications, i.e., especially applications that are "smart" and can sense and act, among cities and regions. Proposals addressing this topic area must describe:

    a. The people and organizational infrastructures needed to identify user needs; mentor developers within the community; identify anchor institutions that commit to experiment with new applications, especially applications that have the potential to be "smart"; and deploy, integrate and evaluate those applications in the community/regional context.
    b. Mechanisms such as prizes, competitions, etc., that will be used to excite, encourage and support early engagement of community participants.
    c. The number of cities/regions supported with a rationale for the number, the reasons for choosing the target cities/regions, and the process by which the target cities/regions have been chosen (or will be chosen in the future).
    d. Mechanisms for transferring successful innovations from one city/region to another. Specifically, the processes for identifying candidate applications; matching applications to potential new cities/regions; and transferring technical and social learnings from the originating city to the new city(ies)/region(s) should be articulated.
    e. The methods and metrics that will be used to evaluate the project effectiveness.
    f. The methods and processes for understanding and documenting the successes and failures of the various community building practices.
    g. Project planning information in sufficient detail to allow the budget to be assessed relative to the work proposed.

II. *Building multi-city/region testbeds/"Living Labs":* NSF seeks proposals that will build communications links between, and computational infrastructure in support of, multi-city/region testbeds and "Living Labs." *Community-wide instillation of fiber or other networking technology is out of scope for this solicitation and will not be supported.* Rather, the intent of this topic area is to support the connection of existing high-speed community networks to advanced services provided by regional or national Research and Engineering (R&E) networks, and to provide community computation resources, such as GENI racks, in support of rapid deployment and trials of new smart gigabit applications. Proposals addressing this topic area should describe:

    a. The architecture of the multi-city/region testbed.
    b. The rationale for testbed size in terms of the diversity and number of cities/regions. In particular, what will be learned from this diversity and the point at which increasing the number of cities/regions yields diminishing returns should be articulated.
    c. How candidate cities/regions will be identified, along with the metrics and processes for choosing them.
    d. The social and engineering processes needed to build the testbed.
    e. If resources such as GENI racks are included the mechanisms and associated costs of installing and supporting their operation.
    f. The operational processes and staffing needed to keep the testbed running.
    g. How the project will document the successes and failures, facilitate future efforts, and share successful applications

within the proposed multi-city/region testbed.
h. How the project will clearly tie the requested funding to bullets (a) through (g).
i. The support of one or more of the candidate cities/regions, as demonstrated via letters of collaboration.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Continuing Grant or Cooperative Agreement

Estimated Number of Awards: 6 to 10

Subject to the availability of funds, NSF expects to award up to eight Track 1 projects and up to two Track 2 projects.

Track 1 proposals may request up to $600,000 for up to three years. Track 2 proposals may request up to $6,000,000 for up to three years.

Anticipated Funding Amount: $10,000,000

Up to $10 million to support both Track 1 and Track 2 projects. The number of awards and average award size/duration are subject to 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

Who May Submit Proposals:

The categories of proposers eligible to submit proposals to the National Science Foundation are identified in the Grant Proposal Guide, Chapter I, Section E.

Who May Serve as PI:

There are no restrictions or limits.

Limit on Number of Proposals per Organization:

There are no restrictions or limits.

Limit on Number of Proposals per PI or Co-PI: 2

An individual may participate as PI, Co-PI, or Senior Personnel in **no more than two proposals** submitted in response to this solicitation. **These eligibility constraints will be strictly enforced in order to treat everyone fairly and consistently**. In the event that an individual exceeds this limit, proposals received within the limit will be accepted based on earliest date and time of proposal submission (i.e., the first two proposals received will be accepted and the remainder will be returned without review). **No exceptions will be made.**

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

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

- 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 Grant Proposal Guide (GPG). The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from 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: (http://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) 292-7827 or by e-mail from 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 the NSF FastLane system. Chapter II, Section D.4 of the Grant Proposal Guide provides additional information on collaborative proposals.

See Chapter II.C.2 of the GPG 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 GPG instructions.

The following information SUPPLEMENTS (not replaces) the guidelines provided in the NSF Grant Proposal Guide (GPG).

Proposal Titles: Each proposal title must begin with "US Ignite:" followed by "Track 1:" or "Track 2:" indicating to which track of this solicitation the proposal is responsive. In other words, appropriate titles for proposals include **US Ignite: Track 1: Title** and **US Ignite: Track 2: Title**. For a collaborative proposal, all participating institutions should use the same title, which should also include the keyword "Collaborative Research," for example, **US Ignite: Collaborative Research: Track 1: Title.**

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

Project Description: Describe the research and education activities to be undertaken **in up to 15 pages for Track 1 proposals** and **in up to 20 pages for Track 2 proposals**.

Proposers are reminded that, as specified in GPG Chapter II.C.2.d.iii, **if any PI or co-PI identified on the project has received NSF funding (including any current funding) in the past five years, information on the award(s) is required**, irrespective of whether the support was directly related to the proposal. This information must appear as part of the Project Description.

Supplementary Documents: In the Supplementary Documents Section, upload the following information:

(1) List of Project Personnel and Partner Institutions (Note: In collaborative proposals, the lead institution should provide this information for all participants):

Provide current, accurate information for all personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. The list should 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:

1. Mary Smith; XYZ University; PI
2. John Jones; University of PQR; Senior Personnel
3. Jane Brown; XYZ University; Postdoc
4. Bob Adams; ABC Community College; Paid Consultant
5. Susan White; DEF Corporation; Unpaid Collaborator
6. Tim Green; ZZZ University; Subawardee

(2) A list of past and present Collaborators not related to this proposal (Note: In collaborative proposals, the lead institution should provide this information for all participants):

Provide current, accurate information for all active or recent collaborators of personnel and institutions involved in the project. NSF staff will use this information in the merit review process to manage conflicts of interest. This list -- distinct from (1) above -- must include all active or recent Collaborators of all personnel involved with the proposed project. Collaborators include any individual with whom any member of the project team -- including PIs, Co-PIs, Senior Personnel, paid/unpaid Consultants or Collaborators, Subawardees, Postdocs, and project-level advisory committee members -- has collaborated on a project, book, article, report, or paper within the preceding 48 months; or co-edited a journal, compendium, or conference proceedings within the preceding 24 months. This list should include (in this order) Full name and Organization(s), with each item separated by a semi-colon. Each person listed should start a new numbered line. The following is a sample format; other similar formats are acceptable.

1. Collaborators for Mary Smith; XYZ University; PI
    a. Helen Gupta; ABC University
    b. John Jones; University of PQR
    c. Fred Gonzales; DEF Corporation
    d. Susan White; DEF Corporation
2. Collaborators for John Jones; University of PQR; Senior Personnel
    a. Tim Green; ZZZ University
    b. Ping Chang, ZZZ University
    c. Mary Smith; XYZ University
3. Collaborators for Jane Brown; XYZ University; Postdoc
    a. Fred Gonzales; DEF Corporation
4. Collaborators for Bob Adams; ABC Community College; Paid Consultant
    a. None
5. Collaborators for Susan White; DEF Corporation; Unpaid Collaborator
    a. Mary Smith; XYZ University
    b. Harry Nguyen; Welldone Institution
6. Collaborators for Tim Green; ZZZ University; Subawardee
    a. John Jones; University of PQR

NOTE: The list of collaborators includes all current and past (see above timelines) projects for all participants in the proposal. It is not a list of the collaborators for the given proposal; this should be provided pursuant to item *(1)* of Supplementary Documents above.

(3) Collaboration Plans (if applicable):

Since the success of collaborative efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, all proposals that include more than one investigator must include a Collaboration Plan *of up to two pages for Track 1 proposals* and *up to four pages for Track 2 proposals*. The length of, and degree of, detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Where appropriate, the Collaboration Plan might include: 1) the specific roles of the project participants in all organizations involved; 2) information on how the project will be managed across all the investigators, institutions, and/or disciplines; 3) identification of the specific coordination mechanisms that will enable cross-investigator, cross-institution, and/or cross-discipline scientific integration (e.g., yearly workshops, 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 with more than one investigator does not include a Collaboration Plan of up to two pages (Track 1) or four pages (Track 2), that proposal will be returned without review.

(4) Postdoctoral Researcher Mentoring Plan (if applicable):

Each proposal that requests funding to support postdoctoral researchers must include, as a supplementary document, a description of the mentoring activities that will be provided for such individuals. In no more than one page, the mentoring plan must describe the mentoring that will be provided to all postdoctoral researchers supported by the project, irrespective of whether they reside at the submitting organization, any subawardee organization, or at any organization participating in a simultaneously submitted collaborative project. Please be advised that if required, FastLane will not permit submission of a proposal that is missing a Postdoctoral Researcher Mentoring Plan. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

Proposals that include Postdoctoral Mentoring Plans exceeding one page in length will be returned without review.

(5) 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 Chapter II.C.2.j of the GPG for full policy implementation.

For additional information, see: http://www.nsf.gov/bfa/dias/policy/dmp.jsp.

For specific guidance for proposals submitted to the Directorate for Computer and Information Science and Engineering (CISE) see: http://www.nsf.gov/cise/cise_dmp.jsp.

Proposals that include Data Management Plans exceeding two pages in length will be returned without review.

B. Budgetary Information

Cost Sharing: Inclusion of voluntary committed cost sharing is prohibited

C. Due Dates

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

  January 21, 2015

D. FastLane / Grants.gov Requirements

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 FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this funding opportunity.

For Proposals Submitted Via Grants.gov:

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

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

Proposers that submitted via FastLane are strongly encouraged to use FastLane to verify the status of their submission to NSF. For proposers that submitted via Grants.gov, until an application has been received and validated by NSF, the Authorized Organizational Representative may check the status of an application on Grants.gov. After proposers have received an e-mail notification from NSF, Research.gov should be used to check the status of an application.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program for acknowledgement and, if they meet NSF requirements,

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

A comprehensive description of the Foundation's merit review process is available on the NSF website at: http://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 *Investing in Science, Engineering, and Education for the Nation's Future: NSF Strategic Plan for 2014-2018*. These strategies are integrated in the program planning and implementation process, of which proposal review is one part. NSF's mission is particularly well-implemented through the integration of research and education and broadening participation in NSF programs, projects, and activities.

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

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

A. Merit Review Principles and Criteria

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

1. Merit Review Principles

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

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

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

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

2. Merit Review Criteria

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

The two merit review criteria are listed below. **Both** criteria are to be given **full consideration** during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (GPG 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 GPG 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 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 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

In addition to the standard NSF merit review criteria, US Ignite proposals will be evaluated based on the following criteria:

For Track 1 proposals:

1. Does the application address a national priority (advanced manufacturing, clean energy, transportation, cyberlearning, health information technology, and/or public safety/emergency preparedness)?
2. Does the team contain the range of subject matter expertise needed to address the application domain(s) and conduct the necessary underlying networking research?
3. Is there clear evidence of collaboration between the proposers and the anchor institution, for example, as evidenced by one or more letters of collaboration?
4. Do the research questions further our understanding of next-generation networking architectures or applications?
5. If successful, will the project demonstrate the value of advanced networking technologies?

For Track 2 proposals:

1. Does the proposal exhibit clear understanding of the social and community processes that need to be either in place or built in order to achieve a successful outcome?
2. Does the proposal exhibit a reasoned balance between the proposed number of cities and what will be learned from them?
3. Is there clear evidence of collaboration between the cities involved in the proposal, for example, as evidenced by one or more letters of collaboration?
4. Are mechanisms in place to learn from the projects such that successes can be replicated and scaled up in future additional cities?
5. Is there a definition of a successful outcome, and does that envisioned outcome support the goals of the US Ignite program?
6. Is there a plan for sustainability, and does it include steps, metrics, and processes for mid-course corrections?

B. Review and Selection Process

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

Contingent upon the numbers of submissions, NSF anticipates placing Track 1 proposals into one or more appropriate review panels, supplemented when necessary by ad hoc reviews, based on research or application areas.

For Track 2 proposals, a single panel, supplemented when necessary by ad hoc reviews, is anticipated. NSF may hold Reverse Site Visits for the most competitive Track 2 proposals to inform final funding recommendations.

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 be completed and submitted by each reviewer. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

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

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

Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

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

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

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

B. Award Conditions

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

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/awards/managing/award_conditions.jsp?org=NSF. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from nsfpubs@nsf.gov.

More comprehensive information on NSF Award Conditions and other important information on the administration of NSF awards is contained in the NSF *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days prior to the end of the current budget period. (Some programs or awards require submission of more frequent project reports). Within 90 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 *Award & Administration Guide* (AAG) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=aag.

VIII. AGENCY CONTACTS

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

General inquiries regarding this program should be made to:

- Joseph B. Lyles, Program Director, CISE/CNS, telephone: (703) 292-8950, email: jlyles@nsf.gov
- Bruce Kramer, Program Director, ENG/CMMI, telephone: (703) 292-5348, email: bkramer@nsf.gov
- Wendy Nilsen, Program Director, CISE/IIS, telephone: (703) 292-2568, email: wnilsen@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.

For questions relating to Grants.gov contact:

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

IX. OTHER INFORMATION

The NSF website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this website by potential proposers is strongly encouraged. In addition, "NSF Update" is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. "NSF Update" also is available on NSF's website at https://public.govdelivery.com/accounts/USNSF/subscriber/new?topic_id=USNSF_179.

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 http://www.grants.gov.

ABOUT THE NATIONAL SCIENCE FOUNDATION

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

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

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

Facilitation Awards for Scientists and Engineers with Disabilities provide funding for special assistance or equipment to enable persons with disabilities to work on NSF-supported projects. See Grant Proposal Guide Chapter II, Section D.2 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 http://www.nsf.gov

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: nsfpubs@nsf.gov

  or telephone: (703) 292-7827
- **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 Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004). 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:

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