

CISE Cross-Cutting Programs: FY 2011

PROGRAM SOLICITATION

NSF 10-575

REPLACES DOCUMENT(S):

NSF 09-558



National Science Foundation

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

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

September 01, 2010 - September 15, 2010

MEDIUM Projects

November 01, 2010 - November 28, 2010

LARGE Projects

December 01, 2010 - December 17, 2010

SMALL Projects

IMPORTANT INFORMATION AND REVISION NOTES

Several changes have been made to the CISE Cross-Cutting Programs solicitation for the FY 2011 competition:

- CISE has added a new cross-cutting program called Smart Health and Wellbeing.
- Modest changes have been made to the Trustworthy Computing and Network Science and Engineering program descriptions to fully define their scientific scope.
- Data-intensive Computing is no longer a CISE cross-cutting program. Proposals that address research challenges and opportunities in cloud and data-intensive computing should be submitted to the most appropriate CISE Core Program: [Computing and Communication Foundations \(CCF\)](#), [Computer and Network Systems \(CNS\)](#) or [Information & Intelligent Systems \(IIS\)](#). Please consult a Cognizant Program Officer identified in this solicitation if further guidance is required.
- The Network Science and Engineering (NetSE) program will accept proposals ONLY in the Medium and Large project classes in FY 2011, to emphasize the fact that NetSE seeks ambitious team efforts that may involve multiple PIs with different research perspectives. This will be the last year in which CISE seeks NetSE proposals in the Cross-Cutting Programs; NetSE projects will be supported in the CISE Core Programs beginning in FY 2012.
- The submission window for all Medium proposals will now be 1-15 annually.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

CISE Cross-Cutting Programs: FY 2011

Synopsis of Program:

This solicitation seeks proposals in areas that are scientifically timely, and that benefit from the intellectual contributions of researchers with expertise in a number of computing fields and/or sub-fields. The cross-cutting programs for FY 2011 are:

- Network Science and Engineering;
- Smart Health and Wellbeing; and
- Trustworthy Computing.

The full descriptions of these programs can be found in the *II. Program Description* section of this solicitation.

CISE expects that over time, these cross-cutting programs will evolve or be absorbed into the core programs, and that new cross-cutting programs will be introduced. For example, the FY 2009-2010 Data-intensive Computing program is absorbed into the CISE core programs for FY 2011, and the Smart Health and Wellbeing cross-cutting

program is being introduced in FY 2011. CISE anticipates that the FY 2009-2011 Network Science and Engineering program will be absorbed into the CISE core programs next year, in FY 2012.

For Smart Health and Wellbeing and Trustworthy Computing, proposers are invited to submit proposals in three project classes, which are defined as follows:

- Small Projects - up to \$500,000 total budget with durations up to three years;
- Medium Projects - \$500,001 to \$1,200,000 total budget with durations up to four years; and
- Large Projects - \$1,200,001 to \$3,000,000 total budget with durations up to five years.

Network Science and Engineering proposals may be submitted only in two of the three project classes defined above: Medium and Large.

A more complete description of the project classes can be found in section II. *Program Description*, of this document.

CISE investments in Small, Medium and Large projects complement the directorate's investments in the Expeditions in Computing program, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169&org=CISE&from=home, where projects are funded at levels of up to \$10,000,000 total for durations up to 5 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.

- Darleen L. Fisher, Point of Contact for Network Science & Engineering, 1175, telephone: (703) 292-8950, email: dfisher@nsf.gov
- Misha (Michael) Pavel, 1125, telephone: (703) 292-2568, email: mpavel@nsf.gov
- Carl Landwehr, Point of Contact for Trustworthy Computing, 1175, telephone: (703) 292-8338, email: clandweh@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 95 to 125; Up to 25 awards in Network Science and Engineering; up to 40 awards in Smart Health and Wellbeing; and up to 60 awards in Trustworthy Computing

Anticipated Funding Amount: \$105,000,000 in FY 2011, dependent upon the availability of funds - up to \$20 million in Network Science and Engineering; up to \$15 million in Smart Health and Wellbeing; and up to \$70 million in Trustworthy Computing

Eligibility Information

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per 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. For example, an individual may participate as PI, co-PI or Senior Personnel in one Trustworthy Computing proposal and in a second proposal submitted to the Smart Health and Wellbeing program, or an individual may participate as PI, co-PI or Senior Personnel in two proposals submitted to Network Science and Engineering, etc.

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.**

The limit on the number of proposals per PI, Co-PI or Senior Personnel applies only to this solicitation.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

Letters of Intent: Not Applicable

- **Preliminary Proposal Submission:** Not Applicable
- **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:** Cost Sharing is not required under this solicitation.
- **Indirect Cost (F&A) Limitations:** Not Applicable
- **Other Budgetary Limitations:** Not Applicable

C. Due Dates

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

September 01, 2010 - September 15, 2010

MEDIUM Projects

November 01, 2010 - November 28, 2010

LARGE Projects

December 01, 2010 - December 17, 2010

SMALL Projects

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

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I. INTRODUCTION

The Directorate for Computer and Information Science and Engineering (CISE) seeks proposals in three scientific areas that pose important and timely research and education challenges optimally addressed by researchers from a range of computing fields or sub-fields and beyond. Proposals submitted to each of the cross-cutting programs will be reviewed collaboratively by the three CISE divisions, with the goal of creating a comprehensive portfolio of high-impact awards.

II. PROGRAM DESCRIPTION

The three cross-cutting programs for FY 2011 are defined below.

- **Network Science and Engineering (NetSE)**

In the past few decades the Internet has undergone radical changes, evolving from a small number of interconnected computer networks to a global socio-technical infrastructure. As we have become increasingly dependent upon the Internet to perform critical societal functions, we have come to recognize that its design must evolve to embody key societal values such as security and privacy and to provide for economic sustainability. Further, it must demonstrate critical systems characteristics such as resiliency, manageability and evolvability, including the ability to support as yet unforeseen technologies, applications and services. To design socio-technical networks of the future effectively requires that we develop a deeper understanding of the dynamics and behaviors of such networks.

The NetSE program seeks to develop science and engineering knowledge about these networks, yielding new scientific understanding about their complexity and informing their future design. The program specifically challenges individuals and teams with different perspectives and with different domain expertise to come together to develop this understanding.

Future networks must be designed to provide users with timely and coherent access to massive quantities of highly distributed information. Consequently, the NetSE program encourages research on Internet-scale, topologically-aware models for accessing, processing and aggregating multiple high-volume information flows; and on cognitive capabilities, context-awareness, and architectures that enable the discovery, invocation and composition of globally distributed, highly evolving services and information systems. These new kinds of models, capabilities, and architectures in turn enable the exploration of new applications that provide information based on both content and context, and the improvement of existing classes of applications, such as telemedicine, gaming, virtual worlds, augmented reality and telepresence. NetSE encourages work on network models that incorporate human values at multiple levels and scale and give coherence to the highly diverse ways users might create and access information in the future.

NetSE also encourages research proposals focused on exploring "clean slate" approaches to innovations in network architecture, complementing the FY 2011 Future Internet Architectures portfolio of awards, <http://www.nsf.gov/pubs/2010/nsf10528/nsf10528.htm?org=NSF>. Researchers are empowered to rethink network functions, layers and abstractions in the context of a range of scientific, technical and social challenges and opportunities. NetSE emphasizes integrative activities focused on creating and synthesizing network components into theoretically grounded architectures that address fundamental policy and design trade-offs, support sound economic models, and promote societal benefits.

NetSE proposals should include a description of how research ideas will be validated, for example, through formal verification, simulation, modeling, proof-of-concept development, prototype evaluation on a experimental platform (such as the Global Environment for Network Innovations (GENI), or when applicable, usability evaluation involving human subjects. NetSE proposals must involve CISE-related networking expertise and additional expertise across CISE or other NSF directorates. Proposals with natural homes in one of CISE's Core Programs (for example, Networking Technology and Systems (NETS)) should not be submitted to NetSE.

- **Smart Health and Wellbeing (SHB)**

Information and communications technologies are poised to transform our access to and participation in our own health and well-being. The complexity of this challenge is being shaped by concomitant transformations to the fundamental nature of what it means to be healthy. Having good health increasingly means managing our long-term care rather than sporadic treatment of acute conditions; it places greater emphasis on the management of wellness rather than healing illness; it acknowledges the role of home, family, and community as significant contributors to individual health and wellbeing as well as the changing demographics of an increasingly aging population; and it recognizes the technical feasibility of diagnosis, treatment, and care based on an individual's genetic makeup and lifestyle. The substrate of 21st century healthcare will be computing and networking concepts and technologies whose transformative potential is tempered by unresolved core challenges in designing and optimizing them for applicability in this domain.

The goal of the Smart Health and Wellbeing program is to seek improvements in safe, effective, efficient, equitable, and patient-centered health and wellness services through innovations in computer and information science and engineering. Doing so requires leveraging the scientific methods and knowledge bases of a broad range of computing and communication research perspectives.

Some illustrative examples are described here. Protecting patient privacy while providing legitimate anytime, anywhere access to health services will require new security and cryptographic solutions. Personalized medicine will require advances in information retrieval, data mining, and decision support software systems. Continuous monitoring and real-time, customized feedback on health and behavior will rely on remote and networked sensors and actuators, mobile platforms, novel interactive displays, and advances in computing and networking infrastructure. Data collected by sensors, at clinics, and labs need to be anonymized and aggregated for

community-wide health awareness and maintenance. Such data, especially collected over populations, can lead to inferences about best practices and cost savings in providing health services. Virtual worlds, robotics, image, and natural language understanding can facilitate better and more efficient delivery of health services. Software-controlled and interoperable medical devices are necessary for providing safe critical care. Healthcare systems and applications must be usable, to preclude or minimize failures due to human error; and they have to be useful, by matching the mental model of users, from provider to patient, so people make appropriate decisions and choices. These examples are meant to convey the breadth of computing areas that can contribute to the general goals of Smart Health and Wellbeing program, but not to limit its scope. We especially encourage the research community to pursue bold ideas that go beyond and/or combine these traditional areas of computer and information science and engineering.

Projects submitted to this program should be motivated by specific challenges in health and wellbeing. The Smart Health and Wellbeing program aims to facilitate large-scale discoveries that yield long-term, transformative impact in how we treat illness and maintain our health.

• Trustworthy Computing (TC)

The Trustworthy Computing Program (TC) envisions a future pervasive cyber infrastructure that supports a wide range of requirements for trustworthy operation, despite known and future threats and an increasingly complex operating environment. Trustworthy operation requires security, reliability, privacy, and usability. Striving for those properties will lead to the levels of availability, dependability, confidentiality and manageability that our systems, software and services must achieve in order to overcome the lack of trust people currently feel about computing and what computing enables.

TC supports all research approaches, from theoretical to experimental to human-centric: theories, models, cryptography, algorithms, methods, architectures, languages, tools, systems and evaluation frameworks. Of particular interest are proposals that address foundations of trustworthy computing (e.g., "science of security" and privacy-preserving algorithms), privacy, and usability. We welcome work that studies the tradeoffs among trustworthy computing properties, e.g., security and privacy, or usability and privacy, as well as work that examines the tension between security and human values such as openness and transparency. We also welcome methods to assess, reason and predict system trustworthiness, including observable metrics, analytical methods, simulation, experimental deployment and, where possible, deployment on live testbeds for experimentation at scale.

TC encourages proposals with new ideas and potentially transformative insights on: adaptive, diverse and continually shifting strategies to increase complexity and costs for attackers; approaches to enable tailored security environments that can support functional and policy requirements across multiple dimensions of trustworthiness; and frameworks to incentivize security deployment and socially responsible behavior and deter cyber crimes. Multi-disciplinary work that undertakes these research challenges in a context that considers legal, social, and ethical implications are strongly encouraged.

Information on projects supported by the Trustworthy Computing program is available at:
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13451&org=CNS&from=home.

PROJECTS CLASSES

Proposals submitted to this solicitation must be consistent with one of three project classes defined below. Proposals will be considered for funding within their project classes.

- **Small Projects, with total budgets up to \$500,000 for durations of up to three years**, are well suited to one or two investigators (PI and one co-PI or other Senior Personnel) and at least one student and/or postdoc.
- **Medium Projects, with total budgets ranging from \$500,001 to \$1,200,000 for durations up to four years**, are well suited to one or more investigators (PI, co-PI and/or other Senior Personnel) and several students and/or postdocs. Medium 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. Since the success of collaborative research efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, a Collaboration Plan is **required** for all Medium proposals with more than one investigator. The length of and level of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.
- **Large Projects, with total budgets ranging from \$1,200,001 to \$3,000,000 for durations of up to five years**, are well suited to two or more investigators (PI, co-PI(s), or other Senior Personnel), and a team of students and/or postdocs. Large 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. Since the success of collaborative research efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, a Collaboration Plan is **required** for all Large proposals. The length of and degree of detail provided in the Collaboration Plan should be commensurate with the complexity of the proposed project. Please see *Proposal Preparation Instructions* Section V.A for additional submission guidelines.

PLEASE NOTE THAT THE NETSE PROGRAM WILL ACCEPT PROPOSALS IN ONLY THE MEDIUM AND LARGE PROJECT CLASSES.

CISE investments in Small, Medium and Large projects complement the directorate's investments in the Expeditions in Computing program, where projects are funded at levels of up to \$10,000,000 total for durations of up to 5 years. The Expeditions solicitation can be accessed at http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169&org=CISE&from=home.

IMPORTANT PROJECT CHARACTERISTICS

In all cross-cutting programs, the submission of far-reaching, creative research and education projects is encouraged. Funds will be used to support potentially transformative research with high-impact potential. In this way, CISE will catalyze exciting new research activities with the potential to make significant advances in the state-of-the-art.

Interdisciplinary, international and/or academic-industry collaborations that promise to result in major science or engineering advances are welcome. The directorate hopes to attract proposals from faculty at a broad range of academic institutions, including faculty at minority-serving and predominantly undergraduate institutions.

Proposals submitted should demonstrate that enriching learning experiences will be provided for a diverse population of students, and may describe the development of innovative curricula or educational materials that advance literacy about and expertise in areas

supported by CISE.

III. AWARD INFORMATION

It is estimated that approximately \$105 million will be available in FY 2011, dependent upon the availability of funds - up to \$20 million in Network Science and Engineering; up to \$15 million in Smart Health and Wellbeing; and up to \$70 million in Trustworthy Computing. Up to 125 awards will be supported.

IV. ELIGIBILITY INFORMATION

Organization Limit:

None Specified

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per 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. For example, an individual may participate as PI, co-PI or Senior Personnel in one Trustworthy Computing proposal and in a second proposal submitted to the Smart Health and Wellbeing program, or an individual may participate as PI, co-PI or Senior Personnel in two proposals submitted to Network Science and Engineering, etc.

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.**

The limit on the number of proposals per PI, Co-PI or Senior Personnel applies only to this solicitation.

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.

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

Proposal Titles: Proposal titles must begin with an acronym that indicates the most relevant cross-cutting program as described below. Select an acronym for the most relevant cross-cutting program from the following list:

- Network Science and Engineering (NetSE);
- Smart Health and Wellbeing (SHB); and
- Trustworthy Computing (TC).

The acronym should be followed with a colon, then the project class, followed by a colon and the title of your project. For example, if you are submitting a Medium proposal to Smart Health and Wellbeing, then your title would be **SHB: Medium: Title**. If you submit a proposal as part of a set of collaborative proposals, the title of the proposal should begin with the acronym that indicates the most relevant cross-cutting program followed by a colon, then the project class followed by a colon, then "Collaborative Research" followed by a colon, and the title. For example, if you are submitting a collaborative set of proposals describing a Large project to the Network Science and Engineering program, the title of each would be **NetSE: Large: Collaborative Research: Title**.

Proposals from PIs in institutions that have RUI (Research in Undergraduate Institutions) eligibility should have a proposal title that begins with the acronym that indicates the most relevant crosscutting program, followed by a colon then the project class, followed by a colon then "RUI", followed by a colon and then the title, for example, **TC: Small: RUI: Title**.

PIs submitting Grant Opportunities for Academic Liaison with Industry (GOALI) proposals should have a proposal title that begins with the acronym that indicates the most relevant crosscutting program, followed by a colon then the project class, followed by a colon then "GOALI", followed by a colon and then the title, for example, **SHB: Medium: GOALI: Title**.

Project Summary: The Project Summary must include an explicit description of both the Intellectual Merit and Broader Impacts of the activities proposed, preferably in separate paragraphs titled "Intellectual Merit" and "Broader Impacts".

Please provide between 2 and 6 sets of key words at the end of the Project Summary. CISE personnel will use this information in the merit review process. The key words should describe the main scientific/engineering areas explored in the proposal. Key words should be prefaced with "Key Words" followed by a colon and each key word set should be separated by semi-colons. Key words should be of the type used to describe research in a journal submission. They should be included at the end of the project summary and might appear, for example, as **Key Words: energy-aware computing; formal logic; computer graphics; sensor networks; information visualization; privacy**.

Project Description:

All Proposals - Describe the research and education activities to be undertaken in 15 pages or less. Describe curriculum development activities in a separate section titled "Curriculum Development Activities."

Medium and Large Proposals - Since the success of collaborative research efforts are known to depend on thoughtful coordination mechanisms that regularly bring together the various participants of the project, all Medium proposals that include more than one investigator and all Large proposals must include a Collaboration Plan. While the length of the Project Description for Small proposals is limited to 15 pages, for Medium and Large proposals up to 3 additional pages are allowed for Collaboration Plans. Collaboration Plans should be included at the end of the Project Description in a section entitled "Collaboration Plan". 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 Large proposal, or a Medium proposal with more than one investigator, does not include a Collaboration Plan, that proposal will not be merit reviewed until the proposing organization submits such a Plan to NSF. Failure to respond within 10 business days to NSF's request for a missing Collaboration Plan may result in the proposal being returned without review.**

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

(1) List of Project Personnel and Partner Institutions (Note - In collaborative proposals, only the lead institution should provide this information),

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 Inc.; Paid Consultant
5. Mary White; Welldone Institution; Unpaid Collaborator
6. Tim Green; ZZZ University; Subawardee

(2) Post Doctoral Mentoring Plan (if applicable)

Proposals that include funding to support postdoctoral researchers in any way must include a Post Doctoral Mentoring Plan. Proposals that request funding to support post docs and that do not include Post Doctoral Mentoring Plans will be returned without review.

(3) Other Specialized Information

RUI Proposals: PIs from predominantly undergraduate institutions should include a Research in Undergraduate Institutions (RUI) Impact Statement and Certification of RUI Eligibility in this Section.

GOALI proposals: PIs submitting GOALI proposals should include industry-university agreement letters on intellectual property in this section.

B. Budgetary Information

Cost Sharing: Cost sharing is not required under this solicitation.

C. Due Dates

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

September 01, 2010 - September 15, 2010

MEDIUM Projects

November 01, 2010 - November 28, 2010

LARGE Projects

December 01, 2010 - December 17, 2010

SMALL Projects

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of preparation and submission via FastLane are 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.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the Grant Proposal Guide for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane Website at: <https://www.fastlane.nsf.gov/fastlane.jsp>.

- **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://www07.grants.gov/applicants/app_help_reso.jsp. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding 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.

VI. NSF PROPOSAL PROCESSING AND REVIEW PROCEDURES

Proposals received by NSF are assigned to the appropriate NSF program where they will be reviewed if they meet NSF proposal preparation requirements. 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 who are experts in the particular fields represented by the proposal. These reviewers are selected by Program Officers charged with the 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.

A. NSF Merit Review Criteria

All NSF proposals are evaluated through use of the two National Science Board (NSB)-approved merit review criteria: intellectual merit and the broader impacts of the proposed effort. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two NSB-approved merit review criteria are listed below. The criteria include considerations that help define them. These

considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which the reviewer is qualified to make judgements.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative, original, or potentially transformative concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

Examples illustrating activities likely to demonstrate broader impacts are available electronically on the NSF website at: <http://www.nsf.gov/pubs/gpg/broaderimpacts.pdf>.

Mentoring activities provided to postdoctoral researchers supported on the project, as described in a one-page supplementary document, will be evaluated under the Broader Impacts criterion.

NSF staff also will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- 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.

Additional Review Criteria:

For Large and relevant Medium proposals, 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 (if required) adequately demonstrates that the participating investigators will work synergistically to accomplish the project objectives.

B. Review and Selection Process

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. 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 is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the deadline or target date, or receipt date, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, 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.

In all cases, 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 and 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.

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 letter, 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 letter; (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 letter. 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 before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after 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 that PI. 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 FastLane, for preparation and submission of annual and final project reports. Such reports provide information on activities and findings, project participants (individual and organizational), publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system. Submission of the report via FastLane constitutes certification by the PI that the contents of the report are accurate and complete. The project outcomes report 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.

Site visits for Cyber Trust Medium and Large awards may be conducted at NSF's discretion.

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:

- Darleen L. Fisher, Point of Contact for Network Science & Engineering, 1175, telephone: (703) 292-8950, email: dlfisher@nsf.gov
- Misha (Michael) Pavel, 1125, telephone: (703) 292-2568, email: mpavel@nsf.gov
- Carl Landwehr, Point of Contact for Trustworthy Computing, 1175, telephone: (703) 292-8338, email: clandweh@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.

In addition to the Program Officers identified as program points of contact above, the following CISE Program Officers also support the cross-cutting programs as indicated below:

Network Science and Engineering (NetSE)

- Susan Fussell, (703) 292-8930, sfussell@nsf.gov, Room 1125
- William Tranter, (703) 292-8910, wtranter@nsf.gov, Room 1115

Smart Health and Wellbeing (SHB)

John Cozzens, (703) 292-8910, jcozzens@nsf.gov, Room 1115

- Helen Gill, (703) 292-8950, hgill@nsf.gov, Room 1175

Trustworthy Computing (TC)

- Samuel Weber, (703) 292-8950, sweber@nsf.gov, Room 1175
- Xiaoyang (Sean) Wang, (703) 292-8930, xwang@nsf.gov, Room 1125
- Nina Amla, (703) 292-8910, namla@nsf.gov, Room 1115

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, National Science Foundation Update is a free e-mail subscription service 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 Regional Grants Conferences. Subscribers are informed through e-mail when new publications are issued that match their identified interests. Users can subscribe to this service by clicking the "Get NSF Updates by Email" link on the [NSF web site](#).

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

NSF provides funding opportunities for the computing community via the following programs and their solicitations:

Discovery Research Programs

CAREER: Faculty Early Career Development, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5262

Collaborative Research in Computational Neuroscience (CRCNS), http://nsf.gov/funding/pgm_summ.jsp?pims_id=5147

Computer and Network Systems: Core Programs, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12765

Computing and Communication Foundations: Core Programs, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503220

Cyber-enabled Discovery and Innovation (CDI), <http://www.nsf.gov/crssprgm/cdi/>

Cyber-Physical Systems (CPS), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286&org=NSF&sel_org=NSF&from=fund

Engineering Research Centers (ERCs), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5502&org=NSF&sel_org=NSF&from=fund

Expeditions in Computing, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503169&org=NSF&sel_org=NSF&from=fund

Foundations of Data and Visual Analytics (FoDaVA), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501081&org=NSF&sel_org=NSF&from=fund

Grant Opportunities for Academic Liaison with Industry (GOALI), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13706&org=CISE&sel_org=CISE&from=fund

High-End Computing University Research Activity (HECURA), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13645&org=NSF&sel_org=NSF&from=fund

Industry/University Cooperative Research Centers Program (I/UCRC) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5501&org=CISE&sel_org=CISE&from=fund

Information and Intelligent Systems: Core Programs, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13707

Partnerships for International Research and Education (PIRE) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12819&org=CISE&sel_org=CISE&from=fund

Research in Undergraduate Institutions (RUI) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5518&org=CISE&sel_org=CISE&from=fund

Science of Learning Centers (SLCs) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5567&org=CISE&sel_org=CISE&from=fund

Science and Technology Centers (STCs) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5541&org=CISE&sel_org=CISE&from=fund

Sustainable Digital Data Preservation and Access Network Partners (DataNet) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503141&org=CISE&sel_org=CISE&from=fund

Education and Workforce Development Programs

ADVANCE: Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5383&from=fund

Advanced Technological Education (ATE) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5464

Broadening Participation in Computing (BPC), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13510&org=NSF&sel_org=NSF&from=fund

Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13655&org=EHR&sel_org=EHR&from=fund

Developing Global Scientists and Engineers [International Research Experiences for Students (IRES) and Doctoral Dissertation Enhancement Projects (DDEP)] http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12831&org=CISE&sel_org=CISE&from=fund

Discovery Research K-12 (DR-K12) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047&org=EHR&sel_org=EHR&from=fund

Federal Cyber Service: Scholarship for Service (SFS) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5228

Graduate Research Fellowships (GRF), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=6201&org=DGE&from=home

Integrative Graduate Education and Research Training (IGERT), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12759

International Research Fellowship Program (IRFP) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5179&org=CISE&sel_org=CISE&from=fund

Information Technology Experiences for Students and Teachers (ITEST) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5467&org=EHR&sel_org=EHR&from=fund

NSF Graduate Teaching Fellows in K-12 Education (GK-12), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5472&from=fund

NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5257&org=EHR&sel_org=EHR&from=fund

Research Experiences for Undergraduates (REU) Sites and Supplements, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&from=fund

Science, Technology, Engineering, and Mathematics Talent Expansion Program (STEP), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5488&org=EHR&sel_org=EHR&from=fund

Transforming Undergraduate Education in Science (TUES), <http://www.nsf.gov/pubs/2010/nsf10544/nsf10544.htm>

Research Infrastructure Programs

Computing Research Infrastructure (CRI), http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=12810&org=NSF&sel_org=NSF&from=fund

EPSCoR Research Infrastructure Improvement Grant Program http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5672&org=CISE&sel_org=CISE&from=fund

Major Research Infrastructure (MRI), <http://www.nsf.gov/od/oiia/programs/mri/>

For more information on these programs, please consult the NSF web site.

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 40,000 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 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:

Suzanne H. Plimpton
Reports Clearance Officer
Division of Administrative Services
National Science Foundation
Arlington, VA 22230

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