Software Development for Cyberinfrastructure (SDCI)

PROGRAM SOLICITATION
NSF 10-508

REPLACES DOCUMENT(S):
NSF 07-503

ınal Science Foundation

Office of Cyberinfrastructure

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

February 26, 2010

REVISION NOTES

Please be advised that the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG) includes revised guidelines to implement the mentoring provisions of the America COMPETES Act (ACA) (Pub. L. No. 110-69, Aug. 9, 2007.) As specified in the ACA, each proposal that requests funding to support postdoctoral researchers must include a description of the mentoring activities that will be provided for such individuals. Proposals that do not comply with this requirement will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II for further information about the implementation of this new requirement).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Software Development for Cyberinfrastructure (SDCI)

Synopsis of Program:

The purpose of the Software Development for Cyberinfrastructure (SDCI) program is to develop, deploy, and sustain a set of reusable and expandable software components and systems that benefit a broad set of science and engineering applications. SDCI is a continuation of the NSF Middleware Initiative (NMI) in an expanded context appropriate to the current expanded vision of cyberinfrastructure.

This program supports software development across five major software areas: system software and tools for High Performance Computing (HPC) environments; software promoting NSF's strategic vision for digital data; network software to support distributed software, software in the form of middleware capabilities and services, and cybersecurity. SDCI funds software activities for enhancing scientific productivity and for facilitating research and education collaborations through sharing of data, instruments, and computing and storage resources. The program requires open source software development.

Cognizant Program Officer(s):

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

- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 25 to 30 (5 - 10 estimated awards for each software area: HPC, Data, Broadband and Networking, Middleware, and Cybersecurity)

Anticipated Funding Amount: $15,000,000 over three years for awards made via this solicitation, subject to availability of funds.

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 be the PI, co-PI, or senior personnel in no more than two proposals that respond to this solicitation.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information

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

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

  February 26, 2010

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

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

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I. INTRODUCTION

Software permeates cyberinfrastructure. Fully functional and performing software is essential to realizing the promises of cyberinfrastructure to transform the ways in which scientific research and education are conducted. NSF's Cyberinfrastructure Vision for 21st Century Discovery (see http://www.nsf.gov/dir/index.jsp?org=OCI) conveys a vision, a mission, and a set of principles predicated on NSF's leadership role in the development and support of a comprehensive cyberinfrastructure essential to 21st century advances in science and engineering research and education. Among NSF's goals and strategies laid out in this vision document are a set of software centric directives:

- Support the development and maintenance of robust systems software, programming tools, and programming environments needed to close the growing gap between peak performance and sustained performance on actual research codes, and to make the use of HPC systems, as well as novel architectures, more productive and more accessible.
- Support state-of-the-art software innovation in data management and distribution systems, including digital libraries, repositories and archives, as well as educational environments that are expected to contribute to many of the scientific breakthroughs of the 21st century.
- Support the continued development, expansion, hardening, and maintenance of end-to-end software systems – user interfaces, data management, analysis and visualization tools, collaborative tools, network and broadband software, cybersecurity, and other software integrated into complete science and engineering systems and organizations via middleware – to bring the full power of a national cyberinfrastructure to communities of scientists and engineers.

In addition, today's software and tools must be developed to be sustainable, self-managing, and energy efficient. Sustainable software includes support for processes of software design, development, deployment, and evolution beyond the use of any single group, community, or platform. Self-Managing software is designed to insulate users from increasing system/application complexity, and includes monitoring, performance management, configuration and patch management, and change/problem management. And energy efficient software considers support to conserve power/energy within applications. These tenets form the basis for NSF's program in Software Development for Cyberinfrastructure (SDCI) and cut across the **five software focus areas for SDCI**: software for HPC systems; software for digital data management; software for broadband and networking; middleware; and cybersecurity.

Each proposal should clearly identify and justify the software focus area to which it is being submitted, as described in the proposal preparation instructions.

II. PROGRAM DESCRIPTION

The FY2010 SDCI solicitation supports the development, deployment, and maintenance of software in the five software focus area listed above, i.e., software for HPC systems, software for digital data management, software for networking, middleware, and cybersecurity, and specifically focuses on cross-cutting issues of CI software sustainability, manageability and power/energy efficiency in each of these software focus areas.

1. **Cross Cutting Issues**

   Each proposal should explicitly address one or more of the three cross cutting issues of sustainability, self-manageability, and/or energy efficiency as part of their software approach.

   CI Software Sustainability: CI software systems must be engineered with long-term sustainability in mind, notwithstanding the unique requirements due to their complexity, the nature of the applications and supported user communities, and the complexity of the systems they target. Software sustainability should focus on models and processes for software design, development, and testing/validation, reengineering or extension of existing systems to support sustainability, and support for transitioning to community-wide sustainability.

   CI Software Self-Manageability: CI software systems must be designed so that the end user is insulated from the complexities and failures of applications, platforms, and cross-platform interactions. CI software self-manageability should focus on the practice of making CI software systems able to optimize,(re-) configure, and heal, and incorporate capabilities such as monitoring, performance management, security management, and configuration/patch management to self-manage through failures and performance changes.

   CI Software Power/Energy Efficiency: Energy efficiency of the computing ecosystem is becoming a critical concern in terms of rising operating costs, increasing system failure rates, and environmental impact, and as such must be addressed at the software and applications level. CI software power/energy management should focus on

mechanisms to support aggressive application/system-aware management that can be integrated in the CI software systems for use by applications, possibly including effective manipulation of processor or virtual machine level controls.

2. **Software Focus Areas**

All software supported by the FY2010 SDCI solicitation is meant to support multiple application domains and large-scale end user communities. Use of privous SDCI and Strategic Technologies for CyberInfrastructure (STCI) software is strongly is encouraged. The five software focus areas of this announcement are described below:

A. **High Performance Computing (HPC) Software**

The HPC focus area involves the development of software tools and systems designed to provide improvements in ease of use, improved performance, and insight into how applications are utilizing the high-end resource. Any tools or approaches must be sensitive to the tens-of-thousands to hundreds-of-thousands of components expected to exist in petascale and near-petascale HPC systems. Tools should address deep-memory hierarchies, multi-core architectures, and heterogeneous/hybrid systems, and ideally be architecture agnostic.

Specific focus areas in Software for HPC Systems for the FY2010 SDCI solicitation include:

- **Debugging:** Innovative debugging solutions with a focus on debugging for tens-of-thousands to hundreds-of-thousands cores and threads.
- **Fault Tolerance:** Novel solutions/approaches, ideally architecture agnostic, to fault-tolerance that scales to tens-of-thousands of components.
- **Performance Tuning:** Tools/approaches to would assist the application developer in understanding and providing insight into existing bottlenecks, evaluate design tradeoffs, and explore parameters values to exploit the benefits of new generation architectures.
- **Migration** Tools to assist in the migration to new architectures and computing paradigms.

All proposals in this focus area will have titles that begin with **"SDCI HPC:".**

B. **Software for Digital Data**

The Data focus area addresses software that promotes acquisition, transport, discovery, access, analysis, and preservation of very large-scale digital data in support of large scale applications or data sets transitioning to use by communities other than the ones that originally gathered the data. Examples of such datasets includes climatologic, ecologic, phonologic, observation data, sensor systems, spatial visualizations, multi-dimensional datasets correlated with metadata and so forth.

Specific focus areas in Software for Digital Data for the FY2010 SDCI solicitation include:

- **Documentation/Metadata:** Tools for automated/facilitated metadata creation/acquisition, including linking data and metadata to assist in curation efforts; tools to enable the creation and application of ontologies, semantic discovery, assessment, comparison, and integration of new composite ontologies.
- **Security/Protection:** Tools for data authentication, tiered/layered access systems for data confidentiality/privacy protection, replication tools to ensure data protection across varied storage systems/strategies, rules-based data security management tools, and assurance tools to test for digital forgery and privacy violations.
- **Data transport/management:** Tools to enable acquisition of high data rate high volume data from varied, distributed data sources (including sensors systems and instruments), while addressing stringent space and data quality constraints; tools to assist in improved low-level management of data and transport to take better advantage of limited bandwidth.
- **Data analytics and visualization:** Tools that operate in (near) real-time, not traditional batch mode, on possible streaming data, in-transit data processing, data integration and fusion.

All proposals in this area will have titles that start with **"SDCI Data:"**.

C. **Broadband and Network Software**

The Network Software area focuses on supporting use of the network substrate to support distributed applications. Target areas of relevance for the SDCI FY2010 solicitation are:

- **End-to-end performance**: Tools to assist in increasing the performance of an application down to the desk top, including increasing desktop performance with a major computational resource such as a supercomputer, cloud, data center, etc.
- **Broadband or network infrastructure experimentation tools**: Software to identify or provide new capabilities for specific domain applications and research. Network experiment tools should improve a set of discipline applications, improve work flows, support greater throughput, decrease response time, support real-time applications across a campus, use of broadband networks, etc.
- **Testing of experimental networks and applications** that bridge multiple network layers to support next generation science requirements for a specific domain application or to support major collaborations such as NEON, NEES, iPLant, OOI, etc.
- **Data and computation co-allocation**: Tools to support resource co-allocation between data and computation or networking at a low level, including real time and soft real time QoS guarantees, pervasive remote monitoring and access and human-in-the-loop interactions, etc.

All proposals in this area will have titles that start with **"SDCI Net:"**.

D. **Middleware**

Focus areas in middleware, each mapped to software elements of cyber-services and virtual organizations in NSF's strategic vision, for the FY2010 SDCI solicitation include:

- **Instrument Access:** Middleware tools and components supporting remote instruments as first class members of cyberinfrastructure, including sensor/instrument data integration.
- **System Monitoring/Management/Testing:** Middleware for monitoring and management of integrated systems and networks, and systems for testing code used in distributed environments.
- **User Interfaces and Accessibility:** Middleware to improve access to, and usability of, distributed environments (including but not limited to large-scale remote computing resources) based on portal, gateway, or other technologies.
- **Bridging technologies:** Tools and middleware to support application use to bridge between campus, regional, and national-scale infrastructures.

Proposals in this area will have titles that begin with **"SDCI NMI:"**.

E. **Cybersecurity**

A fundamental and essential component of cybersecurity is the ability to provide and manage an identity authentication and authorization infrastructure to support CI-based science, engineering and education. To help advance this basic component of cybersecurity, the FY10 SDCI solicitation will support proposals that help advance a scalable identity management system and trust fabric to enable desktop applications to gain access to campus, national and collective scientific resources.

The identity infrastructure must be scalable and be able address a wide breadth of communities and disciplines. The identity infrastructure should, for example, enable virtual organizations to easily create and distribute permissions for use in scientific and scholarly access control; should address significant issues in the development and implementation of policies including training; should focus on improving the state of the practice by introducing state of the art as well as providing higher and more secure approaches such as a two-factor authentication and authorization; must scale to support campus to campus interactions, as well as campus to facility and international partnerships.

All proposed approaches and systems must partner with one or more research communities or projects that will deploy the proposed identity system to support their research and collaboration, preferably across several different scientific domains. The identity infrastructure and trust fabric must be coherent and integrated, and proposals are requested to describe how they fit into or relate to existing elements of the national and international activities in this area.

Proposals in this area will have titles that begin with **"SDCI Sec:"**.

3. **Proposal Categories: (A) New Development and (B) Improvement and Support**

In addition to the software focus areas, each proposal will be categorized as (A) New Development or (B) Improvement and Support.

A. **New Development**

Creation of a new software tool either from scratch or loosely derived from a pre-existing code base will be considered New Development. All proposals for development of new software may not exceed $500,000 per year in requested funds.

Proposals for new development are expected to cite any related and existing software tools and components with similar functionality, and make a compelling case for the need for this new development work in that context.

Proposals addressing new development will have titles that also include the word "New".

B. **Software Improvement and Support**

NSF recognizes the need to also support the improvement and support of existing software with a tangible user base among the NSF community. Projects in this category are of sufficient size and complexity that funding requirements may not exceed $1 million per year. Work must focus on community-driven enhancements that are documented by user requirements and applied to existing deployed software and services. Maintenance and support functions related to the software system are also relevant for award activities. Such projects address the improvement of software with a track record of production use and impact on domain sciences and engineering.

Proposals addressing improvement and support of existing software will have titles that also include the word "Improvement".

4. **Requirements for All SDCI Proposals**

Across all software focus areas, common requirements for SDCI proposals include:

- Identification of the software focus area and proposal category in the title of the proposal.
- Support for at least one cross-cutting issue (software sustainability, software self-manageability, or software energy efficiency) to underscore the proposed approach throughout the project narrative.
- Identification of multiple application areas in science or engineering where the software is needed, a description of the value of the work in the context of a missing capability required by the domain fields, and specific examples of how the use of the tool will have an impact on science and engineering research.
- A clear description of how the proposed approach compares to alternative or existing approaches (including other commercial and research solutions). Proposals that could be supported by other programs at NSF or at other agencies should be submitted to those programs, and possibly related programs should be explicitly identified and reasoned as to why the proposal is not appropriate for those opportunities. Investigators are encouraged to contact the program with questions about appropriateness for this program prior to sending in a proposal.
- An explicit outreach and education plan to allow additional end user groups to take advantage of the proposed work.

- An explicit description of the engineering process used for the design, development, and release of the software, its deployments and associated outreach to the end user community, its interoperability with widely use tools by the community, and an evaluation plan that involves end users. Use of the NMI Build and Test services, or an NSF designated alternative, to support their software development and testing. Details of the NMI Build and Test facility can be found at http://nmi.cs.wisc.edu/.
- The project plan must include milestones with releases of the key software components within the first twelve months (for two-year awards) or 18 months (for three-year awards).
- A list of tangible metrics to be used to measure the success of the software developed, with end user involvement, especially the quantitative and qualitative definition of "working prototype" against which that milestone will be judged, and the steps necessary to take the software from prototype status to production use.
- A compelling discussion of the software's potential use by broader communities, preferably via use cases developed in concert with relevant domain scientists.
- A sustainability plan beyond the lifetime of the award.
- Identification of the open source license to be used.

Strong preference will be shown for efforts that provide near-term benefit to a broad user base in the NSF community.

See Section V, Proposal Preparation and Submission Instructions, for further guidance on preparing proposals.

III. AWARD INFORMATION

The SDCI program will fund software development projects at $50,000 - $1,000,000 per year for 2 - 3 years as standard or continuing grants, subject to award conditions described in the solicitation. Proposals for development of new software may not exceed $500,000 per year in requested funds. Proposals for software improvement and support may not exceed $1,000,000 per year in requested funds.

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 be the PI, co-PI, or senior personnel in no more than two proposals that respond to this solicitation.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions: Proposals submitted in response to this program solicitation should be prepared and submitted in accordance with the guidelines specified 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-PUBS (7827) or by e-mail from nsfpubs@nsf.gov.

This information supplements guidance in the GPG.

Proposal Titles

Proposals must identify the focus area in the title. HPC software related proposal titles must start with "SDCI HPC:" The titles of data related software proposals must start with "SDCI Data:". Broadband and Network software proposals must start with "SDCI Net:". Middleware related proposal titles must start with "SDCI NMI:". Cybersecurity related proposal titles must start with "SDCI Sec:".

If the proposal targets creation of new software, the title must be appended with "New". For example, a proposal to create a new multithreaded debugger for HPC systems might be titled, "SDCI HPC New: the MT-DEBUG Debugging System".

If the proposal targets improvement and maintenance of an existing software tool or system, the title must be appended with "Improvement". For example, a proposal to enhance an existing and popular software system called Grid Virtual Widgets might be titled, "SDCI NMI Improvement: the Grid Virtual Widget System".

Budget

Follow the instructions in the GPG for preparing the budget. The budget must include costs for attendance by one or more project personnel at an annual PI meeting to be held at the NSF facility in Arlington, VA.

Additional Criteria to Address for New Software Development Proposals

Projects in the New Development category should address the following criteria:

- The extent to which the value of the work is described in the context of a missing capability required by science and engineering, and potential impact of the missing capability across a broader segment of the NSF community.
- Clarity in a comparison of the proposed approach to alternative or existing approaches (including other commercial and research solutions).
- A project plan including a proof-of-concept demonstration of the key software components within the first 12 to 24 months.
- Tangible metrics described to measure the success of the software developed, and the steps necessary to take the software from prototype status to production use.
- Extent to which the cross cutting areas of sustainability, self-management, and energy efficiency are addressed and integrated into the proposed software system.
- Plan to extend work to additional user communities.

Additional Criteria to Address for Software Improvement and Support Proposals

Projects in the Improvement and Support category should address the following criteria:

- The extent to which the existing software system is already deployed and used by the NSF research and education community.
- Clarity in the description of proposed enhancements and their relation to identified user requirements moving forward.
- If appropriate, justification for proposed resources needed to support and maintain the existing code base.
- A project plan and WBS including user interaction, community-driven approach, and a timeline of new feature releases.

All proposals should include the following sections as **Required Supplementary Documents**:

- A Post-Doc Mentoring Plan if post-docs will be supported;
- A list of all organizations involved in the project;
- A **single**, alphabetically ordered list of all people, in the academic or professional community, who have collaborated with (within the last 48 months), or have been a Ph.D. advisee or advisor of, any of the personnel involved in the proposed project. In this list, please include, next to the name of each conflicted individual, that individual's institution or company and the name of the project member with whom he or she has the conflict of interest. This should be a combined list from all the bio-sketches of all the PIs, co-PIs and senior personnel. For example:

  Doe, John Northern University PI Anna Smith (co-author)

  Fawn, Henry Southern University PI Joe Jones (PhD advisor)

  Stag, Martha Eastern University PI Anna Smith (co-author)

- Letters of commitment from individuals who are from organizations (other than the proposing organization or proposed sub-awardees) who are described in the Project Description as involved in the project in a senior capacity, or from authorized representatives of institutions or organizations collaborating with the lead institution.
- The total number of letters (including letters of commitment) from third parties is limited to eight.
- Inclusion of additional supplementary materials (appendixes, etc.) will be allowed only after discussion with a relevant program officer.

Improvement project proposals should include the following section as **Required Supplementary Documents**:

- A Work Breakdown Structure (WBS), including release dates of the software.

Refer to Section II, Program Description, for additional information about requirements for all SDCI proposals.

Proposers are reminded to identify the program solicitation number (NSF 10-508) 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.

B. Budgetary Information

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

C. Due Dates

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

  February 26, 2010

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this program solicitation through use of the NSF FastLane system. Detailed instructions regarding the technical aspects of proposal preparation and submission via FastLane are available at: http://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.

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:

Projects in the New Development category will be evaluated with careful attention to the following:

- The extent to which the value of the work is described in the context of a missing capability required by science and engineering, and potential impact of the missing capability across a broader segment of the NSF community.
- Clarity in a comparison of the proposed approach to alternative or existing approaches (including other commercial and research solutions).
- A project plan including a proof-of-concept demonstration of the key software components within the first 12 to 24 months.
- Tangible metrics described to measure the success of the software developed, and the steps necessary to take the software from prototype status to production use.
- The inclusion of all components described in Section II.4 Requirments for All SDCI Proposals.

Projects in the Improvement and Support category will be evaluated with careful attention to the following:

- The extent to which the existing software system is already deployed and used by the NSF research and education community.
- Clarity in the description of proposed enhancements and their relation to identified user requirements moving forward.
- If appropriate, justification for proposed resources needed to support and maintain the existing code base.

A project plan including user interaction, community-driven approach, and a timeline of new feature releases.
- Tangible metrics described to measure the success of the software developed and supported.
- The degree to which the proposal enhances the robustness and usability of the software.
- The inclusion of all components described in Section II.4 Requirments for All SDCI Proposals

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.

Special Award Conditions:

All awards made in the SDCI solicitation will be subject to the following conditions:

- For two-year awards, NSF requires a working prototype to be successfully demonstrated before the 12 month mark of award activities, and the software's open source license to be listed by the Open Source Initiative (see www.opensource.org) as an approved open source license. Where applicable, these milestones must be documented in the Year 1 Annual report before Year 2 spending is authorized.
- For three-year awards, NSF requires a working prototype to be successfully demonstrated before the 18 month mark of award activities, and the software's open source license to be listed by the Open Source Initiative (see www.opensource.org) as an approved open source license. Where applicable, these milestones must be documented in the Year 2 Annual report before Year 3 spending is authorized.
- All awards are required to use NMI Build and Test services, or an NSF designated alternative, to support their software development and testing. Details of the NMI Build and Test facility can be found at http://nmi.cs.wisc.edu/.
- Awardees are expected to participate in an Annual PI meeting with travel costs supported by the award.

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.

Failure to provide the required annual or final project reports 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 following additional reporting requirements apply to awards made in SDCI:

For two-year awards, NSF requires a working prototype to be successfully demonstrated before the 12 month mark of award activities, and the software's open source license to be listed by the Open Source Initiative (see www.opensource.org) as an approved open source license. Where applicable, these milestones must be documented in the Year 1 Annual report before Year 2 spending is authorized.

For three-year awards, NSF requires a working prototype to be successfully demonstrated before the 18 month mark of award activities, and the software's open source license to be listed by the Open Source Initiative (see www.opensource.org) as an approved open source license. Where applicable, these milestones must be documented in the Year 2 Annual report before Year 3 spending is authorized.

All awards are required to show end user interactions, including education and outreach to new communities, within the first 12 months of the award activities.

All awards are required to use NMI Build and Test services, or an NSF designated alternative, to support their software development and testing within the first 12 months of award activities, and to document that process in the 1st year annual report. Details of the NMI Build and Test facility can be found at http://nmi.cs.wisc.edu/.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Jennifer Schopf, telephone: (703) 292-8970, email: sdci@nsf.gov
- Alan Blatecky, telephone: (703) 292-8970, email: sdci@nsf.gov
- Manish Parashar, telephone: (703) 292-8970, email: sdci@nsf.gov
- Phil Bogden, telephone: (703) 292-8970, email: sdci@nsf.gov
- Mimi McClure, telephone: (703) 292-8970, email: sdci@nsf.gov

For questions related to the use of FastLane, contact:

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

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
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