Theoretical Foundations 2006 (TF06)

Program Solicitation

NSF 06-542
***Replaces Document* NSF 05-500**

National Science Foundation
Directorate for Computer and Information Science and Engineering
Division of Computing & Communication Foundations

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

May 25, 2006

REVISIONS AND UPDATES

In furtherance of the President's Management Agenda, in Fiscal Year 2006, NSF has identified programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals, or will require that proposers utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online. A complete listing of these programs is available on the Policy Office website at: http://www.nsf.gov/bfa/dias/policy.

In response to this program solicitation, proposers may opt to submit proposals via Grants.gov or via the NSF FastLane system. In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

A. Collaborative Proposals. All collaborative proposals must be submitted via the NSF FastLane system. This includes collaborative proposals submitted:

- by one organization (and which include one or more subawards); or
- as separate submissions from multiple organizations.

Proposers are advised that collaborative proposals submitted in response to this Program Solicitation via Grants.gov will be requested to be withdrawn and proposers will need to resubmit these proposals via the FastLane system. (Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.)

B. All Other Types of Proposals That Contain Subawards. All other types of proposals that contain one or more subawards also must be submitted via the NSF FastLane system.

The following items are major revisions to the previous program solicitation:

- “Scientific Foundations for Computing” area has been updated;
- “Scientific Foundations for Communication” area has been updated; and
- A third research area – Scientific Foundations for Internet’s Next Generation (SING) -- has been added.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Theoretical Foundations 2006 (TF06)
Program Solicitation

Synopsis of Program:

One of the defining features of the new CISE organization is the introduction of *clusters*; cohesive units formed by combining several (partial) programs that share a common theme and/or have significant overlap. Theoretical Foundations (TF) is a cluster within the Computing and Communications Foundation (CCF) division of CISE. Projects supported in the TF cluster address fundamental issues of information science and technology, both within Computation and Communication, and also at the interface between these, and other disciplines. A new focus this year highlights research efforts for the Internet's next generation, part of the NSF/CISE initiative for the new Internet. The cluster encompasses the research areas covered by the former programs: communications research, numeric symbolic graphic computation, signal processing, and theory of computing. For the foreseeable future, TF will continue to encourage the submission of proposals from the research communities that were served formerly by these programs.

The TF cluster is broadly concerned with problems of information processing that fall between the extremes of purely theoretical studies and of applications within a discipline. Projects sponsored by the cluster advance the foundations of computer science, communication theory, signal processing theory, scientific computing, mathematics, and application areas, and some will apply core theory to fundamental problems throughout science and engineering. Investigators are encouraged to formulate high impact proposals that depart from traditional problem definitions. Proposals should address one or more of the areas described in the body of this solicitation: Scientific Foundations of Computing; Scientific Foundations of Communication; a new focus, Scientific Foundations for the Internet's Next Generation (SING). The cluster encourages investigators to include in their proposals innovative curricula or educational materials to help advance the training of new experts in theoretical foundations of computing and communication.

Cognizant Program Officer(s):

- Sirin Tekinay, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: stekinay@nsf.gov
- John H. Cozzens, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: jcozzens@nsf.gov
- William Steiger, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: wsteiger@nsf.gov
- Kathleen M. O'Hara, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1025 N, telephone: (703) 292-8491, email: kohara@nsf.gov
- Robert B. Grafton, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1114 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: rgrafton@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering

Eligibility Information

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** An investigator may participate as PI, co-PI or Senior Personnel in at most one proposal in response to this solicitation.
- **Limit on Number of Proposals:** There is no limit on the number of proposals an organization may submit. An investigator may participate as PI, co-PI or Senior Personnel in at most one proposal in response to this solicitation.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 80 to 120 - ranging from $70K/year to $500K/year
- **Anticipated Funding Amount:** $42,000,000 in fiscal years 2006 through 2008, pending the availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:**
  - **Full proposals submitted via FastLane:**
    - Grant Proposal Guide (GPG) Guidelines apply
  - **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/bfa/dias/policy/docs/grantsgovguide.pdf) To obtain copies of the Application Guide and Application Forms Package: click on the Apply tab on the Grants.gov website, 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.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Not Applicable.

C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. submitter's local time):
  May 25, 2006

Proposal Review Information

- **Merit Review Criteria:** National Science Board approved criteria apply.

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

TABLE OF CONTENTS

I. INTRODUCTION

The Theoretical Foundations cluster is broadly concerned with problems of information processing that fall between the extremes of purely theoretical studies and of applications within a discipline. Projects sponsored by the cluster advance the foundations of computer science, communication theory, signal processing theory, scientific computing, mathematics, and application areas, and some will apply core theory to fundamental problems throughout science and engineering. Investigators are encouraged to formulate high impact proposals that depart from traditional problem definitions. Proposals should address one or more of the areas described in the body of this solicitation: Scientific Foundations for Computing; Scientific Foundations for Communication; and a new focus, Scientific Foundations for Internet's Next Generation (SING). The cluster encourages investigators to include in their proposals innovative curricula or educational materials to help advance the training of new experts in theoretical foundations of computing and communication.

Focus areas are formulated to embrace the traditional research topics that have been funded within the cluster, as well as to initiate and sustain research and education activities in promising new areas. TF encourages multi-disciplinary collaborations, particularly among research teams who typically have not worked together. Proposals should contribute towards core theory, fundamental algorithms, and applications in these areas.

II. PROGRAM DESCRIPTION

Theoretical Foundations (TF) will fund research projects that belong to one or more of the three areas described below. The cluster encourages proposals that transcend the confines of each of the areas elaborated.

Scientific Foundations for Computing

This field is concerned with the understanding of all computational phenomena, both natural and man-made. It focuses on mathematical modeling of computational processes, and studies the resources that are intrinsically required for solving natural problems. Topics of interest include:

- *Core theory:* models of computations; their interrelations, and their and power and limitations. Computational complexity, randomness and de-randomization, cryptography and security, coding and fault-tolerant systems. Computational learning. Various forms of computing such as distributed, interactive, online, quantum computing. Complexity of proofs.
- *Fundamental algorithms:* seeking efficient, general algorithmic techniques and paradigms that may transcend application domains. Algorithmic and computational approaches i) for Computer Science including optimization and approximation, graphs and networks, large data sets, vision and other geometric reasoning, databases, verification and other logical reasoning, Artificial Intelligence (AI) and machine learning, reactive systems, high-end computing),

ii) for Mathematics including geometry, topology, algebra, number theory, combinatorics and other branches of mathematics, iii) for symbolic, numerical, and other scientific computing, and for engineering domains. In all cases the relevant models may include sequential, parallel, distributed, probabilistic, average-case, on-line and others.
- *Applications:* seeking theory, methods, and models for the computational processes that occur in Science and Engineering; for example in Biology, the generation and function of proteins, modeling the immune system, the cellular system, other systems; in Physics, statistical mechanical systems, cosmology, particle science; in Economics, the study of equilibria, especially in context of computationally bounded players, in contexts such as auctions and mechanism design, social rules, ecological models; in Neurology, the study of the brain, neural systems, cognition; in Computer Science, applications including graphics and visualization. The unifying idea is that algorithms and computation provide a viewpoint for approaching problems in diverse areas.

Also encouraged are interdisciplinary projects with other parts of CISE and with other sciences, as well as experimental studies aimed at improving the foundational understanding.

Scientific Foundations for Communication

This area seeks advances in theory and techniques, as well as supporting software and hardware, for the acquisition and processing of digital and analog information, and for the efficient representation, transmission and reception of digital and analog information over a variety of channels (e.g. wireline, mobile multi-antenna wireless, optical, and biological channels.) Topics of interest include:

- *Core theory:* contributions in communication theory, information theory. Impact of mobility, and traffic. Capacity and performance of communication networks, especially of ad hoc networks. Detection and estimation. Network coding, multiuser coding, source and channel coding. Modern modulation and coding techniques exploiting the time, frequency and spatial dimensions of channels. Statistical signal and array processing. Image and multi-dimensional digital signal processing. Collaborative signal processing. Cryptography.
- *Fundamental algorithms:* including signal compression for reduced data rates, scalable/ progressive/ multiresolution approaches in signal decomposition; compression, and other signal processing techniques to support content analysis. Multicast, broadcast, geocast techniques. Communication algorithms working across network layers.
- *Applications:* including multimedia signal processing. Wireless communications. Efficient transceiver design. Personal communications systems. Local area networks and ad hoc networks. Optical communications, and hybrid systems. Information hiding and steganography. Multi-sensory input to the wireless and mobile communication systems. Distributed sensor systems and networks. Cooperative communication applications.

Fundamental research efforts should aim at re-defining the reference framework for communications, in addition to cross layer research.

Scientific Foundations for Internet's Next Generation (SING)

This area merges elements of the theoretical foundations of computing, communications, and signal processing into a foundation for a clean-slate redesign of the Internet (http://www.nsf.gov/cise/geni/). Though the goal of redesign is to increase security, mobility, location cognition, power efficiency, and other desirable network properties, foundational studies should transcend these. Investigations could provide insight into the interaction between massive scales and individual self-interest, into subnetwork autonomy, into failure models, into distributed control, and into other topics. Formal models, definitions of computational cost, complexity classes, mathematical specifications for communications, and methods for validation of system behavior are all needed.

Wireless technology is expected to play a bigger and more fundamental role in the new Internet than it has to date. Looking forward into the next few years, with optical and wireless communications dominating the Internet, signal processing "at the interface" to the glass wire will become crucial in addressing the potential bottleneck. Speech and vision will become widely available thanks to new sensors.

SING is expected to challenge the well-established theories and break barriers between research communities, by changing the input-output orders in traditional reference framework of computing and communications systems.

In summary, with SING we envision broader research on:

- *Core theory:* expanding existing theory and formulating a new framework. Considering the temporal and spatial distribution of information and power. Ties to physical, biological, and social sciences; e.g., investigating relationships to theoretical foundations of social computing, economic theory, game theory, computational biology, quantum information theory. Theory for Computing and learning with mobile information sources. Establishing the role of location from spatial behavior of propagation to "place."
- *Fundamental algorithms:* such as cooperative communications. Scalability, complexity, and interactivity problems.

Security. Adaptive compression. Signal processing techniques to support content analysis. Power aware processing. Tradeoffs between communication and computation and storage. Models for mobility enhanced information dissemination. Search and information retrieval, complex queries, full text search. Peer-to-peer communications. Auctions. Manipulating massive data sets. Algorithmic distributed mechanism design and distributed control. Quality of service driven mobility.

- *Applications:* wireless communications; mobile and sensor networks, ad hoc networks; smart displays. Signal processing, computing, and communications techniques enabling pervasive computing and communication environments.

III. ELIGIBILITY INFORMATION

The categories of proposers identified in the Grant Proposal Guide are eligible to submit proposals under this program announcement/solicitation.

An investigator may participate as PI, co-PI or Senior Personnel in at most one proposal each calendar year in response to this solicitation. There is no limit on the number of proposals an organization may submit.

IV. AWARD INFORMATION

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

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 80 to 120 - ranging from $70K/year to $500K/year
- **Anticipated Funding Amount:** $42,000,000 in fiscal years 2006 through 2008, pending the availability of funds

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

In furtherance of the President's Management Agenda, in Fiscal Year 2006, NSF has identified programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online.

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

- Proposals submitted via the FastLane system:

  Proposals submitted in response to this Program Solicitation via FastLane 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 pubs@nsf.gov.

- 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/bfa/dias/policy/docs/

grantsgovguide.pdf). 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, i.e., the Program Solicitation Number, 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 pubs@nsf.gov.

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- by one organization (and which includes one or more subawards); or
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Proposers are advised that collaborative proposals submitted in response to this Program Solicitation via Grants.gov will be requested to be withdrawn and proposers will need to resubmit these proposals via the NSF FastLane system. (Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.)

B. All Other Types of Proposals That Contain Subawards. All other types of proposals that contain one or more subawards also must be submitted via the NSF Fastlane system. (Chapter II, Section C.2.g.(vi)(e) of the Grant Proposal Guide provides additional information on subawards.)

B. Budgetary Information

Cost Sharing:

Cost sharing is not required by NSF in proposals submitted under this Program Solicitation.

C. Due Dates

Proposals must be submitted by the following date(s):

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

May 25, 2006

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions for proposal 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 solicitation.

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. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: http://www.fastlane.nsf.gov/

- **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. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: http://www.grants.gov/CustomerSupport. 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. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 (NSB 97-72). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued Important Notice 127, Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the Grant Proposal Guide Chapter III.A for further information). 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 he/she is qualified to make judgments.

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 and original 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?

NSF staff 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.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Ad Hoc 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.

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 Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. The interval ends when the Division Director accepts the Program Officer's recommendation.

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 Division 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.A. 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 (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

Consistent with the requirements of OMB Circular A-16, *Coordination of Geographic Information and Related Spatial Data Activities*, and the Federal Geographic Data Committee, all NSF awards that result in relevant geospatial data must be submitted to Geospatial One-Stop in accordance with the guidelines provided at: www.geodata.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpm. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at http://www.gpo.gov/.

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

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. 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. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, 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.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Sirin Tekinay, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: stekinay@nsf.gov
- John H. Cozzens, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: jcozzens@nsf.gov
- William Steiger, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: wsteiger@nsf.gov
- Kathleen M. O'Hara, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1025 N, telephone: (703) 292-8491, email: kohara@nsf.gov
- Robert B. Grafton, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1114 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: rgrafton@nsf.gov

The primary contacts for the three components are:

- Scientific Foundations for Communication: John Cozzens; Sirin Tekinay
- Scientific Foundations for Computing: Robert Grafton; Kathleen O'Hara; William Steiger
- Scientific Foundations for Internet's Next Generation (SING): Kathleen O'Hara; William Steiger ; Sirin Tekinay

For questions related to the use of Grants.gov, please 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

For questions related to the use of FastLane, contact:

- Tracey M. Wilkinson, Senior Program Assistant, Directorate for Computer & Information Science & Engineering, Division of Computing and Communication Foundations, 1115 N, telephone: (703) 292-8910, fax: (703) 292-9059, email: twilkins@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at http://www.nsf.gov/cgi-bin/getpub?gp. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF E-Bulletin, which is updated daily on the NSF Website at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's MyNSF News Service (http://www.nsf.gov/mynsf/) to be notified of new funding opportunities that become available.

Related Programs:

- CISE Computing Research Infrastructure (NSF 04-588)
- Networking Technology and Systems (NSF 06-516)
- Computer Systems Research (NSF 05-629)
- Cyber Trust (NSF 06-517)

Other Related Program Description

- Integrative, Hybrid & Complex Systems (PD 05-7564)

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages

women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

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