Computing in the Cloud (CiC)

PROGRAM SOLICITATION
NSF 10-550

National Science Foundation

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

Office of Cyberinfrastructure

Directorate for Biological Sciences

Directorate for Education & Human Resources
Division of Undergraduate Education
Research on Learning in Formal and Informal Settings

Directorate for Geosciences

Directorate for Mathematical & Physical Sciences

Directorate for Social, Behavioral & Economic Sciences

Letter of Intent Due Date(s) ***(required)*** (due by 5 p.m. proposer's local time)***:***

April 30, 2010

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

June 15, 2010

IMPORTANT INFORMATION AND 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:

Computing in the Cloud (CiC)

Synopsis of Program:

Cloud services represent a growing paradigm of on-demand access (as a service) to computing, data and software utilities, an abstraction of unlimited resources, and a usage-based billing model where users essentially "rent" virtual resources and pay for what they use. Underlying these cloud (infrastructure, platform, data, software, etc.) services are consolidated and virtualized data centers that provide virtual machine (VM) containers hosting computation and applications from a large numbers of distributed users. It is anticipated that cloud platforms and services will increasingly play a critical role in academic, government and industry sectors, and will thus have widespread societal impact.

NSF's goal is to provide the science and engineering communities with the opportunity to leverage highly-scalable cloud computing platforms to conduct research and education activities in cloud computing and data-intensive computing, and their applications. This solicitation specifically focuses on the use of Microsoft's Windows Azure platform as a complement to the computational platforms that NSF has made available to the research community to date.

While the main focus of the Computing in the Cloud (CiC) program is to stimulate basic and applied research in cloud computing through the Microsoft Azure platform, the potential to foster simultaneous advances in other fields of science and engineering is both recognized and encouraged.

CiC proposals may be submitted in response to this solicitation, or as supplements to existing awards, or as EAGER proposals, as described later in this solicitation.

Cognizant Program Officer(s):

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

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences
- 47.050 --- Geosciences
- 47.070 --- Computer and Information Science and Engineering
- 47.074 --- Biological Sciences
- 47.075 --- Social Behavioral and Economic Sciences
- 47.076 --- Education and Human Resources
- 47.078 --- Office of Polar Programs
- 47.079 --- Office of International Science and Engineering
- 47.080 --- Office of Cyberinfrastructure
- 47.081 --- Office of Experimental Program to Stimulate Competitive Research

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10 to 15 awards will be made in FY 2010, pending the availability of funds. Proposals may request budgets of up to $500,000 total for up to 2 years. CiC EAGER proposals may request no more than $300,000 total for up to 2 years.

Anticipated Funding Amount: $5,000,000 total in FY 2010, for CiC merit reviewed proposals, CiC EAGER proposals and CiC supplements to existing awards.

Eligibility Information

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **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

- **Letter of Intent Due Date(s) *(required)*** (due by 5 p.m. proposer's local time)*:*

  April 30, 2010

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

  June 15, 2010

Proposal Review Information Criteria

Merit Review Criteria: National Science Board approved criteria apply.

Award Administration Information

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

Reporting Requirements: Standard NSF reporting requirements apply.

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I. INTRODUCTION

Cloud services represent a growing paradigm of on-demand access (as a service) to computing, data and software utilities, an abstraction of unlimited resources, and a usage-based billing model, where users essentially "rent" virtual resources and pay for what they use. Underlying these cloud (infrastructure, platform, data, software, etc.) services are consolidated and virtualized data centers that provide virtual machine (VM) containers hosting computation and applications from a large numbers of distributed users. It is anticipated that cloud platforms and services will increasingly play a critical role in academic, government and industry sectors, and will have widespread societal impact. Accordingly, NSF is committed to providing the science and engineering communities with the opportunity to leverage highly-scalable cloud computing platforms to conduct research and education activities in cloud and data-intensive computing and their applications.

Through a Memorandum of Understanding between Microsoft Corporation and the National Science Foundation, Microsoft will provide NSF supported-researchers access to Microsoft's Windows Azure platform. This new agreement between Microsoft and NSF continues in the line of the agency's support for data-intensive and cloud computing, and demonstrates our interest in promoting government-academia-industry partnerships.

This solicitation specifically focuses on the use of Microsoft's Windows Azure platform as a complement to the computational platforms that NSF has already made available to the research community, including the cloud-based software services supported by Google and IBM, the computational platform housed at the University of Illinois at Urbana-Champaign in partnership with HP, Intel, and Yahoo, the Condor pool at Purdue University, the data-intensive Gordon system at the San Diego Supercomputing Center, and the FutureGrid research platform at Indiana University. The Windows Azure platform adds a new dimension to the capabilities provided by these existing resources.

II. PROGRAM DESCRIPTION

The Computing in the Cloud (CiC) program provides the science and engineering communities with the opportunity to leverage the Microsoft Azure computing platform to stimulate research and education advances in cloud and data-intensive computing and their applications.

Windows Azure is a platform for building scalable, multi-tiered web services and it is hosted on Microsoft's large network of data centers. It is ideally suited to host community data collections and analysis tools that can be accessed via web protocols from client devices. Azure services are built on the Windows Server operating system and they can be programmed with C, C++, C#, Python, Java, Ruby and other standard web tools. Windows Azure provides on-demand compute and storage to host, scale, and manage web applications on the Internet. Azure applications consist of one or more "Web roles", which are standard web service processes and "worker roles", which are computational and data management processes. Roles communicate by passing messages through queues or sockets. More details about the Azure architecture can be found at http://www.microsoft.com/windowsazure/.

With access to the Azure cloud computing architecture, the research community is encouraged to be creative in its use in its own right, in combination with other software, hardware, and data infrastructure, and in the development of innovative applications that can exploit it. For example, the emerging "client plus cloud" model has the potential to change the paradigm of scholarly research. Cloud computing is already changing our daily lives. Internet search has transformed our view of how information can be accessed and organized, and applications on our cell phones use cloud services to translate our current physical location to locate nearby resources. By extending the capabilities of powerful, easy-to-use desktop and mobile client applications to cloud services, it may be possible to foster new collaborative research communities and accelerate scientific discovery.

Since many data intensive science and engineering applications can potentially benefit from new cloud computing platforms, research collaborations between computer scientists and other scientists and engineers are encouraged. We invite compelling proposals addressing a broad range of research as related to cloud and data-intensive computing and their applications. Proposals should describe new, innovative use of the infrastructure for basic and applied research in cloud computing, and/or activities that probe the possibilities and fundamental limits of the computing paradigm it enables.

Research projects that benefit from the Azure Services Platform are sought in four categories: ***Foundational Research in Cloud Computing; Research in Data-Centric and Data-Intensive Computing; Computational Science and Engineering Applications;*** and ***Workforce and Education Applications***.

- ***Foundational Research in Cloud Computing***: Projects in this category should address fundamentals underlying cloud computing, as well as its evolution to a wider range of application areas and services. Examples of such areas include new computational models and programming paradigms, new programming abstractions (including models, languages, algorithms) that can accentuate cloud computing capabilities, models for trust, security and privacy, new ways to deliver content from the cloud to mobile devices, new design patterns and protocols for client plus cloud applications, new ways to use the cloud as a collaboration tool, and innovations in the social, legal and economic aspects of cloud. We seek creative proposals that will broaden access to advanced computational and data analysis capabilities to those scholars who consider traditional supercomputers and cluster computers inappropriate or simply out of reach.
- ***Research in Data-Centric and Data-Intensive Computing***: Ultra-large-scale data processing applications powered by massively-scaled highly distributed computing resources are critical in many industry sectors including healthcare, financial, on-line retailing, and search service providers. In addition to the widespread societal impact of data-intensive computing, this computational paradigm also promises significant opportunities to stimulate advances in science and engineering research, where large digital data collections are increasingly prevalent and need powerful paradigms and platforms and tools for analysis and visualization. Further, the possibility for significant discovery by interconnecting different data sources is extraordinarily appealing. In data-intensive computing, the sheer volume of data is the dominant performance determinant. The collocation of storage and computation enables large-scale parallelism over terabytes of data. This scale of computing supports applications specified in high-level programming primitives, where the run-time system manages parallelism and data access. Supporting architectures must be extremely fault-tolerant and exhibit high degrees of reliability and availability. Other areas of interests include scientific data management, data analysis, and new services in cloud for data-intensive research, new techniques for data visualization of large data sets, developing open source public data resources for fostering research in related areas, scalable distributed algorithms and programming abstractions for data-intensive computing that can solve complex problems.
- ***Computational Science and Engineering Applications***: Clouds are rapidly joining high-performance computing systems and Grids as viable computational platforms for scientific exploration and discovery, and it is clear that production computational infrastructures will integrate these paradigms. As a result, understanding the roles of clouds in general and the Azure platform in particular, in this broader ecosystem, with emphasis on the application characteristics and usage modes that are meaningful in such a hybrid infrastructure are critical. The challenge is in understanding how application workflows can effectively utilize such a hybrid cyberinfrastructure (CI) as well as the required programming abstractions, performance models and metrics, and tools. For example, such a hybrid CI may provide benefits to current applications in terms of reduction in run time or response times, more efficient resource usage, reduced cost, or enhanced robustness. Clouds may also serve as on-demand accelerators for more conventional desktop-based tools used in computational science and engineering. The primary goal of this activity is to investigate the roles of cloud computing in science and engineering, and to understand appropriate structures of a hybrid CI, its usage modes and application patterns, and requirements in terms of conceptual foundations, technologies, and support mechanisms.
- ***Workforce and Education Applications***: Clouds are good mechanisms for providing access to scientific resources for STEM education and workforce preparation. Projects in this category should address the use of cloud computing for education and learning research, for innovative STEM curriculum or learning resource development, for research that deepens understanding of how to provide learning resources to professional audiences and the public, and for preparing the next generation workforce in the use of cloud computing.

Since this program provides researchers with access to the Microsoft Azure platform, proposals must clearly describe how access to the platform will support the proposed project.

Many of the logistical details related to operation of the Azure services platform as a research vehicle are under active discussion and will continue to evolve over the life of the program. Information describing the programming environment of the Azure platform, available via the CiC program, can be found on the Microsoft Research Engagement Website,

http://research.microsoft.com/ccf/engagements.aspx, which will also include a FAQ document, tutorials, sample codes, and best practice documents. It is expected that the experience of the awardees will inform subsequent refinement of processes, such as resource allocation and data loading. Allocations on the computing and storage resources will be made post award for authorized users. The exact mechanism will be worked out by Microsoft with the awardees. The procedure for communicating allocation needs will be documented at http://research.microsoft.com/ccf/engagements.aspx.

Modest quantities (a few hundred gigabytes) of data can be loaded on the server over the Internet. Some projects may require the mounting of large (terabytes +) quantities of data on the cluster. The process for loading data is expected to evolve over the life of the program and will be worked out with each project team on a case-by-case basis post award. It is anticipated that a growing number of public data sets will be available on the Windows Azure platform for use by awardees. A catalog of these data sets will be accessible at http://research.microsoft.com/ccf/engagements.aspx.

Principal Investigators (PIs) interested in submitting CiC projects may also submit a request for supplemental funding to an existing NSF award. Supplemental funding requests must be prepared and submitted via FastLane and should include the title "CIC Supplement" as the first line in the Summary of Proposed Work form. Requests for supplemental funding may be submitted immediately for funding consideration, but must be submitted by the full proposal deadline date listed in this solicitation. Supplemental funding requests may request extension of an existing NSF award for an additional year. PIs are cautioned that existing awards must be active at the time a supplement is awarded (not submitted); awards that have concluded before the supplement is awarded will not be reopened. If the supplement request is less than 20% of the existing award, supplement proposals will be reviewed internally at NSF. Additional information about requesting supplemental support is contained in Part II of the NSF Proposal and Award Policy and Procedures Guide (PAPPG) available at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp.

Investigators may also submit CiC EAGER proposals to the CCF division or to OCI and prefix the title with "CiC: EAGER: ". Please note that an EAGER submission must conform to the guidelines for preparation of EAGER proposals as specified in Section II.D.2 of the Grant Proposal Guide (GPG) and is limited to a total budget of $300K for a maximum of two years. CiC EAGER proposals may be submitted immediately for funding consideration, but must be submitted by the full proposal deadline date listed in this solicitation.

III. AWARD INFORMATION

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10 to 15 awards will be made in FY 2010, pending the availability of funds. Proposals may request budgets of up to $500,000 total for up to 2 years. CiC EAGER proposals may request no more than $300,000 total for up to 2 years.

Anticipated Funding Amount: $5,000,000 total in FY 2010, for CiC merit reviewed proposals, CiC EAGER proposals and CiC supplements to existing awards.

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

IV. ELIGIBILITY INFORMATION

Organization Limit:

Proposals may only be submitted by the following:

- Universities and Colleges - Universities and two- and four-year colleges (including community colleges) accredited in, and having a campus located in the US, acting on behalf of their faculty members. Such organizations also are referred to as academic institutions.
- Non-profit, non-academic organizations: Independent museums, observatories, research labs, professional societies and similar organizations in the U.S. associated with educational or research activities.

PI Limit:

None Specified

Limit on Number of Proposals per Organization:

None Specified

Limit on Number of Proposals per PI:

None Specified

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent*(required)*:

Each Letter of Intent should include the following information:

1. Title of the project
2. Names of the PI's
3. A short abstract of no more than 250 words
4. Up to five key words that describe the scientific focus of the project

Letter of Intent Preparation Instructions:

When submitting a Letter of Intent through FastLane in response to this Program Solicitation please note the conditions outlined below:

- Sponsored Projects Office (SPO) Submission is not required when submitting Letters of Intent
- Submission of multiple Letters of Intent is allowed

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.

FastLane Users: Select this program solicitation number from the pull down list in Fastlane. Please note that for administrative purposes only, the NSF Unit Consideration will be "CCF - Division of Computer and Communication Foundations" and Computing in the Cloud will be automatically selected as the program.

Grants.gov Users: The program solicitation number will be pre-populated by Grants.gov on the NSF Grant Application Cover Page. Grants.gov users should refer to Section VI.1.2. of the NSF Grants.gov Application Guide for specific instructions on how to designate the NSF Unit of Consideration.

Proposals submitted in response to this solicitation should indicate in the title the category of project being proposed, as follows:

- For Foundational Research in Cloud Computing projects, the title should begin "CiC (FRCC):";
- For Research in Data-Centric and Data-Intensive Computing projects, the title should begin "CiC (RDDC):";
- For Science and Engineering Applications projects, the title should begin "CiC (SEA):".
- For Workforce and Education Applications projects, the title should begin "CiC (WEA):".

B. Budgetary Information

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

C. Due Dates

- **Letter of Intent Due Date(s)** ***(required)*** (due by 5 p.m. proposer's local time)***:***

  April 30, 2010

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

  June 15, 2010

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. 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. 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.

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: Organizations receiving CiC grants will be required to negotiate and execute a usage agreement with Microsoft within 90 days of the award date.

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.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Chitaranjan Das, CISE point of contact, Computing in the Cloud, telephone: (703) 292-8910, email: CiCQueries@nsf.gov

- Manish Parashar, OCI point of contact, Computing in the Cloud, telephone: (703) 292-4766, email: CiCQueries@nsf.gov
- Reed S. Beaman, telephone: (703) 292-8470, email: rbeaman@nsf.gov
- John C. Cherniavsky, EHR Point of Contact, Computing in the Cloud, telephone: (703) 292-5136, email: CiCQueries@nsf.gov
- Cliff Jacobs, GEO Point of Contact, Computing in the Cloud, telephone: (703) 292-8521, email: CiCQueries@nsf.gov
- Estela Blaisten, MPS Point of Contact, Computing in the Cloud, telephone: (703) 292-2301, email: CiCQueries@nsf.gov
- Cheryl L. Eavey, SBE Point of Contact, Computing in the Cloud, telephone: (703) 292-7269, email: CiCQueries@nsf.gov

For questions related to the use of FastLane, contact:

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

For questions relating to Grants.gov contact:

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

IX. OTHER INFORMATION

The NSF Website provides the most comprehensive source of information on NSF Directorates (including contact information), programs and funding opportunities. Use of this Website by potential proposers is strongly encouraged. In addition, 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.

Investigators interested in other research opportunities in data-intensive computing are encouraged to consider funding opportunities in the CISE Information Integration and Informatics (III) program, http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf10571, and the NSF-wide Cyber-enabled Discovery and Innovation program, http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf11502 .

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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.

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- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information** (NSF Information Center)**:** (703) 292-5111

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- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; and project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to proposer institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies or other entities needing information regarding applicants or nominees as part of a joint application review process, or in order to coordinate programs or policy; and to another Federal agency, court, or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 69 Federal Register 26410 (May 12, 2004), and NSF-51, "Reviewer/Proposal File and Associated Records, " 69 Federal Register 26410 (May 12, 2004). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a valid Office of Management and Budget (OMB) control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding the burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to:

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