

High-End Computing University Research Activity (HECURA)

PROGRAM ANNOUNCEMENT NSF 09-530

REPLACES DOCUMENT(S):
NSF 08-531



National Science Foundation

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

Office of Cyberinfrastructure

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

April 15, 2009

A revised version of the *NSF Proposal & Award Policies & Procedures Guide* (PAPPG), [NSF 09-1](#), was issued on October 1, 2008 and is effective for proposals submitted on or after January 5, 2009. Please be advised that the guidelines contained in [NSF 09-1](#) apply to proposals submitted in response to this funding opportunity.

One of the most significant changes to the PAPPG is implementation of the mentoring provisions of the America COMPETES Act. Each proposal that requests funding to support postdoctoral researchers must include, as a separate section within the 15-page project description, a description of the mentoring activities that will be provided for such individuals. Proposals that do not include a separate section on mentoring activities within the Project Description will be returned without review (see the PAPP Guide Part I: *Grant Proposal Guide* Chapter II.C.2.d for further information).

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

High-End Computing University Research Activity (HECURA)

Synopsis of Program:

High-performance computing is increasingly essential to progress in science and engineering. Contemporary high-end computing (HEC) systems often comprising of tens- to hundreds-of-thousands of processors allow researchers to study complex problems that were previously intractable. However, emerging data-intensive scientific challenges and opportunities demand more of HEC systems. For example, observation- and simulation-driven applications require higher throughput input/output (I/O) capabilities, large data storage capacities, and tools for efficiently finding, processing, organizing and moving data. Data-management challenges also include the need to access large volumes of data produced by different applications, in numerous locations, and in various formats.

Although storage capacity and processing power are growing rapidly, increases in data bandwidth and access times are not keeping pace. In fact, the advent of multicore processors has resulted in a decrease in memory and bandwidth per core. The performance gap between HEC processing power and storage device performance demands advances in massively parallel I/O systems to maintain the throughput of applications. The ability to efficiently map I/O operations between millions of distributed memories and hundreds-of-thousands of storage devices is also a formidable problem that calls for research.

Accordingly, in 2009, the High-End Computing University Research Activity (HECURA) program invites research and education proposals in the areas of I/O, file and storage systems design for efficient, high-throughput data storage, retrieval and management in cases where HEC systems comprise hundreds-of-thousands to millions of processors. Research areas of interest include, but are not limited to:

- I/O architectures and I/O middleware;
- archives/backups as extensions to file systems;
- file systems research and file systems-related protocols;
- metadata research;
- access methods;

- data management systems;
- security;
- novel storage devices for the I/O stack;
- Quality of Service;
- management, and reliability and availability at scale (RAS);
- hardware and software tools for design and simulation of I/O, file and storage systems; and
- efficient benchmarking, tracing, performance measurement and tuning tools of I/O, file and storage systems.

Cognizant Program Officer(s):

- Almadena Y. Chtchelkanova, Program Director, Division of Computing and Communication Foundations, telephone: (703) 292-8910, email: achtchel@nsf.gov
- Krishna Kant, Program Director, Division of Computer & Network Systems, telephone: (703) 292-4776, email: kkant@nsf.gov
- Frank Olken, Program Director, Division of Information and Intelligent Systems, telephone: (703) 292-8930, email: folken@nsf.gov
- Abani Patra, Program Director, Office of Cyberinfrastructure, telephone: (703) 292-8970, email: apatra@nsf.gov

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

- 47.070 --- Computer and Information Science and Engineering
- 47.080 --- Office of Cyberinfrastructure

Award Information

Anticipated Type of Award: Standard Grant or Continuing Grant

Estimated Number of Awards: 10 to 20 awards with cumulative budgets of \$500K-\$1M and project durations of up to 3 years.

Anticipated Funding Amount: \$10,000,000 The anticipated funding amount is subject to the 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:

None Specified

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Not Applicable
- **Preliminary Proposal Submission:** Not Applicable
- **Full Proposals:**
 - Full Proposals submitted via FastLane: NSF Proposal and Award Policies and Procedures Guide, Part I: Grant Proposal Guide (GPG) Guidelines apply. The complete text of the GPG is available electronically on the NSF website at: http://www.nsf.gov/publications/pub_summ.jsp?ods_key=gpg.
 - Full Proposals submitted via Grants.gov: NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: <http://www.nsf.gov/pubs/policydocs/grantsgovguide607.pdf>)

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):

Proposal Review Information Criteria

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.

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I. INTRODUCTION

The way in which scientific and engineering research is conducted has radically changed in the past two decades as simulation and computation are being increasingly used to augment, and in many cases replace, physical experimentation and the construction of prototypes. Complex systems can be analyzed and better understood through computer models. In many fields, such as astrophysics or climate modeling, computational simulation is the principal method for exploring new concepts and ideas. Complex human-made objects such as aircraft and advanced drugs might be better designed through computational optimization and computer-based experimentation and testing. Computation will play an increasingly critical role, not only in coping with advanced scientific and engineering challenges, but in solving societal and environmental problems and in improving the nation's economic productivity and competitiveness.

II. PROGRAM DESCRIPTION

The High-End Computing University Research Activity (HECURA) program was developed as an interagency response to the recommendations of the High-End Computing Revitalization Task Force (HECRTF), <http://www.nitrd.gov/subcommittee/hec/hecrtf-outreach/hec-ura/index.html>, to support basic research in the area of high-end computing (HEC). The program was developed by an interagency group with representatives from NSF, the Department of Energy (DOE) Office of Science, the National Nuclear Security Agency (NNSA), the National Aeronautics and Space Administration (NASA), the Defense Advanced Research Projects Agency (DARPA) and the National Security Agency (NSA).

As part of HECURA, in FY 2004, NSF and DARPA jointly funded the Software Tools for High-End Computing (ST-HEC) program, focusing on research and education projects in the area of software tools and compilers <http://www.nsf.gov/pubs/2004/nsf04569/nsf04569.pdf>. In FY 2006, NSF, DARPA and DOE jointly funded HECURA projects focused in the areas of I/O, file and storage systems design for efficient, high throughput data storage, retrieval and management <http://www.nsf.gov/pubs/2006/nsf06503/nsf06503.pdf>. In FY 2008, NSF supported HECURA projects focused on programming

In this FY 2009 solicitation, NSF seeks research and education proposals in the areas of I/O, file and storage systems design for efficient, high throughput data storage, retrieval and management for HEC systems comprised of tens-of-thousands to millions of processors.

Research topics of interest include, but are not limited to:

- **File systems research.** In recent years, a number of scalable global parallel file systems for the HEC environment have become available. These file systems have shown to scale bandwidth well for large, well-aligned operations. However, a number of problem areas remain: scaling metadata operations to tens of thousands of operations per second; management of trillions of files; bandwidth scaling for small and unaligned I/O; user space file systems components; and, new layouts for file management beyond the current directory tree paradigm.
- **Metadata research.** Metadata or "data about data" is used in file, archival and database systems to facilitate the understanding, characterization, and management of data. Investigations of new approaches to name spaces, use of metadata in novel hybrid storage devices, metadata scalability, extensibility, access control, reliability, availability, and longevity are of interest.
- **Access methods.** Access methods include file layouts, formats, indices, and other file structures and the accompanying code to exploit such file structures for searching, etc. Examples include B-Trees, hash tables, and R-trees. The program is interested in issues such as the scalability of access methods to very large clusters of processors and disks. The program is also interested in novel access methods suitable for common HEC applications such as computational fluid dynamics.
- **Data management systems.** Database management systems (DBMSs) have not yet been widely adopted for HEC applications. The program will support research in the following topics: the performance of DBMSs on very large, highly parallel machines (parallelism in both the processors and the disk I/O); the development of DBMS built on data models better suited to HEC applications, e.g., linear algebra, or vector field data; and, the development of query languages appropriate to HEC applications and their integration with applications, e.g., queries based on the vector calculus, interpolation operators, linear algebra operations, etc.
- **Security.** Security in file systems often is sacrificed for performance or usability. There are many areas of security that need to be addressed: usability; long-term key management; distributed authentication; minimizing the impact of security overhead; and, end-to-end encryption that can be managed over a long period of time.
- **I/O middleware.** I/O middleware is an all-important part of the overall I/O software stack. Middleware is used today to bridge the gap between high-level I/O data management software and the file system. Middleware provides the primary parallel interface to I/O and is also beginning to be of some assistance in dealing with small and unaligned I/O. Some areas in need of research activities include, but are not limited to: active distributed persistent caching to further assist with small and unaligned I/O; research into caching appropriate at all levels of the I/O stack; exploitation of active storage concepts; exploitation of remote direct memory access (RDMA) and one-sided operations; and, possible assistance with reliability at scale for client process migration.
- **Archives/backups as extensions to file systems.** Research is needed on how to make file system interfaces more suitable for archiving and backup operations.
- **I/O architectures.** Although I/O architectures with intelligence in the network or near the disk drive, as well as cluster architectures that contain I/O nodes, have been around for many years, the ability to truly exploit these concepts beyond initial and simple usage has been elusive. Research topics of interest include, but are not limited to: taking advantage of intelligence distributed throughout the stack for caching; active participation in application/data aware reconfigurable I/O; and, novel uses of active storage for archive or other storage paradigms while dealing with associated reliability and availability at scale (RAS) issues.
- **Novel storage devices for the I/O stack.** Novel storage devices are on the horizon. The primary question to be answered is, how can the HEC community best utilize these devices? Research will be considered in areas including, but not limited to: integrating these devices into the hierarchy; metadata operation applications; combining traditional and novel devices for structured data; RAS applications; and, assistance in dealing with small and unaligned I/O operations.
- **Future file systems-related protocols.** The future of HEC depends on evolving file systems standards that must be supported by prototyping, research, and validation. Research efforts are needed to extend existing standards to assist HEC applications with high degrees of concurrency, as well as in the desirable features of new standards for data storage and movement. Research in server-to-server communications concepts including software/hardware means of accelerating the protocols is also of interest.
- **Quality of Service (QoS).** QoS refers to the network capability to control and predictably service selected network traffic. Because global sharing of parallel file systems is becoming widespread, more research is needed to achieve prioritized deterministic performance in the presence of multiple complex parallel applications running concurrently with other non-parallel workload. Innovative approaches are sought in dealing with workloads that may vary up to seven orders of magnitude in performance requirements. In addition, research in dynamically adaptive, end-to-end QoS throughout the entire I/O stack including hardware and software will be considered.
- **Management, and reliability and availability at scale (RAS).** Management and RAS is an area that is reasonably well understood at current scale. However, management and RAS and performance in the presence of failure at large scale (hundreds-of-thousands of disk devices and hundreds of metadata servers) need to be addressed. Research topics include, but are not limited to: novel approaches to management and RAS such as: self management, healing, and tuning (often referred to as autonomies); use of virtual machines and novel devices to assist in management and RAS testing and implementation; and, power management for storage and I/O in future HEC sites.
- **Hardware and software tools for design, simulation of I/O, file and storage systems.** Mapping of I/O operations between tens or hundreds-of-thousands of distributed memories and tens or hundreds-of-thousands of storage devices is a complex task. Tools that allow design and simulation of I/O, file and storage systems interactions will help with building efficient, high throughput data storage, retrieval and management systems.
- **Efficient benchmarking, tracing, performance measurement and tuning tools of I/O, file and storage systems.** Increasing the speed and number of processors is not sufficient for observation- and simulation- data-intensive applications. File and storage system bandwidth and access time can become bottlenecks. Current benchmarks used for HEC system performance evaluations are mostly concerned with Flops (floating operations per second). To achieve a balanced evaluation of HEC system performance, new efficient hardware and software user-friendly tools for benchmarking, performance measurement and tuning of I/O, file and storage systems are needed.

Single- and multiple-investigator proposals are welcome. Research collaborations are encouraged with industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including DOE National Laboratories.

To enable rapid dissemination of the outcomes of this research, PIs are encouraged to describe their plans for converting research outcomes to deployed cyberinfrastructure within their proposal Project Descriptions.

The resulting HECURA award portfolio will advance the HEC research frontier in I/O, file systems and data storage systems, build national education and workforce capacity (including undergraduate, graduate, and faculty development and training), and enhance the performance of HEC systems.

III. AWARD INFORMATION

Estimated program budget, number of awards and award size/duration are subject to the availability of funds. The estimated number of awards is between 10 and 20 awards, with cumulative budgets of \$500K-\$1M and project durations of up to 3 years. NSF anticipates that awards will be made by the end of November 2009.

IV. ELIGIBILITY INFORMATION

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

Organization Limit:

None Specified

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

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

- Full proposals submitted via FastLane: Proposals submitted in response to this program announcement 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. 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 announcement 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/pubs/policydocs/grantsgovguide607.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, (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 pubs@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.3 of the Grant Proposal Guide provides additional information on collaborative proposals.

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):

April 15, 2009

D. FastLane/Grants.gov Requirements

- **For Proposals Submitted Via FastLane:**

Detailed technical instructions regarding the technical aspects of 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 announcement 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 announcement should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement.

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>.

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 announcement 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 pubs@nsf.gov.

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

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the Principal Investigator must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period. (Some programs or awards require more frequent project reports). Within 90 days after expiration of a grant, the PI also is required to submit a final project report.

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.

VIII. AGENCY CONTACTS

General inquiries regarding this program should be made to:

- Almadena Y. Chtchelkanova, Program Director, Division of Computing and Communication Foundations, telephone: (703) 292-8910, email: achtchel@nsf.gov
- Krishna Kant, Program Director, Division of Computer & Network Systems, telephone: (703) 292-4776, email: kkant@nsf.gov
- Frank Olken, Program Director, Division of Information and Intelligent Systems, telephone: (703) 292-8930, email: folken@nsf.gov
- Abani Patra, Program Director, Office of Cyberinfrastructure, telephone: (703) 292-8970, email: apatra@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.

Additional Program Contact:

Velma Lawson, Integrative Activities Specialist, Division of Computing and Communication Foundations, telephone: (703) 292-8910, email: vlawson@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, MyNSF (formerly the Custom News Service) is an information-delivery system designed to keep potential proposers and other interested parties apprised of new NSF funding opportunities and publications, important changes in proposal and award policies and procedures, and upcoming NSF Regional Grants Conferences. Subscribers are informed through e-mail or the user's Web browser each time new publications are issued that match their identified interests. MyNSF also is available on NSF's Website at <http://www.nsf.gov/mynsf/>.

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.

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