CISE Next Generation Software Program (NGS)

Updates Program Announcement NSF 99-8

Program Solicitation

NSF 00-134

DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING

LETTER OF INTENT DEADLINE(S): September 15, 2000 ***(Optional)***

DEADLINE(S): November 3, 2000

NATIONAL SCIENCE FOUNDATION

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Web Site at:

http://www.nsf.gov

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
- **For General Information (NSF Information Center):** (703) 292-5111
- **TDD (for the hearing-impaired):** (703) 292-5090
- **To Order Publications or Forms:**

  Send an e-mail to: pubs@nsf.gov

  or telephone: (301) 947-2722
- **To Locate NSF Employees:** (703) 292-5111

SUMMARY OF PROGRAM REQUIREMENTS

GENERAL INFORMATION

Program Title: CISE Next Generation Software Program (NGS)

Synopsis of Program: The Experimental and Integrative Activities Division in the Computer and Information Science and Engineering (CISE) Directorate announced the **Next Generation Software** (NGS) Program to support multidisciplinary (group-oriented as well as single investigator) research, a new thrust which commenced in Fiscal Year 1999. The NGS program fosters multidisciplinary software research under two components: **Technology for Performance Engineered Systems** (TPES), and **Complex Application Design and Support Systems** (CADSS). The overall thrust of NGS will be research and development for new software technologies integrated across the systems' architectural layers, and supporting the design and the operation cycle of applications, computing and communications systems, and delivering quality of service (QoS). The **TPES** component will support research for methods and tools leading to the development of performance frameworks for modeling, measurement, analysis, evaluation and prediction of performance of complex computing and communications systems, and of the applications executing on such systems. The **CADSS** component will support research on novel software for the development and run-time support of complex applications executing on complex computing platforms; CADSS fostered technology breaks down traditional barriers in existing software components in the application development, support and runtime layers, and will leverage TPES developed technology for delivering QoS. It's expected that technology developed under TPES, when integrated into the design process, will lead to substantial decreases in the development time and cost of future advanced information systems, from the hardware components to the applications executing on such platforms. In addition such capabilities, when integrated into the operational process of these systems, as envisioned with CADSS, will lower the cost of their management, optimize their performance, and ensure QoS. The technologies developed will be validated with demonstrations on important national interest applications. Multidisciplinary teams will involve collaboration among researchers in several areas in computer sciences **and** application developers.

Cognizant Program Officer(s):

- Dr. Frederica Darema, Senior Science and Technology Advisor, Director of the Next Generation Software Program, CISE, EIA, Room 1105, telephone: (703) 292-4764, e-mail: darema@nsf.gov.

Applicable Catalog of Federal Domestic Assistance (CFDA) Number:

- 47.070 --- Computer and Information Science and Engineering

ELIGIBILITY INFORMATION

- **Organization Limit:** Proposals may be submitted by universities in support of individual investigators or small groups.
- **PI Eligibility Limit:** One proposal only as a PI. Can be a co-PI in one other proposal.
- **Limit on Number of Proposals:** None

AWARD INFORMATION

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** Not Specified.
- **Anticipated Funding Amount:** Subject to availability of funds, approximately $6 million will be available for this initiative in FY 2001. Awards will be in the range of $200,000 to $1 million per year. Most awards will be of three years' duration.

PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Guidelines

- **Proposal Preparation Instructions:** Deviations From Standard Preparation Guidelines
    - The program announcement/solicitation contains deviations from the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full program announcement/solicitation for further information.

B. Budgetary Information

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

C. Deadline/Target Dates

- **Letter of Intent Due Date(s):** September 15, 2000 *(Optional)*
- **Preproposal Due Date(s):** None
- **Full Proposal Due Date(s):** November 3, 2000

D. FastLane Requirements

- **FastLane Submission:** Full Proposal Required
- **FastLane Contact(s):**

- Helen Walston, CISE, EIA, Room 1160, telephone: (703) 292-4775, e-mail: hwalston@nsf.gov.

PROPOSAL REVIEW INFORMATION

- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full program announcement/solicitation for further information.

AWARD ADMINISTRATION INFORMATION

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

TABLE OF CONTENTS

I. INTRODUCTION

The Experimental and Integrative Activities Division in the Computer and Information Science and Engineering (CISE) Directorate announced the **Next Generation Software** (NGS) Program to support multidisciplinary (group-oriented as well as single investigator) research, a new thrust which commenced in Fiscal Year 1999.

The NGS program fosters multidisciplinary software research under two components: **Technology for Performance Engineered Systems** (TPES), and **Complex Application Design and Support Systems** (CADSS). The overall thrust of NGS will be research and development for new software technologies integrated across the systems' architectural layers, and supporting the design and the operation cycle of applications, computing and communications systems, and delivering quality of service (QoS). The **TPES** component will support research for methods and tools leading to the development of performance frameworks for modeling, measurement, analysis, evaluation and prediction of performance of complex computing and communications systems, and of the applications executing on such systems. The **CADSS** component will support research on novel software for the development and run-time support of complex applications executing on complex computing platforms; CADSS fostered technology breaks down traditional barriers in existing software components in the application development, support and runtime layers, and will leverage TPES developed technology for delivering QoS.

It's expected that technology developed under TPES, when integrated into the design process, will lead to substantial decreases in the development time and cost of future advanced information systems, from the hardware components to the applications executing on such platforms. In addition such capabilities, when integrated into the operational process of these systems, as envisioned with CADSS, will lower the cost of their management, optimize their performance, and ensure QoS.

The technologies developed will be validated with demonstrations on important national interest applications. Multidisciplinary teams will involve collaboration among researchers in several areas in computer sciences **and** application developers.

II. PROGRAM DESCRIPTION

Background

New and future computing platforms and applications are far more advanced, powerful, dynamic and complex than in the past. Such platforms include both the globally-distributed, meta-computing, heterogeneous, networked, and adaptive platforms, ranging from assemblies of networked workstations, to networked supercomputing clusters or combinations there-of (**Grids**), as well as the more tightly coupled future petaflops platforms, which will be enabled as grids-in-a-box (**GiBs**).

Such complexity requires new systems' software technology for the design, development, run-time support, maintenance and management of the applications and their platforms. The new software technologies need to adopt a more integrated view of the architectural layers and software components of a computing system, consisting of: the applications, the application support environments (languages, compilers, application libraries, linker, run-time support,

security, visualization, etc.), operating system (scheduling, resource allocation and management, etc), computing platform architectures, processing nodes and network layers.

Present software technologies supporting the design and operation of computing systems and applications treat individual layers and components in an isolated fashion. This approach had been reasonably successful when the computing systems and the applications were relatively simple. However such approaches are inadequate in supporting the emerging complex applications and computing platforms.

The research to be fostered under this program is intended to lead to more integrated software environments eliminating boundaries between the different components and layers, and create capabilities that provide a **system** view and management ability.

Research Scope

Overview

The **TPES** component will support research for developing methods, tools and performance frameworks to analyze and predict behavior of the entire computing system and of multiple views of the computing system.

This research will be enabled by creating performance frameworks capable of using models (in a plug-and-play fashion) of different levels of detail of each component and layer, as needed for the specific analysis at hand. Significant advancements are needed in the current methods and tools, to measure, model and analyze computing systems at all levels - from the application level, to the software level, to the hardware levels.

Major technical challenges include: the development of multilevel modeling and simulation methods and tools (application level, system software, and hardware levels, including the network levels), hierarchical or multiscale approaches (models of multiple levels of abstraction and resolution for components at each level), and scalable approaches for modeling the behavior of the entire system, or for analysing the behavior at each level as affected by the behavior of components in the other levels; modeling of how the behavior of system components or the system scales as one shifts from a small prototype to the larger (production or future) machine, or to a machine where some of the architectural features change. The present initiative seeks methods and tools that are general and powerful enough to be applicable for both globally distributed systems as well as high-end petaflops-class systems.

The **CADSS** component will support research on software technologies for the development and runtime support of complex applications which execute on globally distributed as well as on the planned petaflops platforms.

The research and technology to be developed encompasses the following: new programming models; new compiler technology, where part of the compiler becomes embedded in the runtime, and where the compiler interacts with the system resource manager and performance models of the underlying hardware and software (such as the models developed by the TPES program component above) for optimizing the mapping of the application on the underlying platform assembly; knowledge based technology for application components' assembly; integration of these technologies into an application support environment, and demonstration of these

technologies on important national interest applications, including advanced networking applications.

TPES Motivation and Research Agenda

Advanced computing systems will be attained by assemblies of globally distributed, heterogeneous, networked systems, embodying high-end platforms consisting of heterogeneous processing nodes, and complex memory hierarchies. Many factors affect the performance of such complex systems and the applications executing on them. These include the computer and network architecture, the system software components and the end-user applications. There exists an array of isolated modeling and simulation methods and tools used to understand the behavior of isolated components of these systems, from analytical and queuing models, to tracing tools, simulators and emulators. However the present methods do not have the capability to provide a system view and analysis, nor they can provide a well-defined hierarchical analysis and structuring needed to model systems of the level of complexity under consideration.

The TPES component in this competition seeks proposals for multidisciplinary research on the development of methods and tools for a layered, multilevel, scalable performance engineering capability, spanning applications, systems software and hardware, and developing performance methodologies that have predictive as well as evaluation capabilities. In particular we are interested in: methods which provide hierarchical or multilevel analysis of such systems, enable assessment of the effects of individual hardware and software layers and components of these systems, as well as pluggable into the performance frameworks to assess their impact on the performance of the entire system. Various approaches to developing tools that implement such modeling methods will be pursued.

The development of such capabilities requires advances in the following areas:

- Methods for modeling and simulation of the behavior of the application and system components at multiple levels of detail and abstraction.
- Modeling languages for application and system description and modeling, and specification of performance attributes.
- Interfaces that allow models and simulators with different resolution levels to be combined together as needed into performance frameworks to analyze system behavior.
- New instrumentation methods, measurement tools, methods of combining measurements of different levels of resolution and time scales.
- Integration of the technologies above into performance frameworks.

Proposals should include plans to demonstrate the validity of technologies developed above by applying them on important platforms and applications.

CADDS Motivation and Research Agenda

Modern applications consist of multiple inter-operating compute- and data-intensive components. To obtain accurate models and simulations or to deliver real-time results, the

applications need to execute on high-performance globally distributed and high-end petaflops-class computing platforms. At the same time these applications need to achieve high-efficiency and QoS when executing on such platforms.

The present methods of building applications result in applications that are designed for a given platform. When the platform changes, the application needs to be rewritten for a new platform. This is costly and limiting: the resulting applications cannot automatically move to the new platform; the applications cannot be distributed to run concurrently on the old and the new platforms; the applications cannot be dynamically partitioned across globally distributed platform assemblies, map dynamically across such platforms as the resource availability changes, and exploit such platform assemblies with quality-of-service. Similar obstacles exist when the problem size changes, and the application needs for example to be repartitioned and remapped for the bigger problem size. Today's technology necessitates considerable and laborious hand tuning.

Effective use of distributed computing platforms requires automating the process of distributing and mapping the application across such platforms, as well as optimizing the mapping of the application on a given high-end platform. Such automation will require a new generation of compiling technology, which will create compiling systems that extend into the run-time and can dynamically invoke operating systems services, and use performance models of the software and the hardware to dynamically optimize the application mapping across the heterogeneous platform assembly.

In addition, novel approaches and substantial enhancements are needed in computational models used to express the distributed applications and enhance the compiler's ability to: analyze task and data dependencies in the application programs, resolve dependencies, and optimize mapping across a complex memory structure of distributed (Grids or GiBs) platforms with multiple levels of memory hierarchy.

Executing applications on heterogeneous platforms also requires the runtime system to have the ability to dynamically select appropriate application components suitable for each one of the kinds of platforms in the heterogeneous platform ensemble or the problem size. The new compiling technology will be aware of the issues of heterogeneity in the underlying architecture of each of the platforms, such as differing memory organization, machine accuracy, data conversion problems, and link to appropriately selected components to generate consistent code at runtime.

Additional technologies required are: tools for debugging distributed applications; methods and tools to model the features and behavior of components of the system (such as for example that will be developed under TPES); and making these models and tools accessible and available to the compiler for optimizing the mapping of the application.

The CADSS component in this competition will develop technology to support the development and the runtime of complex applications executing on globally distributed or high-end, petaflops-class platforms, and will allow adapting the mapping of the applications dynamically as the underlying resources change or as the application needs change. To create such capabilities requires technical advances to:

***** Develop a distributed programming model which will facilitate the compiler to distribute the application across distributed, heterogeneous, complex computing platforms. This model can be an appropriate extension of existing models.

***** Create a new generation of compiling technology for such platforms, encompassing:

- embedding a portion of the compiler in the runtime system and enabling of the compiler to interface with the underlying systems' linkers and resource managers to determine system resources' availability;
- capability by the compiler to interface and use underlying system models for optimizing application mapping and scheduling;
- techniques for determining functional and data dependencies across distributed platforms and multiple levels of memory hierarchy; and
- ability of the compiler to interface with the application composition systems described below and dynamically select the appropriate components at run-time.

***** Create technology for building knowledge-based application composition systems:

- develop methods for problem specification and content information extraction for automatically selecting such components;
- application interfaces and methods for problem specification and extracting content information;
- ability to interface with the underlying computing platform models to determine suitable application components;
- novel numerical and other component libraries, tolerant of sections of a computation done on heterogeneous platforms of differing accuracy and handling data conversion issues; ability to combine results from such heterogeneous computations;
- development of appropriate application component libraries and interface with the run-time portion of the compiler to link to appropriate libraries; and
- creation of knowledge bases for application components for specific test applications, for example applications relevant to NGI (Next Generation Internet).

***** Develop new methods of instrumentation and measurement accessible to the compiler for application mapping, and for new debugging tools suitable for distributed applications.

***** Provide validation of key technologies developed above and integration of the individual technologies into an application design and support **system**.

Validation and Demonstration of the Technology

This competition will seek proposals for research addressing the challenges discussed above. This new software technology is a deviation from the traditional development approaches, and

will often require the cooperation of researchers in the areas of applications, languages and computational models, compilers, libraries and environments, performance modeling and tools, and computer architecture and networking. An integral part of the work is to demonstrate and validate the developed technology; therefore testing of the technology on important applications will be required. Furthermore, where appropriate, partnerships with industry are encouraged, as it is also important that any prototype technology developed under this program will lead to technology transition to industry.

Proposals should include plans to demonstrate the validity of technologies developed above by applying them on important platforms and applications.

III. ELIGIBILITY INFORMATION

Proposals may be submitted by universities in support of individual investigators or small groups. Synergistic collaboration among researchers and collaboration or partnerships with industry or government laboratories is encouraged when appropriate. Only one proposal may be submitted by a Principal Investigator and he/she may collaborate in one other proposal as a co-Investigator. Group and collaborative proposals involving more than one institution must be submitted as a single administrative package from one of the institutions involved. Due to the limited availability of funds, prospective applicants are strongly urged to contact the cognizant program officer listed at the end of this document for guidance.

IV. AWARD INFORMATION

Available Funding: The program expects to make awards that involve single investigator as well as multi-investigator teams, at levels in the range of $200,000 to $1 million per year; particular circumstances may justify awards outside of this range. It is anticipated that most awards will be for three years, but longer periods will be considered if they are clearly required by the research proposed. Subject to availability of funds, about $6 million is available for this competition.

Pertinent information regarding potential subsequent competitions will be provided via a "Dear Colleague" letter.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG) (NSF 00-2). The complete text of the GPG (including electronic forms) is available electronically on the NSF Web Site at: http://www.nsf.gov/pubs/2000/nsf002/start.htm. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

The following are exceptions to the general guidelines, specific to this activity, and must be added to the 15-page project description:

- each PI and Co-PI may use up to an additional 2 pages each to describe results under prior NSF support, focusing on those results relevant to the proposed project;

- milestones for the full period of the award; and a
- one-page management plan in the case of multi-investigator teams.

Proposals not conforming to these guidelines will be returned to the proposer without review.

Proposers are reminded to identify the program announcement/solicitation number (NSF 00-134) in the program announcement/solicitation block on the proposal Cover Sheet (NSF Form 1207). Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing is not required in proposals submitted under this Program Solicitation .

C. Deadline/Target Dates

Proposals submitted in response to this announcement/solicitation must be submitted by 5:00 PM, local time on the following date(s):

November 3, 2000

For the purposes of review logistics, we will appreciate a Letter of Intent, including a one-page abstract of the proposal and list of co-PI's and their institutions, to be submitted to NSF by 5:00pm, EST, **September 15, 2000, by e-mail to ngs-letr@nsf.gov**. Lack of a submission of Letter of Intent will not preclude submission of proposals, but will be appreciated as it will allow expediting the review process. **Letters of Intent will not be considered in lieu of full proposals**.

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this Program Solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: http://www.fastlane.nsf.gov/a1/newstan.htm. For FastLane user support, call 1-800-673-6188.

Submission of Signed Cover Sheets. The signed copy of the proposal Cover Sheet (NSF Form 1207) must be postmarked (or contain a legible proof of mailing date assigned by the carrier) within five working days following proposal submission and be forwarded to the following address:

National Science Foundation
DIS – FastLane Cover Sheet
4201 Wilson Blvd.
Arlington, VA 22230

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.

Proposals will be reviewed against the following general review criteria established by the National Science Board. Following each criterion are potential considerations that the reviewer may employ in the evaluation. These are suggestions and not all will apply to any given proposal. Each reviewer will be asked to address only those that are relevant to the proposal and for which he/she 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 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?

Principal Investigators should address the following elements in their proposal to provide reviewers with the information necessary to respond fully to both of the above-described NSF merit review criteria. NSF staff will give these elements careful consideration in making funding decisions.

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

enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities
Broadening opportunities and enabling the participation of all citizens - women and men, underrepresented minorities, and persons with disabilities - is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

Additional Review Criteria
Additional criteria specific to this Program The following criteria that reflect the specific objectives of the NGS program will also be considered in proposal evaluation:

- Potential for general impact on the development of techniques, environments, or paradigms that will advance the software to support computing, information processing and communications systems;
- In the case of multi-investigator teams, the extent to which the group is integrated with a common focus; and
- Degree to which educational activities that increase the participation and training of students and researchers are integrated into the proposal.

If the research proposed involves a testbed, the extent to which that testbed advances understanding of computing, information processing and communications systems. The review process will be concluded around the end-of-January 2001, with awards anticipated to be made in April 2001. Additional information may be required on some or all of the following topics prior to making an award:

- Plans for publicity, documentation, support and dissemination of software developed under the award;
- Institutional policy on software licensing and distribution;
- Plans for making results available to the broader community.

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

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 panel and ad-hoc mail 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.

NSF will be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 95 percent of proposals. The time interval begins on the proposal deadline or target date or from the date of receipt, if deadlines or target dates are not used by the program. 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 its 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 NSF brochure, program guide, announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). 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.

*These documents may be accessed electronically on NSF's web site at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (301) 947-2722 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, (NSF 95-26) available electronically on the NSF web site at

http://www.nsf.gov/cgi-bin/getpub?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 web site at http://www.gpo.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. Approximately 30 days before expiration, NSF will send a notice to remind the PI of the requirement to file the final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for that PI. PIs should examine the formats of the required reports in advance to assure availability of required data.

NSF has implemented an electronic project reporting system, available through FastLane. 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 should be made to the CISE Next Generation Software Program Program: Dr. Frederica Darema, Senior Science and Technology Advisor, Director of the Next Generation Software Program, CISE, EIA, Room 1105, telephone: (703) 292-4764, e-mail: darema@nsf.gov.
For questions related to the use of FastLane, contact, Helen Walston, CISE, EIA, Room 1160, telephone: (703) 292-4775, e-mail: hwalston@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 listed in Appendix A of the GPG. 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 web site at http://www.nsf.gov/home/ebulletin, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's Custom News Service (http://www.nsf.gov/home/cns/start.htm) to be notified of new funding opportunities that become available.

The opportunities described herein represent one, but not the only approach to support multidisciplinary research, and this announcement is intended as a complement to those activities rather than a replacement. In particular, the following activities are closely related to this announcement, and prospective proposers are urged to discuss their ideas with the contacts listed in order to determine the most appropriate programs for submission.

Cooperating CISE programs are:

The ACIR Software Tools Program (http://www.interact.nsf.gov/CISE/descriptions.nsf/PD/acr?OpenDocument), and

C-CR Operating Systems and Compilers and the Computer Systems Architecture Programs (http://www.interact.nsf.gov/cise/descriptions.nsf/22f5acb53a93b3ff852567f3005e8dc6/bd8bfd385f2928b4852565d90054e5dd?OpenDocument). Other programs related to NGS are the Special Projects and Advanced Networking Infrastructure programs (http://www.cise.nsf.gov/anir/index.html) in the ANIR Division.

Additional technical information related to the research directions fostered by this program announcement can be found in http://www.cise.nsf.gov/eia/nsg.

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 (unless otherwise specified in the eligibility requirements for a particular program).

Facilitation Awards for Scientists and Engineers with Disabilities (FASED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the program announcement/solicitation for further information.

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, FIRS at 1-800-877-8339.

The National Science Foundation is committed to making all of the information we publish easy to understand. If you have a suggestion about how to improve the clarity of this document or other NSF-published materials, please contact us at plainlanguage@nsf.gov.

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; 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 applicant 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 needing information as part of the review process or in order to coordinate programs; 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," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

Pursuant to 5 CFR 1320.5(b), an agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid 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 this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Information Dissemination Branch, Division of Administrative Services, National Science Foundation, Arlington, VA 22230, or to Office of Information and Regulatory Affairs of OMB, Attention: Desk Officer for National Science Foundation (3145-0058), 725 - 17th Street, N.W. Room 10235, Washington, D.C. 20503.

OMB control number: 3145-0058.