

# **NSF Middleware Initiative (replaces NSF 01-63)**

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## **Program Announcement**

***NSF 02-028***

DIRECTORATE FOR COMPUTER AND INFORMATION SCIENCE AND ENGINEERING  
ADVANCED NETWORKING INFRASTRUCTURE AND RESEARCH

### **FULL PROPOSAL DEADLINE(S) :**

**March 1, 2002 (and then subsequently, the first Friday in March of each year)**



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# SUMMARY OF PROGRAM REQUIREMENTS

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## GENERAL INFORMATION

**Program Title:** NSF Middleware Initiative (replaces NSF 01-63)

### **Synopsis of Program:**

The purpose of the NSF Middleware Initiative (NMI) is to design, develop, deploy and support a set of reusable, expandable middleware functions and services that benefit many applications in a networked environment, and which will, a) facilitate scientific productivity, b) increase research collaboration through shared data, computing, code, facilities and applications, c) support the education enterprise, d) encourage the participation of industry partners, government labs and agencies for more extensive development and wider adoption and deployment, e) establish a level of persistence and availability so that other applications developers and disciplines can take advantage of the middleware, f) encourage and support the development of standards and open source approaches and, g) enable scaling and sustainability to support the larger research and education communities.

The purpose of this announcement is to enable the members of the advanced network community (research universities, government agencies and industrial units) to collaborate in exploring, identifying, developing and assembling the known and needed pieces of middleware and related cyberinfrastructure for NMI.

Middleware refers to the software which is common to multiple applications and builds on the network transport services to enable ready development of new applications and network services. The function of middleware is to,

- 1) allow scientists and engineers the ability to transparently use and share distributed resources, such as computers, data, networks, and instruments,
- 2) develop effective collaboration and communications tools such as GRID technologies, desktop video, and other advanced services to expedite research and education, and to
- 3) develop a working architecture and approach which can be extended to the larger set of Internet and network users.

Middleware makes things transparent to the end user, providing consistency, security, privacy and capabilities.

The first year of the NMI program began in September 2001, through the award of three Cooperative Agreements. These Cooperative Agreements established the NMI Team which in turn functions as the System Integrator and the Service Provider for the NMI program. The NMI Team has developed the initial architecture for the NMI program and is responsible for integrating emerging and existing middleware components and developments into early deployment, production releases and on-going middleware support.

During the second year of the program, additional areas of research are being requested which will feed into and support the NMI Team's processes for production middleware. The areas identified for the second year of the program include distributed authorization and management tools, security for operating systems and software, and collaborative tools. These areas are more fully described in the Program Description.

The limited NSF resources available for this undertaking will require a balance between innovative research and specific development middleware solutions to accomplish real results.

**Cognizant Program Officer(s):**

- Alan Blatecky, Program Director, CISE, ANIR, 1175, telephone: (703) 292-8948, e-mail: [ablateck@nsf.gov](mailto:ablateck@nsf.gov).

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

- 47.070 --- Computer and Information Science and Engineering

**ELIGIBILITY INFORMATION**

- **Organization Limit:** None
- **PI Eligibility Limit:** None
- **Limit on Number of Proposals:** None

**AWARD INFORMATION**

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 10-15
- **Anticipated Funding Amount:** \$7,400,000 for FY02 pending availability of funds

**PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS**

***A. Proposal Preparation Instructions***

- **Full Proposals:** Standard Preparation Guidelines
  - Standard GPG Guidelines apply.

### ***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***

- **Letters of Intent (*optional*):** None
- **Preliminary Proposals (*optional*):** None
- **Full Proposal Deadline Date(s):**

March 1, 2002 (and then subsequently, the first Friday in March of each year)

### ***D. FastLane Requirements***

- **FastLane Submission:** Required
- **FastLane Contact(s):**
  - Priscilla Bezdek, CISE, ANIR, 1175, telephone: (703) 292-8950, e-mail: [pbezdek@nsf.gov](mailto:pbezdek@nsf.gov).

## **PROPOSAL REVIEW INFORMATION**

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

## **AWARD ADMINISTRATION INFORMATION**

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

## **I. INTRODUCTION**

The NSF Division of Advanced Networking Infrastructure and Research (ANIR), is continuing a major theme and emphasis that began with the first Network Centric Middleware Services program announcement (01-63) in February, 2001 and with first awards in September, 2001.

ANIR has evolved in advancing and supporting inter-institutional computer networking for research and education by means of several themes expressed as programs:

- \* 1986-95 - establishment of the basic backbone (NSFNET) program and regional networks.
- \* 1995 - establishment of the very high speed performance backbone network service program(vBNS) and, support of the Internet2 Abilene project.
- \* 1996 - development of the NSF High Performance Connections program for emerging backbone services.
- \* 1997 - the establishment of peering to other Federal networks in The Next Generation Internet (NGI) initiative.
- \* 1998 - the establishment of international connections through STARTAP.
- \* 2001 - the establishment of the NSF Middleware Initiative (NMI) through the awarding of three NSF Cooperative Agreements.

The awardees of the three NSF Cooperative Agreements are working together as the NSF Middleware Initiative (NMI) Team to form the core operational basis and structure for the NSF Middleware Initiative. The NMI Team has developed a common initial architecture for middleware, has developed a process for incorporating existing and developing pieces of middleware into production releases, and works with middleware developers and researchers on how to integrate and use new middleware approaches and solutions.

This announcement seeks research proposals for the next steps of the NMI program which will support and advance the development of additional middleware and capabilities. Specifically, the announcement focuses on four topic areas; authorization and management tools, security for operating systems and middleware software, Session Initiated Protocols for collaboration tools, and authentication and performance improvement tools relating to mobility.

## **II. PROGRAM DESCRIPTION**

There are three primary elements of this NMI Program Announcement:

1. Middleware research: applied research, which focuses on prototyping and experimenting with new middleware solutions in a testbed environment. Some of this research will focus on near-term solutions, while other research will address some longer-term concerns and fundamental issues.
2. Experimental applications including advanced science and education applications: applications which have been specifically deployed for the purpose of experimenting with new middleware prototypes or new application capabilities, or those applications built and deployed by NSF grantees or others, which benefit from and depend on production middleware.

3. Middleware support: applied research, prototypes, solutions and approaches to managing and supporting middleware deployment, including issues relating to large scale deployment.

Specific topic areas to be emphasized for this program announcement are:

- Distributed authorization and management tools
  - Resource schedulers and reservation, especially across multiple domains
  - Resource accounting and monitoring
  - Predictive services including Grid and network prediction tools
  - Directories and certificate authorities
  - Peer-to-peer middleware resources
- Security for operating systems and middleware software
  - User privacy management tools
  - User data integrity and authentication
  - Authorization tools
  - Peer-to-peer middleware resources
- Session Initiated Protocol (SIP) -enabling collaboration tools
- Mobility: public space 802.1x authentication infrastructure and performance improvement tools

Although long-term research issues may be addressed, preference will be shown for projects, research efforts and support solutions which provide more near-term benefit for the NSF Middleware Initiative.

Middleware researchers and developers are encouraged to work closely with other discipline specific researchers in application domains, to work with the NMI Team developers and participants, and to participate in or stimulate coordinated application research and prototype development. In some cases this application research may be co-funded by other programs in NSF or other agencies.

The guidance and advice of the network community outside NSF was sought in formulating this program. These results, which are neither mandatory nor inclusive, are summarized by the following points and should be considered in preparing proposals:

- Theory, simulation, emulation and prototypes, should be used as intermediate steps for developing solutions which will be applied in real-life settings.
- Open standards and open source software should be used where available and suitable.
- Commercially available solutions should be used where available and appropriate.
- Public sector application needs such as privacy, authentication, security and high confidence should be emphasized.

- Projects should recognize the need for an end-to-end perspective for applications and research.
- The future needs of system administrators, service providers, and end-users as well as application developers in middleware research projects should be considered.
- Collaboration with other middleware researchers and efforts is important.
- Some high-risk high-payoff projects and tasks should be included.

### **III. ELIGIBILITY INFORMATION**

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

### **IV. AWARD INFORMATION**

Estimated program budget is \$7.4M for FY 02; 10-15 awards expected; average award size/duration are subject to the availability of funds.

### **V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS**

#### **A. Proposal Preparation Instructions**

##### **Full Proposal:**

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). The complete text of the GPG is available electronically on the NSF Web Site at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. 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](mailto:pubs@nsf.gov).

Proposers are reminded to identify the program solicitation number (NSF 02-028) in the program announcement/solicitation block on the NSF Form 1207, *Cover Sheet For Proposal to the National Science Foundation*. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

#### **B. Budgetary Information**

Cost sharing is not required in proposals submitted under this Program Announcement.



### **C. Deadline/Target Dates**

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

#### **Full Proposals *by 5:00 PM local time:***

March 1, 2002 (and then subsequently, the first Friday in March of each year)

### **D. FastLane Requirements**

Proposers are required to prepare and submit all proposals for this Program Announcement 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 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov).

*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 certifications within five working days following the electronic submission of the proposal. Further instructions regarding this process are available on the FastLane website at: <http://www.fastlane.nsf.gov>.

## **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. Proposers are reminded that both the intellectual merit and the broader impacts of the work to be accomplished should be addressed. While reviewers are expected to address both merit review criteria, each reviewer will be asked to address only considerations 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.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

## **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 Mail 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.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months for 70 percent of proposals. The time interval begins on the date of receipt. 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 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](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](mailto:pubs@nsf.gov).

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, 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 regarding NSF Middleware Initiative (replaces NSF 01-63) should be made to:

- Alan Blatecky, Program Director, CISE, ANIR, 1175, telephone: (703) 292-8948, e-mail: [ablateck@nsf.gov](mailto:ablateck@nsf.gov).

For questions related to the use of FastLane, contact:

- Priscilla Bezdek, CISE, ANIR, 1175, telephone: (703) 292-8950, e-mail: [pbezdek@nsf.gov](mailto:pbezdek@nsf.gov).

## IX. OTHER PROGRAMS OF INTEREST

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

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF [E-Bulletin](#), which is updated daily on the NSF 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.

## **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 (FASSED) 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.

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## **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.

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