

NSF Middleware Initiative (NMI)

Program Announcement

NSF 03-513

Replaces Document NSF 02-028



National Science Foundation

Division of Advanced Networking Infrastructure and Research

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

First Friday in March
beginning in March 2002

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

NSF Middleware Initiative (NMI)

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, digital libraries, 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 researchers and other applications developers and disciplines can take advantage of the middleware, f) encourage and support the development of standards and open source approaches, g) enable scaling and sustainability to support the larger research and education communities, and h) encourage international coordination for interoperability.

The purpose of this program is to enable the members of the advanced network community (research universities, government agencies and industrial units) to further develop, integrate and support key middleware software and technologies, and to collaborate in exploring, identifying, and developing new middleware and related cyberinfrastructure capabilities.

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 manages disparate network components so that end users can focus on their applications and science. Therefore, middleware serves a bridging or an integrating function, and must provide high levels of reliability and consistency, from the individual desktop to the enterprise and beyond. Middleware also addresses a variety of security and privacy concerns to support resource sharing and collaboration.

The NMI program began in September 2001 with three Cooperative Agreements. These Cooperative Agreements established the NMI Team which now functions as the System Integrator and the Service Provider for the NMI program. The NMI Team has developed the 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.

The second year of the program began in August 2002 through the award of several additional middleware development projects and activities. Most of the second year projects are focused on new near-term capabilities and software to support the NMI effort, broaden the base of middleware activities, and provide new tools for the research user community. Some of the awards also addressed longer-term middleware and grid capabilities.

The third year of the program will continue to develop middleware capabilities and functionality, but will have a dual focus. One focus is to further develop the integration and support infrastructure of middleware for the longer term, and the second focus is to encourage the development of additional new middleware components and capabilities for the NMI program. These two focus areas are more fully described in the Program Description.

The limited NSF resources available for this undertaking will require a balance between innovative middleware solutions and the need to provide a longer term base of support and integration to accomplish real results.

Cognizant Program Officer(s):

- Alan R. Blatecky, Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8948, fax: (703) 292-9010, email: 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 Specified.
- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant or Cooperative Agreement
- **Estimated Number of Awards:** 5 to 8
- **Anticipated Funding Amount:** \$7,400,000 per year for 3 years, pending availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** 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. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m proposer's local time):
First Friday in March
beginning in March 2002

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.

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I. INTRODUCTION

The NSF Division of Advanced Networking Infrastructure and Research (ANIR), is continuing a major theme and emphasis that began with the Middleware program announcement (NSF 01-63) in February, 2001 (first awards in September, 2001), and followed with a second year of the program (NSF 02-028) which began in August 2002.

The NSF 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).
- 1996 - development of the NSF High Performance Connections program for emerging backbone services which also supported research connections to the Internet2 Abilene project.
- 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.

- 2002 - first release of NMI Open Source Middleware (Release 1 in April, Release 2 in October)

The awardees of the three NSF Cooperative Agreements have formed the NSF Middleware Initiative (NMI) Team which manages and guides the core operational basis and structure for the NSF Middleware Initiative. The NMI Team has developed a common architecture for middleware, has developed a process for incorporating existing and developing pieces of middleware into production releases twice a year; (Software Release 1 in May 2002, Software Release 2 in Oct 2002, Software Release 3 in April 2003, and so forth). The NMI Team also works with middleware developers and researchers on how to integrate and use new middleware approaches and solutions, and has significant efforts involving campuses, industry and international collaborations. More detail on the NMI Releases and program can be found at this URL: www.nsf-middleware.org.

This announcement seeks two types of proposals for the third year of the NMI program. One type of proposals are those which will provide longer term integration, development and support of middleware. The second type of proposals are those which will promote the development of new additional middleware components and capabilities.

II. PROGRAM DESCRIPTION

There are two primary elements and types of proposals of this NMI Program Announcement:

1. **Middleware infrastructure support and development**

The first program element involves middleware integration, support and deployment with a specific focus on developing the support infrastructure for the research community so that middleware and grid technologies can be effectively used by research applications and domain scientists. Projects in this category must address how to take the existing NMI Software Releases (URL:www.nsf-middleware.org), activities and efforts to the next level of support and deployment. While the existing NMI teams have identified key middleware and grid components and have established a successful initiative, long term viability requires a stable infrastructure for these key formative years for support, development, integration, documentation and training for the research and education community.

Projects in this category must simultaneously address the pressing issues of middleware persistence and robustness with the ongoing requirement for development, integration and testing of enhancements and new capabilities. Since the next major phase of middleware moves from experimental initiatives to early operational capabilities, projects must address a number of issues including support, interoperability, documentation, coordination and even international efforts. Projects are encouraged to involve a mix of institutions, organizations and partners, including industry partnerships, in order to broaden the base of middleware and grid technologies, and to help expedite the transition of experimental efforts into operational support and activities.

Infrastructure support and development projects need to specifically address the services to be provided, including appropriate migration plans to provide new levels of service and support. Projects also need to specifically address exit strategies as appropriate as segments of infrastructure support become fully operational and self-supporting.

2. **Additional new middleware components and capabilities**

The second program element focuses on experimental applications, including advanced science and education applications, which provide new middleware or software capabilities. The projects include experimenting with new middleware prototypes, development of new application capabilities, enhancing applications built and deployed by NSF grantees or others, and so forth.

Specific topic areas to be emphasized for new middleware capabilities in this category are:

- Resource discovery, scheduling and monitoring
- Distributed resource accounting
 - heterogeneous machines and clusters
 - variety of resources (e.g., storage, bandwidth, scientific instruments)
 - economic models for sharing diverse distributed resources
- Distributed authorization and management tools
 - privacy management
 - data integrity, authentication and security
 - virtual organization authorization tools
- Digital Rights Management
- Collaboration Tools

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

Middleware researchers and developers who are interested in developing new capabilities 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.

The guidance and advice of the network and computer communities outside NSF was sought in formulating this program. This guidance and advice is summarized by the following points and should be considered in preparing proposals:

- 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, end-users and application developers should be considered.
- Collaboration with other middleware researchers and efforts is important.

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

The NMI program will fund 2-4 consortia integration/implementation/support projects at up to \$1.4M per year for three years which are expected to be Cooperative Agreements, and 3-4 projects supporting new middleware applications developments at \$50,000 to \$150,000 a year for 2-3 years, which are expected to be Standard or Continuing Grants.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal 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). The complete text of the GPG is available electronically on the NSF Website 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.

Proposers are reminded to identify the program announcement/solicitation number (03-513) in the program announcement/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.

B. Budgetary Information

Cost Sharing:

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

C. Due Dates

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

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

First Friday in March

beginning in March 2002

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this announcement/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 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/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the [Grant Proposal Guide](#) for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

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

...serving institutions, or adjacent disciplines to that principally addressed in the proposal.

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

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

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

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

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make 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?

NSF staff will give careful consideration to the following in making funding decisions:

Integration of Research and Education

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

Integrating Diversity into NSF Programs, Projects, and Activities

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

B. Review Protocol and Associated Customer Service Standard

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

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

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

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. 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 their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards 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 Website 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, available electronically on the NSF Website 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 Website 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. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Alan R. Blatecky, Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8948, fax: (703) 292-9010, email: ablateck@nsf.gov

For questions related to the use of FastLane, contact:

- None Specified.

IX. OTHER PROGRAMS OF INTEREST

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

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF *E-Bulletin*, which is updated daily on the NSF Website at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's *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, although some programs may have special requirements that limit eligibility.

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 GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

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 Website 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

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.

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, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

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