

Networking Technology and Systems (NeTS)

Program Solicitation

NSF 06-516

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National Science Foundation

Directorate for Computer and Information Science and Engineering
Division of Computer & Network Systems

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

March 02, 2006

Second Wednesday in January beginning in 2007

REVISIONS AND UPDATES

In furtherance of the President's Management Agenda, in Fiscal Year 2006, NSF has identified programs that will offer proposers the option to utilize Grants.gov to prepare and submit proposals, or will require that proposers utilize Grants.gov to prepare and submit proposals. Grants.gov provides a single Government-wide portal for finding and applying for Federal grants online. A complete listing of these programs is available on the Policy Office website at: <http://www.nsf.gov/bfa/dias/policy>.

In response to this program solicitation, proposers may opt to submit proposals via Grants.gov or via the NSF FastLane system. In determining which method to utilize in the electronic preparation and submission of the proposal, please note the following:

- A. Collaborative Proposals. All collaborative proposals must be submitted via the NSF FastLane system. This includes collaborative proposals submitted:
- by one organization (and which include one or more subawards); or
 - as separate submissions from multiple organizations.

Proposers are advised that collaborative proposals submitted in response to this Program Solicitation via Grants.gov will be requested to be withdrawn and proposers will need to resubmit these proposals via FastLane. (Chapter II, Section D.3 of the Grant Proposal Guide provides additional information on collaborative proposals.)

- B. All Other Types of Proposals That Contain Subawards. All other types of proposals that contain one or more subawards also must be submitted via the NSF FastLane system.

The following items are major revisions to the previous program solicitation:

- Programmable Wireless Networks (ProWin), Networking of Sensor Systems (NOSS), and Networking Broadly Defined (NBD) have been updated; and
- A fourth research area -- Future Internet Design (FIND) -- has been added.

SUMMARY OF PROGRAM REQUIREMENTS

Program Title:

Networking Technology and Systems (NeTS)

Synopsis of Program:

Computer and communication networks are among society's most important infrastructures. Networks are vital to the operation of many sectors of our society — from financial and manufacturing to education and healthcare — and they are engines for economic growth. However, with the existing network architecture stressed and reaching the limits of its capabilities, significant innovations are necessary to give rise to new applications and to meet current and future demands on the existing Internet.

The Network Technology and Systems Program (NeTS) envisions making significant progress towards realizing a network and communication infrastructure that:

- Protects users' privacy, as well as computers and devices from malicious attacks and natural disasters, helps hold malicious users accountable for their actions, and is trusted enough to manage society's other critical infrastructure such as the power grid, banking and others;
- Bridges the physical and virtual environments through instrumented and managed sensorized physical environments, enabling a new class of science and engineering explorations and provides increased efficiency, safety, and quality of life for individuals and organizations;
- Supports pervasive computing and builds on current trends of more and more computer and communication devices in our lives;
- Enables continued innovations and discoveries in science and engineering through access to a global grid of networked instruments, supercomputers, ever-expanding storage capacity, and massive databases and data mining capabilities; and
- Enables broad innovation of new services, business models, and innovation commons for a wide variety of creative endeavors in all fields.

The NeTS program solicitation invites research proposals in the field of networking and covers all aspects of networking research. It includes research on future end-to-end Internet architectures; sub-network architectures enabled by disruptive technologies such as programmable wireless, mobile wireless, wireless sensors, and optical networks; and strategic research on current Internet including measurement, modeling, and understanding of complex networks. The NeTS program also seeks to develop innovative curricular and educational materials that will help prepare the next generation of networking professionals.

Proposers are encouraged to make bold assumptions about the future of networking. Proposals should describe high impact projects that address novel network architectures, protocols and/or technologies. NeTS proposals are solicited in four research areas:

I. Programmable Wireless Networks (ProWiN): Funded projects will seek to exploit the capabilities of programmable radios to make more effective use of the frequency spectrum and to improve wireless network connectivity.

II. Networking of Sensor Systems (NOSS): Funded projects will seek to create architectures, tools, algorithms and systems that make it easy to assemble and configure networks of sensor systems.

III. Networking Broadly Defined (NBD): Funded projects will include a balance of theoretical and experimental research and/or education projects that expand our understanding of large, complex, heterogeneous networks, design of access and core networks based on emerging wireless and optical technologies, and continue the evolution of Internet.

IV. Future Internet Design (FIND): Funded projects will seek to design a next-generation Internet which we will call the "Future Internet" from core functionalities to designing for security and robustness, manageability, utility and social need, new computing paradigms, integration of new network technologies, higher-level service architectures, and new

theories of network architecture.

A range of project types will be supported:

- Individual and Small Group projects;
- Large Group projects;
- Planning grants;
- Workshops in new and emerging areas; and
- Infrastructure projects.

More information on award types can be found in Section IV. of this solicitation; proposers are encouraged to fully consider this information prior to submission of their proposals.

Cognizant Program Officer(s):

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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:** An individual may appear as PI, Co-PI, Senior Personnel, or Consultant on no more than two NeTS proposals.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant or Cooperative Agreement
- **Estimated Number of Awards:** 60 to 80
- **Anticipated Funding Amount:** \$40,000,000 pending availability of funds

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- Full proposals submitted via FastLane:
 - Grant Proposal Guide (GPG) Guidelines apply
- Full proposals submitted via Grants.gov:
 - NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov Guidelines apply (Note: The NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: <http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf>) To obtain copies of the Application Guide and Application Forms Package: click on the Apply tab on the Grants.gov website, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required by NSF.
- **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. submitter's local time):
March 02, 2006
Second Wednesday in January beginning in 2007

Proposal Review Information

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

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full text of this solicitation for further information.

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I. INTRODUCTION

Computer and communication networks are among society's most important infrastructures. They are vital to the operation of many sectors of our society — from financial and manufacturing to education and healthcare — and they are engines for

economic growth. With the existing network architecture stressed and reaching the limits of its capabilities, significant innovations are necessary to realize new applications and to meet current and future demands on the existing Internet.

The next-generation network must overcome the limitations of existing networks and add new capabilities and services. Future networks should be available anytime and anywhere, be accessible from any communication device, require little or no management overhead, be resilient to failures, malicious attacks and natural disasters, and be trustworthy for all types of communication traffic.

NeTS will fund research and education projects in four targeted focus areas. These areas are Programmable Wireless Networks (ProWiN), Networking of Sensor Systems (NOSS), Networking Broadly Defined (NBD), and Future Internet Design (FIND). Focus areas are chosen to initiate and sustain research and education activities in promising new areas; foster the development of a research area where concentrated efforts facilitate significant advancements; encourage multi-disciplinary collaborations, particularly among research teams who typically have not worked together; or enable the development, implementation, and testing of innovative networking systems and technologies in an area that is ripe for a move from conceptual design to experimental research and prototyping.

To meet emerging requirements for the Internet's technical architecture, the protocols and structures that guide its operation require coordinated, coherent redesign. The NeTS solicitation encourages fundamental and possibly radical innovations in the broad area of networking leading to the next generation of network architectures. A new approach will require rethinking of the network functions and addressing a range of challenges. These challenges include, but are not limited to, the following examples:

- Fundamental policy and engineering trade-offs in the design of secured, privacy protecting, and robust networked systems;
- A new or hybrid paradigm of communication that goes beyond packet and circuit switching; seamless integration of physically embedded network infrastructure with the rest of network infrastructure;
- New models of information dissemination;
- Co-design of data, control, and management planes;
- Self-evolving networks with virtualized overlays; and
- Architectures that promote healthy industry structure and payment for services.

Finally, NeTS also will support projects that develop innovative curricular materials that have the potential to greatly improve higher education on networking systems topics. Investigators who wish to make contributions in this area may propose to do so either as part of a broader research and education project or as a stand-alone educational project. Whatever the case, proposals must provide strong justification for the need for the new educational materials, and must include plans for evaluating their effectiveness and disseminating them to the community.

II. PROGRAM DESCRIPTION

NeTS will fund research and education projects, as described below, in four areas:

- I. Programmable Wireless Networks (NeTS-ProWiN);**
- II. Networking of Sensor Systems (NeTS-NOSS);**
- III. Networking Broadly Defined (NeTS-NB);**
- IV. Future Internet Design (NeTS-FIND)**

I. Programmable Wireless Networking (NeTS-ProWiN)

The Programmable Wireless Networking focus area supports the creation of innovative wireless networking systems based on programmable radios: wireless, multimodal (multi-interface) and/or frequency-agile data communication devices with rich control and monitoring interfaces. The objectives are to:

- Capitalize on advances in processing and radio technology and on recent developments in spectrum policy;
- Improve network connectivity and resilience as well as usage of shared spectrum resources; and
- Enhance the wireless networks community by intermixing the networking, radio, and policy communities, integrating education with research through focused activities, and diversifying participation.

Programmable wireless networks will need to route messages through the network and interoperate with the larger Internet, manage spectrum resources dynamically, self-organize with a rapid initial configuration, accommodate mobility, support a variety of network services, use adaptation to ensure quality of service, and support multiple users and domains. It is

anticipated that this focus area will, within a few years, result in multiple programmable wireless radio platforms, prototypes of dynamic spectrum management systems, and wireless network testbeds that exploit the capabilities of dynamic radios and innovative spectrum approaches.

In order to realize this vision, the Programmable Wireless Networking focus area seeks proposals on the following topics. Proposals on other wireless networking topics should be submitted to the component of **Networking Broadly Defined (NeTS-NBD)**, rather than to this focus area.

- **Topology Formation and Interdomain Operations:** Projects will develop algorithms for topology discovery and optimization in programmable wireless networks and protocols for subsequent network configuration including connectivity across different networks. Programmable wireless systems may take advantage of both dynamic spectrum access and availability of several overlapping networks. For example, by simultaneously using multiple spectrum regions, multimodal and frequency-agile radios offer the capability to construct more complex topologies than have heretofore been possible with traditional radio or wired networks. When overlapping networks are available, flexible wireless topologies provide opportunities for improved connectivity and resilience by exploiting the capabilities of the different systems and administrative domains. Proposed algorithms must determine what topologies are possible and how to choose among them, and protocols must automatically configure the network based upon the topology chosen. The impact on network behaviors, such as convergence and stability, should also be assessed. Projects must include evaluation methods for the network architectures and protocols. Projects should address innovative approaches to topology formation, routing, inter-layer interaction, and management rather than internetworking "handoff" or translation issues currently being addressed by standards organizations and industry.
- **Programmable Wireless Network Testbeds:** Projects will develop testbeds for assessing new wireless network architectures including new techniques for wireless topology optimization and routing. To date, most wireless experiments and testbeds focus on performance metrics, and occasionally on resource use such as power, rather than attempting to understand the interrelationship between algorithms and protocols and the underlying resource, spectrum. Testbeds should investigate the relationship between spectrum use and other factors such as routing algorithms, topologies, protocols, policy mechanisms, and services. In addition to developing architectures and associated facilities, projects will define metrics and establish common frameworks for measuring spectrum use. The expectation is that these projects will develop flexible architectures and facilities for collaborating with related wireless efforts and for incorporating programmable radios such as those developed in prior NeTS projects. (Additional radio platform efforts are not encouraged under this solicitation.) Testbed efforts must provide milestones for developing the architectures and facilities. Innovative plans for wider access to the testbed by the research community and collaborative efforts are encouraged.

For further information, visit the focus area web site at <http://www.nsf.gov/cise/cns/prowin.jsp>.

II. Networking of Sensor Systems (NeTS-NOSS)

An individual sensor system can sense its immediate environment, process what it senses, communicate its results to others over a wireless link, and possibly take an action in response. Sensor systems are enabled by developments in digital sensors, digital actuators, and low power RF radios and by integrating these in a single chip with a processor-memory system. While a single sensor system has very limited use, a network of sensors can be used to instrument and manage large environments and systems.

Significant scientific and technical progress is required to realize the potential of networks of sensor systems. This focus area examines networking aspects of small sensor systems that are used as building blocks in large-scale, in-situ sensing applications. Sensor systems contain new types of computing machines, run different kinds of network applications, execute in different physical environments, and have large numbers of nodes. Moreover, a sensor system needs to operate with severe power and other resource constraints, and it needs to communicate and cooperate with a large number of other sensor systems over wireless links that have severe bandwidth and range constraints. In short, building networks of sensor systems requires overcoming many challenges.

The overall goal of the focus area has been to make it as easy in the next few years to assemble a network of sensor systems as it became in the 1980s to assemble a LAN of workstations using the BSD UNIX protocol stack and socket interface and Ethernet line cards. The focus area will achieve its goals by

- Creating strong foundation and system knowledge for the design and development of networks of sensor systems that are easy to manage, evolve, and secure, and that can provide quality of service guarantees;
- Developing a range of efficient and usable network sensor system platforms and tools;
- Creating a few sensor network architectures and their reference implementations;
- Creating a few network programming systems and their reference implementations; and
- Creating network testbeds for sensor systems with diverse applications and platforms in order to gain significant

experimental knowledge and experience.

The emphasis of this focus area for this and coming years will be on sensor network architectures, network programming systems, and their reference implementations. Successful proposals in this focus area will address at least one of the following topics:

- **Architectures:** Efforts in this area will either build on already proposed and funded sensor network architectures or propose a new comprehensive architecture. An architecture proposal needs to describe a coherent vision of how all the parts of a sensor network system should fit together.
- **Architecture Components:** Efforts in this area will focus on development of components of either one of those already funded or a concurrently proposed architecture. Proposals in this round must explicitly consider how their work will further advance integrative architectural goals and how they would contribute to realization of a comprehensive architecture. Proposals could target, but are not limited to, architectural components such as routing, in-network processing, localization, calibration, energy and resource management, higher-level naming services, storage services, debugging, network management, integration of sensing modalities, and statistical techniques. The focus area encourages proposals on security and privacy solutions for networking of sensor systems as well as proposals on architectures that would support limited mobility of sensors to achieve better coverage and efficiency.
- **Sensor Network Programming Systems:** Successful efforts in this area will focus on development of a sensor-network centric macro-programming paradigm (e.g. declarative, data-centric, data-flow, and others) and a complete associated tool chain. Proposals should describe how the proposed paradigm could be used to implement qualitatively different applications, and should also address how they would work with previously funded or concurrently proposed sensor network architecture(s). Proposals could address, but are not limited to, research areas such as macro-programming abstractions, programmer control for resource management, compile and run-time optimization techniques, code annotation and profiling, optimized code distribution mechanisms, and program analysis techniques. Output of this research should be a software artifact that can be integrated with one or more programming paradigms.
- **Reference Implementations:** Successful efforts in this area will produce a reference implementation of already funded or newly funded architectures and potentially a unified network architecture that encompasses elements of other architectures. Proposed work should carefully justify the design of the unified network architecture, and describe a work plan that leverages existing funded work to maximize return on investment. It should also carefully describe a set of realizable milestones for producing increasingly complete and robust versions of the reference implementation. At bi-annual NOSS meetings, PIs will be expected to demonstrate versions of increasing capability to the community, and discuss integration related tasks with other awardees in the program.
- **Hardware and Software Platforms:** The program will fund the development of sensor system platforms that can be networked and used to prototype other system components and testbeds. The platforms have to possess capabilities that are required for research on networking of sensor systems and that are not available in commercial systems. Proposals may also request support for distributing sensor system platforms. A PI who desires to distribute a platform to others must have significant interest from the community and should talk to a cognizant Program Director before writing a proposal.
- **Testbeds and Applications:** Projects in this area will build testbeds and deploy real applications in collaboration with applications researchers. Proposals must show how the testbeds would be used to demonstrate key networking capabilities and gain experimental experience and insights.

Potential PIs may want to look at some example sensor network architectures such as SNA at UC Berkeley, Tenet at UCLA/USC, COMPASS at Rice, Wavescope at MIT, and others at the focus area web site at <http://www.nsf.gov/cise/cns/noss.jsp>.

Research or development projects on physical sensing devices, distributed real-time embedded sensor systems, or sensor applications that do not include a significant networking component should consider other appropriate NSF programs.

For further information, visit the focus area web site at <http://www.nsf.gov/cise/cns/noss.jsp>.

III. Networking Broadly Defined (NeTS-NBD)

The NeTS-NBD component of this solicitation is concerned with advancing state of the art in key networking areas that are not covered by other focus areas as well as strategic research on the Internet and its evolution. The NeTS-NBD component will fund proposals in a wide range of areas including but not limited to the following:

- **Broadband Access Networks:** Projects in this area will enable innovative network architectures, protocols, and systems for wired or hybrid wired/wireless broadband access networks. Examples include optical/wireless access networks, that explore, for example, the “sweet spot” up to which fiber should be the carrier before wireless takes over; “self-organization” of the wireless part of the network while working in conjunction with the optical part; efficient control and management of large access networks; architectures and protocols that would enable new services; efficient interconnection methods between broadband access networks and metro and backbone networks;
- **Wireless Networking:** Projects in this area include research management and control of wireless networks including support for auto-configuration and self-organization under policy and security constraints; creation of survivable systems in the face of the challenges of the wireless environment; issues in wireless networks from a systems perspective such as the interactions of protocol layers and different access networks including cross-layer optimizations and feedback/control mechanisms; theoretical and systems aspects of pervasive systems including capacity and hierarchy; unique security challenges posed by fluidity, scale, and performance issues in wireless networks; and realistic and affordable means for carrying out representative, repeatable, and verifiable experiments to validate research on wireless networks including open tools and simulation models, as well as experimental facilities to access realistic environments and map experimental results to simulation models.
- **Optical Networking:** Projects in this area will research innovative optical network architectures, protocols, and systems, especially those enabled by emerging optical technologies such as photonic integrated circuits (PICs). PIs are encouraged to take a long-term perspective on role of optics in networks (e.g., optical backplanes to optical switches/routers with the goal to reduce power and increase efficiency of communication). Optical networking systems are meant to push the envelope beyond large electronic cross-connects. Example topics include architectures that build on transparency and ability to dynamically reconfigure the networks for much higher capacity and flexibility at much lower cost; innovative ways to interface computers and networks via optical interfaces; control plane technology and algorithms that allow rapidly dynamically reconfigurable optical network infrastructures to be realized; systems and architectures enabled by programmable optics with integrated electronics; interfacing optical technology with other network technologies such as wireless; and efficient configuration, monitoring, and management of large optical networks. Optical systems proposals should include one or more researchers with optical networking as well as systems-level expertise and address networking problems.
- **Network Measurement, Modeling and Understanding:** One topic in this area is to develop mathematically rigorous models to study and analyze the dynamics and properties of large-scale networks. One of the goals is to understand the fundamental performance limits of networks and to design algorithms that allow us to approach these limits. Another topic is to address the fundamental methodological barriers that make it hard to reproduce experiments or to validate simulations in real world systems. The goal here is to understand network behaviors for varying time-scales, a range of spatial topologies, and a range of protocol interactions. Toward these aims, NeTS will support the development of scalable, non-intrusive mechanisms, tools, and methodologies for measurements, traffic characterization, and simulations. This includes creating Internet-scale simulations to construct simulations of computer networks that are accurate and fully detailed and are on the scale of 100 million network elements or more, as well as using large-scale simulation methods to be able to explore and analyze the performance of any Internet protocol (e.g. BGP) when under specific attacks designed to disrupt the utility of that protocol.
- **Strategic Research for the Internet:** NeTS will also consider compelling, far-reaching projects that are aimed at addressing the strategic evolution of today's Internet and its capabilities in terms of scalability, robustness, security, and ability to support new as well as existing applications. Proposals are expected to address major limitations to the evolution of the Internet and to describe how the proposed solutions could be integrated into the Internet-i.e., into the existing TCP/IP protocol stack-and into existing network components such as routers, switches, and firewalls.

IV. Future Internet Design (NeTS-FIND)

The NeTS-FIND focus area is a multi-year three-phase effort based on a new conceptualization of networking research that alters the *nature* of the research process-moving away from business as usual within the relevant research communities and towards a more collaborative, more integrated, more inclusive program of research. FIND will support fundamental and possibly radical innovations in networking, leading to architectural proposals for a next-generation internet which we will call the "Future Internet".

This program solicitation, phase one, invites basic research proposals that address elements of the new Future Internet architectures. In phase two, NeTS will issue a new program solicitation. We expect that one or more architecture teams will begin to assemble an overarching and coherent architecture, building on the insights from the work put forward in phase one. In phase three, selected architectures are expected to be reduced to practice-fleshing out the details of protocols, and producing integrated code that could run on a research infrastructure. We assume that initial experiments in these later phases will lead to iteration in design, so there will be continuing opportunities to propose and integrate new concepts into a future architecture.

FIND is based on the premise that to achieve substantive change in what the Future Internet might be, the research community must not ask how to make the existing Internet better through an incremental change, but instead ask what is the network that is desired in 10 or 15 years and how should it be designed. In order to envision a Future Internet that might be rather different from that of today, FIND calls for research that addresses the question of how to design a Future Internet, knowing what is now known about requirements and mechanisms, considering lessons from the past, incorporating what is good, proposing new approaches where they are needed, and fitting these ideas into a fresh overall architecture. In this respect, the *process* of design has been called “clean slate” in that the research is not to be constrained by features of the existing network.

Requirements for a Future Internet

Proposals to FIND should consider what would be required in a Future Internet. Candidate requirements for a Future Internet might include the following.

- **Security and Availability:** A Future Internet must offer greatly improved security and robustness. Security should be defined broadly to include network support for end-node security, and high availability and resilience to failure and attack. The Future Internet should be robust enough to support critical societal functions, be of service in times of crisis, and balance societal needs such as privacy and accountability.
- **New Networking Technologies:** The importance of wireless brings a focus on mobility, location-awareness and processing/bandwidth limitations. The emergence of new optical capabilities implies networks that are more reconfigurable, dynamic, and flexible, and have much higher capacity at much lower cost.
- **New Computing Paradigms:** A Future Internet must support the computing environment of ten years from now which includes many small computing devices providing processing, human interfaces, sensing, storage, communications, and so on. All these devices must be networked together, must be able to discover each other, and configure themselves into larger systems as appropriate.
- **Application Support:** Tomorrow’s more complex applications will benefit from a richer and more advanced set of application-support features. The emergence of overlays may signal a fundamental re-layering of a Future Internet.
- **Network Management:** A Future Internet should be easier to configure, debug and manage, both for the large network provider and the consumer. This will contribute to improved ease of use, higher availability, lower costs of deployment and operation, and broader applicability.
- **Economic Concerns:** A Future Internet should foster, rather than inhibit, investment and the development of new functionality. Architecture should provide incentives for its own deployment, encourage deployment of new network facilities, and encourage innovation in applications.
- **Planning for Change:** The architecture for a Future Internet should allow for continued evolution and enhancement while preserving the consistency of the architecture.

In total, requirements such as these define a transformed global network that can be an objective of research and development, a benefit to society, and a driver of new investment and innovation.

FIND Research Topics

The FIND focus area solicits research across a broad range of topics. The criterion for funding is relevance to *architecture*, by which we mean the basic design principles and structures that will define a Future Internet, rather than the specific technical area. Research on the architecture and design of specific subnet technologies, such as wireless or optics, is not appropriate for this focus area unless the primary motivation of the work is to inform architectures at an internetworking level—a level that spans heterogeneous networking technologies and defines the basis on which end-points communicate. The list at the end of this section offers examples of research topics.

NSF does not assume that individual proposals will put forward a complete architecture framework for a Future Internet, nor does it expect formation of large architecture teams in phase one. The focus area is intended to encourage the basic research necessary to inform the development of one or more Future Internet architectures. Research is encouraged that looks at specific mechanisms or approaches that might be a part of a future architecture, or that compares or re-evaluates existing ideas free from the constraint that they interwork with the existing Internet. The community is encouraged to propose and evaluate requirements for a new architecture, to reason carefully about architectural responses to these requirements and to propose, develop and demonstrate new ideas that might be a part of a new architecture. There will be an emphasis across the funded projects on community building, discussion and debate on requirements, and consideration of

mechanisms, approaches and proposals. To accomplish these goals, there will be a series of working meetings, currently anticipated to be three in each year. FIND participants must commit to attend these meetings, and must budget accordingly. Budgets should also allow for student attendance at student meetings at least once a year.

The following list of example topics illustrates the scope of anticipated research. Proposals submitted to FIND should have an architectural focus. Proposals that deal with a specific topic (e.g. network management, measurement) should submit to other focus areas of NeTS.

- **Creating New Core Functionality:** Reconsideration of basics including packets and other modes of multiplexing and data delivery; addressing, naming and identity; routing and delivery; support for mobility; overlay networks, and services required to support overlays; architectural implications of performance objectives; and other elements of network services. Architectural principles such as rethinking the end-to-end arguments, layering and roles, soft state, and fate sharing.
- **Design for Security:** Techniques for high availability and architectures that are resilient under attack; secure protocols that resist flooding attacks; deterrence and forensic analysis; mechanisms for blocking unwelcome traffic from hosts and regions of the network; network support for end-node security, such as dealing with “zombies” and “botnets”; and frameworks and design techniques for secure applications.
- **Design for Manageability:** Enhancing network protocols and mechanisms to facilitate management; development of management abstractions, automated methods for gathering and maintaining network configuration information, higher-level languages for specifying network configuration and policy; cross-layer integrated management; secure approaches to network management, architecture for cross-region coordination, fault reporting and diagnosis.
- **Design for Utility and Social Needs:** Multi-disciplinary research on social and policy issues in the design of mechanisms, such as balancing privacy, identity and accountability; designing for regional difference and local values, architecture for trust, and linking mutual trust to limits on activities; recommendations on policy and mechanism design for surveillance, identity tracking, and response to malicious behavior, in the context of multiple jurisdictions; design for utility in times of crisis including mechanisms for priority access, robust fall-back modes for the network and for applications, access to emergency services; design for usability such as self-configuration of network management and diagnosis at the consumer level, approaches to providing user-comprehensible error reporting. Proposals with a focus on societal needs should include researchers with expertise in networking as well as social science.
- **Architectural Implications of New Wireless and Sensor Network and Embedded Computing Technology:** Support for mobility including addressing and location dynamics, mobility of subnets, Internet-level handoff, and security concerns with mobile hosts; location awareness and dynamic resource location; support for wireless including architectural implications of dynamic variation in performance and capacity allocation as well as cross-layer protocol support; embedded processing and sensors including implications of low power and intermittent operation, application and data driven routing; architectural support for discovery, self-organization and service composition.
- **Creating Higher-Level Service Architectures:** Conceptualizing networking at a higher level, closer to what users want to do rather than at the level of circuits, routers, and connections, including architectures for information handling supporting search, retrieval, naming and storage; architectures for management of location with awareness, location-based services, search and introduction based on location, and architecture for identity systems.
- **Patterns and Architecture for Application Design:** How applications and services should be designed to exploit new architectures including making large-scale distributed applications secure, robust and manageable; developing principles and patterns for distributed applications; and economic incentives for applications.
- **Optical Network Architectures and Their Implications:** Designing in robustness with proactive pre-planning of recovery methods in advance; responding to differing needs with differentiated survivability methods; how to cope with large-scale network disasters so that if some parts of the network are working, they can still support as many services as possible; research on large-scale correlated failures or attacks; implications of advanced optics including dynamic allocation of capacity to flows and aggregates in the backbone; integrated internet/optical management.
- **Holistic Network Design:** Designing networks so that applications, network architecture and physical layers work together harmoniously so that the network architecture layer works with lower layers to determine if good-quality paths exist and can be allocated to the application to meet its needs.
- **Developing Theories of Network Architecture:** Investigating network complexity, scalability, limits to robustness and economic incentives; methods for architecture specification, validation and testing; theories of change including approaches to architecture that will survive evolution over time.

For further information, visit the FIND web site at <http://www.nsf.gov/cise/geni/wsr.jsp>.

Projects that primarily address network security or trustworthiness should be submitted to the Cyber Trust program rather than to the NeTS program.

III. ELIGIBILITY INFORMATION

- **Organization Limit:** None Specified.
- **PI Eligibility Limit:** None Specified.
- **Limit on Number of Proposals:** 2. An individual may appear as PI, Co-PI, Senior Personnel, or Consultant on no more than two NeTS proposals.

IV. AWARD INFORMATION

The NeTS program emphasizes high-impact systems-oriented research with significant experimental and testbed components. Projects should clearly articulate ways in which the architectures, algorithms, protocols, and systems can be evaluated through experimental, emulation, simulation, or analytical means. NeTS will also support theoretical research projects that are closely tied to systems development and that advance understanding of complex networking systems.

The scope of the proposed project should determine the requirements for a particular number of investigators and students, as well as the type and cost of equipment. In the case of FIND submissions, the cost of travel to three annual PI meetings for the PI and one annual PI meeting for a student. These requirements in turn will determine the proposal budget.

The NeTS program expects to make the following types of awards:

- Individual investigator and small group awards that last up to three years and average about \$120,000 per investigator per year.
- Large group awards that last up to four years and request up to \$500,000 per year. Multi-investigator projects must convincingly argue why the collaboration is needed, discuss the management and collaborative aspects of the project, and have a compelling strategy for achieving demonstrable impact.
- Infrastructure awards that develop and possibly distribute platforms for networked sensor systems or build proof-of-concept testbeds. Awards last up to three years and average about \$500,000 per year.

Investigators should also consider the Major Research instrumentation (MRI) http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5260 and Computing Research Infrastructure (CRI) programs <http://www.nsf.gov/pubs/2004/nsf04588/nsf04588.htm> to support instrumentation and equipment.

- Small planning grants to support community building and to develop large-scale collaborations around one or more research topics. The need for such a planning grant must be clearly justified in the proposal. Proposing principal investigators (PIs) are expected to be established researchers; NeTS planning grants are not intended for new investigators seeking to strengthen their ability to write competitive proposals.
- Workshops in new or emerging areas in networking to bring researchers together, including those from multiple disciplines.

Principal investigators considering planning grants or workshops must discuss their idea with a cognizant Program Director prior to submitting a proposal.

In unusual circumstances, the Division of Computer and Network Systems will entertain proposals that are beyond the scope and funding levels noted elsewhere in this solicitation. Such proposals would be expected to explore groundbreaking or paradigm-changing ideas or to pursue a grand challenge requiring the work of a substantial number of researchers. Projects of this type might well include multidisciplinary investigators and cross CNS or CISE programs. PIs who have in mind such a project must first brief the appropriate CNS program officers and the CNS Division Director. PIs may submit a full proposal *only* after being given permission to do so. The briefing must take place before the program solicitation deadline so the Division can plan for the receipt and review of this kind of proposal.

The estimated program budget (\$40M), estimated number of awards (60-80), and average award size/duration are subject to the availability of funds. Awards may be standard or continuing grants or cooperative agreements.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Full Proposal Instructions:

Proposers may opt to submit proposals in response to this Program Solicitation via Grants.gov or via the NSF FastLane system.

- Full proposals submitted via FastLane:

Proposals submitted in response to this program 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/publications/pub_summ.jsp?ods_key=gpg. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov. Proposers are reminded to identify this program announcement/solicitation number 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.

- Full proposals submitted via Grants.gov:

Proposals submitted in response to this program solicitation via Grants.gov should be prepared and submitted in accordance with the NSF Grants.gov Application Guide: A Guide for the Preparation and Submission of NSF Applications via Grants.gov. The complete text of the NSF Grants.gov Application Guide is available on the Grants.gov website and on the NSF website at: (<http://www.nsf.gov/bfa/dias/policy/docs/grantsgovguide.pdf>). To obtain copies of the Application Guide and Application Forms Package, click on the Apply tab on the Grants.gov site, then click on the Apply Step 1: Download a Grant Application Package and Application Instructions link and enter the funding opportunity number, (the program solicitation number without the NSF prefix) and press the Download Package button. Paper copies of the Grants.gov Application Guide also may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

The following instructions deviate from the GPG guidelines:

In FastLane, proposers must select the solicitation number at the beginning of this solicitation.

To assist NSF staff in sorting proposals for review, proposal titles should begin with an acronym that identifies the solicitation area being addressed. Use the following acronyms to identify the area:

- Programmable Wireless Networks = NeTS-ProWiN;
- Networking of Sensor Systems = NeTS-NOSS;
- Networking Broadly Defined = NeTS-NBD; and
- Future Internet Design = NeTS-FIND.

For example, a NeTS proposal submitted this year might have a title such as "NeTS-ProWiN: Cross-layer Architectures for Coordinated Spectrum Management." Proposals not specifically intended for one of the other focus areas should be submitted to the Networking Broadly Defined area.

Proposers to FIND should address the following points in their submission:

- Clearly indicate what architectural requirement(s)-such as those discussed earlier in this solicitation-the proposed work will address;
- Discuss how this work would fit into a larger overall architectural framework. Discuss what other problems this work might mitigate or exacerbate.
- Using Additional Single Copy Documents in FastLane submit no more than two pages describing what infrastructure you would use to validate your proposed work, such as simulation, emulation or demonstration on a networking infrastructure. If the appropriate infrastructure exists, such as ns2, Emulab, or PlanetLab, is sufficient to validate your work, so indicate. If you would need infrastructure that does not exist, describe the characteristics or features you would require to validate your work. This Document will not be seen by reviewers and will not be used to evaluate your proposal. This document will provide input into the planning process for a new network facility to test new architectural ideas.
- Budget for travel to three FIND PI meetings per year for at least one PI and for one student to attend one PI meeting per year for the duration of the award.

Every proposal must include a discussion of broader impacts and ideally will include a substantial educational component, particularly in the larger proposals. Appropriate goals for the broader impacts component include the integration of education and research, promoting diversity in the networking workforce, developing substantial experimental research educational experiences, and developing curriculum in emerging network areas. The following URL contains examples illustrating activities that are likely to demonstrate the broader impacts: <http://www.nsf.gov/pubs/2002/nsf022/bicexamples.pdf>.

Proposers are reminded to identify the program announcement/solicitation number (NSF 06-516) in the program announcement/solicitation block on the proposal Cover Sheet. 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 by NSF in proposals submitted under this Program Solicitation.

C. Due Dates

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

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

March 02, 2006
Second Wednesday in January beginning in 2007

D. FastLane/Grants.gov Requirements

• For Proposals Submitted Via FastLane:

Detailed technical instructions for proposal preparation and submission via FastLane are available at: <https://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this 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/>

- **For Proposals Submitted Via Grants.gov:**

Before using Grants.gov for the first time, each organization must register to create an institutional profile. Once registered, the applicant's organization can then apply for any federal grant on the Grants.gov website. The Grants.gov's Grant Community User Guide is a comprehensive reference document that provides technical information about Grants.gov. Proposers can download the User Guide as a Microsoft Word document or as a PDF document. The Grants.gov User Guide is available at: <http://www.grants.gov/CustomerSupport>. In addition, the NSF Grants.gov Application Guide provides additional technical guidance regarding preparation of proposals via Grants.gov. For Grants.gov user support, contact the Grants.gov Contact Center at 1-800-518-4726 or by email: support@grants.gov. The Grants.gov Contact Center answers general technical questions related to the use of Grants.gov. Specific questions related to this program solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this solicitation.

Submitting the Proposal: Once all documents have been completed, the Authorized Organizational Representative (AOR) must submit the application to Grants.gov and verify the desired funding opportunity and agency to which the application is submitted. The AOR must then sign and submit the application to Grants.gov. The completed application will be transferred to the NSF FastLane system for further processing.

VI. 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 judgments.

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.

Additional Review Criteria:

Additional considerations in evaluating NeTS-FIND proposals include:

- How well does the proposed work address one or more architectural requirement(s)?
- How well does the proposed work relate to and enhance a larger overall architectural framework?
- How important is this work to the framing of a new architecture?

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.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

NSF is striving to be able to tell proposers whether their proposals have been declined or recommended for funding within six months. The time interval begins on the closing date of an announcement/solicitation, or the date of proposal receipt, whichever is later. 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 are administered in accordance with NSF Cooperative Agreement Financial and Administrative Terms and Conditions (CA-FATC). 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.

Consistent with the requirements of OMB Circular A-16, *Coordination of Geographic Information and Related Spatial Data Activities*, and the Federal Geographic Data Committee, all NSF awards that result in relevant geospatial data must be submitted to Geospatial One-Stop in accordance with the guidelines provided at: www.geodata.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/publications/pub_summ.jsp?ods_key=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/>.

*These documents may be accessed electronically on NSF's Website at <http://www.nsf.gov/awards/managing/>. Paper copies of these documents may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.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.

Large group projects may be site visited one or more times at NSF's discretion.

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:

- Darleen L. Fisher, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computer and Network Systems, 1175 N, telephone: (703) 292-8950, fax: (703) 292-9010, email: dlfisher@nsf.gov
- Guru Parulkar, Program Director, Directorate for Computer & Information Science & Engineering, Division of Computer and Network Systems, 1175 N, telephone: (703) 292-8950, fax: (703) 292-9010, email: gparulka@nsf.gov
- David Goodman, telephone: (703) 292-4550, email: dgoodman@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk, telephone: 1-800-673-6188; e-mail: fastlane@nsf.gov.
- Doris A Hutchinson, Program Specialist, 1175 N, telephone: (703) 292-8950, fax: (703) 292-9010, email: dhutchin@nsf.gov

The primary contacts for the four components are:

- Programmable Wireless Networks (ProWiN): Darleen Fisher; Guru Parulkar
- Networking of Sensor Systems (NOSS): Guru Parulkar
- Networking Broadly Defined (NBD): Darleen Fisher
- Future Internet Design (FIND): Darleen Fisher; Guru Parulkar

For questions relating to Grants.gov contact:

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

IX. OTHER 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 *MyNSF News Service* (<http://www.nsf.gov/mynsf/>) to be notified of new funding opportunities that become available.

Related Programs:

- Computer Systems Research
- Cyber Trust
- Computing Research Infrastructure

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 (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 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: (703) 292-7827

- **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.

OMB control number: 3145-0058.

Policies and Important Links	Privacy	FOIA	Help	Contact NSF	Contact Web Master	SiteMap
 The National Science Foundation, 4201 Wilson Boulevard, Arlington, Virginia 22230, USA Tel: (703) 292-5111, FIRS: (800) 877-8339 TDD: (800) 281-8749					Last Updated: 06/09/05 Text Only	