CONNECTIONS TO THE INTERNET

Program Announcement

I. PURPOSE OF THIS ANNOUNCEMENT
The purpose of this announcement is to encourage U.S. research and education
institutions and facilities to connect to the Internet and to establish high performance
connections to support selected meritorious applications. It updates and revises NSF 90-7,
Connections to NSFNET, and includes three connections categories:
a) connections for K-12 institutions, libraries, and museums that utilize innovative
technologies for Internet access;
b) new connections for higher education institutions;
c) connections for research and education institutions and facilities that have meritorious
applications with special network requirements (such as high bandwidth and/or bounded
latency) that cannot readily be met through commodity network service providers.

The NSF Division of Networking and Communications Research and Infrastructure
(NCRI) has advanced and supported inter-institutional computer networking for research
and education since 1986. With this support, the Internet has become an essential
infrastructure for that community and is used extensively to facilitate communication and
collaboration and to provide access to information and computing resources. The
number of Internet users, the number of connected networks, and the amount of
network traffic continue to grow rapidly. NSF supports the goals of the National Science
and Technology Council Committee on Information and Communications (CIC)
Strategic Plan, "America in the Age of Information."

This announcement is issued pursuant to the National Science Foundation Act of 1950, as
amended (42 U.S.C. 1861 et seq).

II. BACKGROUND
As of 1996 the Internet included more than 100,000 networks. These networks
interconnect millions of compute rs and tens of millions of users throughout the world.
NCRI supports connections to the Internet for research and education with the goal of
establishing and enhancing an advanced and ubiquitous computer networking infrastructure
for that community.

The domestic portion of the Internet includes national backbone networks; regional and state networks; and networks at research, education, government, and commercial institutions. Currently, research and education institutions are usually connected to state or regional networks, which, in turn, are connected to either a regional network of broader extent or to a national backbone network. Backbone and other appropriate networks are interconnected at NAPs (Network Access Points), FIXes (Federal Internet eXchanges), and the CIX (Commercial Internet eXchange). The Internet contains a number of NSF-supported networks and network service organizations. Supported networks include network connections at research and education institutions; regional networks; international connections in support of the global activities of U.S. research and education; and a very high speed Backbone Network System called the vBNS (see http://www.vbns.net), first implemented to connect the NSF Supercomputing Centers (currently the Cornell Theory Center, National Center for Atmospheric Research, National Center for Supercomputing Applications, Pittsburgh Supercomputing Center, and San Diego Supercomputing Center) and the NSF-sponsored NAPs. It is projected that the number of Internet users in the research and education community will continue to grow, and that these users will continue to require new levels of connectivity, performance, and services. New applications involving distributed high performance computing, remote visualization and imaging, and telecollaboration, together with growth in aggregate traffic, make the provision of an increasingly high performance network infrastructure necessary to achieve the overall goals of the CIC Strategic Plan. NCRI will seek to utilize services provided by interconnected network service organizations operating in a competitive environment to deliver networking services for research and education.

III. PROJECT REQUIREMENTS
For each of the connection categories described below, it is anticipated that proposers will seek to connect their local network infrastructure to the Internet by acquiring services from one or more network service providers. Each such service provider must be directly or indirectly interconnected with the NSF-designated priority NAPs (currently located in the New York, Chicago, and San Francisco areas); must route and carry all traffic originated at and/or destined for U.S. research and education sites; and must make their routes for all such sites within their respective service area(s) or region(s) available to the Routing Arbiter. Proposing institutions must cost share, normally at least equal to NSF funding, and must continue to support the proposed Internet access after the period of NSF support. Once an institution is connected to the Internet under this program, it is required that appropriate access be made available to all qualified users at the institution. Proposals must specify who are considered to be qualified users and how Internet access is to be made available to those users. For example, a proposal involving a K-12 school might specify that all students and staff of the school will be qualified users and that access will be provided by clusters of networked computers in a media center. Alternatively, such a proposal might specify that Internet access will be provided directly in the classrooms.
A. Connections utilizing innovative technologies for Internet access. This is a highly competitive connections category and is intended to support innovative technologies for Internet access for K-12 education institutions (including vocational technical schools), public libraries, and museums. Only highly innovative approaches that have the potential to accelerate network development at similar institutions (e.g., wireless and CATV technologies) will be considered for funding.
The supported costs of an institutional connection to the Internet may include the acquisition and maintenance of hardware and software to establish institutional access to the Internet as well as the installation and recurring charges for a communication channel. Alternatively, proposals may request funds for the acquisition of Internet connections and services from an external service provider. Proposals must include a clear cost breakdown of items to be supported by grant funds and items that represent institutional cost sharing. A two year non-renewable grant of approximately $15,000 will normally be awarded to

successful proposers. If the proposed innovative connection replaces an existing connection, only the costs above those of the existing connection will be considered for support.

Since Internet access should be available to all qualified users at the proposing institution, proposals should explain how this will be accomplished (local area network, terminal server, etc.). It is the responsibility of the proposing institution to provide local access for qualified users (e.g., personal computers, local area networks, terminal servers, etc.) without NCRI assistance.

The Project Description section of the proposal should include appropriate general information about the institution to enhance understanding of the proposed Internet connection project. It should also clearly address the topics specified in the evaluation criteria given in Section IV.E of this announcement.

This connections category is also open to proposals from consortia of institutions. In the case of consortia proposals, larger awards may be negotiated on a case-by-case basis to support the development or enhancement of multi-location networks using novel and cost-effective interconnection technologies and/or techniques (e.g., interconnecting small colleges, two year colleges, K-12 schools, public libraries, and/or museums in a novel way). Each institution in a consortium must clearly address in the Project Description section the evaluation criteria given in Section IV.E that relate to the individual institution.

B.   Connections for Higher Education

Institutions

This competitive connections category supports initial access to the Internet for higher education institutions (including community colleges and technical colleges) that are not already connected.

The supported costs of an institutional connection to the Internet may include the acquisition and maintenance of hardware and software to establish institutional access to the Internet as well as the installation and recurring charges for a communication channel. Alternatively, proposals may request funds for the acquisition of Internet connections and services from an external service provider. Proposals must include a clear cost breakdown of items to be supported on grant funds and items that represent institutional cost sharing. A two year non-renewable grant of approximately $20,000 will normally be awarded to successful proposers. Since Internet access should be available to all qualified users at the proposing institution, proposals should explain how this will be accomplished (local area network, terminal server, etc.). It is the responsibility of the proposing institution to provide local access to qualified users (e.g., personal computers, local area networks, terminal servers, etc.) without NCRI assistance.

The Project Description section of the proposal should include appropriate general information about the institution to enhance understanding of the proposed Internet connection project. It should also clearly address the topics specified in the evaluation criteria given in Section IV.E of this announcement.

This connections category is also open to proposals from consortia of institutions. In the case of consortia proposals, larger awards may be negotiated (on a case-by-case basis) to support the development or enhancement of multi-location networks using novel and cost-effective interconnection technologies (e.g., wireless and CATV technologies) and/or techniques (e.g., interconnecting small colleges, two year colleges, K-12 schools, public libraries, and/or museums in a novel way). Each institution in a consortium should clearly address in the Project Description section the evaluation criteria given in Section IV.E that relate to the individual institution.

C.   High Performance Connections for

Research and Education Institutions and Facilities This is a highly competitive connections category that supports high performance access to special Internet facilities (such as the vBNS) for research and education institutions and facilities having meritorious applications with special network requirements (such as high bandwidth and/or bounded latency) that cannot readily be met through commodity network service providers.

A two year non-renewable grant of approximately $350,000 will be awarded to each selected institution to help support the cost of establishing a high performance network connection, normally at, or above, the OC-3c level. If the high performance connection replaces an existing connection, only the costs above those of the existing connection will be considered for support. This connection category will be considered only for institutions that have demonstrated experience and success with existing Internet connections. Meritorious applications may include research and education in science and engineering involving a combination of tools, applications, and technologies of high performance networking. Application areas may include, but are not limited to, distributed high performance computing, remote visualization and imaging, and telecollaboration. NSF intends to use a mix of disciplinary and networking reviewers to review proposals. A high performance connection to the Internet should be interconnected with an appropriate high performance local network infrastructure, and the proposing institution will be responsible for funding that local infrastructure without NCRI assistance. The high performance local network infrastructure must be made available as appropriate to all qualified users (initially or in the near future) and not be restricted to just those proposed applications that require the high performance network. The proposal must indicate clearly what Quality of Service (QoS) guarantees are required by the proposed applications and indicate how these guarantees will be implemented end to end. As an example, a proposed OC-3c connection to the Internet might be interconnected with an ATM-based local network infrastructure that initially served the proposed application areas and that would be extended to general campus availability in the near future.

Techniques to guarantee QoS might initially rely on some combination of separate networks for different classes of applications. For example, on-campus traffic from applications requiring special QoS might be segregated from commodity traffic on separate links to avoid congestion. Similarly, separate paths could be established (where economically feasible) for commodity connections from a campus to a commercial network service provider and for "high-performance" connections leading to the vBNS (or other providers of special QoS). Sharing of high-cost access circuits between campus networks and network service providers might also be achieved with switching devices on either end of the access circuit to provide multiple virtual circuits over the single physical circuit. Frame relay or ATM switches, for example, could offer appropriate service assurances for the high performance traffic. Routers at either end of the shared link could view the shared link as multiple logical interfaces, each with its own set of supported routes. One or more logical interfaces would have routes to the vBNS, and others to the commodity Internet. It is anticipated, however, that there may be rapid evolution toward the provision of different classes of service on common, shared networks in response to dynamic requests from applications. In particular, a scheme such as RSVP (Resource reSerVation Protocol) could be used with appropriate scheduling to reserve and guarantee one or more "high performance" qualities of service from end to end as required by a meritorious application.

In such a scenario, traffic requiring guaranteed QoS could be mixed with commodity traffic on a single, high-bandwidth connection from the campus to a network service provider, for example, and be routed there, if appropriate, to the vBNS (possibly through a NAP) and so on to another campus with QoS guaranteed end-to-end. If successful, such new approaches may demonstrate significant advantages in both economics and management.

Proposals should address on-campus as well as off-campus connections, and long-term as well as interim solutions. A network engineering plan prepared jointly by a planning group including persons from the proposed application areas, from campus and/or local network provider organizations, and from involved wide area network service providers should be included in the Project Description section of the proposal. This plan should indicate how the proposed connections will deliver appropriate high-performance QoS initially and later, how it will be extended (possibly at a later time) to all qualified users, how it relates to commodity networking at the campus, region, etc., and how it will be managed and operated. The evaluation of the proposed network engineering plan will include consideration of its contribution to the emerging national/global high performance computing and communications infrastructure in addition to more narrow issues of technical merit.

Network service providers were apprised of the anticipated need to support high performance institutional connections in the NSF Program Announcement "Network Access Point Manager, Routing Arbiter, Regional Network Providers, and Very High Speed Backbone Network Service Provider for NSFNET and the NREN Program" (NSF 93-52). They may, therefore, be prepared to support new high performance connections proposed. Other appropriate methods to obtain high performance connections will also be considered. Institutions proposing a connection or interconnection with the vBNS should familiarize themselves with the NSFNET Backbone Network Service Acceptable Use Policy The Project Description section of the proposal should include appropriate general information about the institution to enhance understanding of the proposed Internet connection project. It should also clearly address the evaluation criteria given in Section IV.E of this announcement.

IV. PROPOSAL SUBMISSION

INFORMATION

Proposals should be prepared in accordance with the guidelines established in the Grant Proposal Guide (GPG), with the exception that the 15 page limitation will be waived for consortium proposals (see GPG Section II.D.12.b).

The remainder of this section describes who may submit proposals in response to this announcement; principal investigator requirements; proposal submission address and proposal processing dates; public access rights to proposals that result in an award; and evaluation criteria that will be applied to submitted proposals.

All NSF publications referred to in this announcement can be accessed through the NSF World Wide Web page (at www.nsf.gov) as well as from the sources indicated below. Information on NSF programs is also available through the Science and Technology Information Systems (STIS), NSF's on-line publishing system, described in the flyer Getting NSF Information and Publications (NSF 95-64) reproduced on the inside cover of this announcement and the STIS Users' Guide (NSF 94-10).

A. Who May Submit

Proposals may be submitted by any U.S. research and/or education institution or consortium of such organizations as appropriate for connections categories I.a, b, and c. Proposals for consortia should be submitted by a lead organization having administrative and negotiation authority for the group and must be signed by an authorized official from each member organization. Should an award be made to a consortium in response to this announcement, that consortium must have a written consortium agreement with a single lead organization, and the principal investigator must be an employee of that organization.

It is recommended that appropriate administrative officials of proposing organizations be familiar with the policies and procedures stated in the NSF Grant Policy Manual (GPM) which are applicable to NSF awards. If a proposal is recommended for an award and if the proposing organization has not previously received an NSF award, the NSF Division of Grants and Agreements will request certain organizational, management, and financial information from the submitting organization. This information must be submitted before any award is made. These requirements are described in Chapter V of the GPM.

B. Principal Investigator

The individual designated as principal investigator will be responsible for the planning, acquisition, management, and maintenance of the Internet connection and any related equipment, and also for liaison with associated network and network service providers.

C. Proposal Submission and Due Date Ten (10) copies of the proposal, including one copy bearing original signatures, should be mailed to:

Proposal Processing Unit - Room P60
Attn.: Connections To The Internet
Program, NSF 96-64
National Science Foundation
4201 Wilson Blvd.
Arlington, VA 22230
Only one (1) copy of NSF Form 1225, Information About PI/PD, should be sent, attached to the original signed proposal. The Connections to the Internet Program has two review cycles per year. The deadline dates are January 31 and July 31. Proposals must be postmarked on or before the aforementioned deadline dates. Proposals received after the deadline dates will be returned to the principal investigator who might want to resubmit for a subsequent review cycle. In order to prevent unnecessarily long evaluation periods, proposals received more than two months in advance of a deadline date will also be returned for later submission.

D. Rights to Proposal Information

A proposal that results in an NSF award will become part of the record of the transaction and will be available to the public on specific request. Information or material that NSF, after consultation with the awardee, determines to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act (5 U.S.C. 552). Without assuming any liability for inadvertent disclosure, NSF will seek to limit dissemination of such information to its employees and, for purposes of evaluation of the proposal, to outside reviewers. Accordingly, any privileged information contained in the proposal should be clearly marked or indicated (such as with an asterisk or highlighter) and identified by a legend similar to the following: "Following is ((proprietary) or (specify)) information that (name of proposing organization) requests not be released to persons outside the Government, except for purposes of evaluation."

E. Evaluation of Proposals

Evaluation of proposals will be administered by the NCRI. Evaluation will be provided by review panels with possible use of individual reviewers as appropriate. In accordance with established Foundation procedures, proposals will be reviewed with respect to the four general NSF evaluation criteria, and with respect to the special evaluation criteria listed below. (The four general NSF evaluation criteria are described in Section III of the NSF brochure Grant Proposal Guide (GPG) and deal with quality of scientific effort proposed, competence of investigators, relevance of research, and impact on science and education

infrastructure.) The general criteria and the special criteria are of equal importance. The special criteria are of approximately equal importance. a.Special Criteria for Connections Utilizing Innovative Technologies for Internet Access 1. Technological innovations involved in providing low-cost Internet access 2. Plans for education and research use of the Internet 3. Definition of qualified Internet users; plan to provide Internet access to all qualified users 4. Contribution to the emerging national network infrastructure 5. Quality of proposed user support services 6. Technical expertise in computer networking (especially Internet networking) or plans to utilize such expertise from associated network service providers; coordination procedures with proposed network service providers 7. Plan for the institution to provide for the future continuing support of the network connection 8. Cost-effectiveness of the proposed network connection; proposed cost sharing (normally at least equal to NSF funding)

9. Plans to disseminate results relating to the technological innovations associated with providing Internet access b.   Special Criteria for Connections for Higher Education Institutions 1. Plans for education and research use of the Internet 2. Definition of qualified Internet users; plan to provide Internet access to all qualified users 3. Contribution to the emerging national network infrastructure 4. Quality of proposed user support services 5. Technical expertise in computer networking (especially Internet networking) or plans to utilize such expertise from associated network service providers; coordination procedures with proposed network service providers 6. Plan for the institution to provide for the future continuing support of the network connection 7. Cost-effectiveness of the proposed network connection; proposed cost sharing (normally at least equal to NSF funding) c.   Special Criteria for High Performance Connections for Research and Education Institutions and Facilities 1. Quality of proposed application(s) that require the high performance connection 2. Contribution to the emerging national/global high performance network infrastructure 3. Network engineering planning process, planning participants, and resulting plan 4. Quality of proposed local network infrastructure 5. Quality of Service (QoS) guarantees and their implementation methods for the proposed high performance applications (the QoS guarantees and implementation methods should pertain to relevant local and wide area network environments)

6. Technical expertise in computer networking (especially Internet networking); coordination procedures with proposed network service providers 7. Plan for the institution to make the service broadly available and provide for the future continuing support of the proposed network connections 8. Cost-effectiveness of the proposed network connection; proposed cost sharing (normally at least equal to NSF funding)

9. Plans to evaluate and disseminate results relating to the technology associated with the high performance connection

V. ADDITIONAL INFORMATION

Awards resulting from this announcement are administered in accordance with the terms and conditions of GC-1, "Grant General Conditions", and CA-1, "Cooperative Agreement General Conditions". Copies of these documents are available at no cost from the NSF Information and Publications Unit, via phone (703-306-1130), electronic mail (pubs@nsf.gov), or the World Wide Web (at www.nsf.gov). More comprehensive information is contained in the Grant Policy Manual.

Cost sharing proposed will be included as a condition of award under this program.

General inquiries should be made to:
Division of Networking and
Communications Research and
Infrastructure, Room 1175

National Science Foundation
4201 Wilson Blvd.
Arlington, VA 22230
(703) 306-1949

Upon completion of the project, a Final Project Report (NSF Form 98A), including the Part IV Summary, will be required. Proposers should review this form prior to proposal submission so that appropriate tracking mechanisms are included in the proposal plan to ensure that required information will be available at the completion of the project.

Support for this program is contingent on the availability of funds. This announcement does not obligate the NSF to make awards.

VI. OTHER PROGRAMS OF

INTEREST
NSF Guide to Programs (NSF 95-138), available from the NSF Forms and Publications Unit, briefly describes Foundation activities.

Partnerships for Advanced
Computational Infrastructure (PACI) (NSF 96-31). Contact Richard Kaplan; email: paci@nsf.gov; phone (703) 306-1963; or http://www.cise.nsf.gov/gov/cise/asc/progsol. html.

The Telecommunications and Information Infrastructure Assistance Program (TIIAP) of the National Telecommunications and Information Administration of the U.S. Department of Commerce. Contact TIIAP Program Director; email: tiiap@ntia.doc.gov; phone: (202) 482-2048.

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 subject to discrimination under any program or activity receiving financial assistance from the National Science Foundation.

Privacy Act and Public Burden. Information requested on NSF application materials is solicited under the authority of the National Science Foundation Act of 1950, as amended. It will be used in connection with the selection of qualified proposals and may be used and disclosed to qualified reviewers and staff assistants as part of the review process and to other government agencies. See Systems of Records, NSF-50, Principal Investigator/Proposal File and Associated Records, and NSF-51, Reviewer/Proposals File and Associated Records, 56 Federal Register 54907 (Oct. 23, 1991). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of your receiving an award.

The 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 or any other aspect of this collection of information, including suggestions for reducing this burden, to Herman G. Fleming, Reports Clearance Officer, Division of Contracts, Policy, and Oversight, National Science Foundation, 4201 Wilson Boulevard, Arlington, VA 22230; and to the Office of Management and Budget, Paperwork Reduction Project (3145-0058), Washington, D.C. 20503.

The National Science Foundation has TDD (Telephonic Device for the Deaf) capability, which enables individuals with hearing impairment to communicate with the Foundation about NSF programs, employment, or general information. This number is 306-0090.

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 projects. See the program announcement or contact the Program Coordinator at 306-1636.

The Foundation provides awards for research in the sciences and engineering. The awardee is wholly responsible for the conduct of such research and preparation of the results for publication. The Foundation, therefore, does not assume responsibility for the research findings or their interpretation.

The Foundation welcomes proposals from all qualified scientists and engineers, and strongly encourages women, minorities, and persons with disabilities to compete fully in any of the research and related programs described here. This program is described in the Catalog of Federal Domestic Assistance, Number 47.070, Computer and Information Science and Engineering.

See http://www.whitehouse.gov/WH/EOP/OSTP/ NSTC/html/cic/cic-plan.html or the National Coordination Office for HPCC; Suite 665; 4201 Wilson Blvd.; Arlington, VA; 22230; email:

nco@hpcc.gov

See, for example, Braden, R., Zhang, L., Berson, S., Wroclawski, J., Resource ReSerVation Protocol (RSVP)--Version 1 Functional Specification, Internet Draft, or http://www.isi.edu/div7/rsvp/rsvp.html See http://ds0.internic.net/nsf/vbns/nsf.policy. The NSF Grant Proposal Guide (GPG) (NSF 95-27) is effective for all proposals submitted after October 1, 1995. The GPG and the Proposal Forms Kit (NSF 95-28) are now available on the World Wide Web (http://www.nsf.gov:80/bfa/cpo/gpg/start.htm). Search NSF Publications for "nsf9527" and "nsf9528", respectively.

Grant Policy Manual (GPM) (NSF 95-26) effective October 1, 1995. The complete text of the GPM is now available on the World Wide Web (http://www.nsf.gov:80/bfa/cpo/gpm95/start.htm). Search NSF Publications for "nsf9526".

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