

PROGRAM ANNOUNCEMENT EXPERIMENTAL SYSTEMS

CISE Advanced Resources for Experiments

DIRECTORATE FOR COMPUTER AND INFORMATION
SCIENCE AND ENGINEERING

DEADLINE DATE: *January 15, 1998*



NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT EXPERIMENTAL SYSTEMS

This is an invitation to submit two kinds of proposals: resource proposals in response to the CISE Advanced Resources for Experiments (CARE) initiative, and research proposals to the Experimental Systems program. The CARE initiative, which is new for FY98, has a proposal receipt deadline of January 15, 1998. For research proposals to the Experimental Systems program there is no target date or deadline.

CARE: CISE Advanced Resources for Experiments Deadline: January 15, 1998

(Proposals not received by the deadline will be returned.)

One of the barriers to experimental research and education, especially at smaller institutions, is the large investment in resources that is needed. This can take the form of elaborate equipment, staff, or data repositories that must be established and maintained. Some of this infrastructure can be distributed across the country, using the Internet to integrate dispersed institutions into an experimental facility. Distributed resources can lower the barriers to experimental research, permitting greater participation and allowing more of our students to be educated in experimental computer science.

During Fiscal Year 1998, the Experimental Systems program will sponsor an initiative for the establishment and maintenance of CISE Advanced Resources for Experiments. Awards under this initiative will complement the research and education activities supported by the program, and are open both to current grantees of the program and those who are not current grantees. During FY98 we anticipate making approximately 5 awards at an average of \$400,000 per year. If the FY98 initiative is successful, it will serve as the model for an annual series of awards supporting experimental distributed facilities.

Activities funded under this initiative will be primarily resources in support of research and education, rather than self-contained research projects. The initiative will support unique resources that, once established, can be accessed remotely by researchers around the country. Resources can be very diverse; for example they could include hardware such as prototyping testbeds, software such as code libraries for experimental compiler research, data such as collections of traces for evaluating architectures, or services such as brokers to bring together designers and fabricators. It is not the intent of this initiative to support research into the technical problems of establishing such facilities, such as how to store and index massive amounts of data or how to provide high-bandwidth national connections. Rather, the projects in this initiative will use the results of current and prior research to provide resources that support experimental research projects and education.

Awards will support the initial establishment or updating of resources, and will typically continue for up to four years. Expenses for operations and maintenance during the first few years of use, including equipment and staff, will also be supported. Resources will be expected to show evidence of distributed use by the end of the

second year of the award, with a transition plan for continuing the resource after the end of NSF support required from all awardees. Only in rare cases will NSF support for a resource be renewed after the initial four years.

Proposals should describe the resource to be established, and should make clear the extent of the national need for such a resource in support of experimental research and education in computer and information science and engineering. The proposal should include plans for making the resource available to users outside of the grantee institution, for technical support of external users, for responding to evolving user needs, and for demonstrating evidence of distributed use within two years of the award date. Plans for continuing activities of the resource after cessation of NSF support should also be included in the proposal. Commitments of support from sources other than the Federal government and the grantee institution are strong evidence of a need for the proposed resource.

Proposals under this initiative will be reviewed according to the criteria recently set forth by the National Science Board (<http://www.nsf.gov/pubs/1997/iin121/>). Reviewers will be asked to give the most weight to the criterion concerning broader aspects of the proposed activity. Panel and mail review will be used as appropriate to individual proposals. Awards may undergo review after two years to ensure that a useful, up-to-date experimental resource has been established.

Research Proposals No deadline

The Experimental Systems program supports research projects that involve building, evaluating, and experimenting with an information-processing system. These are goal-oriented projects undertaken by teams of designers, builders, and users. The building of the system must itself represent a major intellectual effort, and offer advances in our understanding of information systems architecture. A system supported by the Experimental Systems program will usually include both hardware and software components.

Research on information processing systems involves interaction among diverse elements such as hardware architectures, computational models, compilers, operating systems, applications, performance evaluation tools, and user interfaces. Building and evaluating real experimental systems is the only way to understand the interactions in large systems; other techniques, such as simulation and analysis, have only limited uses in understanding the system issues in such a complex environment. Software simulators, for instance, do not provide the computing speed needed for large experiments, nor the needed performance incentives for porting large application systems for experimentation. Without real experimental systems, important areas of information systems architectures cannot advance.

A successful proposal to the Experimental Systems program should demonstrate the feasibility and utility of the project. Feasibility can be shown by describing prior proof-of-concept prototypes or simulation studies that indicate that the proposed system can be

built and will meet its design goals. Utility can be shown by demonstrating that building the system will provide substantial advances in computer system architecture, or that the system is inherently useful. Details of the measurement and evaluation procedures that will demonstrate the benefits of the system in an application should be given in the proposal.

The system to be built must be novel in some way, and the impact of the novel aspects of the system upon its architecture must be evaluated during the course of the research. To justify construction the new system must be potentially superior to existing systems in the chosen application area. Ideally, building the system would provide new knowledge of systems architecture and open up new application areas. An appropriate project might be a system built using a new architecture or technology, which addresses an application in a new way. An inappropriate project would be one in which the research uses, simply as a platform, a special purpose machine whose design, fabrication, and evaluation are straightforward. The novel aspects of an experimental system may fall into several different areas; for example, the system might feature application of a new technology, new architecture, or new techniques for performance measurement and evaluation to a computationally stressing problem. Examples of technological innovation are massively parallel analog systems, or applications of opto-electronics. Architectural innovations might include new parallel I/O structures, hardware-software codesign, or limited modifications to commodity processors. New evaluation techniques might include instrumentation for performance evaluation or debugging. These innovations might be applied to produce high-performance computers, intelligent sensors, or signal processing architectures, for example. A list of projects currently supported under the Experimental Systems program can be found in the Microelectronic Information Processing Systems Division Summary of Awards (NSF 96-44).

Experimental systems projects require larger levels of support and longer commitments than some other types of research. Support in the past has averaged about \$400,000 per year for small groups of researchers. The duration of awards is typically three to four years. About 12-15 awards are expected in FY98.

To justify support under this program, a proposal should show that system building is necessary for answering significant and timely research questions. The research issues should be such that the best way to address them is to build the proposed system and measure its performance. Building for its own sake is discouraged; analysis and simulation should be performed in sufficient detail before a proposal is sent to the Experimental Systems program. Furthermore, off-the-shelf hardware should be employed in the building stage whenever the research goals do not require custom construction.

By encouraging the design, construction, test, and evaluation of novel information processing systems, NSF hopes to achieve several goals:

- Settle major research issues and add to fundamental knowledge in information processing;
- Guide research in computer science and engineering toward meaningful problems;
- Strengthen the system-building expertise in our research institutions;
- Educate a new generation of researchers in experimental systems research.

The Experimental Systems program encourages proposals for research that will help meet these goals.

INQUIRIES

Inquiries about this program may be directed to the program director, Dr. Michael Foster, (703) 306-1936, mfoster@nsf.gov. The mailing address is CISE Directorate, National Science Foundation, 4201 Wilson Boulevard, Arlington, Va. 22230. Potential applicants are encouraged to discuss their research ideas with the program director, either in person, by letter, by email, or by telephone.

PROPOSAL PREPARATION AND EVALUATION

All proposals must be prepared in accordance with the instructions contained in the NSF Grant Proposal Guide (NSF 98-2). Single copies of this brochure are available at no cost from the NSF Clearinghouse, (301) 947-2722, or via Email (pubs@nsf.gov). Brochures are also available through NSF's site on the World Wide Web (<http://www.nsf.gov>).

Proposals should be submitted to the National Science Foundation PPU, 4201 Wilson Boulevard, Room P60, Arlington, Va, 22230. Fifteen copies are required, one of which must be signed by the Principal Investigator(s) and an official authorized to commit the proposing institution. For information regarding electronic proposal submission, visit our site on the World Wide Web.

Proposals to this program will be subject to the NSF peer review process which may include panel and/or mail review. Criteria by which proposals are judged were recently revised by the National Science Board. These new criteria can be found in the Grant Proposal Guide and on the World Wide Web (<http://www.nsf.gov/pubs/1997/iin121/>).

AWARD ADMINISTRATION AND CONDITIONS

Awards resulting from this announcement will be administered in accordance with the terms and conditions of NSF GC-1 (10/95) or FDP-III (7/1/96) *Grant General Conditions*. Copies of these documents are available through NSF's site on the World Wide Web or from the NSF Forms and Publications Unit. More comprehensive information is contained in the *NSF Grant Policy Manual* (7/95) (NSF 95-26), for sale through the Superintendent of Documents, Government Printing Office, Washington, DC, 20402, and available on the World Wide Web. Depending on the nature of the project, NSF may elect to enter into a cooperative agreement with the awardee.

GENERAL INFORMATION

The Foundation provides awards for research and education 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 education related programs described here. 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.

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 (703) 306-1636.

Privacy Act. The information requested on proposal forms 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 disclosed to qualified reviewers and staff assistants as part of the review process; to applicant institutions/grantees; to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers, and researchers as necessary to complete assigned work; and to other government agencies in order to coordinate programs. See Systems of Records, NSF 50,

Principal Investigators/Proposal File and Associated Records, and NSF-51, 60 Federal Register 4449 (January 23, 1995), Reviewer/Proposal File and Associated Records, 59 Federal Register 8031 (February 17, 1994).

Public Burden. 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 Gail A. McHenry, Reports Clearance Officer, Information Dissemination Branch, National Science Foundation, 4201 Wilson Boulevard, Suite 245, Arlington, VA 22230.

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. To access NSF TDD, dial (703) 306-0090; for FIRS, 1-800-877-8339.

This program is described in the Catalog of Federal Domestic Assistance Number 47.070, Computer and Information Science and Engineering.

NSF 98-5 (Replaces NSF 94-142)

OMB 3145-0058

PT 34

KW 1004000