Political Winds Change Direction Again

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Abstract

1995 is off to a good start: there have been quite a few very exciting funding opportunities from NSF, ARPA, NASA, etc. Before looking at these program announcements in detail, we first discuss briefly the potential impact of the 1994 election on research funding.

1 Research Funding under GOP

Almost 3 months after the 1994 election, people are still scrambling to sort out its implications on US science and technology policy and to reposition themselves accordingly.

Although science has traditionally fared well under Republicans, they are more skeptical toward applied technology programs. According to one analysis (see the December 16 1994 issue of Science), the new order on Capitol Hill could mean good news for biomedical research and space, but major political uncertainties for other science programs. For computer and communication related programs, a major problem is that they have been identified with administration initiatives such as NII and HPCC. The Republican "Contract with America" calls for eliminating the Advanced Technology Program (ATP) of NIST, cutting HPCC pretty heavily (but not eliminated), and trimming NSF slightly (1% off projected growth).

The outlook is particularly alarming for defense research funding. Two prominent Republican senators on the Armed Services Committee have proposed to eliminate $1.5B now being spent in military-sponsored medical and university research, which they claim are wasteful and contribute little to US defense posture. The research being targeted includes HPCC and several dual-use technology programs, defense conversion programs, and the TRP program. The impact of such cuts on the computing research community would be devastating. For example, 50% of university funding last year in math and computer science comes from DoD. Moreover, almost 50% of current graduate student support in computer science comes from DoD funding.

As observed by Rick Weingarten of Computing Research Association (CRA), "there is a long standing, clear and bipartisan consensus in the Congress that (1) research funding is a legitimate role for the Federal government, and (2) in light of the severe budget pressures, research had better make some darn good arguments why it ought to get a piece of the pie (and forget asking for any bigger piece, by the way)." The bottom line is that it will be extremely tough to keep the level of research funding from taking a massive hit.

Nevertheless, both research in general and computing research in particular still have many potential friends and powerful political allies in the Congress. These allies and the many new members need help and educating about research and computing. To facilitate this matter, and to follow up with further developments, CRA has created a "Computing Researcher's Guide to Congress", accessible through its home page on WWW at URL address http://cra.org/.

2 NSF Support of Multidisciplinary Research

Building on the Grand Challenge Application program and the National Challenge program started in 1992, NSF has recently announced opportunities in support of multidisciplinary and group-oriented research for 1995 in connection with the HPCC program. The program includes the following distinct but interrelated components:

1. **Grand Challenges**: "to prepare the groundwork for the HPCC goal of sustained teraflop computing on important application problems utilizing parallel, distributed and heterogeneous computing systems and high performance networks." [...] "Projects will include aspects of design of models, algorithms and software, as well as problem solving environments, to fully realize the potential of parallel, distributed and heterogeneous computing systems and of high performance networks on Grand Challenge problems and on enabling technologies."

2. **National Challenges**: "to demonstrate the solution of problems beneficial to a broad spectrum of society which contain an extensive information processing component, and which could benefit greatly by building an underlying information infrastructure." [...] "Example application areas include digital libraries, education, manufacturing, crisis management, health care delivery, environmental research, civil infrastructure, and government information delivery."

3. **Enabling Technologies**: "to accelerate progress in developing those technologies that will enable the community to take full advantage of high performance computing and communications systems in solving problems represented by the Grand Challenges and National Challenges."

   (a) *Computer Science Challenges*: "focus is on the development of computing technology ranging from computer architecture through systems software to algorithms." Areas of interest include:

      i. "Innovative approaches to computing systems architectures, including all aspects of high performance memory systems and wide band I/O;
      ii. Network interface architectures and operating systems for effective, seamless, low-overhead communications among collections of workstations;
      iii. Information access technologies that enable efficient search of large distributed information repositories, make the distributed information resources understandable, and are designed to be made available over data networks;
      iv. Development of environments, system software and algorithms to support the effective utilization of parallel architectures and communications networks;
      v. Foundations for building NII applications from re-usable objects that provide services, such that the applications are affordable, interoperable, easy-to-use and have an appropriate level of security and dependability."

   (b) *Mathematical Sciences Challenges*: "focus is on advances in the mathematical sciences ranging from algorithms through the development of tools to the essential use of computation in extending mathematical frontiers." Areas of interest include:

      i. "Algorithm design and analysis;
      ii. New computational paradigms;
      iii. Mathematical investigations that require high performance computing to open areas of mathematical research that are otherwise inaccessible;
      iv. New mathematical and statistical tools that provide better access to high performance resources."

   (c) *Problem Solving Environments (PSEs)*: "focus is on the development of computational environments that take advantage of unique characteristics of specific problems in order to shorten the problem solving cycle." Areas of interest include:

      i. "PSE foundations: Research in general and abstract properties of PSEs to derive design principles and methodologies for PSEs. This work will include study of generic features of scientific problem solving for large domains, and their efficient mapping onto high performance computer hardware and software;
      ii. Key technologies for PSEs: Research on computational and computer-scientific technologies specifically applicable to PSE development;
      iii. Construction of PSEs: PSE prototypes for important classes of scientific and engineering problems. These will be complex enough to exhibit the general features and difficulties of the process."

NSF expects to fund a total of 15 to 20 proposals, in the range of $300,000 to $800,000 per year for three to five years. This will augment the portfolio of 16 Grand Challenge Applications Groups awarded in 1992 and 1993, and 9 National Challenges Groups awarded in 1994.

"Activities supported under this solicitation are expected to achieve significant progress on one or more of the following:

1. Fundamental problems in science, engineering and information processing whose solution could be advanced by applying high performance computing and communications techniques and resources;

2. Enabling technologies which facilitate those advances;

3. Research in computer science and/or mathematics contributing to the preceding two activities.

The emphasis will be on support for cross-disciplinary groups requiring and/or contributing HPCC capabilities."

Email submission of preproposals is required and is due 02/27/1995. They should be in plain text format addressed to hpccgrps@nsf.gov. Full proposals are due 06/09/1995. The detailed description of the program components and the proposal formats can be found by browsing the SIGMOD Information Server at http://bunny.cs.uiuc.edu/README.html, or by contacting Dr. Darleen Fisher of NSF at (703)306-1949.

3 ARPA Interests in Information Security

ARPA is soliciting proposals for research in computer and network security. This solicitation is part of a larger strategy for developing technology for defensive information warfare. The program is focused on 3 areas: infrastructure protection, protection of end-systems, and assurance. Relevant to database community are the second and third topic areas, which we quote from the announcement below.

On protection of end-systems, "ARPA is seeking technology to allow geographically separated parts of an organization to interact as if they shared a common security perimeter. Approaches should allow uniform system-wide security policies to be enforced, and should provide a high degree of resistance to attack while providing greater interoperability with applications. Of special interest is research and prototyping of firewalls, technologies to support secure distributed applications across heterogeneous platforms, secure configuration controls, and security administration tools. Approaches should allow a variety of organization-specific security policies to be defined and enforced and allow for varying degrees of configurable assurance. Security prototypes may be integrated into standard or emerging systems or be at the core of new technology. Proposals are encouraged in the area of generating and linking policy-enforcement derived from high-level expression of security policy, constraints, and requirements into specific applications. Also of interest is technology to allow system components or devices to be mutually authenticated to provide secure configuration. Proposals regarding security management technology should result in efficient and scalable tools allowing administrators of large systems to assess their systems' vulnerabilities, to bring their systems into compliance with any given set of security requirements, to remotely monitor systems for security compliance, and to quickly assess and correct damage from security incidents. Proposals for end-system protection through appropriate design and function of operating systems and services are strongly encouraged."

On assurance, "proposals are sought for prototype experimental system structuring languages, analysis methods, and systems development tools and development environment to express the structure of information systems, reason about their security and other properties, and allow efficient and secure implementations. The proposed approach should be capable of expressing modular operating system structures, networking and other system services, and distributed information system protocols including those providing security services. Approaches that also address system hardware levels and their integration into higher-level system structures are also desired. Proposed projects should be based on well-founded languages which include abstraction mechanisms suitable for expressing and reasoning about complex system structures. Reuse of current methodologies and tools is encouraged where possible. Approaches are encouraged to integrate security tools and assurance methods into existing or emerging automated programming support environments. Demonstration of the approach on state-of-the-art security systems and an assessment of the degree of increased security achieved is encouraged. Proposals are also sought for metrics, evaluation techniques, and tools for quantitative assessment of system security or strength against attack."

"Proposers are strongly encouraged to include tasks that evaluate the security of their resulting prototypes under realistic scenarios. Remaining vulnerabilities of proposed approaches should be identified, and proposers are encouraged to include techniques for the detection of attacks that exploit those weaknesses. Proposals should identify opportunities for technology transfer within the commercial marketplace and employ evolutionary concepts to allow their approaches to maintain currency with emerging technology. Scalable, efficient, and interoperable approaches are encouraged."

Submission of proposal abstracts is encouraged and is due 02/17/1995. Full proposals are due 04/17/1995. The full text of the announcement can be obtained through the SIGMOD Information Server, or by sending email to baa9515@arpa.mil. For more information, contact Teresa F. Lunt of ARPA/CSTO at fax (703)522-2668.

4 ARPA's Education Initiative

ARPA has recently announced a program for research in and development of advanced education and training technologies in support of the goals of the ARPA Computer Aided Education and Training Initiative

(CAETI). Although the proposal due date has passed (01/09/1995), certain sections of the announcement are still of interest to the (academic) database community.

"The CAETI will develop and demonstrate affordable and effective learning technologies that will significantly improve learning productivity in the Department of Defense Dependent Schools (DODDS) system. CAETI will follow a systems development approach that begins with DODDS requirements and systematically develops technology, integrates it with educational goals and continually evaluates the results to ensure the products support DODDS educational objectives. To achieve these goals, CAETI will

1. adapt and advance technology that will alter the current educational paradigm. This includes advances in simulation and synthetic environments, data visualization, intelligent associates and agents, and affordable simulation networks;
2. provide information navigation, customization and integration tools to students and teachers that will increase their effective use of networked digital resources, and
3. apply advances in software engineering, languages, and architectures to reduce the costs of technology use and support. The objectives of these advances in educational technology are to improve student performance and enhance their readiness for future education or employment by at least 1 sigma and significantly decrease the amount of time teachers spend performing administrative tasks and lesson preparation."

For more information concerning CAETI or DODDS, send email to CAETI@arpa.mil. The full text of the announcement can be obtained through the SIGMOD Information Server, or by sending email to baa9510@arpa.mil.

5 NSF Supports Academic Liaison with Industry

Last October, NSF announced the Grant Opportunities for Academic Liaison with Industry (GOALI). "The GOALI initiative aims to synergize industry-university partnerships by making investment funds available to support an eclectic mix of industry-university linkages. Special interest is focused on affording the opportunity for:

1. faculty, students and postdoctoral fellows to conduct research and gain experience in an industrial setting,
2. industry scientists and engineers to bring industry's perspective and integrative skills to academe, and
3. interdisciplinary industry-university teams to conduct long-term projects.

GOALI seeks to promote collaboration across a broad spectrum of industry-university interests, including education, research, and management of technological innovation. Within this broad scope, proposals are especially encouraged in the engineering design of products and processes and in the enablement of next generation manufacturing systems and enterprises."

In 1994, the first year of the GOALI initiative, awards of approximately $4M were made. In 1995 the award funds are expected to increase. Award decisions are expected to be made around 05/15/1995. Awards will start no later than 09/30/1995. For more information on GOALI, contact Dr. M. C. Roco of NSF at mroco@nsf.gov.

6 NASA's Pathfinder Program

Last December NASA announced research opportunities for the Pathfinder program. As part of its Earth Observing System (EOS), NASA is developing a unique EOS Data and Information System (EOSDIS). "EOSDIS will enable quick and easy access to data for a broad range of users, and will encourage cooperative use of global climate change research. It will process, store, and distribute critical information to thousands of international scientists and other users. Scientists will evaluate environmental data and design global climate models needed to help us understand the complex nature of the Earth's environment; eventually, these models may help us predict how the Earth will change in the future or what effect special human activities may have. These data also will become available to a broader community of users studying the social and economic implications of global change."

EOSDIS comprises a network of Distributed Active Archive Centers (DAACs), and Pathfinders provide access to large remote-sensing data sets obtained through the US Global Change Research Program and the EOS satellites. "The main goal of the Pathfinder program is to make research-quality global change data sets more easily available to the science and environmental communities for use in research and assessments." All Pathfinder data sets involve space-based, long time series, and multi-epoch observations which need further processing to become more readily or affordably available. They are also expected to meet the following conditions: "stable calibration of the raw data should be attainable; and, when data from multiple instruments are involved, consistent intercalibration among instruments should be possible. The resultant time series of geophysical product data sets are made available as they are produced."

NASA is soliciting research proposals from all sources for

1. generation of research-quality and consistent data sets suitable for global change research, and
2. development of innovative and scientific data-processing algorithms or algorithm components capable of generating additional or advanced global change data sets.

NASA anticipates selection of approximately 8 two- to three-year data set production proposals, with typical budgets of $250,000 to $750,000 per year. New proposals are expected to scale up within the first year to full production. Additionally, approximately 10 one- or two-year algorithm component and algorithm development proposals at $50,000 to $200,000 per year will be awarded.

Letters of intent are due 02/01/1995, and full proposals are due 03/10/1995. For more detailed information about the technical background of the Pathfinder program, ongoing Pathfinder activities, proposal formats, and foreign participation, interested readers can browse the full text of the announcement through the SIGMOD Information Server, or contact Ms. Martha E. Maiden at mmaiden@mtpe.hq.nasa.gov and (202)358-0759.

7 DoD University Research Initiative

Last November, DoD announced a Multidisciplinary Research Program within its University Research Initiative. Of particular interest to the database community is the topic area on computational geometry for intelligent systems. The focus is on complex geometric modeling problems that arise in "autonomous vehicle navigation, vulnerability and lethality assessment of combat vehicles, aided/automatic target recognition, design and process representation in intelligent manufacturing, geographic information systems such as terrain and other spatial databases, and real-time graphics in distributed interactive simulation."

DoD calls for proposals to develop and analyze algorithms (sequential and parallel) and the underlying mathematical concepts for geometric computations. Database-related focus areas include advanced data structures and effective database languages, multi-level/hierarchical memory methods for large scale problems, and new approaches to geometric search, query collision detection and avoidance manipulation.

White papers are encouraged and are due 01/13/1995, and proposals are due 03/10/1995. The technical point of contact is Dr. Jagdish Chandra of Army Research Office at (919)549-4254.

8 Aging Aircraft Structures Database

The Wright Laboratory of US Air Force (USAF) is calling for proposals of research to "develop a usable, PC Windows-based database to compile the disjointed structural information on the USAF aging fleet and applicable civilian aging aircraft. Current structural data on the USAF aging aircraft fleet is fragmented, buried throughout the Air Force at the maintenance facilities (both government and contractor), field units, command headquarters, and within contractor organizations. These data are in many different formats and span a wide range of detail. [...] It is extremely difficult for aging aircraft researchers to accurately model the damage that is actually occurring in the USAF fleet, [...] and the integrity of structures that have undergone structural [changes]."

The program is aimed to "(1) identify and collect applicable data throughout the Air Force and its contractors, (2) develop a PC Windows-based database which will allow easy access for data input and retrieval, (3) interpret and enter the data into the database, and (4) identify other potential sources of data. [The database] will greatly aid in the development and verification of more accurate models for assessing USAF aging aircraft structural integrity."

Proposals are due 02/07/1995, and further information can be obtained by contacting Phillip W. Filson at (513)255-5901.

9 US Army establishes Federated Laboratories

The Army Research Laboratory (ARL) has recently announced a new strategy "which focuses in-house laboratory research on Army specific business areas while establishing extramural centers of research in areas where state of the art expertise can be leveraged to satisfy Army technology needs."

ARL is seeking to establish these federated extramural centers with the primary goals to a) "provide affordable state of the art digitization and communications technology which can be rapidly used to support our soldiers", b) "promote industrial/academic partnering to develop proposals in response to the five targeted technical elements", and c) "forge a new, cooperative business relationship between the private sector and Government scientists and engineers to fully exploit the joint development of emerging dual-use technologies".

Federated extramural centers will be established in five technical areas relevant to digitization and communications science:

- Advanced Sensors,
- Advanced Displays and Interactive Displays,
- Software and Intelligent Systems,
- Advanced Distributed Simulation, and
- Telecommunications/Information Distribution.

Each center should consist of at least one industry partner, one Historically Black College or University (HBCU) or Minority Institution (MI), and one non-HBCU/MI academic institution. Proposals are due 03/10/1995. The announcement and related information can be obtained at http://info.arl.mil:80/ or by contacting Linda Klein at (301)394-1604.

10 1995 TRP Program

The Technology Reinvestment Project (TRP) plans to conduct a major competition in 1995 in four areas: Technology Development, Regional Technology Alliances, Manufacturing, and Small Business Innovative Research. There are 12 focused areas in Technology Development, and the one of interest to the database community is the "development of innovative communications and networking products based on advanced, configurable digital wireless technologies to promote such military initiatives as the 'Digitization of the Battlefield'."

Additional information can be obtained by contacting Barry Leiner of ARPA/CSTO at (703)696-2227 or Robert Ruth of ARMY/ARL at (908)532-0362. General program information can also be browsed at http://trp.ida.org/TRP.Home_Page.html.

11 Defense Technology Plan

The recently released DoD Defense Technology Plan documents the rationale, objectives, and funding in major technology areas. It identifies the technical challenges and corresponding objectives over a 10-year plan. According to Anita Jones, Director of Defense Research and Engineering, information technologies are DoD's highest priority. Modeling and Simulation comes second, and Sensor Technologies comes third. Of the 19 identified areas, the area of intelligent systems is of particular relevance to the database community.

The major technical challenges in this area include "the ability to properly abstract low-level signals, data, actions, and features to bring the reality of what is being done closer to the concepts that make sense to the consumer." Expected to become available by the year 2000 are the advanced decision aids seamlessly integrating diverse kinds of reasoning methods and knowledge. By the year 2005, new technology will be available for distributed collaborative planning, resource allocation and scheduling in virtual decision environments that are shared (multiple human and machine problem-solving agents), concurrent (multiple activities), informed (flexible knowledge exchange and timely migration), self-aware (consistent understanding of local and global context), and agile (responsive, reliable, and secure in a dynamic world).

The expected funding for this area starts with $54.8M for 1994 and gradually decreases to $27.8M for 1999.