Turmoil at NASA, and Numerous Funding Announcements

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Abstract

Since the last issue of this column six months ago, there have been many interesting program announcements, some of which have already passed deadline. We'll go over these announcements anyway, with the hope that they can get the readers better prepared for future funding opportunities. But first, we'll talk about the continuing budget battle at Congress, and the recent turmoil at NASA.

1 The Budget Battle, and Turmoil at NASA

President Clinton tried to hold the line on R&D in his FY96 budget request sent to Congress in early February. The strongest area of the budget is in academic R&D, which received a 7% increase to $12.5B. NSF received a 3% increase overall, while its research component getting a 7.6% boost. As NSF Director Neal Lane put it, these increases are "good news in tight times". The biggest winner within NSF is perhaps basic research in networking and communications in CISE, with an increase of 18.7%. The biggest loser is the academic facilities program. In contrast, ARPA's proposed budget is decreased from FY95, although the Computing Systems and Communications Technology program was given a 3.9% increase to $404M. Despite the Republican proposals to eliminate the Commerce Department, Clinton's budget gave a 14% increase to its Advanced Technology Program, and a 25% increase to its Computer Systems program.

In May, the Senate Budget Committee released its Balanced Budget Resolution, containing significant long-term cuts in Science and Technology, but no specific cuts targeted at computing. Most of the S&T cuts were targeted at NASA and DoE, and the Commerce Department will gradually be eliminated. The resolution calls for Defense cuts of $8B in FY96, and of $48B in out years, which could affect ARPA-sponsored research. It also asks that NSF's academic facilities infrastructure program be reduced by $100M in FY96. In the House version of the budget, which is expected to be released soon, basic research funding would decrease from $7.1B to $6.8B, and DoE would be eliminated. Moreover, NASA's Earth Observing System, which has a significant computing component, would be cut by $2.7B.

Fairing surprisingly well is the inter-agency High Performance Computing and Communications program, which got 6% increase from Clinton's budget, and was not even mentioned in Senate's Balanced Budget Resolution.

The budget battle is already spreading to outer-space. Scrambling to survive with a dwindling budget, NASA Administrator Daniel Goldin has proposed to drastically reorganize the agency and eliminate science work at two major NASA centers: cut thousands of jobs at Goddard Space Flight Center in Maryland, and remove space-related activities from Ames Research Center in California. The space-related activities at Ames, including its role in NASA's Mission to Planet Earth program, would be transferred to other centers. Johnson Space Center in Houston would give up the space shuttle to Kennedy Space Center in Florida, and most of its science programs. At the same time, Kennedy would be turned over to a contractor. According to one NASA official, "this is not a situation with winners and losers: everybody is going to lose."

2 ARPA Supports Logistics R&D

ARPA and Defense Logistics Agency (DLA) have a joint program on Logistics Research and Development. The goal of the program is to improve military readiness and customer satisfaction by dramatically improving DLA's responsiveness, quality, and timeliness, while simultaneously reducing DLA's operating costs. ARPA and DLA are interested in technologies in the following categories:

1. **Wide Area Information Exchange** techniques, "including mechanisms for on-line interactive

and/or automated support of business negotiation and contracting, information technology for enhanced decision making, architectures that integrate multiple retrieval methods with tools for formulating requests and assessing responses, interaction paradigms to enable end-users to manage large information spaces, mechanisms to perform useful matchmaking in heterogeneous environments, rapidly searchable registries of services and information, integration and synergy between multiple registration techniques,"

2. **Intelligent Information Access** techniques, "including access to heterogeneous information sources and models, object-oriented data and knowledge representation, facilitators, mediators, wrappers/translators, interchange protocols, and other mechanisms that facilitate finding, analyzing, fusing and reformatting information from multiple sources,"

3. **Enabling Technology for Information Enterprises**, "including techniques from electronic commerce and digital libraries such as security, authentication and on-line financial transactions," and

4. **Integration of Intelligent Information** systems "with automatic identification technology (bar coding, RF tags, Pen based Computing, etc.) and warehouse and shipping automated equipment."

The focus of the program is on prototyping of revolutionary technologies for logistics, and their pilot demonstration for selected DLA applications, which include:

1. "User Source Link, which will link DLA customers (weapons systems program offices, maintenance depots, bases) with DLA suppliers (Government and non-Government manufacturers and distributors) to help DLA customers select the exact items that meet their needs, and enable them to conduct cost/schedule tradeoffs,"

2. "Automated Rule Based Decision Making to improve the speed, consistency and quality of logistics decisions, including supply, technical, and procurement,"

3. "Defense Personnel Support Center Combat Readiness Customer Response (CR)2 to fully explore and implement state of the art information, communications and logistics technologies that fully integrate all enterprise players to include customers and the industrial base," and

4. "Advanced Technology Integrator (ATI) for DLA depots that will provide a testbed for emerging concepts for receipt processing, packing/shipping and material visibility in transit."

The total funding is expected to be approximately $40M over three years. Proposal abstracts were due 4/21/95. Proposals received before 6/2/95 will be considered for initial funding. The announcement remains open for 12 months. For further information contact Dr. Robert Neches at ARPA/SSTO or send email to baa95-25@arpa.mil.

3 ARPA's TransTech Program

ARPA is soliciting proposals for a new program, TransTech. The objectives of the program are "to develop new technologies that will:

1. Allow distributed real-time visualization and interaction with all elements of the military and commercial transportation infrastructure.

2. Allow efficient and effective real time control, planning, replanning, and rehearsal of the movement of forces and materiel, both for deployment and redeployment.

3. Allow decision makers at all levels, from operators to policy makers, to make and validate systematic investment and policy decisions about the transportation infrastructure.

4. Achieve Total Asset Visibility from factory to foxhole using advanced communications architectures, databases and Automated Identification Technologies (AIT).

5. Develop and demonstrate emerging enabling technologies to enhance transportation system performance especially the physical handling and packaging of cargo to meet throughput requirements at intermodal gateways, the mitigation of relative motion for amphibious operations in the Theater of Operations, and Automated Identification Technologies (AIT) for tracking assets."

TransTech focuses in three areas. The first area is TransWeb, which is "the communication network, software, hardware, and data architectures, standards, and protocols that allow distributed resources (users, data, applications and systems) to interact. TransWeb will enable a high fidelity synthetic environment that accurately depicts the national military and commercial transportation infrastructure. TransWeb will permit multiple users to access the same data (both real and simulated), view the same displays, and interact with the environment and one another. TransWeb will provide the integrating environment, permitting other transportation systems, models (for example: ports (air, land, sea), transport vehicles (ship, truck, rail, plane), cost, labor, combat support, environment (weather, pollution, etc.), and safety), and data to work together seamlessly and efficiently. An information services layer will allow the user in government or industry to access all distributed resources of TransWeb. The information will be assimilated and organized in a visual fashion."

The second area is applications. "New models and simulations may be developed, along with standards for model interoperability and seamless data exchange, which must be closely coordinated with [...] TransWeb. Information gathering techniques for real time update of transport and infrastructure information will be developed, along with techniques for combining and displaying the data." A subarea is logistics planning. "To effectively support logistics planning, the concept of a logistics anchor desk (LAD) is being investigated. Essentially an anchor desk is a means of organizing resources to obtain access to multiple systems and decision aids that provide logistical information when it is needed and where it is needed. Further, it also provides the flexibility of determining how the information will be presented to support combat and mobilization operations. It is anticipated that LAD will be seamlessly integrated into TransWeb during the TransTech program. The LAD in the year 2001 would be a synthesizing facility capable of existing at various organizational command levels to provide distributed planning tools and expert 'virtual staff' assistance to theater and deployed joint task force logistics staffs. The LAD would support mission rehearsal and refinement for the Joint Task Force (JTF) staff while enroute to the forward deployed JTF headquarters. Key aspects of the LAD are focused collaborative planning, real-time connections to defense logistics data sources and other LADs, and dynamically reconfigurable software. It is envisioned that the LAD would be capable of being dynamically configured to allow creation of customized information systems that can be individually configured without conventional reprogramming."

The third area is critical transport technologies, which include "automated identification technology, global mobile communications, electronic data transfer, cargo handling technologies for port through-put, mitigation of relative motion technologies for on/off-load in unprotected waters, and packaging technologies."

Funding for FY96 is expected at \$10M. Proposal abstracts are due 6/30/95. Proposals are due 9/11/95 for consideration during the initial evaluation period. The announcement is open for 12 months. Further information can be obtained by contacting Mr. Grant Mayberry at (703)696-2438.

4 Global Mobile Information Systems

In late January ARPA announced a research program in global mobile information systems, which aims at "developing advanced techniques for supporting information and computing systems operation while in motion". The program is motivated by "the military requirement for efficient and effective access to information and the ability to manipulate such information in an environment characterized by rapid changes in connectivity and bandwidth."

Of the five technical areas identified, the one in mobile information systems is of particular relevance of the database community. "The goal [...] is to develop techniques for applications to effectively operate in a mobile environment, taking full advantage of the underlying communications. Techniques to be developed include but are not limited to methods for applications to adapt to variations in the underlying communications connectivity and parameters, distributed file systems that deal with sporadic connectivity, migratable computing that support varying node availability, etc."

Total funding is expected to be approximately \$30M over 3 years. Proposal abstracts were due 2/24/95, and proposals were due 4/28/95. Readers interested in the program may contact Dr. Barry Leiner at ARPA/CSTO or send email to baa9516@arpa.mil.

5 Distributed Processing of Complex Documents

ARPA and the Patent and Trademark Office (PTO)are jointly soliciting proposals for research in an Intelligent Metacomputing Center, which is the interconnection of multiple high-performance computers via high-performance networks to achieve new levels of computing and communication to solve significant problems in the distributed processing of complex documents.

Research is sought in two areas, one of which is especially relevant to the database community. It is "the innovative application of emerging technologies in digital libraries and electronic commerce as applied to complex document handling within Federal agencies. In particular, there is a need for techniques for electronic submission of complex documents that include formatted text and diagrams, the ability to search and retrieve such documents, and the ability to protect the intellectual property contained within said documents. The [PTO] databases are examples of such complex documents."

"Topics of interest include, but are not limited to: textual analysis searching, concept searching, relevance ranking and feedback searching, techniques for searching non-textual databases, and human-computer interfaces to complex search applications. [...] Of special interest are applications which include [...] complex document management and processing, distributed simulation, information visualization, telepresence, and telemedicine."

"The Intelligent Metacomputing Center concept includes issues of cross agency and cross business collaboration. [...] Collaborative efforts should experiment with, and evaluate, a variety of techniques for sharing processing and database resources. The integration of techniques for maintaining the privacy, integrity, and security of information and resources held in the Metacomputing Center are of particular interest. The Government will allow connection to the high speed Advanced Technology Development Network (ATDNet) for the purpose of interconnecting computers and user access to the Metacomputing Center. ATDNet is a high performance (2.4 Gbps) network testbed in the Washington D.C. area. It was established by ARPA to enable collaboration among Defense and other Federal Agencies and to serve as an experimental platform for diverse network research and demonstration initiatives. ATDNet is based on Asynchronous Transfer Mode (ATM) and Synchronous Optical Network (SONET) technologies. [...] The Government will make available a copy of the Patent database for the sole purpose of research and experimentation with complex documents."

An estimated amount of $12M is available in FY95 for this program. Proposals are due 7/13/95. For more information, contact Dr. Gary Minden at ARPA/CSTO or send email to baa9531@arpa.mil.

6 NSF and ARPA Joint Initiative on Human Language Resources

NSF and ARPA are jointly soliciting proposals in research and development in human language technology. The aim "is to accelerate the progress in human language technology by supporting the research and development of widely-accessible and affordable language resources and closely related data resources. It is also of interest to encourage access to these resources by exploring alternative delivery mechanisms that the research community may incorporate as requested resources in their proposals."

Two types of awards are anticipated. The first is the improvement in basic speech and text data resources. Topics of interest include

- "Speech recognition, including the transcription of high-quality continuous speech and other contextual information from talkers unknown to the system."
- "Speech understanding, in which the focus is primarily on domain-specific database query and update by voice."
- "Information retrieval, in which the retrieval request is made in terms of speech, text, or other closely associated modalities."
- "Machine translation, including computer-aided human translation and interlanguage dialog."

The second type of awards is new approaches and means of data collection and distribution. Topics of interest include

- "Development of innovative resources. Examples include: the collection and annotation of video, involving facial gestures and hand movements while speaking to advance research on multi-modal communication using kinesics. Dialogue data collection and annotation to serve as a foundation for the advancement of research on natural language understanding in realistic situations of human-to-human communication."
- "Novel methods of delivery for multimedia resources to support, for example, such areas as the study of prosody, facial expression understanding, multi-agent dialogues, or others."
- "Transportable software tools for speech and written language data access and analysis."
- "Novel mechanisms for language data capture. Means to capture and make available samples such as contrived on-line speech understanding experiments or scenarios for public access and data collection. Experiments using such data to advance language research on speech recognition in noisy environments over telephones by ordinary users."

Total funding for this initiative is expected to be $3.5M. Proposals are due at NSF by 7/14/95. Inquiries about this initiative can be directed to Dr. Gary Strong at (703)306-1928 or gstrong@nsf.gov.

7 Networking Infrastructure for Education

In February NSF issued a second solicitation of a program on Networking Infrastructure for Education (NIE). "The NIE Program aims to hasten the development of a widespread high performance electronic communications infrastructure in support of science, mathematics, engineering and technology (SMET) education reform, and to help lay a foundation on which strategies for the appropriate use of technology in support of increased student achievement can be developed."

NIE seeks proposals in several areas: policy studies, research and development in support of NIE goals, demonstrations and model sites, and infrastructure and testbeds. One area of special interest is Electronic Libraries. Example projects in this area include

- research on accessing information from distributed data repositories;
- research on the use of the network for access to remote resources for experimentation, training, and collaborative studies;
- research on student and teacher human-computer interaction interfaces;
- the educational and equity impact of the use of networked resources including remotely accessible high performance computing capabilities;
- development of support and funding models for large-scale and long-term educational networking and technology support;
- research and development for extending tools and organizational systems to accommodate collaborations among large numbers of participants with diverse viewpoints.

Preliminary proposals were due 2/15/95, and formal proposals were due 4/15/95. General information about NIE can be obtained by contacting (703)306-1651 or nie@nsf.gov.

8 Air Force Integrated Maintenance Data System

The Air Force (AF) Electronic Systems Center is interested in a conceptual study and demonstration of the Integrated Maintenance Data System (IMDS). "The current AF maintenance information systems use many separate computers/software to store information about the state of repair of thousands of subsystems, parts, test devices, maintenance actions, etc. required to keep the AF assets in operational state. These systems have been developed independently, with a resultant overlap of functionality and incompatible representations of the same information. Excessive manual and duplicative human attention is currently required to enter the basic data, resolve inconsistencies, and correlate the reports produced by the different systems."

The AF is interested in developing an IMDS migration strategy by exploiting and implementing current and emerging automated maintenance information systems and technologies, where feasible and cost effective. The conceptual study should research and recommend a technical approach, consisting of architecture and methodology, to guide the evolution of Air Force maintenance information systems which

1. "Integrate all current and emerging automated maintenance information systems into a standards-based, open systems architecture employing modern database, client/server, and graphical user interface technology;"
2. "Enable all users of maintenance information to access it as a single logical data repository, without regard to the technical characteristics and location of the system or systems in which the information resides;"
3. "Enable incremental improvement, re-deployment, and replacement of the underlying information systems while preserving the user view of maintenance information as a single logical data repository."

The demonstration should be carried out at an AF location and should show the ability to seamlessly access and update three AF legacy systems through IMDS. A total of 4 awards of $500K each for eight months are anticipated. Proposals were due 3/15/95. More technical information about the program can be obtained by contacting Major James Cromer at (617)377-6140/6123.

9 Defense Mapping Agency Research in Navigation Safety System

The Defense Mapping Agency (DMA) is interested in funding research and development leading to a Navigation Safety System (NSS). The objective "is to replace and upgrade the functions and capabilities of the Automated Notice to Mariners System (ANMS) and the Navigation Publications Desktop Publishing System which are currently operating within the Navigation Division of DMA."

"The ANMS is a major hydrographic production system which produces the US Notice to Mariners, selected DMA Navigation Publications, and the US Coast Guard Light Lists in addition to supporting other DMA systems in the production and maintenance of hardcopy and digital charts. The ANMS also maintains other vital marine and air safety information data files and allows for remote query access into selected databases via standard and encrypted communication devices." The ANMS consists of the following major components:

- the Consolidated Navigation System (CNS) which allows for the data entry and maintenance of all the unclassified databases on the ANMS and produces the US Notice to Mariners and selected Navigation Publications;
- the Navigation Information Network (NAVINFONET) which allows worldwide remote query access to a number of the unclassified marine and air navigation databases on the ANMS to allow for immediate dissemination of the most current navigational safety information;
- the Classified Hydrographic Information Processing System (CHIPS) which allows for the data entry and maintenance of the classified databases on the ANMS and produces the Classified Notice to Mariners; and
- the Classified Navy Dial-Up System (CNDS) which allows worldwide remote query encrypted access to a number of selected classified and unclassified databases on the CHIPS via STU-III modems.

"The NSS will be required to operate in a near fail safe mode with a redundant architecture, as the databases maintained on the system affect the safety of life and property at sea and in the air. The NSS will incorporate the functionality to:

- produce the products and services of the ANMS with the replacement and upgrade of all of the hardware, software, and databases;
- produce the products of the Navigation Publications Desktop Publishing System and provide for the compilation, composition, and maintenance of Navigation Publications in DMA's Text Product Format (TPF) with the replacement and upgrade of all hardware, software, and databases;
- provide for the capability to produce Navigation Publications in a digital format;
- interface with the Hydrographic Source Assessment System (HYSAS) to support the population and maintenance of the Master Seafloor Digital Database (MSDDB) and to provide data transfer capabilities with other DMA production systems;
- provide a feature-based digital update file to the Vector Product Format Production System (VPF/PS) to be processed as correction for the Digital Nautical Chart (DNC); and
- allow worldwide remote query access to selected NSS databases via commercial telephone lines and the Internet."

"The NSS will incorporate open system and relational database architectures. The NSS will be composed of commercial off-the-shelf (COTS) hardware and software to the maximum extent possible to meet all functional and performance requirements. The NSS will provide up-to-date technology to automate the composition, compilation, maintenance, and management of all navigation information processed by the Navigation Division of DMA."

Proposals are due 8/5/95. Only US firms with DoD TOP SECRET facilities and personnel are eligible. For further details, contact Mr. Robert Ferguson at (301)227-2302.

10 ONR and Tactical Picture Agent

In March, the Office of Naval Research (ONR) announced a research initiative in Tactical Picture Agent, which are intelligent software agents that "can dramatically improve future Naval capabilities for achieving common, consistent, coherent Tactical Picture among Naval decision-makers at sea and ashore."

The initiative is motivated by the need of Naval commanders to access and utilize the right information at the right time, including but not limited to the "disposition of Allied, Neutral, and non-combatant entities, geographical, oceanographic, and meteorological characteristics in the areas of interest, and of course, the disposition of an adversary if one exists. [...] In addition to conventional sources of tactical information such as Naval text messages and tactical data such as radar and sonar tracks, commanders will have access to the burgeoning 'infosphere' of publicly-accessible and proprietary data repositories of weather maps, satellite images, on-line newspapers, intelligence analyses, and newsgroups that the world's interconnected networks are rapidly making available. Future Naval and National surveillance and data acquisition capabilities will be able to collect enormous quantities of information regarding conditions in Naval operational theaters in the open ocean and in the world's littoral zones. This information, together with the vast information resources linked to the world's highly interconnected computer networks, represents a data mining, filtering, and display problem of substantial magnitude."

"A key to effective utilization of the 'infosphere' by Naval commanders is to provide them with automated aids able to discover, retrieve, and display information relevant to the operations being conducted by the commander's platform (e.g., ship), regardless of whether the commander is aware of the existence of such information or able to explicitly direct that such information be retrieved from specific sources. Ideally, a smooth, adaptive man-machine interface would facilitate discovery and acquisition of potentially useful information, filter information for relevance and importance in the context of current or projected operations, and then portray the resulting information in a rational and understandable fashion." Three areas of research have been identified.

Modeling Users and Tasks "What is important for one task and Naval commander at a given time may be irrelevant to another, and what is important at one time may be irrelevant at another. [...] Associated with each task or each person is an agent or set of agents. [...] The agents are responsible for determining what information is needed at each step of the task. The agents initiate searches, which may be performed by other information filtering agents, to get the information. When information is returned, it must be appropriately combined with other information and displayed to the user. Depending on the task, it may also be necessary to communicate with other agents or users to request or provide information or to collaborate on a task. It then becomes necessary to provide a means of ensuring that the common information and task models are consistent."

Information Location and Filtering "Given an explicit or implicit request for information, the purpose of information location and filtering is to select all and only that information that is relevant and reduce it to a manageable and understandable response. Information relevant to a given task is a small subset of the total information in the 'infosphere' accessible at any given time. Relevance is also a function of time, in that different items are important depending on the task and conditions in the environment. For Naval Tactical Picture, a wide variety of multi-media information types will be available, including text, pictures, maps, sensor information, etc. This information is likely to be represented in a non-uniform way using a wide range of formats. There will be different costs associated with information from different sources, and some of the sources might be more reliable than others. It is important for intelligent agents that search and retrieve relevant information to do so in a manner that will conserve scarce network bandwidth and processing capabilities.

Because of time constraints and the heterogeneity of the information and of the repositories, it will generally not be possible to perform exhaustive searches throughout the 'Naval Internet', and it will most likely be necessary to conduct multiple searches in parallel. This leads to the possibility of multiple agents that cooperate or are loosely coordinated, and conduct separate searches for information. Research is needed into controlling multiple agents, negotiation among agents, maintaining consistency, dealing with cost and reliability issues of information sources, efficiently searching for and transmitting information, minimizing redundancy, and ensuring adequate coverage of the information sources. Agents will operate in a heterogeneous networked environment, with different protocols and database systems, and a wide range of computer systems. This may require research into transportable agents and common database access methods."

Portraying the Information "The problem of displaying information to the user is complicated by the wide range of display devices that may be available and the requirement that task execution not be adversely impacted. Multi-media information may be retrieved in many forms, some of which may not be suitable for display on available devices. [...] Determining the most appropriate methods of display, translating between one representation and another, and integrating new information with the existing task are all challenging research problems. [...] Research is needed to address the generation of summaries and the determination of how to present them given the available output devices."

Total funding is anticipated at $3.5M per year for 5 years. Proposals were due 4/7/95. Further information can be obtained by contacting Dr. Michael Shneier at (703)696-4303 or shneiem@onrhq.onr.navy.mil.

11 NIST ATP Programs

Information about NIST ATP programs can be obtained by phone: 1-800-ATP-FUND, fax: 301-926-9524, or e-mail: atp@micf.nist.gov.

11.1 Component-Based Software

This program addresses component-based software and semantic based automation in the software development process. The technical scope and goals "include

1. high risk generic research and development projects leading to practical technology for automated soft-

ware component selection and composition,

2. projects developing enabling technologies that will increase the portion of the software process subject to automation and will reduce the direct involvement of software experts in custom developments, and

3. projects to develop technology that will overcome other potential barriers to a viable commerce in independently developed software components."

First year funding is estimated at $20M. Preproposals were due 4/5/95, and full proposals were due 5/17/95.

11.2 Information Infrastructure for Healthcare

The goal of this program "is to develop critical information infrastructure technologies to enable enhanced, more fully integrated medical information systems across the healthcare industry, greatly reducing costs and errors in handling medical information." Technologies are sought for: "storage and retrieval of complex medical information for varied applications; real-time data driven medical decisions; real-time data entry by mobile medical personnel; real-time global transport of complex medical records with accuracy, speed, and security; computer-based medical training, diagnostic, and reference tools."

NIST expects to fund projects in several categories, including information access, transmission, storage, and retrieval technologies; multimedia information technologies; security and privacy technologies; and mobile and collaborative computing technologies. Examples of specific advanced technology research topics include human/computer interfaces, natural language processing and transcription, digital libraries, resource discovery, network security and privacy, image compression/decompression, and concurrent communications.

First year funding is estimated at $20M. Full proposals are due 6/28/95.