

Computing Research in the FY 2004 Budget Request

Peter Harsha, Computing Research Association

HIGHLIGHTS

- Networking and Information Technology Research and Development (NITRD) activities would increase 5.9 percent over the FY 2003 requested level to \$2.2 billion under the President's FY 2004 budget request (see Table I-10).
- Cybersecurity legislation signed into law in late 2002 signals a new focus on computer and network security in Congress and the Administration in FY 2004.
- A National Science Foundation (NSF) Advisory Committee recommends a new initiative in Cyberinfrastructure at NSF; NSF would begin a new cyberinfrastructure subactivity in FY 2004.

INTRODUCTION AND BACKGROUND

Computing research is often credited with playing a significant role in enabling the new economy. The FY 2004 budget request for the National Science Foundation (NSF), for example, notes that “[i]nformation technology (IT) was responsible for a third of the nation’s economic expansion during the 1990s, primarily due to advances in fundamental understanding of computing, communications, and information systems.” More recent analysis suggests that the remarkable growth the U.S. experienced between 1995 and 2000 was spurred by an increase in productivity enabled almost completely by factors related to IT. “IT drove the U.S. productivity revival [from 1995-2000],” according to Harvard economist Dale Jorgenson. Advances in information technology have fostered these gains in productivity by improving product design, development and distribution for American industry, providing instant communications for people worldwide, and enabling new scientific

Peter Harsha

disciplines like bioinformatics and nanotechnology that show great promise in improving a whole range of health, security, and communications technologies. Federal Reserve Board Chairman Alan Greenspan has said that the growing use of information technology has been the distinguishing feature of this “pivotal period in American economic history.”

Information technology has also changed the conduct of research. Innovations in computing and networking technologies are enabling scientific discovery across every scientific discipline – from mapping the human brain to modeling climatic change. Researchers, faced with research problems that are ever more complex and interdisciplinary in nature, are using IT to collaborate across the globe, visualize large and complex datasets, and collect and manage massive amounts of data.

A significant reason for this dramatic advance in computing technology and the subsequent increase in innovation and productivity is the “extraordinarily productive interplay of federally funded university research, federally and privately funded industrial research, and entrepreneurial companies founded and staffed by people who moved back and forth between universities and industry,” according a 1995 report by the National Research Council. That report, and a subsequent 1999 report by the President’s Information Technology Advisory Committee (PITAC), emphasized the “spectacular” return on the federal investment in long-term IT research and development.

However, in that 1999 report PITAC – a private-sector, congressionally-chartered, presidentially-appointed committee charged with assessing the overall federal investment in IT R&D – also determined that federal support for IT R&D was inadequate and too focused on near-term problems; long-term fundamental IT research was not sufficiently supported relative to the importance of IT to the United States’ economic, health, scientific and other aspirations; critical problems in computing were going unsolved; and the rate of introduction of new ideas was dangerously low. The PITAC report included a series of recommendations, including a set of research priorities and an affirmation of the committee’s unanimous opinion that the federal government has an “essential” role in supporting long-term, high-risk IT R&D. This opinion was buttressed by the inclusion of a recommendation for specific increases in funding levels for federal IT R&D programs

COMPUTING RESEARCH IN THE FY 2004 BUDGET REQUEST

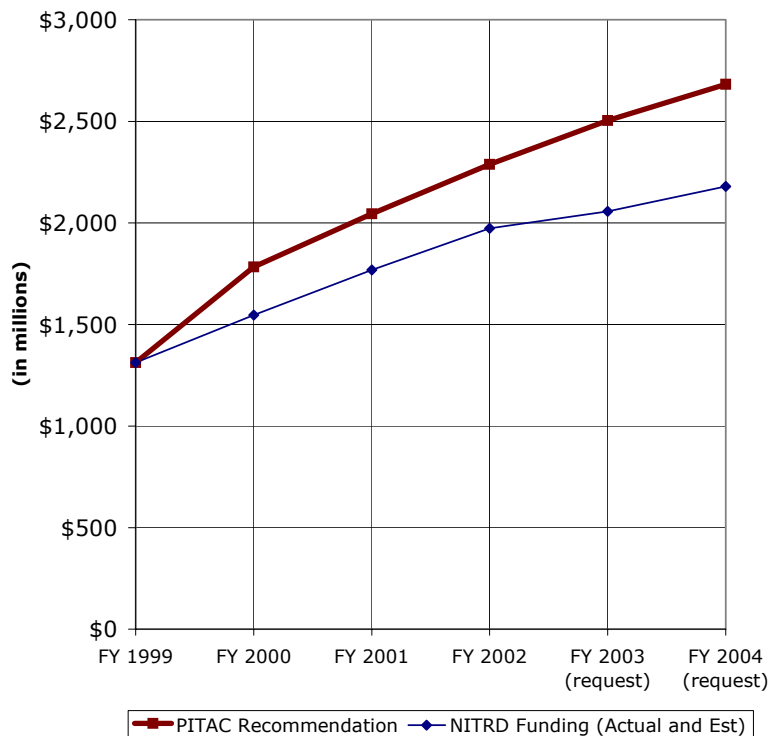
beginning in FY 2000 and continuing through FY 2004 – an increase of \$1.3 billion in additional funding over those five years.

The PITAC report has done much to shape the current federal IT R&D effort – a \$2.2 billion, multi-agency enterprise called the Networking and Information Technology Research and Development (NITRD) program and coordinated by the Interagency Working Group on Information Technology Research and Development of the National Science and Technology Council (NSTC). NITRD is the successor of the High Performance Computing and Communications Program established by Congress in 1991. NITRD agencies coordinate research in seven Program Component Areas (PCAs): High End Computing Infrastructure and Applications; High End Computing Research and Development; Human Computer Interaction and Information Management; Large Scale Networking; Software Design and Productivity; High Confidence Software and Systems; and Social, Economic, and Workforce Implications of IT and IT Workforce Development. The National Science Foundation (NSF) is the lead agency in NITRD; other participating agencies include the Agency for Healthcare Research and Quality (AHRQ), the Department of Defense's (DOD) Defense Advanced Research Projects Agency (DARPA), the Department of Energy (DOE) National Nuclear Security Administration (NNSA), the DOE Office of Science, the Environmental Protection Agency (EPA), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH), the National Institute of Standards and Technology (NIST), the National Oceanographic and Atmospheric Administration (NOAA), DOD's National Security Agency (NSA), and DOD's Office of the Director, Defense Research and Engineering (ODDR&E). (See Table I-10 for NITRD funding details).

CURRENT POLICY ENVIRONMENT

While the PITAC report has generated interest for IT R&D funding in Congress, recent efforts to authorize NITRD programs at PITAC-recommended levels have not met with much success. Rep. Nick Smith (R-MI), Chair of the House Science Subcommittee on Research and Rep. Eddie Bernice Johnson (D-TX), the subcommittee's Ranking Member, co-sponsored H.R. 3400, the Networking and Information Technology Research Advancement Act (NITRA), in the 107th Congress, which would have authorized NITRD-related programs at the agencies under the Science Committee's jurisdiction at the PITAC-recommended levels.

Figure 1. PITAC Recommended Funding Trajectory vs. Actual NITRD funding



COMPUTING RESEARCH IN THE FY 2004 BUDGET REQUEST

Though the legislation was approved unanimously by the House Science Committee, it failed to receive consideration from the full House.

Despite the general tenor of support IT R&D has received from the Administration and the Congress, agency appropriations have fallen well short of the PITAC-recommended funding levels (see Figure 1). Though the President's budget request of \$2.2 billion for NITRD activities in FY 2004 represents a 5.9 percent increase over the FY 2003 requested level, it would still fall \$503 million beneath the PITAC funding recommendation for FY 2004.

PITAC was also a committee in limbo in 2002. Though the President renewed the committee's charter through June 1, 2003, individual PITAC memberships expired December 31, 2001, and were not renewed, making PITAC a committee without members. Indications are that the Administration is making an effort to reconstitute PITAC with members for 2003.

An area where significant activity has occurred – and will likely continue in the 108th Congress – is in cybersecurity research and development. In December, 2002, the President signed H.R. 3394, the Cyber Security Research and Development Act, originally introduced by the Chair of the House Science Committee, Rep. Sherwood Boehlert (R-NY). The bill provides authorization for \$903 million in cyber security research funds and fellowship opportunities at NSF and NIST from FY 2003 through FY 2007. The intent of the legislation, according to Rep. Boehlert, was to address what he believed to be a long-standing neglect of federal support for fundamental computer and network security research. “Cybersecurity research will no longer be a backwater,” he noted during the final debate on the bill, “but rather will become a priority at two of our premier research agencies, the National Science Foundation and the National Institute of Standards and Technology – and through them, a priority in academia and industry.”

For its part, Congress approved \$25 million in new cybersecurity research funding for FY 2003 at NSF as part of the FY 2003 omnibus appropriations bill. The Senate included language in the conference report for its version of the bill echoing Rep. Boehlert's argument, noting that the federal government's “chronic” underinvestment in cybersecurity research has meant that “what little research has been done on cybersecurity has been incremental, leaving the basic approaches to

Peter Harsha

cybersecurity unchanged for decades.” The President’s budget also includes a request for \$35 million in cybersecurity research for FY 2004 at NSF – an increase of \$20 million over the FY 2003 request.

Cybersecurity will likely also be a focus of the new Department of Homeland Security (DHS). The Administration had hoped to move some current computer security activities – specifically, NIST’s Computer Security Division – to the new department. However, members of the computer security research community and the technology industry raised concerns that moving a division with standards-setting authority away from a standards-setting agency like NIST in favor of an agency with a law enforcement, intelligence, or homeland defense mission might significantly affect worldwide confidence in any future standards. Congress agreed and blocked the proposed transfer in the final legislation. Congress will also give more prominence to its oversight of cybersecurity issues at the new Department of Homeland Security. The House Select Committee on Homeland Security now includes a Subcommittee on Cybersecurity.

Another area of computing research likely to see additional oversight in the 108th Congress is Defense-sponsored research into “a prototype network that integrates innovative information technologies for detecting and preempting foreign terrorist activities against Americans.” This research, funded under the Total Information Awareness (TIA) program at the Defense Advanced Research Projects Agency (DARPA), received much attention after media reports suggested the program might be used to create a domestic surveillance capability that would threaten American civil liberties. The five-year, phased program has the goal of creating an experimental network that would integrate information gleaned from large commercially-available and government maintained databases, pattern recognition, new language translation tools and privacy protection technologies, in order to aid law enforcement, defense, and security agencies identify possible terrorists. Concern over TIA and its effect on civil liberties led Sen. Ron Wyden (D-OR) to introduce an amendment to the Senate version of the FY 2003 omnibus appropriations bill prohibiting further funding for the program without specific congressional authorization and requiring the Department of Defense to submit a report outlining the program’s potential effect on privacy. Members of the computing research community also expressed concerns about technical hurdles facing the system that would need to be surmounted before it ever became operational, but stressed the

COMPUTING RESEARCH IN THE FY 2004 BUDGET REQUEST

importance of continued research in those areas. Sen. Wyden's amendment passed on a voice vote and was included in the final bill signed by the President on February 20.

BUDGET REQUEST

Seven agencies included requests for FY 2004 funding as part of the NITRD activity. Under the President's plan, NSF, as the recipient of the largest amount of NITRD funds, would once again be designated as the lead agency for the initiative, with NSF Computing and Information Systems and Engineering (CISE) directorate head Dr. Peter Freeman serving as the head of the NITRD Interagency Working Group. For FY 2004, the President has requested \$2.2 billion for the NITRD initiative, an increase of 5.8 percent over the FY 2003 request (see Table I-10). From a symbolic perspective, it is worth noting that the funding increase requested by the Administration for FY 2004 (5.8 percent) is more than double the rate of the funding increase requested for FY 2003 (2.5 percent). Under the President's plan, all NITRD agencies would see increases above the FY 2003 requested level except EPA, which would receive flat funding in FY 2004, and NASA, which would receive \$18 million less than the FY 2003 requested level, a decrease of 8.5 percent.

National Science Foundation (NSF): NSF has requested \$724 million in NITRD-related funding, an increase of \$46.0 million over the FY 2003 request, or 6.8 percent. The bulk of IT-related funding in the NSF request is contained within the request for the CISE directorate, which would grow 1.0 percent over the final FY 2003 budget to \$584 million (an increase of \$57.3 million, or 10.9 percent, over the FY 2003 requested level). As Table II-7 indicates, the largest programmatic increase within the CISE directorate is the \$9 million increase over FY 2003 in the directorate's share of the NSF-wide Information Technology Research (ITR) initiative. The remaining programs all see funding decreases over FY 2003 appropriated levels (but increases over FY 2003 requested levels).

The President's plan also includes a new subactivity in "Cyberinfrastructure" for FY 2004 with requested funding level of \$20 million. Cyberinfrastructure is the linkage of computational and data resources with sensors and instruments, advanced software and middleware, and visualization resources and facilities. The creation of a new subactivity is largely based on the recommendations of two recent

Peter Harsha

reports: a National Science Board report on *Science and Engineering Infrastructure for the 21st Century*, and a CISE Advisory Committee report on cyberinfrastructure. The CISE Advisory Committee report received significant attention within the computing community for its conclusion that a significant new NSF initiative in cyberinfrastructure was required with a significant increase in funding (on the order of \$1 billion a year). The Senate VA-HUD-Independent Agencies Appropriations Subcommittee took the unusual step of commenting positively on the draft report in their report for the VA-HUD appropriations bill. “Such an initiative,” they wrote, “if focused around a number of critically important challenges, could accelerate the pace of discovery in all science and engineering disciplines, and serve as a ‘multiplier’ for the Government’s substantial investment in R&D. The Committee urges NSF to give this careful consideration in developing the fiscal year 2004 proposal.”

Elsewhere in CISE, NSF plans to continue its focus on broad thematic, large-scale, long-term, basic computer science research challenges for FY 2004. Examples include research addressing the theory and technology for building safe and secure, complex, embedded, networked and autonomous systems; new interfaces, such as speech, touch/tactile sensing, and telepresence; research at the interface of biology and IT, including bioinformatics, biomolecular computation, and biologically inspired computing.

Department of Defense (DOD): The DOD request of \$461 million for NITRD-related activities department-wide represents an increase of \$19 million over the FY 2003 level. DARPA constitutes the largest share of NITRD-related defense funding (\$223 million in FY 2003), with the bulk of that effort taking place within the Information Processing Technology Office (IPTO). Agency-wide, DARPA is focused on future-generations computing, communications and networking as well as embedded software and control technologies. Within IPTO, the focus is on “cognitive computing” – described as “systems that know what they are doing” and have the ability to reason about their environment. Meeting this focus means concentrating on six core research areas: computational perception; representation and reasoning; learning, communications and interaction; dynamic coordinated teams of cognitive systems; and robust software and hardware infrastructure for cognitive systems.

COMPUTING RESEARCH IN THE FY 2004 BUDGET REQUEST

Health and Human Services (HHS): The HHS request includes funding for two NITRD agencies: NIH and AHRQ. The President's plan includes \$386 million in IT R&D funding at NIH, an increase of 7.5 percent, or \$27 million over the FY 2003 request. NIH participates in NITRD by supporting research that advances its mission of developing the basic knowledge for the understanding, diagnosis, treatment, and prevention of human disease. IT research in this area includes applying the power of computing to manage and analyze biomedical data and to model biological processes.

AHRQ would see its NITRD funding increase to \$55.0 million for FY 2004, from \$15.0 million in FY 2003 – an increase of \$40.0 million. AHRQ focuses on research into state-of-the-art IT for use in health care applications such as computer-based patient records, clinical decision support systems, and standards for patient care data.

Department of Energy (DOE): IT R&D activities in DOE's Office of Science and NNSA constitute DOE's participation in NITRD. The Office of Science focuses on computational and networking tools that enable researchers to model, simulate, analyze, and predict complex physical, chemical and biological phenomena important to the department's overall mission. NNSA supports research developing new means of assessing the performance, safety, and reliability of nuclear weapons systems through high-fidelity computer models and simulations. Under the President's plan DOE NITRD funding would be \$317 million for FY 2004, an increase of 2.3 percent, or \$7 million, over the FY 2003 requested level.

National Aeronautics and Space Administration (NASA): Under the President's plan, NASA would see largest percentage decrease in IT funding for FY 2004 of any NITRD agency. NASA NITRD funding would shrink 8 percent for FY 2004, down \$18 million over the FY 2003 request to \$195 million. This change in requested level reflects a one-time funding increase in FY 2003 for High End Computing Infrastructure and Applications at NASA. NASA IT funding is focused on advancing the agency's mission to extend U.S. technological leadership to benefit the U.S. aeronautics, Earth and space science, and spaceborne research communities. NASA, NIH, and NSF are alone among NITRD agencies in their support of research efforts in all seven NITRD program component areas.

Peter Harsha

Department of Commerce (DOC): The DOC request for FY 2004 contains NITRD-related funding requests from two agencies: NOAA and NIST. NIST IT R&D efforts include working with industry, educational, and government organizations to make IT systems more useable, secure, scalable, and interoperable. In addition, NIST works to apply IT to specialized areas like biotechnology and manufacturing, and to encourage industry to accelerate development of IT innovations.

NOAA supports IT research in emerging computer technologies for improved climate modeling and weather forecasting, and for improved communications technologies to disseminate weather products and warnings to emergency responders, policymakers, and the general public.

Environmental Protection Agency: The EPA would receive \$2 million in FY 2004 under the President's plan, the same amount it received in FY 2003 (and FY 2002). EPA intends to use that funding to support IT technologies that facilitate ecosystem modeling, risk assessment, and environmental decision making at the federal, state, and local levels.