



Expanding the Federal Investment in Information Technology Research

The federal investment in fundamental computing, networking, and related research drives advances in information technology, which are critical for sustaining the competitiveness and productivity of the economy; maintaining a technologically superior defense; conquering the frontiers of science and engineering; improving public infrastructure and government services; and enriching the lives and livelihoods of all Americans.

To ensure the continued flow of new ideas and technologies, a focused, sustainable expansion of the federal investment in information technology R&D, initiated in FY 2000 with bipartisan support, is underway in key science agencies with clearly defined priorities and the overarching objective of *re-orienting support toward long-term research*, the cornerstone of the federal Information Technology R&D portfolio. Full support for the following FY 2001 components of IT R&D is crucial to meeting the Nation's needs for advanced information technologies:

NATIONAL SCIENCE FOUNDATION

Information Technology Research Initiative: The NSF is requesting \$327 million in second-year funding for the ITR initiative, which encompasses IT research, education, applications, and infrastructure throughout NSF's operational units. ITR supports long-term, large-scale, merit-reviewed research, emphasizing research that entails a higher risk than that prevailing in established areas. Computing research priorities for FY 2001 include advanced software and computer system architecture, information storage and retrieval, scalable networks and connectivity, and new approaches in computation and applied mathematics. The initiative will also focus on IT applications research across fields of science and engineering, including molecular biology, astronomy, climate and ecological modeling, oceanography, earthquake research, and psychological and social sciences research.

Terascal Computing Systems: The ITR initiative would include \$45 million for the development of terascal computing resources to ensure that the academic research community has access to the most advanced computational infrastructure for solving complex science and engineering problems. The systems will be deployed in conjunction with the NSF's Partnerships for Advanced Computational Infrastructure (PACI) program.

DEFENSE ADVANCED RESEARCH PROJECTS AGENCY

Extensible Information Systems: DARPA is requesting \$70 million in second-year funding for its Extensible Information Systems category, which along with other DARPA computing programs supports research in high-risk/high-payoff ideas and technologies that can contribute to ensuring U.S. military superiority. Priority areas include deeply networked systems, embedded and autonomous systems, and intelligent software.

NATIONAL INSTITUTES OF HEALTH

Biomedical Information Science and Technology Initiative: The NIH is requesting funds for a new initiative to accelerate the development of computing and computational resources, including human resources, tailored to the needs of biomedical research. BISTI includes support for National Programs of Excellence in Biomedical Computing Support; development of new tools and technologies to handle the increasing amount of biomedical data; training of bioinformatics specialists to address emerging research needs; and Centers of Excellence in Genomic Science.

DEPARTMENT OF ENERGY

Advanced Scientific Computing Research: DOE is requesting \$182 million for its civilian IT R&D activities focusing on the development of a new generation of computational modeling and simulation software and infrastructure to enable terascal computers for advanced scientific simulation of complex phenomena in many areas of critical importance to meeting the Nation's energy and environmental needs. The program would take advantage of capabilities being developed through the department's Accelerated Strategic Computing Initiative.

Challenges on the Information Technology Research Agenda

History has shown that advances in computing, networking, and related technologies have an impact throughout society and the economy. Broad-based federal support has been and will continue to be crucial for generating the *fundamental breakthroughs and new capabilities* that unlock the incredible potential of information technologies and stimulate progress in many fields — health care, education, national security, commerce, communications, energy and environmental protection, transportation, manufacturing, banking and finance, and entertainment. Many research challenges have been identified and are incorporated into federal IT program plans:

- computer systems that are dependable, survivable, and trouble-free
- software that is more reliable and predictable, easier and more natural to use, and less expensive to develop
- adaptable software systems that respond to changes in user requirements, technology, and environment
- computer systems that allow us to see, hear, and speak better than we can unaided
- computers that can communicate in and translate among human languages
- high-end computers that perform better and more efficiently
- systems for extracting knowledge and insight from complex information and vast datasets
- computer simulations that more accurately represent physical properties
- scalable networked systems that can grow without practical limits and
- networking technologies that facilitate privacy and security while enabling anytime, anywhere connectivity
- agile networks of rapidly re-configurable mechanical, sensing, and control devices
- autonomous systems of robotic devices that can adapt to their surroundings and accomplish physical tasks
- an educated and highly trained IT workforce that is second-to-none in the world
- better understanding of the social, ethical, and legal implications of information technology

The Growing Consensus on Information Technology R&D

The case for expanding the federal investment in broad-based, long-term information technology research has a *distinguished origin and widespread support*:

- The President's Information Technology Advisory Committee (PITAC), an independent, Congressionally chartered panel of IT experts and stakeholders, concluded after thorough examination that **the federal investment in information technology R&D is inadequate and too focused on near-term problems** and recommended a *five-year expansion* of support for long-term, high-risk, high-stakes IT research.
- In response to the PITAC's analysis and recommendations, the Administration's FY 2000 and FY 2001 budget proposals called for expanded support for fundamental IT research and the development of computational infrastructure at the major federal science agencies.
- The Congress provided many of the requested increases for IT R&D in FY 2000; at the National Science Foundation, for instance, the House VA-HUD appropriations subcommittee provided a "significant down-payment towards what it expects will be a long-term, comprehensive research program in this important field of computing and information technologies," and the Senate VA-HUD appropriations subcommittee said it was "very supportive of NSF's current basic research efforts in the information technology area."
- The *bipartisan* Networking and Information Technology R&D Act (HR 2086), passed by the House in February 2000, would authorize a dedicated program for long-term, fundamental research in the areas identified by the PITAC as the top IT priorities: software, high-end computing, scalable networking infrastructure, the economic and social consequences of IT, and terascale computing facilities.
- A diverse array of science, technology, industry, and higher education organizations have expressed their support for increased funding for IT research and infrastructure, including the Computing Research Association, TechNet, EDU-CAUSE, the Coalition for Academic Scientific Computation, the Council of Scientific Society Presidents, the University Corporation for Advanced Internet Development, the National Association of State Universities and Land-Grant Colleges, the Association of American Universities, the American Association of Community Colleges, and others.
- Many CEO's of major IT companies, like Eric Benhamou of 3Com, and other corporate and research executives, such as those at AT&T, IBM, MCI WorldCom, Microsoft, and Sun, have expressed their support for expanding the federal investment in fundamental IT research.