INFORMATION TECHNOLOGY RESEARCH AND DEVELOPMENT: INFORMATION TECHNOLOGY FOR THE 21ST CENTURY

The President's FY 2001 budget provides $2.314 billion for IT R&D, $594 million more than last year's appropriations and a billion dollars more than the FY 1999 appropriation. The largest increases above FY 2000 funding are proposed for the National Science Foundation, which is leading the interagency effort (+$223M), the Department of Defense (+$115M), the Department of Energy (+$150M), the National Aeronautics and Space Administration (+$56M), and the Department of Health and Human Services (+$42M).

IT R&D Budget Summary

	FY 2000 ($M)	FY 2001 ($M)	Percent Increase
Department of Commerce	$36	$44	22%
Department of Defense	$282	$397	41%
Department of Energy	$517	$667	29%
Environmental Protection Agency	$4	$4	0%
Health and Human Services	$191	$233	22%
NASA	$174	$230	32%
National Science Foundation	$517	$740	43%
TOTAL	$1,721	$2,314	35%

During the past seven years, computers, high-speed communication systems, and computer software have become more powerful and more useful to people at home and work. Nearly half of all American households now use the Internet, with more than 700 new households being connected every hour. More than half of U.S. classrooms are connected to the Internet today, compared to less than three percent in 1993. IT allows Americans to shop, do homework, and get health care advice online, and it has enabled businesses of all sizes to join the international economy. Since 1995, more than a third of all U.S. economic growth has resulted from IT enterprises. Today, more than 13 million Americans hold IT-related jobs, which are being added six times faster than the rate of overall job growth.

This astonishing progress has resulted from Federal agency investments in research conducted in universities, Federal research facilities, and partnerships with private firms. Agencies will continue to support the basic goals established in last year's initiative, focusing on fundamental research in software; development of information systems that ensure privacy and security of data and allow people to get information they want, when they want it, in forms that are easy to use; support for continued advances in high-speed computing and communications, including work needed to ensure that raw speed translates into usable speed; and work to understand the social, economic, and other impacts of IT with a special emphasis on ensuring that all Americans can benefit from these technologies.

FY 2001 IT R&D priority areas include:

Teams to Exploit Advances in Computing: Expanded activities will support new partnerships where information scientists, mathematicians, and experts in areas such as medical research, weather modeling, and astronomy can work together to build tools for solving the Nation's most pressing information problems. These partnerships will advance information science and lead to research breakthroughs in application areas.

Infrastructure for Advanced Computational Modeling and Simulation: In FY 2001, NSF plans to establish a second terascale (five trillion operations per second) computing facility to support the civilian research community.

Storing, Managing, and Preserving Data: Current networks and data storage systems are straining to support vast amounts of information. NASA's new earth observing satellite will generate data equivalent to three times the information in the Library of Congress every year. Research will include developing devices capable of storing a years output of such systems in devices the size of PC hard disks; searching data in a variety of formats including pictures, video, audio; and developing improved ways of filtering information, data mining, and tracking lineage and quality of information.

Managing and Ensuring the Security and Privacy of Information: Research will focus on systems that can ensure privacy and security without compromising speed and ease of use. DOE, for example, recently developed a prototype chip that can encrypt 6.7 billion bits per second. Work will accelerate in network protection and advanced encryption.

Ubiquitous Computing and Wireless Networks: This research will ensure that mobile and wireless systems can be integral parts of the Internet. These inventions will permit devices embedded in equipment, vehicles, portable or wearable devices such as medical monitoring equipment, and even kitchen appliances to identify themselves to networks automatically and operate with appropriate levels of privacy and security.

Intelligent Machines and Networks of Robots: Fundamental research in robots will help revolutionize our work and our lives — from earthmoving devices in hazardous environments to devices that fit inside blood vessels and help operating room surgeons to simple household robots. For example, NASA needs space probes that are smart, adaptable, curious, self-sufficient in unpredictable environments, and capable of operating in groups.

Future Generations of Computers: New paradigms will use advances in quantum computation and molecular and nano-electronics to devise radically faster computers to solve problems previously described as "uncomputable," such as full-scale simulations of our biosphere or surgical simulations. Viewing cells as computational devices will help enable the design of next generation computers that feature self organization, self repair, and adaptive characteristics that we see in biological systems.

More Reliable Software: Software bugs and glitches continue to shut down airports, delay product shipment dates, and crash 911 emergency systems. Methods to design and test software need to be as productive and predictable as tools used to design and test aircraft and bridges.

Broadband Optical Networks: DOD researchers have shown that optical networking can provide 1,000 times faster network backbone speeds. Improvements in optical switching and development of all-optical end-user access technologies will let users take full advantage of these speeds.

Educate and Train a New Generation of Researchers: New investments will fund more researchers, who are critical to increasing both IT research and teaching, and support major research centers. Programs such as the teams to exploit advances in computing will provide opportunities to educate and train a new generation of researchers whose skills cross-disciplinary boundaries.