Calendar No. 334

105TH CONGRESS *2d Session*	SENATE	REPORT 105–173

NEXT GENERATION INTERNET RESEARCH ACT OF 1998

R E P O R T

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ON

S. 1609

APRIL 2, 1998.—Ordered to be printed

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED FIFTH CONGRESS

SECOND SESSION

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APRIL 2, 1998.—Ordered to be printed

Mr. MCCAIN, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

[To accompany S. 1609]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1609) "A Bill to amend the High-Performance Computing Act of 1991 to authorize appropriations for fiscal years 1999 and 2000 for the Next Generation Internet program, to require the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet to monitor and give advice concerning the development and implementation of the Next Generation Internet program and report to the President and the Congress on its activities, and for other purposes", having considered the same, reports favorably thereon without amendment and recommends that the bill do pass.

PURPOSE OF THE BILL

The purpose of the bill is to authorize appropriations to the following agencies for each of the fiscal years (FY) 1999 and 2000: Department of Defense (DOD), Department of Energy (DOE), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Institute of Standards and Technology (NIST), and National Science Foundation (NSF).

BACKGROUND AND NEEDS

The Internet is an international, cooperative computer network of networks that links many types of users, such as governments, schools, libraries, corporations, hospitals, individuals and others. The United States has achieved national strategic advantages and prominence as a result of American leadership in information technology. Furthermore, U.S. dominance in this field grew from criti-

cal federal investment, and continued investment is necessary to maintain that dominance and leadership. The explosion of business, government, and academic uses of the Internet has led to a need to overhaul the network infrastructure. Additional research must be undertaken in order to develop new applications that will improve educational access, while still contributing to economic growth.

Federal efforts to support computer and telecommunications applications and education have been strongly endorsed by the Clinton Administration since 1993. In October 1996, President Clinton called for a renewed resolve to create the Next Generation Internet (NGI). However, the Administration's proposal was redefined after Congressional concerns were raised. Thus, the NGI Implementation Plan was completed in July 1997. The new proposal identified NGI as a research initiative (rather than a deployment initiative) more clearly than in the previous plan.

The NGI implementation plan combined both policy and program prescriptions in three specific goals.

Goal 1: Experimental Research for Advanced Network Technologies. Develop main areas of network service and corresponding protocols including the following: end-to-end Quality of Service (QoS), security and robustness, network growth engineering, new or modified protocols for routing and switching. Defense Advanced Research Projects Agency (DARPA) serves as the lead federal agency.

Goal 2: Next Generation Network Fabric. Develop a next generation network testbed to connect universities and federal research institutions at rates that are sufficient to demonstrate new technologies and support future research. DOE serves as the lead federal agency.

Goal 3: Revolutionary Applications. Demonstrate new applications that meet important national goals and missions. Potential areas for applications include: health care, education, scientific research, national security, environment, government, and design and manufacture.

In its FY 1998 budget request, the Administration requested $100 million in funding for the NGI initiative. Although many in Congress expressed support for the basic principles outlined in the NGI plan, several concerns relating to implementation of the plan remained and funding for the initiative was withheld. The level of funding appropriated for FY 1998 was 10%-15% less than the level of funding included in the President's budget request.

The Next Generation Internet Research Act of 1998 would advance the current state of the Internet, advance university research capabilities, and assist federal agencies in achieving their missions. The bill would provide for a multi-agency program concentrated upon the research and development of a coordinated set of technologies that seeks to create a network infrastructure to support greater speed, robustness, and flexibility beyond what is available in the current Internet.

PROGRAM ISSUES

Congressional apprehension exists regarding agency participation in the NGI. Considering that the current Internet was created by

DOD with ARPANET in the 1970's and then further developed by NSF in the mid-80's, there is some interest for continuing that approach and allowing those two agencies to lead the NGI initiative. In addition, the geographical penalty that exists in the current Internet which imposes high costs on rural users and places them at a distinct disadvantage has raised concerns that the original plan's provisions for only a few select locations with enhanced connectivity will only exacerbate that problem. Other Committee concerns include issues such as: (1) the appropriate roles of the federal and private sector regarding further research and development of the Internet; (2) the avoidance of duplication and redundancy in federal efforts across multiple agencies; and (3) the inconclusiveness in the NGI planning process.

LEGISLATIVE HISTORY

Two hearings have been held on the Next Generation Internet during the 105th Congress. On June 3, 1997, the full committee held a hearing, chaired by Senator McCain, on the Next Generation Internet and the relevance of the NGI proposal. Witnesses included representatives from the Office of Science and Technology Policy, NSF, Rice University, Montana State University, North Dakota State University, Oregon State University, and Internet 2 Project. The Science, Technology, and Space Subcommittee, chaired by Senator Frist, conducted a second hearing on November 4, 1997, with representatives from the Office of Science and Technology Policy, DOD, DOE, NSF, Montana State University, University of Tennessee, and Cisco Systems testifying. The Next Generation Internet Research Act of 1998 was introduced on February 4, 1998, by Senator Frist and Senator Rockefeller. The bill is co-sponsored by Senator McCain, Senator Hollings, Senator Burns, and Senator Kerry.

On March 12, 1998, the Commerce Committee in open executive session considered S. 1609 as introduced by Senator Frist and, without objection, ordered S. 1609 to be reported without amendments.

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, March 24, 1998.

Hon. JOHN MCCAIN,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for S. 1609, the Next Generation Internet Research Act of 1998.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contacts are Kathleen Gramp (for

federal costs) and Pepper Santalucia (for the state and local impact).

Sincerely,

JUNE E. O'NEILL, *Director.*

Enclosure.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

S. 1609—Next Generation Internet Research Act of 1998

Summary: S. 1609 would authorize appropriations for 1999 and 2000 for a multiagency research initiative to advance the speed, flexibility, and robustness of the Next Generation Internet (NGI). The bill also would direct an existing federal advisory committee to assess and report on various aspects of the program's implementation. About 40 percent of the amounts authorized each year would support programs at the Defense Advanced Research Projects Agency (DARPA) within the Department of Defense. The remainder would be distributed among the National Science Foundation, the Department of Energy, the National Institutes of Health, the National Aeronautics and Space Administration.

Assuming appropriation of the specified amounts, CBO estimates that implementing S. 1609 would increase discretionary spending by a total of $214 million over the 1999–2003 period. The legislation would not affect direct spending or receipts; therefore, pay-as-you-go procedures would not apply. S. 1609 contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act of 1995 (UMRA), and would impose no costs on state, local, or tribal governments.

Estimated cost to the Federal Government: For the purposes of this estimate, CBO assumes that the amounts authorized for the NGI programs will be appropriated near the start of each fiscal year and that outlays will follow the historical pattern for similar activities. We assume that the activities of the advisory committee will be funded from the amounts authorized for DARPA, consistent with the current funding arrangement for that advisory committee. The estimated budgetary impact of S. 1609 is shown in the following table. The costs of this legislation fall within budget functions 050 (national defense), 250 (general science, space, and technology), 370 (commerce and housing credit), and 550 (health).

[By fiscal year, in millions of dollars]

	1998	1999	2000	2001	2002	2003
SPENDING SUBJECT TO APPROPRIATION						
NGI spending under current law:						
Net budget authority [1 2]	60	0	0	0	0	0
Estimated outlays	28	24	6	2	0	0
Proposed changes:						
Authorization level	0	103	115	0	0	0
Estimated outlays	0	44	93	58	14	4
NGI spending under S. 1609:						
Authorization level [1 2]	60	103	115	0	0	0
Estimated outlays	28	68	99	60	14	4

[1] The 1998 level is the amount appropriated for that year.

[2] The National Science Foundation was authorized to spend up to $23 million on NGI in 1998 from amounts collected from Internet Domain Registrations. Because the spending would be funded by offsetting collections, the net budget authority for NSF's NGI activities in 1998 is zero.

Pay-as-you-go considerations: None.

Estimated impact on State, local, and tribal governments: S. 1609 contains no intergovernmental mandates as defined in UMRA, and would impose no costs on state, local, or tribal governments. One of the goals of the NGI initiative is to connect 100 sites at speeds 100 times faster than those of today's Internet. Many of these sites would be publicly owned universities. Some of the funds authorized to be appropriated by this bill would be used for this purpose.

Estimated impact on the private sector: The bill would impose no new private-sector mandates as defined in UMRA.

Estimate prepared by: Federal Costs: Kathleen Gramp; Impact on State, local, and tribal governments: Pepper Santalucia.

Estimate approved by: Robert A. Sunshine, Deputy Assistant Director for Budget Analysis.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported.

NUMBER OF PERSONS COVERED

S. 1609, as reported, authorizes the appropriations for the Next Generation Internet Research Act of 1998 for FY 1999 and FY 2000.

ECONOMIC IMPACT

This legislation authorizes funding to ensure continuous research and development of future Internet systems. Such funding should support further U.S. commercialization of technology. In addition the bill requires a report to the President and Congress on the progress and effectiveness of individual agency programs. This action will provide oversight of agency programs and prevent unnecessary and costly duplication of effort while promoting a more cost effective use of Federal funds. The bill will not subject any individuals or agencies affected by the bill to additional regulation.

PRIVACY

This legislation will not have an adverse impact on the personal privacy of individuals.

PAPERWORK

This legislation requires the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet to issue an annual report to the President, the Senate Committee on Commerce, Science and Transportation and House Committee on Science that examines the progress and effectiveness of individual agency programs and Next Generation Internet goals.

SECTION-BY-SECTION ANALYSIS

Section 1. Short title

This section cites the short title of the bill as the "Next Generation Internet Research Act of 1998."

Section 2. Definitions

This section would define several terms, including Internet, geographical penalty, and network.

Section 3. Findings

This section provides Congressional findings with regard to the U.S. role and leadership in Science and Technology. Specifically: (1) the United States has achieved national strategic advantages and prominence as a result of American leadership in information technology; (2) U.S. dominance in this field grew from critical federal investment, and continued investment is necessary to maintain and further American leadership; (3) Federal investment in this area has created both new jobs and new industries; (4) citizens are increasingly relying on the Internet for information about and access to the government; and (5) wasteful duplication of Federal research efforts should be avoided through interagency cooperation.

This section also includes additional findings to the High-Performance Computing Act of 1991. These findings say that: (1) researchers and educators need a high-capacity, flexible, high-speed network for access to computational and information resources; (2) additional research must be undertaken in order to develop new applications that will improve educational access, while still contributing to economic growth; (3) research in new networking technologies could benefit rural areas and ease current economic burdens associated with accessing information; and (4) information security is important and research into this area is a critical component of computing, information and communications research programs.

Section 4. Purpose

This section states the purposes of the legislation as being twofold. First, this bill is the initial component in a series of computing, information, and communications technology initiatives outlined in the High-Performance Computing Act of 1991. Second, this legislation will focus on the research and development of a coordinated set of technologies to create a network infrastructure that will enable users to gain economical high-speed data access with greater robustness and flexibility.

Section 5. Duties of the advisory committee

This section would amend title I of the High-Performance Computing Act to provide the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet with additional responsibilities to issue an annual report to the President, the Senate Committee on Commerce, Science and Transportation, and House Committee on Science. The report would assess the progress of the overall program including the extent to which each participating agency's role

is complementary and non-duplicative of each other and would address concerns relating to geographic penalties and technology transfers. The reporting process shall be terminated September 30, 2000.

Section 6. Authorization of appropriations

This section authorizes funding for the research program through FY 2000. The six agencies involved in FY 1999 are authorized at individual levels including: DOD, $42,500,000; DOE, $20,000,000; NSF, $25,000,000; NIH, $5,000,000; NASA, $5,000,000; and NIST, $5,000,000. Funding levels for FY 2000 are: DOD, $45,000,000; DOE, $25,000,000; NSF, $25,000,000; NIH, $7,500,000; NASA, $5,000,000; NIST, $7,500,000.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the Bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

SEC. 2. FINDINGS. [15 U.S.C. 5501]

The Congress finds the following:

(1) Advances in computer science and technology are vital to the Nation's prosperity, national and economic security, industrial production, engineering, and scientific advancement.

(2) The United States currently leads the world in the development and use of high-performance computing for national security, industrial productivity, science, and engineering, but that lead is being challenged by foreign competitors.

(3) Further research and development, expanded educational programs, improved computer research networks, and more effective technology transfer from government to industry are necessary for the United States to reap fully the benefits of high-performance computing.

[(4) A high-capacity and high-speed national research and education computer network would provide researchers and educators with access to computer and information resources and act as a test bed for further research and development high-capacity and high-speed computer networks.]

(4) A high-capacity, flexible, high-speed national research and education computer network is needed to provide researchers and educators with access to computational and information resources, act as a test bed for further research and development for high-capacity and high-speed computer networks, and provide researchers the necessary vehicle for continued network technology improvement through research.

(5) Several Federal agencies have ongoing high-performance computing programs, but improved long-term interagency coordination, cooperation, and planning would enhance the effectiveness of these programs.

(6) A 1991 report entitled "Grand Challenges: High-Performance Computing and Communications" by the Office of Science and Technology Policy, outlining research and development

strategy for high-performance computing, provides framework for a multiagency high-performance computing program. Such a program would provide American researchers and educators with the computer and information resources they need, and demonstrate how advanced computers, high-capacity and high-speed networks, and electronic data bases can improve the national information infrastructure for use by all Americans.

(7) Additional research must be undertaken to lay the foundation for the development of new applications that can result in economic growth, improved health care, and improved educational opportunities.

(8) Research in new networking technologies holds the promise of easing the economic burdens of information access disproportionately borne by rural users of the Internet.

(9) Information security is an important part of computing, information, and communications systems and applications, and research into security architectures is a critical aspect of computing, information, and communications research programs.

[SEC. 3. PURPOSE.] [15 U.S.C. 5502]

SEC. 3. PURPOSES.

The [purpose of this Act is] *purposes of this Act are* to help ensure the continued leadership of the United States in high-performance computing and its applications by—

(1) expanding Federal support for research, development, and application of high-performance computing in order to—

(A) establish a high-capacity and high-speed National Research and Education network;

(B) expand the number of researchers, educators, and students with training high-performance computing and access to high-performance computing resources;

(C) promote the further development of an information infrastructure of databases, services, access mechanisms, and research facilities available for use through the Network;

(D) stimulate research on software technology;

(E) promote the more rapid development and wider distribution of computing software tools and applications software;

(F) accelerate the development of computing systems and subsystems;

(G) provide for the application of high-performance computing to Grand Challenges;

(H) invest in basic research and education, and promote the inclusion of high-performance computing into educational institutions at all levels; and

(I) promote greater collaboration among government, Federal laboratories, industry, high-performance computing centers, and [universities; and] *universities;*

(2) improving the interagency planning and coordination of Federal research and development on high-performance computing and maximizing the effectiveness the Federal Govern-

ment's high-performance computing [efforts.] *network research and development programs;*

(3) promoting the further development of an information infrastructure of information stores, services, access mechanisms, and research facilities available for use through the Internet;

(4) promoting the more rapid development and wider distribution of networking management and development tools; and

(5) promoting the rapid adoption of open network standards.

SEC. 4. DEFINITIONS. [15 U.S.C. 5503]

As used in this Act, the term—

(1) "Director" means the Director of the Office of Science and Technology Policy;

(2) "Grand Challenge" means a fundamental problem in science or engineering, with broad economic and scientific impact, whose solution will require the application of high-performance computing resources;

(3) "high-performance computing" means advanced computing, communications, and information technologies, including scientific workstations, supercomputer systems (including vector supercomputers and large scale parallel systems), high-capacity and high-speed networks, special purpose and experimental systems, and applications and systems software;

(4) "Network" means a computer [network referred to as the National Research and Education Network established under section 102; and] *network, including advanced computer networks of Federal agencies and departments; and*

(5) "Program" means the National High-Performance Computing Program described in section 101.

* * * * * * *

SEC. 103. ADVISORY COMMITTEE.

(a) IN GENERAL.—In addition to its functions under Executive Order 13035 (62 F.R. 7231), the Advisory Committee on High-Performance Computing and Communications, Information Technology, and the Next Generation Internet, established by Executive Order No. 13035 of February 11, 1997 (62 F.R. 7231) shall—

(1) assess the extent to which the Next Generation Internet program—

(A) carries out the purposes of this Act;

(B) addresses concerns relating to, among other matters—

(i) geographic penalties (as defined in section 2(2) of the Next Generation Internet Research Act of 1998); and

(ii) technology transfer to and from the private sector; and

(2) assess the extent to which—

(A) the role of each Federal agency and department involved in implementing the Next Generation Internet program is clear, complementary to and non-duplicative of the roles of other participating agencies and departments; and

(B) each such agency and department concurs with the role of each other participating agency or department.

(b) REPORTS.—The Advisory Committee shall assess implementation of the Next Generation Internet initiative and report, not less frequently than annually, to the President, the United States Senate Committee on Commerce, Science, and Transportation, and the United States House of Representatives Committee on Science on its findings for the preceding fiscal year. The first such report shall be submitted 6 months after the date of enactment of the Next Generation Internet Research Act of 1998 the last report shall be submitted by September 30, 2000.

SEC. 104. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated for the purpose of carrying out the Next Generation Internet program the following amounts:

Agency	*FY 1999*	*FY 2000*
Department of Defense	*$42,500,000*	*$45,000,000*
Department of Energy	*$20,000,000*	*$25,000,000*
National Science Foundation	*$25,000,000*	*$25,000,000*
National Institutes of Health	*$5,000,000*	*$7,500,000*
National Aeronautics and Space Administration	*$5,000,000*	*$5,000,000*
National Institute of Standards and Technology	*$5,000,000*	*$7,500,000.*

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