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The National Information Infrastructure: The Federal Role

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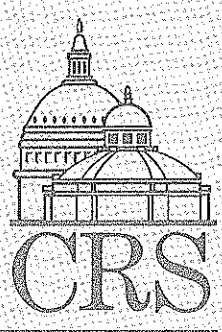

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The National Information Infrastructure: The Federal Role

SUMMARY

The Clinton Administration has developed a broad plan to interconnect industry, government, research, education, and each home with advanced telecommunications networks and information resources and technologies. Considered a key part of a larger vision to improve U.S. high technology, economic development, health care, and education, this is the National Information Infrastructure (NII). The NII may be viewed three ways: as a **policy** for national information infrastructure development; as federal **programs** to enhance and support this development; and a wide range of **applications** which demonstrate the tangible uses and benefits of the technologies. The policy has been articulated in a series of NII reports; the program is supported through major government R&D and grant efforts; the applications focus on a variety of applications in schools, libraries, hospitals, government, and businesses.

Congressional interest in this issue similarly has been strong. Some congressional leaders have expressed their own vision of the future and the role information technologies will play. The 104th Congress addressed part of this issue by passing the Telecommunications Deregulation Act of 1996 (P.L. 104-104). This law contains a wide range of provisions which may affect who develops the information infrastructure of the 21st century. Congress also appropriates money for federal programs, and has reviewed current federal information technology and infrastructure programs.

Policymakers in the 106th Congress continued the approach taken in both the 104th and 105th Congress, questioning the role of the federal government in development of the NII. In 1997 and 1998 the NII policy debate was set by the Clinton Administration, particularly by Vice President Gore. However, many policymakers in the 106th Congress may contend that continued federal support of the NII is at odds with their attempts to reduce the size and scope of a wide range of federal technology programs. The congressional debate over the NII for FY2000 reflects these differing viewpoints.

The current federal debate lies in determining what strategies will best achieve the goals of the national interest, improve the competitive advantage of the United States, and commercial, academic and public use. The question of the government's role raises a general policy issue of how far and to what extent the government should generally involve itself in support for high technology research projects and commercialization of technology. It also revolves around the extent to which technology research, development, and deployment should be undertaken by the private sector; what tangible benefits will accrue to American workers and consumers; and whether government information infrastructure investment is needed to provide economic growth, create jobs, and ensure a leading edge in world markets.

MOST RECENT DEVELOPMENTS

On February 15, 2000, the House of Representatives passed The Networking and Information Technology Research and Development Act (H.R. 2086), by voice vote. This legislation provides multi-year authorization for existing federal computing research programs, starting with $126 million in authorization for federal high-performance computing research in FY2000. The legislation also provides an increase of $240 million for the National Science Foundation's computing efforts, and an increase of $75 million for the National Aeronautics and Space Administration's computing efforts, above current spending.

The Next Generation Internet Act (S. 2046) was introduced into the Senate on February 9, 2000. This bill would reauthorize federal computing programs from FY2000 through FY2003, as well as: earmark 10% of the federal computing funding for reducing the cost of Internet access service to users in geographically remote areas; earmark 5% of federal computing funding for minority institutions of higher learning. This bill was reported out of the Senate Commerce Committee on April 13, 2000. On September 14, 2000, the full Senate passed S. 2046, with H.R. 2086 incorporated as aTitle II of the bill.

For FY2001, the Clinton Administration asks for $2.3 billion for federal information technology R&D. This includes merging the High Performance Computing and Communications Initiative (HPCCI), a part of which includes funding for the Next Generation Internet (NGI), and Information Technology for the 21st Century, or IT^2. This proposed merger is in part a response to congressional concerns that there were too many overlapping and possibly redundant federal information technology programs.

Information technology deployment also is an important part of the federal IT budget. For the National Telecommunications and Information Administration (NTIA), the Administration has requested a significant increase in its overall appropriation of $53 million in FY2000 to a proposed budget of $225 million in FY2001. Among the NTIA programs that would be increased under the proposed budget increase are NTIA's information infrastructure grants program, the Technology Opportunity Program (TOP); grants for greater access by low-income individuals and families to the Internet, broadband technology development, and protection of the nation's critical information infrastructure, and other NTIA programs. Both the House and Senate Appropriations committees have proposed funding levels lower than the Clinton Administration has requested for NTIA/TOP.

BACKGROUND AND ANALYSIS

The NII in the Information Age

Information infrastructure consists of a physical system of telecommunications pathways and connections that transmit and receive voice, video, and data. It also includes the consumer- and business-oriented services delivered over and derived from telecommunications networks, and the information resources accessible through these

networks. In its broadest sense, a National Information Infrastructure (NII) would encompass a web of telecommunications, information, and computing technologies.

An information highway is a physical system of pathways and connections that consists of copper wire, fiber optic cable, coaxial cable, microwave line-of-sight signals, satellite linkages, and other wireless technologies. Individuals connect to these highways through hardware such as telephones, computers, and audio/video receivers. The United States currently possesses a basic information highway that links virtually every individual through telephone and television. An information "superhighway" would consist of broadband (high-capacity) telecommunications circuits, increasingly based on fiber optic technology, which could carry much greater amounts of digitized information, such as high-resolution video, at faster speeds.

Many parts of the public and private sectors already communicate and transfer data through computer networks connected by fiber optic cables or other high-capacity media. Currently, a variety of organizations lease dedicated telecommunications circuits to connect geographically dispersed facilities, creating private networks. A rapidly expanding worldwide system for computer-based communications (i.e., the Internet) is comprised of tens of thousands of interconnected private computer networks operated by a diverse array of government organizations, nonprofit and for-profit companies, associations, universities, school districts, and research institutions. Individuals can purchase access to the Internet through network service providers. The Internet is cited by some as a prototype of this advanced infrastructure. Others believe that diverse telecommunications services supporting high-quality telephony, video entertainment, and two-way video communications will be combined with the computer-based information transport services being pioneered on the Internet to form the NII.

The NII debate raises questions regarding three interconnected areas:

- What is the federal role — if any — to create a de-regulatory, competitive impetus for telecommunications and information technology growth, yet at the same time to maintain oversight and guidance as America moves into the 21st century? This is the debate over the NII **policy** as developed by the Clinton Administration and countered by some in Congress who have a different, if equally expansive, view of information technology and applications.

- What level of funding support should the federal government provide for developing and implementing telecommunication and information technology infrastructure? This is the debate over funding for **programs** which support information and telecommunications infrastructure. In turn, this may be described as programs that support **research** and programs that support technology **deployment**. In the former category are the High Performance Computing and Communications Initiative (HPCCI), which also includes as part of its program the Next Generation Internet (NGI). The Clinton Administration's proposal for the Information Technology for the 21st Century (IT^2) is also in this category. In the area of deployment, the Technology Opportunity Program (TOP) is the lead program. The Department of Education's technology assistance program and the National

Institutes of Health programs at the National Library of Medicine for telemedicine also provide technology deployment.

- What **applications** are supported — or not supported — by information infrastructure development? Public and private attention is focused on how schools, libraries, hospitals, government and commercial applications can be developed or enhanced, either through public or private support (or a combination of the two). The range of applications include education, medicine, commerce and library science.

NII: The Policy

The Clinton Administration has consistently supported the NII as part of its vision for high technology policy, including the rapid expansion of telecommunications- based information superhighways. During the 1996 presidential campaign, President Clinton and Vice President Gore articulated the Administration's support of federal technology policy, an issue they first raised in the campaign of 1992. This support includes greater federal support and funding for a wide range of advanced technology R&D. The Clinton Administration contended that investment in advanced technology would strengthen the U.S. economy by creating jobs and address pressing social problems.

In 1993, Vice President Gore articulated the Clinton Administration's vision of the how telecommunication technologies, services, and applications could be combined in a national information network. This concept was to interconnect businesses, governments, researchers, educators, and the general public with advanced telecommunications networks and a diverse multitude of information resources. While perhaps not the first to introduce the idea of a national information infrastructure — the NII — Vice President Gore provided a clear initiative for policymakers to consider. Advocates of the NII concept recognize that all types of telecommunications networks, end-user equipment, and information management processes are increasingly based on computer-driven devices and technology. Communication — whether in the form of sound, text, or pictures — is increasingly transported within the U.S. telecommunications infrastructure in the language of computers. Sound, photographs, moving pictures, and text can all be reduced to digital signals, which can be sent through various types of telecommunications circuits. Communications and information services that used to be handled by separate companies with differing technologies will be handled by a single high-capacity network with a hybrid of technologies.

Initiatives in the 106th Congress

Until the 106th Congress, most policymakers tended to respond to the Clinton Administration's NII policy, rather than provide a specific policy or program alternative. In the 106th Congress, several Members of Congress have articulated their vision of how to develop and deploy a national information infrastructure that would enable all Americans to access information and communicate with each other using voice, data, image or video at anytime, anywhere.

The overture of a new policy perspective began at the end of the 105th Congress, when the Committee on Science in the House of Representatives released a report *Unlocking Our Future: Toward A New National Science Policy.* This report, authored by Representative Ehlers and endorsed by the majority of the Committee on Science, provided a framework for science and technology policy in the 21st century. While information infrastructure was not directly address in this report, the report emphasized the complementary yet distinct role for government, industry, and academia in supporting national science and technology. It clearly indicated that where technology development and commercialization can be undertaken by U.S. industry, then it should do so. Government's and academia's role, while inter-related with industry, should support basic research.

On June 9, 1999 Representative Sensenbrenner, chairman of the Committee on Science, introduced legislation that will provide a separate authorization bill for federal information research and development. The Networking and Information Technology Research Development Act (H.R. 2086) would double existing federal computing research programs over a five year period, but does not provide specific authorization for the IT^2. The bill was reported out of both the Committee on Science and the Committee on Ways and Means (since it would also make permanent the Research and Experimentation Tax Credit), and was passed by the House of Representatives by voice vote on February 15, 2000.

Congressional debate of the merits of the NII and what future applications may bring to American society — and to the world — likely will continue. Many Members of the 106th Congress will likely contend that the Administration's approach places too great an emphasis on federal spending and direction from Washington. While many recognize the value of connecting rural and urban areas which may not be served by the private sector, or providing some support for connecting schools, libraries, and medical centers, they would contend that the federal role should be limited and smaller than the Clinton Administration plans. President Clinton's FY2000 IT budget proposal of $2.3 billion will likely be examined very closely by congressional appropriators.

Internet2

Internet2 is an existing effort by U.S. universities to improve and enhance current computing capabilities on the Internet. The concept was first announced on September 22, 1996. On that date, over 100 universities announced that they would be undertaking a collaborative effort to develop advanced Internet technologies and applications to support research and education missions. This group of universities contended that increasing traffic on the Internet, combined with their expanded needs to conduct high performance computing research, made an upgrade of the Internet imperative. In addition, the promise of future technologies and applications, such as real time computing for medical diagnostics or sending multimedia over high-speed and high-capacity broadband networks, made it likely that current technologies could not support future applications.

Initially, while both Internet2 and the NII were similar in goals and objectives, the Internet2 was driven by university research needs while the NII has been national in scope and focused on concerns coming from both the private and public sectors. As the NII policy was supported by federal programs, the early Internet2 effort by the universities tended to focus on attaining a common consensus. By 1997, however, a consortium was formed by the universities to provide a single platform for attaining Internet2 goals and objectives. The

University Corporation for Advanced Internet Development (UCAID) has 122 universities as members, and an annual budget of $50 million per year.

In March 1998, 23 members of the UCAID consortium were granted permission by the Clinton Administration to connect to the National Science Foundation's very high speed Backbone Network Service (vBNS). The vBNS was created to address some of the problems of high density data transmission on crowded network paths by providing an avenue for high speed computation. The vBNS can theoretically transfer data at a speed of 622 million bits per second (bps), compared to most home modem speeds of 28,000 bps. The vBNS is expected to be upgraded to 2.4 million bps. However, most experts contend that it is clear that the vBNS alone will not solve the problem of high density data transmission and network traffic on the Internet.

The announcement on April 14, 1998 by Vice President Gore regarding the Administration's support for Internet2 expands on UCAID's current efforts. The announcement had two components. The first was that three major high technology companies — Qwest Communications, Cisco Systems, and Nortel — are committing $500 million worth of technologies and equipment to and service for Internet2. The second is that the Defense Advanced Research Projects Agency (a part of the Department of Defense) will invest $50 million into 27 long-term research projects, as part of that agency's contribution to the Next Generation Internet. (Additional information on the Next Generation Internet is provided in the section *NII: The Programs*).

Universal Service

Since the development of a national telephone system in the early part of the 20th century, U.S. communications policy has emphasized open access and affordable service for all of its citizens. This concept became known as **universal service**, and was codified in the Communications Act of 1934. The concept of universal service is based on the premise that communications services, whether they be by rotary telephone or by digital networks, are so fundamental to modern life that national policies should ensure that all citizens have reasonable and affordable access to such services. In the United States, this policy entailed permitting telephone service providers to charge slightly higher access charges for telephone service in certain well-trafficked areas—such as prosperous urban and suburban areas—to defray the cost of providing services in hard to reach rural areas, under-served urban areas, and to low-income consumers.

In the 1980s, Congress seriously considered legislation that would deregulate the entire U.S. telecommunications industry. By the 1990s, both the 103rd and 104th Congress had wrestled with deregulation legislation, but a series of contentious issues blocked the successful passage of legislation. Among these issues were the future of deregulated cable rates, foreign ownership of the U.S. telecommunications industry, outlawing "cyberporn" on the Internet, "v-chip" technology to block or stop transmission of objectionable material on U.S. television, unrestricted access for regional telephone companies to enter long-distance communications service, and other issues.

In mid-1995, during consideration of telecommunications deregulation in the Senate, another issue arose — extension of universal service to the Internet. A provision introduced by Senators Snow and Rockefeller and amended to the Senate bill addressed this issue. The

Snow-Rockefeller amendment stated that rural nonprofit health care centers would pay rates "reasonably comparable" to those charged to commercial concerns, while schools and libraries would pay "affordable" rates, covering only a portion of a carrier's local costs for the service. The FCC was given responsibility in the law for implementing the fund to pay for this form of "universal service" in the information age.

The Telecommunications Act of 1996 (P.L. 104-104) was passed by Congress on February 1 and signed into law by President Clinton on February 8, 1996. The Snow-Rockefeller amendment was included in Section 254 of the new law, which effectively amended or replaced provisions in the Communications Act of 1934. (For more on this issue, see, CRS Issue Brief IB95067, *Telecommunications Regulatory Reform.*)

As part of its mandate under P.L. 104-104, a federal-state board was created by the FCC. The board determined that a $2.25 billion fund would underwrite the cost of cost to implement section 254 of the law. As with telephone service, this fund would be created through a series of subsidies, in which consumers in more heavily trafficked areas of computer network development would subsidize extension of the Internet into schools and libraries. The FCC also called for the creation of a non-profit Schools and Library Corporation (SLC) to manage the process of applying for and receiving discount services under the law. The universal service discount for schools and libraries, as provided by the SLC-managed fund is called the **E-rate.** (See also: CRS Report 98-604, *E-Rate for Schools: Background on Telecommunications Discounts Through the Universal Service Fund*).

The Clinton Administration supports extension of universal service to schools and libraries seeking to connect its facilities to the Internet. It contends that universal service is an important part of the NII. However, several serious issues have arisen since the FCC's decision. In the first 75 days of the E-rate program in 1998, U.S. schools and libraries requested over $2 billion in annual discounts, with a significant portion requested by schools and libraries with relatively high percentages of low-income students. At this rate, the $2.25 billion would have been exhausted by mid-year. The E-rate, however, is supposed to be drawn from a revolving fund that gets replenished by subsidized rates. Therefore, the FCC called for a moratorium on spending under the universal service, in part bowing to congressional pressure. Congress also is hearing from many consumers, who contend that the subsidy used to support universal service is a hidden "tax" on their monthly telephone bill. Congressional critics also raise concerns about the SLC's management of the fund. (See: CRS Issue Brief IB98040, *Telecommunications Discounts for Schools and Libraries: The "E-Rate" Program and Controversies.*)

What is the Federal Role?

Debate exists as to what role the federal government should play with regard to evolution of the NII, particularly when many contend that developing applications for the information infrastructure will likely reside in the private sector. At the beginning of the Clinton Administration, there was some confusion about campaign statements that seemed to imply that the federal government should take an active role in "building information superhighways," a notion that was unsettling to many within the telecommunications industry. Still, President Clinton has continued to support development of the Information Superhighway, funding for information and telecommunications technologies for schools, and the importance of the V-chip as part of the federal role.

The federal debate regarding creation and development of the NII will in part be shaped by developments in the private sector and among information and telecommunications experts. Several highly regarded reports from outside the federal government may provide congressional policymakers other perspectives when considering the NHI, while others contend that the federal role in developing the NII should be greatly curtailed or eliminated.

Many industry representatives feel that various types of government support for the NII are appropriate to lay the foundation for long-term economic growth and success in international competition. For example, the Computer Systems Policy Project (CSP) has called for the government to develop milestones for NII development, promote industry-developed interoperability standards through government purchases of NII-related equipment and services, support U.S. industry's standards interests in international bodies, fund testbeds and demonstration projects, remove barriers to competition, and develop definitions of essential NII services.

The National Academy of Sciences (NAS), representing the nation's scientific, engineering and technical communities, also has addressed the federal role. In January 1999, the National Research Council (NRC) of the NAS released a report, *Funding A Revolution: Government Support for Computing Research.* The report focuses on the extensive impact that federal government funding has had on computer and communications science and technology. The report provides examples of how many different federal programs have resulted in specific technologies and applications that are now common place, from creation of the Internet to computer software. The NRC cautions that for the United States to continue to enjoy the benefits of computer and communications innovations, long-term investments in R&D need to be increased.

Not all of the experts observing this issue call for an expanded federal role in computing and communications R&D or in supporting the development of the NII. There are critics of the Department of Commerce and of NTIA who call for a reduction—or even the elimination—of both. They point to current private sector initiatives, the de- regulation of the U.S. telecommunications industry and reduced federal role in the management of telecommunications policies and contend that expanding the federal role is not appropriate.

NII: The Programs

The implementation of the NII is through several federal programs. One is the Next Generation Internet (NGI) program, intended to lay the foundation of an advanced infrastructure for the Internet into the 21st century. Another is the Large Scale Network/High Performance Computing and Communications (LSN/HPCC) initiative. The LSN/HPCC initiative is a multi-agency research and development (R&D) program focused on how computing technologies and applications can further federal agencies' mission. A third is Information Technology for the 21st Century, or IT^2. The IT^2 proposal would provide federal funding for fundamental, long-term computer science research; advanced computational applications; and research on economic and social impacts of information technology.

Table 1: Clinton Request for HPCCI, IT2, and NGI for FY2000
(in millions of dollars)

Agency	HPCC FY200 Request	IT² FY2000 Request	NGI FY2000 Request
DOD	207	100	40
DOE	659	70	15
NASA	136	38	10
NSF	314	146	25
NIST	27	6	5
NLM/NIH	115	6	5
TOTAL	1,462[a]	366	100

a. For the HPCC, the FY2000 request total also includes $4 million for the Environmental Protection Agency.

Another set of federal grant programs directly support infrastructure and NII applications. The Technology Opportunity Program (TOP) in the Department of Commerce provides matching grants for technology development and applications intended to create a national information infrastructure. The Department of Education supports programs for technology applications in elementary and secondary schools, as well as distance learning. The National Institute of Health's National Libraries of Medicine provides additional support for telemedicine through several grant programs linking institutions and databases through networks.

The Next Generation Internet (NGI)

On October 10, 1996, President Clinton called for a three-pronged approach for making the Internet more available to every American. The President provided more detail on January 28, 1997 as part of a broad initiative on U.S. education. President Clinton called for a large federal investment that would create the basis of a "Next Generation Internet" (NGI) for FY1998. Since the creation of the Internet, as part of a Department of Defense network with university researchers, traffic on this "network of networks" had grown so large that continued use, particularly for high-speed data transmission, may be at risk. Therefore, the President contended that there is a federal interest in laying the foundation for an improved Internet infrastructure for the next century and beyond.

Table 2: Program Funding: FY1999 Appropriations for NGI
(in millions of dollars)

Program Title	DOD/ DARPA	NSF	DOE	NASA	NIST	NLM/ NIH	TOTAL
Experimental Research	20	6	5	2	3	-a	36
Next Generation Network Testbed	20	11	5	3	-a	-a	39
Revolutionary Applications	10	8	5	5	2	5	35
TOTAL	**50**	**25**	**15**	**10**	**5**	**5**	**110**

Source: National Economic Council, Office of the White House, Washington, DC. November 18, 1998. All program levels are current estimations.
[a] The 106th Congress did not provide specific funding levels.

The NGI has three major components. The first is experimental research, which would extend the capacity of high-speed computing and its applications. This is based on an existing, voluntary effort currently supported by over 200 universities to strengthen network ties and computing speed, called Internet2 (see: NII: The Policy, *above*). The Clinton Administration would like to add at least 100 more universities and national laboratories at speeds at least 100 times that which is currently available, and in the future connect additional institutions at speeds 10 times greater than that goal. The second program component is to promote experimentation of the next generation of network technologies. The third is to demonstrate new applications for national goals and missions (e.g., health care).

On October 28, 1998, President Clinton signed into law The Next Generation Internet Act of 1998 (P.L. 105-211), providing a total funding of $110 million for the Next Generation Internet, an increase over the $85 million Congress appropriated for FY1998. The 106th Congress continues to support this program at this same funding level.

Large Scale Networking/High Performance Computing and Communications (LSN/HPCC)

The NGI is part of a larger federal effort to promote and develop a wide range of computing and communications technology development, applications and activities. This convergence of information, network, and telecommunications technologies and services will require developments in high-speed computing and large-scale networks. The Large Scale Networking/High Performance Computing and Communications (LSN/HPC) program would provide over a billion dollars in funding for federal agencies' computing and communications capabilities to achieve mission goals. This program is run by representatives from each participating agency, comprising a subcommittee on Computing, Information, and Communications R&D. This subcommittee is part of the larger Committee on Computing,

Information, and Communications, which reports to the President's National Science and Technology Council.

While Congress has supported this initiative, many congressional policymakers have been confused over the three name changes of the HPCC in five years. Originally, there was the High Performance Computing and Communications Initiative (HPCCI). The HPCCI was formally established in 1989. It brought together representatives of government, industry, and academia to set a research agenda and collaborate on technology development. The HPCCI supported the application of advanced technology in the investigation of "grand challenges" in science and engineering related to the interests and missions of various federal agencies. However, authorization for the original HPCCI (P.L. 102-194) expired in December 1996. In an effort to ensure that federal high performance computing efforts continued a successor was created, the Computing, Information, and Communications (CIC) R&D program. For FY1999, the Administration renamed this multi-agency effort the Large Scale Networking and High Performance Computing and Communications (LSN/HPCC) program, which it will keep during FY2000.

For its FY2001 request, the Clinton Administration has requested that the LSN/HPCC initiative be merged with the IT^2 initiative (see below), into a single information technology R&D initiative funded at $2.3 billion. This proposal would, according to the Clinton Administration, address congressional concerns of duplication and redundancy in federal information technology/high performance computing programs.

Information Technology for the 21st Century (IT^2)

While there has been a great deal of public and private sector support for the NGI, some are concerned that the initiative does not address several long-term IT problems. In August 1998, the President's Information Technology Advisory Committee (PITAC) released an interim report that addressed the problems facing the United States with regard to the adequacy of federal support for long-term research and development. The PITAC recommended increasing the federal investment in IT R&D by approximately $1 billion over five years. The Clinton Administration used the PITAC interim report as part of its examination of current federal information technology programs and in preparation for its FY2000 budget request.

On January 24, 1999, Vice President Gore gave the keynote address at the annual meeting of the American Association for the Advancement of Science. At this meeting, the Vice President announced a new multi-agency research and development program in information technology as part of the FY2000 budget proposal. Called Information Technology for the 21st Century, or IT^2, his proposal called for an expansion of federal R&D spending on advanced computing, develop new software technologies for "mega" computers, and create new computer simulation and modeling capabilities.

On March 16, 1999, the subcommittee on Basic Research of the Committee on Science held hearings on the IT^2 proposal. Among the issues raised by congressional policymakers during the hearing were those of the relationship between the IT^2 proposal and the HPCCI (including the NGI), the need for federal support for basic research in computer science, and the importance of information technology in U.S. education. On June 1, 1999, Representative Sensenbrenner outlined proposed legislation that would double federal IT research, but would

not fund the IT^2 proposal. A second hearing on this legislation was held by the Committee on Science on July 14, 1999. The bill was reported out of committee on September 8, 1999, and passed by the House of Representatives, with amendments, February 15, 2000. It awaits further action in the Senate.

Technology Opportunity Program (TOP) Grants

The National Telecommunications and Information Administration (NTIA) of the Department of Commerce provides overarching telecommunications policy and program coordination for the federal government. The NTIA funds information infrastructure grants to a variety of industry, academic, state and local government recipients directly related to development of the NII. These include delivery of education and health care services and development of high-speed, interactive information technologies. This program is NTIA's Technology Opportunity Program (TOP) grants, which on January 5, 2000 became the new name given to a program previously called the Technology Information Infrastructure Assistance Program. TOP provides matching grants for technology development and applications intended to create a national information infrastructure. The other NTIA program considered important to infrastructure supports public broadcasting facilities, planning, and construction For FY2001, the Administration has requested additional funding. For a variety of other programs and grants, ranging from home Internet access to protection of the U.S. information infrastructure. The FY2000 NTIA appropriations, the Clinton Administration's FY2001 request, and the House and Senate appropriations proposals are highlighted below.

- For FY2000, Congress appropriated $52.9 million for the full NTIA budget. Within this overall budget, Congress appropriated $10.9 million for NTIA's administration and payroll. For FY2001, the Clinton Administration has requested a large increase in NTIA's total funding, of $22.5 million, with $20.3 million for NTIA salaries and expenses. The House appropriations committee proposed $57.4 million, and the Senate appropriations proposed $76.9 million for the overall NTIA budget; and $10.9 million and $11.4 million, respectively, for salaries in FY2001.

- Congress appropriated $15.5 million for TOP in FY2000. This program provides grants for information and telecommunications technology development deemed critical by the Administration for the NII. The Clinton Administration has requested an increase to $45 million for TOP in FY2001. House and Senate appropriators have proposed $15.5 million for TOP.

- For FY2000, Congress funded NTIA's public broadcasting facilities, planning, and construction, at $26.5 million for FY1999. For FY2001, the Clinton Administration has requested a substantial increase in this program to $110 million. This would be part of a five year request by the Administration to fund this program at a total of $450 million, and would be used to convert current analog broadcasts to digital format. House appropriators proposed $31 million for FY2001; Senate appropriators $50 million.

- For FY2001, the Clinton Administration has requested funding for a new program at NTIA, called Home Internet Access. This program would provide low-income individuals and families with the connections, training and support to go online. The Administration has requested $50 million for this program in FY2001. House and Senate appropriators have not proposed any funding for this initiative in FY2001.

- The Clinton Administration also has requested new funding for an annual NTIA survey, *Falling Through the Net*, which would provide data on Internet access in the United States, at $500,000; funding at $2 million for broadband technology development for the Internet; management of spectrum services, $200,000; and critical infrastructure protection, $6.3 million. House and Senate appropriators have not proposed any funding for this initiative in FY2001.

Department of Education

In addition to its participation in the HPCC program, there are many Department of Education programs which are important to the Clinton Administration's NHI. President Clinton has emphasized his support for applications technology in education. In his 1996 State of the Union message, President Clinton called for connecting all elementary and secondary classrooms by the year 2000. In addition, he added three additional and related goals: providing teachers with the training they need, providing access to technology for teachers and students, and ensuring that effective software and on-line resources be available for U.S. school curricula. The proposal was included in President Clinton's FY1997 budget request as the **Technology Literacy Challenge Fund**, under the authority of the Elementary and Secondary Education Act (ESEA), Title III, Part A, (Technology for Education of All Students). President Clinton has called for increased funding for this program; while Congress has shown strong support in both FY1999 and FY2000, it has provided more modest funding increases. The Technology Literacy Challenge Fund funding will be used to leverage existing public and private funds to connect classrooms through a formula grant program to support statewide strategies to achieve this end.

In addition, several other programs under Title III Part A of ESEA have implications for the NII. They include **The National Technology Innovation Challenge Grants**, a program which supports efforts by consortia to demonstrate high intensity use of technology. **The Regional Technology in Education Consortia** supports regional technology and network uses for learning. Also under ESEA, Title III, Part B, is support for **Star Schools**, linking students and teachers over large distances using telecommunications technologies. (See also CRS Report 96-178, *Information Technology and Elementary and Secondary Education: Current Status and Federal Support.*)

National Institutes of Health

Telemedicine is the use of telecommunications technology for medical diagnosis and patient care. It is rapidly becoming a major provider of medical services between sites over large distances. Telemedicine encompasses everything from the use of standard telephone service to high-speed transmission of digitized signals using computers, fiber optics, satellites, and other sophisticated equipment and software. At the National Institutes of Health (NIH),

the National Library of Medicine (NLM) serves an important role by supporting the collection and indexing of literature on several databases. The NLM collaborates with a number of institutions to develop leading edge technologies and applications for telemedicine. (For more information, see: CRS Report 96-834, *Telemedicine/Telehealth Description and Issues.*)

The NLM supports a wide range of research and development efforts. For FY1999, the NLM received a total appropriations of $181.3 million, a 12% increase over FY1998 funding levels. Several current NLM grant programs focus on increasing the flow of information through networks and supporting projects which have telemedicine goals. The **Information Access Grants** program provides funding for user access to various medical databases (e.g., Grateful Med). The **Information Systems Grant** program provides network connections and other support for larger health institutions. The **Internet Connection Grants** program provides support to health institutions involved in research, education, and patient care by connecting them with the Internet. The **Integrated Advanced Information Management Systems (IAIMS) Grants** program provides external and internal links of users to library research and retrieval systems, as well as a variety of databases. Several other NLM programs provide for support for R&D and resources relevant to informatics and biomedical information in general.

NII: The Applications

Current Applications, Possibilities, and the Future

A key characteristic of the NII concept is information on demand — enabling of individuals and organizations to immediately retrieve any needed information from anywhere for any purpose. In applications that have been proposed for special attention by the federal government, the NII might support the following capabilities.

- **Education**: Connecting all students and teachers to information-sharing networks would provide them immediate access to a wealth of educational resources, whether in urban or rural areas or at school or home. Computer-based instruction can allow students to make progress at their own pace and free teachers to devote more individual attention to each of their students. Electronic libraries could provide students not only with text, but photos, videos, and recordings and interactive multimedia technologies that will more fully engage and enlighten them. Still, some question whether technology alone can provide educational opportunities without other constructive policies in place. Some educators familiar with programs to provide computers in schools are quick to point out that a series of concurrent education reforms, including smaller class sizes, longer school days, and work focused on specific achievements contributed more substantially to improvements in children test scores. In general, some educators are concerned that there is too much emphasis placed on information technology and infrastructure. While important, some teachers contend too much emphasis will divert important resources away from needed other education reforms, such as improved training for teachers.

- **Libraries**: Interconnection and digitization of library collections would enable more individuals to have access to more information resources, while limiting the amount of information that any one library must take responsibility for maintaining on site. Digitization, which is the electronic recording of text, images, sound, and other data resources, would make these resources more accessible to disabled persons such as the mobility-, hearing-, or vision-impaired. Using local libraries as a gateway to the NII might ensure that information is accessible and prevent a society of "information haves and have-nots." NII policies and programs have targeted libraries for technology and infrastructure development. But policymakers still debate whether it is the primary role of the public sector to provide all libraries with technology and applications, or whether it should be some combination of private, federal, state and local support.

- **Health Care**: Advanced communications, including two-way video, might increase the amount and quality of health care that Americans could receive in their homes, in their personal physician's office, or in their local clinic or hospital by allowing better access to remote medical expertise. Computer-based patient records might improve the availability of individual medical histories for decisionmaking by authorized health care providers and reduce costs. Still, there are concerns that there are not enough privacy and security safeguards of patients' medical records to warrant extensive data transfer and retrieval.

- **Government Information**: Quickly identifying, locating, and retrieving specific information from the vast resources created and maintained by government has been a chronic problem for many potential users, including those interested in agricultural, health, weather, economic, science, and other data. Access to all types of government information using the type of storage and retrieval technologies pioneered within the Internet could allow "one-stop shopping" for such information from virtually any computer in the United States. Already there have been great strides in developing on- line federal resources and services, (although it is unlikely that a "virtual government," as some are predicting, will be a reality any time soon, if ever). The Library of Congress has developed an on-line database retrieval system containing congressional legislation, hearings, and reports called "Thomas," intended for all network users. In the executive branch, all federal agencies and departments have instituted efforts to provide electronic data through Web sites.

- **Commerce on the Internet**: Commerce on the Internet has mushroomed over the last several years. This includes the extension of current forms of legitimate business transaction such as financial payments transfers and "e-cash" (electronic cash), and electronic exchanges of global exports and imports. It also includes rapidly expanding "grey" areas of commerce infringing on the privacy, intellectual rights, and security of users and their data. On July 1, 1997, the Clinton Administration announced a nine- point proposal to encourage greater electronic commerce, including elimination of all tariffs and greater use of security and privacy measures on the Internet.

At the end of the 105th Congress, the Internet Tax Freedom Act was included as part of the FY1999 Omnibus Appropriations Act (P.L. 105-277). This law creates a 3-year moratorium on the ability of state and local governments to tax electronic commerce. The 106th Congress has voted to extend this moratorium through the year 2006. (For more information, see: CRS Report 98-597, *Internet Tax Freedom Act: H.R. 4105 as passed by the House*.)

LEGISLATION

H.R. 2086 (Sensenbrenner)

The Networking and Information Research and Development Act. Provides $4.8 billion in federal funding for 5 years to 6 federal agencies for basic research in information technology, as well as other provisions. Introduced June 9, 1999; referred to Committee on Science. Hearings held March 16 and July 14, 1999. Reported out of committee September 8, 1999. Passed by House, with amendments, February 15, 2000. Referred to Senate Committee on Commerce, Science, and Transportation February 22, 2000. Incorporated into S. 2046, September 14, 2000.

S. 2046 (Frist)

Next Generation Internet 2000. Amends the High Performance Computing Act of 1991 to authorize appropriations to carry out the Next Generation Internet program and Large Scale Networking program for FY2000 through FY2003. Introduced February 9, 2000; referred to Committee on Commerce, Science, and Transportation. Reported out of committee, with amendments, April 13, 2000. Considered and passed, with amendments, by the Senate, September 14, 2000.

H.R. 4690 (Rogers)

Appropriations for FY2001 for the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies. Appropriations for the National Telecommunications and Information Administration (NTIA) of the Department of Commerce for FY2001. Introduced February 7, 2000 and referred to Committee on Appropriations, House of Representatives. Approved by the Committee on Appropriations, with amendments, June 26, 2000. Passed by the House of Representatives, with amendments, and referred to the Senate, June 26, 2000. Approved by the Committee on Appropriations, with substitute amendment, July 18, 2000. Placed on Senate calendar, July 19, 2000.