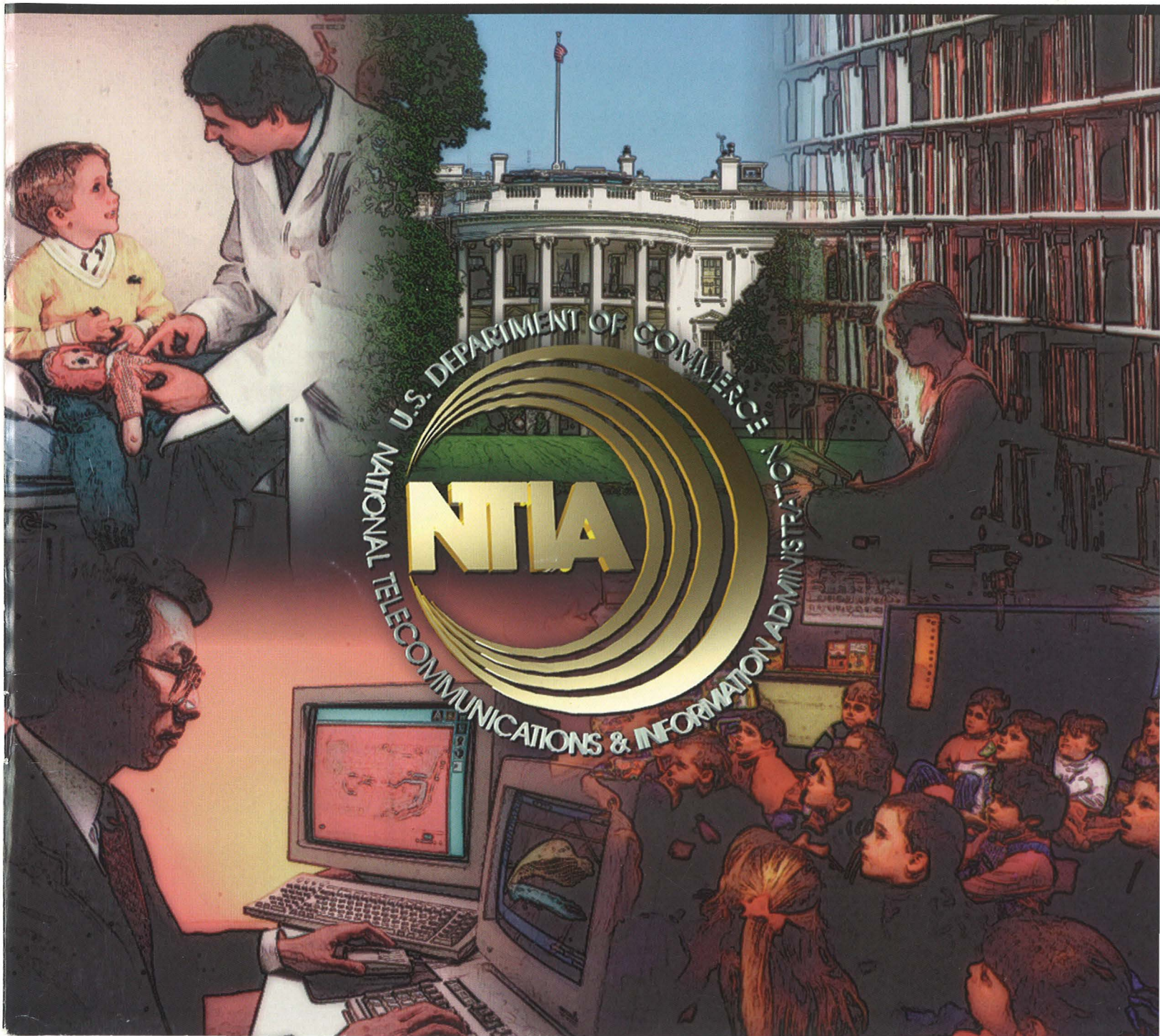
Connecting the Nation:

Classrooms, Libraries, and Health Care Organizations in the Information Age



Connecting The Nation: Classrooms, Libraries, and Health Care Organizations in the Information Age

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UNITED STATES DEPARTMENT OF COMMERCE

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The Clinton Administration has given high priority to working with the private sector to develop an advanced information infrastructure for our country: the National Information Infrastructure (NII). I am pleased to join the Assistant Secretary for Communications and Information, Larry Irving, in releasing Connecting the Nation: Classrooms, Libraries and Health Care Organizations in the Information Age.

As Secretary of Commerce, I believe that it is vital that the public and private sectors work together to shape our vision of the NII. Working together, Americans can create an NII that both makes us competitive abroad and enhances our quality of life at home.

The NII, an interconnection of computer networks, telecommunications services, and applications, can open new vistas and profoundly change much of American life, not by the fact that it exists but by the way it is used. These opportunities for change must be available to all, however, or our Nation risks division into information "haves" and "have nots."

The Federal Government can play a critical role in preventing this division. The Commerce Department's National Telecommunications and Information Administration (NTIA) has initiated the Telecommunications Information Infrastructure Assistance Program (TIIAP) to assist public and private institutions in connecting to the NII. Through support and investment, TIIAP has accelerated the pace of connecting public institutions and has stimulated private-sector investment.

We are embarking on a long journey toward what we believe is a shared goal -- bringing the benefits of the Information Age to all our citizens. This document describes the benefits of connecting our public institutions to the NII, an important step toward meeting this shared goal.

Sincerely,

Ronald H. Brown

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Executive Summary

Connecting every classroom, library, hospital, and clinic in the United States to the National Information Infrastructure (NII) is a priority for the Clinton Administration. It is critical for these public institutions to become and remain active participants in the NII, since they can use telecommunications and information technologies to benefit all Americans. To this end, the Clinton Administration is working actively with Congress, the States, local governments, private industry, public interest groups, and the public institutions themselves.

Connecting the Nation provides a status report on this critical national initiative by drawing from the most current data regarding Internet connectivity, a benchmark for NII access. This report concludes that there is much work to be done before the goal of connecting every classroom, library, and health care organization to the NII is accomplished. Nevertheless, this report highlights how Federal Government funding programs can serve as a catalyst in this effort, spurring public-private partnerships even in disadvantaged and remote areas of the country.

Classrooms. As the transition to a knowledge-based economy accelerates, America's children must have access to communications and information technologies in the classroom. Without these tools, American children will lack the necessary computer skills to compete in the 21st Century. Deploying computers in classrooms and connecting them to the NII will enhance the learning process by providing students and teachers with access to information and teaching materials from around the world. In addition, as a result of the fiscal constraints and rising costs facing public schools, information technologies that offer new opportunities, efficiencies, and improvements in the education process are highly desirable.

Libraries. Public libraries have traditionally served as a repository of information for citizens. In the Information Age, libraries will play an increasingly important role because a changing economy requires that workers continuously learn new skills. Connecting libraries to the NII is critical to ensuring that all Americans can obtain information and services and benefit from life-long learning opportunities, regardless of economic circumstances and geography. This report finds that individuals who are well trained in using information technology gain important economic benefits.

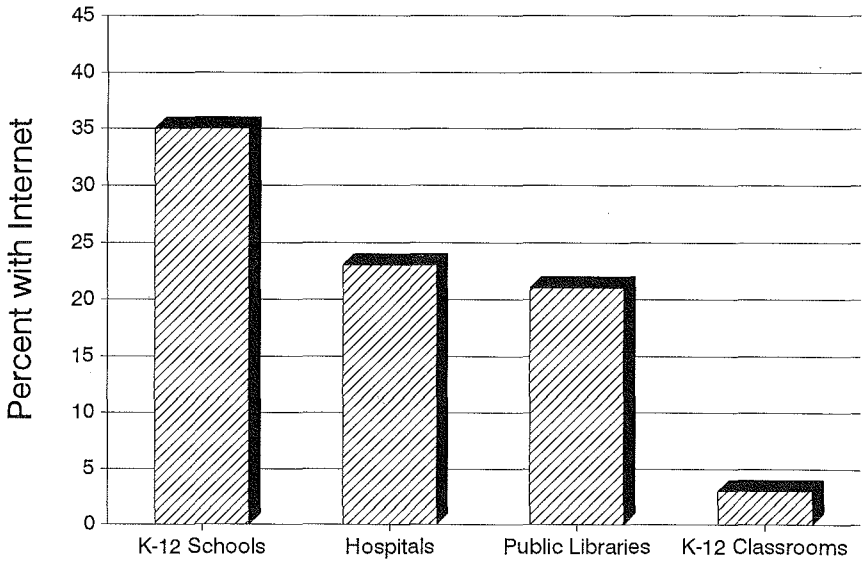
Health Care Organizations. In health care, information technology is also playing an increasingly important role in helping Americans access quality health care and in enabling health care providers to streamline their eligibility determination and billing procedures. A recent study has concluded that America's health care costs can be reduced by more than $36 billion each year by applying selected telecommunications applications nationwide. These cost reductions in the health care industry will flow to patients, employers, and government. Advances in data storage and communications technologies are also improving access to quality health care services through applications such as telemedicine.

Current Status. A review of the status of Internet connectivity at public institutions reveals two important facts. First, these institutions are beginning to use information technology. A foothold has been made. Second, many still remain unconnected, especially those that serve Americans most at risk to become information "have nots."

Specifically, only three percent of K-12 classrooms are connected to the Internet. Recent surveys show that only 21 percent of public libraries are connected, and the vast majority of these connections are in urban areas. Although no data are available concerning the extent of Internet access in clinics, only 23 percent of the Nation's hospitals are connected. These deficiencies are relevant because economic competition in the 21st Century will demand that our public institutions are on the cutting edge in preparing society for the future.

Approximately one-fourth of American households have computers, but computer ownership is highly correlated to family income and education. Thus, public institutions will play a critical role in assuring public access to the economic and social benefits of the Information Age, especially for those who do not have computers at home. This report finds that low-income groups and rural areas tend to have less access to information technology at home and in public schools and libraries.

Figure 1. Internet Access at Public Institutions



Federal Government Role. The Federal Government has a critical role to play in ensuring that public institutions are connected to the NII. The Clinton Administration has created funding programs to assist in the connection of public institutions. Federal Government

support and investment have led to an accelerated pace in connecting public institutions and have stimulated private-sector investment.

One example, which is creating many success stories, is the Telecommunications and Information Infrastructure Assistance Program (TIIAP), administered by the National Telecommunications and Information Administration. The TIIAP is exemplary of how the Federal Government plays a vital role in stimulating private investment and partnerships between public and private entities—two indispensable factors for ensuring that public institutions become and remain active participants in the NII. This program has enabled the Federal Government to leverage $24.4 million in Federal funding to provide a total of $64.4 million for cutting edge demonstration projects for non-profit institutions and state and local governments. Establishing demonstration projects also ensures that there are successful "models" that can be duplicated easily by other public institutions, serving as a catalyst for similar efforts.

The Federal Government is also instrumental in working with the private sector and public institutions to establish a strategic vision for NII development and deployment. A shared vision is important because economies of scale and scope can be captured by aggregating demand. Proactive Federal participation in NII activity also encourages equitable deployment of networks and new communications and information technologies, so that rural and economically distressed communities and low-income and disadvantaged individuals can gain access to the NII.

Highlights

Chapter I of the report reviews the NII initiative and discusses the importance of being connected to the NII.

Chapter II provides an overview of the level of connectivity of U.S. public institutions to the NII.

Chapter III highlights how communities and government are successfully partnering with the private sector to promote the development of public "on-ramps" to the NII, with Federal Government funding serving as a catalyst.

Chapter IV describes NTIA programs and initiatives that are helping to accelerate the connection of public institutions to the NII.

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Introduction

We are moving from an Industrial Age built on gears and sweat to an Information Age demanding skills and learning and flexibility.

President Bill Clinton, January 24, 1995, State of the Union Address.

The Clinton Administration's National Information Infrastructure (NII) initiative strives to connect people to one another and to services and information in new and cutting edge ways. Extraordinary advances in telecommunications and information technology are transforming how we work, learn, and communicate. These advances offer opportunities to improve the Nation's economy, government, and educational and health care delivery systems. Through public and private investment, America's information infrastructure is evolving into an interconnected network of networks, allowing us to share information and to communicate as local, national, and global communities.

But, for many Americans, the opportunity to obtain information, goods, and services easily, and to communicate with others via the NII, will depend on whether advanced telecommunications and information services are widely accessible and affordable. Federal support, therefore, has been targeted to assuring accessibility and affordability, with the aim of preventing us from evolving into a nation of information "haves" and "have nots."

The development of an advanced information and communications infrastructure that serves the needs of the public and private sectors is a priority for the Clinton Administration. The NII initiative was launched in September 1993 by Vice President Albert Gore and Secretary of Commerce Ronald H. Brown with the release of *The National Information Infrastructure: Agenda for Action*.[1] The *Agenda for Action* provides an overall blueprint or vision for leveraging the power of information and communications technology.

Specifically, the *Agenda for Action* presents a flexible policy blueprint for encouraging and stimulating further development of the NII. In keeping with this agenda, the Clinton Administration has proposed nine fundamental principles to guide the initiative:

- promoting private-sector investment;
- extending the "universal service" concept to ensure that information resources are available to all at affordable prices;
- acting as a catalyst to promote technological innovation and new applications;

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1 Information Infrastructure Task Force, *The National Information Infrastructure: Agenda for Action*, September 15, 1993.

- promoting seamless, interactive, user-driven operation of the NII;
- ensuring information security and network reliability;
- improving management of the radio frequency spectrum;
- protecting intellectual property rights;
- coordinating with other levels of government and with other nations; and
- providing access to government information and improving government procurement.[2]

Vice President Gore subsequently articulated five principles which form the basis for the Administration's agenda for telecommunications legislative reform:

- encouraging private investment;
- providing and protecting competition;
- providing open access to the networks;
- avoiding creating information "haves" and "have nots"; and
- encouraging flexibility and responsive government action.[3]

In January 1994, Vice President Gore announced the Administration's commitment to connect every classroom, library, hospital, and clinic in the United States to the NII by the year 2000. Concerned that the United States faces the risk of a widening gap between the information "haves" and "have nots," the Administration seeks to ensure that public institutions can serve as public access sites so that all Americans, regardless of income, location, or disability, can benefit from the NII. The Vice President stated that we "must do this to realize the full potential of information to educate, to save lives, provide access to health care and lower medical costs."[4]

By connecting public institutions to the NII, traditionally unserved and underserved groups, including the poor, ethnic and racial minorities, rural Americans, and disabled individuals, will have greater opportunities to access and benefit from the NII. To accelerate strategic development of the NII and to ensure widespread civic participation, the Administration has created shared-funding programs and has encouraged public-private partnerships. These efforts are described in greater detail in Chapter IV. Strategies that promote and foster public-private partnerships will help make the NII as affordable and ubiquitous as possible.

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2 Information Infrastructure Task Force, *The National Information Infrastructure: Agenda for Action*, op. cit.

3 Vice President Al Gore, Speech at Royce Hall, University of California at Los Angeles, Los Angeles, California, January 11, 1994.

4 Ibid.

Benefits of Connecting to the National Information Infrastructure

The rapid development of communications and information technologies heralds an age of enormous economic and social opportunities. The Information Age has arrived. Powerful and revolutionary technological and economic forces are driving a transformation of our economy and our lives as the rigors of competition increasingly supplant a system of regulated monopolies. The most dominant forces are: 1) technological advances (e.g., digital compression, more powerful computers, and new wireless services); 2) decreasing prices for computers and telecommunications services; and 3) the convergence of information and communications services and technologies.

As information and communication technologies continue to become integral instruments for competing in the global economy, timely access to these technologies and services will be vital for sustaining the competitive advantage of the United States and strengthening U.S. leadership in the electronics and information technology sector. Increasingly, economic success will depend on the ability to leverage technology effectively and strategically for competitive advantage. These forces not only will affect the American economy but also will have far-reaching effects on our ability to attain important social goals.

Economic Benefits

U.S. businesses have begun to recognize the importance of investing in information technologies for gaining competitive advantage. In fact, 1991 was the first year in which U.S. companies invested larger sums on computing and communications equipment than on industrial, mining, farm and construction machines.[5] Today, computers in the work place are common. In 1984, 25 percent of workers used computers on the job; in 1993, 47 percent did.[6]

In 1994, *The Los Angeles Times* reported that telecommunications is now the world's largest economic sector, with a strategic importance that surpasses that of oil or steel.[7] For example, it is estimated by Anderson Consulting that the global telecommunications sector will represent a $1.1 trillion industry by the year 2000. Today the telecommunications and information sectors

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5 Michael J. Mandel, "The Digital Juggernaut," *Business Week*, Special Issue on the Information Revolution, July 12, 1994, p. 23.

6 Wendy Lazarus and Laurie Lipper, "America's Children & the Information Superhighway: A Briefing Book and National Action Agenda," (The Children's Partnership), September 1994.

7 Leslie Helm, "Battling for a Piece of the Global Pie," *Los Angeles Times*, July 26 1994, p. C2.

generate more than $600 billion in annual revenues.[8] The earnings from the U.S. telecommunications sector are more than $172 billion—and that does not include the $26 billion television market, the $25 billion computer software market, the $14 billion-a-year cable television market, or the $13 billion home video market. Estimates and projections vary, but the economic impact of an accelerated deployment of the NII has been estimated to increase U.S. GDP by $194-$321 billion by the year 2007, and increase productivity by 20 to 40 percent.[9]

It is not just telecommunications technology and information services which are adding value to the American economy. Computer and software sales also are contributing to the nation's economic expansion. In 1992, the global market for computer sales (excluding software) totalled $318 billion.[10] In fact, twenty years ago, only 50,000 computers existed in the entire world. Today, more than 50,000 computers are sold every ten hours.[11]

The potential for economic gain will exist for small and large businesses because computers and communications networks are becoming more affordable and easier to use. In addition, businesses are benefiting from the information revolution by using information technology to streamline their inventories, increase productivity and identify new markets. These new markets have already created a positive effect on the national economy, since small businesses are helping to create many of the new jobs in the United States.

Other indications that the transition to an information-intensive economy is underway can be seen in how businesses are using information technologies to provide new services and/or reinvent themselves through telecommuting and electronic commerce initiatives. In 1990 there were an estimated 2 million telecommuters in the United States. That number increased to 7.8 million by 1994. By the year 2001, there will be an estimated 30 million telecommuters. The growth in the use of electronic mail is another example. In 1985, there were only 300,000 registered electronic mail users. In 1993 an estimated 12 million Americans regularly used electronic mail and related on-line services.[12] Today, the number of electronic mail users is estimated to be more than 27 million.[13]

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8 National Telecommunications and Information Administration, Internal Document.

9 Assistant Secretary for Communications and Information Larry Irving, Speech at COMDEX, Las Vegas, Nevada, November 15, 1993. Information based on projections made by the Economic Strategy Institute.

10 Thomas Stewart, "The Information Age," *Fortune*, April 4, 1993.

11 National Telecommunications and Information Administration, Internal Document.

12 J. Eckhouse, "Internet: Millions of Users Plug in to Hug Computer Network," *San Francisco Chronicle*, June 1, 1993, pp. C-1, C-7.

13 Matrix Information and Directory Services, Austin, Texas, October, 1994.

The telecommunications technology sector of the U.S. economy is creating jobs that did not exist twenty years ago. Overall, the revolution in this sector is helping lead the way for new economic opportunities and high-paying jobs for American workers in the 21st Century. One estimate projects 500,000 new jobs in the telecommunications sector by 1995.[14] As computers and advanced telecommunications are now essential tools in the workplace, it will become increasingly important that individuals obtain the necessary training and education to become computer literate and to be able to "navigate" information networks. Economic growth will in many ways depend on whether the Nation's labor force has the necessary education and training to be competitive in the global economy. It is estimated that 60 percent of the new jobs in the year 2010 will require skills possessed by only 22 percent of workers today.[15]

Social Benefits

The NII can facilitate the delivery of tremendous social benefits. With advanced information technology, Americans not only can benefit economically but can enhance the overall quality of life. We can create a government that costs less and is more responsive to public needs. We can improve the delivery of quality health care through technologies that allow rural and remote communities to have access to specialists in urban medical centers. We can and should improve access to education for those in rural, remote, and disadvantaged areas because no child should be deprived of equitable opportunities for education.

The NII offers some valuable "payoffs" for American society. For example, the NII will provide opportunities for distance learning so that children will be able to communicate with teachers and students in other schools, as well as take courses that are not available in their communities. Linking schools to each other and to the Nation's best educational resources will help the United States remain a preeminent economic power by providing American industry with a well-trained labor force. School teachers will find that their job functions will expand, since they will need to become more creative in supplementing their curricula with multimedia technology.

Besides helping to create a computer literate work force, information technology in the classroom can help level the playing field for students of different socio-economic backgrounds and reduce the divide between information "haves" and "have nots." By having access to information in voice, data, full-motion video, and/or multimedia format, students can explore new ways of learning and communicating. Through the NII, students of all ages and backgrounds can access a museum's collection, browse through an electronic library,

14 Council of Economic Advisers, "Economic Benefits of the Administration's Legislative Proposals for Telecommunications," June 14, 1994, Washington, D.C.

15 Elizabeth Corcoran, "High Tech Advocates for Children," *The Washington Post*, October 3, 1994.

communicate with instructors via interactive video, learn another language, or communicate with other students using electronic mail.

Many Americans view their public libraries as a source for accessing and obtaining valuable information and other services. As of 1994, there were 15,312 public libraries in the United States.[16] Accordingly, public libraries can play a vital role in assuring that advanced information services are universally available to all segments of the American population on an equitable basis. Just as libraries have traditionally made available the marvels and imagination of the human mind to all, libraries of the future are planning to allow everyone to participate in the electronic renaissance.

In 1994, the American public spent $1 trillion on health care, nearly 15 percent of the Nation's Gross Domestic Product (GDP). According to the Office of Actuary at the Health Care financing Administration, national health care expenditures have risen by 10.5 percent per year for the past 8 years—more than double the rate of increase in the consumer price index.[17] Capitalizing on opportunities for reducing health care costs will be vital to improving the Nation's economic outlook. Arthur D. Little, Inc. has concluded that "America's health care expenditures can be reduced by more than $36 billion each year by applying selected telecommunications applications nationwide. These cost reductions in the health care industry will flow to patients, employers, and government, who ultimately provide the source of funds."[18]

These social goals depend on ensuring broad availability of access to technology and information across the U.S. By promoting the connection of public institutions to the NII, even those who do not have access through their homes or workplaces can benefit from these advances.

Public Institutions Must Meet the Information Age Challenge

The commitment to provide universal access to the NII is a central element of the Administration's overall NII strategy. During the 1994 State of the Union Address, President Clinton echoed Vice President Gore's challenge to connect the Nation:

> *...the Vice President is right: We must work with the private sector to connect every classroom, every clinic, every library, and every hospital in America to a national information highway by the year 2000. Instant access to information will increase*

16 American Library Directory, 1993-1994 edition, (R.R. Bowker).

17 U.S. Department of Commerce, National Institute of Standards and Technology, *Putting the Information Infrastructure to Work: Report of the Information Infrastructure Task Force Committee on Applications and Technology*, May 1994, p. 43.

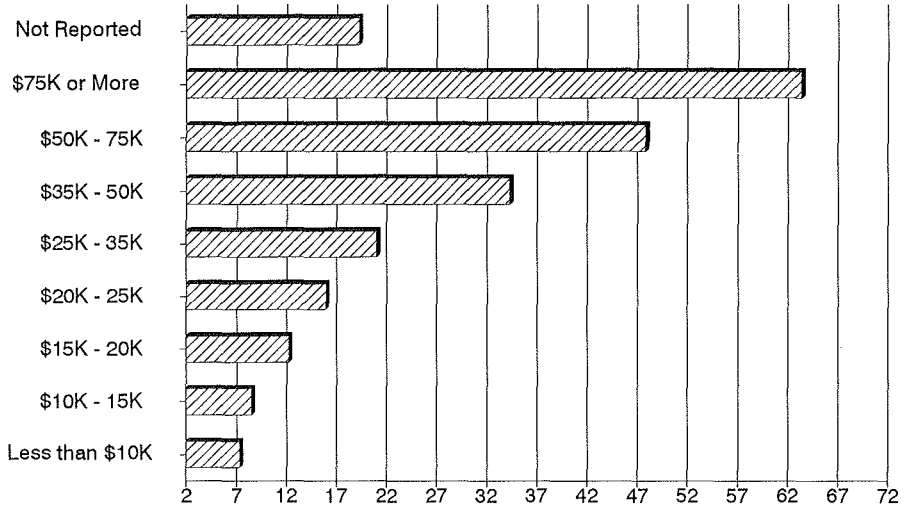
18 Arthur D. Little, Inc., "Telecommunications: Can It Help Solve America's Health Care Problems?" Cambridge, MA, July 1992, p. 2.

productivity, help educate our children, and provide better medical care and create jobs.[19]

In order to achieve this goal, the Administration has created funding programs to assist public institutions (among others) in connecting to the NII. One notable example is the Telecommunications and Information Infrastructure Assistance Program (TIIAP), administered by the National Telecommunications and Information Administration (NTIA) (described in Chapter III).

Connecting public institutions to the NII increases the likelihood that these institutions can provide Americans with the necessary education and training to compete in the 21st Century economy. It will help to ensure that access is not only available to those who can afford to pay, but that communities can provide some minimal access for those who cannot afford to pay.

Figure 2. Computer Households by Family Income



Cource: U.S. Census Bureau

By promoting the connection of public institutions to the NII, even those who do not have access in other ways can benefit from these advances. For example, the U.S. Bureau of the Census compiled information indicating that the presence of home computer technology is highly dependent on the income and educational level of the household. Census reports that 25.5

19 President Bill Clinton, State of the Union Address, January 25, 1994.

percent of U.S. households have one or more personal computers, including systems provided by employers or schools.[20] Public institutions can play an important role in preventing households lacking computers from becoming information "have nots."

Connecting the Nation to the NII will require cooperation and collaboration at all levels of government, with the private sector as a full partner. The transition to a nation connected to the NII will be challenging, because many of the Nation's public institutions are either using obsolete computer technology or lack the funding for establishing communication links to the emerging NII. In fact, when it comes to telecommunications services, schools are among the most impoverished institutions in society.

20 U.S. Department of Commerce, Bureau of the Census, Computer Usage Supplement, (1994).

Status of Connecting the Nation: Public Institutions and the NII

A review of the status of Internet connectivity at public institutions shows that progress is underway. Yet, far too many public institutions, especially schools, lack interconnection with the emerging Information Age. This deficiency is relevant because economic competition in the 21st Century will demand that our nation's educational institutions are on the cutting edge in educating and training American workers. Success has been achieved in many schools, libraries, and health care organizations. Continuing to push forward with the goals of the *Agenda for Action* will bring these opportunities to every American.

There is no single definition of what constitutes connectivity to the NII. The level of access to the Internet, however, may serve as a useful benchmark for determining the extent to which public institutions (i.e., K-12 schools, public libraries, and public and private non-profit hospitals) are connected to the NII as well as each other. Internet connectivity is a valid measure because the Internet is becoming an increasingly important gateway to the NII.

Public Schools (K-12)

The value of having access to advanced telecommunications and information services in America's public schools is clear: the work force of the 21st Century will need to be familiar with information technologies, adept at information gathering, and comfortable with the manipulation and interpretation of data. In order to help prepare and train much of tomorrow's labor force, educational institutions will need to be equipped with information technologies and communications networks that are integral to these processes. Students who do not learn to use computers and information technology in schools will not be competitive in the job market.

Research indicates that, "schools have a long way to go before they can provide what might be called a 'computer-rich environment' for their students."[21] In 1992, U.S. public schools had one computer for every 13 students, and the majority of these systems were not networked. Projections suggest that by late 1995, U.S. schools will have "5.8 million computers for use in instruction—about one for every nine students."[22] Computer networks, especially wide-area networks (WANs), provide the means to access information stored in databases around the world. WANs give students and teachers the opportunity to communicate and access information

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21 Henry Jay Becker, "Analysis and Trends of School Use of New Information Technologies", Contractor Report Prepared for the Congressional Office of Technology Assessment, March 1994. p. 16.

22 United States Congress, Office of Technology Assessment, *Teachers and Technology: Making the Connection*, OTA-EHR-616 (Washington, D.C: U.S. Government Printing Office, April 1995), p.1.

on a vast range of topics on a global basis. This information often contains video and voice that augments the text or data.

When and how computers and networks are deployed in schools is one of the most important questions facing educators today. An equitable distribution of computers and network connections in classrooms will give all children in K-12 schools (regardless of income or geography) an opportunity to learn at an individualized pace suited to their abilities, and access to vast amounts of information from around the world.[23]

Despite improvements in the number of computers and networks deployed in schools, distribution of computers remains uneven throughout the United States. Teachers in affluent and suburban schools are more likely to work in a high-tech environment than teachers in poor and inner-city schools. Overall, "the density of computers in comparison to the number of potential student users remains small .... students attending large schools, Hispanic students, and schools with large minority enrollments are the most disadvantaged in terms of the 'density' of computers (per capita number of computers) at the schools they attend."[24] A recent report by the U.S. General Accounting Office (GAO) concludes that: "Overall, schools in central cities and schools with a 50-percent or more minority population are more likely to have more insufficient technology elements...."[25]

The National Center for Education Statistics recently completed a survey of advanced telecommunications in U.S. public schools (K-12).[26] Some of the noteworthy findings include:

- Overall, 35 percent of public schools have access to the Internet.
- Only three percent of all instructional rooms (classrooms, labs and media centers) in public schools are connected to the Internet.
- Only 40 percent of public schools having computers with telecommunications capabilities indicated that these were located in classrooms. The type of telecommunications systems most often located in classrooms are broadcast television and cable television.

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23 A noteworthy initiative is the newly created National Technology Funding Corporation (NETFC) which is designed to help stimulate private investment in educational technology.

24 Becker, op. cit., Executive Summary.

25 United States General Accounting Office, *School Facilities: America's Schools Not Designed or Equipped for 21st Century*, April 1995, GAO/HEHS-95-95, p. 2.

26 National Center for Education Statistics, "Advanced Telecommunications in U.S. Public Schools, K-12" NCES Study, prepared for the U.S. Department of Education, Office of Educational Research and Improvement, February 1995, Report number NCES 95-731, p. 3. See *Connecting the Nation*, Chapter II, Table 1 and 2.

Table 1. Percentage of public schools having access to selected telecommunications capabilities and the specific location of telecommunications within the school, by capability: 1994

Telecommunication Capabilities	Percent Of Schools Having Access	Percent of Schools Reporting Their Telecommunications Locations				
		Administrative Offices	Teacher Workrooms	Classrooms	Computer Labs	Library/Media Centers
Computer with any telecommunication capabilities (i.e., local area network or wide area network)	75	71	15	40	55	62
Broadcast TV	70	36	31	83	41	84
Cable TV	74	31	24	70	39	85
Closed circuit TV	25	49	31	94	59	89
Two-way video with two-way audio	6	27	14	63	21	61
One-way video with two-way audio or computer link	10	28	14	58	36	67

NOTE: The Percentage of schools reporting telecommunications locations do not total 100 because many schools reported access in more than one location. Location estimates are based on those schools that have access to each type of telecommunications capability.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Survey on Advanced Telecommunications in U.S. Public Schools, K-12," FRSS 51, 1994.

Table 2. Percentage of public schools having access to various types of computer networks: 1994

Type of computer network access	Percentage of schools having access to computer networks
Any type of computer network (i.e., local area network or wide area network)	75
Local area network	26
Wide area network	49
Internet	35
Other wide area networks (e.g., CompuServe, America OnLine, Prodigy)	14

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Survey on Advanced Telecommunications in U.S. Public Schools, K-12," FRSS 51, 1994.

Table 3. Percentage of public schools having access to the Internet and the percent of all instructional rooms across the country with an Internet connection, by school characteristics: 1994

School characteristic	Percent of schools having access to the Internet	Percent of all instructional rooms across the country with Internet access[1]
All public schools	35	3
Instructional level[2]		
Elementary	30	3
Secondary	49	4
Size of enrollment		
Less than 300	30	3
300 to 999	35	3
1,000 or more	58	3
Metropolitan status		
City	40	4
Urban fringe	38	4
Town	29	3
Rural	35	3
Geographic region		
Northeast	34	3
Southeast	29	2
Central	34	3
West	42	5

[1] The percentage of instructional rooms across the country is based upon the total number of instructional rooms (e.g., classrooms, computer labs, library/media centers) in all regular public elementary and secondary schools

[2] Data for combined schools are not reported as a separate instructional level because there were very few in the sample. Data for combined schools are included in the totals and in analyses by other school characteristics.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Fast Response Survey System, "Survey on Advanced Telecommunications in U.S. Public Schools, K-12," FRSS 51, 1994.

- While 75 percent of public schools have access to some kind of computer network, only 49 percent have access to a wide area network—35 percent of public schools have access to the Internet and 14 percent have access to other wide area networks (e.g., CompuServe, America Online, Prodigy).

- Sixty-seven percent of public schools have plans to implement or upgrade to a wide area computer network. Of these, 81 percent indicate that their telecommunications plans are part of a district-level plan, 27 percent are part of a state plan, and 19 percent are part of a regional plan.

- Smaller schools with enrollments of less than 300 students are less likely to be on the Internet than schools with larger enrollments. Only 30 percent of small schools reported having Internet access, while 58 percent of schools with enrollments of 1,000 or more reported having Internet access.

- Only 30 percent of public elementary schools have Internet access, compared with 49 percent for secondary schools.

The Administration and the States are working to forge cooperative ventures with the private sector for accelerating the pace of connecting schools to the NII. By establishing policies that provide incentives for creating public-private partnerships, the likelihood of a successful transition in which all public institutions get connected will be greater. Providing schools with computers and advanced telecommunications will facilitate distance learning, Internet access, and multimedia educational services in the classroom.[27] In addition to providing funding and training, ensuring equitable access to the NII for educational institutions will ultimately be reflected in higher productivity, economic growth, and an enhanced standard of living for Americans.

Public Libraries

Today, 21 percent of the public libraries in the U.S. have Internet access. In addition, only 12.7 percent of those libraries with Internet access provide their patrons with public access computer/kiosk terminals.[28] Moreover, the deployment of information technology and communications networks in public libraries is not evenly distributed in terms of geography (i.e.,

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27 Since roughly two-thirds of K-12 institutions report having computers with some telecommunications capabilities in their media centers/libraries, a viable approach is to provide all public K-12 schools with networked computers (including Internet) via their media centers. Ensuring full connectivity of media centers located in schools could serve as an interim strategy until the goal of connecting every classroom to the NII is accomplished.

28 Charles R. McClure, John Carlo Berlot, and Douglas L. Zweizig, "Public Libraries and the Internet: Study Results, Policy Issues, and Recommendations," prepared for the National Commission on Libraries and Information Sciences, Washington, DC., June 1994. p. 17.

urban versus rural communities). According to the National Commission on Libraries and Information Science, 78.9 percent of urban public libraries have Internet access, while only 16.8 percent of public libraries in rural areas have Internet access.[29]

A comprehensive survey of public libraries in the U.S., commissioned by the National Commission on Libraries and Information Sciences, resulted in some important findings regarding library access to the NII. Some of those key findings include:

- public library access to the Internet is not equitable,
- public libraries serving larger communities are more likely to have access to Internet than public libraries serving smaller communities,
- there are regional variations in public library Internet connectivity,
- few public libraries offer direct access to the Internet,
- public libraries are using Internet services to
  - procure answers to reference inquiries
  - access Federal information resources
  - perform interlibrary loan transactions, and
- Federal assistance for connecting public libraries to the Internet is required.

Many of the cost-saving strategies employed by States for K-12 institutions (e.g., aggregating demand for services and hardware, and leveraging state owned/operated networks) are applicable for accelerating Internet access for public libraries. Statewide initiatives for connecting public libraries to the Internet (especially rural libraries) have been instrumental in stimulating interest by libraries, generating funding, and fostering partnership building. States such as Iowa, Maryland, New York, and North Carolina are involved in establishing Federal-State partnerships for connecting libraries to the NII. Federal Government involvement in this area could help aggregate demand, on a national level, for services and hardware, thus introducing economies of scale and scope that help reduce costs.

It may be possible to accelerate the rate at which libraries are connected to the NII by establishing connections provided by a local free-net or community network. Currently, only 5.7 percent of public libraries have network connections provided by a local free-net or community net. The National Commission on Libraries and Information Science observed that community networks, civic networks, and free-nets are all types of electronic networks that "improve access

29 McClure et al., op. cit., p. 18.

to information of all kinds to the general public, or to targeted members of the local community who are traditionally underserved. Civic network programming can provide access to the Internet, job rosters, community listings, educational resources, health information, and government databases."[30]

The National Commission on Libraries and Information Science report also pointed out that the most important barriers to acquisition or use of advanced telecommunications in public libraries are: 1) the cost of telecommunications links for rural libraries; and 2) the fact that librarians and administrators tend to lack knowledge of the Internet.[31]

Hospitals and the Health Care Industry

The NII holds promise for helping to restructure and enhance America's health care delivery and administrative system. The Clinton Administration's Committee on Applications and Technology of the Information Infrastructure Task Force (IITF) notes that:

> *Implementation of wide-area, comprehensive, integrated, networked information systems is a logical response to the challenges faced by the nation's health care delivery system. These challenges arise from several sources: dissatisfaction over rising health expenditures, in both private and public health care programs, concern over the personal health security issues of access and continuity of insurance coverage, and serious questions about the uneven quality and appropriateness of health care. These challenges are driving the health care system to a cost-conscious, competitive, market-based, managed care environment. In such an environment, information systems linked to the NII are destined to play a central role.*[32]

Information technology is playing an increasingly important role in helping health care providers streamline their eligibility determination and billing procedures. For example, Arthur D. Little Inc. has concluded that "America's health care can be reduced by more than $36 billion each year by applying selected telecommunications applications nationwide. These cost reductions in the health care industry will flow to patients, employers, and government, who ultimately provide the source of funds."[33]

In addition to capturing efficiencies in helping to determine patient eligibility and in streamlining billing procedures, advances in data storage and communications technologies are improving

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30 McClure et al., op. cit., p. 7.

31 McClure et al., op. cit., p. 8.

32 U.S. Department of Commerce, National Institute of Standards and Technology, op. cit., p. 41.

33 Arthur D. Little Inc., op. cit., p. 2.

access to quality health care services through applications such as telemedicine. Telemedicine generally refers to the use of telecommunications and medical technologies to provide live interactive audiovisual communication between physician and patient or between physician and practitioner in distant locations, or to facilitate the exchange of medical information for research and educational purposes.

Although there is no quantitative research to date about the status of connecting clinics to the NII, there are some benchmarks available for hospitals.

- There are a total of 6,467 hospitals in the United States. The National Library of Medicine (NLM) estimates that there are over 4,000 medical libraries located at hospital or academic/research institutions throughout the Nation. About 2,000 of the medical libraries are in hospitals and another 2,000 are located at academic and research institutions. The NLM reports that approximately 24 percent of hospital libraries and 72 percent of medical research/academic libraries have Internet connections.[34]
- Because the majority of medical libraries are accessible by Internet, an electronic connection to these institutions can provide a wealth of information to health care organizations and practitioners. Many medical libraries employ the Medical Literature Analysis and Retrieval System (MEDLARS) on-line information system. MEDLARS reports that roughly 20 percent of all MEDLARS searches are conducted over the Internet.

As an example of how information technology is helping to improve the provision of quality health care, physicians are increasingly turning to on-line medical databases to diagnose difficult cases and track new medical developments. A study of more than 450 Medline searches found that this service helped doctors in saving lives and curing ailments, avoiding unnecessary procedures and assisting patients in disputes with insurance companies. Another report found on-line searches led to significantly lower costs and shorter hospital stays. Currently, only about 20 percent of practicing doctors are on-line.[35]

Summary

Despite the progress that has been made in connecting schools, libraries, and health care organizations to the Internet, there is much work to do before all of these public institutions are connected. Overall, the status of Internet access at public institutions is:

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34 This is based on a survey conducted by the National Library of Medicine which polled over 1,000 medical institutions in 1994.

35 *Wall Street Journal*, "On Line: More Doctors are Adding On-Line Tools to their Kits," October 7, 1994. p. B1.

- 35 percent of K-12 public schools,
- 3 percent of K-12 public school classrooms,
- 22 percent of hospitals, and
- 21 percent of public libraries.

Research on Internet access shows that less affluent areas, such as rural and minority communities, exhibit slow growth when it comes to Internet access. According to the National Commission on Libraries and Information Science, 78.9 percent of urban public libraries have Internet access, while only 16.8 percent of public libraries in rural areas have Internet access.[36]

Many public schools are also struggling when it comes to implementing information technology. A review of the status of Internet connectivity at public institutions, as well as the accomplishments of public and private programs to accelerate NII development, shows that progress is underway. Yet, far too many public institutions, especially schools, lack interconnection with the emerging information age. Overall, public schools in central cities and schools with a 50-percent or more minority population are more likely to have more insufficient technology elements.[37]

36 McClure et al., op. cit., p. 18.

37 United States General Accounting Office, *School Facilities: America's Schools Not Designed or Equipped for 21st Century*, op. cit., p. 2.

NII Partnerships

An interconnection of computer networks, telecommunication services and applications, the National Information Infrastructure can open up new vistas and profoundly change much of America's life, not by the fact that it exists but by the way it is used.

Ronald H. Brown, U.S. Secretary of Commerce

Connecting public institutions to the NII requires cooperation within the public sector and collaboration with the private sector. The formation of strategic partnerships among public entities and the private sector is an integral part of the Administration's overall NII strategy. Although the NII will be built, owned, and operated by the private sector, the Federal Government has a role in facilitating the transition to the Information Age. By stimulating public-private partnerships, the Federal Government can increase the public benefit from investments in infrastructure development, such as telemedicine, electronic libraries, and distance learning.

At the Department of Commerce, the NTIA's Telecommunications and Information Infrastructure Assistance Program (TIIAP) provides a partnering model that accelerates NII investment by leveraging private investments with limited Federal dollars. TIIAP supports NII planning activities and demonstration projects at the grassroots level throughout the Nation. Thus far, the TIIAP initiative has leveraged public investments and created a strong multiplier effect (i.e., for every dollar the Federal Government invested in the 1994 TIIAP grants, the project partners provided an additional $1.60 of matching funding). In October 1994, TIIAP provided $24.4 million for 92 grants in 45 States and the District of Columbia to plan, test, and/or stimulate NII activities by non-profit institutions (i.e., school districts, public libraries, state/local governments, and others). The leveraging effects of the 1994 TIIAP awards resulted in a total investment in public infrastructure of $64.4 million ($24.4 million in TIIAP funds and $40 million in matching funds).

Moreover, by directing funding towards demonstration projects and planning efforts, particularly in disadvantaged areas, TIIAP ensures that there are successful "models" that can be duplicated easily by other public institutions. These models can then serve as a catalyst for similar efforts, thereby leveraging the initial Federal funding even further. The success of these initial public-private partnerships also demonstrates that private matching funds can be generated even in low-income, rural, and other disadvantaged areas.

Examples of partnerships designed to foster NII development demonstrate that, with shared commitment to NII development, the Nation as a whole can benefit. In urban as well as rural areas, public entities and the private sector are teaming up to upgrade the information infrastructure. The range of applications being explored through public-private partnerships is extensive, ranging from law enforcement to education to delivery of government services.

They each demonstrate how Federal funding can stimulate innovation and opportunity, especially for low-income, rural, and disabled Americans. The following examples demonstrate how Federal Government funding is serving as a catalyst in promoting public-private partnerships to ensure that public institutions are connected to the NII.

Public and Private Partnerships for Education

- Education in the State of Alaska. The University of Alaska, the State of Alaska, the K-12 education system, public broadcasting, the library community, and the community at large will integrate diverse networks which will result in 81 percent of the population of Alaska having non-toll access to a combined education/government/library network. The University will determine approaches to K-12 access using direct connection in some cases and/or dial up access to leased lines or frame relay systems of the University and State government. The Fairbanks Northstar Borough School District will be the direct access site and the Sitka area is applying for a separate planning grant to develop regional access. The project will also connect community networks in Anchorage, Fairbanks, and Juneau, and will integrate the University ITV system with public broadcasting facilities for cost effective delivery of distance education. Private-sector funding is provided by Alascom. TIIAP Funds Awarded: $612,506. Total Project Cost: $1,608,583.

- Schools in Siskiyou County, California. The Siskiyou County Office of Education in Yreka, California, will extend their present network service to the 29 area school districts. This process will begin with the creation of SISnet, with a TCP/IP connection to each school in the system. Pacific Bell will contribute 46 ISDN lines for this effort. The second step will be a connection to the California State University network (CSUnet) for full Internet access. Upon completion, the network will provide Internet, audio-visual, library, e-mail, health, and business support services to this predominantly rural area. The project is receiving private-sector funding from Pacific Bell and Gandalt Company. TIIAP Funds Awarded: $120,000. Total Project Cost: $359,735.

- Port Hueneme, California, School District. The Hueneme School District of Port Hueneme, California, will act as the hub connection for three community schools who will participate in a national high quality video distribution test. The system demonstration includes three components: distance instruction/teleconferencing, video on demand and delivery of interactive multimedia courses. The project will test the use of fractal compression technology to deliver high quality interactive video signals over long distance using existing low band-width (ISDN) telecommunications infrastructure, supplied by MCI. The other school districts participating in this test are Savannah-Chathan School District in Savannah, Georgia and the Berryessa Union School District

in San Jose, California. MCI and Total Multi Media Inc., are proving matching funds. TIIAP Funds Awarded: $60,000. Total Project Cost: $445,759.

- Jefferson County, Kentucky School District. Jefferson County Public School District will design the infrastructure necessary to link its 96,000 students, 11,000 employees and 170 sites to the larger national information infrastructure. The plan will also take into consideration the development of the Kentucky Education Technology System (KETS), a major statewide initiative to establish high performance linkages among educational institutions in the state. Local telephone and cable companies are providing private-sector funding. TIIAP Funds Awarded: $10,695. Total Project Cost: $58,893.

- St. Joseph, Missouri School District The St. Joseph Missouri School District will act as the lead agency in the development of a seamless, multi-user, fiber optic, metropolitan network. Through a partnership with the local cable company, all 30 public school sites in Buchanan County will be connected to local and national resources via lines dedicated for educational use. This single effort by the local school board will connect all educational institutions to the larger network and will create local area networks (LAN) connecting each classroom in the system. Private-sector funding is provided by St. Joseph Cablevision. TIIAP Funds Awarded: $262,250. Total Project Cost: $5,447,250.

- Hall, Montana School District Hall Elementary School District No. 8, in rural southwest Montana, will install the town's first Internet connection in their school building. This connection will provide the 25 students and 95 residents of the town with access to Montana statewide information services as well as national resources. Connection facilities will be placed in the two room school building and will be available to all residents. The Blackfoot Telephone Cooperative is providing private-sector funding. TIIAP Funds Awarded: $3,000. Total Project Cost: $6,881.

- Green Valley High School, Henderson, Nevada Green Valley High School in Henderson, Nevada, a suburb of Las Vegas, will install a fiber optic local area network (LAN) in their building to interconnect the library, classrooms and computer laboratories. The LAN will then be connected by the InterAct project to the Internet. The project will provide network access for 3,300 students and 135 professional staff members. The first National Bank of Nevada is providing private-sector funds. TIIAP Funds Awarded: $40,000. Total Project Cost: $85,800.

- Carnegie Mellon School Project. Carnegie Mellon's MPC Corporation proposes further expansion of activities in four schools that are a part of the National Science Foundation's testbeds for school networking—two elementary schools, a middle school, and a high school—with emphasis on the study of foreign languages. With support from DEC and Tele-Communications, Incorporated, the four schools, a community center, and the Carnegie Library will be connected to the Pittsburgh Supercomputing Center

using DEC's Channel Works ethernet over CATV technology, which will provide a 10 Mbps connection to the Internet via the center. The project will examine this technology as a potential model for school interconnects in urban settings. Private-sector funding is provided by Digital Equipment Corporation and TCI of Pennsylvania. TIIAP Funds Awarded: $551,094. Total Project Cost: $1,102,572.

Partnerships for Connecting Public Libraries

The library community has been active in seeking to ensure that libraries have access to the Internet and the emerging NII. Like schools, many libraries are attempting to make information and communications technology an integral part of their mission in serving the community. Libraries are working to form alliances and attract private-sector financing for a number of projects that require technology and technical support, and Federal funding is an important catalyst in this effort.

- The San Francisco Connection Library Project. The San Francisco Connection is a TIIAP-funded Project that facilitates the San Francisco Public Library in spearheading a project to enhance the delivery of social services, including education, culture, and health care. The entire Human Services cluster of City Departments will participate in building the database and information infrastructure. Non-profit partners include KQED-TV (Learning Link), KALW-FM, San Francisco State University, and the Whole Earth 'Lectronic Link (WELL). Pacific Bell is the private-sector partner. TIIAP Funds awarded: $425,000. Total Project Cost: $1,289,474.

- Charlotte's Web, North Carolina. Charlotte's Web network, in the Charlotte-Gastonia-Rock Hill (SC) area, provides citizens and school children with access to information resources. Coalition members include the Library of Charlotte and Mecklenburg County; Charlotte-Mecklenburg Schools; Central Piedmont Community College; WTVI-TV; the University of North Carolina; Southern Bell; Time Warner Cable; and Vision Cable. Initially, 114 public access terminals will be located in libraries, neighborhood and senior centers, shelters, health care facilities, classrooms, and school libraries. Extensive computer literacy training will be provided, and the system will be linked to the North Carolina Information Highway, a fiber network connecting rural and urban areas with broadband data and video. The system will employ switched multi-megabit data service (SMDS), Unix servers, Very Small Aperture Terminal (VSAT) technology, and expanded interactive video using ATM. Private-sector partners are, Time Warner, Southern Bell, and Vision Cable. TIIAP Funds Awarded: $450,000. Total Project Cost: $1,240,000.

- Information Infrastructure Project, Newark, New Jersey. The Newark Electronic Information Infrastructure Demonstration Project will purchase and install advanced

telecommunications equipment in five locations and provide specialized electronic information and communication resources. The project is designed as a component of ewark's Empowerment Zone plan, and targets 55,213 residents, businesses and entrepreneurs, community-based organizations, and children and students who live, work, or attend school in the 27 Empowerment Zone tracts. Secondary beneficiaries will be the balance of the city's 275,000 residents. The basis of the system is a Hewlett-Packard Model 800G Unix-based mainframe, Dell file servers, a local network operating from a Sun SPARC station, public access workstations, and a wide area network connecting the Central Library, a branch library, and City Hall to Bell Atlantic's fiber optic ring serving the City of Newark. TIIAP Funds Awarded: $550,000. Total Project Cost: $1,429,770

- Danbury, Connecticut Public Library. The Danbury Public Library serves 187,000 users in the Connecticut Housatonic Valley. The grant project will support planning for a community FreeNet that would enhance delivery of civic, consumer, social, and business services, and provide Internet access and worldwide electronic messaging. The project would develop a model FreeNet planning process for the state of Connecticut and establish a pool of experienced individuals who can share their expertise with future FreeNet ventures. The planning process would identify networks and systems currently available, determine the feasibility of incorporating existing infrastructure into the FreeNet, and address questions of access and future capacity. Private funding is provided by General Data Communications. TIIAP Funds Awarded: $16,000. Total Project Cost: $33,220.

- Southeastern Library Network. The Southeastern Library Network (SOLINET) is planning to develop regional strategies for information distribution and access, using the Monticello Electronic Library Project as the basis for a Public Information Project; an Unlocking University Information Initiative (dealing with university and scholarly publication); and the Southeastern Special Collections Access (SESCA) project. The objectives of each component are: (1) to build consensus regarding information access and distribution issues and strategies among universities, colleges, educators, state legislative and governors' offices, state agencies, state telecommunications directors, state archives/libraries, and the general citizenry; and (2) to evaluate potential demonstration and production projects. Cox Cable and the Atlanta Journal-Constitution are providing private-sector funding. TIIAP Funds Awarded: $470,400. Total Project Cost: $966,792.

Telemedicine and Health Care Organizations on the NII

Today, telecommunications networks are being developed to expedite health care delivery. As a result, medical specialists around the country will be able to communicate easily, and

standardized medical information and insurance data will be more readily available. Most important, geography will no longer be a barrier to medical treatment.

Most states have instituted telemedicine applications and a number of states have initiated state-wide telemedicine networks which link hospitals with rural areas.[38] Public-private partnerships, such as those stimulated by TIIAP, are helping to ensure that rural and remote communities have access to quality health care via telecommunications.

The following TIIAP projects are some examples of how public-private partnerships are bringing the benefits of the NII to the health care community. Some notable examples which are benefiting from Federal funding are:

- Community Health Information Network, Boise, Idaho. The Boise State University Center of Health Policy has begun to plan for a Community Health Information Network (CHIN) that would serve the Magic Valley region of southern Idaho and northern Nevada. The CHIN would integrate and automate the clinical functions of six hospitals, 200 physicians in their offices, Public Health, and other ancillary health care professionals. Among the services envisioned for the CHIN are electronic capture of patient encounter information, integration of the clinical information systems of all providers, expert system software to provide alerts and reminders to care providers, and incorporation of telemedicine technologies to serve remote, underserved areas. Private-sector funding is provided by Cerner Corporation of Kansas City, Missouri. TIIAP Funds Awarded: $136,284. Total Project Cost: $272,568.

- Telemedicine in North Carolina. The State of North Carolina is linking emergency departments at each of the State's four medical centers affiliated with medical schools (Bowman Gray, Duke University, East Carolina University, and the University of North Carolina Schools of Medicine) with five remote site hospital emergency departments, including one military base hospital emergency department, to provide teleconsultations (including general trauma consults, as well as teleradiology consults, such as x-rays and CT scans) during emergency situations. The project will utilize the broadband, ATM/SONET-based North Carolina Information Highway to connect the sites. Private-sector funding is provided by Bell South, GTE, Southern Bell, and Carolina Sprint. TIIAP Funds Awarded: $550,000. Total Project Cost: $2,393,140.

- Columbia-Presbyterian Medical Center, New York, New York. Columbia-Presbyterian Medical Center, the New York City Department of Health, and the Visiting Nurse Services of New York City will collaborate to develop and demonstrate an information infrastructure to provide coordinated care to tuberculosis (TB) patients in the home, in

38 According to the Center for Public Service Communications, there are over seventy projects in thirty-nine states. See *Telemedicine and Information Technologies in Health Care Project Tracking Document*, Center for Public Service Communications (1994).

doctors' offices, and in the hospital. The project will use automated decision-support systems, networks, interactive wireless hand-held computers, and natural language processing technology to coordinate the many providers of care for TB patients, ensure that appropriate TB protocols are followed, develop an infrastructure that could be used in the treatment of other diseases, and demonstrate how electronic medical records can meet high standards of privacy and confidentiality. Private-sector funding is provided by IBM, NYNEX, and PI Systems. TIIAP Funds Awarded: $733,424. Total Project Cost: $2,576,521.

- University of Cincinnati Medical Center. Working with its partners, the University of Cincinnati Medical Center is improving access to health information to citizens of the Ohio Valley. Information on prescription drugs, diseases, wellness and general health, alternative therapies, insurance, and physician referrals will be made available using the Internet, regional online service providers, and other channels. Anyone with a home computer in the tri-state region will have access to the information, which will also be made available at public workstations. These public workstations will be placed in public libraries, health clinics, hospital waiting rooms, and pharmacies. Private-sector funding is provided by Apple Computer, Hopkins Technology, Info Access Company, Quanta Press, Walgreens Pharmacies, and several local television stations. TIIAP Funds Awarded: $375,000. Total Project Cost: $861,042.

NTIA Programs and Initiatives

The National Telecommunications and Information Administration (NTIA)[39] funds telecommunications infrastructure planning, development, and applications in a number of important areas (e.g., education, health care delivery and administration, public safety, community development, and access to government information). These projects emphasize the use of information and communications technologies for addressing the information and service delivery needs of public and non-profit institutions.

Telecommunications and Information Infrastructure Assistance Program (TIIAP)

NTIA administers the Telecommunications and Information Infrastructure Assistance Program (TIIAP). TIIAP was created in 1994 and is a competitive, merit-based grant program that seeks to accelerate the planning, development, and implementation of NII applications at the state and local levels. TIIAP provides matching funds (up to 50 percent of total project cost) to state and local governments; school districts; hospitals, colleges and universities; public libraries; and other community-based, non-profit groups. TIIAP grant funding for FY94 totalled $24.4 million. Total investment as a result of the matching funds requirement totalled almost $64.4 million. The multiplier investment effect of the TIIAP is an example of the type of cost sharing arrangements that can assist public institutions in gaining access to the NII.

The TIIAP initiative includes an evaluation component that requires a review of a number of pilot projects for their effectiveness. Those projects that are determined to be of top quality can be leveraged in order to create projects that are scalable to a regional or national level. The knowledge base that results from the program will be one of its most valuable products.

Public Telecommunications Facilities Program (PTFP)

Administered by NTIA, the Public Telecommunications Facilities Program (PTFP) is instrumental in assisting rural and remote communities in gaining access to public broadcasting and distance learning services and technologies.

In 1994, NTIA awarded 29 distance learning grants through the PTFP totaling $6.4 million. One example of a distance learning grant was an award of $600,000 to help the University of Maine construct a statewide distance learning channel that will offer bachelor's and master's degree programs to residents unable to regularly attend college in the traditional classroom setting.

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39 NTIA serves as the principal advisor to the President on domestic and international communications and information policy issues.

Other PTFP grants for educational services and technologies include:

- The Massachusetts Corporation for Educational Telecommunications (MCET) has received PTFP and matching funds for planning and technology applications. In 1993, PTFP awarded funds to MCET to conduct a feasibility test of interactive telecommunications through an interconnection system to educational institutions, libraries, government agencies, prisons, hospitals, and other organizations statewide and beyond. The proposed network could potentially incorporate many forms of technology including satellite systems, Instructional Television Fixed Service, cable television and fiber optic lines for multiple channels of distribution.

- In 1993 and 1992, PTFP awarded funds to the Satellite Education Resources Consortium (SERC). SERC is a Star-Schools based initiative that uses communications technologies to deliver distance learning courses. PTFP funds and matching funds allow SERC to purchase 185 receive-only, C and Ku-band steerable satellite earth terminals for predominately small, rural secondary schools in florida, Georgia, Michigan, Mississippi, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Texas, West Virginia, and Wisconsin.

- Agricultural Satellite Corporation (AGSAT) is a non-profit organization composed of Land Grant colleges and universities that provide agricultural courses and agricultural extension programs nationally by installing two Ku-band satellite uplinks in Arkansas and New Hampshire. PTFP funding and matching funds are being used by AGSAT to construct 43 Ku/C band satellite downlinks to be selected from sites in the following states: Colorado, Delaware, florida, Illinois, Indiana, Maine, Mississippi, Nebraska, Nevada, New Hampshire, North Carolina, Pennsylvania, South Carolina, Tennessee, and West Virginia.

- The National Technological University (NTU) is a satellite network that provides information to small and medium manufacturing establishments on improving manufacturing competitiveness as part of the Manufacturing Extension Partnership initiative which PTFP supports through a merit-based grant requiring matching funds. PTFP and matching funds were also awarded to NTU in 1993 to expand the services of NTU by adding five channels of compressed digital video programming for distribution by Ku-band satellite. The equipment will permit the establishment of "on-demand" delivery of instructional programming to students at their place of work.

PEACESAT

Through the PEACESAT program, NTIA supports the distribution of public service satellite communications to the U.S. affiliated territories and small island nations within the Pacific Ocean.

The PEACESAT project was formed in 1971 when the University of Hawaii established an experimental satellite system on NASA's ATS-1 satellite to connect the small island nations of the Pacific. PEACESAT continued to use the NASA satellite until 1985, when the satellite finally ran out of station-keeping fuel and it began to drift out of the Pacific. In 1988, the Congress directed that NTIA restore the PEACESAT service. Using a National Oceanic and Atmospheric Administration (NOAA) satellite, NTIA reestablished the PEACESAT service in 1990.

Today, the PEACESAT project provides noncommercial, educational, medical, environmental and emergency communications services to twenty Pacific Island nations and territories.

The PEACESAT program operates through the cooperative efforts of NTIA, the University of Hawaii, Federal agencies such as NOAA and the National Aeronautics and Space Administration (NASA), and educational institutions in the Pacific Islands.

NTIA awards funds to the University of Hawaii for support of the operations of the PEACESAT headquarters in Honolulu and includes funding for equipment to bring the PEACESAT system into the age of digital communications. NOAA and NASA cooperate in the operation of the GOES satellite which provides the backbone of the PEACESAT satellite service.

In each of the participating Pacific Islands, a PEACESAT earth terminal provides local organizations with a communications link to the world. The earth terminals are located at colleges or other educational or governmental institutions and provide access to Internet, voice exchanges between the Pacific islands, and access to resources in the United States and the rest of the world. The PEACESAT terminals are community resource centers which have not only encouraged the development of partnerships in each island, but have strengthened partnerships between organizations in different islands and in different countries.

The project provides an efficient way for U.S. agencies, such as the Departments of the Interior, Agriculture and Education, the Public Health Service and the Federal Emergency Management Agency, to deliver their services to these isolated island regions.

Conclusion

Connecting public institutions to the NII increases the likelihood that these institutions can provide Americans with the necessary education and training to compete in the 21st Century economy. It will help to ensure that access is not only available to those who can afford to pay, but that communities can provide some minimal access for those who cannot afford to pay.

A review of the status of Internet connectivity at public institutions reveals two important facts. First, these institutions are beginning to use information technology. A foothold has been made. Second, many still remain unconnected, especially those that serve Americans most at risk to become information "have nots."

Approximately one-fourth of American households have computers, but computer ownership is highly correlated to family income and education. Thus, public institutions will play a critical role in assuring public access to the economic and social benefits of the Information Age, especially for those and do not have computers at home. This report finds that low-income groups and rural areas tend to have less access to information technology at home and in public schools and libraries.

The Federal Government has a critical role to play in ensuring that public institutions are connected to the NII. The Clinton Administration has created funding programs to assist in the connection of public institutions. Federal Government support and investment have led to an accelerated pace in connecting public institutions and have stimulated private-sector investment.

The Federal Government is also instrumental in working with the private-sector and public institutions to establish a strategic vision for NII development and deployment. A shared vision is important because economies of scale and scope can be captured by aggregating demand. Proactive Federal participation in NII activity encourages equitable deployment of networks and new communications and information technologies, so that rural and economically distressed communities and low-income and disadvantaged individuals can gain access to the NII.

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